

Background

The McArthur River Mining Joint Venture (MRM) is proposing a change in mining method for the existing McArthur River zinc/lead/silver mining and processing operation which is located approximately 45 km south-west of the township of Borroloola and 740 km south-east of Darwin in the Gulf Region of the Northern Territory.

The current operations were established in 1995 and consist of an underground mine and processing plant which converts the mined ore into bulk concentrate. The concentrate is trucked from the mine to the port of Bing Bong where it is loaded into ships for export to refineries around the world to be made into zinc and lead metal and alloys.

The McArthur River Mine Open Cut Project will result in a change in mining method from an underground mine to an open cut mine. This will enable the mine production to increase from 1.6 million tonnes per year (Mt/y) of zinc/lead/silver ore to 1.8 Mt/y. The project will also include improving the efficiency of the existing processing plant which converts the ore into a bulk zinc/lead/silver concentrate. With the open cut operation, the rate of concentrate production will reduce from 330,000 tonnes per year (t/y) to 320,000 t/y. The existing concentrate storage and transportation systems are adequate for the open cut project.

This draft Environmental Impact Statement (EIS) has been prepared to identify and assess the environmental impacts from the open cut project and to develop appropriate management strategies. It has been prepared in accordance with the requirements of the *Northern Territory Environmental Assessment Act (1982)* and the Environmental Assessment Administrative Procedures under which the Act is implemented.

Project Proponent

The project proponent is the McArthur River Mining Joint Venture (MRM). MRM is operated as an unincorporated joint venture governed by the McArthur River Joint Venture Agreement dated April 1994 between Mount Isa Mines Ltd (75%) and ANT Minerals Pty Ltd (25%). Mount Isa Mines Ltd is a wholly owned subsidiary of Xstrata Queensland Limited. ANT Minerals Pty Ltd was established in Australia to hold the interests of the other shareholders who currently are Nippon Mining & Metals Co Ltd (15%), Mitsui & Co Ltd (5%) and Marubeni Corporation (5%). McArthur River Mining Pty Ltd acts as agent of Mount Isa Mines Ltd, the manager of the McArthur River Mining Joint Venture.

Xstrata plc (Xstrata), the ultimate holding company of Mount Isa Mines Ltd, is a major global diversified mining group listed on the London and Swiss stock exchanges. It is headquartered in Zug, Switzerland and has approximately 19,500 employees world-wide. Xstrata purchased Mount Isa Mines Ltd in June 2003 when it purchased that company's parent company, Xstrata Queensland Limited (formerly MIM Holdings Limited).

Environmental Commitment

Xstrata's business principles ensure that all of Xstrata's operations (including MRM) are committed to the highest standards of health, safety and environmental performance, community consultation and to the principles of sustainable development.

MRM's Environmental Policy is to maintain a high standard of environmental protection. In maintaining this standard, MRM will take appropriate precautions to minimise any potentially adverse impacts of its activities on the environment, the community and its employees.

MRM is also a signatory to the Australian Minerals Industry Code for Environmental Management. MRM has met all of these key requirements since signing the code and continues to work towards achieving a high standard for all code requirements.

The open cut project is being developed with a strong focus on sustainability. In order for the social and economic benefits to be realised, the local, regional and wider environment will be considered to ensure that future generations inherit a healthy and safe environment with improved living standards.

Legal Framework

Both the Northern Territory Government and Commonwealth Government have jurisdiction over the environmental assessment of the McArthur River Mine Open Cut Project.

Northern Territory

This draft Environmental Impact Statement (EIS) has been prepared in accordance with the requirements of the *Environmental Assessment Act (1982)*. A Notice of Intent for the project was submitted to the Northern Territory's Office of Environment and Heritage in January 2003. In March 2003, final EIS guidelines were issued. While these guidelines were for the originally proposed project that included components that have since been deleted (Glyde River weir, zinc refinery, 350 MW power station and an increased production rate), they remain relevant for the remaining project components.

An Authorisation to Operate the existing mine has been received in accordance with the requirements of the *Mining Management Act (2001)*. This Authorisation to Operate requires the mine to operate in accordance with an approved Mining Management Plan that is reviewed and updated on an annual basis, or when significant changes are proposed to existing approved operations. Approval for the proposed open cut mine will be sought under this Act and, if granted, a revised Authorisation to Operate will be issued. Approval will be granted after consideration of a recommendation from the Minister for the Environment under the provisions of the *Environmental Assessment Act (1982)*.

Commonwealth Government

Under the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC), developments require assessment if they have the potential to affect one or more of six matters of National Environmental Significance.

A referral under the EPBC Act was submitted to the Commonwealth Department of Environment and Heritage (DEH) in February 2003. A decision was made in March 2003 that the proposed development constituted a Controlled Action under the following sections of the Act:

- Sections 18 and 18A (listed threatened species and communities); and
- Sections 20 and 20A (listed migratory species).

In May 2003 notification was received from the DEH that the project would be assessed through accreditation of the NT assessment process under the terms of the Bilateral Agreement between the Commonwealth and Northern Territory Governments.

Project Objectives and Benefits

Market Opportunities

World zinc metal output is currently constrained by zinc concentrate supply. The global market is forecast to remain in deficit for a number of years.

Industry forecasts predict a widening gap will emerge between known zinc mine supplies and the demand for zinc in concentrates which reflects the underlying growth in demand for refined zinc. As zinc metal output is now largely restricted to the availability of zinc concentrates in the market, global metal production is increasing moderately.

MRM forecasts that the market will continue at present levels and that MRM bulk concentrate will continue to be placed in this market.

Project Need

The forecast gap between known zinc supplies and the demand for zinc in concentrates provides an opportunity for MRM to increase its participation in the zinc business and to capture an opportunity in the market by developing a highly competitive zinc-lead mine operation. This will be achieved by changing its operations from underground to open cut.

Should the open cut project not proceed, mining at McArthur River will cease. This will result in a loss of economic production for the Northern Territory, the loss of employment for the existing workforce, and detrimental socio-economic impacts in the region.

Project Benefits

This project will secure a substantial and long-term mining operation which will produce significant direct and indirect benefits to the Northern Territory and Australia generally.

The benefits from the proposed open cut project include:

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- Continued contribution to NT and Australian economies: The open cut project will enable the economic benefits of the mine to continue. It will contribute \$175 million to the Gross State Product of the Northern Territory and \$271 million to Australia's Gross Domestic Product.
 - Capital investment: The open cut project will result in an up-front capital investment of \$66 million.
 - Increased mine life: The mine life will be extended to 25 years, securing the future of the mine, its output and its employees.
 - Construction employment: During construction there will be an average of 290 jobs created in the Northern Territory (including flow-on effects) and 570 nationally.
 - Operational employment: During operations there will be an average of 610 jobs created in the Northern Territory (including flow-on effects) and 1,700 nationally.
 - Economic output: MRM's contribution to the economic output of all industries in the Northern Territory will be \$329 million per year (including flow-on effects). Nationally, it will be \$523 million (including flow-on effects).
 - Local economic activity: During both construction and operations, employment opportunities will be available for local residents as well as opportunities for local businesses to provide goods and services to the mine.

Existing Underground Operation

McArthur River Mine is a major underground operation which is developing one of the largest known sedimentary stratiform zinc-lead-silver deposits. It currently produces around 333,000t/y of bulk lead-zinc-silver sulphide concentrate for overseas and domestic markets. The total workforce is approximately 330 permanent personnel. The workforce is employed on a fly-in/fly-out basis and, while on site, lives in a fully equipped accommodation village.

Underground Mine

Access to the mine is gained via declines. One decline is used as the main ventilation exhaust airway while another is used as the primary vehicle access. A conveyor decline connects the surface with an underground crusher and can also be used as a means of emergency access.

Ore is hauled from the production face to the underground crusher by low profile articulated trucks. After crushing, the ore is conveyed to the surface for further crushing and stockpiling.

Processing

The crushed ore is processed in the concentrator by removing of impurities and converting it into a bulk concentrate. The processing operation consists of the following basic steps:

- secondary crushing
- primary grinding

- rougher flotation
- regrinding
- cleaner flotation
- thickening and filtration

Concentrate Storage and Handling

The concentrate from the processing plant is conveyed to a concentrate storage shed awaiting shipment.

Road-trains with covered, side-tipping trailers are used for the transport of concentrate from the mine site to the port at Bing Bong which is on the coast approximately 115 km from the mine. The Northern Territory and Federal Governments have upgraded the haul road between the mine and Bing Bong to a two-lane highway, including a new section, which bypasses the town of Borroloola.

Tailings

Tailings are the fine material that remains after the mineral bearing component of the ore has been extracted during processing. The tailings stream from the flotation circuit is pumped to thickeners. The solids from the thickener are pumped to the tailings storage facility (TSF). The tailings settle in the TSF allowing the water to run off and be collected and returned to the concentrator for reuse.

Bing Bong Port and Bulk Carrier

The road-trains deliver the concentrate to a storage shed at Bing Bong. A shallow-drafted bulk carrier (“Aburri”) is used to transport concentrate from the port to sea-going vessels which anchor at a designated off-shore deep-water transfer zone. A feature of the Aburri is its ability to self-load (from a single shore mounted loading chute) at an average rate of 900 to 1,000 tonnes per hour (tph) and then discharge at an average rate of 900 to 1,000 tph into the ocean-going vessel.

Proposed Open Cut Operation

Overview

MRM proposes to change its mine from the existing underground mine to an open cut mine. The underground mine will be phased out and a new open cut mine phased in. Workforce numbers are likely to decrease from 330 to approximately 270, due to the increased efficiency of the open cut operation. They will continue to live in the existing on-site accommodation village and be employed on a fly-in/fly-out basis.

All operations will take place within the existing mining leases.

Open cut mining will involve the following:

- Realignment of the McArthur River and Barney and Surprise Creeks around the proposed open cut.

- Construction of a flood protection bund around the open cut and associated infrastructure facilities to prevent floodwaters inundating these operational areas.
- Excavation of the alluvial cover materials that overlie the ore. This material will be used for construction purposes, encapsulation of other waste rock, or rehabilitation.
- Excavation of overburden above and in between the orebody. This waste rock will be placed in overburden emplacement facilities.
- Excavation of ore from the open cut. The ore will be hauled to the run-of-mine pad (ROM) where it will be fed into the existing ore processing plant.
- Rehabilitation of the disturbed areas in accordance with statutory requirements and agreed post-mine land uses.

Mining Activities

The open cut will have two distinct activities within the one pit: overburden removal and selective ore mining. The processes are similar for each activity, however the scale and type of equipment used may differ.

To maximise the value of the orebody, the mining operation will separate ore and waste (overburden and interburden) so that relatively pure ore will be fed to the processing plant. In the ore zone, the ore is interspersed with bands of waste rock (interburden). The ore mining fleet will be used to segregate the ore from the waste rock, with ore being delivered to the processing plant and the waste being sent to an overburden emplacement facility.

The mine will be developed in 5 stages over the 25 year mine life. At the end of the mine life there will have been 42.8 Mt of ore mined, 183.3 Mt of overburden generated, and the open cut will be 210 m deep with an area at the surface of 83 ha.

Processing

Ore will be trucked from the open cut to the existing processing plant where it will be processed in the same manner currently used for the underground operation. The existing processing plant has sufficient capacity to treat the 1.8 Mt/y of ore that will be mined and will produce 320,000 t/y of concentrate.

The only new processing facilities proposed will be a run of mine (ROM) pad to receive the haul trucks from the open cut and a new primary crusher to replace the existing one which is located underground.

Concentrate Transport

As is currently the case, the concentrate will be trucked to the port at Bing Bong for export. The existing port facilities have sufficient capacity and will not require any upgrades as the throughput from the open cut operation will be slightly less than at present.

Construction

The construction phase will be undertaken over a two year period during 2006 and 2007, with the majority of activities taking place during the dry seasons.

The open cut mine will be located within the floodplain of the McArthur River. Consequently a flood protection bund will be constructed around the pit and infrastructure to protect the working areas from inundation in flood events. The bund has been designed to protect the site from the 1 in 500 year ARI flood event.

The construction workforce will average 150 and will be accommodated in a construction camp to be built adjacent to the existing accommodation village. They will be employed on a fly-in/fly-out arrangement.

A comparison of the key components of the existing operation and how they will change with the expansion is given in the following table.

Summary Comparison of Existing Operation with Proposed Development

Component	Current Operations	Open Cut Operations
Resource	23.2 Mt proved and probable (subsequently upgraded to 40 Mt total)	Pit designed to recover 43 Mt of ore
Mine Life	Subject to annual review	25 years
Mining method	Underground	Open cut
Mining Rate	1.6 Mt/y	1.8 Mt/y
Tailings	Tailings discharged to tailings storage facility	Existing tailings storage facility to continue to be used
Waste rock	No waste rock brought to the surface – used as backfill in underground mine	Stored on surface in overburden emplacement facilities – capacity 185 Mt
Processing	Flotation process producing concentrate (46% Zn con grade)	Flotation process producing concentrates (average 46% Zn con grade)
Power	Gas fired turbines producing 22 MW. Fired with natural gas delivered to site via a pipeline from Daly Waters	Existing power station to be used.
Product	330,000 t/y of lead-zinc-silver concentrate	320,000 t/y of lead-zinc-silver concentrate
Transport	Concentrate trucked to Bing Bong port, transferred to barge, then offshore loading onto ships	Concentrate trucked to Bing Bong port, transferred to barge, then offshore loading onto ships
Groundwater	Mine dewatering is pumped to the surface and used in the process. Borefields water supply	Borefields water supply to continue Pit water to be collected and used in process
Surface water	Dirty water collected and utilised in the process. Emergency discharge licence in place	Dirty water collected and utilised in the process. Emergency discharge licence in place Realignment of McArthur River and Barney/Surprise Creeks around open cut

Component	Current Operations	Open Cut Operations
Air Emission Sources	Power station Fugitive emissions	Power station Fugitive emissions
Workforce	330 operational personnel	Peak of 150 construction personnel 270 operational personnel

Infrastructure

Water Supply

Approximately 80% of the existing mine's process water currently comes from recycled water. Makeup water is sourced from groundwater bores. There is also some surface water utilisation from the site's surface water management system.

The site water management system for open cut operations will result in the mine becoming a net producer of water. Modelling has also shown that after year 2, there will be no further need to supply borewater to the mine except for potable uses.

There will be no changes required to the existing accommodation village water supply system as a result of the project. The potable water used in the accommodation village for human consumption and sanitary purposes is sourced from groundwater bores in the Mimex borefield.

Water used at Bing Bong is sourced from the Federation groundwater bore. There will be no change in water demand at Bing Bong from the open cut project.

Sewerage

The existing accommodation village and mine, including shower, toilet and crib room facilities, has a reticulated sewerage system. There will be no changes required to the existing sewerage system as a result of the project.

During the construction phase, a package sewage treatment plant will be installed to cater for the construction camp. Treated effluent from the plant will be irrigated in the same manner as the existing sewerage plant effluent.

Roads

There is unlikely to be any significant change in traffic patterns from the open cut project except for during the construction stage when one additional fuel truck per week from Darwin can be expected. Apart from those who live locally, all construction and operational workers will fly in and out of the mine site.

With the open cut project, the haulage rate between the mine and Bin Bong will decrease slightly in line with the reduction in annual concentrate production. The frequency of truck trips will decrease from 4,200 per year to 4,100 per year. This will result in approximately 11 truck trips per day, seven days per week. Thus the impact on the existing road system will be slightly less than for the existing operations.

Power

Electricity for the existing mine is generated on-site in a gas-fired power station. There will be no increase in the power demand with the open cut operation and hence no change to the existing power facilities is required.

Airstrip

At the mine site there is a single sealed runway 1,500 m in length with sealed and paved turning areas at each end. The airstrip is fenced to exclude cattle. The airstrip will continue to be used by the workforce for the open cut project.

Waste Management

Overburden

Over the 25 year mine life for the open cut operations, approximately 183 million tonnes (Mt) of overburden waste rock will be removed from the pit. The majority of this material will be placed in an overburden emplacement facility (OEF) to be constructed to the north of the open cut. The OEF footprint will have an ultimate area of 255 ha and a height of 50 m.

The overburden has been divided into the following categories to define its potential environment impact: Potentially Acid Forming (PAF), Non-Acid Forming (NAF) and Acid Consuming (AC). PAF overburden has the potential, in the presence of air and water, to generate acid water, soluble metals and salts that could impact the environment. NAF overburden is chemically stable with low potential for generation of environmentally significant products. AC overburden has the capacity to neutralise runoff and seepage from PAF material. The available overburden characterisation data indicate that 11% of the total overburden could be PAF.

In the OEF, PAF overburden will be encapsulated within clay cells and layers of NAF/AC waste in the western zone of the OEF to ensure that there is no acidic seepage generated by the facility. Over the life of the OEF, seepage from the western zone will be contained within the site's water management system and transferred to the TSF for recycling to the process plant. NAF overburden only will be used to construct the eastern zone of the OEF.

Two small overburden emplacement facilities for NAF material only have also been planned for the area in between the flood protection bund and the crest of the final pit. This provides a shorter haul, as well as some overburden emplacement capacity during times of flooding outside of the flood protection bund.

Tailings

Existing Tailings Storage Facility

The TSF is located adjacent to the western side of Carpentaria Highway south of Surprise Creek. It is divided into three cells and a clean water dam. Cell 1 is the initial and current tailings impoundment area.

Cells 2 and 3 are planned to store tailings once Cell 1 becomes full but they are currently used as an evaporation pond and dirty water dam.

The TSF operates with a central thickened discharge, with tailings deposited via an elevated riser into the centre of Cell 1 to form a cone of deposited tailings. Tailings bleed water and stormwater runoff flow down the beached tailing cone to the edge of the TSF. This flow is then directed to either the evaporation pond or the dirty water dam. The water may be held in the evaporation pond and allowed to evaporate if there is excess water in the system, or allowed to flow to the dirty water dam from where it is returned to the processing plant for reuse.

Open Cut Tailings Storage Facility

The existing tailings storage facility (TSF) footprint will be utilized for the open cut operations. No additional land disturbance will be necessary. Tailings from the open cut will be placed in the areas currently used for the evaporation pond and dirty water dam. The existing clean water dam will be upgraded (water management dam) to accept decanted tailings bleed water and stormwater runoff. This water will be reused in the processing plant.

Seepage

In 1997, seepage was discovered in Surprise Creek adjacent to the TSF. Water in the creek was found to contain some sulfate (positive indication of tailings origin) but only background levels of lead and zinc. Regular monitoring of the water in Surprise Creek indicated no or minimal transport of lead and zinc in the water from the tailings. Remedial actions taken as a result of the seepage included pumping of water from the creek back into the TSF, installing a cut-off trench between the TSF and the creek, reducing tailings accumulation in the section of the TSF nearest the creek, and instigating of a groundwater monitoring program. In early 2005 it was decided to install a geopolymer barrier wall around the perimeter of Cell 1 fronting Surprise Creek to further control the seepage. In the unlikely event that ongoing seepage is detected, consideration will be given to alternative remedial works such as recovery bores.

Modelling of seepage from the open cut TSF has been undertaken to determine the potential extent of any seepage and to develop seepage controls. The results indicate that the preferred seepage control method is the installation of recovery bores. It is anticipated that the bores will be located around the downgradient (southern) side of the TSF at a spacing of approximately 50 m at a depth of 11 m. Water from the recovery bores will be pumped to the water management dam from where it will be pumped to the concentrator for reuse.

Operational Waste

Waste management at McArthur River Mine is an integral component of the site's environmental management system. Waste management practices aim to reduce waste production through recovery, re-use and recycling and through encouraging efficient utilisation of resources. MRM aims to promote best practice disposal of waste products both on-site through appropriate maintenance of waste disposal areas and off-site through utilising environmentally responsible

waste disposal companies. The site's existing waste management system will continue with the open cut project.

Air Quality

The main fugitive emissions to air from the current mining activities are particulate matter (dust) from exposed areas, stockpiles and vehicle movements. There are also emissions of particulates from the ore crushing and handling operations. With the open cut project, these same emission sources will continue together with additional sources from the open cut mine such as stripping, drilling and blasting, and grading. No new point source emissions will occur as a result of the open cut mining operation.

Modelling of air emissions from the open cut operations has shown that at the nearest sensitive receptor (accommodation village) that will be no exceedences of air quality standards under any meteorological conditions. Thus there will be no significant air quality impacts from the project.

The main sources of greenhouse gas (GHG) emission from the site are the gas-fired power station and, to a lesser extent, diesel and transport use. However natural gas will continue to be used as the energy source for electricity generation. This results in significant reduced GHG emissions compared to the alternative energy sources of coal or oil. With the open cut project, the annual GHG emissions (CO₂ equivalent) will increase marginally from 117,900 t/y in 2004 to 124,100 t/y in 2008. This is not considered to be a significant increase and is within the range of GHG emissions since 2000/01 which have varied from 117,300 to 129,7000 t/y. The GHG emissions per tonne of metal in 2008/12 will be approximately 7% lower than in 2004 (on a per-tonne product basis) demonstrating an improvement in net greenhouse efficiency of mine operations.

Noise

The main sources of noise generation from the open cut project will include mining and blasting activities, crushing and grinding, power generation, and traffic.

Modelling of noise emissions from the open cut operations has shown that at the nearest sensitive receptor (accommodation village) that will be no exceedences of noise standards under any meteorological conditions. Thus there will be no significant noise impacts from the project.

Groundwater

Existing Aquifers

Historically, groundwater has formed an important component of the mine process water and potable supply especially during the dry season. Aquifers in the mining area occur as a result of both intergranular and secondary permeability. There are two main aquifer types as follows:

- Alluvium – sand and gravel deposits in the major river channels and associated palaeochannels; and

- Bedrock – secondary structures (such as faults, shear zones and joints) in the upper weathered bedrock and the lower fresh bedrock.

A network of groundwater monitoring bores has been established to monitor the impacts of the current mining operations on the groundwater resources of the area. MRM routinely completes a monthly sampling program in the local groundwater monitoring bores around the plant site and the tailings storage facility.

Pit Dewatering

To ensure dry working conditions in the proposed open cut, it will be necessary to install a network of interception bores around the pit to remove groundwater that would otherwise flow into the pit threatening the stability of the pit walls and hampering mining operations. The rate of groundwater abstraction has been estimated from the alluvium and associated palaeochannel, weathered bedrock and bedrock. The rate increases slowly during the initial years of mining up to a maximum at year 17 when abstraction from alluvium and weathered bedrock will be 2,770 kL/day and 3,560 kL/day from bedrock. The dewatered groundwater will be re-used in the process plant.

Drawdown

AS a result of the groundwater abstraction required for mine dewatering, groundwater levels will be lowered significantly in the immediate area of the open cut. By the end of mining, the total drawdown will be about 220 m below the initial static groundwater level. However, because of the generally low permeability of the bedrock surrounding the open cut, the very large drawdown that occurs around the open cut will quickly reduce with distance from the mine.

Drawdown caused by dewatering will lower groundwater levels in the superficial sediments around the pit and in the alluvium associated with both the current McArthur River channel and the palaeochannel sediments. Groundwater levels in the superficial sediments over most of the area (away from the major drainages) are already reasonably deep (10 to 15 m below ground surface) and in some areas, these sediments are largely unsaturated. Lowering of groundwater levels in these sediments, therefore, cannot have a significant environmental impact as most flora in the area is likely to rely on soil moisture (rather than the water table) for survival.

Djirrinmini Waterhole

Lowering of groundwater levels in the superficial sediments has the potential to affect water levels in Djirrinmini Waterhole which is a permanent pool in the McArthur River about 1 km upstream of the proposed river realignment. While Djirrinmini Waterhole is filled by stream flow on a seasonal basis each wet season, during the dry season when the stream flow reduces, groundwater inflow from the surrounding aquifers plays an important role in maintaining water levels. Modelling results have predicted that after 25 years of mining, the drawdown at Djirrinmini Waterhole will be approximately 0.5 m in both the weathered bedrock and the alluvial aquifers. This may result in a decrease in the depth and extent of the waterhole at the end of the dry season prior to it being replenished in the following wet season.

It should be noted that the predicted drawdown of 0.5 m is a maximum which will not occur until after 25 years of mining. Prior to that, the drawdown will be less. During the initial years of mining, a program for monitoring groundwater levels will be implemented to confirm the accuracy of the predicted effects. In the event that the monitoring program indicates that drawdown levels are significantly greater than expected, mitigation measures such as sustaining upstream river flows from suitable existing bores will be considered.

Surface Water

River Hydrology

Streamflow throughout the McArthur River catchment is highly variable as a result of thunderstorm, cyclone or monsoonal rainfall. The greatest flows occur during the 'wet season' which generally extends from October to March. River flow in the vicinity of the mine typically dries up to a series of large isolated pools during the "dry season" between August and September. No-flow periods are typically one to two months and can last up to six months.

Floods in the McArthur River are large and highly variable. Peak flows of up to 6,200 m³/s were recorded during floods in February 1975 near the mine site. The floodplain is regularly inundated up to 5 m deep, and rises in flood levels of 5 to 7 m over 24 hours are not uncommon. Flooding in the vicinity of the mine is influenced by a narrowing of the floodplain at the Bukalara Range, 3 km downstream of the mine.

Existing Surface Water Quality

The current McArthur River system is considered to be "slightly to moderately disturbed" relative to ANZECC water quality guidelines for fresh and marine waters. A water quality monitoring program is ongoing at the mine. MRM is currently working with DBIRD to agree on site-specific trigger values for water quality in the McArthur River.

Water in Surprise and Barney Creeks is showing signs of elevated lead and sulfate concentrations. Surprise Creek has elevated levels of sulfates, probably sourced from leachate from the northern side of the TSF. There is no sign of acidification of waters in local streams as a result of acid drainage.

Surface Water Management

The process water component of the existing water management system at the mine is essentially a closed water circuit with approximately 80% of process water being recycled through the tailings water system and runoff containment systems. For containment storages that have large catchment areas and hence are vulnerable to rainfall influences, overflows to the receiving environment only occur in very large and rare rainfall events or from rainfall event sequences.

Catchments at the mine are segregated to minimise the amount of contaminated water to be handled. The catchment dams are designed to capture dirty runoff from contaminated areas such as the concentrator,

portal area, concentrate shed and tailings storages and are the main storages used to source water for re-use in the process plant and for dust suppression.

With the current water management system, the clean water dam has the largest catchment and is also used to store water abstracted as required from Barney Creek and the McArthur River. The inflows to this storage are predominantly clean water. This storage has the greatest potential for overflow and has a licensed emergency discharge procedure.

The open cut project will require a change to the existing mine site water management system to accommodate the new operational areas such as the OEF. The overall philosophy of mine water management will remain the same as the existing system and will be updated over time in accordance with on-going industry improvements in best practice for mine water management. New or modified water storage facilities will be provided in the vicinity of the mine, industrial area and the OEF. A water management dam will be constructed at the TSF in place of the clean water dam and the decommissioned underground mine will also be used as a water storage.

The site water management system for open cut operations will result in the mine becoming a net producer of water. This is primarily due to the need to dewater the open cut to prevent groundwater inflow. Modelling has indicated that there is a 10% chance of needing to install additional containment/evaporative storages and/or implement additional works/strategies to maximise evaporative losses from the system. The modelling has also shown that after year 2, there will be no further need to supply borewater to the mine except for potable uses.

McArthur River and Barney Creek Realignments

Realignment of the McArthur River and Barney Creek around the proposed open cut will be required. In addition, the mine cannot utilise open cut mining methods without protection from flooding from the McArthur River and Barney Creek. Hence a flood protection bund will be constructed around most of the perimeter of the mine pit (excluding the side adjoining Barney Hill) to prevent flood waters from entering the pit.

The design of the realigned channels has been developed to mimic the general geometry of the existing McArthur River low flow channel and the Barney Creek channel. The size and slopes of the new channels have also been designed with the objective of minimising the potential for erosion of the channels and the reaches immediately upstream and downstream. The first 1,700 m of the realigned river channel will pass through alluvial materials while the majority of the balance (3,800 m) will be in rocky material.

The cross section of the realigned river channel will be designed to have a bed 15-28 m wide, a depth up to 18 m, and batter slopes between 2:1 and 3:1. Where the depth is greater than 12 m, a berm 4 to 6 m wide will be placed 9 m above the bed level. The batters and berms will be revegetated with native species which, together with bank protection measures such as rock armouring at susceptible locations, will assist in providing stability and minimising erosion.

Hydraulic modelling has shown that there is unlikely to be wide-scale erosion of the realigned river channel or in the upstream reaches sufficient to alter river shape or alignment. However, the presence of minor erosion and sedimentation along the new channel will generally be allowed to occur as it will assist

in providing substrate diversity to enhance aquatic fauna habitat. Remedial measures will generally be limited to areas that may be problematic for water quality (turbidity).

The combined effects of the river and creek realignment and the flood protection bund will influence flood levels in the McArthur River in the vicinity of the mine. Modelling has shown that the realigned river channel has sufficient capacity to convey the 2-year and 5-year ARI flood event within the top of the bank. For larger floods, surrounding areas will be inundated. Water levels upstream of the mine will increase during larger floods by up to 1.4 m in a 100-year ARI event. Increased flood levels could produce additional minor flooding impacts on the Carpentaria Highway and the airstrip, although both of these facilities are subject to flooding under existing conditions. The increased flood height caused by the project will result in a slightly longer period during which they would be closed.

Biology

Flora

Nine distinct vegetation communities occur within the project area. The riparian and floodplain communities are common and widespread. While the two sandstone plateau vegetation types have some local ecological value, they have no declared conservation value and will not be affected by the open cut project. No plants with declared endangered or threatened IUCN threat status were found during the site surveys.

Development of the open cut mine will result on the staged clearing of the area within the flood protection bund, the river and creek realignments, and the OEF. No additional clearing is required for the TSF. None of the vegetation species to be cleared have declared conservation significance.

An extensive revegetation program will be undertaken along the realigned river and creek channels. A combination of endemic woody, herbaceous and grassy species will be used at planting densities similar to those currently existing. A monitoring and remediation program will be implemented until the area is considered to be ecologically stable.

The site's existing weed and fire management programs will be expanded to incorporate the operations of the open cut project.

Fauna

The five types of fauna habitat in the vicinity of the project area are Riverine, Woodland/ Grassland, Stony Rises, Sandstone Plateau and Gorges, and disturbed areas. Surveys have identified eight threatened fauna species within or near the mine area. In addition, nine migratory birds listed under the EPBC Act have been identified in the project area.

No Endangered fauna species have been confirmed as occurring within the proposed project area in recent years. None of the migratory species are likely to be significantly affected by the project. By their nature, migratory species are wide ranging, and in the absence of important habitats in the project area, they will be largely unaffected.

The break in the riverine corridor that will occur as a result of the realignment of the McArthur River will affect bird species which are specialist to this habitat. However, the break in corridor habitat is not expected to be a major barrier to the dispersal of riverine forest specialist birds which are mobile and not dependent on a continuous riverine habitat for dispersal. Riverine forest trees will be establishing along the new river channel creating a new habitat so that terrestrial fauna will eventually have a new riverine corridor to use. The realignment of parts of Barney Creek is likely to have minimal impacts on terrestrial fauna, as these areas are generally occupied by woodland species or generalists, and do not offer the same type of corridor habitat as the McArthur River.

The proposed OEF will occupy an area of approximately 300 ha of land dominated by a low open coolibah woodland (Vegetation Unit 6) which is degraded by cattle and introduced weeds. No fauna species are specialised to this woodland habitat and the conservation value of the site for fauna is low.

There is no change to the existing TSF proposed by the open cut project. The existing tailings storage facility is already used by many species of waterbirds, including listed migratory species and will continue to provide this habitat. Water quality resulting of the open cut operation will be similar to the existing underground operation. The current bird monitoring program has not recorded any bird deaths or other deleterious effects to birds using the site.

Aquatic Ecology

The known freshwater fish fauna of the McArthur River system consists of about 27 species. All species are naturally occurring and there are no introduced or translocated species recorded from the catchment. Most species are common and widespread across northern Australia. Freshwater crocodiles (*Crocodylus johnsoni*) are also common in the McArthur River

The only fish of conservation value in the area is the freshwater sawfish (*Pristis microdon*) which is listed as Endangered by IUCN and as Vulnerable under the EPBC Act and *Territory Parks and Wildlife Conservation Act 2000*. Worrell's Turtle which is also found in the river is listed as Near Threatened under the *Territory Parks and Wildlife Conservation Act 2000*. This species is common in the McArthur River within the project area, and widespread in streams of the southern Gulf region.

The newly created realigned river channel will initially contain habitat not typical of the existing system. To minimise these effects, the new channel will be designed to emulate the existing physical characteristics of the river. The channel banks will be revegetated and micro-habitats will be placed along the channel bed. The realignment will be designed to ensure that there is no physical or hydraulic barrier to fish movement and fish resting pools will be provided. There will be no significant change to the river's environmental flows.

An aquatic monitoring program will be designed to assess populations of species in permanent pools above the river realignment and to assess movements of species through the realigned channel.

Cultural Heritage

The region in which the mine is located has long been, and continues to be, an area of importance to Aboriginal people. While many Aboriginal people still live in the general region of the mine, no-one lives in the immediate vicinity of the mine.

In October 2002, an archaeological survey of the proposed open cut area were undertaken. The findings were that the identified sites and their archaeological contents were of very low archaeological significance and further scientific investigation unwarranted. A further survey was undertaken in June 2005 in the area of the Test Pit. The background artefact scatters identified during the survey received a permit to destroy from the Minister of the Environment and Heritage as they were assessed as having little archaeological potential for future archaeological research. In addition, two archaeological sites were located in areas adjacent to but undisturbed by the Test Pit clearing. However as they are in the open cut area, permission will be sought from the Minister for Lands, Planning and the Environment to destroy them subject to prior assessment.

In addition to the above, it is proposed to undertake a predictive survey of the area to be cleared by the open cut project. Should the survey identify areas that are likely to contain significant artefacts, it is proposed to have the services of an archaeologist available when these areas are being cleared.

There are a number of registered and recorded sacred sites in the vicinity of the project area. The Aboriginal Areas Protection Authority (AAPA) has issued authority certificates for all of the open cut project areas in accordance with Section 22 of the *Northern Territory Aboriginal Sacred Sites Act 1989*. The AAPA certificates include requirements for protecting nearby sites during the project's construction. MRM and its employees and contractors will adhere to these AAPA requirements.

There are no native title issues which affect the open cut project.

Social and Community Effects

The mine is situated in a sparsely populated area of the Gulf Region and is well removed from the nearest residential area which is Borroloola approximately 45 km to the north-east.

The mine is located on McArthur River station which is owned by Colinta Holdings Pty Ltd, an Xstrata subsidiary. McArthur River station currently stocks approximately 13,000 head of cattle over approximately 7,200 km² which stretch from approximately 70 km south of the mine to the coast at Bing Bong.

MRM has been active in pursuing partnerships and agreements on community development. For example, a Memorandum of Understanding was signed between the NT Government, MRM and the residents of Borroloola aimed at creating skills and career opportunities for residents of Borroloola to improve the scope of education and post-education outcomes for students at Borroloola. MRM provides logistical support and sponsorship to the NT Minerals Council Education Committee for annual classroom visits to the Borroloola and Robinson River schools which promote minerals awareness and education to the

students. The company also supports hearing impaired students from the Borrooloola and Robinson River communities with sponsorship of visits by special teachers of the deaf from Alice Springs.

As the construction workforce will generally be single status, the population increase at the mine site as a result of the imported construction workers will peak at 150. This will be a temporary effect and will only exist for the duration of the two-year (dry season) construction phase. The majority of the construction workers will be employed on a fly-in/fly-out arrangement and hence there will not be any significant impact on the demographics of Borrooloola or any other local communities.

Efficiencies to be obtained in changing from underground to open cut mining will result in the total on-site operational workforce reducing from 330 to 270. Any new employees required as a result of new skills required for the change from underground to open cut mining will be hired predominantly from Darwin or other regions where skilled labour is available. However, MRM is committed to hiring local people when appropriately skilled personnel are available, and will provide employment and training programs in order to train local people with the necessary skills.

It is not expected that there will be any significant effects on local community services such as education and health or recreational facilities as a result of the open cut project.

Community Consultation

MRM consults with a range of stakeholder groups about its operations at McArthur River and Bing Bong on a regular basis and has done so over several years. In addition, the MRM Community Development Officer is an active member of a number of local Borrooloola community organisations.

A wide range of community consultation was undertaken when MRM's open cut mining plans were originally announced in 2003. Many of the original consultations referred to MIM which was the owner of the McArthur River Mine at the time. Furthermore, a number of the issues raised during the initial consultations related to the originally proposed expansion project which included a weir on the Glyde River, a zinc refinery, a sulfur plant, an additional power station, and a limestone quarry. These projects elements are no longer part of the open cut project.

Further community consultation has been undertaken with relevant stakeholders prior to the release of this EIS for public comment. This consultation explained the differences between the original and currently proposed project and outlined the nature of the environmental impacts expected and the proposed management and mitigation strategies.

Health and Safety

The safety management system (SMS) in place at the McArthur River mine is presently based largely on the SiteSafe system. The SiteSafe system is a risk-based system, the main elements of which are:

- Safety risk management procedure;
- Hazard reduction;
- Job safety analysis and standard operating procedures; and
- Risk register.

MRM is currently in the process of establishing a Health, Safety, Environment and Community (HSEC) Management System structure, based on the Xstrata HSEC standards. The procedures within the current SMS will be amended and updated, as appropriate, for inclusion within the new HSEC Management System. The construction and operational phases of the open cut project will be incorporated into the integrated HSEC Management System.

Risk Management

The risk management process used by MRM has various levels or stages which correspond to the stages of project development with an ongoing process of risk assessment and management consistent with Australian Standard AS/NZS 4360:1999 'Risk Management'.

A preliminary hazard study was undertaken during the open cut feasibility study to identify the safety, health, environmental and business risks associated with the project. Thirty one extreme and high risk scenarios were identified by this process. Controls or management strategies to avoid or mitigate these risks were identified and will be implemented.

Rehabilitation and Closure

The main objectives of the MRM rehabilitation program are to:

- Plan the placement of materials in a strategic manner to facilitate progressive rehabilitation and to minimise material handling costs.
- Conduct studies that will enable effective techniques to be implemented when carrying out rehabilitation.
- Carry out rehabilitation works that will, at the completion of the mining project, result in a stable, vegetated landscape having minimal impact on the surrounding environment.
- Carry out construction and rehabilitation works that will, at the completion of the mining project, result in stable stream channels having minimal impact on the surrounding environment.

The rehabilitation strategy will remain flexible and will be amended as new rehabilitation techniques emerge and as environmental investigations progress, or when MRM's Mine Management Plan is modified. To achieve the objectives above, MRM has established:

- An Unplanned and Life of Mine Completion Plan (LOM);
- Rehabilitation requirements, plans and timelines;
- Security and decommissioning life of mine costs which are calculated annually;
- Rehabilitation accrual;
- Post-mining land use objectives; and
- Rehabilitation trials to develop the site rehabilitation requirements and potential success of any rehabilitation programs.

Closure criteria for the site are aimed at reaching long-term stability of the site and the minimisation of off-site impacts. They have been used as the basis for environmental and mine planning strategies outlined in MRM's Mining Management Plan. This plan aims to ensure that the site is left in a condition that reflects government and community expectations.

Biodiversity Offsets

Biodiversity offsets are voluntary conservation activities designed to compensate for the residual, unavoidable harm to the biodiversity of an area caused by development projects. The open cut project is being developed with a strong focus on sustainability and it is MRM's desire to implement an appropriate biodiversity offset to support this focus.

The biodiversity offset program will be designed to manage an area of MRM's land holdings for conservation purposes that is seen to be an appropriate offset to the open cut project. The program will be developed in consultation with all relevant stakeholders so that there can be a net gain to the local community and the environment.

Environmental Management Plan

MRM currently has a Safety Management System (SMS) and Environmental Management System (EMS) that applies at the site. The SMS and EMS are currently being restructured to be compliant with Xstrata's Health, Safety, Environment and Community (HSEC) Management Policy and Standards as well as ISO 14001 (International Environmental Management Standard) and AS 4801 (Australian Standard for Health and Safety Management) requirements. The aim is to develop an integrated health, safety, environment and community management system that can be internally audited by Xstrata and externally audited for compliance with the requirements of ISO 14001 and AS 4801 by an independent certification body.

For each identified area of impact from the open cut project, a draft environmental management plan has been developed. These plans are strategic and define a framework for environmental management by identifying proposed mitigation measures and monitoring and reporting activities together with corrective actions.

Summary of Existing and Proposed Mine Component and Effects

Component	Existing Underground Operation	Proposed Open Cut Operation	Effects
Mine			
Mining method	Underground	Open Cut	Optimum resource recovery, and increasing the mine life
Production Rate	1.6 Mt/y	1.8 Mt/y	Improved efficiency and extraction
Processing	Crushing, grinding , flotation, thickening , and filtration.	Processing operations will remain the same. There will be a new Run of Mine (ROM) pad and primary crusher.	The processing facility has the required capacity for the open cut project.
Product	330,000 t/y of bulk concentrate	320,000 t/y of bulk concentrate	Small reduction
Concentrate storage and handling	On-site storage shed.	No change	No change
Transport to Bing Bong	Road-trains with covered, side-tipping trailers.	No change but number of trips to Bing Bong to reduce from 4,200 to 4,100 per year	Small reduction
Bing Bong and Bulk Carrier	Bing Bong port facilities are utilised. The bulk carrier Aburri transports concentrate to sea-going vessels.	No change but number of Aburri trips to export vessel to reduce from 130 to 126 per year	Small reduction
Overburden Emplacement Facility (OEF)	Not applicable	A new OEF will be built to the north of the mine area.	No significant vegetation to be cleared PAF to be encapsulated Runoff and seepage controlled
Tailings Storage Facility (TSF)	Central thickened discharge at TSF	Existing TSF to be used	New TSF within the existing footprint. Runoff and tailings water to be reused Seepage controlled
Flood Protection Bund	Not required	To be built around the open pit	Provides 500 year ARI flood immunity Increase in upstream flood levels
River and Creek Realignment	Not Required	To be built around the open pit and flood protection bund	No significant change to existing flows No significant erosion or changes to upstream reaches
Workforce	330 operational workers who live on site and fly-in/fly-out (FIFO)	Peak of 150 construction workers for 2 year construction phase	On-site camp for FIFO construction workers Existing on-site accommodation village to be

Component	Existing Underground Operation	Proposed Open Cut Operation	Effects
		270 operational workers	used for FIFO operational workers
Water Supply	Sourced from groundwater bores and surface water reuse.	No need to source bore water after year 2 except for potable supply.	Decrease in the need to use groundwater as a source of water.
Sewerage	Reticulated sewerage system.	No change for the project. During construction a package sewerage treatment plant will be installed.	No change
Power	Gas-fired on-site power station	No change	No change
Air quality	Fugitive emissions (dust) from exposed areas, stockpiles, materials handling and vehicles. Stack emission from gas combustion at power station.	Additional fugitive emissions from open cut mining operations and OEF. No changes to stack emissions.	No significant air quality effects at accommodation village or off-site
Noise	The main source of noise is traffic, process plant and power station.	Additional noise sources from open cut operations.	No significant noise effects at accommodation village or off-site
Groundwater	Groundwater used for water supply for potable and process needs	Open pit will need to be dewatered. Groundwater only required for potable uses	Groundwater levels will be drawdown around the open cut No significant effect on surrounding vegetation Decrease in depth and extent of the Djirrinmini Waterhole at the end of the dry season
Surface Water	Site water management system contains and reuses stormwater with a licensed emergency discharge from the clean water dam	Same surface water management system with the addition of new ponds for new project areas. Licensed emergency discharge to remain.	Due to mine dewatering the site will become a net water producer with a likely requirement for increased evaporation to reduce water inventory.
Flora	Nine vegetation communities present within mine area. No threatened plant species present	Staged clearing of area within flood protection bund, river and creek realignments and OEF. No additional clearing at TSF	No significant species affected Cleared areas will be rehabilitated progressively or at mine closure. River and creek realignments to be revegetated
Fauna	No endangered species have been recorded within mine area. Nine migratory bird species recorded	Clearing of riverine corridor and low woodland habitats.	Temporary break in riverine corridor will not have a significant effect. Use of TSF by migratory birds to continue
Aquatic ecology	Two species of conservation significance in McArthur River: Freshwater Sawfish and Worrell's	Realignment of McArthur River and Barney Creek. Realigned channel to mimic existing conditions, banks to be revegetated and micro-	No physical or hydraulic barrier to fish movement No significant change to environmental flows

Component	Existing Underground Operation	Proposed Open Cut Operation	Effects
	Turtle	habitats placed in bed	
Cultural Heritage	Existing registered and recorded sacred sites in region Previous archaeological surveys found site to be of low significance	AAPA authority certificates issued for open cut project Further archaeological survey proposed	AAPA certificate conditions to be implemented Archaeologist to be available during construction in sensitive areas
Social and Community Effects	MRM is active in pursuing partnerships and agreements with local community	Construction workforce on site for two years on FIFO arrangement Reduced operational workforce also on FIFO arrangement	No significant changes to current effects on local community services Existing community partnerships and agreements to continue
Economics	Existing operations provide a considerable boost to the NT and Australian economies.	Both the operational and construction stages of the project will continue to provide economic benefits.	Continuation of economic benefits to the NT and Australian economies Open cut project avoids closure of mine and loss of economic benefits
Rehabilitation and closure	Rehabilitation is an ongoing process for the life of the mine. Mine closure strategy developed in Mining Management Plan	Existing rehabilitation strategy to incorporate open cut project Existing mine closure strategy to incorporate open cut project	Mine site will be left in a stable and safe condition with minimal off-site impacts
Biodiversity offsets	Not applicable.	Biodiversity offsets program to be implemented	Long term protection of environmentally sensitive area that is not currently protected