Independent Monitor
COMMUNITY REPORT

McARTHUR RIVER MINE

October 2014

ERIAS GROUP

The detailed McArthur River Mine Environmental Performance Annual Report for 2012-2013 can be accessed at the Independent Monitor website:

www.mrmindependentmonitor.com.au

Environmental Performance 2012-2013

Introduction

The Independent Monitor (IM) has prepared this community report to summarise the findings of the IM review of the McArthur River Mine environmental performance for the 2012-2013 Operational Period (from October 2011 to September 2013).

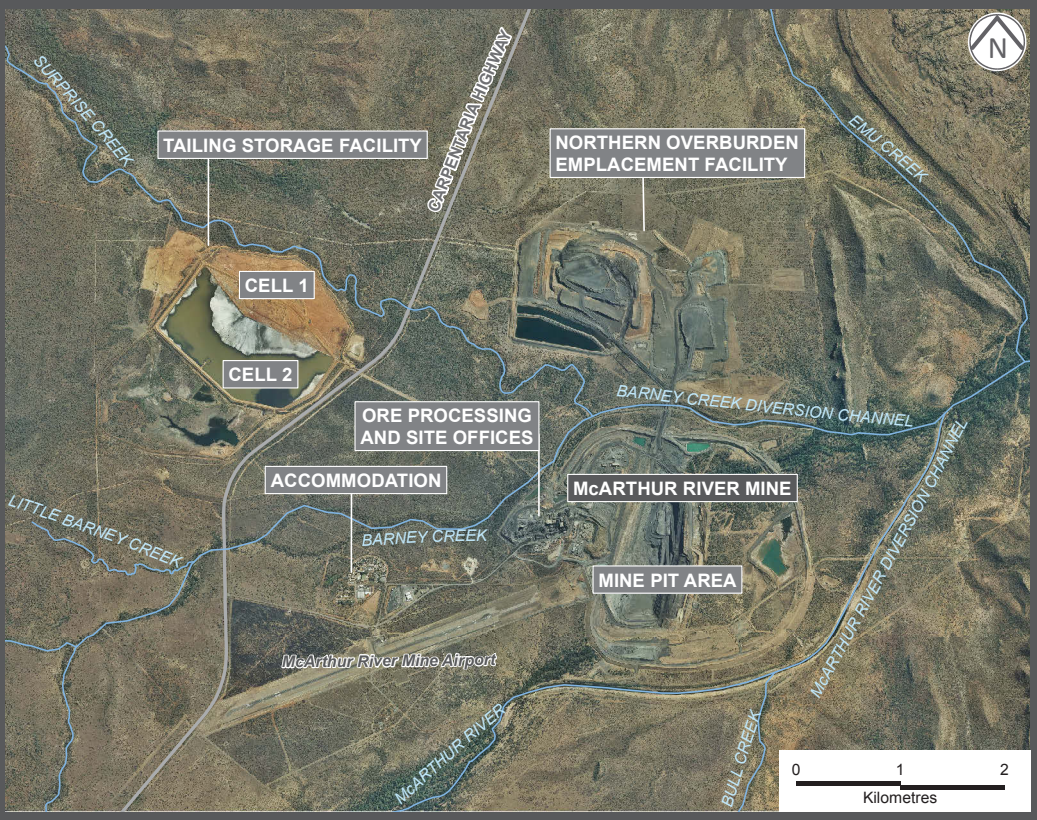
Improvements noted during this period include expanded environmental monitoring programs and continued work on revegetation of the McArthur River diversion channel. Areas for improvement have been identified and these are detailed in this report.

Scope of this Report

The role of the IM is to assess the environmental performance of the McArthur River Mine by reviewing environmental assessments, monitoring and audits undertaken by McArthur River Mining (MRM) and by the Department of Mines and Energy (DME).

Issues relating to mine safety, community and social matters, and mine administration are not included in the assessment.

The scope of the assessment includes the mine itself and Bing Bong Port.



The Key Issues in this Operational Period	
Overburden	Geochemical reclassification and potential water impacts.
Fish and Shellfish	Elevated levels of lead in some fish in Barney Creek.
Tailings Storage Facility	Water level and seepage issues.
McArthur River Diversion	Erosion of the diversion channel.
Water	Water balance, water quality and groundwater.
DME Performance	Opportunities for improvement, e.g., time to finalise audit report.

Overburden (Waste Rock)

MRM has undertaken additional studies into the geochemical properties of the overburden. As a result of these studies, the volume of overburden that is classified as potentially acid-forming, saline, or with potential to leach metals under neutral drainage conditions has increased significantly.

The Northern Overburden Emplacement Facility

Overburden Geochemistry

Since the last IM report, there has been a major change in the understanding of geochemical risks at McArthur River Mine.

Since 2012, MRM has undertaken a number of studies to improve its understanding of the geochemical properties of the overburden. The result of these studies was that in early 2014 a reclassification of the overburden was completed.

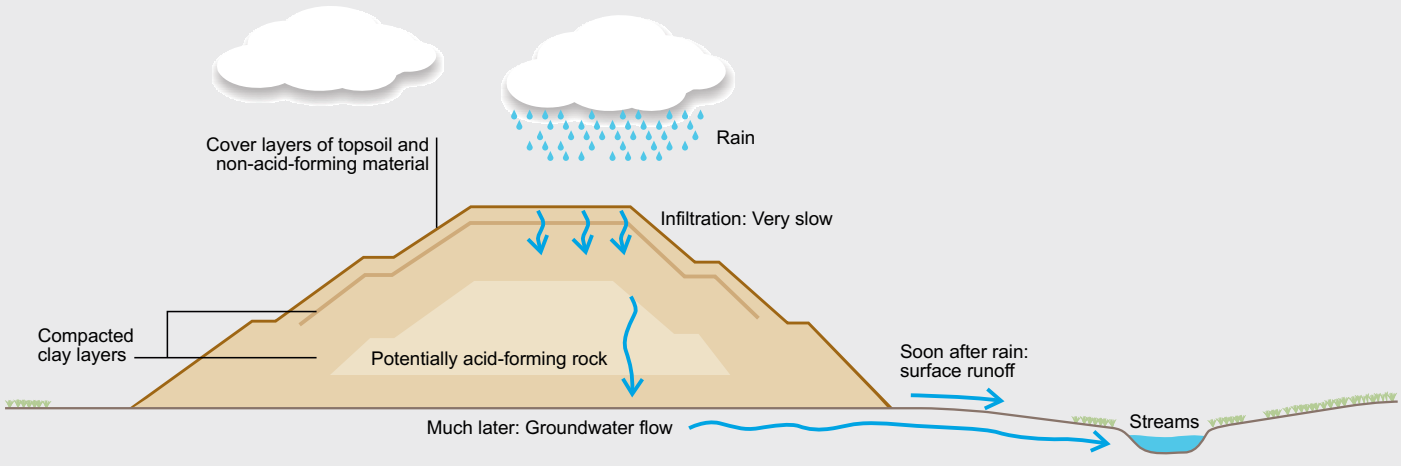
Estimates of the proportion of potentially acid-forming overburden material at the mine have increased from around 30% to over 50%. A further 30% of the overburden is now recognised as having potential for saline and metalliferous drainage.

As such, the IM considers acid, saline and metalliferous drainage the most significant potential environmental issue at McArthur River Mine. MRM is now investigating the implications of reclassification on management of overburden.

Potential issues associated with overburden classified as acid, saline and/or metalliferous include poor quality water slowly leaching from the overburden into groundwater, which could ultimately flow into surface drainage downslope of the mine site (see diagram below).

If this were to occur, it could have long-term impacts on groundwater, surface water quality, and terrestrial and/or aquatic ecosystems near the mine site.

Current and future management strategies for overburden now require reassessment, as does the design of the Northern Overburden Emplacement Facility (NOEF).



Process of water flows through the environment

What is Acid Rock Drainage?

Acid rock drainage, also called acid and metalliferous drainage or acid mine drainage, is the outflow of acidic water from rock. A related process is drainage of saline water (sometimes containing dissolved metals) from rocks and soil.

Potentially acid-forming (PAF) rocks occur naturally in the environment and are harmless when submerged in water or if buried deep below the surface with no oxygen available. When PAF rocks are exposed to air, metal sulfides in the rock break down, causing acidity.

Similarly, salt and metals are a natural part of rocks and soil, which can leach out when exposed rocks break down in response to air and water. Saline, acidic or metal-containing water can then leach from the soil or rock into groundwater.

Overburden Geochemistry

MRM has shown a strong commitment to resolving these overburden management issues. The company has engaged some internationally experienced consultants to prepare revised designs for closure of the NOEF.

MRM submitted a Notice of Intent (NOI) to the Northern Territory Environment Protection Authority (NTEPA) in June 2014 to obtain approval for the redesign of the NOEF.

The NTEPA has reviewed the NOI and in July 2014 issued a Statement of Reasons concluding that an Environmental Impact Statement (EIS) was required for the Overburden Management Project. Terms of Reference for the EIS were issued in September 2014.

The Overburden Management Project is being assessed under the bilateral agreement between the NT and Australian Governments. MRM is currently undertaking a number of studies which will be used in the EIS. These include:

- Ongoing geochemical classification of overburden to increase confidence in predicting the occurrence of acid, saline and metalliferous overburden.
- Review of the proposed cover design to address the reduction in benign overburden.
- Additional technical studies including surface water and groundwater modelling.

Oxidisation of potentially acid-forming rocks

What causes rocks to burn?

Pyrite is a naturally occurring mineral which is present in the rocks around McArthur River Mine and is therefore in the overburden emplacement facility. When pyrite is dug up and exposed to the air, chemical reactions can occur that cause spontaneous combustion - in other words, the rocks set themselves alight.

Overburden Combustion

Aside from aesthetic and air quality impacts, fire in the overburden leads to other issues, such as potential instability in the NOEF.

Environmental effects of fire in the NOEF include the potential for subsidence within the overburden, resulting in instability and/or compromising the integrity of the cover.

Failure of the cover due to subsidence will result in infiltration of water into the overburden resulting in acid, saline and metalliferous drainage.

Management approaches are still being developed. Actions that MRM has taken to address this issue to date include:

- Geochemical assessment and efforts to predict areas of rock with potential to spontaneously combust, to identify these materials before they are mined.
- For materials that are currently burning within the NOEF, spreading these out into thin layers (to cool them) and then recovering with clay.

Aerial view of combustion at the Northern Overburden Emplacement Facility
Source: ABC

Fish and Shellfish

Elevated lead levels have been recorded in fish from Barney Creek. Monitoring data has not identified elevated lead levels in fish caught from McArthur River or Surprise Creek.

As part of MRM's early dry season aquatic fauna surveys, the concentrations of metals and lead in aquatic fauna (fish and prawns) are assessed annually to determine if they exceed maximum permitted levels in food.

In 2012, two of four rainbowfish and one prawn caught at site SW19 on Barney Creek (site downstream of the bridge, see photo below) exceeded the maximum permitted levels of lead as outlined by Food Standards Australia New Zealand. In 2013, the permitted lead level was exceeded in 9 out of 10 fish caught at SW19.

The data showed no evidence of mine-derived lead in McArthur River or Surprise Creek, and fish and prawns sampled from both of these water systems meet food standards requirements.

Scientific testing was undertaken to determine the source of the lead. This testing indicated that it was similar to that at the mine, although the IM cannot state definitely that the mine was the source of the lead until further testing is undertaken.

The lead in fish at SW19 is thought to be due to the location of this site close to Barney Creek bridge, where many haul trucks cross daily.

In August 2014, MRM constructed a sediment management system near Barney Creek bridge. This collects runoff from the haul road and bridge area and removes sediment, before discharging the water to Barney Creek.

The DME has formed an intergovernmental Taskforce including Department of Health, Department of Primary Industries and Fisheries and NT Worksafe. The Taskforce has overseen further field work and is undertaking a detailed assessment of the results.

MRM has installed a dust measuring device at Barney Creek bridge, which alerts MRM when dust levels are elevated so that dust reduction measures can be implemented.

Spangled perch/grunter*

Checkered rainbowfish*

Cherabin/prawns*

Sample site SW19 (near Barney Creek bridge) where elevated lead was recorded in fish*

What does the food standard mean?

The Australia New Zealand Food Standards Code sets maximum levels of contaminants that are permitted to be present in foods.

These levels are set as a risk management tool, and it is considered safer not to eat foods that exceed the maximum levels.

* Source (Thorburn, 2013)

McArthur River Diversion

Rehabilitation of the diversion channel has been ongoing, with thousands of new trees planted. However, a large amount of channel bank erosion has occurred since September 2009.

MRM has invested significant effort into rehabilitating the diversion channel, but there is more work to be done.

Improvements to the McArthur River diversion channel during the operational period have included:

- More large woody debris added to the channel (for fish habitat and to reduce the speed of water flow).
- Sawfish and other marine species now observed to be using the channel.
- Planting of 67,000 new trees during 2012 and 2013.

Despite these improvements, revegetation of the diversion channel has been slow. Flooding and high flows in the wet season cause erosion and have washed away some previous plantings. Flood damage to fencing has meant that cattle access - with grazing and trampling of plants – continues to be a problem.

Slow revegetation has contributed to ongoing erosion, and vice versa. In some sections of the diversion channel, erosion of up to 2 m has occurred in the past four years (see figure below).

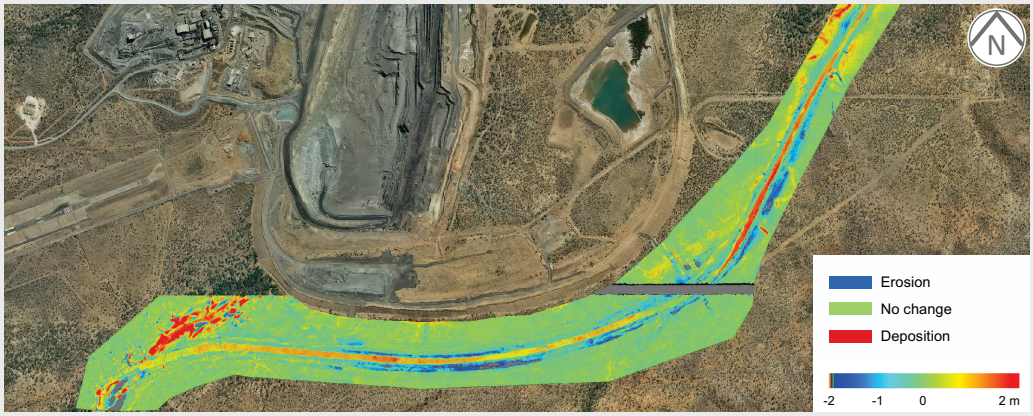
As such, the channel remains unstable and establishing vegetation in areas with such high levels of erosion will present ongoing difficulties.

Due to the slow establishment of vegetation, there continues to be a lack of suitable habitat for terrestrial and aquatic flora and fauna within the diversion channel and its banks.

The IM recommends review of the current rehabilitation strategy and the schedule to identify how the revegetation of the channel can be accelerated.

MRM proposes to undertake a more comprehensive assessment of erosion during 2014.

The perimeter fence has been redesigned in consultation with the NT Department of Primary Industries and Fisheries (so that it will be better able to withstand floods) and fencing contractors have recently commenced work.



McArthur River diversion channel showing change in ground surface level from September 2009 to June 2013

Part of the McArthur River diversion channel, March 2014

Tailings Storage Facility - Water Level and Seepage

The volume of water stored in TSF Cell 2 is of concern, as is seepage that has continued to occur from TSF Cell 1 and Cell 2.

TSF Cell 2 Water Level

The volume of water stored on the surface of Tailings Storage Facility (TSF) Cell 2 was identified as a concern in the 2011 IM report. This continues to be an issue in 2014, with water observed to be at least 2 m deep along a large part of the Cell 2 southern embankment.

Storage of water in the TSF conflicts with MRM's commitments regarding management of water and tailings. This includes a requirement to deposit tailings above the water line in a TSF, so that they settle and form a 'tailings beach'. It may also result in reduced capacity to store tailings.

Maintaining a high water level at the TSF also:

- Increases risk of embankment failure.
- Increases risk of seepage.
- Reduces the volume of water that can be temporarily stored after an extreme rainfall event.
- Has potential to make eventual TSF rehabilitation difficult, if the tailings are not dried out and/or consolidated.

It has previously been recommended (by the IM in 2010 and 2011 as well as the TSF designer) that MRM should install water pressure meters to assess the implications of the elevated water levels and to confirm the dam's ongoing safety.

At the time of writing, MRM plans to complete this task during October 2014.

The DME is seeking clarification from MRM regarding:

- How TSF Cell 3 will be used to manage mine wastewater in the future.
- Timeframe and feasibility of constructing the proposed TSF Cell 4, which was also designed to be part of the wastewater management process.

TSF Cell 2, showing the tailings beach

Panoramic photo of TSF Cell 1

What are tailings?

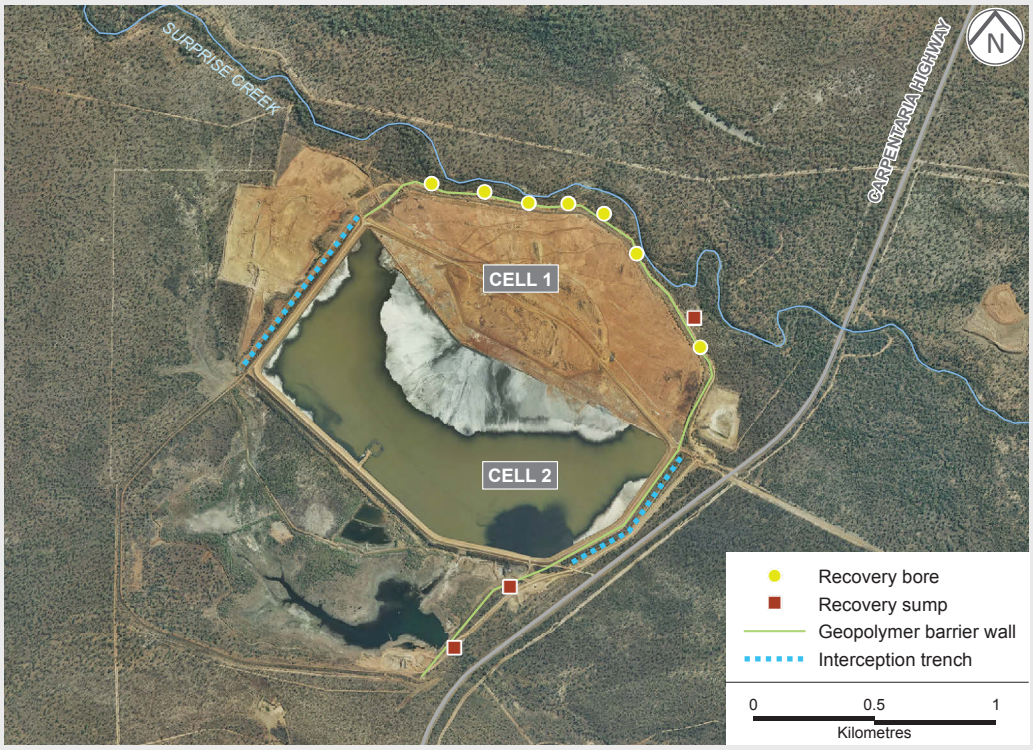
Tailings are the ground-up rock that remains after the removal of zinc and lead from the ore.

How does the TSF work?

Wastewater and tailings from the McArthur River Mine processing plant are taken by pipeline to the nearby tailings dam on the western side of the Carpentaria Highway.

Tailings are deposited around the perimeter of the TSF inside the dam wall. The ground rock settles forming a 'beach' while the water flows to the centre of the TSF and is recycled.

The tailings are deposited in thin layers which allows them to dry out and consolidate, increasing the strength of the TSF.



Aerial photo of the TSF area showing seepage control measures

TSF Seepage

Improvements to management of the TSF during the operational period have included installation of various seepage control measures as well as new groundwater monitoring bores. Tailings in TSF Cell 1 have been covered with clay - this has successfully reduced dust emissions.

Seepage from TSF Cell 1 and TSF Cell 2 has continued during the period, despite the implementation of the above measures. This may be linked to the excess water stored on TSF Cell 2.

The DME has identified that seepage management is a high priority at the TSF, and that as part of this, finalising the design and construction of an effective landform and TSF cover should be a high priority.

As a consequence of seepage from TSF Cell 1, elevated sulfate levels have been recorded in Surprise Creek. MRM plans to undertake the following:

- 2014: improve Cell 1 drainage and undertake monitoring and modelling to inform the management of seepage.
- 2015: install seepage mitigation measures and improve cover drainage as necessary.

The photo above shows existing measures to manage seepage from the TSF, including a low-permeability geopolymer barrier, interception trenches to the northwest and southeast of Cell 2, and water recovery bores/sumps.

Ecology at Bing Bong Port

There is no measureable impact of operations on marine ecology beyond the swing basin and shipping channel. Within and near the dredge spoil ponds, there are some issues with terrestrial vegetation.

Marine Ecology

MRM has taken actions to reduce dust and concentrate spillage at Bing Bong Port, which appear to be reducing levels of contamination. Within the swing basin and shipping channel, there has been a downward trend in the concentration of metals in sediments.

Marine ecology surveys at Bing Bong Port showed that the impact of port operations is restricted to the swing basin and its immediate surrounds. Sites less than 1 km to the west have no measureable impact - seawater and sediment quality, as well as fauna diversity, are consistent with the wider area.

Vegetation adjacent to Bing Bong dredge spoil ponds

Where is the Swing Basin?

At Bing Bong Port, the swing basin is the wider part of the shipping channel next to the port itself, which allows the transport barge room to turn around.

What is Dredge Spoil?

To enable the transport barge to reach the port through the shallow nearshore area, it is necessary to periodically dredge the channel to keep it open.

Dredge spoil is simply the nearshore marine sediment (e.g., sand), which has been pumped out of the channel and into the dredge spoil ponds, south of the port.

Vegetation at the Dredge Spoil Ponds

Much of the dredge spoil itself is currently not vegetated. In some areas this is because more spoil will be added at a later date, while in other areas it is the result of unsuccessful revegetation works.

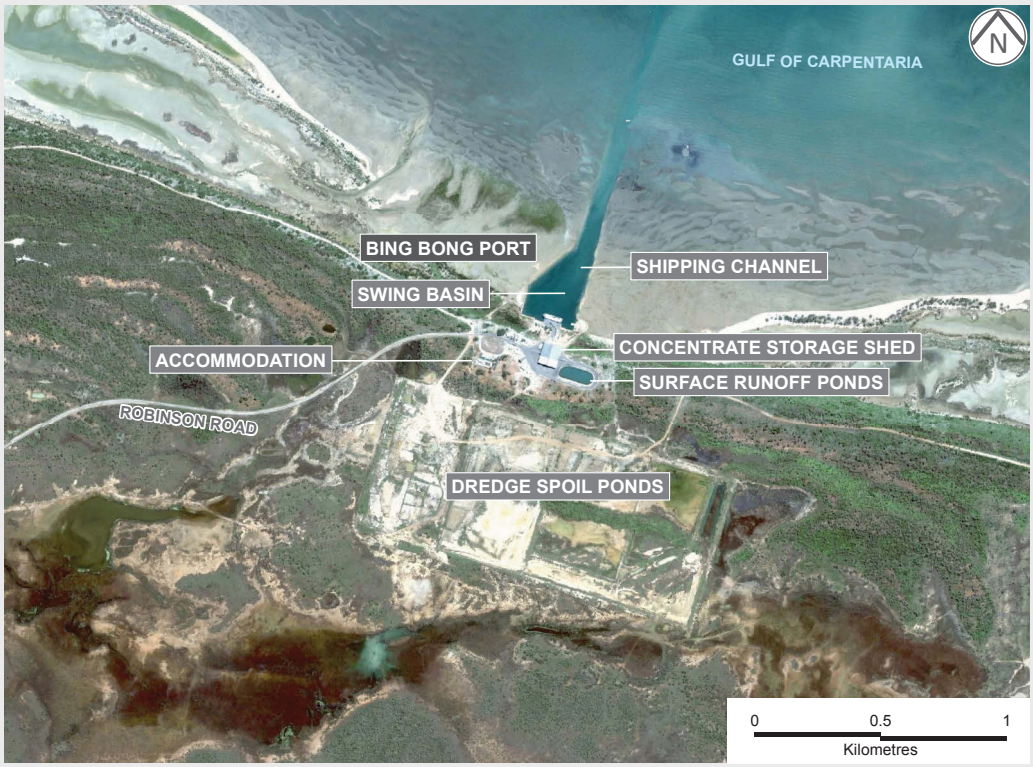
Bare spoil can result in the creation of dust, with potential affects on nearby vegetation and/or health.

The IM has recommended that salt-tolerant grasses be sown to reduce dust between dredging events.

In areas just outside of the dredge spoil ponds there has been dieback of vegetation. This may be due to one or a combination of:

- Previous obstruction of a creekline by dredge spoil, causing inundation of trees. This was rectified by 2012.
- Salt runoff and/or leachate draining from the dredge spoil. MRM has undertaken vegetation condition and soil monitoring annually since 2012 and is currently awaiting the 2014 report.
- Seawater remaining against the outside of the drain bund after the tide recedes.

The IM recommends that the outside of the drain bund wall be inspected regularly, to assess if tidal seawater is ponding against the bund and contributing to vegetation dieback from salinity.



Satellite image of Bing Bong Port, 2005

Water

MRM has undertaken significant efforts to continually improve surface water and groundwater modelling, monitoring and management at the mine site. While water management has improved on site, further opportunities remain.

What is a water balance?

Water balance refers to the relationship between water inputs to the mine site (rainfall, groundwater inflow, surface runoff), water retained or managed on site (e.g., mine site ponds, pumping) and water outputs (including evaporation, seepage and discharge).

Understanding site water balance is important to enable management of site water outputs in particular.

The changes in geochemical classification of the mine's waste rock has implications for the site's water balance, surface water quality, groundwater and downstream beneficial uses.

Water Balance

MRM has continued to revise and improve modelling of the site water balance, as well as investing in water monitoring equipment.

Issues identified in this period include the need for ongoing continuous improvement of the water balance model, including the need to incorporate potential impacts of climate change.

The next water balance report should clarify how water at the tailings storage facility (TSF) is accounted for. It should also assess the risks posed by possible reduced water quality of runoff and seepage.

Surface Water Quality

The IM considers that the existing surface water controls at McArthur River Mine are generally adequate, and monitoring results demonstrate a relatively high level of success in terms of compliance with water discharge requirements. MRM devotes considerable effort to surface water monitoring.

There is potential for poor quality seepage or runoff from the TSF and the northern overburden emplacement facility (NOEF), or from dust generated by operations, to reduce water quality in Surprise and/or Barney Creeks. The IM recommends that monitoring programs be reviewed to ensure early warning of such impacts.

Water quality of the mine pit lake after mine closure should also be assessed, as seepage from the pit has potential to impact groundwater and adjacent ecosystems.

Pete's Pond, which receives dewatering water from the mine pit

Groundwater

MRM has undertaken a significant amount of work during the operational period to address risks related to groundwater, including:

- Assessment of potential seepage impacts at various mine facilities.
- New groundwater modelling and upgrades to monitoring equipment.
- Installation of geopolymer barriers between the old river channel and the mine pit, in order to restrict groundwater flows into the mine pit.
- Installation of new monitoring bores at Bing Bong Port to enable ongoing assessment of groundwater conditions.

The key groundwater risk is seepage of contaminated water from mine site water storages and the TSF into groundwater.

The IM recommends that MRM increase monitoring at the NOEF, and as seepage has continued from the TSF cells (see 'TSF Seepage'), identify/install appropriate seepage control at the TSF and at the NOEF's southern PAF runoff dam, where seepage is also occurring.

Surprise Creek

Review of DME Performance

As well as assessing the environmental performance of McArthur River Mine, it is also the IM's responsibility to review the performance of the Northern Territory Department of Mines and Energy (DME) in regulating and monitoring the mine.

The IM believes there are opportunities for the DME to improve in the following areas:

- The timeliness to issue compliance audit reports – the IM recommends that audit reports should be written within six weeks of the DME site visit to give MRM time to rectify issues before the next audit.
- Defining what 'best practice' means, in relation to different aspects of mine operations. In some instances this would include reference to guidelines. This would enable the DME auditors (and the IM) to more objectively assess the mine's environmental performance.
- Developing a method for tracking MRM's progress in completing DME audits recommendations. The IM recommends that this be in the form of an action plan for high priority items, to be reviewed quarterly.
- Where MRM or the DME disagrees with an IM recommendation, the reasons for this should be documented.
- Focus on ensuring that Mining Management Plan commitments are specific, measurable, realistic, relevant and time-based. They should also be linked to environmental performance.

About the Independent Monitor (IM)

In December 2013, the DME engaged ERIAS Group Pty Ltd to assess the environmental performance of the McArthur River Mine for a five-year period.

ERIAS Group takes over from Environmental Earth Sciences as the Independent Monitor (IM) team leader.

The IM is supported by a team of specialists that brings together the required skills and experience to fulfil the role, including:

- ERIAS Group (environmental impact assessment, risk and management, water quality, soils and closure planning).
- Water Technology (diversion channel, surface hydrology and site water management).
- Pells Sullivan Meynink (geotechnical engineering and TSF operating strategies).
- Groundwater Resource Management (groundwater modelling and monitoring).
- Environmental Geochemistry International (geochemistry, TSF and waste rock cover design).
- Low Ecological Services (terrestrial, aquatic and marine ecology).

For more information, go to the IM website:
www.mrmindependentmonitor.com.au

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