Northern Territory Government
Department of Infrastructure, Planning and Environment

PART A – Introduction and Description

GUIDELINES FOR AN

ENVIRONMENTAL IMPACT STATEMENT

ON THE PROPOSED MCARTHUR RIVER MINE EXPANSION

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These Guidelines have been developed to assist MIM Holdings Limited in preparing a draft Environmental Impact Statement (EIS) for the McArthur River Mine expansion and processing facility in accordance with Clause 8 of the Administrative Procedures of the *Environmental Assessment Act (1982)* of the Northern Territory

The final guidelines will consist of 3 sections. Part A (this section) is the introduction and description of the project and the EIS process. Part B (attached) details, in a generic fashion, all the issues that require addressing by the proponent. Part C (to be attached as part of the final guidelines) will contain additional project specific issues and concerns raised during the public consultation period on the guidelines.

1 Project Description

1.1 History

McArthur River Mine is a major underground operation, which is mining one of the largest known sedimentary stratiform zinc-lead-silver deposits. The orebodies making up the deposit, named Here's Your Chance (HYC), were discovered by Mount Isa Mines Limited geologists in 1955, but development did not commence until 1995. This gap in time between the deposit's discovery and development resulted from the unusual structure and extensive faulting of the orebodies and the extremely fine-grained nature of the ore, which combined to make commercial exploitation of the resource unfeasible for many years. A number of technological advancements in mining, ore treatment and concentrate transport, were necessary before the project could proceed on an economic basis. Trial work failed to develop an economically viable technique of ore beneficiation in the 1960's and 1970's.

A small decline and pilot plant were constructed on site in 1975, with the consequent preparation of a feasibility study and environmental report in 1979. That study was based on a high-tonnage, open-pit operation. In addition to poor recovery rates, no market existed at that time for the low-grade lead and zinc concentrates produced by the pilot plant. Subsequent metallurgical developments in fine grinding technology and the emergence of a market for high-grade bulk concentrate for use by smelters using the Imperial Smelting Process (ISP) technique.

Construction of the current project commenced in 1994, with the first shipment of concentrate loaded in mid-1995. McArthur River Mining produces around 360,000 tonnes of bulk lead concentrate (containing payable zinc, lead and silver) for overseas and domestic markets.

The total workforce is currently 330 permanent personnel. Most production employees work a 7 days on/ 7 days off roster, with most support & management staff working a 5/2,4/3 roster.

1.2 Geology

The McArthur Basin comprises Carpentarian and Adelaidean rocks extending from the Alligator river in the Northern Territory to the Queensland border including the greater part of Arnhem Land and the Gulf of Carpentaria drainage region. The sediment hosted stratiform HYC deposit has similarities with ore-bodies at Mount Isa and Hilton in Queensland. It is about 1.5km long and 1.0km wide with an average thickness of 55m.

The HYC deposit occurs near the base of the HYC pyritic shale member, within the Middle Proterozoic McArthur Group. The member comprises a sequence of inter-bedded pyritic bituminous dolomitic siltstones, sedimentary breccias and volcanic tuffs.

The HYC deposit has been folded and eroded along its western margin, which is covered with 30m of soil. This western margin contains the Hinge ore zone, which is sub-vertical with a strike length of 1.0km and vertical height of 200m. The northern margins inter-finger with sedimentary breccias and the southern margin grades into thinned nodular barren pyritic siltstone. On the eastern margin the ore-body thickens and is folded to form the Fold Zone, which has a strike length of over 600m. The southeastern corner is down faulted 110m by the northeastern trending Woyzbun Fault.

1.3 Resource

Open pit mining will increase the mineable ore reserves from the current underground reserves of 40 Mt to open pit reserves of 160 Mt. The mining rate would peak at around 60Mtpa and the project life would be extended from 25 years to 35 years.

1.4 Mining

1.4.1 Current Mining Method

Current ore recovery at McArthur River is by way of a number of mining methods. Mining to date has focused on the No 2 ore-body, which is near the bottom of the mineralised package. The No 2 ore-body has principally been mined by room and pillar mining, at depths ranging from 60 metres below the surface on the western side to over 400m deep on the eastern side of the deposit. The underground mine will increasingly exploit the No 4 ore-body and the No 3 upper ore-bodies as the No 2 ore-body is depleted. The No 4 ore-body is approximately 20m above the No 2 ore-body. Current plans aim to mine these ore-bodies by open stoping methods. Ore is blasted into the No 2 ore-body level and then loaded into diesel powered trucks and hauled to the underground crushing and conveying system. The ore is then transported to the surface mill stockpile on a conveyor in an access tunnel at a gradient of 1:5.4. The current mining and milling rate is 1.5Mtpa. Further tunnel access development is now underway to mine parts of the Woyzbun ore block by the open stoping method.

1.4.2 Proposed Mining Method

The company is currently investigating the feasibility of developing the HYC ore deposit by the open pit mining method. Previously the company completed open pit investigations in a feasibility study in 1979. This study was to market a concentrate product and the result was seen to be not feasible at that time. The current study has the advantage of significant technology advances and the current strategy is to make zinc metal on site rather than to sell bulk concentrate. Recent scoping study work by ISA indicates this is significantly more viable than the current operation.

The scoping study demonstrates that having the ability to produce zinc cathode metal on site via the Albion Process significantly changes the economics of the McArthur River orebody. The scoping study of the open pit development shows that the likely mining reserve would be approximately 160Mt compared to the current underground reserves of 40Mt.

The open pit development option comprises a conventional staged open pit development of the HYC deposit. The open pit mining rate would be around 4.8Mtpa of ore which is expected to significantly enhance the economic outcomes compared with the current operation. This may commence while the current underground operations are still in progress to ensure continuity of ore supply to the mill. The operation would commence with the construction of a diversion of the McArthur River and construction of a bund wall to protect the future pit workings from inundation during localised wet season flooding. Mining would be by a fleet of conventional rope shovels, hydraulic excavators and large haul trucks. The mining rate would peak at around 60Mtpa and the project life would be around 35 years. The overlying alluvial cover material will be progressively mined as needed and placed on areas designated for rehabilitation such as the waste rock storage facility. The ultimate pit is likely to be approximately 420m deep, 1600m long by1400m wide, with an area of around 200 Ha.

1.5 Mining Waste

The waste rock generated from the open pit mining will be placed in a purpose built waste rock dump. Preliminary estimates of the open pit waste generated are around 800Mt. The waste rock will be characterised as to its acid generating potential and selectively managed so as to minimise potential acid generation. A perimeter drain will be constructed to capture surface runoff, which will be collected in a pond and utilised in the operation as appropriate. The waste rock dump will be progressively rehabilitated. Wherever possible suitable waste rock from the pit will be utilised for construction purposes on site. Where practical waste rock will be backfilled into the open pit.

Industrial wastes generated on site will be managed in accordance with current practice, which includes:

- maximising recycling opportunities where cost effective (eg steel, waste oil and batteries)
- contaminated waste is deposited in the tailings storage facility
- clean waste is buried in a designated landfill
- putrescible waste is buried in a clay lined pit above the RL40 flood level
- a package sewage treatment plant with primary treatment and effluent irrigation

1.6 Ore Processing

1.6.1 Crushing and Comminution

Run of mine ore will be crushed and ground to 80% passing 45 microns prior to flotation. As currently envisaged the crushing and grinding circuit will be rated at 5.0 Mtpa with run of mine ore delivered to the plant at a rate of 4.8 Mtpa and an average zinc head grade of 10.7% w/w.
Run of mine ore will feed a gyratory crusher with crushed ore conveyed to a crushed ore stockpile ahead of comminution. Crushed ore will be conveyed from the stockpile to a SAG mill operating in series with two closed circuit ball mills. Discharge from the ball mill circuit will then be pumped to the concentrator and stored ahead of flotation.

1.6.2 Ore Flotation

Ground ore will be conditioned with flotation reagents prior to being pumped to a bank of pre-flotation cells where a carbonaceous concentrate will be removed and transferred to tailings. After pre-flotation, the slurry will be pumped to a bank of rougher flotation cells, where approximately 92% of the zinc and 85% of the lead bearing minerals will be recovered to a rougher concentrate. The remaining ore slurry will be pumped to a tailings thickener, where the slurry will be thickened and transferred to a tailings storage facility. All waste streams from the process plant will report to this thickener for blending with concentrator tailings prior to disposal to the tailings storage facility.

Rougher concentrate will be transferred to a bank of fine grinding mills, which will grind the concentrate to a size in the range 80% passing 9 - 18 microns. Finely ground concentrate will then be pumped to a bank of cleaner flotation cells, where approximately 90% of the zinc and 70% of the lead bearing minerals will be recovered to a final flotation concentrate, grading 30% w/w zinc. The tailings from the cleaning stage will be pumped to the tailings thickener. Final flotation concentrate will be thickened and transferred to storage tanks ahead of the oxidative leach stage.

1.6.3 Oxidative Leaching

Ground cleaner concentrate will be pumped to the head of the concentrate leach circuit. The leach will operate under atmospheric pressure with all tanks covered to minimise evaporative losses. Concentrate slurry and spent electrolyte from the electrowinning cellhouse will be pumped into the first leach tank, along with makeup water. Slurry will then cascade through each tank in series by gravity. Oxygen will be added to each leach tank from a cryogenic oxygen plant.

The leaching stage will operate at an average temperature of 70^{O}C. Zinc recovery across the leaching circuit will be 98% w/w or greater. Approximately 12% of the iron in the cleaner concentrate will report to the leach solution, and this will be removed in an iron precipitation stage. Other minor impurities that report to the leach solution will be removed in a zinc dust precipitation stage. The residue from the leach stage will consist of predominantly silica gangue and lead sulphate.

1.6.4 Iron Precipitation

The discharge slurry from the oxidative leaching stage will contain low levels of sulphuric acid and iron sulphate. The slurry will gravitate from the leach into a series of iron precipitation tanks. The iron precipitation stage will also operate under atmospheric pressure. Limestone slurry will be added to each of the iron precipitation tanks to control the pH to 3.5. The temperature in each iron precipitation tank will be maintained at 70^{o}C.

The precipitate formed in the iron removal circuit will consist predominantly of goethite and gypsum, and this precipitate will be mixed with the leach residue solids. Slurry overflowing the final iron precipitation tank will gravitate to a thickener. Thickener underflow will be pumped to a bank of pressure filters for filtration, with filtrate recycled to the thickener. The thickener overflow will be pumped through sand filters and fed to the zinc dust purification stage. Filter cake solids, containing less than 1% zinc, will be re-slurried and pumped to the tailings storage facility for disposal.

1.6.5 Zinc Dust Purification

The zinc dust precipitation circuit will remove trace metals from the neutralised solution prior to electrowinning. The purification stage will be operated at 90^{o}C, with zinc dust and other reagents such as copper sulphide and metal trioxides added to the solution to remove trace metals. The discharge from the purification circuit will be filtered to recover the zinc dust precipitate. This precipitate will then be transferred to the concentrator tailings storage facility for disposal. Filtrate from the purification stage will be transferred to the electrowinning cellhouse.

1.6.6 Electrowinning

A conventional zinc electrowinning cellhouse will be used to recover zinc from the purified solution. Purified solution will be mixed with spent electrolyte from the cellhouse to provide a rich electrolyte stream for feed to the electrowinning cells. Zinc metal will be plated from rich electrolyte in the cell, in the form of a 30 - 40 kg cathode sheets, which will be removed from the cellhouse for re-melting and casting. Spent electrolyte will overflow from each cell and gravitate to a spent electrolyte storage tank. A portion of the spent electrolyte will be recycled to the head of the tankhouse for blending with purified solution, with the remainder transferred to the leaching stage.

1.6.7 Cathode Re-melting and Casting

Cathode sheets produced in the zinc cellhouse will be conveyed to a vertical shaft furnace and re-melted. The molten zinc will then be cast into ingots for transport and sale off site. The ingots will meet the specification for Special High-Grade Zinc. Approximately 456,000 tonnes of cast zinc will be produced per annum. Zinc dust will also be generated as part of the casting process for recycle to the purification stage.

1.7 Tailing Disposal

All waste streams from the process plant will report to the tailings thickener for blending with concentrator tailings prior to discharge to the tailings storage facility. Thickened tailings will be deposited in the existing tailings storage facility which will be expanded to the west. Test work of the tailings material will be undertaken to determine the acid generating potential and leachate characteristics.

The current tailings water management design and operational strategy will be utilised on the expanded facility as per existing approvals.

The tailings rehabilitation strategy will be based on the current approach of establishing a capillary layer, 800mm nominal cover with inert material and shedding water from the surface. This approach will be tested and confirmed during rehabilitation trials on the progressively rehabilitated tailings storage facility. The rehabilitated tails will be left in a safe and stable condition.

1.8 Water Management

The climate of McArthur River region is tropical monsoonal, with a pronounced wet season between December and March and generally drier conditions for the remainder of the year. The water management system must accommodate both cases and give consideration for severe shortages and surpluses of water over the life of the mine.
Aspects of the McArthur River Expansion Project that will have an impact on water management include:

- Expansion of Process Plant and construction of a new refinery
- Expansion of Tailings Storage Facility
- Raw Water Collection and Storage
- Establishment of a weir on the Glyde River
- Diversion of McArthur River
- Diversion of Barney Creek
- Open Pit and Protective Bund Wall
- Waste Rock Disposal

The water management system will be designed and operated around these structures and apply the following principles:

- Minimise water consumption
- Maximise water recycling
- Establish a preferential hierarchy of uses based on water quality
- Control discharges from operational areas of the lease
- Minimise the disturbance of land

1.9 Power Generation

Gas fired power generation already exists on site (current generating capacity 22Mw) and a range of options are being considered to increase this capacity to approximately 350Mw.

Options being considered include:

- Additional gas fired power station equipment on site at McArthur River supplied by pipeline gas from alternative locations including PNG and Central Australia.
- A Coal fired power station on site at McArthur River supplied by coal shipped to the Gulf of Carpentaria and transported to the site.

1.10 Transport

The transport of the finished product will be by truck to Bing Bong along the existing sealed highway. The product tonnages are not significantly different to those that are currently being transported - 456kt proposed compared to 360kt actual in 2001/02. The real difference is the product itself which is a relatively inert metal that will be transported in stacked 1 tonne bundles compared with the current concentrate transported loose in covered trailers.
The metal will be unloaded at the port and transported by barge to anchorages in the gulf where it will be transferred to awaiting cargo vessels, using ship's gear in the initial years of the project.

1.11 Site Layout

The proposed site and plant layouts are shown in Figures 8 and 9 of the Notice of Intent. Building wherever possible onto the existing infrastructure the principles applied to the expansion layout are to:

- Minimise disturbance to land
- Design to topographic contours (to minimise cut and fill requirements)
- Utilise and expand on the existing infrastructure
- Design around local issues (eg cultural considerations)
- Design above known and calculated flood levels
- Control potential contaminants

1.12 Infrastructure

The new project is expected to utilise all infrastructure currently being used by the existing operation but in many cases will require it to be improved or expanded. Examples of these improvements are the airstrip and village facilities, which would have to be expanded to cater for the extra personnel and the McArthur River to Bing Bong Highway, which would need upgrading to ensure all weather access to the port.

1.13 Workforce

The operational workforce will increase from its current level of 330 to approximately 600 in the initial years of the operation with further step changes up to > 700 in future years as the mining strip ratio increases.

It is expected that during the three-year construction phase the site based construction workforce will peak at around 1000. There will be a range of other off-site jobs created within the NT and other areas of Australia as a direct result of the project.

1.14 Rehabilitation and Decommissioning

On final decommissioning all plant and infrastructure will be made safe or dismantled and removed unless stakeholders suggest otherwise.

End use objectives will be established through a consultative process involving ISA, government and relevant community stakeholders.

Progressive rehabilitation will be undertaken wherever practicable. Whilst opportunities for placement of waste rock in the open pit will be maximised, the open pit will remain as a void and will fill with water over time.

2 The Purpose of the EIS

The draft EIS aims to provide:

- a source of information from which individuals and groups may gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it would affect, the impacts that may occur and the measures taken to minimise those impacts;
- a basis for public consultation and informed comment on the proposal; and
- a framework against which decision-makers can consider the environmental aspects of the proposal, consider whether it is environmentally acceptable, and if so set conditions for approval to ensure environmentally sound development and recommend an environmental management and monitoring program.

The object of these guidelines is to identify those matters that should be addressed in the draft EIS. The guidelines are based on the initial outline of the proposal in the Notice of Intent. Not all matters indicated in the guidelines may be relevant to all aspects of the proposal. Only those matters that are relevant to the proposal should be addressed. The guidelines should, however, not be interpreted as excluding from consideration any matters which are currently unforeseen, which may arise during ongoing scientific studies or which may arise from any changes in the nature of the proposal during the preparation of the draft EIS, the public consultation process and the preparation of the Supplement to the draft EIS (response to submissions).

The proposal has been declared a controlled action under the Commonwealth *Environment Protection and Biodiversisty Conservation Act* because it was considered likely to have significant impacts on a listed threatened species and several listed migratory species. The listed threatened species is the freshwater sawfish, *Pristis microdon*. Migratory birds inhabit coastal wetlands fed by the McArthur and Glyde Rivers that contain important habitat for the listed species Great knot (*Calidris tenuirostis*), Red knot (*Calidris canutus*), Red-necked stint (*Calidris ruficollis*), Sharp-tailed sandpiper (*Calidris acuminata*) and Black-tailed godwit (*Lumosa lumosa*).

The draft EIS should be a self-contained and comprehensive document written in a clear, concise style that is easily understood by the general reader. Cross-referencing should be used to avoid unnecessary duplication of text. Text should be supported where appropriate by maps, plans, diagrams or other descriptive material. Detailed technical information and baseline surveys should be included as appendices or working papers.

The justification of the project in the manner proposed should be consistent with the principles of ecologically sustainable development. Assessment of the environmental impacts of the proposal and alternatives should consider the life-cycle impacts, from cradle-to-grave, including sourcing of materials, operational impacts and decommissioning. For the purpose of these Guidelines, the “principles of ecologically sustainable development” are as follows:

- the precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- inter- and intra-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations;
- conservation of biological diversity and ecological integrity; and
- improved valuation and pricing of environmental resources.