Ginkgo Mineral Sands Mine

Annual Environmental Management Report 2011
Name of Mine: Ginkgo Minerals Sands Mine

Mining Title / Leases: ML1504

MOP Commencement Date: January 2008       MOP Completion Date: December 2012

AEMR Commencement Date: January 2011       AEMR Completion Date: December 2011

Name of Leaseholder: Peregrine Minerals Sands NL, Imperial Mining (Aust) NL, Probo Mining Ltd

Name of Mine Operator: Bemax Resources Ltd
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1 INTRODUCTION

1.1 Scope of AEMR

This Annual Environmental Management Report (AEMR) refers to the Environment and Community performance of Bemax Resources Ltd (Bemax) Ginkgo Mineral Sands Mine operation. Figure 1 shows the general location of the project. This Report has been prepared in accordance with guidelines published by the Industries and Investment NSW (formerly Department of Primary Industries), dated December 2002. This AEMR describes environment and community performance for the 2011 reporting period, and is intended to satisfy the requirements of:

- Ginkgo Mineral Sands Project Development Consent (DA 345-11-01) Conditions issued by the Department of Planning under Part IV of the Environmental Planning & Assessment Act.
- Mining Lease (ML1504) conditions set by the Industries and Investment NSW under the Mining Act.

This report is distributed to:

- Industries and Investment NSW (I&INSW);
- NSW Department of Planning (DoP);
- NSW Office of Environment and Heritage (OEH)
- NSW Environment Protection Agency (EPA)
- NSW Land and Property Management Authority (LPMA);
- NSW Office of Water (NoW);
- Wentworth Shire Council (WSC); and
- Local Leaseholders.

1.2 Key Statutory Approvals

The key statutory approvals that apply to operations of the Ginkgo Mineral Sands Mine are listed in Table 1:
Table 1 – Main Development Approvals as at 31/12/2011

<table>
<thead>
<tr>
<th>Statutory Approval</th>
<th>Granted</th>
<th>Expires</th>
<th>Approval Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Lease ML 1504</td>
<td>March 2002</td>
<td>2023</td>
<td>Industries and Investment NSW (DPI)</td>
</tr>
<tr>
<td>Development Consent DA 251-09-01</td>
<td>January 2002</td>
<td>2023</td>
<td>Dept of Planning (DOP)</td>
</tr>
<tr>
<td>- Modification September 2003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Modification May 2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Modification April 2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Modification May 2007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Modification December 2008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Modification April 2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Modification December 2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Modification No 8 October 2010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment Protection Licence No. 12264</td>
<td>December 2004</td>
<td>Renewed Annually</td>
<td>Dept of Environment Climate Change and Water (EPA)</td>
</tr>
<tr>
<td>- Variation May 2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Variation October 2006</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>- Variation May 2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Variation No 2 October 2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Variation No 3 December 2010</td>
<td></td>
<td>Pending</td>
<td></td>
</tr>
</tbody>
</table>

1.3 Ancillary Statutory Approvals

Additional approvals have also been granted to allow specific activities to be undertaken at or in relation to the mine site. These approvals in addition to the relevant legislation and the approval authority are listed below.

**NSW Office of Water**
Part 3A Permits (Rivers and Foreshores Improvement Act 1948)
Water Licence (Water Act 1912)
Bore Licences (Water Act 1912)

**Department of Environment and Conservation (formerly NPWS)**
Section 90 Consent (National Parks & Wildlife Act 1974)
Section 87 Permit (National Parks & Wildlife Act 1974)

**NSW Department of Primary Industries- Lands**
Occupation Licence LI495150 - Anabranch Bridge (Peter Withers Bridge) Remediation works
1.4 Amendments to Development Consent

Development Consent for the Ginkgo Mineral Sands Project was granted by NSW Department of Planning (formerly Planning NSW) in January 2002. Since the issue of the consent eight (8) amendments have been approved for the development.

September 2003 Modification (Mod 1)

During 2003, the project was modified to incorporate alterations to ancillary infrastructure component locations but did not involve any modifications at the Ginkgo Mine. The modification included:

- Realignment of sections of the Highway Access Road (HAR); and
- Realignment of the Electricity Transmission Line (ETL).

During consultation with landholders, it was identified that the original alignments of the HAR and ETL could be further refined to minimise the potential landuse impacts of the construction and operation of the ancillary components of the Project on pastoral operations.

May 2005 Modification (Mod 2)

During 2005, further modifications were made to the project as described in the Ginkgo EIS. The modification included an increase in the maximum heavy mineral concentrate (HMC) production rate from 450,000 tonnes per annum (tpa) to approximately 576,000 tpa, transportation of HMC via double road trains and the addition of infrastructure components at the Ginkgo Mine. The additional infrastructure components included:

- A heavy mineral concentrate treatment facility which includes a wet high intensity magnetic separation (WHIMS) circuit, salt washing facility and reverse osmosis (RO) plant;
- Ilmenite, leucoxene and non-magnetic concentrate stockpiles; and
- An RO plant for potable water.

In addition, the modification incorporated the splitting of the initial overburden emplacement into two separate emplacements and locate the second half of this dump off the mine path to the north of the construction pit.

April 2006 Modification (Mod 3)

During 2006, as an outcome of detailed mine planning, the following modifications were made to the project as described in the Ginkgo EIS:

- Modification of the method of overburden replacement. This involved undertaking replacement of deeper sandy overburden by feeding the sandy overburden to an overburden slurrying facility in which it would be screened, slurried and then pumped via a slurry pipeline behind the floating plant and placed on top of the wet plant sand residues.
• Revision of the classification of waste materials to be transported from the Broken Hill MSP along the Ginkgo HAR for disposal at the Ginkgo Mine. Under the Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes (EPA, 1999), the combined waste materials produced from the MSP would be classified as hazardous wastes on the basis they contain radioactive material from the separation circuit and except for this radioactive component would be classified as inert waste as specified in Schedule 1 of the Protection of the Environment Operations Act 1997.

May 2007 Modification (Mod 4)

The Ginkgo EIS pit dimensions were based on a beaching slope angle assumption of 18° for slopes below the dredge pond water level. In practice, the beaching slopes below the water are shallower than 6°, which has resulted in a shallower and shorter dredge pond than described in the EIS and subsequently approved. The shallower beaching slopes prevent efficient dredging by restricting the space required for the dredge to recover the remnant ore from the dredge pond floor. Therefore, in order to allow efficient dredging and sand residue placement an approximate 300m extension to the dredge pond was required.

During 2007 modifications were made to the project. As a result of the proposed larger dredge pond dimensions and excavation requirement, additional topsoil, non-slurried overburden and sand residue would be produced that would require stockpiling externally from the mine path. In addition, the buildup of fines material in the dredge pond has resulted in the requirement to develop a series of water treatment dams to separate the fines material from the process water to facilitate adequate primary mineral separation. As an alternative, process water may also be treated in a series of cells constructed within the sand residue dam.

As a result of the above requirements the Project modification included:

• an extension of the dredge pond;
• an extension of the initial sand residue dam (approved but not constructed);
• a secondary overburden emplacement;
• additional soil stockpiles; and
• treatment of process water in a series of water treatment dams or in the sand residue dam.

December 2008 Modification (Mod 5)

During 2008, three development consent conditions required amendment as the conditions were either identified during an Independent Environmental Audit as requiring amendment, or were to reflect variations with the Ginkgo Mine Environment Protection Licence (EPL 12264).
April 2009 Modification (Mod 6)

The 3 metre capping requirement on the Overburden Slurry Dam, introduced as part of the April 2006 Modification, was originally considered necessary to mitigate possible capillary rise of salt into the rehabilitated soil profile. Investigations were undertaken to determine whether depths of less than 3 metres of capping with non-slurried material increase the risks to revegetation posed by capillary rise of salts. The investigation has established that a depth of 1 metre of capping can be utilised and be suitable to mitigate possible capillary rise of salt into the rehabilitated soil profile. Development approval was granted for a 1 metre capping on the Overburden Slurry Dam.

December 2009 Modification (Mod 7)

During 2009, the project was modified to incorporate changes to the approved consent. The key aspects of the modification included trucking of approximately 2 Mt of high-grade ore from the Snapper Mine to the Ginkgo Mine, along a private road section of the approved haul road.

The modification works are short-term in nature and would be undertaken for approximately 12 months. The approximate 2 Mt of ore represents less than 2% of the total ore to be mined from the Snapper Mine deposit. The ore from the Snapper will be deposited at the front of the Ginkgo dredge pond where upon the material will be mined along with the Ginkgo ore material.

October 2010 Modification (Mod 8)

During 2010, the project was modified to incorporate changes to the existing approved consent conditions.

The key components of the October 2010 Modification No 8 are an increase in Ginkgo total ore mined from 128Mt to 145Mt, with an increase of mine life from 12 years to 14 years. Although with the increased ore tonnages there is a decrease of mineral concentrates from 4.8Mt back to 3.7Mt due to a decrease in average ore grades.

Further changes to the consent condition includes the trucking of HMC to and from both Ginkgo and Snapper dependant on the WHIMS location and also the extension of the haulage and treatment of Snapper High Grade ore out to a total of 4Mt on a temporary basis.

1.5 Amendments to Mining Operations Plan

In March 2008 the MOP was reviewed and prepared for the period covering January 2008 to December 2012. The updated MOP was accepted by the Industry and Investment NSW in May 2008.

During 2010, a variation to the MOP was applied for and is pending to accommodate the changes from the Mod 8 DA amendments.
1.6 **Statutory Compliance**

As required under the Ginkgo DA 251-09-01 Schedule 2 Condition 8.1, Bemax undertook an Independent Environmental Audit using GHD consultants who were approved by the Director General of the Department of Planning. At the time of writing the report was received in Draft format with a total from the 243 Conditions associated with the Ginkgo site of, 9% percent of the conditions noted as non compliant and another 14% of the conditions noted as an Opportunity for Improvement.

The final report will be made available at a later date.

1.7 **Mine Contacts**

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Position</th>
<th>Contact No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chris Reynolds</td>
<td>Operations Manager</td>
<td>(03) 5074 8900</td>
</tr>
<tr>
<td>Tim Chase</td>
<td>Mine Manager</td>
<td>(03) 5074 8930</td>
</tr>
<tr>
<td>Michael Priest</td>
<td>Senior Environmental &amp; Rehabilitation Advisor</td>
<td>(03) 5074 8912</td>
</tr>
<tr>
<td>Jordan Foster</td>
<td>Environmental Officer</td>
<td>(03) 5074 8904</td>
</tr>
</tbody>
</table>

1.8 **Action Required at Previous AEMR Review**

Listed below are the actions arising from the review of the 2010 AEMR. Also listed are the relevant sections of this report that describe the measures taken in response to these actions.

**Table 2 – Actions Required from AEMR 2010 Review**

<table>
<thead>
<tr>
<th>Action Required (2010 AEMR)</th>
<th>Status</th>
<th>AEMR Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting Minutes completed and distributed</td>
<td>Completed</td>
<td>-</td>
</tr>
<tr>
<td>DPI Costs spreadsheets updated and completed</td>
<td>Completed</td>
<td>-</td>
</tr>
<tr>
<td>Greater detail provided of information for incidents reported</td>
<td>Completed</td>
<td>2010 Addendum</td>
</tr>
<tr>
<td>Need more discussion on dust results and high exceedences reported as an incident</td>
<td>Completed</td>
<td>Section 3</td>
</tr>
<tr>
<td>Location of DG13 and DG14 to be changed on the map to reflect their correct locations</td>
<td>Completed</td>
<td>Section 3</td>
</tr>
<tr>
<td>More explanation on erosion issues including size, extent and remediation effort</td>
<td>Completed</td>
<td>Section 3</td>
</tr>
<tr>
<td>Include in AEMR timing and areas of vegetation clearance</td>
<td>Completed</td>
<td>Section 3</td>
</tr>
<tr>
<td>Submit frog survey to OEH and DOP</td>
<td>Submitted 17-3-2011 to DOP, OEH and DPI</td>
<td>Section 3</td>
</tr>
</tbody>
</table>
1.9 Environmental Incidents

During 2011 there were eleven environmental incidents reported internally via the Bernax Incident reporting system.

The following table outlines a summary of the Ginkgo Environmental incidents:

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Actions completed</th>
<th>Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>17/02/2011</td>
<td>Sewerage treatment sludge tank overflowing.</td>
<td>Yes</td>
<td>Extreme</td>
</tr>
<tr>
<td>28/04/2011</td>
<td>Rubbish on road between Ginkgo and Pooncarie township.</td>
<td>Yes</td>
<td>Moderate</td>
</tr>
<tr>
<td>06/05/2011</td>
<td>Sewerage treatment plant overflowed.</td>
<td>Yes</td>
<td>Low</td>
</tr>
<tr>
<td>11/05/2011</td>
<td>Extremely high dust levels on HAR</td>
<td>Yes</td>
<td>Low</td>
</tr>
<tr>
<td>17/05/2011</td>
<td>Evaporation pond sprinklers spraying outside the bunded area.</td>
<td>Yes</td>
<td>Moderate</td>
</tr>
<tr>
<td>31/05/2011</td>
<td>80L of oil spilled from oil storage pod during transfer.</td>
<td>Yes</td>
<td>Moderate</td>
</tr>
<tr>
<td>13/06/2011</td>
<td>A contractors water dam overflowed breaching the western wall.</td>
<td>Yes</td>
<td>Moderate</td>
</tr>
<tr>
<td>21/08/2011</td>
<td>40-60L of oil washed of the back of a vehicle at Ginkgo truck washbay.</td>
<td>Yes</td>
<td>Low</td>
</tr>
<tr>
<td>24/08/2011</td>
<td>Final effluent pumps failed resulting in overflow into surrounding area.</td>
<td>Yes</td>
<td>High</td>
</tr>
<tr>
<td>12/10/2011</td>
<td>Sewerage treatment plant overflowed</td>
<td>Yes</td>
<td>High</td>
</tr>
</tbody>
</table>
2 OPERATIONS DURING THE REPORTING PERIOD

2.1 Exploration

Ginkgo Drilling

At the Ginkgo Mining Lease ML1504, 215 holes were drilled for 13594m. Majority of this drilling was at Ginkgo South to increase the resource drilling definition to 100 x 25m spacings and to investigate ore variability along strike of orebody. 54 of these holes were drilled in the northern part of Ginkgo in the current return path area. These latter holes were designed and drilled for bulk material collation and assaying and Eastern side dredge path edge definition.

2.2 Land Preparation

Details of land clearing operations conducted during the 2011 reporting period are provided in Section 3.4, which includes the size of the area cleared, location of cleared areas and the clearance methodology.

2.3 Construction

During 2011 no construction activities took place on the Ginkgo Mine.

2.4 Mining

Mining activities commenced at Ginkgo in late 2005 after a 10 month construction and commissioning period. The mine utilises conventional wet dredge mining techniques to recover the valuable heavy minerals from the ore deposit. The dredge and primary gravity concentration unit operates in a dredge pond, while overburden is moved via conventional mobile equipment haulage.

The current methods of mining overburden at Ginkgo are primarily by the use of the overland conveyor which has a design capacity of 3000tph. A truck and shovel fleet also operate at Ginkgo to complement the conveyor system as required.

Sections 2.4.2 and 2.4.3 provide a description of mining and mineral processing. Figure 2 shows the Ginkgo Mine general arrangement.

2.4.1 Production

Production statistics detailing overburden stripping, ore mining and mineral grades, and estimates for the next AEMR period is provided in the Table 4 below. A provisional mining schedule is shown on Figure 3.
Table 4 - Production Statistics – AEMR Period

<table>
<thead>
<tr>
<th>Material</th>
<th>Units</th>
<th>AEMR Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2011 (Actual)</td>
</tr>
<tr>
<td>Topsoil / Subsoil Stripped</td>
<td>(Kbcm)</td>
<td>462</td>
</tr>
<tr>
<td>Overburden Removal</td>
<td>(Kbcm)</td>
<td>6526</td>
</tr>
<tr>
<td>Ore</td>
<td>(Kt)</td>
<td>8072</td>
</tr>
<tr>
<td>Heavy Mineral Concentrate</td>
<td>(Kt)</td>
<td>171</td>
</tr>
<tr>
<td>Sand Residues</td>
<td>(Kt)</td>
<td>7901</td>
</tr>
</tbody>
</table>

*Topsoil includes rehabilitation replacement and is based on load counts

2.4.2 Dredge Mining Description

During 2011 a total of 8.0Mt of ore was mined at Ginkgo with a total of 171,000 t of HMC produced from the Ginkgo concentrator.

Dredge mining was selected as the most efficient method of mining the Ginkgo deposit due to the location of the standing groundwater table, the presence of suitable groundwater resources for additional process requirements and the physical characteristics of the sands that make up the ore body.
Insert Figure 2
Insert Figure 3
The floating dredge mines the ore with a rotating bucket wheel to cut/collect the ore and deposit it at the suction pipe inlet to the dredge pump. The ore is relatively free flowing and forms a slope of approximately 26 degrees below the water. The dredge collects the ore from the base of this slope.

The rotating bucket wheel of the dredge is located on a ladder that can be raised or lowered according to the depth of the orebody below the water level and to provide access for maintenance. Movement of the dredge within the pond is achieved by a combination of winches and anchors for lateral movement and use of "spuds" for forward or backward movement within the pond. A spud is a tube that is lowered onto the base of the pond to provide a pivot point for dredge movement.

The dredge discharges ore slurry to the screen and surge bin on the floating plant via a 250 m long pipeline located on a series of pontoons. The pontoons are also used for access between the floating plant and the dredge.
2.4.3 Mineral Processing Description

Ore Concentrating

Primary separation of the target minerals occurs in a floating plant located behind the dredge within the pond. The floating plant consists of a vibrating screen and surge bin, and a wet concentrator.

The dredge delivers the ore slurry containing some 30% solids to the vibrating screen and surge bin located on a floating pontoon adjoining the wet concentrator. The vibrating screen above the surge bin rejects coarse material (> 4 mm), which is returned to the pond behind the floating plant. Material that passes through the vibrating screen flows to a surge bin, which provides a buffer storage to maintain consistent feed rate and pulp density to the subsequent wet concentrator circuits.

The ore slurry is transferred to a gravity separation circuit in the wet concentrator by pumps located near the bottom of the surge bin. The wet concentrator is equipped with conventional gravity concentration circuits to separate target minerals from sand residues. The floating plant is connected to the bank of the dredge pond by a pontoon bridge that carries the mineral concentrate pipeline, process water pipeline and provides access from the bank. All electrical power is provided at 22 kV through a trailing cable from a relocatable transformer on land.

The floating plant is manoeuvred in the pond by four winches, one on each corner of the floating plant pontoon. The winch cables are attached to anchors that will be periodically relocated in accordance with plant advance along the mine path.
The floating plant produces a mineral concentrate comprising approximately 95% valuable heavy minerals. The mineral concentrate will principally contain ilmenite, altered ilmenite, leucoxene, rutile and zircon. The concentrate is pumped ashore to the mineral concentrate stockpile area and dewatered to approximately 6% water content.

Heavy Mineral Concentrate (HMC) Treatment Facility

The heavy mineral concentrate (HMC) is stockpiled next the HMC Treatment Facility awaiting further processing. The HMC Treatment Facility function is to wash the salt from the HMC and separate the HMC into three products; namely ilmenite, leucoxene, and non-magnetic concentrate. The HMC Treatment Facility commenced operation in January 2006, and is comprised of the following:

- a salt washing facility;
- WHIMS circuit; and
- Reverse Osmosis (RO) plant.

Due to the highly saline nature of the groundwater beneath the Ginkgo Mine site, mineral concentrate pumped from the floating wet plant will have a high salt content. Salt contained within the concentrate requires removal to enable efficient subsequent separation techniques during processing. Therefore, the mineral concentrate is washed with desalinated water prior to further processing. The salt washing facility utilises desalinated water provided by the Reverse Osmosis (RO) Plant. Water for the RO Plant is sourced from the borefield.

Following washing, the mineral concentrate will be pumped into the Wet High Intensity Magnetic Separation (WHIMS) circuit. The WHIMS is the preliminary mineral concentrate treatment stage which separates the mineral concentrate into an ilmenite concentrate, a
leucoxene concentrate, and non-magnetic concentrate (containing rutile and zircon) utilising the difference in magnetic properties of these minerals. No chemical reagents are used in this process.

A detailed layout of the mine site arrangement is shown in Figure 2.

2.5 Waste Management

2.5.1 Sand Residue (Tailings) Dam

During 2011 all sand residue deposition was contained inside the pit. A total of 7.9 M tonnes of sand residues were produced and deposited in 2011.

There was no deposition of sand residues outside the pit and all external tailings dams have been decommissioned.

2.5.2 Overburden

During 2011 the main overburden method employed at Ginkgo was an overland conveyor system. Due to production delays experienced with the conveyor a truck and shovel fleet have been maintained at the Ginkgo site.

A total of 6.52M bcm of overburden was relocated during 2011 with all of this deposited as backfill behind the dredge pond.

There was no deposition of overburden outside the pit onto off path storage dumps.
Approximately half or 8.5 ha of the temporary overburden stockpile OB4 was mined through on the return path. The remainder of OB4 has been left to be used as backfill and to cap the open slimes/ tails cells at the Northern end of the Minepath. Slimes cells are being developed at this point to allow the current cells and de-watering voids to be dried out in advance.

2.5.3 Backloaded Broken Hill MSP Waste

Monazite from the Ginkgo deposit is separated from the other heavy minerals at the Broken Hill MSP, and returned to the mine site for disposal. Backloaded waste from the MSP is deposited in a designated stockpile located at the HMC Treatment Facility (Figure 2). This waste is placed in a shore-based hopper, mixed with wastewater from the salt washing facility, and then transported to the Wet Plant via a slurry pipe. This slurry then joins the sand residue stream and be deposited on the sand residue beach, thereafter to be covered with up to 35m of overburden.

The total tonnage of MSP production waste disposed of at the Ginkgo Mine for 2011 is provided in Table 5 below.

Table 5 – MSP Waste Disposed of at Ginkgo

<table>
<thead>
<tr>
<th>EP Licence No.</th>
<th>Disposal Limit (t)</th>
<th>Waste Received (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12264</td>
<td>130,000</td>
<td>30,896</td>
</tr>
</tbody>
</table>

2.5.4 Recycling

The objective of the waste management program is to minimise the production and impact of general waste (all waste other than process waste) produced at Ginkgo through the implementation of the waste minimisation hierarchy:

Avoid/Reduce ⇒ Reuse/Recycle ⇒ Treat ⇒ Dispose

Avoiding waste is the priority, followed by reuse and recycling/reprocessing, with disposal as the last resort. Where appropriate, scrap metal was reused on site. During 2011 recycling included:

- 135 t of scrap metal;
- 216 000 L of waste oil;
- 367 m³ of cardboard;
- 138 m³ of oil filters and rags;
- 57 batteries;
- 168 tyres;
- 1200 L cooking oil;
- 41 600 L from the grease trap;
- 88 700 L of sewerage;
- 72 m³ of compost.
2.6 Water Management

As a result of the limited and well dispersed annual rainfall, the sandy soils, limited topographical relief and high evaporation rates, there are no well defined drainage channels within the ML area, which limits the potential for fluvial erosion and sedimentation. Notwithstanding this point, the water management system has been designed to contain and control waters generated from project development and operational areas, while diverting other runoff water around such areas.

The water management system includes permanent features that will continue to operate post closure and temporary structures that will only be required until the completion of rehabilitation works. The system will be progressively developed as the mine path progresses and water management requirements change over time.

The water management system is based on the containment and reuse of mine site waters and on the control of sediment that may be potentially carried with runoff from disturbed areas such as the overburden emplacement area prior to rehabilitation.

The key components of the strategy are:

- Separation of undisturbed area runoff from disturbed area runoff.
- Collection and reuse of surface runoff from disturbed areas.
- Evaporation/sediment sumps to contain runoff.
- Capture and on-site containment of potentially contaminated mine site waters.
- Reuse of captured and contained water for dust suppression.

Operational water management for the project comprises control of runoff from disturbed areas and the provision and management of process water at the mine site. Operational water management structures during the AEMR period include the:

- Slime dams;
- Process water bore field; and
- Dredge pond.
- Site sediment catchment dams

The bore field comprises six production bores supplying groundwater at 62 L/s during 2010. Bore water is pumped directly to the dredge pond via the HMC Facility. The dredge pond is located approximately 40m below ground level and represents the groundwater table.

A graph outlining the Ginkgo water balance for the life of mine is included as Appendix 1.
Table 6 below provides a summary of stored water on site.

**Table 6 - Stored Water**

<table>
<thead>
<tr>
<th></th>
<th>Start of Reporting Period</th>
<th>At End of Reporting Period</th>
<th>Storage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desalinated Process Water</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Desalinated Potable Water</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Desalinated Water – Wash Bay</td>
<td>-</td>
<td>-</td>
<td>40</td>
</tr>
<tr>
<td>Water Treatment Dams (Slime Dams)</td>
<td>-</td>
<td>-</td>
<td>365*</td>
</tr>
</tbody>
</table>

- Unknown.
* Capacity as built.

### 2.7 Hazardous Material Management

Hazardous materials on-site are managed in accordance with Material Safety Data Sheets, WorkCover and EPA requirements. Due to the free digging nature of the mining operation and the lack of reagents required in the concentrator plant, the only potentially hazardous material required in significant volume is diesel.

Diesel is classified as a combustible liquid (Class C1) for the purposes of storage and handling but is not classified as a dangerous good by the criteria of the *Australian Dangerous Goods Code for Transport by Road or Rail*. The project diesel storage tanks and bunding has been constructed and operated in accordance with the requirements of the AS 1940 i.e. *The Storage and Handling of Flammable and Combustible Liquids*. 
3  ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

3.1  Dust

3.1.1  Management

Prior to the commencement of construction Bemax prepared an Air Quality Management Plan in accordance with Development Consent requirements for the construction and operation of the mine and associated infrastructure. The Air Quality Management Plan prescribes the dust prevention, monitoring, assessment, control, incident response and reporting procedure for the site.

A network of dust monitoring sites consists of 15 dust deposit gauges. The monitoring sites consist of residential sites, a network along the Highway Access Road (HAR) and sites on the Ginkgo mine. The location of the dust deposit gauge sites are listed in Table 7 below and are identified in Figure 4. Data is collected according to AS 3580.10.1-1991 and using a NATA accredited laboratory.

Table 7 – Dust Deposit Gauge Locations

<table>
<thead>
<tr>
<th>Dust Gauge Id</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td></td>
</tr>
<tr>
<td>DG01</td>
<td>Manilla Homestead</td>
</tr>
<tr>
<td>DG02</td>
<td>Woodlands Homestead</td>
</tr>
<tr>
<td>DG15</td>
<td>Trelega Homestead</td>
</tr>
<tr>
<td>Highway Access Road (HAR)</td>
<td></td>
</tr>
<tr>
<td>DG04</td>
<td>Manilla</td>
</tr>
<tr>
<td>DG05</td>
<td>Carstairs</td>
</tr>
<tr>
<td>DG06</td>
<td>Roo Roo South</td>
</tr>
<tr>
<td>DG07</td>
<td>Willow Point</td>
</tr>
<tr>
<td>DG08</td>
<td>Roo Roo North</td>
</tr>
<tr>
<td>DG09</td>
<td>Woodlands East</td>
</tr>
<tr>
<td>DG10</td>
<td>Woodlands West</td>
</tr>
<tr>
<td>DG11</td>
<td>Springwood</td>
</tr>
<tr>
<td>Mine Site</td>
<td></td>
</tr>
<tr>
<td>DG03</td>
<td>Accommodation Camp</td>
</tr>
<tr>
<td>DG12</td>
<td>North Lease Fence</td>
</tr>
<tr>
<td>DG13</td>
<td>East Lease Fence</td>
</tr>
<tr>
<td>DG14</td>
<td>South Lease Fence</td>
</tr>
</tbody>
</table>
Insert Figure 4
3.1.2 Performance

The I&INSW amenity criteria for dust deposition seek to limit the maximum increase in the average annual rate of dust deposition from a new development to 2 g/m²/month and total dust deposition to 4 g/m²/month. The nominal background dust deposition level (as per Ginkgo EIS 2001) was estimated to be less than 2 g/m²/month.

Average dust deposition has generally improved since 2008 with only sample points DG07, DG09, DG10 and DG11 each recording an average dust deposition rate of greater than 4 g/m²/month in 2011. These results are however skewed by extreme outliers in the data collected over the course of the year. If these outliers are removed the averages of all four sample points fall well below the criteria. Our investigations at the time led us to believe that the samples had been contaminated (possibly in transit, or perhaps tampered with in situ), thus they have been removed from the dataset. All other dust deposition sample points recorded annual averages below the 4 g/m²/month limit.

During 2011, 178 dust samples were collected. Figures 5, 6 and 7 on the following pages provide a graphical representation of the monthly dust fallout (insoluble solids) for the residential, highway access road (HAR), and mine lease sites. The outliers have been removed from the graphs to improve their readability (the complete data set is available in Appendix 2). The graphs tend to show higher dust levels during the summer periods (December - January), with the dust deposition dropping during the cooler months. The region experienced above average rainfall this year which contributed to the low levels of dust deposition throughout the year.
Spikes in the data, periods of comparatively high dust deposition, appear to occur during times of the year that have been the wettest (Figure 8). This seems to go against conventional wisdom, in that one would expect greater dust deposition following extended dry periods. These spikes in dust deposition tend to occur along the HAR, and although the yearly averages meet the criteria (once outliers are removed), it appears to be causing high dust deposition in the summer months. One explanation is that after rain, the finer particles are quicker to dry than the coarser material and subsequently is more mobile. This, combined with current maintenance practices where, after rain, the road is graded and then left unwatered for longer periods creates conditions that could result in high dust levels.

Other causes of sample contamination are likely due to bird droppings, insects and nearby stock.

Tabulated summaries of all dust deposition data including insoluble solids, ash and combustible matter is provided in Appendix 2.
HAR Dust Deposition

![HAR Dust Deposition](image)

Figure 6 – Dust Deposition – HAR

Ginkgo Lease Dust Deposition

![Ginkgo Lease Dust Deposition](image)

Figure 7 – Dust Deposition – Mine Lease
3.1.3 Incidents

An incident investigation into extremely high results in March 2011 resulted in the conclusion that the samples had been contaminated.

Incidents were reported for dust deposition exceeding criteria in October 2011 (DG05 and DG10) and December 2011 (DG15). Bird droppings in the funnel and nearby stock where thought to be the cause. Due to late arrival of dust results incidents have been reported in 2012.

3.1.4 Improvements

The dust monitoring program will continue in 2012.

To help solve the problems of high dust following rainfall events, a strict watering trial will be undertaken. The trial will target a stretch of haul road near gauges DG08 and DG09 where dust levels are thought to be highest under these conditions.

Maintenance work on the road is a permanent activity with road crews working a 10 days on 4 days off roster. In warmer months water carts run almost every day of the month to help keep moisture in the road surface and dust levels down.
Earthworks contractors generally cease work onsite on high dust days. Regular use of water carts on site roads and work areas helps to keep dust down while also maintaining the integrity of materials and improving productivity.

3.2 **Erosion and Sediment Control**

3.2.1 **Management**

Prior to the commencement of construction Bemax prepared an Integrated Erosion and Sediment Control Plan (IESCP) in accordance with Development Consent requirements for the construction and operation of the mine and associated infrastructure. The IESCP details the erosion and sediment control measures and performance monitoring of controls. As a result of the limited and well dispersed annual rainfall, the sandy soils, limited topographical relief and high evaporation rates, there are no well defined drainage channels within the Mining Lease area, which limits the potential for fluvial erosion and sedimentation.

Monitoring of sediment and erosion control is conducted after rainfall events. The monitoring is generally conducted as a visual inspection but may also involve water quality testing.

3.2.2 **Performance**

High rainfall conditions were dominant at Ginkgo throughout 2011 with above average rainfall recorded at Pooncarie totalling 521.5 mm, with 66 rain days. This follows high rainfall in 2010, but is in stark contrast to the usual low rainfall weather patterns associated with the Lower Western area of NSW. The historical average rainfall for the area is 265 mm.

Erosion damage to Overburden Dump 1 (OB1) that occurred during 2010 has had extensive repair work and preventative steps taken during 2011. Work to clear silt that blew out from the batters began in late 2011 and is continuing. Work to prevent future erosion is also underway, with bunding and drainage being diverted on OB1 to ensure flow is towards the minepath in the event that these high rainfall conditions continue.

3.2.3 **Incidents**

No incidents relating to erosion and sediment control were reported in 2011.

3.2.4 **Improvements**

Monitoring and maintenance programs consistent with 2011 will be continued in 2012 in accordance with statutory and IESCP requirements.

Earthworks will continue across site to maintain existing drains and dams. Remediation works will also continue into 2012 to repair and improve drainage on and around OB1.

The Western Batter of OB1 which totals approximately 5 ha has been bunded off on the top and drains have been dug to divert water out onto the mine path. This has allowed the
rehabilitation on this batter to commence with the cleaning up of sands washed off the batter. This batter will be shaped and topsoiled in 2012 in preparation for sowing in autumn 2013.

3.3 Water

3.3.1 Management

Prior to the commencement of construction Bemax prepared a Site Water Management Plan (SWMP) and a Borefield Impact Management Plan (BIMP) in accordance with Development Consent requirements for the operation of the mine. The Plans prescribe the process water source and supply requirements, site-water balance, storage, impact management and monitoring of groundwater in the vicinity of the mining operations.

Surface Water

The potential impacts on surface water systems are limited due to the location of the mine site away from any surface water systems. The Darling River and Great Darling Anabranch are significant regional surface water features which, at their closest points, are located some 20 km north-east and 20 km north-west of the mine site, respectively. As a result of the limited and well dispersed annual rainfall, the sandy soils, limited topographical relief and high evaporation rates, there are no well defined drainage channels within the Mining Lease area, which limits the potential for fluvial erosion and sedimentation. Some overland flow may occur during prolonged rainfall events with surface waters accumulating in topographic depressions which then evaporate or seep into the groundwater table over time.

Some localised surface water run-off is generated off compacted areas such as the accommodation and administration blocks, lay down pad, overburden stockpiles and roads etc. This run-off is managed with the construction of diversion drains and sediment sumps.

Drainage and bunding structures are shown in Figure 9. These structures are constantly being modified/extended as mining and rehabilitation progresses.

Groundwater

A network of groundwater monitoring sites consists of 13 monitoring sites. The monitoring sites consist of existing landholder owned wells, DECCW monitoring bores, and project related monitoring bores. The location of the groundwater monitoring sites are listed in Table 8 below and identified in Figures 10 and 11.
Table 8 – Monitoring Bore Locations

<table>
<thead>
<tr>
<th>Borehole/Well ID</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M02</td>
<td>Local (On Lease)</td>
<td>East of Dredge Pond</td>
</tr>
<tr>
<td>M19</td>
<td>Local</td>
<td>North of Mine Path</td>
</tr>
<tr>
<td>M21</td>
<td>Local</td>
<td>South of Mine Path</td>
</tr>
<tr>
<td>M26</td>
<td>Local</td>
<td>SE corner of Mining Lease</td>
</tr>
<tr>
<td>M27</td>
<td>Local</td>
<td>NW corner of Mining Lease</td>
</tr>
<tr>
<td>GW36669</td>
<td>Regional (Off Lease)</td>
<td>5 km south of Site</td>
</tr>
<tr>
<td>GW36670</td>
<td>Regional</td>
<td>36 km WNW of Site</td>
</tr>
<tr>
<td>GW36820</td>
<td>Regional</td>
<td>20 km south of Site</td>
</tr>
<tr>
<td>Trelega Bore</td>
<td>Regional</td>
<td>13 km south of site</td>
</tr>
<tr>
<td>Chalky Well</td>
<td>Regional</td>
<td>12 km NNW of Site</td>
</tr>
<tr>
<td>Greenvale Well</td>
<td>Regional</td>
<td>6 km NNE of Site</td>
</tr>
<tr>
<td>Court Nareen Well</td>
<td>Regional</td>
<td>13 km ENE of Site</td>
</tr>
<tr>
<td>South Tank Bore</td>
<td>Regional</td>
<td>12 km West of Site</td>
</tr>
</tbody>
</table>
Insert Figure 9
Insert Figure 10
Insert Figure 11
3.3.2 Performance

Groundwater Level

11 of the 13 monitoring wells intersect a large saline aquifer that extends west to the Great Darling Anabranch, east to the Darling River and south to the Murray River. 2 of the 13 monitoring wells (Chalky Well & Greenvale Well) intersect isolated lenses of less saline water developed at shallow depth overlying the main aquifer (as a result of incident rainfall recharge concentrated by the local topography). Tabulated groundwater monitoring results are provided in Appendix 3.

In Figure 12 on the following page, the changes evident in the local monitoring bore M21 reflect draw-down in response to the production bore field extractions. The steady rise of groundwater levels during 2010 and 2011 are most likely a factor of reduced groundwater extraction during 2009 and movement of the dredge pond further away from the M21 location. Further contributing factors could be the above average rainfall in the region during 2010/2011 and potentially greater recharge rates caused by the operation pit.

Monitoring bore M19 appears to be gradually returning to equilibrium in response to the movement of the dredge pond. At the end of 2008, the dredge pond was at its closest point to M19 and, as the dredge pond moved further away along the mine path in 2009/2010, groundwater levels in M19 began to rise. This rise has continued through 2011, as might be expected given the high rainfall over the last two years.

Monitoring bore M02 is located approximately 250m from the start-up dredge pond. The changes evident in the local monitoring bore M02 reflect a slight rising of the water table in response to the commencement of backfilling of tails at the rear of the dredge pond. Excess water in the tails slurry is thought to have resulted in a localised mounding of the water table. As the excess water drains out of the tails, and stacking is advancing further from M02, the water levels are returning to equilibrium. Above average rainfall and increased recharge rates are thought to have contributed to another rising of the water table during 2010 and 2011.

Groundwater levels in monitoring bores M26 and M27 have been generally stable indicating little if any impact from mining operations. The steadiness of the water table at these points and at the regional bores (Figure 13) may also suggest that the continued rise of the water table, as measured at bores near to the Ginkgo pit, may be a combined consequence of the high rainfall and the pit/clearing in the area increasing local recharge to the water table. The regional bores, beyond the area of influence of the pit and where the vegetation has changed little in the past 150-200 years, reflect little impact from the higher annual rainfall in recent times.
In Figure 13 below, regional groundwater levels have been generally stable indicating little if any impact from mining operations. Movement in the water table at Greenvale and Chalky Wells during January/February 2011 are most likely due to the fact they are shallow aquifers with wide openings, and are therefore more influenced by rainfall.

Furthermore, the water is of good quality and can be pumped for watering stock; this will also influence the water level. High rainfall in the area early in the year appears to have played a part in the brief rise of the watertable at several other points as well. Bores 36820, Trelega and 36670 are located in low lying natural depressions where water will gather. This rise hasn’t been observed at sites where the bores are situated on slopes or higher in the landscape.
In Figure 14 below, the changes evident in the production bores reflects draw down in response to the commissioning of the production bore field. The production bore field was commissioned in July 2005. Groundwater levels stabilised after pumping rates were reduced when the Start Up Water Dam was filled. Any recharge evident is likely due to a decrease in the extraction rate or a non-operational pump.
**Water Quality**

Salinity (TDS) analysis is undertaken on a monthly basis for all the local monitoring bores and most of the regional bores (GW36820 is measured quarterly). Tabulated groundwater monitoring results are provided in Appendix 3. In Figure 15 on the following page, results have shown no significant changes in local salinity levels since monitoring began.

![Ginkgo Groundwater TDS](image)

**Figure 15 – Mining Lease Groundwater TDS**

In Figure 15 and 16 below, results have mostly shown no significant changes in local salinity levels since monitoring began.

The sudden drop in TDS recorded at 36820 (Figure 17) is most likely due to dilution by high rainfall. Bore 36820 is positioned in the Salt Lakes, 20 km south of the mine, the lakes may have captured the runoff of a storm or rainfall event and as such the results represent the influx of fresh water. Advice from Bemax’s contract hydrologist is that the rising of the water table in early 2011 was due to this influx of fresh water, which was observed soon after due to pressure transfer. The change in salinity would take longer to be observed as the fresh water takes longer to reach the discharge point in the bore, hence why we only see the salinity change in August/September. This theory is backed up by field observations at the time of water in the salt lakes. The salinity has since returned to the usual level.
Groundwater Extraction

In 2005 production bore licences were issued by Department of Natural Resources. The authorised extraction volume was set at 812 ML per year. Table 9 below lists the volume extracted for each production bore for 2011. Total water extracted has increased 419 ML when compared to 2010.
Table 9 – Groundwater Extraction Volume 2011

<table>
<thead>
<tr>
<th>Bore No.</th>
<th>Licence No.</th>
<th>Licence Allocation (ML)</th>
<th>Volume Extracted (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore 1 (P1)</td>
<td>60BL216417</td>
<td>812</td>
<td>227</td>
</tr>
<tr>
<td>Bore 2 (P2)</td>
<td>60BL216418</td>
<td>812</td>
<td>345</td>
</tr>
<tr>
<td>Bore 3 (P3)</td>
<td>60BL216419</td>
<td>812</td>
<td>405</td>
</tr>
<tr>
<td>Bore 4 (P4)</td>
<td>60BL216420</td>
<td>812</td>
<td>404</td>
</tr>
<tr>
<td>Bore 5 (P5)</td>
<td>60BL216421</td>
<td>812</td>
<td>398</td>
</tr>
<tr>
<td>Bore 6 (P6)</td>
<td>60BL216422</td>
<td>812</td>
<td>483</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4873</strong></td>
<td><strong>2262</strong></td>
<td></td>
</tr>
</tbody>
</table>

Groundwater Drawdown

Figures 12, 13 and 14 on the previous pages show the drawdown at individual bores/wells. Figure 18 on the following page shows the drawdown at the end of 2011 compared to the predicted drawdown modelled in the Ginkgo EIS. On a regional scale groundwater levels in monitoring bores have been generally stable indicating little if any impact from mining operations. Groundwater drawdown is within the predicted levels.

Groundwater Trigger Levels

The Ginkgo Development Consent Conditions requires that data trigger levels be established for the purpose of initiating groundwater impact investigations. These trigger levels are presented in Table 10 below:

Table 10 – Groundwater Monitoring Trigger Levels

<table>
<thead>
<tr>
<th>Bore Id</th>
<th>Parameter</th>
<th>Trigger Level</th>
<th>Monitoring Results 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalky Well</td>
<td>Level</td>
<td>5.20 m</td>
<td>Ranged between 4.09 m &amp; 4.67 mbgl</td>
</tr>
<tr>
<td></td>
<td>TDS</td>
<td>&gt; 5000 mg/L</td>
<td>Maximum recorded 4150 mg/L</td>
</tr>
<tr>
<td>Greenvale Well</td>
<td>Level</td>
<td>5.70 m</td>
<td>Ranged between 3.29 m &amp; 5.47 mbgl</td>
</tr>
<tr>
<td>Trelega Bore</td>
<td>Level</td>
<td>&gt; 10 cm drop in level</td>
<td>Stable between 27.10 m &amp; 27.43 mbgl</td>
</tr>
<tr>
<td>GW36669</td>
<td>Level</td>
<td>&gt; 100 cm drop in level</td>
<td>Stable between 19.95 m &amp; 20.15 mbgl</td>
</tr>
</tbody>
</table>

The groundwater level monitoring at the bores listed in the table above were within the determined trigger levels. It is interpreted that there is no adverse impacts on groundwater levels attributable to mining activities.

The groundwater quality (TDS) monitoring at Chalky Well was within the determined trigger levels. It is interpreted that there is no adverse impacts on salinity trends attributable to mining activities.
Insert Figure 18
Tails Dam Water Storage and Slurried Overburden Dam

Four monitoring wells are installed around the perimeter of the initial dam and one at the slurried overburden dam in order to monitor potential seepage movement into adjoining vegetation. Monitoring conducted around the dam indicated no lateral movement of seepage water. Both storage dams are no longer in use. The initial dam in the process of draining prior to rehabilitation and whereas rehabilitation of the slurried overburden dam has commenced.

3.3.3 Incidents

No incidents regarding water management were recorded during 2011.

3.3.4 Improvements

Monitoring programs consistent with 2011 will be continued in 2012 in accordance with statutory, SWMP and BIMP requirements.

3.4 Flora and Fauna

3.4.1 Management

Prior to the commencement of construction Bemax prepared a Flora and Fauna Management Plan in accordance with Development Consent requirements for the construction and operation of the mine and associated infrastructure. The Flora and Fauna Management Plan specifies the measures to be implemented to manage vegetation clearing activities, threatened species protocols, and reinstate, monitor and manage native flora and fauna habitat and communities.

Prior to any clearing on site a pre-clearance survey is conducted in line with the Bemax VCP (Vegetation Clearance Protocol).

3.4.2 Performance

The objectives of the Flora and Fauna Management Plan were achieved in 2011 with impacts controlled in accordance with statutory conditions. During 2011 approximately 9 ha was cleared on the Mining Lease. Disturbance of flora and fauna was minimised as far as practicable.

Land pre-clearance in 2011 at the Ginkgo site consisted of 8.54 ha of land in August (Sluiter 2011 Vegetation pre-Clearance Flora and Fauna Surveys of Land at Bemax Murray Basin Mine sites No (13) Ginkgo Mine) consisting of an extension to the Mags 1 storage at the Whims and also an extension of the toe of the OB2 dump to account for the 1:7 batter slopes. A further 1.39 ha of land was surveyed for pre clearance in November 2011 (Area 1) (Sluiter January 2012, Vegetation pre-Clearance Flora and Fauna Surveys of Land at Bemax
Murray Basin Mine sites No 14) Ginkgo Mine) for an extension to topsoil stockpiles for the relocation of topsoil stockpiles off the return path.

Of the 6.59 ha of land that was surveyed for pre clearance along the Western toe of OB2 a total of only 2 ha was actually cleared. The decision was made to keep a corridor of uncleared vegetation between the OB2 rehabilitation and the Ginkgo return path. The Mine design currently has allowed for a narrow strip of vegetation approximately 50m in width to be left as this vegetation corridor. This method has been utilised at the Northern end of the Ginkgo stockpiles and has the added benefit of mature plants and habitat to aid the recolisation of the young rehabilitation landforms and also the recruitment of indigenous species. Pre-clearance reports are included as Appendix 4.

**Table 11 - Vegetation Clearance Schedule**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pre-Existing Cleared Area*</th>
<th>AEMR Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2005</td>
</tr>
<tr>
<td>Clearance Area</td>
<td>13</td>
<td>203</td>
</tr>
<tr>
<td>Cumulative Clearance Area</td>
<td>13</td>
<td>216</td>
</tr>
</tbody>
</table>

* Existing cleared area was cleared during bulk sampling activities.

3.4.2.2 Painted Burrowing Frog Monitoring

In accordance with the Flora and Fauna Management Plan, surveys will be conducted for the Painted Burrowing Frog (*Neobatrachus pictus*) following heavy rainfall events (>25mm in
24hrs). One such event occurred in October 2011 with the surveys conducted by both Peter Robertson of Wildlife Profiles and Simon Cook of the University of Ballarat. This event happened to occur whilst the Offset 1 and 2 (Wildlife Profiles) and OB3 (University of Ballarat) rehabilitation fauna monitoring was taking place. At the time a total of 190 open pit fall traps were in place. No Painted Burrowing Frogs were detected during the survey.

Previous surveys were undertaken in 2007 by Biosphere Environmental Consultants Pty Ltd and again in 2009 and 2010 by Peter Robertson of Wildlife Profiles. No Painted Burrowing Frogs were detected during the surveys. The closely related Common Spadefoot Toad, \textit{N. sudelli} was detected at various sites across the study area in the 2007, 2009 and 2010 surveys.

Given the widespread occurrence of \textit{N. sudelli} throughout the study area, it appears unlikely that \textit{N. pictus} is present on either the Gingko Mine mining lease area or Snapper Mine mining lease area as it was not recorded despite ideal survey conditions.

Martin Denny who found the suspected original painted burrowing frog during the Ginkgo EA (2000) has been commissioned by Resource Strategies to undertake the fauna study for the Crayfish deposit (10km from the Ginkgo site). During his survey Martin claimed to have found another Painted Burrowing Frog. Under instructions from Bemax, Martin sent the frog to the University of Newcastle where it was identified by Associate Professor Michael Mahoney as not the painted burrowing frog. Email comments from Martin Denny indicate that he himself is not an expert of frog identification which would indicate the original painted frog findings as most likely Sudelli not Pictus (common Spadefoot toad).

As this is the case, the previous identification of \textit{N. pictus} on the Gingko Mine area in 2000 is doubtful. The locations in which \textit{N. pictus} was previously identified in 2000 were monitored. At these sites, \textit{Neobatrachus} individuals were found though they were \textit{N. sudelli} not \textit{N. pictus}.

If the records of \textit{N. pictus} in the Ginkgo Mine area from 2000 were misidentified, the westernmost part of the distribution of \textit{N. pictus} is the New South Wales (NSW)/South Australian border, with the Scotia Sanctuary being the only apparent true record of \textit{N. pictus} in NSW.

### 3.4.2.4 Vegetation Offset

A flora and fauna offset area is required to be implemented as part of the Ginkgo Mine development approval. An Offset Management Plan was prepared to satisfy consent conditions. The Plan outlines the vegetation offset to compensate for the land clearance at the Ginkgo Mine and is located on Trelega Station. Development approval requires an area of 518 Ha of vegetation within the offset which was implemented during 2009 as described in the Offset Management Plan.

The Ginkgo Mine offset area is combined with the Snapper Mine offset requirements for practical reasons and will be managed together as a single area. The Offset Management Plan has been prepared for the combined Ginkgo and Snapper Mine offset areas.
An updated Offset Management has been approved by the OEH and the NSW Department of Planning. Bemax's Michael Priest and our ecological consultant Dr Ian Sluiter from Ogyris have both been approved from the NSW Department of Planning as suitably qualified to complete the Offset Management Plan.

During 2008 implementation of the offset area commenced. A preliminary site inspection was conducted across the offset area to determine the specific need for management measures and collect baseline data for future monitoring programs which included the establishment of permanent quadrats and photo points.

**Offset 1 Flora Assessments**

The Offset flora assessments have been undertaken by Dr Ian Sluiter of Ogyris in Dec 2008, Dec 2009, April 2011 and again in Oct 2011. A brief summary of the vegetation condition assessments show marked increase in vegetation cover from 5-20% in December 2008, 10 -40% vegetation cover in December 2009 and up to 55-65% in 2011. This marked increase is attributable to the management of the offsets as well as the higher than average rainfall over the last 2 years.

The offset 1 area is broken up into 7 main vegetation communities. A brief discussion below will describe their condition and characteristics as reported by Dr Ian Sluiter (Ogyris 2011).

**Chenopod Mallee**

The chenopod mallee community exists at the eastern and northwestern ends of the offset area. The vegetation community comprises 166.2ha or 7% of the total area. This vegetation community at the time of establishment in December 2008 was mostly in good condition but with low plant cover at 5-10%. In 2011 the plant cover in this area had increased to levels between 40-60%.

**Spinifex Mallee**

The spinifex mallee also exists at the eastern and north eastern sections of the offset area. The spinifex mallee area comprises 13ha or 0.5% of the offset area. This vegetation community at the time of establishment in December 2008 was considered to be in moderate condition. In 2011 this vegetation community was considered to be in moderate to good condition.

**Belah – Rosewood Woodland**

The Belah- Rosewood Woodland vegetation community is comprised of two sub communities that haven't been separated in the original ground truthing of the vegetation types in offset 1 during 2008. The area of this vegetation community is 964.9ha and accounts for 40.4% of the offset area.

These two sub communities are:

a) Black Oak-Western Rosewood open woodlands, and
b) Black Oak-Pearl Bluebush open woodlands.
At the time of establishment in 2008 the Belah ō Rosewood Woodlands were considered to be in moderate to poor condition with 5% ground flora and up to 55% bare ground. In 2011 after the exclusion of stock and the higher than average rainfall this community has responded well and has increased plant cover of 55% and are considered to be in excellent condition.

**Bluebush and Australian Boxthorn Shrubland**

This vegetation community can be split into two sub groups being remnant areas and previously cleared/ regrowth areas. At the time of establishment in December 2008 the remnant areas were considered to be in poor to moderate condition whilst the regrowth areas were in very poor to poor condition.

In December 2008 the average plant cover for this community was 10%. In 2011 this community was considered to be in good to very good condition with ground cover at approximately 50%.

**Blackbox Woodland**

This vegetation community is approximately 21.2ha and in December 2008 was considered to be in poor condition. This had improved and in 2011 was considered to be good condition and showed considerable goat damage over the winter of 2011.

**Open Grassland – Copperbur Low Shrubland**

This vegetation community covers about 168.8ha and during the establishment of the offset in December 2008 was considered to be in very poor condition with plant cover around 5%. During the 2011 assessments this vegetation community was considered to be very good with vegetation cover recorded at 60% and an increase in indigenous species from 5 in 2008 to up to 19 in 2011.
Table 12 – (Table 20) From Ogyris (2011) Comparison of Ground Layer Attributes and Plant Species

<table>
<thead>
<tr>
<th></th>
<th>% Plant Cover (Ground Layer &lt; 3cm)</th>
<th>% Bare Ground Cover</th>
<th>% Cryptogam Cover</th>
<th>% Litter/Lag Cover</th>
<th>Indigenous Species Diversity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset Quadrat 1</td>
<td>20 19 20 40</td>
<td>55 55 55 55</td>
<td>19 19 19 19</td>
<td>19 19 19 19</td>
<td>55 55 55 55</td>
</tr>
<tr>
<td>Offset Quadrat 2</td>
<td>10 10 10 30</td>
<td>60 60 60 60</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>60 60 60 60</td>
</tr>
<tr>
<td>Offset Quadrat 3</td>
<td>20 20 20 40</td>
<td>40 40 40 40</td>
<td>20 20 20 20</td>
<td>20 20 20 20</td>
<td>40 40 40 40</td>
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<tr>
<td>Offset Quadrat 4</td>
<td>10 10 10 30</td>
<td>30 30 30 30</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>30 30 30 30</td>
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<tr>
<td>Offset Quadrat 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
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<tr>
<td>Offset Quadrat 6</td>
<td>30 30 30 30</td>
<td>30 30 30 30</td>
<td>30 30 30 30</td>
<td>30 30 30 30</td>
<td>30 30 30 30</td>
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<tr>
<td>Offset Quadrat 7</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
</tr>
<tr>
<td>Offset Quadrat 8</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
</tr>
<tr>
<td>Offset Quadrat 9</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
</tr>
<tr>
<td>Offset Quadrat 10</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
</tr>
<tr>
<td>Offset Quadrat 11</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
</tr>
<tr>
<td>Offset Quadrat 12</td>
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<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
<td>5 5 5 5</td>
</tr>
<tr>
<td>Offset Quadrat 13</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
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<tr>
<td>Offset Quadrat 14</td>
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<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
</tr>
<tr>
<td>Offset Quadrat 15</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
</tr>
<tr>
<td>Offset Quadrat 16</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
<td>10 10 10 10</td>
</tr>
</tbody>
</table>

Offset 1 Fauna Assessment

A survey of the vertebrate fauna present within the Offset 1 area was undertaken by Wildlife Profiles between September and November 2011. Fourteen survey sites were established within the range of vegetation communities.

At each of these sites the survey methods consisted of pitfall trap lines, Elliot traps, bird census, spotlighting, harp traps and anabat recordings.

The pitfall trapping produced a total of 276 captures of reptiles, amphibians, and small mammals, while the Elliot traps produced a further 37 captures (all of which were the common house mouse). The bird census at the 14 survey sites revealed a total of 42 species.

Overall the survey identified the presence of one frog species, 21 reptiles, 54 birds and nine mammals (excluding bats). The anabat data is yet to be analysed.

Of these species recorded within offset 1, four are listed as threatened by the NSW OEH. These four species are:

- Major Mitchell’s Cockatoo
- White-fronted Chat
- Hooded Robin, and
- Marble Faced Delma
Offset 2 Fauna Assessment

A survey of the vertebrate fauna present within the Offset 2 area was undertaken between September and November 2011 by wildlife profiles. At the time of writing the AEMR the report had not been completed and an executive summary had been submitted with brief details of the survey effort and results.

Twelve survey sites were established within the range of vegetation associations. At each of these sites the survey method included pit fall traps, Elliot traps, anabat, harp traps, bird census and spotlight surveys.

The pitfall trapping produced a total of 381 captures of reptiles, amphibians, and small mammals, while the Elliot traps produced a total capture of 23 small mammals (allot which were the introduced House Mouse). The bird census at the 12 sites revealed a total of 54 species.

Overall the survey confirmed the presence of one frog species, 29 reptiles, 58 birds and 9 mammals (excluding bats), including 4 introduced taxa.

Of the species recorded in Offset 2 six are considered threatened in NSW.

The six identified threatened species are:

- Major Mitchell’s Cockatoo
- Hooded Robin
- Marble Faced Delma
- Jewelled Gecko
- Western Bluetongued Lizard
- Inland Forest Bat

At both Offset 1 and 2 sites during the Wildlife Profiles survey no records of the Painted Burrowing Frog (*Neobatrachus pictus*) were found. The common non threatened Spade-foot Toad (*Neobatrachus Sudelli*) was located at both the Offset areas 1 and 2.
Vegetation Offset Area 1 - 2009

Vegetation Offset Area 1 – 2010
3.4.2.5 Other Management Initiatives

Fox Baiting

During 2011 a local landholder was contracted to undertake two fox baiting programs in the offset areas during the autumn period.

Weed Spraying

During 2011 a weed spraying program was initiated on the Bemax Mining leases and the associated Offset areas. The main weed which was focused on was the Bathurst Burr which was quite prevalent after the heavy rains from the two previous summers.

Goats

No specific goat eradication was undertaken on Offset 1 during 2011, although a program to eradicate several smaller mobs of goats on the Snapper lease, adjacent to Offset 1 was undertaken. The lease holder on the Bemax owned Trelega station also rounded up several smaller mobs of goats off the lease cropping country which is adjacent to the south of Offset 1.

Fencing

During 2011 the fence line for Offset 2 was cleared and construction of the fence had begun. The design of the offset fences is of 6 line hinge joint with barb at the top and bottom and post spacing generally at 7m.

During 2011 the Offset 1 Southern fence along Trelega boundary was completed and continued out to the Nob road along the adjacent Trelega cultivation paddocks.
3.4.3 Incidents

No incidents regarding flora and fauna were recorded during 2011.

3.4.4 Improvements

Continuing of Offset management strategies in line with what has been proposed and accepted in the updated offset management plan.

Continuing of the VCP and minesite clearing ahead of the Minepath as required.

3.5 Noise

3.5.1 Management

Prior to the commencement of construction Bemax prepared a Noise Management Plan (NMP) in accordance with Development Consent requirements for the construction and operation of the mine. The NMP prescribes the frameworks to monitor, assess, investigate, mitigate, and report noise generated by the mining operation.

During 2011 Bemax undertook attended and unattended noise monitoring at Manilla and Woodlands Homesteads. Compliance monitoring was undertaken at Manilla as it is the nearest resident to the Ginkgo Mine. The homestead is located approximately 8 km from the operations area of the mine. Compliance monitoring was also undertaken at Woodlands due to its proximity to the Highway Access Road (HAR).

3.5.2 Performance

Unattended noise monitoring was undertaken during 2011 using an environmental noise logger (Model EL316). Audible noise during the tests included insects, birds and wind in trees. Results from the noise monitoring are provided in Table 13 below and the raw data is provided in Appendix 5. Please note, that due to the absence of wind velocity data (technical difficulties with the weather station resulted in the loss of this data), wind speeds of greater than 3 m/s have not been discounted and will have had an impact on results.
Table 13 – Unattended Noise Monitoring at Local Residences 2011

<table>
<thead>
<tr>
<th>Date</th>
<th>Average Noise Level, dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 0700 - 2200</td>
</tr>
<tr>
<td></td>
<td>$L_{90}$</td>
</tr>
<tr>
<td>Woodlands (22/12/2011 – 28/12/2011)</td>
<td>33.10</td>
</tr>
<tr>
<td>Manilla (14/12/2011 – 21/12/2011)</td>
<td>30.86</td>
</tr>
<tr>
<td>Noise Limits*</td>
<td>35</td>
</tr>
<tr>
<td>Project Noise</td>
<td></td>
</tr>
<tr>
<td>Noise Limits†</td>
<td>50</td>
</tr>
<tr>
<td>Traffic Noise</td>
<td></td>
</tr>
</tbody>
</table>

* DECC limit except during rain and wind speeds greater than 3m/s.
† The DECC outlines the procedures for establishing noise goals for public roads and for assessing impacts from road noise in their publication ECRTN (EPA, 1999). The DECC’s ECRTN specifically addresses mining operations in relatively remote locations and notes that the ways of managing impacts on these roads, which are referred to as 'principal haulage routes' have not yet been fully developed. For roads that are not recognized by local authorities as 'principal haulage routes' the road category would be a 'local road in a rural area'.

Noise logging results from Woodlands Homestead meet the criteria for day and night time traffic noise limits. Results taken from Manilla Homestead show a minor exceedences of the day time project noise limits. Considering the small margin of the exceedences it is likely that, should wind be taken into account, the criteria would be met. Manilla noise levels fall short of the traffic noise limits.
Attended noise monitoring was also conducted at Manilla and Woodlands Homesteads.

### Table 14 – Attended Noise Monitoring at Local Residences 2011

<table>
<thead>
<tr>
<th>Date</th>
<th>Average Noise Level, dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 0700 - 2200</td>
</tr>
<tr>
<td></td>
<td>L_90</td>
</tr>
<tr>
<td>Woodlands (21/12/2011 - 22/12/2011)</td>
<td>37.4</td>
</tr>
<tr>
<td>Manilla (21/12/2011 - 22/12/2011)</td>
<td>22.6</td>
</tr>
<tr>
<td>Noise Limits*</td>
<td>35</td>
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<tr>
<td>Project Noise</td>
<td></td>
</tr>
<tr>
<td>Noise Limits†</td>
<td>50</td>
</tr>
<tr>
<td>Traffic Noise</td>
<td></td>
</tr>
</tbody>
</table>

The results shown in Table 14 were collected using a Rion handheld noise logger, over 15 minute periods throughout the day. Notes were taken during these periods on the predominant noise sources, noises related to operations, vehicles passing and general notes of interest. For our attended monitoring, noise criteria are met.

At Manilla the main noise source (causing the average to reach so close to the limit) was the slight gusty wind and, to a lesser extent, the nearby birdlife. Windy points during the day were noted and it is clear in the data collected which points in the day the wind picked up and had an impact on the data. Some project noise was detected at Manilla, particularly during the early morning, this was effectively at background level, at its highest 29.1 dB was registered. Vehicles passing by reached a maximum of 36 dB.

Woodlands Homestead during the day was very much wind affected. Wind gusts consistently reached noise levels over 45 dB, reaching as high as 58 dB. This is largely due to the dense vegetation surrounding the homestead and along the nearby Darling Anabranch. In the evening crickets are dominant sources of loud noise (consistently over 50 dB, up to 59.8 dB). The wind appeared to be less of an issue during the night, such that, when data affected by crickets is removed the night time average drops to 31.2 dB (L_{Aeq}). Vehicle noise at Woodlands could only be practically noted when the wind and crickets were not a significant factor, they generally registered around 40 dB, and as high as 44.9 dB.

Woodlands Homestead is a considerable distance from the Ginkgo mining operations and would not receive noise sourced directly from the mine site. Noise sources at these locations along the haul road are from truck movements and therefore the traffic noise criteria is more applicable. Noise logging results indicate compliance with traffic noise limits.
Figures 19 and 20 show day and night noise ($L_{Aeq}$(dB)) from 2006 to 2011. There has been little change over time, however, Woodlands night noise has increased in the last two years. It seems unlikely this is related to traffic noise, given the results of the attended monitoring, further data is required to determine the source. It is possible that the increase rainfall in the last couple of years has meant greater cricket numbers, resulting in night time noise levels being higher than previous years.
To put the decibel readings in perspective the relative scale of various noise sources is provided in Table 15 below.

**Table 15 - Relative Scale of Various Noise Sources**

<table>
<thead>
<tr>
<th>Noise Level (dBA)</th>
<th>Relative Loudness</th>
<th>Common Indoor Noise Levels</th>
<th>Common Outdoor Noise Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 - 130</td>
<td>Extremely noisy</td>
<td>Rock band</td>
<td>Jet flyover at 1,000 m</td>
</tr>
<tr>
<td>100</td>
<td>Very noisy</td>
<td>Inside subway train</td>
<td>Petrol engine lawn mower at 1 m</td>
</tr>
<tr>
<td>90</td>
<td>Very noisy</td>
<td>Food blender at 1 m</td>
<td>Diesel truck at 15 m</td>
</tr>
<tr>
<td>90</td>
<td>Loud</td>
<td>Garbage disposal at 1 m, Shouting at 1 m</td>
<td>Urban daytime noise</td>
</tr>
<tr>
<td>70</td>
<td>Loud</td>
<td>Vacuum cleaner at 3 m, Normal speech 1 m</td>
<td>Commercial area heavy traffic at 100 m</td>
</tr>
<tr>
<td>60</td>
<td>Moderate to quiet</td>
<td>Large business office</td>
<td>-</td>
</tr>
<tr>
<td>50</td>
<td>Moderate to quiet</td>
<td>Dishwasher next room, Wind in trees</td>
<td>Quiet urban daytime</td>
</tr>
<tr>
<td>40</td>
<td>Quiet to very quiet</td>
<td>Small theatre, large conference room (background), Library</td>
<td>Quiet urban night-time</td>
</tr>
<tr>
<td>30</td>
<td>Quiet to very quiet</td>
<td>Bedroom at night, Concert hall (background)</td>
<td>Quiet rural night-time</td>
</tr>
<tr>
<td>20</td>
<td>Almost silent</td>
<td>Broadcast and recording studio</td>
<td>-</td>
</tr>
<tr>
<td>10-0</td>
<td>Silent</td>
<td>Threshold of hearing</td>
<td>-</td>
</tr>
</tbody>
</table>

*After United States Department of Interior (1994)*

### 3.5.3 Incidents

No incidents regarding noise were reported during 2011.

### 3.5.4 Improvements

During 2012 noise monitoring will continue to be undertaken at the boundary of homesteads at Manilla and Woodlands. Attended monitoring using a handheld noise monitor will be conducted more regularly at Manilla and Woodlands homesteads in 2012.
3.6 Contaminated Polluted Land

The Ginkgo Mine was a greenfield site and no contaminated sites are recorded on the lease.

A contaminated sites register will be developed, if required, and any contaminated sites will be updated and reported in future AEMRs.

A facility is in place for the treatment of hydrocarbon contaminated soils (Refer 3.16).

3.7 Indigenous and European Heritage

3.7.1 Management

Prior to the commencement of construction Bemax prepared a Barkandji Heritage Management Plan in accordance with Development Consent requirements for the construction and operation of the mine and associated infrastructure. The Barkandji Heritage Management Plan addresses the consultation program with the local indigenous community and identification, assessment, monitoring, conservation and management of archaeological heritage.

The Plan included results from Aboriginal heritage surveys and assessments of ML 1504, the HAR and ETL. The surveys and assessments were undertaken in accordance with DECCW requirements and in consultation with representatives from local Aboriginal organisations.

3.7.2 Performance

The objectives of the Barkandji Heritage Management Plan (BHMP) were achieved in 2011 with impacts controlled in accordance with statutory conditions. During 2011, no heritage objects were identified during operations requiring action to be undertaken in accordance with the Barkandji Heritage Management Plan. The site barricaded during the 2007 salvage program is inspected regularly and is satisfactory.

3.7.3 Incidents

No incidents regarding Aboriginal archaeology or European heritage were recorded in 2012.

3.7.4 Improvements

In 2012, management of Aboriginal heritage will continue to be undertaken in accordance with the Barkandji Heritage Management Plan.

3.8 Weeds
During 2011 several weed spraying campaigns were undertaken focussing mainly on Bathurst Burrs which had grown due to the high rainfall over the summer periods.

An annual Flora monitoring program has commenced on all the rehabilitation areas which includes weed monitoring. Section 5.2 provides a summary of the program conducted during 2012.

### 3.9 Blasting

Not applicable. Bemax does not conduct any blasting on site.

### 3.10 Bushfire

#### 3.10.1 Management

Prior to the commencement of operations Bemax prepared a Bushfire Management Plan (BMP) in accordance with Development Consent requirements for the operation of the mine. The BMP prescribes the frameworks the operation arrangements and fuel management strategies for the mining operation.

In addition, as a requirement of the Development Consent, Bemax has entered into an Emergency Services Cooperation Agreement with Wentworth Shire Local Emergency Operations Management Committee (WSLE). The committee includes representatives of the NSW Fire Brigade.

#### 3.10.2 Performance

Since the turn in the seasons there is ample grass growth around the Ginkgo site and the general area. The risk of bushfire in the area has increased greatly and management for bushfire threats have continued.

The management strategies implemented by Bemax during 2011 included the grading of fire trails and mine lease boundaries, building of dams on the minisite to catch run off, maintaining the access roads and drains to farm dams under the control of Bemax, the maintenance/ availability of a diesel driven pump at the Ginkgo washbay and also selectively stocking paddocks owned by Bemax that are not included in the offset areas.

The firebreaks are designed to act as control lines for low-intensity fires, and assist with safer access and egress for high-intensity fires, as well as providing for a defence line for back burning. Firebreaks have been maintained by grading.
3.10.3 Incidents

No fire incidents were recorded during 2011.

3.10.4 Improvements

Bemax intend to nominate members of staff to join the local RFS Brigades at both Polia and Central Para to both give support to the local community and be able to call on the RFS Brigades for assistance.

The Bushfire Management plan is due for review and will be undertaken in consultation with the RFS team based in Dareton.

Areas for fuel reduction strategies will be selected annually after considering the recent fire history, fuel hazards present and environmental considerations of the area. Appropriate fuel reduction strategies will then be selected and implemented according to the Bushfire Management Plan.

3.11 Visual Light Stray

Visual amenity or stray light is not deemed to be an issue due to the remote location of the site to any affected neighbours.
3.12 Radiation

3.12.1 Management

Prior to the commencement of construction Bemax prepared a Landfill Environmental Management Plan in accordance with the Development Consent conditions for the construction and operation of the mine and associated infrastructure. The Landfill Environmental Management Plan outlines the strategy for low level radioactive waste material from the Broken Hill MSP to be backfilled at the Ginkgo Mine.

Rejects containing some monazite (a naturally occurring radioactive material) from the MSP is transported via road train to the Ginkgo Mine. Waste material is blended with the sand tailings stream and deposited on the sand residue beach, thereafter to be covered with up to 35 metres of overburden.

3.12.2 Performance

The gamma radiation readings of tailings deposited on the sand residue beach measured one metre vertically above the surface are recorded periodically. Surveys were conducted only in areas where the blended waste had been deposited. Table 16 below summarises the survey results for 2010 and the data and statistical calculations are provided in Appendix 6.

Table 16 – Blended Tails Gamma Radiation Survey 2011

<table>
<thead>
<tr>
<th>DECCW Criteria (µSv/h)</th>
<th>Average Readings (µSv/h)</th>
<th>95% UCL (µSv/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7</td>
<td>0.25</td>
<td>0.29</td>
</tr>
</tbody>
</table>

Radiation analysis of product and waste material stockpiled are summarised in Table 17.

Table 17 – Average Radiation Analysis by Gamma Spectrometry

<table>
<thead>
<tr>
<th>Material</th>
<th>Total Activity (Bq/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSP Rejects</td>
<td>44*</td>
</tr>
<tr>
<td>Ore Body Front of Dredge Pond</td>
<td>3.8</td>
</tr>
<tr>
<td>Tails Rear of Dredge Pond</td>
<td>0.4</td>
</tr>
</tbody>
</table>

* 100 Bq/g limit for classification as hazardous waste. Refer Section 2.5.3

3.12.3 Incidents

No incidents regarding radiation were reported in 2011.
3.12.4 Improvements

Radiation monitoring will continue to be undertaken in 2012 in accordance with statutory requirements.

3.13 Natural and European History

Not applicable. Archaeological and environmental surveys have been conducted and no sites considered to be of Natural or European historical importance were discovered on the mining lease.

3.14 Spontaneous Combustion

Not applicable.

3.15 Mine Subsidence

Not applicable.

3.16 Hydrocarbon Contamination

Management of hydrocarbon contaminated soils is ongoing at the Ginkgo Mine. The current technique employs the use of a bioremediation area that is designed and managed in accordance with Bemax procedures.

Contaminated material from spills etc are taken to the bioremediation area and placed within the bunded structure. The contaminated soil is spread out over the area, with the application of fertiliser, and mixed to induce aeration and biological activity.

Two incidents involving hydrocarbon spills were reported via Bemax’s internal incident reporting system. The first incident occurred when on end of a suction hose that was placed in an oil transfer pod slipped out, resulting in approximately 80L of oil being syphoned out of the pod onto the ground. The other incident occurred when 40-60L of oil was washed off the back of a vehicle at the truck wash bay.

3.17 Methane Drainage/Ventilation

Not applicable.

3.18 Public Safety
The site is closed to the public and access is via the Bemax site office. The mine site is fenced to restrict unauthorised access and warning signs are in place. Fencing consisted of a standard stock-proof fence the access gates are fitted with padlocks. A security gate has been placed at the main entrance from off the Mine Haul Road. Employees and contractors are required to be inducted to the site. All visitors are accompanied at all times whilst on the site.

There were no reports of unauthorised access to the mine site during 2011.
4 COMMUNITY RELATIONS

4.1 Environmental Complaints

Under the Ginkgo EMS, the mine has implemented a procedure for receiving, investigating, responding to and reporting complaints received from the community.

During 2011, one environmental complaint was received regarding operations at the Ginkgo Mine. The complaint was in relation to rubbish being left on the roadsides from employees / contractors at the mine during shift change. This was dealt with swiftly and no further complaints or actions have been required.

Discussion with the EPA has taken place in regards to this incident and as it was offsite it is not reportable to the EPA and as such is an internal incident report only.

4.2 Community Liaison

Site Visits

Bemax Resources Ltd provided site visits in 2011, including the following:

- Site visit by mining students from University of NSW,
- Site visit by mining students from Broken Hill High School,
- Site visits by local landholders,
- Site visits by various State and Local Government representatives.
- Site Visits by the Country Womens Association

Sponsorship

Bemax Resources Ltd has a commitment to support local community projects and activities. As part of this commitment, financial sponsorship and in kind support was provided to a variety of community charities, events, initiatives and organisations during 2011.
5 REHABILITATION

During 2011 rehabilitation activities carried out at the Ginkgo Mine consisted of the following:

- Flora and Fauna monitoring of the completed Overburden Stockpile No. 3 (OB3), which included the monitoring of the Hand planted areas,
- the topsoiling of the DMU rehabilitation landform
- the seeding on the Slurried Overburden Dam (DMU),
- shaping of the Overburden Stockpile No. 2 (OB2) to lower its height,
- rehabilitation of topsoil and laydown area stripped ahead of Minepath,
- commencement of the erosion remediation and prevention works on OB1 western batter and
- the installation of the OB3 irrigation system and hand planting of approximately 850 tubestock on OB3.

5.1 Buildings

No buildings were removed during the AEMR period.
5.2 Rehabilitation of Disturbed Land

Table 18 below provides a summary of the disturbed and rehabilitated areas at Ginkgo.

Table 18 - Rehabilitation Summary

<table>
<thead>
<tr>
<th>Area Affected / Rehabilitated (Ha)</th>
<th>To date: 31/12/2011</th>
<th>Last report</th>
<th>Next Period (est.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A:</strong> MINE LEASE AREA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 Mine Lease(s) Area</td>
<td>3381</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B:</strong> DISTURBED AREAS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1 Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)</td>
<td>131</td>
<td>129</td>
<td>131</td>
</tr>
<tr>
<td>B2 Active Mining Area (excluding items B3- B5 below)</td>
<td>44</td>
<td>115</td>
<td>77</td>
</tr>
<tr>
<td>B3 Waste emplacements (active/unshaped/in or out of pit)</td>
<td>183</td>
<td>166</td>
<td>190</td>
</tr>
<tr>
<td>B4 Tailings emplacements (active/unshaped/uncapped)</td>
<td>108</td>
<td>91</td>
<td>110</td>
</tr>
<tr>
<td>B5 Shaped waste emplacements (awaits final vegetation)</td>
<td>55</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>B6 Topsoil Stockpiles</td>
<td>128</td>
<td>146</td>
<td>148</td>
</tr>
<tr>
<td><strong>ALL DISTURBED AREAS</strong></td>
<td>715</td>
<td>706</td>
<td>764</td>
</tr>
<tr>
<td><strong>C:</strong> REHABILITATION PROGRESS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1 Total Rehabilitated area (except for maintenance)</td>
<td>66</td>
<td>37*</td>
<td>108</td>
</tr>
<tr>
<td><strong>D:</strong> REHABILITATION ON SLOPES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1 10 to 18 degrees</td>
<td>30</td>
<td>14</td>
<td>40</td>
</tr>
<tr>
<td>D2 Greater than 18 degrees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E:</strong> SURFACE OF REHABILITATED LAND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1 Pasture and grasses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2 Native forest/ecosystems</td>
<td>37</td>
<td>37</td>
<td>55</td>
</tr>
<tr>
<td>E3 Plantations and crops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E4 Other (include non-vegetative outcomes)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 21 shows the disturbance domains as at the end of 2011.
Insert Fig 21
Monitoring Program

A set of Protocols have been established for monitoring rehabilitation at the Ginkgo and Snapper Mines (Ogyris 2010 “Protocol for Monitoring Rehabilitation at the Ginkgo and Snapper Mines”) to establish the baseline data and assessment techniques.

The bases of the rehabilitation monitoring protocols are that they are based on simple repeatable methodologies that are able to be subject to statistical analysis.

The proposed methods for the rehabilitation monitoring are:

- Site and Topographic Delineation and Description
- Transect Monitoring
- Permanent Fixed-Area Quadrats and Photopoint Monitoring

Site and Topographic Delineation and Description

The description of the site and topographic characteristics of the rehabilitation site are broadly based on the characteristics as described in Speight (1990) in the Australian Soil and Land Survey Field Handbook.

The major topographic elements from Tongway (2009) are:

- Crest
- Upper Slope
- Mid Slope
- Lower Slope
- Closed Depression or Lake
- Flat
- Open depression or Stream Channel

Transect Monitoring

The rehabilitation areas should have repeat transect monitoring sites in each of the major topographic units represented. The standard transect type will be a 20 m x 1 m permanently marked belt transect, this transect is then divided into 20 (1 m x 1 m) quadrats.

The information collected from the monitoring transects will include:

- Soil texture and profile assessment at establishment
- Soil surface roughness and resistance to disturbance
- Observations on erosion type and severity
- Incorporation and subsequent deposition of coarse debris and type
- A ground condition assessment for 5 of the 20 mini-quadrats
- Vegetation species composition, cover and height for each of the 20 mini-quadrats
- A photograph taken from the start peg looking directly along the monitoring line.
The ground condition part of the field assessment includes:

- % vegetation cover (perennial and annual)
- % bare ground and bare ground / vegetation patch ratio along the centre line of the mini quadrat
- % cryptogram cover
- % litter cover and type

**Permanent Fixed-Area Quadrats and Photopoint Monitoring**

A representative number of 20 m x 20 m quadrats will be permanently marked and located in the major topographic units on the rehabilitation areas.

The information collected from these permanent quadrats will include species composition and structure, as well as the ground condition assessment. A photo monitoring point will be set up on two permanent stakes (one at 1 m high for the camera and another at 0.5 m high for the photo-point board) located 8 m apart in a north-south direction.

**Overburden Stockpile No. 3 (OB3)**

The Bulk Rehabilitation of the Ginkgo OB3 dump commenced in June 2008 and was completed in September 2009.

The Rehabilitation effort of OB3 consisted of the following:

- The shaping of the batters and paddy’s using Laser buckets and tractors with GPS
- Relocation of 200mm of subsoil and 200mm of topsoil
- Carting and spreading of timber stockpiles on the batters
- Ripping and seeding (the batter ripping was surveyed on the contours)
- Handplanting of tubestock
- Watering of tubestock

The revegetation effort on OB3 consisted of the direct seeding of 405 kg of native seed by a seed box mounted onto a D7 dozer. The seed was sown at a high rate of approximately 18.4kg/ha on the batters and approximately 25.8kg/ha on the paddy’s.

There has been approximately 3850 tubestock planted on OB3 in three different programs. 2500 tubestock were planted by Outback Native Seeds in July 2009, 500 tubestock were planted by Bemax staff in March 2010 and another 850 tubestock were planted in September 2011.

During 2011 an irrigation system was installed onto the OB3 rehabilitation capable of watering up to 1000 tubestock. This irrigation was commissioned in September 2011 along with the planting of 850 tubestock under drippers.

The long term success of the Bemax rehabilitation is dependent on establishing vegetation types of similar composition to the original vegetation. This requires the successful establishment of a Belah Woodland Community.
OB3 Permanent Transects and Nearby Remnant Vegetation Sites - FLORA

In May 2010 Ogyris (Ogyris 2010 Establishment Report on Revegetation at OB3) established the permanent 20m Long transects at 9 batter slope and 5 pad locations across OB3. In addition, 6 remnant vegetation transects were also established in nearby remnant vegetation on the mine lease. Information was collected on soil type, landscape setting, ground condition and biological activity. The monitoring transects were also assessed for vegetation type and cover.

During the 2010 assessment the batter transects were dominated by Shrubby Twin-leaf along with lesser levels of Cannon Balls and Black Bluebush and sub dominate levels of Erect Bluebush and Bramble Wattle. In all 41 indigenous species were recorded on batter slopes at an average plant cover of 22%. The Pad transects were dominated by Bladder Saltbush, Black Bluebush, Shrubby Twin-leaf, Ruby Saltbush and Cannon Balls. Pad areas recorded 32 indigenous species at an average plant cover of 20%. Weed covered was assessed as low on both the batter slope and pad areas.

In October 2011 all permanently pegged transects on the OB3 revegetation areas were re-examined, as were the six sites located in the remnant vegetation. The final report has not been compiled at the time of writing this report but a summary of comments have been provided by Ogyris.

The summary of the October 2011 indicates that the vegetation cover and height of plants has generally increased across the OB3 rehabilitation. A number of taxa that were dominant across the batter areas in May 2010 such as the Shrubby Twin-leaf had grown appreciably, but were in decline due to the low rainfall across the winter and spring in 2011. This Shrubby Twin-leaf has a relatively short lifecycle but has played an important role as a primary colonizer of the revegetated site. Other taxa such as Black Bluebush and Ruby Saltbush have assumed greater levels of importance.

OB3 Permanent Transects and Nearby Remnant Vegetation Sites - FAUNA

In November 2011 pitfall sites were established at six of the vegetation monitoring sites on OB3 and six of the remnant vegetation sites adjacent to OB3. The pitfall lines comprised five 20 litre buckets in a 20 metre line connected by a 30m fly wire fence.

The pitfall lines were opened for 4 nights in mid-November and another 4 nights in mid-December 2011. Also, half hour bird surveys were carried out twice at each habitat during the November survey.

Anabat detectors were used for one night in November at 4 of the OB3 sites and 4 of the Remnant vegetation sites.

Invertebrate pitfalls were also installed during the December trip to sample the invertebrate fauna. This was a late inclusion based on the high abundance of fat-tailed dunnarts found on OB3.

The preliminary findings indicate that the native fauna have begun to successfully recolonise the rehabilitated OB3 landform. Terrestrial vertebrates were captured in relatively high
numbers on OB3, with the fat tailed dunnart quite abundant on OB3 in comparison to the remnant vegetation or the Offset areas surveyed at the same time by Wildlife Profiles. On the OB3 the total capture of fat-tailed dunnarts was 20 in comparison to only 1 in the adjacent remnant vegetation. One species of frog with 3 individual captures was found on OB3 and was identified as the Common spade foot toad, *Neobatrachus sudelli*.

The abundance of fauna species on OB3 at 80 was almost double the amount of captures that were recorded in the remnant vegetation at 43 captures, with the house mouse accounting for 45 captures on the OB3 rehabilitated landform and 21 captures in the remnant areas. A species of blind snake *Ramphotyphlops bicolor* and a Curl snake were also recorded on the OB3 areas but not in the remnant areas.

Both these findings along with that of the fat tailed dunnarts and the Common spade foot toads are quite pleasing and thus evidently indicate that the rehabilitated OB3 landform has begun a natural progression of recolinitisation towards remediation.

Reptiles and birds as would be expected were found to be more prolific in the remnant vegetation than on OB3. There were 11 species of reptiles identified in the remnant vegetation in comparison to only 5 on OB3. There was 20 species of birds identified in the remnant vegetation in comparison to only 8 on the OB3 landform.

As the habitat structure and complexity of the flora on OB3 changes in time it will be interesting to see how the variety and numbers of different species changes.

**Hand Planting Trials**

Ogyris in May 2010 and again in October 2011 undertook monitoring of 7 hand planting trails established on OB3 during July 2009. The summary results from Sluiter October 2011 (Appendix 7) indicate that the best performing taxa from the seven species planted are Belah at 72% survival and Hooked Needlewood at 58% survival. Approximately 64% of the tubestock planted in the winter 2009 were alive in May 2010 and in 2011 45% of the total tubestock planted were still alive.

The results from Sluiter (2011) indicate that the establishment and short term survival of Belah trees is achievable; it also indicates other species such as the mallee eucalypts were not as successful as the Belah and Hooked Needlewood. From these findings future rehabilitation planning can be designed for the best use of resources for the best achievable result by selecting species for tubestock planting that have a greater chance of success.

The addition of the irrigation system on the OB3 rehabilitation and the ability to relocate this infrastructure makes the possibility of successful Belah tube stock at the Ginkgo minesite quite reasonable.

It should be noted that although the success rate of Mallee eucalypts from tubestock was extremely low, their establishment from direct seeding is evident. The comparison of tubestock mallee spp during October 2011 at 90 -110cm in height with mallee spp that have established from seeding were in the order of 100-150cm in height. This would indicate that the mallee trees established from direct seeding were growing with greater vigour than the tubestock planted mallee.
The following pictures give a brief time line of the rehabilitation success of OB3 over a four year period.

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 2008</td>
<td>View of the Southern facing Batters of OB3 from the Minepath</td>
</tr>
<tr>
<td>Dec 2009</td>
<td>View of the temporary stockpile OB4 (sand) looking South west down the Western batters of OB3</td>
</tr>
<tr>
<td>Dec 2010</td>
<td>View of the temporary stockpile OB4 (sand) looking South west down the Western batters of OB3</td>
</tr>
<tr>
<td>Dec 2010</td>
<td>View of the temporary stockpile OB4 (sand) looking South West from the top of OB2, looking across the capped DMU and OB3 (the green section)</td>
</tr>
<tr>
<td>Dec 2010</td>
<td>View of a seedling <em>Mariana sedifolia</em> which has established on OB3.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Dec 2010</td>
<td>View of a seedling <em>Mallee sp.</em>, which has established on the OB3 rehabilitation from direct sown seeds.</td>
</tr>
<tr>
<td>Dec 2011</td>
<td>View of mallee species with the irrigation line in place.</td>
</tr>
<tr>
<td>Dec 2011</td>
<td>Section of batter on the Western facing slope with the Ginkgo Minepath backfill in the background.</td>
</tr>
</tbody>
</table>
DMU Rehabilitation 2011

The shaping of the Slurried Overburden Dam (DMU) sand material was completed in August 2009. The DMU dam has been capped with a minimum of 1 m of clay. This clay capping began in October 2009 and will be completed in January 2011. The capping clay material has been sourced from the adjacent Overburden Dump No. 2 (OB2).

The topsoil program commenced on the DMU in January 2011 and was completed in June 2011.

In July 2011 Outback Native Seeds, who are contracted to collect and store the seeds for Bemax, was commissioned to undertake the seeding of the DMU. A hire seeder box was transported from Toowoomba and placed on the back of a D7 dozer. The DMU rehab area was seeded at a rate of approx 10kg/ha during July 2011. The species used in the seeding program and their sowing rates are as below.

Table 19 – DMU Rehabilitation Seed List

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>DMU Seed Rate (g/Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIMOSACEAE</td>
<td>Acacia burkitii</td>
<td>300</td>
</tr>
<tr>
<td>MIMOSACEAE</td>
<td>Acacia colletioides</td>
<td>300</td>
</tr>
<tr>
<td>MIMOSACEAE</td>
<td>Acacia victoriae</td>
<td>300</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Atriplex eardleyae</td>
<td>250</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Atriplex holocarpa</td>
<td>250</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Atriplex lindleyi</td>
<td>250</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Atriplex nummularia</td>
<td>500</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Atriplex stipitata</td>
<td>264</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Atriplex vesicaria</td>
<td>1500</td>
</tr>
<tr>
<td>CASUARINACEAE</td>
<td>Casuarina pauper</td>
<td>215</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Chenopodium desertorum ssp desertorum</td>
<td>71.4</td>
</tr>
<tr>
<td>CONVOLVULACEAE</td>
<td>Convolvulus sp</td>
<td>335.7</td>
</tr>
<tr>
<td>SAPINDACEAE</td>
<td>Dodonaea viscosa ssp. angustissima</td>
<td>125</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Enchytraena tomentosa</td>
<td>250</td>
</tr>
<tr>
<td>MYRTACEAE</td>
<td>Eucalyptus mix (provenance)</td>
<td>550</td>
</tr>
<tr>
<td>MALVACEAE</td>
<td>Lavatera phlebia</td>
<td>32.1</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Maireana georgei</td>
<td>350</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Maireana pentatropis</td>
<td>200</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Maireana pyramidata</td>
<td>1500</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Maireana triptera</td>
<td>203</td>
</tr>
<tr>
<td>CHENOPODIACEAE</td>
<td>Maireana turbinata</td>
<td>300</td>
</tr>
<tr>
<td>ZYGOPHYLLACEAE</td>
<td>Nitraria billardiera</td>
<td>300</td>
</tr>
<tr>
<td>ASTERACEAE</td>
<td>Olearia pimelioides</td>
<td>250</td>
</tr>
<tr>
<td>AMARANTHACEAE</td>
<td>Ptilotus exaltatus</td>
<td>200</td>
</tr>
<tr>
<td>CAESALPINACEAE</td>
<td>Senna nothosubsp. coriacea/subsp. filifolia/subsp. petiolaris/subsp. zygophylla</td>
<td>500</td>
</tr>
<tr>
<td>MALVACEAE</td>
<td>Sida intricata</td>
<td>44.6</td>
</tr>
<tr>
<td>ASTERACEAE</td>
<td>Vittadinia gracilis</td>
<td>310.7</td>
</tr>
<tr>
<td>ZYGOPHYLLACEAE</td>
<td>Zygophyllum aurantiacum</td>
<td>500</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>10151.5</strong></td>
</tr>
</tbody>
</table>
The following pictures give a brief time line of the rehabilitation success of the DMU dam over a two year period.

<table>
<thead>
<tr>
<th>DMU Rehabilitation Dec 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note the gully erosion and washouts on the DMU batter. There is no washing at all on the stabilised and rehabilitated OB3 waste dump adjacent.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DMU Rehabilitation Dec 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>The extent and depth of the gully erosion can be seen clearly. Note the 1m clay cap can be seen over the Slurried Sand Overburden.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DMU Rehabilitation Dec 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Showing Northern Facing batter which has been rehabilitated. It has been topsoiled, timber replacement the ripped and seeded. The DMU was seeded in July 2011 at 10kg/ha.</td>
</tr>
</tbody>
</table>

Mine Path

Due to operational issues and water management requirements, no areas on the backfill have yet been made available for rehabilitation. For these reasons it is anticipated that rehabilitation on the mine path will not be able to commence until mining operations have both established and advanced along the return path a sufficient distance to allow the back fill of overburden.
Topsoil Stockpiles

During 2011 a topsoil stockpile ripping program was undertaken on several of the topsoil stockpiles onsite. The stockpiles were ripped to allow the penetration of moisture into the dumps.

It has been found that the dumps which have been ripped previously, then used to replace topsoil onto OB3 had substantially better moisture content than stockpiles which hadn’t been ripped previously.

The topsoil management program will continue to include ripping and seeding going forward. The ripping has been done in a two pass operation with a D9 ripping as deep as possible then a D8 following with the winged tyne creating a furrow to capture moisture.

**Sept 2010** (seeded Sept 2009)

The adjacent picture illustrates the success of the seeding of topsoil stockpiles. The area on the right hand side of the picture was seeded whilst the area on the left was not seeded.

**Sept 2010** (seeded Sept 2009)

The topsoil piles were seeded with a mix of native seeds which are predominately blue bush/salt bush based shrubs to improve topsoil structure and seed bank in the stored soil.

Figure 22 shows the rehabilitation areas at Ginkgo for the next 5 years and an indication of the commencement timing.
Insert Figure 22
**Maintenance**

Table 20 provides a summary of the maintenance activities during the period and activities proposed for 2012.

**Table 20 - Maintenance Activities on Rehabilitated Land**

<table>
<thead>
<tr>
<th>Area Treated (ha)</th>
<th>Report Period</th>
<th>Next Period</th>
<th>Comment / control strategies / treatment detail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional erosion control works</strong> (drains re-contouring, rock protection)</td>
<td>5</td>
<td>5</td>
<td>Drainage around OB1 and bunds on top of OB1</td>
</tr>
<tr>
<td><strong>Re-covering</strong> (detail i.e. further topsoil, subsoil sealing etc)</td>
<td>25</td>
<td>42</td>
<td>DMU topsoiled and seeded</td>
</tr>
<tr>
<td><strong>Soil treatment</strong> (detail i.e. fertiliser, lime, gypsum etc)</td>
<td>0</td>
<td>0</td>
<td>Shaping/topsoiling of OB2</td>
</tr>
<tr>
<td><strong>Treatment/Management</strong> (detail i.e. grazing, cropping, slashing etc)</td>
<td>0</td>
<td>0</td>
<td>Fertiliser trial treatments included on OB3</td>
</tr>
<tr>
<td><strong>Re-seeding/Replanting</strong> (detail i.e. species density, season etc)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Adversely Affected by Weeds</strong> (detail i.e. type and treatment)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Feral animal control</strong> (detail i.e. additional fencing, trapping, baiting etc)</td>
<td>5 km</td>
<td></td>
<td>Fencing OB2 and OB3 including DMU</td>
</tr>
</tbody>
</table>

**5.3 Other Infrastructure**

No infrastructure was decommissioned during the 2011 AEMR period.
5.4 **Rehabilitation Trials and Research**

**Rehabilitation Trials (2007 Trials on the Original Tails dam)**

No further works were undertaken in 2011 to the 2007 trials. The following 4 pictures give a clear indication of the potential growth of tubestock at Ginkgo once it has established itself.

<table>
<thead>
<tr>
<th>July 2007</th>
<th>Sept 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="July 2007" /></td>
<td><img src="image2" alt="Sept 2010" /></td>
</tr>
<tr>
<td>Numerous tubestock trees planted into what could be described as super dry topsoil. These trees received only three hand watering with a very high mortality rate.</td>
<td>The surviving trees have grown and are currently benefiting from the high rain fall events. The adjacent picture is of a Mallee tree which is approx 2m high and thriving.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dec 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Dec 2011" /></td>
</tr>
<tr>
<td>The continued survival of the mallee eucalypts on the 2007 trials area.</td>
</tr>
</tbody>
</table>
OB3 Sand Trials

The vegetation assessment of the OB3 sand placement trials was completed on the 11th May 2010. The OB3 sand trials consist of 6 trial plots on the Eastern Batter of OB3. The trials consist of plot 1 – 6 with sand placement over the clay of 0 cm, 20 cm, 40 cm, 60 cm, 80 cm, and 100 cm, respectively.

Ian Sluiter completed the field work component of the Sand Trials vegetation Assessment on the 11th May 2010.

The results from the 2010 assessment of the batter sand trails indicated that there was a good establishment of indigenous shrubby plant cover with evidence of early signs of biological activity in the form of ant and spider holes, spider webs and lizard burrows. The timing of the 2010 assessment was considered insufficient to induce a response from the plants present to the presence of the underlying sub strata. That is the plant roots will not have had time to penetrate the topsoil and subsoil layers to reach the sand layers overlain the clay overburden.

No monitoring of the OB3 Sand trails were completed in 2011 and they are due for their next monitoring program in autumn 2012.

Fertiliser Trials

A small area on the OB3 paddocks has been set up as a fertilizer trial with three different treatments.

- Trial area 1: 25 kg/ha of Slow release Fertiliser plus 25 kg/ha of Soluble Humate Granules
- Trial area 2: 40 kg/ha MAP fertiliser plus 25 kg/ha Soluble Humate Granules
- Trial area 3: 100 kg/ha MAP fertiliser

The fertiliser trials were monitored as part of the 2010 rehabilitation monitoring program.

No monitoring on the OB3 fertiliser trials was undertaken in 2011 and they are due for their next program in autumn 2012.
5.5 **Further Development of the Final Rehabilitation Plan**

**Final Land Use Objectives**

The mine site is located on Western Lands Leases which are pastoral leases administered under the jurisdiction of the Western Lands Commissioner appointed by the NSW Land and Property Management Authority. Land use on the mining lease and in the nearby area is predominantly light intensity livestock grazing of native pastures.

Subject to further consultation with stakeholders and regulatory authorities, the objectives of the rehabilitation program are to revegetate the disturbance areas to return the land to a condition suitable for light intensity grazing of native pastures.

This objective aims to maintain the Agricultural Suitability Class 4 and Rural Land Capability Class VI land classification.

**Completion Criteria**

This section provides a summary of some of the completion criteria used to measure achievement of the rehabilitation and land use objectives. A more detailed outline will be provided in the Ginkgo Mine Closure Plan which will be prepared in consultation with stakeholders and regulatory agencies.

Completion criteria need to be developed to determine when rehabilitation of the disturbance area at Ginkgo can be agreed to be complete. An approved set of completion criteria will be used as a basis for assessing this completion. Conceptual completion criteria are outlined in Table 21.

Preliminary discussions have taken place with stakeholders including landholders and representatives from the Industry and Investment NSW, and industry experts.

Bemax have currently adopted a stepped approach to the completion criteria for the mine sites. The stepped approach allows for targets to be set throughout the mining operation lifecycle to ensure each step is completed satisfactorily and also to track areas that need attention.

**Table 21 – Rehabilitation Completion Criteria**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Measure/Target</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Undertake mining pre-clearance flora and fauna surveys in accordance with the Ginkgo Mine Vegetation Pre-clearance Protocol.</td>
<td>Mining pre-clearance surveys undertaken. Flora habitat described. Wildlife captures documented. Threatened Species Management Protocol invoked if required. Captured wildlife returned to similar vegetation types in Bemax Offset areas.</td>
<td>Mining pre-clearance survey reports written and included with the Ginkgo AEMR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2) Soil stripping and overburden removal and storage undertaken in accordance with the Ginkgo MOP</td>
<td>Topsoil, subsoil and overburden stockpiles constructed in accordance with Ginkgo Mine designs with appropriate batter angles and heights. Topsoil stockpiles direct seeded to increase biological activity and organic matter.</td>
<td>Survey control of completed earthwork structures and work programs. Topsoil stockpiles monitored for vegetation cover and weed presence</td>
</tr>
<tr>
<td>3) Overburden, subsoil and topsoil retuned in accordance with the Ginkgo MOP</td>
<td>Bemax Earthworks Supervisor and Rehabilitation Officer to ensure target sub-soil and topsoil depths achieved and no root impeding layers are present.</td>
<td>Survey control of completed earthworks structures and work programs. Amelioration of root impeding layers if required.</td>
</tr>
<tr>
<td>4) Achieve stable, non-eroding landforms that can support indigenous native vegetation.</td>
<td>Soil profiles reconstructed with no significant limitations to revegetation.</td>
<td>Soil survey assessments undertaken as part of the Ginkgo Mine Vegetation Monitoring Strategy to ensure long term rehabilitation stability</td>
</tr>
<tr>
<td>5) Restore self-regenerating vegetation types comprised of indigenous plant taxa in vegetation community types similar to those occurring in surrounding areas.</td>
<td>Revegetation undertaken by a combination of direct seeding and strategic hand-planting of species unable to be successfully direct seeded. Revegetation targeted for appropriate climatic conditions conducive to vegetation establishment. Strategic fauna monitoring of revegetated areas and surrounding vegetation to assess re-colonization.</td>
<td>Post-mining flora assessment reports of new areas undertaken annually for three years, then every three years after that until final completion criteria achieved and property hand-over occurs. Fauna studies written up as reports.</td>
</tr>
<tr>
<td>6) Maintain and enhance where necessary, vegetation community types similar to those occurring in surrounding areas in readiness for hand-over to owner for light grazing end-use.</td>
<td>Post-mining surveys conducted in line with Ginkgo Mine Vegetation Monitoring Strategy.</td>
<td>Post-mining flora and fauna survey reports completed and included with the Ginkgo AEMR</td>
</tr>
</tbody>
</table>
6 ACTIVITIES PROPOSED IN NEXT AEMR PERIOD

Environment and Community activities proposed for 2011 have been previously reported within relevant sections of this document. These actions were based upon the implementation of all aspects of the environmental management plans as activities on site progress from construction to operational phases.

Overburden Stockpile Reshaping and Rehabilitation Works

OB2

During 2012 it is anticipated that the bulk earthworks for cutting and shaping the OB2 will be finalised and the area topsoiled and ready for seeding in autumn 2013. The Northern Batter on OB2 will have a small area ready for seeding in the 2012 seeding program.

Two topsoil stockpiles on the return path adjacent to OB2, which are required to be relocated, will be used to topsoil any completed sections of the OB2 Northern Batter. The remainder of these topsoil piles will then be stored on the top of the OB2 paddocks for future use. This has the advantage that new areas are not required to be cleared to stockpile these piles and when the OB2 batters are completely shaped, the haulage distance from the topsoils to the batters will be minimal.

OB1

During 2012 the Western batter of OB1 will be rehabilitated to remediate and eliminate the erosion that is occurring off this batter. The rehabilitation of OB1 is not due to commence until 2013 but with the ongoing erosion issues Bemax have decided to repair the existing erosion and prevent any future occurrences.

The Ginkgo Mine plan during the return path requires an excess amount of overburden that may require storage off path. The Mine designs are still not fully complete but there is potential to place some excess Overburden on the edges of OB1 and to cap the Original Tails dam.

Table 22 gives an indication of the disturbance domains including their areas disturbed and their areas rehabilitated as the time frame for rehabilitation commencement, stages of rehabilitation and percentage complete.
### Table 22 - Schedule of Rehabilitation Activities

<table>
<thead>
<tr>
<th>Domain</th>
<th>Area Disturbed (ha)</th>
<th>Area Rehabilitated (ha)</th>
<th>% Complete</th>
<th>Stage of Rehabilitation</th>
<th>Time frame for Rehabilitation to begin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure includes Water Management Structures</td>
<td>131</td>
<td>0</td>
<td>Nil</td>
<td>Nil</td>
<td>2018 +/-</td>
</tr>
<tr>
<td>Mine Path Active Mining Area</td>
<td>44</td>
<td>0</td>
<td>Nil</td>
<td>Nil</td>
<td>2012</td>
</tr>
<tr>
<td>Cleared Ahead</td>
<td>40</td>
<td>40</td>
<td>0</td>
<td>Natural Regrowth</td>
<td>2011</td>
</tr>
<tr>
<td>Topsoil Stockpiles</td>
<td>142</td>
<td>14</td>
<td>9.8%</td>
<td>Progressive</td>
<td>2010</td>
</tr>
<tr>
<td>Waste Dumps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste Dump OBD1</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>Western Batter under Rehab</td>
<td>2012</td>
</tr>
<tr>
<td>Waste Dump OBD2</td>
<td>35</td>
<td>0</td>
<td></td>
<td>In Progress</td>
<td>2010</td>
</tr>
<tr>
<td>Waste Dump OBD3</td>
<td>36</td>
<td>36</td>
<td>100%</td>
<td>Completed Monitoring commenced</td>
<td>2008</td>
</tr>
<tr>
<td>Slurry Dam DMU</td>
<td>22</td>
<td>19</td>
<td>86%</td>
<td>Seeded Small Area joining OB2 to complete</td>
<td>2009</td>
</tr>
<tr>
<td>Waste Dump Minepath</td>
<td>119</td>
<td></td>
<td></td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Waste Dump OB4</td>
<td>8</td>
<td></td>
<td></td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Tailings Emplacements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tails Dam Initial Dam</td>
<td>40</td>
<td>3</td>
<td>7.5%</td>
<td>Rehab trials and 1 ha around catch dam wall</td>
<td>2013 Awaiting Mineplan review</td>
</tr>
<tr>
<td>In Pit Tailings</td>
<td>43</td>
<td></td>
<td></td>
<td>Nil</td>
<td>Will be capped with OB</td>
</tr>
<tr>
<td>Slimes Dams</td>
<td>30</td>
<td></td>
<td></td>
<td>Nil</td>
<td>Will be mined out</td>
</tr>
</tbody>
</table>
Rehabilitation Monitoring

DMU

During 2012 the initial establishment monitoring program will be implemented on the DMU rehabilitation.

The monitoring protocol will follow that which has been established on OB3 and includes both flora and fauna monitoring programs.

The DMU rehabilitation area has in 2011 been set up with the pit fall traps, which have been left buried with their lids on.

Overburden Dump 3

During 2012 the third annual monitoring program for OB3 will be completed.

2007 Trials

Further monitoring of the 2007 rehabilitation trials will be undertaken using the monitoring strategy outline previously. Further monitoring work will include excavating pits below trees and shrubs to investigate the root penetration into the various rehabilitation substrates being trialled.