Name of Mine:	**COWAL GOLD MINE**
Titles/Mining Leases:	**ML 1535**
MOP Commencement Date:	**October 2012**
MOP Completion Date:	**January 2014**
AEMR Commencement Date:	**23 DECEMBER 2011**
AEMR End Date:	**22 DECEMBER 2012**
Name of Leaseholder:	**BARRICK (COWAL) LIMITED**
Name of Mine Operator (if different):	**AS ABOVE**
Reporting Officer:	**GARRY PEARSON**
Title:	**ENVIRONMENTAL MANAGER**
Signature:	.....
Date:	**19 August 2013**

DOCUMENT COPY No:

ISSUED TO:

DATE: **19 August 2013**

Plate 1
Lake Cowal shortly before reaching full capacity (6 March 2012)

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PLANS

In accordance with Section 3 of the *Guidelines and Format for the Preparation of an Annual Environmental Management Report:* (NSW Department of Trade and Investment, Regional Infrastructure and Services [**DTIRIS (Minerals), 2006**]) a number of plans (including a land preparation plan, proposed mining activities plan and proposed rehabilitation plan) are required to be prepared for the Annual Environmental Management Report (**AEMR**). These plans are to show equivalent information to plans provided in the current CGM Mining Operations Plan (October 2012 – January 2014) (**MOP**).

Land Preparation Plan

Disturbance areas associated with the CGM and soil stockpile areas are shown on Figure 4. Plans showing proposed land preparation areas for the next reporting period are included in the MOP (Figures 20 and 21 of this AEMR).

Proposed Mining Activities Plan

Mining operations commenced on 21 April 2005.

Figure 4 shows the layout of the open cut pit, soil stockpiles and water management structures.

Mining activities for the next reporting period have been addressed in the MOP. A summary of operations for the next reporting period is provided in Paragraph 6 of this report.

Rehabilitation Plan

Areas where rehabilitation activities have occurred during the reporting period are shown on Figure 4. Plans showing proposed rehabilitation activities for the next reporting period are included in the MOP (Figures 20 to 21).

Figures 1 to 19 provide additional plans and information relevant to this AEMR.

1 INTRODUCTION

This Annual Environmental Management Report (**AEMR**) has been prepared by Barrick (Cowal) Limited (**Barrick**) for the Cowal Gold Mine (**CGM**) in accordance with the conditions of the Development Consent DA 14/98 for the CGM granted on 26 February 1999 (**Development Consent**) and the Conditions of Authority for Mining Lease (**ML**) 1535 granted on 13 June 2003. This AEMR has been prepared for the period 23 December 2011 to 22 December 2012. The requirements for the AEMR are set out in the Conditions of Authority for ML 1535 and the CGM Development Consent.

The AEMR has also been prepared in accordance with the NSW Department of Trade and Investment, Regional Infrastructure and Services Division of Resources and Energy (**DTIRIS [DRE]**) *Guidelines and Format for Preparation of an Annual Environmental Management Report* (**DTIRIS, 2006**).

This AEMR has been prepared in consultation with relevant stakeholders. A meeting regarding the AEMR was held on 30 July 2012 at the CGM**.** Attendees included representatives from the Environmental Protection Authority (**EPA**) (formerly part of the Office of Environment and Heritage [**OEH**]), the DTIRIS (DRE), DPI-Agriculture and Barrick (Cowal) Limited. In addition, Barrick has been in contact with the DTIRIS (DRE) and Department of Planning and Infrastructure (**DP&I**) regarding the development of this AEMR. No additional requirements in relation to the AEMR were requested by the DTIRIS (DRE) or the DP&I.

In accordance with Development Consent Condition 9.2(iii), copies of the AEMR will be provided to the Director-General of the DP&I, EPA, NSW Office of Water (**NoW**), DTIRIS (DRE), the NSW Dams Safety Committee (**DSC**), DPI-Fisheries, the Bland Shire Council (**BSC**) and the Community Environmental Monitoring and Consultative Committee (**CEMCC**).

1.1 CONSENTS, LEASES, LICENCES AND PERMITS

1.1.1 Current List of Consents, Leases, Licences and Permits

The key consents, leases, licences and permits under which CGM operates are presented in Table 1.

Table 1
Key Consents, Leases, Licences and Permits

Instrument	Relevant Authority	Date of Grant	Duration of Approval
Development Consent (DA 14/98)	DP&I	26/02/1999	Mining operations may take place until 30 June 2019. "Mining operations" includes all ore extraction, processing and transportation activities carried out on site. The Development Consent then continues in force until Barrick rehabilitates the site in accordance with the conditions of the Development Consent.
Development Consent (DA2011/64) (Eastern Saline Borefield)	Forbes Shire Council	20/12/2010	N/A
Mining Lease (ML 1535)	DTIRIS (DRE)	13/06/2003	21 years (2024).
Environment Protection Licence (EPL 11912)	EPA	23/12/2003	Until the licence is surrendered, suspended or revoked. The licence is subject to review every three years, and was last updated on 2 May 2013.
Permit #1361 under section 87(1) of the NPW Act	EPA	23/05/2002	Valid for period of exploration drilling on the lots covered by the permit.
Consent #1467 under section 90 of the NPW Act	EPA	27/11/2002	The approval lapses when the Minister for Environment acknowledges that satisfactory rehabilitation work has been completed under ML1535 or 18 years after completion of constructions works, whichever occurs first.

Table 1 (Continued)
Key Consents, Leases, Licences and Permits

Instrument	Relevant Authority	Date of Grant	Duration of Approval
Permit #1468 under section 87(1) of the NPW Act	EPA	27/10/2003	Same as Consent #1467.
Consent #1680 under section 90 of the NPW Act	EPA	28/07/2003	The approval lapses when the Minister for Environment acknowledges that satisfactory rehabilitation work has been completed under ML1535 or 18 years after completion of construction works, whichever occurs first.
Permit #1681 under section 87(1) of the NPW Act	EPA	28/07/2003	Same as Consent #1680.
Production bore licence (Bland Creek Palaeochannel borefield) #70BL229248	NoW and EPA	19/12/2008	18 December 2013.
Production bore licence (Bland Creek Palaeochannel borefield) #70BL229249	NoW and EPA	22/12/2008	21 December 2013.
Production bore licence (Bland Creek Palaeochannel borefield) #70BL229250	NoW and EPA	22/12/2008	21 December 2013.
Production bore licence (Bland Creek Palaeochannel borefield) #70BL229251	NoW and EPA	22/12/2008	21 December 2013.
Production bore licences (saline groundwater supply borefield within ML 1535) #70BL232691 - #70BL232692	NoW and EPA	28/01/2010	27 January 2015. Valid for the operation of three lake floor saline production bores when not inundated by Lake Cowal.
DA No. 2011/0064 #70BL233321 #70BL233323	FSC and NoW	20/12/2010	20/12/2015. Valid for the operation of the eastern saline borefield.
Pit dewatering bore licences #70BL230205 – #70BL230234 and newer.	NoW and EPA	6/1/2010	5 January 2015. Replacement de-watering bore licenses as exchanged for decommissioned bores.
Monitoring and test bore licences	NoW and EPA	Various	Various.
High Security Title WAL13749 NoW Reference 70AL603333	LPI and NoW	21/12/2006	Title for allocation from Regulated River Source.
High Security Title WAL14981 NoW Reference 70WA603145 (80 Units)	LPI and NoW	15/09/2011	Title for allocation from Lachlan River Regulated Source- Water Sharing Plan. Followed WAL13749/ 70AL603333 (21/12/2006) (above).
General Security WAL13748 NoW Reference 70AL603332	LPI and NoW	21/12/2006	Title for allocation from Regulated River Source.

Source: Barrick (2012)

DP&I: NSW Department of Planning and Infrastructure

DTIRIS: NSW Department of Trade and Investment, Regional Infrastructure and Services – Mineral Resources and Energy

EPA: NSW Environmental Protection Authority

FSC: Forbes Shire Council

LPI: NSW Land and Property Information

NoW: NSW Office of Water

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

Mining Operations Plan (MOP)

Two MOPs were applicable to the CGM during the reporting period and are described below.

2011 to 2012 MOP

Preparation of a new MOP for the period January 2011 to September 2012 commenced during the previous reporting period as a requirement of ML 1535 Conditions of Authority and Development Consent conditions and in accordance with the MOP guidelines.

The 2011 to 2012 MOP was approved by the DTIRIS (DRE) on 30 March 2011. An extension to the submission of the new 2011 to 2012 MOP from December 2010 to the end of March 2011 was granted in writing by DTIRIS (DRE) on 23 November 2010 (due to unresolved Hearing outcome for s75W).

2012 to 2014 MOP

The October 2012 to January 2014 MOP was approved by the DTIRIS (DRE) on 19 December 2012. The next MOP will be submitted for review in November 2013.

During the current reporting period (2011 to 2012 MOP), the footprints of the Perimeter Waste Emplacement (**PWE**), Northern Waste (rock) Emplacement (**NWE**) and Southern Waste (rock) Emplacement (**SWE**) remained unchanged. E42 Pit walls continued to lay back and deepen in Stages D, E, F and G. The outer batters of the fourth lift (third augmentation) of the Southern Tailings Storage Facility (**STSF**) were rehabilitated ready for filling with tailings from April 2013. The third lift of the Northern Tailings Storage Facility (**NTSF**) was in use and approaching the end of the tailings fill cycle at the end of the reporting period. Stripping of topsoil from the subsoil stockpiling area adjacent the Tailings Storage Facility (**TSF**) Depot commenced and provided the majority of the fill for the waste rock – topsoil cover rehabilitation method (Paragraph 5.4) needs of the outer batters of the fourth lift (third augmentation) of the STSF. The Lake Protection Bund (**LPB**) outer bund and eastern face of Pond D1 were rock armoured before Lake Cowal levels rose over the Temporary Isolation Bund (**TIB**) shortly after the near 1:100 year ARI flood event of 7 March 2012. The Pond D1 north rehabilitation trial area was constructed and covered with waste rock, 10 t/ha of gypsum and 150, 200 and 300 mm topsoil in preparation for final plot design treatments at the start of the reporting period. Unfortunately, due to the dry year in 2012 there was no native pasture hay available to complete the setup of the trial (Paragraph 5.4).

1.1.2 Approval Variations Applicable to the Subject Area

Environment Protection Licence

Barrick has not applied for nor received a s58 variation since the EPL11912 variation posted on 24 June 2011. The previous requested changes appear in track change at:

http://www.environment.nsw.gov.au/prpoeoapp/ViewPOEONotice.aspx?DOCID=-1&SYSUID=1&LICID=11912 .

During the 2012 AEMR reporting year the EPA introduced the *Protection of the Environment Legislation Amendment Act 2011* which requires the preparation of a Pollution Incident Response Management Plan (**PIRMP**). In accordance with the PIRMP Barrick commenced providing monthly monitoring data on Barrick's website from 1 July 2012. The EPA accepted modification to Barrick's Emergency Response Plan (**ERP**) as meeting the requirements for a PIRMP on 1 September 2012.

Development Consent

No amendments to the CGM's Development Consent occurred during the reporting period.

Amendments and Revisions to Environmental Management Plans

A description of the relevant amendments and revisions to the EMPs required under the Development Consent is provided below.

Site Water Management Plan

In February 2012 a revised SWMP incorporating the eastern saline borefield was submitted to relevant government departments for comment in accordance with Development Consent Condition 4.1/4.2. Comments

were addressed and a revised SWMP was provided to the DP&I in late February 2012. The DP&I provided review comments on the revised SWMP in August 2012. Barrick subsequently revised the SWMP to address the DP&I's comments and submitted the SWMP back to the relevant consultees for comment in May 2013. The outcome of consultation regarding the revised SWMP will be provided in the 2013 AEMR.

In accordance with Development Consent Condition 4.1/4.2(b), a long-term strategy for decommissioning water management structures and a strategy for the final void was prepared during the reporting period. A request for an extension of the timing for submission of the long-term strategy, to the end-June 2013 was submitted to the DP&I on 13 November 2012. The long-term strategy has been incorporated into the revised SWMP. Barrick is currently consulting with NoW and EPA on the revised SWMP and consulting with DTIRIS (DRE) and the CEMCC regarding the long-term strategy for decommissioning water management structures.

Surface Water, Groundwater, Meteorological and Biological Monitoring Programme

After DP&I approval of MOD10 in July 2011, Barrick prepared an Addendum to the Meteorological and Biological Monitoring Programme (**SWGMBMP**) to include the Eastern Saline Borefield in consultation with relevant regulatory agencies in accordance with Development Consent Condition 3.2(a). The Addendum to the SWGMBMP was then submitted to the DP&I for approval in February 2012. The DP&I approved the Addendum on 14 August 2012. To maintain consistency with the revised SWMP (which was updated to address DP&I review comments provided in August 2012), Barrick commenced preparation of another Addendum to the SWGMBMP towards the end of the 2012 reporting period.

Blast Management Plan

The BLMP was revised (May 2010) to reflect the modification of the Development Consent conditions relevant to blasting on 10 March 2010. The DP&I provided feedback on the content of the BLMP in their letter dated 14 August 2012. Barrick subsequently prepared a revised BLMP to address the DP&I's review comments and submitted the revised BLMP to the DP&I on 11 December 2012. Barrick is currently awaiting approval of the revised BLMP.

Noise Management Plan

The NMP (July 2010) was revised to reflect the modification of the Development Consent conditions relevant to noise on 10 March 2010. The DP&I provided feedback on the content of the NMP in a letter dated 14 August 2012. Barrick subsequently prepared a revised NMP to address the DP&I's review comments and lodged the revised NMP with the DP&I on 24 December 2012. Barrick is currently awaiting approval of the revised NMP.

Threatened Species Management Strategy

The Threatened Species Management Strategy was prepared in consultation with EPA (for the Inland Forest Bat, Sloane's Froglet and Woodland birds Little Eagle, Spotted Harrier, Square-tailed Kite, Varied Sittella and White-fronted Chat). An addendum to the Strategy was submitted to the DP&I for approval in February 2011. The Strategy was amended to address DP&I comments provided on 14 August 2012. The Strategy was resubmitted to DP&I on 13 November 2012 and is currently awaiting DP&I approval.

Rehabilitation and Offset Management Plan (ROMP)

A ROMP was prepared in accordance with the Modified Development Consent approved on 10 March 2010. The ROMP was prepared in consultation with EPA, NoW and BSC and then submitted to both DRE and DP&I for approval. Subsequent to receiving DP&I review comments on 14 August 2012, Barrick continued to prepare a revised ROMP at the end of the reporting period.

Transport of Hazardous Material Study

Barrick advised the DP&I Major Hazards Unit of two emergency route changes during the reporting period. The first was for the two weeks in February 2012 when the Newell Highway was closed due to flooding. Sodium cyanide was transported for two weeks via an alternate risk assessed route. The second was to move a single isotainer using the same alternate risk assessed route after Queensland flooding in early-2013 disrupted train shipments from Brisbane to Sydney.

1.2 MINE CONTACTS

Contact details for the CGM are provided below:

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Alan Fearon
Telephone: (02) 6975 4707
Fax: (02) 6975 4740
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Email: gpearson@barrick.com

1.3 ACTIONS REQUIRED AT THE PREVIOUS AEMR REVIEW

The 2011 Annual Environmental Management Report (**AEMR**) meeting was held on 30 July 2012 at the CGM. Actions arising from this meeting are included in Table 2. No additional directions were given during site visits during the reporting period.

Table 2
AEMR Meeting Actions

Action	Responsibility	Status	Document Reference
Answer questions arising with EPA (Griffith) Officer – as discussed during and post 2010 AEMR review meeting.	Barrick	**Completed**.	Correspondence EPA (25 Oct 2011)
Field trip with DPI-Agriculture Officer to collect specimens of Box Grass to trial on south side of STSF. Planted and marked.	Barrick	**Completed.**	6 October 2011.
Revised MOP Guidelines, 2013	Barrick/DTIRIS (DRE)	**Ongoing** – Barrick will move to convert format of the MOP after requesting renewal of current draft MOP.	CGM MOP(Jan 2011 – Sept 2012) CGM MOP(Oct 2012 – Jan 2014)

1.4 CGM BACKGROUND

The CGM is owned and operated by Barrick and is located approximately 38 kilometres (km) north-east of West Wyalong, New South Wales (NSW) (Figure 1). Figure 2 provides the cadastral boundaries of properties in the vicinity of the CGM. Figure 3 provides a satellite image of the CGM (as at September 2011).

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 acquired Homestake and its operating subsidiary. Barrick continued the drilling programme. Additional drilling of the E42 ore body was undertaken between 2001 and 2005. During 2003 and 2004, the CGM 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.

Construction was carried out in accordance with the Development Consent. Vegetation clearance and soil stripping activities were undertaken prior to the commencement of construction of mine infrastructure. All clearance areas were subject to Development Consent Condition 3.10(B) which required Barrick to minimise the removal of trees and other vegetation to specified approved areas. Vegetation clearance activities were conducted in accordance with the Vegetation Clearance Protocol and Threatened Species Management Protocol.

Details of these are provided in the Flora and Fauna Management Plan (**FFMP**) and Implementation of the Threatened Species Management Protocol (**TSMP**) (Barrick, 2003h).

The CGM was the first non-operational gold mine using cyanide in the world to be certified to the International Cyanide Management Institute Code (**ICMI Code)** for Cyanide Management (17 April 2006). The CGM was also the first gold mine using cyanide in the world to be pre-operationally and operationally certified to the ICMI Code (2 August 2007). An independent professional third-party re-certification audit occurred in early August 2009 during which the operations were found to have maintained full compliance during the previous three years.

A further independent professional re-certification audit occurred during 12-15 December 2011. Details regarding the re-certification audit are provided on the ICMI's website (dated 17 May 2010) *viz*. http://www.cyanidecode.org/media_pr403.php

Barrick (Cowal) Limited was again officially re-certified to the ICMI Code for a third time on 3 May 2012.

1.5 INDEPENDENT ENVIRONMENTAL AUDIT

Condition 8.8(a) of the CGM Development Consent requires that an independent environmental audit be undertaken every three years to assess the performance of the CGM against conditions of the Development Consent and other licences and approvals and the results included in the AEMR. The CGM Independent Monitoring Panel (**IMP**) recommended in their 2007 Annual Report that "*Barrick consider continuing use of the template-based approach established by aemc for environmental auditing of operations in order to regularly and systematically update progress on each of the environmental management and monitoring components*".

An Independent Environmental Audit (**IEA**) of the CGM was conducted during 16-20 April 2012 by Trevor Brown and Robert Drury of Trevor Brown & Associates. The IEA was conducted in accordance with the Australian/New Zealand Standards AS/NZS ISO 14010:1996 – *Guidelines and General Principles for Environmental Auditing* and AS/NZS ISO 14011:1996 – *Procedures for Environmental Auditing*. The scope of the work for the compliance audit included the following:

- review of the implementation of the requirements of the Development Consent, licences and approvals for the CGM;
- conduct a site inspection and review of on-site documentation and monitoring data relevant to the audit;
- discussions with CGM staff in relation to the requirements of the Development Consent;
- assessment of the CGM against the requirements of the Development Consent; and
- preparation of the Compliance Audit Report providing assessment of compliance against each condition of the Development Consent.

A copy of the 2012 IEA is provided as Appendix A.

2 OPERATIONS DURING THE REPORTING PERIOD

Sections 2.1 to 2.10 below describe the operations undertaken at the CGM during the reporting period. Activities included exploration, land preparation, infrastructure construction, mining, mineral processing, waste management, ore and product stockpiling, water management, hazardous material management and other infrastructure management.

2.1 EXPLORATION

A summary of the exploration, drilling and other geology related activities undertaken within ML 1535 during the reporting period is provided below.

Exploration activities undertaken during 2012 included resource definition drilling over the western portion of the E42 open pit and exploration drilling to the east, north-east and west of the open pit. The E42 pit drilling (7 holes) was part of a Prefeasibility Study (PFS) on a possible expansion of the open cut and also included geotechnical drilling (7 holes) and metallurgical studies. Total drilling completed within ML1535 during 2012 amounted to approximately 22,786 m. All the drilling consisted of diamond drilling to an average depth of 470m. Deeper drilling was conducted on the E46 prospect within Lake Cowal within the boundary of ML 1535 where 25 holes with depths ranging between 500-800m were completed, testing a zone of mineralization for underground mining possibilities.

The drilling during the reporting period was concentrated 50:50 both inside of the lake protection bund as well as within the lake at E46. All drill holes completed during the program as well as those drilled on the lake bed were concrete grouted throughout the entire length after the completion of each hole.

Land disturbance was minimal as a result of the exploration activities. Lake drilling was conducted from purpose built track mounted platform rigs designed to reduce impact on the ground. The rig has a self-contained fluid retention system and drip trays that prevent spillage of fluids into the lake. Rehabilitation of the drilling areas is described in detail in the October 2012 to January 2014 MOP.

2.2 LAND PREPARATION

Land preparation activities for the reporting period involved soil stripping of the following areas (Paragraph 3.6.3.2);

- Pond D1 trial area; and
- TSF Depot area.

Approximately 20,000 m³ of topsoil was stripped from the TSF Depot area in preparation for the relocation of the Millers Crusher Subsoil stockpile. Topsoil resources were stripped to a depth of approximately 250 mm. The stripped topsoil was used immediately for concurrent rehabilitation of the 4th Lift (3rd augmentation) of the STSF. The Pond D1 north trial area was independently assessed as requiring re-topsoiling with Topsoil Stockpile 06 to give a more representative starting point of typical site stockpiles than the previously placed grey-brown soils mix taken from north-east Pit during the prior reporting period. The stripped material from the Pond D1 north trial was used immediately on the adjacent LPB-PWE works prior to the Lake Cowal filling event. Rehabilitation of the LPB road upper and lower slopes consumed an additional 8,000 m^3 of topsoil during incorporation of gypsum and waste rock into the outer batters of the south-east PWE.

Prior to soil stripping being undertaken at a particular location, the CGM Vegetation Clearance Protocol (**VCP**), Threatened Species Management Protocol and Aboriginal Heritage Clearance requirements were implemented.

ML1535 stripped soils are either re-used or delivered directly to soil stockpiles for use in rehabilitation as shown on Figure 4. The date, location, soil type, volume and description of any ameliorants added to stockpiled materials were recorded in the CGM soils database.

2.3 INFRASTRUCTURE CONSTRUCTION

The construction details and the construction status of infrastructure components at the end of the reporting period are provided in Table 3. The infrastructure components are shown on Figure 3.

Table 3
Infrastructure Construction Components during the Reporting Period

Infrastructure Component	Construction Status
Temporary Isolation Bund and Pond D1	Lake Cowal met the Temporary Isolation Bund (TIB) in August 2010 and the Lake Cowal surface water and sediment monitoring trigger point of 204.5mRL. The 1:100 year ARI designed TIB was overtopped by Lake Cowal in mid-March 2012 after flood water entered from the north-east, east and south of the lake. The south wall of Pond D1 was raised 0.5m in mid-March 2012 as a precaution against any further heavy rain. The LPB road was protected from erosion using rock. Works are proposed to raise the TIB by 0.5m when Lake Cowal has receded to a safe distance for earthworks to occur. These works will be detailed in the next relevant AEMR/ MOP reporting period.
Pond D2	Pond D2 was deepened towards the western end. About 75,000 m^3 of clay material was removed to increase the water storage volume from approximately 90 to 180 ML. There was no change in Pond D2 footprint. The removed clay was used in the wall building for the 4th lift (3rd augmentation) of the STSF.
Southern Tailings Storage Facility (STSF)	Tailings deposition ceased in March 2012. Construction works on the 4th lift (3rd augmentation) were completed during the reporting period. The fourth lift will be operational from April 2013.
Northern Tailings Storage Facility (NTSF)	Construction and rehabilitation works ceased on the third lift of the NTSF in early-2012, and tailings deposition commenced in March 2012. Planning for the 4th Lift planning commenced in early-2013. The 3rd Lift will be operational until late-April 2013. Gas cannons have been concentrated around the NTSF Decant as Lake Cowal levels drop. A saline seep developed in the north-east toe area of NTSF in mid-December 2012. A clear water seep developed in the middle of the south wall above the first Lift and has been managed safely back into the NTSF since January 2013. Geotechnical monitoring and Lift engineering design review will continue into the next reporting period (see section 3.5.1.2).
Southern Waste Emplacement (SWE)	The SWE has been used to store waste rock from Pit stages D, E, F and G. Preliminary non-native tree clearing occurred alongside buildings at the old 'Cowal West' homestead and Shearing Shed adjacent to Pond D9 in March 2011. Final VCP clearing occurred at the area in May 2012 (see Paragraph 3.7.3.1). The 1:200 clay basal layer was placed after the felled trees and the last of the State Heritage conservation materials were removed before commencement of waste rock filling in this portion of the SWE. Monitoring of the rehabilitation trials on the south side of the SWE have continued. The much wetter year has not resulted in any significant erosion on the treated areas. Pre-treated seed was spread across the trial plots with topsoil treatment in late 2011.
Perimeter Waste Emplacement (PWE)	Rehabilitation of the outside lifts above and below the LPB roadway occurred. The LPB road was rocked from the north to the Drill Rig Boat Jetty during the start of the reporting period. The remainder of the LPB to the south was gypsumed and waste rocked after the March 2012 peak flood level.
Northern Waste Emplacement (NWE)	The NWE continued to receive waste from the Pit stages D, E, F and G. The upper two Lifts of the NWE replicate trials adjacent to Pond D1 (Pond D1 north) were constructed in readiness for wheaten-lucerne straw and pasture hay cover treatments early in 2012. Due to unseasonal rainfall patterns, no native pasture hay was collected from Barrick land during 2012 thus affecting the Pond D1 north trial progress. Pond D1 north trial was re-topsoiled with 3,600 m^3 of Topsoil 06. The timing of tube stock planting and seeding will be dependent on a period of suitable rainfall.
Lake Cowal Monitoring Equipment	Lake Cowal blast monitoring stations were inundated by 0.1 - 0.5m of water just before annual maintenance and recalibration checks were due. New technology Lake loggers arrived in June 2012 for fitting onto tall tripod stations of between 2 and 4m in height. Toward the end of 2012, further enhanced logging capabilities were due be installed at each of the stations to access meteorological conditions at each station. This has been delayed as commissioning continues on the new logger technology. New tripod stations were manufactured in early-2012 to install duplicate, taller dust gauges alongside existing 2m tall monitors. Lake Cowal levels rose quickly and dropped slowly as waters entered from the south and east, and left the north end of the Lake system, respectively. Deployment of the raised dust tripods and ambient noise monitoring chairs and logger stands in the 3 to 4m deep parts of Lake Cowal occurred from May 2012.

Table 3 (Continued)
Infrastructure Construction Components during the Reporting Period

Infrastructure Component	Construction Status
Miller's Crusher Subsoil Stockpile	In early-December 2012, the Miller's Crusher subsoil stockpile at the north end of E42 Pit was moved to the area adjacent the TSF Construction Crew Depot (the underlying topsoil on the tip area had been stripped to 250mm and used for the rehabilitation of the outer batters of the 4th lift (third augmentation) of the STSF). The 1:200 clay basal layer was placed after the movement of the Subsoil, and before commencement of waste rock filling in this portion of the NWE. An aerial survey of the volume of the new stockpile is scheduled to occur in April 2013 and will be reported in the 2013 AEMR reporting period. This material requires about 45-60 tonnes gypsum/m^3/ha and aging/ draining time as an amelioration treatment before use as a capping material in rehabilitation (McKenzie, 2012).
Millers Crusher Topsoil Stockpile	In late-December 2012, the majority of the Millers Crusher topsoil stockpile at the north end of E42 Pit was moved to the area immediately south of Pond D9. Two lesser volume temporary stockpiles were placed adjacent the TSF Construction Crew Depot (the underlying topsoil on the tip area had been stripped to 250mm and used for the rehabilitation of the outer batters of the 4th lift (third augmentation) of the STSF), and inside the TSF fence on the eastern side of the NTSF. Not all the topsoil has been moved from the southern end of the Millers location. The 1:200 clay basal layer was placed after the movement of the Topsoil and before commencement of waste rock filling in the northern end of this portion of the NWE. Aerial survey of the volume of the three new stockpiles and the Millers Crusher remnant portion is scheduled to occur in April 2013 and will be reported in the 2013 AEMR reporting period. This material requires between 15-45 tonnes gypsum/m^3/ha and aging/draining time as an amelioration treatment before use as a topsoil material in rehabilitation (McKenzie, 2012).

2.4 MINING

Mining operations continued throughout 2012. Material types mined included ore and waste (including mineralised material). Mostly sulphide ores were extracted with some oxide ores being stockpiled for later processing. A total of 9,838,166 tonnes of ore and 22,730,667 tonnes of waste rock was mined during the reporting period. A further 793,153 tonnes of mineralised material was also mined during the reporting period.

No expansions occurred on the NWE or PWE during the reporting period. No reclamation shaping of the outer northern batter occurred during 2012. Rehabilitation trial plots were constructed adjacent to Pond D1 using the rock-topsoil method as a basis (Section 5.4). The north-west corner of the SWE expanded into the area of basal layer where the 'Cowal West' homestead and State Heritage protected Shearing Shed stood until about May 2012 (see Paragraphs 2.3 and 3.14.1.1). The outer faces either side of the LPB road were stabilised using the rock-topsoil method from late-2011 to the start of the heavy rains of early 2012. No native pasture hay was recovered during the drier 2012 year so the Pond D1 trials are currently on hold.

Waste rock mined from the open pit was stockpiled for the STSF and NTSF wall raising works and outer slope rehabilitation. Clay obtained from phase E works was stockpiled near the TSF Depot for future works. The upstream lift material was direct hauled on occasions. This process of TSF lifts will continue on an annual basis.

Mining during 2012 occurred in four separate areas Stage D, Stage E, Stage F (since September 2009), and Stage G started in December 2012. Mining concluded in Stage D in June 2012 and in Stage E mining was completed in November 2012.

Mining occurred in the Stage D pit from RL 966m to RL 930m, representing a vertical advance of 36m. Mining occurred in the Stage E pit from RL 1,182m to RL 1,119m, representing a vertical advance of 63m. Mining occurred in the Stage F pit from RL 1,083m to RL 984m, representing a vertical advance of 99m. Finally, Mining occurred in two separate horizons in the Stage G pit, from RL 1,209m to RL 1,173m and from RL 1,119m to RL 1,110m, representing a total vertical advance of 45 m.

Vertical and horizontal dewatering systems were maintained throughout the reporting period. Additional horizontal holes were drilled as mining progressed through phase E and phase G. Development of both the Stage E and Stage G pushbacks mined out several of the older vertical bores. These were replaced with new bores outside the current pit perimeter.

A new MOP was approved during the reporting period. As stated in Paragraph 1.1.1, the preparation of the MOP for the period January 2011 to September 2012 commenced during the previous reporting period as a requirement of ML 1535 Conditions of Authority and Development Consent conditions and in accordance with the MOP guidelines. The new 2012 to 2014 MOP was approved by the DTIRIS (DRE) on 19 December 2012.

2.5 MINERAL PROCESSING

Processing continued throughout 2012. The processing plant recovered 267,966 ounces of gold during the reporting period. The maximum ore processing rate during the reporting period was approximately 7.2 Mtpa (Table 4).

Tailings were deposited into the third lift of the STSF until March 2012, after which tailings were deposited into the third lift of the NTSF for the remainder of the year. Construction works began on the third lift of the NTSF in June 2012 and continued into the 2013 reporting period.

The October 2012 – January 2014 MOP provides further detail regarding minerals processing undertaken at the CGM.

2.6 WASTE MANAGEMENT

Waste Rock (including mineralised material), Ore and Processing Waste

The CGM produced waste rock (including mineralised material), ore, processing waste and product during the reporting period. Topsoil continued to be stripped, used and spread during the reporting period in accordance with the Soil Stripping Management Plan (**SSMP**) (Barrick, 2003a) as described in Paragraph 3.6. The amount of ore and waste rock (including mineralised material), ore, processing waste and product produced is set out in Table 4. Table 21 (Paragraph 3.4.3.2) describes 2012 year topsoil stripped, spread and used.

Table 4
Production and Waste Summary

	Cumulative Production		
	Start of Reporting Period	**At End of Reporting Period**	**End of Next Reporting Period (estimated)**
Waste Rock (Mt) (excluding mineralised material)	140.61	163.34	182.89
Mineralised Material (Mt)	12.92	13.71	14.97
Ore (Mt)	53.68	63.52	71.68
Processing Waste (Tailings) (Mt)	37.84	45.13	52.55
Product (oz)	1,353,213	1,621,180	1,888,952

Non-Mining Waste

Non-mining waste generated at the CGM during the reporting period was transported, handled and disposed of in accordance with the Hazardous Waste and Chemical Management Plan (**HWCMP**) (Barrick, 2006c). Wastes generated during the reporting period consisted of:

- administration area domestic and packaging waste;
- sewage effluent;
- waste hydrocarbons including lubricating oils, hydraulic oils, degreasing fluids, distillate and petroleum fuels;
- used oil filters, grease and fuel/oil contaminated rags;
- vehicle batteries and light vehicle tyres;
- general waste/obsolete operational and maintenance chemicals;
- process plant trash screen oversize plastic mulch;
- scrap metals including electrical off-cuts and undersized grinding media magnet rejects; and
- spill kit recovery/ clean-up materials.

Any hazardous material or dangerous good not used or obsolete for site use is disposed of to the appropriate off-site disposal facilities by a licensed waste management contractor.

Table 5 provides a summary of operational waste types generated during the reporting period.

Table 5
Operational Phase Wastes – Transport, Handling and Disposal

Waste	Handling	Transport/Disposal
General inert construction waste (e.g. concrete, and timber)	Waste stockpiled on-site and progressively removed/disposed.	Disposal in West Wyalong landfill/refuse facility by arrangement with BSC.
Office and packaging waste	Waste collected on-site.	Removed by contractor or BSC truck or disposal on-site in waste rock emplacements only. Disposal to West Wyalong landfill/refuse facility by arrangement with BSC or recycling depot (e.g. cardboard, aluminium cans, plastics and paper). Cardboard bailer installed and operational since 2009. Bails taken to recycler in West Wyalong.
Food waste	Domestic solid waste held in specific storage containers.	Removed by contractor or BSC covered vehicle. Disposal to West Wyalong landfill/refuse facility by arrangement with BSC.
Scrap metal streams	Waste was segregated and held on-site in designated areas.	Removed from site by contractor for recycling.
Used lead acid batteries	Used batteries were stored in a bunded area.	Periodically removed from site by a licensed contractor. Recycled by licensed contractor.
Degreasing fluids, distillate and petroleum fluids	Used and flammable petroleum liquid wastes stored in dedicated storage vessel(s).	Removed from site by licensed contractor for recycling/disposal.
Lubricating oils and hydraulic oils	Used and waste oils stored in dedicated storage vessel(s).	Removed from site by licensed contractor for recycling/disposal.
Used/rejected tyres	Tyre store was maintained in designated area.	On-site disposal at surveyed locations in waste rock emplacements.
Hydrocarbon tainted soils/ rock.	Treated in on-site bioremediation facility.	Treated in on-site bioremediation facility.
Used oil/fuel filters	Filters stored in dedicated bins prior to removal.	Removed by licensed contractor. Disposal or recycling at licensed waste facility (material is inert by EPA Guidelines for waste classification).
Processing Plant trash screen oversize plastic mulch	Dried and boxed for disposal in WRE layer.	Not used 2008 through 2011. Commenced early 2012 to address build-up of plastic in carbon stripping circuit.
Drained/crushed oil/fuel filters	Filters stored in dedicated bins prior to removal.	Removed from site for recycling disposal via licensed contractor.
Used absorbents – free liquid	Clearly marked to avoid mixing of incompatible substances. Transferred to clearly labelled drums or similar containers.	Removed by licensed contractor. Disposal at licensed waste facility.
Liquid waste from sewage system	Contents of septic systems pumped out as required (currently). Portaloo units maintained by contractor.	Treated effluent from site sewage treatment facility disposed of via above ground pipeline to tailings storage. Solids from site sewage treatment facility pumped out and collected as required via licensed contractor. Grey water used for watering of Geology garden beds and landscaping or as TSF make-up water.

The October 2012 to January 2014 MOP provides further detail regarding waste management activities undertaken at the CGM.

2.7 ORE AND PRODUCT STOCKPILES

The amount of CGM ore and waste rock (including mineralised material) produced during the reporting period is set out in Table 4.

The October 2012 to January 2014 MOP provides further detail regarding ore and product stockpile management undertaken at the CGM.

2.8 WATER MANAGEMENT

Groundwater

The quantity of water approved to be extracted from the Bland Creek Palaeochannel (**BCPC**) is limited by:

a) Development Consent Condition 4.4(a) which states:

> *(a) The maximum daily extraction of water from the Bland Creek Palaeochannel shall not exceed 15 ML/day, and not exceed 3,650 ML/year. A total extraction of 30,000 ML shall not be exceeded for the life of the mine, unless otherwise agreed by the Director-General of the DP&I, in consultation with NoW. All bores from the Bland Creek Palaeochannel borefield used for mine purposes must be metered.*

and

b) the NoW bore water licences.

Development Consent Condition 9.2(i) (f) requires the outcome of the water budget for the year and the quantity of water used from water storages and BCPC borefield to be included in the AEMR. A summary of the volume of water extracted from the BCPC borefield is summarised in Paragraph 3.4.3.2.

A total of 1062.4 megalitres (ML) of water was extracted from the BCPC borefield during the reporting period. No water was extracted from the eastern saline borefield during the reporting period.

The saline groundwater supply borefield on the floor of Lake Cowal within ML 1535 was commissioned in mid-2009 (Production bore licences #70BL232691 and #70BL232692 were granted by the NoW for the period 28 January 2010 to 27 January 2015). 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.

Extracted water was used mainly for the treatment of sulphide ores through the processing plant. Water is also used for dust suppression and soil conditioning to achieve optimal compaction rates during TSF lift construction works.

Pond D9 held approximately 361 ML of groundwater (from the BCPC, saline groundwater de-watering/supply borefields and rainfall) and surface water (Regulated Lachlan River water) at the end of the reporting period.

The groundwater level associated with the BCPC borefield is monitored on a continuous basis by the NoW groundwater monitoring bore on Burcher Road (GW036553). Contingency measures have been developed for implementation when water levels reach either RL 137.5m AHD or RL 134m AHD. These trigger levels were developed in consultation with the 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.

Notwithstanding, Barrick continues to assist local BCPC water users with access concerns. As per an agreement with the NoW (13 September 2006), Barrick previously supplied water to users in the West Plains and Trigalana schemes via the Barrick (Cowal) Limited BCPC borefield pipeline during the reporting period. Also as agreed with the NoW and BCPC Water Users Group, Barrick has conducted regular surveys to monitor eight monuments on the east side of Lake Cowal for any evidence of soil compaction. Both the West Plains and Trigalana schemes have since been removed from the Barrick pipeline system by mutual agreements.

Development Application No. 2011/0064 was granted by the Forbes Shire Council on 20 December 2010 for the construction and operation of the eastern saline borefield (ESB), located approximately 10 km east of Lake Cowal's eastern shoreline, for a period of five years (until 20 December 2015). The November 2011 revised SWMP (eastern saline borefield MOD10), replaced the November 2010 SWMP. The DP&I provided review

comments on the revised SWMP in August 2012. Barrick has subsequently updated the revised SWMP to address the DP&I's review comments and has submitted the revised SWMP to relevant consultees. NoW summarily issued two presently unused production bore and monitoring bore piezometer licenses. The eastern saline borefield and associated production bore licences are included in the Addendum to the SWGMBMP, approved by the DP&I in August 2012. SB01 (#70BL233321) and SB02 (#70BL233323) have not been used during the reporting period due to wet regional conditions and local access issues.

The E42 open pit dewatering borefield was established external to the perimeter of the E42 Pit. A total of 6.46 ML was extracted from the open pit borefield, and a further 564ML from the open pit de-watering sumps (including ponds D4, D3, D8A and heavy rainfall) during the reporting period. The water from the borefield was mainly used for ore treatment within the processing plant via Pond D6, dust control on E42 Pit and TSF haul roads and for soil conditioning to achieve optimal compaction rates during TSF lift construction works.

Surface Water

A total of 336.68ML was pumped from the Jemalong Irrigation Channel during the reporting period due to the wet conditions. A total of 2,500ML of Jemalong water was purchased from the regulated Lachlan River trading market for use during the water year (1 July 2012 – 30 June 2013). Barrick's High Security (80 Units) and General Security (zero allocation) water access licences (High Security Title Identifier WAL14981 has a NoW Lachlan River Regulated Water Source – Water Sharing Plan Reference of 70WA603145 (previously 70AL603333), and General Security Title Identifier WAL13748 (NoW Reference of 70AL603332)), enable trade of Temporary Water. The Jemalong irrigation channel transfer at the Bore 4 intake pumping station (Figure 1) to the CGM was used for the 336.68ML transfer during the reporting period.

Table 6 provides the volume of water contained in the water storages at the beginning and end of the reporting period. The Cowal Gold Mine water management system is conceptually shown in Figure 5.

Table 6
Stored Water

	Volumes Held (ML)		
	Start of Reporting Period	**End of Reporting Period**	**Storage Capacity**
Contained Water Storage (D1, D2, D3, D4, D5 and D8B)	103.8	35	375
Process Water Storage (D9)	641.4	361	700
Process Water Storage (D6 + TSF Decant[s])	51.5	47	250

The October 2012 to January 2014 MOP provides further detail regarding water management undertaken at the CGM.

2.9 HAZARDOUS MATERIAL MANAGEMENT

Hazardous Materials and Dangerous Goods were managed in accordance with the Environmental Impact Statement (**EIS**) and HWCMP during the reporting period (Barrick, 2006c).

Emergency response spill kits are provided at all fuel storage locations. Licensed waste contractors remove all waste oil and used engine coolant from site for recycling.

In accordance with the Chemical Management Strategy (**CMS**) described in the HWCMP, all raw materials/consumables brought on-site for use at the CGM are recorded in an Inventory Register which is updated and available for inspection by the appropriate authorities. Manufacturer's Safety Data Sheets (**SDS**) for these substances are also included in the Inventory Register. Substances that are designated as hazardous and/or dangerous goods (**HSDG**) are also included in the Hazardous Substances Dangerous Goods Register (**HSDGR**). Fuels and oils in the Inventory Register are also included in the Fuels and Oils Register (**FOR**). The HWCMP (Barrick, 2006c) was approved by the Director-General of the DP&I on 6 March 2006. In 2009 an addendum to the HWCMP was prepared to: revise the waste classifications in accordance with the *Waste Classification Guidelines* (EPA, 2008); revise the waste tracking requirements in accordance with the amended *Protection of the Environment Operations (Waste) Regulation, 2005;* revise the proposed management measures for waste tyres generated at the CGM; and include proposed management measures for the area of historic

contamination. The addendum to the HWCMP was approved by the DP&I on 15 May 2009. The CGM HWCMP was updated in accordance with Development Consent Conditions 3.2 and 5.7 to reflect changes in operational practices since the commencement of the CGM. The DP&I approved the revision on 12 May 2011.

The application and approval process for the introduction of new substances at the CGM is conducted via the ChemAlert web-based management system. The Manufacturer's Safety Data Sheet information for approved chemicals, lubricants and fuels is available to all employees via the CGM intranet using the ChemAlert 3 software package. Laminated field hardcopy information folders are also available.

Any surplus chemical substances from the operations are removed by licensed contractors to approved locations for re-use/disposal.

Hazard Audit

In accordance with the Development Consent Condition 5.4 (e), a Hazard Audit is required to be conducted 12 months after the commencement of operations (and three yearly thereafter).

An audit was conducted by an independent qualified person (Dean Shewring of Pinnacle Risk Management) using DP&I Hazard Audit Guidelines (Advisory Paper No 5) in 2007. No significant findings were made. Barrick prepared a Progress Report detailing the status of the Hazard Audit's 14 recommendations during the 2010 reporting period.

The first triennial Hazard audit occurred on 19 to 23 April 2010 and was conducted by an independent qualified person (Dean Shewring of Pinnacle Risk Management). Eleven recommendations were made, which were tracked and addressed in a timely manner.

The second triennial Hazard audit is scheduled to occur on 8 to 10 April 2013 and be conducted by an independent qualified person (Dean Shewring of Pinnacle Risk Management), in compliance with the Department of Planning and Infrastructure's HIPAP No. 5.

The October 2012 to January 2014 MOP provides further detail regarding hazardous material management undertaken at the CGM.

2.10 OTHER INFRASTRUCTURE MANAGEMENT

This Paragraph is not applicable to the CGM for this reporting period.

3 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

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

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

The sixth, annual operational phase IEA was conducted for the CGM from 16 - 20 April 2012. The auditors concluded that Barrick has demonstrated general compliance with the conditions attached to the Development Consent, licences and approvals granted for the CGM. The results of the audit indicated that the overall performance against the licences, approvals and EMPs has been of a high standard. The report is attached in Appendix A. The IEA for the seventh year of operations will be conducted during the 2013 AEMR reporting year (15 - 18 April 2013).

Barrick has complied with the commitments of the 2011 – 2012 MOP and the more recent approved current term (October 2012 – January 2014) to the extent that site conditions permitted.

The Environment Protection Licence No. 11912 Annual Environmental Return (**AER**) for the 23 December 2011 to 22 December 2012 reporting period was submitted to the EPA on 21 February 2013. The AER provides the EPA with (amongst other things) a Statement of Compliance by Barrick in relation to its monitoring obligations under Environment Protection Licence No. 11912. In its 2012 AER, Barrick identified non-compliances related to monitoring not being undertaken at some surface water, dust, groundwater and blast monitoring points. The reasons for the non-compliances were inaccessibility of monitoring points due to weather, scheduling errors or equipment failure. The occurrence of non-compliances is listed on the EPA website at: http://www.environment.nsw.gov.au/prpoeoapp/

Sections 3.1 to 3.22 describe the objectives of relevant EMPs, their management measures and discuss the environmental performance of each EMP for the reporting period. Overall, due to Barrick's substantial compliance with the EMPs, environmental management for the CGM during the reporting period has been highly effective. Reportable incidents and any further improvements to the environmental management strategies at the CGM are also discussed.

Expected Performance of Licences, Approvals and Environmental Management Plans

Barrick has all the relevant Project Management systems, staffing and consultancy arrangements in place to enable it to be in a position of confidence regarding compliance with all relevant licences, approvals and EMPs. Barrick expects to undertake CGM activities for the next reporting year in accordance with all relevant licences, approvals and EMPs. Paragraph 6 discusses the management objectives and targets for the CGM during the next reporting period.

Independent Environmental Audit

The Development Consent for the CGM requires an IEA of compliance. Development Consent Condition 8.8 states:

(a) An Independent Environmental Audit shall be completed:

- *a. six monthly during construction;*
- *b. 12 months after the commencement of ore processing; and*
- *c. then every three years thereafter until decommissioning of the mine and ore processing operations respectively, or as otherwise directed by the Director-General of the DP&I.*

The Applicant shall conduct an environmental audit of the mining and infrastructure areas of the development in accordance with ISO 14010 - Guidelines and General Principles for Environmental Auditing, and ISO 14011 - Procedures for Environmental Auditing (or the current versions), and in accordance with any specifications required by the Director-General of the DP&I. Copies of the report shall be submitted by the Applicant to the Director-General of the DP&I, BSC, EPA, NoW, DTIRIS (Minerals) and CEMCC within two weeks of the report's completion for comment.

(i) The audit shall:

- *assess compliance with the requirements of this consent, licences and approvals;*
- *in the event of any non-compliance, report on the effectiveness of the environmental management of the mine as it may relate to the area of non-compliance;*
- *be carried out at the Applicant's expense; and*
- *be conducted by a duly qualified independent person or team approved by the Director-General of the DP&I in consultation with BSC and CEMCC.*

(ii) The Director-General may, after considering any submission made by the relevant government agencies, BSC and CEMCC on the report, notify the Applicant of any requirements with regard to any recommendations in the report. The Applicant shall comply with those reasonable requirements within such time as the Director-General may require.

As described in Section 1.5, the IMP recommended in their 2007 Annual Report that "*Barrick consider continuing use of the template-based approach established by aemc for environmental auditing of operations in order to regularly and systematically update progress on each of the environmental management and monitoring components*".

The 2012 IEA was conducted between 16 - 20 April 2012 by Trevor Brown and Robert Drury of Trevor Brown & Associates to assess the status of the development activities undertaken during the prior year of operations. The audit generally confirmed a high degree of compliance with the Minister's Conditions of Approval, Environment Protection Licence conditions and requirements of the conditions attached to the Mining Lease. Upon receipt, this report was distributed to the above regulatory agencies in July 2012, and is appended in the 2012 AEMR as Appendix A.

Environmental Risk Identification

A Preliminary Hazard Analysis (**PHA**), Transport of Hazardous Materials Study (**THMS**), *Hazard and Operability Study Report, Cowal Gold Project* (**HAZOP**) (Pinnacle Risk Management, 2004), *Fire Safety Study, Cowal Gold Project* (**FSS**) (Pinnacle Risk Management, 2005), HWCMP, Final Hazard Analysis (**FHA**), Bushfire Management Plan (**BMP**), CMP, Safety Management System (**SMS**) and Emergency Response Plan (**ERP**), including the PIRMP have been completed and relevant measures implemented for the CGM. Relevant measures continue to be implemented for the CGM, as appropriate.

Revision of Monitoring Programmes

Development Consent Condition 8 requires the monitoring programmes in Development Consent Conditions 8.1 to 8.6 to be revised or updated annually to reflect changing environmental requirements, significant changes in technology/operational practices and results from monitoring conducted. The monitoring programmes include:

- Meteorological monitoring (Development Consent Condition 8.1)
- Surface water (and biological), groundwater and cyanide monitoring (Development Consent Condition 8.2)
- Air quality and dust monitoring (Development Consent Condition 8.3)
- Noise and blasting monitoring (Development Consent Conditions 6.3(b) and 6.4(g) respectively)
- Fauna and flora monitoring (Development Consent Condition 8.5)
- Cultural heritage monitoring (Development Consent Condition 8.6)

As discussed in Paragraph 1.1.2, several EMPs (including monitoring programmes) were revised during the reporting period.

Comments on specific monitoring programs are set out below.

Surface Water, Groundwater, Meteorological and Biological Monitoring Programme (SWGMBMP)

In accordance with Development Consent Condition 8.2(a) (ii), the SWGMBMP was revised in consultation with the EPA, NoW and DPI (Fisheries). The DP&I approved the revised SWGMBMP on 10 March 2010.

After DP&I approval of MOD10 in July 2011, Barrick prepared a revised SWGMBMP and provided it to the Independent Monitoring Panel (**IMP**) and other appropriate regulators in accordance with CGM Development Consent Condition 3.2(a) for review. The addendum to the SWGMBMP was submitted to relevant government departments. The DP&I approved the addendum on 14 August 2012.

To maintain consistency between the SWGMBMP and the FFMP, Barrick also revised the FFMP to incorporate the revised biological monitoring programme as presented in the approved SWGMBMP for the 2012 reporting period. The Threatened Species Management Strategy was prepared in consultation with former EPA (for the Inland Forest Bat, Sloane's Froglet and Woodland birds Little Eagle, Spotted Harrier, Square-tailed Kite, Varied Sittella and White-fronted Chat). The Strategy was submitted to DP&I on 13 November 2012 and is currently awaiting DP&I approval.

Air Quality Monitoring Programme

The use of galvanized brushes during sample collection ceased during 2009. Regular cleaning, maintenance and replacement of dust gauge components were also introduced as part of regular monthly monitoring activities. On the recommendation of IMP, Barrick has implemented a QA/QC programme with respect to its air quality monitoring programme, incorporating a portable duplicate station. ALS Environmental, a National Association of Testing Authorities (NATA) accredited laboratory, was the preferred laboratory for dust analysis until July 2012 at which time all depositional dust samples were sent to the National Measurement Institute (NMI) Sydney Laboratory. All duplicate depositional dust samples remain with ALS to provide a comparison between the two laboratories. ALS supplied depositional dust collection jars with a non-copper based algaecide during the reporting period. ALS has stated that the algaecide is used for clients where copper analysis is required and has been shown to cause no interference with metals detection. NMI supplied collection jars do not contain algaecide.

In 2012, Barrick successfully approached the National Measurement Institute (**NMI**), Sydney Laboratory regarding the creation of a new dust standard for Cowal operations QA/QC works. Barrick switched from ICP-AES to ICP-MS methodology with ALS, Sydney Laboratory during the 2012 reporting period to gain lower limits of reporting for metals analysis. Barrick advised the EPA and IMP of this intended change in analysis in February 2012.

Blast Monitoring Programme

The modification to the Development Consent (approved by the DP&I in March 2010) deletes Development Consent Condition 8.4 which was relevant to blast monitoring. A revised Blast Management Plan (**BLMP**) was submitted to the Director-General of the DP&I at the end of July 2010 in accordance with Development Consent Condition 6.3(b). Following the BLMP was again revised and submitted to the DP&I on 11 December 2012 and is currently awaiting DP&I approval.

Due to flood inundation in March 2012, the blast monitoring units in Lake Cowal (BM04, BM05 and BM06) were mounted upon taller tripod stands from May 2012. Enhanced logger technology has been installed in the land-based and Lake cabinets of blast monitoring units around Lake Cowal since June 2012. The new technology loggers commissioning was continuing at the end of the current reporting period. Meteorological condition monitoring is intended to be installed at each blast logger unit during the next reporting period. BM07 is to be relocated to the Lake Protection Bund (**LPB**) during 2013 to enhance blast signalling as the mining activity in the E42 Pit becomes deeper.

Noise Monitoring Programme

As reported in the AER to EPA on 21 February 2013, monitoring was undertaken by SLR Consulting Australia Pty Ltd (formerly Heggies Pty Ltd) (**SLR Consulting**) in January-February and July 2012. The control strategies implemented during the reporting period in accordance with the NMP are considered to be effective. During September 2009, noise monitoring locations NO7 ("West Lea") and NO8 ("McLintock's") were added to the NMP.

The modification to the Development Consent (approved by the DP&I in March 2010) replaces Development Consent Condition 6.4 relevant to noise monitoring and deletes Development Consent Condition 8.4. As a result, a revised NMP was submitted to the Director-General of the DP&I at the end of July 2010, in accordance with Development Consent Condition 6.4(g) and is currently awaiting approval. DP&I comments were received on 14 August 2012. The revised NMP to address the DP&I's comments was lodged with the DP&I on 24 December 2012 and Barrick is currently awaiting DP&I approval.

Reporting Requirements

Development Consent Condition 9.2(i) (c) requires the AEMR to include results of all environmental monitoring under the Development Consent and other approvals which includes interpretation and discussion by a suitably qualified person. Accordingly, the requirements of this condition are provided for each of the environmental risks in the sub-sections below.

The Development Consent and the EPL have a complaints mechanism. All complaints received during the reporting period are discussed in Paragraph 4.1.

The EPL requires that Barrick notify the EPA of incidents causing or threatening material harm to the environment. There have been no such incidents during the reporting period.

3.1 AIR QUALITY

3.1.1 Reporting Requirements

3.1.1.1 Development Consent

The reporting of air quality monitoring is required by Development Consent Condition 8.3(c), which states that the applicant shall:

> *Provide all results and analysis of air quality monitoring in the AEMR including a determination of the dust deposition rate in g/m^2/month, which shall be plotted in the AEMR.*

The reporting of meteorological monitoring is required by Development Consent Condition 8.1, which states:

> *The Applicant shall continue meteorological monitoring by utilising and maintaining the existing weather station on-site. The data shall be particularly used for predicting noise, dust and blasting impacts on nearby residences, and bird breeding areas identified by the Applicant in consultation with EPA.*

The Dust Management Plan (**DMP**) (Barrick, 2003c) was prepared in accordance with Development Consent Condition 6.1 to establish a dust management strategy for CGM.

In accordance with the DMP, the following air quality related issues are required to be reported in the AEMR:

- Annual average dust deposition results (plotted in g/m^2/month) and comparison to the EPA amenity criteria;
- Total suspended particulates (TSP) monitoring results and comparison to the EPA criteria;
- Measures employed to minimise/prevent excessive dust emissions;
- Dust related complaints and amelioration measures undertaken in the event of any confirmed exceedances of the EPA criteria;
- Review of the performance of dust control measures and the monitoring program;
- Interpretation and discussion of the air quality monitoring program results and management measures by a suitably qualified person; and
- Community Environmental Monitoring & Consultative Committee (**CEMCC**) decisions relating to CGM dust issues.

In order to improve access and reliability in collecting samples due to the effects of adverse weather conditions, wet weather access roads have been constructed and/or repaired where possible. Recommendations by Dr Cattle (University of Sydney) to change dust analysis from ICP-AES to ICP-MS occurred during the reporting period. This change in method occurred mid-2012 with the aim of obtaining a lower detection limit and was notified to the EPA and IMP.

3.1.1.2 Environmental Protection Licence

The EPL requires Barrick to undertake dust and Total Suspended Particulates (**TSP**) monitoring at points identified in EPL Condition P1.1. The licence also requires Barrick to undertake weather monitoring at the location identified in EPL Condition P2.1 and M8.1.

Condition R1 of the licence requires the completion of an Annual Environmental Return (**AER**) comprising of a Statement of Compliance and a Monitoring and Complaints Summary at the end of each annual reporting period. Barrick submitted an AER for the period 23 December 2011 to 22 December 2012 to the EPA on 21 February 2013.

Additionally, Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.1.1.3 Any Other Relevant Approvals

Barrick reported to the Greenhouse Challenge, Energy Efficiency Opportunities Program (**EEO**), National Greenhouse and Energy Reporting (**NGER**) Scheme and National Pollutant Inventory during the reporting period.

3.1.2 Environmental Management

3.1.2.1 Control Strategies

Air quality safeguards and control strategies were implemented at CGM during the reporting period to minimise dust emissions from mining activities and exposed areas in accordance with the Development Consent, DMP and EPL. These control strategies are summarised in Table 7.

Table 7
Air Quality Safeguards and Control Strategies Implemented During the Reporting Period for Dust Sources

Source	Control Strategies
Disturbed Surfaces	• Disturbed surfaces were watered using water trucks to suppress dust. • Areas for soil stripping were minimised to reduce the area of exposed ground at any one time.
Access Roads	• Access roads were watered and regularly maintained. • A dust suppressant chemical (PetroTac) was applied to 5 km of unsealed Mining Lease roads around the general Administration and 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.

Dust control equipment was maintained in accordance with the site maintenance schedule based on equipment manufacturer's specifications. Data provided by the Cowal Automatic Weather Station (**AWS**) and the new Kattron system is monitored continually for potential storm activity. The CGM pit and exploration geology supervisor vehicles are equipped with lightning warning alert meters in the event of approaching storm front which have historically generated considerable local dust. Such information is utilised to make decisions regarding dust control strategies. The dust management procedures decision-making flowchart from the DMP is provided on Figure 6.

3.1.2.2 Effectiveness of Control Strategies

In accordance with the DMP, implementation of the control strategies at the CGM minimised dust emissions from mining activities. The control strategies implemented during the reporting period are considered effective as demonstrated by the environmental performance outcomes as discussed in Section 3.1.3.2.

3.1.2.3 Variations from Proposed Control Strategies

The Kattron lightning tracking system was introduced to operations in early-2012 (replaced the obsolete Cowal Storm Vue system). The Mining Dispatch Control Room operators continually monitor and pass on alert levels between red, amber and yellow to other employee groups and the ERT until all clear conditions resume.

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

3.1.3 Environmental Performance

3.1.3.1 Monitoring

Meteorological Monitoring

A meteorological station located near the south Mining Lease boundary collected meteorological data throughout the reporting period. The station measures real-time wind speed and direction, standard deviation of wind direction, temperature (2m, 10m), barometric pressure, humidity, solar radiation and rainfall. The Cowal AWS is supported by quarterly independent maintenance and calibration as well as production of monthly data reviews by Sentinel Pty Ltd. Review of the AWS by Sentinel Pty Ltd in 2006 resulted in upgrades to the station to ensure uninterrupted collection of weather data.

Annual and monthly wind roses from the Cowal AWS are presented in Figures 7a and 7b.

Monthly total rainfall measured at the Cowal AWS is shown in Table 8. Total annual rainfall in 2012 was approximately 484.8 mm, with the highest total rainfall recorded during February (129.2 mm) and the lowest recorded in April (15.6 mm). Table 8 indicates that conditions were relatively wet throughout the 2011 monitoring period, which saw Lake Cowal with a steady supply of water for most of the year. The Cowal AWS continued to work well and was calibrated in May, July, October and December 2012. The correlation of real time data to the reference station has been very accurate with minimal error found.

Table 8
Monthly Rainfall (mm) Measured at CGM in 2010, 2011 and 2012

Month	Rainfall in 2010 (mm)	Rainfall in 2011 (mm)	Rainfall in 2012 (mm) (mm)(mm)
January	2.8	24.4	26.6
February	95.6	138.6	129.2
March	44.6	146.2	78.0
April	50.6	20.2	15.6
May	40.0	22.0	32.6
June	22.8	29.4	29.6
July	62.2	11.8	49.8
August	34.0	41.8	19.0
September	64.2	13.8	25.0
October	94.0	31.0	16.0
November	60.2	130.4	36.4
December	111.7	135.0	27.00
TOTAL	**682.7**	**744.6**	**484.8**

The remaining monthly Cowal AWS meteorological station data for 2012 is presented in Table 9**.**

Table 9
2012 Monthly Average Meteorological Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mean Humidity (%)	49.01	59.13	63.47	61.35	66.94	75.67	75.69	65.53	56.67	46.02	41.58	38.28
Mean Pressure (mbar)	986.28	985.95	988.56	992.99	995.28	993.68	996.02	992.09	990.67	991.10	988.00	986.80
Mean Wind Direction (^{o})	139.88	146.95	151.75	162.22	179.97	187.80	185.54	211.23	195.00	185.46	166.78	164.64
Mean Wind Velocity (m/s) 15min	3.65	3.16	3.54	2.63	2.35	2.51	2.83	3.06	3.28	3.40	3.54	3.92
2m Temp Max (^{o}C)	39.85	37.85	33.53	34.01	28.14	19.70	18.86	24.26	28.17	36.96	41.89	42.68
2m Temp Min (^{o}C)	9.37	10.84	5.49	3.31	-0.03	-1.14	-2.84	-3.41	-1.44	2.00	6.53	9.32

Air Quality Monitoring

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

Dust deposition was monitored at 18 sites within and surrounding the CGM (as well as one roaming duplicate station), as shown in Figure 8. Of these 18 sites, 2 are located at private receivers (DG1 and DG6) and 4 are located within the ML (DG11, DG12, DG13 and Site 52).

A high-volume sampler (HV1) at 'Coniston' Homestead to the north of the CGM collected TSP data throughout 2012, operating for 24 hour periods every 6 days.

Air Quality Impact Assessment Criteria

The air quality impact assessment criteria specified in Condition 6.3(d) of the Development Consent are provided in Table 10.

Table 10
Air Quality Impact Assessment Criteria

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Long term impact assessment criteria for deposited dust			
Deposited Dust	Annual	2 g/m^2/month	4 g/m^2/month
	Averaging Period	**Criterion**	
Long term impact assessment criteria for particulate matter			
Total suspended particulate (TSP) matter	Annual	90 µg/m^3	
Particulate matter < 10 µm (PM_{10})	Annual	30 µg/m^3	
Short term impact assessment criterion for particulate matter			
Particulate matter < 10 µm (PM10)	24 hour	50 µg/m^3	

Source: EPA (2001)
Note 1: Dust is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).
Note 2: Deposited dust is 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.
Note 3: Dust emissions generated by the development shall not cause additional exceedances of the air quality impact assessment criteria listed in the above Table at any residence on privately-owned land, or on more than 25 percent of privately-owned land not located within Lake Cowal (March 2010 section 75W approval condition).

3.1.3.2 Performance Outcomes

Total Suspended Particulates (TSP)

On an annual average basis, the TSP data collected by the HVAS is well below the NSW EPA (2001) assessment criterion for TSP matter (90 µg/m^3) (Table 10). Compared to previous years, the TSP level in 2012 (34 µg/m^3) was higher than that of 2011 (28 µg/m^3), but lower than that of each of the preceding five years (2010 - 39 µg/m^3; 2009 - 63 µg/m^3; 2008 - 43 µg/m^3; 2007 - 43 µg/m^3; 2006 - 43 µg/m^3).

In keeping with the five years of TSP measurements from 2006 to 2010 at CGM, there was moderately strong seasonality in the 2012 TSP data. For the summer and autumn months of January, February, March, April and May the average TSP was around 38 µg/m^3; for the winter months of June, July and August the average TSP was around 14 µg/m^3; and for the spring and summer months of September, October, November and December the average TSP was around 46 µg/m^3.

Deposited Dust

A summary of the dust deposition results for the reporting period is provided in Table 11. Detailed dust monitoring results are provided in Appendix B.

Table 11
Monthly and Mean Dust (insoluble solids) Deposition Rates (2012)

Dust gauge site	Monthly deposition of insoluble solids in dust (g/m^2/month)												
	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	**Mean**
Private Receiver Locations													
DG1	3.9	3.3	0.6	0.8	0.5	0.5	0.7	0.7	5.0	1.8	2.5	1.1	**1.8**
DG6	1.6	-	10.1	4.4	18.4	5.6	4.1	2.0	7.2	5.2	5.4	2.5	**6.1**
Locations within Lake Cowal													
DG4	0.9	4.3	-	-	-	0.5	0.4	1.0	6.1	1.1	2.0	1.0	**1.9**
DG5	1.1	2.3	-	-	-	-	0.3	1.1	3.1	1.1	43.4	2.5	**6.9**
Locations within the ML													
DG11	1.8	5.3	1.3	1.5	1.4	1.5	3.7	4.4	3.2	2.0	7.3	2.9	**3.0**
DG12	7.6	12.2	0.4	4.1	3.6	1.2	2.0	13.1	2.0	8.7	5.6	12.4	**6.1**
DG13	1.8	4.5	-	-	-	0.9	0.9	2.3	8.5	2.3	0.9	8.8	**3.4**
Site 52	3.0	11.2	-	1.2	1.1	2.5	2.3	2.8	2.4	3.5	11.1	2.5	**4.0**
Other Locations													
DG2	1.3	1.4	-	-	0.7	0.5	0.2	0.9	4.1	0.4	0.9	1.1	**1.2**
DG3	0.4	2.1	-	-	0.6	0.6	0.3	1.5	1.0	1.3	10.0	0.9	**1.9**
DG7	4.9	5.6	4	2.1	10.8	1.5	2.2	3.1	1.0	10.8	2.7	7.9	**4.7**
DG8	2.1	2.2	1.0	1.3	2.2	1.9	0.7	2.1	0.7	5.7	3.0	4.1	**2.3**
DG9	1.8	2.0	1.0	0.7	4.6	1.6	1.1	1.3	0.8	1.4	1.6	0.8	**1.6**
DG10	1.0	2.2	0.5	1.0	6.2	1.5	1.0	2.7	1.2	1.2	2.5	1.0	**1.9**
I5	1.9	-	9.0	2.0	1.7	0.7	2.1	1.1	1.4	4.2	4.1	11.8	**3.6**
Lakeside (Barrick)	2.5	6.3	1.7	3.4	1.6	0.8	10.3	29.1	8.1	4.4	10.0	4.9	**6.9**
McLintock's Shed	2.4	18.8	17.4	3.9	14.3	120.0	4.2	1.5	1.11	2.3	15.8	5.6	**17.3**
Site Office	1.3	0.8	3.5	0.7	3.7	2.1	6.8	2.2	0.7	1.3	5.4	1.2	**2.5**
Mean	**2.4**	**5.0**	**4.2**	**2.1**	**4.8**	**8.5**	**2.4**	**4.1**	**3.2**	**3.3**	**7.5**	**4.1**	

Yellow highlight indicates and exceedance of Air Quality Impact Assessment Criteria

In accordance with Development Consent Condition 8.3(c), the annual average dust deposition rate has been plotted in g/m^2/month as shown in Figures 10a to 10d.

In accordance with Australian Standard 3580.10.1 - 2003 extraneous organic material has been removed, where possible, from insoluble solids reporting results. Verbal confirmation has also been gained from ALS Environmental that where possible, they remove any obvious foreign material from dust samples (e.g. sticks, grass etc.). Dust monitoring procedures are outlined in the CGM procedure titled' ENV-002 Depositional Dust Monitoring' and has been prepared in accordance with appropriate standards and guidelines. Causes for the exceedances are provided by Dr Stephen Cattle and are described below.

Tabulated results for all dust gauges are presented in Appendix B.

The monitoring results presented in Table 11 show that dust deposition levels above 4 g/m^2/month were measured at several locations; however it is likely that these exceedances are due to located dust sources, rather than the CGM.

For example, the McLintocks Shed gauge recorded an annual average dust deposition of 17.3 g/m^2/month, however, the on-site DG11, which is located in the same direction as McLintocks yet is much closer to mining activities, measured an average of 3.0 g/m^2/month over the same period. Hence the dust deposition at McLintocks is most likely to be due to localised sources, rather than mining activities.

Similarly, the Lakeside gauge measured an average of 6.9 g/m^2/month, however, DG1 which is located in close proximity to the Lakeside gauge measured an average of only 1.8 g/m^2/month.

Table 11 also indicates exceedance of the total dust deposition assessment criterion of 4 g/m^2/month at DG6, which is located at a private receiver, and as such, further analysis of dust deposition at this location is provided below.

The exceedance of the annual average dust deposition assessment criterion of 4 g/m^2/month was caused by a substantial combustible fraction (i.e. organics, including insects and plant matter) in the deposited dust. Combustible material is generally not associated with mine-related dust. If this combustion fraction was removed from the average dust deposition at DG6 then the annual average dust deposition would be below the annual average dust deposition assessment criterion of 4 g/m^2/month.

In addition, DG6 had an unusually high rate of dust deposition of 18.4 g/m^2/month in June 2012 (representing the collection period of 21 May to 12 June). DG6 is most likely to be impacted by dust from the CGM when winds are blowing from the west-northwest. Whilst a small proportion of winds from this direction were recorded during June, winds were predominately from the southeast and south-southeast (Figure 7b).

The next highest result at DG6 in 2012 was recorded in the month up to 16 April, with a level for this period of 10.1 g/m^2/month. During this period, very few winds came from the direction of the CGM (Figure 7b). September (28 August-26 September 2012) also reported an elevated dust deposition result (7.2 g/m^2/month). Whilst this period did show a small proportion of winds from the west-northwest, the majority of winds were from other wind directions (predominately the southwest quadrant).

These results indicate that elevated dust levels recorded at DG6 in 2012 are not likely to be the result of activities at the CGM.

It is also worth noting that winds on an annual basis are not generally from the west-northwest, as shown in Figure 7, and as such it is unlikely that the CGM is the dominant source of annual dust levels at DG6.

Further analysis of the dust deposition results is provided below (Cattle, 2013):

- Temporal and spatial variation in monthly dust deposition was considerable during 2012, which is typical for dust monitoring programs. Monthly deposition of 10 g insoluble solids/m^2 was exceeded twenty-one times in 2012, across ten different months and across nine different gauges. This indicates that a range of processes, including willy-willies, vehicular traffic on gravel roads, mining activities, vandalism and contamination by birds, may be responsible for the observed fluctuations in dust deposition rates.

- Changes in monthly dust deposition rates at each gauge were only very weakly correlated with seasonal weather conditions in 2012. Monthly dust deposition rates averaged across all gauges ranged from 2.1 to 8.5 g/m^2, but for no month did relatively high rates of deposition occur for all gauges. For all of the months, different combinations of several gauges received appreciably greater dust deposits than all of the other gauges.
- Compliance with the assessment criterion of 4 g/m^2/month average annual deposited dust was achieved at 8 out of 14 gauges[1] during 2012. Of the gauges located at residences and bird breeding and native flora areas (*DG1*, *DG2*, *DG4*, *DG6*, *DG7*, *DG8*, *DG9*, *DG10*), compliance was achieved at *DG1*, *DG2*, *DG4*, *DG8*, *DG9* and *DG10*.
- For the six gauges external to the ML that exceeded the assessment criterion of 4 g/m^2/month (*DG5*, *DG6*, *DG7*, *McLintocks Shed*, *Lakeside*, *I5*), the causes of the exceedances varied. In the case of the *McLintocks Shed* gauge, the exceedance is due to a number of large deposits (>14 g/m^2/month) and particularly to the very large 120 g/m^2/month measured for the June sampling period. As this sample was predominantly comprised of inorganic solids (~92% ash content), it is presumed to be due to vandalism and/or mud addition by birds. For the other five gauges, between one and three large deposits (>10 g/m^2/month) caused the yearly average to exceed 4 g/m^2/month, but these large deposits generally included a substantial combustible fraction; if these combustible fractions are removed the average dust deposition for all of these gauges would fall to less than 4 g/m^2/month.
- Two of the dust gauges within the ML area (*DG12* and *Site 52*) recorded an annual average dust deposition above the assessment criterion. In both cases, these exceedances were largely due to several larger (11-13 g/m^2) dust deposits captured during different sampling periods. Levels recorded in the four gauges inside the ML area are not relevant to the Project Development Consent conditions.

3.1.4 Reportable Incidents

The DMP requires that dust-related complaints and amelioration measures undertaken in the event of any confirmed exceedances of the EPA criteria be reported in the AEMR.

No complaints were received relating to dust at the CGM during the reporting period. PetroTac treatment was continued during the reporting period and will continue into the next reporting period. PetroTac was also applied near the 'Coniston' residence to minimize production of dust related to mine traffic on the road.

3.1.5 Further Improvements

As described in Paragraph 3, recommendations made in the 2012 IMP report (for ongoing analysis of dust samples) will continue to be actioned during the next reporting period.

Review and interpretation of the dust monitoring data for the reporting period was conducted by Dr Stephen Cattle of the University of Sydney (2013) in accordance with requirements of the DMP. The main recommendations of Dr Cattle's analysis relevant to dust deposition and TSP monitoring are summarised below.

Improvements to Dust Monitoring Program

- In two of the last three years, at least one monthly dust deposit at the *McLintocks Shed* gauge has exceeded 50 g/m^2/month, indicating a potentially recurring theme of vandalism or contamination by birds at this location. Consideration might be given to moving this gauge away from buildings and other infrastructure, but maintaining a gauge site due west of the Project is still important.
- As the purpose of the HVAS is to measure TSP, a feature of air that relates to human health in residential environments, it seems appropriate to leave the HVAS at its current location, given that this is the nearest residence to the Project which may regularly receive winds that have passed over the Project.

To address the likely contamination issues contributing to elevated copper levels in dust, a non-copper based algaecide was provided by ALS Environmental during 2012 (NMI collection jars to not contain algaecide) and will be used throughout the next reporting period (switched from ALS to NMI in mid-2012).

[1] Of the 18 depositional dust gauges installed for the Project, 14 are located outside the ML boundary.

Other improvements to the air quality monitoring program that Barrick will continue to implement during the next reporting period to improve confidence in future analyses include:

- The continuing use of standardised sample collection procedures across the site monitoring program, whilst maintaining current Barrick site standards.
- Barrick will continue a QA/QC system utilising trip blanks and duplicates, blanks and control samples during the next reporting period.
- All monitoring equipment is currently and will continue to be decontaminated each sample round using a solution of deionised water and Decon 90.
- NMI is intended as the secondary laboratory to provide a third party QA/QC check against ALS Environmental and has produced the control dust sample for Barrick.
- A review of laboratory testing procedures will continue during 2013 to ascertain the most accurate method of calculating results in accordance with Australian Standards and applicable conditions.
- DG8 at 'Hillgrove' hill will likely be relocated to a point inside the mining lease between Site 52 and DG05 in mid-2013 (i.e. upwind to the north-east of the E42 Pit). DG09 remains as the EPL dust monitoring point at 'Hillgrove' (i.e downwind).

The University of Sydney will continue to liaise with Barrick sampling personnel on routine dust sampling methodology, as a means to reduce the likelihood of sample contamination during collection and dispatch stages.

To mitigate dust generated by vehicle movements within ML 1535, PetroTac (a water emulsified bitumen sealant) was first applied to 5 km of unsealed Mining Lease roads during October 2006. PetroTac has since been routinely applied around the general administration and workshop areas, on roads within the processing plant and on the portion of Lake Cowal Road between the two 'Coniston' farm southern entry roads (BSC approved).

Barrick will apply further PetroTac dust suppressant to unsealed roads within ML 1535 that are subject to high-frequency light vehicle use during the next reporting period.

The use of saline pit water on heavy mobile equipment haul roads in the open pit mine and waste emplacement areas to reduce dust generation will continue throughout the next reporting period.

Other dust mitigation measures employed at CGM include water sprays at the primary crusher, covered conveyors within the processing plant and maintaining minimal dust levels at the crushed ore stockpile.

The Cowal Mine CEMCC is kept informed of any public comment or complaint about dust, and external dust study updates during quarterly meetings. The CEMCC raised no concern about dust during 2012.

3.2 EROSION AND SEDIMENT

3.2.1 Reporting Requirements

3.2.1.1 Development Consent

The Erosion and Sediment Control Management Plan (**ESCMP**) (Barrick, 2003d) was prepared in accordance with Development Consent Condition 3.5(a) to provide erosion and sediment control strategies for works to be undertaken throughout the life of the Project (i.e. construction and operations).

In accordance with the ESCMP, the following issues are required to be reported in the AEMR:

- surface and groundwater monitoring results;
- comparison of surface water and groundwater monitoring results with criteria in the Surface Water, Groundwater, Meteorological and Biological Monitoring Programme (**SGWMBMP**) (Barrick, 2003e);
- interpretation and discussion of the surface and groundwater monitoring program results; and
- CEMCC decisions relating to CGM ESCMP issues.

In addition, any proposed improvements to erosion and sediment control systems are required to be included in the AEMR (when monitoring indicates the need).

The ESCMP was amended to include the soil disturbance and management measures associated with the approved saline groundwater supply borefield within ML 1535. The addendum to the ESCP was approved by the DP&I on 10 March 2010. Lake Cowal filled to the TIB by August 2010 and the Lake floor saline bore has remained capped and inundated during the reporting period.

3.2.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.2.1.3 Any Other Relevant Approval

There are no other relevant reporting requirements from approvals in relation to erosion and sediment management for the reporting period.

3.2.2 Environmental Management

3.2.2.1 Control Strategies

A summary of the control strategies/management measures implemented during the reporting period in accordance with the ESCMP (Barrick, 2003d) is provided in Table 12. The erosion and sediment control systems for the reporting period are shown in Figure 11.

Table 12
Summary of the Relevant 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. • Stabilisation of the access road surface. • Rapid stabilisation and revegetation of road batters.
ML 1535 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.
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.

Table 12 (Continued)
Summary of the Relevant Erosion and Sediment Control Strategies/ Management Measures

Project Development	Control Strategy/Management Measure
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.
Borrow Pits	• Use of temporary sediment traps and sediment control barrier filters (bales). • Use of temporary sediment basins.
Earthworks Associated with Landscaping	• Use of sediment control barriers and sediment traps to minimise soil movement.
Up-Catchment Diversion System (UCDS)	• Use of temporary sediment traps and sediment barrier filters (rock bars). • Installation of silt fences and hay bale weirs downslope of all disturbed areas. • Installation of rip-rap structures along UCDS. • Vegetation stabilisation.
Internal Catchment Drainage System	• Construction of the internal catchment drainage system 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. Provision of clean water diversion and settlement storages for runoff control at borrow areas. • Stabilisation and revegetation of the batters of the Temporary Isolation Bund.
Earth Mounds	• Rapid vegetative stabilization (straw armour).
Monitoring and Maintenance	• Water quality monitoring in accordance with the SWGMBMP. • Maintenance of erosion and sediment control structure where necessary.

3.2.2.2 Effectiveness of Control Strategies

In accordance with the ESCP the primary objectives of the control strategies are to:

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

The control strategies implemented during the reporting period were considered to be effective in meeting the above objectives as demonstrated by the environmental performance indicators. The environmental performance indicators are discussed in Section 3.2.3 below.

3.2.2.3 Variations from Proposed Control Strategies

There were no variations to the Erosion and Sediment Control strategy during the 2012 reporting period.

3.2.3 Environmental Performance

3.2.3.1 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.

As discussed in Paragraph 3.2.1.1 above, the ESCMP also requires the following to be reported in the AEMR:

- Surface and groundwater monitoring results. The surface and groundwater monitoring results are provided in Paragraph 3.3.3.2 and 3.4.3.2 respectively.
- Comparison of surface water and groundwater monitoring results with criteria in the SWGMBMP. The surface and groundwater monitoring results are discussed in Paragraph's 3.3.3.2 and 3.4.3.2 respectively.
- Interpretation and discussion of the surface and groundwater monitoring program results. The surface and groundwater monitoring results are discussed in Paragraphs 3.3.3.2 and 3.4.3.2 respectively.
- CEMCC decisions relating to CGM ESCMP issues.

There were no CEMCC decisions relating to CGM erosion and sediment control issues.

There are no additional monitoring requirements in any other approval.

No additional improvements to erosion and sediment control systems were made during the reporting period.

3.2.3.2 Performance Outcomes

The Cowal geotechnical department conducted monthly monitoring and assessment of structures such as all water holding facilities on site, waste dumps and the lake protection bund for sediment movement and erosion control effectiveness. In particular, analysis of the Lake Protection Bund (**LPB**) indicated that the increased rainfall experienced during 2010 and 2011 had not significantly impacted on the stability of the structure. Some erosion and sediment movement was found to be evident, the effects of which have been minimised by improved vegetative cover on all slopes on site, resulting in improved soil stability. In May 2012 Barrick sought and received relevant regulator permission to lower the level of the sediment laden PWE storm water run-off held between the LPB and Temporary Isolation Bund (**TIB**) by pumping to Pond D1 and into the Processing Plant, lest more storm activity might cause this water overflow into the immediately adjacent high level in Lake Cowal (the Lake level had decreased to about 100 mm below the top of the TIB since the March 2012 peak flood level). Lake Cowal has not been impacted due to the presence and effectiveness of the TIB, Ponds D1 and D4 and the initial vegetation covers on the adjacent lifts trapping any sediment movement.

Furthermore, water quality results as discussed in Section 3.3.3 have not indicated that any impact on Lake Cowal has occurred. Water quality monitoring results will continue to be monitored and evaluated throughout the next monitoring period.

Early in 2011, Barrick conducted repair of the eastern edge of UCDS and the installation of a concrete causeway apron, to direct water flow to causeway and additional rock weirs to prevent further erosion damage. These works were very timely given the excess water flows through this area in early-2012 and subsequent Lake level inundation of the area. De-silting of the front basin of the Southern Up Catchment Pond will occur when next dry.

Stabilisation works on the downstream and upstream slopes of the STSF and NTSF were conducted using several methods which were all more effective than topsoil alone during the heavy summer storm rains of early-2010 and in early-2012.

During 2012, further works were conducted on the Northern Diversion Channel to those completed in mid-2011. The outer slopes of the 4th Lift of the STSF were completed in 2012 using the new rock-topsoil method (as was used on the 8 ha of the outer slopes of the 3rd Lift of the NTSF during 2011).

As described in Paragraph 5.4, the new rock-topsoil rehabilitation treatment method continues to appear to have demonstrated greatly reduced risk of erosion loss as evidenced by independent review (DnA Environmental, 2010). The rehabilitation trial areas created during the reporting period are discussed further in Paragraph 5.4 of this report.

3.2.4 Reportable Incidents

No environmental incidents or complaints were reported or received relating to erosion and sediment control at the CGM during the reporting period. There were no CEMCC decisions regarding erosion and sediment issues for the reporting period.

3.2.5 Further Improvements

Works similar to those carried out during 2010, 2011 and 2012 to enhance the eastern edge of the Up Catchment Diversion System (**UCDS**) by repair and strengthening of erosion control structures. Works will include repairing any previous erosion damage and construction of diversion weirs to direct storm water into the E42 Pit or towards Pond D4 catchment. De-silting of the front basin of the Southern Up Catchment Pond will occur when next dry.

The outer slopes of the 4th Lift of the NTSF will be completed in 2013 using the new rock-topsoil rehabilitation method.

Further independent confirmation and rehabilitation success monitoring works will occur during the next reporting period. Annual risk review workshops occur during each reporting period to assess the outcomes of the new rock-topsoil cross-rip erosion control method decision from the July 2008 on-site peer review workshop.

3.3 SURFACE WATER

3.3.1 Reporting Requirements

3.3.1.1 Development Consent

The reporting of surface water monitoring is required by Development Consent Condition 8.2 (a) (iv), which states:

> *(iv) The results and interpretation of surface and ground water monitoring (including biological monitoring) are to be provided by the Applicant in an approved form to the NoW, EPA, and DTIRIS (Fisheries) on a three monthly basis during construction and the first 12 months of ore processing operations and thereafter on an annual basis, unless otherwise agreed by the Director-General. The results are also to be contained and analysed in the Annual Environmental Management Report (Condition 9.2(a)).*

The Site Water Management Plan (**SWMP**) (Barrick, 2003b) and the SWGMBMP (Barrick, 2010) were prepared in accordance with Development Consent Conditions 4.1 and 8.2(ii), respectively, to provide management objectives for the CGM site water management system.

The revised SWMP was lodged with the DP&I in June 2010 and a further revised version was lodged on 30 November 2010 (following review comments provided by EPA, and NoW). The revised SWMP (eastern saline borefield MOD10) was submitted to DP&I in November 2011 and was again revised to address DP&I review comments provided in August 2012. Barrick is currently consulting with NOW and EPA regarding the revised SWMP.

Barrick prepared a revised SWGMBMP and provided it to the IMP and other appropriate regulators in accordance with the consent condition requirements, for review. The DP&I approved the revision of the SWGMBMP on 10 March 2010 after consultation with other departments and the IMP.

An addendum to the SWGMBMP was submitted to relevant government departments after DP&I approval of MOD10 in July 2011. The addendum was approved in August 2012. A separate Addendum to the SWGMBMP has been prepared to reflect changes to the SWGMBMP as a result of revisions to the SWMP. Barrick is currently consulting with NOW, EPA and DPI- Fisheries regarding the Addendum.

In accordance with both the SWMP and the SWGMBMP the following water-related issues are required to be reported in the AEMR:

- surface water, groundwater and biological monitoring results;
- details of any trends observed in the monitoring data;
- details of investigations and consultation with regulatory agencies;
- review of the performance of control measures and the monitoring program; and
- interpretation and discussion of the monitoring program results and management measures by a suitably qualified person.

3.3.1.2 Environmental Protection Licence

The EPL requires Barrick to undertake storm water and ambient water quality monitoring at points identified in EPL Condition P1.3.

Condition R1 of the licence requires the completion of an Annual Return comprising a Statement of Compliance and a Monitoring and Complaints Summary at the end of each annual reporting period (i.e. the AER). Barrick submitted an Annual Return for the period 23 December 2011 to 22 December 2012 to the EPA on 21 February 2013. Storm water and ambient water quality of monitoring points identified in EPL Condition P1.3 were reported. The storm water and ambient monitoring points and frequencies required by the EPL are consistent with monitoring required by the Development Consent and SWGMBMP. Additionally, Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.3.1.3 Any Other Relevant Approval

There are no other relevant reporting requirements for the reporting period.

3.3.2 Environmental Management

3.3.2.1 Control Strategies

The site water management system is designed to contain all potentially contaminated water and comprises the following major components as noted on Figure 11:

(i) UCDS;

(ii) Lake Isolation System (comprising the Temporary Isolation Bund, Lake Protection Bund and Perimeter Waste (rock) Emplacement (**PWE**));

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

(iv) Integrated Erosion and Sediment Control System (refer to Paragraph 3.2); and

(v) Pit Dewatering System.

3.3.2.2 Effectiveness of the Control Strategies

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.

In accordance with the ESCMP, the primary objectives of the control strategies are to:

- Control the movement of sediment and salinity migration from areas disturbed by mining and construction activities; and
- Maintain downstream (Lake Cowal) water quality.

The control strategies implemented during the reporting period effectively met the above objectives as demonstrated by the environmental performance outcomes discussed in Paragraph 3.3.3.

3.3.2.3 Variations from Proposed Control Strategies

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

3.3.3 Environmental Performance

3.3.3.1 Monitoring

Surface water monitoring was conducted in accordance with the SWGMBMP and EPL. Details of the location, frequency and analytical requirements for each monitoring point are presented below in Table 13. All monitoring results for the reporting period are provided in Appendix C with a summary discussion in Paragraph 3.3.3.2.

Table 13
Surface Water Monitoring Programme

CGM Component	Site	Monitoring Frequency	Parameter/Analyte
Up-catchment Diversion System	Up-catchment diversions north and south (UCD north and UCD south)	Weekly and following rainfall events of 20 mm or greater in a 24 hour period	Suspended Solids, EC, pH.
Internal Catchment Drainage System	Contained water storages D1 and D4	Weekly and following rainfall events of 20 mm or greater in a 24 hour period	Suspended Solids, EC, pH.
	Contained water storages D2, D3, D9 D6 and D8B	Quarterly	Oil and grease, EC, pH.
	Contained water storages D5 and D6	Monthly	EC, pH, turbidity, dissolved oxygen, temperature.
		Quarterly	Biological oxygen demand, faecal indicators, total hardness, total suspended solids, total dissolved solids. Ca, Mg, K, sodium, chloride, sulphate, Total As, Cd, Mo, Ni, Pb, Sb and Zn Dissolved As, Cd, Mo, Ni, Pb, Sb and Zn.
	Sediment control structures	Monthly and following rainfall events of 20 mm or greater in a 24 hour period	Structural integrity, Suspended Solids.
		Overflow event	Suspended Solids, pH, EC.
Open Pit/Void Water	Pit sumps	Monthly	Suspended Solids, EC, pH.
Lake Cowal Water Level	Lake Cowal gauge board	Monthly (when lake water is present)	Lake water level.
Lake Cowal Chemical Monitoring	B1, B5, P1, P2, P3	Weekly and following rainfall events of 20 mm or greater in a 24 hour period	Suspended Solids, EC, pH.
	Lake Cowal transect sampling sites (including the Lachlan floodway, irrigation channel, Bland Creek, east shore, Project and control transects [refer to Figure 8])	Monthly (when lake water is present)	EC, pH, turbidity, dissolved oxygen, temperature, and lake water level.
		Quarterly (when lake water is present)	Suspended Solids, Alkalinity, cations and anions. Total Fe, Ca, Mg, K, sodium, chloride, sulphate, total phosphate, ortho phosphate, ammonium, nitrogen as nitrate and nitrite. Total As, Cd, Mo, Ni, Pb, Sb and Zn Dissolved As, Cd, Mo, Ni, Pb, Sb and Zn.
Lake Cowal Inflow Sites	Lake inflow sites (including the Lachlan floodway, irrigation channel, Bland Creek and Sandy Creek inflow sites)	Monthly (when lake water is present)	EC, pH, turbidity, dissolved oxygen, temperature.
		Quarterly (when lake water is present)	Suspended Solids, Alkalinity, cations, anions Total Fe, Ca, Mg, K, sodium, chloride, sulphate, Total As, Cd, Mo, Ni, Pb, Sb and Zn Dissolved As, Cd, Mo, Ni, Pb, Sb and Zn.
Other Waters	Lachlan River - Jemalong Weir Stream Gauge	Continuous (data to be obtained from NoW every 6 months)	Flow.

Source: SWGMBMP Addendum (Barrick, 2013)

3.3.3.2 Performance Outcomes

A summary of the CGM and Lake Cowal surface water monitoring results is provided in Tables 14 and 15 respectively while detailed data is presented in Appendix C. Water quality monitoring at Lake Cowal Inflow Sites is summarised in Table 16. Lake Cowal sediment monitoring results are presented in Table 17. Unless otherwise noted, all analytical data was obtained by ALS Environmental Laboratory (Sydney, NSW).

Table 14
Summary of Surface Water Monitoring Results for the Reporting Period

Weekly Surface Water Monitoring - D1, D4, UCD North, UCD South, Pit Sumps 1, 2 & 3				
Pond D1	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	54	5.90	10.07	8.27
Electrical Conductivity - Field (µS/cm)	54	692	4880	1732.9
Total Suspended Solids (mg/L)	54	<5	298	34.97
Pond D4*	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	54	6.84	9.18	8.35
Electrical Conductivity - Field (µS/cm)	54	4650	142700	15241
Total Suspended Solids (mg/L)	54	8	525	57.24
UCD North	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	53	7.03	9.49	8.02
Electrical Conductivity - Field (µS/cm)	53	86.8	561	269.77
Total Suspended Solids (mg/L)	53	10	345	90.79
UCD South	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	53	7.21	9.18	8.27
Electrical Conductivity - Field (µS/cm)	53	92.3	1095	402
Total Suspended Solids (mg/L)	53	4.6	1300	278.17
Monthly Surface Water Monitoring – D5, D6 and Pit Sumps				
Pond D5	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	12	7.48	9.15	8.27
Electrical Conductivity - Field (µS/cm)	12	4420	16100	9284
Dissolved Oxygen - Field (mg/L)	12	4.21	11.6	7.65
Temperature (Deg C)	12	9.08	27.01	18.73
Turbidity (NTU)	12	2	41.8	11.24
Pond D6	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	12	6.4	8.23	7.93
Electrical Conductivity - Field (µS/cm)	12	10.75	18270	8420.45
Dissolved Oxygen - Field (mg/L)	12	3.41	8.81	5.45
Temperature (Deg C)	12	16	29.76	23.26
Turbidity (NTU)	12	4.8	147	52.57
Pit Sump 1	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	8	6.96	8.25	7.64
Electrical Conductivity - Field (µS/cm)	12	11200	58900	46792
Total Suspended Solids (mg/L)	8	<5	72	22.9
Pit Sump 2	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	2	7.97	8.1	8.03
Electrical Conductivity - Field (µS/cm)	2	22660	36500	29580
Total Suspended Solids (mg/L)	2	11	29.2	20.1
Pit Sump 3	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	3	7.79	8.22	7.95
Electrical Conductivity - Field (µS/cm)	3	50300	53900	50333
Total Suspended Solids (mg/L)	3	<5	38900	19530

***** Saline groundwater from Lake Floor production bores was occasionally pumped to and stored in Pond D4 from 2008-2010. Recent two wetter years has seen saline water from Subsoil Stockpile 04 on the south side of the SWE entering Pond D4 storm water inflows.

Table 14 (Continued)
Summary of Surface Water Monitoring Results for the Reporting Period

Quarterly Surface Water Monitoring – D2, D3, D8B, D9, D6				
Pond D2	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	4	7.16	9.48	8.67
Electrical Conductivity - Field (µS/cm)	4	4340	6780	3977
Oil & Grease (mg/L)	4	<5	<5	<5
Pond D3	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	4	6.68	9.02	8.26
Electrical Conductivity - Field (µS/cm)	4	2770	30950	15661
Oil & Grease (mg/L)	4	<5	<5	<5
Pond D8B	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	4	6.79	8.97	8.31
Electrical Conductivity - Field (µS/cm)	4	674	1824	1059
Oil & Grease (mg/L)	4	<5	<5	<5
Pond D9	**COUNT**	**MIN**	**MAX**	**MEAN**
pH - Field	4	6.75	9.37	8.53
Electrical Conductivity - Field (µS/cm)^	4	11240	13940	12768
Oil & Grease (mg/L)	4	<5	<5	<5
D6	**COUNT**	**MIN**	**MAX**	**MEAN**
Antimony - Total	6	<0.001	0.009	0.006
Arsenic - Total	6	0.005	0.029	0.009
Biochemical Oxygen Demand	4	<2	17	14
Cadmium - Total	6	<0.0001	0.001	0.0007
Calcium - Dissolved	6	14	444	247.5
Chloride	6	218	5130	2817.5
Coliforms	4	<	1	1
Copper - Total	6	0.013	2.54	0.708
Enterococci	4	<1	20	20
Escherichia coli	4	<1	1	1
Faecal Coliform -Total	4	<1	1	1
Iron - Total	6	0.58	18.4	4.23
Lead - Total	6	0.001	0.019	0.007
Magnesium - Dissolved	6	9	333	174.2
Manganese - Total	6	0.057	0.475	0.313
Mercury - Total	4	<0.0001	<0.0001	<0.0001
Potassium - Dissolved	6	7	511	241.5
Selenium - Total	6	<0.01	0.02	0.02
Sodium - Dissolved	6	227	2710	1679.5
Sulfates	6	87	3330	1553
Total Dissolved Solids	6	754	11600	6697
Total hardness as CaCO3	6	72	2480	1334
Total Suspended Solids	14	28	727	134
Zinc - Total	6	0.014	0.062	0.036

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

Table 15
Summary of Lake Water Monitoring Results for the Reporting Period

Parameter	Lake Cowal Water Quality Results (November 2010)	Lake Cowal Water Quality Results (2011) Ranges (Mean)	Lake Cowal Water Quality Results (2012) Ranges (Mean)	Lake Cowal Baseline Water Quality Results (1991 -1992)	Aquatic Ecosystems^ ~
Alkalinity (mg/L)	105	64 – 142 (100)	50 – 152 (87)	NA	NA
Suspended Solids (mg/L)	6 - 192	5 – 184 (38)	7 – 274 (67)	NA	NA
Acidity – Alkalinity scale (pH)	7.03 – 8.27	7.22 – 8.82 (8.14)	5.56 – 9.78 (7.81)	8.27 – 8.67	6.5 to 8.0
Electrical Conductivity (µS/cm)	100 – 701	190 – 727 (322)	107 – 433 (236)	222 – 1557[1]	20 to 30 µS/cm[1]
Turbidity (NTU)	8.2 – 211	11.5 – 144 (53.3)	7.8 – 829 (246.1)	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)	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)	NA	Not applicable
Depth (m)	0.1 – 1.2	0.6 – 2.5 (1.7)	0.5 – 3.6 (2.0)	0.2 – 2.0	Not applicable
Lake Water Level (m)	204.5	205.25 – 205.75	205.40 – 206.88	205.1	Not applicable
Total Iron (mg/L)	6.50	0.36 – 11.00 (2.50)	0.92 – 22.6 (9.55)	NA	NA (insufficient data)
Calcium (mg/L)	17	10 – 26 (19)	8 – 28 (14)	NA	NA
Magnesium (mg/L)	10	6 – 12 (9)	4 – 14 (7)	NA	NA
Potassium (mg/L)	15	12 – 19 (15)	12 – 19 (14)	NA	NA
Sodium (mg/L)	19	13 – 35 (24)	12 – 38 (22)	NA	NA
Chloride (mg/L)	25	19 – 41 (28)	12 – 66 (22)	NA	NA
Sulphate (mg/L)	3	1 – 10 (2)	1 – 10 (4)	NA	NA
Cations (mg/L)	2.81	1.98 – 3.77 (3.02)	1.56 – 3.82 (2.11)	NA	NA
Anions (mg/L)	2.83	1.93 – 3.67 (2.91)	1.45 – 3.77 (2.00)	NA	NA

Table 15 (Continued):
Summary of Lake Cowal Surface Water Quality

Parameter	Lake Cowal Water Quality Results (November 2010)	Lake Cowal Water Quality Results (2011) Ranges (Mean)	Lake Cowal Water Quality Results (2012) Ranges (Mean)	Lake Cowal Baseline Water Quality Results (1991 -1992)	Aquatic Ecosystems^ ~
Arsenic (mg/L)	0.006[3] (total)	<0.001 – 0.007 (0.003[3]) (total)	0.002 – 0.007 (0.004[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)	0.0016[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)	0.000055[3] (total)	0.0006
	0.0001[3] (dissolved)	<0.0001 – 0.0004 (0.0001[3]) (dissolved)	<0.00001 – <0.0001 (0.00001[3]) (dissolved)	0.00005[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)	NA	NA (insufficient data)
	0.001[3] (dissolved)	<0.001 - 0.001 (0.001[3]) (dissolved)	<0.001 – 0.001 (0.001[3]) (dissolved)	NA	
Nickel (mg/L)	0.007[3] (total)	<0.001 – 0.009 (0.0036[3]) (total)	<0.001 – 0.018 (0.009[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)	NA	
Lead (mg/L)	0.003[3] (total)	<0.001 – 0.004 (0.0013[3]) (total)	<0.001 – 0.009 (0.004[3]) (total)	0.0029[3](total)	0.001
	0.001[3] (dissolved)	<0.001 - 0.001 (0.001[3]) (dissolved)	<0.001 – 0.003 (0.001[3]) (dissolved)	0.0005[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)	NA	NA (insufficient data)
	0.001[3] (dissolved)	<0.001 - 0.001 (0.001[3]) (dissolved)	<0.001 – <0.001 (0.001[3]) (dissolved)	NA	
Zinc (mg/L)	0.012[3] (total)	<0.005 – 0.038 (0.0074[3]) (total)	<0.005 – 0.040 (0.016[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)	0.00306[3] (dissolved)	

After: North Limited (1998) and NSR Environmental Consultants (1995).

^ Guideline values in accordance with ANZECC and ARMCANZ (2000).

~ 99% protection level trigger values for toxicants – lakes and reservoirs.

NA – Not Available.

[1] ANZECC and ARMCANZ (2000) notes that conductivity in lakes is generally low, but will vary depending upon catchment geology.

[2] ANZECC and ARMCANZ (2000) notes that lakes in catchments with highly dispersible soils will have high turbidity.

[3] Mean value.

Table 16
Summary of Lake Cowal Inflow Water Monitoring Results for 2010, 2011 and 2012

Parameter	Lake Inflow Water Quality Results (November 2010) (Mean)	Lake Inflow Water Quality Results (2011) Ranges (Mean)[#]	Lake Inflow Water Quality Results (2012) Ranges (Mean)	Lake Cowal Baseline Water Quality Results (1991 -1992)[#]	Aquatic Ecosystems^ ~
Alkalinity (mg/L)	50	16 – 79 (56)	39 – 101 (67)	NA	NA
Suspended Solids (mg/L)	14	11 – 201 (53)	23 – 372 (124)	NA	NA
Acidity – Alkalinity scale (pH)	7.30	7.17 – 7.73 (7.37)	7.55 – 7.90 (7.73)	8.27 – 8.67	6.5 to 8.0
Electrical Conductivity (µS/cm)	178	126 – 348 (199)	89 – 871 (246)	222 – 1557[1, 3]	20 to 30 µS/cm[1]
Turbidity (NTU)	116	31 – 807 (237)	18.6 – 693 (296)	22 – 224	1 to 20[2]
Total Iron (mg/L)	6.5	0.9 – 42.8 (10.7)	2.09 – 36.7 (13.68)	NA	NA
Calcium (mg/L)	9	3 – 15 (8)	5 – 23 (11.3)	NA	NA
Magnesium (mg/L)	5.5	2 – 9 (5)	3 – 16 (6.9)	NA	NA
Potassium (mg/L)	10.5	8 – 17 (12)	10 – 16 (12.6)	NA	NA
Sodium (mg/L)	15.5	11 – 34 (17)	14 – 45 (22.4)	NA	NA
Chloride (mg/L)	18	9 – 28 (18)	12 – 94 (31)	NA	NA
Sulphate (mg/L)	4.5	1 – 13 (5)	2 – 11 (6.2)	NA	NA

Table 16 (continued):
Summary of Inflow Water Quality Results for 2010, 2011 and 2012

Parameter	Lake Inflow Water Quality Results (November 2010) (Mean)	Lake Inflow Water Quality Results (2011) Ranges (Mean)	Lake Inflow Water Quality Results (2012) Ranges (Mean)[#]	Lake Cowal Baseline Water Quality Results (1991 -1992)	Aquatic Ecosystems^ ~
Cations (mg/L)	1.7	1.11 – 2.40 (1.71)	1.43 – 4.78 (2.46)	NA	NA
Anions (mg/L)	1.6	1.26 – 2.27 (1.74)	1.27 – 4.64 (2.33)	NA	NA
Arsenic (mg/L)	0.0035[3] (total)	0.001 – 0.007 (0.003[3]) (total)	0.003 – 0.007 (0.004[3]) (total)	0.0026[3] (total)	0.008
	0.0015[3] (dissolved)	<0.001 – 0.004 (0.002[3]) (dissolved)	0.001 – 0.003 (0.002[3]) (dissolved)	0.0016[3] (dissolved)	
Cadmium (mg/L)	<0.0001[3] (total)	<0.0001 - <0.001 (<0.0001[3]) (total)	<0.001 - <0.001 (0.001[3]) (total)	0.000055[3] (total)	0.0006
	<0.0001[3] (dissolved)	<0.0001 – <0.0002 (<0.0001[3]) (dissolved)	<0.001 - <0.001 (0.001[3]) (dissolved)	0.00005[3] (dissolved)	
Molybdenum (mg/L)	<0.001[3] (total)	0.001 – 0.004 (0.0015[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)	NA	
Nickel (mg/L)	0.007[3] (total)	0.001 – 0.026 (0.008[3]) (total)	0.005 – 0.021 (0.011[3]) (total)	NA	0.008
	0.002 – 0.003 (0.0025)[3] (dissolved)	0.002 – 0.005 (0.003[3]) (dissolved)	0.003 – 0.005 (0.004[3]) (dissolved)	NA	
Lead (mg/L)	0.0035[3] (total)	<0.001 – 0.029 (0.006[3]) (total)	<0.001 – 0.021 (0.007[3]) (total)	0.0029[3](total)	0.001
	0.001[3] (dissolved)	<0.001 - 0.003 (0.002[3]) (dissolved)	<0.001 – 0.007 (0.002[3]) (dissolved)	0.0005[3] (dissolved)	
Antimony (mg/L)	<0.001[3] (total)	<0.001 – 0.004 (0.002[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)	NA	
Zinc (mg/L)	0.015[3] (total)	<0.005 – 0.074 (0.0022[3]) (total)	0.009 – 0.051 (0.024[3]) (total)	0.012[3](total)	0.0024
	0.03[3] (dissolved)	<0.005 – 0.219 (0.046[3]) (dissolved)	<0.005 – 0.068 (0.036[3]) (dissolved)	0.00306[3] (dissolved)	

After: North Limited (1998) and NSR Environmental Consultants (1995).

^ Guideline values in accordance with ANZECC and ARMCANZ (2000).

~ 99% protection level trigger values for toxicants – lakes and reservoirs.

Two readings only for December 2010

NA – Not Available.

[1] ANZECC and ARMCANZ (2000) notes that conductivity in lakes is generally low, but will vary depending upon catchment geology.

[2] ANZECC and ARMCANZ (2000) notes that lakes in catchments with highly dispersible soils will have high turbidity.

[3] Mean value.

On the 14th of March 2012, Lake Cowal was at full capacity for the first time since mining commenced in 2005. This was a result of above average rainfall in February 2012 and heavy rains to the north of Lake Cowal. Plate 2 shows the filling and drying cycle of Lake Cowal.

Plate 2
Lake Cowal Water Level

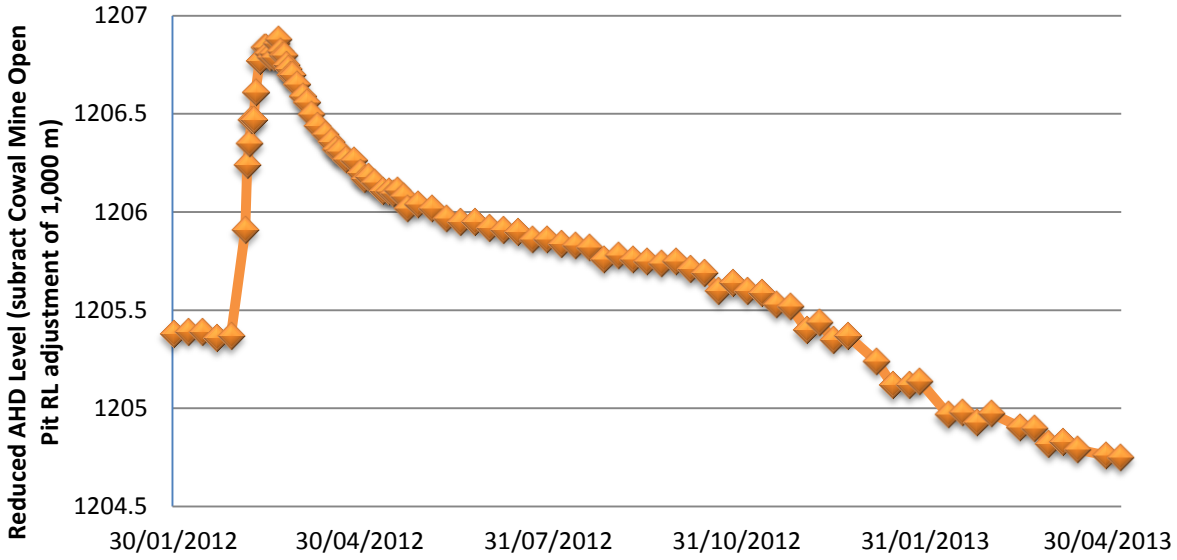


Plate 3 below is a low altitude aerial photograph taken from the north looking south across the Lake Protection Bund. The February 2012 flood event raised the lake level over the top of the majority of the Lignum beds until drainage to the north re-exposed much of the vegetation.

Plate 3
Aerial Photograph of the Lake Protection Bund (LPB) 06 March 2012.

3.3.3.3 Interpretation

A full summary of surface water monitoring results is provided in Appendix C. A comparison of surface water results with the Australian and New Zealand Environmental Conservation Council (**ANZECC**) and Agriculture and Resource Management Council of Australia and New Zealand (**ARMCANZ**) (2000) guidelines has not been undertaken on 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**.** A summary of the on-site water quality monitoring results and a comparison of all lake water and sediment monitoring results against relevant ANZECC and ARMCANZ (2000) guideline values (detailed in the SWGMBMP) is provided below.

Up Catchment Diversion North (**UCD North**) and Up Catchment Diversion South (**UCD South**) are stilling basins at the edges of Lake Cowal which collect upstream water flowing through diversion channels around the perimeter of the closed catchment.

UCD North pH and Conductivity remained constant throughout the 2012 reporting period; this would be due to the large amount of water flowing into Lake Cowal after heavy rains in March and Lake Cowal holding plenty of water for the year. Samples are still taken from same sample point using a GPS unit and aluminium boat.

The pH values in **UCD South** remained constant throughout the year however Conductivity trended up later in the year when the water level in the dam evaporated.

The pH values in Pond **D1** remained fairly consistent however some fluctuations have been noticed during 2012, likely attributed to rainfall events and operator data entry error. Conductivity trended up later in the year due to low rainfall and the pond water evaporating.

Pond D4 followed the same trend as the rest of the surface water ponds on site with the pH remaining constant throughout the reporting period and the Conductivity increasing later in the year when the pond water evaporated.

In summary, throughout the 2012 reporting period, pH values seen in on-site water quality monitoring data has remained constant where Conductivity has trended upward towards the end of the year due to the ponds drying up due to low rainfall.

Pit sump monitoring points are continuously destroyed and recreated due to the vertical advancement of the pit floor. When they exist, sumps continue to be sampled on a monthly basis.

Lake Cowal Surface Water Monitoring Results

A summary of the 2012 Lake Cowal surface water monitoring results compared with the baseline surface water monitoring results conducted during 1991 – 1992, the 2010 and 2011 monitoring results and the ANZECC and ARMCANZ (2000) default trigger values is provided in Table 15.

Surface water and sediment monitoring of Lake Cowal commenced during November 2010. Monitoring was undertaken by David McMahon of DM McMahon Pty Ltd Environmental Consultants. 2011 saw the first full year of Lake Water monitoring since production commenced in 2005.

A summary of the surface water and sediment monitoring results from David McMahon's *Surface Water and Sediment Sampling and Analysis Lake Cowal, NSW 2012* is provided below. Of the 34 lake surface water sample sites only 32 were able to be sampled in February 2012 with the sites L12 and L13 being too shallow to access safely at the time of sampling. All 34 sites were able to be sampled in April, July and October 2012. Additionally, only 2 of the 4 inflow sites were able to be sampled throughout the 2012 monitoring program owing to them being dry or inaccessible.

pH and Electrical Conductivity

pH results within Lake Cowal ranged from 5.56 to 9.78 with a mean of 7.81. This is lower overall than the baseline water quality data collected in 1991 – 1992 (Table 15) and slightly lower than the ANZECC and ARMCANZ (2000) upper level of 8.0 and 2011 results. pH results from the Inflow sites ranged from 7.55 to 7.90 with a mean of 7.73. This is lower than the baseline data, but within the ANZECC 99% protection level range.

EC results within Lake Cowal ranged from 107 to 433 µS/cm with a mean of 236 µS/cm which generally lower than the baseline data but higher than the ANZECC and ARMCANZ (2000) level of 30 µS/cm for slightly disturbed ecosystems (lakes). However, ANZECC and ARMCANZ (2000) note that conductivity in lakes will vary depending on catchment geology. These results are lower than those recorded in 2010 and 2011 owing to a large influx of fresh water into the lake during the March 2012 floods. EC results from the Inflow sites ranged from 89 to 871 µS/cm with a mean of 246 µS/cm. This is consistent with the baseline data, but higher than the ANZECC 99% protection level range.

Turbidity and Suspended Solids

Turbidity results ranged from 7.8 to 829 mg/L NTU with a mean of 246.1 NTU. This is higher than the baseline data which ranged between 22 and 224 NTU. The turbidity results are also above the ANZECC and ARMCANZ (2000) level of 20 NTU for slightly disturbed ecosystems (lakes). As expected, these results are well above those recorded in 2010 and 2011. Turbidity results from the Inflow sites ranged from 18.6 to 693 NTU with a mean of 296 NTU. These results are also higher than the baseline data, and above than the ANZECC 99% protection level range. However, ANZECC and ARMCANZ (2000) note that lakes in catchments with highly dispersive soils will have high turbidity.

The suspended solids results ranged from 7 to 274 mg/L with a mean of 67 mg/L which is above the 2010 and 2011 results. The ANZECC and ARMCANZ (2000) recommended guideline trigger values for toxicants do not include a trigger value for suspended solids. There is also no baseline data for this parameter. The Inflow sites recorded suspended solids in the range 23 to 372 mg/L with a mean of 124 mg/L.

Dissolved Oxygen

Dissolved Oxygen results ranged from 2.24 to 17.89 mg/L with a mean of 8.95 mg/L which is similar to the 2011 results. The ANZECC and ARMCANZ (2000) recommended a guideline range of between 90 and 110% saturation which is a different scale to what was directly measured at Lake Cowal.

Heavy Metals

The mean results for dissolved heavy metals for 2012 are generally equal to or lower than the ANZECC and ARMCANZ (2000) default trigger values, with the exception of Zinc. The mean 2011 and 2012 results for heavy metals are similar to the mean baseline results recorded in 1991-1992 and the results from the 2010 monitoring round, both of which were above ANZECC and ARMCANZ (2000) values.

Lake Cowal Sediment Monitoring Results

A summary of 2012 Lake Cowal sediment data is presented in Table 17.

Of the 34 lake surface water sample sites specified only 32 were able to be sampled in February 2012 with the sites L12 and L13 being too shallow to access safely at the time of sampling. All 34 sites were able to be sampled in April, July and October 2012.

The mean heavy metals results for 2012 were very similar to the mean heavy metals results for 2010 and 2011 with some minor variation noted. Mean heavy metals results were below the ANZECC and ARMCANZ (2000) sediment trigger values for extractable metals. All Total Antimony results were reported as <5mg/L (the laboratory method detection limit (MDL)), which is above the ANZECC and ARMCANZ (2000) sediment trigger value (2 mg/L). However, the 2012 mean Antimony results are consistent with the 2010 and 2011 mean Antimony results and the mean extractable Antimony result is below the ANZECC and ARMCANZ (2000) trigger level.

Table 17
Summary of Lake Cowal Sediment Monitoring Results for the Reporting Period

Parameter	Lake Cowal Sediment Results (November 2010)	Lake Cowal Sediment Results (2011) Range (Mean)	Lake Cowal Sediment Results (2012) Range (Mean)	Aquatic Ecosystems^
Arsenic (mg/L)	2.6[1] (total)	0.02 – 5.6 (3.1)[1] (total)	1 – 6 (3.2)[1] (total)	20
	1.5[1] (extractable)	<0.1 – 1.8 (1.25)[1] (extractable)	1 – 3.1 (1.4)[1] (extractable)	
Cadmium (mg/L)	1[1] (total)	<1 - <1 (1)[1] (total)	1 – 1 (1)[1] (total)	1.5
	0.1[1] (extractable)	<0.1 - <0.1 (0.1)[1] (extractable)	0.1 – 0.1 (0.1)[1] (extractable)	
Lead (mg/L)	15[1] (total)	8 – 20 (13.7)[1] (total)	7 – 20 (12.6)[1] (total)	50
	8.7[1] (extractable)	3.8 – 15 (8.8)[1] (extractable)	4.3 – 14.5 (8.6)[1] (extractable)	
Zinc (mg/L)	31.5[1] (total)	14 – 57 (32.5)[1] (total)	11 – 43 (23.3)[1] (total)	200
	3.5[1] (extractable)	1 - 14.8 (3.9)[1] (extractable)	1.1 – 7.7 (3.6)[1] (extractable)	
Antimony (mg/L)	5[1] (total)	<5 - <5 (5)[1] (total)	5 – 5 (5)[1] (total)	2
	1[1] (extractable)	<1 – 6.9 (1.1)[1] (extractable)	1 – 7.6 (1.1)[1] (extractable)	

After: NSR Environmental Consultants (1995).

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

[1] Mean value.

3.3.4 Reportable Incidents

In accordance with the SWGMBMP, should monitoring results indicate values in excess of the ANZECC and ARMCANZ (2000) default 99% protection level triggers, an investigation shall be conducted to assess the need to implement additional management measures. Ameliorative measures will be developed in consultation with the relevant authorities based on the results of the investigative process.

No environmental incidents or complaints were received relating to surface water at the CGM during the reporting period. There were no CEMCC resolutions regarding surface water quality during the reporting period.

3.3.5 Further Improvements

Lake water and sediment monitoring data will continue to be collected during the next reporting period should the lake level remain at or above 204.5 m AHD.

As described in Paragraph 1.1.2, a request for an extension of the timing for submission of the long-term strategies (including addressing Development Consent Condition 4.1/4.2(b) (see Items 1.2.2 and 1.4) regarding strategy for decommissioning water management structures and a strategy for the final void), to the end-June 2013 was submitted to the DP&I on 13 November 2012. Barrick is currently consulting with NoW and EPA regarding the revised SWMP.

3.4 GROUNDWATER

3.4.1 Reporting Requirements

3.4.1.1 Development Consent

The reporting of groundwater monitoring is required by Development Consent Condition 8.2 (a) (iv), which states:

> *(iv) The results and interpretation of surface and ground water monitoring (including biological monitoring) are to be provided by the Applicant in an approved form to the NoW, EPA, and NSW DPI-Fisheries on a three monthly basis during construction and the first 12 months of ore processing operations and thereafter on an annual basis, unless*

otherwise agreed by the Director-General. The results are also to be contained and analysed in the Annual Environmental Management Report (Condition 9.2(a)).

The SWMP (Barrick, 2010a) and the SWGMBMP (Barrick, 2010b) were prepared in accordance with Development Consent Conditions 4.1 and 8.2 (ii) respectively to provide management objectives for the CGM site water management system.

In accordance with both the SWMP and the SWGMBMP the following water related issues are required to be reported in the AEMR:

- surface water, groundwater and biological monitoring results;
- details of any trends observed in the monitoring data;
- details of investigations and consultation with regulatory agencies;
- review of the performance of control measures and the monitoring program; and
- interpretation and discussion of the monitoring program results and management measures by a suitably qualified person.

3.4.1.2 Environmental Protection Licence

The CGM EPL requires Barrick to undertake groundwater quality monitoring at the points identified in EPL Condition P1.3.

Condition R1 of the licence requires the completion of an Annual Return comprising a Statement of Compliance and a Monitoring and Complaints Summary at the end of each annual reporting period (i.e. the AER). Barrick submitted an Annual Return for the period 23 December 2011 to 22 December 2012 to the EPA on 21 February 2013. The groundwater quality of monitoring points identified in EPL Condition P1.3 was reported. The groundwater monitoring points and frequencies required by the EPL are consistent with monitoring required by the Development Consent and SWGMBMP.

No groundwater bores were installed or decommissioned during the monitoring period.

3.4.1.3 Any other Relevant Approval

Barrick holds various licences for monitoring bores, open pit dewatering bores and Bland Creek Palaeochannel (**BCPC**) production bores. Each of the four BCPC production bore licences require Barrick to provide the NoW with a return showing the meter readings of hours pumped and the extraction rate for each month during the previous 12 months. There is also an obligation to provide pumping and non-pumping levels at least quarterly (or on request to the NoW). Barrick has met all NoW reporting requirements during the reporting period. The BCPC licences daily limit of 15 ML/day was not exceeded during the reporting period.

During the previous reporting period, Barrick submitted a development application to the Forbes Shire Council (**FSC**) for the construction and operation of the Eastern Saline Borefield (**ESB**) located approximately 10 km east of Lake Cowal's eastern shoreline. The FSC approved the development application for the ESB on 20 December 2010. NoW summarily issued two presently unused production bore and monitoring bore piezometer licenses. The eastern saline borefield and associated production bore licences are described in Paragraph 2.8. In February 2012 a revised SWMP incorporating the eastern saline borefield modification was submitted to relevant government departments for comment. Comments were collated and provided to the DP&I in February 2012. A request for an extension of the timing for submission of the long-term strategies (including addressing Development Consent Condition 4.1/4.2(b) (see Items 1.2.2 and 1.4) regarding strategy for decommissioning water management structures and a strategy for the final void), to the end-June 2013 was submitted to the DP&I on 13 November 2012. Barrick is currently consulting with NoW and EPA regarding the revised SWMP.

3.4.2 Environmental Management

3.4.2.1 Control Strategies

The SWMP and the EIS establish the following objectives for the Project 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 project area and diversion of all other water around the perimeter of the site (North Limited, 1998)
- 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 piezometers have been installed (Figure 11 of the SWGMBMP).

In accordance with the SWGMBMP, groundwater monitoring includes:

- monitoring of bores in aquifers potentially affected by the Project (Figure 11 of the SWGMBMP) (drawdown levels); and
- feedback from private groundwater users regarding adverse changes in groundwater quantity.

3.4.2.2 Effectiveness of the Control Strategies

The control strategies implemented during the reporting period effectively met the objectives described in Paragraph 3.4.2.1 as demonstrated by the environmental performance outcomes discussed in Paragraph 3.4.3.2.

3.4.2.3 Variations from Proposed Control Strategies

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

3.4.3 Environmental Performance

3.4.3.1 Monitoring

Groundwater monitoring was conducted in accordance with the SWGMBMP and EPL. Details of the location, frequency and analytical requirements for each monitoring point are presented in Table 18. Groundwater monitoring locations are shown in Figure 12. All monitoring results for the reporting period are provided in Appendix C with a summary discussion in Paragraph 3.4.3.2.

Table 18
Groundwater Monitoring Program

Site	Monitoring Frequency	Parameters
Open pit area (PDB1A & PDB1B, PBD3A & PDB3B, and PDB5A & PDB5B).	Daily.	Bore water level.
	Monthly.	SWL, EC, pH.
	Quarterly.	Total hardness, Alkalinity, total suspended solids and anions. Chloride, sulphate, Ca, Mg, K and Na. Dissolved metals – As, Cd, Mo, Ni, Pb, Sb, Zn.
Processing plant area (PP03 & PP04).	Monthly.	SWL, EC, pH.
	Quarterly.	Total hardness, Alkalinity, total suspended solids and anions. WAD and total cyanide. Chloride, sulphate, Ca, Mg, K and Na. Dissolved metals – As, Cd, Mo, Ni, Pb, Sb, Zn.
Northern Tailings Storage Facility Area (P561A & P561B, P418 A & P418 B, MON01A & MON01B, TSFNA, TSFNB & TSFNC).	Monthly.	SWL, EC, pH.
	Quarterly.	Total hardness, Alkalinity, total suspended solids and anions. Chloride, sulphate, Ca, Mg, K and Na. Dissolved metals – As, Cd, Mo, Ni, Pb, Sb, Zn.
Southern Tailings Storage Facility Area (P412 A-R & P412 B, P414 A & P414 B, P417 A & P417 B, MON02A & MON02B).	Monthly.	SWL, EC, pH.
	Quarterly.	Total hardness, Alkalinity, total suspended solids. and anions. Chloride, sulphate, Ca, Mg, K and Na. Dissolved metals – As, Cd, Mo, Ni, Pb, Sb, Zn.
Up-gradient of the northern and southern tailings storage facilities (P558A-R, P555A-R & P555B).	Monthly.	SWL, EC, pH.
	Quarterly.	Total hardness, Alkalinity, total suspended solids. and anions. Chloride, sulphate, Ca, Mg, K and Na. Dissolved metals – As, Cd, Mo, Ni, Pb, Sb, Zn.
Northern, Southern and Perimeter Waste Rock Emplacement (External toe drain).	Monthly.	SWL, EC, pH.
	Quarterly.	Total hardness, Alkalinity, total suspended solids. and anions. Chloride, sulphate, Ca, Mg, K and Na. Dissolved metals – As, Cd, Mo, Ni, Pb, Sb, Zn.
BLPR1, BLPR2, BLPR3, BLPR4 BLPR5, BLPR6, and BLPR7.	Monthly.	SWL, EC, pH. Quantity of water extracted.
	Quarterly.	Total hardness, Alkalinity, total dissolved solids. Chloride, sulphate, Ca, Mg, K and Na. Dissolved metals: Fe, Mn.
Private registered bores 29094, 57974, 29574, and 31341.	As provided by private groundwater users.	Bore water level.
NoW piezometers 36551, 36552, 36553, 36523, 36524, 36528, 36594, 36595, 36596, 36597, 36609, 36610, 36611, 36613, 36700, and 90093.	Monthly.	Bore water level.
Above ground sections of the pipeline.	Monthly.	Visual inspection.
Tailings seepage (see above - northern and southern tailings storage facility monitoring bores).	See above -northern and southern tailings storage facility.	See above -Northern and southern tailings storage facility monitoring bores.
Saline Groundwater Supply Borefields (WB01, WB20 and PZ09, PZ10 and PZ11)	Monthly.	SWL, EC, pH. Quantity of water extracted.
	Quarterly.	Total Hardness, Alkalinity, total dissolved solids, chloride, sulphate, calcium, magnesium, potassium, sodium, iron, manganese.
Water Supply Pipeline from Saline Borefield (Above ground sections of the pipeline).	Monthly.	Visual Inspection.

3.4.3.2 Performance Outcomes

Groundwater Monitoring Data and Annual Monitoring Report

Stiff plots of water quality and quantity results for the Bland Creek Palaeochannel Borefield (formerly the Jemalong Borefield), Processing Plant Area bores, Pit Area bores and Tailings Storage Area bores are provided in Figures 13a,13b and Figure 14. Detailed monitoring data is provided in Appendix C. The annual report containing the results and interpretation of the groundwater monitoring programme is included in Appendix C of this report, in accordance with Development Consent Condition 8.2(a) (iv).

Groundwater Production Bores

Groundwater extraction from the BCPC commenced in August 2004 at bore PB4. Extraction from production bores PB1, PB2 and PB3 commenced in June 2005. A summary of monthly extraction volumes from BCPC in 2012 is presented in Table 19. The total volume extracted during the reporting period was 1062.40 ML. This equates an average of 2.90 ML/day over the 12 month period which is within the licence limit of 15 ML/day.

Table 19
Bland Creek Paleochannel Production Bores - Extraction Volumes

Month	Extraction Volume (ML)				
	PB1	PB2	PB3	PB4	Total
January	0	5.28	0	58.25	63.53
February	0	26.83	0	41.22	68.05
March	0	26.42	0	7.08	33.50
April	30.18	11.49	4.68	0	46.35
May	31.79	1.10	0.42	0	33.31
June	25.50	45.40	7.41	0	78.31
July	75.13	75.12	0	0	150.25
August	78.82	76.68	0.08	0	155.58
September	76.29	76.26	0	0	152.55
October	78.72	78.72	0	0	157.44
November	49.84	49.86	23.57	0.001	123.27
December	0	0.26	0	0	0.26
ANNUAL TOTAL					**1,062.40**

As described in Paragraph 2.8, the groundwater supply borefield within ML 1535 was commissioned in mid-2009 (Production bore licences #70BL232691 and #70BL232692 were granted by the NoW for the period 28 January 2010 to 27 January 2015). The groundwater supply borefield has been estimated to supply up to 0.5 ML/day. No water was extracted from the saline groundwater supply borefield within ML 1535 during the reporting period (Paragraph 2.8).

As discussed in Paragraph 3.4.1.3, Development Application No. 2011/0064 was granted by the FSC on 20 December 2010 for the operation of the eastern saline borefield for a period of five years (until 20 December 2015) (Paragraph 2.8).

From January 2012, bores PZ01, PZ02 and PZ05 were in operation in the Eastern Saline Borefield. Since these bores are constructed with slotted pipe over their full depth, their water levels are not representative of any individual hydrogeological unit. Therefore, the monitoring program at the Eastern Saline Borefield has amended from September 2012 to more accurately reflect the hydrological units . Bores PZ09, PZ10 and PZ11 were constructed with different screen intervals and were monitored instead of PZ01, PZ02 and PZ05 from September 2012. Bore PZ01 was decommissioned in October 2012 while bores PZ02 and PZ05 remained operational.

The following observations have been made for the Eastern Saline Borefeild bores:

- All the bores show small but continuing rises in groundwater level; and
- The groundwater level has increased in bores PZ02 and PZ05 by 1.4 m and 0.8 m, respectively during 2012.

Hydrogeological Setting

The geological setting of the Cowal area is dominated by Gilmore Fault Zone (**GFZ**), a structurally and lithographically complex feature which trends north-south though ML 1535 approximately 500 m west of E42 pit. It separates Late Ordovician igneous units of the Lake Cowal Volcanic Complex to the east from Siluro-Devonian sedimentary basement to the west. Siluro-Devonian sedimentary rocks also occur east of Lake Cowal Volcanic Complex on the eastern side of Lake Cowal where the basement has been deeply incised and lays host to Palaeochannel deposits of the Bland Creek Unit (part of the Lachlan Formation, inferred to be Miocene to Pliocene in age).

The entire area is covered by varying thicknesses of Tertiary and Quaternary regolith deposits, including Pleistocene Cowra alluvium across the CGM ML and thick Quaternary lacustrine sediments underlying Lake Cowal. The Cowra Formation consists of interbedded clays and sandy clays. It contains two minor clayey sand aquifers, separated and confined by clay aquitards (Hawkes, 1998; Lyons *et al*., 2000). Early work by Hawkes (1998) and Coffee Partners (1995) identified five aquifer units across the mining lease and Jemalong or Bland Creek Paleochannel Borefield area as summarised in Table 20.

Table 20
Preliminary Groundwater Model for the Cowal Mining Lease

Aquifer Unit	Sub-Unit and Occurrence	Hydrochemical Facies Characteristics	Intersecting Bores
Cowra Formation (Tertiary-Quaternary)	Upper Alluvial Aquifer - across mining lease and Cowal area.	Na-Mg:Cl pH: Circum-neutral TDS: 17,000 – 41,000 mg/L mg/L Low Fe: <0.5 mg/L Moderate Mn: 0.01 – 1.7 mg/L	P412B, P414B, P417B, P418B, P555B, P561B, TSFNC.
	Lower Alluvial Aquifer and saprolitic units - across mining lease and Cowal area (the saprolite-saprock is probably a distinct aquifer unit but the facies includes both).	Na-Mg:Cl Na-Mg:Cl-SO_4 pH: Circum-neutral TDS: 20,000 – 42,000 mg/L Low Fe (generally <0.5 mg/L) Moderate Mn, (generally <0.5 Mg/L) which increases with depth and intersection with saprolitic units e.g. P555A-R, P331	P558A-R, P555A-R, P412A, P414A, P417A, P418A, P555A, P561A, TSFNB, MON02A, MON02B, PDB1B, PDB3B, PDB4B, PDB5B.
Siluro-Devonian Sedimentary Basement	Includes Burcher Greywacke & Ootha Group Sandstone.	Na-Mg:Cl-SO_4 pH: Circum-neutral Moderate to high Mn and Fe	MON01A, P412A-R, P555A-R.
Lake Cowal Volcanic Complex (Late Ordovician)	Volcanic and intrusive lithologies and the overlying saprolitic horizon immediately east of the GFZ underlies alluvial sediments in the open pit area beneath Lake Cowal.	Na-Mg:Cl-SO_4 pH: Circum-neutral TDS: 31,000 – 43,000 mg/L. Moderate Fe: <0.5 – 1.5 mg/L High Mn: 0.2 – 8.0 mg/L High trace element composition due to mineralisation history	TSFNA, PDB1A, PDB2A, PDB3A, PDB4A, PDB5A.
Bland Creek Paleochannel		Na:Cl-HCO3 TDS: 900 – 3000 mg/L pH: Circum-neutral Fe: 0.3 – 0.7 mg/L Mn: 0.07 – 0.16 mg/L	BLPR1, BLPR2, BLPR3, BLPR4, BLPR5, BLPR6, BLPR7, GW36553, GW36609.

Source: Hawkes (1998) and Coffey (1995).

Groundwater Levels and Quality

Detailed groundwater monitoring data for the reporting period is presented in Appendix C. The 2012 data set was analysed by Coffey Geotechnics (2013).

A number of dry bores exist in the vicinity of the tailings storage facilities where the piezometers do not intersect the groundwater piezometric surface. These bores continued to be dry during 2012 and are expected to remain dry unless groundwater levels rise. Seven additional piezometers installed around the tailings storage facilities in late 2004 (P412A-R, P555A-R, P558A, MON01A, MON01B, MON02A, and MON02B) to augment the existing network.

The Cowal groundwater system generally shows limited response to rainfall (Coffey Geotechnics, 2013). The main groundwater level response is to pumping for water supply and pit dewatering. From 2004 to 2012, water supply pumping has resulted in a maximum drawdown of approximately 62 m in the Bland Creek Palaeochannel borefield, and pit dewatering has resulted in a maximum drawdown of approximately 70 m in the pit area monitoring bores (Coffey Geotechnics, 2013). In general, vertical hydraulic gradients within the groundwater system surrounding the mine pit are downward. Measured piezometric levels within the Transported material tend to change more slowly than those for the Saprolite and Saprock (Coffey Geotechnics, 2013).

A localised increase in groundwater levels has been observed in the vicinity of the TSF area. A separate groundwater level investigation was conducted by Coffey to further assess the change in groundwater level in this area (Coffey, 2009b). A model of the groundwater system adjacent to the southern TSF was developed and calibrated using 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). The direction of seepage flow towards the open pit is consistent with the seepage flow direction predicted in the EIS and in recent hydrogeological assessments (Coffey, 2011 and 2012).

The following observations have been made relating to the groundwater levels surrounding the TSF (Coffey, 2012):

- Most of the bores show small but continuing increases in groundwater level, possibly associated with tailings dam activities (such as loading or movement of tailings water).
- An increase in groundwater levels is evident for bores MON01A, MON01B, MON02A, MON02B, P412A-R, P412A, P555A-R, P558A-R, P561A and P561B.
- The groundwater level in bores P417A, P417B, P561A, P561B, P412A-R, P555A-R, P558A-R, MON01A, MON01B, TSFNB and TSFNC have fluctuated significantly up to 2m and returned to their former level during 2012. The fluctuations may have been caused by near-surface effects (i.e. rainfall infiltration), which temporarily affect the bores in this area (or may be due to data measurement error).
- The paired monitoring bores MON02A and MON02B south of the southern TSF show increasing groundwater levels since October 2006. Increases of 7.9 m (MON02A) and 7.8 m (MON02B) have been recorded between May 2006 and December 2012.

In their evaluation of the 2012 groundwater monitoring data, Coffey Geotechnics concluded (Coffey Geotechnics, 2013):

- The zone of influence of the pit dewatering after five years of mine dewatering is small (around 1 km), indicating low lateral permeability.
- There has been a localised increase in groundwater levels south of the southern TSF and groundwater chemistry has remained relatively stable at monitoring bores MON02A and MON02B. A separate groundwater level investigation was conducted by Coffey to further assess the change in groundwater level in this area (Coffey, 2009b). It was concluded that increasing groundwater levels at MON02A and MON02B south of the southern TSF and northeast of the southern TSF at P412A-R are related to the movement of seepage from the TSF. The direction of seepage flow towards the open pit is consistent with the seepage flow direction in the EIS and in the recent hydrological assessment (Coffey, 2011 and 2012).
- Water management control measures appear to have successfully prevented groundwater contamination.

Groundwater contour surfaces for December 2011 and December 2012 are presented in Figures 19a and 19b for the Transported (Shallow) and Saprock/Saprolite (Deep) aquifers. Pumping from new pit dewatering bores in the vicinity of PDB3A is likely to have affected groundwater levels on the eastern side of the pit particularly for the Saprock aquifer.

The groundwater quality results and trends reported in this assessment illustrate that the water management control measures for full containment of mine site water and control of runoff from the TSF and waste rock emplacements appear to have successfully prevented groundwater contamination.

BCPC Settlement Monuments

Barrick installed nine settlement monitoring monuments on and adjacent to the BCPC borefield. The inaugural survey of the monuments was conducted in August 2007. Additional surveys have been conducted in April and October 2008, June 2009, March and December 2010, June 2011, and February and August 2012. The monuments have shown no significant trending movement since surveys began.

3.4.4 Reportable Incidents

No environmental incidents or complaints were received relating to groundwater pollution at the CGM during the reporting period. There were no CEMCC resolutions regarding groundwater quality during the reporting period.

3.4.5 Further Improvements

As described in Paragraph 1.1.2, the revised SWMP submitted in November 2011 has been updated to address DP&I review comments provided in August 2012. Barrick is currently consulting with the NOW and EPA regarding the revised SWMP and a Addendum to the SWGMBMP which has been prepared to reflect the revised SWMP. The monitoring and management measures as described in the SWGMBMP will continue to be implemented during the next reporting period.

3.5 CYANIDE MANAGEMENT

3.5.1 Reporting Requirements

3.5.1.1 Development Consent

The reporting of cyanide monitoring is required by Development Consent Condition 8.2(b), which states:

The Applicant shall prior to any tailings disposal prepare a cyanide monitoring program in consultation with the EPA and DTIRIS (Minerals), and to the satisfaction of the Director-General. The plan shall include, but not be limited to, provision for:

- *monitoring of CN_{WAD} levels of the aqueous component of the tailings slurry stream at the discharge point to tailings twice daily or as otherwise directed by the Director-General, with any increases above 20mg CN_{WAD}/L to be assessed daily to ensure compliance and reported monthly to the DTIRIS (Minerals) and EPA, unless otherwise agreed by the Director-General. If the CN_{WAD} levels of 30mg/L are exceeded in the liquid at any time, discharge to the tailings dams shall cease until CN_{WAD} levels can be achieved below the levels stated in condition 5.3(a) and such exceedance shall be reported to the EPA within 24 hours;*
- *monitoring CN_{WAD} levels in the decant water of the tailings dams twice daily or as otherwise directed by the Director-General;*
- *an onsite laboratory for quickly establishing CN_{WAD} levels in the liquid at the discharge point to tailings dams and in the decant ponds for monitoring purposes;*
- *on-line monitoring of CN (FREE) at locations where employees are operating; and*
- *establishing a monitoring regime for detection of cyanide movement beneath and adjacent to the tailings impoundments.*

A summary of the cyanide monitoring results shall be provided to the Director-General, EPA and DTIRIS (Minerals) on a three monthly basis, unless otherwise agreed by the Director-General. All results shall be included in the AEMR.

The CMP (Barrick, 2006e) was prepared in accordance with Development Consent Condition 5.3(b) to provide objectives for monitoring and reporting of cyanide use on-site. The CMP was prepared prior to commissioning of cyanide use on-site and was approved by the DP&I on 9 January 2006. In 2008, both the FFMP and CMP were amended to reflect changes to the Development Consent related to reporting of fauna deaths.

Barrick has continued to report monthly weak acid dissociable (CN_{WAD}) cyanide results to the Director-General of the DP&I, EPA and DTIRIS (DRE) during the reporting period. Barrick also reported and discussed these results with the CEMCC at quarterly meetings.

An amendment to the CMP was prepared in October 2010 to reflect the June 2009 Modification which allowed the addition of a cyanide destruction method (i.e. the INCO process) as an alternative to Caro's Acid and the associated introduction of sulphur dioxide (SO_2) as SMBS. The addendum to the CMP was approved by the DP&I on 24 March 2010.

As described in Paragraph 1.1.2, Barrick commenced negotiations with the EPA and DTIRIS (DRE) in September 2010 regarding a proposed change to the location at which monitoring of CN_{WAD} levels of the aqueous component of the tailings slurry stream is undertaken at the CGM. An addendum to the CMP was subsequently prepared and approved by the Director-General of the DP&I on 20 October 2010. A variation of the EPL was also issued by EPA on 24 June 2011 to reflect this change in monitoring location to the final tailings hopper (Point 48).

3.5.1.2 Environment Protection Licence

The CGM EPL requires Barrick to undertake cyanide monitoring at the points identified in EPL Condition P1.3.

Condition R1 of the licence requires the completion of an Annual Return comprising a Statement of Compliance and a Monitoring and Complaints Summary at the end of each annual reporting period (i.e. the AER). Barrick submitted an Annual Return for the period 23 December 2011 to 22 December 2012 to the EPA on 21 February 2013. Cyanide monitoring at points identified in EPL Condition P1.3 were reported. The cyanide monitoring points and frequencies required by the EPL are consistent with monitoring required by the Development Consent and SWGMBMP. Additionally, Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

The DSC inspected the TSFs, various bunds and the Pond D9 structure in June 2007 and approved their use. Barrick continues to engage the services of Dr Neil Mattes (URS Corporation) to advise in various matters of inspection, maintenance and construction of walls and dams.

3.5.1.3 Any Other Relevant Approval

There are no other relevant reporting requirements for the reporting period.

3.5.2 Environmental Management

3.5.2.1 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 tailings storage facility, processing plant and processing plant dams. Maintenance of the LPB and upper catchment diversion drain systems;
- Provision of emergency containment channels alongside tailings storage pipelines to and from the tailings storage facility. Maintenance of process pipe work, equipment and leak detection equipment;
- Terrestrial fauna protection fencing and avifauna deterrent methods to minimize the potential for impacts of tailings operations;
- Use of SMBS to destruct cyanide in tailings slurry to permissible levels before the processing plant slurry discharge is pumped to the tailings storage facility (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; and
- Routine patrols of tailings and process areas to ensure the potential for spillage, dust or native fauna and flora impacts are minimised.

3.5.2.2 Effectiveness of Control Strategies

Monitoring and reporting was conducted in accordance with the CMP and resulted in the effective maintenance of WAD cyanide levels below 20 mg/L (90 percentile over six months) and below 30 mg/L at all times.

On 17 April 2006, the CGM became the first cyanide-using gold operation in the world to gain Pre-Operational Plant Certification under the International Cyanide Management Institute's (**ICMI**) Code for Cyanide Management.

The ICMI required certification to Operational requirements within 12 months after first delivery of cyanide stock. An external independent ICMI Operational Phase Code for Cyanide Management Certification Audit was undertaken from 23 to 30 March 2007. The operation was found to be in full compliance with the Code's Principles and Standards of Practice. On 2 August 2007, the CGM became the first gold operation using cyanide to be certified pre-operationally and operationally compliant with the ICMI Code. Cowal Gold was audited for 3-yearly re-certification in September 2009 and was confirmed as fully compliant with the Code.

An independent professional third-party re-certification audit occurred in early-August 2009 during which the operations were found to have maintained full compliance during the past three years. Effective 3 May 2012 Cowal Gold was again re-certified to the Code for a further 3 years after an independent ICMI site audit was conducted on 12-15 December 2011. A follow up audit is scheduled for November 2013. Additional details/ media on the ICMI Code for Cyanide Management are available at www.cyanidecode.org.

3.5.2.3 Variations from Proposed Control Strategies

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

3.5.3 Environmental Performance

3.5.3.1 Monitoring

In accordance with the CMP and Development Consent Condition 8.2(b), results of WAD cyanide monitoring of decant water at the process plant were reported monthly, in writing by the Environmental Manager, to the DP&I, EPA and DTIRIS (DRE), and by quarterly presentation to the CEMCC throughout the reporting period.

In accordance with Consent Condition 5.3(b)(ii), CN_{WAD} levels of the aqueous component of the tailings slurry stream will be maintained so that they do not exceed 20 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.

As described in Paragraph 3.5.1.2, the CMP was revised following approval of the section 75W modification to the Development Consent (i.e. the E42 Modification - Modified Request) to incorporate relocation of the automated sampler from the discharge point to the tailings storage facilities to the process plant. The revision of the CMP was approved by the DP&I on 20 October 2010. Monitoring results at the process plant have remained low and are summarised in Table 21.

Table 21
WAD cyanide Day-Night Shift Monitoring Data for Tailings Discharged to the STSF (23/12/2011 to 10/03/2012) and NTSF (11/03/2012 to 22/12/2012)

NTSF	WAD Cyanide (mg/L)			Total Cyanide (mg/L)		
	Site Lab	SGS, WWy	NATA, Syd	Site Lab	SGS, WWy	NATA, Syd
No. Samples Taken	555	558	51	42	42	42
Minimum	0.32	0.24	0.16	8.78	8.48	1.91
Mean	5.48	4.45	3.50	16.50	19.07	5.61
Maximum	14.96	19.40	7.85	29.57	30.90	19.00
STSF	**WAD Cyanide (mg/L)**			**Total Cyanide (mg/L)**		
	Site Lab	SGS, WWy	NATA, Syd	Site Lab	SGS, WWy	NATA, Syd
No. Samples Taken	135	134	10	10	10	10
Minimum	0.15	0.10	0.40	4.21	9.05	2.32
Mean	4.58	2.93	2.81	14.41	17.02	4.85
Maximum	12.54	7.19	5.47	22.73	25.30	7.87

The current recognised international safe limit for tailings storage facility fauna usage protection is 50 mg/L WAD cyanide. Barrick internal environmental management controls and the ICMI Code for Cyanide Management requires signatories to ensure that any spillage outside a bunded area above 0.5 mg/L WAD cyanide is recorded as an incident and treated as an emergency requiring immediate surface clean up. As per the CMP, on and off-site laboratories are used to monitor reagent levels inside the fenced TSF. Approval was granted during the 2007 reporting period for use of the Picric Acid method for on-site WAD cyanide level determinations in the Plant Laboratory for cyanide destruction monitoring purposes.

3.5.3.2 Performance Outcome

Groundwater
A detailed summary of groundwater monitoring results is provided in Appendix C.

During the 2012 reporting period one bore reported total cyanide concentrations above the ANZECC 2000 trigger value of 0.007 mg/L. The exceedance of 0.01 mg/L was recorded in bore P417B, immediately south of the southern TSF, in May 2012. The WAD cyanide result for that bore in May 2012 was above the Limit of Reporting (LOR). Follow up monitoring of this bore in July 2012 did not detect cyanide above the laboratory LOR.

All other groundwater results for cyanide in the monitoring period remained below the laboratory detection limit.

3.5.4 Reportable Incidents

No reportable incidents during the reporting period.

3.5.5 Further Improvements

An addendum to the CMP was prepared in October 2009 to include the June 2009 Modification to use SMBS as an alternative cyanide destruction method. The addendum of the CMP was approved by the DP&I on 24 March 2010. Construction and commissioning of the SMBS occurred during 2010 and has continued to operate effectively. The CEMCC will receive ongoing updates during the next reporting period.

Barrick commenced negotiations with EPA and DTIRIS (DRE) in September 2010 regarding a proposed change to the location at which monitoring of CN_{WAD} levels of the aqueous component of the tailings slurry stream is undertaken at the CGM. On 28 July 2010, pursuant to Development Consent condition 8.2(b) (ii), the Director-General of DP&I directed Barrick to change the location for the monitoring of cyanide levels in the tailings slurry stream, and this change in locations was then reflected in addendum to the CMP approved by the Director-General of DP&I on 20 October 2010 and a variation of the EPL issued on 24 June 2011. Point 48 replaced Points 46 and 47 in the varied EPL.

Barrick will prepare for the ICMI Code re-certification audit by conducting an internal audit during the 2013 AEMR reporting period. No additional management measures are proposed for the current reporting period. The cyanide management measures as described in the CMP will continue to be implemented during the next reporting period. As such, no further improvements are intended for the management of cyanide.

3.6 CONTAMINATED LAND

3.6.1 Reporting Requirements

3.6.1.1 Development Consent

The Monitoring Programme for Detection of Any Movement of Lake Protection Bund, Water Storage and Tailings Structures and Pit/Void Walls (**LPBMP**) (Barrick, 2003f) was prepared in accordance with Development Consent Condition 8.2(a)(v) to establish a monitoring programme for CGM to prevent the contamination of the land surrounding the CGM by providing for the detection of any movement of the Lake Protection Bund, water storage and tailings structures and pit/void walls during the life of the mine, with particular emphasis on monitoring after any seismic events.

In accordance with the LPMBP, the following related issues are required to be reported in the AEMR including:

- monitoring program results;
- measures employed in response to any identified movement where necessary;
- discussion of the definition of significant movement and whether a different definition is more appropriate; and
- interpretation and discussion of LPBMP results and management measures by a suitably qualified person.

The SSMP (Barrick, 2003a) prepared in accordance with Development Consent Condition 3.5(b) requires that the effectiveness of the soil stripping methods employed and the performance of CGM activities against the objectives of the SSMP are to be reported in the AEMR. Proposed improvements to soil stripping methods and any improvements to other soil management practices are also to be reported in the AEMR.

The HWCMP (Barrick, 2006c) prepared for the CGM in accordance with Development Consent Condition 5.7 requires that any major or emergency spills that occur during the reporting period as well as any remedial measures that have been implemented to reduce the risk of occurrence are to be reported in the AEMR. Since the construction phase was completed (i.e. April 2006), hydrocarbons and paints were no longer the major relevant substances used at CGM and are further discussed in Paragraphs 2.6, 2.9 and 3.18.2. The HWCMP (Barrick, 2006c) required revision of the plan to reflect results of pre-commissioning studies and the CMP. The revised HWCMP (Barrick, 2006c) was approved by the Director-General of the DP&I on 6 March 2006.

A prior amendment of the HWCMP was approved by the Director-General of the DP&I in January 2008 to reflect the proposed management procedures for two new waste streams generated at the CGM, viz.: trash screen oversize waste and hydrocarbon-impacted material. The amendment of the HWCMP was consistent with the variations to the EPL that were approved on 16 July 2008. Hydrocarbon impacted material will be treated at the site bioremediation area.

The HWCMP was amended to reflect the June 2009 Modification to allow the addition of a cyanide destruction method (i.e. the INCO process) as an alternative to Caro's Acid, and the associated introduction of sulphur dioxide (SO_2) as sodium metabisulphite (SMBS). The addendum to the HWCMP was approved by the DP&I on 10 March 2010.

In accordance with Development Consent Conditions 3.2 ad 5.7, the HWCMP was updated/ revised to reflect changes in operational practice since the commencement of CGM. The revised HWCMP addresses aspects, recommendations and findings relating to hazardous waste and chemical management in a number of other CGM management plans that were prepared subsequent to the HWCMP. The revised HWCMP was submitted to the EPA (formerly OEH) and BSC for comment and received DP&I approval in accordance with Development Consent Condition 5.7 early during the 2011 AEMR reporting period.

3.6.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.6.1.3 Any Other Relevant Approval

The *Protection of the Environment Operations Act, 1997 (NSW)* (**POEO Act**) ensures licences are specified by activity to avoid associated impact e.g. Noise, Air, Water, etc. The POEO Act also requires the notification of potential environmental harm e.g. disposal of waste, leaks and spillages. In addition, the *Contaminated Land Management Act, 1997 (NSW)* (**CLM Act**) imposes a duty on a person who causes contamination or who is the owner of contaminated land to notify the EPA if the person becomes aware that the land is contaminated in such a way as to present a significant risk of harm. In addition to the POEO Act and CLM Act, numerous EPA guidelines referring to contaminated land state the requirements of land holders to effectively assess, manage and prevent land pollution.

As described in Paragraph 1.1.2, the EPA introduced new legislation during the reporting period which requires the preparation and implementation of PIRMP. As a result of consultation with the EPA, Barrick incorporated the relevant requirements of the PIRMP within the CGM's existing EMP (Paragraph 1.1.2).

3.6.2 Environmental Management

3.6.2.1 Control Strategies

Control strategies described in the SSMP (Barrick, 2003a) were implemented during the reporting period and included:

- scheduling of soil stripping activities (including meteorological monitoring);
- stripping of soil quantities/depths to reflect the intended use of the stripped soil;
- conducting soil stripping activities in accordance with other relevant requirements (e.g. Section 87 permits and Section 90 consents (NSW) NPW Act), Vegetation Clearance Protocol and Threatened Species Management Protocol);
- implementing appropriate dust, erosion and sediment control measures; and
- managing soil stockpiles to optimise the retention of soil characteristics.

The control strategies described in the HWCMP (Barrick, 2011) relevant to hydrocarbons are provided in Paragraph 3.18.

The overriding control strategy for the monitoring of any movement of the LPB and water storages at the CGM during the reporting period was to implement the LPBMP (Barrick, 2003f).

Significant movement is currently defined as (URS, pers. comm., 15 August 2003):

- lateral movement greater than 20 mm since previous survey, or greater than 500 mm in total; and/or
- vertical movement greater than 20 mm since previous survey, or greater than 0.1% of total embankment height.

This definition remains the most appropriate definition for detecting significant movement.

Visual and survey assessments of the LPB and TIB are the management measures described in the LPMBP (Barrick, 2003f). The NSW DSC approved Barrick's request for the de-prescription of the LPB from the DSC Register of Dams (5 March 2007 CGP letter attached to 2006 LPB Inspection Report, Dr. N. Mattes, URS Corporation).

3.6.2.2 Effectiveness of the Control Strategies

Open pit visual inspections of the Lake Protection Bund, Temporary Isolation Bund, NTSF and STSF and open pit/void walls were effective in determining the satisfactory construction of the bunds.

Monthly inspections of the waste emplacements focusing on waste dump integrity (e.g. seepage inspections) were undertaken by Barrick geotechnical personnel.

The control strategies implemented during the reporting period were considered to be effective as discussed in Paragraph 3.6.3 below.

3.6.2.3 Variations from Proposed Control Strategies

No variations to control strategies outlined in the SSMP and the LPBMP occurred during the reporting period.

Top of bank survey monuments exist every 200 m at the top of the NTSF and STSF. These monuments have been re-established and resurveyed (or will be scheduled), where required, after recent earthmoving works and/or after upcoming scheduled TSF earthworks. Survey monuments at the NTST and STSF will remain at their surveyed locations. Additional survey monuments will be installed at each progressive 3-metre lift.

3.6.3 Environmental Performance

3.6.3.1 Monitoring

The visual assessments of the LPB, TIB and NTSF and STSF were undertaken by geotechnical engineers during the reporting period. The reporting focused on seepage, cracking, stability, depressions, vegetation growth, fauna activity and other necessary structural factors. Any issues raised were suitability managed.

Routine visual and annual written assessments and review of Barrick's survey works throughout the year were undertaken by URS Dam's specialist (Dr Neil Mattes) to review the NTSF, STSF and all structural walls for geotechnical engineering integrity.

Soil stripping activities were carried out during the reporting period in accordance with the SSMP. A site soil database was updated as new soil stripping was undertaken during the reporting period. The database recorded details such as soil stockpile locations, soil volumes, amelioration treatment, weed control, fertiliser application and date(s) of soil stripping.

3.6.3.2 Performance Outcomes

Routine visual assessments by URS and the Cowal Geotechnical Department did not detect any movement of the Temporary Isolation Bund or Lake Protection Bund during the reporting period. No seismic events were recorded during the reporting period.

Due to the Lake filling event of mid-2010, the piezometers were again measured during the reporting period. Monitoring of the Lake Protection Bund piezometers began during early-2011. No influence beyond that anticipated in the shallow aquifer response zone has occurred since the lake fill.

Late in December 2012, a seep developed at the top of the first Lift near the middle of the south side of the NTSF. It was independently assessed as non-structural. The water is clear, has no cyanide WAD in it. A saline seep developed at the end of 2012 at the north-east edge toe of the NTSF. Again the flow was clear with no cyanide WAD. EPA was informed and DRE visited site. Independent TSF Design Engineer relayed event to DSC. A TSF design review was in progress from early 2013 and will be discussed in next reporting period.

A summary of the locations where soil stripping activities occurred during the reporting period, including the volumes of soil used for rehabilitation and for stockpiling purposes, are provided in Table 22. The soil stockpile locations are shown on Figure 4.

Table 22
Summary of Soil Stripping Activities for the Reporting Period

Location of Areas Stripped	Volume of Soil Used for Rehabilitation (m^3)	Volume of Soil Stockpiled (m^3)
Pond D1 north trial area re-top soiling (Topsoil 06)	3,600	
TSF Depot (ready for relocated Millers Crusher Subsoil)		20,000
4^{th} Lift (3^{rd} augmentation) STSF	20,000	
LPB road upper and lower south-east PWE	8,000	
Total	31,600	20,000

The site soil database enables records to be monitored to determine the effectiveness of soil stripping methods.

The soil management measures employed during the reporting period are considered to be effective in achieving the objectives set out in the SSMP and minimising impacts of the CGM during soil stripping. As stated above, the site soil database determines the effectiveness of soil stripping methods and will continue to be utilised during the

next reporting period. An aerial LiDAR survey for 3-D ± 0.1 m will be conducted with a satellite photograph update early in the next reporting period.

3.6.4 Reportable Incidents

In accordance with the LPBMP, should visual or survey assessments indicate any significant movement of the LPB or water storages, Barrick will record this movement in the database and undertake further monitoring to verify and assess the extent and potential impacts of the movement.

As required by the DTIRIS (DRE), Barrick would then enter into discussions with the DTIRIS (DRE) and DP&I to facilitate the undertaking of a risk assessment to devise ameliorative measures depending on the severity of the problem.

No environmental incidents were reported in relation to any movements of the LPB or water storages at the CGM during the reporting period.

In accordance with Development Consent Condition 9.1, soil stripping operations will be reported in accordance with the MOP. In accordance with Development Consent Condition 9.1, the predicted annual soil stripping volumes and detailed soil stockpile locations and soil management measures have been provided in the CGM MOP (2012 - 2014).

No environmental incidents or complaints were reported or received relating to soil stripping or soil management activities at the CGM during the reporting period.

Reportable incidents regarding hydrocarbons for the reporting period are discussed in Paragraph 3.18.

3.6.5 Further Improvements

Soil stockpile characterisation, commenced during the prior reporting period (McKenzie), will conclude during the 2013 reporting period. Characterisation will allow Barrick to better define the quality and volume of soil resources present and inform rehabilitation efforts now and into the future. The next MOP will describe how higher salinity subsoil and topsoil stockpiles will be ameliorated by gypsum treatment.

An aerial LiDAR survey for 3-D +/- 0.1 m will be conducted with a satellite photograph update early in the next reporting period.

No other improvements are proposed for the next reporting period. Barrick will work with relevant government departments and independent professional input to ensure that operations continue to prevent the contamination of the surrounding land whilst working towards setting phased completion criteria.

3.7 FLORA

3.7.1 Reporting Requirements

3.7.1.1 Development Consent

The reporting of flora monitoring is required by Development Consent Condition 8.5, which states:

> *The Applicant shall monitor the effectiveness of measures outlined in the fauna management plan and Threatened Species Protocol (condition 3.4). A summary of monitoring results shall be included in the AEMR.*

The Flora and Fauna Management Plan (**FFMP**) (Barrick, 2003g) was prepared in accordance with Development Consent Condition 3.4(a). In accordance with the FFMP, the following flora related issues are required to be reported in the AEMR:

- vegetation clearance activities;
- weed and pest management;
- results of the flora monitoring program; and

- the progress of remnant vegetation and wetland enhancement programmes.

The Threatened Species Management Protocol (**TSMP**) (Barrick, 2003h) was prepared in accordance with Development Consent Condition 3.4(b).

In accordance with Development Consent Condition 8.5, a summary of the effectiveness of the measures outlined in the FFMP and TSMP are required to be included in the AEMR.

As described in Paragraph 1.1.2, a Rehabilitation and Offset Management Plan (**ROMP**) was prepared in accordance with the Modified Development Consent Condition 3.6(d) and submitted to relevant government departments for review on 30 July 2010. The ROMP was lodged with the DP&I on 9 January 2011. Barrick received comments from DP&I on the ROMP in August 2012. Barrick is currently preparing a revised ROMP to address DP&I comments.

Development Consent Condition 3.6(d) provides:

Rehabilitation and Offset Management Plan

3.6(d) The Applicant shall prepare and implement Rehabilitation and Offset Management Plan for the Project to the satisfaction of DTIRIS and the Director-General. This plan must be prepared in consultation with EPA, NoW and BSC, and be submitted to the Director-General and DTIRIS (Minerals) for approval by the end of July 2010.

This plan must include:

(i) the rehabilitation objectives for the mine site and offset areas;

(ii) a description of the short, medium, and long term measures that would be implemented to:

- *rehabilitate the mine site;*
- *implement the offset strategy; and*
- *manage the remnant vegetation and habitat on the mine site and in the offset areas;*

(iii) detailed performance and completion criteria for the mine site rehabilitation and implementation of the offset strategy;

(iv) a detailed description of the measures that would be implemented, including the procedures to be implemented for:

- *progressively rehabilitating disturbed areas;*
- *implementing revegetation and regeneration within the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understory and ground strata;*
- *protecting vegetation and soil outside the disturbance areas;*
- *rehabilitating creeks and drainage lines on the site (both inside and outside the disturbance areas);*
- *managing salinity;*
- *conserving and reusing topsoil;*
- *undertaking pre-clearance surveys;*
- *managing impacts on terrestrial and aquatic fauna;*
- *landscaping the mine site to minimise visual impacts;*
- *collecting and propagating seed for rehabilitation works;*
- *salvaging and reusing material from the mine site for habitat enhancement;*
- *controlling weeds and feral pests, including terrestrial and aquatic species;*
- *managing grazing and agriculture on site;*
- *controlling access; and*
- *bushfire management;*

(v) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;

(vi) a description of the potential risks to successful rehabilitation and/or revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and

(vii) details of who would be responsible for monitoring, reviewing, and implementing the plan.

Development Consent Conditions 3.6(a), (b) and (c) are also relevant to rehabilitation of the mine site and implementation of the offset strategy. Development Consent Conditions 3.6(a) to (c) provide:

Rehabilitation and Offsets

3.6(a) The Applicant shall:

(i) progressively rehabilitate the mine site in a manner that is generally consistent with the final landform in the EA (as shown in Appendix 1);

(ii) maximise the salvage and beneficial use of resources in areas subject to disturbance; and

(iii) Implement the biodiversity offset strategy as described in the EA, and summarised in Table 1 (and shown conceptually in Appendix 2), to the satisfaction of the Director-General and DTIRIS (Minerals).

Table 1: Offset Strategy

Area	***Minimum Size***
Offset - Enhancement Area	*110 ha*
Offset - Revegetation Area	*100 ha*
Total	*210 ha*

3.6 (b) By the end of December 2011, the Applicant shall make suitable arrangements to provide appropriate long term security for the offset areas to the satisfaction of the Director-General.

3.6 (c) By the end of December 2001, the Applicant shall demonstrate that appropriate monetary bonds are, or will be, in place with applicable authorities to fully implement the offset strategy, to the satisfaction of the Director-General.

As per Consent Condition 3.6(c), Barrick (Cowal) advised the DP&I on 17 December 2010 that the offset bond (to implement the offset strategy) is currently held with DTIRIS (DRE).

3.7.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.7.1.3 Any Other Relevant Approvals

There are no other relevant reporting requirements from other approvals in relation to threatened flora for the reporting period.

3.7.2 Environmental Management

3.7.2.1 Control Strategies

Flora control strategies are described in the FFMP (Barrick, 2003g). The following control strategies were implemented at the CGM during the reporting period:

- implementation of Compensatory Wetland Management Plan (**CWMP**) (Barrick, 2003i) initiatives and the remnant vegetation enhancement program;
- incorporation of flora management initiatives during operational design;
- implementation of the VCP) (Figure 16);
- implementation of the TSMP;
- rehabilitation of disturbance areas;
- implementation of rehabilitation monitoring report;
- development of a ROMP (including mine site rehabilitation performance and completion criteria and a mine site rehabilitation monitoring programme and offset performance and completion criteria and an offset monitoring programme);
- assessment of rehabilitation completion criteria;
- weed management and pest control;

- flora monitoring programme;
- observance of the TSMSs for the relevant Endangered Ecological Communities (**EEC**s):
  - Inland Grey Box Woodland – approved 31 August 2007;
  - Myall Woodland – approved 24 September 2007; and
  - Aquatic Ecosystems (lower Lachlan River) – approved 12 October 2007; and
- provision of information relevant to the management of native flora during employee and contractor inductions.

Mine Site Rehabilitation Monitoring Programme

In accordance with Consent Condition 3.6(d) (v), a rehabilitation monitoring programme has been developed to monitor the effectiveness of the short, medium and long-term mine site rehabilitation measures and progress against performance and completion criteria.

The performance of the mine site rehabilitation will be monitored annually against the performance and completion criteria provided in the ROMP. The performance criteria have been developed to reflect the measures for mine site rehabilitation. This monitoring will therefore assess the effectiveness of these measures and determine the need for additional measures. The quality of revegetation will be monitored using Ecosystem Function Analysis (**EFA**), or a similar systems-based monitoring approach. EFA is a method developed by the Commonwealth Scientific and Industrial Research Organisation (**CSIRO**) which provides indicators of revegetation/rehabilitation success and allows the assessment of ecosystem sustainability through the plotting of development trajectories.

EFA monitoring of revegetated/rehabilitated areas will be used to measure the progression of the revegetation/rehabilitation towards a self-sustaining ecosystem. The mine site rehabilitation monitoring programme also includes monitoring of the:

- New Lake Foreshore;
- waste rock emplacements and tailings storage facilities;
- effectiveness of the erosion and sediment control systems; and
- fauna usage of rehabilitated areas and compensatory wetland.

A detailed rehabilitation monitoring programme (and offset monitoring programme) has been proposed and is detailed in the ROMP currently submitted to the NOW, EPA and BSC for comment.

Offset Areas

In accordance with Development Consent Condition 3.6 an offset strategy has been developed for the CGM and is detailed in the ROMP. The offset strategy involves the conservation and management of two designated areas located on land owned by Barrick, herein referred to as the northern and the southern offset areas (Figure 17).

The offset strategy includes:

- a description of the offset;
- objectives;
- short, medium and long-term management measures;
- performance and completion criteria; and
- a monitoring programme.

Management Areas

In accordance Development Consent Condition 3.6(a) two types of management areas have been defined in order to facilitate the management of remnant vegetation and habitat in the offset areas, namely, Offset Enhancement Areas and an Offset Revegetation Area (Table 23). The management areas are shown on Figure 17.

Table 23
Offset Management Areas

Offset Management Area	Description	Minimum Size (hectares [ha])
Offset Enhancement Area (Southern Offset Area)	Enhancement through natural regeneration and management for conservation.	110
Offset Revegetation Area (Northern Offset Area)	Re-establishment of woodland in cleared agricultural land by revegetation.	100
Total Area Conserved (ha)		210

Offset Objectives

The objectives for the offset areas are to:

- secure the tenure of the offset areas for long-term conservation purposes;
- enhance flora and fauna habitats within the offset areas, including increasing the area of Myall Woodland through regeneration and revegetation; and
- establish native vegetation characteristic of a Eucalypt Woodland in cleared agricultural land.

Short, medium and long-term measures will be implemented within the different management areas and are detailed in the ROMP. The flora and fauna characteristics, vegetation communities, habitat complexity and condition and threatened flora and fauna characteristics of the offset areas are described in the ROMP.

Offset Monitoring Programme

In accordance with Consent Condition 3.6(d) (v), an offset monitoring programme has been developed to monitor the effectiveness of the short, medium and long-term measures proposed to implement the offset strategy and to monitor the progress against performance and completion criteria.

The performance of the offset will be monitored regularly (and at least annually) against the performance and completion criteria provided in the ROMP. The performance criteria have been developed to reflect the offset strategy measures. This monitoring will therefore assess the effectiveness of these measures and determine the need for additional measures.

The offset monitoring programme will be conducted within both the Offset Revegetation Area (Northern Offset Area) and Offset Enhancement Areas (Southern Offset Area) and will include:

- a preliminary site inspection;
- visual monitoring;
- photographic monitoring; and
- permanent flora quadrats.

As described in Paragraph 3.7.1.1, Barrick has prepared a revised ROMP to address comments provided by the DP&I in August 2012. A description of the revised ROMP will be provided in the next AEMR once relevant regulatory agencies have reviewed the revised ROMP and it has been approved by the DP&I. DnA Environmental has developed a detailed rehabilitation and offset monitoring programme for the CGM which has been included in the revised ROMP. The 2013 AEMR will include a description of the rehabilitation and offset area monitoring programmes and outline the performance indicators and completion criteria relevant to mine site rehabilitation and the offset areas.

3.7.2.2 Effectiveness of Control Strategies

Development Consent Condition 8.5 requires the effectiveness of the TSMP and FFMP to be reported in the AEMR. The control strategies implemented during the reporting period were considered to be effective in minimising impacts to threatened flora. In accordance with the CGM VCP (Figure 16), mining activities were confined to delineated and cleared areas. Vehicle movements within ML 1535 were restricted to designated

roads limiting the impact on threatened flora. The TSMP identifies threatened flora populations and management strategies were implemented accordingly.

The results of the rehabilitation monitoring programme currently implemented to assess the effectiveness of mine site rehabilitation measures and offset strategy measures is provided in Paragraph 5.

3.7.2.3 Variations from Proposed Control Strategies

Following approval of the revised ROMP, an assessment of rehabilitation monitoring results against approved performance and completion criteria will be provided in the next AEMR.

There are no other anticipated variations to the proposed control strategies in the next reporting period.

3.7.3 Environmental Performance

3.7.3.1 Monitoring

Monitoring and management of flora continued in accordance with the requirements of the FFMP (Barrick, 2003g) (Paragraph 3.7.1), during the reporting period. Measures undertaken are discussed below.

Vegetation Clearance

Vegetation clearance activities conducted during the reporting period were monitored and undertaken in accordance with the VCP (Figure 16). The VCP was applied to 33 trees on the north-west corner of the SWE during demolition of the old 'Cowal West' homestead and relocation of the Shearing Shed (March 2011 - May 2012). Additionally seven trees were cleared adjacent Pond D9 in accordance with the VCP to allow for the proposed January 2013 relocation movement of the Millers Crusher Topsoil stocks into this area.

There were no other vegetation clearance activities undertaken during the reporting period.

Weed Management

The annual weed survey of Barrick property was undertaken in December 2012 by Carnegie Natives. Weed management measures resulting from the survey will continue to be implemented during 2013.

There were no other alterations to any weed management requirements during the reporting period.

Weed management is discussed further in Paragraph 3.9.2.

Flora Monitoring Program

Flora monitoring was undertaken during the reporting period in the following areas of interest:

- Compensatory Wetland;
- Rehabilitation areas and Trial areas;
- Offset Management areas;
- *Pilularia novae-hollandiae* (Austral Pillwort) habitat; and
- Remnant Vegetation Enhancement Programme areas.

Monitoring of re-vegetated and rehabilitated areas within ML1535 and the offset areas was conducted during the reporting period in accordance with the ROMP, and is discussed below.

The Australian Museum Business Services (AMBS) undertook flora surveys covering Barrick-owned land within and surrounding the CGM in two stages during the 2012 reporting period between the 25 and 26 of April 2012 and on the 5 September 2012. The aim of the flora surveys was to map and validate vegetation communities present, assess vegetation condition, and target potentially occurring threatened flora. A total of 130 full floristic survey sites were surveyed within the study area as well as 65 rapid data point sites, which recorded dominant flora species and broad condition.

A total of 451 flora species from 80 plant families have been recorded within the CGM and surrounds during surveys from 1995 to 2012. The recent survey conducted by the AMBS recorded a total of 306 vascular plant species from 69 families and 176 genera.

No threatened flora species were found during the surveys. One threatened ecological community, the Weeping Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes Bioregions endangered ecological community listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Threatened Species Conservation Act 1995* was recorded. Parts of this community also conform to the Weeping Myall Woodlands endangered ecological community listed under the EPBC Act.

AMBS also undertook targeted surveys for threatened flora species. Further targeted searches for the Austral Pilworth (*Pilularia novae-hollandiae*) were conducted in April 2012 over all major areas of gilgais and some waterways within the study area. No populations of Austral Pillwort were found.

3.7.3.2 Performance Outcomes

DnA Environmental is engaged by Barrick to conduct annual monitoring of the Compensatory Wetland (**CW**); rehabilitation area and rehabilitation trial areas; the offset areas; Austral Pillwort habitat and RVEP areas. A summary of DnA's monitoring programme from 2012 is provided below.

Compensatory Wetland

Monitoring of regeneration in the **CW** was undertaken by DnA Environmental between the 5 to 15 November 2012. Monitoring during spring aims to capture a more accurate representation of species present in the area. Future monitoring of the CW will continue to be undertaken in spring, subject to the area not being inundated.

Due to the continued inundation of Lake Cowal only two sites CW3 and CW1 which are situated on the lake foreshore, could be accessed for monitoring since 2010. The remaining ten sites were well under water. The following summary of results therefore includes data from 2008 and 2009 from all 12 monitoring sites, but from 2010 to 2012 data was obtained from only CW3 and CW1. Comparisons between the **CW**, remaining and wetland areas could therefore not be made in the 2012 reporting period (DnA Environmental, 2013b).

Results of the 2012 monitoring included:

- In 2012 there has been a significant germination event of *Eucalyptus camaldulensis* (River Red Gum) seedlings with most being very small (2 leaf stage at Foreshore).
- Due to significant flooding again in March 2012 CWs have undergone a significant transformation due to the receding water and partial inundation of the sites and there had been substantial deposition of sand and vegetative debris resulting in a decline in total ground cover, especially at CW3;
- There has also been considerable movement of large logs and branches around site CW1 and there continued to be healthy population of skinks which inhabit the fallen branches and leaf litter indicating the importance of retaining these as critical habitat requirements and the necessity of introducing these into rehabilitation areas;
- The permanent photo points and general area photographs show a marked improvement in tree health in most areas around the Lake Cowal environment;
- The changing and highly disturbed environment as a result of the March 2012 flood waters and subsequent active wave action have had a significant influence on the structure and composition of the two lake foreshore communities (DnA Environmental, 2013b).

Monitoring of the CW regeneration will continue annually.

In order to limit disturbance to the CW, vehicular access continued to be limited to authorised personnel.

Rehabilitation Monitoring Report and Cowal Completion Criteria

Revegetation trials have been set up on the New Lake Foreshore in accordance with the CWMP (Barrick, 2003i). The trials are discussed in Paragraph 5.4. Also discussed in Paragraph 5.4 are the monitoring results of CGM

rehabilitation areas and rehabilitation trial areas and a description of the development of detailed rehabilitation completion criteria for mine landforms.

As described in Paragraph 3.7.2.1, Barrick has prepared a revised ROMP to address comments provided by the DP&I in August 2012. A description of the revised ROMP will be provided in the next AEMR once relevant regulatory agencies have reviewed the revised ROMP and it has been approved by the DP&I. The 2013 AEMR will include a detailed description of CGM rehabilitation area and offset area monitoring programmes and outline the performance indicators and completion criteria relevant to mine site rehabilitation and the offset areas.

Offset Management Areas

Two monitoring sites were established at each of the Offset Management Areas (Northern Offset Area and Southern Offset Area) in 2010 in accordance with Development Consent Condition 3.6(a). The Offset Areas are discussed in Paragraph 5 along with the results of the 2012 monitoring program.

Pilularia novae-hollandiae (Austral Pillwort) Habitat

A survey of potential habitat for the threatened species *Pilularia novae-hollandiae* (Austral Pillwort) was undertaken within ML 1535 and nearby properties by DnA Environmental from 5 - 7 November 2012 and due to wet weather was completed on 12 – 15 November 2012. Undisturbed areas of ML 1535 and nearby properties were searched, targeting areas of potentially suitable habitat such as gilgais, farm dams, lake foreshore, areas free of water or recently receded water and areas previously surveyed.

Lake Cowal continued to be relatively full throughout the year with hot dry weather preceding the surveys resulting in the Lake starting to recede and all gilgais drying out during the 2012 survey. There were dense swards of native and introduced grasses which provided very high levels of dead litter cover, while ground cover levels were very high and limited visual opportunities. These swards also provided high competition levels and limited opportunities for Austral Pillwort to inhabit.

The Austral Pillwort was not found during 2012 despite expanding the search areas (DnA Environmental, 2013). Suitable habitat may have been present along the receding lake foreshore; however no specimens were located during the survey (DnA Environmental, 2013).

In most cases increasing ground cover and dry gilgais habitats during 2012 are unlikely to provide conditions suitable for the establishment of this small aquatic fern (DnA Environmental, 2013).

AMBS also undertook targeted surveys for the Austral Pilworth (*Pilularia novae-hollandiae*) in April 2012 over all major areas of gilgais and some waterways within the study area. No populations of Austral Pillwort were found.

Remnant Vegetation Enhancement Program (RVEP)

RVEP monitoring has been undertaken in spring in all years with the 2012 monitoring undertaken from 7 - 15 November 2012.

In line with Barrick Cowal's Land Management Plan (LMP) permanent monitoring sites have been established to measure changes occurring within the remnant vegetation as part of the Remnant Vegetation Enhancement Program (RVEP). In the LMP, there are four main areas requiring livestock exclusion and the establishment of permanent monitoring sites, including:

- RVEP1: *Eucalyptus dwyeri* (Dwyer's Red Gum) – *Callitris glaucophylla* (White Cypress Pine) woodland on Fellman's Hill, "Hillgrove";
- RVEP 2: *Muehlenbeckia florulenta* (Lignum) area in the lake bed on "Lakeside";
- RVEP 3: *Eucalyptus camaldulensis* (River Red Gum) woodland on the northern section of "Lake Cowal" foreshores and;
- RVEP 4: *Eucalyptus camaldulensis* woodland on the southern section of "Lake Cowal" foreshores.

In 2006, four monitoring sites were established within targeted areas of remnant vegetation in RVEP 1 which have been free from livestock since 2004. RVEP2 is situated in the middle of the bed of "Lakeside" and fencing requires careful consideration and no monitoring has yet been undertaken as this area was still being grazed by livestock and since 2010 it has been under water. RVEP areas 3 and 4 were fenced off in mid-2007 and monitoring sites were established in each of these areas since 2007.

Since RVEP1 has been excluded from grazing by domestic livestock, there has been an increasing number of macropods using this site, in particular a growing population of Eastern Grey Kangaroos. Due to the potentially high grazing pressure, four Kangaroo-proof enclosures were constructed in 2008 and monitoring sites were also established within these to assess the impact of the macropod grazing, if any, on the health and diversity of the remnant vegetation.

In total, there have been ten permanent monitoring quadrats established within the RVEP areas 1, 3 and 4. In six sites, the survey quadrats are 50m x 20m and are surveyed annually to monitor changes in vegetation cover, species diversity and to determine the extent of regeneration occurring within these conservation sites. In the remaining four exclosure sites in RVEP1 (Fellman's Hill), the size of the monitoring quadrats needed to be reduced to a 20x20m quadrat to fit within the enclosures.

There has been no consistent trend in changes of native floristic diversity since 2008 however the different seasonal conditions have had a major influence in all sites. The lowest floristic diversity was recorded in all sites in 2009 which was a particularly dry year while there was a peak in 2010 due to improved rainfall conditions. In 2011 dry conditions resulted in a decline in total floristic diversity and in 2012 there tended to be a slightly higher diversity across all sites despite having a very dry period preceding the monitoring event.

In 2010, two noxious weed species of the Bland Shire were recorded in RVEP03 and these were *Lycium ferocissimum* (African Boxthorn) and *Sclerolaena birchii* (Galvanised Burr) which are likely to have been killed as a result of the weed control program. In 2012 one small *Lycium ferocissimum* was recorded at site Hill04 within RVEP1.

Monitoring of the RVEP areas will continue during the next reporting period.

There were no alterations to any threatened flora species reporting requirements during the reporting period.

3.7.4 Reportable Incidents

The FFMP requires the reporting of any incidents relating to threatened flora. No environmental incidents or complaints were reported or received at the CGM relating to threatened flora during the reporting period.

3.7.5 Further Improvements

Improved soil classification works prior to rehabilitation works is required to ensure the optimum substrate for plant growth and establishment. These works commenced during the 2011 monitoring period and continued during this reporting period. As described in Paragraph 3.6.5, results from soils stockpile characterisation works will be described in the next AEMR and will be used to inform the CGM rehabilitation programme.

As described in Paragraph 3.7.2.3, following approval of the revised ROMP, the 2013 AEMR will also include a detailed description of the monitoring programmes for CGM rehabilitation and offset areas and outline the performance indicators and completion criteria relevant to mine site rehabilitation and the offset areas.

No further improvements to threatened flora management measures are proposed for the next reporting period.

3.8 FAUNA

3.8.1 Reporting Requirements

3.8.1.1 Development Consent

The reporting of fauna monitoring is required by Development Consent Condition 8.5, which states:

> *The Applicant shall monitor the effectiveness of measures outlined in the fauna management plan and Threatened Species Protocol (condition 3.4). A summary of monitoring results shall be included in the AEMR.*

The AEMR is also required to include the results of fauna monitoring and records of any wildlife/fauna deaths or other incidents due to mining operations by Conditions 3.4(a)(ii) and 9.2(i)(d) of the Development Consent.

The FFMP (Barrick, 2003g) was prepared in accordance with the Development Consent Condition 3.4(a). In accordance with the FFMP, the following fauna related issues are required to be reported in the AEMR:

- a summary of deaths or other incidents involving native fauna;
- fauna usage of tailings storages;
- results of any native fauna autopsies;
- vegetation clearance activities (discussed in Paragraph 3.7.3);
- weed and pest management (discussed in Paragraph 3.9.2);
- results of the flora and fauna monitoring programs; and
- the progress of remnant vegetation and wetland enhancement programs (discussed in Paragraph 3.7.3.2).

The FFMP and CMP were amended in 2008 to reflect changes to the Development Consent related to reporting of fauna deaths.

A TSMP (Barrick, 2003h) has been prepared in accordance with Development Consent Condition 3.4(b). In accordance with the TSMP, TSMS were prepared in consultation with the EPA during the current reporting period for the following species:

- Inland Forest Bat;
- Sloane's Froglet;
- Woodland birds including:
  - Little Eagle;
  - Spotted Harrier;
  - Square-tailed Kite;
  - Varied Sitella; and
  - White-fronted Chat.

The above TSMSs were submitted to the DP&I on 28 February 2011 and at time of writing, were awaiting approval.

In accordance with Development Consent Condition 8.5 a summary of the effectiveness of the measures outlined in the FFMP (Barrick, 2003g) and TSMP (Barrick, 2003h) is required to be included in the AEMR.

In accordance with Development Consent Condition 3.6(d)(iv) (Paragraph 3.7.1.1), the ROMP includes a description of measures that will be undertaken to manage the impacts on terrestrial and aquatic fauna and preliminary habitat assessment measures (including pre-clearance surveys) to identify roosting/nesting habitat resources that may be impacted by vegetation clearance activities.

3.8.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing harm or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.8.1.3 Any Other Relevant Approvals

There are no other relevant reporting requirements from other approvals in relation to threatened fauna for the reporting period.

3.8.2 Environmental Management

3.8.2.1 Control Strategies

The relevant control strategies for the management of threatened fauna species are described in the FFMP (Barrick, 2003g) and the ROMP (Barrick, 2010) and include:

- implementation of CWMP (Barrick, 2003i) initiatives and the remnant vegetation enhancement program (discussed in Paragraph 3.7.3.2);
- incorporation of fauna management initiatives during operational design;
- implementation of the VCP (Figure 16) (including pre-clearance surveys) (discussed in Paragraph 3.7.3.1);
- implementation of the TSMP (Barrick, 2003h);
- implementation of the Plan to Protect Fauna from Interactions with the Tailings Storage Facilities (Barrick, 2005e);
- management of impacts on terrestrial and aquatic fauna;
- rehabilitation of disturbance areas;
- weed management and pest control (discussed in Paragraph 3.7.3 and 3.9.2);
- 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.

3.8.2.2 Effectiveness of Control Strategies

In accordance with the FFMP, implementation of the control strategies minimised impacts on threatened fauna species during the operation of the CGM.

The number of native fauna fatalities on-site has remained similar to those reported in the previous reporting period. Paragraph 3.8.3.2 lists the fauna deaths and incidents that have occurred on ML 1535 over the reporting period. The majority of native fauna deaths that occurred during the reporting period were associated with interactions with vehicles.

No native fauna deaths occurred as a result of the VCP activities described in Paragraph 3.7.3.

Several members of the Barrick Environmental team and some local community members (sponsored by Barrick) are trained NSW Wildlife Information Rescue & Education Service (**WIRES**) members. Many Barrick employee members have been trained in handling venomous snakes by Wildlife Australia. Having locally trained snake handlers and registered WIRES members has improved the care that can be given to injured native wildlife on ML 1535 and within the local community. The Barrick Cowal Environmental Manager is the WIRES Riverina Reptiles Coordinator for 2010-2012.

A compensatory wetland habitat and fish investigation was conducted by frc Environmental during July 2012 in accordance with the CWMP. Fish communities of the survey area were species poor and were dominated by the following exotic species: eastern gambusia (*Gambusia holbrooki*), goldfish (*Carassius auratus*) and common carp (*Cyprinus carpio*). Of the five fish species recorded in the surveys, only two were native species: common carp Gudgeon (*Hypseleotris* sp.) and Australian smelt (*Retopinna semoni*) (frc Environmental, 2012).

The community composition of fish in the surveys was similar to the community composition of fish recorded elsewhere within the Murray-Darling Basin, in areas that experience adverse environmental conditions (i.e. high temperatures or hypoxia) (frc Environmental, 2012). Based on this assessment of aquatic habitat and fish communities, the wetland areas within ML 1535 offer similar habitat to adjacent comparative sites, as they provide structure that supports feeding, shelter and reproduction for a variety of fish species (frc Environmental, 2012). The current surveys show the dominance of exotic species, which are more resilient to adverse and varied conditions, and are able to rapidly colonise newly available habitats.

3.8.2.3 Variations from proposed Control Strategies

There were no variations from the proposed control strategies.

3.8.3 Environmental Performance

3.8.3.1 Monitoring

In accordance with the FFMP, monitoring in relation to fauna was conducted during the reporting period. Activities conducted during the reporting period relating to fauna monitoring included:

- continuation of long-term monitoring of bird breeding (Table 24);
- twice daily fauna usage of the tailings storage facilities;
- regular checking of the main diesel tank and hydrogen peroxide tank concrete bund sumps after rainfall events to rescue and relocate frogs; and
- daily and weekly fauna incident inspections and field patrols.

Table 24
Bird Breeding Monitoring Conducted During the Reporting Period

Monitoring Component	Summary
Birds	Continuation of long-term bird breeding monitoring, including: 1. Waterbird breeding surveys. 2. Collection of environmental data including lake depth, changes in depth, Southern Oscillation Index (SOI), season, and rainfall. 3. Statistical analysis to examine variation in the abundance of breeding birds, and the number and survival of fledglings and the mean number of breeding bird species between years, seasons, lake water cycle and climatic conditions.

Twice daily monitoring of fauna usage of the tailings facilities has been undertaken since the commissioning of the facilities in April 2006. One patrol is conducted after dawn and the other in the late afternoon. The patrol includes inspection of the tailings dam fence for evidence of fauna usage (e.g. tracks or breaks in the fence) and to determine the need for any maintenance measures (e.g. fence repair). Any maintenance measures are undertaken, as soon as practicable. The fauna monitoring results are utilised to determine the requirement for modifications to the mechanisms being utilised to deter fauna from the tailings dams.

The following details and observations are recorded:

- observer details (i.e. name and position);
- date and time of inspection;
- type of species present;
- number of individuals of each species;
- location within the tailings dam (e.g. on tailings dam, beach or embankment, etc);
- behaviour and habits of individuals (e.g. flying over tailings and/or wading in the tailings facility, etc);
- visually observed fauna effects; and
- any fauna incidents and/or fauna deaths.

Weekly boundary inspections of ML 1535 were conducted by environmental and/or security personnel to identify any native fauna incidents and/or deaths. On some occasions however, surveys were not able to be conducted due to access restrictions caused by wet weather, including for all of 2012, no inspection of the eastern fence and parts of the northern and southern fences was able to be undertaken due to the high lake water level during the reporting period. In this case, opportunistic inspections were carried when conducting water monitoring on Lake Cowal.

Fauna '*incidents*' are considered to occur where the observed behaviour of native fauna indicates that a negative impact on individual(s) is occurring as a result of the presence or operation of the mine (e.g. fauna is observed trapped within the ML 1535 fence). In the event that fauna incidents are observed, the following details and observations are recorded:

- observer details (i.e. name and position);
- date and time of inspection;
- type of species;
- number of individuals of each species;
- location; and
- any other relevant details of the native fauna incident.

Any native fauna found dead in the ML 1535 area are reported to environmental personnel who coordinate collection. Dead fauna are collected for autopsy to enable the cause of death to be determined. The details and observations listed above are recorded, as well as condition of the species and surface water conditions of the Lake and surrounding area (when inundated, if relevant). Where practicable, photographs or video footage are taken (e.g. of landscape, stance of clinically affected animal, place of death) to provide additional information for veterinarian and site investigation. If cyanide is suspected or known to be a contributor to the death of a native or feral animal, the West Wyalong Veterinarian is contacted immediately and special preservation techniques followed for the sampling process. No cyanide related recorded deaths of animals occurred during the reporting period.

Pest Management

Pest Management is described in Paragraph 3.9 of this AEMR.

3.8.3.2 Performance Outcomes

There were 528 WIRES rescues and relocations of native fauna that have been undertaken during the reporting period, when mining activities have been a threat to their safety.

70 of the relocations were for large Carp taken during their attempt to migrate up the Southern UCD during an inflow event at the edge of Lake Cowal. There have also been a number of the injured animals listed on the next page that have been taken into WIRES home care and later released at suitable habitat once rehabilitated.

The rescues and relocations to immediately adjacent suitable habitat for the 2012 reporting period included:

4	Swamp Wallaby	6	Emu
2	Eastern Grey Kangaroo	5	Microchiroptera (Bat)
14	Brown Snake	1	Red-naped Snake
8	Tiger Snake	1	Blind Snake
10	Bearded Dragon	5	Myall Snake
1	Blue Tongued Lizard	3	Blue-bellied Black Snake
3	Snake Necked Turtle	2	Black Snake
3	Diamond (Carpet) Python	3	Legless Lizard
1	Gecko	1	Sign-bearing Frog
3	Hoary-headed Grebe	1	Silver Gull
1	Nankeen Kestrel	1	Nankeen Night Heron
1	Welcome Swallow	1	Sacred Kingfisher
3	Australian Magpie	1	Eastern Banjo Frog
372	Spotted Marsh Frog		

All native animals rescued at the CGM are entered into the WIRES database (www.wires.org.au).

A summary of all the reported fauna deaths during the reporting period is provided in Table 25.

Table 25
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**23 December 2011**	
Location	E42 Pit haul road	
Species and number of individuals	Nankeen Kestrel	1
Description of Incident	Night shift Rock Engineering personnel noted the bird covered in mud and recovered it for Veterinary inspection and reporting	
Outcome	Unknown exact cause for muddy sticking point. Bird likely to have been de-hydrated	
Date/Time of Incident	**30 December 2011**	
Location	Bitumen access road to site	
Species and number of individuals	Blue-bellied Black Snake	1
Description of Incident	Employee noted deceased Blue-bellied Snake on bitumen access road whilst was entering site mid-morning. Carcass Collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Outcome	Snake travel path error	
Date/Time of Incident	**4 January 2012**	
Location	Southern tailings storage facility	
Species and number of individuals	Wallaby	1
Description of Incident	Env Officer noted Wallaby stuck in southern tailings storage facility wet tailings. Animal subsequently euthanized and Env Manager notified Vet.	
Outcome	Animal deceased. Could have sought refuge during thunderstorms	
Date/Time of Incident	**18 January 2012**	
Location	Bitumen access road spillway, Mining Lease.	
Species and number of individuals	Brown Snake	1
Description of Incident	ER noted a deceased Brown Snake on first concrete spillway of bitumen access road during night patrol. Carcass Collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Outcome	Injuries consistent with motor vehicle impact.	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**4 January 2012**	
Location	Bitumen access road, Mining Lease.	
Species and number of individuals	Magpie-Lark	1
Description of Incident	Employee noted deceased Magpie-Lark in the centre of outgoing lane of bitumen access road. Carcass bagged, paperwork completed and delivered to local Vet Clinic.	
Outcome	Injuries were consistent with vehicle impact. Flight path error	
Date/Time of Incident	**23 January 2012**	
Location	Vehicle workshop	
Species and number of individuals	Stubble Quail	1
Description of Incident	Employee found a deceased Stubble Quail at base of Workshop door entry. Bird impacted with the door and died.	
Outcome	Injuries were consistent with impact. Flight path error	
Date/Time of Incident	**24 January 2012**	
Location	Bitumen access road, Mining Lease.	
Species and number of individuals	Bearded Dragon	1
Description of Incident	Employee noted deceased juvenile Bearded Dragon on bitumen access road.	
Outcome	Injuries were consistent with vehicle impact.	
Date/Time of Incident	**31 January 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Australian Magpie	1
Description of Incident	Employee noted a deceased Australian Magpie on the 60 kph bend of outgoing bitumen access road lane. Carcass Collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Injuries consistent with vehicle contact during flight path misadventure.	
Date/Time of Incident	**7 February 2012**	
Location	Bitumen access road, Mining Lease.	1
Species and number of individuals	Brown Snake	
Description of Incident	Employee entering site noted a deceased Brown Snake on inbound lane of bitumen access road opposite. Env Manager ccollected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Injuries consistent with vehicle contact. Travel path error	
Date/Time of Incident	**16 February 2012**	
Location	Western Haul Rd	
Species and number of individuals	Brown Snake	1
Description of Incident	Grader Operator noted a Brown Snake had been run over on the Western Haul Rd. Snake was bagged and dropped off to Env Office to be transported to Vet Clinic.	
Outcome	Injuries consistent with vehicle contact.	
Date/Time of Incident	**23 February 2012 15:30hrs**	
Location	Blow Clear road	
Species and number of individuals	Kangaroo	1
Description of Incident	Employee driving to site from West Wyalong unable to avoid collision with a large male Kangaroo. Kangaroo dispatched off road by driver with WIRES Authority.	
Outcome	Injuries consistent with vehicle contact.	
Date/Time of Incident	**29 February 2012**	
Location	Mining Offices.	
Species and number of individuals	Stubble Quail	1
Description of Incident	Bird found deceased near building where it had earlier been reported as scurrying about under walkway and between Mining offices. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Injuries consistent with impact during flight	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**6 March 2012**	
Location	Bitumen access road, Mining Lease.	
Species and number of individuals	Blue-bellied Black Snake	1
Description of Incident	Deceased Blue-bellied Black Snake noted on bitumen access road. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Cause of death was most likely from motor vehicle contact	
Date/Time of Incident	**7 March 2012**	
Location	Exploration gravel Road at Lake Protection Bund (LPB)	
Species and number of individuals	Myall (Curl) Snake	1
Description of Incident	Deceased Myall (Curl) Snake reported on Exploration gravel road at LPB. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Cause of death was most likely from motor vehicle contact. Snake suffered spinal damage and probable evisceration of the mid body	
Date/Time of Incident	**8 March 2012**	
Location	Bend of bitumen access road	
Species and number of individuals	Blue-bellied Black snake	1
Description of Incident	Deceased Blue-bellied Black snake noted on bend of bitumen access road. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Injuries were consistent with motor vehicle trauma. Completely eviscerated body and crushed head.	
Date/Time of Incident	**8 March 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Blue-tongued Lizard	1
Description of Incident	A lizard was reported as dead on bitumen access road. Env Manager transported animal immediately to Vet Clinic to be euthanized.	
Outcome	Cause of death was most likely from motor vehicle contact.	
Date/Time of Incident	**9 March 2012**	
Location	Mining haul road	
Species and number of individuals	Brown Snake	1
Description of Incident	Deceased Brown Snake found on mining haulage road.	
Outcome	Injuries were consistent with motor vehicle trauma. Snake was completely squashed with multiple areas of broken skin	
Date/Time of Incident	**12 March 2012**	
Location	Process Plant (Falcon gravity gold separator security enclosure)	
Species and number of individuals	Stubble Quail	1
Description of Incident	Deceased Stubble Quail found trapped inside Falcon gravity gold separator security enclosure during routine maintenance. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Snake had suffered desiccation	
Date/Time of Incident	**16 March 2012**	
Location	East end of Western Haul Road near entrance to ROM Skyway.	
Species and number of individuals	Brown Snake	1
Description of Incident	Brown Snake noted by Haul Truck driver as crushed on east end of Western Haul Road near entrance to ROM Skyway.	
Outcome	Road traffic impact by misadventure travel path of snake	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**22 March 2012**	
Location	Perimeter fence	
Species and number of individuals	Richard's Pipit	1
Description of Incident	An Env employee noted a deceased bird that had become caught in the fence during a weekly boundary inspection. The bird had impaled itself on the barb in the barbed wire fence. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Evidence suggests an accidental injury resulting in death. The injuries were consistent with impact during flight	
Date/Time of Incident	**29 March 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Bearded Dragon	1
Description of Incident	Deceased Bearded Dragon noted on bitumen access road	
Outcome	Injuries were consistent with vehicle trauma	
Date/Time of Incident	**29 March 2012**	
Location	Lake Protection Bund (LPB) on gravel road	
Species and number of individuals	Bearded Dragon	1
Description of Incident	A deceased lizard was found in the dusty gravel road of LPB adjacent Pond D4. .	
Outcome	Injuries were consistent with vehicle trauma	
Date/Time of Incident	**3 April 2012**	
Location	Exploration front gate	
Species and number of individuals	Australian Magpie	1
Description of Incident	An Env Graduate noted a deceased bird at the front gate of exploration. In-flight impact was suspected.	
Outcome	Injuries consistent with impact during flight	
Date/Time of Incident	**11 April 2012**	
Location	Roadside between Gate 15 towards Gate 14	
Species and number of individuals	Emu	1
Description of Incident	Emu ran in front of vehicle from under tree on the roadside. A subsequent impact occurred whilst travelling at 60kph.	
Outcome	Injuries were consistent with vehicular impact.	
Date/Time of Incident	**13 April 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Australian Magpie	1
Description of Incident	An Australian Magpie was caught in the front grill of a B-Double road train on arrival to site. Upon rescuing the magpie from the vehicle grill the bird was noted as conscious, however extremely lethargic and disorientated. The magpie died on delivery to West Wyalong Vet.	
Outcome	Injuries were consistent with vehicle trauma. The bird suffered severe haemorrhaging and a potentially broken wing.	
Date/Time of Incident	**18 April 2012**	
Location	E42 southern pit ramp	
Species and number of individuals	Emu	1
Description of Incident	Emu struck down by vehicle and pelvis broken whilst wandering in a group with parent father.	
Outcome	Injuries were consistent with vehicle trauma.	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**19 April 2012**	
Location	Bulk oil area	
Species and number of individuals	Brown Goshawk	1
Description of Incident	One bird was found deceased on the road near the bulk oil area. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	The bird was compressed, eviscerated and had multiple wing, leg and skull fractures. These injuries were consistent with motor vehicle trauma.	
Date/Time of Incident	**25 April 2012**	
Location	Mining haul road	
Species and number of individuals	Hoary-headed Grebe	1
Description of Incident	Operator collected bird from haul road overnight and delivered to ERO. Animal died in care and sent to West Wyalong Vet for autopsy on 26/4/12.	
Outcome	Injuries were consistent with vehicle trauma.	
Date/Time of Incident	**13 April 2012**	
Location	Orica depot straw bale stockpile	
Species and number of individuals	Blue-bellied Black snake	1
Description of Incident	Deceased Blue-bellied Black Snake was noted on bench of straw bales stockpile after movement of bale by tractor. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Injuries were consistent with heavy object falling on the snake or being run over by a light vehicle	
Date/Time of Incident	**28 May 2012**	
Location	Elution oil heater bund	
Species and number of individuals	Spotted marsh frog	1
Description of Incident	Frog found deceased in the elution oil heater bund. A small amount of water was present in the bund from recent rainfall. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Travel path misadventure	
Date/Time of Incident	**29 May 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Grey Kangaroo	1
Description of Incident	LV impact with mid-sized female Kangaroo when leaving site on bitumen access road. Pouch checked and was clear. Body immediately disposed of off ML1535 at 'Hillgrove' forest.	
Outcome	Injuries were consistent with vehicle trauma.	
Date/Time of Incident	**24 June 2012**	
Location	Between flotation Tanks 7 and 8	
Species and number of individuals	Nankeen Kestrel	1
Description of Incident	Employee noted a desiccated, deceased bird in a ledge between flotation Tanks 7 and 8. Shift Supervisor presented the carcass to the Env Manager. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Unknown. Likely flight misadventure	
Date/Time of Incident	**17 July 2012**	
Location	Southern Tailings Storage Facility (STSF)	
Species and number of individuals	Black-shouldered kite	1
Description of Incident	Employee reported deceased bird on edge of busy earthworks construction ramp at 4th lift STSF.	
Outcome	Unknown. Likely natural causes attributed to cold temperature and lack of food (mice) and/or secondary kill from Talon XP control baiting	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**20 May 2012**	
Location	Elution oil heater bund	
Species and number of individuals	Spotted marsh frog	Species and number of individuals
Description of Incident	A spotted marsh frog was found deceased in the elution heater bund. A small volume of water was present in the bund from recent rainfall. The frog had been there for some period of time, so a vet examination was not possible.	
Outcome	Unsuitable environment in bund for travelling frog	
Date/Time of Incident	**24 July 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Buff-banded Rail	1
Description of Incident	Employee noted deceased bird in the outgoing lane when leaving site after 5 o'clock traffic run.	
Outcome	Flight misadventure with injuries consistent with vehicle trauma.	
Date/Time of Incident	**5 August 2012**	
Location	Heavy vehicle filter yard	
Species and number of individuals	Black Cormant	1
Description of Incident	A small bird entered the HV filter yard (#1) and touched two insulators, electrocuting itself and dropping the power out to the processing plant.	
Outcome	Travel path misadventure lead to cause of death.	
Date/Time of Incident	**15 August 2012**	
Location	Access ramp below Primary Crusher.	
Species and number of individuals	Juvenile Hoary-headed Grebe	1
Description of Incident	Patrolling Process Plant Shift Supervisor noted a dead bird on access ramp corner below Primary Crusher. The bird was dorso-ventrally compressed and had been decapitated (head found with the body)	
Outcome	Injuries were consistent with vehicle trauma.	
Date/Time of Incident	**23 August 2012**	
Location	Process leach tanks	
Species and number of individuals	Hoary-headed Grebe, Swallow	1 each
Description of Incident	Process employee found two decapitated birds on top of leach tanks during routine sampling patrol. Birds were bagged and taken to West Wyalong Vet Clinic by Env Manager.	
Outcome	Flight path misadventure	
Date/Time of Incident	**24 August 2012**	
Location	Process leach tank adjacent top of Reagent Kiln	
Species and number of individuals	Stubble Quails	2
Description of Incident	Two headless birds were found on Leach tank adjacent top of Reagent Kiln. Carcasses were collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Initial injuries were consistent with impact trauma	
Date/Time of Incident	**28 August 2012**	
Location	Top barbed wire of Gate 3	
Species and number of individuals	Southern Boobook Owl	1
Description of Incident	Deceased, desiccated, headless Southern Boobook Owl found hanging, headless by wings entangled in the top barbed wire of Gate 3 boundary fence.	
Outcome	Injuries are consistent with being entrapped in fence and predation. In flight error at night time was the most likely cause.	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**29 August 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Kangaroo	1
Description of Incident	Environmental staff member noted a deceased kangaroo on the side of the access road when driving to work; kangaroo appears to have been hit during the night. The carcass was taken to West Wyalong Vet Clinic for autopsy.	
Outcome	Injuries were consistent with vehicle trauma.	
Date/Time of Incident	**29 August 2012**	
Location	Lake Cowal shoreline near boat ramp	
Species and number of individuals	Eurasian Coot	1
Description of Incident	A bird was found deceased on the edge of the lake near the boat ramp. The bird was nearly completely eaten by crows and was bagged and taken to vet.	
Outcome	It was not possible to determine the root cause of death as the carcass had been greatly predated	
Date/Time of Incident	**29 August 2012**	
Location	Mine Maintenance Shed floor	
Species and number of individuals	Juvenile Welcome Swallow	1
Description of Incident	The site storeman noted a deceased bird to the Environmental Department. The bird was located in the Mine Maintenance Shed floor. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Post mortem revealed no significant injuries; however impact such as falling from a nest was determined to be a cause of death to for a bird of this size.	
Date/Time of Incident	**4 September 2012**	
Location	Boart Longyear Compound.	
Species and number of individuals	Myall Curl Snake	1
Description of Incident	Employee noted a small snake in gravel pile whilst spreading gravel at Boart Longyear Compound. Env Officer given approval to euthanize under WIRES Authority due to eviscerated body and unlikely rehabilitation success.	
Outcome	Injuries were consistent with vehicle trauma.	
Date/Time of Incident	**5 September 2012**	
Location	Process reclaim tunnel	
Species and number of individuals	Little Black Cormant	1
Description of Incident	Environmental staff member noted a deceased bird in the reclaim tunnel. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	The neck of the bird was fractured which most likely occurred during flight	
Date/Time of Incident	**19 September 2012**	
Location	Processing Plant kiln chimney	
Species and number of individuals	Stubble Quails	2
Description of Incident	An employee noted two deceased birds at the kiln chimney in the processing plant. The Carcasses were collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Birds suspected to have been either preyed upon died of natural causes.	
Date/Time of Incident	**21 September 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Bearded Dragon	1
Description of Incident	An employee noted a deceased lizard on bitumen access road. The carcass was taken immediately to Vet Clinic en route to town	
Outcome	Injuries were consistent with vehicle trauma.	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**2 October 2012**	
Location	Front Gate of bitumen access road, Mining Lease	
Species and number of individuals	Hoary-headed Grebe	1
Description of Incident	An employee noted a deceased Hoary Headed Grebe located on the front access road near the front gate. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Suspect death of flight misadventure	
Date/Time of Incident	**8 October 2012**	
Location	Cattle Grid of bitumen access road, Mining Lease.	
Species and number of individuals	Bearded Dragon	1
Description of Incident	Employees in vehicle noted a deceased lizard fairly close to site entry at Cattle Grid / Flag posts area in inbound lane of bitumen access road. Env Manager bagged as leaving site not long after and took to the carcass to the Vet Clinic for reporting.	
Outcome	Crushing injuries were consistent with motor vehicle trauma	
Date/Time of Incident	**9 October 2012**	
Location	Processing surface pond D6	
Species and number of individuals	Silver Gull	1
Description of Incident	An employee noted a sick bird during a routine patrol of operations. Environmental crew immediately dispatched to rescue. The bird was delivered to West Wyalong Vet Clinic and cared for.	
Outcome	Harmful pathogens during drier spell in weather the most likely cause. The bird was provided with antibiotics and 46 grams of fresh Atlantic salmon and home care rest.	
Date/Time of Incident	**9 October 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Bearded Dragon	1
Description of Incident	Employee noted a deceased lizard on the inbound bitumen lane near start of site access road (50 m down from cattle grid and flag poles).	
Outcome	Crushing injuries are consistent with vehicle impact	
Date/Time of Incident	**10 October 2012**	
Location	Site Haul Road	
Species and number of individuals	Juvenile Brown Snake	1
Description of Incident	Employee noted deceased lizard on a site Haul Road. ERO collected body in bag and delivered to Environmental handover at start of day Shift. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Crushing injuries are consistent with vehicle impact	
Date/Time of Incident	**10 October 2012**	
Location	Site Haul Road	
Species and number of individuals	Blue-bellied Black Snake	1
Description of Incident	Haul Truck driver noted but unable to avoid running over a Black Snake on Haul Road. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Outcome	The snake was compressed dorso-ventrally with the injury causing death being consistent with trauma by heavy vehicle	
Date/Time of Incident	**12 October 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Australian Raven	1
Description of Incident	A deceased bird was noticed along the bitumen access road. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	The injuries are consistent with motor vehicle impact	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**15 October 2012**	
Location	Tailings Storage Facility Access Road	
Species and number of individuals	Brown Snake	1
Description of Incident	Brown Snake accidentally run over by Cleaning Crew vehicle on gravel TSF access road. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	The injuries are consistent with motor vehicle impact	
Date/Time of Incident	**17 October 2012**	
Location	Outbound lane of bitumen access road, Mining Lease	
Species and number of individuals	Bearded Dragon	1
Description of Incident	An employee noted deceased (cranial crushed), lizard on outbound lane of bitumen access road at first causeway adjacent Pond D9 swamp.	
Outcome	The lizard's head and neck was compressed with crushing injuries being consistent with motor vehicle impact.	
Date/Time of Incident	**23 October 2012**	
Location	Waste dump southern ramp	
Species and number of individuals	Brown Snake	1
Description of Incident	Deceased Brown Snake removed from under Haul Truck travel path at top of waste dump Southern ramp.	
Outcome	The injuries are consistent with motor vehicle impact	
Date/Time of Incident	**23 October 2012**	
Location	Unsealed track road near Exploration Dept.	
Species and number of individuals	Tiger Snake	1
Description of Incident	An employee noted one deceased snake reported on the dirt track toward exploration. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Injury causing death was compression behind head which is consistent with physical trauma	
Date/Time of Incident	**26 October 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Bearded Dragon	1
Description of Incident	An employee noted one deceased lizard on the site access road. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	The lizard was severely macerated with multiple fractures. The injuries are consistent with motor vehicle impact	
Date/Time of Incident	**30 October 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Apostlebird	1
Description of Incident	An employee noted a deceased bird noted on road as entering site. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	The bird had been compressed dorso-ventrally causing multiple fractures along its body. These injuries were consistent with vehicular impact	
Date/Time of Incident	**31 October 2012**	
Location	TSF gravel access track	
Species and number of individuals	Bearded dragon	1
Description of Incident	Deceased Bearded Dragon with cranial crush noted on south verge of TSF gravel access track adjacent to ERT Rescue Shed.	
Outcome	The lizard's body was compressed with serious fractures to the skull and jaw bones. These injuries were consistent with vehicular impact	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**1 November 2012**	
Location	Hydrogen Peroxide sump	
Species and number of individuals	Spotted Marsh frog	9
Description of Incident	Nine deceased (well advanced state of decay) Spotted Marsh frogs were found in Hydrogen Peroxide sump pump pit.	
Outcome	Cause of death unconfirmed	
Date/Time of Incident	**6 November 2012**	
Location	Grassed area adjacent to topsoil stockpile 13.	
Species and number of individuals	Raven	1
Description of Incident	An employee noted a deceased, desiccated, headless bird in dead long grass whilst ripping topsoil stockpile 13 west of the fauna fence of STSF. The Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	It was impossible to determine the cause of death as the bird was extensively desiccated and headless. Most likely died of natural causes	
Date/Time of Incident	**8 November 2012**	
Location	Processing Lab	
Species and number of individuals	Spotted Marsh frog	1
Description of Incident	A deceased frog was located in the Processing Lab. Frog taken to WW vet for autopsy. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy	
Outcome	Perhaps the frog was accidentally trodden on or something fell on it that would result in crushing injuries.	
Date/Time of Incident	**9 November 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Beaded Dragon	1
Description of Incident	Employee noted a deceased Bearded Dragon on the bitumen access road when returning to site. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Outcome	The body had been squashed, tail severed from its body and fractures to the both hind legs. These injuries were consistent with vehicular impact	
Date/Time of Incident	**12 November 2012**	
Location	Lake Protection Bund (LPB)	
Species and number of individuals	Long-necked Turtle	1
Description of Incident	Independent rehabilitation consultants working in LPB noted a large, recently deceased turtle flipped over in drying mud	
Outcome	Natural causes. Later predation	
Date/Time of Incident	**13 November 2012**	
Location	Processing Pond D2	
Species and number of individuals	Brown Snake	1
Description of Incident	Roller driver working in toe of dig wall in floor deepening project at Pond D2 noted a flattened large snake body in the soft clay. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Outcome	The snake was dorso-ventrally compressed and was eviscerated behind the head. These injuries were consistent with vehicular impact.	
Date/Time of Incident	**9 November 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Emu	1
Description of Incident	An employee driving own utility to speed limit witnessed one Emu get struck by another Emu. Bird euthanized promptly under WIRES Riverina Authority	
Outcome	Injuries were consistent with collision involving two Emus	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**22 November 2012**	
Location	Processing Operations	
Species and number of individuals	Legless lizard mortality	1
Description of Incident	An employee noted a small dead legless lizard lying in pieces on the concrete, thought it was a snake and reported it to the Environmental Manager. Env Officer collected lizard, bagged and was transported to Vet less than an hour later for autopsy.	
Outcome	There were several severed areas along the body of the lizard, these probably resulting from being driven over with a motor vehicle.	
Date/Time of Incident	**22 November 2012**	
Location	Processing Operations	
Species and number of individuals	Spotted Marsh Frogs	1
Description of Incident	Five deceased frogs removed from H2O2 sump pump pit during rescue of 200 others of same species in 20 minutes.	
Outcome	Carcasses were collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Date/Time of Incident	**5 December 2012**	
Location	Bitumen access road, Mining Lease	
Species and number of individuals	Australian Magpie	1
Description of Incident	Deceased bird was found on the bitumen access road when Env superintendent was leaving site. Carcass was transported to the West Wyalong Vet Clinic.	
Outcome	The carcass was compressed and had been beheaded. Not possible to determine the cause of death or whether injuries were pre / post mortem	
Date/Time of Incident	**7 December 2012**	
Location	Northern end of the pit on a bench	
Species and number of individuals	Hoary-headed Grebe	1
Description of Incident	Env Officer was out with Geo-Technical Engineer and found Grebe deceased and partially preserved by clay. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Outcome	Unknown	
Date/Time of Incident	**7 December 2012**	
Location	Site Car park	
Species and number of individuals	Major Mitchell's Cockatoo	1
Description of Incident	An employee noted a deceased bird found in the main entry car park to the mine. It is suspected that the bird was caught in a vehicle outside ML 1535 and fell off in the vicinity of the car park.	
Outcome	Injuries were consistent with vehicular impact.	
Date/Time of Incident	**10 December 2012**	
Location	Western Haul Road	
Species and number of individuals	Brown Snake	1
Description of Incident	An employee noted an immobile snake curled up in middle of Western Haul Road between Pond D2 and Orica Depot.	
Outcome	The snake had been run over/skidded on from vehicular impact causing compression of the body.	
Date/Time of Incident	**10 December 2012**	
Location	Toe of the Northern Tailings Storage Facility (NTSF)	
Species and number of individuals	Snake-necked Turtle	1
Description of Incident	An employee noted a deceased turtle near a poly pipe and outside edge of the toe of the NTSF fauna exclusion fence. Exact location was a dried out storm water puddle.	
Outcome	The turtle had been dead for some time. Injuries were consistent with vehicular impact.	

Table 25 (Continued)
Records of Fauna Deaths and Other Incidents for the Reporting Period

Date/Time of Incident	**12 December 2012**	
Location	Processing operations, tails disposal bunded area.	
Species and number of individuals	Myall Curl Snake	1
Description of Incident	Processing Manager noted a small snake on gravel road surface adjacent groundwater monitoring bore pad near Processing Tails Disposal bunded area. Assessed by attending Env Manager as deceased	
Outcome	Multiple eviscerated areas along the compressed body of the snake. Injuries were consistent with vehicular impact.	
Date/Time of Incident	**13 December 2012**	
Location	Admin car park overflow parking area.	
Species and number of individuals	Noisy Miner Bird	1
Description of Incident	A bird was found deceased on the ground in the Admin car park overflow parking area. Likely fallen off a car grill after parking.	
Outcome	Massive haemorrhaging and significant bruising of the pectoral muscles. Injuries were consistent with vehicular impact.	
Date/Time of Incident	**15 December 2012**	
Location	Gravel access road at Primary Crusher hill ramp area.	
Species and number of individuals	Bearded Dragon	1
Description of Incident	Employee noted a deceased lizard on gravel access road at Primary Crusher hill ramp area.	
Outcome	Injuries were consistent with vehicular impact.	
Date/Time of Incident	**16 December 2012**	
Location	E42 Pit South Ramp haul road	
Species and number of individuals	Brown Snake	1
Description of Incident	Employee noted a deceased Snake on E42 Pit South Ramp haul road. Bagged and delivered to Duty ERO to keep cool until Monday morning delivery to Vet Clinic.	
Outcome	Injuries were consistent with vehicular impact.	
Date/Time of Incident	**17 December 2012**	
Location	Windrow floor of Wiradjuri ground clearing area	
Species and number of individuals	Brown Snake	1
Description of Incident	Employee noted rear half of snake in windrow floor of Wiradjuri ground clearing area after dust of working grader cleared. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Outcome	Snake was completely squashed with its head missing and intestinal tract exposed. These injuries are consistent with a heavy machinery impact	
Date/Time of Incident	**22 December 2012**	
Location	Haul road near South Ramp Go-Line of E42 Pit	
Species and number of individuals	Brown Snake	1
Description of Incident	Employee noted a dead snake on the haul road near South Ramp Go-Line of E42 Pit. Carcass was collected, bagged and placed in fridge ready for transport to vet for autopsy.	
Outcome	The snake was completely squashed, consistent with vehicular impact	

Plate 4
A Nankeen Kestrel (*Falco cenchroides*) being bathed after rescue from misadventure flight

Lake Cowal Waterbird Monitoring

Bird breeding monitoring has been conducted at Lake Cowal since 1989. The long-term monitoring of bird breeding was continued by Peter Gell from the University of Ballarat during January, August and October 2012 (potential bird breeding periods) with the results summarised in Table 26.

A summary of Professor Peter Gell's monitoring results from the 2012 reporting period is provided below.

January 2012

The first survey for 2012 was carried out between the 29 and 30 January by Peter Gell and Paul Peake. Transects 1 and 2 were surveyed on the morning of the 29th and transects 7 and 8 on the morning of the 30th. Waterbird breeding surveys were completed on the afternoon of the 29th January. Farm dams remained full and connected directly to the Lake. Surface water levels remained high and the Lake margins were extensively inundated. Surveys were possible for all four transects. A survey for colonial breeding was undertaken by boat and incidental observations were made along transects.

The generally high water levels and trend towards deepening over recent months had stimulated considerable breeding activity. This was not evident in the 2011 October survey which usually marks the beginning of the breeding season so water level trend, and not just water level, continues to be an important trigger for activity. There were many, scattered nests of Australasian Darter – some in early stages of egg laying and others with developed young. Little Black and Little Pied Cormorants were recorded nesting. Several nests of young Royal Spoonbill and Eastern Great Egret were noted. Large numbers of Ibis were observed breeding with evidence ranging from nests with eggs to fledged young. A large number of Glossy Ibis nests were observed with nestlings. Evidence for recent breeding of duck species was widespread.

Table 26
Bird Breeding Monitoring Results for the Reporting Period

Species	2012 Survey Period												Total
	January				August				October				
	T1	T2	T7	T8	T1	T2	T7	T8	T1	T2	T7	T8	
Australian Pelican		1		17		31	1		3	25	10	2	**90**
Australasian Darter	19	28	10	7	2				2	3	2	4	**77**
Pied Cormorant	6			2					1				**9**
Little Pied Cormorant	55	92	32	83	13	1			6		1	4	**287**
Great Cormorant	11	56	2	52	3			1	7				**132**
Little Black Cormorant	78	147	1	34	17			2	2	1		4	**286**
Hoary-headed Grebe	749	163	94	92	412	314	31	24	58	5	2		**1944**
Australasian Grebe	279	155	79	32	35	4	5			1			**590**
Black Swan		1											**1**
Australian Shelduck						2							**2**
Pacific Black Duck	20	19	38	23	48	6	65	22	15	11	23	4	**294**
Grey Teal	163	79	231	136	72	23	315	80	92	26	112	83	**1412**
Chestnut Teal	3												**3**
Australasian Shoveler			6										**6**
Pink-eared Duck	16		16					3					**35**
Hardhead	28	49	1		63				1				**142**
Australian Selduck									9				**9**
Australian Wood Duck	4		21	49	16	23	34	80	32	42	48	80	**429**
Musk Duck			1	1					1				**2**
Buff-banded Rail				1									**1**
Black-tailed Native hen	1		37			4	95	1	3	1	105	1	**248**
Dusky Moorhen	9	9	3		8	5	10		4		1		**49**
Purple Swamphen	11		4						1				**16**
Eurasian Coot	128	268	156	118	178	168	318	219	42	105	154	169	**2023**
Eastern Great Egret		101	6	40	5	1	4	2	1		1	3	**164**
Intermediate Egret					2		1						**3**
White-necked Heron	10	15	1	5	1	1	2	2					**37**
White-faced Heron	1	4	3	5	4	3	4	1	1	4	1	4	**35**
Roufous Night Heron								14					**14**
Nankeen Night-Heron	4												**4**
Glossy Ibis		1	2	1									**4**
Australian White Ibis	14	4	8	3	4	2		4				2	**41**
Straw-necked Ibis	6	8	6	2							2	1	**25**
Royal Spoonbill						1				1	4	5	**11**
Yellow-billed Spoonbill						20	1		1		5	2	**29**
Black Necked Stilt									2				**2**
Masked Lapwing		2	2	2	2	1	1	6	2				**18**
Black Fronted Dotterel									1	1			**2**
Silver Gull	6		2	38	1	4		6				1	**58**
Whiskered Tern	54	1	37	2		184			112	50	1	2	**443**
Gull-billed Tern		2											**2**
Total	**1675**	**1205**	**799**	**745**	**886**	**796**	**897**	**449**	**419**	**276**	**475**	**371**	**8977**
Total Species	**24**	**22**	**26**	**23**	**19**	**19**	**20**	**14**	**27**	**14**	**18**	**17**	**40**

A total of 33 species (cf 34 in October 2011) were observed along transects, totalling 4424 (cf 7656) birds. The most common species observed remained Hoary-headed Grebe (1098 cf 231), Pacific Black Duck (100 cf 510), Grey Teal (609 cf 1341), Eurasian Coot (670 cf 3356) but large numbers of Little Black Cormorant (260 cf 192), Australasian Grebe (545 cf 284) were also noted during this survey. The numbers of Eastern Great Egret increased, while the numbers of Hardhead (78 cf 418), Whiskered Tern (94 cf 396) and Australian Wood Duck (74 cf 230) had declined since October. The overall numbers of piscivorous species increased with darter and cormorants representing more than 16% of all birds observed.

Surface water remained over the margins of all parts of the lake so that all transects could be surveyed. The surveys of T1, T2, T7 and T8 revealed that Lake Cowal continues to support a high, and increasing, diversity and abundance of waterbirds, particularly waterfowl and waterhens. The number of fish-eating species increased substantially from October particularly cormorants and darter and the Eastern Great Egret. The numbers of Ibis on transects remained low although skeins were seen flying to and from the northern breeding areas. They were found to be breeding in large numbers, as were egrets and spoonbill.

Breeding is usually well underway in October, but a slight decline in water level appeared to inhibit activity in the last survey. Recent rainfall provided the trigger to breeding in January even though water levels were not much higher that the October survey. This reinforces previous observations that the trend in water level is as important as the level itself when explaining variations in breeding activity. (Gell, 2012a).

August 2012

Lake Cowal was visited on August 6th and 7th. Owing to high winds, all four transects were surveyed on the 6th. A survey of breeding activity was made on the morning of the 7th from a high vantage point to the north-west of the Lake and incidental observations of breeding activity were made along transects. While recent rainfall was not unusual farm dams remained full and connected directly to the Lake. Surface water levels were higher than the previous survey and the Lake margins were extensively inundated. There was considerable flooding of local farmland, including Lake Nerang Cowal, and these shallow waters carried large and diverse populations of waterbirds.

There was no evidence of breeding activity in the areas where colonial nesting typically occurs. Also, no observations of breeding activity were made during the transect surveys

A total of 28 species (cf 33 in January 2012) were observed along transects, totalling 3028 individuals, well down on previous surveys. The most common species observed remained Hoary-headed Grebe (781 cf 1098), Pacific Black Duck (141 cf 100), Grey Teal (490 cf 609), Eurasian Coot (883 cf 670). Numbers of Little Black Cormorant (19 cf 260), Australasian Grebe (44 cf 545) were well down on the January 2012 survey. A large number of Black-tailed Native-hen were observed on transect 7.

Recent rainfall and low winter temperatures ensured the level of Lake Cowal was higher than the previous summer. The deep waters ensured that all transects could be surveyed. The greater depth however, limited the extent of shallows around the margins of the lake. This, coupled with extensive flooding of neighbouring farmland, and Lake Nerang Cowal, meant that waters other than the margin of Lake Cowal were attractive to waterbirds, particular waders. So, the transects supported species that favour deeper water, such as Eurasian Coot and grebes, rather than waders such as spoonbill and egrets.

Colonial breeding typically does not commence in August and again this proved the case. Being the first week of August, it also seemed too early to observe ducklings or cygnets. However, with such high water levels, it is likely that activity will be high in October, provided average rainfall is received. (Gell, 2012b).

October 2012

The final survey Lake Cowal was visited on October 29th and 30th, 2012. A survey of breeding activity was made on the afternoon of the 29th. Recent rainfall was low and so the lake level had declined. Even so, farm dams remained full and connected directly to the Lake and extensive areas of shallow waters existed around the lake margins. There was much less surface water across the surrounding hinterland yet Lake Nerang Cowal remained covered with water.

There was no evidence of breeding activity in the areas where colonial nesting typically occurs. Also, few observations of breeding activity were made during the transect surveys. Four pairs of Australian Wood Duck were seen with ten (transect 1), one (transect 7), and five and six ducklings (transect 8) respectively. Also an adult Pacific Black Duck was seen with three ducklings.

A total of 31species (cf 28 in August 2012) were observed along transects, totalling 1541 birds, well down on the 3028 individuals observed in August, itself well down on previous surveys. The most common species observed remained Hoary-headed Grebe (65 cf 781), Pacific Black Duck (53 cf 141), Grey Teal (313 cf 490) and Eurasian Coot (470 cf 883). The numbers of Australian Wood Duck were high (202) and were evenly spread across transects. A large number of Black-tailed Native-hen was again observed on transect 7.

While the numbers of Australian Pelican continued to increase the numbers of fish-eating birds (e.g. cormorants and darter) remains relatively low, although Whiskered Tern were well represented along the transects on the western side of the lake.

Recent climatic conditions were very dry and so the level of Lake Cowal had fallen since the August survey. Despite this the lake waters were deep enough for all transects to be surveyed. The reduced depth increased the extent of shallows around the margins of the lake. The reduced water covering farmland across the region resulted in Lake Cowal being the main habitat for waterbirds. So, while the transects supported species that favour deeper water, such as Eurasian Coot and grebes, more waders were recorded than in the august survey.

By far the greatest diversity of birds was recorded on the mine site transect (T1). The species recorded around the bund wall were similar to those found on the other transects. Many of the other species were recorded from the sanctuary to the south of the mine attesting to the value of this reserve in supporting waterbird populations.

Colonial breeding typically commences by October each year. However, there was no evidence of colonial nesting, and limited evidence of any waterbird breeding activity. So, while the high water levels brought an expectation of extensive breeding, the fall in water level appeared sufficient to inhibit activity. The direction of water level change remains a critical predictor of colonial breeding activity.

Plate 5
Yellow-billed Spoonbill on flooded road, Nerang Cowal (August 2012)

Fauna monitoring of tailings storages and ML 1535 boundary

Both the southern TSF and the northern TSF were active during the course of the reporting period. The STSF was active till March 11 2012 and then the NTSF became active. The STSF was decommissioned for most of 2012 for annual upstream lift project work, including a 3 metre rise in wall height and associated decant road works. Fauna monitoring of the tailings storages was initiated at the time of commissioning of the facilities with the twice daily fauna inspections as described in Paragraph 3.8.3.1.

Donato Environmental Services (DES) conducted a refresher training course on 29 March 2012 for the CGM mill technicians that are responsible for conducting wildlife surveys. The CGM personnel were presented with information on field survey techniques and systematic procedures for reporting observations into field data sheets. Training also included in-field observations of wildlife at NTSF and a wildlife guild identification test. Training is planned for May 2013.

Additional to the fauna observation monitoring, bat monitoring using Anabat detectors were undertaken every evening each month during the reporting period at the active tailings facility and also at the Control site (dam at Hillgrove residence).

Data collected from the monitoring is stored in a database, with the information being used to assess the seasonal usage of the tailings dam, the effectiveness of hazing/deterrent techniques and to record any effects that the tailings may be having on native fauna.

Three reports were prepared by Donato Environmental Services during the reporting period, 01 October 2011 to 31 March 2012, 01 April 2012 to 30 September 2012 and 01 October 2012 to 31 March 2013, respectively. The main findings of the reports included:

- The cyanide discharge concentrations were below those established as a condition of operations.
- Monitoring of cyanide concentrations within the active TSF and other water bodies has been conducted frequently and at a high standard consistent with industry best practice.
- No cyanide-related wildlife mortality or effect was recorded.
- Considering currently accepted knowledge of cyanide toxicoses in the gold industry, the range of concentrations reported at CGM are considered benign to wildlife.
- No evidence suggests that insectivorous bats have been subject to incident or effect at CGM TSFs during the reporting period.
- Nocturnal surveys indicate that insectivorous bats were consistently present in the airspace above the active TSF and the control site.
- Monthly nocturnal surveying conducted at CGM represents a proactive approach to environmental monitoring and it is clearly best practice methodology employed by a gold mining operation in Australia and internationally.
- Birds were the only diurnal vertebrate wildlife recorded to visit and interact with the active TSF.
- The low cyanide concentrations recorded at the active TSF significantly reduced the risk of cyanide toxicosis to avifauna.
- The frequency of systematic wildlife surveys makes it very unlikely that cyanide-related wildlife deaths were occurring and not detected.
- Rainfall patterns were not the sole influence on wildlife patterns during the reporting period.
- The drying and filling phases of Lake Cowal has been a significant influence on bird visitations to the TSF.

Six-monthly monitoring reports on fauna usage of the TSFs will be continued and results included in future AEMRs.

Hazing techniques were employed during the reporting period at the tailings facilities. The following different methods are utilised to deter different bird species:

- one to two radar lobe systems that detect avifauna presence at the tailings facilities;
- up to six bird deterrent stations, activated remotely by either the radar or timer mode which broadcast bird distress calls, barking dogs, gun shots etc.;
- one to two gas cannons linked to the radar or timer-mode control station/s;
- car horns; and
- human presence.

These hazing techniques will continue to be used and monitored over the next reporting period, with new methods trialled if required.

The management measures as described in the TSMP (Barrick, 2003h) were implemented during the reporting period. Weekly visual inspections of the ML 1535 boundary fence were conducted and fence maintenance completed as necessary.

3.8.4 Reportable Incidents

In accordance with Development Consent Condition 3.4(a)(ii), any deaths or other incidents involving native fauna (except those attributable to physical trauma such as vehicle strike) on ML 1535 have been reported to the DTIRIS (DRE) and the EPA within 24 hours (or the next working day), and to the CEMCC as soon as practicable. All deaths or other incidents attributable to physical trauma are summarised in this report. The CEMCC requested at the meeting in December 2006 that in future they would like a summary of native fauna deaths to be provided on a quarterly basis at each meeting, rather than individual letters for each incident.

A summary of the reported native fauna deaths that occurred on ML 1535 in 2012 is provided in Table 25. Incident reports and investigations are undertaken for all native fauna deaths occurring on ML 1535 and are recorded on a site data base.

There were no alterations to any threatened fauna species reporting requirements during the reporting period.

No complaints were received relating to threatened fauna at the CGM during the reporting period.

3.8.5 Further Improvements

On-going annual training of Emergency Response and Security staff including any interested WIRES rescuers and carers from West Wyalong, will occur as required in the next reporting period. This will maintain or increase the number of staff on-site that can respond to native fauna incidents.

Further improvements in best practice avifauna deterrence will be investigated and implemented as new methods become available.

Approximately 50 mammal and bat boxes are already in position at ‘Lakeside’ and ‘Hillgrove’ and, a further 10 boxes are located on ML 1535 in the fenced forest areas. Usage of these boxes by possums, spiders, bats, galahs and other birds was observed during checks throughout 2012. A further $4,000 of nesting boxes were manufactured locally and were to be installed by elevated work platform during 2012. Due to wet conditions these habitat boxes have been stored at the LCCC and shall be installed when safer to do so.

“Beep for Birds” warning signs were installed along the bitumen access roads to the CGM in October 2010. The signs are intended to reduce the number of bird deaths on ML 1535 due to the increased number of birds in the vicinity of the ML as a result of the wet conditions experienced since mid-2010. Bird deaths on the bitumen access road of the ML remain lower than prior since the installation of the eight road signs.

Approximately 440 mouse bait stations have been placed in and around all buildings and perimeter fences on the mining lease and Barrick-owned properties around Lake Cowal due to the mouse population increasing to plaque proportions in early-2011. Rentokil, Albury staff are contracted to restock bait stations on a fortnightly basis.

3.9 WEEDS AND PESTS

3.9.1 Reporting Requirements

3.9.1.1 Development Consent

The Land Management Plan (**LMP**) (Barrick, 2003j) was prepared in accordance with Development Consent Condition 3.10(A)(i) to provide for proper land management for all of Barrick's landholdings including the control of noxious weeds as required by the Lachlan Livestock Health and Pest Authority (**LHPA**), Bland Shire Council (**BSC**) and DTIRIS (DRE). In accordance with Development Consent Condition 3.6(d)(iv) the ROMP is also required to describe measures for controlling weeds and feral pests (including both terrestrial and aquatic species) within ML 1535 and the offset areas.

In accordance with the LMP (Barrick, 2003j) and the ROMP (Barrick, 2010), general weed and pest management activities within ML 1535 and the offset areas will be reported in the AEMR. As a component of the AEMR reporting, the weed control program will be assessed for performance annually, and amended where necessary (e.g. to implement new control measures as advised by BSC or DPI [Agriculture]). Any proposed significant amendments to weed monitoring and management will be discussed with BSC.

3.9.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.9.1.3 Any Other Reporting Requirement

There are no other relevant reporting requirements from other approvals in relation to weeds for the reporting period.

3.9.2 Environmental Management

3.9.2.1 Control Strategies

In accordance with the LMP and ROMP, the control strategies for weed management on Barrick-owned land (including the offset areas) include 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;
- where practicable, prevention of the establishment of new weeds on Barrick-owned land by minimising seed transport of weed species to and from the CGM through the use of a vehicle wash bay (primarily for use on agricultural and earthmoving equipment that are likely to carry weed seeds); 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 and the offset areas described in the LMP and the ROMP include the following measures:

- regular property inspections to assess the status of pest populations within Barrick-owned land;
- mandatory pest control for declared pests (i.e. rabbits, pigs and wild dogs) in accordance with Pest Control Orders under the *Rural Lands Protection Act, 1998*; and
- inspections to assess the effectiveness of control measures implemented and review these if necessary.

Barrick undertakes pest control activities in conjunction with adjacent landholders for more effective pest control. This process is facilitated via consultation with local landholders and landholder groups through the CEMCC process.

The *Threat Abatement Plan for Predation by Feral Cats* (Commonwealth Department of the Environment, Water, Heritage and the Arts [**DEWHA**], 2008a) and the *Model Code of Practice for the Humane Control of Feral Cats* (Sharp and Saunders, 2004) will be used as a guide for the humane control of feral cats within ML 1535. The *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008b) will be used to guide fox control within ML 1535.

In accordance with the LMP and ROMP, the control strategies for pest management on Barrick-owned land (including the offset areas) include those in Table 27.

Table 27
Summary of Vertebrate Pest Control Measures

Species	Status	Method of Control[2]
[1]European Rabbit (*Oryctolagus cuniculus*)	Declared pest	• baiting rabbits with 1080 and pindone poisoned carrot; and • ripping of rabbit warrens.
[1]European Red Fox (*Vulpes vulpes*)	Nuisance animal	• fox baiting; and • implementing a shooting programme.
[1]Feral Cat (*Felis catus*)	Nuisance animal	• feral cat baiting and Veterinarian euthanasure via WIRES.
Feral Pig	Declared pest	• feral pig trapping.
Wild Dog	Declared pest	• wild dog trapping; • wild dog baiting with 1080; and/or • implementing a shooting programme.

Source: ROMP (Barrick, 2010)

1 Recorded in the surrounding area by Cenwest Environmental Services (2009).

2 NSW Livestock Health and Pest Authority (2010).

Suitable pest controls are determined in consultation with surrounding landholders, Lachlan LHPA and DTIRIS (DRE) prior to implementation of the pest control programme on Barrick-owned land. This assists in integrating the controls implemented on Barrick-owned land with other pest control in the local area/region.

3.9.2.2 Effectiveness of Control Strategies

The implementation of control strategies adequately suppressed the spread of noxious weeds and pests during the reporting period within ML 1535 and on Barrick-owned land. Fox baiting did occur during the monitoring period when weather prevailed. Follow-up site inspections found that no problem existed. Semi-formal pest threat level dialogue was maintained with Lachlan LHPA staff during the prior and current monitoring period for the observed presence of mice, foxes and locusts around Lake Cowal.

3.9.2.3 Variations from Proposed Control Strategies

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

During the previous reporting period, Cenwest Environmental Services was consulted in the matter of continued unwelcome nuisance numbers of Welcome Swallows in the large Mining Maintenance and Processing Warehouse Sheds. Whilst the numbers have not escalated to a significant workplace health concern the numbers continued to be monitored during 2012. A Scary Man bird deterrent unit on the top of the Mining Maintenance Workshop Shed continued to be operated during this reporting period.

Spider spray fogging by local contractors in the same large sheds and around operations has been an effective control since 2010. This will need to continue in order to manage Red-back, Black and Orb spider numbers.

3.9.3 Environmental Performance

3.9.3.1 Monitoring

In accordance with the LMP and the ROMP, Barrick has implemented a weed monitoring program at the CGM. Barrick-owned land including the 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). Follow-up inspections may also be required after control implementation, depending on the weed species and nature of the problem. Weed monitoring is to be conducted by suitably qualified personnel from a slow moving vehicle.

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 landuse practices);
- optimum herbicide application or physical removal timing (for implementation of controls);
- any resistance to a 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 CGM area on vehicles accessing the site and become established near the vehicle wash-down area.

3.9.3.2 Performance Outcome

Weed Management

The 2012 weed survey was undertaken during December 2012 by Carnegie Natives on behalf of Barrick (Cowal) Limited. The survey involved recording the extent of weed occurrences, details of weed distribution and any new weed species infestations. Photographs, general descriptions and GPS coordinates were taken of each of the surveyed areas covering the extent of Barrick-owned land and ML 1535. Weeds of concern, those that are declared noxious in the BSC Local Government Area, and environmental weeds were targeted.

Control methods included chemical boom and spot spraying of the plants when conditions were suitable or their physical removal by manually chipping the weeds out. Weed spraying activities were carried out by a local contractor, with the measures used satisfactorily controlling any outbreaks within the site and on Barrick-owned land.

During 2012, CGM experienced a drier than normal winter-early spring period with monthly rainfall was below the Wyalong Post Office (WPO) monthly average for the months of January, April, May, June, July, August, September and December. February and March were significantly above the average monthly rainfall for WPO, whilst October and November were on average. Late spring and summer plant growth (including weed germination) has been limited by below average rainfall with warm weather and windy conditions combining to reduce germination of annual species and growth of perennial species.

A summary of the monitoring results from the 2012 weed survey report (Carnegie Natives, 2012) is provided below.

Xanthium spinosum (Bathurst Burr) is the most prevalent of the summer weeds typically growing on any disturbed soil, along roadsides, dams and around buildings. Bathurst Burr requires an ongoing control program on the ML, "Lake Cowal" and "Hillgrove" properties. Areas currently requiring particular attention include the 2012 rehabilitation areas of the Northern Tailings Storage Facility and the Permanent Isloation Bund, and the Lake Cowal foreshore on all Barrick Cowal owned land. A close relative, *Xanthium occidentale* (Noogoora Burr) found on the ML along the eastern reach of the Northern Low-Flow channel and along spring Creek on the "Lake Cowal" property appears to be controlled however, monitoring of this species must continue in these areas.

Lycium ferocissimum (African Boxthorn) control on the "Lake Cowal" and "Hillgrove" properties continues to reduce the prevalence of this problematic weed. During 2012 monitoring and follow-up spraying has continued on both properties timely spraying operations in March and September yielding good results. Spraying in these windows also reduces the risk of damage to desirable species due to volatilisation of the most effective chemicals used in control. All areas must continue to be monitored closely, carefully assessing kill rates due to the persistent nature of this pest. Some recruitment present on the southern wall of the Permanent Isolation Bund and the north-eastern portion of the "Hillgrove" property.

Populations of *Onopordum sp*. (Scotch Thistle) located on the ML have been reduced significantly in 2012 through strict chemical control which must be maintained as a major part of the Barrick Cowal weed control program. Small pockets of this weed continue to establish in other locations following wind dispersal of seed from this primary site.

Marrubium vulgare (Horehound) continues to be a target weed on the "Hillgrove" property with isolated outbreaks continuing to emerge. Monitoring for this weed must continue at this location.

Hypericum perforatum (St John's Wort) is a persistent problem, particularly at the Lake Cowal Grain Storage Shed and on adjacent Travelling Stock Reserve lands with current control measures containing the infestation to this area. Barrick contractors and staff from Lachlan Livestock, Health and Pest Authority (LHPA) and the Bland Shire Council have been spraying for this weed as part of a concentrated effort to eradicate it in the shorter term.

Sclerolaena birchii (Galvanised Burr) prevalence has been significantly diminished as a result of Barrick's control program and the increase in groundcover due to improved seasonal conditions reducing the opportunity of bare ground for the recruitment of this pioneer species.

Proboscidea louisianica (Purple-Flowered Devil's Claw) is a lesser problem in 2012 on the low-lying moist clay soils of the "Lake Cowal" property. Monitor and control needs to continue. Phyla nodiflora (Lippia) was also observed on this property at the confluence of Spring Creek and Lake Cowal. This weed presents a major concern for Lake Cowal itself as it is a vigorous weed of ephemeral wetlands without truly viable options for control. It is spread via the movement of seed and plant segments in water flows and can be transported on the feet of waterbirds.

Centaurea solstitialis (St. Barnaby's Thistle) continues to persist in the Southern Low-Flow channel running along the southern side of the Mine Access Road from the mine entrance to the first road bend throughout the winter months. This area was sprayed for control and follow-up monitoring of this area is required to ensure eradication. This weed was introduced in straw which was brought in for mulching of bare soils. Future straw mulch purchases need to be restricted to suppliers of weed-free, high quality product preferably from the local area to reduce the potential for import of new weed species.

Other weeds of concern observed during the survey include: *Nicotiana glauca* (Tobacco Bush) at the confluence of Sandy Creek and Lake Cowal; *Conyza bonariensis* (Flax-Leaf Fleabane) is present across the majority of the survey area; *Centaurea melitensis* (Maltese Cockspur) is present on heavy clay soils in gilgai areas; and *Euphorbia sp.* (False Caper) on the roadside verge of Boneham's Lane at Lake Cowal silos.

Pest Management

During 2010, extensive control activities were directed at controlling mice populations. They were not only a visual pest (i.e. infesting work areas) but they also caused a large amount of damage, chewing through many fibre optic and other cables. Initially a small number of Talon bait stations and then Mouse-Off was used to try and control mice in offices and warehouse locations. When the mice number began to increase during daylight hours of business, Rentokil staff from Albury were engaged to promptly install an eventual 440 large bait stations using Talon XP rodentcide mouse baits in conjunction with care in maintaining a clean work environment, throughout the later part of 2010 and throughout 2011 and into 2012.

As a result, regular inspections and maintenance activities have been and will continue to be carried in an ongoing effort to contain the pest mouse populations. Live, large Black Snakes and the occasional Brown Snake have been found inside the bait boxes on multiple inspections.

A feral cat eradication program continued during 2012. Collapsible cat traps with crush end modifications (retrofitted by the West Wyalong TAFE) were purchased during 2009 and were continued to be used during the reporting period on Barrick-owned property. No Feral cats were trapped during the 2012 reporting period although several attempts were made to no avail.

Red Foxes
1080 Fox baiting from 27 June 2011 to end-2011. Baiting resumed May 2012 until November.

During the reporting period there were no alterations to any of the pest management requirements and the work carried out in the past few years has shown a the reduction of weeds and pests on the ML and also on the Barrick owned properties.

3.9.4 Reportable Incidents

The LMP and the ROMP require any incidents regarding weed and pest management to be reported in the AEMR. There were no complaints or incident reports required for weeds or pests.

3.9.5 Further Improvements

Review of fox, mouse and feral cat control programs will continue during the next reporting period on ML 1535 and Barrick-owned land. Rabbit baiting and warren ripping will be undertaken during the next reporting period if required, should populations be observed during regular monitoring programs.

Rentokil, Albury were contracted during the 2012 reporting period to assist Barrick in the control and eradication of pest rodent populations.

Current weed and pest monitoring will continue during the next reporting period as stated in the LMP and ROMP along with weed eradication programs across ML 1535 and Barrick-owned land. The 2010 Lake Cowal fill event has reduced the area required for pest and weed control activities and could potentially concentrate pests onto Barrick owned land and reveal weed species not seen in previous years. Sustained, adaptive response weed and pest control activities will occur during the next monitoring period.

3.10 BLASTING

3.10.1 Reporting Requirements

3.10.1.1 Development Consent

The modification to the CGM Development Consent (approved by the DP&I in March 2010) deleted Development Consent Condition 8.4. A revised BLMP was subsequently submitted to the Director General of the DP&I at the end of July 2010. The BLMP was revised to reflect the EPL variation (granted on 24 June 2011). The DP&I provided review comments in August 2012. The BLMP was revised to address the DP&I's comments and is currently awaiting approval.
The reporting of blasting monitoring is required by Development Consent Condition 6.3(b)(iii), which states:

> *(iii) ensure that blast monitoring data is assessed regularly, and that operations are relocated, modified and/or stopped as required to ensure compliance with the relevant blast criteria;*

The revised BLMP (Barrick, 2012) for the CGM requires that the AEMR reports on the following blasting related issues:

- a summary of all blast monitoring results;
- measures employed to minimise/prevent excessive blast emissions;
- blasting related complaints and amelioration measures undertaken in the event of any confirmed exceedances of blast criteria;
- review of the performance of blast control measures and the monitoring program by a suitably qualified person; and
- CEMCC decisions relating to CGM blast issues.

3.10.1.2 Environment Protection Licence

The EPL requires Barrick to undertake blast monitoring at the points identified in Licence Condition M7.

Condition R1 of the EPL requires the completion of an Annual Return comprising of a Statement of Compliance and a Monitoring and Complaints Summary at the end of each annual reporting period (i.e. the AER). Barrick submitted the Annual Return for the period 23 December 2011 to 22 December 2012 to the EPA on 21 February 2013. Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident. Condition R4.2 of the EPL requires Barrick to report any exceedances of the EPL blasting limits to the regional office of the EPA as soon as practicable after the exceedance becomes known.

Condition R4 of the EPL requires the results of the blast monitoring required by condition M7.1 to be submitted to the EPA at the end of the reporting period. Barrick has reviewed and submitted the 2012 Review of Blast Monitoring Results, prepared by Saros (Australia) Pty Ltd (**Saros**), to the EPA on 28 February 2013.

Further, on 24 June 2011, a variation of the EPL was issued to Barrick, which amongst other things, amended the blasting limits and blast monitoring locations consistent with the approved E42 Modified Request. A description of the varied EPL is provided in this AEMR (see Paragraph 1.1.2).

3.10.1.3 Any Other Relevant Approval

There are no other relevant reporting requirements from approvals in relation to blasting for the reporting period.

3.10.2 Environmental Management

In accordance with Development Consent Condition 6.3(a) & (b), the revised BLMP and EPL Conditions L7 and M7, six blast monitors were installed at designated locations around the operation to record ground vibration and airblast overpressure. In addition, a 'control' monitor is installed at BM07, located at the main administration building.

3.10.2.1 Control Strategies

In accordance with Development Consent Condition 6.3(a) & (b), the revised BLMP and EPL Condition M7, airblast overpressure and ground vibration levels must be measured at nearby residences BM01, BM02 and BM03, at bird breeding areas BM04 and BM05 and at the general monitoring site BM06. Figure 8 shows the locations of the monitors at distances of approximately 4.5 to 9 km from the open pit.

Monitoring units located in areas that have the potential to flood have been customised so that ground vibration sensors are waterproof and airblast overpressure sensors are above the high water mark (and remained so during the 2012 monitoring period). During early 2012, another series of rainfall events occurred which resulted in a further rise of the Lake Cowal water level and inundation of three blast monitors situated in Lake Cowal. Further improvements to the monitoring technology and height of the loggers are expected during the next reporting period.

Communication with the remote units is conducted via battery powered GSM modem fitted and recharged via solar panel. The units send data to Saros, Brisbane. All field monitoring stations are removed annually for independent off-site maintenance and calibration. Barrick typically removes the units in early February and a Saros representative re-installs them in the field in early March. A hired roving unit is maintained on-site during that time.

In accordance with the revised 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 airblast 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.

3.10.2.2 Effectiveness of Control Strategies

The implementation of control strategies resulted in compliance with blasting compliance limits during the reporting period. Seventeen complaints were received during the reporting period relating to blasting. Details of the complaints are provided in Paragraph 4.1.

3.10.2.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies.

3.10.3 Environmental Performance

Given the updated licence conditions, monitoring data is now divided into *'residence on privately owned land'* and *'specified sensitive locations'.* Monitoring locations BM01 (Gumbelah) and BM03 (Coniston) 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 28).. All other monitoring locations are referred to as '*specified sensitive locations'*, with limits described in the BLMP.

Table 28
Blasting Impact Assessment Criteria

Location	*Time of Blasting*	*Airblast overpressure (dB(Lin Peak))*	*Ground vibration (mm/s)*	*Allowable exceedance*
Residence on privately owned land	*Any time*	*120*	*10*	*0%*
	Day	*115*	*5*	*5% of the total number of blasts over a period of 12 months*
	Evening	*105*	*2*	
	Night	*95*	*1*	
	Sundays and Public holidays (24 Hrs)	*95*	*1*	

After extended independent monitoring and review identified no exceedances related to blasting activities at CGM, the temporary hired Blast Monitor (BM08) at 'Cowal North' was decommissioned and returned to Saros (26 June 2012).

Blast monitor 09 (BM09) was installed on 14 June 2012 on a 4 metre tripod in Lake Cowal on the east-west transect line between BM07 (Admin) and 'Gumbelah' (BM01).

Annual calibration of all fixed and roving units was performed by Saros and occurred during the period 12 to 14 March 2013, in accordance with Australian Standard 2187.1 and the manufacturer's specifications.

Ground Vibration

A total of 340 blasts were fired during the period 23 December 2011 to 22 December 2012. Based on the monitoring data and blasting information available, recorded levels of ground vibration induced by blasting activities conducted at the Cowal Gold Mine were compliant with respect to the ground vibration compliance limits. The maximum blast induced vibration level at the nearest residence was 0.27 mm/s recorded at BM03-Coniston Residence on the 22nd of May 2012 (Saros, 2013). This level is significantly lower than compliance limit of 10 mm/s at any time.

Air Overpressure

Cowal Gold Mine achieved compliance in relation to the specified air overpressure levels for the period 23rd of December 2011 until the 22nd of December 2012.
Out of a total of 340 blasts:

- No blast related events exceeded the maximum compliance level of 120dB(L);
- Three blast related events exceeded the 95dB(L) level on Sundays and Public Holidays (Coniston Residence).
- The number of exceedances was not more than the 5% of the total number of blasts, and therefore, the individual exceedances of the 95dB(L) air blast overpressure level on Sundays and Public Holidays were in compliance with the blasting impact assessment criteria specified in Condition 6.3 of the Development Consent (Table 28).

A summary of the peak overpressure levels from individual blasts exceeding the day, evening and compliance criteria, complete with likely cause, is presented in Table 29. A detailed examination of the monitoring and blasting information was undertaken data by Saros (2013) to ascertain the peak overpressure levels recorded around the time of the specified blasts. A total of 17 events were identified as having a peak overpressure level exceeding the compliance criteria at privately-owned receivers.

The events have been analysed in detail to determine the likely source of overpressure. Of the 17 events that exceeded compliance levels, only 3 of these were directly related to blasting practices and 14 of these were caused by localised environmental factors such as wind. This has been identified by the extended durations of high overpressure readings within the 30 minute histogram blast window (Saros, 2013).

The majority of exceedances identified at blast times were related to Sunday and Public Holiday 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 115 dB(L). It is important to note that this 20dB(L) reduction is equivalent to reducing the weekday and Saturday limit by 90% for Sunday and Public Holiday blasting (Saros, 2013).

A summary of the peak overpressure levels exceeding the compliance criteria, complete with likely cause, is presented in Table 29.

3.10.4 Reportable Incidents

During the 12 month monitoring period there were five incidences where units were down for more than 24 hours.

- BM05 – Southern Bird Breeding from the 7th of March 2012 to the 25th of June 2012.
- BM06 – General Monitoring Location from the 10th of March 2012 to the 25th of June 2012.
- BM04.1 – Northern Bird Breeding from 12th of March 2012 to the 25th of June 2012.
- BM04.1 – Northern Bird Breeding from the 12th September 2012 to the 17th of September 2012.
- BM01- Gumbelah Residence from the 7th of November 2012 to the 8th of December 2012.

All incidences in the months of March to June were related to flooding in Lake Cowal in which time units were water damaged. Due to flooding, access to the monitoring locations was limited and new units could not be installed until the water had subsided.

BM04.1 and BM01 were offline during September and November to December, respectively due to hardware issues.

There were 21 community complaints received related to blasting during the reporting period. A summary of which is provided in Paragraph 4.1.

The CEMCC were kept informed of complaints relating to blasting overpressure during the reporting year. No additional issues or resolutions related to blasting were raised by the CEMCC during the reporting period.

3.10.5 Further Improvements

During 26 to 27 July 2012, as a result of the inundation of Lake Cowal monitoring locations BM04, BM05 and BM06, these locations were fitted with new enhanced technology logger units atop the tripod mounts (taller mounts installed on the lake 14 - 15 June 2012).

Anemometers and wind direction sensors are intended to be installed on the new enhanced loggers at each location, later in 2013. This intended to improve the determination of localised effects of weather conditions.

Administration Blast Monitor (BM07) will be moved to the east side of the E42 Pit and re-commissioned on a dedicated concrete pad near Pond D3. This is recommended by Saros to better define the blasting signature as the Pit is deepened.

Under the 2012 rental agreement with Saros, incoming units (for calibration) will continue to be swapped out with ‘duty’ units on the same day to further minimise data loss.

Table 29
Summary of individual blasts peak overpressure levels exceeding compliance criteria for CGM (23/12/2011-22/12/2012)

Location	Date	Time	Time		Compliance Limit	Comments
			PPV (mm/s)	O'Press dB(L)		
BM01 - Gumbelah Residence	22/01/2012	13:26	0.01	95.9	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM01 - Gumbelah Residence	22/01/2012	13:40	0.03	101.9	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM01 - Gumbelah Residence	26/01/2012	12:33	0.01	95.9	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM01 - Gumbelah Residence	29/01/2012	12:45	0.03	95.9	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM01 - Gumbelah Residence	05/02/2012	12:44	0.01	98.8	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM01 - Gumbelah Residence	26/02/2012	12:37	0.01	101.0	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM03 - Coniston Residence	04/03/2012	12:42	0.07	97.5	95dB(L) - Sundays and Public Holidays	Likely blast related.
BM03 - Coniston Residence	18/03/2012	15:15	0.05	95.9	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM03 - Coniston Residence	15/04/2012	12:33	0.14	95.9	95dB(L) - Sundays and Public Holidays	Likely blast related.
BM01 - Gumbelah Residence	17/06/2012	15:15	0.12	95.9	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM01 - Gumbelah Residence	01/07/2012	12:39	0.11	100.0	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM03 - Coniston Residence	29/07/2012	12:49	0.10	101.0	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM01 - Gumbelah Residence	05/09/2012	12:38	0.10	117.1	115dB(L)	Local environmental factors, unable to differentiate from background levels.
BM03 - Coniston Residence	09/09/2012	12:37	0.11	100.0	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM03 - Coniston Residence	23/09/2012	12:40	0.09	101.0	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.
BM03 - Coniston Residence	18/11/2012	12:23	0.09	105.5	95dB(L) - Sundays and Public Holidays	Likely blast related.
BM03 - Coniston Residence	18/11/2012	12:38	0.10	97.5	95dB(L) - Sundays and Public Holidays	Local environmental factors, unable to differentiate from background levels.

New EPL compliance limits with respect to residences on privately owned land, instated 24 June 2011:

- The PPV level of 5mm/s for ground vibration during the day may be exceeded for up to 5% of the total number of blasts for a period of 12 months. The level should not exceed 10mm/s at any noise sensitive location;
- The air blast overpressure level of 115dB (Linear Peak) during the day may be exceeded for up to 5% of the total number of blasts for a period of 12 months. The level should not exceed 120dB (Linear Peak) at any noise sensitive location; and
- The airblast overpressure level of 95dB (Linear Peak) on Sundays (24 hours) and Public Holidays (24 hours) may be exceeded for up to 5% of the total number of blasts for a period of 12 months.

3.11 OPERATIONAL NOISE

3.11.1 Reporting Requirements

3.11.1.1 Development Consent

The management and reporting of noise monitoring is required by Development Consent Condition 6.4(g), which states:

Noise Management Plan

6.4(g) The Applicant shall prepare and implement a Noise Management Plan for the project in consultation with EPA and to the satisfaction of the Director-General. This plan must be submitted to the Director-General for approval by the end of July 2010 and include provisions to:

(i) evaluate noise impacts on privately-owned residences

(ii) demonstrate compliance with the noise impact assessment criteria in Table 8;

(iii) implement all reasonable and feasible noise mitigation measures;

(iv) investigate ways to reduce the noise generated by the project, including:

- *off-site road noise; and*
- *noise levels which may result in sleep disturbance and disturbance to bird breeding behaviour; and*

(v) report on these investigations and the implementation and effectiveness of these measures in the AEMR.

As described in Section 1.1.2, the modification to the CGM Development Consent (approved by the former DoP in March 2010) updated Development Consent Condition 6.4 relevant to noise. Subsequently, in accordance with Development Consent Condition 6.4(g), a revised NMP was developed for the CGM and was submitted to the Director-General of the former DoP at the end of July 2010. The DP&I provided review comments on the NMP on 14 August 2012. Barrick subsequently revised the NMP to address the DP&I's review comments and submitted the revised NMP to DP&I for approval on 24 December 2012. Barrick is currently awaiting approval of the revised NMP.

The modification to the CGM Development Consent (approved by the DP&I in March 2010) requires the management and reporting of traffic noise monitoring and truck movements in accordance with Development Consent conditions 6.4(d) and (e), which provide:

(d) The Applicant shall take all reasonable and feasible measures to ensure that traffic noise generated by the project does not exceed the traffic noise impact assessment criteria in Table 9.

Table 9: Traffic noise criteria dB(A) $L_{Aeq\ (1\ hour)}$

Road	***Day/Evening***	***Night***
Ungarie Road	*60*	*55*
Wamboyne Road, Blow Clear Road, Carrawandool-Warroo Road, Burcher Road, Condobolin Road, Lake Cowal Road	*55*	*50*

Note: Traffic noise generated by the project is to be measured in accordance with the relevant procedures in EPA's Environmental Criteria for Road Traffic Noise.

(e) Truck movements for material delivery purposes will be restricted as far as practicable to the day and evening periods.

The relevant components of the former Traffic Noise Management Plan (**TNMP**) have been incorporated into the revised NMP (submitted to the Director-General of the DP&I for approval in December 2012, in accordance with Development Condition 6.4[g]). Following approval of the revised NMP, the TNMP will not be necessary.

SLR Consulting was engaged to conduct mine operating noise and traffic noise monitoring during the reporting period and in accordance with the NMP.

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 CGM does not exceed the criteria in Table 29 below, at any residence on privately-owned land, or on more than 25 percent of privately owned land not located within Lake Cowal.

Table 30
Noise Impact Assessment Criteria dB(A) $L_{Aeq\ (15minute)}$

Location	Day/Evening/Night[1]
Bungabulla	39
Coniston	44
Cowal North	38
Gumbelah	39
Lake Cowal (non-Barrick)	38
Laurel Park	39
Mattiske	36
McLintock	41
The Glen	38
West Lea	41
All other residences	35

Notes:

- To interpret the locations referred to in Table 28, see Figure 8.
- Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.
- The noise limits do not apply if the Applicant has an agreement with the relevant owner/s of these residences/land to generate higher noise levels, and the Applicant has advised the Department of Planning in writing of the terms of this agreement.
- [1]Mine noise emission criteria – applicable to condition 6.3(a) of the March 2010 modified development consent

3.11.1.2 Environmental Protection Licence

As described in Paragraph 3.11.1.1, the modification lodged in January 2009 sought changes to the Development Consent, to contemporise the Development Consent and for consistency with the EPL and Industrial Noise Policy (**INP**). The application to modify the Development Consent was approved by the Minister for Planning on 11 February 2009. The NMP was revised/up-dated during 2009 to reflect the approved modifications. The revised NMP was approved on 8 April 2010.

The modification to the CGM Development Consent (approved by the DP&I in April 2010) again revised the Development Consent Conditions relating to noise. A revised NMP was subsequently submitted to the Director-General of the DP&I at the end of July 2010, in accordance with Development Consent Condition 6.4(g). The DP&I provided review comments on the NMP on 14 August 2012. Barrick subsequently revised the NMP to address the DP&I's review comments and submitted the revised NMP to DP&I for approval on 24 December 2012. Barrick is currently awaiting approval of the revised NMP.

An application to vary the EPL to reflect the modifications to the Development Consent was prepared during the 2011 reporting period and the application was approved by the DP&I on 20 June 2011.

3.11.1.3 Any Other Relevant Approval

There are no other relevant reporting requirements from approvals in relation to noise for the reporting period.

3.11.2 Environmental Management

3.11.2.1 Control Strategies

In accordance with the NMP, control strategies used at the CGM during the reporting period (for operational activities) utilised best management practices and the best available technology economically achievable.

Best Management Practice

Best management practices applied during the reporting period to minimise CGM noise emissions include:

- restricting movement of trucks on ridgelines and exposed haul routes where their noise can propagate over a wide area, especially at night. This means restricting night-time movement of material to areas shielded by

barriers or mounds, and reserving large-scale material movement for daytime. The LPB provides noise shielding, thereby reducing noise levels that could propagate from the open pit across Lake Cowal;

- scheduling the use of any noisy equipment during daytime;
- sighting noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area, or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise;
- where there are several noisy pieces of equipment, scheduling operations so they are used separately rather than concurrently;
- keeping equipment well maintained;
- employing 'quiet' practices when operating equipment (e.g. positioning idling trucks in appropriate areas);
- educating staff on the effects of noise and the use of quiet work practices;
- specify maximum noise/sound levels when purchasing equipment; and
- including maximum noise/sound levels in tender documents and contracts.

Best Available Technology Economically Achievable

Best available technology economically achievable that may be applied to minimise CGM noise emissions during the reporting period include:

- adjusting reversing alarms on heavy equipment limiting acoustic range to the immediate danger area;
- minimising night time tracking of dozers on top of stockpiles;
- restricting working hours on faces closest to neighbours during wall lift project works;
- using equipment with efficient mufflers;
- damping or lining metal trays on Dump Trucks; and/or
- employing active noise control measures during normal and maintenance shutdown periods.

3.11.2.2 Effectiveness of Control Strategies

In accordance with the NMP, the implementation of the control strategies minimised noise emissions from the CGM. The control strategies implemented during the reporting period are considered to be effective, as demonstrated by the environmental performance indicators (discussed in Paragraph 3.11.3 below).

3.11.2.3 Variations from Proposed Strategies

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

3.11.3 Environmental Performance

3.11.3.1 Monitoring

The daytime, evening and night-time operator-attended mine operating noise surveys were conducted in January/February 2012 (B), May 2012 (C), July 2012 (D) and in October 2012 (E) by SLR Consulting with field assistance by the CGM Environmental Department. The survey results are presented together with the respective noise criteria in the NMP, determined in accordance with the NSW INP.

No non-compliances of the noise impact assessment criteria specified in the Development Consent were reported during the reporting period.

3.11.3.2 Daytime Operator-attended Noise Survey Results

Daytime operator-attended mine operating noise surveys were conducted in January/February 2012 (B), May 2012 (C), July 2012 (D) and October 2012 (E). A summary of the survey results is presented in Table 31, together with the respective noise criteria.

Table 31
Daytime Noise Emission Levels $L_{Aeq(15minute)}$

Location	Address	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Noise Impact Assessment Criteria[4] $L_{Aeq(15minute)}$
		B (dBA)	C (dBA)	D (dBA)	E (dBA)	
No.1	New Lake Foreshore	24, 24	65, 32	30, 32	27, N/A[1]	[3]
No.2	'Coniston' Residence	21, 21	N/A[2]	27, 28	N/A[2]	44 dBA
No.3	Bird Breeding Area (South)	<28, <28	N/A[2]	35, 35	N/A[2]	[3]
No.4	Bird Breeding Area (North)	N/A[1], N/A[1]	N/A[2]	34, 34	N/A[2]	[3]
No.5	'Gumbelah' Residence	NA[1]/, N/A[1]	32, 31, 31[4], 34[4], 28[4], 38[4], 36[4], 36[4], 30[4], 27[4], 33[4], 33[4], 31[4], 37[4], 35[4]	<12, <23	N/A[2]	39 dBA
No.6	'Lake Cowal' Residence	<24, 21	N/A[2]	<15, <15	N/A[2]	[5]
No. 7	'West Lea' Property	<17, <21	N/A[2]	<26, N/A[1], 43[4], 39[4], 40[4], 40[4], 38[4], 38[4], 40[4], 42[4], 42[4], 37[4]	<15, <15, 43[4], 40[4], 39[4], 39[4], 36[4], 41[4], 37[4], 39[4]	41 dBA
No. 8	'McLintock' Property	22, 25	N/A[2]	<16, <16	N/A[2]	41 dBA
No. 9	"Cowal North" Residence	N/A[2]	<20, N/A[1], <20[4]	N/A[1], N/A[1], 32[4], 34[4]	<28[3], <29[3]	38 dBA
No. 10	'Boongarry' Residence	N/A[2]	N/A[1], N/A[1]	N/A[2]	N/A[2]	35 dBA

Note:
N/A[1] - Mine noise emission not discernible.
N/A[2]- No Survey Conducted
[3] - Mine noise emission criteria apply to residences only
[4] - Mine noise emission criteria – applicable to condition 6.4(c) of the Development Consent
[5] – Mine owned property

According to the Industrial Noise Policy Section 11.1.3, non-compliances with Noise Conditions states *"A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutary noise limit specified in the consent or licence condition"*. It follows that the mine noise emissions of 42 dBA and 43 dBA at location No. 7 would not be considered a non- compliance with the noise criterion of 41 dBA. Furthermore, the day-time noise level of 43 dBA coincided with a south south-easterly wind at a mean wind speed of 3.9m/s and is therefore outside the assessable weather conditions determined in accordance with the consent.

3.11.3.3 Evening Operator-attended Noise Survey Results

Evening operator-attended mine operating noise surveys were conducted in January/February 2012 (B), May 2012 (C), July 2012 (D) and October 2012 (E). A summary of the survey results are presented in Table 32 together with the respective noise criteria.

Table 32
Evening Noise Emission Levels $L_{Aeq(15minute)}$

Location	Address	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Noise Impact Assessment Criteria[4] $L_{Aeq(15minute)}$
		B (dBA)	C (dBA)	D (dBA)	E (dBA)	
No. 1	New Lake Foreshore	20, 21	N/A[2]	40, 41	N/A[2]	[3]
No. 2	'Coniston' Residence	27, 25	N/A[2]	21, 37	N/A[2]	44 dBA
No. 3	Bird Breeding Area (South)	<29, <29	N/A[2]	N/A[2]	N/A[2]	[3]
No. 4	Bird Breeding Area (North)	N/A[1], N/A[1]	N/A[2]	N/A[2]	N/A[2]	[3]
No. 5	'Gumbelah' Residence	25, 22	31, 33, 34[4], 35[4]	N/A[1], N/A[1]	N/A[2]	39 dBA
No. 6	'Lake Cowal' Residence	<30, <30	N/A[2]	29, 30	N/A[2]	[5]
No. 7	'West Lea' Property	20, 24	N/A[2]	<20, <20	<19[3], 27[3]	41 dBA
No. 8	'McLintock' Property	<22, <24	N/A[2]	29, 28	N/A[2]	41 dBA
No. 9	"Cowal North "Residence	N/A[2]	N/A[1], N/A[1]	28, 29	<14, N/A[1]	38 dBA
No. 10	'Boongarry' Residence	N/A[2]	21, <20	N/A[2]	N/A[2]	35 dBA

Note:
N/A[1] - Mine noise emission not discernible.
N/A[2]- No Survey Conducted
[3] - Mine noise emission criteria apply to residences only
[4] - Mine noise emission criteria – applicable to condition 6.4(c) of the Development Consent
[5] – Mine owned property

During the January/February 2012 (B), May 2012 (C), July 2012 (D) and October 2012 (E) monitoring periods, the measured evening mine noise emissions at the residential dwellings were below the applicable evening intrusive $L_{Aeq(15minute)}$ criteria

3.11.3.4 Night-time Operator-attended Noise Survey Results

Night-time operator-attended mine operating noise surveys were conducted in January/February 2012 (B), May 2012 (C), July 2012 (D) and October 2012 (E). A summary of the survey results are presented in Table 33 together with the respective noise criteria.

Table 33
Night-time Noise Emission Levels $L_{Aeq(15minute)}$

Location	Address	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Mine Contributed $L_{Aeq(15minute)}$	Noise Emission Criteria[4] $L_{Aeq(15minute)}$
		B (dBA)	C (dBA)	D (dBA)	E (dBA)	
No.1	New Lake Foreshore	37,37	36, 32	33, 33	24, N/A[1]	[3]
No.2	'Coniston' Residence	27,28	N/A[2]	35, 35	N/A[2]	44 dBA
No.3	Bird Breeding Area (South)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	[3]
No.4	Bird Breeding Area (North)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	[3]
No.5	'Gumbelah' Residence	29,31	36, 36, 35[4], 35[4], 35[4], 35[4], 35[4],35[4], 34[4]	<25, <24	N/A[2]	39 dBA
No.6	'Lake Cowal' Residence	22,22	N/A[2]	<22, <23	N/A[2]	[4]
No. 7	'West Lea' Property	33, 31	N/A[2]	36, 34, 38[4]	24, 25, 39[4]	41 dBA
No. 8	'McLintock' Property	27, 27	N/A[2]	29, 31	N/A[2]	41 dBA
No. 9	"Cowal North" Residence	N/A[2]	<20, N/A[1]	31, 31	<26[3], <27[3]	38 dBA
No. 10	'Boongarry' Residence	N/A[2]	22, N/A[2]	N/A[2]	N/A[2]	35 dBA

Note:
1: N/A Mine noise emission not discernible.
2: N/A[2] No survey conducted.
3: Mine noise emission criteria apply to residences only.
4: Mine owned property.

During the January/February 2012 (B), May 2012 (C), July 2012 (D) and October 2012 (E) monitoring periods, the measured night-time mine noise emissions at the residential dwellings were below the applicable intrusive $L_{Aeq(15minute)}$ criteria.

3.11.3.5 Unattended Continuous Noise Logging

Unattended continuous noise loggers were positioned at all monitoring locations from 30 January to 17 February 2012 and from 02 July to 16 July 2012. Additional loggers were also deployed from 08 May to 23 May 2012 and 18 October to 1 November 2012. The loggers were used to quantify the ambient noise environment in the vicinity of CGM.

A summary is presented below:

- A comparison of the noise levels indicated that the noise levels monitored in January/February 2012 were generally higher than the previous summer at all locations especially during the evening and the night-time except at West Lea where the levels were generally lower than the previous summer. A review of the earlier operator-attended noise monitoring results indicates that the ambient noise levels is not due to the CGM operations, rather, the increased noise levels are due to increase in fauna activity (insects and birds), presumably due to rainfall during the weeks leading up to the January/February noise survey.
- Comparison of the noise levels indicates that the noise levels monitored at Cowal North in July 2012 were generally similar to the noise levels measured during May 2012.
- Noise levels measured during July 2012 were generally similar than the noise levels monitored during the previous year.
- Comparison of the noise levels indicates that the noise levels monitored at West Lea in October 2012 were generally higher than the levels measured during the July 2012 and previous winter (2011).

- Noise levels monitored in October 2012 were generally higher than the noise levels monitored during the previous year.

3.11.3.6 Operator-attended and Unattended Traffic Noise

In addition to the operational noise monitoring, SLR Consulting were engaged during the reporting period to conduct mine traffic noise surveys in accordance with the NMP.

The following monitoring locations were selected in the (pre-construction) Baseline Traffic Noise Assessment. These locations were and remain to be representative of the locality types which are potentially impacted along the access route between the CGM and West Wyalong. In addition, unattended continuous noise loggers were positioned at the three monitoring locations:

- TN1 140 Ungarie Road, West Wyalong (near intersection with Dumaresq Street)
  Offset distance from the road – 30 m
- TN2 “Clairview”, 56 – 86 Wamboyne Road
  Offset distance from the road – 45 m
- TN3“Windstone”, 648 Wamboyne Road
  Offset distance from the road – 150 m

To quantify traffic volumes and determine peak traffic periods, three traffic counters were deployed. To quantify overall ambient and traffic noise levels during mine operations, operator attended traffic noise measurements were conducted at the three monitoring locations, listed above, during the morning and evening peak-traffic movement periods on 31 January and 2 February 2012.

In order to quantify the overall traffic volumes and determine peak traffic periods, three traffic counters were deployed next to the monitoring locations (TN1, TN2 and TN3), commencing 30 January 2012 to 10 February 2012.

Weather analysis was conducted in order to determine if weather conditions were a significant variable in the noise levels recorded. The analysis found that weather conditions were not a significant variable in the traffic noise levels recorded (SLR Consulting, 2012).

Traffic count data showed that the morning peak traffic period was from 0600 hours to 0730 hours, and the evening peak traffic period from 1600 hours to 1900 hours at TN1 and from 1730 hours to 1900 hours at the other two locations. The ambient LAeq (1hour) noise levels and corresponding calculated LAeq (1hour) traffic noise contribution at TN1 ‘140 Ungarie Road’ are presented in Table 34, together with the respective vehicle counts.

Table 34
Operator-attended Traffic Noise Emission Survey Results (January 2012)
TN 1 - 140 Ungarie Road

Date	Time	Mine Traffic Criteria	Traffic Counts			Traffic Noise Levels (Calculated)				Unattended (Overall)
			Total	Non-Mine	Mine	Total	Non-Mine	Mine	Mine Exceedances	
Daytime Peak (1700 hours to 1900 hours)										
Tuesday 31 January	1700-1800	60	118	93	25	60	59	54	-	59
	1800-1900	60	80	57	23	59	57	53	-	56
Wednesday 1 February	1700-1800	60	137	119	18	61	60	52	-	59
	1800-1900	60	84	62	22	58	57	53	-	57
Thursday 2 February	1700-1800	60	113	86	27	60	59	54	-	-
	1800-1900	60	98	65	33	59	57	55	-	-
Three-Day Average	1700-1800	60	122	99	23	60	59	53	-	59
	1800-1900	60	87	61	26	59	57	53	-	57
Night-time Peak (0500 hours to 0700 hours)										
Tuesday 31 January	0500-0600	55	55	35	20	56	54	53	-	56
	0600-0700	55	92	41	51	59	56	56	1	59
Wednesday 1 February	0500-0600	55	48	20	28	56	52	54	-	56
	0600-0700	55	111	54	57	60	57	56	1	59
Thursday 2 February	0500-0600	55	47	28	19	56	53	52	-	54
	0600-0700	55	103	56	47	59	57	56	1	59
Three-Day Average	0500-0600	55	50	28	22	56	53	53	-	56
	0600-0700	55	102	50	52	59	57	56	1	59

TN1 140 Ungarie Road

The three day average calculated LAeq(1hour) mine generated traffic noise at TN1 during the daytime peak (1700 hours to 1800 hours) is 53 dBA (ie below the 60 dBA criterion). The three day average calculated LAeq(1hour) mine generated traffic noise at TN1 during the night-time peak (0600 hours to 0700 hours) is 56 dBA which is marginally (1 dBA) above the 55 dBA criterion.

Furthermore, dwellings located within the 37m of Ungarie Road may potentially receive traffic noise levels in excess of 55 dBA during the night-time peak hour. Based on the NMP, approximately 8 dwellings are located within 37 m from Ungarie Road. The nearest dwelling being approximately 30m from Ungarie Road where the mine generated traffic noise is marginally (1dBA) above the 55 dBA criterion.

The ambient LAeq (1hour) noise levels and corresponding calculated LAeq (1hour) traffic noise contribution at TN2 ‘Clairview’ are presented in Table 35, together with the respective vehicle counts.

Table 35
Operator-attended Traffic Noise Emission Survey Results (January 2012)
TN2 - 'Clairview' Residence

Date	Time	Mine Traffic Criteria	Traffic Counts (Identification)			Traffic Noise Levels (Calculated)				Unattended Overall
			Total	Non-Mine	Mine	Total	Non-Mine	Mine	Mine Exceedances	
Daytime Peak (Afternoon 1700 hours to 1900 hours)										
Tuesday 31 January	1700-1800	55	76	43	33	54	52	51	-	54
	1800-1900	55	35	6	29	50	42	49	-	50
Wednesday 1 February	1700-1800	55	66	45	21	54	52	49	-	54
	1800-1900	55	51	38	13	52	51	45	-	53
Thursday 2 February	1700-1800	55	50	26	24	52	48	50	-	55
	1800-1900	55	44	15	29	51	46	50	-	55
Three-Day Average	1700-1800	55	64	38	26	53	50	50	-	54
	1800-1900	55	44	20	24	51	46	48	-	52
Night-time Peak (0500 hours to 0700 hours))										
Tuesday 31 January	0500-0600	50	49	24	25	52	49	50	-	53
	0600-0700	50	71	12	59	54	46	53	3	58
Wednesday 1 February	0500-0600	50	36	12	24	51	46	50	0	51
	0600-0700	50	70	23	47	54	49	52	2	54
Thursday 2 February	0500-0600	50	40	13	27	51	46	50	-	51
	0600-0700	50	60	25	35	53	49	50	-	54
Three-Day Average	0500-0600	50	41	16	25	52	47	50	-	52
	0600-0700	50	67	20	47	53	48	52	2	55

The ambient LAeq (1hour) noise levels and corresponding calculated LAeq (1hour) traffic noise contribution at TN3 'Windstone' are presented in Table 36, together with the respective vehicle counts.

Table 36
Operator-attended Traffic Noise Emission Survey Results (January 2012)
TN3 - 'Windstone' Residence

Date	Time	Mine Traffic Criteria	Traffic Counts (Identification)			Traffic Noise Levels (Calculated)				Unattended (Overall)
			Total	Non-Mine	Mine	Total	Non-Mine	Mine	Mine Exceedances	
Daytime Peak (1700 hours to 1900 hours)										
Tuesday 31 January	1700-1800	55	76	43	33	51	48	47	-	-
	1800-1900	55	35	6	29	47	39	46	-	-
Wednesday 1 February	1700-1800	55	66	45	21	50	49	45	-	-
	1800-1900	55	51	38	13	49	48	42	-	-
Thursday 2 February	1700-1800	55	50	26	24	49	45	46	-	-
	1800-1900	55	44	15	29	48	43	47	-	-
Three-Day Average	1700-1800	55	64	38	26	50	47	46	-	-
	1800-1900	55	44	20	24	48	43	45	-	-
Night-time Peak (0500 hours to 0700 hours))										
Tuesday 31 January	0500-0600	50	49	24	25	43	40	41	-	-
	0600-0700	50	71	12	59	45	37	45	-	-
Wednesday 1 February	0500-0600	50	36	12	24	43	37	42	-	-
	0600-0700	50	70	23	47	45	41	43	-	-
Thursday 2 February	0500-0600	50	40	13	27	43	37	41	-	-
	0600-0700	50	60	25	35	44	40	42	-	-
Three-Day Average	0500-0600	50	41	16	25	43	38	41	-	-
	0600-0700	50	67	20	47	45	39	43	-	-

TN2 'Clareview' Residence, Wamboyne Road and TN3 'Windstone' Residence, Wamboyne Road

Analysis of the data shows that the night-time/early morning peak traffic period at TN2 and at 200m east of Clear Ridge Road occurred from 0600 hours to 0730 hours and the daytime (evening) peak traffic period occurred from 1730 hours to 1900 hours.

The three day average calculated LAeq (1hour) mine generated traffic noise at TN2 during the daytime peak (1700 hours to 1800 hours) is 50 dBA (ie below the 55 dBA criterion). The three day average calculated LAeq (1hour) mine generated traffic noise at TN2 during the night time peak (0600 hours to 0700) is 50 dBA which is moderately (2 dBA) above the 50 dBA criterion.

The three day average calculated LAeq (1hour) mine generated traffic noise at TN3 during the daytime peak (1700 hours to 1800 hours) is 46 dBA (ie below the 55 dBA criterion). The three day average calculated LAeq (1hour) mine generated traffic noise at TN2 during the night time peak (0600 hours to 0700) is 43 dBA which is below the 50 dBA criterion.

Furthermore, dwellings located within 64 m of Wamboyne Road may potentially receive traffic noise levels in excess of 50 dBA during the early night-time peak hour. Based on the NMP (Barrick, 2012), approximately two dwellings are located within 64 m from Wamboyne Road. The nearest dwelling being 'Clareview' (TN2) where the mine generated traffic noise is up to 2 dBA above the relevant traffic assessment criterion during the night-time peak.

Although exceedances were recorded during the traffic noise surveys, they have not coincided with complaints from the occupants of this (or any other) residence regarding traffic noise. Accordingly, the complaint validation monitoring process documented in the NMP was not enacted during the reporting period.

Traffic Noise Agreements

Barrick entered into Traffic Noise Agreements in August 2012 with residents who may potentially be affected by traffic noise attributable to the mine traffic with the following proposal.

The Agreement letters were signed by each of the landowners notified, and the Director-General of DP&I was notified of the terms of agreement on 3 September 2012.

3.11.4 Reportable Incidents

There were no community complaints received during the reporting period relating to operational or traffic noise.

3.11.5 Further Improvements

During the next monitoring period, the traffic and operational noise monitoring will be conducted in February and August to better align with public holidays and thereby reflect normal road use periods.

3.12 VISUAL, STRAY LIGHT

3.12.1 Reporting Requirements

3.12.1.1 Development Consent

In accordance with the Landscape Management Plan (**LSMP**) (Barrick, 2003m), the following visual issues are required to be reported in the AEMR:

- landscaping, rehabilitation and building, works and structure maintenance measures (including the reporting of any related complaints);
- contingent planting of additional screening vegetation on Barrick owned land in consultation with the CGM CEMCC on an as needs basis; and
- any additional planting on neighbouring properties if required, in consultation with the affected landholder.

As described in the currently approved CGM MOP (October 2012 to January 2014) the relevant components of the LSMP have been incorporated into the ROMP. Following approval of the ROMP by the DP&I, the LSMP will not be necessary.

In accordance with Development Consent Condition 3.6(d)(iv), the ROMP includes a description of landscaping measures that will be undertaken to minimise visual impacts of the CGM.

In addition, Development Consent Condition 6.5 requires:

> *The Applicant shall take all reasonable and feasible measures, in consideration of Australian Standard AS 4282-1997 Control of the obtrusive effects of outdoor lighting, to mitigate visual and off-site impacts of the project, to the satisfaction of the Director-General.*

3.12.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.12.1.3 Any other Relevant Approval

There are no other relevant reporting requirements from approvals in relation to landscaping and visual impact for the reporting period.

3.12.2 Environmental Management

3.12.2.1 Control Strategies

In accordance with Development Consent Condition 3.6(d)(iv), the LSMP and the ROMP, Barrick used the landscaping strategies/control measures outlined below to minimise visual impacts from the mine site.

Progressive Rehabilitation

Progressive rehabilitation of areas of the perimeter waste emplacements and tailings storage facilities was undertaken during the reporting period to reduce the contrast between the CGM landforms and the surrounding landscape. This included progressive rehabilitation with selected grass, shrub and/or tree species.

The final void is screened from public views on Lake Cowal Road by the tailings storage facilities and waste emplacements.

Foreground Visual Screening/Vegetation Screens

Earth mounds have been constructed on sections of the western and northern boundaries of ML 1535 to break up continuous views from Lake Cowal Road. These earth mounds and vegetation screen areas surrounding ML 1535 (including along Lake Cowal Road) have been planted with endemic plants that are compatible with the existing surrounding vegetation.

Maintenance of the vegetation screens (e.g. addition and replacement of plants, where required) will continue to be undertaken in these areas during the next reporting period. An increase in screening effect will result over time as plants continue to grow.

Visual impact mitigation measures that have been employed at CGM included landscaping and design specifically conducted for visual impact mitigation purposes. Specific landscaping strategies included:

- utilising existing vegetation as visual screens;
- planted vegetation screens around the ML 1535 boundary;
- construction of PWE, reducing visual impact of processing plant from the eastern side of Lake Cowal;
- placement of topsoil stockpiles on the southern and western sides of the STSF to break up the view from the relocated Travelling Stock Route;
- lighting design (such as directional lighting) to reduce any potential impacts of night lighting on wildlife and nearby residences; and
- selecting the colour of the processing plant buildings to blend with the adjacent landscape in accordance with the requirements of BSC.

Night Lighting

In accordance with the Modified Request Environmental Assessment (Barrick, 2010), Barrick has employed one or more of the following measures to mitigate impacts from night-lighting, where practicable:

- Scheduling of mining operations, where practicable, so that evening and night-time operations on the waste emplacements will be located on the southern waste emplacement (i.e. the lower waste emplacement) to reduce the potential for direct lighting impacts to locations north of ML 1535.
- Restriction of night-lighting to the minimum required for operations and safety requirements, where appropriate.
- Use of unidirectional lighting techniques, where practicable.

- Use of light shields to limit the spill of lighting, where practicable.
- Provision of curtains, cladding and/or screens at nearby dwellings to help screen any potential night-time lighting impacts, in consultation with the landholder.
- Planting of trees at nearby dwellings to help screen any potential night-time lighting impacts, in consultation with the landholder.
- Waste rock dumping will be scheduled such that elevated bunds of waste rock are placed between primary work areas and residences, where practicable, to mitigate potential impacts from night-lighting.

3.12.2.2 Effectiveness of Control Strategies

In accordance with the LSMP, ROMP and Modified Request EA (Barrick, 2010), the implementation of the control strategies above minimised visual impacts from mining activities of CGM. However two complaints were received during July 2012 regarding intrusive night lighting. Barrick immediately responded to the complaints and measures were undertaken to rectify the issue. A detailed description of the measures is provided in Table 39 of Paragraph 4.1.

3.12.2.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies.

3.12.3 Environmental Performance

3.12.3.1 Monitoring

In accordance with Development Consent Condition 6.5, Barrick will take all reasonable and feasible measures, in consideration of Australian Standard AS 4282-1997 *Control of the obtrusive effects of outdoor lighting*, to mitigate visual and off-site impacts of the CGM, to the satisfaction of the Director-General of the DP&I.

Table 37 provides a summary of the landscape maintenance and monitoring programme that has been undertaken at the CGM during previous reporting periods and continued during the 2012 reporting period.

Table 37
Landscape Maintenance and Monitoring Summary

Component	Monitoring Frequency	Monitoring Method	Typical Maintenance
Landscaping Works • General Inspections	Annually.	Visual assessment of moisture stress, plant survival, presence of weeds and erosion/ sedimentation.	• Supplementary watering if required. • Control of invasive weed species in accordance with the requirements of the LMP. • 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 by a suitably qualified building inspector.	• Replace or repair items as necessary to maintain structural integrity. • Repaint any exterior surfaces where the finish has deteriorated.
Rehabilitation Works • General Inspections	Annual	Monitoring in accordance with the MREMP (with reporting in the AEMR).	• Repair any significant erosion or washout areas. • Control of invasive weed species in accordance with the LMP. • 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.

3.12.3.2 Performance Outcomes

Landscape maintenance and monitoring measures conducted during the reporting period included:

- 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.
- Maintenance of erosion control structures.
- Placement of native pasture hay on newly constructed TSF slopes to minimise erosion potential.

Construction of the permanent buildings remaining onsite was completed early in 2006 and they are now subject to regular monitoring and maintenance by Barrick employees and contractors.

3.12.4 Reportable Incidents

As described in Section 3.12.2.2, two visual amenity or light-spill complaints were recorded during the reporting period. Details of the nature of these complaints is provided in Section 4.1.

3.12.5 Further Improvements

Landscape maintenance and monitoring will continue as summarised in Table 36, during the next reporting period. Maintenance, addition and replacement (if required) of plants within the boundary screen plantings will continue to be of high importance.

3.13 ABORIGINAL HERITAGE

3.13.1 Reporting Requirements

3.13.1.1 Development Consent

The reporting of Aboriginal heritage issues is required by Development Consent Condition 8.6, which states:

> *The applicant shall monitor the effectiveness of measures outlined in the archaeology and heritage management plan (condition 3.3). A summary of monitoring results shall be included in the AEMR.*

The Indigenous Archaeology and Cultural Heritage Management Plan (**IACHMP**) (Barrick, 2003n) was prepared in accordance with Development Consent Condition 3.3(b) to identify future salvage, excavation and monitoring of archaeological heritage within the CGM area prior to and during development and to address Aboriginal cultural heritage issues.

3.13.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.13.1.3 Any Other Relevant Approvals

Barrick and its consultant archaeologists have obtained permits and consents under s 87 and s 90 of the *National Parks and Wildlife Act 1974* (NSW) (**NPW Act**) for CGM which include:

- Permit 1468 authorising certain archaeological works in the ML 1535 area, water pipeline area and borefield area.
- Consent 1467 authorising the destruction of Aboriginal objects (in certain circumstances) in the ML 1535 area, water pipeline area and borefield area.
- Permit 1681 authorising certain archaeological works in the relocated TSR area and road upgrade area.
- Consent 1680 authorising the destruction of Aboriginal objects (in certain circumstances) in the relocated TSR area and road upgrade area.

3.13.2 Environmental Management

3.13.2.1 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 CGM area. The management measures include strategies for registered sites and other Aboriginal objects.

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

There are currently eight registered sites remaining within ML 1535. Registered sites (Exposures) B, C, D, E and H are subject to ongoing conservation works including covering by geo-textile blanket and sign posting to protect the site. Should the location of these sites be proposed to be utilised, the procedure detailed in Special Condition 8 of Permit 1468 would apply after notice is provided to the Director-General of the OEH and in consultation with the local Aboriginal community.

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

A summary of the management measures that have previously been undertaken for each of the registered sites identified within the AHIMS is provided in Table 38. These management measures were undertaken during the CGM construction phase. It should be noted that not all the registered sites included in the table below are located within ML 1535 or in proximity to the BCPC water supply pipeline and associated borefield.

Table 38
Summary of Major Management Measures Undertaken for Registered Sites

Site Name	Zone and Location Relative to Currently Proposed Disturbance Areas	Condition of Permit 1468	Management Summary
Site P1	Lake Edge Ridge Zone Open Pit	Special Conditions 6, 12 and 13 Special Condition 3	Representative sample of surface Aboriginal objects collected, documented and stored at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. Collected surface Aboriginal objects to be eventually replaced. Excavation of 3 alluvial fans within footprint of proposed open pit and Site P1. A representative sample of sub-surface Aboriginal objects to be collected, documented and stored at an onsite "Keeping Place".
Site P2	Beach Zone Open Pit	Special Condition 4	Scarred tree removed, conserved and stored or displayed at the Wiradjuri Study Centre in Condobolin.
Site LC1	Lake Edge Ridge Zone Between NWE and Open Pit	Special Conditions 6, 12 and 13 Special Condition 5	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. Collected surface Aboriginal objects to be eventually replaced. Excavation of Site LC1. A representative sample of sub-surface Aboriginal objects collected, documented and stored at an onsite "Keeping Place".
Exposure A	Back Plain Zone Within NWE	Special Conditions 6, 12 and 13	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.
Exposure F	Back Plain Zone Within Northern Tailings Storage	Special Conditions 6, 12 and 13	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.
Exposure G	Back Plain Zone Within Northern Tailings Storage	Special Conditions 6, 12 and 13	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.
Exposure I	Back Plain Zone Within Northern Tailings Storage	Special Conditions 6, 12 and 13	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.
Exposure J	Back Plain Zone Within Northern Tailings Storage	Special Conditions 6, 12 and 13.	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.

Table 38 (Continued)
Summary of Major Management Measures Undertaken for Registered Sites

Site Name	Zone and Location Relative to Currently Proposed Disturbance Areas	Condition of Permit 1468	Management Summary
Exposure K	Back Plain Zone Within Northern Tailings Storage	Special Conditions 6, 12 and 13.	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.
Exposure L	Back Plain Zone Within Southern Tailings Storage	Special Conditions 6, 12 and 13	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.
Exposure M	Back Plain Zone Within Southern Tailings Storage	Special Conditions 6, 12 and 13	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.
Exposure N	Back Plain Zone Within Southern Tailings Storage and close to Access Road	Special Conditions 6, 12 and 13.	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Remaining Aboriginal objects collected with the topsoil during soil stripping and temporarily stored in soil stockpiles. All collected Aboriginal objects to be eventually replaced.
Site LCB9	Back Plain Zone Within water pipeline area/borefield	Special Condition 7	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Excavation of test pits and extended excavation where necessary. A representative sample of sub-surface Aboriginal objects collected, documented and stored at an onsite "Keeping Place". All collected Aboriginal objects to be eventually replaced.
Site LCB14	Back Plain Zone Within water pipeline area/borefield	Special Condition 7	Representative sample of surface Aboriginal objects collected, documented and stored for safe-keeping at an onsite "Keeping Place". Excavation of test pits and extended excavation where necessary. A representative sample of sub-surface Aboriginal objects collected, documented and stored at an onsite "Keeping Place". All collected Aboriginal objects to be eventually replaced.
Site LCB1-LCB8, LCB10–LCB13, LCB15, LCB16	Back Plan Zone Within water pipeline area/borefield	Special Condition 2	No specific archaeological works required.

After: North Limited (1998); Pardoe (2002)

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 CGM 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 CGM as amended by Permit 1468 and Permit 1681. Activities undertaken during the 2012 reporting period include the following:

- Wiradjuri monitors from the Wiradjuri Condobolin Cultural Heritage Company (**WCCHC**) have been employed during the year on archaeological works at CGM.
- The majority of cultural heritage work continues to be surface and subsurface monitoring for topsoil removal.

Cultural heritage work has been consistently carried out since the start of construction at the CGM. Work areas were examined previously (before CGM construction works) and collections of cultural material were made in accordance with relevant approvals (see Table 37 above). The 2009 revised Ground Disturbance Procedure has led to improvements in both assessing and tracking ground disturbance on-site.

Barrick employees and contractors undertake a Cultural Heritage Induction presented by the WCCHC. These inductions are held on an as needed basis.

3.13.2.2 Effectiveness of Control Strategies

The control measures for managing and monitoring Aboriginal heritage were implemented in accordance with the IACHMP and were effective during the reporting period.

3.13.2.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies.

3.13.3 Environmental Performance

3.13.3.1 Monitoring

In accordance with the IACHMP, all areas within the Development Consent area where soil stripping and construction earthworks occur surface and subsurface surveys are carried out by Wiradjuri monitors and, where appropriate, by archaeologists, to identify "datable materials".

3.13.3.2 Performance Outcomes

In accordance with Aboriginal heritage permits and consents and IACHMP, Aboriginal heritage objects were collected prior to the commencement of all earthworks under the supervision of a qualified archaeologist and representatives of the WCCHC. Objects collected were stored in the on-site temporary “Keeping Place” during the reporting period. Archaeological analysis of these objects is ongoing.

All construction earthworks were monitored by Wiradjuri monitors and/or an archaeologist. No non-compliance issues were reported. Areas where soil stripping has taken place were inspected under the supervision of representatives of the WCCHC.

3.13.4 Reportable Incidents

No environmental incidents or complaints were reported or received relating to Aboriginal heritage at the CGM during the reporting period.

3.13.5 Further Improvements

During the next reporting period, following from the implementation of the Community Relations Management System, a Cultural Heritage Practice Guide will form part of an Indigenous Peoples Plan, due to be completed in March 2013. This guide will provide plain English instruction to ensure all ground disturbance is managed in accordance with Aboriginal heritage permits and consents and the IACHMP. A detailed description of these improvements will be provided in the 2013 AEMR.

3.14 EUROPEAN HERITAGE

3.14.1 Reporting Requirements

3.14.1.1 Development Consent

The reporting of European heritage issues is required by Development Consent Condition 8.6 which states the applicant shall:

> *The Applicant shall monitor the effectiveness of measures outlined in the archaeology and heritage management plan (condition 3.3). A summary of monitoring results shall be included in the AEMR.*

The Heritage Management Plan (**HMP**) (Barrick, 2003o) was prepared in accordance with Development Consent Condition 3.3(a).

In accordance with the HMP, the following non-indigenous heritage-related issues are required to be reported in the AEMR:

- new items of non-indigenous heritage significance identified by the Environmental Manager within ML 1535;
- new listings of non-indigenous heritage significance items on the Local Environment Plan (**LEP**) or NSW State Heritage Register within ML 1535;
- a brief overview of maintenance conducted on listed non-indigenous heritage items; and
- a summary of results from any monitoring, management and maintenance measures undertaken.

In 2006, the BSC granted Development Consent for the demolition of the 'Cowal West' Shearer's Quarters and Kitchen. Demolition was required for the construction of contained water storage D9. Demolition of the remainder of the 'Cowal West Homestead Complex' (**CWHC**) (i.e. the Homestead; Shearing [Wool] Shed and Hayshed) was approved via the March 2010 modification and was completed in October 2012.

3.14.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.14.1.3 Any Other Relevant Approval

There are no other relevant reporting requirements from approvals in relation to European heritage issues for the reporting period.

3.14.2 Environmental Management

3.14.2.1 Control Strategies

Dismantling and relocation of the 'Cowal West' Shearing Shed to the 'Hillgrove' LCCC occurred during April 2012. Once the Shearing Shed has been reconstructed at the LCCC, the Stable remnants and any out buildings and Sheep Yard components will be relocated to the 'Hillgrove' LCCC to re-create the buildings. Barrick's VCP was undertaken in mid-May 2012 to remove the 43 trees in the immediate vicinity of the CWHC in preparation for final grading and establishment of the clay basal layer of the completed portion of the Southern Waste Rock Emplacement near Pond D9. The heritage security fencing was rolled up and recycled as scrap metal. Signage and fencing remained intact around the large adjacent heritage items storage shed near Pond D9.

Management measures that were implemented during the reporting period prior to demolition of the CWHC included:

- retrieval and salvage of items of historic uniqueness from the Shearing (Wool) Shed and Hayshed;
- compilation of a photographic record of the Homestead; and
- storage of the salvaged items at the Lake Cowal Conservation Centre (**LCCC**).

An interpretive display has been established at the LCCC in consultation with the Lake Cowal Foundation (**LCF**), BSC and Bland District Historical Society (**BDHS**). The display includes maps, photographs, narrative, and fragments/elements salvaged from the CWHC 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.

3.14.2.2 Effectiveness of Control Strategies

During the 2011 reporting period, the peripheral items and gardens to the 'Cowal West' homestead and Shearing Shed were removed or cleared. Windows, doors and other items of interest from the homestead were placed in on-site storage shed. The asbestos was removed from the 'Cowal West' homestead by licensed removalists to the BSC approved disposal pit in early-August 2011. The demolished portion of the 'Cowal west' homestead was trucked away and encapsulated in waste rock at the Southern Waste Rock Emplacement on 12 August 2011.

3.14.2.3 Variations from Proposed Control Strategies

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

3.14.3 Environmental Performance

3.14.3.1 Monitoring

'Cowal West' information plaques for the CWHC were fabricated in early-2009 and stored at the 'Hillgrove' LCCC facility pending further planning works at the Homestead and Shearing Quarters. Barrick consulted with the prior land owners, and the West Wyalong Historical Society regarding the content of these plaques which will be installed adjacent to any exhibit material which is planned to be housed at the nearby 'Hillgrove' LCCC facility.

3.14.3.2 Performance Outcomes

The maintenance works carried out within the CWHC have been effective in preserving the integrity and heritage value of the buildings.

3.14.4 Reportable Incidents

No environmental incidents or complaints were reported or received relating to European heritage at the CGM during the reporting period. No CEMCC issues were raised during the reporting period relating to European heritage.

3.14.5 Further Improvements

No further improvements to European heritage management measures are proposed for the next reporting period.

3.15 SPONTANEOUS COMBUSTION

This Paragraph is not applicable to CGM for this reporting period.

3.16 BUSHFIRE

3.16.1 Reporting Requirements

3.16.1.1 Development Consent

The BMP (Barrick, 2003p) was prepared in August 2003 to establish a bushfire management strategy for the CGM that complies with Development Consent Condition 3.8. The BMP was reviewed in 2008 in accordance with the Development Consent Condition 3.2. No revisions to the BMP were considered necessary. The BMP requires the following bushfire related issues to be reported in the AEMR:

- fuel management activities undertaken in the reporting period; and
- a summary of any bushfire events that involved Barrick lands or the use of CGM on-site fire control equipment during the reporting period.

Bushfire management measures for mine site rehabilitation areas and the offset areas are also required to be detailed in the ROMP in accordance with Development Consent Condition 3.6(d)(iv). Subsequently the ROMP (Barrick, 2010) prepared during the 2010 reporting period describes bushfire preventative measures and fuel management measures for mine site rehabilitation areas and the offset areas.

3.16.1.2 Environment Protection Licence

Condition R2 of the EPL requires Barrick to notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after Barrick becomes aware of the incident.

3.16.1.3 Any Other Relevant Approval

There are no other relevant reporting requirements from approvals in relation to bushfire for the reporting period.

3.16.2 Environmental Management

3.16.2.1 Control Strategies

In accordance with the BMP and the ROMP, bushfire preventative control strategies for the CGM and the CGM 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; and
- fuel management (e.g. hazard reduction burns) in consultation with the NSW Rural Fire Service.

In accordance with the BMP and the ROMP, fuel management control strategies for the CGM and the CGM offset areas include:

- fuel management by means other than burning; including such methods as grazing, slashing, pruning, mulching or other operations (such as ploughing, herbicide application and rolling);
- fuel management via burning where conventional fuel management strategies are inappropriate, impracticable or not successful (undertaken in consultation with relevant authorities); and
- maintaining designated firebreaks.

3.16.2.2 Effectiveness of Control Strategies

The control strategies implemented during the reporting period are considered to be effective as demonstrated by the environmental performance outcomes (discussed in Paragraph 3.16.3 above).

3.16.2.3 Variations from Proposed Control Strategies

There were no variations from the proposed control strategies.

3.16.3 Environmental Performance

3.16.3.1 Monitoring

In accordance with Development Consent Condition 8.1, data from the meteorological station maintained on-site was used to determine whether current weather conditions are suitable for fire management activities, and to assist in the management of bushfire fighting activities. Meteorological monitoring data is discussed in Paragraph 3.1.3.1 above.

3.16.3.2 Performance Outcomes

The bushfire management measures as described in the BMP (Barrick, 2003p) and the ROMP (Barrick, 2010) were implemented at the CGM during the reporting period. Fuel management activities carried out during the reporting period included:

- the creation of firebreaks around the ML 1535 boundary by slashing, weed control spraying and grading;

- slashing of large open areas within ML 1535 that had high fuel loads;
- sustainably crash grazing areas with neighbouring farms sheep and/or cows;
- mowing and grounds maintenance of borefield stations;
- keeping all operating areas neat and tidy and with low fuel loads; and
- conducting regular inspections of the ML 1535 area to identify any significant fire risks.

Bushfire management measures and fuel management measures implemented for the offset areas will be provided in the 2013 AEMR.

The Emergency Response Team (**ERT**) currently consists of about 30 members consisting of Barrick staff members, five of which are full time Emergency Response Officers (**EROs**). The CGM Emergency Response Coordinator is now an accredited trainer with approval to train the Suppress Wildfire course from mid-2010 (currently the crews are trained to Suppress Urban Fire level).

The ERT fire fighting equipment currently consists of two Cat 7 equivalent 4WD fire tenders with a capacity of 1,000 L each, and two dedicated 1,000 L fire fighting trailers. Barrick currently has two 70,000 L water trucks, fitted with water cannons, used in mining operations and a number of contracted water trucks during TSF Wall Lift Project construction which could be used to cart water in the event of a bushfire on ML 1535.

The fire trail register was maintained during the reporting period. All-weather access tracks were established in 2010 to the DG2, BM04.1 and NO4 location and to the lake floor saline bores system to assist in fire control. Since August 2010 the majority of these tracks have been completely inundated by Lake Cowal. The LPB was rock covered and became an all-weather access track from March 2013 which can be used for outer Pit perimeter fast response access during summer if Lake Cowal remains full for a prolonged period.

The CGM Rescue Station houses all the ERT equipment, a clean room for bottle refilling and clothes cleaning, training facilities (smoke chamber, car rescue, fire extinguisher, ropes, hoses, breathing apparatus, etc), offices, lockers and conference room for staff, volunteer trainees and visitors.

There were no bushfire events that occurred on Barrick-owned land or the use of CGM on-site fire control equipment during the 2012 reporting period.

3.16.4 Reportable Incidents

No environmental incidents or complaints were reported or received relating to bushfires during the reporting period.

3.16.5 Further Improvements

No further improvements are proposed for the next reporting period.

3.17 MINE SUBSIDENCE

This Paragraph is not applicable to the CGM for this reporting period.

3.18 HYDROCARBON CONTAMINATION

3.18.1 Reporting Requirements

3.18.1.1 Development Consent

The HWCMP (Barrick, 2006c) has been prepared in accordance with Development Consent Condition 5.7. The HWCMP (2006c) has previously been revised to reflect results of pre-commissioning studies and requirements of the CMP on 6 March 2006.

An amendment to the HWCMP was approved by the Director-General of the DP&I in January 2008 to reflect the proposed management procedures for two new waste streams generated at the CGM, viz.: trash screen oversize

waste (classified as inert waste), and hydrocarbon-impacted material (classified as solid waste following treatment in a designated bioremediation facility). The EPL was varied to reflect these amendments in July 2008.

As described in Paragraph 1.1.2 above, the HWCMP was amended to reflect the June 2009 Modification that approved the use of SMBS as an alternative cyanide destruction method. The December 2009 addendum of the HWCMP was approved by the DP&I on 10 March 2010.

In addition to the above, Barrick prepared a revised HWCMP during the 2011 reporting period. The HWCMP was updated in accordance with Development Consent Conditions 3.2 and 5.7 and revised to reflect changes in operational practices since the commencement of the CGM. The DP&I approved the revised HWCMP on 13 May 2011.

The HWCMP contains provisions for the minimisation of hydrocarbon contamination. In accordance with the HWCMP, any major or emergency spills that occur during the reporting period as well as any remedial measures that have been implemented to reduce the risk of occurrence are required to be reported in the AEMR and are provided below.

In accordance with Development Consent Condition 5.4(d):

> *Within 24 hours or the next working day of any incident or potential incident with actual or potential significant off-site impacts on people, or the biophysical environment (including wildlife), a report shall be supplied to the Director-General outlining the basic facts and mitigation measures undertaken at the time. A further detailed report shall be prepared and submitted following investigations of the causes and identification of necessary additional preventative measures. The report must be submitted to the Director-General no later than 14 days after the incident or potential accident*.

The incident report should include the following information:

- location of the incident;
- person's name and contact number who discovered the incident;
- the best estimate of the time the incident occurred;
- the time the person reporting the incident and/or the organisation/company they represent became aware of the incident;
- a description of the incident;
- the suspected cause of the incident;
- the environmental harm or environmental nuisance caused, threatened or suspected to be caused by the incident; and
- actions taken to prevent further similar incidents and mitigate any environmental harm or environmental nuisance caused by the incident.

In accordance with Development Consent Condition 5.4(d):

> [Barrick] *shall maintain a register of such accidents, incidents, and potential incidents. The register shall be made available for inspection at any time by the independent hazard auditor and the Director-General.*

Barrick will maintain a record of/and report on any unauthorised release of hazardous waste or chemicals to the environment.

3.18.1.2 Environment Protection Licence

The EPA is required to be notified of any spills that cause "material harm" to the environment, whereby "material harm" is defined in section 147 of the POEO Act.

3.18.1.3 Any Other Relevant Approvals

The approval for onsite remediation of hydrocarbon contaminated waste and further reuse requires that soils are sampled and assessed by external consultants for waste classification in accordance with NSW EPA (2009) *Waste Classification Guidelines: Part 1: Classifying Waste*.

3.18.2 Environmental Management

3.18.2.1 Control Strategies

Based on the principles detailed in *Leading Practice Sustainable Development Program for the Mining Industry - Hazardous Materials Management* handbook (Department of Resources, Energy and Tourism, 2009), Barrick employees and contractors have adopted a Chemical Management Strategy (**CMS**) as part of the HWCMP. This strategy allows for the management of each chemical used at the CGM.

A discussion of the primary components of the CMS is provided in the following sub-paragraphs.

Control Strategies include:

- Site wide inductions, awareness and training on Hazs Substs and Hydrocarbon spill response;
- Annual concrete bunding and tankage integrity audits;
- Area planned general inspections;
- Hazardous Substance and Dangerous Goods Register; and
- Incident reporting and follow up action items.

Inventory Register

In accordance with best practice and the CMS all raw materials/consumables brought on-site for use at the CGM are recorded in an Inventory Register which is updated and available for inspection by the appropriate authorities. Manufacturer's Safety Data Sheets (**SDSs**) for all chemicals will also be included in the Inventory Register. The CGM uses the ChemAlert 3 system for the management of MSDSs of chemical/consumable on-site and to achieve site substance control.

Hazardous Substance and Dangerous Goods Register (HSDGR) and Fuel and Oils Register (FOR)

In accordance with Paragraph 6.4.1 of the EIS (North Limited, 1998) and the CMS, chemicals recorded on the Inventory Register that are designated as hazardous substances and/or dangerous goods and/or fuels and oils are included in the HSDGR and the FOR.

Personnel Training

Most if not all activities associated with hazardous consumables require the intervention or interaction of workers and management. In accordance with the CMS and HWCMP, Barrick employees and contractors are trained in:

- hazardous chemical/substance awareness;
- job hazard analysis preparation and use;
- use of Manufacturer's SDS information;
- measures to prevent accidental release;
- potential environmental impacts;
- ChemAlert 3 application and usage;
- use and maintenance of Personal Protective Equipment (**PPE**);
- emergency spill response and containment; and
- spill response and clean-up techniques.

Education and training programmes are used to instruct employees and contractors on the appropriate use of chemicals and requirement for "approved for use on-site" chemicals. The programme is also be used to distribute information on the occupational health and safety implications and potential environmental impacts of these consumables.

Employee and contractor education and training programmes continued to be provided during the reporting period. The training programmes include and are not necessarily limited to:

- induction of all company employees, contractors and first time visitors;
- training in the Job Hazard Analysis for the use of each chemical for those personnel whose work involves its use;
- specific emergency response training to suit individual work requirements; and
- ongoing refresher training programmes for key employees and contractors to improve skills and competencies as necessary.

Training also includes reinforcement by refresher courses, short 'toolbox' discussions, and/or routine discussion with supervisors. Records of all staff induction and environmental training are kept to assist in the identification of personnel who require 'refresher' training.

Operators moving or using any reagents are trained in the requirements of the material such as PPE, handling procedures and spill clean-up procedures in accordance with the HSDGR.

Specific HSDG training provided to employees during the reporting period included:

- The pocket-sized employee spill response handbook continues to be distributed across the site to all new employees or those not previously inducted.
- The Environmental Awareness Handbook also continues to be distributed to all employees and visitors during the year.

Auditing of Chemical Management

The CGM is subject to periodic audit and review. During the audit and review process CGM chemical management practices and procedures are assessed against the CMS and the HWCMP. Audit results are used to identify improvements that can be made to the site CMS procedures, if appropriate.

SAI Global conducted several days of audit training during 2011; this was the first basic audit training conducted on site for some years.

ChemAlert 3 employee training occurred 17 to 20 September 2012 and is intended to occur during the next reporting period after the change from version 3.2 to 3.3. Version 4 of ChemAlert 3 will be commissioned in coming year or so.

3.18.2.2 Effectiveness of Control Strategies

A number of minor substance spillage incidents occurred during the reporting period, however the control strategies set out in the HWCMP are considered to be effective as the spills were minor in nature and were fully contained.

The number of internally reported spills reflects the effectiveness of site awareness training sessions undertaken with more intensive oil and chemical spill training sessions.

3.18.2.3 Variations from Proposed Control Strategies

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

3.18.3 Environmental Performance

3.18.3.1 Monitoring

There are no specific monitoring programmes for hydrocarbons relevant to the reporting period however there are a number of preliminary spill response procedures which are discussed below. Sampling of bioremediated soil is undertaken and confirmed to be suitable prior to reuse on rehabilitation locations on-site. In addition, hydrocarbon sampling is undertaken on a quarterly basis as per SGWMBMP.

Preliminary Spill Responses

A number of minor substance spillage incidents occurred during the reporting period and the spill response procedures outlined in the HWCMP were implemented at CGM. The CGM preliminary spill responses were implemented for the minor incidents. Impacted material was then transferred to the temporary hydrocarbon waste transfer station for bioremediation.

A Total Waste Management Service was maintained during the reporting period to handle, transport and dispose of all waste material streams generated at CGM. JR Richards & Sons, West Wyalong, have provided this service since the construction of the CGM. A number of licensed sub-contractors are coordinated by the JR Richards & Sons contract to appropriately recycle and/or dispose of the various waste streams.

3.18.3.2 Performance Outcomes

As described in Paragraph 2.6 above, on-site bioremediation of site-generated hydrocarbon contaminated soils commenced in early 2009.

3.18.4 Reportable Incidents

There were no government reportable incidents relating to hydrocarbon spillage management during the reporting period. Barrick maintains records of loss control incident reports on any unauthorised release of hazardous waste or managed substances beyond bunded areas or to the environment.

In accordance with the HWCMP, relevant emergency services/agencies will be contacted if:

- the spill has spread or has the potential to spread beyond the boundaries of the CGM;
- it is beyond the resources of the CGM to respond to the spill;
- the available protective equipment is inadequate for dealing with the situation; or
- staff, the public or the environment is, or could potentially be placed at risk.

In accordance with the ERP/PIRMP, relevant emergency services/agencies will be contacted immediately if material environmental harm results from an incident.

The incidents that occurred during the reporting period were minor in nature and therefore not required to be reported to relevant emergency services/agencies.

3.18.5 Further Improvements

Whilst only minor substance spillage incident occurred during the reporting period, Barrick has continued to make additional improvements to infrastructure, systems and employee awareness about substance management and spillage prevention:

- Obsolete substances continued to be appropriately disposed of and new substances are registered for use on-site. Spillage clean up materials were disposed of appropriately;
- Continued maintenance of spill response stations. A register of bins continues to be maintained during the reporting period to facilitate content stock auditing and usage reporting;
- The Mining Hardstand truck and vehicle wash facility including the associated oily water coalescing plate separator by-product collected for off-site recycling by licensed waste management contractors;
- The Bioremediation Facility has been operational since early-2009;
- Employee spill response and environmental awareness handbooks continue to be distributed to employees (includes contractors), government regulators, CEMCC, goods suppliers, various VIP visitors, etc;
- The fuel tracking system (Banlaw) hardware was installed at all diesel dispensing stations during the 2011 reporting period. The main diesel tank bund floor has continued to be maintained;
- Barrick Regional Office introduced a Regional OHS Standard for Hazardous Materials (May 2012);

- Barrick Cowal introduced a Site Standard for Hazardous Substances and Dangerous Goods (July 2012); and
- Barrick Cowal introduced a Site Standard for Hydrocarbon performance management (July 2012).

The HSDG and hydrocarbon management measures as described in the HWCMP will continue to be maintained during the next reporting period.

3.19 METHANE DRAINAGE/VENTILATION

This Paragraph is not applicable to the CGM for this reporting period.

3.20 WASTE GEOCHEMISTRY

3.20.1 Reporting Requirements

During annual on-site AEMR performance review meetings in 2005 and 2006, the DTIRIS (DRE) (formerly DTIRIS & DPI) [Mineral Resources]) requested confirmatory test-work of waste rock geochemistry be undertaken. In their 2007 report, the IMP also recommended that Barrick 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.

A description of the testwork that has been undertaken since 2007 is provided in Section 3.20.2.1.

3.20.2 Environmental Management

The regional and local geology of the Endeavour 42 deposit (**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* 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 1m to 15m thick and are interpreted to have formed as a result of remobilisation of gold during weathering processes in association with water table fluctuations.

3.20.2.1 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). Overall, the EGi (2004) results indicated a very low likelihood of Acid Rock Drainage (**ARD**) generation from waste rock, Carbon in Leach (**CIL**) 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 CGM. 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.

Detailed geochemical investigations were conducted by EGi prior to commencing mining operations at the CGM. Subsequent geochemical investigations were also conducted by EGi in 2004 and by O'Kane Consultants Pty Ltd (**O'Kane**) in 2008. A Tailings and Waste Rock Geochemical Assessment was also conducted as part of the E42 Modification Modified Request Environmental Assessment (Barrick, 2010) by Geo-Environmental Management Pty Limited (GEM) (2009).

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 NWE, SWE and PWE external toe drain points in accordance with the EPL.

As recommended by EGi in 2004 and GEM (2009), operational monitoring and testing was 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 that may be exposed during mining.

As described in Section 5, final cover material on the waste rock emplacement and tailings storage facility batters will be of low salinity to avoid the potential for saline runoff and enable satisfactory vegetation growth. It will comprise of benign rock mulch, covering the waste rock or process tailings, which will then be covered with the layer of low salinity topsoil.

In accordance with Recommendation 1 of the 2010 Sixth Annual Report of the IMP, the volume of benign, competent rock likely to be required for future rehabilitation and mine closure was calculated in 2011 based on the latest topsoil and subsoil inventory calculations; the Barrick Reclamation Cost Estimator (BRCE) model estimates; and proposed stockpiled soil resource characterisation. The volume of benign, competent waste rock anticipated to be available from future development of the open pit, is also proposed to be re-calculated during the next reporting period and used to update the materials inventory and evaluate the balance of materials available for future rehabilitation through to mine closure.

3.20.2.2 Effectiveness of Control Strategies

The current control strategies implemented during the reporting period were considered adequate.

3.20.2.3 Variations from Proposed Control Strategies

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

3.20.3 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 CGM. The ongoing drilling and metallurgical testing carried out by Barrick during the reporting period provided the opportunity to update the geochemical database for the project and to verify the findings of previous studies by EGi (2004) and GEM (2009). Ongoing periodic field observations undertaken during the reporting period confirmed the low salinity potential of waste hard rock types mined during the reporting period.

As stated above, 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 DTIRIS (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.
There has been no seepage from the waste (rock) emplacement areas. There has been some localised stormwater run-off in areas that are yet to undergo final rehabilitation treatment.

3.20.4 Reportable Incidents

There were no reportable incidents relating to waste geochemistry during the reporting period.

3.20.5 Further Improvements

Chemical groundwater data will continue to be collected as part of the groundwater monitoring programme detailed in the SGWMBMP. Leachate water quality monitoring will be undertaken at the northern, southern and PWE external toe drain points in accordance with the EPL if and when any seepage is detected.

As recommended during repeat external reviews (2004-2009), operational monitoring and testing continued to be carried out on an occasional and as-need basis to confirm the low ARD potential of all waste types with particular focus on any unexpected rock types or alteration types that may be exposed during mining.

The waste rock-topsoil cross-rip methodology has been implemented since the 2nd Lifts of the NTSF and STSF, at NWE northern, the SWE south trials, PWE east re-works (2012-2013) and Pond D1 Trial plots. These areas have exhibited signs of improved reclamation performance (DnA Environmental, 2012), which is a good outcome for salinity control on final slopes.

3.21 PUBLIC SAFETY

3.21.1 Reporting Requirements

The following control strategies have been implemented to ensure public safety is achieved on-site:

- general site induction programme (relevant to all personnel, contractors and visitors entering Barrick-owned land);
- specific area inductions (relevant to mining, processing and geology);
- visitors induction programme;
- all Barrick employees, contractors and visitors are issued with card access identification;
- appropriate Barrick employees including contractors have undertaken a First-Aid training course;
- the perimeter of ML 1535 is fenced restricting access to site (in accordance with Development Consent Condition 2.3);
- there is 24 hour security coverage at the Main Gate (including security cameras vision around the site);
- regular security patrols are performed of the external perimeter;
- off-site locations (e.g. borefields) are securely fenced;
- contained on-site is a Emergency Response Office equipped with a fully functional First-Aid room and a commissioned site based First-Aid vehicle;
- in accordance with the BMP a fire break has been placed along the perimeter of ML 1535 and other structures of importance;
- the ERT was assembled and have been trained in fire fighting, First-Aid response, vehicle trauma, HAZMAT, rope rescue and basic bushfire fighting; and
- cyanide awareness sessions have been held for local Emergency Services groups and community groups.

Barrick has conducted quarterly meetings with the CEMCC during the reporting period. Hazardous substances and dangerous goods management and emergency preparedness are ongoing topics covered by updates.

3.21.1.1 Effectiveness of Control Strategies

The control strategies implemented during the reporting period are considered to be effective.

3.21.1.2 Variations from Proposed Control Strategies

The final 18 of the 31 yellow maritime special buoys have been placed along the inundated ML boundary to advise any potential members of the public of access restrictions.

3.21.2 Environmental Performance

There were no reportable incidents relating to public safety during the reporting period (see Paragraph 3.21.3 below). Therefore it is considered that the control strategies implemented above have been performing adequately to ensure public safety within ML 1535 and immediate surrounds.

3.21.3 Reportable Incidents

There were no reportable incidents relating to public safety during the reporting period.

3.21.4 Further Improvements

The ERT will continue to be trained in public safety preventative measures including fire fighting, First-Aid response, vehicle trauma, HAZMAT, rope rescue and basic bushfire fighting. The ERT will attend joint training sessions with the RFS, SES, St John Ambulance, Hospital and NSW Fire and Rescue.

3.22 NATURAL HERITAGE

Lake Cowal, a portion of which is located within ML 1535, is listed on the Register of the National Estate. The Lake is protected by CGM approvals and relevant EMPs. A summary of the landscape values in the CGM area and management initiatives is provided below.

The general landscape of the CGM mining operations area is flat to very gently undulating land with occasional hills such as Wamboyne Mountain. The region supports mainly dryland agriculture with irrigation farming practised in the Jemalong/Wyldes Plains to the north-east of the Lake.

Land use surrounding the mine site is dominated by sheep and cattle grazing and grain cropping. Grazing and occasional cropping within the high water mark of the Lake has historically occurred when the lake was dry and market conditions were suitable. Irrigation farming is practised to the north-east of the Lake in the Jemalong-Wyldes Plains Irrigation District.

The game reserve previously located in ML 1535 was relocated to an area outside of ML 1535 in 2005. The travelling stock reserve was also previously relocated around the western and parts of the southern and northern boundaries of ML 1535 in 2005. The management of grazing and cropping associated with Barrick-owned lands potentially allows native plant communities to recover from 150 years of agricultural pressure. This is expected to provide enhanced terrestrial and wetland habitat opportunities for threatened herb and grass species for which grazing is a dominant threatening process, as well as fauna species. The enhancement initiatives associated within areas of Barrick-owned lands include a Remnant Vegetation Enhancement Programme, a Compensatory Wetland and the enhancement of remaining areas of wetland within ML 1535 (excluding the New Lake Foreshore). These enhancement initiatives are documented in the LMP, CWMP and ROMP. Two offset areas have also been designated on land owned by Barrick to the north and south of the CGM (Figure 17). In accordance with Development Consent Condition 3.6(a), the offset areas include offset enhancement areas and an offset revegetation area. A description of the offset areas and offset strategy is provided in Paragraph 3.7.

After decommissioning of the CGM, the modified Lake foreshore, waste rock emplacements and tailings storages are predicted to expand habitat opportunities for wetland and terrestrial flora and fauna species. The rehabilitation programme will include the revegetation of the new landforms with selected communities of native vegetation that are suitable to both the physiographic and hydrological features of each landform, whilst expanding the areas of remnant native vegetation that currently exist in the region and providing habitat opportunities for flora and fauna.

Subject to the outcomes of consultation, the Bland Creek Palaeochannel Borefield bores and associated pump stations may be transferred to regional landholders upon agreement by Barrick and in consultation with the OoW. Alternatively, the Bland Creek Palaeochannel Borefield bores and associated pump stations may be dismantled and the bores plugged and capped.

4 COMMUNITY RELATIONS

Barrick recognises developing and maintaining a positive relationship with the local community is essential to running a successful mining operation. Barrick has developed a "Community Relations Strategy" designed to support the Barrick Community Relations vision of:

"Working together with local communities for mutual long-term success".

Barrick has also developed a "Corporate Social Responsibility Charter". The Charter states that at Barrick, we are committed to making a positive difference in the communities in which we live and work. Barrick strive to earn the trust of all with whom we interact, whether they be our employees, the community, Government or other stakeholders. The Charter guides Barrick in its conduct of business around the world.

In addition, Barrick implemented a Community Relations Management System (CRMS) during the reporting period to ensure a more systemic and consistent approach to Community Relations. During the next reporting period an internal audit of the CRMS will occur.

4.1 COMMUNITY COMPLAINTS

A community complaints line was established on 9 December 2003 and operates 24 hours per day. Complaints and/or concerns can be made by dialling (02) 6975 3454 where an operator advises the caller that they have reached the CGM Complaints Line. This number is listed in the local Telstra Directory (2011-2012), Whitepages online, West Wyalong Visitors Directory, Forbes Visitors Directory and the Condobolin Business Directory. The operator requests the caller's name, the nature of their complaint/concern, and a return phone number. The information is logged along with the date and time that the call was made. A record of each call is immediately forwarded to the Barrick CGM Community Relations department via the CGPComplaints@barrick.com email. For immediate notification of complaints logged outside of regular business hours, the Community Relations Manager receives a copy to his mobile phone. Upon receiving an enquiry, the Community Relations Manager conducts necessary investigations and prepares a response. The caller is contacted within 24 hours of the complaint, and notified of any action taken or proposed by Barrick.

A summary of the community complaints received during the reporting period (as required by the Development Consent) is provided in Table 39.

Table 39
Summary of Community Complaints during the Reporting Period

DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	7 February 2012 – 12:42pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at 3:39pm on 07/02/2012. There was no answer so the caller left a message on the household answering service. 2. Subsequent complaints were received on 17/3, 22/3, 25/3, 29/3 and 3/4 and these subsequent complaints lead to further contact and engagement with the complainant as outlined in later references within this report. 3. A meeting was held at the complainant's home on 11 April 2012 attended by the complainants and the residents of another nearby property (Complainant B). The Barrick Cowal Gold Mine was represented by the General Manager, Community Relations Manager and Environment Manager. 4. During the meeting a table of blast monitoring results was provided which indicated that the blast undertaken on 07/02/2012 complied with the Blasting Impact Assessment Criteria described in Condition 6.3(a) of the project's statutory Development Consent Conditions. 5. The blast monitoring data revealed that on 07/02/2012, peak Ground Vibration was measured at 0.10 mm/s and peak Airblast Overpressure was measured at 104.2dB(L). These peak levels were recorded within the mine site boundaries, lower levels were recorded at and adjacent to private homes including lower levels at the complainant's property.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	6. During the meeting, a copy of the report entitled Assessment of Blasting Impacts at BM08 – Cowal Gold Mine, April 2012 was provided. This report provided details of additional blast monitoring undertaken at the complainant's homestead between 22/05/2011 and 29/02/2012. The report confirmed compliance with the relevant conditions for the monitoring period. 7. During the meeting, Barrick representatives undertook to arrange for structural engineers to attend the home and undertake a dilapidation survey. Engineers from KBR attended the property on 30/05/2012. The final dilapidation survey report is currently pending delivery.
DATE OF RESPONSE	7 February 2012
DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise
DATE and TIME	17 March 2012 – 3:13pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at approximately 9:45am on 19/03/2012. Barrick's representative undertook to investigate the matter and provide further information. 2. Barrick sent a letter to the complainant dated 26/03/2012 regarding the matter. 3. The letter advised that Barrick undertakes regular monitoring per the requirements of the project's Development Consent Conditions. 4. The report on noise monitoring undertaken in June/July 2011 was provided as an attachment to the letter. This report indicated Barrick's operations at the Cowal Gold Mine were in compliance with the relevant development consent conditions as they relate to the affect of operational noise. 5. The letter advised that further monitoring had been undertaken in January 2012 and a copy of the report from that activity would be provided as soon as it is released by the noise monitoring consultants. 6. The letter advised that Barrick would engage noise monitoring consultants to undertake further noise monitoring activities in addition to the noise monitoring required as part of the Cowal Gold Mine's Development Consent Conditions. This additional noise monitoring was scheduled to take place during May 2012. 7. Per point 5, a copy of the report on noise monitoring undertaken in January 2012 was provided as an attachment to correspondence issued to the complainants dated 27/04/2012. This report indicated Barrick's operations at the Cowal Gold Mine were in compliance with the relevant development consent conditions as they relate to the affect of operational noise. 8. Per point 6, additional noise monitoring was undertaken in May 2012. The report on this monitoring activity was provided to Barrick on 29/6/2012 and was be posted to the complainants during the week commencing 02/07/2012. This report indicates Barrick's operations at the Cowal Gold Mine were in compliance with the relevant development consent conditions as they relate to the affect of operational noise.
DATE OF RESPONSE	19 March 2012
DETAILS	Resident of Lake Cowal (Complainant B)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise
DATE and TIME	19 March 2012 – 9:28pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at approximately 11:30am on 20/03/2012. Barrick's representative undertook to investigate the matter and provide further information. 2. Barrick sent a letter to the complainant dated 26/03/2012 regarding the matter. 3. The letter advised that Barrick undertakes regular monitoring per the requirements of the project's Development Consent Conditions. 4. The report on noise monitoring undertaken in June/July 2011 was provided as an attachment to the letter. This report indicated Barrick's operations at the Cowal Gold Mine were in compliance with the relevant development consent conditions as they relate to the affect of operational noise. 5. The letter advised that further monitoring had been undertaken in January 2012 and a copy of the report from that activity would be provided as soon as it is released by the noise monitoring consultants.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	6. The letter advised that Barrick would engage noise monitoring consultants to undertake further noise monitoring activities in addition to the noise monitoring required as part of the Cowal Gold Mine's Development Consent Conditions. This additional noise monitoring was scheduled to take place during May 2012. 7. Per point 5, a copy of the report on noise monitoring undertaken in January 2012 was provided as an attachment to correspondence issued to the complainants dated 27/04/2012. This report indicated Barrick's operations at the Cowal Gold Mine were in compliance with the relevant development consent conditions as they relate to the affect of operational noise. 8. Per point 6, additional noise monitoring was undertaken in May 2012. The report on this monitoring activity was provided to Barrick on 29/6/2012 and is due to be posted to the complainants during the week commencing 02/07/2012. This report indicates Barrick's operations at the Cowal Gold Mine were in compliance with the relevant development consent conditions as they relate to the affect of operational noise. 9. The complainants also attended a meeting on 11 April 2012 at a neighbouring homestead. During the meeting, representatives of the Barrick Cowal Gold Mine offered to engage consultants to undertake a noise mitigation survey at the complainant's homestead. The complainant advised that this would not be necessary.
DATE OF RESPONSE	19 March 2012
DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT / CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	22 March 2012 – 12:37pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at 12:46pm on 22/03/2012. There was no answer so the caller left a message on the household answering service. 2. A meeting was held at the home on 11 April 2012 attended by the complainants and the General Manager, Community Relations Manager and Environment Manager as representatives of the Barrick Cowal Gold Mine. 3. During the meeting a table of blast monitoring results was provided which indicated that the blast undertaken on 22/03/2012 complied with the Blasting Impact Assessment Criteria described in Condition 6.3(a) of the project's statutory Development Consent Conditions. 4. The blast monitoring data revealed that on 22/03/2012, peak Ground Vibration was measured at 0.15 mm/s and peak Airblast Overpressure was measured at 101.9dB(L). 5. During the meeting, a copy of the report entitled Assessment of Blasting Impacts at BM08: Cowal Gold Mine, April 2012 was provided. This report provided details of additional blast monitoring undertaken at the complainant's homestead between 22/05/2011 and 29/02/2012. The report confirmed compliance with the relevant conditions for the monitoring period. 6. During the meeting, Barrick representatives undertook to arrange for structural engineers to attend the home and undertake a dilapidation survey. Engineers from KBR attended the property on 30/05/2012. The final dilapidation survey report is currently pending delivery.
DATE OF RESPONSE	22 March 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	25 March 2012 – 12:39pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at 12:43pm on 25/03/2012. There was no answer so the caller left a message on the household answering service. 2. A meeting was held at the home on 11 April 2012 attended by the complainants and the General Manager, Community Relations Manager and Environment Manager as representatives of the Barrick Cowal Gold Mine. 3. During the meeting a table of blast monitoring results was provided which indicated that the blast undertaken on 25/03/2012 slightly exceeded the Blasting Impact Assessment Criteria for Sundays and Public Holidays as described in Condition 6.3(a) of the project's statutory Development Consent Conditions.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	4. The blast monitoring data revealed that on 25/03/2012, peak Ground Vibration was measured at 0.09 mm/s and peak Airblast Overpressure was measured at 103.5dB(L). 5. During the meeting, it was explained that despite the slight exceedance of the Blast Impact Criteria for Sundays and Public Holidays, the Conditions allowed for up to 5% of total blasts in the category within a 12 month period to exceed the Blast Impact Criteria Levels in that category. It was explained that the Cowal Gold Mine's activities had not breached the 5% threshold of allowable exceedances. 6. During the meeting, a copy of the report entitled Assessment of Blasting Impacts at BM08: Cowal Gold Mine, April 2012 was provided. This report provided details of additional blast monitoring undertaken at the complainant's homestead between 22/05/2011 and 29/02/2012. The report confirmed compliance with the relevant conditions for the monitoring period. 7. During the meeting, Barrick representatives undertook to arrange for structural engineers to attend the home and undertake a dilapidation survey. Engineers from KBR attended the property on 30/05/2012. The final dilapidation survey report is currently pending delivery.
DATE OF RESPONSE	25 March 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	29 March 2012 – 12:36pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at 4:28pm on 29/03/2012. There was no answer so the caller left a message on the household answering service. 2. The complainants returned the call on 30/03/2012 and discussed matters which were scheduled to be addressed at a meeting to be held at the complainant's property on 11/04/2012. 3. A meeting was held at the home on 11 April 2012 attended by the complainants and the General Manager, Community Relations Manager and Environment Manager as representatives of the Barrick Cowal Gold Mine. 4. During the meeting a table of blast monitoring results was provided which indicated that the blast undertaken on 29/03/2012 complied with the Blasting Impact Assessment Criteria described in Condition 6.3(a) of the project's statutory Development Consent Conditions. 5. The blast monitoring data revealed that on 29/03/2012, peak Ground Vibration was measured at 0.14 mm/s and peak Airblast Overpressure was measured at 102.8dB(L). 6. During the meeting, a copy of the report entitled Assessment of Blasting Impacts at BM08: Cowal Gold Mine, April 2012 was provided. This report provided details of additional blast monitoring undertaken at the complainant's homestead between 22/05/2011 and 29/02/2012. The report confirmed compliance with the relevant conditions for the monitoring period. 7. During the meeting, Barrick representatives undertook to arrange for structural engineers to attend the home and undertake a dilapidation survey. Engineers from KBR attended the property on 30/05/2012. The final dilapidation survey report is currently pending delivery.
DATE OF RESPONSE	29 March 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	3 April 2012 – 12:57pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager emailed the complainants at 5:07pm on 04/04/2012. 2. The email included blast monitoring data relative to the blast conducted on 3/4/3012. The blast monitoring data revealed that on 3/4/2012, peak Ground Vibration was measured at 0.25mm/s and peak Airblast Overpressure was measured at 108.4dB(L). These peak levels were recorded within the mine site boundaries, lower levels were recorded at and adjacent to private homes including lower levels at the complainant's property. 3. A meeting was held at the home on 11 April 2012 attended by the complainants and the General Manager, Community Relations Manager and Environment Manager as representatives of the Barrick Cowal Gold Mine.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	4. During the meeting a table of blast monitoring results was provided which indicated that the blast undertaken on 3/04/2012 complied with the Blasting Impact Assessment Criteria described in Condition 6.3(a) of the project's statutory Development Consent Conditions. 5. The blast monitoring data tabled at the meeting reflected the information provided in the email dated 4/4/2012 and referred to above at point 2. 6. During the meeting, a copy of the report entitled Assessment of Blasting Impacts at BM08: Cowal Gold Mine, April 2012 was provided. This report provided details of additional blast monitoring undertaken at the complainant's homestead between 22/05/2011 and 29/02/2012. The report confirmed compliance with the relevant conditions for the monitoring period. During the meeting, Barrick representatives undertook to arrange for structural engineers to attend the home and undertake a dilapidation survey. Engineers from KBR attended the property on 30/05/2012. The final dilapidation survey report is currently pending delivery.
DATE OF RESPONSE	4 April 2012
DETAILS	Resident of Lake Cowal, (Complainant C)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	14 April 2012 – 12:47pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager called the complainants at approximately 4:30pm on 16/04/2012 and sent a further email to the complainants at 5:13pm on the same date. 2. The email included blast monitoring data relative to the blast conducted on 14/4/2012. The blast monitoring data revealed that on 14/4/2012, peak Ground Vibration was measured at 0.62mm/s and peak Airblast Overpressure was measured at 110.9dB(L). These peak levels were recorded within the mine site boundaries, lower levels were recorded at and adjacent to private homes. 3. The Community Relations Manager attempted calling the complainants again on 26/04/2012 however there was no answer. 4. The lieu of a telephone conversation, the Community Relations Manager emailed the complainants on 26/4/2012 to advise that Barrick had engaged KBR as Structural Engineering Consultants to attend properties in the area and conduct dilapidation surveys. The email advised that the Structural Engineers would be available on 30 May 2012. 5. The complainant replied via email on 26/4/2012 to advise that they would be on holiday on 30/5/2012 and would not be able to have a structural engineer attend their property on that date.
DATE OF RESPONSE	16 April 2012
DETAILS	Resident of Lake Cowal, (Complainant C)
COMPLAINT / CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	17 April 2012 – 12:40pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager called the complainants at approximately 1:15pm on 17/04/2012 and advised the complainant that no blast had occurred that day and therefore, activities at the Cowal Gold Mine could not have caused the "tremor" reported within their complaint.
DATE OF RESPONSE	17 April 2012
DETAILS	Resident of Lake Cowal, (Complainant D)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	20 April 2012 – 12:46pm

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer called the complainants on 20/04/2012 to advise that Barrick would review the Blast Monitor Data and get back in touch if the review of the data revealed any breach of the development consent conditions. 2. The complainants called again on 30/4/2012 to request that the blast monitoring data from the 20/4/2012 be provided to them. 3. Barrick's Community Relations Manager emailed the complainant on 30/4/2012 and provided details of blast monitoring data for 20/4/2012 with revealed Ground Vibrations at the complainant's residence of 0.08mm/s and Airblast Overpressure of 98.8dB(L). The email advised that the blast monitoring data revealed that the effects of blasting on 20/4/2012 were within the limits as described in the Development Consent Conditions for the mine.
DATE OF RESPONSE	20 April 2012
DETAILS	Resident of Lake Cowal, (Complainant D)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	6 May 2012 – 12:39pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer called the complainants on 06/05/2012 at 1:10pm to advise that Barrick would review the Blast Monitor Data and provide it via email as soon as possible. 2. Barrick's Community Relations Manager emailed the complainant on 8/5/2012 and provided details of blast monitoring data for 6/5/2012 which revealed peak Ground Vibrations of 0.57mm/s and Airblast Overpressure of 103.5dB(L). These peak levels were recorded within the mine site boundaries, lower levels were recorded at and adjacent to private homes including lower levels at the complainant's property. 3. The email advised that the blast monitoring data revealed that the effects of blasting on 20/4/2012 were within the limits as described in the Development Consent Conditions for the mine. 4. The email went on to advise that the attendance of a structural engineer at the property, which had been arranged to take place on 30/5/2012 would assist in determining whether blasting at the Cowal Gold Mine is likely to be causing damage at the property. 5. Structural Engineers from KBR attended the property on 30/5/2012 to conduct a dilapidation survey. The final dilapidation survey report is currently pending delivery.
DATE OF RESPONSE	6 May 2012
DETAILS	Resident of Lake Cowal, (Complainant B)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding use of roads
DATE and TIME	8 May 2012 – 5:41pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager called the complainants on 08/05/2012 at 5:45pm. During the call, the complainant advised that they were concerned that officers from Barrick who were installing noise monitoring equipment nearby would use a particular road (the front road) adjacent to the property which was wet. The complainant was concerned that if the Barrick officers used the road they would damage the road. 2. Barrick's Community Relations Manager undertook to immediately contact the relevant Barrick Officers in the field and instruct them not to use the front road. The Community Relations Manager then undertook to call the complainant back. 3. Barrick's Community Relations Manager called the complainant back at approximately 6:00pm on the same day to advise that the Officer had not used the wet section of the road and had instead proceeded by foot over the wet terrain in an effort to avoid causing any damage to the road. The complainant was appreciative of the returned call and for the actions taken by the field officers to avoid damage to the road.
DATE OF RESPONSE	8 May 2012

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise
DATE and TIME	26 May 2012 – 7:01pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer returned the call at approximately 2:00pm on 28/05/2012. 2. During the call, Barrick's representative confirmed that Operational Noise Monitoring had recently been undertaken at the property and that the results of that monitoring would provide further insights into Barrick's ongoing compliance with the development consent conditions as they relate to operational noise. 3. The report on this monitoring activity was provided to Barrick on 29/6/2012 and was posted to the complainants during the week commencing 02/07/2012. This report indicates Barrick's operations at the Cowal Gold Mine were in compliance with the relevant development consent conditions as they relate to the affect of operational noise.
DATE OF RESPONSE	28 May 2012
DETAILS	Resident of Lake Cowal (Complainant D)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise
DATE and TIME	26 May 2012 – 7:18pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer returned the call at approximately 2:00pm on 28/05/2012. There was no answer and a message was left on the household answering service. 2. Barrick's representative called again at approximately 2:30pm. During the call, Barrick's representative confirmed that Operational Noise Monitoring had recently been undertaken at the property and that the results of that monitoring would provide further insights into Barrick's ongoing compliance with the development consent conditions as they relate to operational noise. 3. The report on this monitoring activity was provided to Barrick on 29/6/2012 and was posted to the complainants during the week commencing 02/07/2012. This report indicates Barrick's operations at the Cowal Gold Mine were in compliance with the relevant development consent conditions as they relate to the affect of operational noise. 4. Barrick's representative also referred to a report into potential Noise Mitigation Treatments which had been provided to the complainants during 2011. Barrick's representative advised that Barrick would write to the complainants to formally offer to contribute to the costs associated with installing noise mitigation treatments at the home. 5. In correspondence to the complainants dated 31 May 2012, Barrick offered to contribute to the costs associated with installing noise mitigation treatments at the complainant's homestead. The owners of the complainant's homestead are presently seeking quotes which will be provided to Barrick for consideration.
DATE OF RESPONSE	28 May 2012
DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise
DATE and TIME	3 June 2012 – 9:17pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer returned the call at approximately 9:50am on 04/06/2012. There was no answer and a message was left on the household answering service. 2. Barrick's representative sent an email on 06/06/2012 advising that the Cowal Gold Mine had undertaken regular monitoring of operational noise and its impacts on nearby homes. 3. The email advised that all of the recent monitoring had revealed that Barrick's Operations did not exceed the allowable noise impacts as described within the relevant Development Consent Conditions for the project. 4. The email went on to say that despite this ongoing compliance with the Development Consent Conditions, Barrick acknowledges that the complainants continue to hold genuine concerns over the noise impact of the Cowal Gold Mine. In an effort to address these concerns, despite compliance with statutory obligations, Barrick is prepared to engage SLR Consulting to undertake a survey of the home and recommend any noise mitigation treatments which could be installed. Barrick would then be prepared to enter into an agreement with the complainant to contribute to the costs of installing the recommended noise mitigation treatments at the home.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	5. The complainants agreed to Barrick's offer to have SLR Consulting attend their home. SLR was been engaged by Barrick to attend the complainant's Homestead on 5/7/2012 to undertake a noise mitigation survey.
DATE OF RESPONSE	4 June 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	5 June 2012 – 1:27pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager called the complainants at 1:32pm on 5/6/2012. Barrick's representative undertook to retrieve the blast monitoring data and provide the data to the complainant via email as soon as possible. 2. Barrick's representative emailed the complainant on 6/6/2012. The details of the blasting conducted on 5/6/2012 were included within the email. The blast monitoring data revealed that on 5/6/2012, peak Ground Vibration was measured at 0.68mm/s and peak Airblast Overpressure was measured at 106.0dB(L). These peak levels were recorded within the mine site boundaries, lower levels were recorded at and adjacent to private homes including lower levels at the complainant's property. 3. The email advised that the blast monitoring data indicated that Barrick's blasting activities undertaken on 5/6/2012 complied with the Blasting Impact Assessment Criteria described in Condition 6.3(a) of the project's statutory Development Consent Conditions.
DATE OF RESPONSE	5 June 2012
DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise
DATE and TIME	5 June 2012 – 5:02pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer returned the call at approximately 2:20pm on 6/06/2012. There was no answer and a message was left on the household answering service. 2. Barrick's representative sent an email on 06/06/2012 advising that the Cowal Gold Mine had undertaken regular monitoring of operational noise and its impacts on nearby homes. 3. The email advised that all of the recent monitoring had revealed that Barrick's Operations did not exceed the allowable noise impacts as described within the relevant Development Consent Conditions for the project. 4. The email went on to say that despite this ongoing compliance with the Development Consent Conditions, Barrick acknowledges that the complainants continue to hold genuine concerns over the noise impact of the Cowal Gold Mine. In an effort to address these concerns, despite compliance with statutory obligations, Barrick is prepared to engage SLR Consulting to undertake a survey of the home and recommend any noise mitigation treatments which could be installed. Barrick would then be prepared to enter into an agreement with the complainant to contribute to the costs of installing the recommended noise mitigation treatments at the home. 5. The complainants agreed to Barrick's officer to have SLR Consulting attend their home. SLR has been engaged by Barrick to attend the complainant's homestead on 5/7/2012 to undertake a noise mitigation survey.
DATE OF RESPONSE	6 June 2012
DETAILS	Resident of Lake Cowal (Complainant E)
COMPLAINT/CONCERN	Jason Price (NSW Environment Protection Authority) contacted the Cowal Gold Mine's Environment Manager to advise that he had been contacted by the resident of a property located near the Cowal Gold Mine who had raised concerns about mine operational noise.
DATE and TIME	12 June 2012

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME	1. The Barrick Cowal Gold Mine's Community Relations Manager returned the call to Mr Price on 12/06/2012. 2. Mr Price advised that he had given an undertaking to the complainant to attend the property in the coming weeks to conduct some informal noise monitoring in an effort to determine whether the issue warranted further investigation. 3. Barrick's representative advised that Barrick had been engaging SLR Consulting to undertake regular noise monitoring in the area per the requirements of the Cowal Gold Mine's Development Consent Conditions. 4. Barrick's representative advised that the results of noise monitoring had been provided to the complainant previously and that the next round of scheduled noise monitoring was due to commence in July 2012. Barrick's representative advised that a copy of the report on noise monitoring undertaken in July 2012 would be provided to the complainant. 5. Barrick's representative also advised that it was now Barrick's intention to write to the complainant and provide a further copy of the most recent noise monitoring report to the complainant. Further, a copy of the report entitled Property Dwelling Noise Control Treatments was also provided as an attachment to the letter. This letter with attachments was sent on 12/06/2012 and a copy was provided to Mr Price. 6. Within the letter, Barrick offered to contribute to the costs associated with installing the noise control treatments recommended within the report. 7. On 28/6/2012, the complainant contacted Barrick's Environment Manager directly to advise that Jason Price from the NSW Environment Protection Authority had attended his property and undertaken noise monitoring. 8. Barrick's Community Relations Manager contacted Mr Price who was able to advise that he had undertaken informal noise monitoring with a hand-held device which had revealed noise levels up to 38dB which indicated no exceedance of the relevant Development Consent Conditions. Mr Price was pleased to note that additional formal noise monitoring would be undertaken during the following week at the complainant's property. 9. The complainant called the Cowal Gold Mine's Community Relations Manager at approximately 4:10pm on 2/7/2012. During the call a number of matters were discussed including specific matters relating to operational noise. The complainant advised that he did not accept that the Cowal Gold Mine's noise monitoring activities were independent and he believed they were inappropriately favouring the mine operators. He also advised that he did not think the offered noise mitigation treatments were sufficient nor would they address his concerns. The complainant expressed a desire to sell the property and his view that the operators of the Cowal Gold Mine should purchase the property. 10. Barrick's representative advised that the Cowal Gold Mine had no current requirement to purchase the property. Barrick's representative also refuted the suggestion that Noise Monitoring was being undertaken in an inappropriate manner. 11. Barrick's representative undertook to provide the results of future noise monitoring activities to the complainant. Barrick's representative also suggested to the complainant that if he thought additional mitigation was required at his property, Barrick would be pleased to consider such a proposal. 12. The complainant indicated he intended to continue escalating his concerns to other external parties including government regulators.
DATE OF RESPONSE	12 June 2012
DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise. The complainant also emailed Barrick Cowal Gold Mine's Community Relations Manager directly regarding the same matter.
DATE and TIME	17 June 2012 – 5:24am
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer returned the call at approximately 2:25pm on 18/06/2012. There was no answer and a message was left on the household answering service. 2. Barrick's representative sent an email on 18/06/2012 advising that the Cowal Gold Mine had undertaken regular monitoring of operational noise and its impacts on nearby homes. 3. The email advised that all of the recent monitoring had revealed that Barrick's Operations did not exceed the allowable noise impacts as described within the relevant Development Consent Conditions for the project.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	4. The email went on to say that despite this ongoing compliance with the Development Consent Conditions, Barrick had arranged for SLR Consulting to attend the home on 30/5/2012 to conduct a noise mitigation survey. 5. The email went on to suggest that if the complainant felt that Barrick were not dealing with their complaints appropriately, they were welcome to contact the independent Community, Environmental Monitoring and Consultative Committee (CEMCC) which has capacity to act as an independent grievance committee. Barrick's representative provided contact details for the independent chairperson of the CEMCC. 6. The complainant called Barrick's Community Relations Manager on 19/6/2012 following up on the email from Barrick dated 18/6/2012. The complainant advised that she had called the complaints line to put her concerns about noise on "on the record". Barrick's representative asked whether the complainant thought there was any further action Barrick could be taking in an effort to address the complainant's concerns. The complainant said she thought the actions Barrick is taking as explained in the most recent correspondence and emails to her are sufficient but she would continue to call the complaints hotline at any time that noise from the Mine caused her concern.
DATE OF RESPONSE	18 June 2012
DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise.
DATE and TIME	19 June 2012 – 5:59am
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer returned the call at approximately 9:58am on 19/06/2012. There was no answer and a message was left on the household answering service. 2. The complainant called Barrick's Community Relations Manager at 5:37pm on 19/6/2012 following up on the email from Barrick dated 18/6/2012 and on the call placed by Barrick's representative earlier that day. The complainant advised that she had called the complaints line to put her concerns about noise on "on the record". Barrick's representative asked whether the complainant thought there was any further action Barrick could be taking in an effort to address the complainant's concerns. The complainant said she thought the actions Barrick is taking as explained in the most recent correspondence and emails to her are sufficient but she would continue to call the complaints hotline at any time that noise from the Mine caused her concern.
DATE OF RESPONSE	19 June 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT / CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	24 June 2012 – 12:35pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager emailed the complainants at 10:47am on 26/6/2012. 2. The details of the blasting conducted on 5/6/2012 were included within the email. The blast monitoring data revealed that on 24/6/2012, peak Ground Vibration was measured at 0.39mm/s and peak Airblast Overpressure was measured at 110.2dB(L). 3. Despite the slight exceedance of the Blast Impact Criteria for Sundays and Public Holidays, the Conditions allow for up to 5% of total blasts in the category within a 12 month period to exceed the Blast Impact Criteria Levels in that category. The Cowal Gold Mine's activities had not breached the 5% threshold of allowable exceedances.
DATE OF RESPONSE	26 June 2012
DETAILS	Resident of Lake Cowal, (Complainant D)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	29 June 2012 – 12:48pm

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager called the complainants at 1:05pm on 29/6/2012. Barrick's representative undertook to retrieve the blast monitoring data and provide the data to the complainant via email as soon as possible. 2. Barrick's representative emailed the complainant on 2/7/2012. The details of the blasting conducted on 29/6/2012 were included within the email. The blast monitoring data revealed that on 29/6/2012, peak Ground Vibration was measured at 0.34mm/s and peak Airblast Overpressure was measured at 103.5dB(L). These peak levels were recorded within the mine site boundaries, lower levels were recorded at and adjacent to private homes including lower levels at the complainant's property. 3. The email advised that the blast monitoring data indicated that Barrick's blasting activities undertaken on 29/6/2012 complied with the Blasting Impact Assessment Criteria described in Condition 6.3(a) of the project's statutory Development Consent Conditions.
DATE OF RESPONSE	29 June 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	3 July 2012 – 12:36pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at 11:35am on 04/07/2012. Barrick's representative spoke to the complainant's daughter who advised that the complainant was not at home. 2. The Community Relations Manager sent an email to the complainant at 11:59am on 04/07/2012. The email included a summary table which showed the results of blast monitoring undertaken for the blast relevant to the complaint. The blast monitoring data indicated that the blast was undertaken in conformance with the Blast Impact Assessment Criteria detailed in the operation's Development Consent Conditions. 3. The email invited the Complainant to contact the Community Relations Manager directly in there were any further questions or concerns regarding the matter. 4. The Community Relations Manager attempted to call the Complainant at 2:25pm on 06/07/2012 to confirm receipt of the abovementioned email. There was no answer so a message was left on the automated answering service inviting the Complainant to contact the Community Relations Manager if they had any further questions or concerns.
DATE OF RESPONSE	4 July 2012
DETAILS	Local Contractor (Complainant B)
COMPLAINT / CONCERN	Local Contractor – called the CGM Complaints Line regarding blasting
DATE and TIME	3 July 2012 – 12:38pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at approximately 11:37am on 04/07/2012. 2. The Complainant advised that he was a contractor working at the home of Complainant A and he had experienced the effect of blasting while at the property. The Complainant advised that Complainant A had instructed him to call Barrick's Community Complaints Hotline if he felt the impact of the blast. The Complainant advised that he had noticed the windows rattle and vibrate at the time of the blast on 04/07/2012. 3. The Community Relations Manager advised that the operation's activities are governed by conditions which restrict the impact of blasting at nearby homes. It was explained that the condition relevant to the blast on 3 July 2012 was that air blast overpressure should not exceed 115dB and the blast on that day did not exceed those criteria. 4. The Complainant was also advised that The Community Relations Manager would contact Complainant A directly to provide details of the relevant blast which triggered the complaint. 5. The Complainant thanked the Community Relations Manager for returning his call.
DATE OF RESPONSE	4 July 2012

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

DETAILS	Resident of Lake Cowal (Complainant C)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	14 July 2012 – 12:32pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at approximately 3:58pm on 14/07/2012. Barrick's representative undertook to investigate the matter and provide further information. 2. Barrick sent an email to the complainant at 10:34am on 16/07/2012 regarding the matter. 3. The email included a summary table of blast monitoring data for the relevant blast which triggered the complaint. The email advised that the blast monitoring indicated that the blast on 14 July 2012 was undertaken in conformance with the blast impact criteria as set out in the operation's Development Consent Conditions. 4. The Community Relations Manager attempted to call the Complainant at 10:27am on 17/07/2012 to confirm receipt of the abovementioned email. There was no answer so a message was left on the automated answering service inviting the Complainant to contact the Community Relations Manager if they had any further questions or concerns.
DATE OF RESPONSE	14 July 2012
DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding intrusive light
DATE and TIME	14 July 2012 – 8:32pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager emailed the Complainant at 10:04pm on 14 July 2012 to advise that the Shift Supervisor on duty that night had been contacted and asked to review site lighting and adjust lights which could be pointed in the offending direction. The email also asked to arrange for the Community Relations Manager to visit the home of the Complainant to observe the issue directly and resolve any remaining concerns. 2. The Complainant responded to the email at 11:01am on 15/07/2012 and a meeting was arranged at the home of the Complainant at 6:30pm on 16/07/2012. 3. During the visit to the Complainant's home, the Community Relations Manager was able to observe the light which had been causing concern to the Complainant. The Community Relations Manager contacted the Shift Supervisor and the light was identified and moved so that it was no longer visible to the Complainant. 4. The Complainant indicated their satisfaction that the matter had been resolved. 5. The Community Relations Manager invited the Complainant to contact him directly in the future if a similar problem arose.
DATE OF RESPONSE	14 July 2012
DETAILS	Resident of Lake Cowal, (Complainant D)
COMPLAINT/CONCERN	Local Landholder – inquired about blasting activities via the NSW Environment Protection Authority
DATE and TIME	16 July 2012 – 8:24am
OUTCOME	1. An Officer from the NSW Environment Protection Authority (the Officer) contacted the Barrick Cowal Gold Mine's Environment Manager via email to advise that an inquiry had been submitted by Complainant D regarding blasting activities at the Cowal Gold Mine on 5 July 2012. 2. Barrick Cowal's Community Relations Manager responded to the Officer's email at approximately 11:19am on 16/07/2012 to advise that blast monitoring data for the relevant blast would be sent to him as soon as it was provided by Barrick's third-party blast monitoring consultants. 3. The Community Relations Manager emailed the Officer again at 11:56am on 16/07/2012. The email included a summary of blast monitoring data for the relevant blast, as provided by Barrick's third party blast monitoring consultants. The blast monitoring data indicated that the blasting activities on 05/07/2012 were undertaken in accordance with the blast impact criteria outlined in the operation's Development Consent Conditions. 4. The Community Relations Manager noted he had missed a call on his mobile phone from Complainant D on the morning of 16/07/2012. The Community Relations Manager returned the missed call at approximately 11:58am on 16/07/2012.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	5. The Complainant advised that he was enquiring as to whether Barrick had conducted a blast on 5 July 2012. He advised that he had felt/heard something at around 9:00am or 10:00am which had disturbed him. 6. The Complainant was advised that Barrick had also received an enquiry from the NSW Environment Protection Authority with regard to Barrick's Blasting activities that day. 7. The Complainant was advised that a summary of Barrick's blast monitoring data had been sent to the NSW Environment Protection Authority to confirm Barrick's compliance with its obligations under the Development Consent Conditions. 8. The Complainant was also advised that Barrick's blast that day had taken place at approximately 12:40pm not between 9am and 10am as suggested by the Complainant. 9. The Complainant thanked the Community Relations Manager for returning the call. 10. The Officer from the NSW Environment Protection Authority sent an email to Barrick's Community Relations Manager at approximately 12:34pm on 16/07/2012 acknowledging receipt of the Community Relations Manager's earlier email (Point 3). The Officer lodged no further queries regarding the matter.
DATE OF RESPONSE	16 July 2012
DETAILS	Resident of Lake Cowal, (Complainant C)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting and intrusive light
DATE and TIME	18 July 2012 – 2:17pm
OUTCOME	1. During a scheduled visit to the home of the Complainant, Barrick's Environment Manager was approached by the Complainant who raised concerns regarding the effects of the blast which had occurred at approximately 12:45pm that day. The Complainant also reported that they were experiencing some disturbance from intrusive light from the mine. The Complainant reported that one annoying light had been shifted earlier this week and was no longer providing an annoyance however there are still two lights which are causing annoyance. 2. The Community Relations Manager attempted to call the Complainant at approximately 12:48pm on 19/07/2012. There was no answer so a message was left on the home's automated answering service. The message explained that adjustment would be made to the lighting arrangements over the coming days in an effort to resolve any concerns. The message also explained that details of blast monitoring from 18/07/2012 would be sent via email as soon as it was provided from Barrick's third-party blast monitoring consultants. 3. The Community Relations Manager received advice on 20/07/2012 from Barrick's Site Electrical Supervisor that a visual inspection of lighting arrangements had been conducted and an error had been identified with the fixed angle of two flood lights. The error was corrected on 19/07/2012. 4. The Community Relations Manager received a call from the Complainant at approximately 9:43am on 20/07/2012 responding to the message left by the Community Relations Manager on 19/07/2012 (Point 2). 5. With regard to light, the Complainant advised that she had noticed an improvement in the light intrusion from the mine last night (19/07/2012). She said that there had obviously been some effort to move/adjust the lighting arrangement during the day and now her concerns about light intrusion had been resolved. The Community Relations Manager said that he was pleased to be able to respond to her concerns and that if she had similar concerns in the future; she was welcome to make contact again. 6. The Community Relations Manager also advised that the blast monitoring results from the blast which took place on 18/07/2012 had been received. The Community Relations Manager said that the blast monitoring demonstrated that the blast had complied with the relevant Development Consent Conditions and he committed to sending the blast monitoring summary to the Complainant via email for her records. 7. The Community Relations Manager sent an email to the Complainant at 10:12am on 20/07/2012 providing a summary table of blast monitoring data for the relevant blast which occurred on 18/07/2012. The monitoring data indicated that the blasting was undertaken in conformance with the blast impact criteria set out in the operation's Development Consent Conditions.
DATE OF RESPONSE	19 July 2012

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	17 August 2012 – 12:34pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the Complainant's call at approximately 12:35pm on 17/08/2012. 2. The Complainant's spouse answered the call and explained that the Complainant had felt blast vibrations that day. 3. The Community Relations Manager undertook to send details of blast monitoring via email as soon as it was available from Barrick's third-party blast monitoring consultants. 4. The Complainant suggested that because blast monitors were not directly in line with their property, they would not provide sufficiently accurate data regarding the blast impact at the property. 5. The Complainant also enquired as to the progress of a Structural Engineer's Survey of the property which had been previously arranged by Barrick. The Community Relations Manager advised that the Engineer's Report would be posted to the Complainant as soon as it was received by Barrick. 6. The Complainant also enquired as to whether the report on operational noise monitoring in July had been completed. The Community Relations Manager advised that the report was not yet complete and that once Barrick's third-party noise monitoring consultants had finalised the report, a copy would be posted to the complainant. 7. The Community Relations Manager sent an email to the Complainant at 5:09pm on 20/08/2012 passing on blast monitoring data as provided by Barrick's third party blast monitoring consultants. The blast monitoring data indicated that the blast on 17/08/2012 was undertaken in conformance with the blast impact assessment criteria included in the operation's Development Consent Conditions. 8. The Community Relations Manager posted a letter to the Complainant, dated 27/08/2012 attaching a copy of the Structural Engineer's Survey Report (Point 5). 9. The Community Relations Manager sent a further email to the Complainant at 8:10am on 28/08/2012 providing details of advice regarding the suitability of blast monitoring locations relevant to their proximity to the complainant's property (Point 4). The advice from Barrick's third-party blast monitoring consultants was that the existing blast monitoring locations should be representative of the levels at the Complainant's property. 10. The Community Relations Manager posted a letter to the Complainant, dated 30/08/2012 attaching a copy of the report entitled, Cowal Gold Mine: Mine Operation Noise Monitoring – July 2012 (Point 6). The Report revealed mine operation noise during the monitoring period was in conformance with the requirements set out in the operation's Development Consent Conditions.
DATE OF RESPONSE	17 August 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT / CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise
DATE and TIME	29 August 2012 – 9:07pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager attempted to call the Complainants at approximately 12:44pm on 30/08/2012 however there was no answer so a message was left on the home's automated answering service. The Community Relations Manager said that he would be sending some information regarding noise monitoring activities and reporting in the coming days and if the Complainant had any further questions regarding the matter, they were invited to contact him. 2. The Community Relations Manager posted a letter to the Complainant, dated 30/08/2012 attaching a copy of the report entitled, Cowal Gold Mine: Mine Operation Noise Monitoring – July 2012. The Report revealed mine operation noise during the monitoring period was in conformance with the requirements set out in the operation's Development Consent Conditions. 3. The letter also advised that Barrick would engage its third-party noise monitoring consultants to undertake additional noise monitoring at the property during October and/or November 2012 in an effort to confirm the results of the Noise Monitoring Report for the monitoring undertaken at the property during July 2012.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	4. The letter went on to invite the Complainant to submit quotes to Barrick for the installation of Noise Mitigation Treatments at the property as outlined in the other report attached to the letter entitled Cowal North Property: Dwelling Noise Control Treatments. Upon receipt of the quotes from the Complainant, Barrick would agree to pay the reasonable costs associated with the installation of the Proposed Noise Control Treatments at the home. 5. The Community Relations Manager emailed the Complainant at 8:47pm on 30/08/2012 confirming that an attempts had been made to return the complainant's call and that a letter had been posted to the Complainant that day attaching a copy of recent noise monitoring survey reports as developed by Barrick's third-party noise monitoring consultants. The Complainant was invited to contact the Community Relations Manager directly if they had any further questions or concerns regarding the matter.
DATE OF RESPONSE	30 August 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding operational noise
DATE and TIME	7 September 2012 – 7:36am
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager called the complainants at approximately 10:35am on 7/09/2012 however there was no answer. A message was left on the home's automated answering service advising that additional noise monitoring would be undertaken in either October or November 2012 to confirm the results of a Noise Monitoring Report which had been recently provided to the Complainant. 2. The Community Relations Manager sent an email to the Complainant at 10:51am on 7/09/2012 confirming the details of the telephone message left earlier that morning that additional noise monitoring would be undertaken in October and/or November 2012 with a view to confirming the findings of the Noise Monitoring undertaken at the property in July 2012. The email also confirmed the information provided to the complainant in correspondence dated 30/08/2012 (details of this correspondence are included in the above complaint summary – 29 august 2012).
DATE OF RESPONSE	7 September 2012
DETAILS	Resident of Lake Cowal, (Complainant A)
COMPLAINT / CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	15 September 2012 – 12:32pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer attempted to call the complainants at 11:57am on 17/09/2012. There was no answer so a message was left with the automated messaging service to advise that an email would be sent to the Complainant with details of blast monitoring undertaken for the relevant blast which prompted the complaint. The Community Relations Manager invited to Complainant to contact him directly if there were any further questions or concerns. 2. The Community Relations Manager sent an email to the Complainant at 12:49pm on 17/09/2012 providing a summary table of blast monitoring undertaken on 15/09/2012. The blast monitoring data provided by Barrick's third-party blast monitoring consultants indicated that the blasting undertaken on 15/09/2012 conformed to the blast impact assessment criteria set out in the operation's Development Consent Conditions.
DATE OF RESPONSE	17 September 2012
DETAILS	Community Member, (Complainant E)
COMPLAINT/CONCERN	Community Member – called the CGM Complaints Line regarding employee driver behaviour
DATE and TIME	18 October 2012 – 8:16pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager called the Complainant at 8:17pm on 18/10/2012. 2. The Complainant advised that he was concerned about the driving behaviour of a busload of Barrick personnel travelling home from site at approximately 7pm that night. The Complainant felt like a collision had only barely been avoided due to his evasive actions. 3. The Community Relations Manager apologised to the Complainant for the situation and undertook to re-brief bus drivers and passengers on expected safe driving behaviours when travelling to and from site. 4. Barrick's Commercial Manager reviewed the tape of the journey (Barrick buses are fitted with cameras to record the journey) and was unable to locate any incident similar to that described by the Complainant.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	5. Despite not being able to find evidence of the incident, the Commercial Manager spoke to the Manager of the Company that provides bus drivers to Barrick and reminded him of the required driving behaviours. 6. The Community Relations Manager called the Complainant again at 12:43pm on 19/10/2012 to advise that the company that provides Barrick's bus drivers had been counselled on the driving behaviours expected when travelling to and from site. 7. The Complainant said that he appreciated the returned call. He said that while he didn't want anyone punished for the incident, sometimes it's worthwhile to get a reminder about safe driving practices. 8. The Community Relations Manager invited the Complainant to make contact again if he had any other concerns in the future.
DATE OF RESPONSE	18/10/2012
DETAILS	Resident of Lake Cowal, (Complainant F)
COMPLAINT / CONCERN	Local Landholder – contacted a Barrick employee directly regarding roadside litter
DATE and TIME	5 November 2012 – 5:41pm
OUTCOME	1. The Complainant contacted Barrick's Environment Manager directly regarding concerns over litter being left by the roadside near her property. 2. The Community Relations Manager called the Complainant at approximately 10:18am on 5/11/2012. The Complainant advised of her concern that some unidentified persons were setting up campfires by the roadside and having parties. The complainant said that she wasn't sure who was doing it but she found "miner's gloves" at the site along with other rubbish, bottles etc. The Community Relations Manager agreed to visit the site at 8:00am on 9/11/2012 to have a look at the problem. 3. The Community Relations Manager attended the site with the Complainant at approximately 8:00am on 9/11/2012. The Community Relations Manager observed that a variety of litter had been left by the roadside (not part of Barrick's approved routes to site). The Community Relations Manager apologised to the Complainant if anyone associated with the Cowal Gold Mine had been responsible for the litter however pointed out that there was no way of knowing if the litter had been deposited by a Barrick employee or contractor. The Community Relations Manager collected the litter and disposed of it at Barrick's onsite waste management facilities. The Complainant thanked the Community Relations Manager for visiting and for cleaning up the mess. 4. The Community Relations Manager prepared a presentation on the littering complaint and this was delivered to Barrick personnel at team meetings in the weeks following receipt of the complaint. Employees and Contractors were advised that the littering was not acceptable behaviour from Barrick personnel and could result in disciplinary action.
DATE OF RESPONSE	5 November 2012
DETAILS	Resident of Lake Cowal (Complainant G)
COMPLAINT / CONCERN	Community Member – contacted Barrick employee directly regarding employee parking in Condobolin
DATE and TIME	14 November 2012 – 1:24pm
OUTCOME	1. The Complainant emailed Barrick's Community Relations Officer at approximately 1:24pm on 14/11/2012. The Complainant's email detailed concerns that Barrick personnel were parking their private vehicles in front of her shop in Condobolin prior to catching the bus to site for their shift at the Cowal Gold Mine. The Complainant was concerned that this would reduce her business as customers were unable to easily park their cars near her shop. 2. The Community Relations Officer called the Complainant on 19/11/2012 but there was no answer. 3. The Community Relations Manager called the Complainant at 12:58pm on 20/11/2012 and discussed the matter with the Complainant. The Complainant was advised that a notice had been issued to personnel to remind them of the proper pick-up and drop-off locations in Condobolin. The Complainant was also advised that the bus pick-up and drop-off locations for Barrick personnel were in a different area of town and it was unlikely that Barrick personnel were parking their vehicles near her business. Rather, another (non-Barrick) mine operates nearby and that mine's bus pick-up zone is located close to the Complainant's business. The Community Relations Officer provided the Complainant with the contact details for the other (non-Barrick) Mine.
DATE OF RESPONSE	19 November 2012

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	18 November 2012 –12:41pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Officer returned the call at approximately 10:44am on 19/11/2012. 2. The Complainant advised that his house was shaking on the previous day. The Complainant said he was sick of making complaints and having no response from Barrick. 3. The Community Relations Manager responded to the Complainant's comments by advising that all of the Complainant's concerns had been responded to through an investigation of blast monitoring data relevant to each blast which had triggered a complaint from the Complainant. Details of monitoring data had been provided to the Complainant for each complaint and that data had revealed that all blasting activities had conformed with the blast impact assessment criteria set out in the operation's Development Consent Conditions. 4. The Complainant indicated that as he "was here first" he shouldn't have to put up with the effects of a mining operation located near his property. 5. The Community Relations Manager undertook to refer the matter to the NSW Government's Department of Planning and Infrastructure to determine whether the Department held any concerns over Barrick's monitoring of compliance with Development Consent Conditions and to determine whether there are any further actions required to ensure Barrick's activities are conducted in accordance with government expectations of how Barrick meets the requirements of the Development Consent. 6. Barrick Cowal Gold Mine's General Manager wrote to the Director-General of the Department of Planning and Infrastructure on 22/11/2012 seeking advice as to whether the Department require any additional actions from Barrick to demonstrate compliance with the relevant Development Consent Conditions. 7. The Community Relations Manager wrote to the Complainant on 26/11/2012 to confirm that a letter had been sent to the Department of Planning and Infrastructure in accordance with the telephone discussion on 19/11/2012 (Point 5). 8. A representative of the Department of Planning and Infrastructure wrote to Barrick on 3/12/2012 advising that the Complainant is entitled to request an independent review of Barrick's compliance with the Development Consent Conditions and that the Complainant was yet to make such a request. The departmental representative suggested that Barrick should advise the owners of their rights for an independent review under the development consent. 9. The Community Relations Manager wrote to the Complainant on 17 December 2012 to advise that Barrick had received a response to the correspondence dated 26/11/2012 regarding the Complainant's ongoing concerns over Barrick's compliance with consent conditions. The letter pointed out that the Complainant is entitled to request an independent review of the Cowal Gold Mine's Compliance with the Development Consent Conditions. A copy of the Department of Planning and Infrastructure's letter to Barrick was also attached.
DATE OF RESPONSE	19 November 2012
DETAILS	Resident of Lake Cowal (Complainant A)
COMPLAINT / CONCERN	Local Landholder – called the CGM Complaints Line regarding blasting
DATE and TIME	19 November 2012 – 12:44pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at approximately 10:29am on 20/11/2012. The Complainant's spouse took the call. 2. The Complainant explained that the felt effect of blasting on 19/11/2012 was similar to the effects felt on 18/11/2012. 3. Barrick's Community Relations Manager reiterated the commitment from the previous day's telephone discussion with the Complainant to write to the NSW Government and seek some input as to whether there were any ongoing concerns regarding the operation's compliance with the Development Consent Conditions. 4. The Community Relations Manager also undertook to send the results of blast monitoring from 18 and 19 November 2012 to the Complainant via email.

Table 39 (Continued)
Summary of Community Complaints during the Reporting Period

OUTCOME (Continued)	5. The Community Relations Manager sent an email to the Complainant at approximately 5:21pm on 20/11/2012 providing summary tables of blast monitoring data for the blasts which took place on 18 and 19 November 2012. The blast monitoring data indicated that the blasting activities on the relevant days were undertaken in accordance with the blast impact assessment criteria outlined in the Development Consent Conditions. 6. Barrick Cowal Gold Mine's General Manager wrote to the Director-General of the Department of Planning and Infrastructure on 22/11/2012 seeking advice as to whether the Department require any additional actions from Barrick to demonstrate compliance with the relevant Development Consent Conditions. 7. The Community Relations Manager wrote to the Complainant on 26/11/2012 to confirm that a letter had been sent to the Department of Planning and Infrastructure in accordance with the telephone discussion on 20/11/2012 (Point 3). 8. A representative of the Department of Planning and Infrastructure wrote to Barrick on 3/12/2012 advising that the Complainant is entitled to request an independent review of Barrick's compliance with the Development Consent Conditions and that the Complainant was yet to make such a request. The departmental representative suggested that Barrick should advise the owners of their rights for an independent review under the development consent. The Community Relations Manager wrote to the Complainant on 17 December 2012 to advise that Barrick had received a response to the correspondence dated 26/11/2012 regarding the Complainant's ongoing concerns over Barrick's compliance with consent conditions. The letter pointed out that the Complainant is entitled to request an independent review of the Cowal Gold Mine's Compliance with the Development Consent Conditions. A copy of the Department of Planning and Infrastructure's letter to Barrick was also attached.
DATE OF RESPONSE	20 November 2012
DETAILS	Local Government Officer, (Complainant H)
COMPLAINT/CONCERN	Local Government Officer – contacted a Barrick employee directly regarding dumped rubbish
DATE and TIME	13 December 2012 – 3:32pmpm
OUTCOME	1. A Local Government Officer Contacted a Barrick employee on 13 December 2012 regarding rubbish which had been improperly dumped on the roadside. The Local Government Officer explained that the rubbish appeared to be household waste but that some papers amongst the rubbish had Barrick details printed on them. This indicated that the rubbish came from a household of a Barrick employee or contractor. 2. Barrick's Environment Manager called the Complainant at 12:21pm on 19/12/2012 regarding the matter and undertook to have the rubbish cleared. 3. The Environment Manager engaged contractors at approximately 12:30pm on 17 December 2012 to clear the rubbish from the roadside. 4. The Environment Manager contacted the Contractors on 19 December 2012 to confirm that the rubbish had been cleared and disposed of correctly. The contractor confirmed. 5. Barrick's Community Relations Manager phoned the Complainant on 20/12/2012 to confirm that the household rubbish had been cleared to the Complainant's satisfaction. The Complainant confirmed that the matter had been resolved to his satisfaction.
DATE OF RESPONSE	17 December 2012
DETAILS	Resident of Lake Cowal (Complainant I)
COMPLAINT/CONCERN	Local Landholder – called the CGM Complaints Line regarding stolen equipment
DATE and TIME	22 December 2012 – 7:23pm
OUTCOME	1. Barrick Cowal Gold Mine's Community Relations Manager returned the call at approximately 9:31am on 23/12/2012. 2. The Complainant advised that the Battery from his header had been stolen and he contacted Barrick because the majority of traffic in the area that the header was parked is mine related. 3. The Community Relations Manager advised that there has been increased activity in the area due to the commercial fishing happening in Lake Cowal however there is no way of knowing who may have taken the battery. 4. As an act of goodwill from Barrick, The Community Relations Manager invited the Complainant to send an invoice for $200 to pay to costs of replacing the stolen battery. 5. The Complainant appreciated Barrick's response and the complaint was resolved.
DATE OF RESPONSE	23 December 2012

4.2 COMMUNITY LIAISON

Community Environmental Monitoring and Consultative Committee

Barrick established a CEMCC prior to commencement of construction works, in accordance with the Development Consent Condition 8.7(i). The CEMCC monitors compliance with conditions of the Development Consent and other matters relevant to the operation of the mine.

During the reporting period, Barrick conducted quarterly meetings with the CEMCC.

The CEMCC quarterly meetings during the reporting period occurred on 29 February, 13 June, 28 August, and 5 December 2012. 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 CGM. Minutes are taken from each meeting and published in the local library and also on BSC and Lachlan Shire Council websites (see Appendix D).

Community Information Newsletters

The "Cowal Update" is the CGM external newsletter that was released regularly during the construction and start-up phase of the project (2003 to August 2006). A publication of the Cowal Update was released in July 2012 with a further edition released in December 2012 to all households in the Bland, Lachlan and Forbes Shires. It is scheduled that the Cowal Update will be published every six months with the next edition due in June 2013.

Other Community Involvement

Barrick extended invitations to numerous community groups to visit the CGM for presentations and site visits. Site visits were undertaken by a number of groups during the reporting period including:

- Bland, Forbes and Lachlan Shire Councils;
- Wiradjuri Condobolin Corporation;
- local farmers;
- various community and charity groups from neighbouring towns and villages;
- various primary and secondary schools;
- employee family visits: and
- community visit day for community members of Bland, Forbes & Lachlan Shires

Community and Family visit days are conducted annually with up to 340 people in attendance over the two days. In addition, on average one community/school group visits the CGM once a month with an average of approximately 40 people in attendance. Stakeholder meetings are carried out on-site or in the local community depending upon the group and topic. These meetings can consist of 3 to 20 people, for example:

- CEMCC meetings (which are held quarterly – 8 to 10 persons in attendance);
- Local landholders and local community and charitable groups: and
- Local Government and State agency meetings.

Barrick 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.

Barrick is involved with numerous committees and organisations such as the:

- Bland Catchment Management Committee;
- Lachlan Catchment Management Authority;
- Events West Wyalong;
- Lake Cowal Conservation Centre;
- Lake Cowal Foundation;
- NSW Minerals Council Social, Economic & Community Working Group;
- West Wyalong Community Education Fund;
- NSW Minerals Council Royalties for Regions Working Group; and
- State Water – Lachlan Catchment Service Committee.

Wiradjuri Condobolin Community Liaison

Barrick works with the Wiradjuri Condobolin Community through the WCC and a number of formal committees:

- the Cowal Project Coordinating Committee (**CPCC**); and
- the Employment, Training and Business Committee (**ETBC**), which meets with the WCC on a regular basis.

Barrick has committed to provide employment opportunities for Wiradjuri people on-site and at the end of the reporting period had a total of 11 Wiradjuri people directly employed with Barrick onsite. The Wiradjuri Traineeship Program was implemented in early 2010 with the introduction of a Business Administration Traineeship and a Store Warehousing Traineeship, both traineeships were successfully filled. During the reporting period a traineeship partnership between Barrick and the Lachlan Catchment Management Authority was established. Through this partnership 1 traineeship was awarded and completed in early 2013.

WCC was awarded the offices and facilities cleaning contract in February 2007, which is a further 12 employees. WCC were also successful in tendering for the CGM's freight and logistics contract in 2009.

During the reporting period the WCCHC has provided archaeological monitoring services on-site. Monitoring has been carried out on an as needs basis.

Barrick employees and contractors continued to attend Cultural Heritage Inductions presented by the WCCHC during the reporting period.

Through the ETBC, Barrick and the WCC have continued to award Scholarships to Wiradjuri students moving into University studies. Since the Scholarship program commenced in 2004 a total of 23 scholarships have been awarded. During the reporting period 2 Wiradjuri scholarships were awarded.

In addition to Wiradjuri support, Barrick continues to support students in the Bland, Lachlan and Forbes Shires and offers the "Endeavour" Scholarship program. Since 2006, Barrick has awarded 175 scholarships for a total investment of over $580,000. In collaboration with local senior schools, Barrick has reviewed the structure of the Endeavour Scholarship program, ensuring it meets the needs and aspirations of Barrick and local students.

Barrick Donations

Barrick has continued to support numerous donation, sponsorships and partnerships to a variety of local schools, annual events, charity and not for profit groups, community infrastructure and town advancement groups. Barrick again made substantial contributions to the community during this reporting period.

Barrick operates two schemes to facilitate financial contributions to the community. The Cowal Partnering Program (**CPP**) and the Barrick Buddies (**BB**) Program, both programs were established in 2006 and both programs will continue to operate during the next reporting period.

The BB Program offers $250 to successful employee volunteers, completing 25 or more hours of service to a charity, sporting or community group per annum. The employee presents the funds to their nominated group. The BB Program promotes community involvement amongst the work force.

The CPP allocated approximately $163,000 of funds to approved applications during 2012.

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 CGM. The LCF Board meet as required, some meetings are held via teleconference.

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

The LCF has now been involved in approximately 32 conservation projects in the Lake Cowal region and has developed a relationship with 34 project partners, including:

- numerous local land owners and managers;
- Lachlan Catchment Management Authority;
- EPA, National Landcare Program, Natural Heritage Trust, Environmental Trust, Greening Australia and DPI (Fisheries);
- Forbes, Lachlan, Weddin, Temora and Bland Shire Councils, and Condobolin, Forbes and Young Pastures Protection Boards;
- 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 restocking of Bland and Sandy Creeks with native fingerlings;
- 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 ten kilometre 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 LCCC; and
- seed collection, assessment of remnant vegetation and establishment of a 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.

5 REHABILITATION REPORT

5.1 BUILDINGS

Aside from the asbestos taken to BSC landfill under permit, and the items of interest disturbed at the 'Cowal West' heritage site works, no buildings were renovated or removed from ML 1535 during the reporting period.

5.2 REHABILITATION OF DISTURBED LAND

A chronological summary of the rehabilitaton of the CGM undertaken to date is provided below.

A total of 22 ha were prepared for rehabilitation works during the 2008 reporting period (Figure 4) on the southern portion of the SWE and on the STSF. A large trial plot was established on the southern outer batter of the SWE by the end of September 2009 to conduct rehabilitation trial work consistent with the on-site learnings from the inside east pit wall trials. Of the 100 tube stock trees planted across the topsoil plots in the SWE trial area in December 2010 there was no survival. Direct seeding was trialled in October 2011 just prior to a significant rainfall event (dry winter). DnA Environmental conducted testing of soil profile nutrients and root penetration for previous eucalyptus planting survivors during surveys in late-2012. Weeping Myall (*Acacia pendula*), have regenerated fairly well in amongst the grasses, weeds and shrubs cover on the topsoil trial portions at the end of the 2012 reporting period.

The 8ha of the outer slopes of the 2nd Lift of the NTSF were rehabilitated using the rock-topsoil method during 2009. North and south side trial plots were constructed on the lower slopes of the NTSF by the end of September 2009 in response to comments from the IMP. Independent evaluation and monitoring by DnA Environmental of the outcomes of NTSF and SWE trial plot treatment covers for waste rock was ongoing during the reporting period. The outcomes of the rehabilitation trials to date are described in Paragraph 5.4.

The rock-topsoil cross-rip rehabilitation method used in the 2nd Lift of NTSF was applied to a designated trial area on the northern slopes of the western extension to NWE (adjacent to Pond D1) after agreement to extend the trial was received from DTIRIS (DRE) on 6 January 2010. About 2 ha had been treated with gypsum and a further 6 ha was in progress by the end of the 2010 reporting period. Substantial re-shaping works were required adjacent Pond D1 during 2010 and 2011 to facilitate the establishment of the Pond D1 north trial plot area.

The rehabilitation activities undertaken during the reporting period were consistent with the principles and objectives described in the MOP (2011 – 2012 and 2012 – 2014). As described in the 2012 to 2014 MOP, the cover system concept for the final landform batters will be revised based on the results of rehabilitation cover treatment trials conducted to date. The concept would include using a rock mulch-topsoil cover on the batter slopes and include cross-ripping with approximately 10 t/ha gypsum. The concept (based on CGM rehabilitation trial outcomes) is considered in accordance with CGM rehabilitation principles and objectives presented in the EIS.

Approximately 6 ha of the 3rd Lift of the STSF was rehabilitated during the reporting period using the waste rock – topsoil cross-rip method with wheaten straw used to protect the northern slope from the harsher conditions in the times between rains. During late-2011 and into early-2012, 8 ha of the 3rd Lift of the NTSF was also rehabilitated using the waste rock – topsoil cross-rip method with gypsum at 10 t/ ha.

During late-2012 to early-2013, 8 ha of the 4th Lift of the NTSF was rehabilitation using the waste rock – topsoil cross-rip method and with gypsum at least 10 t/ha.

During November – December 2011 the foreshore of the LPB was rock armoured given the forecast of a wet start to 2012. The Lift above the LPB received all the stripped waste rock – topsoil layer from the proposed Pond D1 north trial area (fresher, more homogenous topsoil was required for the replicate trial plots to be of value). A number of large gullies toward the southern end of the first Lift above the LPB were dozed out and re-packed, and then covered with waste rock – topsoil cross-ripped with gypsum at 10 t/ha as added protection.

Soil stockpile characterisation undertaken by McKenzie Soil Management and Carnegie Natives, commenced during the prior reporting period, will conclude during the 2013 reporting period. As per Barrick MOP (October 2012 – January 2014), soil resource characterisation will allow Barrick to better define the quality and volume of soil resources present and inform rehabilitation efforts now and into the future. The next MOP will describe how higher salinity subsoil and topsoil stockpiles will be ameliorated by gypsum treatment.

During late-2012 to early-2013, approximately 6 ha of the 4th Lift of the STSF was rehabilitation using the waste rock – topsoil cross-rip method and with gypsum at least 10 t/ha. Clean wheaten straw will be applied to the northern face from end-March 2013 for plant growth protection against the hotter aspect conditions. The west facing outer batter of the 4th lift of STSF will also be armoured with clean wheaten straw during 2013.

Table 39 provides details of the nature of disturbance, area and rehabilitation status for areas that have been disturbed prior to and during the reporting period.

Rehabilitation works were carried out in the following areas during the reporting period:

- PWE - re-shaped 1st Lift southern and eastern sections;
- NWE – North Wall (extension of Pond D1 rock – topsoil method trials on north-eastern side);
- SWE – South Wall (rock – topsoil trial plots) ongoing monitoring of the direct seeding of November 2011;
- SWE – south wall corner by Pond D4 re-shaped ready for rocking and topsoiling in early 2013;
- LPB – re-shaped and rocked – topsoiled with gypsum applied at a rate of10 t/ha lower Lift;
- Pond D1 – 0.5m wall rise on eastern face to Lake Cowal;
- Pond D9 walls maintenance with clean wheaten straw additions;
- Temporary and Lake Protection Bund - road and weed maintenance;
- STSF – Walls (various trials, repairs on north lower wall, and rock - topsoil method on 4th Lift); and
- NTSF – Walls (various trials and rock - topsoil method on 3rd Lift).

Topsoil and subsoil stockpiles were relocated from the Millers Crusher during late 2012, to allow for construction of the waste emplacement basal layer ahead of waste rock emplacement during the 2013 reporting period.

All disturbed areas/structures had temporary erosion and sediment control measures implemented during construction in accordance with the EIS and ESCP. 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 Paragraph 3.2.2 and presented in the ESCP.

Perimeter Waste Emplacement

The PWE will be constructed to approximately RL 223 m and will surround the pit to the north, east and south (Figure 4). The emplacement will occupy an area of approximately 60 ha. It will form 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.

As per the January 2009 s96(1A) Modification, the PWE bund wall to the north-east of the open pit was reduced in height to maintain geotechnical performance during vertical advancement of the pit floor. This cut reshaped the inside eastern pit wall from June 2009 and removed the northern half of the earlier rehabilitation trial plots in mid-March 2010. The 1st eastern Lift of the PWE was repaired using the rock – topsoil method with gypsum at 10 t/ha along the full length whilst rock armouring of the outer face of the LPB was conducted from November 2011.

In early 2012, before the Lake Cowal fill event of March, the first Lift above the LPB access road and the lower face in the TIB-LPB (wave break), was retreated by repairs with the waste rock, topsoil and gypsum methodology. During 2013, the remaining portions of the eastern side of the PWE will be retreated using the same method. No tube stocks have been planted due to the dry end of 2012 and start to 2013. The late 2011 direct seeding trial works at the SWE are yet to mature enough to warrant independent consultant review on the effectiveness of the applied mix.

Table 40
Nature of Disturbance and Rehabilitation Status of Disturbed Land at the end of the Reporting Period

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	15	Shaped and covered
• Upstream lift	✓	✓	✓	Commenced	20	Rock-topsoil cover
STSF						
• Floor	✓	✓	✓	Complete	156	Not yet rehabilitated
• Starter embankment	✓	✓	✓	Complete	15	Shaped and covered
• Downstream lift	✓	✓	✓	Complete	24	Some sections shaped and covered
• Upstream lift	✓	✓	✓	Commenced	18	Rock-topsoil cover
Open Pit	✓	✓	✓	Commenced	107	Not yet rehabilitated
PWE	✓	✓	✓	Commenced	60	Southern section shaped and covered
NWE (excluding outer batters)	✓	✓	✓	Commenced	230	Not yet rehabilitated
SWE (excluding outer batters)	✓	✓	✓	Commenced	140	Southern section shaped
NWE and SWE outer batters	✓	✓	✓	Commenced	20	Some sections shaped and covered
Ore Stockpiles	✓	✓	✓	Commenced	58	Not yet rehabilitated
Tailings service corridor	✓	✓	✓	Complete	5	Not yet rehabilitated
Soil stockpiles	✓	✓	✓	Commenced	125	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, D8A and D8B	✓	✓	✓	Complete	11	Not yet rehabilitated

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

Table 40 (Continued)
Nature of Disturbance and Rehabilitation Status of Land under Rehabilitation at the end of the Reporting Period

Disturbed Area	Nature of Disturbance				Area (ha) (approximately)	Rehabilitation Status
	Vegetation Cleared	Topsoil and Subsoil Stripped	Earthworks	Construction Works Status*		
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	1	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
Borrow pit within NWE	✓	✓	✓	Complete	10	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	Shaped and covered
Lake protection bund	✓	✓	✓	Complete	10	Shaped and covered
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
Saline groundwater supply borefield 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	1	Not yet rehabilitated

N/A: Not applicable
* Construction works status refers to earthworks, excavations and/or emplacement of material.

A summary of the construction and rehabilitation measures relevant to the PWE is provided below.

Physical and Chemical Characteristics of Emplaced Material Relevant to Rehabilitation

Material within the perimeter waste rock emplacement will consist primarily of oxide waste rock. Oxide waste rock will be typically saline and non-acid forming silty clayey rock fill. This material will break down following track rolling/compaction and will most likely form a material of medium to low permeability.

Method of Land Shaping

The perimeter waste rock emplacement will be constructed in approximately 5m to 10m lifts with land shaping and rehabilitation works to be undertaken progressively during run-of-mine operations.

Characteristics of Cover Material

As described above, based on rehabilitation trial results to date, the cover material of the waste emplacement batters likely to provide stable landforms and successful revegetation performance includes a rock mulch topsoil cover treatment. As a result, areas of the PWE have been reshaped and covered using this cover system.

Thicknesses of Cover Layers and Methods of Laying and Compaction

The raised cover system concept includes approximately 0.25 m deep layer of rock mulch, cross-ripped with 10 t/ha gypsum and a layer of 0.25 m topsoil. Topsoil will be transferred from soil stockpiles or directly from newly stripped areas and be spread using tractors, dozers and scrapers.

Drainage and Erosion Control

Batter drainage will be affected by the use of wide reverse-graded berms every 5m vertical height. The berms will diffusely grade inwards and the surfaces be kept as rough as possible to maximise absorption. This will have the effect of absorbing and storing rainfall in all but extreme events (in which case, runoff will longitudinally fall along the berms to be held for absorption by a series of depressions constructed every 50m – 100m in the reverse-grading berms). This minimises the use of artificial drainage structures on the batters. Drainage on the top surfaces of the emplacement will be similarly managed via a series of small shallow basins (depressions) and deep cover of high absorption capacity. The use of depressions is aimed at maximising internal drainage without creating permanent ponding during normal and heavy rainfall events. The reverse-graded berms will be progressively installed as the lifts are constructed.

In-field observations of slope response to heavy rainfall during the 2008 reporting period prompted a review of the risks associated with proposed methods of rehabilitation. The large-scale trial area on northern slopes of the NWE is being constructed to assess the performance of various treatments associated with the rock mulch/topsoil cover systems.

Final Landform Profile and Slopes

A typical section through the perimeter waste rock emplacement and lake isolation system is shown in Figure 18. Typical slopes of the perimeter waste rock emplacement will be 1(V):5(H) (Figure 18).

Soil Treatment

Soils to be used in rehabilitation are treated with gypsum where necessary. Gypsum will be spread over the waste rock by tractor spreader before topsoiling as areas become available. It is anticipated that a rate of 10 t/ha will be used. A scientific trial using six different types of mulch was initiated in 2006 with full results forming the basis of a thesis by an ANU honours student during the 2008 reporting period. An ANU PhD student continued investigations into soil treatment and plant species combinations for optimum rehabilitation during the 2010 and 2011 reporting periods. This work is discussed further in Paragraph 5.4.

Additionally, as a component of the soil treatment soil characterisation works, gypsum application rates for the stockpiles are being prepared by McKenzie Soil Management.

Revegetation Species and Methods for Establishment

Top surfaces of the emplacements and outer batters will be revegetated following placement of topsoil with native and introduced grasses. Barrick is still reviewing options for the PWE with continued poor growth during dry 2012 conditions. The results of the 2nd Lift of NTSF and the SWE trial plots suggest that no seeding is necessary when using the new rock mulch-topsoil method. As discussed in Section 5.4, early observations of the surface treatments (e.g. rock mulch) trials on the outer batters of the waste rock emplacements are positive (i.e. landforms are stable and vegetation is establishing within the rock mulch) and indicate that this cover treatment is likely to provide for successful rehabilitation of mine landforms at the CGM (Barrick, 2011). 3rd Lifts of the STSF and NTSF have also been conducted using waste rock – topsoil method using gypsum at 10 t/ha and wheaten straw along the northern face and are demonstrating similar trends.

Long-term rehabilitation of the waste rock emplacement will be informed by the results of the rehabilitation trials carried out over the mine life and would include the progressive re-establishment of woodland community species with the planting/seeding of local native grasses, shrubs and trees.

Extent to which Agreed Rehabilitation Outcomes and Landuse Have Been Met

The proposed progressive rehabilitation of the perimeter waste rock emplacement is in accordance with rehabilitation concepts presented in the EIS. Further rehabilitation of the emplacement will be undertaken to achieve final rehabilitation outcomes and other subsequent environmental approvals in accordance with the EIS.

Maintenance Activities/Requirements

Visual monitoring of revegetated landforms including the perimeter waste rock emplacement will be 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 early 2012 and mid 2013 rehabilitation works are subject to ongoing independent consultant review of effectiveness.

Northern and Southern Waste Rock Emplacements – Outer Batters

The NWE will be constructed to approximately 266 m AHD and will occupy an area of approximately 230 ha northwest of the pit. The SWE will be constructed to approximately 250 m AHD and will occupy an area of approximately 140 ha southwest of the pit (in accordance with the modification of the Development Consent on 10 March 2010).

Physical and Chemical Characteristics of Emplaced Material Relevant to Rehabilitation

Material within the northern and southern waste rock emplacements predominantly consists of primary waste rock and a minor proportion of oxide waste rock.

Method of Land Shaping

The waste rock emplacements will be constructed in lifts with land shaping and rehabilitation works to be undertaken progressively during run-of-mine operations. Land shaping will be carried out by graders and dozers and will involve the construction of drainage and erosion and sediment control features.

During the 2008 reporting period, a 22ha portion of the southern wall of the SWE was shaped to be used for a rehabilitation trial area. During the 2009 reporting period, a series of large trial rehabilitation plots were established in this area to assess the erosion potential of various cover treatments (Plate 10 below).

The 22ha portion of SWE was re-shaped and extended by about 10ha by dozer during 2012. The area immediately adjacent the intake to Pond D4 was rocked and shaped at the end of the 2012 year.

Topsoil-rocking and gypsum ripping for the majority of the outer batters of the SWE is scheduled to occur during 2014. The same equipment will be scheduled to complete the NWE northern topsoil-rock ripping during 2014.

Characteristics of Cover Material

The waste emplacement outer batter cover material will be of low salinity to avoid the potential for saline runoff and enable satisfactory vegetation growth. The cover system concept for the NWE and SWE batters will be the same as applied to PWE described earlier in this section.

Thicknesses of Cover Layers and Methods of Laying and Compaction

The cover system concept for the NWE and SWE batters will be the same as applied to PWE described earlier in this section.

Drainage and Erosion Control

Batter drainage will be the same as applied to PWE described earlier in this section.

Final Landform Profile and Slopes

A typical section through the waste rock emplacement is shown in Plate 6. Typical slopes of the waste rock emplacements will be 1(V):5(H) (taken from Figure 9 of CGM MOP (2012 – 2014)).

Soil Treatment

Soils to be used will be the same as applied to PWE described earlier in this section.

Revegetation Species and Methods for Establishment

Outer batters of the emplacements will be the same as applied to PWE described earlier in this section.

In November 2011 a direct seeding application of local provenance stock was applied to the topsoil plots of the SWE south trial area. Plate 3 provides a visual summary of the varieties of treated native seed that was broadcast.

DnA Environmental conducted surveys of nutrient in soil profile and tree root penetration tracking through the SWE south trial plots (as per Independent Monitoring Panel recommendation (2011 report)). The results of DnA Environmental's survey is provided in Paragraph 5.4.

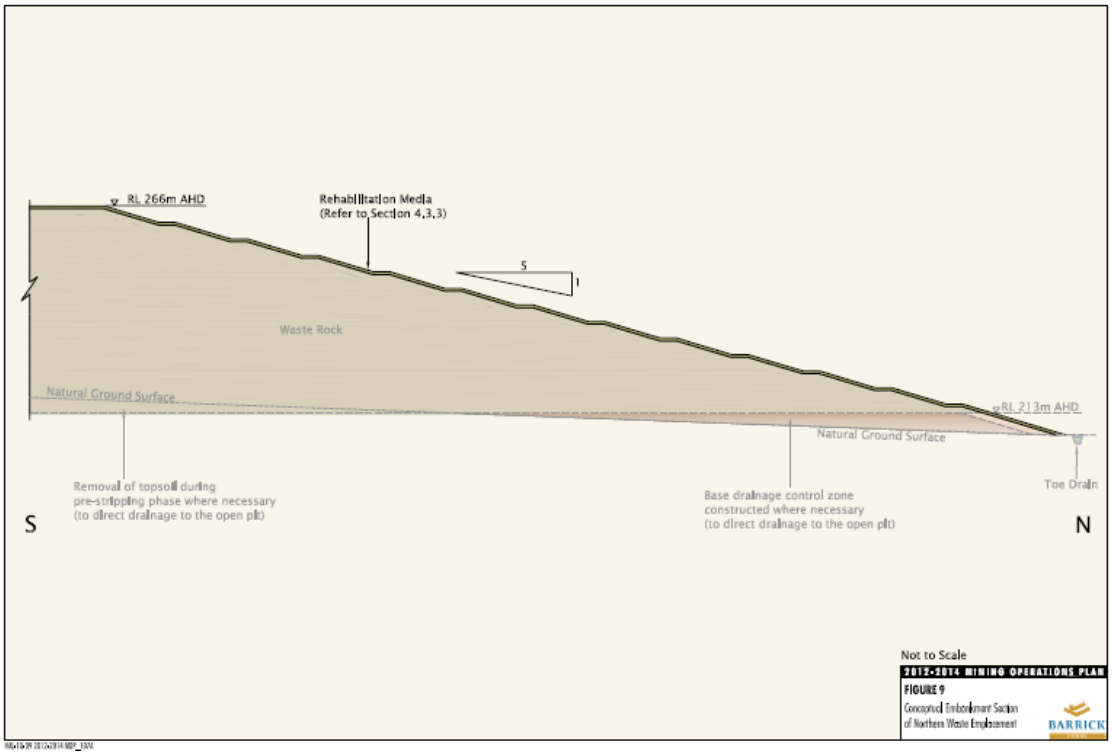
Extent to which Agreed Rehabilitation Outcomes and Landuse Have Been Met

The proposed progressive rehabilitation of the waste rock emplacements is in accordance with rehabilitation concepts presented in the EIS and Preliminary EA for the proposed Modification (mid-2013). Further rehabilitation of the emplacements will be undertaken to achieve final rehabilitation outcomes and landuse in accordance with the EIS.

Maintenance Activities/Requirements

Visual monitoring of revegetated landforms including the northern and southern waste rock emplacements will be 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).

Plate 6
Conceptual Embankment Section of Northern Waste Emplacement



Temporary Isolation Bund and Lake Protection Bund

The temporary isolation bund was designed to control water inflow to the open pit development area from the lake during construction of the lake protection bund (Figure 4). This structure was designed with a short-term function, however, the bund will remain until stability of the PWE is assured. The permanent lake protection bund is a low permeability embankment to prevent water inflow from the lake into the open pit development area over the life of the mine and in the longer term.

Physical and Chemical Characteristics of Emplaced Material Relevant to Rehabilitation

The Honours project (Paragraph 5.4) undertaken during 2006 indicated that the soil was potentially dispersive. Amelioration with gypsum was undertaken in August 2006 at a rate of 5 t/ha tractor spread over the surface area of the Lake Protection Bund.

In early 2012, before the Lake Cowal fill event of March, the first Lift above the LPB access road and the lower face in the TIB-LPB (wave break), was reshaped and treated with the waste rock, topsoil and gypsum methodology.

Since the inundation of the TIB in March 2012 by the Lake Cowal flood event, there has been significant growth of native plants on the east face of the TIB due to the continued availability of water. The east face of the LPB was adequate to withstand wave action during the flood until the water receded back below the top of the TIB in July 2012

Plate 7
TIB – Eastern Face Native Re-growth

Method of Land Shaping

The temporary isolation bund was constructed to RL 206.5m, has a crest length of 3,170m and reaches a height of 2m in the centre of the arc. Approximately 180,000m^3 of fill was required for construction. Settlement analysis undertaken by SNC Lavalin (SNC Lavalin, 2004) indicated the subsurface formation is typically well consolidated and any settlement is likely to cease soon after completion of the construction period. Prior to commencement of construction and, in accordance with the EIS, a silt fence was erected to provide the lake protection from any sediment laden runoff. Prior to the placement of fill, the upper approximate 300mm of topsoil was stripped from the footprint area of the bund and stored for later rehabilitation of the bund. The bund was constructed in short sections with placement and compaction of the fill section in 0.3m lifts. Following construction of the bund to its final height the structure was shaped and the side slopes were flattened to slopes of 4(H):1(V) on the mine side and 5(H):1(V) on the lake side (Barrick, 2007). Further details on rehabilitation of the structure are provided in Paragraph 4 of the 2012 – 2014 MOP (Barrick, 2012).

The lake protection bund has been constructed to its final height of RL 208.35m. The structure was built as a two-zone earthfill embankment and meets specific engineering criteria for compaction to ensure that required compaction densities are achieved. The bund has a crest length of 4,200m and approximately 500,000m^3 of fill was used for construction. Prior to construction, the upper 300mm of topsoil and loose clay sediment material were stripped and stored for future rehabilitation of the bund. A cut-off section a further 1.7m deep was constructed as a means of even further reducing the expected minimal seepage under the bund system. Placement and compaction of the fill section was conducted in 0.3m lifts. Following construction of the bund to its final height, the structure was shaped and the lake side slope flattened to 5(H):1(V) (Barrick, 2010). Further details on rehabilitation of the structure are provided in the 2012 - 2014 MOP (Barrick, 2012).

Short-term heavy rain during the 2011 reporting period lead to degradation and temporary closure of the lake protection bund access road. The first lift of the LPB outer slope was repaired using the rock-topsoil method and gypsum at 10 t/ha from November 2011 after the north-east outer slopes of the NWE were shaped up and rock – topsoil treated for the Pond D1 north trials. The top of the LPB was covered in a 0.5 m layer of course crushed waste rock with a fines finish in March 2012 and the road is now an all weather access.

Characteristics of Cover Material

The cover material will be of low salinity to avoid the potential for saline runoff and enable satisfactory vegetation growth.

Thicknesses of Cover Layers and Methods of Laying and Compaction

Prior to the placement of fill, the upper approximate 300mm of topsoil was stripped from the footprint area of the bund and stored for later rehabilitation of the bund.

Drainage and Erosion Control

Incidental rainfall runoff from the LPB outer face is held by the temporary isolation bund.

Final Landform Profile and Slopes

A typical section through the perimeter waste rock emplacement and lake isolation system is shown on Figure 18. Typical slopes of the perimeter waste rock emplacement and lake protection bund will be 1(V):5(H) (Figure 18).

Soil Treatment

Soils used in rehabilitation have been treated with gypsum. Gypsum had previously tractor spread over the topsoiled surface of the LPB a rate of 5 t/ha.

Revegetation Species and Methods for Establishment

The New Lake Foreshore will continue to be opportunistically revegetated (subject to seasonal conditions) using native seedlings (propagated on-site or obtained from a supplier) and direct seeding.

Extent to which Agreed Rehabilitation Outcomes and Landuse Have Been Met

During the prior 2years there was no additional revegetation work undertaken on the LPB. The 2010 rains and wet start to 2011 appears to have increased cover marginally, however, the cessation of traffic along the top of the bund by placement of log stocks was the main contributor to growth (G Pearson 2011, *pers. comm*.). The Lake Fill placed water against the TIB from August 2010 and water sat between the TIB and LPB for all of the recent reporting period.

Maintenance Activities/Requirements

Visual monitoring of revegetated landforms including the bunds will continue to be 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). Vegetation monitoring of the new lake foreshore was undertaken during the reporting period.

There were no variations in activities undertaken from those proposed in the MOP. Barrick proposes to raise the height TIB by 0.5 metre when Lake Cowal recedes to a suitably safe distance from the toe of the TIB. These works would be undertaken in consultation with DTIRIS-DRE when necessary.

Northern and Southern Tailings Storage Facility – Starter Embankments and Lifts

The tailings storage facilities are located 3.4km west of the Lake shoreline. Starter embankments will be progressively raised throughout the mine life with tailings disposal alternating between each facility. The STSF starter embankment was completed and the facility was commissioned in May 2006 for disposal of oxide tailings. The NTSF starter embankment was completed and the dam commissioned in April 2007 for disposal of sulphide tailings. The STSF required a downstream and upstream lift to meet geotechnical design concerns for the oxide layer and was commissioned in mid-2008. The NTSF received a 2nd Lift in 2009 and was commissioned in late-2009. The 3rd Lift (2nd augmentation) of the STSF was in progress from late-2009 until mid-2010 and used the waste rock – topsoil cross-rip method with 10 tonnes of gypsum per ha and wheaten straw mulch was also applied along the northern and western faces. Repairs were made along the original un-rocked lower Lift face using the waste rock – topsoil method with straw after gully erosion occurred on them in several places in 2011 and 2012 years.

Approximately 8 ha of the outer slopes of the 2nd Lift of the NTSF was rehabilitated using the trial waste rock-topsoil cross-rip method during 2009. North and south side trial plots were constructed on the lower slopes of the

NTSF by end-September 2009 after written approval was received from the DP&I in response to supporting comments from the Lake Cowal IMP. Rock ribbons, woodchips, rock-topsoil, rock mulch and straw rehabilitation trials of outer slopes of the STSF occurred from February to October 2009. Outer slope rehabilitation trials on the initial lift walls of the NTSF during the same period consisted of biosolids, bioremediation solids, straw and rock mulch and rock-topsoil and were completed by October 2009. Monitoring of these trials continued during the reporting period. The 3rd Lift of the NTSF was rehabilitated using the waste rock – topsoil method and 10 tonnes gypsum / ha from late-2011 until early-2012.

The 4th Lift (3rd augmentation) of the STSF occurred from mid-2012 until end-2012 (a MOP (2011-2012) variation was sought for this activity). The 4th Lift of the NTSF will commence in late-2013. Rehabilitation of the outer batter will occur by end 2013 using the rock, topsoil, gypsum and wheaten straw armour methodology.

Physical and Chemical Characteristics of Emplaced Material Relevant to Rehabilitation

Material used in the construction of the tailings storage facilities starter embankments includes soft oxide waste rock and clays. Results of recent and past geochemical testing indicate that oxide waste rock will be typically saline and non-acid forming silty clayey rock fill. Clays excavated from within the tailings storage footprints are expected to be stable with low permeability and high strength when compacted (North Limited, 1998).

Soils to be used in rehabilitation will be treated with gypsum by tractor spreading 10 t/ha in the waste rock before topsoiling.

Method of Land Shaping

The cover system concept for the tailings storage facility batters is also proposed to be updated and would be consistent with the updated concept for the waste emplacement batter cover system.

Characteristics of Cover Material

As applied to the WREs.

Thicknesses of Cover Layers and Methods of Laying and Compaction

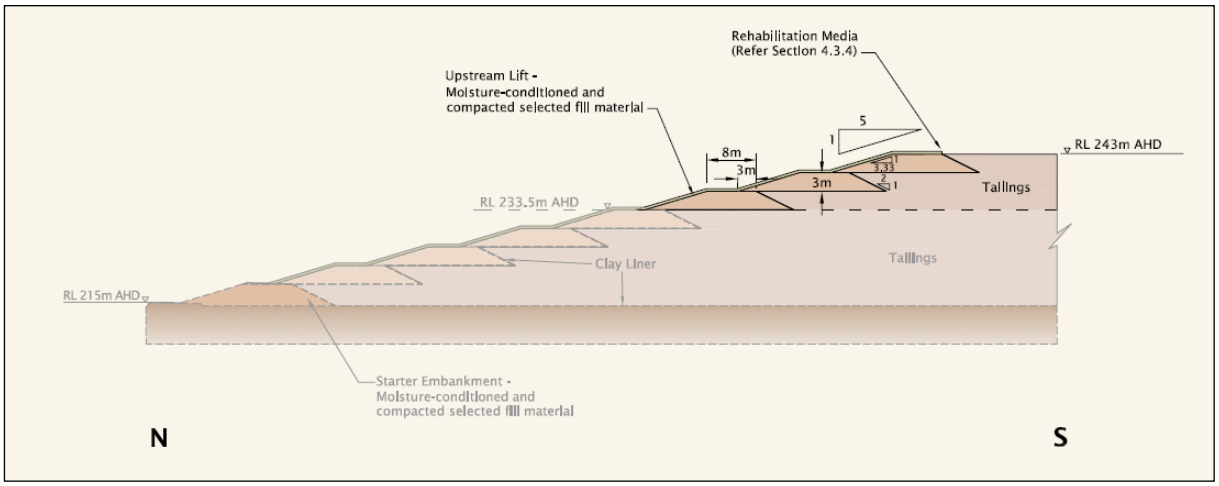
Similar to the proposed waste rock emplacement cover system, the proposed thickness of the rock mulch layer would be 0.25 m followed by a 0.25 m thick layer of topsoil.

The cover system for the top surfaces of TSFs will be conducted according to closure plan and include capping and shallow-medium root depth species.

Final Landform Profile and Slopes

The final landform profile for the tailings facility starter embankments is shown in Plate 8 below. Typical slopes of the downstream rehabilitation zone will be 1(V):5(H).

Plate 8
Conceptual Cross-section of a TSF Embankment



Soil Treatment

Soils to be used in rehabilitation will be treated with gypsum where necessary.

Revegetation Species and Methods for Establishment

The downstream rehabilitation zone will be ripped and seeded. Revegetation species will include native and introduced grasses. As a result of the hay mulching on the northern wall of the NTSF in previous years, germination of annual grass species and groundcover was generally quite good compared to the untreated eastern wall. No additional seeding took place on the NTSF or STSF starter embankments during the reporting period.

As discussed in Paragraph 5.4, early observations of the surface treatments (e.g. rock mulch) trials on the outer batters of the tailings storages are positive (i.e. landforms are stable and vegetation is establishing within the rock mulch) and indicate that this cover treatment is likely to provide for successful rehabilitation of mine landforms at the CGM (Barrick, 2011).

Extent to which Agreed Rehabilitation Outcomes and Landuse Have Been Met

The proposed progressive rehabilitation of the walls of the NTSF and STSF starter embankments is in accordance with rehabilitation concepts presented in the EIS and subsequently in proposed preliminary EA MOD (mid-2013). Further rehabilitation of the embankments will be undertaken to optimise rehabilitation outcomes and landuse in accordance with the EIS. The short term rehabilitation objectives for the NTSF are to establish good groundcover using native and exotic pasture species. The long-term rehabilitation of the tailings storages will include the re-establishment of woodland communities and will commence following the cessation of tailings deposition.

The existing rehabilitation trials on the tailings storage facilities involving various mulch treatments and native species combinations continued to be monitored during the reporting period in accordance with Recommendations 2 and 3 of the Sixth Annual Report of the IMP. Results from rehabilitation trials established on the tailings storage facilities are detailed in Paragraph 5.4.

Maintenance Activities/Requirements

Visual monitoring of revegetated landforms including the NTSF and STSF starter embankments will be 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). A 1 ha area was prepared for a small biosolids trial during the 2009-2010 reporting period. The intent of the trial was to assess the benefit of using biosolids with mulch for rehabilitation works. The trial showed best results for 45 tonnes per hectare application rate reducing to negligible growth at 15 tonnes per hectare. A monoculture of a grass

appeared to flourish in this area and therefore biosolids is not being pursued as a rehabilitation tool at this time (G Pearson 2011, *pers. comm*.).

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 Cowal Mine TSF fauna protection practices, no trees shall be encouraged to grow until after the final capping is completed on the TSFs.

Contained Water Storage D9

The D9 water storage facility occupies an area of approximately 13 hectares and has an operational maximum volume of 690 Million Litres (**ML**).

Physical and Chemical Characteristics of Emplaced Material Relevant to Rehabilitation

Rehabilitation of the water storage will be undertaken to optimise rehabilitation outcomes and land use in accordance with the EIS.

Method of Land Shaping

The water storage was constructed as a "turkey's nest" type of dam with no direct catchment external to its perimeter embankment. The dam has a nominal fill height of 8 Metres (**m**) and a nominal cut depth of approximately 2 m. Freeboard for a 1 in 100 year Annual Recurrence Interval (**ARI**) 48 hour rainfall event will be maintained in the storage.

Characteristics of Cover Material

The embankment cover material will be of low salinity to avoid the potential for saline runoff and enable satisfactory vegetation growth. The embankments will be covered with rock mulch-topsoil cover system.

Thicknesses of Cover Layers and Methods of Laying and Compaction

Topsoil that had been stripped from the footprint of the dam was used to cover the outer batters of the facility with a depth of 250 mm using an excavator.

Drainage and Erosion Control

The outer walls drain to the adjacent stormwater Pond D8B.

Final Landform Profile and Slopes

The outer slopes of Pond D9 were topsoiled and are sloping at about 1 (V): 4 (H).

Soil Treatment

Soils to be used in rehabilitation will be treated with gypsum where necessary.

Revegetation Species and Methods for Establishment

Outer batters of the storage was revegetated following placement of topsoil with native and introduced grasses.

Extent to which Agreed Rehabilitation Outcomes and Landuse Have Been Met

Pond D9 did not exhibit any useful surface growth on the northern face and much of the western face during the recent decade of drought. The wet start to 2011 resulted in good growth on all faces except the north. Consequently re-ripping and straw mulching of the northern face was conducted during the 2011 reporting period. Rehabilitation of the storage will be undertaken to achieve final rehabilitation outcomes and landuse in accordance with the EIS. The east, south and west walls of Pond D9 were dozed to remove small surface gullies and thatch armoured with clean wheaten straw during 2011. There has been no further erosion and cover remains good on these slopes. During 2012, the north-eastern corner was lightly ripped and bladed by dozer and then covered in clean wheaten straw thatch manually (machinery access restrictions by design top edge).

Maintenance Activities/Requirements

Visual monitoring of revegetated landforms including Pond D9 continued be conducted during the reporting period 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).

Boundary Amenity Plantings

No additional tubestock was planted during the reporting period.

5.3 OTHER INFRASTRUCTURE

No other rehabilitation activities were conducted during the reporting period further to those described above.

5.4 REHABILITATION TRIALS AND RESEARCH

Barrick has from 2008 – 2011 commissioned the following specialists/expert personnel to work with mine and University personnel on the following issues relevant to the rehabilitation/stabilisation of landforms at the CGM:

- Geo-Environmental Management Pty Ltd – review of erosion control and restoration strategies for the Lake Protection Bund, Waste Rock Emplacement and Tailings Storage Facilities. Specifically, the investigation of the geochemical suitability of rock armouring on the outer batters of the mine landforms.
- Landloch – completion of a surface materials assessment and review of rehabilitation strategies and landform design. Specifically, investigation and recommendations regarding erosion control, landform design and the suitability of different treatment materials (e.g. rock mulching).
- Gilbert and Associates – assessment and revision of the rehabilitation and water management concepts, particularly in regard to erosion control and water management on the top surfaces of the mine landforms.
- Australian National University – ongoing trials and research relevant to revegetation and alternative surface treatment measures (e.g. mulch) that will assist in the refinement of revegetation objectives. Additional research into topsoil resources and investigation into optimal topsoil amendment rates (i.e. gypsum treatment) and fertiliser treatments.
- DnA Environmental - design of rehabilitation monitoring methodology and trial design and to determine a set of completion criteria that complies with and is consistent with conditions specified with Management Plans and approval documents and relevant NSW legislation, policies and best practice guidelines.
- Carnegie Natives - design of rehabilitation monitoring methodology and revegetation tube trial design to assist in informing CGM's rehabilitation programme.
- The results of the abovementioned investigations will be used to inform the progressive rehabilitation/stabilisation of mine landforms at the CGM. Other specialists/expert personnel experienced in dealing with the rehabilitation issues relevant to the CGM (e.g. URS Corporation, Principal GSS Environmental and the Lake Cowal Foundation) will continue to be engaged where necessary as rehabilitation progresses.

A detailed description of the monitoring results of the new lake foreshore revegetation trials, tailings storage facility and waste rock emplacement revegetation trials, offset areas monitoring and completion criteria establishment by DnA Environmental (2010,2011) is provided below.

Rehabilitation Monitoring Methodology and Determination of Completion Criteria: Ecosystem Sustainability

DnA Environmental was engaged by Barrick to design a monitoring methodology and determine a set of rehabilitation completion criteria for the CGM. The primary objective of the monitoring of rehabilitation areas and trials was to establish an annual rehabilitation monitoring program and develop an set of completion criteria that complies and is consistent with conditions within applicable approval documents and management plans and aligns with the DTIRIS (DRE) (2011) *Rehabilitation and Environmental Management Plan Guidelines Consultation Draft V2.0 June 2010*. Monitoring of rehabilitation areas and trials was undertaken by DnA Environmental during

7 to 15 November 2011. Monitoring during spring aims to capture a more accurate representation of species present in the area.

The project aimed to establish a program which used clearly defined, repeatable and consistent methodologies for monitoring changes in various aspects of ecosystem stability, recovery and long-term sustainability. The process included:

- Establishing a range of relevant reference sites to compare and track the progress of rehabilitation areas and inherent ecosystem function;
- Selecting a range of suitable reference sites that reflect the desired final land use, biodiversity targets, historical disturbances and local community expectations; and
- Undertaking a monitoring program that provides simple and reliable information that indicates positive recovery trends or rapid detection of rehabilitation failure.

The objective behind the use of reference sites is to set the benchmark for rehabilitation success or at least provide a target to achieve. To account for variations in ecosystems across the landscape, each vegetation community is best represented in triplicate. In 2010, there was difficulty in selecting three reference sites for each of the four broad vegetation community types. This was largely due to the lack of suitable area of remnant vegetation in the near vicinity of the mine and due to flooding of some the Lake Cowal Environment. Further attempts of establishing a full number of reference sites will be made during 2011.

The broad rehabilitation vegetation communities used within part of this program include those associated with:

- Lake: Woodlands occurring within the lake and lake foreshores (RL 205 – 220m) = 2 sites (one 2010 site inaccessible; one new site established);
- Slopes: Woodland occurring on flat to gently undulating slopes (RL 210 – 225m) = 2 sites:
- Hills: Woodlands occurring on low ridges, hills and elevated land (RL 220 – 245m) = 3 sites; and
- Grass: Cleared native grasslands, predominantly occurring on flat to gently undulating slopes (RL 210 – 225m) = 2 sites.

The resultant number of revegetation monitoring sites established during 2011 was nine. Results of the DnA Environmental report *'2011 Rehabilitation Monitoring Report'* are described below.

A new approach to rehabilitation and environmental management accountability, including rehabilitation monitoring and completion criteria has recently been drafted and released for consultation by the DITRIS (DnA Environmental, 2011e). The DTIRIS draft guidelines indicate that in order to receive closure sign-off of rehabilitation, it will be necessary to demonstrate that selected performance indicators (or criteria) have reached their established completion criteria or that a satisfactory successional trajectory has been established that will result in a self-sustainable ecosystem. The new draft approach has been broken down into five major stages of ecosystem development as demonstrated below, by which a set of performance indicators or criteria will need to be monitored and either be equivalent to or exceed those assessed for the reference sites (DnA Environmental, 2011e):

- Landform establishment;
- Growth medium development;
- Ecosystem establishment;
- Ecosystem development; and
- Ecosystem sustainability.

The monitoring methodology adopted is a standard and simple procedure that can be easily replicated over any vegetation community or revegetation area and importantly results in a system that essentially compares like with like (DnA environmental, 2011e). The methodology used includes a combination of Landscape Function Analysis (LFA), accredited soil analyses and various measurements of ecosystem diversity and habitat values (DnA Environmental, 2011e). For a full description of rehabilitation methodology, refer to the DnA Environmental report titled '*Rehabilitation monitoring methodology & determination of completion criteria: Ecosystem sustainability'.*

Numerous areas have already undergone some rehabilitation, which will be progressive over the life of the mine.

New Lake Foreshore Revegetation Trials

There have been significant changes occurring on the new lake foreshore area since 2005. The sites have been progressing and are beginning to stabilise despite extreme climatic conditions. The ponded water within the temporary bund has become well established with a variety of aquatic species which have largely colonised from the soil seed bank. There continues to be active erosion derived from the unvegetated slope and poor drainage construction of the perimeter waste emplacement above the permanent lake protection bund. Despite some remedial earthworks being undertaken during 2011, numerous active gullies remain along the foreshore bunds and will require further amelioration.

Two six year old lake foreshore rehabilitation sites (CWT2 and CWT3) have demonstrated a dramatic improvement in ecological function, but remain short of meeting LFA completion targets. Increasing trends in ecosystem function at these sites can be attributed to increasing cover of vegetative materials including litter and annual and perennial plants.

One lake foreshore rehabilitation site (CWT6) has been significantly affected by wave action eroding almost half of the site, estimated to be in the order of 10m from the original foreshore area. Despite increasing vegetation cover, it appears that the sodic soils are particularly susceptible to waves from the lake. Rock lining may be required to half further deterioration of the lake foreshore area.

Tailings Dam Walls Revegetation Trials

The northern and southern tailings storage facility walls have been the focus of additional rehabilitation trials, implemented during 2009. A variety of treatments were setup with a full description provided in the report "*2010 Cowal Rehabilitation Monitoring Report"* (DnA Environmental, 2011c).

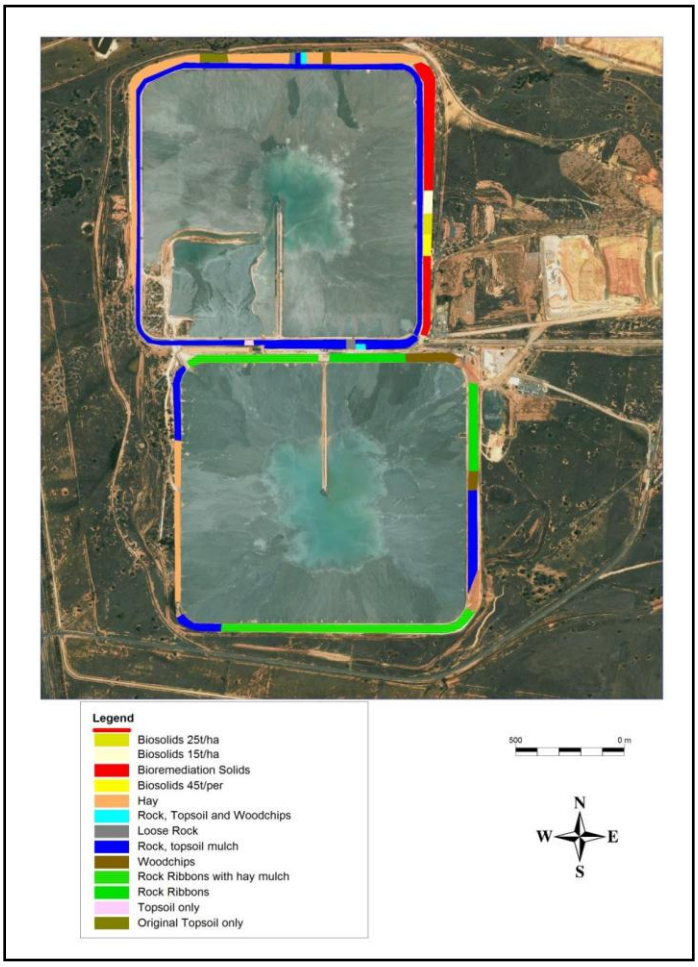
NTSF01 (rock mulch + topsoil on northern TSF) appeared to be more stable and functional compared to other rehabilitation sites in 2010 however there was a significant improvement in NTSF02 (topsoil + wheaten hay on northern TSF) in 2011. Both sites on the northern TSF now have very similar LFA indices for infiltration and nutrient cycling capacity to the grassland reference sites, but remained lower in stability. STSF01 (rock ribbon + wheaten hay) has demonstrated a decline in overall ecological function and continues to fall well short of meeting LFA targets.

Major changes occurring within the rehabilitation areas in 2011 and 2012 included increased perennial ground cover and typically increased levels of litter cover due to the abundance of annual plants which have colonised the sites.

Sites situated on the NTSF have performed relatively well, but are still considered immature and have further ecological development to undertake. It has been noted in treatments using wheaten hay, the hay was often applied in far greater depths than required, limiting the establishment of plants.

For future rehabilitation, recommendations include applying locally harvested native pasture hay bearing mature seeds immediately onto newly prepared rehabilitation areas, rather than using wheaten hay. Improved analysis of spoil materials prior to use in rehabilitation programs is also required to improve the condition of the growing mediums.

Plate 9
STSF and NTSF Wall Rehabilitation



Source: DnA Environmental, 2010

Southern Offset

Two reference sites were established in the southern offset area resembling woodlands occurring on low ridges, hills and elevated land (RL 220 – 245). These communities are dominated by *Eucalyptus dwyeri, Acacia doratoxylon, Callitris endlicheri and E. sideroxylon* on the rockier ridge tops and intergraded with *E. populnea*, *E. microcarpa* and *Callitris glaucophylla* woodlands on the lower parts of the slope. The reference sites that form the revegetation benchmarks and completion targets are named “RHill01” and “RHill02”.

The southern offset area contained a high diversity of ground cover plants and while many of these were exotic annual species or colonising plants, the majority were native species which were increasing in numbers. Exotic species had declined in 2011 and this trend is expected to continue provided there is limited disturbance. The sites were demonstrating additional successional recovery with the further development of vegetative cover and soils surface crusting, increasing abundance of cryptograms, increased soil coherency and reduced erosion and deposition.

Soil properties remained within the local or desirable levels and no adverse soil chemistry was apparent from the soil test results with the exception of increased ESP in Offest02 indicating the soils may have a tendency to disperse. There was a lack of tree and shrub species as well associated structure and habitat requirements indicating these monitoring sites currently fall short of the completion targets. Continual rehabilitation of these sites should show an improvement in Key Performance Indicators (**KPIs**) providing appropriate species and densities are implemented. As the completion criteria have been derived from the adjacent Hill communities, revegetation activities should aim to replicate these community types (DnA Environmental, 2013c).

AMBS conducted a flora survey and mapping of the CGM and its surrounds (including the offset areas) in April 2012. The results of the survey and mapping are included in this AEMR in Paragraph 3.7.3.1.

Northern Offset Woodland revegetation

Two monitoring sites (Offset03 and Offset04) were established in the northern offset area prior to rehabilitation. The established sites were chosen to resemble *Acacia pendula – Casuarina cristata* woodlands occurring on flat to gently undulating slopes. These sites were compared to reference sites RSlope01 and RSlope02.

The northern offset area continued to be a diverse environment and despite a reduction in total floristic diversity, it maintained a high diversity of ground cover plants and was dominated by native plants. The sites were demonstrating positive successional recovery with improved ground cover and in terms of ecological function, both sites were within ranges provided by the woodland slope reference sites. The water filled gilgais were a particularly important feature in these sites in 2010 and while they were dry this year they continued to provide topographic relief and additional habitat features, resulting in a relatively high floral diversity. The sites were similar in composition to the reference sites however they contained slightly more exotic species and lacked a population of shrubs.

The soils differed considerably between the two sites with some significant changes having occurred over the past year. Most primary soil characteristics were similar to the reference sites in 2011 with the exception of low nitrates. Most changes in soil chemistry were attributed to the variable topographic relief provided by the gilgais landscape in combination with high rainfall throughout 2011 and at the start of 2012.

DnA Environmental recommended that as part of the rehabilitation process that deep ripping is not undertaken due to the occurrence of potentially highly sodic soils, gilgais, and the high species richness. Deep ripping may compromise the ecological function and high conservation significance of the site. Any rehabilitation that is to occur should aim to replicate the associated reference sites, taking care to replicate the structure and future habitat requirements of these communities (DnA Environmental, 2013c).

AMBS conducted a flora survey and mapping of the CGM and its surrounds (including the offset areas) in April 2012. The results of the survey and mapping are included in this AEMR in Paragraph 3.7.3.1.

Southern Waste Emplacement rehabilitation trials

These trials were established on the south side of the Southern Waste Emplacement (**SWE**) in late 2009 to examine the benefits of rehabilitating slopes with long continuous slopes compared to a three tiered battered slope, with and without different mulching treatments. A variety of treatments were setup with a full description provided in the DnA Environmental report from 2011 titled *2010 Cowal Rehabilitation Monitoring Report*.

A preliminary assessment was undertaken during March 2010 by DnA Environmental (initial assessment not formal) and minimal difference was observed between the sub soil and no subsoil treatments. Differences between slope types were also minimal but more rilling had occurred on the single continuous slope. Mulch treatments showed more promising stabilising cover (rock and hay) and during this initial assessment there was little vegetative cover. Woodchips provided excellent stabilising cover but seemed to inhibit the growth of vegetation. The rock and topsoil and topsoil only treatments contained the highest establishment of plants, but site stability was questionable.

Whilst the treatments were not subjected to rigorous statistical analysis the results of the 2010 monitoring showed that there was little difference in ecosystem function or plant cover and diversity whether subsoil was applied or not, but there may have been some slight advantage in using a subsoil treatment. There was also little difference between continuous slopes or 3-tiered reverse graded batters except for more rilling in the straight slope. Other observations include some additional erosion control within the reverse graded batter, as a temporary alluvial fan had developed within some of the sub-treatments. Other advantages of the 3-tiered slope include shorter slopes and better and safer access for ongoing revegetation and maintenance activities (DnA Environmental, 2011c).

The better performing sites in terms of ecological sustainability and similarity to the native grassland reference sites were found to be those with a topsoil application. Rock mulch as a treatment (in shallow depths to allow for plant growth) also provides stability in the case of extreme climatic events. As a result, in order to prevent erosion from occurring before the plants have become well established, a light application of rock, woodchips or preferably native pasture hay will provide temporary and critical soil surface protection and erosion control in the initial site establishment phase (DnA Environmental, 2011c).

As with all rehabilitation sites at Cowal, the ability to meet completion targets will depend on the capacity of native perennial plants to drive the ecological functions of the site. Whilst at this stage the sites contain a high number of weedy species, these species are part of the successional process and provide important ground cover and assist in the development of the microbial and nutrient recycling processes. On the other hand, these two sites contained a good representation of native species which are expected to set seed and become more abundant over time.

The SWE South trials were established to examine the benefits of rehabilitating slopes with long continuous slopes compared to a three tiered battered slope, with and without different mulching treatments. The layout of the trial is shown above. The growth rate on the southern aspect has been observed to be higher than the sunny northern aspect (hotter and drier). The trials were constructed in September 2009 as follows using an 8m wide D9 dozer blade as a spacing guide:

- Subsoil (with and without);
- Slope (3 tiered 1:3 battered, single continuous slope);
- Rock mulch (R);
- Rock mulch + woodchips (R+Wc);
- Rock + topsoil + woodchips (R+T+Wc);
- Rock + topsoil (R+T);
- Topsoil (T); and
- Control or No treatment (C).

In 2012, DnA Environmental excavated soil from around the root zone of four tubestock which were planted in 2010 to determine if the seedling roots were able to penetrate through the waste rock layers and to what depth they had reached within a two year growing period. The seedlings were relatively small for being two years old and of the four, two seedlings were spindly and chlorosed which may be the result of their condition when they were first planted (they may have been tall and spindly tubestock in the first place) but this may also be partially reflected in the dry seasonal conditions experienced throughout most of 2011 and 2012, despite flooding during summer in both years. It appears however that the seedlings had well developed root systems that easily penetrated down through the different combinations of topsoil, subsoil and oxide layers, with one major exception in tree 4, where the roots abruptly terminated, reduced in size and/or changed direction when they entered into the oxide layer. While the oxide layers were typically very strongly alkaline and extremely saline and had high levels of sulfur and arsenic in all excavation holes the tree roots appeared to have penetrated into this layer in three of the four excavation holes. Therefore DnA Environmental did not find any consistent and conclusive evidence that suggests that the seedling roots do not or cannot penetrate any of the strata used in this rehabilitation site.

DnA will be consulted for a progress review on the performance of these trials in 2013. Direct seeding may have produced a suitable number of seedlings in the next few years to assist future rehabilitation (Plate 11).

Plate 10
SWE – Southern Slope Trial Plots

(October 2009)

(March 2010)

(July 2011)

(October 2012)

(January 2013)

No Subsoil												Subsoil											
3 tiered Batter (1:3)						Single continuous slope (1:5)						Single continuous slope (1:5)						3 tiered Batter (1:3)					
R	R+Wc	R,T+Wc	R+T	T	C	R	R+Wc	R,T+Wc	R+T	T	C	R	R+Wc	R,T+Wc	R+T	T	C	R	R+Wc	R,T+Wc	R+T	T	C

Plate 11
SWE – Southern Slope Trial Direct Seeding Mix

Plate 12
Weeping Myall (*A. Pendula*) Re-growth from topsoil SWE Southern Slope Trials

5.5 DEVELOPMENT OF THE FINAL REHABILITATION PLAN

Proposed rehabilitation outcomes have been continuously developed throughout the CGM approval process. The EIS detailed a final rehabilitation philosophy and objectives for the CGM as well as the proposed rehabilitation programme and final landform and revegetation concepts.

Subsequent to the EIS approval a series of management plans were developed in accordance with Development Consent Conditions. The CWMP, FFMP, LSMP and ROMP further developed rehabilitation concepts presented in the EIS. The following stakeholders were consulted during preparation of these plans:

- EPA (formerly OEH);
- DTIRIS (DRE);
- DPI - Fisheries;

- NoW;
- Lake Cowal Landowners Association;
- Lake Cowal Foundation;
- DP&I; and
- BSC.

Results of consultation undertaken with the abovementioned stakeholders were incorporated into the management plans where relevant.

In accordance with the EIS and subsequent to the commencement of mining operations, consultation with respect to the detail of the concepts will be commenced as part of an ongoing process (in accordance with the Mining Rehabilitation and Environmental Management Process (MREMP) throughout the life of the CGM. The final rehabilitation concepts have been developed and are described in the ROMP. Rehabilitation will continue to be iterative and based on results of rehabilitation trials and formulated in consultation with DTIRIS (DRE) and other relevant stakeholders. A Final Rehabilitation Plan (**FRP**) will be included in the CGM Mine Closure Plan.

Table 41 provides a summary of rehabilitation activities at the CGM during the reporting period. The table includes details of rehabilitation at the start of the reporting period and estimated for the next report.

Table 41
Rehabilitation Summary

		Area Affected/Rehabilitated (hectares)		
		Previous Report	**Current Report**	**Next Report (estimated)**
A	**MINE LEASE AREA**			
A1	Mine Lease(s) Area	2,650	2,650	2,650
B	**DISTURBED AREAS**			
B1	Infrastructure Area[1]	296	350	350
B2	Active Mining Area[2]	107	107	107
B3	Waste Emplacements[3]	335	342	342
B4	Tailings Emplacements	369	369	369
B5	Shaped Waste Emplacement[4]	62	87	127
ALL DISTURBED AREAS[5]		1,156	1,255	1,295
C	**REHABILITATION PROGRESS**			
C1	Total Rehabilitated Area[6]	189	214	254
D	**REHABILITATION ON SLOPES**			
D1	10 – 18 Degrees	159	184	224
D2	Greater than 18 Degrees	0	0	0
E	**SURFACE OF REHABILITATED LAND**			
E1	Pasture and Grasses	151	151	151
E2	Native Forest/Ecosystems	38	38	38
E3	Plantations and Crops	0	0	0
E4	Other	0	0	0

1 Includes areas such as ore and soil stockpiles, contained water storages, processing plant and roads.
2 Open pit area.
3 Areas of waste emplacements yet to be shaped and rehabilitated.
4 Areas of waste emplacements that have been shaped and rehabilitated.
5 Includes any area that has been disturbed by mining activities. This value includes the Total Rehabilitation Area presented in C1.
6 Any areas that have been rehabilitated including areas of waste emplacements and tailings storage facilities progressively shaped and rehabilitated.

Table 42 gives a summary of the maintenance works carried out on rehabilitated land over the reporting period. Also summarised are planned works to be undertaken during the next reporting period.

Table 42
Maintenance Activities on Rehabilitated Land

Nature of Treatment	Area Treated (ha)		Comments/Control Strategies/Treatment Detail
	Report Period	Next Period	
Additional erosion control works	2	10	The reverse-graded berms that were constructed at the top of the Lake Protection Bund were reshaped during the reporting period to remove sediment build up and improve their effectiveness in minimising runoff from the PWE. Maintenance of the road on the top of the Lake Protection Bund was also undertaken.
Re-covering	45	50	The 3rd Lift of NTSF was treated by rock-topsoil during early-2012. The 4th Lift (3rd augmentation) of STSF was treated by rock-topsoil during late-2012. The 4th Lift of the NTSF will require outer batter rehabilitation works during late-2013. The Pond D1 end of the NWE was re-shaped after the rock bars were re-shaped in the Northern Diversion Channel during 2012 to early-2013. The Pond D4 end and the south side of the SWE was re-shaped and the Southern Lowflow Diversion Channel and settlement basin were cleaned out and re-shaped during 2012 and the start of 2013. PWE works are budgeted to occur during 2013 year. SWE and NWE shaping and rehabilitation covers works are scheduled for 2014 year. Inside the PWE is being considered for 2016 year planning (grey lake sediments requiring re-shaping, gypsum and rock addition).
Soil treatment	0	0	Despite field sampling testwork indicating a need for higher gypsum dose (above 10t/ha), and extended treatment times, no area has presently been approved for the treatment of the relevant site subsoil and topsoil stocks.
Treatment/Management	100	20	Slashing and grading of firebreaks was undertaken during the reporting period. It is expected that the same activities will undertaken in the next reporting period. Lake Fill event has covered the lake fire trails for now.
Re-seeding/Replanting	0	4	The southern slope of the SWE was seeded during October 2011. There was no replanting of any trees and shrubs in any area. The southern Lake edge of the PWE is scheduled to have native tubestock planted in late-2013.
Adversely affected by weeds	500	300	*Xanthium spinosum* (Bathurst Burr), *Sclerolaena birchii* (Galvanised Burr) *Ibicella* lutea (Devil's Claw) and *L ferrocissimum* (African Boxthorn) were treated by spot spraying with chemical or by manual removal. Infestations were mainly in isolated low lying areas that held enough moisture long enough for germination. Lake Fill event has covered the 'Lakeside' control areas since August 2010.
Feral animal control	2,650	2,650	Feral animal control activities were undertaken during the reporting period. Activities included fox and rabbit baiting on ML 1535 and parts of Barrick-owned land, and feral cat trapping.

6 ACTIVITIES PROPOSED FOR THE NEXT AEMR PERIOD

Mining and landform rehabilitation activities will continue to be undertaken in the next AEMR period in accordance with the Development Consent, EMPs and other approvals.

Operational activities will include the continuation of mining and mineral processing during the next reporting period.

6.1 ENVIRONMENTAL MANAGEMENT TARGETS AND STRATEGIES FOR THE NEXT YEAR

The management strategies set out in the CGM EMPs prepared to date would continue to be implemented during the next reporting period in order to meet the objectives and targets described in the EMPs. A summary of the management targets and objectives, as set out in the EMPs for the next reporting year is provided in Table 43.

In accordance with Development Consent Condition 3.2. a 5-yearly review and update of all CGM EMPs will be undertaken in 2013 and the outcomes documented in the 2013 AEMR.

Table 43
Summary of Environmental Targets and Management Strategies for the Next Reporting Year

Environmental Management Plan	Objectives/Targets (for next reporting period)	General Management Strategies
BLMP	• Optimisation of blasts by Geotechnical personnel. • Maintain network during continued Lake Fill. • Continue to work with near neighbours and CGM Community Relations and adjust programme resources as required.	• Blasting in accordance with the identified criteria. • Maintain monitoring network and Cowal Blast Hub external services. • Remedial measures in events which exceed blast criteria or disturb birdlife. • Install new meteorological sensors equipment on the new generation blast loggers of 2012. • Relocate BM07 (Admin) to Pond D3 to reduce loss of blast signature as the E42 Pit deepens. Becomes location BM10. • Ongoing consultation with affected landholders as required. Move BM06 to 'Cowal North'.
BMP	• Conduct staff training and drills. • Maintain the new fire trails from 'Lakeside' to Gate 10 after Lake Fill.	• Maintenance of Emergency Response Procedures. • Reduction of bushfire threat and protection of assets at risk after growth period.
CWMP	• Continue weed and pest control.	• Prevention of grazing stock entry. • Frog surveys – annual/ bi-annual (rain). • Natural regeneration of native plants. • Limitation of vehicular access. • Improvement of habitats for wildlife. • 2014 Lake Cowal fish survey.
DMP	• Continued use of Petro Tac on light roads. • Continue NMI and ALS use of CGM bulk dust standard (2011). • Continue learning from Uni of Sydney Thesis of Ryan, 2012 (plant uptake) and Anning (in-situ tracking As using pXRF). • Maintain network during continued Lake Fill.	• Reduction/control of dust emissions. • Move DG8 'Hillgrove' to ML location n-e of E42 Pit between Site 52 and DG 5 (as per Cattle, 2012). Becomes in-Lake ML location DG14. • The University of Sydney will continue to advise Barrick personnel on the dust sampling methodology, to reduce the likelihood of sample contamination via the incorrect implementation of sampling techniques. • Evaluate use of original and new tripod gauges in Lake Cowal for duplicates with gauge campaigns of up to 3 months to further investigate high Cu and Zn assays.

Table 43 (Continued)
Summary of Environmental Targets and Management Strategies for the Next Reporting Year

Environmental Management Plan	Objectives/Targets (for next reporting period)	General Management Strategies
HMP	• Advise the relevant stakeholders that Cowal Mine has no remaining HMP items of interest. Request removal of HMP. • Post information plaques at proposed LCCC Museum if Barrick proceed with Shearing Shed component of section 75W approvals.	• Maintenance of stored items. • Weed and pest control around items. • Fire control around stored items Shed. • Surface water control, basal layer. • Relocation to LCCC museum area. • Opening of 'Cowal West' Shearing Shed at LCCC on 19 April 2013 .
ESCP	• Continue event based structure inspections. • Enhance the southern portion of the UCDS through repair and strengthening of erosion control structures. Clear sediment from UCDS south front basin. • Conduct annual peer risk review. • Reclamation Standard compliance.	• Effective control of sediment and salinity migration. • Maintain lake floor/ edge access fire trail and planned general inspections of assets after lake Fill event. • Maintenance of downstream (Lake) water quality. • Ongoing approval use for the rock-topsoil method using independent review and amended MOP, EMPs, DC modification, etc.
CMP	• Continued cyanide management. • Continue use of SMBS system and maintain Caro's Acid preparedness. • Maintain TSF auto-sampler to the concrete bunded tailings slurry pumping hopper area. • Independent audit ICMI Code 12-14 November 2013 (fourth triennial re-certification is due in 2014).	• Maintain strategy of excellence in environmental management of installed facilities, process water streams, on-site reagent storage, use and emergency preparedness. • Implement engineering design solution for repeat, aggressive corrosion at sulphuric acid sump and continue maintenance program for the SMBS area. • Maintain full compliance status with the ICMI Code.
FFMP	• Continue NSW WIRES training for employees. • Relocate wildlife as required. • Continue maintenance of TSF and Pond D6 bird deterrent system and fences. • Continue control of vermin and noxious weeds. • Approval and implementation of ROMP.	• Remnant vegetation enhancement programme. • Vegetation clearance protocol. • Weed management and pest control. • Protection of flora and fauna threatened species located within the CGM. • Additional bird and bat nesting boxes and hollows at 'Hillgrove'.
HWCMP	• Continue appropriate transport, handling, disposal, and recycling of wastes. • Maintain steel drum crusher and cardboard bailer operations. • Ongoing ICMI Cyanide Code full compliance – operational phase. • Appropriate responses to spillages. • Ongoing use and management of bioremediation area. • Audit and maintain emergency preparedness oil & chemical spill kits.	• Substances Inventory Register (IR). • Distribution of revised employee environmental awareness handbook and spill training. • Emergency preparedness contingency. • Root cause analysis of spill incidents with action programs to eliminate. • Enhanced employee use of upgraded Chemalert III system software features. • Independent review of waste rock geochemistry as a portion of the Application for s75W Extension.
IACHMP	• Continued assessment of areas as per IACHMP prior to soil stripping. • Revised IACHMP – include GDP process.	• Protection/Management of sites within the CGM area. • Dissemination of cultural heritage information and offsets.

Table 43 (Continued)
Summary of Environmental Targets and Management Strategies for the Next Reporting Year

Environmental Management Plan	Objectives/Targets (for next reporting period)	General Management Strategies
LMP	• Continue control of vermin and noxious weeds. • Maintain ML boundary buoys (Plate 6). • Approval and implementation of the ROMP. • Review the draft Lachlan River Floodplain MP (January 2011) and incorporate as required.	• Pasture and remnant vegetation management. • Weed management and pest control. • Farm Planning.
Monitoring Programme for Detection of any Movement of Lake Protection Bund, Water Storage and Tailings Structures and Pit/Void Walls	• Maintain monuments inspection frequency of TSF walls. • Maintain Pond structure inspections. • Raise height of TIB by 0.5 m when Lake Cowal recedes to safe distance.	• Detection of any movement of the Lake Protection Bund, water storage and tailings structures, and pit/void walls. • Effective responses to any detected movement.
LSMP	• Continued building inspections. • Ongoing visual assessments. • Approval and implementation of the ROMP.	• Blending of structures with the surrounding landscape as far as possible. • Establishment of shrubs and trees in accordance with the requirements of BSC. • Effective maintenance of landscapes and buildings.
SSMP	• Continue soil stockpile management. • Update database as required.	• Continue McKenzie survey of site rehabilitation stockpiles qualities. • Conduct a LiDAR aerial 3-D survey of site stockpiles. • Continued use of ArcGIS as a management tool. • Effective scheduling and management of soil stripping operations.
SWMP	• Maintain monitoring and reporting of open pit dewatering system. • Continue process water management. • Water Conservation Standard compliance.	• Prevent the quality of any surface water (including waters within Lake Cowal) and groundwater being degraded. • Effective management of the quantity of surface water and groundwater generated within the CGM area. • Effective amelioration of potential impacts to surface water and groundwater.
SWGMBMP (Programme)	• Ongoing use of approved revised SWGMBMP.	• Detection of any adverse affects to surface water, groundwater, and/or biology. • Effective responses to any detected adverse affects. • Re-stocking Lake with native fish should Lake levels rise enough in 2013. • 2014 Lake Cowal fish survey.
NMP (including traffic noise)	• Continue employee awareness. • Continued monitoring in accordance with NMP. • DP&I approval of the revised NMP to include traffic noise criteria to reflect the modification of the Development Consent on 10 March 2010.	• Prevention of adverse mine operational noise. • Ongoing development of bund walls and waste rock emplacements. • Prevention of adverse mine traffic noise. • Ongoing consultation with affected landholders as required. • Complaint response and dispute resolution procedures.
TSMP	• Develop species-specific plans as required. • Conduct surveys for threatened species as required • Biodiversity Conservation Standard compliance.	• Ensure the viability of a local population of a threatened species is not put at risk by the CGM. • Species-specific management plans.

Table 43 (Continued)
Summary of Environmental Targets and Management Strategies for the Next Reporting Year

Environmental Management Plan	Objectives/Targets (for next reporting period)	General Management Strategies
Implementation Plan to Protect Fauna from Interactions with the Tailings Storage Facilities	• Continue monthly bat monitoring • Conduct daily routine inspection and monitoring of fauna, process, tailings discharge, surface water and groundwater. • Investigate use of LRAD noise gun/s for recalcitrant visitors to TSF beaches.	• Prevent fauna and avifauna use of operational tailings storage facilities. • Maintain TSF perimeter fencing and avifauna deterrents. • TSF Operations and Maintenance Plan. • Maintain readiness for end of current Lake Fill.
MOP (October 2012 –January 2014)	• Schedule Mine development. • Continue progressive landscape and rehabilitation management.	• Soil stripping scheduling. • Soil stockpile management – amelioration options. Continue to prevent the contamination of surrounding land whilst working towards setting phased completion criteria. • Mine waste rock emplacements. • Closure and decommissioning plan. • Life of Mine Plan. • TSF Operations and Maintenance Plan. • Next draft MOP by November 2013.
THMS	• Maintain arrangements for THMS. • Continue emergency preparedness contingency with external services. • Use of inland road and/or other emergency routing as required (2011-12 Flooding).	• Employee awareness training. • On-site facilities inspection and maintenance. • Contract management. • Emergency preparedness.
ROMP	• Approval and implementation of the ROMP.	• Mine site rehabilitation management. • Offset areas management. • Establish mechanism for long-term security of the offset areas (i.e. VCA, VPA, other).

Environmental Management System

Barrick will continue development of the CGM EMS in accordance with corporate standards during the next reporting period. Risk-based management of significant environmental aspects by ongoing management review and employee involvement in site wide planned general inspections will continue during the next reporting period.

Barrick has five (5) environmental standards and the core EMS standard:

- Closure;
- Water;
- Tailings Facility Design;
- Climate Change; and
- Incident Reporting and Investigation.

Internal and external review of compliance to these standards is ongoing across Barrick operations.

The CGM underwent both Preliminary and Stage 1 EMS audits during the 2012 reporting year. The CGM passed a Stage 2 ISO 14001 external audit by ERM-CVS on 28 February 2013 and was recommended for certification to occur during the next reporting period. The first six-monthly surveillance audit as an ISO 14001 certified site will occur in late-October 2013.

Plate 13
A Bandy Bandy Snake in defence mode upon relocation to a safer place.

Plate 14
Glorious colours of Lake Cowal in May 2012.

7 REFERENCES

Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC and ARMCANZ) (2000) *National Water Quality Management Strategy No. 4: Australian Guidelines for Water Fresh and Marine Water Quality Monitoring and Reporting Vol 1 & 2.*

Australian Geological Survey (2000) *Forbes 1:250 000 Geological Sheet – Explanatory Notes 2nd edition SI55-7*. Mineral Resources – Geological Survey of New South Wales. ISBN 0 642-39837-2 Commonwealth of Australia.

Australian Museum Business Services (2012) *Cowal Gold Mine and Surrounds Flora Survey*.

Barrick Australia Limited (2003a) *Cowal Gold Project Soil Stripping Management Plan*.

Barrick Australia Limited (2003b) *Cowal Gold Project Site Water Management Plan*.

Barrick Australia Limited (2003c) *Cowal Gold Project Dust Management Plan*.

Barrick Australia Limited (2003d) *Cowal Gold Project Erosion and Sediment Control Management Plan*.

Barrick Australia Limited (2003e) *Cowal Gold Project Surface Water, Groundwater, Meteorological and Biological Monitoring Programme*.

Barrick Australia Limited (2003f) *Cowal Gold Project Lake Protection Bund, Water Storage and Tailings Structures and Pit-Void Walls Monitoring Programme*.

Barrick Australia Limited (2003g) *Cowal Gold Project Flora and Fauna Management Plan*.

Barrick Australia Limited (2003h) *Cowal Gold Project Threatened Species Management Protocol.*

Barrick Australia Limited (2003i) *Cowal Gold Project Compensatory Wetland Management Plan*.

Barrick Australia Limited (2003j) *Cowal Gold Project Land Management Plan*.

Barrick Australia Limited (2003m) *Cowal Gold Project Landscape Management Plan*.

Barrick Australia Limited (2003n) *Cowal Gold Project Indigenous Archaeology and Cultural Heritage Management Plan*.

Barrick Australia Limited (2003o) *Cowal Gold Project Heritage Management Plan*.

Barrick Australia Limited (2003p) *Cowal Gold Project Bushfire Management Plan*.

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

Barrick Australia Limited (2006c) *Cowal Gold Project Hazardous Waste and Chemical Management Plan*.

Barrick Australia Limited (2006e) *Cowal Gold Project Cyanide Management Plan.*

Barrick Australia Limited (2006f) *Cowal Gold Project Mining Operations Plan.*

Barrick Australia Limited (2007) *Cowal Gold Project Mining Operations Plan.*

Barrick (Cowal) Limited (2009) *Cowal Gold Project Mining Operations Plan.*

Barrick Australia Limited (2009) *Cowal Gold Project Surface Water, Groundwater, Meteorological and Biological Monitoring Programme – Mine Operations*.

Barrick Australia Limited (2012) *Cowal Gold Project Blast Management Plan*.

Barrick Australia Limited (2010) Modified Request Environmental Assessment.

Barrick (Cowal) Limited (2011) *Cowal Gold Project Mining Operations Plan.*

Barrick (Cowal) Limited (2012) *2012-2014 Mining Operations Plan*.

Barrick (Cowal) Limited (2013) *Addendum to the Surface Water, Groundwater, Meteorological and Biological Monitoring Programme – Mine Operations*.

Carnegie Natives (2011) *Cowal Gold Mine Annual Weed Survey*.

Carnegie Natives (2012) *Cowal Gold Mine Annual Weed Survey.*

Cattle, S. (2012) *Interpretation and Discussion of 2012 Air Quality Monitoring Results Cowal Gold Project*. University of Sydney.

Cenwest Environmental Services (2009) *Cowal Gold Mine E42 Modification – Modified Request Fauna Assessment*.

Coffey Geotechnics (2009a) *Cowal Gold Mine – Groundwater Monitoring Review 2008.* Report No. *GEOTLCOV21910AE-AB.*

Coffey Geotechnics (2009b) *Cowal Gold Mine Groundwater Level Investigation*. Report No. *GEOTLCOV21910AF-AB*.

Coffey Geotechnics (2011) *Cowal Gold Mine Groundwater Monitoring Review 2011*.

Coffey Geotechnics (2013) *Cowal Gold Mine Groundwater Monitoring Review 2012*.

Department of Resources, Energy and Tourism (2009) *Leading Practice Sustainable Development Program for the Mining Industry - Hazardous Materials Management Handbook.*

Department of the Environment, Water Heritage and the Arts (2008a) *Threat Abatement Plan for Predation by Feral Cats.*

Department of the Environment, Water Heritage and the Arts (2008b) *Threat Abatement Plan for Predation by the European Red Fox.*

Department of Trade and Investment, Regional Infrastructure and Services (Department of Mineral Resources) (2006) *Guidelines and Format for Preparation of an Annual Environmental Management Report*.

Department of Trade and Investment, Regional Infrastructure and Services (2011) *Rehabilitation and Environmental Management Plan Guidelines Consultation Draft V2.0 June 2010*.

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

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

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

Donato Environmental Services (2009) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: October 2008 to March 2009.*

Donato Environmental Services (2010) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: April 2009 to September 2009.*

Donato Environmental Services (2010) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: October 2009 to March 2010.*

Donato Environmental Services (2011) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: April 2010 to September 2010.*

Donato Environmental Services (2011) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: October 2010 to March 2011.*

DnA Environmental (2009) 2009 Weed Survey & Farm Management Report.

DnA Environmental (2010) Cowal Gold Mine Rehabilitation Trials: Preliminary Assessment March 2010.

DnA Environmental (2011a) 2010 *Austral pillwort survey*.

DnA Environmental (2011b) 2010 *Compensatory Wetland Regeneration Monitoring Results.*

DnA Environmental (2011c) 2010 *Rehabilitation Monitoring Report.*

DnA Environmental (2011d) 2010 *Remnant Vegetation Enhancement Program: 2010 monitoring results.*

DnA Environmental(2011e) *Rehabilitation monitoring methodology & determination of completion criteria: Ecosystem sustainability.*

DnA Environmental (2012)

DnA Environmental (2012a) 2011 *Austral pillwort survey*.

DnA Environmental (2012b) 2011 *Compensatory Wetland Regeneration Monitoring Results.*

DnA Environmental(2012c) 2011 Rehabilitation Monitoring Report.

DnA Environmental (2012d) 2011 *Remnant Vegetation Enhancement Program: 2011 monitoring results.*

DnA Environmental (2013)

DnA Environmental (2013a) 2012 *Austral pillwort survey*.

DnA Environmental (2013b) 2012 *Compensatory Wetland Regeneration Monitoring Results.*

DnA Environmental(2013c) 2012 Rehabilitation Monitoring Report.

DnA Environmental (2013d) 2012 *Remnant Vegetation Enhancement Program: 2011 monitoring results.*

Environment Australia (1997) *Best Practice in Environmental Management in Mining*.

Environment Protection Authority (2008) *Waste Classification Guidelines*.

Environmental Geochemistry International Pty Ltd (2004) *CGP Geochemical Assessment of Waste Rock and Process Tailings*.

Environmetrics Australia Pty Ltd (2008) *Review of Statistical Aspects of Cowal Gold Mine Operations Monitoring Program.*

FloraSearch (2008). *Cowal Gold Mine E42 Modification Flora Assessment.* Report No. HAL-26.

frc environmental (2012). Cowal Compensatory Wetland Habitat and Fish Investigation. Ref 101209.

Gell (2012a) *Lake Cowal Waterbird Monitoring Survey Progress Report – January 2012.*

Geo Environmental Management (2009) *Cowal Gold Mine E42 Modification – Modified Request – Taililngs and Waste Rock Geochemical Assessment*.

Hawkes, G. E. (1998) *Hydrogeology of the Proposed Lake Cowal Gold Mine NSW*, MSc Thesis, University of Technology Sydney.

Heggies (2009). *Cowal Gold Project Traffic Noise Monitoring January 2010.* Report No. 10-4111-R9 Traffic.

Heggies (2009). *Cowal Gold Project Mine Operation Noise Monitoring January 2009.* Report No. 10-4111-R9 Mine.

Heggies (2009). *Cowal Gold Project Mine Operation Noise Monitoring July 2009.* Report No. 10-4111-R10 Mine

Heggies (2010). *Cowal Gold Project Traffic Noise Monitoring January 2010.* Report No. 10-4111-R11 Traffic.

Heggies (2010). *Cowal Gold Project Mine Operation Noise Monitoring January 2010.* Report No. 10-4111-R11 Mine.

Heggies (2010). *Cowal Gold Project Mine Operation Noise Monitoring July 2010.* Report No. 10-4111-R12 Mine.

Lyons *et al.* (2000) *The Cowra - Yass Province.* Geoscience Australia.

NEPC (1999) *National Environment Protection (Assessment of Site Contamination) Measure.*

North Limited (1998) *Cowal Gold Project – Environmental Impact Statement*. Report prepared by Resource Strategies Pty Ltd.

NSR Environmental Consultants (1995) *Lake Cowal Gold Project Environmental Impact Statement.*

NSW Agriculture and CMPS&F (1996) *Environmental Guidelines for the Assessment and Cleanup of Cattle Tick Dip Sites for Residential Purposes.*

NSW Agriculture (2003) *Draft Vertebrate Pest Control Manual*.

NSW Livestock, Health and Pest Authority (2010) *Controlling Pests on your Land.*

Miles, Brooker, McInnes, *et al* [1993-1998]

McInnes, P., Freer, L. (2007). The Cowal Gold Corridor – Opening Other Doors. Barrick Gold of Australia.

McInnes, P., Miles, I., Radclyffe, D., and Brooker, M. (1998) Endeavour 42 (E42) gold deposit, Lake Cowal; in Berkman D A, Mackenzie D H (Ed.s), 1998 Geology of Australian & Papua New Guinean Mineral Deposits The AusIMM, Melbourne Mono 22 pp 581-586.

McKenzie Soil Management and Carnegie Natives (2012) *Preliminary Soil Characterisation Report – 'Subsoil 02' and 'Topsoil 02'.*

McMahon, D.M. (2012) Surface Water and Sediment Sampling and Analysis 2011, Lake Cowal NSW.

O'Kane Consultants Pty Limited (O'Kane) (2008) *Waste Rock Geochemical Infill Programme Cowal Gold Mine.*

Pardoe, C. (2002) *Supplementary Archaeological Survey of Part of the Proposed Borefield and Pipeline for the Cowal Gold Project, Lake Cowal, NSW - Draft Report.*

Parsons Brinkerhoff (2005) *Fire Safety Study, Cowal Gold Project.*

Parsons Brinkerhoff (2007), Parsons *Cowal Gold Project – Preliminary Hydrogeochemical Review of the Groundwater System.* Report prepared by Edward Oldmeadow for Barrick Australia Ltd.

Pinnacle Risk Management (2004) *A Preliminary Hazard Analysis, Transport of Hazardous Materials Study, Hazard and Operability Study Report, Cowal Gold Project*.

Pinnacle Risk Management (2005) *Fire Safety Study, Cowal Gold Project*.

Ryan, A and Cattle, S (2010) *Understanding the local pedological and ecological impacts of dust emitted from Cowal Gold Mine*. University of Sydney. 19th World Congress of Soil Science, Soil Solutions for a Changing World, Brisbane.

Saros (Australia) Pty Ltd (2010). *2009 review of Blast Monitoring Results.*

Saros (Australia) Pty Ltd (2011). *2010 review of Blast Monitoring Results.*

Saros (Australia) Pty Ltd (2012). *2011 review of Blast Monitoring Results.*

Saros (Austraia) Pty Ltd (2013). *2012 review of Blast Monitoring Results.*

SLR Consulting Australia Pty Ltd (2012) *Cowal Gold Project Mine Operation Noise Monitoring January 2012*.

Smits J (2008) The Effectiveness of different mulches in mine rehabilitation: short-term effects on the surface stability and the conditions for plant growth, Cowal Gold Mine, NSW. Honours, ANU.

SNC Cavalin (2004) *Lake Bund Final Design Report Lake Protection System Design.*

Summerfield D (2006) Mulch and cover crops in stabilising sloping rehabilitation areas at Cowal Gold Project, West Wyalong, NSW. Honours, ANU.

Tsoar and Pye (1987) *Dust Transport and the Question of Desert Loess Formation.* Sedimentology 34, 139-153.

University of Ballarat (2010a) Gell, P. Lake Cowal Waterbird Monitoring Survey Progress Report January 2010

University of Ballarat (2010b) Gell, P. Lake Cowal Waterbird Monitoring Survey Progress Report August 2010

University of Ballarat (2010c) Gell, P. Lake Cowal Waterbird Monitoring Survey Progress Report October 2010

University of Ballarat (2011a) Gell, P. Lake Cowal Waterbird Monitoring Survey Progress Report January 2011

University of Ballarat (2011b) Gell, P. Lake Cowal Waterbird Monitoring Survey Progress Report August 2011

University of Ballarat (2012a) Gell, P. Lake Cowal Waterbird Monitoring Survey Progress Report October 2011

University of Ballarat (2012b) Gell, P. *Lake Cowal Waterbird Monitoring Survey Progress Report – August 2012.*

University of Sydney (2010) *Interpretation and Discussion of 2009 Dust Monitoring Results, Cowal Gold Project*. Report prepared by Dr. Stephen Cattle for Barrick (Cowal) Limited.

University of Sydney (2011) *Interpretation and Discussion of 2010 Dust Monitoring Results, Cowal Gold Project*. Report prepared by Dr. Stephen Cattle for Barrick (Cowal) Limited.

University of Sydney (2012) *Interpretation and Discussion of 2011 Dust Monitoring Results, Cowal Gold Project*. Report prepared by Dr. Stephen Cattle for Barrick (Cowal) Limited.

University of Sydney (2013) *Interpretation and Discussion of 2012 Dust Monitoring Results, Cowal Gold Project*. Report prepared by Dr. Stephen Cattle for Barrick (Cowal) Limited.

8 GLOSSARY OF TERMS

AER	Annual Environmental Return (EPA)
AEMR	Annual Environmental Management Report (DTIRIS [DRE] coordinated for DP&I and other regulators)
ANZECC	Australian New Zealand Environmental Conservation Council
ARD	Acid Rock Drainage
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARI	Annual Recurrence Interval
ASWAT	Aggregate Stability in Water
AWS	Automatic Weather Station
BB	Barrick Buddies
BCPC	Bland Creek Paleochannel
BDHS	Bland District Historical Society
BLMP	Blast Management Plan
BMP	Bushfire Management Plan
BSC	Bland Shire Council
CEMCC	Community Environmental Monitoring & Consultative Committee
CGM	Cowal Gold Mine
CIL	Carbon in Leach
CLM	Contaminated Land Management
CMP	Cyanide Management Plan
CMS	Chemical Management Strategy
CPCC	Cowal Project Coordinating Committee (WCC - Barrick)
CWHC	Cowal Partnering Program
CRMA	Cowal Risk Management Application
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CW	Compensatory Wetland
CWHC	Cowal West Homestead Complex
CWMP	Compensatory Wetland Management Plan
DMP	Department of Mines & Petroleum
DP&I	Department of Planning and Infrastructure
DECCW	Department of Environment, Climate Change and Water (now EPA)
DII	Department of Industry and Investment - Minerals Resources (DTIRIS)
DPI	Department of Primary Industries – Agriculture, Fisheries
DTIRIS-MR	Department of Trade, Investment and Regional Infrastructure Services – Mineral Resources
DSC	Dams Safety Committee
EA	Environmental Assessment
EC	Electrical Conductivity
EEC	Ecologically Endangered Community
EFA	Ecosystem Function Analysis
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EMSS	Environmental Management System Standards
EPA	Environment Protection Authority
EPL	Environment Protection License
ERO	Emergency Response Officer
ERP	Emergency Response Plan (see PIRMP)
ERT	Emergency Response Team
ESCP	Erosion and Sediment Control Program
ESB	Eastern Saline Borefield
ESCMP	Erosion and Sediment Control Management Plan
ETBC	Employment Training Business Council
FFMP	Flora and Fauna Management Plan
FOR	Fuel and Oils Register
FRP	Final Rehabilitation Plan
GDP	Ground Disturbance Protocol
GEM	Geo-Environmental Management

GFZ	Gilmore Fault Zone
HMP	Heritage Management Plan
HSR	Hazardous Substances Register
HWCMP	Hazardous Waste and Chemical Management Plan
HSDG	Hazardous Substances and Dangerous Goods
HSDGR	Hazardous Substances and Dangerous Goods Register
IACHMP	Indigenous Archaeology and Cultural Heritage Management Plan
ICMC	International Cyanide Management Code
IEA	Independent Environmental Audit
IMP	Independent Monitoring Panel
INP	Industrial Noise Policy
KPI	Key Performance Indicator
LCCC	Lake Cowal Conservation Centre
LCF	Lake Cowal Foundation
LEP	Local Environment Plan
LHPA	Livestock Health and Pest Authority (formerly RLPB).
LOR	Limit of Reporting
LPB	Lake Protection Bund
LPMBP	Monitoring Programme for Lake Protection Bund, Water Storage and Tailings Structures and Pit-Void Walls
LFA	Landscape Function Analysis
LMP	Land Management Plan
LSMP	Landscape Management Plan
MIC	Maximum Instantaneous Charge
ML	Mega Litres = 1 Million Litres
m	Metres
ML	Mining Lease
MOP	Mining Operations Plan
MSDS	Material Safety Data Sheet
NAF	Non Acid Forming (rock acid forming potential)
NGER	Australia's National Greenhouse and Energy Reporting Scheme
NMP	Noise Management Plan
NoW	New South Wales Office of Water (formerly DWE within OEH - EPA).
NPI	National Pollutant Inventory
NPWS	National Park and Wildlife Service
NSWFR	NSW Fire and Rescue (formerly NSW Fire Brigade)
NTSF	Northern Tailings Storage Facility
NWE	Northern Waste (rock) Emplacement
OEH	Office of Environment and Heritage
OSCAR	Australian Online System for Comprehensive Activity Reporting
PIRMP	Pollution Incident Response Management Plan (see ERP)
PPE	Personal Protective Equipment
PRA	Preliminary Risk Assessment
PWE	Perimeter Waste (rock) Emplacement
RAB	Rotary Air Blast
Registered Site	Registered Site (NSW) NPW Act
RFS	Rural Fire Service
RL	Relative Level
ROMP	Rehabilitation and Offset Management Plan
RVEP	Revegetation Enhancement Project
SDS	Manufacturer's Safety Data Sheet
SMBS	Sodium metabisulphite (cyanide destruct reagent replacing Caro's Acid)
SOE	State of the Environment
SOI	Southern Oscillation Index
SSMP	Soil Stripping Management Plan
STSF	Southern Tailings Storage Facility
SWE	Southern Waste (rock) Emplacement
SWGMBMP	Surface Water, Groundwater, Meteorological and Biological Monitoring Programme
SWMP	Site Water Management Plan
THMS	Transport of Hazardous Materials Study

TIB	Temporary Isolation Bund
TNMP	Traffic Noise Management Plan
TSF	Tailings Storage Facility
TSMP	Threatened Species Management Protocol
TSMS	Threatened Species Management Strategy
TSP	Total Suspended Particulates
TSR	Travelling Stock Route
UCDS	Up Catchment Diversion System
VCP	Vegetation Clearance Permit
VCP	Vegetation Clearance Protocol
VPA	Voluntary Planning Agreement
WAD	Weak Acid Dissociated
WCC	Wiradjuri Condobolin Corporation
WCCHC	Wiradjuri Condobolin Cultural Heritage Company
WIRES	Wildlife Information Rescue and Education Service