ASSESSMENT REPORT 44

BOOTU CREEK MANGANESE PROJECT

ENVIRONMENTAL ASSESSMENT REPORT

AND

RECOMMENDATIONS

by the

OFFICE OF ENVIRONMENT AND HERITAGE

NORTHERN TERRITORY GOVERNMENT

October 2004

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APPENDICES

ABBREVIATIONS

AAPA	Aboriginal Areas Protection Authority
AHC	Australian Heritage Council
DBIRD	Northern Territory Department of Business, Industry and Resource Development (formerly DPIF, DME)
DEH	Department of the Environment and Heritage (Commonwealth Department)
DHCS	Northern Territory Department of Health and Community Services (formerly THS)
DIPE	Northern Territory Department of Infrastructure, Planning and Environment (formerly Department of Lands, Planning and Environment; Department of Transport and Works; and Parks and Wildlife Commission)
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth Act)
ISO	International Standards Organisation
L/sec	Litres per second
m^3	cubic metre (a volume 1 m x 1 m x 1 m)
m^3/hr	cubic metre per hour
m^3/y	cubic metre per year
Mt/y	million tonnes per year
Mdt/y	million dry tonnes per year
ML	million litres
ML/y	million litres per year
MMP	Mining Management Plan
NEPM	National Environment Protection Measure
NOI	Notice of Intent
NT	Northern Territory
OEH	Office of Environment and Heritage
PER	Public Environmental Report
TSF	Tailings Storage Facility

EXECUTIVE SUMMARY

This report assesses the environmental impacts of the proposal by Bootu Creek Resources Pty Ltd (the proponent), to establish a manganese mining operation within the Bootu Creek Mineral lease tenement 100 km north of Tennant Creek. The proposal is to develop a number of open cut pits to access the manganese ore bodies and construction of a small processing plant. Ore is to be extracted through blasting and excavation. The excavated material will be processed in a heavy media separation plant before being loaded onto trucks and transported to a storage area adjacent to the Alice Springs to Darwin Railway Line, which is located some 59 km to the west of the proposed minesite. From the storage area manganese product will be loaded onto suitable rail wagons and transported to Darwin for export.

The Assessment Report reviews the Public Environmental Report (PER), public comments and information, comments and advice provided by Northern Territory Government.

Environmental Assessment is the process of defining those elements of the environment which may be affected by a development proposal and of determining the significance, risk and consequences of the potential impacts of the proposal. Recommendations arising from the assessment address methods to mitigate these impacts.

Major Issues

The principal environmental issues associated with the proposed project are:

- Water management, including water quality, water lost through seepage from the Tailings Storage Facility (TSF) and disposal of excess water from the dewatering program;
- Impacts on local fauna and flora;
- Topsoil management and erosion control;
- Aboriginal and European Heritage; and
- Rehabilitation of waste dumps, open pits and TSF.

Conclusions

The outcome of the environmental impact assessment for this proposal is that the Office of Environment and Heritage is unable to conclude that the project can proceed without unacceptable environmental impacts. The Office of Environment and Heritage is reasonably confident that ultimately mining at the site can be managed in an environmentally appropriate manner, however information that allows such a conclusion to be reached has not yet been presented. The additional information provided by MBS Environmental on 24 September 2004 at the request of the Minister for the Environment and Heritage did not satisfy the stated requirements. In particular the issues relating to surface water management have not been dealt with adequately.

Accordingly, before any approval is issued for mining operations, the Office of Environment and Heritage requires additional information be provided with respect to the surface water management issues outlined in Section 3. Upon receipt of this information, the Office of Environment and Heritage can complete its assessment of the proposal and provide advice to the Department of Business, Industry and Resource Development for its incorporation into a subsequent approval.

LIST OF REQUIREMENTS AND RECOMMENDATIONS

REQUIREMENTS (information to be provided before approval is issued)

Requirement 1

Information on the impact on downstream hydrology and ecology of the disposal of the excess groundwater from the dewatering program is to be provided to the Office of Environment and Heritage for assessment.

Requirement 2

Evidence must be provided to the Office of Environment and Heritage that confirms that the water is of suitable quality for discharge to the environment and that the salinity of the water is within acceptable limits. It will then be required that a Monitoring Program be developed that records extraction volumes as well as conductivities.

Requirement 3

The proponent is to specify in more detail, to the satisfaction of the Department of Business, Industry and Resource Development and the Office of Environment and Heritage, erosion controls for the proposed creek diversion channels. Methods of construction and design of the proposed creek diversion channels must be undertaken in such a way as to not impact on the downstream hydrological regime of the creeks.

RECOMMENDATIONS

Recommendation 1

Bootu Creek Resources Pty Ltd shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **identified in the Bootu Creek Manganese Project Public Environmental Report; and**
- **recommended in this Assessment Report (No. 44).**

All safeguards and mitigation measures outlined in the PER are considered to be commitments by Bootu Creek Pty Ltd and are included in Appendix 1 of this report.

Recommendation 2

In accordance with clause 14A of the Administrative Procedures of the *Environmental Assessment Act 1982* the proponent shall advise the Minister of any changes to the proposal for determination of whether or not further environmental impact assessment is required.

Recommendation 3

Future proposals for expansion of the tailings storage facility are to be provided to the Office of Environment and Heritage for consideration under the *Environmental Assessment Act*, in accordance with Recommendation 2 of this Assessment Report.

Requirement 4

The proponent is to undertake further investigation of the aquifer and monitoring of environmental flows in consultation with the Department of Infrastructure, Planning and Environment.

A report on the investigations is to be provided to the Department of Business, Industry and Resource Development and the Department of Infrastructure, Planning and Environment prior to commissioning to demonstrate that the water extraction regime is not compromising the values of the aquifer and its adjacent environment (to the satisfaction of the Controller of Water Resources).

Recommendation 5

The proponent should specify in more detail, to the satisfaction of the Department of Business, Industry and Resource Development, the methods for pumping the tailings, including pipe size and description and appropriate bunding requirements. An inspection schedule of the tailings circuit should be incorporated into the Environmental Management Plan.

Recommendation 6

Solids removed from the sewage treatment system should not be placed in the TSF as the increase in nutrient content provides ideal mosquito breeding conditions. Solid effluent is to be treated as primary sewage and disposed of according to the relevant health guidelines.

Recommendation 7

The proponent shall submit to the Controller of Water Resources and the Department of Business, Industry and Resource Development a proposal to effectively monitor discharge water quality from the TSF.

Recommendation 8

Prior to commencement of construction full field surveys of the flora and fauna are to be conducted to provide baseline data on which to base monitoring protocols and a target for rehabilitation and regeneration works. The surveys should also include the identification of any suitable threatened species habitat. Specific surveys for the Bilby and suitable Bilby habitat will need to be conducted prior to the start of the project. Survey methodology is to be developed in conjunction with the Department of Infrastructure, Planning and Environment Biodiversity Unit.

The surveys are to include the areas that the proposed haul road and rail siding are to be constructed.

Recommendation 9

A Weed Management Plan is to be included in the Mining Management Plan and submitted to the the Department of Infrastructure, Planning and Environment for approval prior to the commencement of operations.

Recommendation 10

An Erosion and Sediment Control Plan must be developed in consultation with the Office of Environment and Heritage and other relevant agencies and be included in the Mining Management Plan for approval prior to the commencement of operations.

Additional erosion control measures to those listed in the PER are to be implemented to protect topsoil from wind and water erosion. In accordance with best practice environmental management in mining (Environment Protection Agency (Cth) 1995) the stockpiled topsoil should be revegetated to protect the soil from erosion, discourage weeds and maintain active populations of beneficial soil microbes.

Recommendation 11

The Environmental Management Plan should include measures that limit the time water is allowed to pool to less than 5 consecutive days. Evaporation or irrigation areas should be appropriately sited and managed to prevent effluent water pooling. Culverts on the haul road should be designed to prevent the impoundment of water.

The rehabilitation plans should be prepared in conjunction with advice from the Department of Health and Community Services to ensure that no new mosquito breeding sites remain after closure of the mine site.

Recommendation 12

Sewage treatment systems used during the construction and operational phases will require approval from the Department of Health and Community Services. In conjunction with Recommendation 5 effluent re-use or disposal should be in accordance to the Department of Health and Community Services guidelines.

Recommendation 13

A historical desktop review of historic sites and activity within the area is to be undertaken to provide a contextual framework in which to assess the significance of extant historic remains. This process should also involve historic archaeological survey and detailed recording of historic places.

Recommendation 14

An archaeological survey of the proposed mining lease is to be conducted to identify archaeological places. The significance of any uncovered place or object is to be assessed with the view to develop management strategies that will mitigate the impact of mining activities on these places. All survey work should be undertaken in consultation with Heritage Conservation Services of the Office of Environment and Heritage. Surveys should be undertaken prior to any earthworks, clearing or ancillary activities that may disturb prescribed archaeological places or objects and constitute a breach of the *Heritage Conservation Act 1991*.

Recommendation 15

A rehabilitation plan is to be developed in consultation with the Office of Environment and Heritage and the Department of Business, Industry and Resource Development, which includes rehabilitation objectives and constraints, and a detailed methodology for the progressive rehabilitation of waste rock dumps, TSF, roads, infrastructure and pits. The plan should also include a rehabilitation outlook outlining the likely success of the plan and justify using examples of rehabilitation in similar terrain and climate. The plan should also include a contingency, for example, rehabilitation offset. The plan should become part of the Mining Management Plan.

Recommendation 16

The proponent is to conduct an investigation into in-pit waste rock disposal and determine how the above 'intermittent' outcome can be achieved. The results of the investigation are to be included in the rehabilitation objectives and Mining Management Plan.

Recommendation 17

The proponent is to develop a fire management plan in consultation with the land holder and submit it to the Department of Infrastructure, Planning and Environment for approval. The plan is to become part of the Mining Management Plan.

Recommendation 18

The proponent is to undertake an assessment of greenhouse gas emissions for the project. This assessment should outline, as a minimum, the following:

- **Energy requirements for the project.**
- **Fuel sources for the project.**
- **Estimated greenhouse gas emissions.**
- **A comparison with the national levels of greenhouse gas emissions.**

Details are to be provided on the project's commitment to:

- **Greenhouse gas emissions inventory and benchmarking.**
- **Measures to minimise greenhouse gas emissions.**
- **Minimising emissions over the life of the project.**
- **Benefits of this project to abatement of greenhouse gas emissions on a national or global scale.**

These commitments are to become part of the Mining Management Plan.

Recommendation 19

Environmental Management Plans covering construction and operation are required to be prepared and submitted to the Office of Environment and Heritage and the Department of Business, Industry and Resource Development for approval prior to commencement of construction and operation respectively. The Environmental Management Plans are to be included in the Mining Management Plan as an appendix.

In preparing each Environmental Management Plan, the proponent is to include any additional measures for environmental protection and monitoring contained in this Assessment Report and recommendations made by the NT Government with respect to the proposal. Each Environmental Management Plan is to be referred to relevant NT Government agencies for review prior to finalisation, after which it shall become a public document. The Environmental Management Plans shall form the basis for approvals and licences issued under relevant NT legislation.

1 INTRODUCTION AND BACKGROUND

This report assesses the environmental impact of a proposal by Bootu Creek Resources Pty Ltd to commence open cut mining for manganese at Bootu Creek. The proposed development comprises open cut mining of three pits at Bootu Creek (Shekuma, Gogo and Chugga), processing in a heavy media separation plant, construction of ancillary infrastructure including access roads, construction of a haul road to the Adelaide to Darwin Railway and rail transportation of the ore to East Arm Port in Darwin for distribution overseas.

This Environmental Assessment Report is based on a review of the Public Environmental Report (PER), and comments from the public and Northern Territory Government agencies.

1.1 The Proposal

The proposed development comprises a number of open cut pits to access the manganese ore bodies and construction of a small processing plant. Ore is to be extracted through blasting and excavation. The excavated material will be processed in a heavy media separation plant before being loaded onto trucks and transported to a storage area adjacent to the Alice Springs to Darwin Railway Line, which is located some 59 km to the west of the proposed minesite. From the storage area manganese product will be loaded onto suitable rail wagons and transported to Darwin for export.

The mining process will involve:

- Removal of vegetation – vegetation will be cleared for the purposes of mining, where practicable it will be stockpiled for later use.
- Removal and stockpiling of topsoil – the top 200 mm of soil will be removed and stockpiled for later re-use.
- Removal and stockpiling of overburden – approximately 800,000 tonnes will require removal annually.
- Extraction of ore – the ore and waste rock will be blasted and removed via an excavator and fleet of trucks. Ore will be stockpiled on a run-of-mine (ROM) pad adjacent to the processing plant. Shekuma pit will be mined from south to north to a depth of 30 m, then again from north to south to a final depth of 70 m. The Gogo pit will be mined in a similar manner from north to south. The third pit, Chugga, will be a continuation of Gogo. The resultant Shekuma and Gogo pits will be 200 m wide, 1.75 km long and 70 m deep, and Chugga will be 200 m wide, 550 m long and 70 m deep.
- Processing of ore – this will occur in a two stage process:
  - Blending, crushing, screening and washing;
  - Beneficiation in a heavy media separation plant to produce lump manganese product via a drum separator and fines manganese product via a cyclone.
- Transport – the product will be trucked to a trans shipment facility located at a siding to be developed on the Adelaide to Darwin Railway Line.
- Waste disposal – waste rock is to be stockpiled in purpose built waste rock dumps. Waste from processing of ore will be discharged to a purpose built tailings storage facility located near the plant.
- Rehabilitation – will be progressive where practicable.

1.2 Issues Not Included in this Environmental Impact Assessment

1.2.1 Future Expansion of Tailings Storage Facility

Plans for tailings storage up to 2008 are given in Section 2.5.4 of the PER. Plans for the long-term storage of tailings are currently under development. Environmental studies and community consultation cannot be undertaken until the preferred options have been developed.

Any proposed change to the tailings disposal strategy including expansion to the tailings storage facility and in-pit disposal will be subject to further assessment under the NT *Environmental Assessment Act.*

1.2.2 Darwin Port

Trains will be unloaded at the Darwin port using a purpose built bottom dump unloading facility owned by the Darwin Port Corporation. The lump and fines products will be distributed into stockpiles on land owned by the Port Corporation and leased to Bootu Creek Resources.

Materials handling at Darwin Port is not included in the PER or this assessment report and is currently being negotiated.

1.2.3 Rail Transport of Product

Lump and fine manganese will be unloaded at the rail siding from the road train trailers and placed into stockpiles 400 m in length parallel to the rail. Ore will be moved from the stockpile to the railway wagons using a front-end loader.

Ore will be transported to Darwin seven times a fortnight, with each train composed of 40 rail wagons capable of carrying about 70 tonnes per wagon giving a total train load of 2,800 tonnes (if each wagon is loaded to its limit). The transport of the product from to Darwin Port facility is not included in the PER or this assessment report.

1.3 Environmental Impact Assessment History

The proponent lodged a Notice of Intent (NOI) with the Department of Business, Industry and Resource Development in December 2003, proposing the development of open cut mining operations at Bootu Creek and associated facilities. The development proposal was formally referred to the Office of Environment and Heritage in May 2004. It was considered that the environmental issues associated with the proposal were sufficiently significant to warrant assessment under the Northern Territory *Environmental Assessment Act 1982* at the level of a PER.

On 10 May 2004 the Minister for the Environment and Heritage directed that a PER be prepared for the proposal. Draft guidelines covering issues to be addressed in the PER were subject to public review from 15 May 2004 to 28 May 2004. Final guidelines were prepared, taking into account the comments received from the public and Government agencies. The Minister issued the final guidelines and a direction to the proponent to prepare the PER on 16 June 2004.

The proposal was referred to the Australian Government for a determination on whether it is a controlled action under the *Environment Protection and Biodiversity Conservation Act* and would require approval by the Australian Minister for the Environment and Heritage. The Australian Government determined that the proposal was not a controlled action and as such does not require further assessment under their legislation.

The PER was submitted on 26 July 2004 and placed on public review for four weeks from 26 July 2004 to 20 August 2004. Further information was requested from Bootu Creek Resources Pty Ltd by the Minister for the Environment and Heritage on 19 August 2004. Additional information was supplied by MBS Environmental Pty Ltd on behalf of Bootu Creek Resources Pty Ltd on 24 September 2004 in the form of:

- A letter from MBS Environmental Pty Ltd;
- Plans and diagrams of the proposed Muckaty Rail Siding layout;
- A report titled "Draft Bootu Creek Haul Road Terrain"; and
- A draft report titled "Surface Water Management Review Bootu Creek Manganese Project."

Sections 2, 3 and 4 of this Assessment Report deal with issues raised in the Government submissions to the PER and the proponent's commitments to environmental management provided within the PER.

2 ENVIRONMENTAL IMPACT ASSESSMENT

2.1 Introduction

The main purpose of this Environmental Assessment Report is to determine if the proposed project can proceed without unacceptable environmental impacts. It does this by identifying all relevant potential environmental impacts and evaluating the feasibility and likely effectiveness of environmental safeguards put forth by the proponent. Where the proposed safeguards were considered incomplete, inadequate or insufficiently clear, or for safeguards that are particularly crucial, this Assessment Report makes recommendations to complete or emphasize the safeguards and commitments made by the proponent.

The environmental acceptability of the project is based on consideration of the following, from the PER:

- adequacy of information outlining the proposal (particularly which structures or activities are likely to impact the environment);
- adequacy of information on the existing environment (particularly environmental sensitivities);
- adequacy of information on the range and extent of potential impacts; and
- adequacy of the proposed safeguards to avoid or mitigate potential impacts.

The outcome of the environmental impact assessment for this proposal is that the Office of Environment and Heritage is unable to conclude that the project can proceed without unacceptable environmental impacts. The Office of Environment and Heritage is reasonably confident that ultimately mining at the site can be managed in an environmentally appropriate manner, however material that allows such a conclusion to be reached has not yet been presented. The additional information provided by MBS Environmental on 24 September 2004 at the request of the Minister for the Environment and Heritage did not satisfy the stated requirements. In particular the issues relating to surface water management have not been dealt with adequately.

Surface water management must be addressed in considerably more detail and provided to the Office of Environment and Heritage for further assessment prior to the Government giving approvals for mining operations. Section 3 outlines the outstanding matters and the requirements of the NT Government.

The Office of Environment and Heritage also considers that there are a number of other issues that were inadequately addressed in the PER and additional information supplied, and have provided recommendations for the management of these issues in Section 4 of this Assessment Report.

Section 3 contains requirements (in **bold**) and Section 4 recommendations (in **bold**), each of which are preceded by text that identifies concerns, suggestions and undertakings associated with the project. For this reason, the requirements and recommendations should **not** be considered in isolation.

3 REQUIREMENTS PRIOR TO APPROVAL AND FOR FURTHER ASSESSMENT

3.1 Surface Water Management

The potential surface water issues posed by the proposed mining and processing operations are mainly related to deterioration in surface water quality and the potential adverse effect of excess mine dewatering on natural drainage systems. The PER states that the dewatering program will produce an excess of water in all years of mining, with a maximum excess of 2 292 mega litres in year 4 of mining. After eight years of mining it is estimated that a total of 11 885 mega litres will have been released to the ephemeral streams. No impact assessment of this excess water on the downstream hydrology or ecology has been provided.

Requirement 1

Information on the impact on downstream hydrology and ecology of the disposal of the excess groundwater from the dewatering program is to be provided to the Office of Environment and Heritage for assessment.

Preliminary studies presented in the PER indicate that the electrical conductivity of the groundwater is up to ten times higher than the ANZECC 2000 guidelines for fresh water. Information on the impact on downstream ecology of disposing excess groundwater into the ephemeral streams has not been provided.

Requirement 2

Evidence must be provided to the Office of Environment and Heritage that confirms that the water is of suitable quality for discharge to the environment and that the salinity of the water is within acceptable limits. It will then be required that a Monitoring Program be developed that records extraction volumes as well as conductivities.

Siltation of watercourses downstream of the mine poses a significant hazard to riparian flora and fauna. The PER does not adequately describe the design of the three creek diversions indicated in Figure 3 of the PER. Diversion of runoff from operational areas and protection bunds preventing flooding of the pits are referred to briefly in Section 5.3.1 bullet point one, and Section 5.3.2 bullet point one. The potential impacts on the local and downstream hydrological regime and downstream ecology are not referred to in the PER.

The URS Australia May 2004 draft report titled "Surface Water Management Review Bootu Creek Manganese Project" provided to the Office of Environment and Heritage by the proponent on 24 September 2004, discusses the proposed three creek diversions in terms of protecting the pits from flooding, but does not refer to potential impacts on the hydrological regime. A letter report provided by MBS Environmental on behalf of the proponent on 24 September states "The environmental impact of the three creek diversions is expected to be minimal." Quantitative or anecdotal evidence based on similar projects in similar climactic regimes has not been provided to enable this conclusion to be made with any confidence.

Bootu Creek Resources intends to implement a range of measures to manage and mitigate the surface water issues to provide minimal impact on surface water in the project area. Whilst these mitigation and management measures are necessary, it is not possible from the information provided in the PER or the additional information supplied on 24 September 2004 to evaluate to what extent these measures can counter the impacts the proposed mining and processing operations would have on the surface water in the area.

Requirement 3

The proponent is to specify in more detail, to the satisfaction of the Department of Business, Industry and Resource Development and the Office of Environment and Heritage, erosion controls for the proposed creek diversion channels. Methods of construction and design of the proposed creek diversion channels must be undertaken in such a way as to not impact on the downstream hydrological regime of the creeks.

4 RECOMMENDATIONS

Subject to decisions that permit the project to proceed, the primary recommendation of this assessment is:

Recommendation 1

Bootu Creek Resources Pty Ltd shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **identified in the Bootu Creek Manganese Project Public Environmental Report; and**
- **recommended in this Assessment Report (No. 44).**

All safeguards and mitigation measures outlined in the PER are considered to be commitments by Bootu Creek Pty Ltd and are included in Appendix 1 of this report.

Recommendation 2

In accordance with clause 14A of the Administrative Procedures of the *Environmental Assessment Act 1982* the proponent shall advise the Minister of any changes to the proposal for determination of whether or not further environmental impact assessment is required.

Recommendation 3

Future proposals for expansion of the tailings storage facility are to be provided to the Office of Environment and Heritage for consideration under the *Environmental Assessment Act*, in accordance with Recommendation 2 of this Assessment Report.

4.1 Groundwater Management

Groundwater management of the proposed Bootu Creek Manganese Project is a significant issue. Dewatering is to commence ahead of mining to lower groundwater levels ahead of the second pass of mining in both the Shekuma and Gogo pits. The groundwater level will be progressively lowered from about 260 m to 220 m Australian Height Datum (AHD).

The information provided on the regional and local hydrogeology does not adequately describe the hydrogeological setting and the aquifer units. There has been no survey done to determine the regional groundwater levels, and therefore the regional groundwater flow direction is not known. This information is required in order to determine long-term sustainability of groundwater abstraction, and the potential for impacts on other groundwater users.

The aquifer tests were of insufficient duration or design to make an assessment of long-term expected drawdown in the production bores. No determination of aquifer storage has been made. Single bore production tests (as conducted) cannot be used to calculate aquifer storage. Monitoring bores were not used to measure aquifer response during testing.

The use of late time data from a semi-logarithmic straight-line analysis to determine aquifer properties is inappropriate in the case of a leaky aquifer model, which is the model described. This can lead to an overestimation of transmissivity. The report states that during pumping it is likely that there will be leakage of groundwater from the underlying units. There is no evidence to support this.

The material supplied by MBS Environmental did not contain sufficient information upon which the impact of the proposed mining operation on the region's groundwater resources can be assessed.

Recommendation 4

The proponent is to undertake further investigation of the aquifer and monitoring of environmental flows in consultation with the Department of Infrastructure, Planning and Environment.

A report on the investigations is to be provided to the Department of Business, Industry and Resource Development and the Department of Infrastructure, Planning and Environment prior to commissioning to demonstrate that the water extraction regime is not compromising the values of the aquifer and its adjacent environment (to the satisfaction of the Controller of Water Resources).

Once this information is received it is the intention of the Office of Environment and Heritage to require:

- A comprehensive minesite water management plan to be submitted prior to commissioning for endorsement by the Department of Business, Industry and Resource Development and the Department of Infrastructure, Planning and Environment; and

- A waste discharge license be negotiated under the *Water Act* in case of off-mining lease discharges. Should it be determined that significant volumes be discharged off-site a Beneficial Use declaration for receiving waters will also be required.

4.2 Tailings Containment

The tailings are to be thickened to 55% solids prior to discharge to the TSF. The PER does not describe the transfer of tailings at 55% solids from the process plant to the TSF. It also does not describe procedures in case of a rupture of a tailings pipeline.

Recommendation 5

The proponent should specify in more detail, to the satisfaction of the Department of Business, Industry and Resource Development, the methods for pumping the tailings, including pipe size and description and appropriate bunding requirements. An inspection schedule of the tailings circuit should be incorporated into the Environmental Management Plan.

The PER states that most of the water from the TSF will be lost to seepage due to underlying sands and will readily drain downwards into the underlying aquifer. The PER has also committed (Commitment 5.3.2I), if it is required, to remove solids from the sewage treatment systems and place them within the TSF.

Recommendation 6

Solids removed from the sewage treatment system should not be placed in the TSF as the increase in nutrient content provides ideal mosquito breeding conditions. Solid effluent is to be treated as primary sewage and disposed of according to the relevant health guidelines.

Recommendation 7

The proponent shall submit to the Controller of Water Resources and the Department of Business, Industry and Resource Development a proposal to effectively monitor discharge water quality from the TSF.

4.3 Biodiversity

Biodiversity issues have not been covered in the PER. The data provided was not sufficiently detailed to determine whether there are any major issues from a wildlife perspective. Particularly as there have been recent sightings of Bilby *Macrotis lagotis* in the Churchill's Head and Morphett Creek regions (close to the project site). The Bilby is listed as Vulnerable under both the *Territory Parks and Wildlife Conservation Act 2001* and the Australian Government's *Environment Protection and Biodiversity and Conservation Act 1999*.

Recommendation 8

Prior to commencement of construction full field surveys of the flora and fauna are to be conducted to provide baseline data on which to base monitoring protocols and a target for rehabilitation and regeneration works. The surveys should also include the identification of any suitable threatened species habitat. Specific surveys for the Bilby and suitable Bilby habitat will need to be conducted prior to the start of the project. Survey methodology is to be developed in conjunction with the Department of Infrastructure, Planning and Environment Biodiversity Unit.

The surveys are to include the areas that the proposed haul road and rail siding are to be constructed.

4.3.1 Weeds

The description of the existing weed species in the PER was not sufficient to determine a management plan. Further advice should be sought from the Conservation and Natural Resources on weed management.

Weed management must be integrated into all land management, and the introduction and spread of weeds should be avoided or minimised. It is essential that all machinery brought on site be washed down prior to entry to and exit from the site.

Recommendation 9

A Weed Management Plan is to be included in the Mining Management Plan and submitted to the Department of Infrastructure, Planning and Environment for approval prior to the commencement of operations.

4.4 Topsoil Management and Erosion Control

A detailed soil survey has not been undertaken, however soils along the haul road alignment were observed and documented by the consulting geological engineer (Warren, 2004). The soils of the Bootu Creek project area comprise lithosols on the ridges and slopes, and typically lateritic red sands on the plain areas, with alluvial soils in and adjacent to the creeks.

Sandy soils in an arid climate make land cleared for mining, infrastructure and stockpiles and ground under rehabilitation susceptible to wind and water erosion. Although the average annual rainfall is low the distinct seasonality adds to the risk of erosion as rainfalls tend to be infrequent and intense. Erosion control is an intrinsic objective of reconstructing pre-mining landforms, with specific measures during the rehabilitation phase to protect exposed soils from wind- and water-erosion and feral browsers.

Effective topsoil management is critical to rehabilitation success in arid climates. The PER states that the aim of topsoil management is to conserve surface soil to assist the long-term rehabilitation of the site, and to minimise environmental degradation. However, there are a number of inconsistencies in the list of commitments which relate to this statement.

- Commitment 5.1.2i states that rehabilitated and disturbed surfaces will be inspected for erosion after significant rainfall events and appropriate remediation measures will be implemented should erosion be observed. For soils of this nature once erosion has taken place any form of remediation measure will be too late, the important topsoil will be lost, and would have already reported to the streams adding to potential downstream sedimentation impacts.

- Commitment 5.4.2c states that if vegetation has not yet established satisfactorily on areas reshaped and topsoiled after two years, seed from local plant species will be collected and spread on these areas. If rehabilitated areas are left bare for two years to undergo two wet seasons without any form of erosion control, all of the topsoil will be lost and again would have already reported to the streams potentially adding to downstream sedimentation impacts. This loss of topsoil will make rehabilitation of disturbed surfaces very difficult.

- Section 2.5.4.3 on page 14 states that windrows will be formed from topsoil stripped at the time of construction from the TSF to divert run-off away from the TSF. Commitment 5.6.2h states that topsoil stripped from the product ore stockpile area will be placed in a windrow at the edge of the stockpile area, this will assist with reduction of ground surface winds and hence minimise wind erosion. However, there is no commitment made for the protection of the topsoil contained in the windrows from wind- and water-erosion. The use of topsoil as a protection measure for the ore stockpiles is inconsistent with the stated aim of conserving topsoil for rehabilitation measures.

The inconsistencies relating to topsoil management should be clarified in the management measures determined once the baseline surveys have been undertaken.

Recommendation 10

An Erosion and Sediment Control Plan must be developed in consultation with the Office of Environment and Heritage and other relevant agencies and be included in the Mining Management Plan for approval prior to the commencement of operations.

Additional erosion control measures to those listed in the PER are to be implemented to protect topsoil from wind and water erosion. In accordance with best practice environmental management in mining (Environment Protection Agency (Cth) 1995) the stockpiled topsoil should be revegetated to protect the soil from erosion, discourage weeds and maintain active populations of beneficial soil microbes.

4.5 Biting Insects

The Medical Entomology Branch was not asked for comments during the preparation of the PER. There are likely to be high pest numbers of mosquitoes in the project area in the wet season, sourced from nearby ephemeral creeks and associated low lying flood plains. This will be exacerbated by the permanent presence of water in ephemeral creek systems where excess water will be discharged. The presence of permanent freshwater will promote semi-aquatic reed growth, in particular from the bullrush (*Typha sp.*), which can form dense stands conducive to mosquito breeding. Potential mosquito breeding in the TSF should be considered. Increased mosquito breeding can have negative public health impacts, due to pest and potential disease problems associated with mosquitoes, such as Ross River Virus, Barmah Forest virus and Murray Valley encephalitis virus.

Water pooling in the TSF, tops of waste rock dumps and drains for longer than 5 consecutive days is conducive to mosquito breeding and should be minimised as much as practicable. Monitoring of any water impoundments for the presence of mosquito larvae should be included in the Environmental Management Plan. Water impoundments should be constructed to prevent mosquito breeding as per the Department of Health and Community Services recommendations.

Recommendation 11

The Environmental Management Plan should include measures that limit the time water is allowed to pool to less than 5 consecutive days. Evaporation or irrigation areas should be appropriately sited and managed to prevent effluent water pooling. Culverts on the haul road should be designed to prevent the impoundment of water.

The rehabilitation plans should be prepared in conjunction with advice from the Department of Health and Community Services to ensure that no new mosquito breeding sites remain after closure of the mine site.

Recommendation 12

Sewage treatment systems used during the construction and operational phases will require approval from the Department of Health and Community Services. In conjunction with Recommendation 5 effluent re-use or disposal should be in accordance to the Department of Health and Community Services guidelines.

4.6 Heritage

The proposed Bootu Creek mining operations have the potential to impact upon archaeological places and objects resulting from Aboriginal occupation in the past. The proponent should note that all prescribed archaeological places and objects are protected under the *Heritage Conservation Act 1991*, regardless of whether or not sites have been previously identified and reported to the Department.

Bootu Creek Resources are in the process of commissioning a Heritage consultant to conduct an archaeological survey and heritage assessment. They anticipate that this work will be completed by November 2004.

Recommendation 13

A historical desktop review of historic sites and activity within the area is to be undertaken to provide a contextual framework in which to assess the significance of extant historic remains. This process should also involve historic archaeological survey and detailed recording of historic places.

Recommendation 14

An archaeological survey of the proposed mining lease is to be conducted to identify archaeological places. The significance of any uncovered place or object is to be assessed with the view to develop management strategies that will mitigate the impact of mining activities on these places. All survey work should be undertaken in consultation with Heritage Conservation Services of the Office of Environment and Heritage. Surveys should be undertaken prior to any earthworks, clearing or ancillary activities that may disturb prescribed archaeological places or objects and constitute a breach of the *Heritage Conservation Act 1991*.

4.7 Rehabilitation

The rehabilitation information provided in the PER is preliminary in nature. The rehabilitation objectives have not been stated in the PER. These, as well as evidence of these being agreed to by the landowner, should be included in the Mining Management Plan. It is important that rehabilitation occurs progressively

Recommendation 15

A rehabilitation plan is to be developed in consultation with the Office of Environment and Heritage and the Department of Business, Industry and Resource Development, which includes rehabilitation objectives and constraints, and a detailed methodology for the progressive rehabilitation of waste rock dumps, TSF, roads, infrastructure and pits. The plan should also include a rehabilitation outlook outlining the likely success of the plan and justify using examples of rehabilitation in similar terrain and climate. The plan should also include a contingency, for example, rehabilitation offset. The plan should become part of the Mining Management Plan.

After decommissioning the final water surface in the pits will be above the waste rock returned to the bottom of the pits. Final pit water quality was not discussed in sufficient detail in the PER, and it is likely that the water quality will be poor given the on-going cycles of evaporation/concentration to trace contaminants and salts. It would be desirable to have only intermittent surface expression rather than permanent exposure.

Recommendation 16

The proponent is to conduct an investigation into in-pit waste rock disposal and determine how the above 'intermittent' outcome can be achieved. The results of the investigation are to be included in the rehabilitation objectives and Mining Management Plan.

4.8 Fire Management

The objectives of fire management have not been addressed in the PER. It is important that a fire management plan is prepared to ensure that the mine area and surrounding countryside are not impacted upon unnecessarily, or placed in danger, either through uncontrolled or unplanned burning, or through the build up of fuel.

Recommendation 17

The proponent is to develop a fire management plan in consultation with the land holder and submit it to the Department of Infrastructure, Planning and Environment for approval. The plan is to become part of the Mining Management Plan.

4.9 Greenhouse Gas Emissions

The additional information supplied by the proponent on 24 September 2004 states that estimates of greenhouse gas emissions from the operations will be submitted to the Department of Infrastructure, Planning and Environment in October 2004.

Recommendation 18

The proponent is to undertake an assessment of greenhouse gas emissions for the project. This assessment should outline, as a minimum, the following:

- **Energy requirements for the project.**
- **Fuel sources for the project.**
- **Estimated greenhouse gas emissions.**
- **A comparison with the national levels of greenhouse gas emissions.**

Details are to be provided on the projects commitment to:

- **Greenhouse gas emissions inventory and benchmarking.**
- **Measures to minimise greenhouse gas emissions.**
- **Minimising emissions over the life of the project.**
- **Benefits of this project to abatement of greenhouse gas emissions on a national or global scale.**

These commitments are to become part of the Mining Management Plan.

5 MONITORING AND ENVIRONMENTAL MANAGEMENT

An Environmental Monitoring Program needs to be developed as part of the Mining Management Plan. The Monitoring Program must have clear objectives and be implemented in such a way as to demonstrate the effectiveness of the company's environmental management system and their effectiveness in achieving the stated objectives.

The proponent is required to report monitoring data on a regular basis, to undertake an annual review of monitoring data and to submit an annual report to the Department of Business, Industry and Resource Development on the interpretation of the monitoring data and the company's performance against stated environmental objectives or targets. Interpretation of monitoring data also requires analysis of developing trends so that potential issues can be identified and addressed will before they reach trigger values and become environmental issues.

5.1 Environmental Management Plan

The proponent has not provided a Draft Environmental Management Plan as part of the requirements of the PER.

Recommendation 19

Environmental Management Plans covering construction and operation are required to be prepared and submitted to the Office of Environment and Heritage and the Department of Business, Industry and Resource Development for approval prior to commencement of construction and operation respectively. The Environmental Management Plans are to be included in the Mining Management Plan as an appendix.

In preparing each Environmental Management Plan, the proponent is to include any additional measures for environmental protection and monitoring contained in this Assessment Report and recommendations made by the NT Government with respect to the proposal. Each Environmental Management Plan is to be referred to relevant NT Government agencies for review prior to finalisation, after which it shall become a public document. The Environmental Management Plans shall form the basis for approvals and licences issued under relevant NT legislation.

6 REFERENCES

Environment Protection Agency (Cth) 1995, "*Rehabilitation and Revegetation*," Best Practice Environmental Management in Mining series

MBS Environmental, 2004, "*Public Environmental Report Bootu Creek Manganese Project Northern Territory,*" prepared for Bootu Creek Resources Pty Ltd

URS Australia Pty Ltd, 2004, "*Draft Report – Surface Water Management Review Bootu Creek Manganese Project*" prepared for Bootu Creek Resources Pty Ltd, May 2004

Warren, T., 2004, "*Draft Bootu Creek Haul Road Terrain*," Consultant Geological Engineers report prepared for Bootu Creek Resources Pty Ltd

APPENDIX 1

Summary of environmental commitments made by the proponent.

Commitment Number	Commitment
2.5.2	Tailings materials will be tested to confirm design assumptions and behaviour of tailings deposition and consolidation.
2.5.4	The storage of tailings in years four to 10 will be investigated in year two of operations and the preferred disposal option designed and necessary approvals obtained to allow construction and commissioning prior to the end of year three.
2.5.4.4a	A minimum total freeboard of at least one metre will be provided within the ponding water area after making allowance for an inflow corresponding to a 1 in 100 year 72-hour duration rainfall event falling in the catchment of the TSF itself.
2.5.4.4b	A minimum operational freeboard of 0.3 metre will be provided within the western and central portions of the TSF between the coarse tailings beach and the embankment crest.
2.8	The rail wagons to be used for the task will be bottom-dump bulk wagons of a similar configuration to the ballast wagons used in the recent construction of the railway.
2.9	Bootu Creek Resources will comply with the requirements of the Darwin Port Corporation's EMS as these relate to their operations.
5.1.2a	All areas of proposed development will be stripped of topsoil to an average depth of about 200 millimeters.
5.1.2b	Topsoil will be removed progressively to ensure large surface areas are not left exposed.
5.1.2c	Topsoil will be direct replaced where possible or stockpiled for later use in the rehabilitation process.
5.1.2d	Topsoil stockpiles will not exceed a height of two metres to ensure topsoil viability is maximised.
5.1.2e	Rehabilitation will be undertaken progressively to minimise the disturbed area and minimise the topsoil stockpile storage period.
5.1.2f	Slope gradients will be controlled to minimise erosion and soil loss.
5.1.2g	Diversion bunds and drains will be installed as necessary to control local surface water run-off to minimise overland flow and consequential erosion.
5.1.2h	Rehabilitation areas will be ripped on the contour after placing of topsoil to remove compaction, improve soil structure and improve infiltration capacity.
5.1.2i	Rehabilitated and disturbed surfaces will be routinely inspected for erosion, particularly after significant rainfall events. If soil erosion is observed during routine inspections, appropriate remediation measures will be implemented.
5.2.2a	Process water storage structures including the TSF will be constructed to minimise seepage.
5.2.2b	Tailings will be thickened and discharged at about 55% solids to minimise free draining water contained in the TSF.
5.2.2c	The TSF will be operated in a manner to maximise evaporation of contained water.
5.2.2d	Flow meters will be fitted to groundwater abstraction bores to enable monitoring of

Commitment Number	Commitment
	abstraction volumes.
5.2.2e	Groundwater monitoring bores will be installed in areas close to the TSF and the Gogo, Chugga and Shekuma pits to allow evaluation of changing groundwater levels and early detection of any contaminated seepage from mining related activities.
5.3.2a	Protection bunds and diversion channels will be constructed to prevent flooding of the pits, process areas, or other mine infrastructure. The location of diversion structures is illustrated in Figure 13.
5.3.2b	Catchments within the project area will be categorised based on the potential contaminants in each. Surface water run-off in potentially contaminated catchments will be captured and treated in accordance with the potential risk. Clean water flows will be separated from potentially contaminated flows to minimise the volume of water requiring active management.
5.3.2c	Out of pit waste rock stockpiles will be constructed so that interference with natural surface water drainage is prevented or where this is not practicable, impacts are minimised.
5.3.2d	Surface water run-off from ore product stockpile areas at the rail siding will be directed through purpose built drains to a containment structure. Water in the containment structure will be allowed to evaporate. Sediments including manganese particles will be periodically removed and returned to the mine site where they will be fed into the processing plant.
5.3.2e	Release of sediments to watercourses will be prevented by installation of sediment control structures at discharge points where release of sediment is identified as a potential risk.
5.3.2f	A water release management plan will be developed for the disposal of excess mine water.
5.3.2g	Culverts and/or floodways will be installed where mining haul roads and the ore product haul road cross watercourses.
5.3.2h	All water releases to the environment will meet approved water quality criteria.
5.3.2i	Commercially available sewage treatment systems will be installed at the accommodation village and processing areas. Where solids are required to be removed, these will be placed within the TSF. Treated water will be dissipated through evaporation or irrigation of the accommodation village surrounds.
5.3.2j	Hydrocarbons and other hazardous materials will be stored in appropriately designed (e.g. bunded) areas.
5.3.2k	A minimum operational freeboard of 0.3 metre will be provided within the western and central portions of the TSF.
5.3.2l	A minimum total freeboard of at least one metre will be provided within the ponding water area of the TSF after making allowance for an inflow corresponding to a 1 in 100 year 72-hour duration rainfall event falling in the catchment of the TSF itself.
5.4.2a	Clearing of vegetation will be restricted to the absolute minimum.
5.4.2b	Topsoil will be stripped and replaced directly on areas reshaped as part of the rehabilitation process wherever possible. This will ensure the seed bank and microbes contained in the topsoil assist in rapid revegetation.
5.4.2c	If establishment of vegetation on areas reshaped and top soiled is not satisfactory after two years, seed from local plant species will be collected and spread on these areas.

Commitment Number	Commitment
5.4.2d	The effectiveness of rehabilitation programs will be assessed annually.
5.4.2e	Weeds will be controlled through prevention, monitoring and early eradication. If after construction commences spread of weeds is identified as being an issue of concern, a weed management plan will be prepared in conjunction with the Northern Territory Government Controller of Weeds and other relevant experts.
5.4.2f	Company vehicles will be confined to traveling on purpose built roads to minimise potential vehicle borne spread of weed species.
5.4.2g	Vegetation surveys will be conducted prior to commencement of construction at excess water discharge points, annually during discharge and for a period of two years after discharge ceases to determine the impacts of continual water discharge in ephemeral creek systems.
5.5.2a	Vegetation clearing will be kept to a practicable minimum.
5.5.2b	Employees and contractors would be required to attend an induction program that will include a component relating to environmental management. In particular, the induction would clearly explain employee and contractors' roles and responsibilities in terms of restricting impacts on fauna and habitat.
5.5.2c	Sightings of species of conservation significance will be reported to the Parks and Wildlife Commission.
5.5.2d	No domestic animals or firearms will be allowed on site.
5.5.2e	Haulage routes will have speed restrictions in place to minimise fauna death on roads.
5.5.2f	The area of freestanding water on the TSF will be minimised to make it less attractive for migratory water birds.
5.5.2g	A domestic waste management program will be developed to minimise the attraction of feral animals to the project area.
5.5.2h	Bootu Creek Resources will participate in feral animal control programs on Banka Banka Station if requested by owners of Banka Banka Station.
5.6.2a	All roads will be clearly marked to confine vehicle movements to areas where dust control methods can be used.
5.6.2b	Water will be applied to unsealed roads, especially haul roads to ensure dust emissions are minimised. The volume and frequency of water applied will be modified to control dust emissions in different climatic conditions.
5.6.2c	Vehicles traveling on unsealed roads will be required to travel at speeds that will not generate excessive dust.
5.6.2d	Areas will be rehabilitated progressively to minimise areas exposed to wind erosion. Vegetation established will be compatible with the post mining land use of the area.
5.6.2e	Vehicle access on rehabilitated surfaces will be prohibited except for management purposes.
5.6.2f	Employees and contractors will participate in site inductions to ensure they are aware of site rules for permanent and temporary roads.
5.6.2g	Vehicle and equipment will be regularly maintained to manufacturers specifications to minimise exhaust emissions.
5.6.2h	Topsoil stripped from the product ore stockpile area will be placed in a windrow at the edge of the stockpile area. The stockpile will be formed to assist with reduction of ground surface winds and hence minimise wind erosion.

Commitment Number	Commitment
5.6.2i	Equipment operators will remain in enclosed, air conditioned cabins to minimise exposure to dust emissions.
5.6.2j	Emissions will be reported as part of the National Pollutant Inventory.
5.6.2k	During operation of the TSF, tailings will be discharged across areas in the TSF identified as a potential dust source, thereby wetting the surface and preventing the dust problem.
5.7.2a	A register of all hazardous materials imported to the site or generated as a result of activities undertaken at the site will be developed and maintained. This will document the hazardous material name, location, approximate volume, storage method and where applicable, disposal method for the substance and containers.
5.7.2b	Hazardous materials and wastes will be stored in appropriately labeled containers within bunded areas.
5.7.2c	Processing activities will be conducted in areas where surface drainage can be captured to ensure overflows, spillages or leaks can be contained.
5.7.2d	Bunding will be maintained to prevent potential contamination of land and/or groundwater
5.7.2e	An inventory of hydrocarbon use will be maintained to allow determination of whether storage containers are leaking.
5.7.2f	Hazardous wastes generated by the operation will be transported offsite to licensed waste disposal facilities.
5.7.2g	An Emergency Response Plan will be developed for the project. This plan will contain information regarding appropriate response to chemical spillages, leaks, fires or explosions.
5.7.2h	Hazardous materials will be brought to the site in bulk packaging wherever possible. This practice will minimise the number of containers and reduce the risk of spillage.
5.7.2i	Waste rock identified as being potentially acid forming (PAF) will be disposed of in encapsulated areas within waste rock stockpiles.
5.7.2j	All mobile equipment and light vehicle servicing activities including wash down will be conducted on impermeable surfaces.
5.7.2k	The heavy vehicle workshop facility shall contain a purpose built wash down facility incorporating a triple interceptor style sediment and oil/grease removal system.
5.7.2l	Refueling of mobile equipment will primarily be conducted on a sealed surface, however some refueling will take place within the open pits using a mobile refueling vehicle.
5.7.2m	An explosives magazine will be constructed and operated in accordance with regulatory requirements.
5.8.2a	Access to the project site will be limited to employees and authorised visitors.
5.8.2b	Areas of land clearing and disturbance will be minimised.
5.8.2c	Permanent features that will remain after closure of the operation i.e. waste rock stockpiles and TSF will be contoured so that they blend in with the natural topography.
5.8.2d	Areas of disturbance will be progressively rehabilitated with local provenance vegetation.
5.9.2a	Construction activities or mining will not occur on any area of land until appropriate clearances have been obtained from the Aboriginal Area Protection Authority and/or Northern Land Council.

Commitment Number	Commitment
5.9.2b	The Northern Land Council and owners of Banka Banka Station will be kept informed of planned operations.
5.9.2c	The general site induction will include information regarding the importance of cultural sensitivity, respect for land and protection of items of heritage significance. All employees and contractors will be required to participate in this induction.
5.9.2d	All employees and contractors will be advised of the correct procedure to be followed in the case of any items of potential Aboriginal or heritage significance being discovered during mining.
5.9.2e	The Aboriginal Areas Protection Authority and Northern Land Council will be contacted immediately in the advent of items of potential Aboriginal significance being discovered during mining.
5.9.2f	If significant Aboriginal artifacts are identified during mining operations, where practicable, these will be protected to avoid unnecessary disturbance of those objects. Where protection is not practicable, Bootu Creek Resources will work with the Aboriginal Areas Protection Authority and Northern Land Council to gain consent for disturbance.
5.10.2a	Ore transportation will not be undertaken along the Stuart Highway.
5.10.2b	The ore product haul road will be fenced to the extent agreed with landowners.
5.10.2c	On completion of mining activities, infrastructure will be removed and the site rehabilitated to allow the pre mining land use to recommence. Infrastructure will not be decommissioned where agreement has been reached for post mining land users to take responsibility for infrastructure of value to them i.e. ore product haul road.
5.10.2d	Compensation agreements will be reached with landowners for loss of use of land used by Bootu Creek Resources for mining or associated infrastructure.
5.10.2e	Employment opportunities will be advised to the Northern Land Council Tennant Creek Office, and preference will be given to local candidates.
5.10.2f	Provision of goods and services will be advised to the Northern Land Council Tennant Creek Office, and preference will be given to local businesses.
5.10.2g	Accommodation for employees and subcontractors will be provided on site.
5.10.2h	First aid facilities will be established onsite for the duration of the project. These facilities will be manned by appropriately qualified employees.
5.10.2i	A relationship will be established between onsite Emergency Response and First Aid personnel and providers of equivalent services in Tennant Creek.
6.1.1a	The Shekuma and Gogo pits will be partially backfilled to about 260 metres AHD.
6.1.1b	Ensuring PAF waste rock is identified and is encapsulated within NAF waste rock as waste rock stockpiles are constructed.
6.1.1c	Contouring the Shekuma waste rock stockpile so that it ties in with the ridge west of the pit. The maximum height will be governed by the varying maximum height of the ridge so that the final design is aesthetically pleasing.
6.1.1d	The eastern side of the Shekuma waste rock stockpile being constructed with gentle slopes (18 degrees) separated by a back sloping 10 metre wide berm (two degrees fall) to facilitate controlled water shedding.
6.1.1e	Leaving of gaps within the Shekuma waste rock stockpile to prevent interference with natural drainage off the ridge.

Commitment Number	Commitment
6.1.1f	The Gogo waste stockpile height being limited to 20 metres with gentle slopes (18 degrees) separated by a back sloping 10 metre wide berm (two degrees fall) to facilitate controlled water shedding.
6.1.1g	Shaping of stockpile top surfaces to promote water absorption rather than water shedding, i.e. concave surface.
6.1.1h	Direct application of stripped topsoil to reshaped areas to maximise success of vegetation establishment.
6.1.1i	Respreading of stockpiled vegetation on reshaped surfaces.
6.1.1j	Construction of low bunds at the crest of each batter to assist with surface water control on batters.
6.1.1k	Deep ripping on the contour to assist with water adsorption and minimisation of erosion.
6.1.2	Adequate freeboard will be maintained in the TSF at all times during the wet season to ensure capacity exists to contain a one in 100, 72-hour rainfall event
6.2.1	Abstraction rates are anticipated to increase as pit depth increases. Abstraction volumes and depth to water in production bores and monitoring bores will be monitored regularly during the life of the operation to enable Bootu Creek Resources to gain a better understanding of the behaviour of the underlying aquifer systems and the impacts of abstraction.
6.2.3	Once dewatering is required in both the Skekuma and Gogo pits, an excess of water will be experienced. Prior to this situation developing, only sufficient water will be abstracted from groundwater bores as is required by water consumers.
6.2.4a	If in pit sumps are required to be developed, water will be discharged only after it has flowed through sediment removal structures.
6.2.4b	A dewatering management plan will be developed to prevent or minimise degradation of natural drainage systems as a result of water release.
6.2.4c	Quality of the groundwater will be regularly monitored to ensure that it meets water release criteria.
6.3a	Progressive rehabilitation will be undertaken wherever practicable.
6.3b	As part of obtaining all permissions necessary to commence mining, Bootu Creek Resources will submit to DBIRD a security bond in case of any unplanned failure of the project. The size of this security bond will be regularly reviewed in conjunction with DBIRD to ensure it remains consistent with the level of disturbance caused by the project at any specific time.
6.3.3a	All outer batters of the TSF embankments will be constructed with slopes of 5:1 (11.3°) and rehabilitated at the time of construction. They will be covered with five to 10 centimetres of topsoil and contour ripped.
6.3.3b	Rehabilitation of the upper surface will involve: • Covering the tailings surface with inert waste rock or overburden. • Shaping the upper surface to divert run-off from the structure in a controlled manner. Where necessary, permanent drains will be rock armoured to maximise long-term stability. • Spreading of topsoil on shaped surface. • Deep ripping on the contour to assist with water adsorption and surface water control.

Commitment Number	Commitment
	• Application of seed to ripped surfaces if rehabilitation monitoring shows that natural revegetation has not occurred satisfactorily within two years of rehabilitation
8.0a	As part of the design, construct and operate contracts let by Bootu Creek Resources for the ore processing and mining, HAZOP style risk assessments will be conducted for operational aspects. The results of these assessments will be used to minimise risk for the project.
8.0b	Bootu Creek Resources will develop and maintain a suitably qualified and trained Emergency Response Team for the duration of the project.
8.0c	Procedures will detail the roles and responsibilities of personnel at each stage of the response plan. Training will be provided to all personnel identified within the Emergency Response Plan to ensure they understand their individual responsibilities with regard to implementation of the plan.
8.0d	Bootu Creek Resources will establish a relationship with emergency response organisations and operators of medical facilities within Tennant Creek. Bootu Creek Resources will upgrade the existing airstrip on Banka Banka Station to enable access to the operations by the Royal Flying Doctor Service.
8.0e	Bootu Creek Resources will ensure that people with appropriate First Aid and medical training are employed at all times. A dedicated First Aid facility will be constructed and maintained for the duration of the project. First Aid kits will be maintained in all office buildings, light vehicles and mobile equipment.
8.0f	To minimise the risks associated with bushfire, firebreaks will be installed and maintained around key pieces of infrastructure.
8.0g	Fire extinguishers will be maintained in operational areas in accordance with regulatory requirements. Extinguishers will also be fitted in all light vehicles and mobile equipment.
8.0h	Mobile equipment such as water carts, graders and bulldozers will be used for fire suppression activities where necessary.