

# Independent Monitor Community Report

2011 Operational Period

Community Report by the Independent Monitor of the  
McArthur River Mine, November 2012



Welcome to the Independent Monitor's fifth annual Community Report on the Environmental Performance of the McArthur River Mine (MRM), NT. This report summarises the findings of our audit of MRM's environmental performance over the period from October 2010 to September 2011, which we refer to as the "2011 Operational Period".

## INTRODUCTION

### Introduction

This community report outlines the significant findings of the Independent Monitor's annual audit report. Our annual report is submitted directly to the Minister for Mines and Energy. The detailed report is available at:

[www.mrm-independentmonitor.com.au](http://www.mrm-independentmonitor.com.au)

### About the Independent Monitor

The Independent Monitor is a team of independent scientists and engineers who review MRM's environmental performance each year. The team is made up of specialists from:

- Environmental Earth Sciences, who specialise in soil, sediment, groundwater, surface water, dust and mining waste;
- Bewsher Consulting who specialise in river hydraulics;
- Knight Piésold, who provide geotechnical engineering advice for mine structures; and
- Low Ecological Services, who specialise in terrestrial and marine flora and fauna.

The team assesses the Mine's environmental performance by reviewing MRM's environmental monitoring data and documentation, conducting a mine site inspection, and holding meetings with key staff from MRM and the Department of Mines and Energy (DME).



Members of the Independent Monitor team inspecting the Bing Bong diversion channel in May 2012.



Revegetation of the McArthur River diversion channel has been an ongoing focus of Independent Monitor audits. Revegetation has come a long way over the last five years, but there is still work to be done.

## SIGNIFICANT FINDINGS THIS AUDIT PERIOD

### Overview

The Independent Monitor has observed many improvements this audit period. MRM continue to demonstrate proactive efforts to improve their environmental performance for many areas of environmental monitoring, and have made efforts to follow up on many of the recommendations made in past Independent Monitor audit reports.

The Independent Monitor considers the following areas of environmental monitoring to be generally appropriate this audit period:

- flora and fauna monitoring both at the mine site and at Bing Bong Port;
- surface water monitoring;
- fluvial sediment monitoring;
- structural monitoring of the river diversions; and
- we also note that general reporting has improved for many monitoring programs.

There are many improvements still to be made and many aspects of environmental monitoring are still considered to be insufficient to detect and mitigate environmental damage. Key areas of concern this audit period include:

- volume of water stored in Cell 2 of the Tailings Storage Facility (TSF);
- delineation of seepage at the TSF, and its impact on Surprise Creek;
- progress of acidification of the tailings and identification of the treatment options;
- identification and management of Potentially Acid Forming (PAF) rock waste at the Overburden Emplacement Facility (OEF);
- progress of revegetation on the McArthur River diversion; and
- further dust migration at PAC RIM.

Additional areas of monitoring are discussed within the body of the technical report.

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Above: Aerial photograph of the TSF taken in late May 2012. Note: WMD (Water Management Dam) holds fresh water.

### Tailings Storage Facility excess water storage

The volume of water held in the TSF remains to be an issue. While the volume of water stored on Cell 2 remains significant and there is no clear picture of water balance, the risk of overtopping during wet season remains a serious concern. We note that the site inspection occurs after the wet season when water levels are high in the TSF. Throughout dry season, water levels are reduced through evaporation and recycling efforts by MRM. MRM have begun works to raise the height of the walls at the TSF, which will increase the capacity of Cell 2. These works will need to be reviewed in the next Independent Monitor audit.

The tailings deposition is currently taking place along the southern embankment of Cell 2, which will eventually result in the water stored against the embankment wall being moved towards the centre of the Cell 2.

### Seepage from TSF into Surprise Creek

Seepage from the TSF Cell 1 into Surprise Creek remains a significant concern. MRM continues to investigate this issue. Independent Monitor notes that it is likely that a paleochannel connects the seepage area at TSF Cell 1 near Surprise Creek with the up-gradient Water Management Dam (WMD) (south of TSF Cell 2). MRM have not yet undertaken any investigatory works to prove this theory.

Salt deposition was again observed at Surprise Creek as a result of seepage from the TSF and doesn't appear to have decreased substantially. Despite this, a frog and macrophytes were observed during the May inspection within the seepage recovery sump, a possible indicator of improved water quality.

Planning for the long term acidification of tailings and mitigation of acidic seepage is likely to be the most significant issue for mine closure relating to the TSF. The Independent Monitor recommendation is that further investigation should:

- identify where the seepage originates from;
- design a tailings seepage and closure management system that includes the evaluation of the possibly reprocessing the tailings from TSF Cell 1; and
- investigate and discuss when and where seepage will occur from TSF Cell 2, and what the likely impacts will be.

The Independent Monitor recommends that bi-annual vegetation surveys are conducted at Surprise Creek to monitor effect of tailings seepage on vegetation. Ideally, surveys should be timed to monitor wet season and dry season leachate impacts on vegetation separately.



Top: Photo taken along the southern wall of TSF Cell 2 in May 2012. This wall will be raised to increase the capacity of Cell 2. Bottom: The level of water in Cell 2 at inspection is still of concern.



Seepage recovery sump between TSF Cell 2 and Surprise Creek, where a frog and macrophytes were observed. This indicates that the seepage water may be fresher than in previous years.



In May 2012, the seepage from the TSF Cell 1 appeared to be fresher than in previous years, as evidenced through the presence of algae and grasses along the drainage line.



Waste rock placed in the Overburden Emplacement Facility (OEF) is potentially acid forming, and is placed strategically within the OEF according to design, to minimise the future potential for environmental damage.



An area of seepage has been flowing from the north eastern toe of the Overburden Emplacement Facility.

### Overburden Emplacement Facility (OEF)

Currently waste rock is being actively placed in the north overburden emplacement facility (OEF). Potentially acid forming (PAF) waste is segregated and stored separately from the non acid forming/acid consuming (NAF/AC) waste, which is used as encapsulation material. The placement of clay is designed to minimise infiltration of rainfall that can transport any oxidation products generated by the placed PAF material that is covered by the clay.

The OEF was inspected as part of the Independent Monitor site inspection in May 2012. Seepage was observed in an area at the north eastern side of the OEF. This seepage was seen to be flowing down a natural drainage line and is being collected in a sump. The origin of the seepage has not yet been determined by MRM. The Independent Monitor has recommended that MRM undertaken investigatory works to assess the origin of the seepage and the likelihood of the seepage becoming acidic in future.



Geotechnical investigation was underway at the Bing Bong dredge spoil walls during the Independent Monitor's May 2012 site inspection.



### Bing Bong dredge spoil ponds

The Bing Bong dredge spoil ponds hold marine sediments that have been dredged from the Bing Bong port shipping channel. Periodic dredging is required to allow passage of the Aburri barge, which transports the zinc/lead/silver concentrate to ships in the Gulf of Carpentaria.

Previous observations made at the Bing Bong dredge spoil resulted in a poor geotechnical rating of the spoil pond walls. Poor geotechnical monitoring was undertaken, and there was no record of actual design for the dredge spoil walls (embankments) or for water management.

Significant improvements at the dredge spoil ponds have been made recently. We note that in-situ geotechnical testing was being carried out during the 2012 site inspection. Pond walls have been reshaped in damaged areas and vegetation is taking hold to stabilise the walls. Also, the surface water management has been addressed to some extent with drainage paths being created from cell to cell.

Overall, the general trend is positive with significant improvement having been made. However, outstanding issues remain such as the poor condition of some dredge spoil pond walls, with very deep erosion observed on the outer embankment slopes in 2012. Also, the storage capacity for further dredge material is questionable and should be assessed by MRM before further dredging occurs. Further, a water management design should be carried out allowing for a water balance model. Lastly, regular monitoring should be included as part of the operations at Bing Bong, particularly during the wet season.

Left: Aerial view of the Bing Bong dredge spoil pond, spoon drain and outer area, which has been affected by saline seepage.



May 2008



May 2009



June 2010



May 2011



May 2012



Seepage flowing from the toe of the OEF is collected in a sump and is pumped to an onsite containment dam - see previous page for details.

### McArthur River Diversion rehabilitation

Rehabilitation and monitoring at McArthur River Mine continues to improve since the first Independent Monitor audit was completed in 2008 (see photos left). In May 2012, the Independent Monitor observed significant improvement to the vegetation community along the McArthur River diversion, particularly along the opposite bank where MRM have dedicated substantial efforts in rehabilitation.

In addition to the water sled irrigation system previously positioned on the mine side bank, a second water sled has been installed on the opposite bank of the diversion. The vegetation has responded positively to this irrigation and the density of plants in the irrigated area has increased noticeably.

Planting of tube stock occurred throughout February/March 2011 along the mine side of the diversion, and October/November 2011 on the opposite bank of the diversion.



Aerial view of the upstream area of the McArthur River diversion taken in May 2012.

Over the past five years, the IM has observed increasing success of revegetation at the upstream end of the McArthur River diversion channel, as seen in the sequential photographs.



Revegetation along Barney Creek diversion, also showing woody debris in the river bed.

We have recommended that MRM focus on achieving a species diversity which more closely resembles the original river channel, including the key species, Freshwater Mangrove *Barringtonia acutangula* and Native Cane Grass *Chionachne cyathopoda*. These species were again almost absent from tube stock planting in the 2011 Operational period.

The Independent Monitor understands the difficulty in cultivating these species and is encouraged by the successful propagation of many *Barringtonia acutangula* from seed in the MRM nursery observed during the site inspection. These individuals will be planted in 2012. A new greenhouse has also been constructed at the MRM plant nursery with the capacity of holding up to 40,000 seedlings.



Revegetation along Barney Creek diversion continues to progress well.

### Barney Creek diversion rehabilitation

The revegetation of the Barney Creek Diversion continues to progress well, exhibiting good vegetation cover with tall *Eucalyptus camaldulensis* observed (over 10 metres tall) and a vegetation community of varying maturities.

MRM have planted an additional 2,959 tube stocks on 9.49 hectares focusing on the lower regions of Barney Creek and the flatter areas at the top of the batter

The Independent Monitor is satisfied that MRM is meeting commitments, though at Barney Creek additional survey could be carried out, and improvements should be made to the survey design of vegetation monitoring to improve the quality of results.

### Flora monitoring

Increased vegetation cover on the Bing Bong dredge spoil was observed during the May 2012 site inspection, although cover in places, particularly in low-lying areas, was still quite sparse. Direct seeding of the dredge spoil ponds occurred during the first half of 2012. Elevated mounds in the spoil ponds have been very successful in allowing grasses to establish and reduce wind erosion and dust. Areas outside of the ponds, close to the spoon drain, were very low in coverage with large areas of salt deposition.

Vegetation dieback outside the spoon drain does not appear to have recovered yet, although improvements have been seen since the addition of the spoon drain, which diverts saline seepage from the spoil ponds out to sea.

Weed control at Bing Bong appears to have been particularly successful with only several *Parkinsonia* individuals observed at the dredge ponds in 2012.

Survey results found that seagrass coverage at Bing Bong Port is continuing to increase. Control sites remain absent from the seagrass monitoring program. Control sites are needed to correctly interpret causes and trends in seagrass distribution.



Area of vegetation dieback outside the Bing Bong dredge spoil ponds, which has previously been affected by saline seepage from the ponds.



Aerial view of the Bing Bong dredge spoil ponds.

### Fauna monitoring

Damage of riparian vegetation by stock has been shown to greatly affect bird abundance and composition, observed near the southern bund and at the diversion inlet inside the cattle exclusion fence area. The opposite was seen in areas where fencing had been damaged by flooding. The White-browed Robin has been recorded a number of times during survey in the undisturbed riparian forests on the lower bank of McArthur River particularly within areas of Freshwater Mangrove.

As results indicate that both the presence of Cane Grass and the structure of cattle exclusion fences play a substantial role in the number of bird species found in an area, the Independent Monitor advises that MRM continue to concentrate efforts of established Cane Grass stands, ensuring fencing is complete and stock are mustered out of the exclusion areas as soon as practical.

While MRM followed the Independent Monitor's recommendation to plant more Cane Grass along the McArthur River diversion for the Purple Crowned Fairy Wren, only a small number were planted. Increasing planting of this species will be beneficial to habitat development for the targeted bird species.

Annual fish monitoring in the McArthur River was carried out during May/June 2011 and October 2011 at 47 sample sites along the McArthur River.



Freshwater crocodile observed in the Water Management Dam during the IM's site inspection in May 2012. The presence of the crocodile and fish provides an indication of the good water quality of this dam.



Cattle and donkeys still pose a problem at the mine site, as they continue to cause erosion and damage tubestock, which is particularly problematic in areas undergoing revegetation.

The vulnerable species, Freshwater Sawfish (*Pristis microdon*) protected under Federal and Territory legislation was captured four times during the May/June survey, upstream of the mine (Eight Mile Waterhole) and downstream of the mine (before and after the Burketown Crossing). A fifth individual was observed free-swimming within the McArthur River diversion channel. During October, one individual was captured above the Burketown crossing. Despite recording elevated levels of sulphate and conductivity, fish abundances in the Surprise Creek and Little Barney Creek were found to be high.

Heavy metal concentrations in oysters and gastropods from the Bing Bong and Sir Edward Pellew Islands sites were found to be below the ANZ Food Standards (2009) Maximum Levels for molluscs. The Independent Monitor is satisfied with the methods used for heavy metal monitoring in biota and the interpretation of the data.



The Independent Monitor team inspecting the Barney Creek diversion in May 2012.



Water tanks have been installed around the Bing Bong concentrate storage shed to capture the first flush of rain water and divert consequent rainfall to sea, rather than to onsite storage



Aerial photograph of the Bing Bong port facility, which now has three surface water runoff ponds to contain contaminated runoff water.

### Surface water monitoring and management

The natural surface water monitoring program monitors 24 locations along the McArthur River and Surprise and Barney Creeks, upstream and downstream of the Mine. Monitoring trigger levels have been set, and any breach of triggers is investigated and mitigated if necessary. The Independent Monitor considers this program to be appropriate, and the MRM have demonstrated improved monitoring, management and reporting this audit period.

With regards to the artificial monitoring points, an additional two locations have been recommended on the northern and eastern sides of the OEF. It is noted that MRM (2012) recommend that these locations (as well as the north-eastern side of the OEF) have sediment dams constructed and that the northern OEF surface water area be included in the natural surface water monitoring program.

The Independent Monitor also considers (based on the May 2012 site inspection) that surface water management at the Bing Bong port facility has been improved significantly from the previous review. This is due primarily to:

- the significant increase in surface water run-off storage capacity through the addition of a third surface water runoff pond;
- construction of the concentrate storage shed water monitoring and discharge system (above left photo); and
- maintenance of the dredge spoil pond perimeter bunding, including a geotechnical testing program using a Cone Penetration Test (CPT) method.



Philip Mulvey of the Independent Monitor team training the Sea Rangers in surface water sampling.



### Dust monitoring and management

Considerable improvements were observed by the Independent Monitor team during the May 2012 site inspection with respect to dust generation at the PACRIM ore crushing area. In general, less concentrate dust was observed overlying the surrounding area, or visibly emanating from the plant than in previous years, which is a positive improvement. This result has been achieved through increasing dust suppression sprays over the PACRIM conveyor system.

As in previous years, the highest zinc and lead dust concentrations correspond to locations near the PACRIM / ROM pad area. This remains unacceptable. The Independent Monitor agrees with MRM's assessment that mitigation measures appear to be having some positive effect in reducing the lead/zinc concentrations particularly at some monitoring locations nearby the PACRIM / ROM pad since 2009.

For Bing Bong Port, it is noted that in general whilst dust levels seem to have decreased, lead and zinc dust concentrations did not. This highlights that although dust has been mitigated effectively, the proportion of mineral concentrate in dust has remained similar and therefore further mitigation needed, such as keeping the concentrate storage shed doors shut. The Independent Monitor observed that the Bing Bong Concentrate Storage shed roller doors still remained open in May 2012, which has been an ongoing concern identified by the Independent Monitor. This audit period, MRM provided documentation to the Independent Monitor as evidence that improvements to the storage shed have been approved, which will allow the doors to remain closed and reduced the potential for dust emissions.

The Independent Monitor inspected a recently-installed real-time air monitoring. Housed in a small shed at the north-western perimeter of TSF Cell 1, this monitoring system has been set up to provide real-time alerts to the Environment team when dust levels exceed criteria. MRM have advised that they are preparing to install a second monitoring shed downwind of the PACRIM crushing area, which has been the primary source of contaminated dust generation.



New real-time air monitoring shed positioned at the upwind perimeter of TSF Cell 1.



Dust suppression at the 'Pacrim' crushing plant has improved this audit period with the addition of sprays along the conveyor system. The IM noted a visual decrease in dust from this plant. Note the wet foreground from water sprays. Note though levels have come down, measured dust levels and lead is similar to previous years.

### Community environmental concerns

During the May 2012 visit, the Independent Monitor talked to a number of local residents in the township of Borroloola to identify any concerns which they may have. Their concerns included:

- low numbers of mudskippers along the coast;
- the effect of the mine on dugongs and sea turtles;
- die back of Mangroves to the west of Bing Bong; and
- the effect of the Aburri taking shelter behind the Sir Edward Pellew Islands during bad weather.

In 2012, the Sea Rangers conducted a survey of mangrove health along the coast and were of the view that any damage present was not due to the effects of the mine but most likely due to storm damage. A Traditional Owner also informed MRM that he had witnessed an increase in dugongs in the McArthur port area in recent times. It has also been reported by traditional owners that turtle fat is again a green colour rather than the black colour that was reportedly observed in stressed turtles around 2005.

The Independent Monitor has asked MRM to comment on the procedure in regard to the Aburri during bad weather. The Independent Monitor is having discussions with government agencies and MRM in regard to low number of mud skippers on the coast.



Although it isn't the role of the Independent Monitor to train members of the community in monitoring, as a response to a request we provided some basic training. Independent Monitor team leader, Philip Mulvey conducted groundwater sampling training with the Sea Rangers at Bing Bong in May 2012.

### Seawater and sediment

The marine monitoring program aims to assess whether activities at the Bing Bong Port facility are having a significant impact on sediments and seawater in the area.

Upon review of the data collected, the Independent Monitor makes the following observations:

- in general, lead and zinc results for both seawater and sediments recorded higher concentrations in the swing basin site as opposed to the control sites, indicating an impact from mining operations. Lead isotope analysis undertaken on sediment at a beach site west of the Bing Bong facility also revealed an MRM ore impact (isotopic lead signature) in lead concentrations;
- lead isotope analysis of suspended sediment at the McArthur River delta and Sir Edward Pellew Islands was again not undertaken by MRM in the 2011 Operational Period. We continue to recommend that this be undertaken and compared with bottom sediments in the delta.
- all seawater results were below the ANZECC/ARMCANZ (2000) threshold for the protection of 95% of the species and generally showed a noticeable decrease when compared to last year's results; and

- all sediment results recorded metal concentrations below the ANZECC/ARMCANZ (2000) ISQG-Low during the 2011 monitoring (one round). Metal concentrations also showed a decrease with respect to previous years.

It is expected that with the further planned improvements regarding the management of fugitive dust emissions from the Bing Bong concentrate storage shed, heavy metal



Aerial view of the Bing Bong swing basin, dredging channel and beach, May 2012.



Groundwater treatment system used to recover diesel product from the impacted groundwater.



Surface expression of seepage from the Northern OEF.

### Groundwater monitoring

MRM conducts groundwater monitoring to:

- monitor the impacts of groundwater abstraction;
- determine the impacts of any contaminants in shallow aquifers;
- assess the effectiveness of TSF seepage control systems; and
- assess potential impact of the establishment of the northern OEF.

The Independent Monitor has provided recommendations to and commended MRM for recent improvements to the groundwater level and quality programs.

MRM have correctly identified the OEF as a potential source of groundwater contamination. The OEF will influence underlying groundwater due to the weight of the facility increasing hydraulic pressure on aquifer pore space, as well as through potential seepage impacts. These occurrences are particularly important to the south of the OEF (potential discharge to Barney Creek), but will be picked up from static water levels over time in monitoring bores, as well as changes in water chemistry in these bores and in Barney Creek.

The Independent Monitor has reviewed documentation relating to the cleanup and management of an incident that resulted in a hydrocarbon spill, and inspected the area where the spill occurred.

Following the spill, 5-10m<sup>3</sup> of diesel-impacted soil was taken to the TSF. Groundwater has been affected by the spill. Impacted groundwater is being pumped to the surface to extract the diesel product (see photo left). This will be followed up next year.

Though, we commend MRM for the level of technical detail in the groundwater data collected and reported, as well as the relatively reasonable nature of the conclusions drawn and recommendations made, further improvements in data interpretation are required. An independent audit of hydrocarbon infrastructure was prepared and is considered appropriate, however the IM has not viewed any documentation stating whether MRM have actioned the recommendations of the audit.

## PROCEDURAL REVIEW OF MRM AND THE DME

### Department of Mines and Energy

The Department of Mines and Energy (DME) (previously the 'Department of Resources') continues to provide the Independent Monitor with thorough administrative procedures, which the DME uses to assess and regulate the environmental aspects of the MRM operation. Based on the documented evidence provided, the Independent Monitor considers the DME's assessment of MRM's annual Management Plans to be thorough and generally appropriate. The Independent Monitor is pleased to note that the DME have increased the frequency of compliance audits undertaken at the Mine this audit period.

Of particular note this audit period, the DME requested that MRM undertake an assessment of the geotechnical stability of the Tailings Storage Facility (TSF) in response to the Independent Monitor's previous concerns regarding the TSF, as well as an audit of hydrocarbon infrastructure across the mine site. The Independent Monitor commends the DME for requesting these audits from MRM.



The Independent Monitor team examine the Tailings Storage Facility realtime dust monitoring in May 2012.

### Assessment of MRM's environmental commitments

As in previous years, MRM have demonstrated a high level of procedural compliance with their commitments made in the 10/11 Mining Management Plan (MMP). However, two noncompliances with their stated commitments were identified this audit period.

The first relates to the commitment that MRM would have 'No environmental fines, penalties or prosecutions' over the monitoring period. However, one prosecution has commenced relating to a hydrocarbon spill at the mine site (please note, the outcome of the prosecution process is yet to be concluded).

The second non-compliance relates to the method of deposition of tailings in the TSF. MRM made the commitment that "tailings will be deposited sub-aerially in thin layers to maximise the density of the tailings beach against the embankment, providing a low permeability beach of tailings between the decant water pond and the perimeter embankment", however, in 2011, the IM noted that tailings were being deposited aqueously (into water), rather than sub aerial deposition. It is noted that MRM states that subsequent depositions does not appear to be impacting consolidation and final density of the tailings.



Members of the Independent Monitor team inspect the Tailings Storage Dam in May 2012.



Aqueous deposition of tailings in TSF Cell2 observed by the IM during the May 2011 site inspection.

## Conclusions

MRM have continually shown a willingness to address many of the issues identified by the Independent Monitor over the past five years, and many improvements have been made to increase environmental performance. However, significant works are still required to mitigate the potential environmental risks.

We note that in late 2011, MRM submitted an Environmental Impact Statement (EIS) to the NT Government proposing the 'Phase 3' expansion of the mine. At the time of this report, the Phase 3 EIS was undergoing ministerial review. The \$270 million expansion is expected to increase the mine's production to 2036. Although the Phase 3 expansion is outside the scope of this audit period, the potential expansion of the operation is important to bear in mind when considering the environmental outcomes of this audit.

## PROPOSED PROGRAM FOR 2013

Late May – June 2013:

Independent Monitor's annual inspection of the McArthur River Mine, and Community visit.

October 2013:

Delivery of the Independent Monitor's Audit Report to the Minister for the 2012 Operational Period.

November 2013:

Presentation of the findings of the Audit report to the Borroloola Community.

Environmental Earth Sciences has been acting as the Independent Monitor for the past five years. As the five-year contract has come to an end, we note that the Independent Monitor may consist of a different team as of 2013. As such, the above timetable is only anticipatory.

## FURTHER INFORMATION

Please visit our website to access the complete Independent Monitor's Audit Report for this year and previous years.

[www.mrm-independentmonitor.com.au](http://www.mrm-independentmonitor.com.au)

If you would like to contact the Independent Monitor about an environmental issue related to the McArthur River Mine, please contact:

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