3

3. Common Stakeholder Responses

3 Common Stakeholder Comments

This section provides a summary of the common stakeholder submission comments received on the environmental impact statement (EIS) during the public exhibition period of the Draft EIS. The following project aspects have also been individually addressed as required, as part of McArthur River Mining's responses to specific stakeholder submission comments (refer to **Supplementary EIS Section 7 – Draft EIS Stakeholder Submission Comments and MRM Responses**).

The most common stakeholder comments were associated with the following:

- The environmental performance of McArthur River Mine (MRM).
- An overly complex description of the Overburden Management Project (OMP).
- Project verses no project analysis, and particularly the environmental impacts of each.
- Further detail on the MRM Adaptive Management process.
- Further clarification on the final void closure process.
- Further assessment of the open cut backfill options.
- Further detail on the viability of tailings reprocessing.
- Assessing alternative scenarios.
- Future Waste Discharge Licence (WDL) environmental compliance requirements.
- Managing and minimising downstream environmental impacts.
- Project closure funding.
- Clarifying the MRM policy on creation of local jobs and career development opportunities.

3.1 MRM Environmental Performance

A number of submission comments have questioned McArthur River Mining's ability to manage the proposed project risks, based on past performance.

McArthur River Mining has undertaken this OMP environmental assessment in accordance with industry leading practice, which has included the adoption of a comprehensive risk-based approach over a three year period. It was completed in consultation with project stakeholders and focused on the identification, evaluation, monitoring and management of environmental hazards.

With 20 years of operating experience, McArthur River Mining has significantly improved its understanding of the overburden material properties and potential environmental impacts of the project on the surrounding environment and local community. Many of the new management measures presented in the Draft EIS constitute industry-leading practice and are based on rigorous scientific investigations, early planning and extensive monitoring. This management approach is driven by the closure objectives, and focusses on managing and mitigating key long-term environmental risks from the outset, as part of the project design and operational phases. This approach reduces the reliance on the post-mining phase to address potential long-term environmental risks.

McArthur River Mining participates in the Independent Monitor (IM) Program, an independent and publically available annual review of the operation's environmental performance and regulatory environment. The latest IM report has noted considerable improvement in a number of areas of the operation, including:

- Completion of geochemical testing and investigations that have resulted in a comprehensive dataset using an appropriate suite of static and kinetic tests, so that the geochemical properties of overburden and tailings materials at the mine are well understood.
- Development of updated conceptual geological and hydrogeological models for the mine site, based on extensive field investigations. This is considered by the IM to be a significant step forward in understanding the groundwater system across the site.

McArthur River Mining will continue to address areas identified for improvement.

Supplementary EIS Section 3.1.1 and **Supplementary EIS Section 3.1.2** below provide further details on MRM's environmental performance, and commitments to future environmental stewardship.

3.1.1 History of the McArthur River Mine

The Project has had several phases of development since initial production in 1995. This section seeks to guide the reader through these key development phases and its environmental performance over that period.

3.1.1.1 The Current Status (as at Q4 2017)

A plan of the current site can be seen in **Supplementary EIS Section 6 – Simplified Project Description**. Operations are progressing at a reduced rate. Each domain (as defined in **Draft EIS Section 3.4.1**) is presented below, with the key environmental performance elements discussed.

3.1.1.1.1 Open Cut Domain

The open cut has progressed down to a depth of approximately 175 m, with ore being mined from Stage I Mini, overburden stripping in Stage I Major, and some alluvials development in the shallow benches of Stage J. The boundary of Stage J is similar to the planned final open cut crest from Phase 2. The open cut has potentially acid-forming (reactive) (PAF(RE)) material being mined in the I Major benches, with instances of spontaneous combustion being managed successfully by temperature measurement, campaigned blasting and mining, and remediation where required. The open cut is being actively dewatered, so it is a groundwater sink for both deeper sources and shallow palaeochannels. Extracted water is being stored in the North Overburden Emplacement Facility (NOEF) perimeter runoff dams (PRODs), and treated mine water is stored in the Tailings Storage Facility (TSF) Cell 3 Water Management Dam (WMD). A new 6 megalitre per day (ML/day) water treatment plant is due to come online shortly.

The South Overburden Emplacement Facility (SOEF) and West Overburden Emplacement Facility (WOEF) store overburden within the Mine Levee Wall, but are no longer active overburden emplacement facilities (OEFs). The SOEF is overwhelmingly metalliferous saline non-acid forming (MS-NAF) rock on a foundation of clayey alluvial material, while the WOEF has a clay-encapsulated potentially acid forming (PAF) core surrounded by non-acid forming (NAF) material (**Supplementary EIS Figure 3-1**). Both OEFs utilise local drains and sumps to manage surface runoff in the contaminated water system, while seepage reports to the open cut contaminated dewatering system. The WOEF is now used as the run-of-mine (ROM) pad for temporary ore storage, and for some mining office and workshop facilities. The OEFs are physically stable, with no active slips. Dust from these areas is managed by combinations of caps, water carts and restricted traffic.

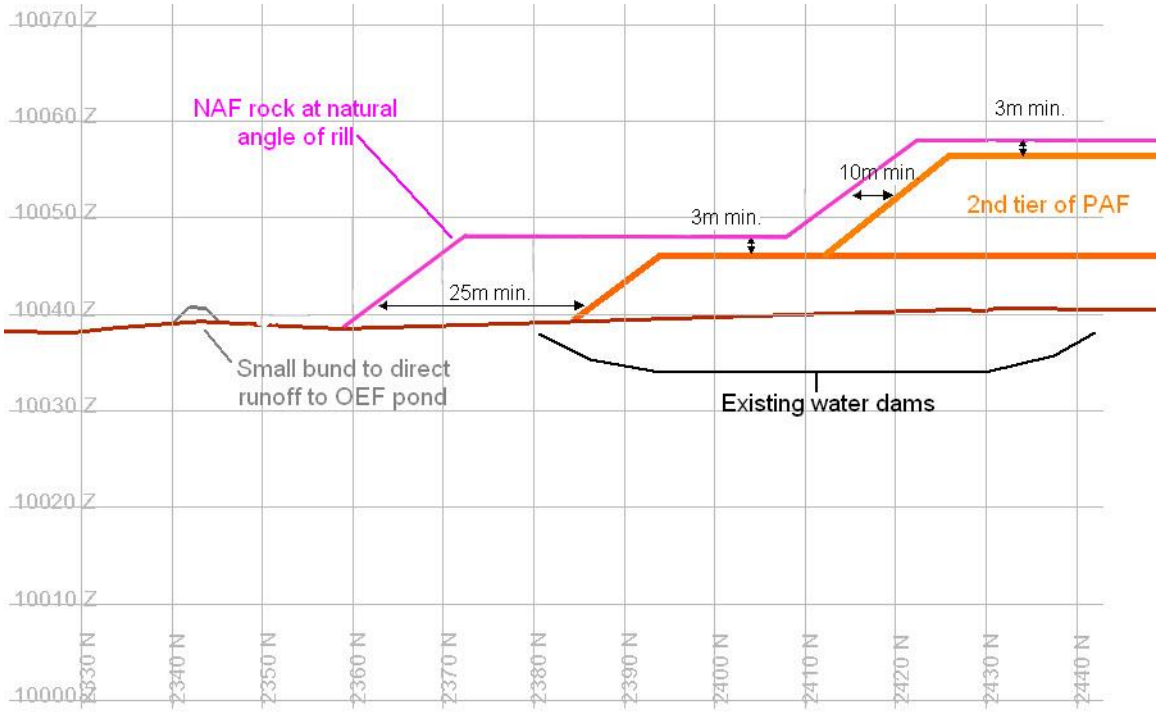

Figure 3-1 Schematic Cross-section through the WOEF Design

Management of the processing area incorporates the application of site specific engineering controls to manage dust emissions. These controls include the installation of hoods and water spray nozzles over crushers and conveyor transfer points. The concentrate shed has had upgrades to the dust extraction system and sealing doors.

The diesel fuel system has an upgraded management system to monitor for leaks and to track usage. The changehouse and wheel wash have also been upgraded in the last few years to improve effectiveness and health and safety.

Rehabilitation is continuing in the McArthur River Diversion Channel and Barney Creek Diversion Channel. The program of installing large woody debris (LWD) is proving to be successful (refer to **Supplementary EIS Figure 3-2**), with increased species diversity and abundance being observed at levels of both upstream and downstream monitoring sites. The IM Environmental Performance Annual Report 2016 (published in October 2017) has noted MRM improvement in this area; acknowledging:

> *"Placement of a substantial amount of LWD into the downstream end of the McArthur River diversion channel. Large woody debris is essential for the rehabilitation of the diversion channel as it provides important refuge habitat for fish species, helps to slow flow rates and acts as a sediment trap providing substrate for vegetation to grow in."*

The IM has also acknowledged that monitoring activities are well documented with the creation of maps indicating where LWD timber has been placed and dumped. LWD placement is planned to be ongoing, with systematic planning conducted to source LWD timber for the next 10 years. In addition, there are plans to create a permanent access ramp into the 'gorge' section of the diversion channel to allow placement in currently inaccessible areas. The IM has stated that:

> *"this is a significant improvement to the LWD placement program."*

Figure 3-2 Placement of Large Woody Debris in the McArthur River Diversion Channel (Dry Season)

3.1.1.1.2 The NOEF Domain

Significant remediation effort has been invested in the NOEF over the last three years. The program of flattening off the batters, and application of wet season caps and alluvial advection barriers, then building a MS-NAF halo around the PAF cell, has removed the surface spontaneous combustion (**Supplementary EIS Figure 3-3**). The temperature and gas probes indicate that the interior of the PAF cell where the early remediation work was completed is cooling (refer to **Supplementary EIS Appendix F – NOEF Temperature Update**). Water monitoring bores through the NOEF show there is no groundwater mound inside or under the NOEF PAF cell.

The Central West (CW) stage has been brought online to receive non-benign materials. The construction of compacted clay layers (CCLs) reliably with minimal rework to the required specifications was a highlight for the 2017 civils program. CCLs were completed on the base, up the batters, and in the west perimeter runoff dam (WPROD).

This enabled the new PAF cell area to be commissioned. Fresh PAF(RE) that has been mined and placed in the CW stage is performing as expected, with no smoke and limited sulphur dioxide generation. This previously approved stage is being constructed as per the proposed OMP EIS PAF(RE) cells, with two metre tipheads being progressively dozed for compaction, before each lift is capped in fine-grained alluvial advection barriers (**Supplementary EIS Figure 3-4**)

Figure 3-3 NOEF Viewed from the Northwest above WPROD in Q3 2017

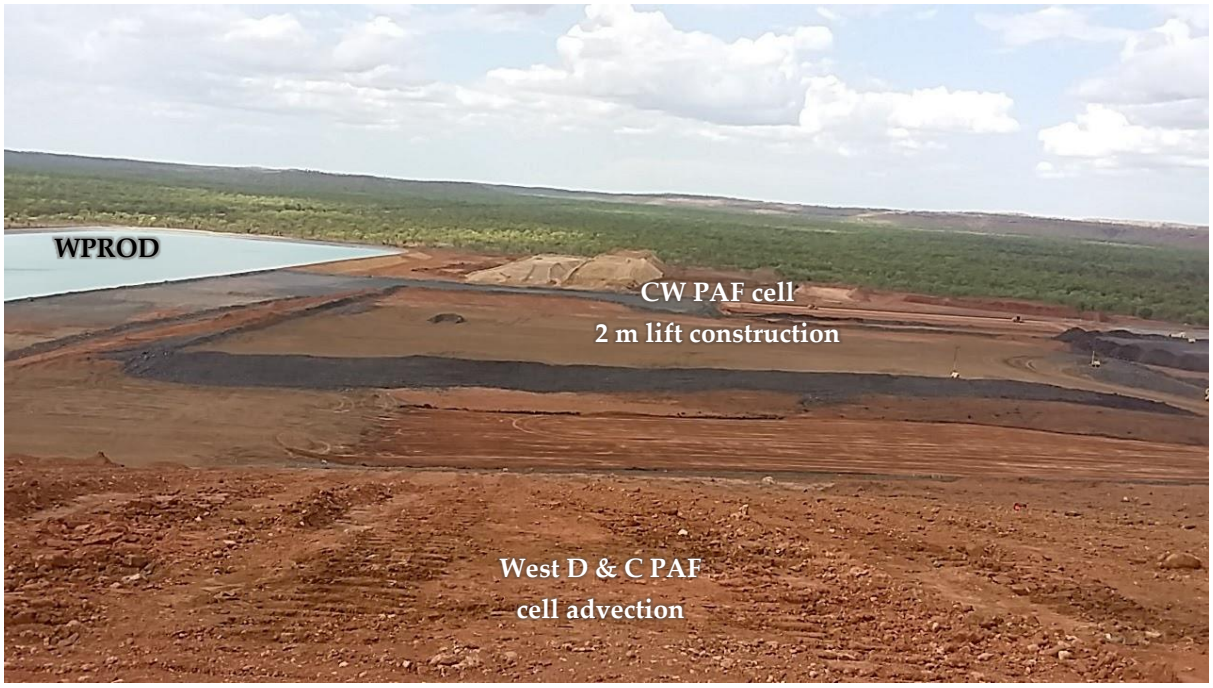

Figure 3-4 View of CW Core with PAF(RE) Being Managed

Drainage around the NOEF is being improved at present with surface drains off the PAF cell being constructed to direct runoff safely into the PRODs. The high-density polyethylene (HDPE) lined WPROD has been commissioned to service the CW stage, while the south perimeter runoff dam (SPROD) and the southeast perimeter runoff dam (SEPROD) continue to service the West and Southeast stages.

Circumneutral toe seepage (as a result of rainfall infiltration on the NOEF) with high sulphate and zinc values is collected from the original creek beds underlying the NOEF, confirming that the natural in-situ clays act as a low permeability foundation. The seepage is collected and pumped into the PRODs. Additional groundwater monitoring bores were installed through 2017 at the direction of the NOEF Independent Review Board (NIRB). This group of experts was directed by the Department of Primary Industry and Resources (DPIR) to review the NOEF for actual historic or potential future environmental harm. Following their review, the NIRB reported:

> *"Preliminary groundwater monitoring from the base on the NOEF (primarily from 2016) indicates that the NAF foundation of the NOEF remains unsaturated, above the water table, in most of the areas monitored. Cores and the monitoring bore completed above the CCL in the PAF disposal section of the NOEF were also unsaturated. This further supports the conclusion that current effects identified in groundwater to the south of the NOEF are related to the former operation of the SPROD and SPSD* [south perimeter sediment dam] *rather than from seepage from the base of the NOEF."*

The NIRB determined that seepage mitigation was not required, and that continuation of groundwater monitoring was sufficient to manage the risk at this stage.

The DPIR and MRM will be tracking groundwater quality records to monitor and manage the quality and movement of any plumes around the NOEF. Sulphate remains the current contaminant of concern.

The construction of flood barriers to the 100 year annual recurrence interval (ARI) commenced during 2017. Sections from the west of SEPROD to the south of the hardstand were completed, and from the hardstand to the eastern end of SPROD were commenced. Once the approved NOEF outline is determined, the eastern and northern sides will be constructed.

The sulphur dioxide monitoring at Devils Spring and Borroloola continued to show no readings. Therefore, with the approval of the NT EPA the monitoring location was changed to a location just north of the NOEF on the perimeter fence line. This monitoring station has been positioned in its current location as part of the site's air quality management plan, and is used to monitor air quality across the lease in the direction of MRM's nearest sensitive receptor at Devils Spring.

The revised water and sediment management practices around the Barney Creek bridges have improved water and sediment quality in SW19 in successive years since 2013. The established fish metal monitoring program detected elevated lead concentrations in some fish directly underneath the bridge in 2012. In response, there have been modifications to the bridge drains, sediment sumps and roads to reduce loads reporting to the creek. Since the dry season of 2017, a new sump called the MIA sump receives most road runoff (refer to **Supplementary EIS Figure 3-5**). The capacity of the Barney Creek sumps has also been increased whilst servicing smaller catchments (refer to **Supplementary EIS Figure 3-6**).

Figure 3-5 New HDPE-lined MIA Sump

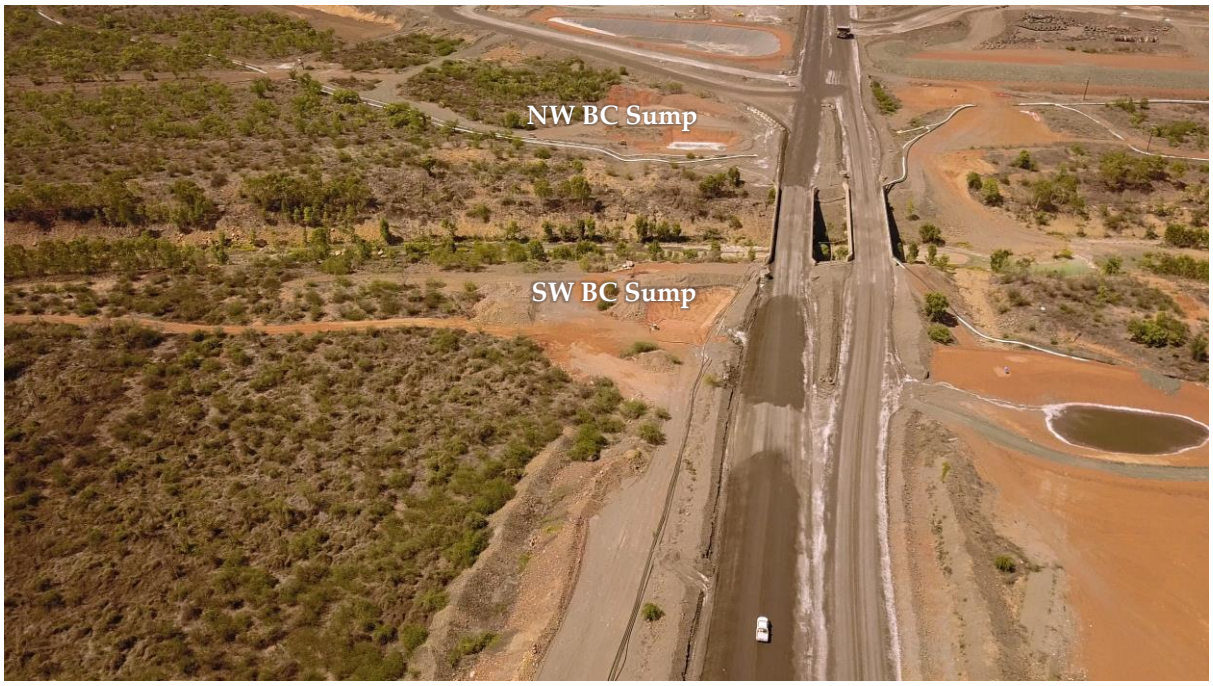

Figure 3-6 New Barney Creek Sumps

Lead has been previously reported to be entering sediments at SW19, primarily via surface runoff from the haul road and, to a lesser extent, from haul road traffic generated dust (Indo-Pacific Environmental 2013, 2014, 2015). Whilst elevated lead concentrations were recorded in some of the fauna collected from SW19, these remained within relevant limits. During 2016 the concentrations in *Nematalosa erebi* (Bony Bream) continued to decrease in response to improved sediment and water management.

During the 2016 late dry season monitoring period, no samples (muscle or liver) taken from the monitoring sites were found to have a lead concentration exceeding the 0.5 milligrams per kilogram (mg/kg) MPC (Maximum Permitted Concentration) for fish or 2 mg/kg in the case of molluscs.

IPE (2016a) concluded that the results of the early dry season survey indicated a very low risk to human health, as metal concentrations in samples of commonly consumed species collected downstream of MRM generally showed no exceedances of relevant MPCs, or were considered to be within historic norms.

The focus on fence maintenance and removal of domestic and feral animals from inside the operations area has continued through 2017. As described in the Cattle Management Plan, cattle mustering has taken place approximately every six weeks during the dry season to ensure that the site is maintained to a cattle-proof standard in critical areas. Cattle mustering has and will continue to be undertaken in consultation with DPIR and McArthur River Station. During the next reporting period, the fenced cattle exclusion area will be expanded. In addition to excluding cattle from potentially lead impacted areas with the expansion of the NOEF, this expanded area will enable the creation of new high quality habitat for a number of fauna species including riparian birds.

Overall, significant advances in understanding the mechanisms for potential harm from the NOEF have been made, mitigation strategies determined and executed where required. The water management systems and mitigation strategies have restricted impacts to local on-lease areas. A number of specialists engaged by both MRM and regulators (e.g. NIRB, IM and EIS technical consultants and peer reviewers) have reviewed the NOEF and its surrounds, and whilst environmental hazards and risks have been identified, actual environmental harm has been limited in both extent and degree. The NOEF risks are well understood and MRM believes that the plans as presented in the Draft EIS and Supplementary EIS will manage the landform appropriately over its life.

3.1.1.1.3 TSF Domain

The performance and risk profile of the TSF has been subject to specialist reviews, extensive data collection, detailed modelling and design, operational discipline and strict regulation. MRM are confident that the TSF can be operated and closed in a responsible manner.

The adjacent Barney Creek and Surprise Creek are ephemeral with the vast majority of biota occupation occurring during relatively short wet season flow periods when the creeks allow recruitment from the main channel of the McArthur River. These flows generally cease by late April. In areas along Surprise Creek in close proximity to the TSF where permanent water holes do remain throughout the year, these are heavily vegetated to the water's edge and have been found to support diverse and abundant fish fauna year round.

The active tailings cell during 2017 was Cell 2. The focus on strict operating controls saw the continuation of moist but not saturated tailings beaches, with evenly distributed deposition and a small centralised decant pond (**Supplementary EIS Figure 3-7**). Checks on the tailings density showed that the achieved in-situ density has increased to 1.8 tonnes per cubic metre (t/m^3) compared to the conservatively planned 1.7 t/m^3. This means the tailings will be stronger and have a lower permeability than modelled, further reducing the risks to the facility.

A raise of the embankment by one metre was completed during the dry season of 2017. This utilised clay and rock won from borrow pits to the west and south of the TSF, which are above the groundwater level.

Significant hydrogeological investigations conducted through 2016 and 2017 have assisted in understanding the mechanisms influencing seepage and groundwater movements in the TSF area. Seepage from the TSF was monitored and collected as part of management of waters from Barney Creek as required, to protect water quality in the downstream environment. Plans were progressed for a seepage interception trench between Cell 1 and Surprise Creek – the trench has been designed deeper to increase the effectiveness, based on the drilling and pump testing data. The trench will be constructed in 2018.

A revised LOM plan for the TSF was presented to the Independent Tailings Review Board (ITRB) in 2016, and refined with their guidance in 2017. The ITRB has endorsed this plan to the DPIR, and formal approval has been sought to combine Cells 1 and 2.

Figure 3-7 TSF as of June 2017 Showing Dry Large Tailings Beaches and Small Central Decant Pond

3.1.1.2 Phase 1 – The Early Years of MRM

MRM development and operations commenced following submission of an EIS for an underground mine and processing plant at the deposit, concentrate transport, and concentrate storage and loading facility at Bing Bong in the Gulf of Carpentaria. The project was approved in 1993.

Underground operations commenced in 1994, with mining commencing in to the west of the deposit, in dolomitic sediments. This material was used to build pads for infrastructure to the west of the deposit. Once the infrastructure was established, mining for extraction of the orebodies began in 1995. Early mining did not require the removal of significant overburden, as it was generally retained underground in mined-out workings.

The operations produced up to 1.8 million tonnes per annum (Mtpa) of high grade ore. The ore was crushed underground and conveyed to the surface, and processed through the plant constructed on top of Barney Hill, above the 100 year flood level.

Concentrates were trucked to Bing Bong Loading Facility (BBLF) using contractor road trains. Carpentaria Shipping Services (CSS) were contracted to run the Aburri, the concentrate transfer barge based at Bing Bong. CSS is currently a joint venture between P&O Shipping, Mawurli and Wirriwangkuma Aboriginal Association (MAWA) (a local indigenous enterprise) and IBA (Indigenous Business Australia), a federal government agency.

The tailings were deposited in Cell 1, located to the west of the operation on higher ground. TSF Cell 1 was constructed in 1995 and was initially a 2-3 m high perimeter bund designed to retain tailings and liquid, based on a central thickened discharge system. Tailings deposition was cycled around individual small cells.

3.1.1.3 Phase 2 – Conversion to Open Cut Mining

3.1.1.3.1 2001-2004 and 2005-2008

Studies into the conversion to open cut mining methods commenced in 2001. Open cut mining would enable higher mining of all orebodies, not just the high grade ones. Mining rates are also higher, so the switch could be coupled with an expansion of processing capacity from 1.8 Mtpa.

Open cut mining would require several major changes including: diversion of the McArthur River and Barney Creek around the economic portion of the deposit, with construction of a significant Mine Levee Wall around the future mining area; development of an open cut, which generates large quantities of overburden to be moved to uncover the ore; OEFs to store the mined overburden; and the expanded processing operations which would require a larger TSF to store tailings.

Various feasibility studies were completed between 2001 and 2004. As part of this process, a large amount of drilling was completed to gather over 4000 overburden samples for an overburden classification study. The geochemistry of overburden was based on Net Acid Producing Potential (NAPP) and Net Acid Generating pH (NAGpH) to place samples into one of three 3 classes –NAF, PAF and Uncertain (UC). This classification conformed to Australian and international standards at the time. The geological block model showed that the vast majority of the deposit (around 86%) was NAF. Tailings would continue to be PAF.

This open cut was to be approximately 200 m deep (compared to the full deposit depth of 420 m) – so only about half of the main deposit would be taken. However, the infrastructure was planned so any future expansion of the open cut would be possible without moving mine levee walls and diversions.

During 2006-07, tailings deposition transitioned from Cell 1 to Cell 2. Cell 2 was set up with a clay core embankment, with perimeter tailings spigoting and a water decant near the western embankment.

A series of temporary clay core levees around the operations area were used to isolate the early open cut and WOEF up to the 100 year flood level. With the approvals granted, the main works on river and creek diversions and Mine Levee Wall began in the dry season of 2007, and were completed during the 2008 dry season. This provided flood immunity for the open cut and WOEF to over the 500 year flood level and as such the 2008/09 wet season saw the McArthur River Diversion Channel flow for the first time around the Mine Levee Wall.

As part of the final approvals, an Independent Monitor group was required to assess the environmental performance of the project, reporting to the NT Government each year, along with other additional environmental conditions.

The processing rate was increased from 1.8 Mtpa to 2.5 Mtpa through these early years. Along with the increased processing rates, the operations saw increased trucking of concentrate to the BBLF and increased barge trips by the Aburri.

In 2006 to 2007 a geopolymer groundwater barrier was installed in several locations on the northern and western side of TSF Cell 1 to act like a grout curtain, with recovery bores placed along sections of its perimeter in line with Surprise Creek. Focus was then placed on additional studies and investigation of the area in order to inform future decisions. During this time several drill programs were undertaken along with Electromagnetic Surveys and attenuation investigations. Interim capping was also conducted on Cell 1 of the TSF between 2009 and 2010, with 500mm of clay being placed over its surface.

Projects funded by the Community Benefits Trust (CBT) between these years included 16 grants valued at $1.5M.

3.1.1.3.2 2009-2012

3.1.1.3.2.1 Operations

The NOEF was prepared for construction towards the end of 2008. SPROD was constructed in 2008, as a clay core dam and base. The preparation of the foundation of the NOEF involved stripping vegetation and topsoil, but leaving the natural clayey foundation intact. Placement of overburden in the NOEF commenced in 2009 in accordance with the approved URS 2008 design, with a NAF wedge built to above the level of SPROD, and then a clay liner over the wedge to direct runoff from the PAF cell into the dam.

The NOEF West PAF cell was designed to be built in 15 m high lifts and was tipped in lifts from 5-15 m high. NAF and PAF identification was based upon visual mark-up of in-pit lithostratigraphic boundaries by the geologists. As of 2015, the NOEF West PAF cell contained in the order of 57% NAF.

With the diversions completed and the Mine Levee Wall fully closed (protecting the operations from outside surface water and river flows), the open cut was expanded to the south into Stage D. The alluvials overburden from this stage was used to start the SOEF inside the Mine Levee Wall, with the top shaped to direct clean runoff into the old creeks to the east of the mining operations area.

Supplementary EIS Figure 3-8 shows the status of the NOEF in late 2011.

Supplementary EIS Figure 3-9 shows the status of the MRM site in mid-2012.

An expansion of the open cut to the east moved into what was called Stage F. From 2012, a new rock type called Black Bituminous Shale (BbH) was mined for the first time. This unit is characterised by variable but generally high pyrite grades, and what is now known to be carbonaceous material. The BbH material, which was correctly identified as PAF, was tipped in predominantly 15-18 m tipheads in the PAF cell.

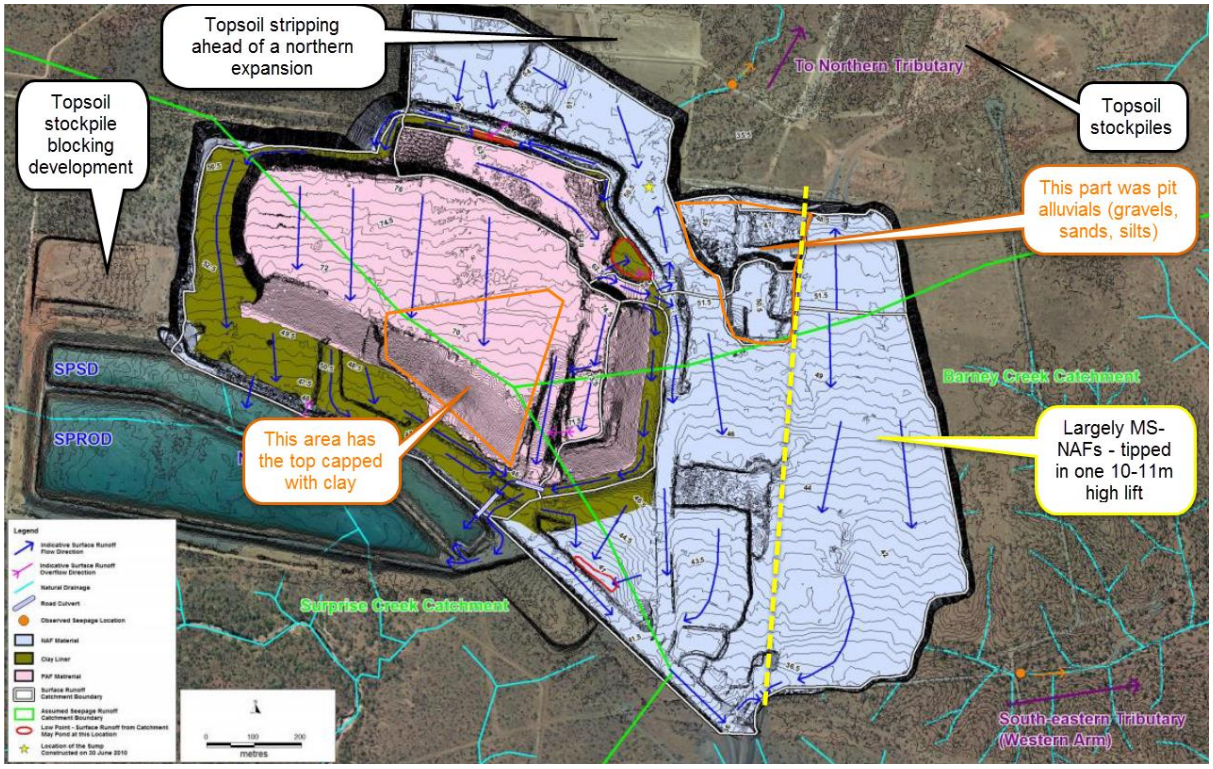

Figure 3-8 NOEF in Late 2011

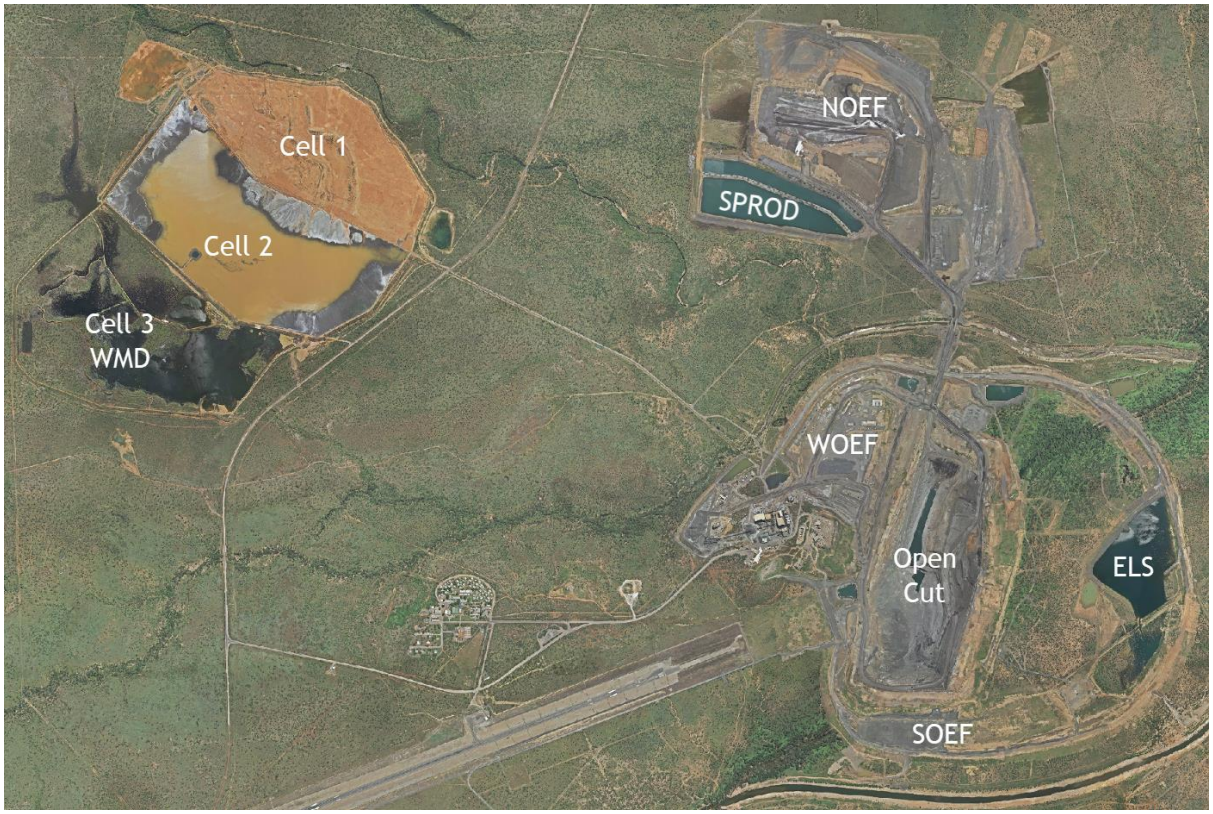

Figure 3-9 Site in Mid-2012

3.1.1.3.2.2 Phase 3 Studies

Investigations into expanding the processing production rates further to 5 Mtpa were undertaken in 2011 and 2012. A feasibility study was commenced, looking into all elements of the project including the processing plant, expanded overburden storage requirements, open cut stability, water management and supporting infrastructure.

An extensive program of overburden characterisation drilling was completed in 2012 as part of the Phase 3 EIS. Geochemical testing commenced and kinetic testing was conducted on various samples for a period of several years in both field and lab conditions. The more rapid static testing results were compiled and the geological block model updated. The proportion of PAF indicated in the LOM model increased to approximately 34% of the total overburden to be mined.

The Phase 3 Project included an expanded NOEF at 80 m maximum height, and an EOEF and SOEF comprised of NAF material extending outside the Mine Levee Wall towards the diversions. The TSF would require expansion to include a Cell 3 and 4, with both these cells used to manage excess water until being required for tailings storage later in the project life.

The Phase 3 Project was approved in 2012 with conditions, and the associated Mining Management Plan (MMP) was completed in early 2013. One condition was to continue with the updated geochemical analysis of the overburden. TSF Cell 4 was not approved due to more information being required to assess its potential impact.

3.1.1.4 Transition to Phase 3

The Phase 3 Expansion works (primarily geochemical investigations, plant expansion and WOEF ROM pad establishment) were completed through 2013 and 2014.

At the NOEF, SEPROD was being constructed to service a NAF expansion of the NOEF on the east side. The NOEF West PAF cell was also preparing to expand to West D.

During 2013, the geochemistry results and analysis committed to as part of Phase 3 became available, with the non-benign nature of a large proportion of the NAF becoming evident. In recognition that the NAF was indicating to be non-benign, MRM proactively chose to remove sandy patches of foundation from the West D footprint, and replace them with compacted clay, to reduce the risk of poor quality seepage escaping the controlled operations area. Additionally, a clay core levee was constructed around the stage to separate the base from clean external waters.

In late 2013, as part of the annual MMP process, a revised overburden classification was proposed, where NAF was divided into benign and non-benign types. This MMP was referred to the NT EPA in 2014. This led to the start of the OMP EIS. Marking up and management of overburden began using the revised classification system in 2014.

3.1.2 Future Environmental Stewardship

McArthur River Mining's commitment to managing the environmental impacts of its future activities, both during project operations and closure phases, has been clearly described throughout various sections of the Draft EIS. McArthur River Mining has established the necessary policies, processes, procedures and resourcing in order to fulfil commitments made in the OMP EIS, including commitments to external review and ongoing open and transparent decision making. The following sections provide a summary on aspects of MRM organisation.

3.1.2.1 Changes to Organisational Structure

Since 2014 the number of operational people employed on site, and their specialist skill levels, has changed significantly and reflects changes in the business that are primarily based around risk. Both MRM's Technical Services team and Environment team have doubled in size over the past three years, with 31 Technical Services personnel and 23 Environment personnel currently employed on site.

3.1.2.2 New Processes and the Fundamental Changes

3.1.2.2.1 Overview

The establishment of new processes and procedures, in combination with MRM's resourcing efforts have been acknowledged by the IM in its latest report, whereby it made the following statements:

> *"McArthur River Mining continues to devote considerable effort to water management at both the mine site and Bing Bong Loading Facility. Surface water quality monitoring data up to October 2016 indicates that adverse impacts on downstream surface waters due to the mine are limited, although some effects are noticeable in watercourses within the mine lease boundaries (and this is not unexpected) and some non-compliance with WDL SSTVs* [site specific trigger values] *at SW11 due to mine activities has occurred (but to a lesser extent than was noted in last year's IM report). Monitoring data suggests that adverse impacts on coastal waters near Bing Bong Loading Facility similarly remain limited."*

> *"As with previous years, considerable efforts have been carried out by MRM in regards to site geochemistry issues since the last IM report, greatly improving the understanding of AMD potential of mine materials and long-term risks, and better defining management options to mitigate current mining impacts, and future impacts during operations and closure".*

Over time MRM has made major environmental improvements on site as a result of both regulation and forward planning. Due to the large array of environments that MRM operates in, the level of monitoring conducted could be classified as one of the most substantial regimes implemented for a mine site in regards to the number of sites monitored, frequency of monitoring, and conditions and potential impacts monitored.

3.1.2.2.2 Focusing on Closure during Operations

McArthur River Mining now has a much improved understanding of its closure phase. It was evident in the early stages of this OMP EIS process that even though a closure plan is quite different to an EIS, it plays an integral part in the design and strategies to be implemented for individual domains around site including the NOEF. Historically, the mining industry has largely considered closure as an issue to be managed at the end of a mine life. MRM has chosen a different, best practice approach with closure being articulated and planned for now so it can be included in the construction and implementation phases. By having key closure objectives that have been developed in consultation with stakeholders, MRM believes it will make for a successful operation and provide for positive environmental outcomes. MRM is committed to the long-term management of the site from closure through to the proactive and reactive monitoring stages well after operations have completed.

3.1.2.2.3 Material Characterisation

The geochemical understanding, prediction and identification of overburden at MRM has evolved significantly over the last five years, driven by advances in geochemical sampling and testing, evolving industry practice, stakeholder expectations and changing regulatory frameworks. The current criteria for segregating overburden types are based on site specific values and take into consideration the specific geology and geochemistry of the MRM overburden, as well as the sensitivity of potential receptors and closure objectives. This approach is considered best practice by international guidelines.

3.1.2.2.4 NOEF Construction Methodology

The construction methodology for the NOEF now follows leading industry practice in the management of potentially environmentally deleterious material including:

- Segregation of PAF(RE) and encapsulation in dedicated reactive PAF cells involving preferential dry season mining, low lift construction, wet season covers and regular low air permeability barriers.
- Regular placement of low air permeability barriers to limit air ingress into the stockpile during the construction phase, prior to the placement of the final cover system.
- Internal temperature monitoring of the NOEF PAF cell. Presently there are over 140 temperature sensors and 115 gas sensors within the existing NOEF structure, ranging from 1 m to 40 m below the surface. Monitoring results to date indicate that the higher temperature bores have decreased in temperature, with no increases in temperature for the cooler bores. This indicates that current rehabilitation techniques, including the use of the advection barriers, is working as intended.
- Very low permeability barriers as source control for limiting NOEF seepage. A geosynthetic liner (GSL) will be integrated into the NOEF cover system, which is anticipated to result in a net perculation rate of approximately 1% of rainfall. This is leading industry practice.

3.1.2.2.5 TSF Reprocessing and In-pit Disposal

Historically, the TSF closure plan involved a conventional method of closure, which included retaining the tailings in-situ with the installation of an overlying cover system. This design meant that ongoing maintenance and monitoring would be required for an additional domain to the NOEF and hence the potential for both ongoing costs for seepage management and monitoring.

The project description has incorporated the reprocessing of tailings through the mill, with the waste stream being deposited in the open cut final void prior to rapid filling with water. This will be conducted via hydraulic mining and will allow operations to occur for an additional ten years after mining ceases. This additional ten years of operation will provide ongoing employment for the local community and other direct and indirect benefits. With the removal of tailings from their current location it allows for the complete rehabilitation of the TSF footprint area and hence a return to its prior use of pastoralism.

The reprocessing of tailings and placement of the waste stream within the open cut has been considered by all stakeholders as a positive approach. It has also been endorsed by the IM.

3.1.2.3 Ongoing Resourcing

As mentioned above, MRM senior management have committed to the ongoing management of the site after cessation of operations (i.e. during the closure phase). There is also a clear acknowledgement by senior management that ongoing resourcing will be required, and this has been detailed in such sections as **Draft EIS Section 12 – Socio-economic Environment** and **Draft EIS Appendix Z – Economic Impact Assessment Report**). In addition, MRM has committed to supporting local employment opportunities; both through the creation of new jobs and upskilling of personnel (refer to **Supplementary EIS Section 3.12** for further details).

3.1.2.4 Community Engagement

McArthur River Mining has a long (approximately 20 year) history of actively engaging with the local community and other relevant stakeholders and has developed long term, mutually respectful working relationships with numerous individuals, organisations and communities. McArthur River Mining appreciates that its "social license to operate" is just as important as its legal obligations under Northern Territory and Federal law. Therefore, MRM will continue to enage with all relevant stakeholders across all site issues, risks and management approaches. McArthur River Mining's vision for the site during the closure phase is to maintain community involvement in the management of the site.

3.1.2.5 Continued Commitment to External Review via Third-party Reviewers

MRM operations have been subject to ongoing external review from a number of third parties including the:

- ITRB; and
- IM, which conducts annual reviews of MRM's environmental performance and develops publicly available annual IM Reports.

These above parties, as well as other regulatory agencies all report on MRM performance on site, and provide a series of recommendations, which McArthur River Mining has progressively implemented.

McArthur River Mining commits to its continuing cooperation with these parties as part of its continuous improvement philosophy and Adaptive Management approach.

3.2 Overly Complex Project Description

Draft EIS Chapter 3 – Project Description and Justification provided a detailed description of the proposed OMP. Stakeholder feedback indicated that the Draft EIS project description was complex and MRM has subsequently developed an abbreviated, simplified project description, which is included as **Supplementary EIS Section 6 – Simplified Project Description**.

3.3 "Project" versus "No Project" Analysis

Immediate closure and backfilling of the mine void has been suggested by some stakeholders as the preferred approach to address any potential environmental risks at the mine site. McArthur River Mining has given serious consideration to a range of closure strategies that meet the site closure objectives. Based on specialist technical advice and comprehensive modelling, McArthur River Mining does not believe that immediate closure and backfilling of the mine void is the best approach nor would it necessarily result in a better environmental outcome given all scenarios would require some level of ongoing management (for example maintenance or water management).

Continuing operations, coupled with McArthur River Mining's proposed mine closure strategy (including the undertaking of trials as well as validation and/or modification of conceptual models) enables collection of more information whilst the site is still operational, including geochemical, hydrogeological, geomorphological, limnological and ecological data. This in turn enables the site to adapt to any required changes, particularly associated with initial rehabilitation performance, and ultimately presents a lower risk to closure. This additional information will result from the following:

- The progressive rehabilitation of the NOEF, which enables the cover design to be adjusted and fine-tuned based on the performance of earlier stages.
- The collection of many more years of ground and surface water monitoring data, which will provide invaluable information to support MRM's understanding of site wide water movements, enabling improved calibration of modelling and optimisation of any mitigation requirements.
- Closure at the completion of mining and tailings reprocessing, which allows further work to be completed on the inputs into the mine pit lake modelling and stratification, increasing the confidence in the connected lake cases.

Selected stakeholder review comments have called for backfilling of the open cut, presumably on the basis that the site will be returned to its pre-mining condition. However, due to broken rock swell factors, this cannot be achieved. It is not just an issue of cost that has led McArthur River Mining to conclude that backfilling is not a viable option.

If a complete or largely backfilled open cut was to be established, it would require backfilling through zones of rock where groundwater movement occurs. There is insufficient benign material in the OEFs or known quarry sites to place in this 'active' zone. Therefore, a substantial perimeter of the open cut would require permanent waterproofing in order to isolate the non-benign overburden. In addition, there would be no viable way of repairing the seal if water seepage was to occur. This would result in an increased risk of groundwater and downstream surface water contamination. This scenario poses a higher risk than the NOEF and TSF closure proposals, as described in the project description.

Immediate closure extinguishes the opportunities and benefits arising from the responsible development of a large well defined mineral resource, without any reduction in the long term environmental risks associated with closure. Apart from the issue of resource stewardship and the likely sterilisation of 100 million tonnes (Mt) of zinc lead ore which is in high global demand, the immediate closure and pit backfill leaves a tailings dam on the surface, a surface overburden pile and a backfilled pit with significant groundwater interaction risks in immediate proximity to the McArthur River. The closure plan as described in the OMP presents a low long term environmental risk profile.

The abovementioned opportunities and benefits associated with continuing operations include an operational revenue stream extending until 2047 and the 30 years of direct jobs (with MRM) and indirect jobs (with MRM goods and services suppliers, including MAWA through their joint venture operation of the Aburri). In addition, continuing operations will enable ongoing funding for the regionally-orientated CBT and payment of taxes and royalties to the governments in Australia. Immediate closure clearly misses this opportunity.

3.4 The Adaptive Management Process: Additional Explanation

Draft EIS Section 3.3.4 included a proposed Adaptive Management phase to be established for a 70 to 80 year period after project closure whereby a:

- site presence will be periodically maintained to monitor and mitigate potential impacts;
- flexible management approach will be adopted, whereby modifications to landforms and/or their management will be implemented in response to closure and rehabilitation monitoring results and/or regulatory requirements; and
- performance trajectory will be established through monitoring, and assessed in the context of predictive modelling conducted as part of the OMP EIS.

Stakeholder submission comments on the Draft EIS have however requested further detail, including:

- clarification on how the Adaptive Management process will be implemented, including further details on:
    - specific objectives;
    - identification of uncertainties;
    - quantitative triggers for implementation;
    - monitoring;
    - options for each rehabilitation goal; and
    - action plans in the event that triggers are exceeded; and
- commentary on key decision points for environmental management of a closed site and information required to inform that decision-making.

In addition, regulatory feedback indicated that a robust framework needs to be developed for action where monitoring indicates that implemented measures and approaches are not effective. Monitoring would need to be designed with adequate sensitivity to detect issues in time to limit environmental harm, and include appropriate parameters and locations for detection in the long-term.

MRM has subsequently engaged with the NT EPA throughout the preparation of this Supplementary EIS in order to develop an Adaptive Management Framework which provides further detail as identified above. This framework includes development of the following:

- Phase 1 document, as provided in **Supplementary EIS Appendix R – Adaptive Management Framework**; and
- A commitment to development a Phase 2 operationally focussed document (with updated details on performance indicators and management measures) post-EIS approval. To support the preparation of this Phase 2 document, MRM has included details of a number of proposed work programs within this Supplementary EIS, which will be conducted in 2018 and will provide supporting information for the further development of SSTVs. These include studies associated with:
    - ecotoxicology (refer to **Supplementary EIS Appendix W – Ecotoxicology Forward Work Program**);
    - spontaneous combustion (refer to **Supplementary EIS Appendix X – Spontaneous Combustion Forward Work Program**);
    - NOEF construction pad trials (refer to **Supplementary EIS Appendix Y – Trial Pad Design Work Program**);
    - geomorphology (refer to **Supplementary EIS Appendix Z – McArthur River Geomorphology/Load/Sediment Deposition – Forward Work Program**); and

- TSF load assessment (refer to **Supplementary EIS Appendix AA – TSF Load Assessment Forward Work Program**).

3.5 The Final Void Closure Process: Additional Explanation

Stakeholder feedback indicated that the final void closure process (as described in the Draft EIS) required clarification. Information had been provided in a number of separate sections throughout the Draft EIS (including **Draft EIS Chapter 3 – Project Description and Justification**, **Draft EIS Chapter 4 – Rehabilitation and Decommissioning**, and **Draft EIS Chapter 8 – Water Resources**).

MRM has subsequently developed a consolidated description of the final void closure alternative, which includes:

- an assessment of alternative scenarios considered;
- a description of the staged closure (including isolated mine pit lake, backflow and flowthrough scenarios), with each stage having a different level of interaction with the McArthur River; and
- the decision making process that has been established and the role of Adaptive Management in this process.

The preferred development of the open cut domain is to follow the below sequence:

- Completion of approved open cut mining operations.
- Tailings reprocessing and selected overburden backfill.
- Final void rapid filling with harvested river water.
- Establishment of an isolated mine pit lake.
- Conversion to a backflow mine pit lake.
- Conversion to a secondary flowthrough mine pit lake.
- Ongoing proactive and reactive monitoring programs.
- Eventual relinquishment.

Refer to **Supplementary EIS Appendix B – Final Void Closure Process** for further details.

3.6 Assessment of the Complete Backfill Options

A number of submissions were received which questioned McArthur River Mining's process to identify its preferred final void closure alternative.

McArthur River Mining has subsequently developed a consolidated description of the final void closure process, including additional details on the final void complete backfill option. Refer to **Supplementary EIS Appendix C – Assessment of the Complete Backfill Options** for details.

Selected stakeholder review comments have called for backfilling of the open cut, presumably on the basis that the site will be returned to its pre-mining condition. However, due to broken rock swell factors, this cannot be achieved. It is not just an issue of cost that has led McArthur River Mining to conclude that backfilling is not a viable option.

If a complete or largely backfilled open cut was to be established, it would require backfilling through zones of rock where groundwater movement occurs. There is insufficient benign material in the OEFs or known quarry sites to place in this 'active' zone. Therefore, a substantial perimeter of the open cut would require permanent waterproofing in order to isolate the non-benign overburden. In addition, there would be no viable way of repairing the seal if water seepage was to occur. This would result in an increased risk of groundwater and downstream surface water contamination. This scenario poses a higher risk than the NOEF and TSF closure proposals, as described in the project description.

3.7 Tailings Reprocessing Viability

Stakeholder submission comments included a request for further detail on the technical and economic viability of tailings reprocessing.

Tailings retreatment projects are becoming more common as project economics alter and as processing technologies improve. In 2016 MRM completed a study on the retreatment of tailings material. The reprocessing of MRM tailings will provide a better long-term closure solution for the operation and allow further value to be realised from the considerable low-grade mineral resources that otherwise would be stored for extended periods without a clear beneficiation plan. The continuation of operations also provides numerous opportunities for continued employment as well as potential for additional value extraction from the existing MRM area, assets and infrastructure.

The relocation and in-pit deposition of the reprocessed tailings is considered best practice, given the elimination of the surface water and groundwater impacts associated with an above ground TSF, and the subsequent long-term monitoring and management effort required to manage such facilities over an extended period.

Based on the historical data, the implied resource currently held in the TSF impoundment is around 30.3 Mt at 3.8% zinc, 3.6% lead, 45 grams per tonne (g/t) silver and 0.16% copper. Additional tailings material will be deposited into the storage facility over the next 20 years until open cut mining operations conclude in the year 2035. This will provide a total expected resource of 95 Mt assaying 3.7% zinc, 4.0% lead and 44 g/t silver based on current projections.

The mining schedule is based on a 95 million tonne resource as quoted for the tailings impoundment only. It is assumed that the MRM project enters the closure phase with no further underground or open cut mine activity being undertaken or included in this study.

The production schedule is based on a production rate of 10,500,000 dry tonnes per year (dtpa) to be extracted via hydraulic mining.

The defined recoverable tailings resource is sufficient to support a reclaim operation with a life of 10 years. The material will be mined using conventional hydraulic mining methods to reclaim solids from within the TSF impoundment and relocate the material (after reprocessing) within the open cut final void for long-term storage and final closure.

3.8 Assessing Alternative Scenarios

Selected stakeholder comments requested further details on domain alternatives. **Draft EIS Section 5 – Project Alternatives** provides details on all project alternatives considered, including those for the major project domains including:

- open cut closure process;
- NOEF development and closure; and
- TSF.

MRM consulted with the regulator on these requests, and it was agreed with Environment Division of the Department of Environment and Natural Resources (DENR), on behalf of the NT EPA, that comparative analyses of the numerous alternative scenarios was sufficient, with quantitative analyses only being required for the preferred "base case" scenarios.

3.9 Future WDL Compliance Requirements

Several submissions have commented that there will be likely changes to the WDL conditions in the future, and a move towards more SSTVs.

MRM's impact assessment process and resulting predicted impacts and selected conclusions, have been made on the basis of existing WDL trigger values. MRM acknowledges that any amendments to these trigger values may affect a number of surface water quality related conclusions made in the EIS. Accordingly, MRM has developed its Adaptive Management Framework (refer to **Supplementary EIS Appendix R – Adaptive Management Framework**) and has committed to the ongoing development and update of the framework to incorporate:

- updated trigger values (in order to establish an early warning system in the event that environmental monitoring indicates environmental performance is not achieving the desired performance criteria);
- any changing regulatory requirements; and/or
- changing environmental conditions.

Development of regional or even site-specific guideline values (GVs) is often required for adequate protection of a specific waterbody's water quality values. Site-specific GVs are especially required where generic GVs are likely to be too under-protective or over-protective (due to either or both physicochemical and biological factors). The key aim of undertaking site-specific toxicity studies will be to increase the understanding of how a toxicant(s) may adversely affect biota under the relevant environmental conditions, such that more robust and appropriate GVs can be derived.

MRM has committed to a number of work programs to support the development of GVs, including ecotoxicology studies (refer to **Supplementary EIS Appendix W – Ecotoxicology Forward Work Program**) and geomorphological investigations (refer to **Supplementary EIS Appendix Z – McArthur River Geomorphology/Load/Sediment Deposition – Forward Work Program**). These investigations will provide for a more robust method of monitoring and management.

3.10 Managing and Minimising Downstream Environmental Impacts

Selected comments have highlighted that MRM's monitoring program does not appear to adequately assess downstream impacts. It should be noted that MRM's existing environmental monitoring program is extensive and includes mine site monitoring, monitoring at nearby upstream and downstream reference and control sites as well as regional monitoring sites located an extended distance from the mine site. The program is based on the existing Authorisation and is described in the MMP and the annually prepared Operations Performance Report (OPR). This OPR is submitted to DPIR, and it:

- covers the reporting period 1 June to 31 May each year;
- provides a summary of operational activities; and
- provides an outline of its environmental monitoring program and a summary of the monitoring program results for the preceding 12 month period.

Current environmental monitoring includes mine site and off-site (including downstream) monitoring of a number of selected aspects. Relevant chapters in the report include:

- Surface Water.
- Fluvial Sediment.
- Groundwater.
- Soil.
- Ambient Air Quality.
- Rechannel Vegetation Health.
- Saline Vegetation Health.
- Riparian Birds.
- Dredge Spoil Emplacement Area Vegetation Health.
- Migratory and Wetland Birds.
- Diversity and Abundance of Macroinvertebrates.
- Metal Concentrations in Aquatic.
- Diversity and Abundance of Aquatic.
- Seagrass Diversity and Abundance.
- Marine Sediment Quality, Water Quality and Metals in Marine.
- Rehabilitation.
- Geomorphological Assessment of McArthur River and Barney Creek Channels.
- Gouldian Finch Habitat Assessment.
- Assessment of Metals in Cattle Forage Species.
- Marine Metal Concentrations.
- Metal and Metalloid Concentrations in Near Shore.
- Metal and Metalloid Concentrations in Transhipment Seafloor Sediment.

Refer to **Supplementary EIS Figure 3-10** for an overview of the MRM regional monitoring program.

In addition, the MRM monitoring program has been subject to past and ongoing external review from a number of third parties including the following:

- The NIRB, which has reviewed monitoring around the current NOEF and has recommended selected modifications in the past. These are being implemented.
- The ITRB, which has also made a number of recommendations which have subsequently been implemented.

- The IM, which conducts annual reviews of MRM environmental performance and develops publicly available annual IM Reports. These reports include a series of recommendations (including monitoring related), which have been progressively implemented or incorporated into future work programs at MRM. Note that as part of each IM Report, comments are made on progress in implementing the previous year's recommendations.

Therefore, McArthur River Mining believes its existing monitoring program is adequate, but acknowledges that continual review and updating is important, in line with its continuous improvement philosophy and Adaptive Management approach.

3.11 Project Closure Funding

As previously mentioned, MRM senior management have committed to the ongoing management of the site upon cessation of mining. With respect to ongoing funding, note the following:

- Section 43 of the *Mining Management Act* provides the Northern Territory Government with the necessary protection for rehabilitation costs or to prevent, limit or rectify environmental harm. McArthur River Mining is only permitted to undertake activities authorised pursuant to its Authorisation. A security is required to be provided by McArthur River Mining which corresponds to those authorised activities. McArthur River Mining complies with its obligations under the Act and the Northern Territory is protected by the provisions of the Act.
- A review of the current security bond held by the Northern Territory Government in respect of MRM will be completed when the next mining management plan is lodged in accordance with relevant NT legislation. This will cover rehabilitation of the site based on current disturbance.

GULF OF CARPENTARIA

Limmen Bight and Nathan River U/S and D/S Reference Sites

Bing Bong Loading Facility

Batten Creek

McArthur River

King Ash Bay

Borroloola

Devil Springs

Caranbirini Conservation Reserve

McArthur River Mine

Frazer Creek

The Fletcher

Wearyan River

Foelshe River

Clyde River

McArthur River

Robinson River U/S and D/S Reference Sites

METSERVE Mining & Energy Technical Services Pty Ltd

McArthur River Mining

A GLENCORE COMPANY

LEGEND

- Localities
- Watercourse
- Road
- MRM Mining Lease
- Native Vegetation

Off-Lease Environmental Monitoring

- Air Quality Monitoring Sites
- Aquatic Fauna Monitoring Sites
- Aquatic Fauna Metals Monitoring Sites
- Macroinvertebrate Monitoring Sites
- Marine Monitoring Sites
- Migratory Shore Bird Ground Count Sites
- Riparian Bird Monitoring Survey Sites (Downstream)
- Seagrass Survey Sites
- Riparian Bird Monitoring Survey Sites (Upstream)
- Soil Monitoring Sites
- Surface Water and Fluvial Sediment Monitoring Sites
- Woodland Bird Survey/ Gouldian Finch Monitoring Sites
- Metals in Cattle Forage Species Monitoring Sites

Data Source: Mining Lease - NT Gov. (2012); Monitoring Locations, Roads, Watercourse, Native Vegetation, Terrain - MRM (Jan 2018)

McArthur River Mine
OMP Supplementary EIS
Regional Environmental Monitoring Locations

10 0 10 20

Kilometres

Scale: 1:500,000 (A3)

21/03/2018

Datum: GDA94
Projection: MGA53

FIGURE 3-10

S:\Projects\GZ003_MapInfo\Workspaces\GZ003_MRM_Issue340-Fig3-10_RegionalMonitoring_C.wor

3.12 Creation of Local Job and Career Development Opportunities

Certain stakeholder comments questioned MRM's commitment to the creation of local jobs, and in particular MRM's commitment to upskill the local workforce and provide career development opportunities.

The long-term nature of the project presents a rare opportunity for MRM to create inter-generational employment, and assist with retaining future generations in the local community. MRM is therefore committed to the development of local employment, both in terms of the number of jobs created and the opportunities for career development (i.e. further training and upskilling), and will continue to explore options for education programs and upskilling opportunities.

MRM has set a 20% Indigenous workforce employment target and continues to train and employ Indigenous community members. Whilst there is an immediate (albeit intermittent) need for people with specific industry knowledge and skills, MRM also acknowledges that given the long-term nature of the project it has a social and moral obligation to educate, train and upskill the local workforce, of both existing employees and future (potential) employees. Thus, MRM will continue to invest in training programs to lift the skill levels and capabilities of the local workforce.

Examples of existing training and support programs and initiatives are included below:

- McArthur River Mining has been in consultation with Charles Darwin University to identify opportunities to provide scholarships and further education to local candidates.
- Working with Borroloola School to introduce Certificate 1 in Conservation and Land Management in readiness to take up roles in the environment team, with positions being set aside in that team for local recruits. Other school-based programs are also being explored.
- Currently McArthur River Mining contributes funds through the CBT to support youth employment opportunities such as the Indigenous Trainee Program. There are also employment programs which are funded by the NT and Federal governments which can be extended to Work Ready programs in conjunction with McArthur River Mining's current community partners such as Pandanus Development Group Northern Territory (PDGNT), Indigenous Employment (IE) Project and the Community Development Program.
- McArthur River Mining also supports the community through multiple channels of benefits which are outlined on the McArthur River Mine's website (http://www.mrmcommunitytrust.com).

Additionally, there is an active employment program with the local Borroloola workforce. In February 2017, 117 applicants were engaged of which 48 were shortlisted. Of these 48, 21 were offered employment as part of the Indigenous Employment Program. This has provided ongoing Trainee and Apprenticeship positions, with the opportunity for Trainees to be placed across the business in all areas including operator level, environmental technicians, community relations and mine survey roles. This will continue with the approval of the EIS and the local workforce will continue to play an active part in the development of the OMP.