

Appendix E3 – Commitments

Introduction

This Appendix identifies the new commitments particular to the McArthur River Mine Phase 3 Development Project (the Project). Commitments that are already current, or standard practice at MRM, have only been included where they aid in the understanding and/or context of Project specific items.

Chapter 5 – Rehabilitation and Decommissioning

Section 5.8.1 – Design Criteria

The Project's rehabilitation design will be based on the following criteria:

- all areas significantly disturbed by mining activities will be rehabilitated to a stable landform with a self-sustaining vegetation cover
- outer OEF slopes will be designed at no greater than a 1(V):4(H) overall slope.
- the OEF will have a 600 mm layer of growth media (mix of NAF rock, alluvials and soils) to provide a layer for storing water and nourishing vegetation
- the surface of the OEFs will be shaped with a gentle slope of 1(V):100(H) and will be directed towards drop chutes to transport water down to ground level
- until further geotechnical and geochemical assessments are completed, PAF cells must have at least 20 m of NAF surrounding them at the end of construction. No PAF material shall be placed below the 1-in-100 year flood level in any ex-pit OEFs.

Section 5.8.2 – Rehabilitation

All areas disturbed by mining activities will be rehabilitated to a stable landform with a self-sustaining vegetation cover, with progressive rehabilitation commencing within one year of when areas become available for rehabilitation purposes.

The Proponent will progressively rehabilitate where practicable, however there will be large areas of disturbed land that will not be available for rehabilitation until later in the mine life for the following reasons:

- the disturbed area is effectively integrated with nearby, unavailable areas
- it necessitates an uneconomic use of resources to undertake the work at the time
- the chemical characteristics of the OEF may improve with time of exposure, thereby improving the success of the rehabilitation.

Section 5.9 – Decommissioning

Consultation with government and local stakeholders is expected to continue over the next five years for the development of post-mining land-use strategies for the Project.

Section 5.9.5 – Final Open Pit

The open pit will be stabilised, with rock armour placed over the alluvial materials where water will flow back into the open pit. The open pit void will be fenced off and allowed to flood. The open pit will be left to fill naturally from groundwater inflows, direct rainfall, surface water flow off the internal slope of the OEFs surrounding the open pit, together with TSF seepage pumped to the open pit. No surface water inflows to the open pit from the McArthur River will occur.

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Section 5.9.9 – Chemical Contaminated Sites

Sites which have been contaminated during the life of the mine will have contaminated soils and aggregates removed and placed into the designated area at the TSF. A 500 mm layer of ungraded material will be placed on top of the sites, and then they will be topsoiled, ripped and seeded. Potential contaminants include tailings, pyritic material, ore, hydrocarbons, reagents or other chemicals.

Chapter 7 – Land Resources

Section 7.3.5.1 – Erosion Controls

- erosion and sediment control measures will be employed which are consistent with the practices described in the Northern Territory Erosion and Sediment Control Guidelines. The existing erosion and sediment control practices will be upgraded and implemented throughout construction and operation phases of the Project.
- report results of erosion monitoring in SDWMP or SDMMP.

Section 7.3.6 – Topsoil Management

- stockpiles which need to be retained for extended periods and which have not revegetated naturally, will be seeded with plant species planned for the revegetation component in the rehabilitation program.

Chapter 9 – Waste

Section 9.5.4 – Waste commitments and targets

Waste commitments and targets have been developed by MRM to assist in effective waste management to:

- reduce the total amount of, and environmental impacts from waste
- recover and recycle 10% more than currently recycled over the next five years.

Chapter 10 – Water Resources

Groundwater

Further definition of factors that influence groundwater predictions will be collected before the open pit intersects the Western Fault and Cooley Dolomite, which may be a source of additional groundwater.

The groundwater monitoring network will be expanded to meet environmental requirements of the Project. Particular focus will be on monitoring of groundwater quality at depth and drawdown associated with the proposed interception bores that will surround the open pit. Detailed planning work for this monitoring program is anticipated to commence later in 2012.

Surface Water

The existing flood mitigation measures at the MRM site will remain during Project mining operations. In addition, a number of additional measures are proposed to minimise the impact of flooding on Project mine infrastructure. The additional measures include:

- Constructing a new erosion protection bund to protect South and East OEFs from erosion up to the 1% AEP (100 year ARI) flood level;
- Continuing to place North OEF PAF material and North OEF PAF Runoff Dam spillway levels above the 1% AEP (100 year ARI) flood level.

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Undertaking a regular erosion monitoring program along channel reaches and floodplain areas where potentially elevated velocities and velocity increases have been identified. If any evidence of erosion is found at these locations following major flow events, appropriate erosion protection works at these affected locations would be undertaken.

Changes to the surface water monitoring program include:

- The removal of the existing stream gauging station on Barney Creek (SW19) and replacing it with two new stations – one on Barney Creek approximately 5 km upstream of the removed station at the Carpentaria Highway crossing (SW4) and the other on Surprise Creek at the at the Carpentaria Highway Crossing (SW2);
- The installation of three new surface water quality monitoring stations to monitor the impact of the North Overburden Emplacement Facility (NOEF) runoff on Emu Creek receiving waters; and
- The installation of six new stations to monitor water quality in the new 'contaminated' storages proposed for the site. These are the two new storages in the TSF area (TSF Cell 3 WMD and TSF Cell 4 WMD) and the four new storages in the NOEF area, namely South-East PAF Runoff Dam (SEPROD), East PAF Runoff Dam (EPROD), North-East PAF Runoff Dam (NEPROD) and North-West PAF Runoff Dam (NWPROD).

During Project mining operations, it is proposed to direct runoff from NAF areas in the North, South and East OEFs towards sediment ponds. This is based on the assumption that runoff and seepage from the North, South and East OEF areas can be considered 'dirty' and can be released to the receiving waters after treatment in a sediment pond. Monitoring of water quality in these sediment ponds would be required to demonstrate that the water quality is within the limits specified in MRM's WDL prior to release into receiving waters. If runoff and/or seepage from North, South and East OEF areas is found to be 'contaminated', active management measures and/or additional storage volume would be required to fully contain the 'contaminated' water on site.

An additional 'contaminated' water storage may be required to manage water dewatered from the open pit water when TSF Cell 4 is used for tailings deposition after 2032. The additional post-2032 storage requirement will be assessed in the future when more Project operational data becomes available

Further scheduled geochemical investigations will verify the final void wall geochemistry.

It is proposed to remove SW19 from the surface water monitoring network and replace this station with two new stations – one on Barney Creek approximately 5 km upstream of the removed station at the Capricorn Highway crossing (SW4) and the other on Surprise Creek at the at the Capricorn Highway Crossing (SW2).

Three new surface water quality monitoring stations are proposed to monitor the potential impact of the NOEF runoff on Emu Creek receiving waters. These stations will monitor the background (upstream) water quality in Emu Creek, the quality of surface runoff entering Emu Creek from the NOEF area and the potential impact of the NOEF on Emu Creek receiving water quality. The proposed locations of the above three stations are provided in Appendix D3. No changes to the existing suite of parameters monitored or the monitoring frequency are proposed.

It is proposed to expand the artificial surface water monitoring network to include the monitoring of the six new 'contaminated' storages proposed for the site. These are the two new storages in the TSF area (TSF Cell 3 WMD and TSF Cell 4 WMD) and the four new storages in the NOEF area, namely South-East PAF Runoff Dam (SEPROD), East PAF Runoff Dam (EPROD), North-East PAF Runoff Dam (NEPROD) and North-West PAF Runoff Dam (NWPROD).

During the Project, it is proposed to direct runoff from NAF areas in the South and East OEFs towards sediment ponds. This is based on the assumption that runoff and seepage from the North, South and East OEF areas can be considered 'dirty' and can be released to the receiving waters after treatment in a sediment pond. Monitoring of water quality in these sediment ponds would be required to demonstrate

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that the water quality is within the limits specified in MRM's WDL prior to release into receiving waters. If runoff and/or seepage from North, South and East OEF areas is found to be 'contaminated', active management measures and/or additional storage volume would be required to fully contain the contaminated water on site

Irrigation

The following will be required in a detailed design phase of irrigation systems to further develop the concept before implementation:

- Further water quality sampling and analysis, including complete water analyses (covering major anions and cations, pH, conductivity and total alkalinity)

Suitable sites for irrigation will be identified in the detailed design phase of the irrigation investigations. The key parameters to be used in this search will include:

- Soil selection
 - Physical properties – soil type, structure, thickness and profile, permeability, particle size
 - Chemical properties – nutrients, salinity
- Terrain – slope is ideally less than 4° so that pivot machinery does not become unstable.
- Proximity to mine site. Closer sites will reduce distribution costs. Fields are preferably on the same side of the river to avoid flooding access issues and possible damage of pipe crossings.
- Groundwater
 - No shallow groundwater flows that could mobilise contaminants
- Surface water
 - Out of flood zones
- Buffer zones to watercourses

Chapter 11 – Air Quality and Greenhouse Gases

Section 11.7 – Mitigation Measures

An additional monitoring programme will be undertaken at monitoring points at the accommodation camp to:

- measure PM₁₀ that will evaluate the effectiveness of dust controls in place at the mine and, in particular, at the mill's grinding and crushing points
- monitor nitrogen dioxide emissions from the power station (on a campaign basis) to confirm ambient standards are being met.

Section 11.10.2 – Climate Change Adaption

The Proponent is committed to reducing its GHG emissions on a per-tonne mined basis and is a contributor to research programs to develop energy efficiency technologies, such as technology and improvements to grinding processes.

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Chapter 12 – Noise and Vibration

Measures proposed in order to avoid or minimise potential adverse noise and vibration impacts associated with the Project are described below.

- by locating the power plant at site 2, noise levels for the Project's accommodation village are expected to remain below guideline specifications. If an alternative site is selected, then ameliorative measures will be undertaken to ensure noise levels remain below guidelines.

In order to comply with the blasting goals, the maximum instantaneous charge will be below 500 kg for a regular blast and below 1,050 kg for a void blast, where practicable, for blasting only during daylight hours.

Chapter 13 – Nature Conservation

Section 13.3.7 – Management of Aquatic Fauna

- Where practicable, development of the old McArthur River Channel will be delayed until riparian ecosystem functionality of the surrounding channel has been enhanced.
- In order to retain the Barney Creek and the McArthur Channels as functioning ecosystems and avoid impacts on aquatic biodiversity, buffer zones in excess of 70 m will be maintained between the OEF/ bund and waterways
- when the eastern OEF is established, banks will be stabilised by increased planting of the channel batters, direct seeding and planting of established trees to help prevent excessive erosion due to elevated flow rates and provide slow back-waters to aid upstream fish migration. Building additional baffling on the western channel wall to reduce erosion will be implemented if erosion appears
- Appropriate water management infrastructure will be incorporated into the expanded North OEF to prevent flow of contaminants into the McArthur River via drainage lines entering below the channel

Section 13.3.8 – Recommendations for monitoring of aquatic fauna

- development of the East and South OEFs will result in disturbance of the two old McArthur River channel areas. Should ecological values within the old channel areas exist immediately prior to disturbance of this area, surveys of aquatic fauna will be undertaken to identify their relevance as dry season refugia and wet season resting areas, as well as to inform the management of the potential impacts of this Project component
- due to the presence of elevated sulphate levels both within surface waters and deposited along banks of Surprise and Barney Creeks, monitoring of fish abundance and diversity in these systems will be incorporated into the ongoing monitoring program.

Section 13.4.10 – Project impacts on terrestrial fauna

- where practicable, development of the South and East OEF within the old McArthur River channel will be delayed to allow sufficient time for the ecological value of the Channel to be enhanced.

Section 13.4.11 – Management

- to maximise success of rehabilitation of the McArthur River Channel, where practicable, these areas will be avoided and buffer zones in excess of 70 m will be established and maintained according to best practice management

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- Where practicable, development of the old McArthur River channel will be delayed, until the ecological value of the channel has been enhanced through revegetation activities
- clearing of vegetation for the South and East OEF areas is to be staged over four years. Monitoring of riparian birds, aquatic fauna and other species of conservation significance will occur as clearing progresses
- impacts of staged clearing will be monitored within revegetation sites to allow mitigation of any impacts on successful rehabilitation, particularly along the McArthur River Channel
- increased planting and seeding of the channel batters and planting of established local provenance trees along and adjacent to the channel will be undertaken. Revegetation will be conducted in accordance with MRM's revegetation strategy
- the feasibility of a program to relocate populations of purple-crowned fairy-wrens and buff-sided robins from within the pit area and the two old McArthur River channel sites will be investigated by suitably qualified ecologists
- Consideration will be given to increasing the cattle exclusion areas along the McArthur River channel and expanding these into woodland habitats will mitigate removal of habitat for purple-crowned fairy wrens, Australian bustards, Merten's water monitors and other threatened species
- fencing will be rapidly maintained following each wet season to minimise potential for cattle to enter the exclusion areas.

Section 13.4.12 – Monitoring

- should the option to increase cattle exclusion areas be adopted as a management strategy, a monitoring program to assess the success of habitat improvement and fauna communities, including threatened species and indicator species, will be established.

Section 13.5.5 – Flora – Management of Impacts

- buffer areas in excess of 70 m will be retained between new mining facilities and drainage lines that are to remain functional
- where practicable, final landforms will be contoured to resemble the original local topography to include hill slopes and rocky drainage lines. This will provide a structure to facilitate the establishment of a variety of habitat types.
- buffer zones around riparian vegetation of the McArthur River Channel will be mapped and maintained and designed to prevent development of the southern and eastern OEF impeding revegetation of the channel.

Chapter 14 – Cultural Heritage

Section 14.7.2 – AAPA Certificates

- prior to construction commencing, the Proponent will also apply for a new AAPA certificate for the East OEF area not currently covered by an Authority Certificate.

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Section 14.7.3.2 – Archaeological and Historical Sites Management

Site No.	Actions to be taken
MRM ₃	Fenced with star pickets at regular intervals along the boundary and signage indicating that entry is prohibited.
MRM ₄	Avoided during previous works and should also be avoided during any future works. Fenced with star pickets at regular intervals along the boundary and signage indicating that entry is prohibited.
MRM ₅	Permission sought to destroy the site from the Minister for Heritage. Detailed surface recording of the area carried out before disturbance by a qualified archaeologist.
MRM ₆	Permission sought to destroy the site from the Minister for Heritage. Detailed surface recording of the area including sample collection of artefacts carried out before disturbance by a qualified archaeologist.
BS ₃₀ , BS ₃₅₋₃₆ , BS ₃₈₋₃₉ , BS ₄₁₋₅₅ , BS ₅₈₋₅₉ , and BS ₆₄₋₆₇	Permission sought from the NRETAS Heritage Branch for areas to be disturbed before works begin.
Section of the old Borroloola Rd	No further action required.
Mobile cattle yard	No further action required.
Clay Pigeon Shooting range	No further action required.

- a rapid response plan will be put in place to ensure that the NRETAS Heritage Branch is contacted in the event of the discovery of protected heritage objects during works at the Project site.

Chapter 15 – Social Environment

Section 15.7 – Mitigation and Enhancement

- MRM is to investigate impact on family/community cohesion of personnel leaving the community to become FIFO employees from Darwin
- MRM is to work with Territory Housing to highlight limitations the social housing policy poses on expanding Indigenous employment
- MRM is to explore opportunities to encourage private developers to enter the community and develop private accommodation options, seeking input from Northern Land Council on land tenure issues
- utilise the Trust to identify proactive opportunities to work with the NT Government
- house the workforce in purpose built on-site accommodation village.

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Increases in local employment during the construction and operation phases may lead to a greater use of alcohol and drugs within the community. The following impact mitigation measures are proposed for the Project:

- continue enacting zero tolerance drug and alcohol policy at the Project's work site during work hours
- support community health initiatives through the Trust, sponsorships and donations, including drug/alcohol education programs and substance abuse support services
- investigate incorporating more substantial drug and alcohol management on-site as part of induction/training to encourage behaviour that can be replicated when back in the community.

Increases in local employment during the construction and operation phases may lead to increases in humpbugging. The Project recommends the following impact mitigation measures:

- MRM is to explore strategies to overcome social issues in consultation with NT Government and Traditional Owners/Indigenous leaders, including the possibility of setting up new models for salary payments, undertaking community education programs, and providing support to workers experiencing humpbugging.

Increased traffic during the Project's construction and operation phases may lead to accelerated degradation of roads and require greater maintenance. The Project recommends the following impact mitigation measures:

- work with NT Government to highlight the importance of undertaking improvements to existing roads
- continue MRM voluntary maintenance of Mule Creek Road (located at Bing Bong).

Increased traffic during the construction and operation phases may increase the potential for more road accidents. The Project recommends the following impact mitigation measures:

- work with MRM Community Reference Group, NT Government and other groups to develop driver education programs
- work with NT Government regarding lowering the speed limit
- investigate providing bus in/out service from Borroloola to MRM mine site for all local employees.

Increase in transportation of zinc-lead concentrate during the operations phase may lead to increased risk of spills. The Project recommends the following impact mitigation measures:

- maintain and review the existing zinc-lead concentrate handling and transportation policy
- maintain the existing emergency response plan, including longer term rehabilitation requirements
- follow the disclosure policy to ensure that government and community stakeholders are made immediately aware of any incidents involving hazardous material.

Extension of the life of Trust means increased potential for youth services and facilities to be implemented in the local area during the construction and operation phases. The Project recommends the following enhancement strategies:

- MRM to provide results of consultation relating to youth opportunities to the Trust Project Officer and work to help encourage grant applications in this area.

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Section 15.7.4 – Employment and income

The following section identifies mitigation measures and enhancement strategies for potential impacts on employment and income.

Increased employment opportunities during the Project's construction and operations phases act as a potential community benefit. The Project recommends the following enhancement strategies:

- develop community partnerships allowing flexible workplace arrangements in support of greater engagement of Indigenous personnel
- engage with the community to increase awareness regarding Project employment opportunities
- review and update communication processes to facilitate advice about employment opportunities is available in a timely manner and local people are provided with support to develop their skills and become better positioned to maximise employment opportunities
- raise awareness about MRM's Indigenous Employment Coordinator through internal engagement with staff
- review staff retention programs regularly to draw on lessons learned
- source skilled construction workers from the local area. It is anticipated that the majority of the Project's construction and operational workforce will be employed on a FIFO arrangement from Darwin.

Increased employment opportunities for locals and youths during the construction and operation phases act as a benefit to the community. The Project recommends the following enhancement strategies:

- continue involvement in and support of the Northern Territory Government Department of Education and Training *Strong Start, Bright Future* program
- identify and implement mechanisms to support proactive dissemination of information about youth employment and training opportunities.

The potential extended operational mine life until 2036 acts as a benefit to the community. The Project recommends the following enhancement strategies:

- review Trust funding in 2015 (in line with the legal agreement for the establishment of the Trust) to consider contribution levels made by the Trust to community development in the local region and determine the level of ongoing annual financial commitment
- The Trust has been established for the life of mine and so will automatically be extended with the Project's implementation. Subject to periodic reviews, this will increase the total commitment of the Trust from in the order of \$32 million (by 2027) to \$43.3 million by 2036.
- promote the Trust Project Officer's visiting times to the local community more widely.

Section 15.7.5 – Education

The following section identifies mitigation measures and enhancement strategies for potential impacts on education and training.

Increased education opportunities for locals and youths during the Project's construction and operation phases act as a benefit to the community. The Project recommends the following enhancement strategies:

- continue MRM's commitment to support local skills development and training through the Pathways to Employment strategy

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- review and update the Project's communication processes to facilitate advice about education opportunities is provided in a timely manner and local people are provided with support to develop their skills and become better positioned.

Section 15.7.6 – Social, economic and political organisations

The following section identifies mitigation measures and enhancement strategies for potential impacts on social, economic and political organisations.

Opportunities for local and regional businesses to engage with the mine during construction and operation phases act as a benefit to the social, economic and political organisations. The Project recommends the following enhancement strategies:

- continue the local procurement program underpinning operations throughout the proposed Project
- communicate with local businesses to increase the level of awareness about MRM's expectations and requirements for supplier accreditation
- explore opportunities to work with business and industry groups to support local businesses wishing to attain supplier accreditation
- report success and development of local procurement programs through the MRM Community Reference Group and other local services/non-government organisations (NGO).

Chapter 16 – Economic Environment

Section 16.5.3 – Local Community infrastructure and services

- In 2007, MRM, in conjunction with the Northern Territory Government, established the MRM Community Benefits Trust. MRM commits \$1.35 million per year to the Trust for the first eight years. The level of funding is then subject to review for subsequent defined periods.

Appendix E1 – TSF Management Plan

Section 2.1 – TSF Risk Assessment

- any seepage that does occur will be contained by a combination of measures including the low permeability clay core and cut-off key in the TSF embankment, the geopolymer cut-off barrier, the network of recovery bores and surface perimeter drains, and underliner drainage to designed collection zones
- operation of the seepage recovery bores after mine closure (if required, based on monitoring performance) will reduce the groundwater head within the TSF, so that expression of ongoing seepage will not occur on the surface
- MRM will continue to be responsible for post mine closure monitoring, and maintenance of the recovery system (if required), until closure criteria have been met and it is demonstrated that recovery wells are no longer required.

Section 4.3 – TSF Cell 4 Embankment Design

- Cell 4 will also include an engineered liner (such as HDPE, bentonite or clay) to further limit potential seepage from the TSF

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Section 4.7 – Future Seepage Quality and Control Measures

Appropriate practices to limit the degradation of the quality of seepage water that may be released from the system will be adopted. As a minimum, provisions to be made to maintain seepage water quality or the impact of seepage migration will include:

- maintaining an appropriate tailings deposition regime (in terms of cycling periods) such that oxidation of tailings solids, with associated release of oxidation products to seepage waters, is limited. This relates to maintaining defined levels of saturation/moisture within the beach to inhibit oxidation
- monitoring of surface water and groundwater quality around the TSF to detect excessive seepage migration
- implementation of effective rehabilitation works to minimise the potential seepage footprint.

It is appropriate, however, that seepage collection points be formed downstream from the embankment to enable recovery of any seepage expression occurring beyond the storage. A network of under-drains to collect any seepage and channel it to sumps for collection will be investigated during detailed design. Predictions of seepage volumes, quality and impact will occur throughout the life of mine to determine the effect of the six lines of defence.

Section 5.5 – Future Environmental Monitoring

Monitoring data will be collected as per current schedules and reported as part of the mine's Water Management Plan

Section 6.1 – Decommissioning Objectives

The main rehabilitation and decommissioning objectives of the TSF are:

- further monitor groundwater levels for five years after the seepage recovery systems have been decommissioned to confirm the mitigation of seepage from the TSF.

Appendix E2 – OEF Management Plan

Section 3 – North OEF

Section 3.2.3 – NOEF Design and Operations for Stability

The design of the NOEF used the following parameters to meet the requirements of the stability analysis:

- The overall slope of the final OEF is approximately 1:4.3, comprised of the following slope components:
 - nominal 13.6 m high lifts at an angle of repose of 35°, with 35 m wide berms; or
 - nominal 13.6 m high lifts with batters flattened off to 1:4 slope, with a 10 m berm on every second lift.

The combination of batter and berm parameters depends on the location of the slope and the rock used in its construction, as will be discussed in upcoming sections.

On-going investigation and testing of foundation conditions will be required in advance of the active NOEF areas to verify the presence of bedrock and gain site specific material properties to enable appropriate designs and operating practices to be planned.

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Section 3.3 – Other Design Parameters

The NOEF has been limited to a maximum height of approximately 80m to match the height of the surrounding natural landforms. Note that the true height varies dependent on ground elevation – the design criteria employed was to limit the highest point of the OEF to 116 RL, which is the top of the nearby Mt Stubbs hill.

Section 3.7.4 – NAF Dams (Sediment Ponds)

Sediment ponds will be sized and configured during the detailed design phase of the OEFs and the TSF in accordance with the Best Practice Erosion and Sediment Control guidelines (IECA, 2008). Sediment ponds will be designed as 'Type F' sediment basins (see IECA, 2008).

The following is of note:

- the sediment ponds will have two zones: a settling zone to treat the sediment laden water; and a sediment storage zone for the collection of sediment that drops out of the water
- the settling zone of the sediment ponds will be sized to capture the required 63% AEP (1 year ARI) 5-day rainfall event from the contributing catchment area. The size of the sediment storage zone of the sediment pond will be 50% of the settling zone. Note that the adopted sediment pond volumes mean that the capacity of the sediment ponds will be exceeded regularly and water will spill to the receiving waters at least once in most years
- where possible, sediment ponds will be located in old drainage channels such as old or abandoned creek channels that have been isolated due to mining activities to minimise the amount of excavation required for the storage and allow water to overflow/be pumped into a natural downstream channel after treatment
- the sediment ponds will be designed for a 5-day cycle where by the sediment laden water fills the sediment pond, is treated and then pumped out to the receiving environment within a maximum of five days. The water will be then pumped down to the sediment storage zone in preparation for the next runoff event
- de-silting of the sediment pond should be undertaken as required when the sediment storage zone is close to full
- long-term sediment ponds that will be active for longer than 2 wet seasons, will be constructed with spillways designed to convey the 1% AEP (100 year ARI) discharge plus a 300 mm freeboard to the crest of the dam wall
- short-term sediment ponds that will be active for 2 wet seasons or shorter, will be constructed with spillways designed to convey the 10% AEP (10 year ARI) discharge plus a 300 mm freeboard to the crest of the dam wall
- adequate erosion protection will be required at and downstream of the spillway of the sediment pond.

Section 4 – East and South OEFs

The OEFs have a setback of at least 75 m from the crest of the channels, and this buffer is over 125 m in many areas

A feature of the EOEf is a step in the top lift, which extends to a height of 80 m above ground level. This is required to ensure that the rockpile (and equipment operating on it) is safely below the Obstacle Limitation Surface (OLS) of the McArthur River airstrip. The OLS ensures safe operation of the aerodrome is possible in all weather conditions.

As a risk mitigation measure, these OEFs will not be used to store PAF overburden.

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Section 4.1 – Stability Analysis

Further foundation investigations will be required to increase confidence in the design parameters before the OEFs are developed. Investigation of drainage parameters of the soils will be important.

Due to exposure of the toe of the OEFs to floodwaters of the channels, special precautions will be taken to protect them from erosion and scouring which may lead to local instability. The construction of an Erosion Protection Bund (EPB) as an integral component of the OEFs will be elaborated in later sections.

Section 4.2 – Other Design Parameters

The EOEF has been limited to a maximum height of approximately 80 m to match the height of the surrounding natural landforms, and to remain under the airstrip OLS.

The lift heights vary depending on the lift being constructed. Due to the set height of the mine levee wall (at 44 RL), the base layer is from 12 m to 18 m high. The other lifts have been designed to a nominal height of 15 m. Lower lift heights may be used to enhance stability and reduce differential settlement in certain circumstances, depending on materials used and compaction factors.

The EPB is a trapezoidal shaped bund wall that will be constructed out of select NAF fill. The rock wall must be permeable to enable any high levels of water to drain away from the toe of the OEFs. The crest width is a nominal 20 m wide, assuming that mining operations haul trucks will be used to construct the wall – this may be reduced if smaller equipment is utilised. The outer face will be constructed to a 1:4 slope with a coarse rock erosion protection armour layer. The inner batter will be constructed to an angle of 1:2. The crest elevation has been set to the 100 year ARI event level, which changes along the length of the wall, but is typically around 39 m AHD to 41 m AHD. This makes the wall from 5 m to 13 m high, depending on local topography.

Section 4.5.2 – Dirty Water Drains and Sediment Ponds

If runoff and/or seepage from South and East OEF areas are found to be contaminated, active management measures and/or additional storage volume would be required to fully contain the contaminated water on site

Dirty runoff drains constructed on the outer perimeter of the dump (which is exposed to McArthur River and Barney Creek floodwaters) will be located on the inside toe of the proposed Erosion Protection Bund. Runoff from the contributing areas will be directed to temporary sediment ponds located at the inside toe of the erosion protection bund.

Overflows from the sediment ponds will either seep through the EPB or flow through a spillway (overflow) pipe through the EPB. The final design of the sediment pond spillways will depend on the permeability of the erosion protection bund. One-way flap gates may be required on the end of the sediment pond pipe spillway to prevent McArthur River water from back-flowing into the sediment pond during periods of high flow.

The proposed drainage system would be protected from the McArthur River and Barney Creek flooding by the EPB. However, the proposed drainage system would be inundated by McArthur River floodwater seeping through the EPB on average every 2 to 5 years. Note that the dirty runoff management controls located along the EPB will be progressively covered over by NAF material as the OEFs progress towards the EPB. Rehabilitating the OEF close behind the advancing face will be important in managing erosion once the ground level sediment controls are buried.

Section 4.6 – Staged Development and Rehabilitation Strategy

The SOEF and EOEF staging is shown in the below figures. The strategy for the development of these OEFs is outlined below:

- The EPB will always be advanced in front of the bulk OEF tipping to ensure that water management and erosion controls are in place. Vegetation clearing and topsoil stripping will only occur in the dry season. Cleared and stripped areas not protected by the EPB must have rock tipped over them before the annual wet season
- The SOEF will be developed first, as this can be constructed to finished level very quickly, providing a large open area for storage of rehabilitation materials that will be stripped out from the EOEF footprint (topsoil and alluvials)
- The western end of the SOEF that fills in the old remnant McArthur River channel will be delayed until suitable habitat is established for fauna living in this area, subject to satisfactory control of ground and surface water in this area.
- The EOEF will then develop from the south out to the point of the triangle, but avoiding the old McArthur River channel in the north until the new channel has achieved agreed rehabilitation targets enabling this to occur
- Much of the base layer of the EOEF will have to be constructed to enable a large enough area for upper lifts to be placed

The external faces of the OEFs closest to the channels will be rehabilitated as soon as practicable after construction to minimise erosion.

Section 6 – OEF Monitoring

Section 6.2 – Further Geochemical Assessment

Over 5,000 m has been drilled and sampled by both a combination of regular sample intervals and specific targeting of known PAF strata. This information will add to the existing overburden geochemistry data base. This work will continue throughout the mine life to increase data density ahead of mining.

Section 6.3 – Monitoring Program

Background soil samples in the vicinity of the proposed OEF footprints will be tested for metals to determine the significance of any enriched metals with respect to final rehabilitation. Rehabilitation of the OEF surface will be progressively undertaken and field trials will be conducted to determine any significant effects on rehabilitation success from any elevated metal concentrations in potential outer cover materials.

As the construction of the NOEF progresses, lysimeters will be installed at appropriate locations to monitor water infiltration. The lysimeter installation program commenced in 2011 at existing operations and will be described in future Sustainable Development Mining Management Plans.

Section 6.4 – Monitoring Frequency

Three new surface water quality monitoring stations are proposed to monitor the impact of the North OEF runoff on Emu Creek receiving waters. These stations will monitor the background (upstream) water quality in Emu Creek, the quality of surface runoff entering Emu Creek from the NOEF area and the impact of the NOEF on Emu Creek receiving water quality.

It is also proposed to expand the artificial surface water monitoring network to include the monitoring of the six (6) new storages proposed for the site, of which four new storages in the NOEF area, namely South-East PAF Runoff Dam (SEPROD), East PAF Runoff Dam (EPROD), North-East PAF Runoff Dam (NEPROD) and North-West PAF Runoff Dam (NWPROD) will be included.