COWAL GOLD OPERATIONS

2021 ANNUAL REVIEW

Evolution
MINING
Cowal

COWAL GOLD OPERATIONS
2021 Annual Review

Name of Operation	*Cowal Gold Operations*
Name of Operator	*Evolution Mining (Cowal) Pty Limited*
Development Consent	*DA 14/98 and SSD 10367*
Name of Holder of Development Consent	*Evolution Mining (Cowal) Pty Limited*
Mining Lease #	*ML 1535*
Name of Holder of Mining Lease	*Evolution Mining (Cowal) Pty Limited*
Mining Lease #	*ML 1791*
Name of Holder of Mining Lease	*Evolution Mining (Cowal) Pty Limited*
Environmental Protection Licence #	*EPL11912*
Name of Holder of EPL	*Evolution Mining (Cowal) Pty Limited*
Water Licence #	*WAL 36569, WAL 31864, WAL 36615, WAL 36617, WAL 13749, WAL 14981, WAL 13748, WAL 13748, WAL 31568, WAL 31563, WAL 42993*
Name of Holder of Water Licences	*Evolution Mining (Cowal) Pty Limited*
MOP Start Date	*1 October 2021*
MOP End Date	*2 July 2022*
Annual Review Start Date	*1 January 2021*
Annual Review End Date	*31 December 2021*

I, John Penhall, certify that this audit report is a true and accurate record of the compliance status of the Cowal Gold Operations for the period 1 January – 31 December 2021 and that I am authorised to make this statement on behalf of Evolution Mining (Cowal) Pty Limited.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of Authorised Reporting Officer	*John Penhall*
Title of Authorised Reporting Officer	*General Manager*
Signature of Authorised Reporting Officer	
Date	*31 March 2022*

Prepared by	
Name	**Tammy Rawson**
Title	**Snr Environmental Advisor**
Date	**31 March 2022**
Signature	
Reviewed by	
Name	**Simon Coates**
Title	**Environmental Superintendent**
Date	**31 March 2022**
Signature	

Document #	COW.400.05.6010SC
Issued to	**Steve O'Donoghue – Department of Planning, Industry and Environment**
Date	**31 March 2022**

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1 STATEMENT OF COMPLIANCE

The compliance status of the Cowal Gold Operations (CGO) with its relevant approval conditions at the end of the reporting period (31 December 2021) is provided in Table 1.

There was one incident during the reporting which exceeded limits in the DA 14/98 and EPL 11912. This incident is covered in detail in section 6.6.

Table 1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Development Consent DA 14/98	No
State Significant Development 10367	YES
Environmental Protection Licence (EPL) 11912	No
Mining Lease (ML) 1535	YES
Mining Lease (ML) 1791	YES

2 INTRODUCTION

The 2021 Annual Review (AR) has been prepared by Evolution Mining (Cowal) Pty Limited (Evolution) for the CGO in accordance with the requirements of Condition 9.1(b) of the development consent (DA 14/98) for the CGO and condition C9 of State significant Development 10367. This document also satisfies the requirements for Condition 26 of the Conditions of Authority for ML 1535. This AR is also consistent with the New South Wales (NSW) Government's (2015) Annual Review Guideline – Post-approval Requirements for State Significant Mining Developments.

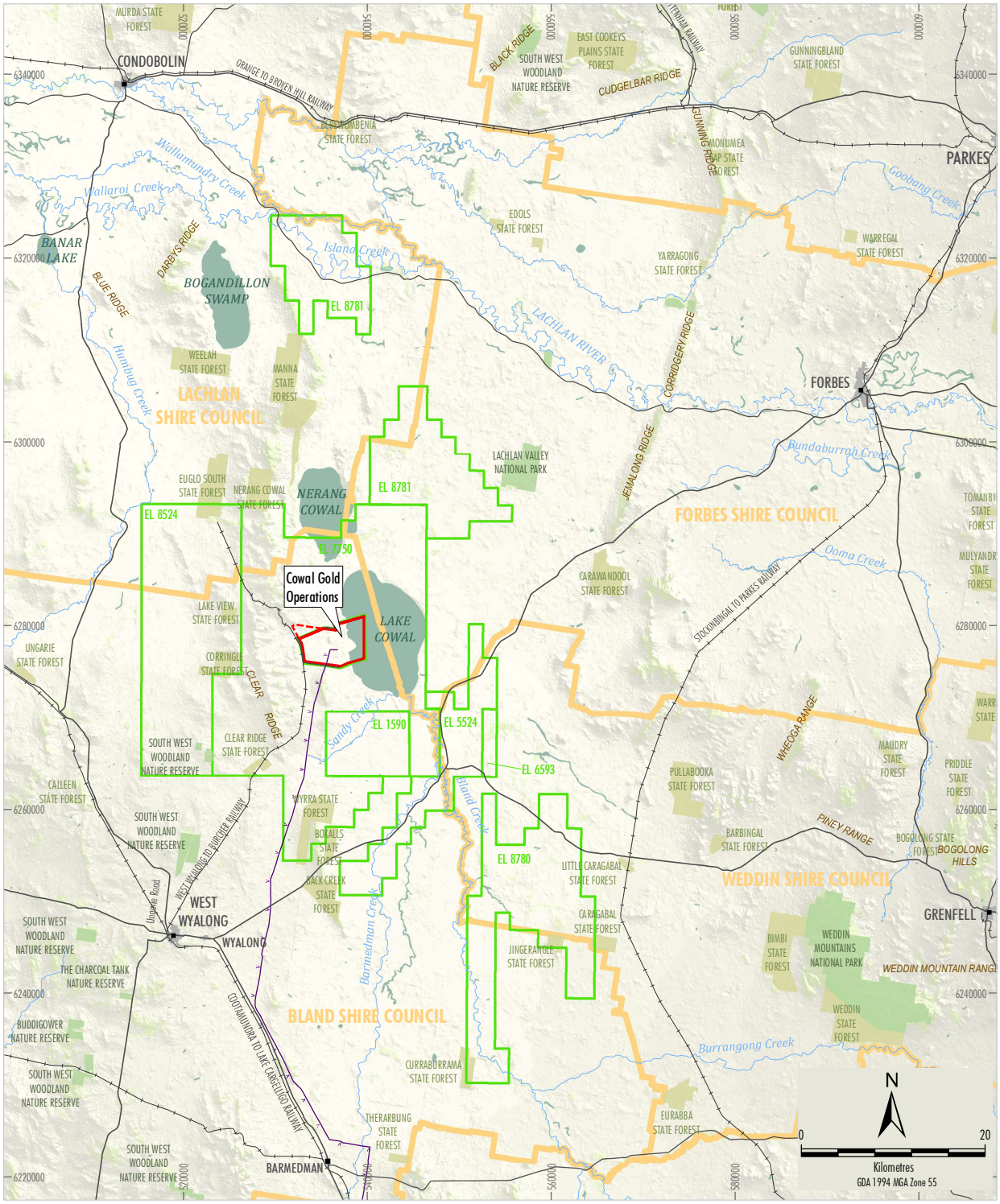
2.1 CGO BACKGROUND

The CGO is a gold-silver mine owned and operated by Evolution and is located approximately 38 kilometres (km) north-east of West Wyalong, NSW (Figure 1). The land immediately adjacent to and surrounding the CGO consists of Lake Cowal and farming land (Figure 2 shows the land tenure of properties in the vicinity of the CGO). A satellite image of the CGO was captured in October 2021 and is presented on Figure 3, which also presents the current operational disturbance footprint and general arrangement of the CGO components. Land preparation areas and the extent of rehabilitation during the reporting period is presented on Figure 4, while the offset areas are presented on Figure 5. Further information relating to rehabilitation and offset areas are provided in Section 6.8 and 8 respectively.

North Limited (North) commenced exploration along the western side of Lake Cowal in 1981. From 1981 to 1994, exploration was concentrated on the Endeavour 42 (E42) ore body to increase the size and confidence of the resource by infill and deep drilling.

North received Development Consent for the Cowal Gold Project in February 1999. North was later acquired by Rio Tinto which subsequently sold the Cowal Gold Project to Homestake Australia Limited (Homestake). Homestake commenced advanced drilling on E42 in late 2001. In December 2001, Barrick (Cowal) Pty Ltd (Barrick) acquired Homestake and its operating subsidiary. Barrick continued the drilling programme of the E42 ore body between 2001 and 2005. During 2003 and 2004, the CGO underwent a detailed design phase and construction commenced on 12 January 2004. Mining operations commenced in April 2005, followed by operation of the final stage of the open pit dewatering system in June 2005. Processing operations commenced in April 2006. Evolution acquired Cowal on 24 July 2015.

In 2020, Evolution submitted State Significant Development application 10367 to DPE for assessment. On 30 September 2021 the DPE granted approval for SSD 10367 approving underground mining at the Cowal Gold Operation.



LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Boundary (ML 1791)
- Exploration Licence (EL) National Park & Nature Reserve State Forest
- Local Government Area Boundary Electricity
- Transmission Line Railway

Source: © NSW Department of Finance, Services & Innovation (2017); Office of Environment & Heritage NSW (2017)

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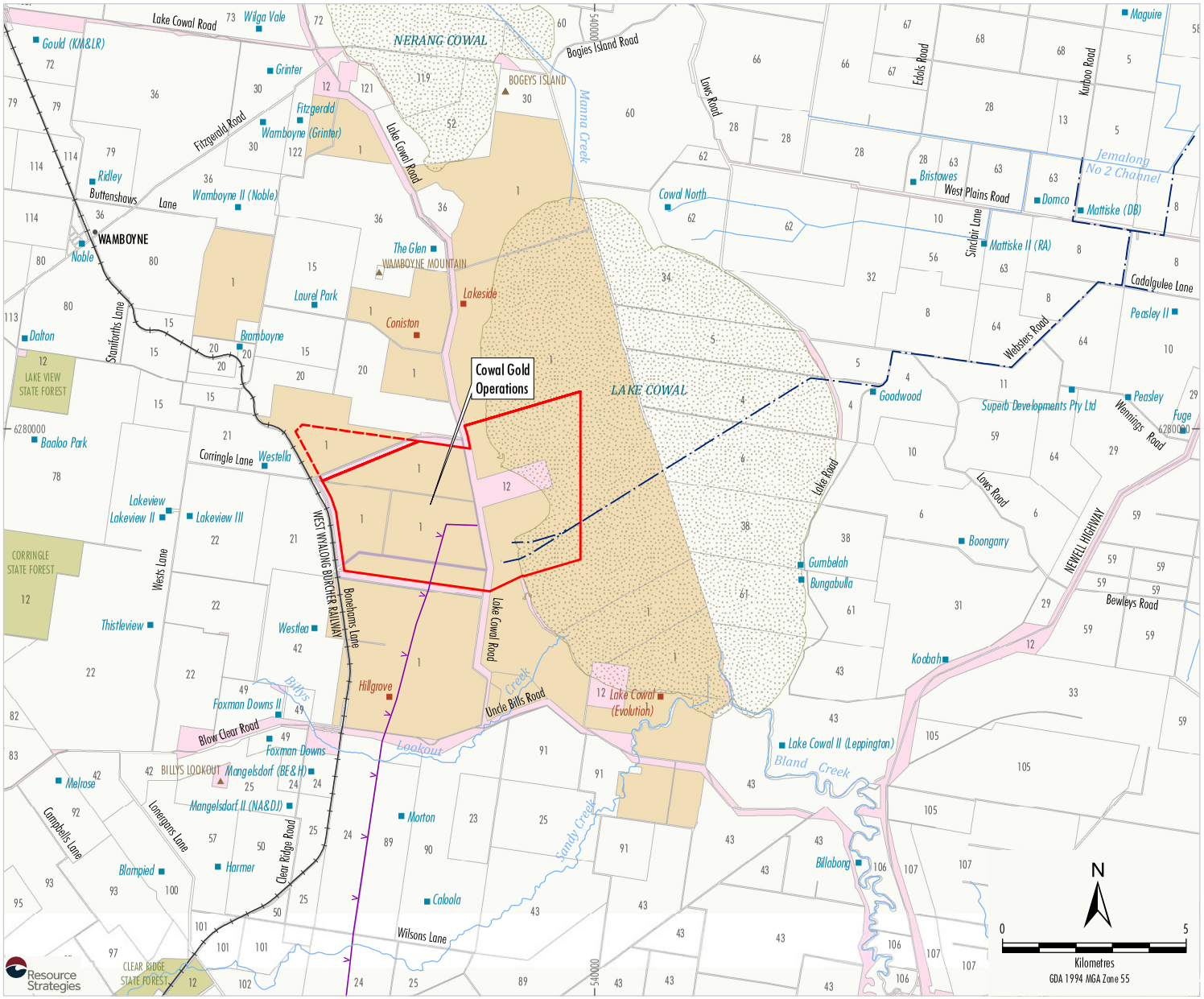
FIGURE 1

CGO Locality

Evolution MINING Cowal



LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Boundary (ML1791)
- Evolution Mining (Cowal) Pty Limited
- Crown Land
- Local Government
- Private Landholder
- State Forest
- Company-owned Dwelling
- Privately-owned Dwelling
- Railway
- Electricity Transmission Line
- Pipeline

Refer to Figure 1-3b for Landholder Key

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

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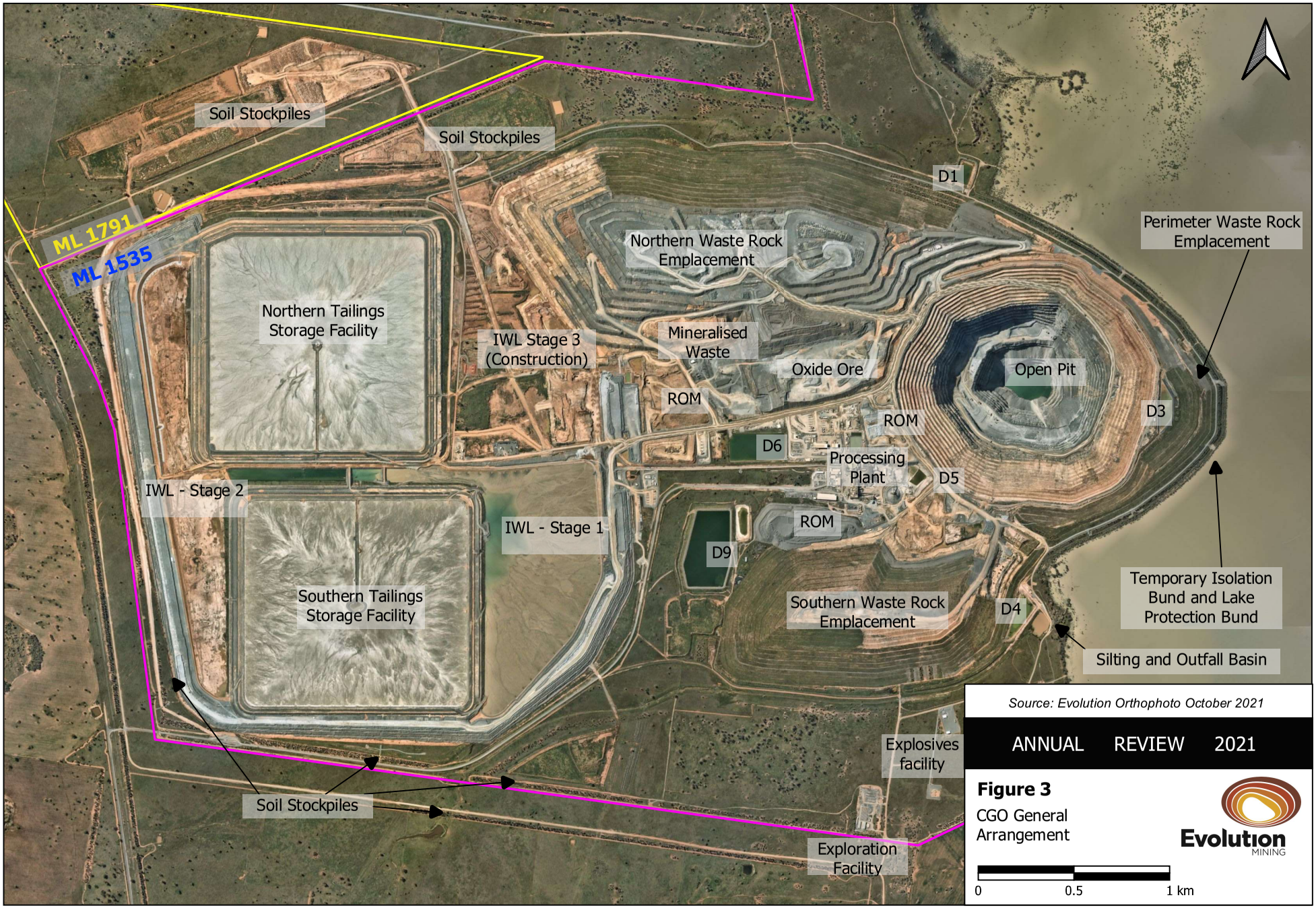
FIGURE 2

Land Tenure of CGO Area

Evolution MINING Cowal



Source: Evolution Orthophoto October 2021

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Figure 3

CGO General Arrangement

Evolution MINING

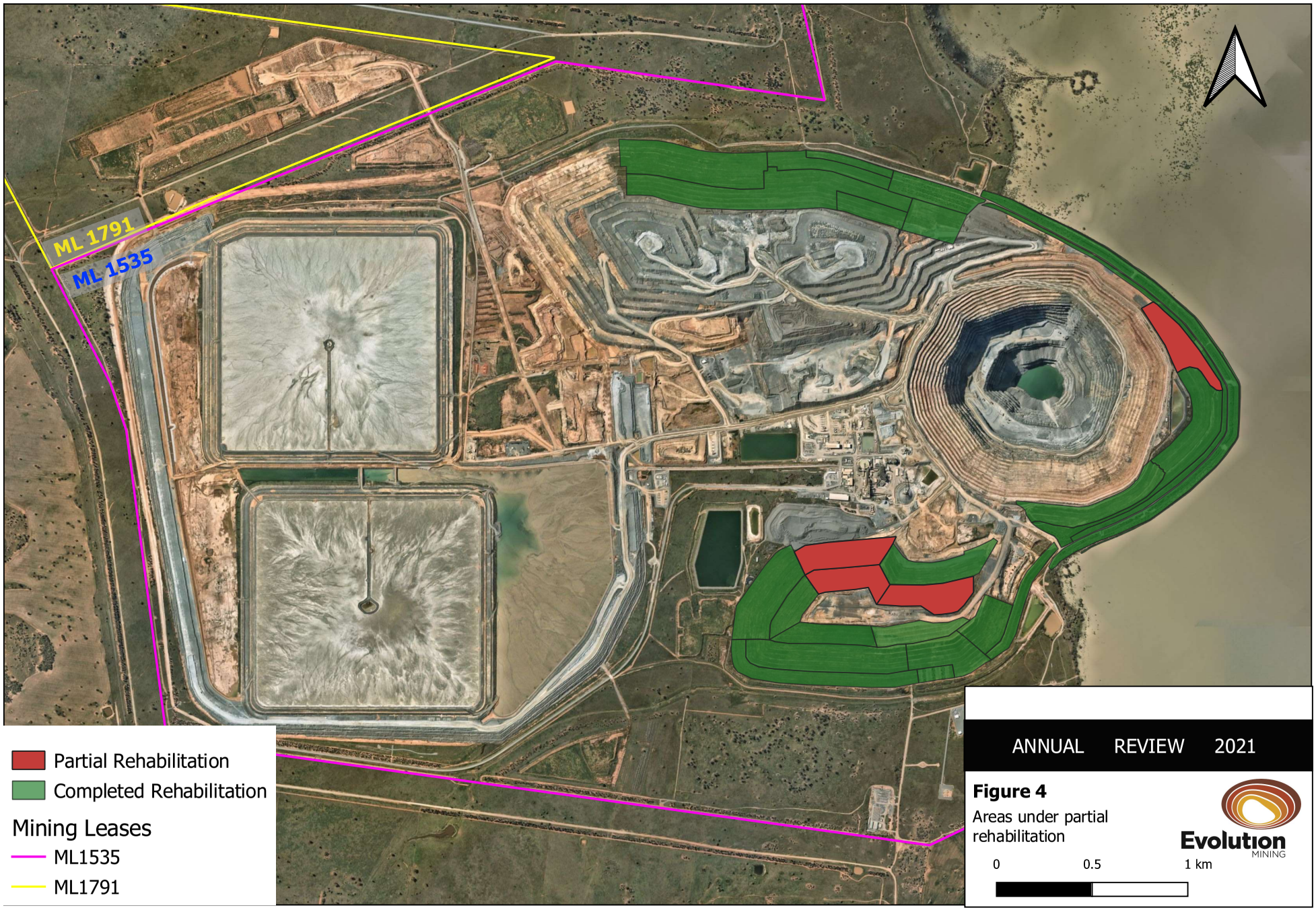

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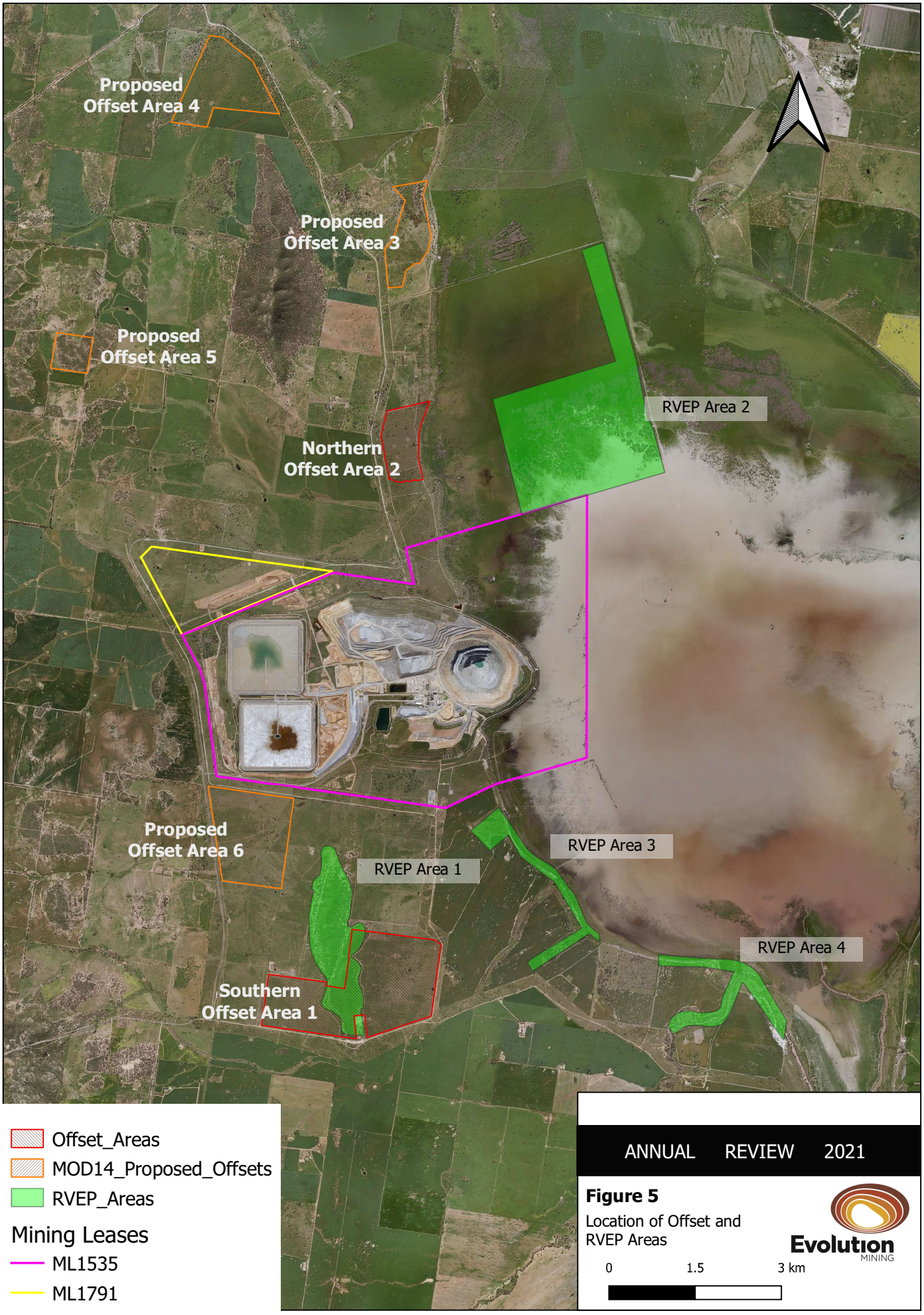
Figure 4

Areas under partial rehabilitation

Evolution MINING


Proposed Offset Area 4
Proposed Offset Area 3
Proposed Offset Area 5
Northern Offset Area 2
RVEP Area 2
Proposed Offset Area 6
RVEP Area 1
RVEP Area 3
RVEP Area 4
Southern Offset Area 1
Offset_Areas
MOD14_Proposed_Offsets
RVEP_Areas
Mining Leases
ML1535
ML1791
ANNUAL REVIEW 2021
Figure 5
Location of Offset and RVEP Areas
Evolution MINING
0
1.5
3 km

2.2 MINE CONTACTS

Contact details for key Evolution employees at the CGO are provided below:

John Penhall
General Manager
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Sustainability Manager
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Simon Coates
Environmental Superintendent
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Email: Simon.Coates@evolutionmining.com

The street and postal addresses for the CGO are provided below:

Street Address
Lake Cowal Road
LAKE COWAL NSW 2671

Postal Address
PO Box 210
WEST WYALONG NSW 2671

3 APPROVALS

3.1 CURRENT LIST OF CONSENTS, LEASES, LICENCES AND PERMITS

The key consents, leases, licences and permits under which the CGO operates (relevant to the reporting period) are presented in Table 2. Any applicable changes to these approvals during the reporting period are also outlined in Table 2.

Table 2: Key Consents, Leases, Licences and Permits

Instrument	Relevant Authority	Date of Grant	Expiry Date	Last Issue Date	Changes During AR Period
EPBC 2017/7989	DAWE	5/02/2019	31/12/2032	05/02/2019	Nil
Development Consent (DA 14/98)	DPE	26/02/1999	31/12/2040	30/09/2021	Mod 16 issued
State Significant Development (SSD 10367)	DPE	30/09/2021	31/12/2040	30/09/2021	New consent issued
Development Consent (DA2011/64) (Eastern Saline Bore field [ESB])	FSC	20/12/2010	Life of ML	2010	Nil
Mining Lease (ML 1535)	DRG	13/06/2003	13/06/2024	13/06/2003	Nil
Mining Lease (ML 1791)	DRG	20/06/2019	20/06/2040	20/06/2019	Nil
Environment Protection Licence (EPL 11912)	EPA	23/12/2003	N/A	06/05/2021	Disposal of drill waste in IWL
Permit #1361 under section 87(1) of the NPW Act	OEH	23/05/2002	Life of ML	2002	Nil
Consent #1467 under section 90 of the NPW Act	OEH	27/11/2002	Life of ML	2002	Nil
Permit #1468 under section 87(1) of the NPW Act	OEH	27/10/2003	Life of ML	2003	Nil
Consent #1680 under section 90 of the NPW Act	OEH	28/07/2003	Life of ML	2003	Nil
Permit #1681 under section 87(1) of the NPW Act	OEH	28/07/2003	Life of ML	2003	Nil
AHIP number: C0004570	OEH	27/06/2019	27/06/2033	27/06/2019	Nil
Care Agreement C0004976	OEH	01/07/2019	31/12/2032	01/07/2019	Nil
Bland Creek Paleochannel (BCPC) bore field Water Access Licence (WAL) 31864 Water supply work approval 70WA614076	DI-Lands & Water	14/09/2012	13/9/2025	2015	Nil
Eastern Saline Bore field WAL 36569 Water supply work approval 70WA614933	DI-Lands & Water	10/06/2011	09/06/2026	20/11/2020	Nil

Table 2 (Continued): Key Consents, Leases, Licences and Permits

Instrument	Relevant Authority	Date of Grant	Expiry Date	Last Issue Date	Changes During AR Period
Saline groundwater supply bore field within ML 1535 WAL 36615 Water supply works approval 70WA614090	DI-Lands & Water	21/03/2014	13/09/2025	13/09/2015	Nil
Pit dewatering WAL 36615 Water supply works approval 70WA614090	DI-Lands & Water	21/03/2014	13/09/2025	13/09/2015	Nil
Pit dewatering WAL 36617 Water supply works approval 70WA614090	DI-Lands & Water	21/03/2014	13/09/2025	13/9/2015	Nil
Monitoring and test bore licences	DI-Lands & Water	Various	Various	2015	Nil
High Security Title WAL13749	DI-Lands & Water	21/12/2006	Life of ML	21/12/2006	Nil
High Security Title WAL14981 (80 Units)	DI-Lands & Water	15/09/2011	Life of ML	15/092011	Nil
General Security WAL13748	DI-Lands & Water	21/12/2006	Life of ML	21/12/2006	Nil
Lake Cowal pipeline and Temporary Isolation Bund and Lake Protection Bund structures Water Supply Works Approval 614805	DI-Lands & Water	12/01/2010	13/9/2025	13/9/2015	Nil
NSW Dangerous Goods Acknowledgement (NDG037143)	WorkCover	2005	Life of ML	2005	Nil

DPE: NSW Department of Planning and Environment.

DI-Lands & Water: Department of Industry – Lands & Water.

DRG: Division of Resources and Geoscience – within the Department of Planning and Environment (previously the Division of Resources and Energy).

EPA: NSW Environmental Protection Authority.

FSC: Forbes Shire Council.

NPW Act: NSW *National Parks and Wildlife Act 1974.*

OEH: NSW Office of Environment and Heritage.

3.2 STATUS OF ENVIRONMENTAL MANAGEMENT PLANS REVIEW

No Environmental Management Plans (EMPs) were approved by the DPE during the reporting period. Management plans have been reviewed following the approval of SSD and relevant manage plans have been updated and submitted via the Major Projects planning portal.

4 OPERATIONS SUMMARY

4.1 MINING AND PROCESSING OPERATIONS

During the reporting period, mining operations from the E42 open pit continued as per relevant approvals outlined in Section 3.1. The processing plant also operated as per all relevant approvals. A summary of key production statistics for the reporting period are provided in Table 3 below.

Table 3: Production Summary

Material	Approved Limit	2018 AR	2019 AR	2020 AR	2021 AR
Ore (t)	N/A	7,119,947	3,963,558	2,183,946	6,841,017
Mineralised Waste (t)	N/A	670,907	638,904	915,622	821,296
Waste Rock (t)	N/A	24,404,148	13,807,518	16,812,132	14,200,057
Northern Waste Rock Emplacement (NWRE) (m AHD)	308[1]	268[3]	268	288	307.5
Southern Waste Rock Emplacement (SWRE) (m AHD)	283[1]	278	283	283	283
Perimeter Waste Rock Emplacement (PWRE) (m AHD)	233[1]	209	223	223	223
Waste rock for use as gravel road base (t per year)	150,000	N/A	N/A	102,470	43,717
Tailings Storage Facilities (TSFs)/ Integrated Waste Landform					
Northern TSF (NTSF) (m AHD)	264[1]	236	240.5	240.5	240.5
Southern TSF (STSF) (m AHD)	272[1]	243.7	243.7	248.4	248.4
Integrated Waste Landform (IWL) (mAHD)	246	Under Construction	Under Construction	233	239
Mill Throughput (Mtpa)	7.5[2]	7.94	8.36	8.31	8.72
Saleable Product (oz)	N/A	244,217	270,492	231,133	217,429

[1] Development Consent Condition 1.2(c). Following approval of MOD16 on 30 September 2021

[2] Development Consent Condition 1.2(b).

t – tonne; m AHD – metres Australian Height Datum; Mtpa – million tonnes per annum; Oz – ounce.

4.1.1 Mining

Mining of the open pit during 2021 occurred in Stage H exclusively. Mining in Stage H occurred from Relative Level (RL) 1145 metres (m) to RL 1020 metres, representing a vertical advance of 125 metres.

Vertical dewatering systems were maintained throughout the reporting period. Horizontal holes were drilled as mining progressed through Stage H in order to de-pressurise specific areas from January to December 2021.

Waste rock mined from the open pit where appropriate was sent to the IWL, any remaining waste was stockpiled on the North Waste emplacement or used on outer slope rehabilitation. Mining operations will continue in Stage H during the 2022 reporting period.

4.1.2 Processing

Processing continued throughout the reporting period. No changes to the processing operation took place during the reporting period.

Completion of stage 1 construction on the IWL occurred at the start of October 2020, with commissioning and deposition commencing on the 14th of that month. Construction of the IWL stage 2 commenced in the reporting period. Deposition into stage 2 of the IWL occurred during the reporting period with stage 3 still under construction.

In accordance with Development Consent Condition 5.3(a), cyanide levels in the aqueous component of the tailings slurry stream did not exceed 20 mg cyanide weak acid dissociable per litre (CN_{WAD}/L) (90 percentile over six months), and exceeded the permissible limit of 30 mg CN_{WAD}/L (maximum permissible limit at any time at the process plant) once during the reporting period. This is covered in detail in section 6.6.

Processing operations will continue in 2022, including general process improvements.

4.2 EXPLORATION

Exploration activities within ML 1535 undertaken during the reporting period included exploration and resource development drilling within and surrounding the main E42 open pit and proximal deposits, including Endeavour 46, Galway/Regal and Endeavour 41 deposits.

A total of approximately 100,998m of drilling was completed within ML1535 during the reporting period including:

- A total of 2,156 holes for 55,851m in-pit RC drilling
- A total of 194 holes for 45,147m diamond drilling
- No regional exploration was conducted on ML 1535 during 2021. Exploration was focussed on resource definition work at the GRE46 UG Deposit.

With the exception of the in-pit RC drilling, all holes were fully cement grouted. Land disturbance within ML 1535 was minimal as a result of the exploration activities, and rehabilitation of the drilling areas was undertaken on completion of each program.

Exploration and resource development drilling are expected to continue within ML 1535 throughout 2022 and is outlined in the currently approved MOP. Further Geotechnical and Underground drilling is proposed to be undertaken during 2022.

4.3 HAZARD AUDIT

The triennial hazard audit was conducted from 15-17 April 2019 and report provided to the Department on 14 May 2019. All actions arising for the audit were closed out by the 5th of December. Next Hazard audit is scheduled to occur in 2022 and will be reported on in the next AR.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

No additional directions were given by the administering department for the 2020 Annual Review.

6 ENVIRONMENTAL PERFORMANCE

Environmental management at the CGO during the reporting period has been conducted under the guidance of and in accordance with the EMPs prepared for the CGO, required under the Development Consent.

Overall Performance against Licences, Approvals and Environmental Management Plans and Effectiveness of Environmental Management

Evolution has fully complied with the commitments of the Resources Regulator (formerly DRG/DRE) approved MOP during the reporting period, and any subsequent updates approved by the Resources Regulator.

The EPL 11912 Annual Return for the 23 December 2020 to 22 December 2021 reporting period was submitted to the EPA via the portal on 17 February 2022. In the 2019 Annual Return, Evolution identified non-compliances related to monitoring not being undertaken at some monitoring points. A summary of the EPL 11912 non-compliances is provided on the EPA website at: http://www.epa.nsw.gov.au/prpoeoapp/.

Evolution has all the relevant project management systems, staffing and consultancy arrangements in place to be in a position of confidence regarding compliance with all relevant licences, approvals and EMPs. Evolution expects to undertake CGO activities for the next reporting year in accordance with all relevant licences, approvals and EMPs. Section 6 discusses the management objectives and targets for the CGO during this and the next reporting period.

Overall, due to Evolution's substantial compliance with the EMPs, environmental management for the CGO during the reporting period has been highly effective.

6.1 AIR QUALITY

Development Consent Condition 6.1(a) details the air quality impact assessment criteria against which air quality monitoring results are compared for the CGO. As required by Development Consent Condition 6.1(c) the CGO Air Quality Management Plan (AQMP) has been prepared, submitted and approved by DPIE (18 February 2016).

Monitoring and management of air quality and meteorology during the reporting period was undertaken in accordance with the relevant Development Consent conditions, the approved AQMP and the EPL 11912.

Evolution reported to the National Greenhouse and Energy Reporting Scheme and National Pollutant Inventory for the CGO during the reporting period.

6.1.1 Environmental Management

6.1.1.1 Control Strategies

Air quality safeguards and control strategies were implemented at CGO during the reporting period to minimise dust emissions from mining activities and exposed areas in accordance with the Development Consent conditions, the approved AQMP and the EPL 11912. These control strategies are summarised in Table 4.

Table 4: Air Quality Safeguards and Control Strategies Implemented During the Reporting Period

Source	Control Strategies
Disturbed Surfaces	• Disturbed surfaces were watered using water trucks to suppress dust.
Access Roads	• Access roads were watered and regularly maintained. • A dust suppressant chemical (PetroTac) was applied to unsealed roads around the general administration and processing plant area to reduce dust generation. • Site access routes are clearly marked, and workplace inductions specify routes. • The speed of vehicles travelling on unsealed surfaces is restricted.
Soil Stripping	• Access tracks used for soil stripping during the loading and unloading cycle were watered. • Soil stripping was limited to areas required for future mining operations.

6.1.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.1.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.1.2 Environmental Performance

6.1.2.1 Monitoring

Meteorological Monitoring

The CGO Automatic Weather Station (AWS) meteorological station, located near the southern ML 1535 boundary, collected meteorological data throughout the reporting period. The station measures real-time wind speed and direction, standard deviation of wind direction, temperature (2 m, 10 m), barometric pressure, humidity, solar radiation and rainfall. The CGO AWS is supported by quarterly independent maintenance and calibration, and daily summary reports and automatic alerts.

Monthly total rainfall measured at the CGO AWS is shown in Table 5. Total annual rainfall for the 2021 reporting period was 698.4 millimetres (mm). Other parameters recorded by the CGO AWS meteorological station during the reporting period are presented in Table 6 and Figure 6a. Annual and seasonal wind rose from the CGO AWS are presented in Figures 6b and 6c.

Atmospheric stability refers to the degree of turbulence or mixing that occurs within the atmosphere and is a controlling factor in the rate of atmospheric dispersion of dust from mining operations (Zephyr Environmental, 2022). Highly stable conditions lead to poor dispersion while unstable conditions enable more effective dispersion of pollutants.

Atmospheric stability for 2021 has been calculated using the AWS meteorological data collected, and Graph 1 presents the diurnal variation in atmospheric stability at Cowal. The profile shows that atmospheric instability increases during the daylight hours as the sun generated convective energy increases, whereas stable atmospheric conditions prevail during the night-time. This profile indicates that the potential for effective atmospheric dispersion of emissions would be greatest during day-time hours and lowest during evening through to early morning hours (Zephyr Environmental, 2022).

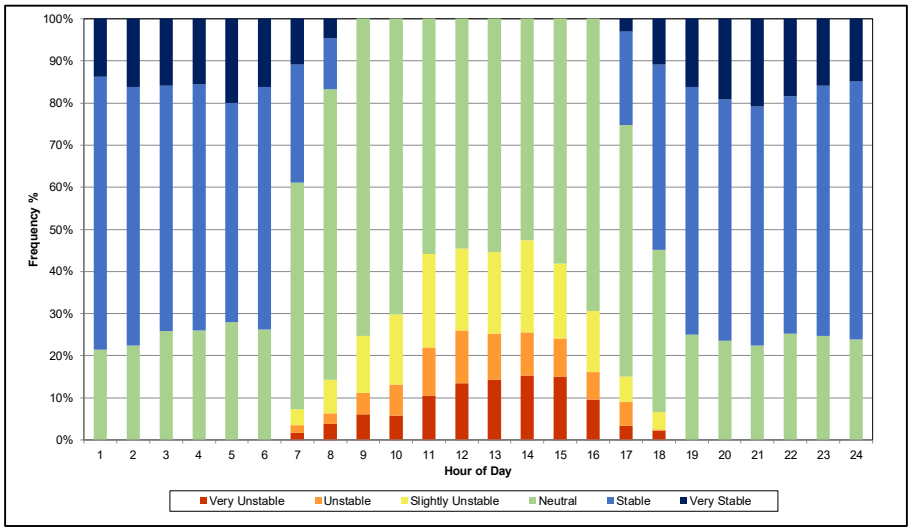
Table 5: Monthly Rainfall Measured at CGO AWS 2011 – 2021

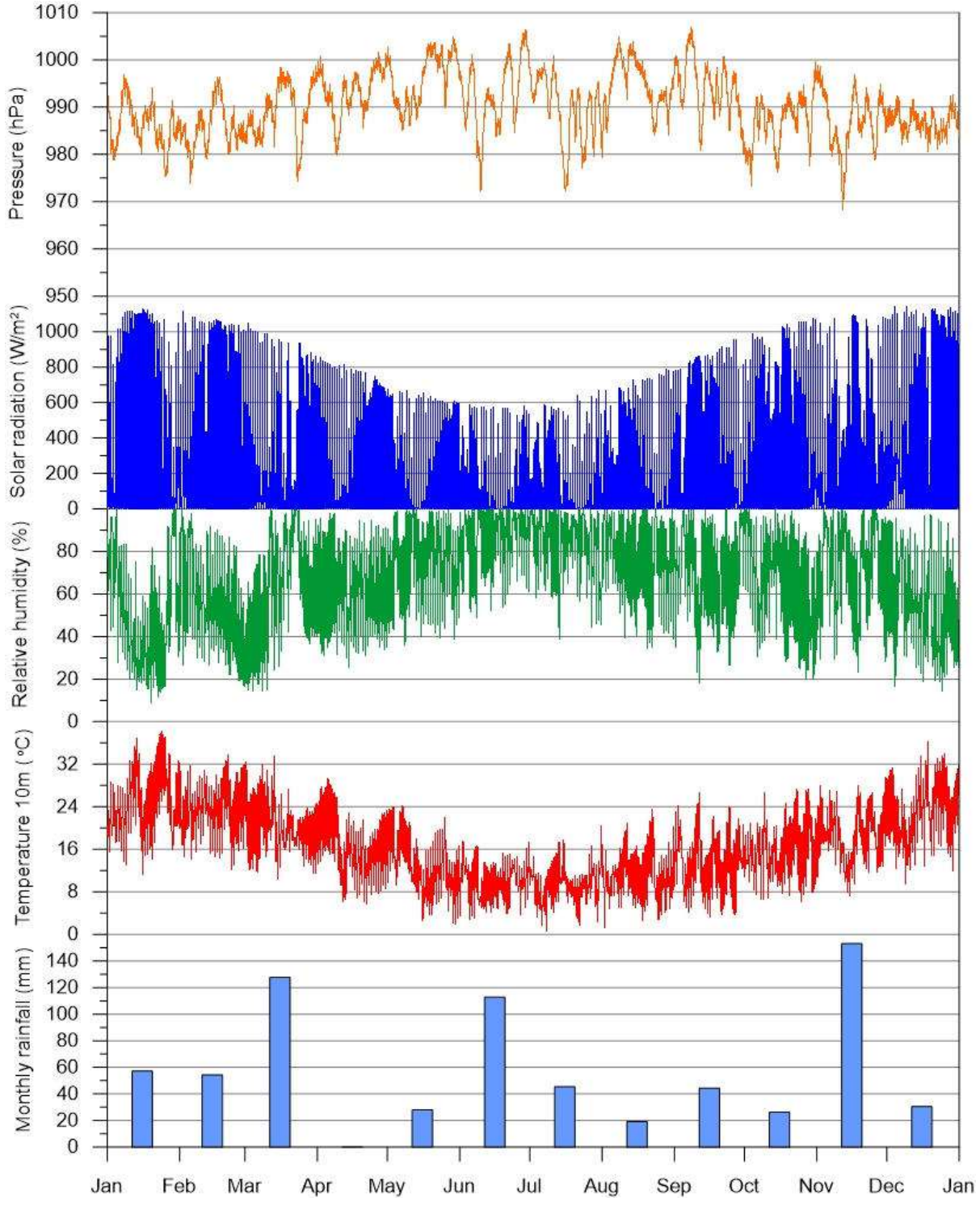
Month	2011 (mm)	2012 (mm)	2013 (mm)	2014 (mm)	2015 (mm)	2016 (mm)	2017 (mm)	2018 (mm)	2019 (mm)	2020 (mm)	2021 (mm)
January	24.4	26.6	5.2	32	75.8	67	24.8	21	24.8	18.8	57.2
February	138.6	129.2	26	23.2	11	1.4	8.6	3.6	31.8	61.0	54.4
March	146.2	78	45.4	71	0.4	16.8	45.4	1.2	57.4	56.4	127.6
April	20.2	15.6	3.4	20.2	56.8	11.4	18.6	7.8	0	126.8	0
May	22	32.6	30.4	21.2	12.8	61.8	31	22	19.8	15.2	28
June	29.4	29.6	87.8	59.4	27.2	122.6	7.6	40	21.2	34.2	112.8
July	11.8	49.8	33.4	9	77.2	72.6	27.8	2.2	9	41.6	45.4
August	41.8	19	18.8	10.8	49	31.2	22.4	4.4	10.2	52.0	19.2
September	13.8	25	60.4	16.8	8.6	136.8	0.8	4.2	5	29.0	44.2
October	31	16	7.2	15.2	52.6	28.8	38	30.4	8.6	51.4	26.2
November	130.4	36.4	9	1.6	24.6	28	50.6	38	13.2	33.2	153
December	135	27	14.6	48.4	19.2	24.8	123.8	24.8	1.6	44.8	30.4
TOTAL	**744.6**	**484.8**	**341.6**	**328.8**	**415.2**	**603.2**	**399.4**	**199.6**	**202.6**	**564.4**	**698.4**

Table 6: Monthly Average Meteorological Data (2021)

Aspect	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mean Humidity (%)	49.3	55.0	61.7	61.7	74.5	86.8	84.0	77.6	71.6	65.3	72.4	54.4
Mean Pressure (mbar)	986.1	985.5	989.0	993.2	996.0	992.8	989.5	994.7	994.3	986.8	987.0	986.8
2m Temp Min (ºC)	17.4	16.1	13.9	7.9	5.6	4.7	4.6	4.1	5.8	7.9	13.1	15.1
2m Temp Max (ºC)	31.6	30.1	26.2	22.8	18.7	14.4	13.4	16.6	19.5	22.0	23.6	29.7

Graph 1: Diurnal variation in stability for CGO during 2021

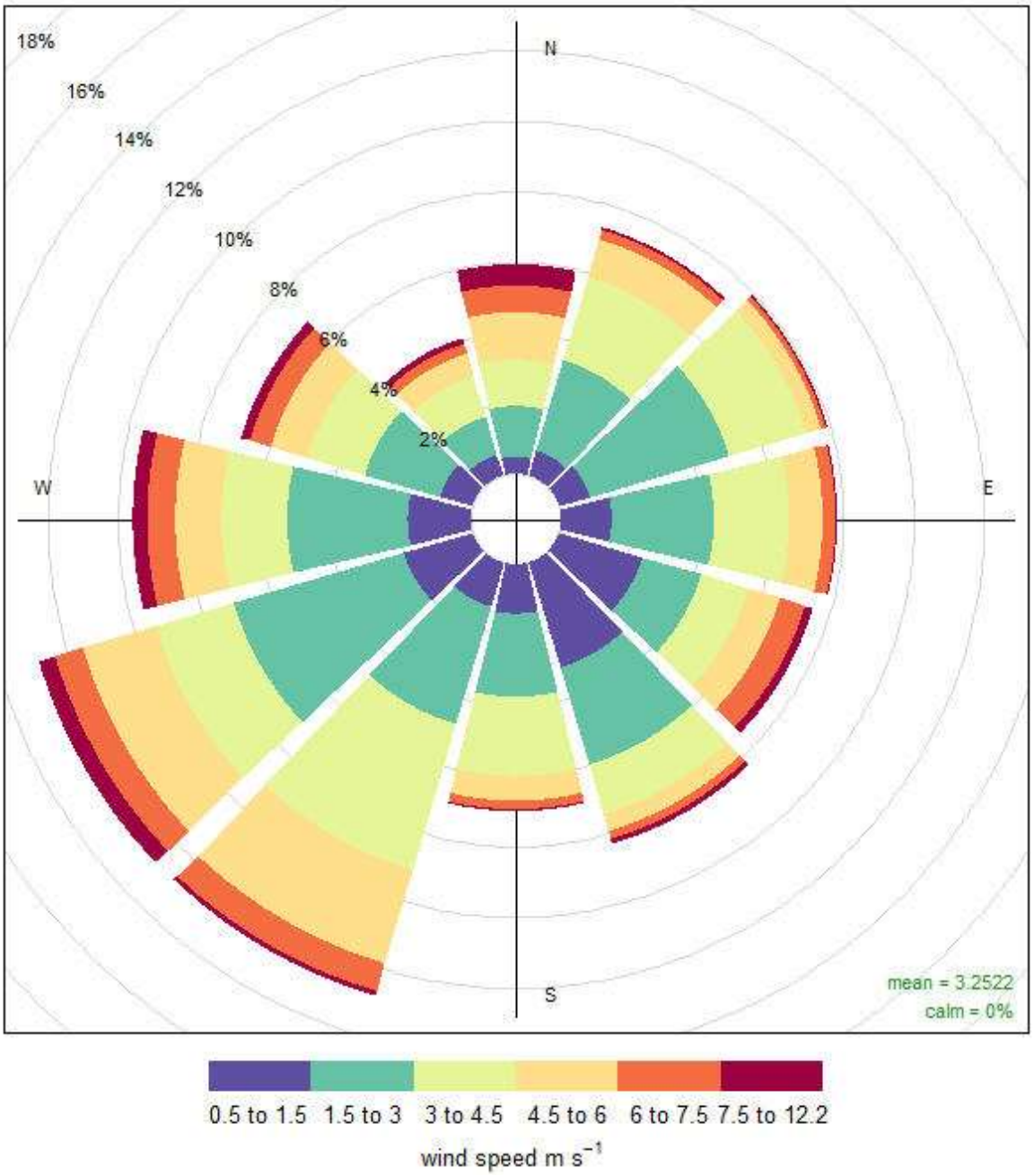




Source: Zephyr Environmental (2022)

FIGURE 6a
Annual Meteorological Summary for 2021

Evolution MINING Cowal



Source: Zephyr Environmental (2022)

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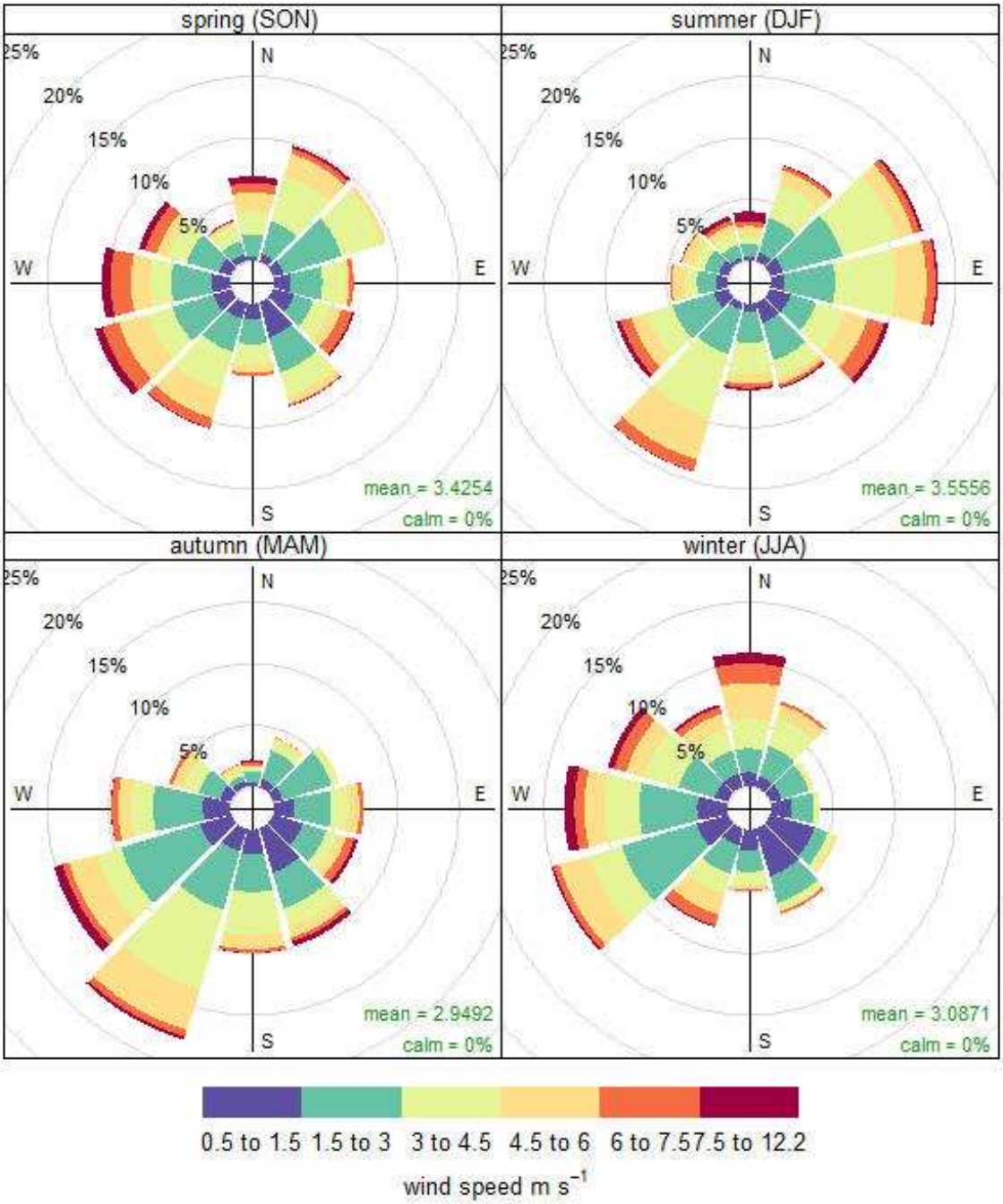
FIGURE 6b
Annual Wind Rose for 2021

Evolution MINING Cowal



Source: Zephyr Environmental (2022)

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FIGURE 6c
Seasonal Wind Roses for 2021

Evolution MINING Cowal

Air Quality Monitoring

During the reporting period, dust monitoring was carried out in accordance with the AQMP utilising depositional (static or gravimetric) and high-volume Total Suspended Particulate (TSP) sampling equipment.

The high-volume air sampler (HVAS) was used throughout 2021 to obtain measurements of suspended solids approximately every 7 days. The HVAS collects suspended particles with diameters less than approximately 50 µm. This enables determination of dust concentrations in units of mass per cubic metre (µg/m^3). The HVAS monitor is located at a company owned residence near the CGO (Coniston). The TSP criteria adopted by the EPA were recommended by the National Health and Medical Research Council of Australia as the maximum permissible level of TSP in the air to protect public health in residential environments.

There is also a BAM co-located with the HVAS that measures PM_{10} continuously, together with wind speed and wind direction. There have been a number of calibration and maintenance issues with the instrument during 2021, resulting in a capture rate of approximately 68% (248 out of a possible 365 daily measurements). Therefore, PM_{10} assessment were based on values inferred from TSP measurements, which is consistent with the approach utilised in historical Annual Reviews. $PM_{2.5}$ monitoring requirements were also introduced during 2021, with the approval of MOD 16 (DA 14/98). Like PM10, PM2.5 is not measured directly but is inferred from TSP. An HVAS with a PM2.5 head will be co-located with the TSP HVAS to carry out direct measurements of PM2.5 prior to the commencement of underground production.

A network of static dust deposition gauges was used throughout 2021 to collect monthly dust samples. The dust gauges are located at varying distances and directions from the CGO open pit (Figure 7). A number of the gauges are situated near homesteads of properties that adjoin the mine site, and a number are near areas of ecological importance (i.e. Lake Cowal). Two duplicate dust gauges are installed near pre-existing dust gauges (DG01 and DG13), with dust samples collected and analysed quarterly for metal concentrations. Quarterly dust gauges allow for a longer sampling period and a larger sample size for analysis and are used to compare and verify monitoring results against the monthly CGO dust monitoring programme. There was also duplicate sampling carried out two gauges, to understand the variability between samples taken at the same location.

Air Quality Impact Assessment Criteria

Table 7 details the long-term impact assessment criteria for deposited dust for any residence on privately-owned land, as required by Development Consent Condition 6.1(a).

Table 7: Long-term Impact Assessment Criteria for Deposited Dust

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Deposited dust[1]	Annual	2 g/m²/month[2]	4 g/m²/month[3]

1 Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: *Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method*.

2 Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

3 Cumulative impact (i.e. incremental increase in concentrations due to the Cowal Gold Operations plus background concentrations due to all other sources).

g/m^2/month – grams per square metre per month.

Table 8 and Table 9 detail the long–term and short-term impact assessment criteria for TSP, particulate matter less than (<) 10 µm (PM_{10}) and <2.5 µm ($PM_{2.5}$) for any residence on privately-owned land as required under Development Consent Condition 6.1(a).

Table 8: Long-term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion [1]
Total suspended particulate (TSP) matter	Annual	90 µg/m³ [2]
Particulate matter < 10 µm (PM_{10})	Annual	25 µg/m³ [2]
Particulate matter < 2.5 µm ($PM_{2.5}$)	Annual	8 µg/m³ [2]

1 Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

2 Cumulative impact (i.e. incremental increase in concentrations due to the Cowal Gold Operations plus background concentrations due to all other sources)

Table 9: Short-term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion [1]
Particulate matter < 10 µm (PM_{10})	24 hours	50 µg/m³ [2]
Particulate matter < 2.5 µm ($PM_{2.5}$)	24 hours	25 µg/m³ [3]

[1] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

[2] Cumulative impact (i.e. incremental increase in concentrations due to the Cowal Gold Operations plus background concentrations due to all other sources).

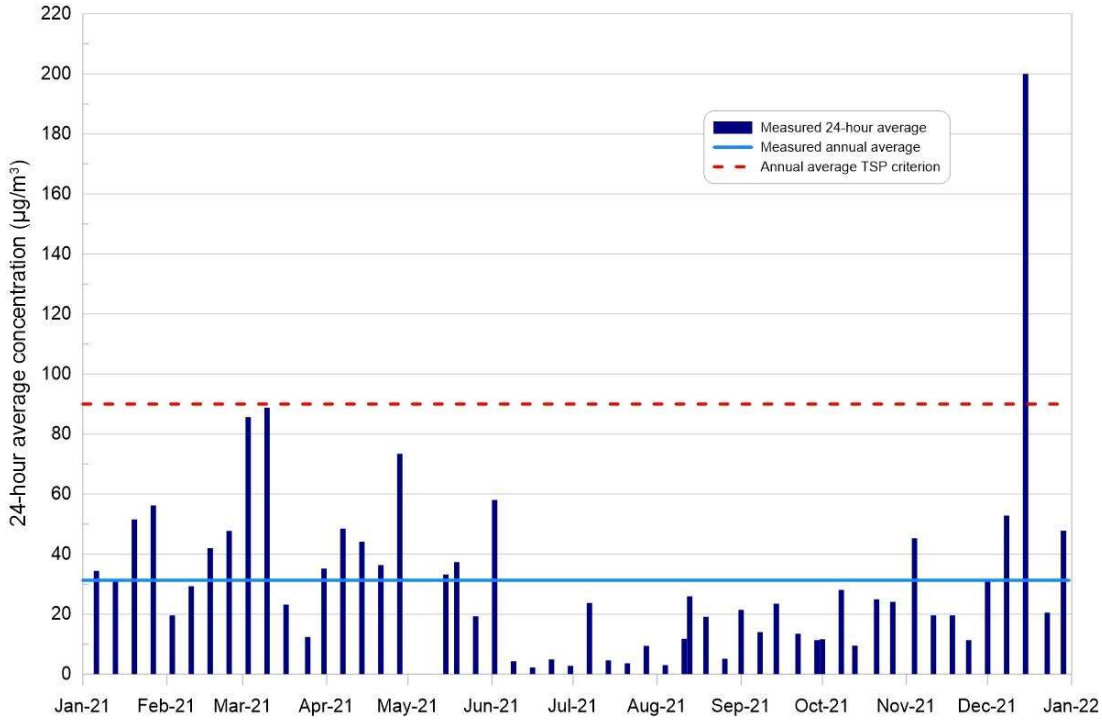
[3] Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

6.1.2.2 Performance Outcomes

Total Suspended Particulates

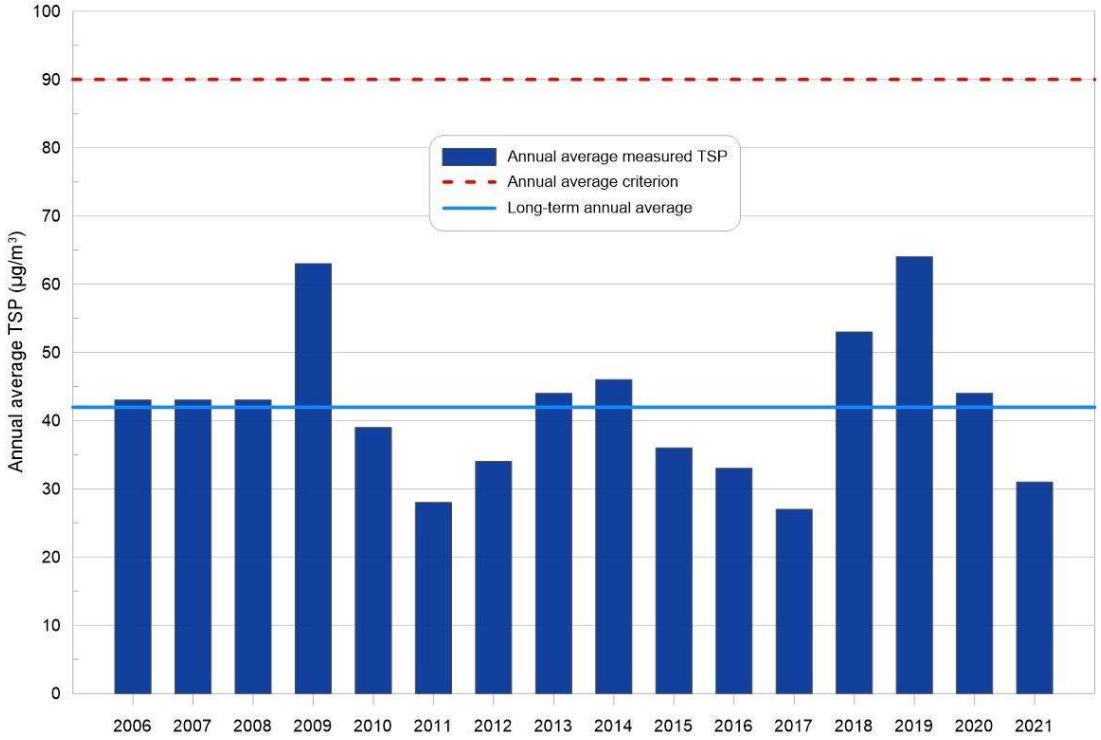
The measurements of TSP, taken by the HVAS on a (generally) seven-day cycle, are shown below in Graph 2. While there are individual elevated concentrations, the annual average calculated from 54 measurements (31.3 µg/m3) was well below the annual average TSP criterion of 90 µg/m3. The highest concentration of 200 µg/m3, measured on 15 December, was recorded during a local dust storm after significant wind gusts of up to 70 km/h.

Graph 2: TSP masses measured at the Coniston Homestead during 2021.



The historical annual average TSP measurements from 2006 to 2021 are displayed in Graph 3. The annual average TSP concentrations for 2021 are not only below the assessment criterion, but also well below the long-term average for the site of 42 µg/m3. This indicates that the concentrations are influenced by external factors, such as drought, with high annual averages in years following significant drought (2009 and 2019), and much lower concentrations in wetter years.

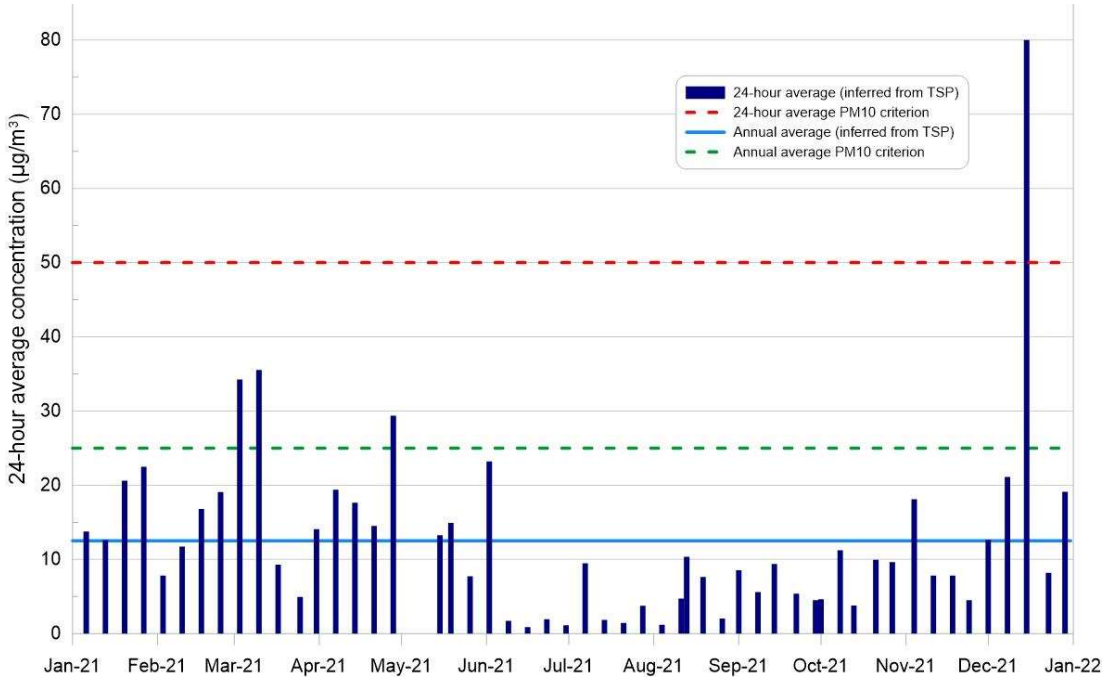
Graph 3: Annual average TSP concentrations – 2006 to 2021



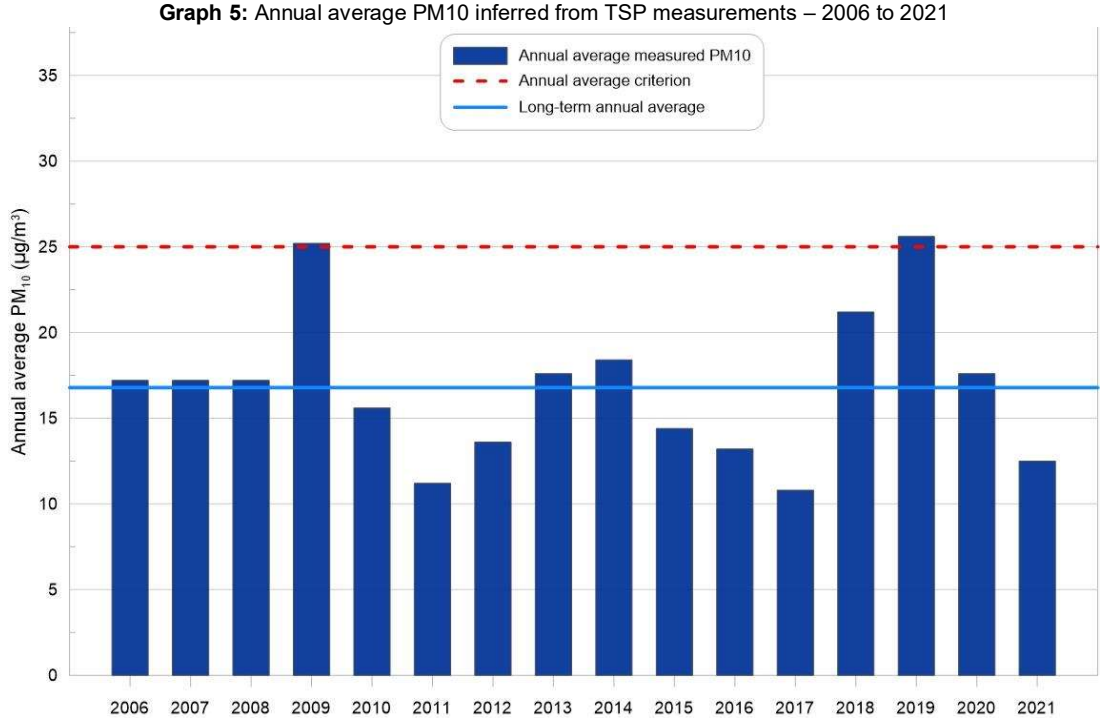
Particulate matter < 10 µm (PM_{10})

As described in the *Cowal Gold Mine Extension Modification Air Quality Impact Assessment* undertaken by Pacific Environment Limited (PEL) (2013), PM_{10} can be calculated as 40% of measured TSP (NSW Minerals Council, 2000). All 'inferred' annual average PM_{10} concentrations remain below the 24-hour average criterion (Graph 4), except for the aforementioned dust storm recorded on 15 December. Despite this, the annual average of 12.5 µg/m3 remained well below the annual criterion of 25 µg/m3. The 'inferred' annual average PM_{10} concentration was also well below the long-term average of 16.8 µg/m3, as shown in Graph 5.

Graph 4: PM10 data inferred from TSP measurements – 2021



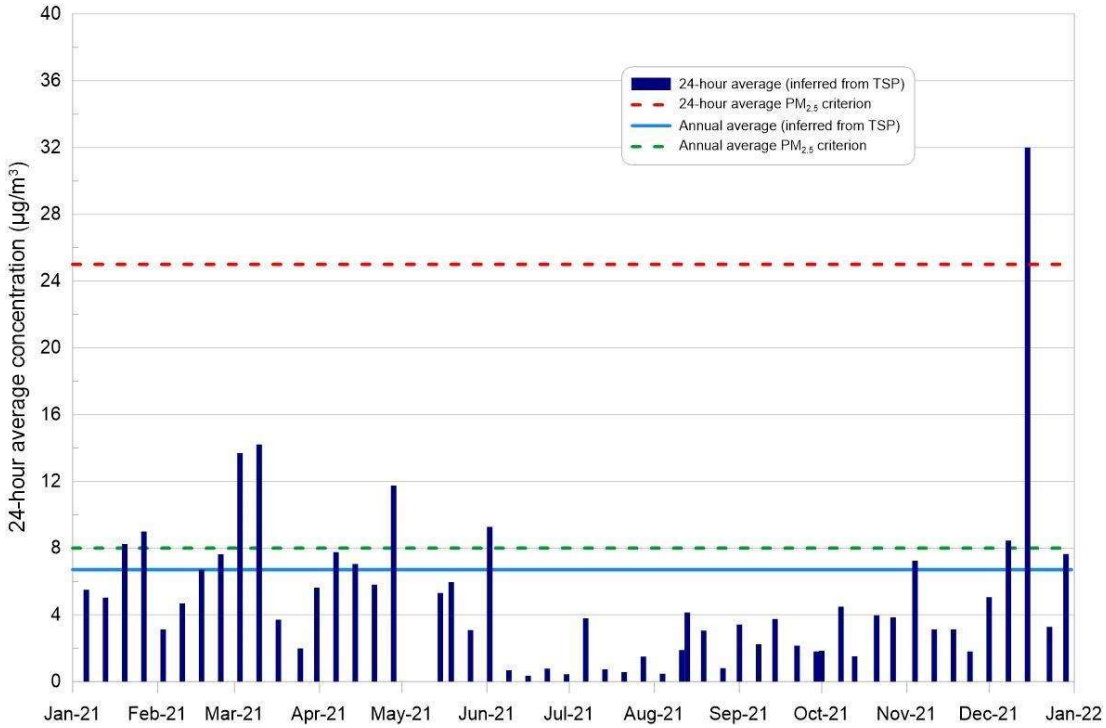
Graph 5: Annual average PM10 inferred from TSP measurements – 2006 to 2021



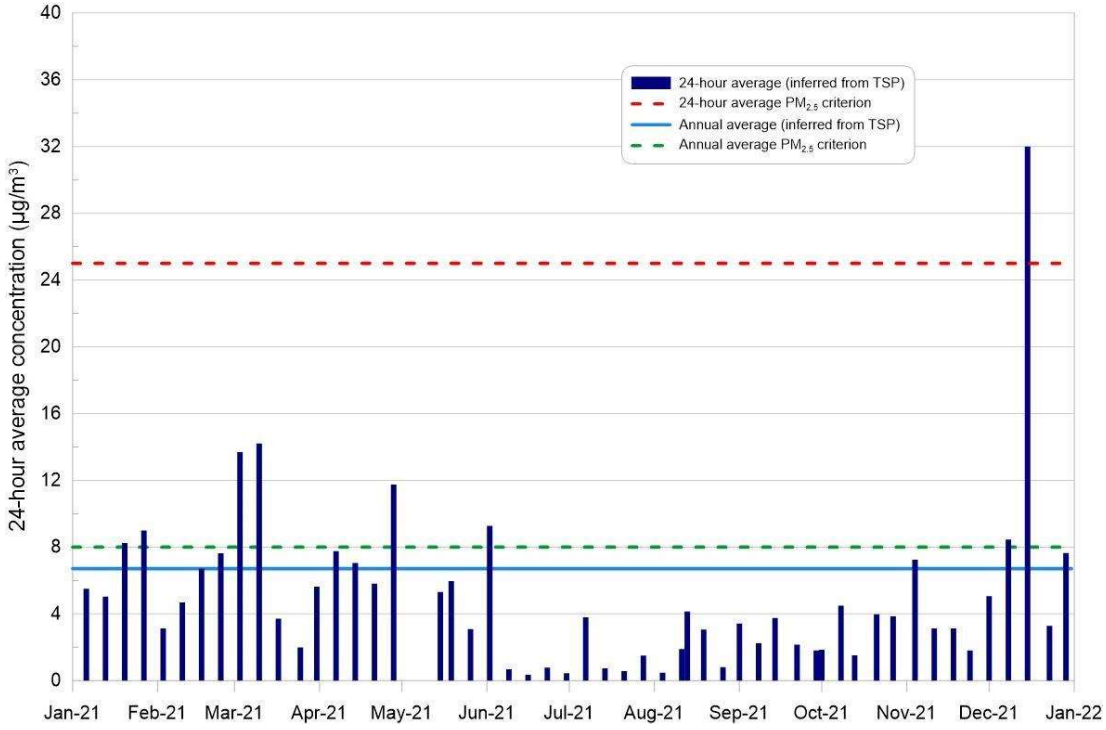
Particulate matter < 2.5 µm ($PM_{2.5}$)

Like PM_{10}, $PM_{2.5}$ is not measured directly but again is inferred from TSP. An HVAS with a $PM_{2.5}$ head will be co-located with the TSP HVAS to carry out direct measurements of $PM_{2.5}$ prior to the commencement of underground production. In the meantime, the following methodology has been used to estimate $PM_{2.5}$ concentrations. Historical data from co-located PM_{10} and $PM_{2.5}$ monitors in the Hunter Valley have determined that the ratio between the two, for a non-urban environment, is approximately 40%. That is, typically 40% of PM_{10} (or approximately 16% of TSP) falls within the $PM_{2.5}$ size fraction (Zephyr Environmental, 2022). Graph 6 shows the $PM_{2.5}$ data based on these TSP measurements. All inferred $PM_{2.5}$ concentrations except one remain below the 24-hour average criterion. As described above for TSP, there was a dust storm on 15 December resulted in one highly elevated concentration on this day of 32 µg/m3 (inferred from TSP). Despite this isolated high concentration, the annual average of 4.9 µg/m3 remained well below the annual criterion of 8 µg/m3. The inferred annual average PM2.5 concentration is also well below the long-term average of 8 µg/m3, as shown in Graph 7.

Graph 6: PM2.5 data inferred from TSP measurements – 2021



Graph 7: Annual average PM2.5 inferred from TSP measurements – 2006 to 2021



Deposited Dust

A detailed discussion of the depositional dust monitoring results is provided in the Annual Air Quality Review 2021 (Zephyr Environmental, 2022). A summary of the key findings is provided below and in Table 10.

Measured total insoluble solids are used to determine compliance with the relevance assessment criteria. Six of the ten dust gauges (DG1, DG7, DG9, DGI5, Site 52 and Site Office) recorded annual averages less than the prescribed 4 g/m2/month. Gauges DG13 and DG14 were inaccessible for most of the year due to heavy rainfall periods and so were unable to generate enough samples to allow a reasonable annual average to be calculated. The remaining two sites (DG6 and McLintocks Shed) registered annual averages above the 4 g/m2/month limit (Table 10).

DG6 is located well to the east of the CGO site, on the eastern edge of Lake Cowal. The highest deposition levels were recorded in autumn when the winds were predominantly from the southwestern quadrant. These contributions were unlikely to be from the activities at CGO. Levels at McLintocks Shed were also above 4 g/m2/month on 6 of the 12 months of the year. This is directly west of the IWL. However, there is no consistent pattern of high deposition levels occurring during the same months as dominant easterly winds. For example, winds were strong from the east during February with a resulting deposition level of 2.8 g/m2/month, while in December the level was 10.1 g/m2/month with easterlies occurring too. Conversely, in May when there were very few easterlies the deposition level was measured at 8.8 g/m2/month. It is therefore not likely that the elevated deposition levels were due to activities at CGO.

Table 10: Monthly and annual average dust deposition rates (insoluble solids) for 2021

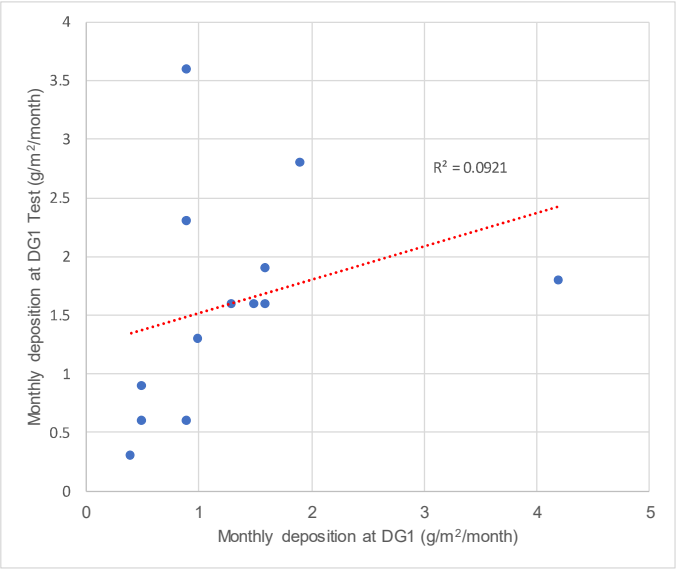
Month	DG1	DG6	DG7	DG9	DG13	DG14	DG I5	McLintocks Shed	Site 52	Site Office
January	0.9	2.8	1.4	1.1	13.9	ND^	2.1	3.6	1.9	2.1
February	0.9	4.0	3.1	5.5	ND^	ND^	3.8	2.8	3.0	3.0
March	1.6	7.6	1.1	0.9	ND^	ND^	2.0	9.5	2.0	1.0
April	0.4	10.1	1.1	0.5	ND^	ND^	1.5	1.1	0.3	0.4
May	1.6	12.4	1.5	1.3	ND^	ND^	1.6	8.8	8.2	1.6
June	1.5	7.6	5.9	3.6	ND^	ND^	3.0	3.3	3.5	4.2
July	0.5	ND *	1.4	2.6	ND^	ND^	1.1	6.8	ND	8.8
August	0.5	ND *	2.4	0.8	ND^	ND^	2.9	7.0	ND	1.4
September	0.9	1.8	1.9	0.9	20.3	ND^	5.2	3.5	7.4	3.3
October	1.0	4.3	1.8	3.8	2.2	0.6	10.6	3.9	3.3	4.8
November	1.9	1.6	2.4	0.8	ND^	0.8	2.4	6.9	2.1	12.9*
December	4.2	4.6	6.2	1.3	2.4	2.5	ND^	10.1	2.7	9.3
Average	**1.3**	**5.7**	**2.5**	**1.9**	**	**	**3.3**	**5.6**	**3.4**	**3.6**

^ Samples not collected as the site could not be accessed due to high water levels
** Contaminated and not included in the annual average*
*** Not sufficient data captured in the year to calculate an annual average*

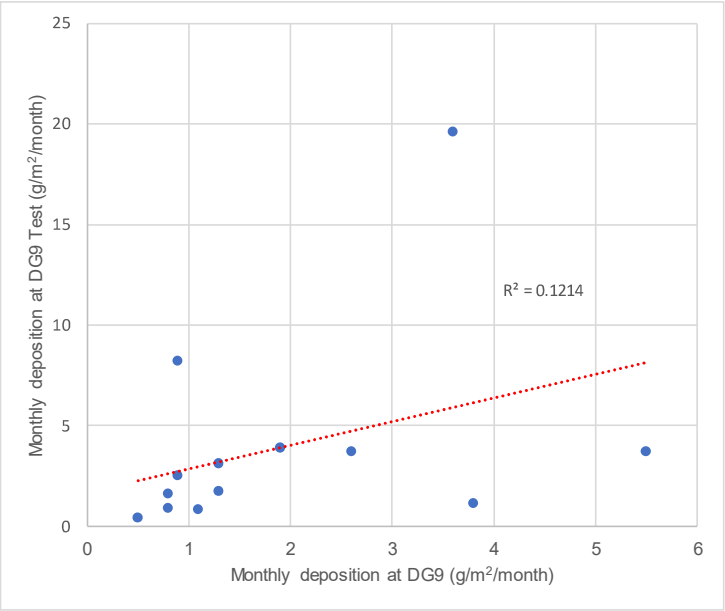
Due to the nature of the sampling method, depositional dust samples can sometimes become contaminated by the presence of trapped insects and bird droppings, which can lead to anomalous results. The accompanying field logs note when this has occurred, and these can be taken into consideration when discussing the results. Additional sampling was also carried out at DG1 Test and DG9 Test throughout 2021, which are co-located with DG1 and DG9 to understand the variability between samples taken at the same location. Despite 'test' gauges also measuring annual averages below 4 g/m2/month, Graphs 8 and 9 show the poor correlation between duplicate samples taken at same location. Deposition gauges are relatively antiquated and not a particularly useful method of measuring air quality (Zephyr Environmental, 2022).

It is suggested that depositional dust network be downsized to reflect this, with preference given to the HVAS and continuous measurements of airborne particulates. Reasonable coverage and representation could be achieved by retaining DG01, DG09, DG14 and McLintocks Shed. This would cover the areas to the north, south, east and west, as well as retaining a co-located gauges with the HVAS (DG01) and a site representative of the lake (DG14) (Zephyr Environmental, 2022).

Graph 8: Correlation between monthly deposition levels at DG1 and DG1 Test



Graph 9: Correlation between monthly deposition levels at DG9 and DG9 Test



Comparison with Environmental Impact Statement (EIS) Predictions

PEL's (2013) modelling predicted the Coniston residence (i.e. the location of the HVAS [hv1]) as the receiver with the highest predictions for 24-hour average PM_{10}, annual average PM_{10}, TSP and depositional dust. Table 11 summarises the 2021 monitoring results for 24-hour average PM_{10}, annual average PM_{10}, TSP and depositional dust and the predicted results at Coniston in comparison with the relevant Development Consent air quality impact assessment criteria for 24 hour and annual average PM_{10}, TSP and depositional dust.

Table 11: Summary of Predicted PM_{10}, TSP and Dust Deposition at HV1

Emission Parameter	2021 Monitoring Results	Predicted Result at Coniston[1]	Development Consent Air Quality Impact Assessment Criteria
Maximum 24-Hour Average PM_{10}	80 µg/m^2	28.8 µg/m	50 µg/m
Annual Average PM_{10}	12.5 µg/m^2	3.7 µg/m	25 µg/m
Annual Average TSP	31.3 µg/m^2	3.9 µg/m	90 µg/m
Annual Average Depositional Dust	1.3 g/m^2/month	0.16 g/m^2/month	4 g/m^2/month

[1] Source: PEL (2013).

6.1.3 Reportable Incidents

There was an exceedance of the dust deposition annual average criterion of 4 g/m2/month at gauges DG6 and McLintocks Shed. However, as previously described, these exceedances are unlikely to be due to activities at CGO. There was also one inferred exceedance in the maximum 24-hour average $PM_{2.5}$ and PM_{10} concentration criterion. This occurred during the dust storm with high wind gusts on 15 December 2021.

6.1.4 Further Improvements

The key recommendations of the Zephyr Environmental (2022) review are summarised as follows:

1. Retain the continuous PM10 monitoring at the HVAS site to enable comparison of datasets.
2. Implement PM2.5 monitoring co-located with the TSP HVAS and continuous PM10, prior to the commencement of UG mining production.
3. Rationalise the dust deposition gauge network, reducing it to four gauges at locations DG01, DG09, DG14 and McLintocks Shed.

6.2 BLASTING

Development Consent Condition 6.3(a) details the blast impact assessment criteria relevant to the CGO. As required by Development Consent condition 6.3(e), the Blast Management Plan (BLMP).

Monitoring and management of blasting during the reporting period was undertaken in accordance with the relevant Development Consent conditions, the approved BLMP and the EPL 11912.

6.2.1 Environmental Management

In accordance with Development Consent Condition 6.3, the BLMP and EPL 11912 Conditions L5 and M7, four blast monitors have been installed at designated locations around the CGO to record ground vibration and air blast overpressure (Figure 7). In addition, a 'control' monitor is installed at BM10, located on the eastern edge of the open pit.

6.2.1.1 Control Strategies

In accordance with the BLMP, the control strategies for blasting during the operation of the open pit include the following:

- Reducing the Maximum Instantaneous Charge (MIC) to lowest possible level.
- Use of crushed aggregate material for stemming in blast holes to maximise confinement of the explosives in the blast hole thereby minimising the air blast effects.
- Design of drill patterns to ensure stemming heights in the blast holes are adequate to ensure confinement of the explosives.
- Delaying or postponing blast times in unfavourable weather conditions if possible.

Additionally, Evolution has adopted a practice of spacing pre-split and production blasts by one to two minutes to reduce the potential for cumulative overpressure impact on the immediate surrounds of Lake Cowal.

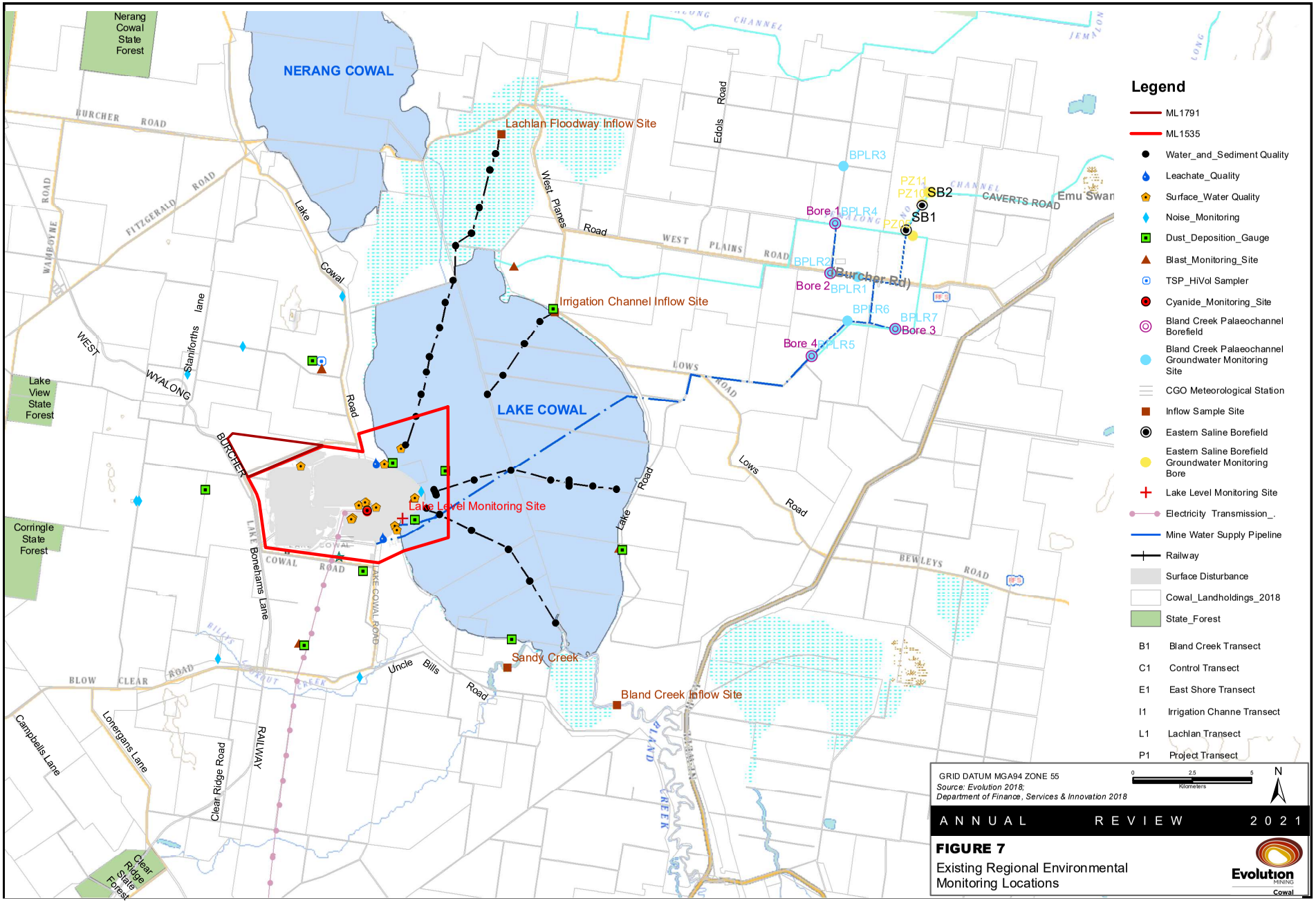
In accordance with Development Consent Condition 6.3, the BLMP and EPL 11912 Condition M7, air blast overpressure and ground vibration levels must be measured at nearby residences BM01, BM02, BM03 and BM08.1, and at the general monitoring site BM10.

6.2.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period are considered to be effective are demonstrated by the environmental performance indicators.

6.2.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.


NERANG COWAL
LAKE COWAL
Nerang Cowal State Forest
Lake View State Forest
Corringle State Forest
Clear Ridge State Forest
Lachlan Floodway Inflow Site
Irrigation Channel Inflow Site
Lake Level Monitoring Site
Sandy Creek
Bland Creek Inflow Site
BURCHER ROAD
FITZGERALD ROAD
WAMBOYNE ROAD
WEST WYALONG
Staniforths lane
Lake Cowal Road
West Plains Road
Edols Road
WEST PLAINS ROAD
CAVERTS ROAD
Emu Swan
Burcher Rd
LOWS ROAD
Lows Road
Lake Road
BEWLEYS ROAD
LAKE COWAL ROAD
Lake Bonehams Lane
BLOW CLEAR ROAD
Uncle Bills Road
Campbells Lane
Lonergans Lane
Clear Ridge Road
RAILWAY
BLAND CREEK
BPLR1
BPLR2
BPLR3
BPLR4
BPLR5
BPLR6
BPLR7
Bore 1
Bore 2
Bore 3
Bore 4
PZ11
PZ10
PZ09
SB1
SB2
Legend
ML1791
ML1535
Water_and_Sediment Quality
Leachate_Quality
Surface_Water Quality
Noise_Monitoring
Dust_Deposition_Gauge
Blast_Monitoring_Site
TSP_HiVol Sampler
Cyanide_Monitoring_Site
Bland Creek Palaeochannel Borefield
Bland Creek Palaeochannel Groundwater Monitoring Site
CGO Meteorological Station
Inflow Sample Site
Eastern Saline Borefield
Eastern Saline Borefield Groundwater Monitoring Bore
Lake Level Monitoring Site
Electricity Transmission_.
Mine Water Supply Pipeline
Railway
Surface Disturbance
Cowal_Landholdings_2018
State_Forest
B1 Bland Creek Transect
C1 Control Transect
E1 East Shore Transect
I1 Irrigation Channe Transect
L1 Lachlan Transect
P1 Project Transect
GRID DATUM MGA94 ZONE 55
Source: Evolution 2018;
Department of Finance, Services & Innovation 2018
0 2.5 5
Kilometers
N
ANNUAL REVIEW 2021
FIGURE 7
Existing Regional Environmental Monitoring Locations
Evolution MINING
Cowal

6.2.2 Environmental Performance

6.2.2.1 Monitoring

Monitoring locations BM01 (Gumbelah) and BM08.1 (Cowal North) are categorised as *'residence on privately owned land'* and required to comply with the compliance limits specified in Condition 6.3 of the Development Consent (Table 12). Monitoring was also undertaken at locations BM02 (Hillgrove Residence), and BM03 (Coniston Residence), located on company owned land (Figure 7). In addition to the monitors located at sensitive receptors, one non-reported monitor (BM10) was located adjacent to the pit within ML 1535.

Ground vibration and air overpressure monitoring was conducted with the use of MiniMate blast monitors. Five units were used located at fixed monitoring stations in accordance with the BLMP. All blast monitoring equipment underwent an annual calibration, in accordance with Australian Standard specifications. Additional to the monitor and sensor calibrations, all batteries were replaced, and routine maintenance was carried out on all units.

Blast operations occurred in the open pit over the course of the 2021 reporting period. Underground blasting activities were included in compliance reporting from October 2021, following the approval of MOD 16 (DA 14/98).

Table 12: Blasting Impact Assessment Criteria

Location and Time	Air blast Overpressure (dB [Lin Peak])	Ground Vibration (mm/s)	Allowable Exceedance
Residence on privately-owned land - Anytime	120	10	0%
Residence on privately-owned land - Monday to Saturday during day	115	5	5% of the total number of blasts over a period of 12 months
Residence on privately-owned land - Monday to Saturday during Evening	105	2	
Residence on privately-owned land - Monday to Saturday at Night, Sundays and Public holidays	95	1	

Notes: mm/s – millimetres per second; dB – decibel.

During the 12-month monitoring period there were several incidents where a unit was offline for more than 24 hours, as follows:

- The monitoring unit BM10 (Nearfield) was offline on the 27th January 2021 –31st January 2021
- The monitoring unit BM02 (Hillgrove residence) was offline on the 14th September 2021 due to calibration
- The monitoring unit BM03 (Coniston residence) was offline on the 14th September 2021 due to calibration

6.2.2.2 Performance Outcomes

Ground Vibration

A total of 452 blasts were fired during the 2021 reporting period, including 199 Open Pit and 253 Underground blasts. Based on the monitoring data and blasting information available, recorded levels of ground vibration induced by blasting activities conducted at the CGO were compliant with respect to the relevant ground vibration limits for both Open Pit and Underground operations.

Based on the monitoring data and blasting information available, recorded levels of ground vibration induced by blasting activities conducted at Cowal Gold Operations were compliant with respect to the relevant ground vibration limits (Table 12). The maximum recorded vibration level for Open Pit Blasting was 0.54mm/s at BM08.1 – Cowal North on the 14th of February 2021. The peak vibration levels recorded at the time of underground blasting was 0.20mm/s at BM08.1 – Cowal North on the 26th November 2021.

Air Overpressure

A detailed examination of the monitoring data and blasting information was undertaken to ascertain the overpressure levels recorded around the time blasting. No Open Pit or Underground blast-related events exceeded the maximum compliance level of 120dB(L). However, a total of 11 Open Pit blasting events were identified as having a peak overpressure level exceeding the relevant compliance criteria during 2021. The events were analysed in detail to determine the likely source of overpressure. Of the 11 events that exceeded compliance levels, three (3) of these were assessed to be most likely related to blasting practices (Table 13), with the remaining being attributed to localised environmental factors, such as wind (Saros, 2022). No Underground blasts exceeded the nominated compliance criteria (Table 14).

Table 13: Open Pit Overpressure Events most likely related to blasting practices (2021)

Monitoring Location	Date	Time	Level PPV mm/s	Level O' Press dB(L)	Compliance Limit	Comments
BM01- Gumbelah	*18/04/2021*	*13:07:43 PM*	*0.11*	*97.5*	*95dB(L) - Sundays' and Public Holidays*	*Likely blast related.*
BM01- Gumbelah	*18/04/2021*	*13:15:33 PM*	*0.11*	*100.0*	*95dB(L) - Sundays' and Public Holidays*	*Likely blast related.*
BM02 - Hillgrove	*8/08/2021*	*9:17:43*	*0.15*	*95.9*	*95dB(L) - Sundays' and Public Holidays*	*Likely blast related.*

All the exceedances identified at blast times were in relation to the Sundays' and Public Holidays' compliance limit of 95dB(L). This is to be anticipated given the Sundays' and Public Holiday's overpressure level of 95dB(L) is a significant reduction to the normal weekday and Saturday limit of 115dB(L). It is important to note that this 20dB(L) reduction is equivalent to reducing the weekday and Saturday limit to 90% for Sunday and Public Holiday blasting.

Table 14: Compliance percentages for the previous 12 months (2021)

Type of Exceedance	Total Number of Blasts (12 months)	No. of Exceedences (12 Months)			
		Daily Operation	Evening Operation	Night, Sunday and Public Holiday	Total % Exceedance
Open Pit					
Vibration	199	0	0	0	0.0%
Overpressure	199	0	0	3	1.5%
Underground					
Vibration	253	0	0	0	0.0%
Overpressure	253	0	0	0	0.0%
Combined					
Vibration	452	0	0	0	0.0%
Overpressure	452	0	0	3	0.7%

Community Complaints

During the reporting period there were no community complaints received in relation to blasting.

Comparison with EIS Predictions

Blasting monitoring results during the reporting period are consistent with previous years and with the predictions detailed in the *Cowal Gold Operations Mine Life Extension Modification Environmental Assessment* (Evolution, 2016) and MOD 16:

- No exceedance of the air blast overpressure level of 120 dB(L) or ground vibration level of 10 mm/s at any residence on privately-owned land at any time.
- Not more than 5% of the total number of blasts at any residence on privately-owned land exceeding the air blast overpressure levels or ground vibration levels Monday to Saturday during the day, evening, night or on Sundays and public holidays.
- 100% of ground vibration levels were compliant with licence conditions.
- Following a detailed review of overpressure results for events that were above the compliance levels, three (3) were identified as being most likely blast related. This accounts for 0.7% of the total Open Pit and Underground blasts for the monitoring period. All other peak levels above the compliance limitations were affected by localised environmental factors and were not distinguishable above background levels.
- Blast induced overpressure impacts were compliant within licence conditions.

6.2.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.2.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.3 OPERATIONAL NOISE

Development Consent Condition 6.4(c) details the noise impact assessment criteria relevant to CGO. As required by Development Consent condition 6.4(e), the Noise Management Plan (NMP) has been established and is in place at the CGO.

Monitoring and management of noise during the reporting period was undertaken in accordance with the relevant Development Consent conditions, approved NMP and the EPL 11912.

6.3.1 Environmental Management

6.3.1.1 Control Strategies

In accordance with the NMP, control strategies used at the CGO during the reporting period utilised best management practices and the best available technology that is economically achievable.

Best Management Practice

Best management practices applied during the reporting period to minimise CGO noise emissions included:

- The Lake Protection Bund provides noise shielding, thereby reducing noise levels that could propagate from the open pit across Lake Cowal.
- Where appropriate or possible, locate mobile noise generating equipment behind structures that act as barriers, or at the greatest distance from any noise sensitive areas or orienting the equipment so that noise emissions are directed away from any sensitive areas where practicable or possible.
- Where there are several noisy pieces of equipment, scheduling operations so they are used separately rather than concurrently.
- Keeping equipment well maintained.
- Operating equipment in line with manufactures operating protocols.
- Educating staff on the effects of noise and the use of quiet work practices.
- Specify maximum noise/sound levels when purchasing equipment.
- Including maximum noise/sound levels in tender documents and contracts.

6.3.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.3.1.3 Variations from Proposed Strategies

There were no variations from the proposed control strategies during the reporting period.

6.3.2 Environmental Performance

6.3.2.1 Monitoring

Noise monitoring was undertaken during the reporting period to demonstrate compliance with the noise impact assessment criteria set out in Development Consent Condition 6.4(c), which requires that noise generated by the CGO does not exceed the criteria outlined in Table 15 below, at any residence on privately-owned land.

Table 15: Noise Impact Assessment Criteria dB(A) $L_{Aeq\ (15minute)}$

Location (Figure 7)	MOD14 - Day/Evening/Night
Lakeview III	38
The Glen	37
Lakeview, Foxham Downs II	36
All other privately-owned land	35

Spectrum Acoustics conducted mine operational noise monitoring at quarterly intervals throughout the reporting period in accordance with the NMP and Development Consent. During May 2021, field measurements were completed by Evolution Mining personnel, with remote support and analysis provided by Spectrum Acoustics. Table 16 provides a summary of the quarterly attended noise monitoring results for the Laurel Park, Bramboyne, Lakeview, Lakeview III, The Glen, Caloola and Foxam Downs II properties recorded during the reporting period (Spectrum Acoustics, 2021a, 2021b, 2021c, 2021d). For each sample point, two consecutive 15-minute field measurements were taken, allowing for calculation of two values for the Mine Contributed LAeq(15minute) – dBA.

Table 16: Attended Noise Monitoring Results for 2021 - Mine Contributed LAeq(15minute) - dBA

Location	Period	Feb-21		May-21		Aug-21		Nov-21	
N09 Lakeview III	Day	<20	<20	23	27	<20	<20	31	29
	Evening	<20	<20	23	23	17	15	<20	<20
	Night	24	22	29	27	15	<20	<20	<20
N10 Bramboyne	Day	<20	<20	23	22	<20	<20	30	29
	Evening	<20	<20	22	26	<20	<20	<20	<20
	Night	22	25	24	25	<20	<20	<20	<20
N11 Laurel Park	Day	<20	<20	24	20	<20	<20	27	25
	Evening	<20	<20	22	23	20	15	<20	<20
	Night	20	21	32	30	<20	<20	<20	<20
N12 The Glen	Day	<20	<20	23	23	<20	<20	<20	<20
	Evening	<20	<20	24	24	15	<20	<20	<20
	Night	<20	<20	24	29	15	16	<20	<20
N15 Caloola 2	Day	<20	<20	<20	<20	<20	<20	<20	<20
	Evening	<20	<20	<20	<20	<20	<20	<20	<20
	Night	<20	<20	<20	<20	<20	<20	<20	<20
N16 Foxman Downs II	Day	<20	<20	25	21	<20	<20	<20	<20
	Evening	<20	<20	22	25	<20	<20	<20	<20
	Night	<20	<20	<20	<20	<20	<20	<20	<20
N17 Lakeview	Day	<20	<20	26	23	<20	<20	32	32
	Evening	<20	<20	<20	22	<20	17	<20	<20
	Night	<20	<20	21	<20	<20	<20	<20	<20

Source: Spectrum Acoustics (2021a, b, c, d).

Notes: <20 = Mine noise emission inaudible or barely audible.

6.3.2.2 Performance Outcomes

Attended noise monitoring results for all the properties were well below the noise impact assessment criteria for these properties defined in Development Consent Condition 6.4(c).

Comparison with EIS Predictions

Table 17 summarises SLR's (2013) predicted $L_{Aeq(15\ minute)}$ noise levels at the nearest privately-owned residential receivers (excluding those properties already afforded acquisition rights [i.e. Westella]) during day, evening and night-time periods during a strong inversion, in comparison to the noise impact assessment criteria for these properties listed in Development Consent Condition 6.4(c).

Table 17: Summary of Predicted Intrusive $L_{Aeq(15\ minute)}$ Noise Levels at Nearest Privately-owned Residential Receivers

Privately-owned Residential Receiver	Predicted Noise Level $L_{Aeq(15\ minute)}$ Day/Evening/Night-time during Strong Inversion (1800 – 0700 hours)	Noise Impact Assessment Criteria defined in Development Consent Condition 6.4(c)
Laurel Park	37	35
Bramboyne	36	35
Bungabulla	35	35
The Glen	36	37
Gumbelah	35	35

Source: SLR (2013).

6.3.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.3.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.4 VISUAL, STRAY LIGHT

Development Consent Condition 6.5(b) and SSD 10367 condition B20 details the requirements for the management of visual and off-site lighting impacts from CGO.

CGO received one lighting complaint from a nearby neighbour during the reporting period. This was attributed to mobile lighting plant being shifted to light up the dumping face. Upon receipt of the complaint the lighting plant was readjusted.

6.4.1 Environmental Management

6.4.1.1 Control Strategies

In accordance with Development Consent Condition 6.5(b) and SSD 10367 condition B20, visual impact mitigation measures that have been employed at the CGO during the reporting period included landscaping and design specifically conducted for visual impact mitigation purposes. Specific strategies during the reporting period included:

- utilising existing vegetation as visual screens.
- planting of vegetation screens around the ML 1535 boundary.
- construction of the waste emplacements, reducing visual impact of the processing plant from the eastern side of Lake Cowal.
- placement of topsoil stockpiles on the southern and western sides of the STSF to break the view from the relocated Travelling Stock Route.
- ensuring no fixed outdoor lighting shines directly above the horizon.
- ensuring mobile lighting is directed internal of the mine lease.

6.4.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered effective as demonstrated by the environmental performance indicators.

6.4.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.4.2 Environmental Performance

6.4.2.1 Monitoring

A summary of the landscape maintenance and monitoring programme implemented during the reporting period is provided in Table 18.

Table 18: Landscape Maintenance and Monitoring Summary

Component	Monitoring Frequency	Monitoring Method	Typical Maintenance
Landscaping Works			
• General Inspections	Annual	Visual assessment of moisture stress, plant survival, presence of weeds and erosion/ sedimentation.	• Supplementary watering if required. • Control of invasive weed species. • Supplementary planting of failed plants where necessary.
• Erosion Inspections	Following significant, high intensity rainfall events.	Visual assessment of earth mound screening to determine if significant erosion or washouts have occurred in accordance with the ESCMP.	• Repair any significant erosion or washout areas on earth mounds. • Stabilisation with Jute mesh or other materials as required. • Additional revegetation planting or sowing if required.
Buildings, Structures and Facilities	Annual	Visual assessment as required.	• Replace or repair items as necessary to maintain structural integrity. • Repaint any exterior surfaces where the finish has deteriorated. • Maintain fixed outdoor and in-pit mobile lighting.
Rehabilitation Works			
• General Inspections	Annual	Monitoring in accordance with the RMP, the BOMP and MOP (with reporting in the AR).	• Repair any significant erosion or washout areas. • Control of invasive weed species in accordance with the Land Management Plan. • Supplementary planting or seeding of failed plants where necessary.
• Erosion Inspections	Following significant, high intensity rainfall events.	Visual assessment of rehabilitation works to determine if significant erosion or washouts have occurred in accordance with the ESCMP.	• Repair any significant erosion or washout areas on earth mounds. • Stabilisation with Jute mesh or other materials as required. • Additional revegetation planting or sowing if required.

BOMP – Biodiversity Offset Management Plan.

6.4.2.2 Performance Outcomes

Visual impact management and landscape maintenance and monitoring measures conducted during the reporting period included:

- inspections and maintenance of fixed outdoor lighting and in-pit mobile lighting.
- general inspections of landscaping (i.e. visual screens) and rehabilitation works.
- monitoring of tree and shrub survival rates of landscape plantings; and
- erosion inspections of landscaping and rehabilitation works following periods of significant, high intensity rainfall.

As a result of this visual landscape monitoring the following maintenance activities were undertaken:

- weed control within landscaping and rehabilitation areas by manual removal or chemical application; and
- maintenance of erosion control structures.

6.4.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.4.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.5 EROSION AND SEDIMENT

Development Consent Condition 3.5(a) provides erosion and sediment control strategies for works to be undertaken throughout the life of the CGO (i.e. construction and operations).

Monitoring and management of erosion and sediment control during the 2021 reporting period was undertaken in accordance with the relevant Development Consent Conditions, relevant ML 1535 and ML 1791 conditions, the ESCMP and EPL 11912.

6.5.1 Environmental Management

6.5.1.1 Control Strategies

A summary of the control strategies/management measures implemented during the reporting period in accordance with the ESCMP is provided in Table 19.

Table 19: Summary of Erosion and Sediment Control Strategies/ Management Measures

Project Development	Control Strategy/Management Measure
Temporary Erosion and Sediment Controls Systems	
Internal Mine Access Road	• Minimisation of disturbance to watercourses that cross the road. • Provision of culverts and diversion of runoff from undisturbed areas. • Erection of sediment control barrier downslope of small, disturbed areas. • Provision of sediment basins for concentrated runoff areas. • Stabilization of the access road surface. • Rapid stabilisation and revegetation of road batters.
ML 1535 and ML 1791 Fences	• Minimising the area disturbed and restricting access to non-disturbed areas.
Ore Stockpile and Process Plant Area	• Minimising the area disturbed and restricting access to non-disturbed areas. • Settlement/plant runoff storage. • Installation of sediment control barrier. • Installation of runoff collections drains. • Dewatering of settlement storage following rainfall events. • Ripping and rehabilitation of hardstand areas.

Table 19 (Continued): Summary of Erosion and Sediment Control Strategies/ Management Measures

Project Development	Control Strategy/Management Measure
Soil Stockpiles	• Use of sediment control barrier and sediment traps to minimise soil movement. • Use of diversion banks, channels and rip-rap structures to divert surface water around disturbed areas and control runoff velocity.
Internal Mine Roads	• Constructing all access roads at an appropriated slope along the contour, where practicable. • The use of spoon drains, table drains and concrete culverts to control surface runoff from access roads. • Ripping and rehabilitation of roads no longer required for access.
Contractors' Area	• Minimising the area disturbed and restricting access to non-disturbed areas. • Erection of sediment control barrier downslope of small, disturbed areas. • Provision of sediment basins for concentrated runoff areas. • Ripping and rehabilitation of hardstand areas.
Earthworks Associated with Landscaping	• Use of sediment control barriers and sediment traps to minimise soil movement.
Internal Catchment Drainage System (ICDS)	• Construction of the ICDS as described in the ESCMP. • Construction of sediment retention storages to reduce non-colloidal fraction of sediment carried in runoff from large disturbed areas. Storages sized to provide flow detention and effective settlement during small to medium sized flood events (1 in 20 year 1 hour event). • Use of small-scale runoff controls comprising hay bales and rockfill bunds to control sediment loads in runoff from small areas. Silt control hay bale weirs installed downslope of all disturbed areas. • Rapid stabilisation of disturbed areas using contour banks and furrows, erosion-stable drainage paths and early revegetation or armouring of disturbed areas. Disturbed areas rapidly stabilised to reduce sediment fluxes.
Permanent Erosion and Sediment Controls Systems	
Lake Isolation System	• Construction of the Temporary Isolation Bund and Lake Protection Bund as described in the ESCMP. • Stabilisation and revegetation of the batters of the Temporary Isolation Bund and Lake Protection Bund.
Up-Catchment Diversion System (UCDS)	• Construction of the UCDS as described in the ESCMP to divert upper catchment water around the CGO. • Installation of rip-rap structures along UCDS and rock outfalls at confluences with existing natural drainage lines. • Vegetation stabilisation.
Earth Mounds (associated with the ICDS)	• Vegetative stabilisation.
Monitoring and Maintenance	• Water quality monitoring in accordance with the Surface Water, Groundwater, Meteorological and Biological Monitoring Program (SWGMBMP). • Maintenance of erosion and sediment control structure where necessary.

6.5.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.5.1.3 Variations from Proposed Control Strategies

There were no variations to the proposed control strategies during the reporting period.

6.5.2 Environmental Performance

6.5.2.1 Monitoring

In accordance with the ESCMP, inspections and maintenance of erosion and sediment control structures (e.g. silt fences, hay-bales, sediment ponds and diversion structures) occurred as required during the reporting period.

The ESCMP also requires the following to be reported in the AR:

- Surface and groundwater monitoring results.
- Comparison of surface water and groundwater monitoring results with criteria in the SWGMBMP.
- Interpretation and discussion of the surface and groundwater monitoring programme results.
- Community Environmental Monitoring & Consultative Community (CEMCC) decisions relating to ESCMP issues.

6.5.2.2 Performance Outcomes

The CGO geotechnical department conducted monthly monitoring and assessment of structures such as all water holding facilities on site, waste emplacements and the lake protection bund for sediment movement and erosion control effectiveness in accordance with the CGO's *Monitoring Programme for the Detection of Movement of the Lake Protection Bund, Water Storage and Tailings Structures and Pit/Void Walls*. The monthly monitoring and assessments indicated no significant sediment movement, ponding or erosion incidence of the contained water storages, waste rock emplacements, lake protection bund and temporary isolation bund, however, some pooling was experienced following significant rainfall events. These were managed effectively through draining techniques. UCDS and ICDS inspections are carried out quarterly using a drone to ensure full inspection.

During the reporting period minor scaling and reshaping works were carried out on the waste emplacements and drains to correct minor rilling of dispersive soils which during inspections has proved to be effective.

Higher than average rainfall was experienced in the reporting period and Lake Cowal has filled. Monitoring during the lake fill was undertaken which identified some erosion occurring on the temporary isolation bund resultant from wave action and high winds. Once lake water levels recede, remedial actions will be undertaken to repair erosion areas.

The progressive rehabilitation for final landform slopes continues to demonstrate effective erosion control as evidenced by independent specialists DnA Environmental (DnA Environmental, 2021a). Continued monitoring however will be necessary and remedial actions required on minor rilling to prevent further deterioration on exposed areas of rehabilitation.

6.5.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.5.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.6 CYANIDE MANAGEMENT

Development Consent Condition 5.3 outlines requirements in relation to the management of cyanide at the CGO. A cyanide monitoring program has been developed for CGO and is incorporated into the CGO's Cyanide Management Plan (CMP), which has been prepared in accordance with Development Consent Condition 5.3(b).

The EPL 11912 requires Evolution to undertake cyanide monitoring at the points identified in EPL 11912 Condition P1.3. The cyanide monitoring points and frequencies required by the EPL 11912 are consistent with monitoring required by the Development Consent and the CMP. The CMP has also been prepared to address the relevant requirements of ML 1535.

Monitoring and management of cyanide during the reporting period was undertaken in accordance with the relevant Development Consent Conditions, the approved CMP and EPL 11912.

Evolution has continued to report monthly weak acid dissociable cyanide (CN_{WAD}) results on the company's website during the reporting period. Evolution Continues to report and discussed these results with the CEMCC at all quarterly meetings.

6.6.1 Environmental Management

6.6.1.1 Control Strategies

A summary of the control strategies maintained during the reporting period in accordance with the CMP is provided below:

- Containment of all tailings waters within the TSFs/ IWL, processing plant and processing plant dams.
- Maintenance of the Lake Protection Bund and upper catchment diversion drain systems.
- Provision of emergency containment channels alongside tailings storage pipelines to and from the TSFs/ IWL.
- Maintenance of process pipe work, equipment and leak detection equipment.
- Terrestrial fauna protection fencing and avifauna deterrent methods to minimise the potential for impacts of tailings operations.
- Use of sodium metabisulphite to destruct cyanide in tailings slurry to permissible levels before the processing plant slurry discharge is pumped to the IWL (with standby Caro's Acid circuit).
- Routine monitoring and reporting of tailings facility flows, ground and surface waters, and employee work areas for cyanide levels.
- Maintenance of emergency preparedness of employees and supply chain in reporting and response capability.
- Routine patrols of tailings and process areas to ensure the potential for spillage, dust or native fauna and flora impacts are minimised.

The CGO is certified under the International Cyanide Management Institute's (ICMI) Code for Cyanide Management. Details regarding the re-certification audit are provided on the ICMI's website: http://www.cyanidecode.org/signatory-company-categories/evolution-mining-cowal-pty-ltd-australia

6.6.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.6.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.6.2 Environmental Performance

6.6.2.1 Monitoring

In accordance with the CMP and Development Consent Condition 5.3(d), results of CN_{WAD} monitoring of tailings discharge (at the processing plant) and decant water were monitored during the reporting period. Levels of CN_{WAD} recorded are presented in Table 20.

6.6.2.2 Performance Outcomes

With the exception of one isolated incident (see below), CN_{WAD} levels of the aqueous component of the tailings slurry stream were maintained so that they do not exceed 20 milligrams (mg) CN_{WAD}/L (90 percentile over six months) and 30 mg CN_{WAD}/L (maximum permissible limit at any time) at the process plant during the reporting period. Groundwater results for cyanide during the reporting period remained below the laboratory detection limit.

Table 20 : CN_{WAD} Levels of the Aqueous Component of the Tailings Slurry - 2021

			CN_{WAD} (mg/L)	
Frequency	**Month**	**No. Sampled during Month**	**Minimum**	**Maximum**
Twice daily	January	62	0.00	7.96
Twice daily	February	48	0.00	9.15
Twice daily	March	62	0.00	12.03
Twice daily	April	46	0.00	18.71
Twice daily	May	58	0.00	9.31
Twice daily	June	60	0.00	18.30
Twice daily	July	61	0.13	35.00
Twice daily	August	42	0.13	6.03
Twice daily	September	60	0.00	6.95
Twice daily	October	62	0.00	11.92
Twice daily	November	60	0.00	12.33
Twice daily	December	62	0.00	7.91

6.6.3 Reportable Incidents

At approximately 6.30am on 7 July 2021, WAD (Weak Acid Dissociable) cyanide at the Tailings Hopper exceeded the 30ppm license limit. The processing plant was immediately shut down in accordance with CGO_PRO_SWI_420_FTL_Cyanide_Destruct_Controlling_WAD_CN_Discharge_Level. A combination of Caros acid dosing and dilution was used to reduce the WAD cyanide. The processing plant was restarted by 11.00am on 7 July 2021. Elevated WAD levels were not detected at the decant pond in the IWL, indicating that remedial actions adequately controlled the risk of environmental impact. Refer to Section 6.9 (Fauna) for more details.

Through the internal investigation, it was determined that high pH levels in the Float Tails Leach (FTL) and destruct tank had inhibited the INCO cyanide destruct process, resulting in elevated WAD cyanide at the final tailings discharge within the processing plant. High pH in the FTL circuit was attributed to continued lime dosing into the FTL following the overload of the thickener on the previous day (INX incident 305044). The pinch valve for lime addition to the FTL circuit was setup during commissioning (MPEC commissioning team) to operate and control normal slurry flow fluctuations from the Float Tails Thickener. No other control logic for this valve had been considered, documented or setup to manage a crash stop scenario. Therefore, lime dosing continued after throughput ceased, resulting in high pH levels in the Float Tails Leach (FTL). Following the incident, logic conditions were added for the lime dosing valve to switch off under zero flow from thickener and if pH in the FTL is > 10.

The incident was initially reported by Simon Coates, Superintendent – Environment, on 7 July 2021. A detailed notification was provided on 13 July 2021.

6.6.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.7 FLORA

Development Consent Condition 3.2 details the requirements for the CGO in relation to the management of flora and fauna. A Flora and Fauna Management Plan (FFMP) and Threatened Species Management Protocol (TSMP) have been developed for the CGO in accordance with Development Consent Conditions 3.2(b) and 3.2(c), respectively. The FFMP has also been prepared to address the relevant requirements of ML 1535 and ML 1791.

Monitoring and management of flora continued in accordance with the requirements of the FFMP, the TSMP, the BOMP and the RMP during the 2021 reporting period.

6.7.1 Environmental Management

6.7.1.1 Control Strategies

Flora control strategies for the CGO are described in the FFMP. The following control strategies were implemented at the CGO during the 2021 reporting period:

- implementation of Compensatory Wetland Management Plan (CWMP) initiatives and the Remnant Vegetation Enhancement Program (RVEP).
- incorporation of flora management initiatives during operational design.
- implementation of the Vegetation Clearance Protocol (VCP).
- implementation of the TSMP.
- weed management and pest control.
- flora monitoring programme.
- observance of the Threatened Species Management Strategies (TSMSs) for the relevant Endangered Ecological Communities:
  - Inland Grey Box Woodland Myall Woodland
  - Aquatic Ecosystems (lower Lachlan River)
  - Weeping Myall Woodland
- provision of information relevant to the management of native flora during employee and contractor inductions.
- development and submission of an RMP (including mine site rehabilitation performance and completion criteria and a mine site rehabilitation monitoring programme relevant to the approved CGO); and
- development and submission of a BOMP (including an offset performance and completion criteria and an offset monitoring programme relevant to the approved CGO offset areas).

6.7.1.2 Effectiveness of Control Strategies

The control strategies implemented during the 2021 reporting period were effective as demonstrated by the environmental performance indicators.

6.7.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.7.2 Environmental Performance

6.7.2.1 Monitoring

Monitoring and management of flora continued in accordance with the requirements of the FFMP (Section 6.7.1.1), the BOMP and the RMP during the 2021 reporting period.

Flora monitoring was conducted during the reporting period in accordance with the RMP, including within the following areas:

- Compensatory Wetland (CW).
- Rehabilitation areas and rehabilitation trial areas.
- Offset management areas.
- *Pilularia novae-hollandiae* (Austral Pillwort) habitat; and
- RVEP areas (Figure 5).

6.7.2.2 Performance Outcomes

Flora monitoring within the CW and RVEP areas was undertaken by DnA Environmental (2021b) during the 2021 reporting period. A summary of the results from this monitoring survey are outlined below.

Compensatory Wetland

The range of ecological characteristics have also been significantly impacted on by the fluctuating water levels associated with the wetting and drying cycles of the lake. During 2017 - 2019, the drought combined with increased grazing by macropods has resulted in a decline in numerous characteristics of the lake foreshore communities, however, the receding water from the lakebed has also led to an increase in many other ecological attributes in the wider lakebed communities, including the development of the vast ephemeral grasslands and significant regeneration of a variety of wetland trees and shrubs. Many old growth trees however were becoming senescent and/or deteriorating in condition due to a combination of factors, including grazing, drought and storm Damage.

Since 2020, there has been above average rainfall and the lake was relatively full during the year and at both monitoring events. Despite both of the monitoring sites that were able to be accessed being half under water, there has been significant growth of the vegetation on the upper banks and floodplains, including desirable native perennial ground covers. The mature trees and shrubs appeared to have improved in health since the drought, with many bearing reproductive structures. Saplings from previous regeneration events that were tall enough (>2.0m) are likely to survive the current period of inundation, however small seedlings may not. Nonetheless, there has been periodic regeneration events of the primary wetland species, which have been strongly impacted on by seasonal conditions and resultant water levels, and these are expected to continue under the current management regime.

No threatened species have been recorded in any Compensatory Wetland monitoring site since monitoring began in 2005.

One Lycium ferocissimum (African Boxthorn), a priority weed of the Bland Shire was recorded in CW1 Monitoring site, which was regrowth from previous years eradication program.

The results to date have generally indicated significant improvement in the health of the lake and the lake foreshore environments with extensive colonisation of native perennial grasses and natural regeneration of endemic lake species including River Red Gum, Lignum and Native Liquorice. Most changes in the wetlands have occurred as a result of climatic and biophysical factors.

Pilularia novae-hollandiae (Austral Pillwort) Habitat

The annual surveys conducted since 2006 have failed to locate Austral Pillwort in the Lake Cowal area despite extensive and targeted searches.

The increasing vegetation cover and extremes in seasonal conditions, particularly periods of extended hot dry conditions have likely to have been impacting on populations of Austral Pillwort, but the extent that this has occurred is unknown as none have been located since monitoring began. There appears to be a requirement to reduce the increasing density and cover of competitive native and introduced grasses, sedges and rushes in areas previously thought to contain Austral Pillwort to improve its known habitat.

The drought conditions from 2017 – 2019 resulted in increased grazing and disturbance in most areas around Lake Cowal by wildlife, especially by kangaroos. Grazing of the grasslands and gilgais has been occurring, reducing the abundance of competitive ground covers and deep litter layers in many areas.

Since 2020 however, improved seasonal conditions have again promoted high densities of ground cover and despite the rainfall activity throughout the year, all but the deepest gilgais were completely dry. Subsequently Austral Pillwort again, failed to be found. Ongoing surveys will be conducted in an attempt to locate populations of Austral Pillwort.

Remnant Vegetation Enhancement Program (RVEP)

The six permanent monitoring sites, Hill01, Hill02, Hill03, Hill04, RVEP3 and RVEP4 are surveyed annually (when accessible) to monitor changes in vegetation cover, species diversity and to determine the extent of regeneration occurring within these conservation areas. The monitoring methodology has been a simplified version of the CGO annual rehabilitation monitoring program and includes an assessment of ecosystem characteristics using an adaptation of methodologies derived from CSIRO Grassy woodland Benchmarking project and associated Biometric Model. It does not include Landscape Function Analysis or comprehensive soil sampling. RVEP monitoring has been undertaken in spring in all years, with the 2021 monitoring undertaken during the 3rd to the 11th November 2021.

The highest stem densities continued to be recorded in Hill03 which had 48 live individuals, despite the loss of several individuals as a result of drought induced mortality. There was an additional individual in Hill01 with a total 18 being recorded, as the acacias saplings continue to grow. There was no further change in tree densities in Hill02 or Hill04, where there were 8 and 3 mature trees respectively. In 2020, the mature *E. camaldulensis* tree had fallen over at RVEP4.

In the Hill sites, the most common trees were Eucalyptus dwyeri (Dwyer's Red Gum), E. microcarpa (Grey Box), E. sideroxylon (Mugga Ironbark), Geijera parviflora (Wilga), Alectryon oleifolius (Rosewood) and Allocasuarina verticillata (Drooping Sheoak). Mature shrubs were A. doratoxylon (Spearwood) and Pittosporum angustifolium (Butterbush). In the RVEP3 and 4 sites the trees included old growth E. camaldulensis (River Red Gum).

All RVEP sites contained a population of shrubs and juvenile trees (dbh<5cm) with densities being highly variable across the range of sites. In 2019, densities of shrub and juvenile trees in the Hill01, Hill02 and Hill03 tended to decline since 2013 due to the prolonged dry combined with increased grazing pressure by resident macropods. This year, there has been a significant increase in seedling densities in Hill01 and Hill03, and a minor increase in Hill04, however, there were fewer in Hill02, with densities ranging from 9 – 312 this year across the sites.

In 2019 floristic diversity was at its lowest since monitoring began and was especially low in the Hill RVEP sites where there were only three species recorded in both Hill01 and Hill03. There was a higher number in the transitional woodland/grassland sites Hill02 and Hill04 with 14 and 23 species respectively. In 2019, in RVEP3 and RVEP4 there were 23 and 17 species recorded respectively. This year, there has been a significant increase in floristic diversity with the highest diversity being recorded in Hill02 and Hill04. Diversity in 2021 has been highest it has been since monitoring began. There were 24 – 64 species found in the Hill woodland sites, while there were 39 in RVEP4.

Since 2020, there was significant improvement in ground cover abundance and diversity because of the improved seasonal conditions and relaxation in grazing pressure. Continued monitoring of macropod populations and their effects on the condition of the vegetation will be required.

Vegetation Clearance

Several campaigns of vegetation clearance activities were undertaken during the reporting period, including:

- January 2021, to allow construction of the Western wall of the IWL and extension of trucking to the area.
- March 2021, to allow for construction of the inner Northern wall of the IWL and the Northern section of the new UCDS.

All clearance works were undertaken consistent with the requirements of the VCP.

6.7.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.7.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.8 BIODIVERSITY OFFSET AREAS

Development Consent Condition 3.4 details the requirements for the CGO in relation to the biodiversity offset strategy. A BOMP has been developed for the CGO in accordance with Development Consent Condition 3.4(c). The BOMP has also been prepared to reflect the approved biodiversity offset strategy described in subsequent Environmental Assessments and approvals.

Monitoring and management of the biodiversity offset areas continued in accordance with the requirements of the BOMP and the Development Consent during the reporting period.

6.8.1 Environmental Management

6.8.1.1 Control Strategies

The Biodiversity Offset Strategy is described in the BOMP and includes:

- a description of the offsets.
- objectives for the offsets.
- short, medium and long-term management measures and performance criteria.
- a description of how the strategy integrates with the CGO's rehabilitation programme.
- a monitoring program.
- revegetation and regeneration performance indicators and completion criteria.
- details for the long-term protection mechanism for the offset areas; and
- the conservation bond requirements relevant to implementation of the biodiversity offset strategy.

The following control strategies were implemented at the CGO during the reporting period:

- Progression in securing the tenure of the offset areas and calculating the required bond/ credits.
- Weed management and pest control.
- Offset monitoring program.

6.8.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were effective as demonstrated by the environmental performance indicators.

6.8.1.3 Variations from Proposed Control Strategies

Evolution completed a cull of Eastern Grey Kangaroos within the Felman's Hill area in 2017 and 2018, as the population became unsustainable (Section 6.7.2.2). The CGO applied for 200 drop tags from the Griffith NSW National Parks & Wildlife Services prior to conducting the cull. No Culling program was conducted in the reporting period due to extreme wet weather deeming the properties inaccessible but would be considered in 2022 if macropod numbers continue to increase.

6.8.2 Environmental Performance

As required by Development Consent Condition 3.4(b), Evolution is required to enter into a Voluntary Planning Agreement (VPA) with the NSW Minister for Planning to secure tenure over 440 hectares (ha) of land to the north and south of ML 1535 as a biodiversity offset for the CGO. Additional offset areas proposed through MOD14 (Figure 5) are currently under review, pending consultation with BCS. DPE provided an extension to the retirement deadline for the MOD14 offsets by the end of October 2022.

6.8.2.1 Monitoring

Monitoring and management of the offset management areas continued in accordance with the requirements of the BOMP during the reporting period.

6.8.2.2 Performance Outcomes

In 2021, biodiversity offset monitoring was undertaken by DnA Environmental (2022a). A summary of the results from this monitoring survey are outlined in the sections below.

Northern Offset Area

The Northern Offset Area (NOA) contains approximately 74 ha of Weeping Myall Woodland Endangered Ecological Community (EEC) listed under both the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act) and the NSW Biodiversity Conservation Act, 2016 (BC Act) and approximately 1 ha of Grey Box Woodlands EEC listed under the EPBC Act.

The Acacia pendula – Casuarina cristata (Myall – Belah) woodland reference sites (RSlope01, RSlope02) contained some large bare areas which are often typical of these communities. In the Northern Offset Area (NOA) sites, functional patch area and related LO had also significantly declined in both sites in 2019 as a result of overgrazing by wildlife. Since 2019 all sites had significantly improved, with LO's of 100% being recorded this year.

Species diversity in the offset sites followed similar trends to the reference sites as a result of the changing seasonal conditions. This year there were 52 – 58 species in the NOA sites, with 17 – 20 of these being exotic species. This year native plants provided 88% of the live plant cover in the reference site, while there was 45 – 59% native plant cover in the offset sites and were therefore weedier than desired.

Since 2020, improved seasonal conditions and management resulted in an increase in ground covers and subsequently all BOA monitoring sites had increased ecological function.

The northern offset sites had a decrease in perennial ground covers this year with 33 - 35% cover recorded in the two NOA sites and there was 20 – 24% dead leaf litter. There were increased levels of annual plants which provided 37 – 38% cover and only 0.5% cover was provided by cryptogams in NOA02.

Total floristic diversity recorded has been highly variable between the sites, as well and between the monitoring years. Initially increased diversity was recorded across the range of sites, however the drought conditions experienced during 2017 – 2019 resulted in a declining trend. Some rainfall prior to the monitoring event had stimulated a flush of plant growth in the revegetation areas which saw a minor increase in diversity in 2019 and since 2020, floristic diversity has significantly increased across all monitoring sites as a result of the above average rainfall.

This year there were 52 – 58 species in the slope offset sites NOA01 and NOA02, with 17 – 20 of these being exotic species.

The soil in the NOA slope monitoring sites tended to be slightly to moderately alkaline, saline and low in organic matter.

In all of the Northern and Southern Offset sites there were elevated levels iron and iron concentrations were also significantly high in all of the hill woodland reference sites, suggesting that these elements may naturally occur in elevated levels in the Lake Cowal environment.

No rills were recorded in the Northern or Southern Offset Areas.

Southern Offset Area

The Southern Offset Area (SOA) contains approximately 122 ha of Weeping Myall Woodland EEC listed under both the EPBC Act and the BC Act, and approximately 150 ha of Grey Box Woodlands EEC listed under the EPBC Act. These areas have been defined as offset enhancement areas. The cleared 100 ha of agricultural land mapped as Spear Grass – Windmill Grass Grassland to the west of Fellman's Hill in the SOA has been identified as the offset revegetation area.

The SOA monitoring sites are situated in old cropping paddocks and have become very stable due to the relatively high levels of litter largely derived from dead annual plants and very hard compacted soils. In previous

years, the four SOA's have remained well vegetated grassland areas with 100% functional patch areas, despite grazing by livestock in SOA03 and SOA04 in 2016. This year an increase in total ground covers was recorded in all reference and offset sites.

This year the improved seasonal conditions resulted in an increase in ground covers and subsequently all monitoring sites had increased LOs. This year all four reference sites had 100% LO, and so did the southern offset sites.

Some rainfall prior to the monitoring event had stimulated a flush of plant growth in the revegetation areas which saw a minor increase in diversity in 2019 and since 2020, floristic diversity has significantly increased across all monitoring sites as a result of the above average rainfall, especially in the Grey Box woodlands. In the SOA sites, there were a total of 41 – 58 species. Native species were more diverse than exotic species in all sites, however, there was an increased diversity of exotics this year, with 10 – 21 species. This year, all sites had an acceptable diversity of total and native species, however, SOA04 had a slightly higher diversity of exotic species compared to the Hill reference sites.

During the drought in 2019 there was high seedling mortality in the reference sites however numbers have been increasing with 20 - 383 individuals represented by 2 – 4 different species being recorded this year. This year most individuals were less than 0.5m in height. Some individuals >2.0m in height were recorded in three sites.

In the SOA sites, there were a total of 41 – 58 species. Native species were more diverse than exotic species in all sites, however, there was an increased diversity of exotics this year, with 10 – 21 species. All sites had an acceptable diversity of total and native species. SOA04 had a slightly higher diversity of exotic species compared to the Hill reference sites.

All SOA sites had a composition of ground covers (sub-shrubs, herbs, grasses, reeds and ferns) comparable to the reference sites, due to the relatively low diversity in the Dwyer's Red Gum reference sites. In SOA01, no trees or shrubs were recorded, and no shrubs were recorded in SOA03 or SOA04. SOA02 was the only site with a composition of species comparable to the reference sites.

Soil pH in the Grey Box woodlands was higher compared to the Dwyer's Red gum, but collectively the soil pH ranged from 4.6 – 5.9. The soils in the Grey Box woodlands were moderately to strongly acidic, while in the Dwyer's Red Gum woodland the soils were very strongly acidic (Bruce and Rayment 1982). The soil pH recorded in the southern offset sites ranged from 6.0 – 6.9 and were moderately acidic to neutral and within desirable agricultural ranges.

All SOA sites had an EC comparable to the local woodlands and are non-saline.

In terms of meeting completion targets there was an absence of mature trees and shrubs and associated structure and habitat requirements in all NOA and SOA monitoring sites. In most NOA and SOA enhancement areas additional revegetation activities will be required as the density and diversity of existing mature seed producing trees and shrubs is low and little natural regeneration has occurred despite the exclusion of grazing for many years. Revegetation activities undertaken in SOA02 and surrounding area in 2016, has been developing and presently meets numerous tree and shrub density and diversity targets. Revegetation activities are also required in the remaining offset sites in order to transform the derived grasslands into the desired slope and hill woodland communities.

No rills were recorded in the Northern or Southern Offset Areas.

No threatened species were recorded within the range of offset or reference monitoring sites.

6.8.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.8.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.9 FAUNA

As outlined in Section 6.7, Development Consent Condition 3.2 details the requirements for the CGO in relation to the management of flora and fauna. A FFMP and TSMP have been developed for the CGO in accordance with Development Consent Conditions 3.2(b) and 3.2(c), respectively. The FFMP has also been prepared to address the relevant requirements of ML 1535.

Monitoring and management of fauna continued in accordance with the requirements of the FFMP, the TSMP, the BOMP and the RMP during the reporting period.

6.9.1 Environmental Management

6.9.1.1 Control Strategies

The relevant control strategies for the management of fauna species are described in the FFMP, RMP and BOMP and include:

- implementation of CWMP initiatives and the RVEP.
- incorporation of fauna management initiatives during operational design.
- implementation of the VCP (including pre-clearance surveys).
- implementation of the TSMP.
- management of impacts on terrestrial and aquatic fauna.
- rehabilitation of disturbance areas.
- weed management and pest control.
- fauna monitoring program.
- maintaining a clean, rubbish free environment to discourage scavenging.
- prohibition for the introduction of animals including domestic pets on ML 1535.
- imposing speed limits within ML 1535 to reduce the risk of fauna mortality via vehicular strike; and
- provision of information relevant to the management of native fauna during employee and contractor inductions.

6.9.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.9.1.3 Variations from proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.9.2 Environmental Performance

6.9.2.1 Monitoring

In accordance with the FFMP, monitoring activities in relation to fauna were conducted during the reporting period, including:

- continuation of long-term monitoring of bird breeding.
- bat call monitoring at the active TSF and control site.
- twice daily monitoring of any fauna usage of the IWL.
- weekly boundary inspections of ML 1535.

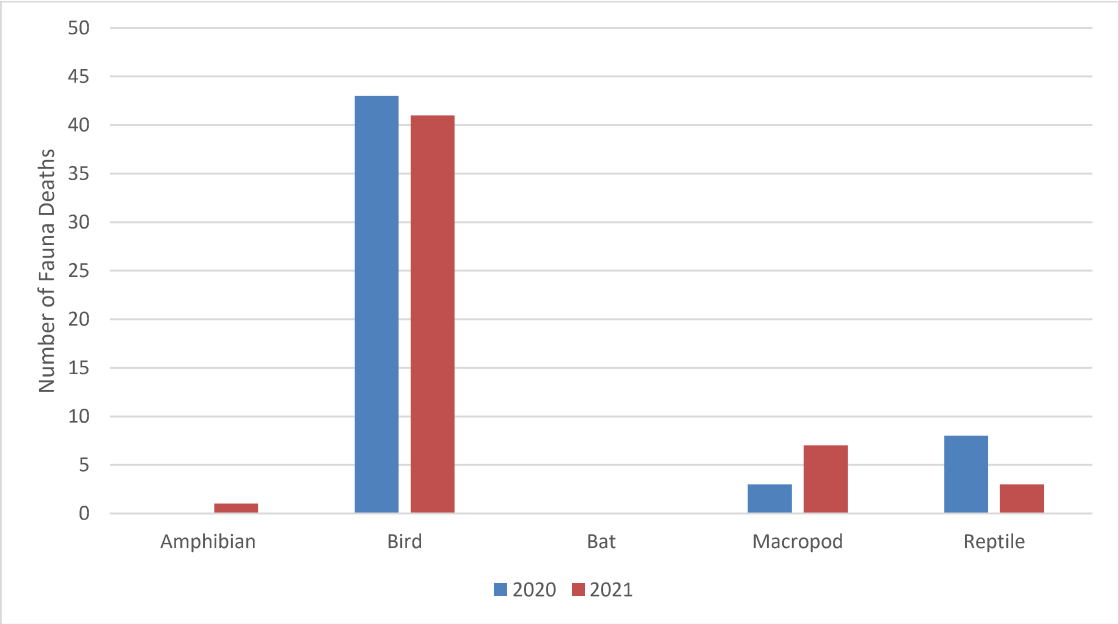
- daily and weekly fauna incident inspections and field patrols.
- annual compensatory wetland habitat and fish investigation

6.9.2.2 Performance Outcomes

Reported Fauna Deaths

There was a total of 52 fauna incidents on ML 1535 during the reporting period (Graph 10), which was consistent with 54 fauna deaths recorded during 2020. All injured or deceased fauna were taken to the local vet for examination as required (i.e. in instances where cause of death cannot be immediately determined). There were no cyanide related fauna incidents or deaths recorded during 2021.

Graph 10: Graph of Fauna Deaths for the Reporting Period



Lake Cowal Waterbird Monitoring

The long-term monitoring of bird breeding continued during 2021. A summary of monitoring results undertaken by Malcom Carnegie and Professor Peter Gell (2021a, 2021b, 2021c) during the reporting period is provided below. The location of waterbird monitoring transects are presented on Figure 8.

March 2021

Lake Cowal was visited on March 2nd, 2021. Water was confined to the Lake centre and was not sufficiently close to the transect lines to justify survey. Incidental observations were made of the birds at the farm dam on the northern end of Transect 8, including four Australasian Grebe, 40 Grey Teal, 30 Wood Duck, eight Pacific Black Duck, and two White-faced Herons. The areas in the lake's north that typically host colonial breeding were dry and not being utilised.

August 2021

Lake Cowal was visited on August 16th, 17th, and 19th, 2021. Lake levels were much higher than the March 2021 survey, allowing for the original survey lines to be followed. Recent rainfall across the catchments and the release of water down the Lachlan River led to the almost complete inundation of the lake area. A total of 30 species were observed along transects, which is among the highest of the August tallies since refilling in 2010. The total of 5143 individual birds observed was also the highest for that period. Transect 7 supported the greatest number of species while Transect 2 recorded the greatest number of birds. However, the high-water depth reduced the width of shallows around the margins, providing less habitat for wading waterbirds. As a result, the August 2021 survey contrasts with the shallow water survey in August 2018, where there was a large diversity of wading species. The new conditions favoured waterhens, which exploit the inundated cane grass and grassy margins rather than mudflats. While the water was relatively deep, the immaturity of the lake likely means there is few larger fish, so the lake is yet to prove attractive to fish-eating species such as cormorants.

The most commonly recorded species were Hoary-headed Grebe (1011), Grey Teal (933), Pink-eared Duck (295), Hardhead (317), Black-tailed Native-Hen (117), Eurasian Coot (1690) and Purple Swamphen (297). The bird assemblage at Lake Cowal supported very low numbers of fish-eating species and wading birds (< 2%) and was dominated by ducks (34%) and waterhens (41%). This shift reflects the combination of the early stage of filling (few fish eaters) and high-water levels (few waders). The count was the highest August tally (2010 – present) for Hoary-headed Grebe, Black Swan, Black-tailed Native-hen, Purple Swamphen, White-necked Heron, and Australian White Ibis. By contrast, it was the first survey since 2010 where no Silver Gulls were recorded. No breeding activity was observed at the colonial breeding sites at Lake Cowal during the survey. However, seven pairs of Black Swans were observed caring for a total of 26 cygnets on Transect 7.

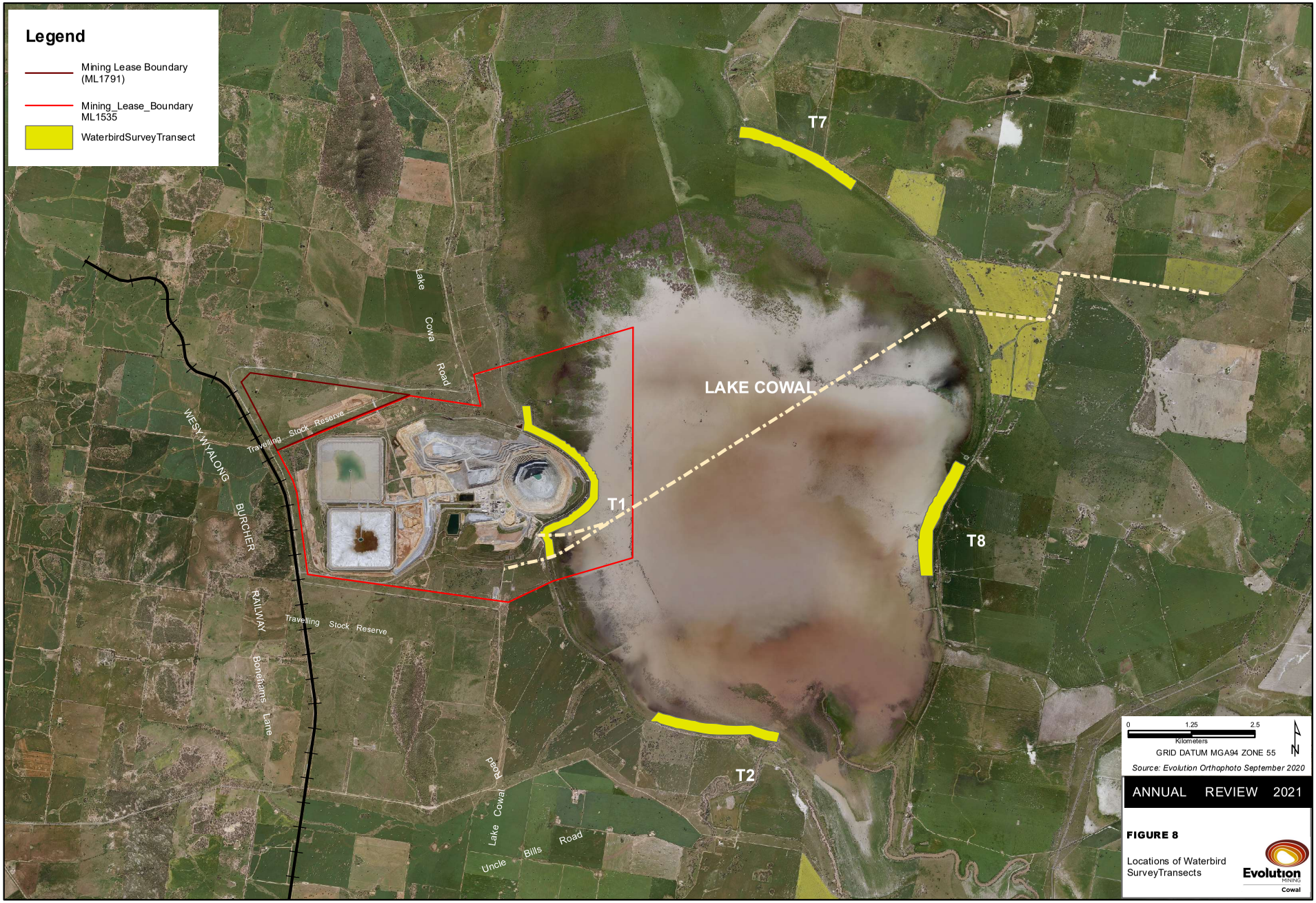
October 2021

Lake Cowal was visited on October 16th, 17th and 19th 2021. Lake levels were higher than the August 2021 survey, the transect lines were close to lake capacity and lake margins were largely inundated. A total of 37 species were observed along transects, which exceeds previous 'October' counts since 2010. The total of 4473 birds observed was slightly higher than the average for October from 2010-21. Transect 7 supported both the greatest number of species (28) and the greatest number of birds (1629).

Birds typical of infilling events, including Hoary-headed and Great-crested Grebes, and White-necked Heron, were common during the survey. Other deep-water species, such as grebes and Eurasian Coot, were common and diving ducks were observed. The most commonly recorded species were the Hoary-headed Grebe (1282), Grey Teal (926), Pink-eared Duck (495), Hardhead (132), Eurasian Coot (463), Black-tailed Native-hen (189) and Whiskered Tern (416). Observations were dominated by diving species (grebes, diving ducks; 30%), dabbling ducks (37%) and gallinules (16%). These proportions reflect the deeper nature of the lake and the limited availability of shallow water habitat for wading birds. Other than 416 Whiskered Tern, the bird assemblage at Lake Cowal still supported only low numbers of fish-eating species. Numbers of cormorants and Australian Pelican are likely to increase as this high lake phase continues.

Colonial breeding

Colonial breeding was well underway during the October 2021 survey, with over 1500 nests observed. Large numbers of Straw-necked Ibis, Glossy Ibis and Royal Spoonbill were observed during October 2021 in the stands of lignum in the north-east of the lake. Two active White-necked Heron nests, and a Yellow-billed Spoonbill nest, were observed along Transect 8. Seven Eurasian Coot nests were observed on Coniston Lake. Two pairs of Grey Teal were observed at Transect 1 with 13 juveniles, while two pairs with 14 juveniles were observed on Transect 7. A pair of Australian Wood Ducks were also observed with seven juveniles on Transect 7 and a pair of Pacific Black Duck were observed on Transect 8 with three juveniles. Two pairs of Black Swans, with 12 cygnets, were also observed on Transect 8.

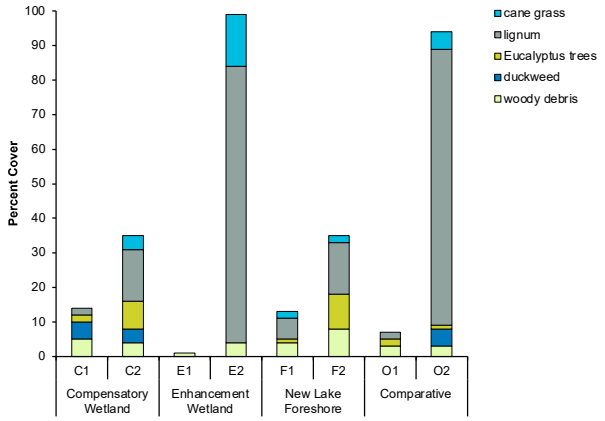

Legend
Mining Lease Boundary (ML1791)
Mining_Lease_Boundary ML1535
WaterbirdSurveyTransect
T7
T1
T8
T2
LAKE COWAL
Lake Cowa Road
Travelling Stock Reserve
WESTWYALONG
BURCHER
RAILWAY
Travelling Stock Reserve
Bonekams Lane
Lake Cowal Road
Uncle Bills Road
0
1.25
2.5
Kilometers
N
GRID DATUM MGA94 ZONE 55
Source: Evolution Orthophoto September 2020
ANNUAL REVIEW 2021
FIGURE 8
Locations of Waterbird SurveyTransects
Evolution MINING
Cowal

Compensatory Wetland Habitat and Fish Investigation

A compensatory wetland habitat and fish investigation was conducted during January 2022, in accordance with The requirements of the CWMP and DA14/98. Due to the stage of lake fill, travel restrictions and the flood regime in late 2021, survey work was conducted from 12-15 January 2022 while the lake was substantially inundated. FRC Environmental previously undertook similar assessments in 2011, 2012, 2014, 2016 and 2017.

Fish communities and habitat for aquatic fauna were assessed at sites within the Compensatory Wetland, Enhancement Wetland and New Lake Foreshore areas (Graph 11). Comparative sites were also assessed within areas of Lake Cowal next to ML1535 to provide comparative data regarding fish communities and aquatic habitat of the lake. In January 2022, the water levels were high and the habitat available to fish was limited to lignum, eucalypt trees, cane grass, and woody debris. There was some floating duckweed at three sites. Water levels were higher than in August 2017, with the tops of cane grass visible only at some sites. Floating/unattached canegrass was present at most sites which provided additional aquatic habitat to fish. Two sites had very low aquatic habitat cover, while one site had no visible aquatic vegetation present. Dense lignum growth at two sites provided moderate aquatic habitat cover for fish species.

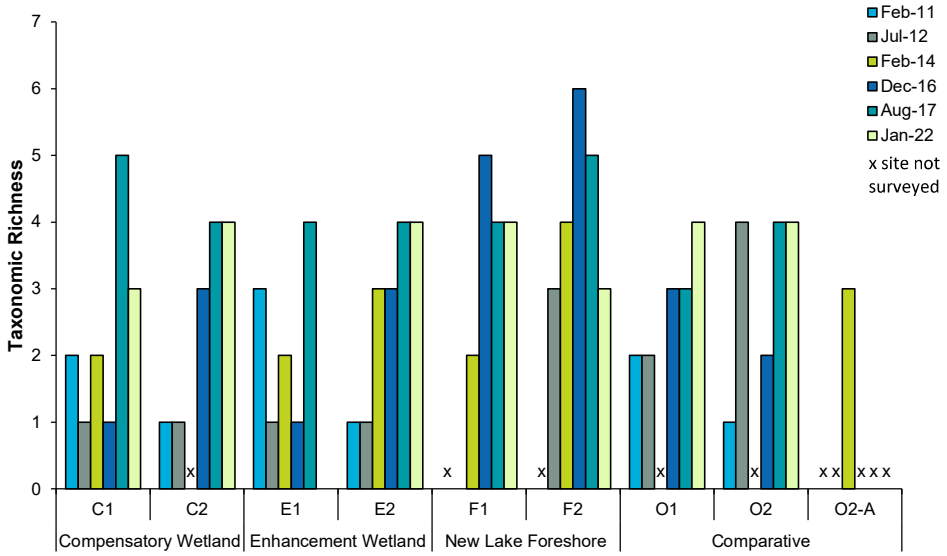
Graph 11: Percent cover of vegetation and large woody debris at each site in January 2022.



The diversity of fish species in Lake Cowal in the recent surveys was lower than that found by historical studies (Graph 12). One native species, the common carp gudgeon (*Hypseleotris spp.*), was caught in January 2022 (FRC Environmental, 2022). Three introduced species, including the common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*) and gambusia (*Gambusia holbrooki*), were also caught during the survey period. The most abundant species were the eastern gambusia and common carp gudgeon, with 1692 and 671 individuals caught, respectively. No fish species listed under the EPBC Act or the FM Act were caught in any of the surveys. The community composition of fish in the surveys was similar to that of other areas within Murray Darling Basin that experience adverse environmental conditions (i.e. ephemeral waterbodies, high water temperatures, low percent saturation of dissolved oxygen). Such communities are often dominated by eastern gambusia with some native common carp gudgeon, and occasionally, other tolerant, small-bodied species, such as introduced goldfish, that can rapidly colonise newly available habitat (FRC Environmental, 2022).

During the January 2022 survey, deceased goldfish were observed at each site and dead yabbies (*Cherax sp.*) were observed at some locations. No dead native fish species were recorded. Dead ducks were also observed among the lignum and along the lake margin adjacent to the compensatory and comparative area. The large number of deceased biota observed in the January 2022 survey compared to previous surveys is likely due to the very high phytoplankton concentration observed at each site, with the blooms likely comprised of toxic strains such as cyanobacteria. Large algal blooms in January 2022 are likely the result of a combination of high summer water temperatures, low flows and increased nutrient and sediment run-off following a prolonged period where Lake Cowal and its surrounds have been dry. As the fish community in January 2022 was similar to previous surveys and the fish caught showed no evidence of poor health, it is expected that the majority of the fish community remains unharmed from the large algal blooms observed.

Graph 12: Historic species richness recorded at each survey site



Fauna Monitoring of IWL and ML 1535 Boundary

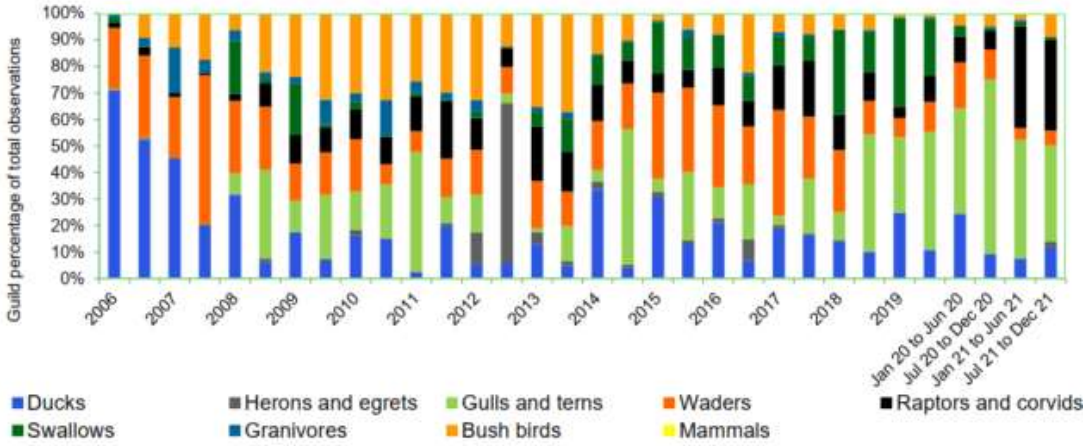
Fauna observations during 2021 boundary inspections were slightly higher than recorded during 2020 (9331 and 8907 individuals, respectively). Detailed fauna usage reports in relation to the active IWL areas were prepared by Donato Environmental Services (DES) (2021; 2022) during the reporting period being, 1 January to 30 June 2021 and 1 July 2021 to 31 December 2021, respectively.

The main findings included:

- With the exception of an isolated incident on 7 July 2021 (Section 6.6), the cyanide discharge concentrations were below those required by the Development Consent.
- Monitoring of cyanide concentrations within the active IWL and other water bodies has been conducted frequently and at a high standard consistent with industry best practice.
- Considering currently accepted knowledge of cyanide toxicosis in the gold industry, the range of concentrations reported at CGO are considered benign to wildlife (DES, 2022).
- No cyanide-related wildlife mortality or effect was recorded at the IWL.
- CGO processing personnel (mill technicians) conducted twice-daily routine inspections for wildlife at the IWL on 730 occasions from a possible 365 days (100%) during 2021. The frequency of systematic wildlife surveys makes it very unlikely that cyanide-related wildlife deaths were occurring undetected.
- Birds were the most common diurnal vertebrate wildlife recorded alive visiting and interacting directly with the IWL during the 2021 monitoring period. Birds were identified from eight guilds, in varying abundances, at the active IWL (Graph 13).
- After several years of intense drought, the Lachlan Catchment experienced high levels of rainfall throughout 2020 and 2021, resulting in a population explosion of the house mouse (*Mus musculus*) across the region. The mouse plague appears to be directly responsible for the increase in observations of the two scavenger guilds, raptors and corvids and gulls and terns, in comparison to the previous monitoring periods (Graph 13).
- It is clear that Lake Cowal influences the number of observations of waders and ducks within the region. However, it is also possible that broader climatic influences across eastern Australia may influence the wildlife guild composition.

- No insectivorous bat deaths were recorded at the IWL during the 2021 monitoring period or since systematic wildlife monitoring commenced in April 2006.
- Nocturnal surveys, including echolocation call recording methods, indicate that insectivorous bats were consistently present in the airspace above the active IWL and the control site.
- Monthly nocturnal surveying conducted at CGO represents a proactive approach to environmental monitoring.

Graph 13: Guild-specific percentages of total wildlife observations recorded at the active IWL cell



6.9.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.9.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.10 WEEDS AND PESTS

General weed and pest management activities within ML 1535 and the biodiversity offset areas have been managed during the 2021 reporting period in accordance with the Land Management Plan (LMP), the FFMP and the BOMP.

6.10.1 Environmental Management

6.10.1.1 Control Strategies

In accordance with the LMP, FFMP and the BOMP, the control strategies for weed management on Evolution -owned land (including the biodiversity offset areas) include (but are not limited to) the following:

- identification of weeds by regular and annual site inspections.
- communication with other landholders/leaseholders and regulatory authorities to keep weed management practices in line with regional weed control activities.
- mechanical removal of identified noxious weeds and/or the application of approved herbicides in authorised areas (herbicide use in wetland areas will be strictly controlled).
- implementing follow-up site inspections to determine the effectiveness of the weed control measures; and
- pest control activities.

The implementation of weed management strategies typically occurs according to seasonal and climatic requirements.

The pest control activities within ML 1535, ML 1791 and the offset areas described in the LMP, FFMP and the BOMP include the following measures:

- regular property inspections to assess the status of pest populations within Evolution owned land.
- mandatory pest control for declared pests (i.e. rabbits, foxes, pigs and wild dogs) in accordance with Pest Control Orders under the NSW *Local Land Services Act, 2013*; and
- inspections to assess the effectiveness of control measures implemented and review these if necessary.

6.10.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.10.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.10.2 Environmental Performance

6.10.2.1 Monitoring

In accordance with the LMP, the FFMP and the BOMP, Evolution has implemented a weed monitoring program at the CGO. Evolution-owned land including the biodiversity offset areas continues to be surveyed for weeds annually. Follow-up inspections are also to be made for specific areas following the implementation of weed control measures (to assess the success of the weed controls). Weed monitoring is conducted by suitably qualified personnel from a slow-moving vehicle or on foot when required.

Weed monitoring includes identification of:

- extent of weed occurrence (noxious or otherwise).
- details of weed distribution (i.e. locations of infested areas) and possible reasons for any infestations (e.g. a change in land use practices).
- optimum herbicide application or physical removal timing (for implementation of controls).
- any resistance to an herbicide type or herbicide application technique (on the basis of success of previous controls); and
- identification of any new weed species that may be carried into the CGO area on vehicles accessing the site and become established near the vehicle wash-down area.

6.10.2.2 Performance Outcomes

Weed Management

During the weed survey undertaken for the reporting period, no Priority Weeds in the Riverina Local Land Services Area were recorded (NGH Environmental, 2020). In 2020, African Boxthorn was not observed during the 2020 survey. During 2021 this species was recorded along transect 13, 14, 26, 27, 31, N-3, N-18, N-22, N-27 and N-30. It was also recorded along the fence line just off of transect 25. This was an observational recording due to being a Priority Weed. This species may have been present in transects that could not be surveyed due to wet conditions.

Six species listed as weeds of concern under the Riverina Regional Strategic Weed Management Plan (RRSWMP) 2017 – 2022 were identified during the 2021 survey, including:

• African Boxthorn (**Lycium ferocissimum*)
• Bathurst Burr (**Xanthium spinosum*)
• Galvanised Burr (*Sclerolaena birchii*)
• Lippia (**Phyla canescens*)
• Scotch Thistle (**Onopordum acanthium*)
• St John's Wort (**Hypericum perforatum*)

Eight other weed species were identified during the 2021 survey period. These species are not listed as priority weeds or weeds of concern under the RRSWMP 2017- 2022.

• Aaron's Rod (**Verbascum thapsus*)
• Black Roly-poly (*Sclerolaena muricata*)
• Camel melon (**Cucumis sp.*)
• Common Nightshade (**Solanum nigrum*)
• Fleabane (**Conyza sp.*)
• Patterson's Curse (**Echium plantagineum*)
• Saffron Thistle (**Carthamus lanatus*)
• Spear Thistle (**Cirsium vulgare*)

These weeds all have a General Biosecurity Duty, which means any person who deals with these plants has a duty to ensure the biosecurity risk is prevented, eliminated or minimised so far as reasonably practicable.

Previous surveys recorded several additional species listed below. However, these species were not recorded during the 2020 survey period. Due to wet conditions, some transects where these species were recorded during the 2019 period could not be accessed.

- Fleabane (*Conyza sp.*)
- Noogooraburr (*Xanthium occidentale*)
- Scotch Thistle (*Onopordum acanthium*)

In 2020, African Boxthorn was not observed during the 2020 survey. During 2021 this species was recorded along transect 13, 14, 26, 27, 31, N-3, N-18, N-22, N-27 and N-30. It was also recorded along the fence line just off of transect 25. This was an observational recording due to being a Priority Weed. This species may have been present in transects that could not be surveyed due to wet conditions.

In 2020, Lippia was found along the lake edges not located on a formal transect. During the 2021 survey it was found along transect 31. There was no difference in weed abundance from 2020 to 2021. Continued weed control is required.

In 2020, Bathurst Burr was found along transects transect 6. During the 2021 surveys Bathurst Burr was recorded along transect N-1, N-9, N-11, N-12, N-20, and 27.

A comparison of 2020 to 2021 weed surveys shows an increase in the abundance of Galvanized Burr. Galvanized Burr is easily spread as burrs adhere to vehicle tyres, livestock and other animals. Continued weed control is required.

In 2020, Scotch Thistle was not recorded during the weed surveys. During the 2021 survey Scotch Thistle was recorded along transects 20, N-5, N-21 and N-23.

During the 2020 survey Aarons's Rod was not found. During the 2021 survey Aaron's Rod is located along transect 4.

During the 2020 survey Black Roly-poly was not found. During the 2021 survey Black Roly-poly is located along transects 0, 4, 14, 17, 20, 25, 31, 34, 49, N-1, N-4, N-5, N-7, N-8, N-18, N21, N-21, N-22, N-23, N-25, N-26, N-27, N-28, N-29, N-31, N-33 and N-34.

During the 2020 survey Camel Melon was found in transects 12 and 32. During the 2021 survey Camel Melon was located on transects 0 and N-22.

During the 2020 survey Common Nightshade was not found. During the 2021 survey Common Nightshade was found in transects 31 and N-22

During the 2020 survey Fleabane was not found. During the 2021 survey Fleabane was found in transects 32 and N-22.

In 2020, Patterson's Curse was present in every surveyed transect except 0, 5, 47, 57. All other transects contained Patterson's Curse, across most of the transect sites a high abundance of this species was present. During the 2021 survey Patterson's Curse was present on every surveyed transect except 28 and N-24.

During the 2020 survey Saffron Thistle was recorded on transects 14, 16, 17, 28, 31,33, 34, 35, 36, 39,41, 44, 46, 47, 49, 52, 53, T7 and T8. During the 2021 survey Saffron Thistle was found in transects 13, 14, 16, 17, 20, 31, 34, 49, N-3, N-5, N-7, N-8, N-9, N-10, N-15, N-20, N-21, N-22, N-23, N-26 and N-27.

During the 2020 survey Spear Thistle was not recorded. During the 2021 survey Spear Thistle was found in transects 14, 24, 25, 32, N-6, N-11, N-16 and N-21.

Weed management practices will continually be implemented to help prevent the spread and establishment of these weed species.

Pest Management

A pest eradication program continued during the reporting period using collapsible traps**,** 1080 Fox baits and Talon mouse bait blocks and traps. No rabbit baiting was conducted during the reporting period. Further investigations are being conducted to determine feral pig activity for which control programs will be implemented.

6.10.3 Reportable Incidents

No incidents were recorded in the reporting period.

6.10.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.11 ABORIGINAL HERITAGE

Development Consent Condition 3.1(a)(ii) outlines the requirements in relation to salvage, excavation and monitoring of archaeological sites-within the CGO area prior to and during development. An Indigenous Archaeology and Cultural Heritage Management Plan (IACMP) has been prepared and approved for the CGO.

Monitoring and management of Aboriginal objects and archaeological sites continued in accordance with the IACHMP and relevant permits and consents (under section 87 and section 90 of the NPW Act) during the 2021 reporting period.

6.11.1 Environmental Management

6.11.1.1 Control Strategies

The IACHMP sets out the salvage, excavation, monitoring and other management measures that have been undertaken for each of the registered archaeological sites and other Aboriginal objects within the CGO area.

In general, the strategies include protection; investigation; collection; excavation; documentation and storage of Aboriginal objects in an on-site temporary “Keeping Place”.

Sites LC2, LC3 and LC4 are managed in accordance with Special Conditions 6, 12 and 13 of Permit 1468.

Management measures are not limited to registered sites. Permit 1468 and Permit 1681 authorise a range of management measures proposed in the Research Design and Study Plan for other Aboriginal objects in the CGO area that are not contained within the Registered Sites. The details of the management and mitigation measures for other Aboriginal objects is contained in the Research Design and Study Plan (Pardoe, 2002) for the CGO as amended by Permit 1468 and Permit 1681.

Activities undertaken during the reporting period included the following:

- Numerous cultural heritage and due diligence inspections with archaeologists and representatives from the Aboriginal community.
- Archaeological salvage activities with archaeologists and representatives from the Aboriginal community.

It is noted that the majority of cultural heritage work in the 2021 reporting period continued to be surface and subsurface monitoring for Modification approval areas for the IWL, exploration drill pads and roads.

6.11.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.11.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.11.2 Environmental Performance

6.11.2.1 Monitoring

During the reporting period, due diligence inspections were undertaken within proposed exploration areas within ML 1535.

6.11.2.2 Performance Outcomes

No non-compliance issues were reported.

6.11.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.11.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.12 EUROPEAN HERITAGE

The Heritage Management Plan (HMP) was prepared in accordance with Development Consent Condition 3.1. Monitoring and management of European heritage continued in accordance with the HMP during the reporting period.

6.12.1 Environmental Management

6.12.1.1 Control Strategies

An interpretive display has been established at the Lake Cowal Conservation Centre (LCCC) in consultation with the Lake Cowal Foundation (LCF), BSC and Bland District Historical Society. The display includes maps, photographs, narrative, and fragments/elements salvaged from the Cowal West Homestead Complex to illustrate its history. Other items containing a level of local heritage significance identified in the HMP will continue to be maintained in accordance with the HMP.

6.12.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.12.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.12.2 Environmental Performance

6.12.2.1 Monitoring

Inspections of heritage sites are conducted periodically in accordance with the HMP.

6.12.2.2 Performance Outcomes

The maintenance works carried out within the Lake Cowal Homestead during the reporting have been effective in preserving the integrity and heritage value of the buildings.

6.12.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.12.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.13 BUSHFIRE

Development Consent Condition 3.6 and the Emergency Preparedness Response Plan (EPRP), RMP and BOMP describe fire preventative measures and fuel management measures for the mine site, rehabilitation areas and biodiversity offset areas.

Monitoring and management of bushfire risk continued in accordance with Development Consent Condition 3.6, the EPRP, RMP and BOMP during the 2021 reporting period.

6.13.1 Environmental Management

6.13.1.1 Control Strategies

In accordance with the RMP and BOMP, bushfire preventative and control strategies for the CGO and the CGO offset areas include:

- educating employees and contractors on general fire awareness and response procedures.
- fire track (and fire break) maintenance for fire control.
- annual inspections to identify areas requiring bushfire control measures including assessment of fuel loads.
- fuel management (e.g. hazard reduction burns) in consultation with the NSW Rural Fire Service.

6.13.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators

6.13.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.13.2 Environmental Performance

6.13.2.1 Monitoring

In accordance with Development Consent Condition 6.2, data from the meteorological station maintained on-site was used to determine whether current weather conditions were suitable for fire management activities, and to assist in the management of bushfire fighting activities.

The Weather Zone lightning tracking system was introduced to operations in early-2012. The Mining Dispatch Control Room operators continually monitor and pass on alert levels between red, orange and yellow to other employee groups and the Emergency Response Team until all clear conditions resume.

6.13.2.2 Performance Outcomes

There were no uncontrolled bushfires within ML 1535 or the biodiversity offset areas during the 2021 reporting period.

A number of all-weather access tracks are established and have been maintained during the 2021 reporting period – within the ML 1535, on Evolution-owned land and within Lake Cowal.

6.13.3 Reportable Incidents

There were no other reportable incidents during the reporting period.

6.13.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.14 HYDROCARBON CONTAMINATION

A Hazardous Materials Management Plan (HMMP) has been prepared for the CGO in accordance with Development Consent Condition 5.4 (d), The HMMP was approved in October 2020. Monitoring and management of hazardous waste and chemicals continued in accordance with the HMMP during the reporting period.

6.14.1 Environmental Management

6.14.1.1 Control Strategies

Evolution employees and contractors have adopted a Chemical Management Strategy as part of the HMMP. This strategy allows for the management of each chemical used at the CGO.

Control strategies include:

- Site wide inductions, awareness and training on Hazardous Substances and Hydrocarbon spill response.
- Concrete bunding and tankage integrity audits.
- Area planned general inspections.
- Hazardous Substance and Dangerous Goods Register.
- Incident reporting and follow up action items.
- Bioremediation Facility for treatment of hydrocarbon contaminated soils.

6.14.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.14.1.3 Variations from Proposed Control Strategies

The concrete bunding and tankage integrity audit was unable to be completed during 2021 due to government-mandated travel restrictions. With the exception of the bund audit, there were no variations from the proposed control strategies during the reporting period.

6.14.2 Environmental Performance

6.14.2.1 Monitoring

Monitoring for hydrocarbon contamination continued during the reporting period.

6.14.2.2 Performance Outcomes

A number of minor substance spillage incidents occurred during 2021; however, these spills were classified as low risk and not material. All spills were fully contained, recovered and/ or treated in the bioremediation facility.

6.14.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.14.4 Further Improvements

No further improvements are proposed for the next reporting period.

6.15 WASTE GEOCHEMISTRY

During annual on-site AR performance review meetings in 2005 and 2006, the then DPI Mineral Resources requested confirmatory test-work of waste rock geochemistry to be undertaken. In their 2007 report, the Independent Monitoring Panel also recommended that Evolution continue to monitor the waste rock being removed from the open pit, to facilitate identification of potentially acid-generating material (if present) and selective placement of that material within the waste emplacements.

6.15.1 Environmental Management

The regional and local geology of the E42 Deposit has been described by Miles, Brooker, McInnes, *et al* [1993-1998]). The complex consists of calc-alkaline to shoshonitic volcanic rocks and related sedimentary rocks deposited in a deep-water environment and are unconformably overlain, in parts, by the Siluro-Devonian Manna Conglomerate. The auriferous quartz-carbonate-sulphide and carbonate-quartz-sulphide veins occur throughout the deposit and have a consistent dip of 305° and dip of 35° to the southwest. McInnes *et al.* (1998) describe the gold-bearing veins as generally being associated with one of two alteration styles: ankerite-quartz-pyrite-sphalerite-chalcopyrite-galena veins, which are associated with ankerite-quartz-sericite-carbonate alteration; and quartz, potassium feldspar, pyrite, sphalerite, and chalcopyrite veins associated with the chlorite-carbonate-pyrite alteration. Oxide blankets occur at the base of tertiary transported lacustrine cover, saprolite-saprock transition and at the base of oxidation (*pers. comm*, McInnes, Freer [2007]). These flat lying blankets can be up to several hundred metres wide and 1 m to 15 m thick and are interpreted to have formed as a result of remobilisation of gold during weathering processes in association with water table fluctuations.

6.15.1.1 Control Strategies

Based on prior test work there is no indication that the E42 Deposit or the process tailings are acid forming (Environmental Geochemistry International Pty Ltd [EGi], 2004; and Geo-Environmental Management [GEM], 2009; 2013). Overall, the EGi (2004) results indicated a very low likelihood of Acid Rock Drainage (ARD) generation from waste rock, Carbon in Leach tailings and combined primary tailings represented by the samples included in the testing programs. Therefore, no special handling requirements were indicated for ARD control at the CGO. However, operational monitoring and testing was recommended to be a carried out on an occasional and as needed basis to confirm the low ARD potential of all waste types with particular focus on any unexpected rock types or alteration types which may be exposed during mining.

Chemical groundwater data will continue to be collected as part of the groundwater monitoring programme detailed in the SGWMBMP. Leachate water quality monitoring will continue to be undertaken at the NWRE, SWRE and PWRE external toe drain points in accordance with the EPL 11912.

6.15.1.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

6.15.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

6.15.2 Environmental Performance

The results of detailed geochemical investigations of waste rock and tailings were reported in the EIS and in subsequent environmental assessments undertaken for the CGO. Ongoing periodic field observations undertaken during the reporting period confirmed the low salinity potential of waste hard rock types mined during the reporting period.

Barrick commissioned O'Kane in late-2007 to conduct repeat test work of the Waste Rock Emplacement and the contents of the TSFs. O'Kane representatives visited site to obtain samples in January 2008. A report was delivered in June 2008 (O'Kane, 2008) and was provided to the DRE. O'Kane (2008) concluded that the results are generally consistent with previous investigations, which predicated that waste rock would be predominantly non-acid forming. GEM (2009) also verified these findings.

A Geochemical Assessment of Proposed Pebble materials was carried out in 2020 by GEM (Geo-Environmental Management Pty Ltd) which confirmed previous findings indicating a very low likelihood of Acid Rock Drainage

(ARD) generation from waste rock materials.

6.15.3 Reportable Incidents

There were no reportable incidents during the reporting period.

6.15.4 Further Improvements

No further improvements are proposed for the next reporting period.

7 WATER MANAGEMENT

7.1 WATER SUPPLY

Water taken by CGO during the reporting period is summarised in Table 21 below.

Table 21: Water Taken for CGO during 2021

Water Licence #	Water Sharing Plan, Source, Management Zone	Entitlement (ML)	Passive Take/Inflows	Active Pumping (ML)	TOTAL
WAL 31864 (BCPC)	*Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012.*	15ML/day and 3,350ML/yr	-	1267.64	1267.64
WAL 36569 (ESB)	Upper Lachlan Alluvial Groundwater Source. Upper Lachlan Alluvial Zone 7 Management Zone	300 ML (with temporary transfer of 750 ML per bore per yr)	-	228.91	228.91
WAL 36615 (Saline groundwater supply bore field within ML 1535 and pit dewatering bores)		3,660 ML/yr	-	-	-
WAL 36617 (pit dewatering)	*Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011.* Lachlan Fold Belt Murray Darling Basin Groundwater Source. Lachlan Fold Belt Mdb (Other) Management Zone	3,294 ML/yr	-	793.59	793.59
WAL 13749 (High Security Title)	*Water Sharing Plan for the Lachlan Regulated River Water Source 2003.* Lachlan Regulated River Water Source. That Part of The Water Source Upstream of Lake Cargelligo Weir.	Zero share component enabling temporary trade of water from regulated Lachlan River source.	-	603.34	603.34
WAL 13748 (General Security)			-		
WAL 14981 (High Security Title)	*Water Sharing Plan for the Lachlan Regulated River Water Source 2003.* Lachlan Regulated River Water Source. That Part of The Water Source Downstream of Lake Cargelligo Weir.	80-unit shares.	-		

Notes: ML – megalitre; ML/day – megalitres per day; ML/year – megalitres per year.

7.1.1 Groundwater

A total of 1267.64 ML of water was extracted from the BCPC bore field during the 2021 reporting period (Table 21). The groundwater level associated with the BCPC bore field is monitored on a continuous basis by the DPE Water groundwater monitoring bore on Burcher Road (GW036553). Contingency measures have been developed for implementation when water levels reach either RL 137.5 m AHD or RL 134 m AHD. These trigger levels were developed in consultation with the then NSW Office of Water (NoW) and other water users within the BCPC including stock and domestic users and irrigators. The trigger levels were not reached during the reporting period.

In addition, as agreed with the then NoW and BCPC Water Users Group, Evolution conducted regular surveys to monitor 11 monuments on the east side of Lake Cowal for any evidence of soil compaction. Monitoring of these monuments has indicated no significant movement to date and shows no specific trends that would be of concern.

Development Application No. 2011/0064 was granted by the FSC on 20 December 2010 for the construction and operation of the ESB, located approximately 10 km east of Lake Cowal's eastern shoreline (Figure 7). Water extraction from the ESB is licensed under WAL 36569. The total volume extracted from the ESB during the 2021 reporting period was 228.91 ML.

The saline groundwater supply bore field on the floor of Lake Cowal within ML 1535 (Figure 9a) was commissioned in mid-2009. Water extraction from the saline groundwater supply bore field within Lake Cowal is licensed under WAL 36615. However, no extraction has occurred since April 2010 due to access restrictions resulting from the inundation of Lake Cowal. The production and monitoring bores on the floor of Lake Cowal remain capped. Access via a gravel track to these bores was reinstated during 2015, however extraction from these bores did not occur during the reporting period.

A total of 793.59 ML was extracted from the open pit dewatering sump (which collected water from rock wall seepage, horizontal depressurisation bores, underground dewatering, and rainfall) during the 2021 reporting period. Water extraction from the open pit dewatering bore field is licensed under WAL 36615 and WAL 36617.

Extracted water was used mainly for ore treatment within the processing plant, dust suppression on haul roads and soil conditioning to achieve optimal compaction rates during IWL construction works.

7.1.2 Surface Water

A total of 603.34 ML was pumped from the Jemalong Irrigation Channel during 2021, which marks a significant reduction from the previous reporting period (2677.0 ML).

The Jemalong Irrigation Channel water was purchased from the regulated Lachlan River trading market. Water access from the Lachlan River Regulated Water Source is licensed under Evolution's High Security WALs 14981 and 13749 (80 Units) and General Security (zero allocation) WAL 13748. Licenced water from the Lachlan River is supplied via a pipeline from the Jemalong Irrigation Channel to the BCPC Bore 4 pumping station (Figure 9b).

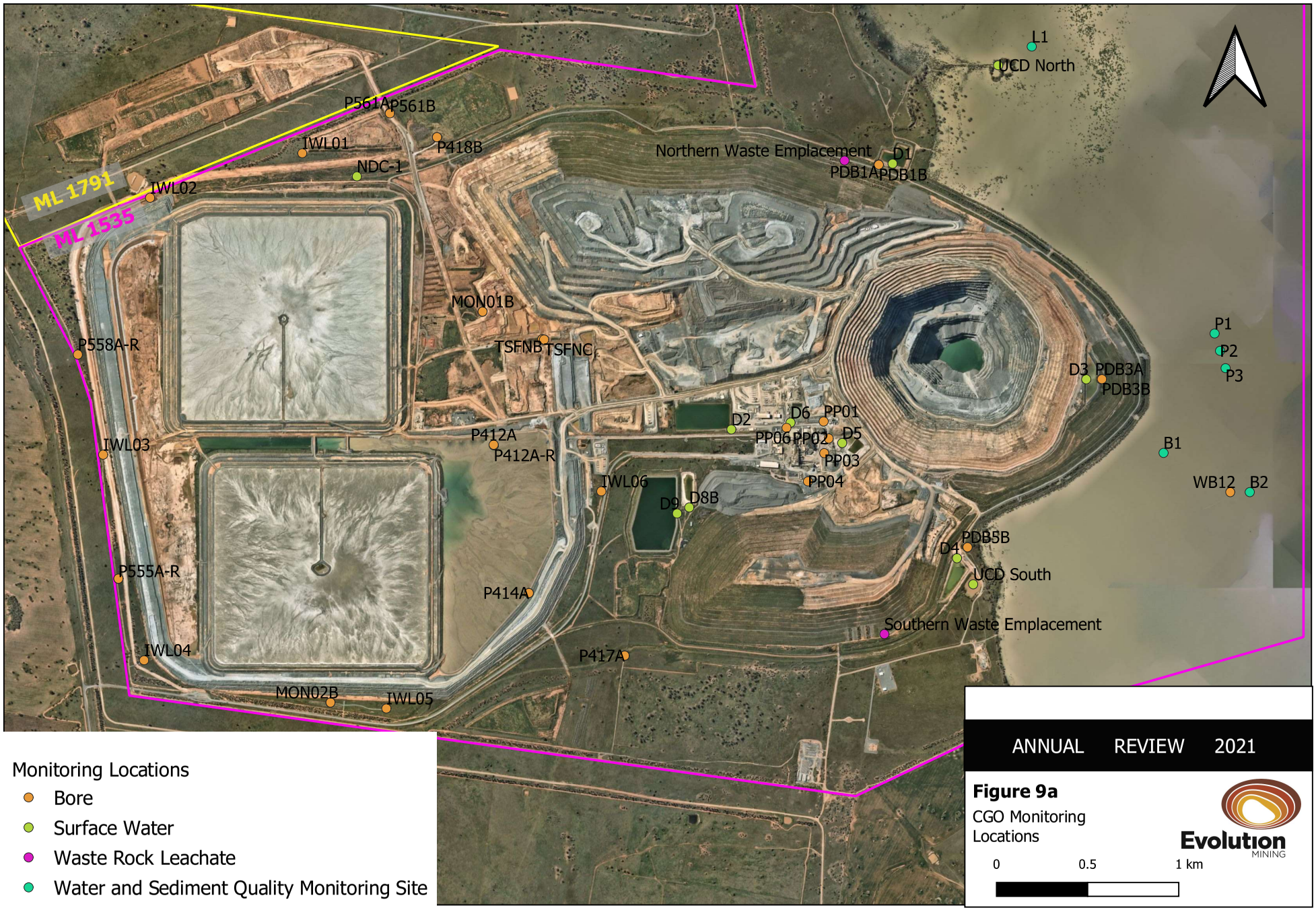
The CGO water management system is conceptually shown in Figure 10.

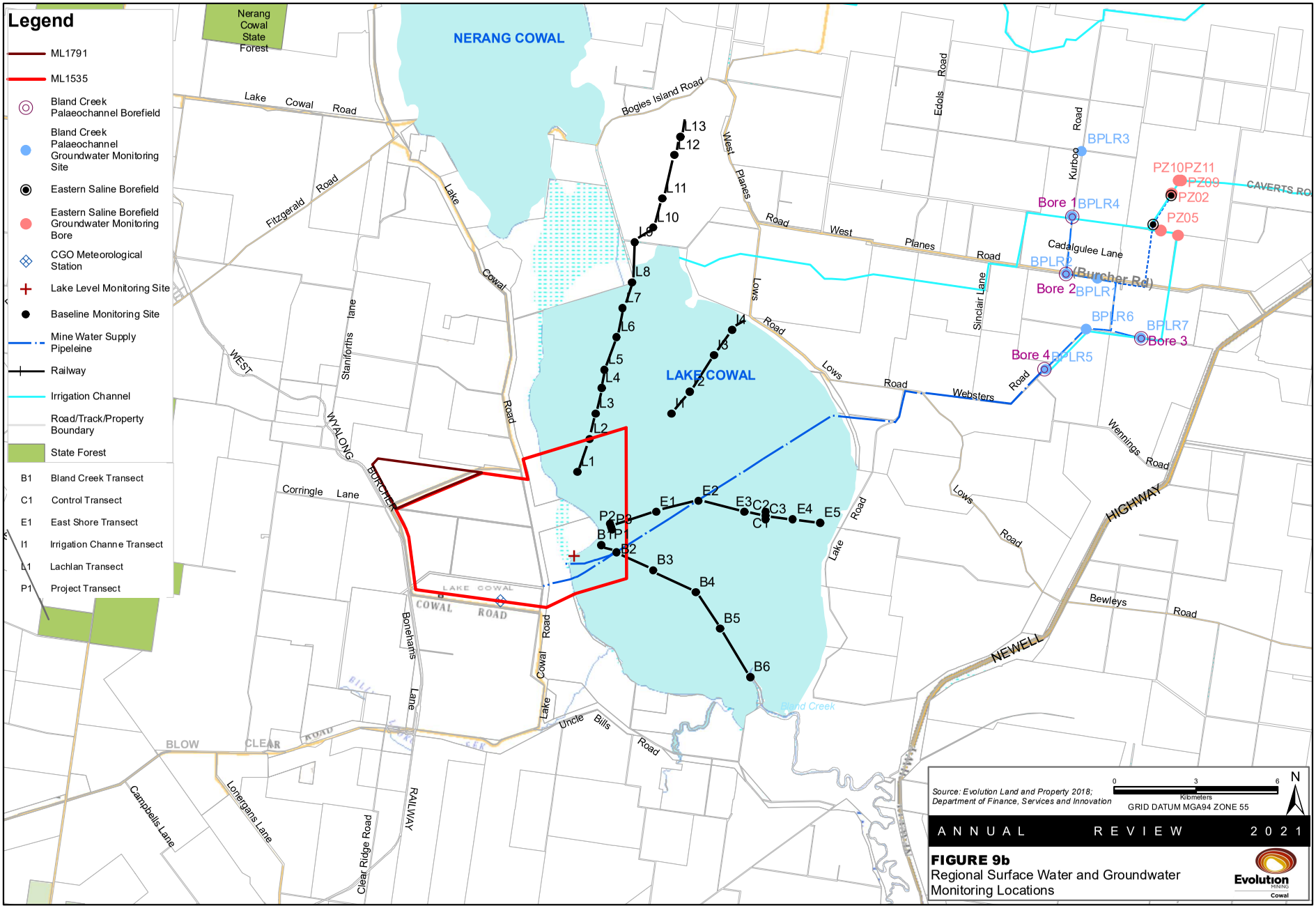
The CGO's Water Management Plan (WMP) and MOP provide further detail regarding water management at the CGO.

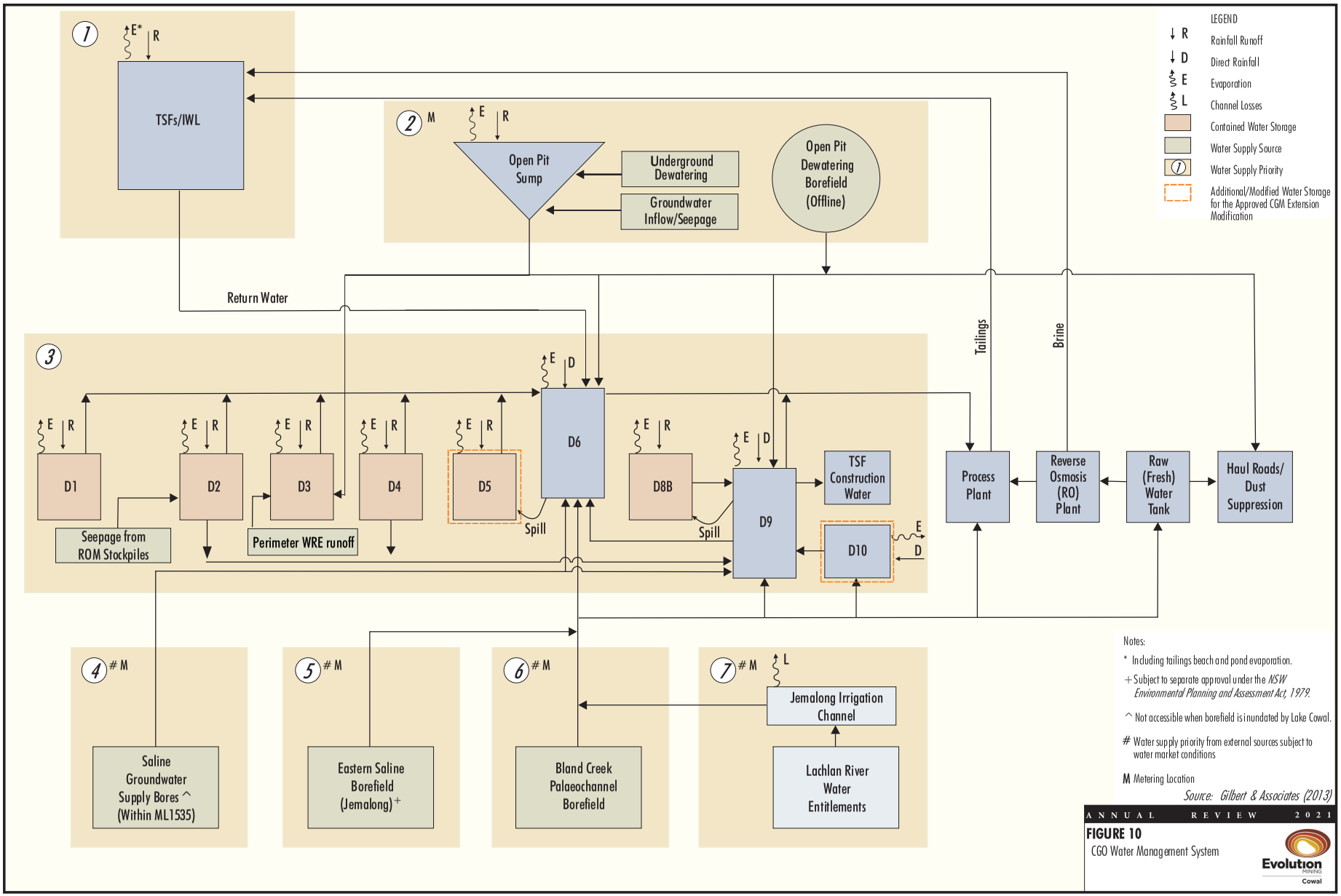
7.2 SURFACE WATER

The WMP and the SWGMBMP have been prepared in accordance with Development Consent Conditions 4.4(a) and 4.5(b) (and other relevant Development Consent Conditions) to guide water management and detail the CGO's water monitoring programme, respectively.

Monitoring and management of surface water during the reporting period has been undertaken in accordance with relevant Development Consent Conditions, the WMP, the SWGMBMP and the EPL 11912.


ML 1791
ML 1535
L1
UCD North
P561A
P561B
IWL01
P418B
NDC-1
IWL02
Northern Waste Emplacement
D1
PDB1A
PDB1B
MON01B
TSFNB
TSFNC
P558A-R
P1
P2
P3
D3
PDB3A
PDB3B
D2
D6
PP01
PP06
PP02
D5
PP03
PP04
P412A
P412A-R
IWL03
B1
WB12
B2
IWL06
D9
D8B
PDB5B
D4
UCD South
P555A-R
P414A
Southern Waste Emplacement
IWL04
P417A
MON02B
IWL05
Monitoring Locations
Bore
Surface Water
Waste Rock Leachate
Water and Sediment Quality Monitoring Site
ANNUAL REVIEW 2021
Figure 9a
CGO Monitoring Locations
Evolution MINING
0
0.5
1 km


Legend
ML1791
ML1535
Bland Creek Palaeochannel Borefield
Bland Creek Palaeochannel Groundwater Monitoring Site
Eastern Saline Borefield
Eastern Saline Borefield Groundwater Monitoring Bore
CGO Meteorological Station
Lake Level Monitoring Site
Baseline Monitoring Site
Mine Water Supply Pipeleine
Railway
Irrigation Channel
Road/Track/Property Boundary
State Forest
B1 Bland Creek Transect
C1 Control Transect
E1 East Shore Transect
I1 Irrigation Channe Transect
L1 Lachlan Transect
P1 Project Transect
Nerang Cowal State Forest
NERANG COWAL
LAKE COWAL
Lake Cowal Road
Bogles Island Road
Fitzgerald Road
Lake Cowal Road
West Planes Road
Lows Road
Edols Road
Kurboo Road
Sinclair Lane
Cadalgulee Lane
(Burcher Rd)
Websters Road
Wennings Road
Bewleys Road
Uncle Bills Road
Corringle Lane
WYALONG BURCHER ROAD
Stanifortns Lane
Bonehams Lane
Clear Ridge Road
Campbells Lane
Longergans Lane
BLOW CLEAR ROAD
RAILWAY
NEWELL HIGHWAY
CAVERTS RO
Bland Creek
BPLR3
PZ10PZ11
PZ09
PZ02
PZ05
Bore 1 BPLR4
BPLR2
Bore 2 BPLR1
BPLR6
BPLR7
Bore 3
Bore 4 BPLR5
L1 L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 L12 L13
I1 I2 I3 I4
P1 P2 P3
B1 B2 B3 B4 B5 B6
E1 E2 E3 E4 E5
C1 C2 C3
Source: Evolution Land and Property 2018; Department of Finance, Services and Innovation
0 3 6 Kilometers
GRID DATUM MGA94 ZONE 55
N
ANNUAL REVIEW 2021
FIGURE 9b
Regional Surface Water and Groundwater Monitoring Locations
Evolution MINING Cowal



Notes:

* Including tailings beach and pond evaporation.

\+ Subject to separate approval under the *NSW Environmental Planning and Assessment Act, 1979.*

^ Not accessible when borefield is inundated by Lake Cowal.

\# Water supply priority from external sources subject to water market conditions

M Metering Location

Source: Gilbert & Associates (2013)

ANNUAL REVIEW 2021

FIGURE 10

CGO Water Management System

Evolution Mining Cowal

HAL-04-22_AR2017_005A

7.2.1 Environmental Management

7.2.1.1 Control Strategies

The site water management system is designed to contain all potentially contaminated water and comprises the following major components:

(i) Up Catchment Diversion System (UCDS).

(ii) Lake Isolation System (comprising the Temporary Isolation Bund (TIB), Lake Protection Bund (Lake Protection Bund) and PWRE.

(iii) Internal Catchment Drainage System (including the permanent catchment divide and contained water storages).

(iv) Integrated Erosion and Sediment Control System.

(v) E42 Open Pit and Underground Dewatering System.

The site water management system is designed to contain all potentially contaminated water generated within the closed catchment of the ML 1535 area while diverting all other water around the perimeter of the site. The UCDS, Lake Isolation System and Internal Catchment Drainage System are designed to minimise the volume of surface water entering ML 1535 by isolating the site from Lake Cowal and the up-slope catchment above the UCDS. Surface water collected within ML 1535 is controlled using a number of water management structures which are designed to prevent discharge to Lake Cowal. No discharge to Lake Cowal has occurred to date or during the reporting period.

7.2.1.2 Effectiveness of the Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

7.2.1.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies during the reporting period.

7.2.2 Environmental Performance

7.2.2.1 Monitoring

During the reporting period surface water monitoring was conducted in accordance with the WMP, SWGMBMP and EPL 11912. Surface water monitoring locations within ML 1535 are shown in Figure 9a.

7.2.2.2 Performance Outcomes

Surface Water Quality

pH, electrical conductivity (EC) and Total Suspended Solids (TSS) results fluctuated across the on-site surface water ponds throughout the 2021 reporting period, likely due to changes in the standing water level within the ponds (Table 22). pH results were relatively stable throughout the reporting period, ranging from 4.36 to 10.3 across the on-site surface water ponds. EC ranged from 187 to 51604 microSeimens per centimeter (µS/cm) and TSS ranged from 2 to 974 milligrams per litre (mg/L) and were both significantly influenced by the filling and drying of the ponds, with high values observed in the early months of 2021 due to lower water storage levels (Table 22). Observed monitoring results and fluctuations are generally consistent with previous reporting periods.

A comparison of surface water results with the ANZG (2018) guidelines has not been undertaken for on-site surface water ponds as they are contained inside a closed catchment in the mining lease area. The closed catchment is engineered to contain all runoff on the mining lease and physically separates mine water from offsite waters in the upstream diversion drains and Lake Cowal.

Table 22: Summary of Monthly and Quarterly Surface Water Monitoring Results for 2021

Monthly Surface Water Monitoring - D1, D4, UCD North and UCD South				
Dam D1	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	22	4.36	7.08	9.2
Electrical Conductivity - Field (µS/cm)	22	3413	8379	18969
Total Suspended Solids (mg/L)	22	6	58	184
Dam D4	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	8	5.91	7.83	9.0
Electrical Conductivity - Field (µS/cm)	8	5819	9787	12432
Total Suspended Solids (mg/L)	8	3	72	467
UCD North	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	18	6.24	7.8	9.5
Electrical Conductivity - Field (µS/cm)	18	253.9	683	3634
Total Suspended Solids (mg/L)	18	7	23	89
UCD South	**COUNT**	**MIN**	**MEAN**	**MAX**
pH – Field	21	5.82	7.5	9.4
Electrical Conductivity - Field (µS/cm)	21	187	343	685
Total Suspended Solids (mg/L)	21	6	72	233
Quarterly Surface Water Monitoring – D2, D3, D8B, D9, D6, D5 and Pit Sumps				
Dam D5	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	3	7.98	8.16	8.5
Electrical Conductivity - Field (µS/cm)	3	3265	3871	5012
Total Suspended Solids (mg/L)	3	36	58	81
Dam D6	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	4	7.77	8.51	10.3
Electrical Conductivity - Field (µS/cm)	4	11367	14949	20502
Total Suspended Solids (mg/L)	4	49	77	92
Pit Sump 1	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	12	5.54	6.97	8.0
Electrical Conductivity - Field (µS/cm)	12	29157	39313	51604
Total Suspended Solids (mg/L)	12	4	239	974
Dam D2	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	4	8.23	8.34	8.4
Electrical Conductivity - Field (µS/cm)	4	5329	6573	8199
Oil & Grease (mg/L)	4	<5	5.4	7
Dam D3	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	4	7.94	8.08	8.2
Electrical Conductivity - Field (µS/cm)	4	11612	16791	23922
Oil & Grease (mg/L)	4	<5	5.2	6

Table 22 (Continued): Summary of Monthly and Quarterly Surface Water Monitoring Results for the Reporting Period

Dam D9	COUNT	MIN	MEAN	MAX
pH - Field	4	8.41	9.40	10.2
Electrical Conductivity - Field (µS/cm)^	4	543	4968	6643
Total Suspended Solids (mg/L)	4	2	6	8
Oil & Grease (mg/L)	4	<5	<5	<5
Dam D8B	**COUNT**	**MIN**	**MEAN**	**MAX**
pH - Field	4	7.83	8.19	8.7
Electrical Conductivity - Field (µS/cm)^	4	3235	10043	20847
Total Suspended Solids (mg/L)	4	4	14	35

^ Dam D9 was used as storage for water collected from surface water runoff dams after heavy rain.

EC and TSS results fluctuated across both UCD North and UCD South throughout the reporting period, due to changes in the standing water level within the ponds. pH results were generally stable throughout the reporting period and ranged from 5.82 to 9.4 across both ponds. UCD North was unable to be accessed from May-August (inclusive), due to high water levels in the lake. 2021 monitoring results and fluctuations due to changes in standing water levels are consistent with previous reporting periods and base line monitoring results for the 1991-1992 periods, which are above the ANZG (2018) guideline values for pH, EC and turbidity.

Lake Cowal

Lake Cowal was previously dry between February 2019 and February 2020 before above average rainfall in March 2020 led to the lake starting to fill with water. Consequent flows from Bland Creek and Lachlan River floodwater (August 2020) contributed to a slow rise in water levels. By March/April 2021, lake levels had reached the 204.5 mRL monitoring trigger (Graph 14). By 23/09/2021, the lake was fully inundated (205.5 mRL) and monitoring was deemed safe to recommence. Lake inflow water monitoring sites were inaccessible throughout 2021 therefore no samples could be collected.

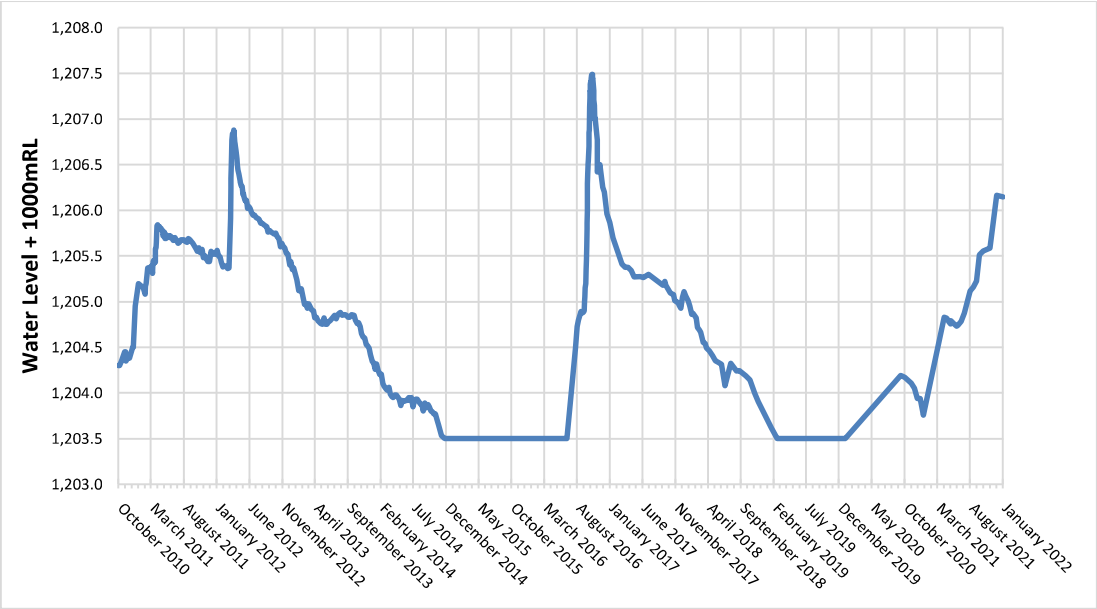
Water quality monitoring at Lake Cowal was undertaken by Evolution Mining personnel (weekly) and DM McMahon Pty Ltd (monthly/ quarterly). Key summaries of the lake water monitoring results (McMahon, 2022) are provided in the subsections below and Table 23.

A comparison of the 2021 Lake Cowal water quality results against the ANZECC and ARMCANZ (2000) default trigger values for surface water (lakes) indicates that the 2021 monitoring results (totals and dissolved) are below or only marginally above the default trigger values. Heavy metal readings were similar to historical data, and the pH and EC were within the range of values previously recorded.

A comparison of the 2021 Lake Cowal sediment results against the ANZG (2018) trigger values indicated that the results were all below the recommended default trigger values (Table 24).

Plate 1: Aerial Photograph of the Lake Protection Bund (August 2021)

Graph 14: Lake Cowal Water Level 2011 - 2021



pH and Electrical Conductivity

Lake water pH, field and laboratory determination, ranged from 6.65 to 9.19 units with a mean of 7.88 units, which was not within the baseline water quality data collected in 1991 – 1992. However, 2021 results were within the ANZG (2018) guideline values. The lake water pH in 2021 was 0.73 units lower than in 2018, and 0.28 units lower than the 2011-2018 average.

2021 lake water EC ranged from 213 to 619 µS/cm with a mean of 346 µS/cm, which fell within the baseline data results, and was higher than the freshwater guideline values (ANZG, 2018). However, electrical conductivity in lakes will vary depending upon catchment geology. Historical data trends analysis demonstrated that lower EC levels corresponded with high inflows and lake levels; and higher EC levels occurred when inflows and lake levels were the lowest. This is consistent with the historical trend (McMahon, 2022).

Turbidity and Suspended Solids

Turbidity of the lake water ranged from 4.6 to 204 NTU with a mean of 116.6 NTU, which was within the baseline data range from 1991 – 1992. The turbidity of the lake water in 2021 was higher than the ANZG (2018) level of 20 NTU for Fresh Water. However, lakes in catchments with highly dispersive soils are likely to have high turbidity (ANZG, 2018). The suspended solid concentration in the lake water ranged from 3 to 87 mg/L with an average of 26 mg/L. The ANZG (2018) recommended guideline trigger values for toxicants does not include a trigger value for suspended solids. The suspended solid concentration in 2021 was the lowest since monitoring began in 2010.

Dissolved Oxygen

Dissolved Oxygen concentration of the lake water ranged from 6.20 to 9.58 mg/L with a mean of 8.08 mg/L, which was lower than the previous determination in 2017 and 2018. The 2021 dissolved oxygen concentration was within the 1991-92 baseline results for Lake Cowal.

Heavy Metals (total and dissolved)

The dissolved arsenic concentration of the lake water ranged from 0.001 to 0.005 mg/L with an average concentration of 0.0026 mg/L. For total arsenic concentration, the 2021 results ranged from 0.002 to 0.004 mg/L with a mean of 0.0037 mg/L. The concentration of both dissolved and total arsenic exceeded the ANZG (2018) default trigger value of 0.0008 mg/L, however it was lower than the 2018 mean concentration of 0.0098 mg/L (total) and 0.0092 mg/L (dissolved).

The dissolved lead concentration of the lake water was below the limit of reporting for all samples (<0.001 mg/L). For total lead concentration, the results ranged from <0.001 to 0.005 mg/L with a mean of 0.0024 mg/L. The concentration of total lead exceeded the ANZG (2018) default trigger value of 0.0001 mg/L, however it was lower than the 2018 mean concentration of 0.0029 mg/L (total).

The dissolved nickel concentration of the lake water ranged from 0.002 to 0.011 mg/L with an average concentration of 0.0058 mg/L. For total nickel concentration, the results ranged from 0.002 to 0.003 mg/L with a mean of 0.002 mg/L. The concentration of both dissolved and total nickel was lower than the ANZG (2018) default trigger value of 0.0008 mg/L. The mean dissolved nickel concentration increased from 0.0032 mg/L in 2018, whilst the mean total nickel concentration fell from 0.008 mg/L in 2018.

The mean concentrations of other heavy metals (total and dissolved); including zinc, antimony and cadmium; were all below the limit of reporting and/or the ANZG (2018) default trigger values during 2021.

Historical data trends analysis indicated that high metals concentrations were found at the times where the inflow and lake level were low, which may be due to accumulation through evaporation. Consequently, when inflow and lake level were high, the metals concentration were low.

Table 23: Summary of Lake Cowal Water Monitoring – 2010 – 2021

Parameter	Lake Cowal Water Quality Results (November 2010 – Mean#)	Lake Cowal Water Quality Results (2011) Ranges (Mean)	Lake Cowal Water Quality Results (2012) Ranges (Mean)	Lake Cowal Water Quality Results (2013) Ranges (Mean)	Lake Cowal Water Quality Results (2014) Ranges (Mean)	Lake Cowal Water Quality Results (2016) Ranges (Mean)	Lake Cowal Water Quality Results (2017) Ranges (Mean)	Lake Cowal Water Quality Results (2018) Ranges (Mean)	Lake Cowal Water Quality Results (2021) Ranges (Mean)	Lake Cowal Baseline Water Quality Results (1991 -1992)	Fresh Waters ^ ~
Alkalinity (mg/L)	105	64 – 142 (100)	50 – 152 (87)	113 – 178 (157)	191 – 322 (269)	44 – 356 (160)	102 – 192 (140)	199 – 320 (244)	107 – 151 (129)	NA	NA
Suspended Solids (mg/L)	6 - 192	5 – 184 (38)	7 – 274 (67)	66 – 472 (216)	57 – 556 (233)	13 – 417 (145)	24 – 650 (361)	36 – 130 (70)	3 – 87 (26)	NA	NA
Acidity – Alkalinity scale (pH)	7.03 – 8.27	7.22 – 8.82 (8.14)	5.56 – 9.78 (7.81)	7.82 – 8.43 (8.19)	8.45 – 8.97 (8.72)	7.05 – 8.76 (7.8)	7.12 – 8.44 (7.88)	8.27 – 9.01 (8.61)	6.65 – 9.19 (7.88)	8.27 – 8.67	6.5 to 8.0
Electrical Conductivity (µS/cm)	100 – 701	190 – 727 (322)	107 – 433 (236)	351 – 572 (503)	882 – 1350 (1193)	119 – 1350 (583)	299 – 511 (409)	514 – 838 (641)	213 – 619 (346)	222 – 1557[1, 3]	20 to 30 µS/cm[1]
Turbidity (NTU)	8.2 – 211	11.5 – 144 (53.3)	7.8 – 829 (246.1)	271 – 755 (470)	189 – 671 (391)	57 – 644 (366)	26.7 – 640 (360.6)	58.4 – 300 (180.9)	4.6 – 204 (115.1)	22 – 224	1 to 20[2]
Dissolved Oxygen (mg/L)	0.84 – 8.89	1.64 – 14.74 (9.76)	2.24 – 17.89 (8.95)	1.84 – 12.70 (9.03)	5.65 – 13.83 (9.0)	0.08 – 8.57 (6.46)	0.04 – 15.97 (9.4)	3.18 – 23.53 (9.51)	6.20 – 9.58 (8.08)	7.3 – 11.5	90 to 110 (derived from daytime measurements)
Temperature (°C)	24.9	9.6 – 29.8 (18.4)	7.5 – 28.8 (16.7)	9.80 – 27 (17.4)	7.8 – 30 (18.6)	11.7 – 27.3 (18.3)	7.6 – 29.2 (16.7)	20.0 – 27.6 (23.0)	4.86 – 28.2 (18.7)	NA	Not applicable
Depth (m)	0.10 – 1.20	0.60 – 2.50 (1.7)	0.50 – 3.60 (2.0)	0.40 – 2.00 (1.2)	0.25 – 1.0 (0.54)	0.8 – 4.5 (2.6)	0.6 – 3.1 (1.64)	0.4 – 1.8 (1.18)	0.7 – 3.33 (2.05)	0.2 – 2.0	Not applicable
Lake Water Level (m)	204.5	205.25 – 205.75	205.40 – 206.88	204.33 - 205.24	203.5 - 204.78	204.88 – 207.45	204.93 - 205.86	204.95 – 203.62	204.73 – 206.17	205.1	Not applicable

Table 23 (Continued): Summary of Lake Cowal Water Monitoring – 2010 – 2021

Parameter	Lake Cowal Water Quality Results (November 2010 – Mean#)	Lake Cowal Water Quality Results (2011) Ranges (Mean)	Lake Cowal Water Quality Results (2012) Ranges (Mean)	Lake Cowal Water Quality Results (2013) Ranges (Mean)	Lake Cowal Water Quality Results (2014) Ranges (Mean)	Lake Cowal Water Quality Results (2016) Ranges (Mean)	Lake Cowal Water Quality Results (2017) Ranges (Mean)	Lake Cowal Water Quality Results (2018) Ranges (Mean)	Lake Cowal Water Quality Results (2021) Ranges (Mean)	Lake Cowal Baseline Water Quality Results (1991 -1992)	Fresh Waters ^ ~
Total Iron (mg/L)	6.50	0.36 – 11.00 (2.50)	0.92 – 22.6 (9.55)	2.54 – 33.6 (21.49)	4.76 – 21.7 (11.7)	4.05 – 21.7 (14.81)	10.7 – 25.4 (16.6)	<0.05 – 12.8 (7.47)	0.29 – 13 (5.37)	NA	NA (insufficient data)
Calcium (mg/L)	17	10 – 26 (19)	8 – 28 (14)	22 – 32 (26)	20 – 50 (42)	8 – 41 (22)	15 – 30 (23)	24 – 47 (36)	18 – 27 (23)	NA	NA
Magnesium (mg/L)	10	6 – 12 (9)	4 – 14 (7)	9 – 17 (13.4)	16 – 32 (29)	4 – 32 (14)	9 – 20 (12)	15 – 25 (19)	10 – 16 (11)	NA	NA
Potassium (mg/L)	15	12 – 19 (15)	12 – 19 (14)	14 – 27 (21)	26 – 36 (31)	5 - 27 (15)	12 – 18 (16)	17 – 25 (22)	8 – 14 (13)	NA	NA
Sodium (mg/L)	19	13 – 35 (24)	12 – 38 (22)	35 – 59 (50)	105 – 168 (144)	9 – 164 (64)	27 – 43 (37)	50 – 91 (64)	27 – 44 (32)	NA	NA
Chloride (mg/L)	25	19 – 41 (28)	12 – 66 (22)	36 – 61 (51)	91 – 194 (155)	9 – 194 (77)	26 – 39 (34)	42 – 77 (56)	25 – 76 (35)	NA	NA
Sulphate (mg/L)	3	1 – 10 (2)	1 – 10 (4)	14 -38 (21)	29 – 37 (33)	1 - 37 (16)	6 – 15 (8)	9 – 18 (11)	6 – 14 (9)	NA	NA
Cations (mg/L)	2.81	1.98 – 3.77 (3.02)	1.56 – 3.82 (2.11)	3.74 – 5.85 (5.13)	8.85 – 12.6 (11.51)	1.35 – 12.4 (5.4)	3.09 – 5.4 (4.13)	5.58 – 8.56 (6.73)	3.28 – 4.58 (3.79)	NA	NA
Anions (mg/L)	2.83	1.93 – 3.67 (2.91)	1.45 – 3.77 (2.00)	3.76 – 5.78 (5.02)	1.1 – 13.2 (11.05)	0.35 – 13.2 (5.40)	3.00 – 5.11 (3.93)	5.37 – 8.70 (6.7)	3.51 – 4.73 (3.78)	NA	NA

Table 23 (Continued): Summary of Lake Cowal Water Monitoring – 2010 – 2021

Parameter	Lake Cowal Water Quality Results (November 2010 – Mean#)	Lake Cowal Water Quality Results (2011) Ranges (Mean)	Lake Cowal Water Quality Results (2012) Ranges (Mean)	Lake Cowal Water Quality Results (2013) Ranges (Mean)	Lake Cowal Water Quality Results (2014) Ranges (Mean)	Lake Cowal Water Quality Results (2016) Ranges (Mean)	Lake Cowal Water Quality Results (2017) Ranges (Mean)	Lake Cowal Water Quality Results (2018) Ranges (Mean)	Lake Cowal Water Quality Results (2021) Ranges (Mean)	Lake Cowal Baseline Water Quality Results (1991 -1992)	Fresh Waters ^ ~
Arsenic (mg/L)	0.006[3] (total)	<0.001 – 0.007 (0.003[3]) (total)	0.002 – 0.007 (0.004[3]) (total)	0.006 – 0.014 (0.009[3]) (total)	0.014 – 0.023 (0.018[3]) (total)	0.002 – 0.02 (0.00748[3]) (total)	<0.001 – 0.01 (0.005) (total)	0.008 – 0.012 (0.0098) (total	0.002 – 0.004 (0.0037[3]) (total)	0.0026[3] (total)	0.008
	0.005[3] (dissolved)	<0.0003 – 0.006 (0.0026[3]) (dissolved)	0.001 – 0.006 (0.003[3]) (dissolved)	0.003 – 0.011 (0.007[3]) (dissolved)	0.012 – 0.024 (0.017[3]) (dissolved)	0.0001 – 0.014 (0.00561[3]) (dissolved)	0.003 – 0.006 (0.0045) (dissolved)	0.007 – 0.013 (0.0092) (dissolved)	0.001 – 0.005 (0.0026[3]) (dissolved)	0.0016[3] (dissolved)	
Cadmium (mg/L)	0.0001[3] (total)	<0.0001 - 0.001 (0.0001[3]) (total)	<0.0001 – 0.005 (0.0002[3]) (total)	0.0001 – 0.0002 (0.0001[3]) (total)	0.0001 – 0.0001 (0.0001[3]) (total)	0.0001 – 0.0002 (0.0001[3]) (total)	0.0001 – 0.0002 (0.0001) (total)	<0.0001 – <0.0001 (<0.0001) (total)	<0.0001 – <0.0001 (<0.0001[3]) (total)	0.000055[3] (total)	0.0006
	0.0001[3] (dissolved)	<0.0001 – 0.0004 (0.0001[3]) (dissolved)	<0.00001 – <0.0001 (0.00001[3]) (dissolved)	0.0001 – 0.0002 (0.0001[3]) (dissolved)	0.0001 – 0.0002 (0.0001[3]) (dissolved)	0.0001 – 0.0001 (0.0001[3]) (dissolved)	<0.0001 – <0.0001 (<0.0001) (dissolved)	<0.0001 – <0.0001 (<0.0001) (dissolved)	<0.0001 – <0.0001 (<0.0001[3]) (dissolved)	0.00005[3] (dissolved)	
Molybdenum (mg/L)	0.001[3] (total)	<0.001 – 0.006 (0.0012[3]) (total)	<0.001 – 0.004 (0.001[3]) (total)	0.001 – 0.003 (0.0014[3]) (total)	0.002 – 0.005 (0.003[3]) (total)	0.001 – 0.003 (0.0016[3]) (total)	<0.001 – 0.002 (0.001) (total)	0.001 – 0.004 (0.0017[3]) (total)	<0.001 – <0.001 (<0.001[3]) (total)	NA	NA (insufficient data)
	0.001[3] (dissolved)	<0.001 - 0.001 (0.001[3]) (dissolved)	<0.001 – 0.001 (0.001[3]) (dissolved)	0.001 – 0.002 (0.0014[3]) (dissolved)	0.003 – 0.004 (0.035[3]) (dissolved)	0.001 – 0.004 (0.0019[3]) (dissolved)	<0.001 - 0.003 (0.0012) (dissolved)	<0.001 – 0.003 (0.001[3]) (dissolved)	<0.001 – 0.002 (0.0011[3]) (dissolved)	NA	

Table 23 (Continued): Summary of Lake Cowal Water Monitoring – 2010 – 2021

Parameter	Lake Cowal Water Quality Results (November 2010 – Mean#)	Lake Cowal Water Quality Results (2011) Ranges (Mean)	Lake Cowal Water Quality Results (2012) Ranges (Mean)	Lake Cowal Water Quality Results (2013) Ranges (Mean)	Lake Cowal Water Quality Results (2014) Ranges (Mean)	Lake Cowal Water Quality Results (2016) Ranges (Mean)	Lake Cowal Water Quality Results (2017) Ranges (Mean)	Lake Cowal Water Quality Results (2018) Ranges (Mean)	Lake Cowal Water Quality Results (2021) Ranges (Mean)	Lake Cowal Baseline Water Quality Results (1991 -1992)	Fresh Waters ^ ~
Nickel (mg/L)	0.007[3] (total)	<0.001 – 0.009 (0.0036[3]) (total)	<0.001 – 0.018 (0.009[3]) (total)	0.006 – 0.025 (0.018[3]) (total)	0.010 – 0.025 (0.016[3]) (total)	0.004 – 0.025 (0.015[3]) (total)	0.009 – 0.021 (0.0147) (total)	0.003 – 0.012 (0.008[3]) (total)	0.002 – 0.003 (0.002[3]) (total)	NA	0.008
	0.004[3] (dissolved)	<0.001 – 0.004 (0.0023)[3] (dissolved)	<0.001 – 0.004 (0.003[3]) (dissolved)	0.002 – 0.005 (0.0035[3]) (dissolved)	0.004 – 0.007 (0.006[3]) (dissolved)	0.002 – 0.007 (0.0052[3]) (dissolved)	0.002 – 0.02 (0.0032) (dissolved)	0.001 – 0.005 (0.0032[3]) (dissolved)	0.002 – 0.011 (0.0058[3]) (dissolved)	NA	
Lead (mg/L)	0.003[3] (total)	<0.001 – 0.004 (0.0013[3]) (total)	<0.001 – 0.009 (0.004[3]) (total)	0.003 – 0.015 (0.009[3]) (total)	0.003 – 0.010 (0.006[3]) (total)	0.002 – 0.011 (0.0067[3]) (total)	0.003 – 0.06 (0.008) (total)	<0.001 – 0.005 (0.0029[3]) (total)	<0.001 – 0.005 (0.0024[3]) (total)	0.0029[3](total)	0.001
	0.001[3] (dissolved)	<0.001 - 0.001 (0.001[3]) (dissolved)	<0.001 – 0.003 (0.001[3]) (dissolved)	0.001 – 0.001 (0.001[3]) (dissolved)	0.001 – 0.001 (0.001[3]) (dissolved)	0.001 – 0.01 (0.0015[3]) (dissolved)	<0.001 – 0.01 (0.003) (dissolved)	<0.001 - <0.001 (<0.001[3]) (dissolved)	<0.001 - <0.001 (<0.001[3]) (dissolved)	0.0005[3] (dissolved)	
Antimony (mg/L)	0.001[3] (total)	<0.001 – 0.004 (0.0014[3]) (total)	<0.001 – <0.001 (0.001[3]) (total)	0.001 – 0.001 (0.001[3]) (total)	0.001 – 0.050 (0.017[3]) (total)	0.001 – 0.05 (0.017[3]) (total)	<0.001 - <0.001 (<0.001) (total)	<0.001 – <0.001 (<0.001[3]) (total)	<0.001 – <0.001 (<0.001[3]) (total)	NA	NA (insufficient data)
	0.001[3] (dissolved)	<0.001 - 0.001 (0.001[3]) (dissolved)	<0.001 – <0.001 (0.001[3]) (dissolved)	0.001 – 0.001 (0.001[3]) (dissolved)	0.001 – 0.001 (0.001[3]) (dissolved)	0.001 – 0.0001 (0.001[3]) (dissolved)	<0.001 - <0.001 (<0.001) (dissolved)	<0.001 - <0.001 (<0.001) (dissolved)	<0.001 - <0.001 (<0.001[3]) (dissolved)	NA	

Table 23 (Continued): Summary of Lake Cowal Water Monitoring – 2010 – 2021

Parameter	Lake Cowal Water Quality Results (November 2010 – Mean#)	Lake Cowal Water Quality Results (2011) Ranges (Mean)	Lake Cowal Water Quality Results (2012) Ranges (Mean)	Lake Cowal Water Quality Results (2013) Ranges (Mean)	Lake Cowal Water Quality Results (2014) Ranges (Mean)	Lake Cowal Water Quality Results (2016) Ranges (Mean)	Lake Cowal Water Quality Results (2017) Ranges (Mean)	Lake Cowal Water Quality Results (2018) Ranges (Mean)	Lake Cowal Water Quality Results (2021) Ranges (Mean)	Lake Cowal Baseline Water Quality Results (1991 -1992)	Fresh Waters ^ ~
Zinc (mg/L)	0.012[3] (total)	<0.005 – 0.038 (0.0074[3]) (total)	<0.005 – 0.04 (0.016[3]) (total)	0.008 – 0.079 (0.036[3]) (total)	0.009 – 0.047 (0.023[3]) (total)	0.006 – 0.047 (0.028[3]) (total)	0.015 – 0.045 (0.027) (total)	<0.005 – 0.020 (0.011[3]) (total)	<0.005 – 0.023 (0.011[3]) (total)	0.012[3](total)	0.0024
	0.015[3] (dissolved)	<0.005 – 0.022 (0.0109[3]) (dissolved)	<0.005 – 0.264 (0.035[3]) (dissolved)	0.005 – 0.067 (0.018[3]) (dissolved)	0.005 – 0.03 (0.011[3]) (dissolved)	0.005 – 0.052 (0.014[3]) (dissolved)	<0.005 – 0.017 (0.0064) (dissolved)	<0.005 – <0.005 (<0.005) (dissolved)	<0.005 – <0.005 (<0.005[3]) (dissolved)	0.00306[3] (dissolved)	

^ Guideline values in accordance with ANZG 2018.
~ 99% protection level trigger values for toxicants – lakes and reservoirs.

[1] ANZG (2018) notes that conductivity in lakes is generally low but will vary depending upon catchment geology.
[2] ANZG (2018) notes that lakes in catchments with highly dispersible soils will have high turbidity.
[3] Mean value.
Two readings only for December 2010

7.2.3 Reportable Incidents

There were no reportable incidents during the reporting period.

7.2.4 Further Improvements

No further improvements are proposed for the next reporting period.

Table 24: Summary of Lake Cowal Sediment Results

Parameter	Lake Cowal Sediment Results (November 2010)	Lake Cowal Sediment Results (2011) Range (Mean)	Lake Cowal Sediment Results (2012) Range (Mean)	Lake Cowal Sediment Results (2013) Range (Mean)	Lake Cowal Sediment Results (2014) Range (Mean)	Lake Cowal Sediment Results (2016) Range (Mean)	Lake Cowal Sediment Results (2017) Range (Mean)	Lake Cowal Sediment Results (2018) Range (Mean)	Lake Cowal Sediment Results (2021) Range (Mean)	DVG^
Electrical Conductivity (µS/cm)	33 – 142 (94)	3 – 162 (99)	49 – 215 (94)	53 – 187 (105)	70 – 207 (133)	45 – 218 (105)	46 – 184 (90)	47 – 162 (90.7)	48 – 171 (86)	No data
Arsenic (mg/L)	2.6 (total)	0.02 – 5.6 (3.1)[1] (total)	1 – 6 (3.2)[1] (total)	1.9 – 5.8 (3.2)[1] (total)	2.2 – 6.0 (3.62)[1] (total)	1.6 – 5.8 (3.2)[1] (total)	1.3 – 5.6 (2.8) (total)	1.8 – 3.3 (2.62) (Total)	1.6 – 4.6 (2.74) (total)	20
	1.5 (extractable)	<0.1 – 1.8 (1.25)[1] (extractable)	1 – 3.1 (1.4)[1] (extractable)	1 – 3.1 (1.2)[1] (extractable)	1 – 2.2 (1.38)[1] (extractable)	1 – 3.4 (1.7)[1] (extractable)	<1 – 3.4 (1.4) (extractable)	<1 - 1.8 (1.26) (extractable)	<1 – 2.2 (1.20) (extractable)	
Cadmium (mg/L)	1 (total)	<1 - <1 (1)[1] (total)	1 – 1 (1)[1] (total)	1 – 1 (1)[1] (total)	1 – 1 (1)[1] (total)	1 – 1 (1)[1] (total)	<1 - <1 (<1) (total)	<1 - <1 (<1) (total)	<1 - <1 (<1) (total)	1.5
	0.1 (extractable)	<0.1 - <0.1 (0.1)[1] (extractable)	0.1 – 0.1 (0.1)[1] (extractable)	0.1 -0.1 (0.1)[1] (extractable)	0.1 – 0.1 (0.1)[1] (extractable)	0.1 – 0.1 (0.1)[1] (extractable)	<0.1 - <0.1 (<0.1) (extractable)	<0.1 - <0.1 (<0.1) (extractable)	<0.1 - <0.1 (<0.1) (extractable)	
Lead (mg/L)	15 (total)	8 – 20 (13.7)[1] (total)	7 – 20 (12.6)[1] (total)	8 – 23 (14.2)[1] (total)	9 – 20 (13.53)[1] (total)	5 – 18 (12.55)[1] (total)	7 – 22 (12) (total)	6 - 13 (10.36) (total)	6 – 32 (13.52) (total)	50
	8.7 (extractable)	3.8 – 15 (8.8)[1] (extractable)	4.3 – 14.5 (8.6)[1] (extractable)	3.5 –13.3 (7.33)[1] (extractable)	5.3 -13.5 (8.51)[1] (extractable)	3.5 – 14.8 (8.09)[1] (extractable)	4.4 – 16.3 (8.4) (extractable)	4.2 – 9 (7.0) (extractable)	2 – 11.2 (5.08) (extractable)	

Table 24 (Continued): Summary of Lake Cowal Sediment Results

Parameter	Lake Cowal Sediment Results (November 2010)	Lake Cowal Sediment Results (2011) Range (Mean)	Lake Cowal Sediment Results (2012) Range (Mean)	Lake Cowal Sediment Results (2013) Range (Mean)	Lake Cowal Sediment Results (2014) Range (Mean)	Lake Cowal Sediment Results (2016) Range (Mean)	Lake Cowal Sediment Results (2017) Range (Mean)	Lake Cowal Sediment Results (2018) Range (Mean)	Lake Cowal Sediment Results (2021) Range (Mean)	DVG^
Zinc (mg/L)	31.5 (total)	14 – 57 (32.5)[1] (total)	11 – 43 (23.3)[1] (total)	13 – 63 (33.2)[1] (total)	16 – 100(36.8)[1] (total)	11 – 39 (25.8)[1] (total)	11 – 37 (22) (total)	10 - 23 (16.5) (total)	12 – 36 (24.74) (total)	200
	3.5 (extractable)	1 - 14.8 (3.9)[1] (extractable)	1.1 – 7.7 (3.6)[1] (extractable)	1 – 11.4 (3.4)[1] (extractable)	3.3 – 52 (27.19)[1] (extractable)	1.2 – 6.3 (2.83)[1] (extractable)	<1 – 10.5 (3.3) (extractable)	1.2 – 4.4 (2.5) (extractable)	<1 – 6.1 (1.99) (extractable)	
Antimony (mg/L)	5 (total)	<5 - <5 (5)[1] (total)	5 – 5 (5)[1] (total)	<5 - <5 (5)[1] (total)	<5 – <5 (5)[1] (total)	5 – 5 (5)[1] (total)	<5 - <5 (<5) (total)	<5 - <5 (<5) (total)	<5 - <5 (<5) (total)	2
	1 (extractable)	<1 – 6.9 (1.1)[1] (extractable)	1 – 7.6 (1.1)[1] (extractable)	1 - 4.8 (1.18)[1] (extractable)	1- 2 (1.03)[1] (extractable)	1 – 2.2 (1.02)[1] (extractable)	<1 – 1.9 (1.1) (extractable)	<1 – 3.4 (1.19) (extractable)	<1 – <1 (<1) (extractable)	

After: NSR Environmental Consultants (1995) and DM McMahon (2018).

^ Guideline values in accordance with ANZECC and ARMCANZ (2000) recommended sediment quality guidelines.

[1] Mean value.

7.3 GROUNDWATER

The WMP and the SWGMBMP have been prepared in accordance with Development Consent Conditions 4.4(a) and 4.5(b) (and other relevant Development Consent Conditions) to guide water management and detail the CGO's water monitoring programme, respectively.

Evolution also holds various licences for monitoring bores, open pit dewatering bores and CGO supply water/production bores.

Monitoring and management of groundwater during the reporting period has been undertaken in accordance with relevant Development Consent Conditions, the WMP, the SWGMBMP and the EPL 11912.

7.3.1 Environmental Management

7.3.1.1 Control Strategies

The WMP establishes the following objectives for the CGO site water management system including groundwater:

- Prevent the quality of any surface water (including waters within Lake Cowal) and groundwater being degraded, through the containment of all potentially contaminated water (contained water) generated within the CGO and diversion of all other water around the perimeter of the site.
- Manage the quantity of surface water and groundwater within and around the mine site through appropriate design (i.e. sizing), construction and operation of water management structures.
- Establish a monitoring, review and reporting programme that facilitates the identification of potential surface water and groundwater impacts and the development of ameliorative measures as necessary, including provision of appropriate compensation measures for landholders affected by changes to the flood regime of Nerang Cowal.

The review procedure relevant to groundwater monitoring detailed in the SWGMBMP provides:

> *Groundwater Monitoring: Groundwater quantity and quality data will be compared to relevant baseline data, data collected since the commencement of operations and assessment presented in the Project EIS. Where the data analysis indicates that an adverse impact is occurring to the efficiency of surrounding bores an investigation will be undertaken to determine the need and type of ameliorative measures. The scope and timeframe of the investigation will be developed in consultation with the relevant authorities. The results of the investigation will be presented to the relevant authorities and the CEMCC within the agreed timeframe.*

In order to monitor important background and predicted future water level draw-downs, monitoring bores and piezometers have been installed within ML 1535 and within aquifers potentially affected by the CGO (i.e. surrounding the BCPC Bore field and ESB) (Figures 9a and 9b).

In accordance with the SWGMBMP, groundwater monitoring includes:

- monitoring of bores in aquifers potentially affected by the CGO (drawdown levels); and
- feedback from private groundwater users regarding adverse changes in groundwater quantity.

7.3.1.2 Effectiveness of the Control Strategies

The control strategies implemented during the reporting period were considered to be effective as demonstrated by the environmental performance indicators.

7.3.1.3 Variations from Proposed Control Strategies

There were no variations from the control strategies during the reporting period.

7.3.2 Environmental Performance

7.3.2.1 Monitoring

During the reporting period groundwater monitoring was conducted in accordance with the SWGMBMP and EPL 11912. Groundwater monitoring locations within ML 1535 are shown in Figure 9a and regional groundwater monitoring locations shown on Figure 9b. The CGO water management system is outlined in Figure 10.

7.3.2.2 Performance Outcomes

A Groundwater Monitoring Review 2021 report has been prepared by Environmental Geochemistry International (2022), which provides a detailed description and interpretation of the groundwater monitoring results during the reporting period. Piper Plots of groundwater chemistry of the BCPC Bore field, processing plant area bores, pit area bores and TSF bores are provided on Figure 11. Contour maps of the hydraulic head and groundwater drawdown are presented in Figures 12 and 13, respectively. Key summaries of the groundwater monitoring results presented in EGI (2022) are provided in the subsections below.

Groundwater Levels

The Cowal groundwater system generally shows limited response to rainfall. Cumulative Rainfall Deviation (CRD) analysis has been performed for both the BCPC and Mine Site Area. For the BCPC there is an inferred relationship where above average rainfall results in less draw on the borefield and consequent recovery of the borefield water levels. For the mine site area there is no relationship observed between rainfall and water levels. The main groundwater level response appears to be pumping for water supply and pit dewatering.

Groundwater extraction within the BCPC has resulted in a maximum groundwater drawdown of approximately 67 m (in bore BPLR5) since April 2004 (lowest level recorded for BPLR5 was in October 2018). Water levels in the borefield are still well above the prescribed trigger levels and generally reflect the pumping schedule (Figure 14). As of December 2021, the average drawdown in the bores (since April 2004) was approximately 47 m. Less impact (drawdown of about 20 m) is observed in BPLR3 due to the higher screened interval of that bore, which intersects the Lower Cowra Formation rather than the Lachlan Formation (EGI, 2022).

In the CGO mine area, piezometric levels generally decline toward the pit. Pit dewatering has resulted in a maximum measured drawdown of approximately 79 m in the pit area monitoring bores. As is to be expected, water levels fall towards the pit and water levels are slowly stabilising immediately adjacent to the pit (Figure 12). There is little reduction below the pre-mining level of approximately 200 m AHD at distances greater than approximately 2 km from the pit centre. In general, vertical hydraulic gradients within the groundwater system surrounding the mine pit are downward. Groundwater levels tend to be highest in the transported material and lowest in the saprock. The observation of a limited zone of influence after 15 years of mine dewatering indicates low lateral permeability. The pit will continue to dominate groundwater flow directions at the mine site and the greater part of any groundwater contamination that occurs within the mine site, including all the groundwater between the IWL and the pit will eventually flow towards and into the pit (EGI, 2022).

A localised increase in groundwater levels has been observed in the vicinity of the TSF area. A separate groundwater level investigation was previously conducted by Coffey to further assess the change in groundwater level in this area (Coffey, 2009). A model of the groundwater system adjacent to the southern TSF was developed and calibrated to provide reasonable agreement with the measured groundwater levels in the area. It was concluded that increasing groundwater levels south of the southern TSF at bores MON02A and MON02B, and northeast of the southern TSF at P412A-R, are related to the movement of seepage from the TSF (Coffey, 2009b). It was also assessed that groundwater level rises associated with the TSF are not expected to reach the ground surface (Coffey, 2009). That investigation is now being updated by EGi and will be reported separately. At this stage there appears to be evidence that the rate of rise of the water level mound is slowing.

Standing water levels measured during the reporting period are presented in Figure 14 a-e.

Groundwater Quality

Variations in groundwater chemistry can be due to natural conditions such as drought and biological activity, changes in groundwater level due to pit dewatering or water supply pumping, or possible anthropogenic inputs such

as the introduction of cyanide in the gold extraction process. Possible reasons for changes in water quality are discussed below.

Physiochemical parameters pH and EC have generally remained stable for the groundwater data reviewed since mining operations began in 2005. ANZG 2018 default guideline values for pH range between 6.5 and 8 and are based on values for NSW upland rivers. Some pH results are below the guideline value of pH 6.5. However, pH levels have generally remained stable, are slightly acidic to neutral, and are similar to baseline EIS levels. EC results have also generally remained stable and are similar to, or higher than, the baseline EIS levels. EC in the southern TSF have been increasing since recording began in 2004, the rate of increase changed in 2010 and slowed in 2020, with a slight increase in 2021. Pit area bore PDB1A showed a significant downward EC trend in 2021, reducing from 48,000 to 14,000 µS/cm. This bore has experienced significant variability since 2004, most likely due to changes in groundwater flow associated with pit dewatering and rainfall.

Major ion concentrations have historically generally remained stable in the region. A broad trend of increasing sodium concentrations was observed between 2004 and 2010, beyond which sodium concentrations begin falling. This trend is stronger for the mine site than for the Bland Creek Paleochannel borefield, suggesting the cause may be related to severe drought conditions between 2004 and 2010. Groundwater with higher TDS, in high evaporation climates, is more prone to impact by drought conditions. Trends in major ions, based on sodium concentrations for 2021 include a slight downward trend in the BCPC, related to increased rainfall and recent floods. Reduced pumping in the BCPC has resulted in lower variability in water level, which is likely to be contributing to stability of major ions.

Monitoring bores within the Pit Area exhibit a slight downward trend for major ions, most likely due to inflow of lower salinity water. The Processing Plant Area demonstrates a consistent downward trend of approximately 2.5% per year. As groundwater in this area is predominantly flowing towards the pit and downwards from transported to saprolite and saprock, resulting in lower salinity water reporting to these bores.

NTSF monitoring bores have shown a general major ion decline in both saprolite and transported aquifers, indicating that some dilution by increased rainfall infiltration may be occurring. Fluctuations in pH, EC, sodium, sulphate, and bicarbonate levels at MON01B to the east of the NTSF may also reflect a response to increased rainfall recharge over this period. STSF monitoring bores are largely steady after a decline in major ion concentrations in the saprolite aquifer. Mine site sulphate concentrations appear to show an inverse correlation with annual rainfall, with increasing concentrations during sustained dry conditions. Sulphate concentrations reduced in 2010, when about double the annual rainfall fell, compared to average annual rainfall since 2000. This relationship continues in 2021.

Variations in metal concentrations, particularly iron and manganese, are assessed to reflect the natural heterogeneity in ground conditions, rather than direct impacts from mining. The metalliferous geological sequences surrounding CGO have resulted in regional groundwater in which iron and manganese naturally dominate the metal concentrations. Local fluctuations in iron and manganese concentrations were evident in the pit area and this may be related to ground disturbance and proximity to the pit.

During the 2021 reporting period there were no cyanide detections in the groundwater monitoring network.

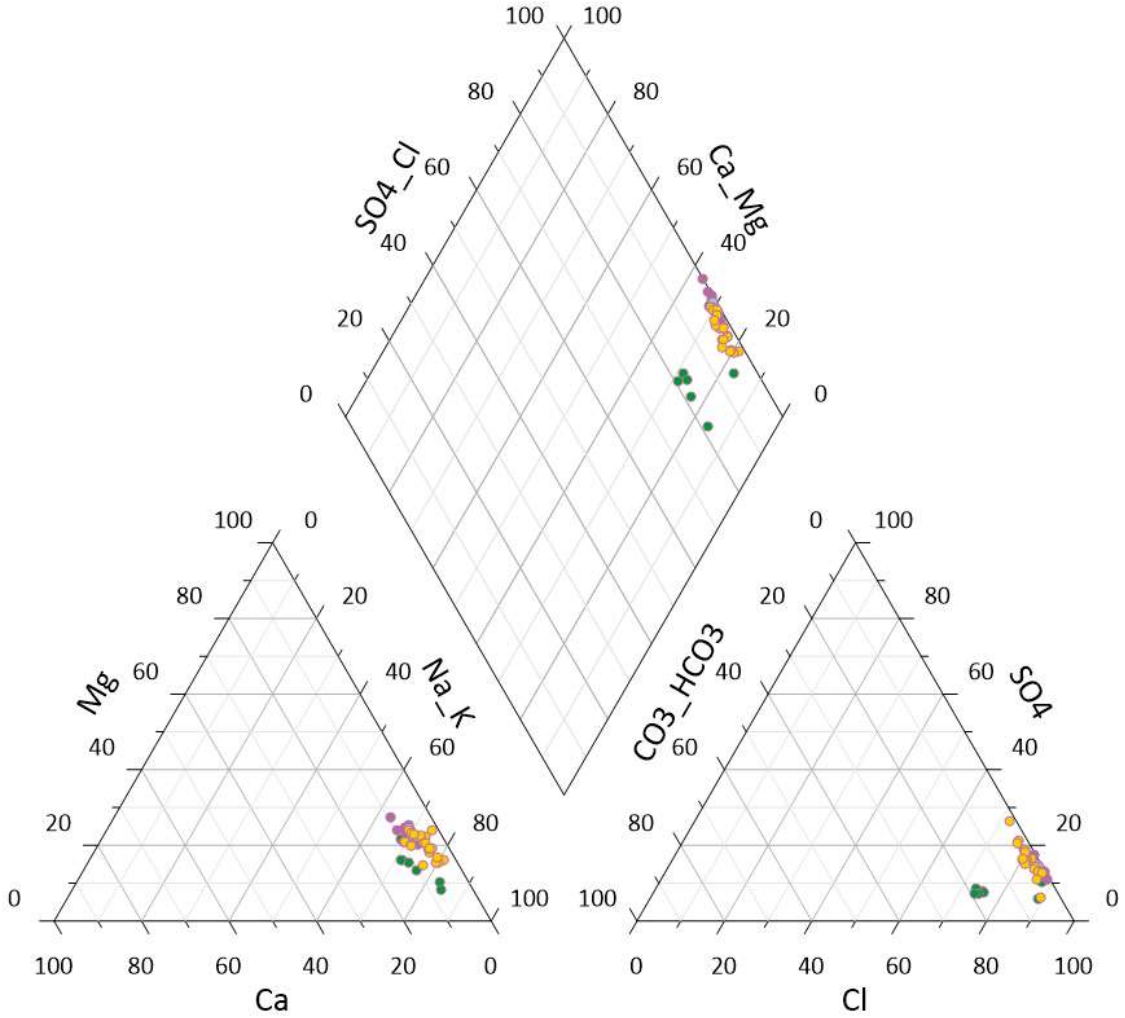
Significant variations in pH, EC, sodium, sulphate and iron levels at BCPC bore BPLR2 may be related to bore completion or localised ground conditions, as the trend is not reproduced in other monitoring bores. It is suspected that the steel casing in BPLR2 may have corroded and begun to collapse.

7.3.3 Reportable Incidents

There were no reportable incidents during the reporting period.

7.3.4 Further Improvements

Investigate likely causes of inconsistent results and field observations recorded at BLPR2.

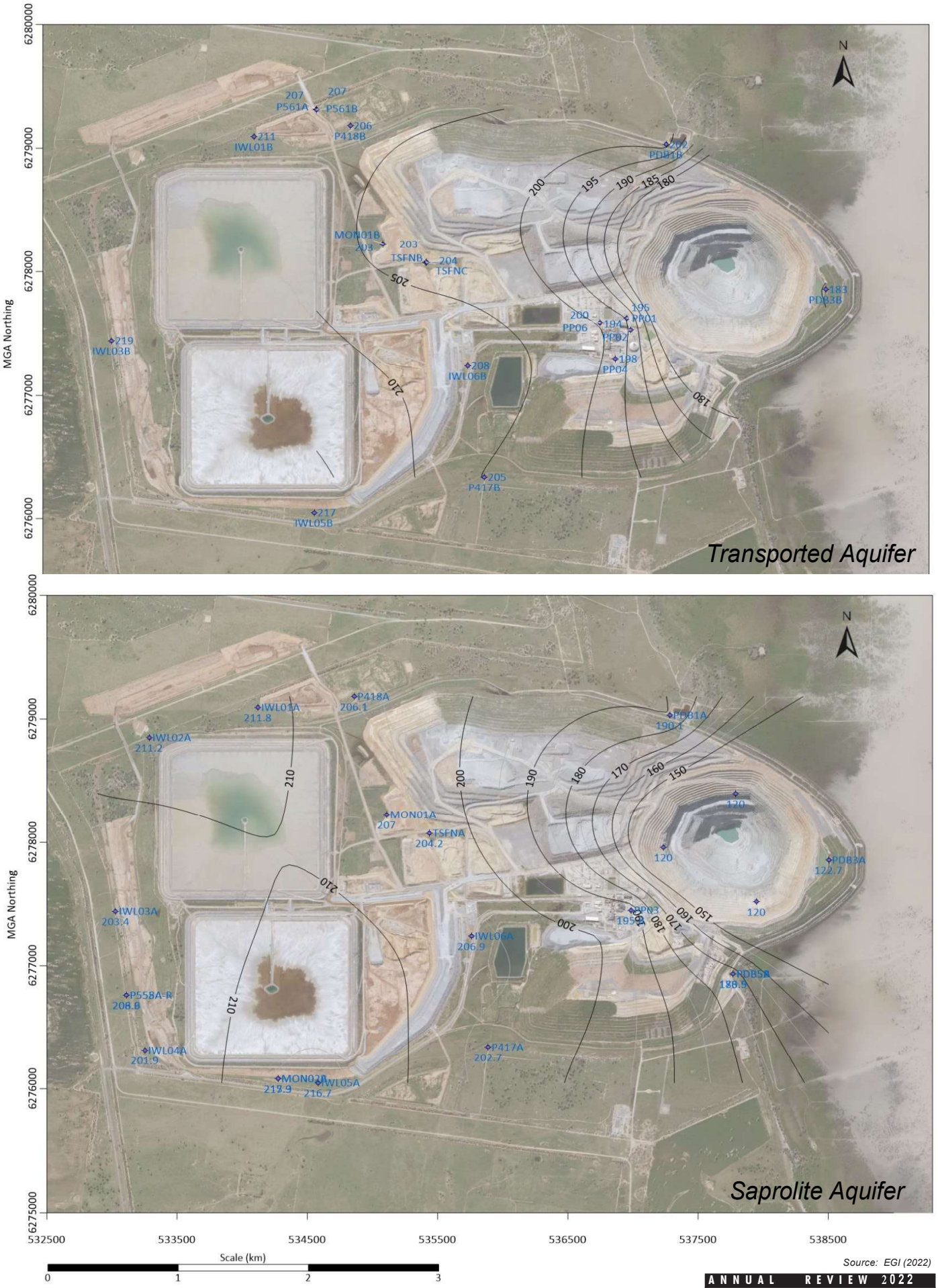


Source: EGI (2022)

ANNUAL REVIEW 2021

FIGURE 11
Piper Plot of Groundwater Chemistry

Evolution MINING Cowal



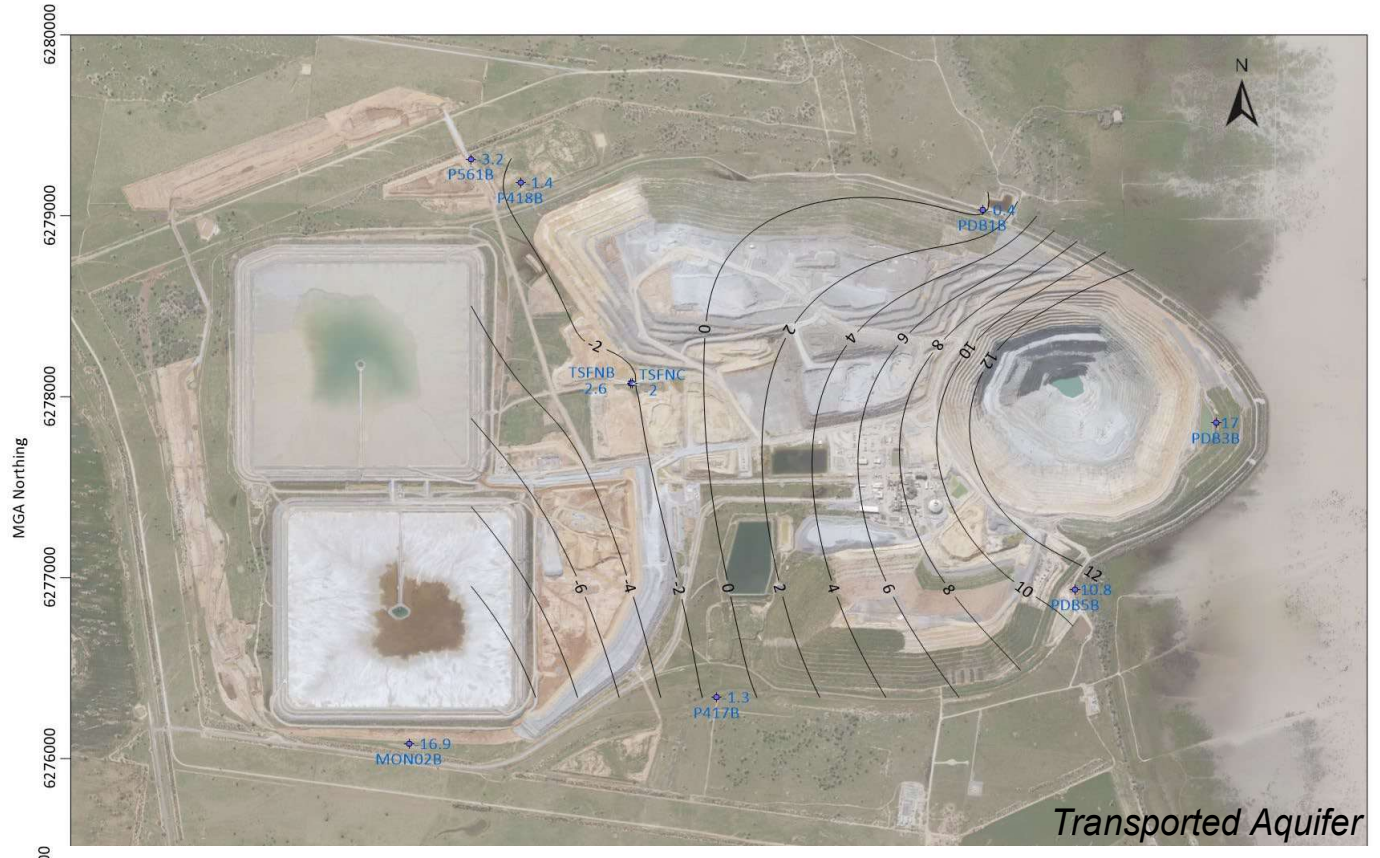
Source: EGI (2022)

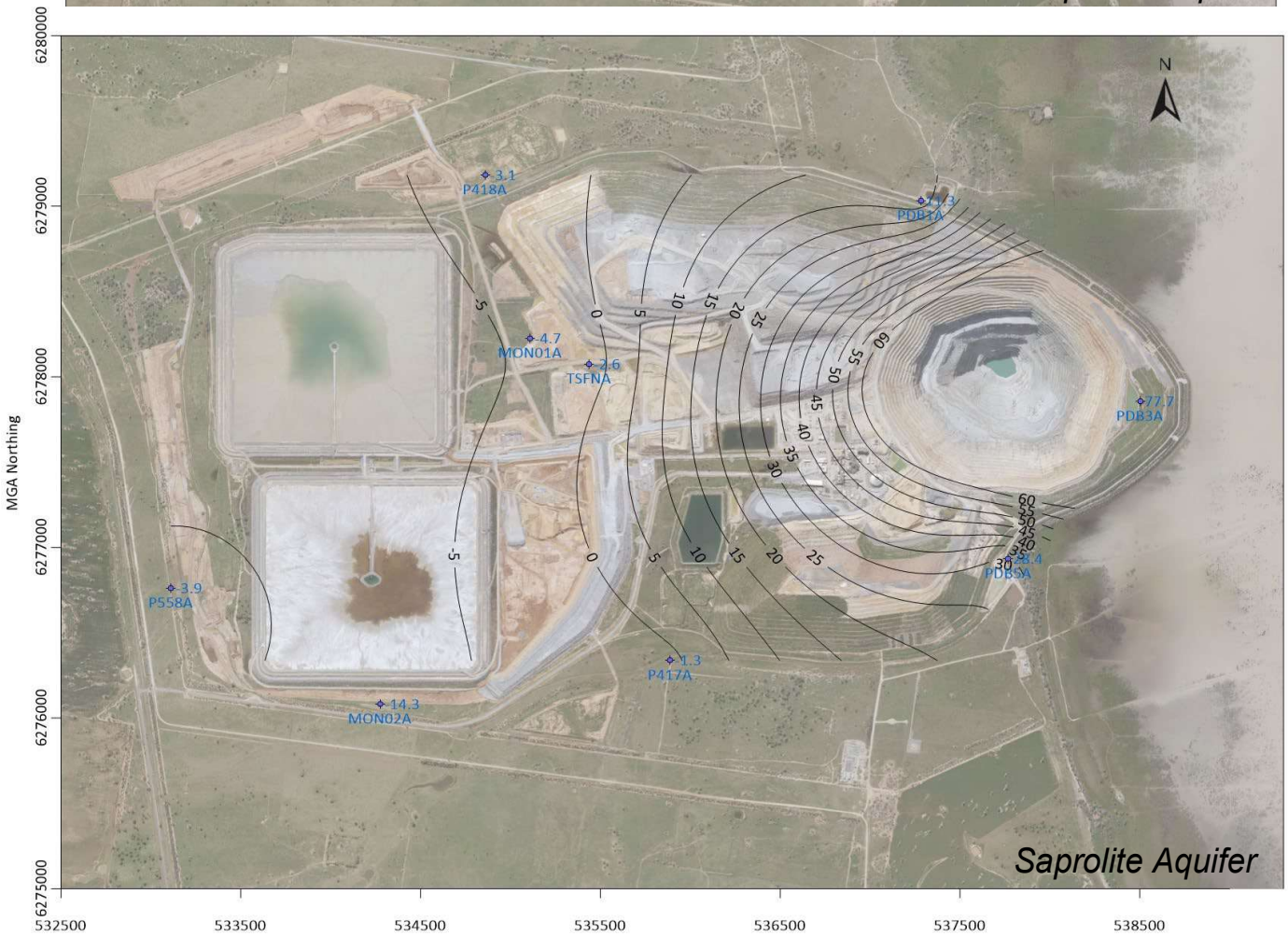
ANNUAL REVIEW 2022

FIGURE 12

Hydraulic Head (mAHD), Dec 2021

Evolution MINING Cowal





Scale (km)

0 1 2 3

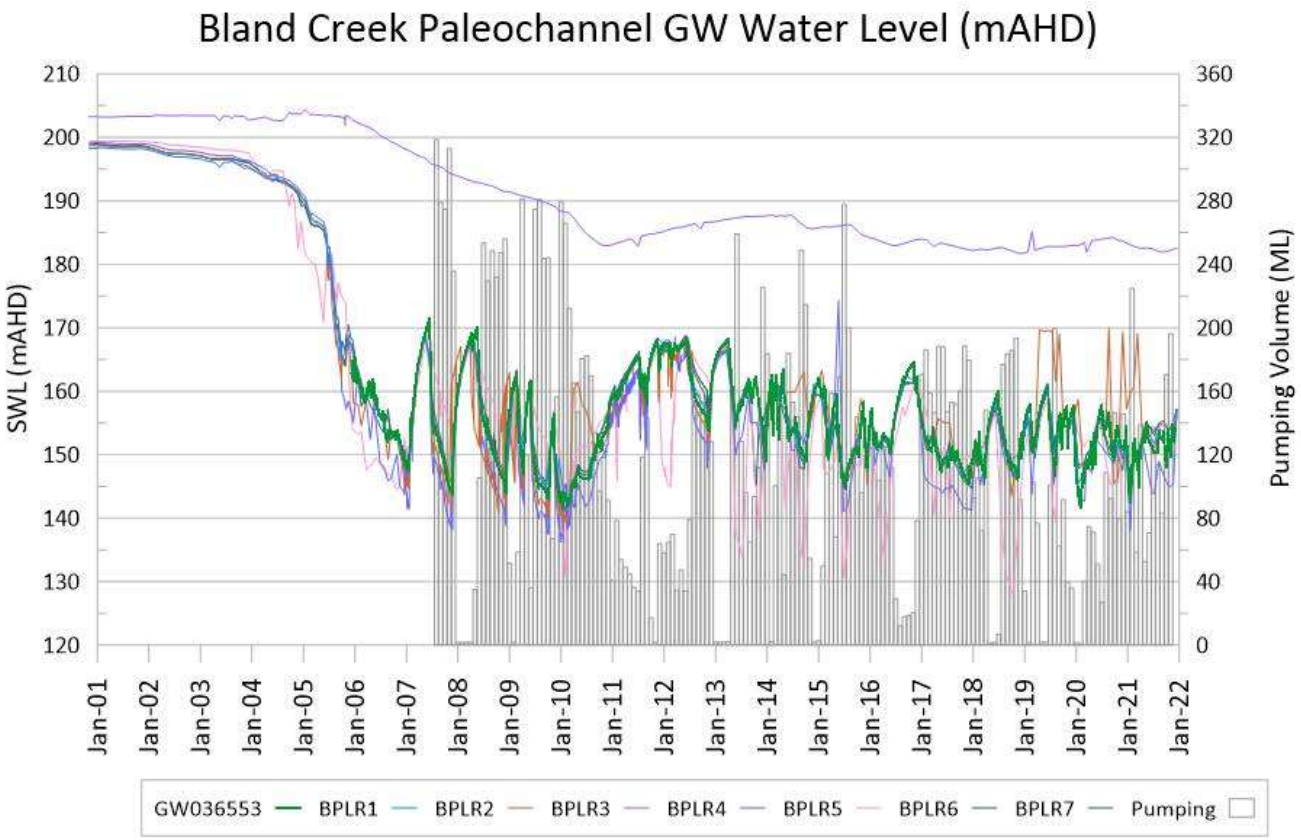
Source: EGI (2022)

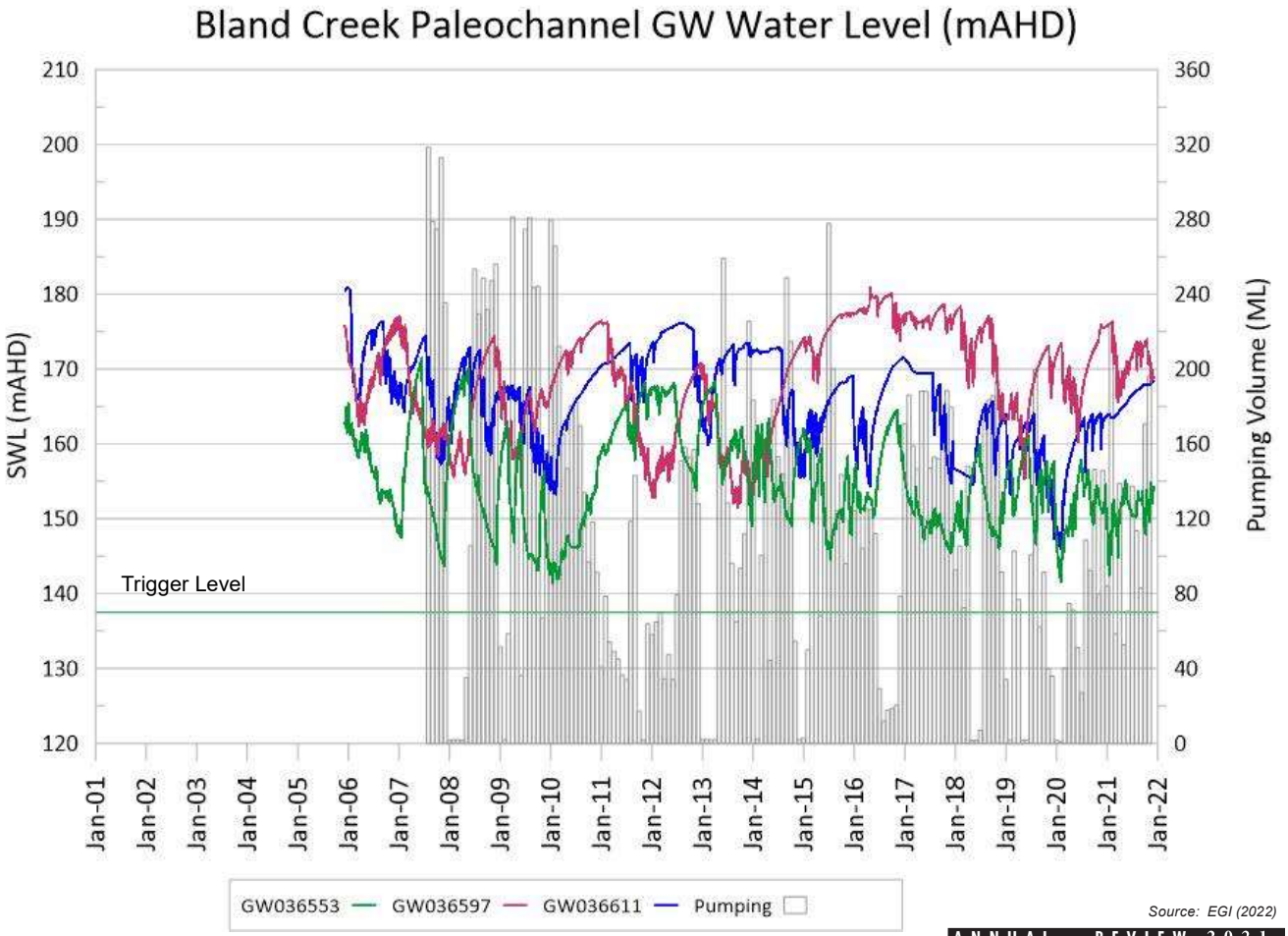
ANNUAL REVIEW 2022

FIGURE 13

Groundwater Drawdown (m)
Dec 2004 - Dec 2021

Evolution MINING Cowal





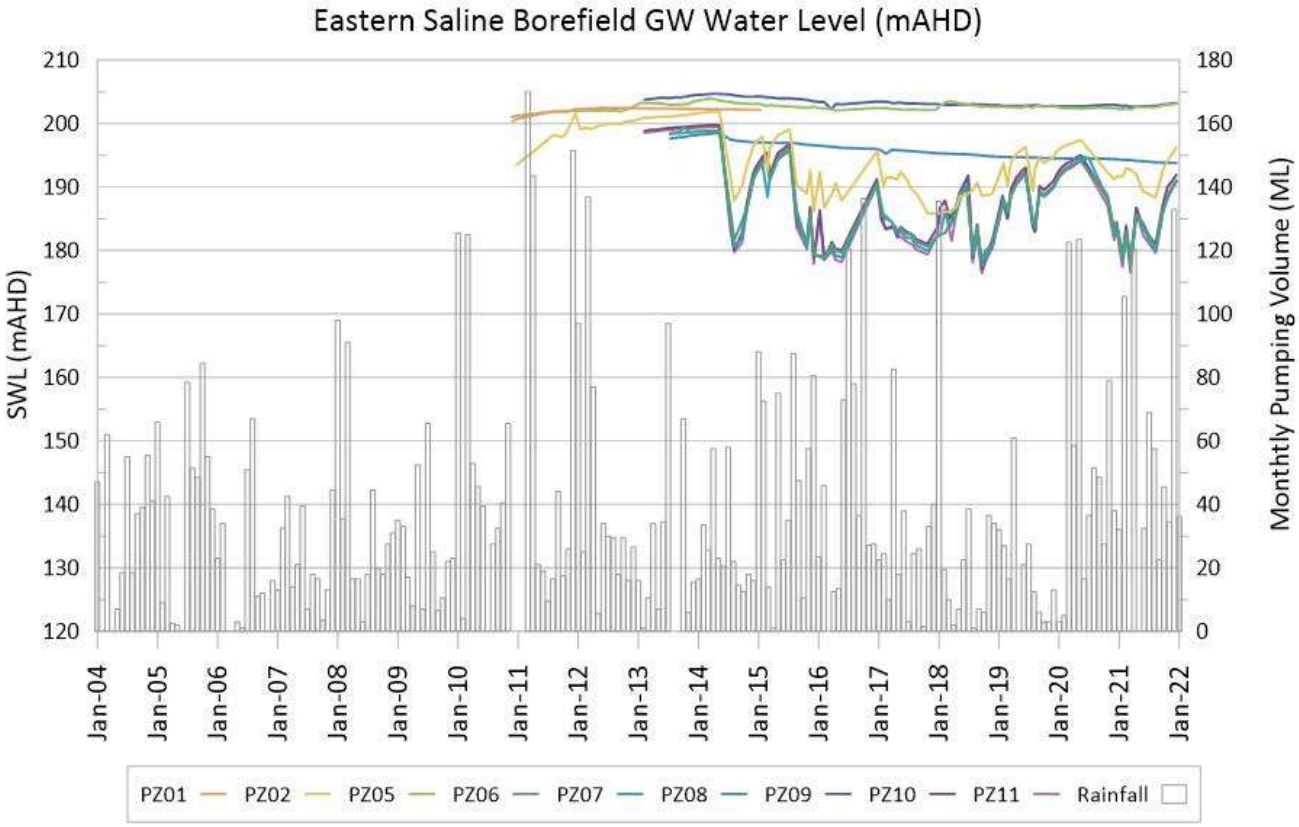
Source: EGI (2022)

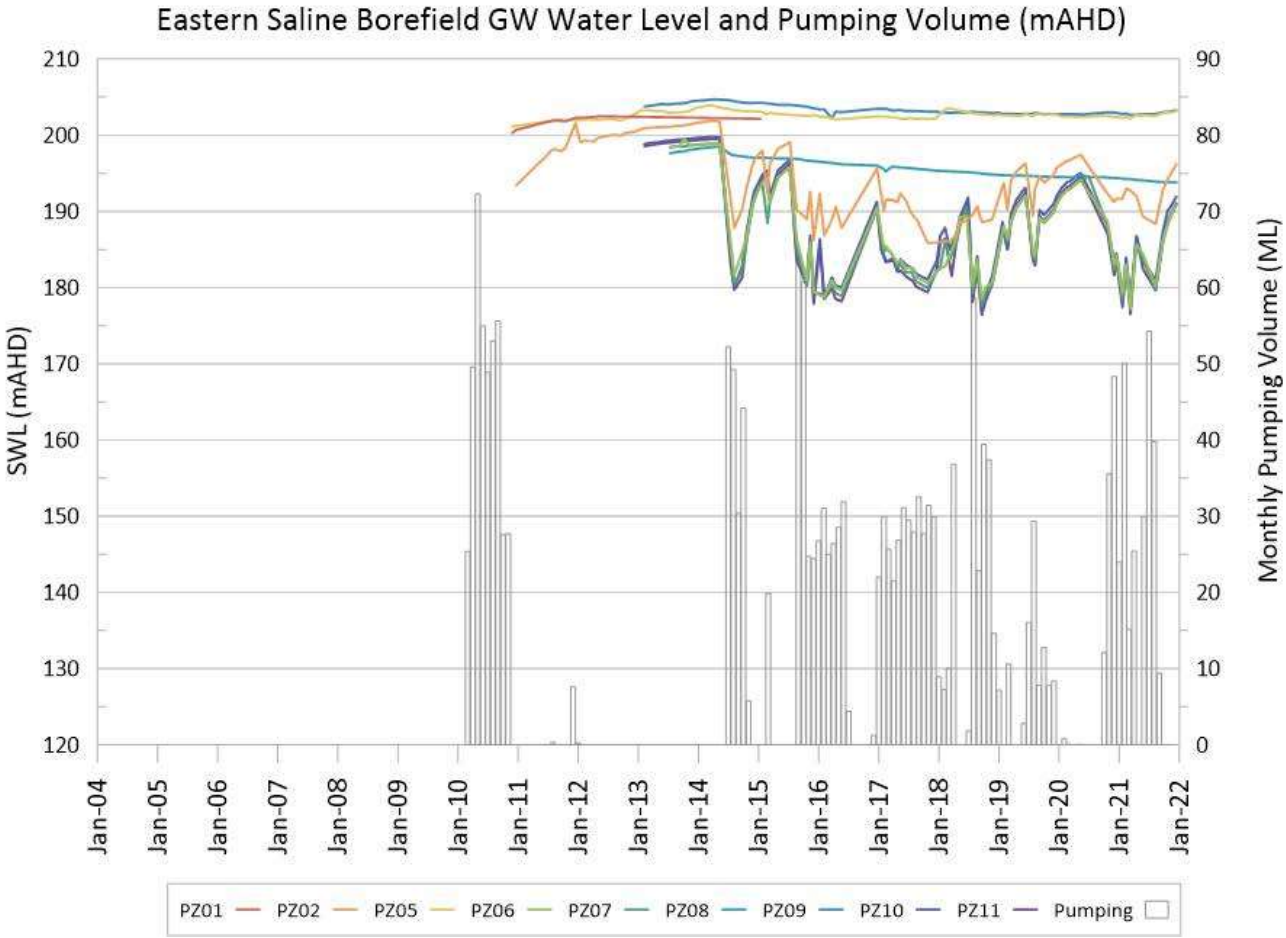
ANNUAL REVIEW 2021

FIGURE 14a

Standing Water Levels Measured During the Reporting Period

Evolution MINING Cowal





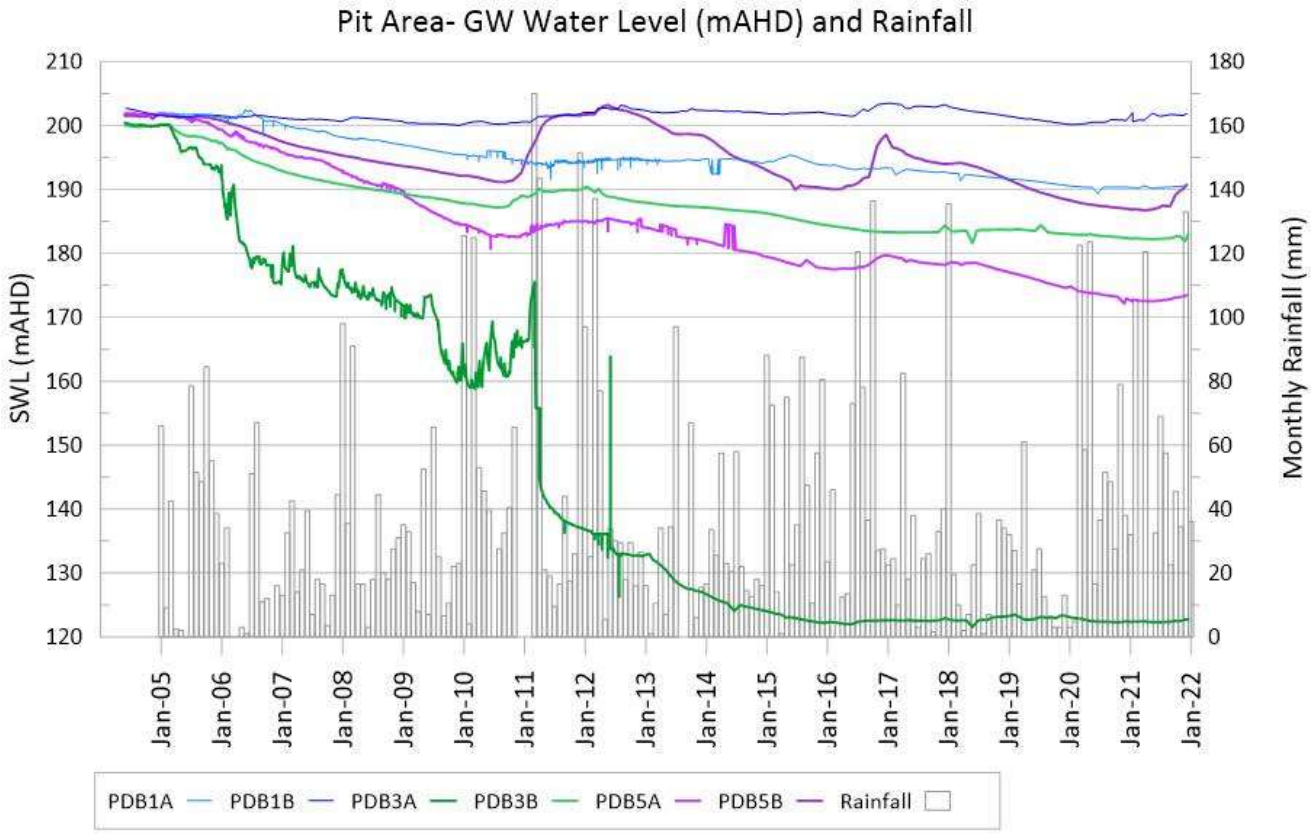
Source: EGI (2022)

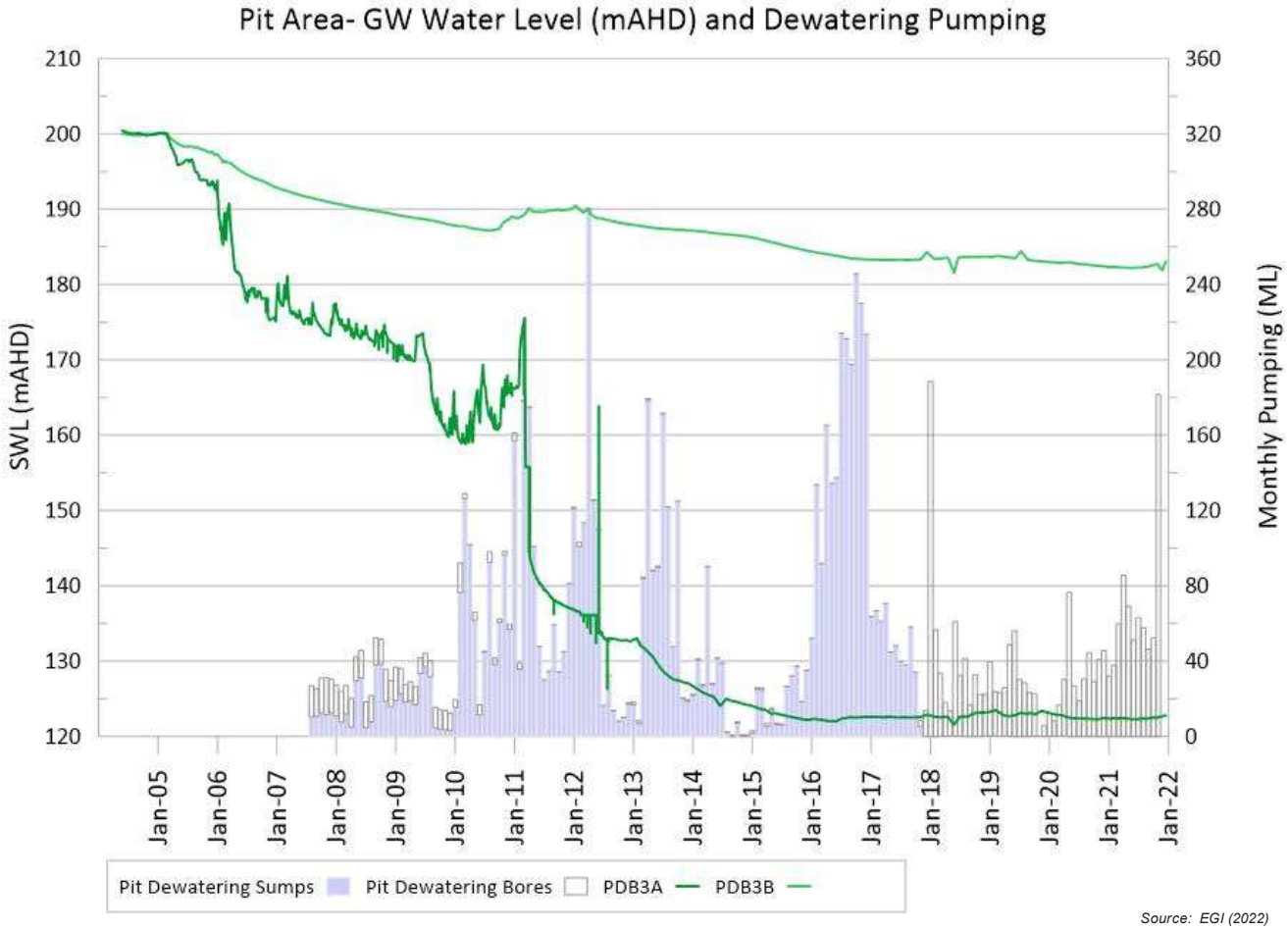
ANNUAL REVIEW 2021

FIGURE 14b

Standing Water Levels Measured During the Reporting Period

Evolution MINING Cowal





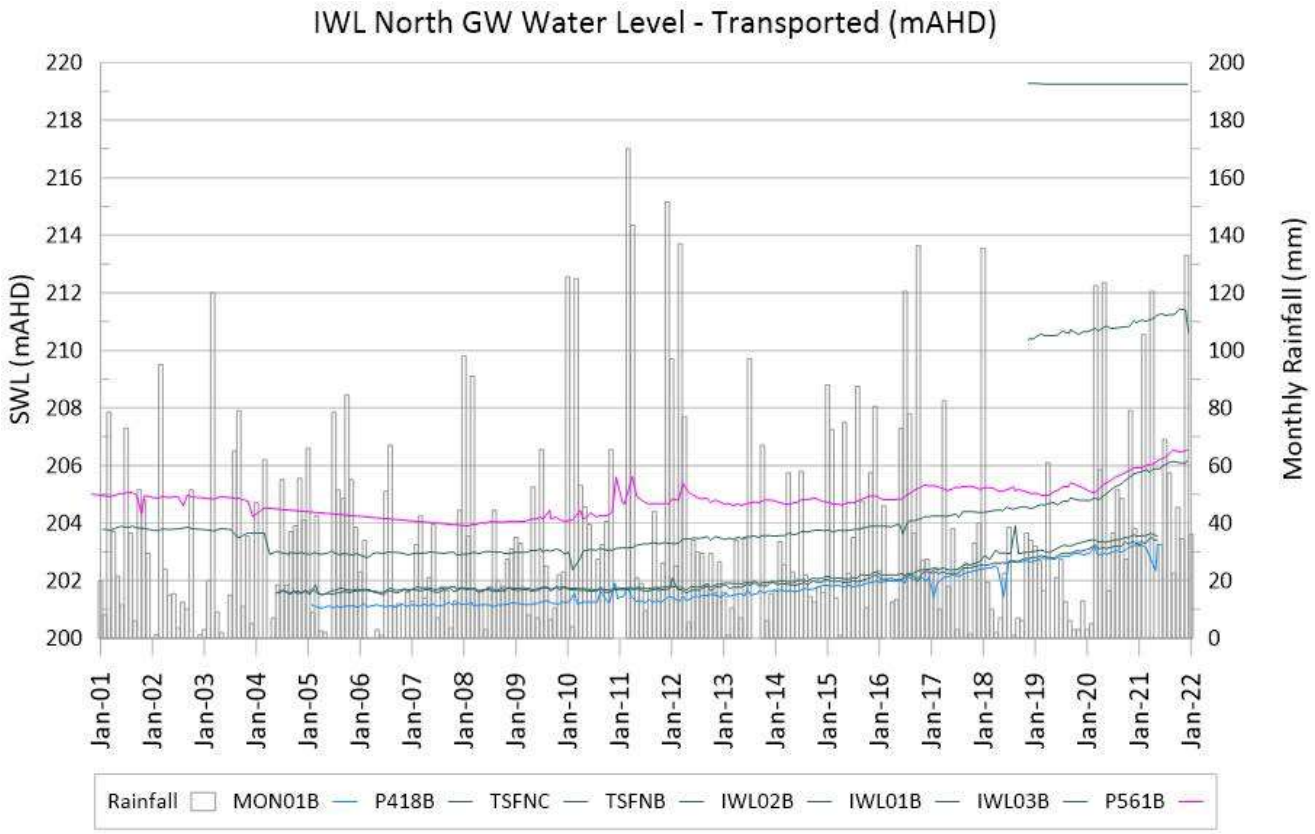
Source: EGI (2022)

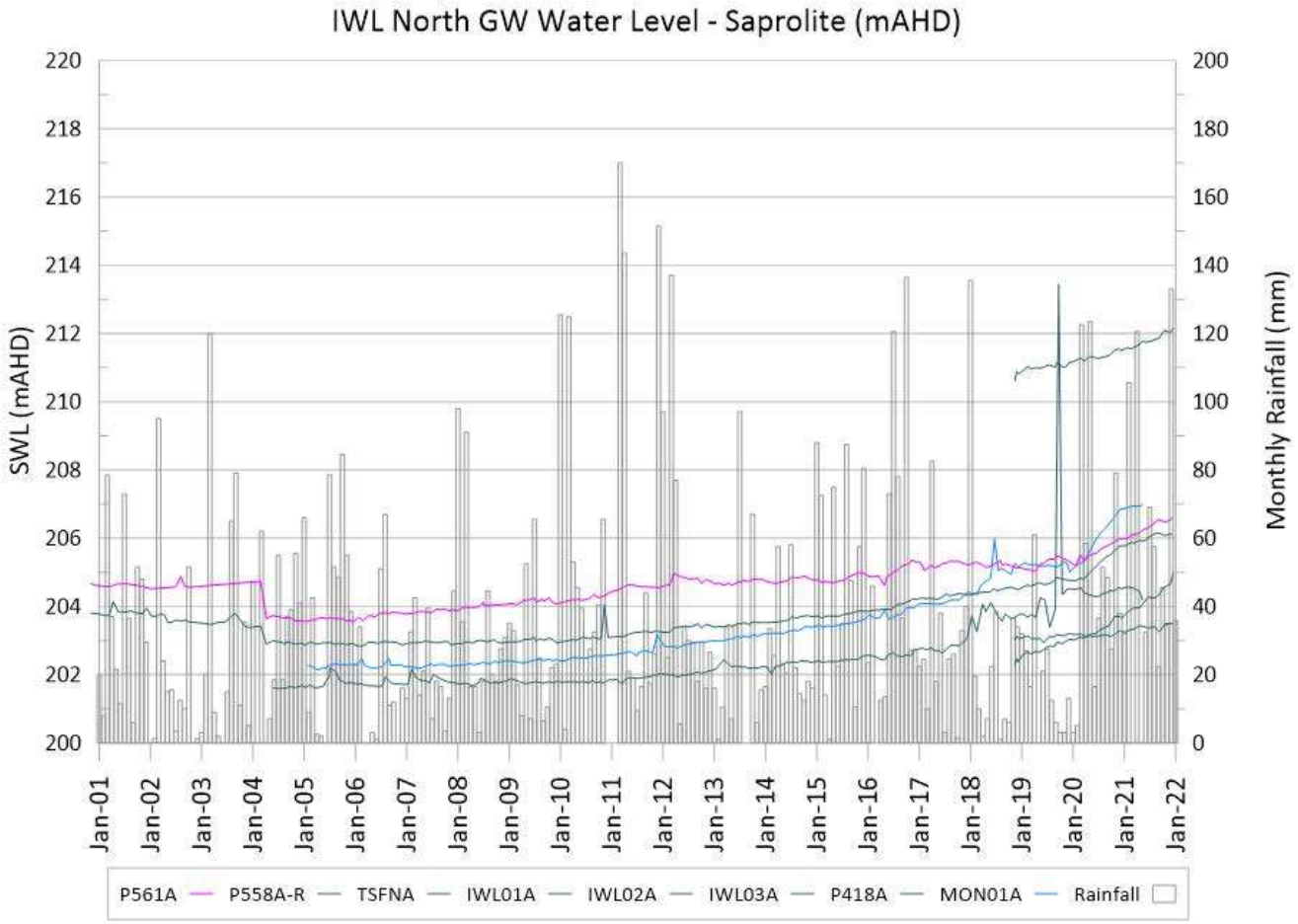
ANNUAL REVIEW 2021

FIGURE 14c

Standing Water Levels Measured During the Reporting Period

Evolution MINING Cowal





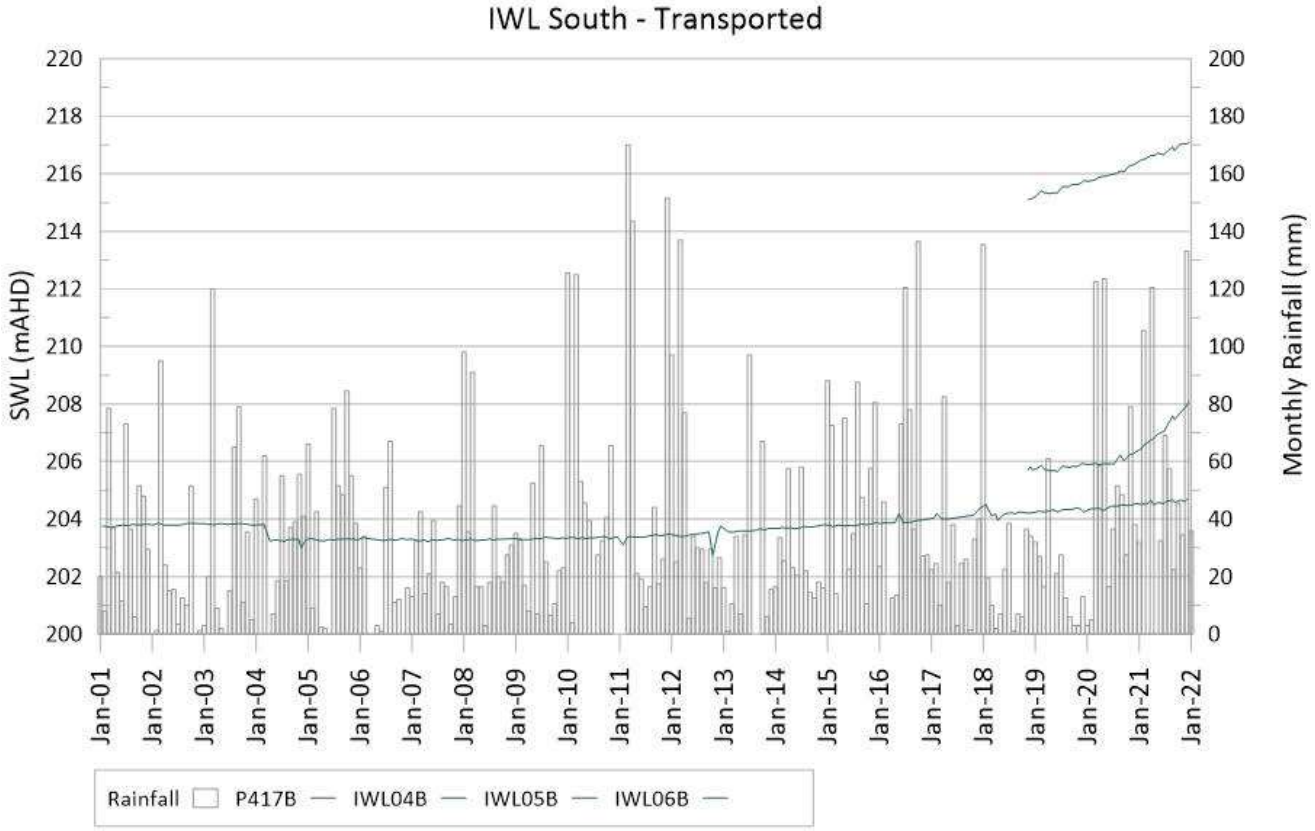
Source: EGI (2022)

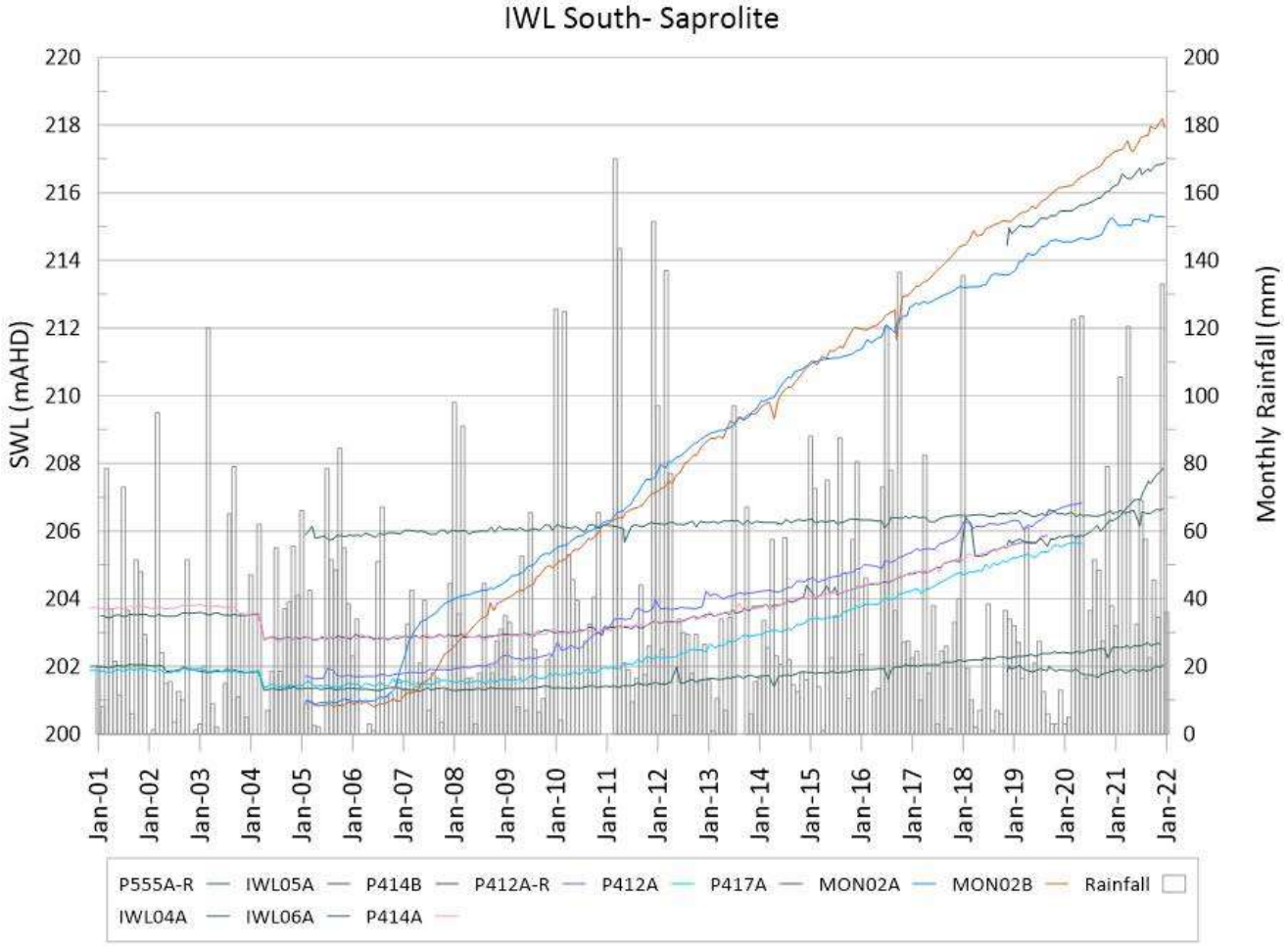
ANNUAL REVIEW 2021

FIGURE 14d

Standing Water Levels Measured During the Reporting Period

Evolution Mining Cowal





Source: EGI (2022)

ANNUAL REVIEW 2021

FIGURE 14e

Standing Water Levels Measured During the Reporting Period

Evolution MINING Cowal

8 REHABILITATION

Condition 2.4(c) of the DA 14/98 and condition B24 of SSD 10367 requires Evolution to prepare a Rehabilitation Management Plan (RMP). The RMP is currently being updated in line with the Rehabilitation reforms using the 'Form and Way: Rehabilitation Management Plan (large mines) as a guideline.

CGO operated in accordance with the approved RMP. The RMP includes a rehabilitation monitoring programme that was developed to monitor the effectiveness of the short, medium and long-term mine site rehabilitation measures and progress against performance and completion criteria.

Monitoring and management of rehabilitation areas was undertaken during the reporting period in accordance with relevant conditions in the Development Consent, ML 1535, ML 1791, and the RMP.

8.1 REHABILITATION OF DISTURBED LAND

The total active disturbance area for ML 1535 and ML (1791) was 1,668 ha at the end of the reporting period. Land being prepared for rehabilitation or under active rehabilitation was approximately 153 ha at the end of the reporting. There was no completed rehabilitation at the end of the reporting period.

A summary of rehabilitation undertaken at the CGO during the reporting period is described below:

- NWRE – North Wall – continued monitoring of 47.9ha on all lower, mid and upper batters, post seeding.
- SWRE – Internal Wall - continued monitoring of stabilising rock armour placement on 18ha.
- SWRE – South Wall – continued monitoring 37.7ha on all lower, mid and upper batters post seeding.
- SWRE – South Wall (rock – topsoil trial plots) ongoing monitoring of the direct seeding of November 2011.
- PWRE – Inner and outer Perimeter wall – continued monitoring of shaped oxide layer to design of approximately 6ha.
- Temporary Isolation Bund and Lake Protection Bund – road and weed maintenance;

Table 25 provides a summary of rehabilitation activities at the CGO during the reporting period. The table includes details of rehabilitation at the start of the reporting period and estimated for the next report.

Table 25: Rehabilitation Summary

		Area Affected/Rehabilitated (hectares)		
		Previous Reporting Period (2020)	Current Reporting Period (2021)	Next Reporting Period (estimated) (2022)
A	Total Mine Footprint	1,668	1,668	1668
B	Total Active Disturbance	1,668	1,668	1668
C	Land being prepared for Rehabilitation	0	0	12
D	Land under active Rehabilitation	46	109.6	121.6
E	Completed Rehabilitation	0	0	0

During the next reporting period, rehabilitation activities at the CGO will continue in line with the RMP.

Table 26 provides details of the nature of disturbance and the rehabilitation status for areas that have been disturbed up to and including the reporting period.

All disturbed areas/structures had temporary erosion and sediment control measures implemented during construction in accordance with the ESCMP. Control measures included temporary sediment traps, sediment filters, diversion banks and silt fences. Further detail of erosion and sediment control measures for these areas/structures is described in the ESCMP.

Table 26: Nature of Disturbance and Rehabilitation Status of Disturbed Land

Disturbed Area	Nature of Disturbance				Area (ha) (approximate)	Rehabilitation Status
	Vegetation Cleared	Topsoil and Subsoil Stripped	Earthworks	Construction Works Status*		
NTSF						
• Floor	✓	✓	✓	Complete	168	Not yet rehabilitated
• Starter embankment	✓	✓	✓	Complete	12	Rehab removed
• Upstream lift	N/A	N/A	✓	Complete	8	Rehab removed
• Upstream lift	N/A	N/A	✓	Complete	16	Not yet rehabilitated
• Upstream lift	N/A	N/A	✓	Complete	24	Not yet rehabilitated
• Upstream lift	N/A	N/A	✓	Complete	32	Not yet rehabilitated
• Upstream lift	N/A	N/A	✓	Complete		
STSF						
• Floor	✓	✓	✓	Complete	156	Not yet rehabilitated
• Downstream lift	✓	✓	✓	Complete	13	Shaped and covered
• Upstream lift	✓	✓	✓	Complete	24	Not yet rehabilitated
• Upstream lift	N/A	N/A	✓	Complete	32	Not yet rehabilitated
• Upstream lift	N/A	N/A	✓	Complete	40	Not yet rehabilitated
• Upstream lift	N/A	N/A	✓	Complete	48	Not yet rehabilitated
• Upstream lift	N/A	N/A	✓	Complete	56	Not yet rehabilitated
IWL						
• Stage 1	✓	✓	✓	Commenced		Not yet rehabilitated
• Stage 2	✓	✓	✓	Commenced		Not yet rehabilitated
• Stage 3	✓			Not Commenced		Not yet rehabilitated

Open Pit	✓	✓	✓	Commenced	120	Not yet rehabilitated
PWE	✓	✓	✓	Commenced	60	All sections shaped and covered
NWRE (excluding outer batters)	✓	✓	✓	Commenced	248	Not yet rehabilitated
SWRE (excluding outer batters)	✓	✓	✓	Commenced	140	Southern section shaped
NWRE outer batters	✓	✓	✓	Commenced	65	Some sections shaped and covered
SWRE outer batters	✓	✓	✓	Commenced	45	Some sections shaped and covered
Ore Stockpiles	✓	✓	✓	Commenced	74	Not yet rehabilitated
Tailings service corridor	✓	✓	✓	Complete	5	Not yet rehabilitated

Table 26 (Continued): Nature of Disturbance and Rehabilitation Status of Disturbed Land

Disturbed Area	Nature of Disturbance				Area (ha) (approximate)	Rehabilitation Status
	Vegetation Cleared	Topsoil and Subsoil Stripped	Earthworks	Construction Works Status*		
Soil stockpiles	✓	✓	✓	Commenced	91	Not yet rehabilitated
Processing plant (including contained water storages D5 and D6)	✓	✓	✓	Complete	20	Not yet rehabilitated
Mining Hardstand (including workshop and fuel farm)	✓	✓	✓	Complete	8	Not yet rehabilitated
Internal mine access road	✓	✓	✓	Complete	8	Not yet rehabilitated
Contained water storages D1 and D4	✓	✓	✓	Complete	5	Not yet rehabilitated
Contained water storages D2, D3 & D8B	✓	✓	✓	Complete	11	Not yet rehabilitated
Contained Water Storage D9	✓	✓	✓	Complete	13	Not yet rehabilitated
Stilling basin and outfall	✓	✓	✓	Complete	1	Not yet rehabilitated
Temporary tank and holding pond for bore field water	✓	✓	✓	Complete	<1	Not yet rehabilitated
Mine dewatering bores	✓	N/A	✓	Complete	<1	Not yet rehabilitated
Minor internal roads and haul roads	✓	✓	✓	Commenced	40	Not yet rehabilitated
Temporary laydown areas	✓	✓	✓	Complete	2	Not yet rehabilitated
Exploration Geology office	✓	✓	✓	Complete	1	Not yet rehabilitated
Administration office	✓	✓	✓	Complete	1	Not yet rehabilitated

Temporary administration office	✓	✓	✓	Complete	1	Not yet rehabilitated
ML 1535 perimeter fence	✓	N/A	✓	Complete	<1	Not yet rehabilitated
Magazine compound	✓	✓	✓	Complete	2	Not yet rehabilitated
Temporary isolation bund	✓	✓	✓	Complete	10	Rehabilitated
Lake protection bund	✓	✓	✓	Complete	10	Rehabilitated
Up-catchment diversion system	✓	✓	✓	Complete	2	Rehabilitated and under maintenance
Internal catchment drainage system (permanent catchment divide)	✓	✓	✓	Complete	2	Rehabilitated and under maintenance
BCPC water supply pipeline	✓	✓	✓	Complete	2	Not yet rehabilitated

Table 26 (Continued): Nature of Disturbance and Rehabilitation Status of Disturbed Land

Disturbed Area	Nature of Disturbance				Area (ha) (approximate)	Rehabilitation Status
	Vegetation Cleared	Topsoil and Subsoil Stripped	Earthworks	Construction Works Status*		
Saline groundwater supply bore field and associated pipeline	N/A	✓	✓	Commenced	10	Not yet rehabilitated
Boart Longyear office	✓	✓	✓	Complete	1	Not yet rehabilitated
Bioremediation area	✓	✓	✓	Complete	1	Not yet rehabilitated
Waste management yard	✓	✓	✓	Complete	1	Not yet rehabilitated
TSF construction compound	✓	✓	✓	Complete	2	Not yet rehabilitated

N/A: Not applicable.

* Construction works status refers to earthworks, excavations and/or emplacement of material.

During the reporting period there were no additional final landform areas available for additional progressive rehabilitation. The following text provides detail of the rehabilitation monitoring conducted on each key final landform at the CGO.

Annual rehabilitation (and visual) monitoring of revegetated landforms is conducted to ensure vegetation is establishing and to determine the need for any maintenance and/or contingency measures (such as the requirement for supplementary plantings, erosion control and weed control). The rehabilitation works are subject to ongoing independent consultant review of effectiveness.

Progressive rehabilitation of each key final landform will continue to be undertaken in accordance with relevant environmental assessments and approvals and the RMP.

Perimeter Waste Emplacement

The PWRE has been constructed to approximately 223 m RL and surrounds the pit to the north, east and south (Figure 3). The emplacement occupies an area of approximately 60 ha and forms part of the series of embankments (i.e. Temporary Isolation Bund and Lake Protection Bund) between the open pit and Lake Cowal. The emplacement elevation has been designed to reduce potential noise and light impacts of mining and processing on the surrounding environment and sensitive receptors.

Approximately 21ha of the inner and outer perimeter wall was previously seeded and 6ha were reshaped and rock armoured. Both areas were monitored for stabilisation and effectiveness of seeding during the 2021 reporting period.

Plate 2: Aerial View Perimeter Waste Rock Emplacement (October 2021)

Northern Waste Rock Emplacement – Outer Batters

The NWRE is approved to be constructed to approximately 308 m AHD and will occupy an area of approximately 269 ha northwest of the pit (Plate 2).

No additional rehabilitation was conducted on the NWRE during the reporting period.

Approximately 47.9ha of the entire NWRE was re ripped and direct seeded with native species in the previous reporting periods and was monitored during this reporting period.

Tube stock planted in previous years on the NWRE was monitored during the reporting period.

Plate 3: Aerial View Northern Waste Rock Emplacement (October 2021)

Southern Waste Rock Emplacement – Outer Batters

Area of approximately 18ha on the SWRE batters were rock armoured, topsoiled, gypsum spread and were direct seeded via aerial application during previous reporting periods and was monitored during the 2021 reporting period.

Plate 4: Aerial View - Southern Waste Rock Emplacement (October 2021)

Northern and Southern Tailings Storage Facility – Starter Embankments and Lifts

No rehabilitation occurred on the NTSF, STSF or IWL during the reporting period due to the construction of the IWL. The construction of the IWL primarily used waste rock and therefore will be protected from erosion.

The long-term rehabilitation objectives for the tailing's storage facilities include the re-establishment of woodland communities and will commence following the cessation of tailings deposition.

Any emergent deeper-rooted species that germinate in the walls of the TSF structures continued to be poisoned by stump paste with glyphosate. As per ongoing TSF fauna protection practices, no trees shall be encouraged to grow until after the final capping is completed on the IWL.

Boundary Amenity Plantings

Inspections of the vegetation screening surrounding the CGO identified that no additional tube stock were required to be planted during the reporting period. Due to disturbance to tree screens for approved development additional planting will be investigated and may be implemented in future reporting periods.

8.2 REHABILITATION MONITORING RESULTS

Monitoring within the active rehabilitation areas was undertaken by DnA Environmental (2021) during the reporting period. A summary of the results from this monitoring survey are outlined below. The indicative location of soil stockpiles and the location of rehabilitation offset and RVEP monitoring sites are presented on Figures 15 and 16, respectively. Final landforms and final land use areas are presented on Figure 17.

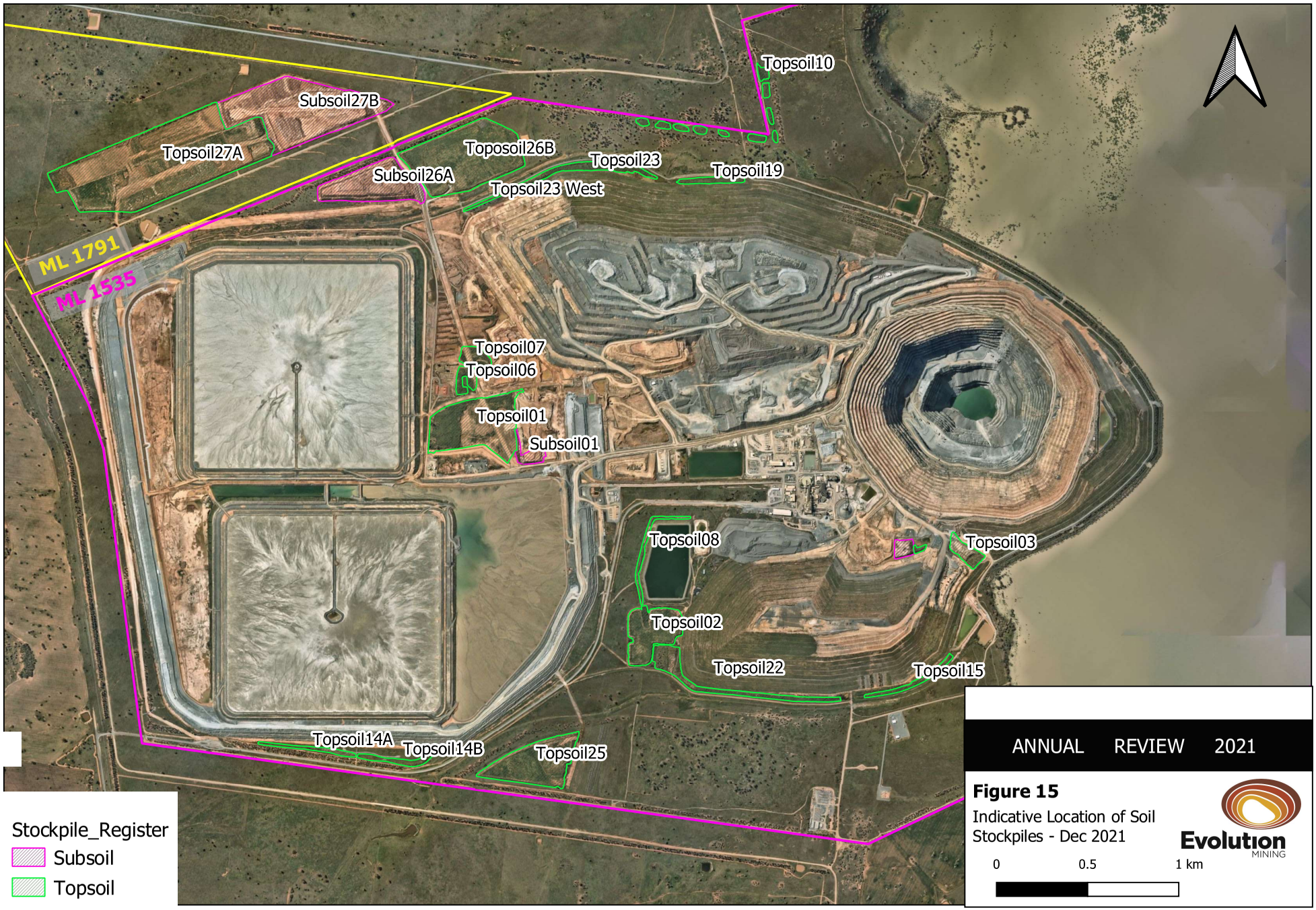


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Figure 15

Indicative Location of Soil Stockpiles - Dec 2021

Evolution MINING

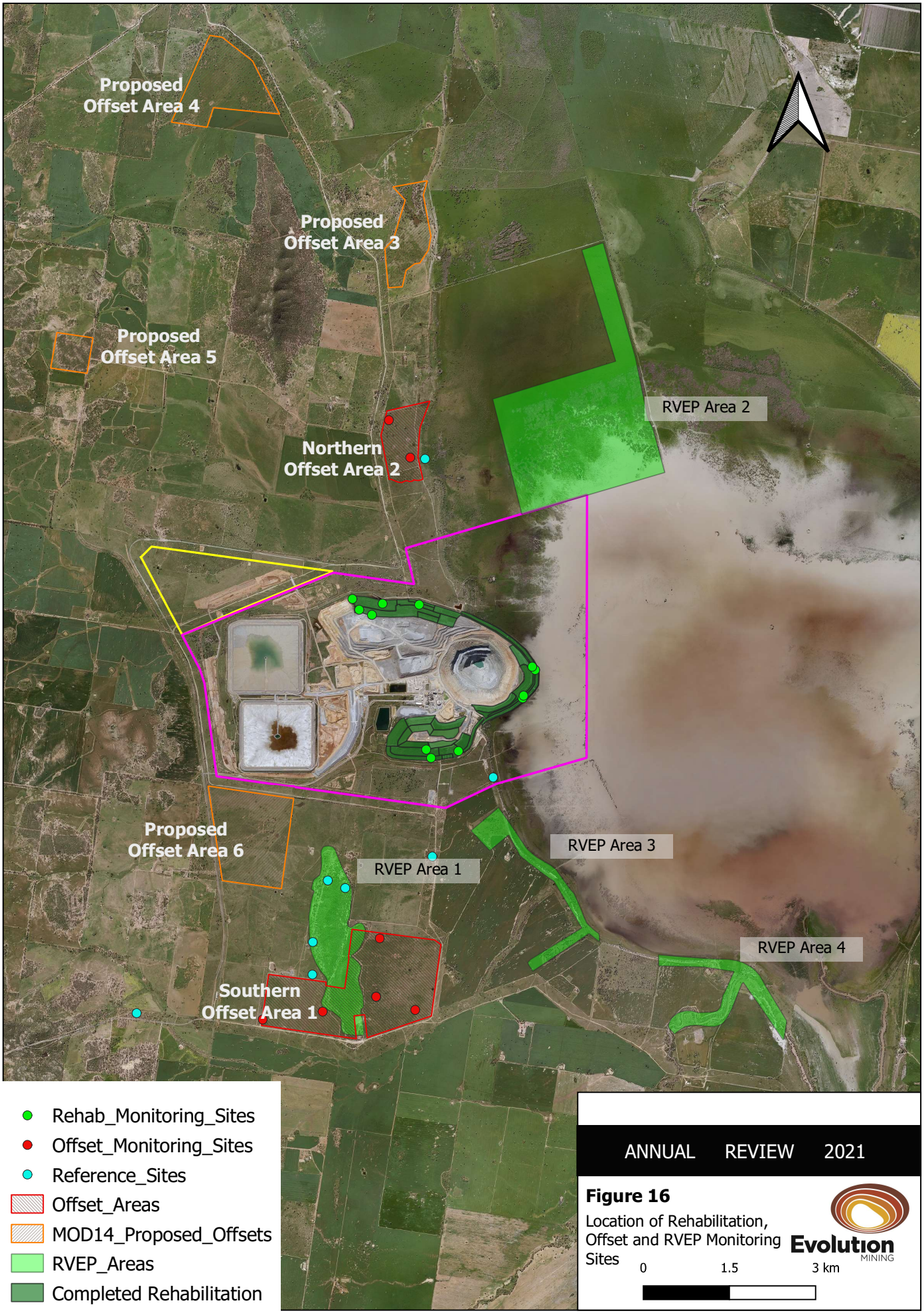

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Figure 16

Location of Rehabilitation, Offset and RVEP Monitoring Sites

Evolution MINING

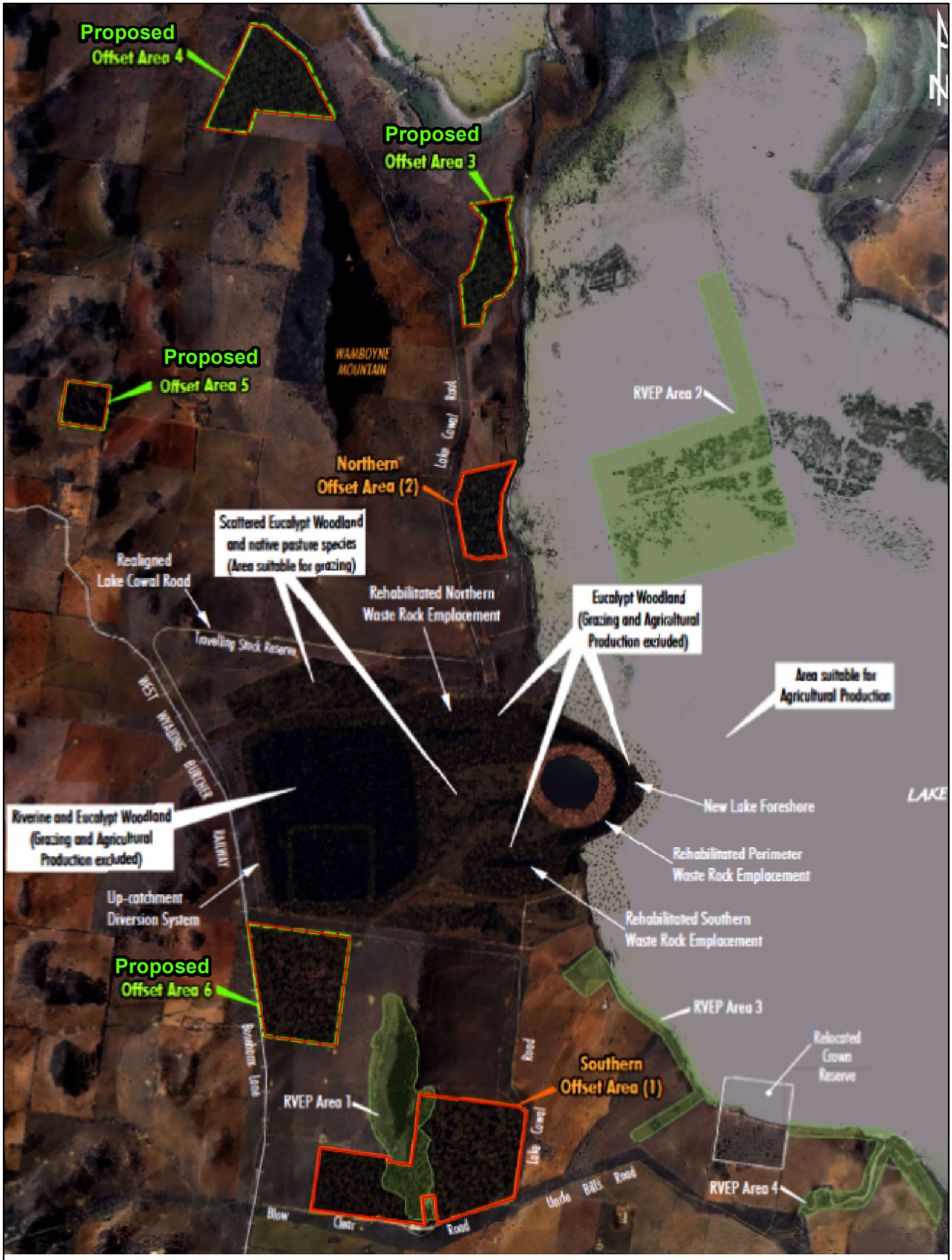

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FIGURE 17
Conceptual Final Landform and Proposed Final Land Use Areas

Evolution MINING Cowal

8.2.1 Waste Rock Emplacement Monitoring Results

The range of ecological monitoring data in 2021 indicated there have been significant ecological and chemical changes occurring within the rehabilitation areas largely as a result of the volunteer colonisation of the exotic annual grasses *Lolium rigidum* and/or *Avena fatua.* While the *Lolium* and *Avena* had dried off during the monitoring period, the dead leaf litter has been accumulating and typically provides a thick mulch cover across much of the rehabilitation areas, which is essential in building the soil surface profile, reducing soil hardness and increasing soil coherency and stability. The data also indicate that hardy native perennial ground covers were becoming naturally colonised across many rehabilitation areas and were increasing in abundance. All but four rehabilitation sites were ecologically more functional than the Grey Box reference site, Grey02, and only one site NWRE05 was performing poorly. While NWRE05 has slightly improved, it has adverse soil chemistry and has not developed at similar rates.

Due to the increase in protective litter cover and slight to moderate levels of litter decomposition there has been a decrease in surface crusting, increased soil coherency and there was less evidence of resources being mobilised across the sites. In 2018, many of the older sites on the NWRE, PWRE and SWRE had been re-ripped and seeded, exposing bare soil and scattered rocks and subsequently reducing the patch area and LOI in these sites.

During 2017 - 2019, there tended to be a decline in ecological function in most monitoring sites due to the prolonged dry conditions combined with heavy grazing and disturbance by macropods. The effects of grazing and disturbance were more apparent on most sites on the NWRE as they tended to have increased grass cover and shade especially in the older sites which were close to the NWRE trials, and in this area, there was much less mining activity thus being more attractive to resident macropod populations.

Since 2020 improved seasonal conditions resulted in an increase in ground covers and subsequently all monitoring sites had improved ecological function, with all sites except NWRE03, SWRE02, NWRE04 and NWRE05 having a total ecological function greater than the Grey Box woodland reference site, Grey02. The least functional monitoring site this year was NWRE05, however this site had improved since last year.

The tree population includes trees and mature shrubs with a diameter at breast height (dbh) >5cm and in the reference sites there was one less individual recorded in Dwyers01 as a result of drought mortality, to provide a target population density of 6 – 48 live trees represented by 2 – 5 species. This year two *E. dwyeri* saplings were recorded in NWRE03 with dbh's of 5 – 6 cm, however none were recorded in the remaining WRE rehabilitation areas.

During the drought there was high mortality of tree and shrub seedlings (<5cm dbh) in the reference sites, especially in Dwyers02 however there have been increasing seedling densities since 2020 with 20 – 383 individuals being recorded this year, with these being represented by 2 – 4 different species.

On the rehabilitation areas, a small number of seedlings continue to be recorded in NWRE02, NWRE03, NWRE05 PWRE01, SWRE03 and SWRE04 with some being the result of seeding, while others were volunteer species.

In NWRE03, tubestock were planted prior to monitoring in 2016 where 10 individuals have survived. Most individuals in the rehabilitation areas continued to be less than 1.0m in height however in NWRE02 and NWRE03 some individuals were >2.0m tall. Compared to the hill woodland reference sites there continues to be a low density of shrubs and/or juvenile trees on all of the WRE rehabilitation areas except in NWRE02.

There has also been a significant increase in perennial ground covers across the range of rehabilitation monitoring sites, and all sites had levels comparable to the reference sites, except in SWRE02 which had low levels of 11%. There was 21 – 77% litter cover and while they had significantly declined, scattered annual plants persisted in most areas with the highest annual plant cover being recorded on the PWRE and SWRE with up to 27% cover.

Floristic diversity has typically fluctuated with changes in seasonal conditions and this year all sites had a higher diversity of species due to the improved rainfall conditions. This year, a total of 22 – 55 species were recorded in the reference sites, with 14 - 42 of these being native species and 4 – 18 were exotic. Similar trends have typically occurred in the WRE rehabilitation areas, and an increase in floristic diversity was recorded in most rehabilitation sites where there were 30 - 46 species recorded this year. There was an increased diversity of native and exotic species, and these tended to be comparable to the reference sites this year.

The levels of exotic plant cover have been quite variable, with them providing 70 - 94% of the live plant cover in the reference site this year. On the NWRE, there was typically a marginal improvement in native plant cover where they provided 73 – 87% of the live plant cover, which was in levels comparable to the reference sites. There tended to be a decline on the PWRE as exotic covers increased, however native plants provided 45 – 53% of the live plant cover. On the SWRE, native plant cover declined in most areas with native plants providing 41 – 59% of the live plant cover this year, with sites on the PWRE and SWRE being weedier than desired.

Native grass *Walwhalleya proluta* (Rigid Panic) was the most abundant species across many of the rehabilitation sites, and a variety of species including the natives *Eriochloa crebra* (Cup Grass), *Enchylaena tomentosa (Ruby Saltbush) and Atriplex semibaccata* (Creeping Saltbush) were increasing in abundance across several rehabilitation areas. There were also several exotic species that were relatively abundant in one or more sites, but overall abundance scores were low.

One deep, but seemingly stable rill remained at NWRE02, and there was no change in the size of one rill at PWRE02. At the SWRE02, which was rehabilitated in 2019, there were previously many rills exceeding the minimum size for concern. Since then, the number and extent of rills has declined however much of the wider rehabilitation area was also noted to have minor to major rills which may require amelioration.

The soils in the rehabilitation sites are slightly to strongly alkaline and low in organic matter. Exchangeable Sodium Percentage (ESP) in most sites has been demonstrating a slowly declining trend, however, there were several significant exceptions including sites NWRE05 and PWRE02, with the soils being sodic to highly sodic. In most rehabilitation sites, EC tended to be higher than the local woodlands but were classed as non-saline, except in NWRE05 where they were highly saline.

In the older rehabilitation sites, sulfur (S) concentrations appear to have been variable but typically S concentrations have been demonstrating a declining trend and are now significantly lower than when they were first measured, with some exception. Monitoring results in soils on the WREs have indicated declining EC and S levels could be expected, and this year a decrease in EC, ESP and S was recorded in numerous rehabilitation sites, presumably after high rainfall activity. There continued to be elevated levels of iron in all four of the hill woodland reference sites suggesting iron is probably naturally occurring at elevated levels around the hills of Lake Cowal.

8.2.2 Rehabilitation Trial Monitoring Results

The NWRE rehabilitation trials were not assessed this year, however a summary of the trials and previous findings have been provided below.

Due to the various issues associated with the implementation of the NWRE D1 rehabilitation trial and difficulties in the timing and applying uniformity to the experimental design, there was high variability within and across the experimental treatments, therefore, all results should be treated with caution.

Most trial treatments have been demonstrating positive ecological succession, with significant improvements in function, ground cover and structure being recorded during the first few years. Since 2018 ecological function has declined in all trial treatments as a result of the drought, and this was also recorded in the local woodland reference sites. The dry conditions combined with increased grazing and disturbance by macropods resulted in the loss of perennial ground covers and a deterioration of the litter layers, across most trial treatment sites. Sites that had a higher level of grass cover and higher levels of shade provided by the establishing trees tended to have a higher levels of animal disturbance.

In the short to medium term, it appears all trial areas regardless of topsoil depth or mulching technique were improving in ecological function and were developing in structure and composition. Despite the drought, there has been an increase in growth in the tubestock populations with trees and mature shrubs >5cm dbh now being recorded in all but one trial plot and are indicative of good growth rates. The maturing trees and shrubs are likely to have an impact on the diversity and composition of the grassy understorey which are likely to undergo significant change over time as mature canopy covers. This was already being observed this year as macropods congregated under trees that provided high levels of shade, thus reducing the integrity of the ground covers. In previous years, there has been an increase in diversity and abundance of native perennial grasses and ground covers and many of the planted acacias and some eucalypts are of reproductive age and setting seed.

It appears that many of the undesirable soil attributes such as high Electrical Conductivity (EC), ESP and sulfur (S)have not had a significant effect on the ecological development of the area as the data indicate there have been significant improvements in most of the treatment sites during the early developmental phases. A reduction in

ecological function has been apparent in most of the trial sites due to the drought, however many ecological attributes remain comparable to the woodlands occurring on the local hills and ridges which had also been negatively affected by the drought. Results up to 2019 have typically indicated positive successional trends are occurring, despite some experimental setbacks and the extreme climatic conditions experienced since the trials commenced.

The 2017 Direct Seeding Trials were monitored this reporting period and a summary of results presented below.

The application of native tree and shrub seed onto freshly topsoiled rehabilitation areas has resulted in significantly higher seedling densities in comparison to those where established grassland had been ripped. The rocky substrate produced in NWRE may also have resulted in higher seeding establishment initially as there was higher soil surface relief, increased stability and microsites for germination, thus having less mobilisation capacity for deep seedling burial as was observed in SWRE.

The trials were undertaken during particularly dry conditions however the results indicate that the application of seed directly onto freshly prepared rehabilitation areas that have a rocky soil surface resulted in higher seedling establishment. Given years of “average” monthly rainfall, it would be expected that seedlings establishment would be much higher and include a greater density and diversity of species especially eucalypts.

The results also indicate that successful seedling establishment can also be obtained in areas where exotic grasslands have already become established, however deep ripping prior to seeding is likely to be critical. Again, improved seedling establishment occurred on the NWRE where dead leaf litter and rocks provided more stable surfaces and germination microsites. Although the rocky NWRE produced higher seedling densities, all seeding trial sites contained a density and diversity of shrub species which was comparable to the local woodlands on the hills and ridges, however NWREDS02 and SWREDS02 did not have any eucalypts, and overall eucalypt establishment was poor. Future rehabilitation on the WREs should aim to replicate the community diversity and composition of the woodlands occurring on hills using a more refined seed mix. Completion targets are not likely be met due to poor eucalypt establishment and regeneration of the surviving shrub seedlings will be critical in the longer-term.

These trials will continue during the next reporting period.

Plate 5: NWRE – Pond D1 North Trial Tube stock

9 COMMUNITY RELATIONS

Evolution recognises developing and maintaining a positive relationship with the local community is essential to running a successful mining operation.

Evolution strives to earn the trust of all with whom we interact, whether they be our employees, the communities where we live and work, the governments that host us, or other stakeholders with whom we engage in the sustainable development of mineral resources. The Community Relations Policy guides Evolution in its conduct of business around the world, including at the CGO.

9.1 COMMUNITY COMPLAINTS

The Development Consent, SSD 10367 and EPL 11912 require implementation of a complaint's mechanism. A community line for enquiries, feedback or complaints was established on 9 December 2003 and operates 24 hours per day. Complaints and/or concerns can be made by calling (02) 6975 3454 where a member of the Cowal Community team will advise the caller that they have reached the Evolution CGO Community line and assist with their enquiry, feedback or complaint. The information is logged along with the date and time that the call was made. Upon receiving an enquiry, the Community Team conducts necessary investigations and prepares a response. The caller is contacted within 24 hours of the complaint, to gather further information and notify of any proposed action to take place. Enquiries, complaints and feedback can also be made by emailing the community team on cgo.community@evolutionmining.com.
Complaints may also be submitted through regular stakeholder interactions that may occur between CGO personnel and community members from time to time.

Details of the Cowal Community Line and contact details are advertised quarterly in the following local newspapers, The West Wyalong Advocate, The Forbes Advocate and The Condobolin Argus. They also are included within the Cowal Update community newsletter, released by Evolution bi-annually and distributed to all households within West Wyalong, Forbes, and Condobolin.

A summary of the community complaints received during the reporting period (as required by the Development Consent) is provided in Table 27.

Table 27: Summary of Community Complaints during the Reporting Period

Summary of Community Complaints 2021	
Record No 1	
Details	Business owner of Wyalong
Complaint/Concern	Community
Date	05/01/2021
Outcome	1. Business owner called Community Line to advise that Evolution employees were currently parking in areas that were affect business operations. 2. Site communications went out to notify employees of parking protocols near and around bus pick up/drop off points. Vehicle owners involved in complaint were notified and instructed to relocate parking to other areas.
Date of Response	Initial response – 06/01/2021 Complaint closed – 15/01/2021
Record No 2	
Details	Business owner of Wyalong
Complaint/Concern	Community
Date	1/03/2021
Outcome	1. Business owner called Community Line to advise that Evolution employees were currently parking in areas that were affect business operations. 2. Site communications went out to notify employees of parking protocols near and around bus pick up/drop off points. Vehicle owners involved in complaint were notified and instructed to relocate parking to other areas. 3. Parking restrictions signage has also been investigated.
Date of Response	Initial response – 1/03/2021 Complaint closed – 3/04/2021
Record No 3	
Details	Resident of West Wyalong
Complaint/Concern	Community
Date	19/03/2021
Outcome	1. A nearby landholder informed CGO of increased lighting from operations, resulting in sleep disturbance. 2. Lighting could only be moved slightly as per safety issues. Landholder has advised operations that this has mitigated the disturbance. 3. An outdoor awning is also going to be installed to address the issue and allow landholder to mitigate immediately.
Date of Response	Initial response – 19/03/2021 Complaint closed – 13/05/2021
Record No 4	
Details	Business Owner of West Wyalong
Complaint/Concern	Community
Date	17/06/2021
Outcome	1. Business owner called Community Line to advise that Evolution employees were currently parking in areas that were affect business operations. 2. Site communications went out to notify employees of parking protocols near and around bus pick up/drop off points. Vehicle owners involved in complaint were notified and instructed to relocate parking to other areas.
Date of Response	Initial response – 18/06/2021

	Complaint closed – 15//07/2021
Record No 5	
Details	Nearby landowner
Complaint/Concern	CGO operations concern
Date	15/07/2021
Outcome	1. Notification via email from BSC that a 30-ton crane was seen on Bodell's lane which if engaged by EVN, it would be a breech to the current DA consent. Immediate investigation through site access and planning logs determined crane contractor was not engaged by EVN. Contact with a crane operator determined that the one seen on Bodell's lane was engaged by a property on Clear Ridge Road for the construction of a commercial shed. This information was reported back to BSC. 2. Comms also to go out to site to re-enforce the importance of using the approved access routes to site to all of our employees and contract partners.
Date of Response	Initial response – 15/07/2021 Complaint closed – 18/07/2021

9.2 COMMUNITY LIAISON

Community Environmental Monitoring and Consultative Committee

During the reporting period, quarterly meetings of the CEMCC were conducted in accordance with the Development Consent.

The CEMCC was established prior to commencement of construction works, in accordance with the Development Consent requirements. The CEMCC monitors compliance with conditions of the Development Consent and other matters relevant to the operation of the mine.

The CEMCC meets on-site or in local communities, undertakes regular inspections, reviews environmental and audit reports and discusses any incidents or complaints that may have been registered. The CEMCC members are an active conduit between local communities and the CGO. Minutes are taken from each meeting and published on the BSC website and also on the Cowal Gold Mine website (http://www.evolutionmining.com.au/cowal/).

Community Consultation

The "Cowal Update" is the CGO community newsletter that is distributed to all households in West Wyalong, Condobolin, and Forbes, and via insert within the four local newspapers covering the Bland, Lachlan and Forbes Shires. The Cowal Update is released bi-annually June/December.

Evolution previously has extended invitations to numerous community groups to visit the CGO for presentations and site visits. Site visits have been undertaken by a number of groups during the reporting period including:

- Bland, Forbes and Lachlan Shire Councils.
- various community and charity groups from neighbouring towns and villages; and
- various primary and secondary schools.

Unfortunately, due to the COVID pandemic, site visits to non-essential workers/visitors have been restricted.

Our Schools open day also has not been able to occur during the COVID pandemic.

Stakeholder meetings are carried out on-site (if seen as essential and meet current COVID restrictions) or in the local community depending upon the group and topic. These meetings can consist of 3 to 20 people, for example:

- CEMCC meetings (held quarterly)
- Local landholders, local community and charitable groups
- Local Government and State agency meetings.

Evolution also attended several off-site presentations involving the community including:

- local community and charitable groups.
- Wiradjuri Condobolin Corporation
- Lachlan, Bland and Forbes Shire Councils; and
- Local secondary schools.

Indigenous Consultation

Evolution continued to work with the Wiradjuri Community through the Wiradjuri Condobolin Corporation and a number of formal committees, including:

- the Cowal Project Coordinating Committee; and
- the Employment, Training and Business Committee.

The CGO meets with the Wiradjuri Condobolin Corporation on a regular basis.

Community Development

Evolution continued to support numerous donations, sponsorships and partnerships to a variety of local schools, annual events, charity and not for profit groups, community infrastructure and town advancement groups.

Evolution operated the Cowal Partnering Program, the Cowal Cares Program, the Shared Value Projects and the Endeavour and Wiradjuri Scholarship programs to facilitate financial contributions to the community during the reporting period.

The Lake Cowal Foundation Limited

The Lake Cowal Foundation (LCF) continues to grow into an important local independent "Environmental Trust". The Foundation is actively supported financially and in-kind by CGO. The LCF Board meet as required, some meetings are held via teleconference.

In addition to housing the LCCC on Evolution-owned property 'Hillgrove', Evolution has also provided the LCF with considerable freehold property to undertake conservation and research projects.

The LCF has now been involved in approximately 50 conservation projects in the Lake Cowal region and has developed a relationship with 40 project partners, including:

- numerous local landowners and managers.
- Riverina and Central West Local Land Services.
- Lachlan Landcare, National Mallee fowl Recovery Team, National Landcare Program, Natural Heritage Trust, Environmental Trust, Greening Australia and DPI (Fisheries).
- Bland, Forbes, Lachlan, Weddin, and Temora Shire Councils.
- Charles Sturt University, CSIRO, Western Research Institute, Western Institute of TAFE and West Wyalong High School; and
- numerous local bodies such as the West Wyalong Anglers and Gardening Clubs.

Some of the projects that the LCF have completed or are involved in include:

- the LCCC where over 8,000 people visit and participate in environmental education and activities each year
- Lake Cowal and Bland Creek revegetation projects.
- Bland Creek Catchment Incentives Grants Project that has combined contributions of approximately $5 million.
- a Natural Sequence Farming project which aims to reconnect the hydrologic function of the 10 km Spring Creek with its floodplain.
- collaborative research with CSIRO Plant Industry into native grassland population dynamics.
- Pasture Re-establishment Trials and Pasture Cropping Trials.
- the restocking of Bland and Sandy Creeks with native fingerlings; and
- seed collection, assessment of remnant vegetation and establishment of an herbarium.

The LCF continues to be an important organisation with conservation, pastoral, community, government, educational and mining groups working collaboratively together to achieve considerable outcomes for the Lake Cowal region.

10 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit (IEA) was conducted in 2019. IEA's are required under DA 14/98 and SSD 10367. CGO's next IEA is forecast to take place in quarter 2 of the calendar year 2022 satisfying requirements for both consents.

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

11.1 NON-COMPLIANCES DURING THE REPORTING PERIOD

Summaries of any non-compliances during the audit period have been described in Sections 1 and 10 of the AR.

11.2 INCIDENTS DURING THE REPORTING PERIOD

305176: Tailings WAD cyanide exceeded discharge limit

At approximately 6.30am on 7 July 2021, WAD (Weak Acid Dissociable) cyanide at the Tailings Hopper exceeded the 30ppm license limit. The processing plant was immediately shut down in accordance with CGO_PRO_SWI_420_FTL_Cyanide_Destruct_Controlling_WAD_CN_Discharge_Level. A combination of Caros acid dosing and dilution was used to reduce the WAD cyanide. The processing plant was restarted by 11.00am on 7 July 2021. Elevated WAD levels were not detected at the decant pond in the IWL, indicating that remedial actions adequately controlled the risk of environmental impact. Refer to Section 6.6 (Cyanide Management) and 6.9 (Fauna) for more details.

Through the internal ICAM investigation, it was determined that high pH levels in the Float Tails Leach (FTL) and destruct tank had inhibited the INCO cyanide destruct process, resulting in elevated WAD cyanide at the tailings discharge. High pH in the FTL circuit was attributed to continued lime dosing into the FTL following the overload of the thickener on the previous day (INX incident 305044). The pinch valve for lime addition to the FTL circuit was setup during commissioning (MPEC commissioning team) to operate and control normal slurry flow fluctuations from the Float Tails Thickener. No other control logic for this valve had been considered, documented or setup to manage a crash stop scenario. Therefore, lime dosing continued after throughput ceased, resulting high pH levels in the Float Tails Leach (FTL). Following the incident, logic conditions were added for the lime dosing valve to switch off under zero flow from thickener and if pH in FTL is > 10.

The incident was initially reported by Simon Coates, Superintendent – Environment, on 7 July 2021. A detailed notification was provided on 13 July 2021.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Summaries of the activities to be completed in the next reporting period have been described in the 'Further Improvements' sections included throughout this AR.

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GLOSSARY OF TERMS

AR	Annual Review
ANZECC	Australian New Zealand Environmental Conservation Council
ARD	Acid Rock Drainage
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AWS	Automatic Weather Station
BCPC	Bland Creek Paleochannel
BLMP	Blast Management Plan
BOMP	Biodiversity Offset Management Plan
BSC	Bland Shire Council
CEMCC	Community Environmental Monitoring & Consultative Committee
CGO	Cowal Gold Operations
CMP	Cyanide Management Plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CW	Compensatory Wetland
CWMP	Compensatory Wetland Management Plan
DP&I	Department of Planning and Infrastructure
DPIE	Department of Planning Industry and Environment
DECCW	Department of Environment, Climate Change and Water (now EPA)
DPI	Department of Primary Industries
DRE	Department of Resources and Energy
DRG	Division of Resources and Geoscience
EC	Electrical Conductivity
ECCC	Evolution Cowal Consultation Centre
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environment Protection Authority
EPL	Environment Protection License
ESB	Eastern Saline Bore field
ESCMP	Erosion and Sediment Control Management Plan
ETBC	Employment Training Business Council (WCC – Evolution)
Evolution	Evolution Mining (Cowal) Pty Limited

FFMP	Flora and Fauna Management Plan
HMP	Heritage Management Plan
HWCMP	Hazardous Waste and Chemical Management Plan
IACHMP	Indigenous Archaeology and Cultural Heritage Management Plan
IEA	Independent Environmental Audit
LMP	Land Management Plan
ML	Mining Lease
MOP	Mining Operations Plan
NPWS	National Park and Wildlife Service
NTSF	Northern Tailings Storage Facility
NWRE	Northern Waste Rock Emplacement
OEH	Office of Environment and Heritage
PWRE	Perimeter Waste Rock Emplacement
RL	Relative Level metres
RMP	Rehabilitation Management Plan
RMP	Rehabilitation and Offset Management Plan
RVEP	Remnant Revegetation Enhancement Programme
STSF	Southern Tailings Storage Facility
SWRE	Southern Waste Rock Emplacement
SWGMBMP	Surface Water, Groundwater, Meteorological and Biological Monitoring Programme
TSF	Tailings Storage Facility
TSMP	Threatened Species Management Protocol
TSMS	Threatened Species Management Strategy
TSP	Total Suspended Particulates
WAD	Weak Acid Dissociated
WIRES	Wildlife Information Rescue and Education Service
WMP	Water Management Plan

Simon Coates

From: Jason Price <Jason.Price@epa.nsw.gov.au>
Sent: Tuesday, 13 July 2021 12:10 PM
To: Simon Coates
Subject: Self report

Caution! This message was sent from outside the company. Care should be taken with links, attachments and instructions.

G'day Simon – just following up your report last week about the elevated cyanide levels in the mills discharge.

We have reviewed the report and acknowledge appropriate action was taken by Evolution and we do not require anything further.

Regards
Jason Price
Operations Officer
Regulatory Operations
NSW Environment Protection Authority
D: 02 6969 0705 M: 0428 460 247

www.epa.nsw.gov.au @NSW_EPA

Report pollution and environmental
incidents 131 555 or +61 2 9995 5555

Simon Coates

From: do-not-reply@epic.epa.nsw.gov.au on behalf of EPIC <do-not-reply@epic.epa.nsw.gov.au>
Sent: Wednesday, 7 July 2021 4:44 PM
To: Simon Coates
Subject: REF-NO-3899 Report to NSW EPA 07/07/2021

Dear Simon Coates

Thank you for making a report to the EPA. We appreciate you taking the time to report this matter.

Date and time the report was made: 07/07/2021 04:29 PM
Incident type: WATER,CHEMICAL,Mining for minerals
Incident description: SELF REPORT FROM EPL 11912. Exceedance of cyanide at the processing plant. Fluctuating pH observed at shift change from 10pm, and elevated pH noted at shift change at 6am. At 6:35am a sample was taken after flushing the probe, result 35ppm (maximum limit is 30ppm). Upon receiving results the mill was shut down and second sample was taken. Carous acid was used to lower cyanide levels . Next reading at 8:45am 12.8ppm. Sample also taken from the IWL, result was 3.9ppm - this is around the norm for this point. Mill operations restarted from around 11am.

Based on the information you have provided, a report has been created (REF-NO-3899) and allocated for action.

The EPA Case Officer will contact you if they require further information.

If you would like to follow up on this report, you are welcome to call the EPA's Environment Line on 131 555 during business hours (8.30am to 5pm weekdays) and quote your Reference Number. An Environment Line Officer will provide you with advice on what action has been taken.

If you would like to provide any further details or updates regarding the incident please call the EPA's Environment Line on 131 555.

Regards
Environment Line Officer
Email: info@environment.nsw.gov.au
www.epa.nsw.gov.au and www.environment.nsw.gov.au

IMPORTANT NOTICE: CONFIDENTIALITY AND LEGAL PRIVILEGE

This e-mail may contain privileged and/or confidential information intended for the person addressed.

Please note that in order to respond to your report the EPA will record the personal details you have provided, including email address. These details may also be used to inform the EPA's environmental regulatory processes or alternatively you can request that your details are only used in relation to the report you have made by emailing Environment Line (info@environment.nsw.gov.au). Details of the EPA Privacy information can be found at: www.environment.nsw.gov.au/help/privacy.htm

Email: NTN01