

ASSESSMENT REPORT 70

ROPER BAR IRON ORE PHASE 1 PROJECT

WESTERN DESERT RESOURCES LTD

ENVIRONMENTAL ASSESSMENT REPORT
AND
RECOMMENDATIONS

by the

Environment Protection Agency

September 2012

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Glossary

AMD	Acid/Metalliferous drainage
ANC	Acid neutralising capacity
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average recurrence interval
BFO	Beneficiated Ore
DEM	Dust Extinction Moisture level
DME	NT Department of Minerals and Energy
DSO	Direct Shipping Ore
EA Act	Environmental Assessment Act (NT)
EIA	Environmental impact assessment
EIS	Environmental Impact Statement
EMR	Environmental Mining Report
EPBC Act	Environment Protection and Biodiversity Conservation Act (Cmth)
ESCP	Erosion and sediment control plan
ESD	Ecologically sustainable development
FIFO	Fly-in, fly-out
MLA	Mineral Lease Application
MMP	Mining Management Plan
MRM	McArthur River Mining Pty Ltd
NAF	Non acid forming
NES	National Environmental Significance
NOI	Notice of Intent
NRETAS	Department of Natural Resources, Environment, the Arts and Sport
EPA	NT Environment Protection Agency (Formerly EH Division of NRETAS)
OGV	Ocean Going Vessel
PAF	Potentially acid forming
REDOX	Reduction / Oxidation reactions
ROM	Run-of-mine
SEC	Specific Electrical Conductivity
SOCS	Site of Conservation Significance
TDS	Total dissolved solids
TSS	Total suspended solids
WDRL	Western Desert Resources Limited (the Proponent)
WRD	Waste rock dump

Units and Symbols

%	Percent
>	Greater than
As	Arsenic
B	Boron
Cd	Cadmium
Co	Cobalt
Cu	Copper
Fe	Iron
Ha	Hectare
km	Kilometre
km ²	Square kilometre
m	Metre
m ³	cubic metre
Mn	Manganese
mm	Millimetre
Mt	Million tonnes (mega tonne)
Mtpa	Million tonnes per annum
Ni	Nickel
Pb	Lead
s	Second
t	Tonne
Zn	Zinc

Executive Summary

Environmental impact assessment (EIA) is the process of defining those elements of the environment that may be affected by a development proposal and analysing the risks associated with the potential impacts that have been identified. This Assessment Report (the Report) assesses the environmental impact of the Roper Bar Iron Ore Phase 1 Project (the Project).

Western Desert Resources Limited (WDRL) proposes to construct and operate an iron ore mine within the Gulf region of the Northern Territory. The mine site is approximately 50km west from the coast, 60 km south east of Ngukurr and approximately 140km from Roper Bar, along Nathan River Road.

WDRL's exploration tenements in the region total almost 1850km², and approximately 5000Ha is under Mineral Lease Application (MLA). The tenements contain an estimated resource of 311 million tonnes (Mt). Initial mining is proposed of the high grade deposit located at MLA 28264 and MLA 28967 with an approximately 24Mt mineable resource of Direct Shipping Ore and an expected mine life of approximately eight to ten years.

The Proponent proposes:

- Open pit mining of DSO iron ore reserves;
- Waste rock and/or overburden stockpiles;
- On-lease haul roads and light vehicle access roads;
- Run of Mine pad;
- Crushing plant;
- Power generation;
- Ancillary infrastructure;
- A 165km haul road from the mine site to Bing Bong Port traversing eight major rivers and numerous streams;
- Ore stockpile area 2-3km from Bing Bong;
- Covered conveyor to barge load out facility at Bing Bong port; and
- Trans-shipment by barge to ocean going vessels.

Mining will be conducted using conventional truck and shovel equipment with an option to use surface mining machines where required. Drilling and blasting will be required, as well as pit dewatering. The iron ore will be transported by haul road to Bing Bong Load Out Facility (owned by Xstrata for its McArthur River Mine), from where it will be transhipped to Ocean Going Vessels (OGVs) according to operational practices of the existing facility. The construction and operations crews will be housed in camp facilities on site on a fly-in fly-out (FIFO) work arrangement.

Major Issues

- The lack of certainty regarding the environment in which the mine is proposed to operate and the ability for mining to be conducted without significant impacts to the downstream environment of the Towns River;

- The potential for acid mine drainage (AMD) to occur from the mine site and lack of certainty regarding the geochemical characteristics of the overburden and waste material to produce AMD;
- The realignment of the Towns River through an engineered channel to facilitate mining with part of the channel to flow through a mine pit. This has the potential to impact downstream aquatic health through habitat loss, changes in hydrology and contamination ;
- The potential for floral and aquatic fauna species listed under the *Environment Protection and Biodiversity Conservation Act* to be significantly impacted by construction of a 165km long haul road;
- The potential for listed aquatic fauna to be impacted by construction and operation of the mine site, in particular the freshwater sawfish (*Pristis microdon*);
- The uncertainty associated with potential impacts to marine species at the Bing Bong Port; and
- The uncertainty regarding the stability of post-closure landforms associated with the Project site and the long-term impacts associated with above ground disposal of potentially acid forming wastes.

Conclusions

This Project assessment is unable to conclude that the matters that may cause significant impacts to the environment have been fully assessed.

The assessment of the environmental risks, potential impacts and proposed management measures of this green field mine site has been restricted by limited baseline information and an unfounded risk assessment. This has increased the probability that the monitoring programs and management strategies proposed are based on inadequate findings.

It is acknowledged that the Roper River region has experienced very little development activity and therefore has not been well studied. It is the responsibility of the Proponent and its consultant when planning for projects of this magnitude and future potential to demonstrate to stakeholders and the regulator that there is sufficient understanding of the environment in which the Project is proposed to operate, and that risks are well understood to ensure that identified risks can be managed appropriately. The Proponent was unable to demonstrate this in all aspects during the EIA.

The Proponent's documentation contains high level commitments to minimising environmental impact. This requires Government, particularly the regulator, and community stakeholders to place a significant degree of trust in the Proponent to ensure works are undertaken in accordance with those commitments and other safeguards that have been recommended in this assessment process.

It is an expectation of stakeholders to this process that the Proponent now demonstrate that it can work within the framework required to conduct business in accordance with ESD principles and existing regulatory requirements.

Information gaps remaining from the EIA process require the Proponent, Government and the regional community to rely on intensive, post-assessment data collection, analyses and monitoring to determine the significance of, and appropriate responses to, key impacts. These requirements are largely captured in the commitments made by the Proponent and recommendations in this Report. The ongoing risk analysis, environmental monitoring and management required from the Proponent must

demonstrate that environmental impacts from the Project are no greater than those predicted in this assessment.

The information requirements in this assessment must be addressed and appropriate management procedures implemented through the Proponent's Mining Management Plan. The EPA is of the opinion that the Project can proceed in an environmentally acceptable manner, provided that the environmental commitments, safeguards and recommendations detailed in the EIS, this Assessment Report and in the final management plans approved by the Department of Mines and Energy, are implemented and subject to regular reporting and compliance auditing.

List of Recommendations

Recommendation 1

The Proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **Identified in the Roper Bar Iron Ore Project Environmental Impact Statement (draft EIS and Supplement); and**
- **Recommended in this Assessment Report.**

All safeguards and mitigation measures outlined in the Environmental Impact Statement are considered commitments by the Proponent.

Recommendation 2

The Proponent shall advise the Minister of any changes to the proposal in accordance with clause 14A of the Environmental Assessment Administrative Procedures, for determination of whether or not further assessment is required.

Recommendation 3

The Proponent should ensure that the potential for future mining on the site is taken into account in developing the Project design for the Mining Management Plan, particularly with respect to the establishment of mine components and landforms on the site.

Recommendation 4

Before mining commences, the Proponent should demonstrate to the satisfaction of the Environment Protection Agency, Department of Mines and Energy and the Australian Government that the realignment of the Towns River and integration of Area F Pit 3 into the channel will not lead to long-term impacts on the aquatic health of the Towns River system.

Recommendation 5

The Proponent should undertake more comprehensive characterisation of materials within proposed pits. This may be staged on a pit by pit basis. Results should be reported to the Department of Mines and Energy for assessment prior to the commencement of mining activities in any proposed pit. The Mining Management Plan should include contingencies in the event that the volume of potentially acid-forming material has been underestimated or where insufficient suitable material is available on site to cover potentially acid forming waste.

Recommendation 6

The Proponent should include relevant strategies in the water management plan and acid/metalliferous drainage management plan for managing acid/metalliferous drainage

in pit voids during and post mining. These plans will form part of the Mining Management Plan for approval by the Department of Mines and Energy.

Recommendation 7

The surface water monitoring plan should be updated to include additional baseline monitoring locations, sampling and analysis as outlined in this Assessment Report 70 and agreed with the Department of Mines and Energy. The plan should be included as part of the Mining Management Plan for approval by the Department of Mines and Energy.

Recommendation 8

The water management plan should be updated to include additional baseline groundwater information as outlined in this Assessment Report 70 and to the satisfaction of the Department of Mines and Energy. The plan should be included as part of the Mining Management Plan for approval by the Department of Mines and Energy.

Recommendation 9

A study of fish assemblages up and down stream of the mine site should be undertaken during full flow events in the Towns River prior to the commencement of construction.

Outcomes of this study should inform strategies to ensure fish migration is not significantly affected by the realignment, and monitoring of fish assemblages should be undertaken annually to confirm their effectiveness.

Recommendation 10

A comprehensive assessment of risks to significant marine species and their habitats should be completed prior to commencement of construction of Project marine components, including any further studies required to address information gaps identified during the risk assessment. The development of an integrated marine management and monitoring program to the satisfaction of the Environment Protection Agency should be informed by the outcomes of the risk assessment.

Where relevant, improved information on local and regional populations of significant species should be used to refine mitigation and monitoring for acoustic disturbance and increased boat traffic.

Recommendation 11

The Proponent should conduct a comprehensive flora survey along the haul road route, following the methods described in the *'Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping'* (Brocklehurst *et al.* 2007) at a representative number of sites, as well as targeting sensitive and significant habitat types.

An assessment of any threatened species that may be impacted by the proposed haul road should be conducted and appropriate management actions implemented to the satisfaction of the Environment Protection Agency and the Australian Government prior to construction of the proposed haul road.

Recommendation 12

The Proponent should engage with the NT and Australian Governments (where required) to provide detail regarding the appropriateness of its proposed offsets to compensate for residual detriment of the Project to ecological communities and matters of National Environmental Significance.

Recommendation 13

The Proponent should commit to sealing the haul road prior to its commissioning and use. A schedule for bituminising the haul road should be provided in the MMP.

Recommendation 14

The Proponent must provide a conceptual closure plan to the Department of Mines and Energy for approval under the *Mining Management Act*.

Recommendation 15

The Proponent should commit to in-pit burial of PAF material and backfilling of pits when it is practicable to do so and if it can be demonstrated that environmental risks are acceptable.

Recommendation 16

During Phase 1 mining, the Proponent should undertake investigations to fully inform the most appropriate option for the Towns River alignment within the mining lease at mine closure.

Recommendation 17

All management plans for the Roper Bar Iron Ore Phase 1 Project are to be submitted to the Department of Mines and Energy for approval under the *Mining Management Act* prior to commencement of any works for which the plans apply.

In preparing each plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report and Recommendations. The plans shall be referred to relevant Northern Territory Government agencies and key stakeholders for review prior to finalisation.

The proponent should provide regular reporting of monitoring outcomes and ongoing management actions to key stakeholders as construction and mining progresses.

1 Introduction and Background

This report assesses the environmental impact of the Roper Bar Iron Ore Phase 1 Project (the Project).

Western Desert Resources Limited (WDRL) (the Proponent) proposes to construct and operate an iron ore mine in the Gulf region of the Northern Territory. The mine site is approximately 50km west from the coast, 60 km south east of Ngukurr and approximately 140km from Roper Bar, along Nathan River Rd.

WDRL's exploration tenements in the region total almost 1850km², and approximately 5000Ha is under Mineral Lease Application (MLA). The tenements contain an estimated resource of 311 million tonnes (Mt). Initial mining is proposed of the high grade deposit located at MLA 28264 and MLA 28967 with an approximately 24Mt minable resource of Direct Shipping Ore (DSO) and an expected mine life of approximately eight to ten years.

The Proponent proposes:

- Open pit mining of DSO iron ore reserves;
- Waste rock and/or overburden stockpiles;
- On-lease haul roads and light vehicle access roads;
- Run of Mine pad;
- Crushing plant;
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Mining will be conducted using conventional truck and shovel equipment with an option to use surface mining machines where required. Drilling and blasting will be required, as well as pit dewatering. The iron ore will be transported by haul road to Bing Bong Load Out Facility (owned by Xstrata for its McArthur River Mine), from where it will be trans-shipped to ocean going vessels (OGVs) according to operational practices of the existing facility. The construction and operations crews will be housed in camp facilities on site on a fly-in fly-out (FIFO) work arrangement.

This Environmental Assessment Report (the Report) is based on a review of the draft Environmental Impact Statement (draft EIS), Supplement to the draft EIS (Supplement), and comments from the public and Northern Territory Government agencies on the draft EIS. The draft EIS and Supplement are collectively referred to as the EIS.

The EIS can be viewed on the Environmental Assessment Register website at:

<http://www.nretas.nt.gov.au/environment-protection/assessment/register/roper-bar-iron-ore>.

1.1 Environmental Impact Assessment Process

Environmental impact assessment (EIA) should:

- identify potential impacts on the environment (where environment is defined broadly according to the *Environmental Assessment Act*); and
- evaluate the risks of those impacts occurring.

Through its assessment of Project risks the Proponent must demonstrate:

- that these risks can be satisfactorily managed within acceptable levels e.g. impacts would not result in long term environmental detriment; and
- the effectiveness/feasibility of management measures in a precautionary/risk management framework.

Assessment gives weighted consideration to:

- values and risks;
- estimation of the likelihood of success of preventative and remedial measures; and
- the validity and comprehensiveness of programs established to provide ongoing measures of the environmental effects of the proposed development.

This assessment considers that risks can be more reliably evaluated where there is a substantial baseline of relevant information. Where this information is limited or not available, risk assessment is inevitably constrained and far less precise. It is appropriate to use the precautionary principle in the evaluation of possible impacts. If potential impacts are understood with a reasonable level of certainty, monitoring programs can be better informed to detect impacts, and management measures can be more effectively targeted to address those impacts.

This Report evaluates the adequacy of commitments and environmental safeguards proposed by the Proponent to avoid or mitigate the risks of potential impacts identified in the assessment process. The safeguards may be implemented at various levels in the planning framework of a project and include (among other approaches):

- Design and layout of components such as mine pits, waste rock dumps, water management devices and other mining infrastructure on the site/s;
- Management of construction activities; and
- Management of processes used in operations of the mine site (e.g. inputs and outputs).

A list of commitments made by the Proponent is provided in Appendix A of the Supplement to the draft EIS. Additional safeguards are recommended in this Assessment Report where appropriate.

The contents of this Report form the basis of advice to the NT Minister for Lands, Planning and the Environment (the Minister) on the environmental issues associated with the project.

1.2 Regulatory Framework

Environmental assessment was undertaken in accordance with the requirements of the Northern Territory *Environmental Assessment Act 1982* (EA Act).

The proposal was declared a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as it was considered likely to have significant impacts on the following controlling provisions:

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

The NT assessed the project on behalf of the Australian Government under the bilateral agreement.

This Report forms the basis of advice to the Minister on the environmental issues associated with the project. The Minister is required to make comment and/or recommendations with regard to the proposal to the Minister for Mines and Energy (the responsible Minister) and the Australian Government Minister for Sustainability, Environment, Water, Population and Communities (Australian Government Minister).

The responsible Minister, taking into consideration this Report, will then make a determination as to whether or not an authorisation under the *Mining Management Act* will be issued to the Proponent for the Project and if so, the conditions that may be applied.

The Australian Government Minister will need to consider the Project for an approval decision under the EPBC Act.

A more complete list of Government approvals and relevant legislation for the regulation of the proposal is provided in Chapter 1 of the draft EIS.

1.3 Environmental Impact Assessment History

On 16 June 2011, a *Notice of Intent* (NOI) for the Roper Bar Iron Ore Phase 1 Project was received under the Memorandum of Understanding between the Department of Resources (now the Department of Mines and Energy) and the former Department of Natural Resources, Environment, the Arts and Sport (NRETAS). The Proponent simultaneously provided a separate NOI for transport of ore via pipeline. These separate NOIs were subsequently withdrawn and in August 2011, the Proponent submitted a single NOI with the mine and pipeline transport option combined.

On 5 October 2011, the Minister determined that the project required formal assessment at the EIS level. The Project was also determined to be a controlled action under the EPBC Act.

On 30 November 2011, the Proponent advised its intent to amend the ore processing and transport components of the Project, in accordance with clause 14A of the NT Environmental Assessment Administrative Procedures (EAAP). On 8 December 2011, the NT Minister determined that the revised Project would require assessment at the EIS level. It was also determined to be a controlled action under the EPBC Act. A number of revised NOIs were subsequently provided and draft Guidelines for an EIS were advertised and underwent a 2-week public exhibition period. Final EIS Guidelines were issued to the Proponent on 3 April 2012.

A preliminary review of the draft EIS for the project was undertaken by Government on 23 April 2012. The review determined that a number of issues either had not been included in the NOI or had not been adequately highlighted to the public as

potentially significant issues. It was determined that the Proponent should provide notification of an alteration to the proposal to include these components. The Project was again determined to require an EIS and draft guidelines were again advertised for public comment.

The draft EIS underwent a 4-week public exhibition period from 23 June to 21 July 2012. A total of eight submissions were received on the draft EIS including four from non-Government stakeholders.

A detailed list of submissions is included in Appendix B of the Supplement.

The Proponent lodged the Supplement in response to the submissions with the former Environment and Heritage Division of NRETAS (hereonin called the Environment Protection Agency [EPA]) on 14 August 2012. The Supplement was circulated among Government agencies and non-Government respondents to the draft EIS for comment. The EPA prepared this Report, and provided the Report to the Minister.

1.4 Ecologically Sustainable Development

The Australian Government affirmed its commitment to sustainable development at United Nations conferences on environment and development, notably via the Rio Declaration and Agenda 21 in 1992 and the Johannesburg Declaration at the United Nations 2002 World Summit. Australia reaffirmed its commitment at the Summit to promote the integration of the three components of sustainable development—economic development, social development and environmental protection—as interdependent and mutually reinforcing pillars.

Australia developed the National Strategy for Ecologically Sustainable Development (ESD) identifying four national principles. The Strategy identified ways to apply the principles to a range of industry sectors and issues such as climate change, biodiversity conservation, urban development, employment, economic activity, and economic diversity and resilience.

In December 1992 the NT Government endorsed the National Strategy and agreed, along with all other States and Territories, to the Intergovernmental Agreement on the Environment.

The Strategy defines ESD as:

‘Using, conserving and enhancing the communities’ resources so that ecological processes, on which life depends, are maintained and the total quality of life now and in the future can be increased.

ESD is development that aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations.’

The principles of ESD as defined in the National Strategy are:

ESD Principle	Definition
Precautionary principle	Where 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	The present generation should ensure

	that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of present and future generations.
Conservation of biological diversity and ecological integrity	The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making
Improved valuation, pricing and incentive mechanisms	Should be promoted to ensure that the costs of environmental externalities are internalised and that the polluter bears the costs associated with environmental pollution.

In response to the draft EIS, one submission raised issues relating to the application of ecological sustainability – specifically the principle of intergenerational equity (serious environmental harm for short term economic gain), and the principle of biodiversity conservation (destructive impacts of haul road, mine pits and waterway diversion).

The Proponent indicated that the principles of ESD assisted in determining the best way to develop the Project, including employment of the precautionary principle in regard to any aspects of the project where any level of uncertainty existed.

The Proponent aimed to ensure ongoing best practice environmental management, which required a whole-of-project approach to risk assessment and ensured that ESD was considered in the engineering designs, the management practices and the ongoing management, rehabilitation and monitoring plans.

The Proponent acknowledged that several of the ESD principles were difficult to manage for a resource activity with a finite timeframe and consequently identified a social benefits offsets package as a means to providing social and economic benefits far beyond the lifespan of the mining operation.

To achieve the objective of ESD, the Project needs to continually be informed and guided by the ESD principles. Accordingly, the assessment of this proposal, its potential impacts (positive and negative) and the management measures used to enhance positive and reduce negative impacts was undertaken in the context of ESD principles.

Subsequent decision-making processes by approval bodies must be guided by ESD principles and the continued project design and development, as well as the development and implementation of management and monitoring programs by the Proponent, should all aim to meet the objective of ESD.

2 The Proposal

2.1 The Proponent

WDRL is a diversified resources business with assets in the Northern Territory (NT), including gold, copper and other base metal prospects.

The company's flagship project is the iron ore deposits at Roper River, of which this Project is regarded as Phase 1 of the development.

2.2 Project description

The Proponent is seeking approval to mine within Mineral Lease Application (MLA) 28264 and MLA 28963 in the Roper River Region of the Northern Territory. These leases contain a number of deposits including the high grade Area E East and Area F. The inventory for the MLA areas currently stands at an Inferred and Indicated Mineral Resource estimate of approximately 65Mt at 42% Fe with 20Mt of DSO grade material included. The expectation is for a 24Mt DSO operation due to an expected resource upgrade from Area E Pit 1, which will procure the full estimated amount of DSO resulting in an expected mine life for these mineral leases of approximately 8 - 10 years.

The location of the Project proposal is shown in Figure 1.

The Project would involve the following steps and components:

- Clearing and grubbing;
- Topsoil removal and stockpiling;
- Pre-stripping of waste where it covers the ore zone;
- Construction of haul roads, run-of-mine (ROM) pad and drainage channels;
- Construction of sediment control devices, and associated water storage facilities;
- Re-alignment of the stream channel that will be impacted by mining of the Area F deposit;
- Mining of free-dig material (ore and waste that does not require blasting);
- Drilling and blasting of ore and waste;
- Loading, hauling and dumping of ore and waste in designated areas;
- Crushing and screening of ore;
- Road haulage of ore to Bing Bong; and
- Stockpiling and barge loading facilities at Bing Bong.

Ancillary infrastructure for the mining operation includes:

- Mine buildings and service centre;
- Power generation;
- Roads; and

- Hazardous materials storage, including explosives;

2.2.1 Product

The EIS indicates that the Project would exploit a high grade ore (~60% Iron [Fe]) that is defined as DSO. DSO is material that is of a high enough grade to be mined, crushed and shipped to market without the need for further processing on site. A large volume of lower grade material requiring beneficiation prior to sale is present in the reserve. This material, referred to as Beneficiated Ore or BFO (30 - 50% grade), would require crushing, grinding and then beneficiation, which involves the liberation of non-ferrous minerals from the ore so as to increase the iron percentage of the remaining material. The EIS indicates that the different products allow for different transport options with the DSO product being a lump and gravel sized (5mm – 30mm) material suitable for road transport and the BFO being a very fine product suitable for transport as a slurry.

This Project only involves the crushing, transport by haul road and shipping of DSO product. Treatment of BFO would likely require a separate assessment under the EA Act and authorisation under the *Mining Management Act*.

2.2.2 Mine

Mining would be undertaken through drilling and blasting with waste rock removal and ore recovery using conventional truck and shovel methods. Mining is planned to begin in several locations to access surface outcropping ore as well as removing overburden and waste from other mining areas.

Figure 2 shows the proposed mining deposits Areas E and F. Area F is divided into four pits. The eastern most (and deepest) being Pit 1, then moving west to Pit 2 and Pit 3, and west again to the smaller Pit 4.

Area F is planned to be mined for the entire strike length at a rate of 20 metres vertically per year. There are a number of small and shallow surface outcropping deposits that will be mined out in a single campaign.

Area E is planned to be mined at ten metres vertically per month.

It is proposed that approximately 15 million tonnes per annum (Mtpa) of ore and waste material would be mined during the initial phase, targeting areas with most detailed information and producing approximately four million tonnes of DSO over a two to three year period. During this initial period the Proponent would undertake further resource definition of other known deposits.

It is proposed that working bench heights in the pits would be maintained at five metres, although ultimately this would be determined by the physical characteristics of the mineralisation. Each bench will consist of free dig or blasted material excavated in two discrete levels, each nominally of 2.5m height.

Ore will be identified visually and the different ore types and grades will be identified with varying degrees of visual inspection and sampling in conjunction with pit geological mapping. Once blasted a hydraulic excavator and fleet of dump trucks will be used for extraction. Ore bearing material will be loaded onto haulage trucks and taken to the ROM stockpile close to the processing plant.

Ore processing will have a designed capacity of up to 3Mtpa to cater for peak production periods.

Overburden and waste rock would be separated into potentially acid forming (PAF) and non-acid forming (NAF). NAF material would be used to construct mine infrastructure such as mine roads and the ROM pad, as well as providing protective cover for PAF material storage in designed waste rock dumps (WRDs).

A sub grade storage facility is proposed to store material that is below 56% iron so that it can potentially be beneficiated in the future. This facility is likely to store ore for the life of this Project, so it will require an impervious pad, erosion and sediment control structures and monitoring devices for surface and groundwater.

Clearing within the mining tenements, which includes internal access roads will total approximately 450ha.

Potential impacts from mining include habitat loss, surface and groundwater contamination, and acid/metalliferous drainage (AMD).

2.2.3 Towns River diversion

In order for the Area F mineral deposit to be accessed, the Proponent is proposing to realign the Towns River. This diversion in relation to mining components is shown in Figure 3.

The Proponent's preferred construction approach is:

- To mine out Area F Pit 3 during a single Dry season;
- Construct an inlet at the western end of Pit 3 and provide an inlet and outlet at the eastern end;
- Allow the pit to permanently flood during following Wet seasons as an integral part of the river channel;
- Construct channels between oxbows on the northern side of Pit 2 where pit infrastructure is to be constructed across existing flow channels; and
- Construct the final outlet into the existing stream channel.

This approach is referred to as Option C in the EIS.

2.2.4 Haul Road

The haul road is proposed to connect the mine site to the port at Bing Bong without impacting on the existing Nathan River Road (Savannah Way) (Figure 4). The haul road would be 165km long with a cleared width of up to 30m, though wider in sections where construction vehicles are required to turn around. Borrow pits and temporary camps would be established within a 200m-wide corridor as required. Total clearing of vegetation for the road is expected to be approximately 500Ha.

The land tenure crossed by the haul road includes crown and pastoral leases, and a number of mineral titles which are predominantly exploration leases. Native title rights and interests are expected to exist over all haul road land tenure. The declaration of Limmen National Park included an exclusion of a two kilometre wide corridor for the haul road, the majority of which would become part of the park once the haul road is finalised. The haul road intersects the Savannah Way bringing mine traffic into contact with the public and local communities.

The Proponent has planned for the haul road to avoid significant areas such as rocky outcrops, wetlands and riparian vegetation; however, there are a number of waterways including eight major rivers that would require the installation of crossings

such as culverts and bridges. Sections of the road would be raised above the level of the plain to improve flood immunity during Wet seasons. This would require significant quantities of fill material, which the EIS states would be sourced entirely from within the 200m width of the road corridor.

The surface of the haul road would be spray sealed following the first Wet season and then subsequently bituminised along its entire length.

Key risks associated with the haul road are considered to be habitat loss and loss of connectivity, sedimentation impacting surface water and obstruction of fish passage, and interaction of mine traffic with the public.

2.2.5 Bing Bong Port

The Proponent would use the existing load out facility at Bing Bong for the direct shipping of ore to overseas markets (Figure 5).

Initially the project would establish a Stockyard and Barge Loading facility with sufficient capacity to export 1.5Mtpa of product through the Bing Bong Port with further scope to expand to 3Mtpa whilst operational. Early operations propose to use a manual stockpiling operation with plans to move to an automated stockpiling operation later.

Administration offices, workshop, fuel storage, power station, stockyard area, reclaim hoppers, reclaim conveyors and barge loading system would be installed. A more-detailed description of the Port facilities is contained in Chapter 2 of the draft EIS.

Initially, two self-propelled barges would transport the ore from the port to the transshipping point for the 1.5Mtpa operation. This would increase to three self-propelled barges for the 3Mtpa operation. Operations up to 1.5Mtpa would see the transshipping anchorage point closer to the port due to the shallower draft of the Supramax vessels. Once operations have ramped up to 3Mtpa, the transshipping point would be lengthened to approximately 21 nautical miles from the Port to accommodate larger Panamax vessels. The ore will be transferred from barge to OGV by using the ship gear and grabs. OGVs would be moored approximately 20-30km offshore.

The Proponent indicates that additional dredging of the channel would not be required to support the Project as the under-keel clearance or draught of the barges is planned to be the same as that of the existing barge. Some disturbances associated with the construction of the berthing and loading point would be required. Dredging of approximately 9000m³ of sediment would be required to install a combi-pile wall in the barge berthing area. Ongoing dredged channel maintenance is undertaken by the current port operator, Xstrata, and a new dredge spoil disposal facility is proposed under a separate application.

The potential impacts associated with the Project port infrastructure and activities include contamination of coastal and marine waters with spilled product and dust emissions, impacts to marine fauna from underwater noise and boat strike, and increased suspended sediments from dredging.

Figure 1: Roper Bar Iron Ore regional setting (draft EIS)

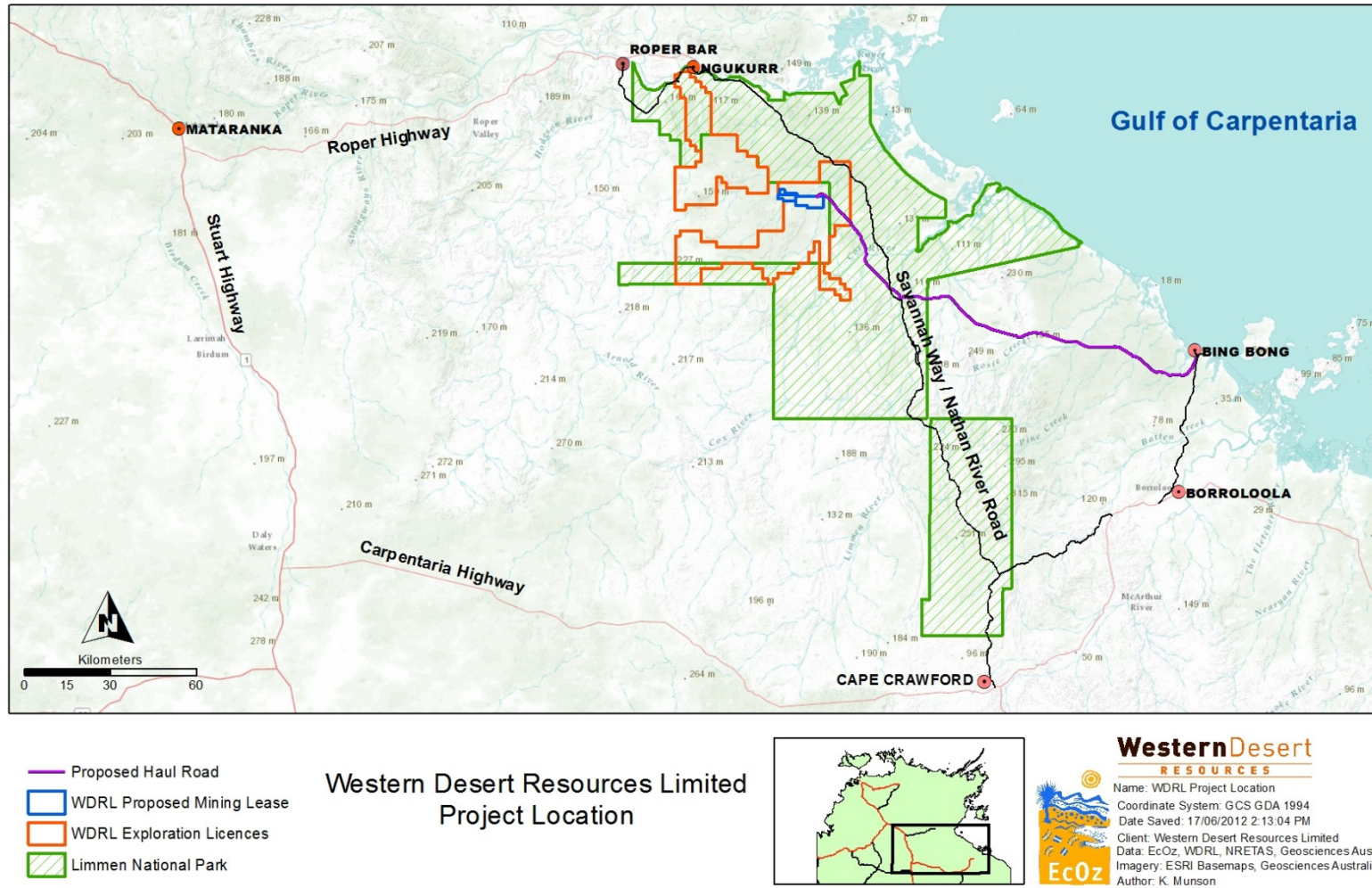


Figure 2: Layout of the Roper Bar Iron Ore Project mine site (draft EIS)

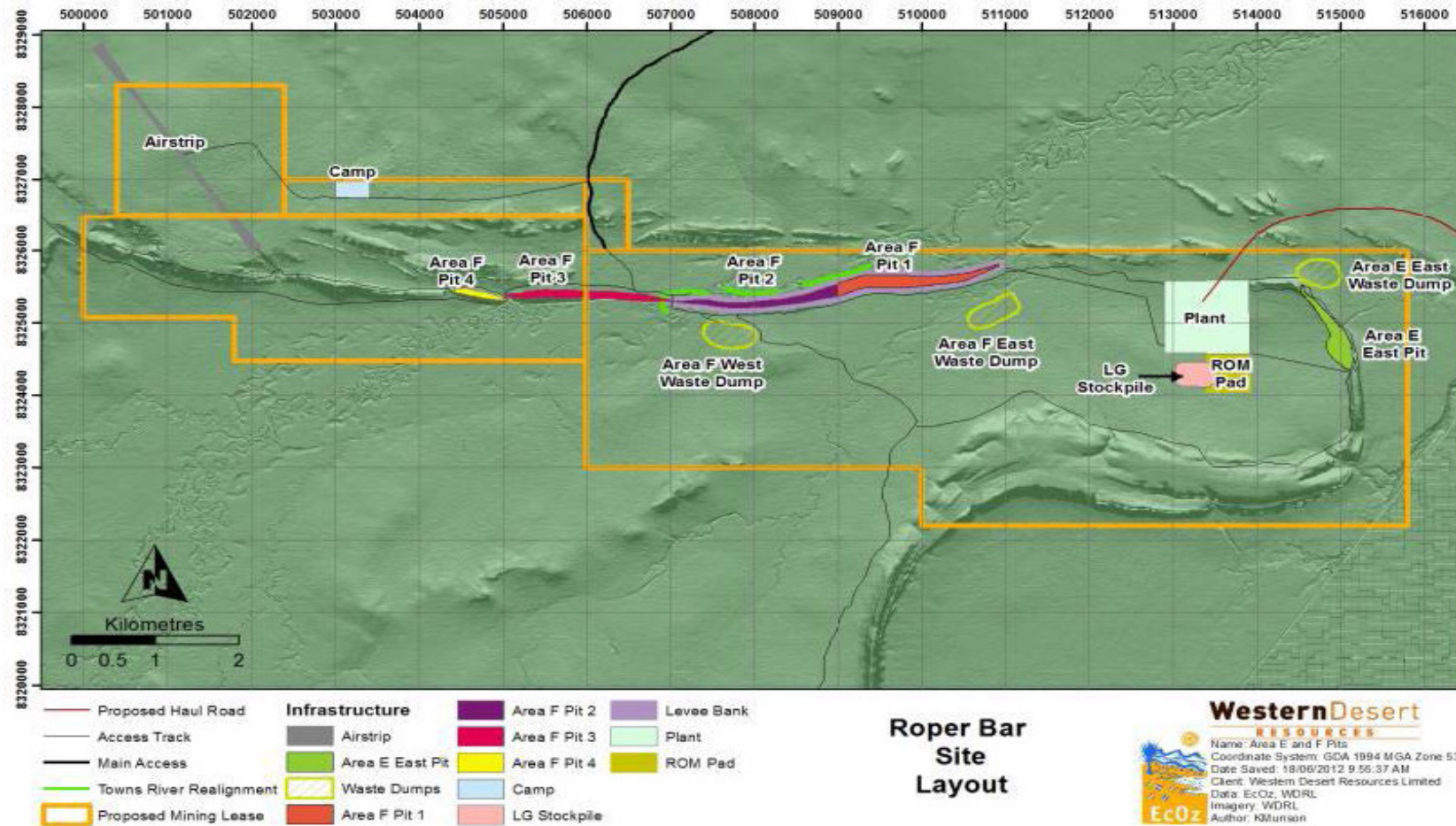


Figure 3: Towns River realignment (Supplement)

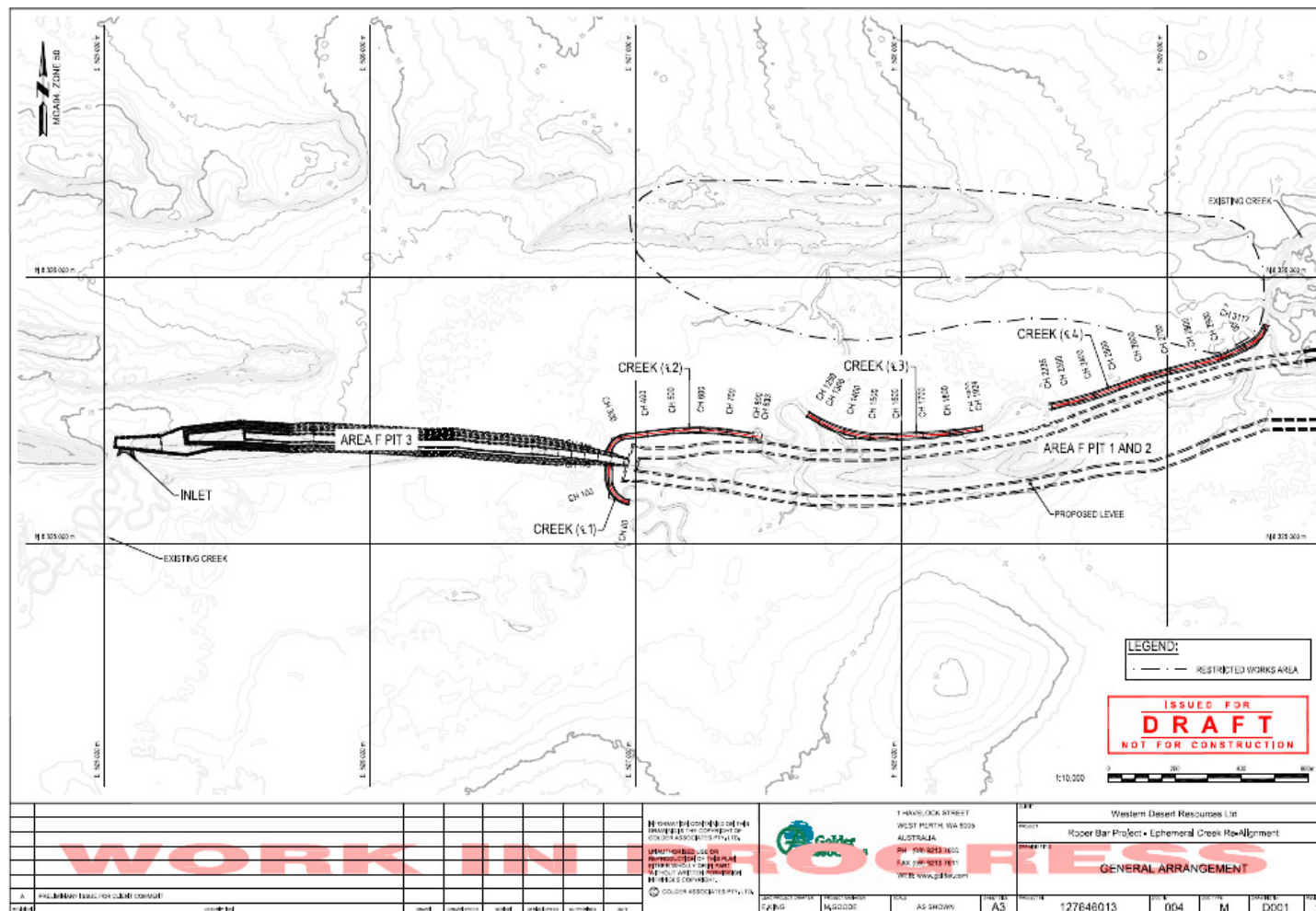
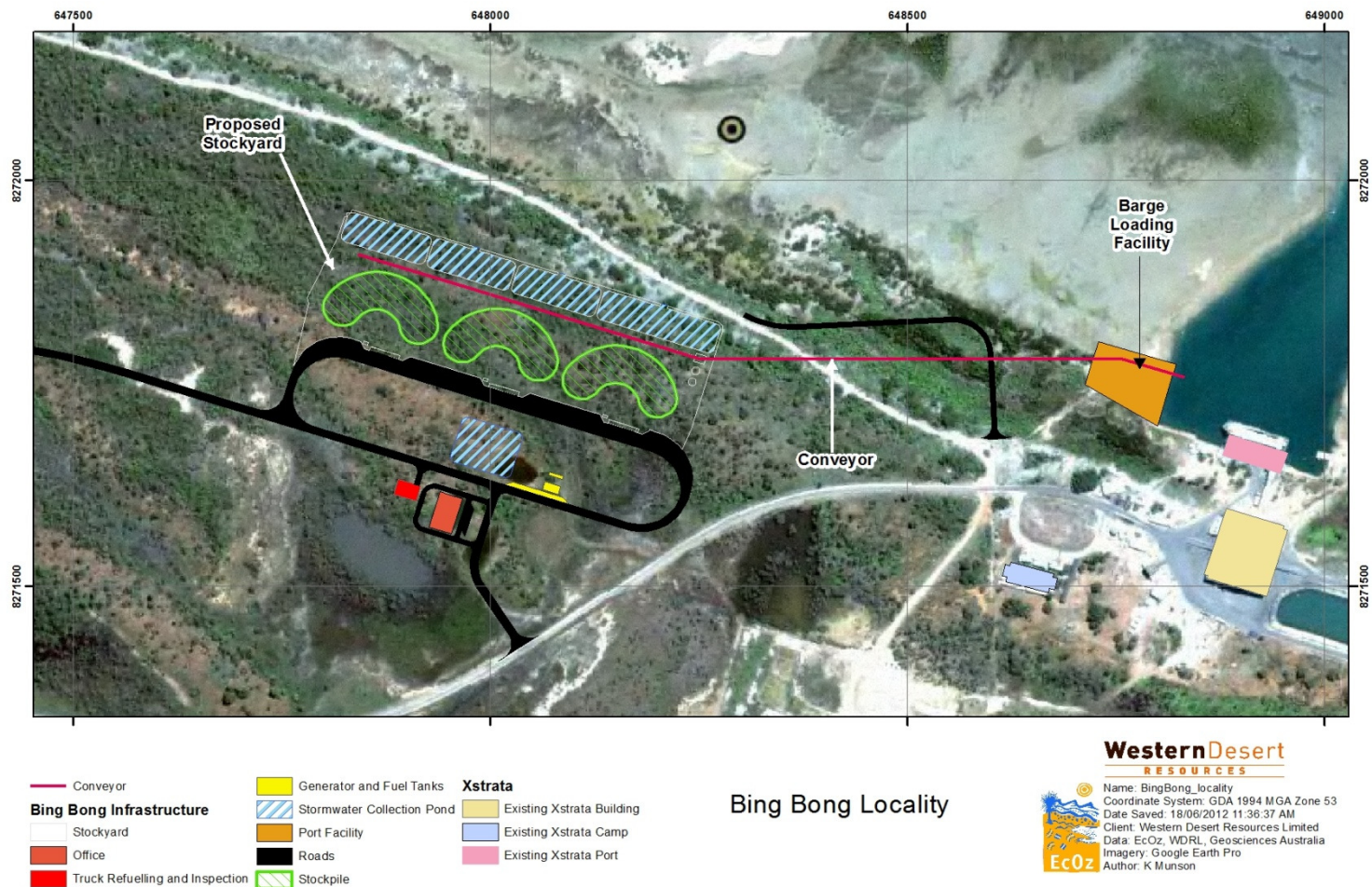


Figure 4: Haul road route (draft EIS)



Figure 5: Bing Bong Port facilities (draft EIS)



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3 Regional Setting

3.1 Physical

The Project area and 165km-long proposed Haul Road to the Port of Bing Bong are located in the broad-scale drainage system termed the “Gulf Fall” in the EIS. All rivers and creeks in this system flow towards the Gulf of Carpentaria, with the Project area located on the Towns River, approximately 46 km upstream from its mouth in the Gulf. The Towns River flows across a broad, flat, coastal floodplain for most of its distance downstream of the Project. There is very little rise in elevation between the Gulf coastline and the Project area. The Project area is between 20 m and 60 m above sea level.

At a broad scale, the mine site and first two thirds of the Haul Road are located in undulating terrain comprising scattered low, steep hills. Soils across the region are mostly skeletal or shallow sands.

The last third of the Haul Road to Bing Bong traverses across gently undulating to flat coastal plains, with scattered rugged areas. Soils are predominantly sandy red earths and shallow gravelly sands.

The Port of Bing Bong is located on the Gulf coast in an area of coastal sand dunes, sand sheets, and chenier plains adjacent to tidal mud flats, tidal creeks, and mangroves.

Ridges in the Project area are susceptible to high erosion (e.g. where Area E and some of Area F are located) and the lower rises susceptible to moderate erosion. The areas along the Towns River (e.g. Area F pits) are highly susceptible to flooding and the lower lying areas near the river (e.g. low grade stockpiles, processing plant, and waste dumps) are moderately susceptible to flooding.

The haul road crosses areas of high and moderate erosion risk or moderate or high flooding risk.

The Gulf Fall region is remote and undeveloped and has significant wilderness and environmental conservation values. The sense of remoteness and solitude people can experience when visiting the area is unique and areas where people can gain such an experience are rapidly disappearing. Scenic values of the region around the Project area and along the haul road route include rolling hills, sandstone escarpments, pristine river systems, and billabongs. Recreational values include opportunities to camp, drive, fish, walk, swim, and view wildlife and scenic areas via the Savannah Way.

Ecosystems (wildlife and vegetation) are largely intact except for pervasive impacts from feral animals and changes to fire regimes. Fishing opportunities in the region are very good and the experience of fishing away from crowds is highly valued. The area is host to some spectacular geological formations, such as the escarpments along the Limmen Bight River, also “lost city” formations, which are accessible from the Savannah Way south of the Nathan River Ranger Station. The Yiyintyi Range is a spectacular area of rugged and dissected sandstone escarpment.

The scenic and recreational values of the region are recognised in the recent declaration of Limmen National Park by the Northern Territory Government. The declaration is to protect the natural and cultural values of the Gulf region and to provide access to tourism sites for visitors travelling the Savannah Way between

Queensland and the Northern Territory. The complementary zoning of the Limmen Bight Marine Park and potentially a Commonwealth marine reserve will fully integrate the protection of biodiversity from catchment-to-coast-to-sea in the Limmen Bight area.

3.2 Biological

3.2.1 Terrestrial/aquatic

The Project is in the Gulf Coastal and the Gulf Falls and Uplands bioregions. The vast majority of these bioregions comprise extensive areas of intact (uncleared) and relatively common land types. The extensive low undulating plains are interspersed with a number of major river systems, low to steep rocky hills, gorges, and freshwater wetlands. The coastal areas feature significant river mouths, tidal wetlands and mudflats. The less typical landscape features, particularly those associated with surface water flows, provide critical hotspots for the bioregions' biodiversity. Three of these are regarded as Sites of Conservation Significance (SOCS).

A number of notable plant and animal species are found in the Gulf region, including those which are rare, threatened, endemic, or occur only in a restricted range. The knowledge base for the biodiversity of the two Gulf bioregions is poorly developed because of the remoteness of the region. Few surveys have been conducted in the region and most have been concentrated in the vicinity of known areas of conservation significance or more accessible areas. There is potential to discover new species and variations within known species (distribution, ecology and genetics).

The **Gulf Fall and Uplands** bioregion is the second largest in the NT and stretches from the Arnhem Plateau into western Queensland. It comprises undulating terrain with scattered low, steep hills and rugged dissected plateaux. The most extensive vegetation is woodland dominated by Darwin Stringybark (*Eucalyptus tetradonta*) and Variable barked Bloodwood (*Corymbia dichromophloia*) with spinifex understorey, and woodland dominated by Northern Box (*Eucalyptus tectifica*) with tussock grass understorey.

The **Gulf Coastal** bioregion encompasses the lower reaches of many major rivers that originate in the Gulf Fall and Uplands Bioregion. Eucalyptus woodland with tussock or hummock grass understorey dominates the bioregion, with significant areas of tidal flats, mangroves and littoral grassland.

The major landforms in the MLA areas are low ironstone and sandstone ridges, seasonally inundated *Melaleuca* swamps, creek-lines, and flat sandy plains supporting mixed *Eucalyptus* and Lancewood woodlands. Generally, five broadly-defined vegetation types dominate the MLA areas, and these correlate with the main land forms. The vegetation types include: Acacia woodlands; Eucalyptus/Corymbia woodlands and hummock grasses; Eucalyptus woodlands over tussock grasses; *Melaleuca* woodlands; and wetlands and riparian woodlands. None of the vegetation communities are listed under any legislation (TPWC or EPBC Acts) or were specifically regarded as being sensitive habitat.

The EIS identifies six species of significance that have the potential to be threatened by the Project, including:

- Northern Quoll (*Dasyurus hallucatus*);
- Gulf Snapping Turtle (*Elseya lavarackorum*);
- Dwarf Sawfish (*Pristis clavata*);

- Freshwater Sawfish (*Pristis microdon*);
- Green Sawfish (*Pristis zirjon*); and
- Thorny Solanum (*Solanum carduiforme*).

Three main sensitive habitat types identified in the project disturbance footprint that were considered to be at risk of impact, including:

- Sandstone escarpments, hills, and ridges;
- Wetlands; and
- Riparian vegetation (major rivers and creeks).

3.2.2 Marine

The South Western Gulf of Carpentaria is characterised by relatively shallow depths with a coastline dominated by alluvial plains, tidal channels and estuaries of river systems over clays and muds.

The proposed WDRL wharf mooring would be similar to the existing Xstrata barge loading wharf at Bing Bong. It is located in a swing basin which has a depth of 4.5m and is dredged by the operators of the Bing Bong facility. Limited bathymetric and topographic survey is available however shallow tidal flats extend to the east and west of the existing basin and access channel, with greater depths (5m) attained approximately 3-5km offshore. Depths exceeding 18m are reached approximately 40km offshore.

Tides in the region are diurnal with a range of approximately 2-3 metres.

Two SOCS are located in the immediate vicinity of the barge landing area and offshore transshipping and cyclone anchorages; the McArthur River Flood Plain (Site of Primary Conservation Significance) and the Sir Edward Pellew Island Group (Site of Secondary Conservation Significance).

The lower reaches of the Towns River and adjacent marine and estuarine environments are located in the Limmen Bight and associated floodplains SOCS. These feature extensive mangrove communities, salt pans, and extensive sandflats and mudflats.

Areas of seagrass are known to be present in all the inshore areas from the Roper River south-east to the Pallews. Nesting Flatback sea turtle and dugong records are located to the south of the Towns River. Significant numbers of Flatback turtles are known to nest on nearby Maria Island, which also provides foraging areas for one of the Territory's largest breeding colonies of silver gulls. Important shorebird records have been documented to the north of the Towns River mouth correlating with the presence of extensive sandflats and mudflats.

Commonwealth and Territory waters adjacent to the McArthur River coastal floodplain and Sir Edward Pellew Islands are of importance for several marine ecological communities and conservation-dependent species.

These waters support high biological productivity and are significant feeding, resting, breeding and nursery areas for several protected species, or are important parts of species ranges or migratory pathways. Abundant subtidal seagrass meadows are important for green turtles and dugong. Soft substrates and the inshore coral reefs provide important feeding habitat for Olive Ridley and Flatback Turtles.

The extensive intertidal sand and mud flats and shallow subtidal areas of the Gulf of Carpentaria and its associated estuaries contain significant and extensive coastal habitats including seagrass and macro-algal communities, intertidal banks, sandy beaches, mangrove forests, salt flats, open waters, inshore rocky reefs, and freshwater wetlands.

Matters of National Environmental Significance associated with near shore environments include threatened and migratory marine species such as cetaceans, dugongs, birds, turtles, sharks, seahorses and migratory birds.

Coastal dolphins, dugongs, marine turtles, and sawfish are known to occur in the immediate area. The EIS reports that the most significant breeding and feeding grounds are found to the south-east in the Sir Edward Pellew Islands, and to the north in the Limmen Bight.

3.3 Socio-economic/cultural

The current economic base of the broader gulf region is principally derived from tourism, pastoral enterprise, commercial fishing and mining.

According to the EIS, the development of the Project has potential to impact (both positively and negatively) on the residents and stakeholders of four particular communities and their surrounds, those being Borroloola; Minyerri; Ngukurr; and Numbulwar. The Supplement provided the following summary information, including data from the Australian Bureau of Statistics 2006 census, on these communities:

- Populations are very young with nearly 40% under the age of 25 years, and for many of the communities almost one-third of the population is below 15 years of age. The data also suggests that life expectancy across the communities is low with very small numbers reported in the 65+ years age group (Borroloola being the exception).
- The median age for Borroloola is 25 years and is below 21 years for the other three communities. There are currently large numbers of young people who have transitioned from high school education to employment and training since these census data were collected in 2006.
- All communities report low levels of high school attainment with few students completing Year 10-12 and large percentages having Year 8 and below as the highest level of schooling or not having attended school at all.
- Accordingly, in all communities there are low levels of engagement with the labour market and as at 2006, Community Development Employment Projects participation was the highest reported employment category in each community. Non-schooling qualifications are infrequent. This provides challenges in terms of developing employment and training opportunities for local populations.
- The economic base across the communities is limited. There appear to be opportunities for the Proponent to contribute to the development of some Indigenous Business Enterprises that provide the goods and services required for large scale operations and wider industry needs in the region.
- There is significant community strength that can be harnessed and enhanced including a number of Aboriginal Community Controlled Organisations and strong cultural heritage, traditions and practices. The communities are firm in ensuring culture is preserved and not damaged over the life of the Project.

- The highest area of interest to emerge from the Proponent's consultations has been in the area of employment and training. Expectations are high in relation to the ability of the Project to expand the labour market and the ability of Indigenous people to meet the increased labour demand.

The demographics of the region and the Proponent's consultation outcomes are further detailed in Appendix G of the draft EIS and Appendices F and G of the Supplement.

4 Environmental Impact Assessment

4.1 Introduction

The purpose of this Report is to evaluate the Project and to determine whether it can proceed with acceptable environmental impacts. This is achieved by identifying the potentially-significant risk of an environmental impact occurring as a result of Project components and activities, and evaluating the Proponent's corresponding safeguards or prevention measures to remove or mitigate the risks. Where the proposed safeguards are considered insufficient, or where a safeguard is deemed particularly important, recommendations are made in this Report to add to or emphasise commitments made by the Proponent.

The environmental acceptability of this project is based on analysis of the following from the EIS:

- Adequacy of information outlining the proposal (particularly which components 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 the risks of those impacts occurring within the Project context; and
- Adequacy of the proposed safeguards to avoid or mitigate potential impacts.

Conclusions and recommendations are based on comments from the review of the draft EIS by relevant government agencies and the public, and responses from the Proponent to those comments in the Supplement.

In this Report, the recommendations (in **bold**) are preceded by text that identifies concerns, suggestions and undertakings associated with the project. For this reason, the recommendations should **not** be considered in isolation.

As minor and insubstantial changes are expected in the design and specifications of the proposal following the conclusion of the EIS process, it will be necessary for approval mechanisms to accommodate subsequent changes to the environmental safeguards described in the EIS and recommendations in this Report. If the Proponent can demonstrate that changes are unlikely to significantly increase the risks of an impact on the environment, an adequate level of environmental protection may still be achieved by modifying the conditions attached to relevant statutory approvals governing this project. Otherwise, further environmental assessment may be required.

Therefore, subject to decisions that authorise / permit the project to proceed, the primary recommendations of this assessment are:

Recommendation 1

The Proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **Identified in the Roper Bar Iron Ore Project Environmental Impact Statement (draft EIS and Supplement); and**
- **Recommended in this Assessment Report.**

All safeguards and mitigation measures outlined in the Environmental Impact Statement are considered commitments by the Proponent.

Recommendation 2

The Proponent shall advise the Minister of changes to the proposal in accordance with clause 14A of the Environmental Assessment Administrative Procedures, for determination of whether or not further assessment is required.

4.2 Issues outside the scope of the assessment

A number of submissions to the draft EIS included issues associated with aspects of the proposal that had been authorised to proceed under separate approval processes or are as yet undefined and will be the subject of future applications. This section considers these aspects.

4.2.1 Beneficiated ore project

The Proponent intends to extract DSO over the 8-10 year lifespan of this Project.

DSO is ore that contains approximately 60% or greater concentrations of iron (Fe) and does not require processing beyond crushing and screening prior to transport from the site. Therefore no tailings are produced and there is no need to establish tailings storage facilities, which can be a challenge with respect to water management and are often one of the key environmental risks of mining developments.

Any lower grade ore mined during the campaign (Fe < 56%) is proposed to be stored in a purpose-built sub grade storage facility. The lower grade ore must be beneficiated to increase the Fe concentration prior to off-site transport. This ore is therefore known as beneficiated ore (BFO). The Proponent intends to apply for authorisation for a BFO mining operation in the medium term with Phase 1 being only a precursor.

The Proponent estimates the total Fe resource that could be mined in its current mineral leases to be approximately 311Mt of which only 24Mt is estimated to be mineable as DSO. Consequently, a significant proportion would remain in the ground until such time as future applications for beneficiation projects are authorised.

A BFO project would likely require alternative product processing and transportation arrangements and lead to a significantly greater disturbance in the region. A number of submissions expressed concern that the potential impacts of the longer-term BFO mining campaigns should be considered in the design of the current Project. The Department of Mines and Energy (DME) requested that justification be provided for the layout of the Project site and discussion included of the modifications required to minimise impacts prior to mining of BFO reserves.

The EA Act limits consideration of impacts to specific projects. While consequential and cumulative impacts can be considered in this context, the Proponent is not expected to include detailed consideration of potential future projects for which details may not be known and where uncertainties are high (e.g. market conditions). Mine planning can consider the potential for future mining activities. This is discussed in Section 4.3.1 of this Report.

Any future mining program would require a separate authorisation under the *Mining Management Act* and will be subject to further assessment under the EA Act.

4.2.2 Bulk sampling components

On 29 August 2012, the Proponent applied for a variation of the proposal to exclude a number of components of the Project undergoing assessment, including:

- Infrastructure:
 - Airstrip upgrade (existing 15m wide, 1500m long, proposed to extend to 30m wide, 1800m long);
 - Accommodation (existing 1.5Ha /36 person, proposed to relocate camp to final mine camp location 5.6Ha/80 person); and
 - Small scale ROM pad (at site proposed in current EIS).
- Bulk samples from three proposed mine pits totalling 796 801 tonnes (55 178 t ore, 741 623 t overburden);
- Overburden (waste rock that needs to be removed to access the ore body from which the bulk sample will be taken) to be used for road, stockpile base and ROM pad construction; and
- Total area of disturbance is approximately 61Ha, including a stockpile area of 50Ha.

The Proponent was seeking the variation to allow continued exploration and development activities focused on extracting bulk samples for further metallurgical product testing to ensure a marketable product. The Proponent was concerned that these works would be identified as part of the notified action with consequent delays affecting the test work.

On 5 September, the Minister for Lands, Planning and the Environment, determined that excluding the above components would not affect the environmental significance of the proposal and agreed to the proposed variation in accordance with clause 14A of the Environmental Assessment Administrative Procedures.

While these components are not considered further in this Report, they are subject to authorisation under the *Mining Management Act*.

4.3 Alternative options

The EIS guidelines required consideration of a number of alternative options for various aspects of the Project proposal. The EIS considered the following alternative options:

- Not proceeding with the proposal;
- A range of mining methodologies, including improvements in energy consumption and efficiencies;
- Open pit optimisation and mining schedules;
- Open pit location and size;
- Re-alignment of the Towns River;
- Location of associated facilities;

- ROM ore handling, preparation and processing;
- Ore handling and transportation;
- Overburden and waste management;
- Disposal of general waste;
- Disposal of sewage;
- Raw water supplies for construction and operations;
- Water storages to capture and reuse mine affected water;
- Power supply during construction and operations;
- Distribution of site power;
- Energy use and efficiencies;
- Accommodation options;
- Methods to transport the construction and operations workforce; and
- Rehabilitation methods and environmental management techniques.

Those alternatives that elicited concerns from stakeholders are discussed in this Section of the Report.

4.3.1 Project alternatives

Originally, the Proponent submitted a proposal that was of a larger scale and included exploitation of a greater proportion of the defined and inferred resource, including DSO and BFO. As discussed previously in this Report, withdrawal of the larger Project significantly reduced the scope of the Project. This potentially allows for a more simplified and expedient approval process and therefore a more rapid exploitation of the resource. It defers consideration of more significant components associated with the mineral leases, including future mine infrastructure design, ore processing and transport options.

DME requested that justification be provided for the layout of the Project site and discussion included of modifications required to minimise impacts prior to mining of BFO reserves.

As discussed in Section 4.2 of this Report, the EA Act limits consideration of impacts to specific projects. The Proponent would benefit from taking a strategic approach to planning and design of Project mine site components to ensure that any future development that may be undertaken will not unduly affect the integrity of structures and landforms proposed for the current Project. For example, siting and design of waste rock dumps and water management structures to allow for the appropriate location of potential tailings facilities and additional waste rock disposal in the future, would remove the need for unnecessary disturbance of potentially acid forming material and minimise the potential for locating future components inappropriately.

In planning strategically for future expansion, the Proponent should include in its Mining Management Plan (MMP) information such as:

- The infrastructure that would be required to mine the larger mineral resource;
- Indications of the additional PAF material likely to be generated in further mining programs; and

- The likely additional footprint of disturbance including waste rock dumps.

Recommendation 3

The Proponent should ensure that the potential for future mining on the site is taken into account in developing the Project design for the Mining Management Plan, particularly with respect to the establishment of mine components and landforms on the site.

4.3.2 Towns River diversion

Part of the mineable reserve of DSO is within the alignment of the current Towns River channel. In order for the pits to be mined, the Proponent proposes to divert the Towns River to facilitate mining. The Proponent considered a number of alternative approaches to mine pit development in the Towns River channel.

The two Towns River realignment options considered in greatest depth were a single alignment to the north of the pits with full flood protection (Option A) and an alignment requiring Area F Pit 3 to be mined out in one Dry season and then become part of the river channel (Option C). An Option B was not seriously considered. Option A, the original realignment option, was rejected by the Proponent prior to the release of the draft EIS. The Proponent chose not to consider this option (Option A in the EIS) further due to the requirement for significant flood control engineering to protect the mine site and predicted increases in afflux (the upstream rise in water level due to the presence of a structure or restriction in a waterway). This is discussed in more detail in Appendix N2 of the draft EIS and Appendix C of the Supplement.

Hydrologic and hydraulic modelling was conducted by Golder and Associates on behalf of the Proponent to predict river flows and flooding potential. The catchment drained by the Towns River to the proposed mine site was estimated from maps to be approximately 344km² where it meets the western end of the site, to approximately 422km² where the river exits the eastern end of the site. Flows into and out of the mine site sub-catchments were estimated using hydrologic flood modelling with rainfall intensity-frequency-duration data derived using an online estimation tool from the Bureau of Meteorology. Very little data for the area were available to input into the model so data were extrapolated where required from other areas believed to be climatically similar, such as Ngukurr (60km to the north of the mine) and the Kimberley region of Western Australia.

The hydrographs generated from the modelling for a 24 hour rainfall event up to a 20 year average recurrence interval (ARI) predicted that the maximum peak flow for a 1 year ARI event would be 128m³/s. Given the dimensions and estimated physical properties of the existing channels, Golder predicted that such flows for a relatively low magnitude event would exceed the natural channels' capacity to contain flows within banks and therefore overbank flooding would occur in an average Wet season.

Hydraulic modelling was then used to predict flood levels in the vicinity of the mine site under various ARI scenarios up to a 50 year ARI. These predictions were used to investigate the options put forward by the Proponent.

Option A relied on confining all stream flows within an engineered channel where flows might normally spread over the flood plain. This would constrict the river and force water to pile up above the realigned channel thus increasing velocities through the channel and the extent of flooding upstream of the mine site. While the veracity of

the hydraulic modelling predictions on which the options are based could be questioned due to the lack of available data for the region, the EPA considers this issue to be well founded.

Option B was designed to provide more than one flow path to mitigate afflux. This was not modelled due to its complexity and the extra disturbance required to realise this option.

Option C was selected as the preferred option as the presence of the pit within the stream realignment would provide a buffer against significant afflux and downstream velocity increases. Stakeholders were particularly concerned about this option due to the uncertainty associated with the paucity of geochemical data for Area F Pit 3 within the channel (see Section 0 of this Report). This data gap heightens the risk setting and, in combination with the potential effects on seasonal stream flows and aquatic health, led to serious concerns for Government and non-government stakeholders. The potential impacts of the integration of Pit 3 into the Towns River channel are discussed in Sections 4.4.4 and 4.6.1.

Some further options proffered by stakeholders during the assessment, included:

- Implementation of option A to avoid the uncertainty of option C;
- Mining of pits 1 and 2 initially to allow for further investigations of the realignment options at the western end of the mine site; and
- Not mining Area F Pit 3.

The Proponent's concerns about implementing Option A are described above and, despite some uncertainty with the modelling, these concerns are considered to be well founded. Although the second alternative above was not included in submissions and therefore not considered by the Proponent, it is expected that the realigned channel protecting Pits 1 and 2 could create similar velocity and afflux issues to those modelled for Option A. This could have potentially significant impacts to the river and management issues for the mine until such time as research demonstrated a sound outcome could be achieved or a suitable alternative determined.

The option of not disturbing the area proposed for Pit 3 in Area F was dismissed by the Proponent in the Supplement with a similar response to that contained in the draft EIS. The Proponent argued that if deposit F was removed from the potential ore reserves, the viability of the project would be dramatically impacted to the point where it would no longer be a viable project. No evidence to support this statement was provided by the Proponent.

Option C is considered to be a high risk option. To proceed with this option, the Proponent must demonstrate with a high level of certainty that:

- The geochemistry of the pit presents a low risk to water quality in the Towns River;
- Integration of the pit into the alignment will not significantly impact connectivity for fish migration between stream reaches below and above the mine site;
- Integration of the pit into the alignment will not significantly affect early Wet season stream flows over the long term such that downstream aquatic ecosystems reliant on these flows are significantly impacted; and
- The presence of a perennial water body in the middle catchment of the Towns River will not create negative biodiversity impacts in the region.

Additional work is required by the Proponent prior to commencement of mining to improve certainty that Option C can be safely implemented and will be sustainable into the long term.

Recommendation 4

Before mining commences, the Proponent should demonstrate to the satisfaction of the Environment Protection Agency, Department of Mines and Energy and the Australian Government that the realignment of the Towns River and integration of Area F Pit 3 into the channel will not lead to long-term impacts on the aquatic health of the Towns River system.

4.3.3 Haul road /product transport options

The haul road proposed by the Proponent is approximately 165km long and would be cleared to 30m along the length of the route. This entails an area to be cleared of approximately 500 hectares with numerous waterways, including eight major rivers to be crossed along its length. The recent declaration of Limmen National Park included an excised route with 2km width to allow the proposed road through the park. On finalisation of the route and completion of the road, much of this area would be repatriated back into the park.

The Savannah Way connects Broome to Cairns in Queensland. Within the Roper region, the Nathan River road connects Ngukurr with the Carpentaria Highway to the south and runs generally parallel with the proposed haul road.

A number of submissions suggested that the alternative haul road route for transportation of DSO using the Savannah Way rather than a purpose-built road should have been more seriously considered in the draft EIS.

The EIS indicated that the use of public roads between the mine site and the Port of Bing Bong was not considered for the following reasons:

- The distance from the mine site to Bing Bong via the existing road infrastructure is approximately 340kms, more than twice the distance of the proposed private Haul Road. This factor results in a minor difference in capital requirements and major differences in operational and maintenance costs.
- Iron ore is a bulk commodity and transport costs are a significant influence on project viability.
- The existing road network would require adherence to load and road restrictions resulting in the need for many more, smaller trucks as they would have a reduced carrying capacity. Additionally, road weight restrictions and seasonal closures would be restrictive and threaten project viability.
- There would be a major and unacceptable disruption to existing road users. More than one truck every 9 minutes would result in serious safety management issues.
- The Nathan River road is used by mostly Indigenous People from local communities and travellers along the iconic Savannah Way. Travellers along the Savannah Way would be seriously impacted by iron ore trucks. The impacts on the safety of all road users along with the major impact on the tourist experience were preclusive factors.

A number of variations on the Savannah Way alternative did not appear to be considered by the Proponent including accessing only the stretch of Nathan River road between the mine site and Bing Bong port using purpose-built roads to intersect

it at appropriate points, and upgrading the Nathan River road to improve flood immunity and load restrictions. One NT Government agency argued that the use of a public road would remove the issue of trespassers on a private haul road, which WDR could find difficult to police, particularly in the Wet season when the current Nathan River road is closed due to flooding. There was a suggestion that joint use of the public road, in conjunction with an adequate traffic management plan, would make economic and environmental conservation sense.

The EPA agrees that a separate haul road dedicated to mine traffic would likely be the most acceptable option given the significant threat to public safety and the potential impacts to amenity of tourist sites along the Savannah Way.

The NT Government requested that the Savannah Way be prioritised with respect to mine traffic giving way on the haul road intersection. The Proponent responded that haul vehicles would be required to come to a complete stop at the intersection with the Savannah Way and give way to any traffic on the Savannah Way. In all cases public traffic will have priority over vehicles using the private Haul Road.

The EPA considers that the potential for an increase in mining projects in the region warrants consideration by both Government and the Proponent for developing arrangements for the haul road to operate as a multiple user facility.

4.4 Acid/metalliferous drainage

4.4.1 Waste rock characterisation

One of the key risks raised in submissions on the draft EIS was the potential for generation of acid/metalliferous drainage (AMD) from the mine pits and material storage facilities such as overburden facilities, waste rock dumps (WRD) and BFO storage facility.

AMD occurs when rock, including ore, containing sulfides is exposed to air and water. Consequent oxidation leads to the formation of acid and the mobilisation of solutes that can lead to contamination of surface water and groundwater resources as well as aquatic habitats downstream. Metals and ion salts in circum-neutral or alkaline conditions can mobilise and become problematic in downstream aquatic environments.

The Proponent evaluated the risk of acid/metalliferous drainage impacting water quality and subsequently, aquatic ecosystem health for a considerable distance downstream as 'extreme' in the absence of appropriate management.

The Proponent relied on analysis of 204 samples selected from 58 exploration drill holes within Areas F and E for preliminary characterisation of the AMD potential of the mineable reserve. The Proponent concluded from the study that AMD was not likely to be an issue with major implications for the Project. A number of draft EIS submissions questioned the limited sample number and the Proponent's conclusions.

For example, DME commented that only single holes were drilled for PAF assessment in Area F Pit 4 and the western end of Pit 3. Additionally, Area F Pit 1 and Pit 2 assessed PAF using considerably fewer drill holes than Area E or the eastern end of Area F Pit 3. DME concluded that the number of drill holes in these locations were too few to provide confidence in the PAF assessment and requested justification for the low number.

The EPA requested a discussion of the availability of opportunities prior to operational activity to get improved definition of the spatial distribution and reactivity of the PAF material in those areas to be mined.

The Supplement provided no justification for the relatively low sample numbers, no discussion of the uncertainties about the balance of PAF and NAF material generated by a reliance on extrapolation, and no indication of the sampling opportunities prior to mine operation. No further data from sampling and analyses were provided in the Supplement. The Proponent/consultant did not allow for the provision of this information in the scheduling of its EIS as the turnaround from when comments on the draft EIS were provided, to lodgement of the Supplement, was only three weeks.

The Proponent has chosen to defer detailed information on the potential for AMD to the MMP despite the potential significance of this issue.

The lack of certainty raises questions about the manageability of AMD on the mine site and the potential for contamination of downstream aquatic systems. Consequently, the uncertainty increases the risk setting of the Project with the potential for delays in approvals and the Project's commencement.

The Supplement indicates that further testing would be undertaken before mining commences. The Proponent proposed to refine the block model through identification of overburden, ore and PAF layer materials; field geochemical characterisation/screening of PAF materials; and column kinetic testing.

Identification of overburden, ore and PAF layer materials would occur before ore extraction, involving the following:

- The top 30m of the stratigraphic column will be grade controlled/assessed before ore extraction starts. This includes the minimum 15m oxide layer which is believed to blanket most of the mine footprint.
- The grade control, which will incorporate vertical and diagonal drilling to depths of 30m, will be ongoing until the final depth of the pit is reached.

The Proponent is seeking authorisation to commence a bulk sampling program outside of this assessment process. Detailed sampling and analysis of the material should be undertaken before the reserve is mined or significantly disturbed to better characterise the mass balance of PAF and NAF material.

The Proponent indicated that wherever PAF materials are encountered, the following contingency approach would be applied:

- Materials will go through a rigorous characterisation, testing, quantification and risk assessment process.
- The day to day block model will be updated to consider these conditions and will trigger a case specific management approach.
- Materials will be immediately segregated and protected by well-designed, multi-layered cover systems. Studies to achieve optimum encapsulation and/or covers (dry or wet) are to be initiated.
- Depending on the severity and extent of PAF materials, multilayered cover systems may include clay liners and mixing with high acid neutralising capacity (ANC) materials. NAF materials may be crushed to achieve optimum conductivities and prevent water and oxygen entering into the PAF materials.

- Capping of PAF materials will follow the criteria, “PAF placement in cells- immediate capping-compaction of cover- PAF placement in cells”, until the WRD is completed.

In the first instance, the Proponent should undertake further sampling prior to commencement of mining activities to better understand the AMD potential of the reserve. The Proponent will need to re-evaluate its PAF management contingencies to determine their adequacy in the event that higher volumes of PAF materials are encountered as well as where NAF / ANC volumes are inadequate to provide coverage of the PAF materials.

The Proponent will be required to provide further information in its MMP to give confidence that all potential avenues for acidic release have been addressed appropriately. For example, waste landforms will need to be designed to prevent lateral movement of water through the cell, and the hydraulic conductivity of available materials will need to be such that the objective of preventing oxidation of reactive sulphides is achievable.

Recommendation 5

The Proponent should undertake more comprehensive characterisation of materials within proposed pits. This may be staged on a pit by pit basis. Results should be reported to the Department of Mines and Energy for assessment prior to the commencement of mining activities in any proposed pit. The Mining Management Plan should include contingencies in the event that the volume of potentially acid-forming material has been underestimated or where insufficient suitable material is available on site to cover potentially acid forming waste.

4.4.2 Waste rock disposal

A number of issues regarding the disposal of waste rock were raised in submissions to the draft EIS, including:

- Uncertainty about waste rock characteristics associated with the mineable reserve;
- Whether or not sufficient benign overburden material suitable for PAF encapsulation would be present in the mine pits; and
- The Proponent 's reconsideration of its original proposal to commit to infilling of pits as a PAF management measure.

The first two points are discussed in Section 4.4.1 of this Report.

The EIS indicates that refinements in project development have identified that pits would not be available immediately for storage of PAF material and therefore the material would need to be stored temporarily on the surface. The Proponent indicates that backfilling of pits could be considered once sterilisation of reserves was no longer a concern and/or it was economically viable to do so and did not present a source of contamination. The EIS acknowledged that there is a great deal of uncertainty regarding the in-pit storage method given that little work has been done to determine the viability of this option. The likely lag between exposure of PAF material and availability of pits for backfilling means the Proponent will require a well-designed, permanent facility for waste rock storage.

The EIS indicated that there would be insufficient material to completely fill the pits. This means that voids would remain even if pits were backfilled. This presents

challenges for planning and viability of in-pit PAF storage. Actual studies of in-situ conditions, particularly associated with groundwater, would be required to provide the level of knowledge required to safely design and operate in-pit storage and covers. These studies were not carried out during the EIA process.

The Supplement suggests that pits would be allowed to flood via high level flood inflows to maintain water levels well above the depths at which PAF materials are believed to be present. Pit void water quality is discussed in Section 4.4.4 of this Report.

As discussed in the preceding section of this Report, the inherent risks of above-ground PAF disposal are significant. The potential impacts to sensitive receptors from contaminated seepage due to factors such as poor siting and design, and inadequate covers and bases, resulted in an 'extreme' risk classification in the EIS.

The Proponent maintains that WRDs will be engineered to be sustainable over the long term and this is strongly supported. The EIS indicates that WRDs will be monitored to:

- Ascertain that the cover systems are geotechnically stable, there is no significant differential settlement and that there is no erosion and/or unwanted porosity forming;
- Detect that accelerated infiltration through preferential pathways is not originating within non-uniformly compacted cover areas;
- Check that surface water is not eroding the lower portions of the WRD and that drainage systems are free draining and functioning optimally;
- Evaluate that waste cover materials are geochemically stable and are not generating saline or any other potentially polluting leachates; and
- Ascertain whether vegetation establishes as a result of well-placed soil covers with soils having sustainable nutrient capacities.

The EIS states that groundwater within and around WRDs would be monitored by using shallow boreholes installed within their vicinity. Wherever contamination is detected, a risk assessment would be completed and remediation measures implemented immediately. The groundwater monitoring design is discussed in Section 4.5 of this Report.

The Proponent will need to provide further detail on the WRD designs in the MMP for approval by DME, including:

- Consideration of alternative locations for WRDs within the mineral lease area to reduce the potential requirement for significant drainage and diversion works;
- The predicted optimal hydrological, geochemical and geotechnical properties of encapsulation materials;
- The predicted volumes of suitable encapsulation material available on site as well as the volume required for construction of the landforms;
- The provision of alternative designs and contingencies in the event that waste characterisation underestimates the volume of PAF, in accordance with Recommendation 5 of this Report;
- A commitment to maintain records that ensures waste landforms are built to design specifications; and
- Provision of conceptual closure objectives in the conceptual closure plan.

Additionally, the Proponent should commit to undertaking ongoing investigations to determine the practicability and potential long-term environmental impacts/benefits, of in-pit waste rock disposal as part of mine closure. Pit closure is discussed further in Section 4.8 of this Report.

4.4.3 Storage of low grade (BFO) ore

A concern was raised regarding the potential for generation of AMD from lower grade ore that would be stored above ground for future beneficiation. As discussed previously in this Report, the Proponent intends to apply for authorisation to continue mining into lower grade ore reserves once the DSO is mined out. This is considered to be a separate project and would need to undergo further impact assessment at the time. Any low grade ore (BFO) removed from pits during the current Project is likely to require storage until such time as it can be beneficiated (>8 years). Depending on its composition and reactivity, it is likely to generate AMD if exposed to air and water. This presents a risk to local surface and groundwater resources with potential for downstream impacts on the Towns River. The EIS is not explicit about the risks to surface water associated with BFO. It is assumed that they are similar to that of waste rock, which the EIS assesses as 'extreme' in the absence of appropriate management and/or mitigation measures.

The Supplement stated that where there is a potential for AMD to occur, low grade ore will be placed in well-structured PAF cells and covered by NAF materials. Non PAF material with potential to be beneficiated at a later date would be stockpiled on an area with appropriate bunding to ensure that runoff is contained and treated prior to discharge or re-use.

This risk should be managed in accordance with the waste rock management practices specified in the EIS and to the satisfaction of DME, as discussed in Section 4.4.2 of this Report.

4.4.4 Mine pits

A number of issues were raised in submissions on the draft EIS associated with mine pits including the acidification of material in the pit walls with consequent impacts to the quality of pit water and its disposal/use, and the integration of Area F Pit 3 void into the Towns River alignment and its impacts on the river.

Towns River realignment options and impacts are discussed in Sections 4.3.2 and 4.6.1 respectively. Water quality monitoring discussions for ground water and surface water are included in Section 4.5 of this Report.

The draft EIS did not discuss the potential for acidification of mine pit water. A number of Government and non-government stakeholders questioned the potential for acid formation in the pit walls and the consequences to water quality in the pits. Of particular concern was the fate of contaminated pit water, either through proposed use of the water for processes on site including dust suppression, or the potential discharge of water from pits into the Towns River.

The Supplement indicated that AMD issues were not anticipated in Pits 3 and 4 due to the general absence of PAF materials in the oxidised zone between the surface and 15m deep. Any water (groundwater influx and rainwater) from Pit 3 would be pumped into Pit 4 prior to allowing the pit to flood as part of the Towns River stream realignment. Consequently, any AMD generated during mining of Pit 3 would likely be removed. Pit 4 would be maintained with sufficient freeboard to prevent discharge to the river.

According to the Supplement, once flooded, the Pit 3 water level would be maintained at a level no less than 25m below ground surface level to ensure that PAF materials would remain permanently submerged. The Proponent expects that the pit lake water level would remain at full surface level throughout the Wet season and is likely to recede by up to 7.4m during the Dry season. Pit water balances in the EIS indicated that this water would be replaced as soon as runoff from rain commenced in the following Wet season.

DME responded to these claims in the Supplement, indicating that the disturbance from mining would be likely to partially oxidise PAF present in the pit. While keeping the PAF submerged to reduce oxidation, there would likely be an initial impact on pit water quality in the first stages of refilling. Surface water would be aerated during refilling, facilitating further, albeit less, oxidation. Additionally, surface water might not have enough buffering capacity to completely mitigate acidification during re-filling. Over time the volume of water and flow would likely mitigate impacts.

There did not appear to be any acknowledgement of the potential for impacts from PAF materials to be greater than anticipated. There was no information specific to the potential AMD issues in Area F Pits 1 and 2 or Area E on how any potential water quality issues in these pits associated with AMD would be managed post-mining.

The EIS proposed the following solutions to AMD contamination of groundwater:

- Sterilisation of pit exposed PAF materials using NAF wastes;
- Implementation of monitoring programs to define water quality evolution;
- Recovery of contaminated water and treatment by mixing/liming; and
- Recycling of treated water in various mining activities such as dust suppression at the plant (not roads), irrigation, and replenishment of pits.

The EIS indicates that any required treatment of contaminated water may include:

- Passive treatment including neutralization via cut-off walls, trenches or wells or in collection systems intercepting both surface-runoff and groundwater flows.
- Active treatments including neutralisation using biological, chemical processes or water treatment.

Few of these solutions are considered to address the concerns of stakeholders.

The draft EIS indicates that any contaminated water associated with PAF materials will be monitored and managed in accordance with:

- A detailed Water Management Plan, to be developed by the Proponent and approved by the regulating authorities prior to commencement of mining; and
- A detailed PAF Management Plan, to be developed by the Proponent and approved by the regulating authorities prior to commencement of mining.

A Draft Acid Mine Drainage Management Plan and Draft Water Management Plan were submitted with the EIS. The detail provided in these plans was insufficient to provide confidence in the adequacy of monitoring or management measures proposed. These plans will need to be refined to demonstrate that contaminated water in pit voids can be adequately managed without the risk of discharge to the Towns River catchment.

Recommendation 6

The Proponent should include relevant strategies in the water management plan and acid/metalliferous drainage management plan for managing

acid/metalliferous drainage in pit voids during and post mining. These plans will form part of the Mining Management Plan for approval by the Department of Mines and Energy.

4.5 Water

4.5.1 Surface water monitoring

A number of submissions on the draft EIS highlighted shortfalls with the Proponent's surface water monitoring program. Issues were raised in relation to:

- Analysis of samples for the full suite of metals as part of the baseline data collection;
- Analysis of total as well as dissolved metals as part of a baseline data set;
- The need for all monitoring data to be provided rather than just averages;
- Hardness modified trigger values; and
- Appropriateness of monitoring locations, spatial coverage, frequency of sampling and analysis.

In almost all cases, the Supplement disputed the need for any changes to the surface water monitoring programs outlined in the draft EIS and in some cases requested justification for data requirements.

It is the Proponent's responsibility to demonstrate how the monitoring program has been designed to respond to risks that have been identified through a rigorous assessment. The proponent has not demonstrated an understanding of baseline conditions through the undertaking of baseline studies. The risk assessment is not considered to be sound. This increases the probability that the monitoring program proposed is not based on sound findings, and doubt remains that it would enable adequate response to risks. Adequate baseline studies need to be completed and a solid risk assessment, using actual data conducted. It is expected that the monitoring programs will include all requirements of the EPA and DME.

The following points must be considered in preparing the surface water monitoring program to ensure it is acceptable to regulators:

- Collection of Dry season baseline water quality data in remnant pools;
- An assessment of water volumes in remnant pools to establish the extremes tolerated by fauna present ;
- An assessment of the potential impact to water quality of the first flush of the Wet season;
- Commitment to sample remnant pools before the commencement of each Wet season;
- Sampling should be undertaken prior to the 2012 Wet season to ensure that baseline data are available before mining operations commence;
- A full suite of metals analyses should be undertaken before mining commences to establish the metals that are naturally present. Once the baseline is established, future analyses will distinguish between background and mine

contaminants and those metals that are regularly below detection limits or well below guidelines trigger values can be excluded from future regular analyses;

- Total metals concentrations should be analysed. The ANZECC guideline trigger values are based on totals analysis in the first instance. Understanding the loading of total metals in the system rather than just dissolved metals is considered important as their fate in the environment is unknown and changes in pH, hardness and REDOX can potentially remobilise metals where they have accumulated further downstream;
- All raw monitoring data should be provided as well as the manipulated data;
- Water quality reporting should include graphs with:
 - The constant ANZECC trigger value;
 - The variable hardness modified trigger value to provide an accurate representation of metal bioavailability due to hardness;
 - The variable total and dissolved concentrations of the metals;
- Increased water sampling locations near pits to monitor potential pit seepage entering the Towns River, particularly near isolated water bodies closest to pits. These locations will need baseline sampling and analysis;
- Additional sampling locations are required downstream of the mine site;
- In-situ, daily sampling for pH, SEC (calibrated for temperature), dissolved oxygen, turbidity and temperature should be undertaken up and down stream of specified crossings on the haul road during construction. Laboratory analysis should be undertaken weekly at these haul road crossings during construction and then monthly during operation. Dust influences should be accounted for in selecting upstream locations. Analysis should include at a minimum: major ions, TDS, TSS, total and dissolved metals (As, B, Cd, Co, Cu, Fe, Mn, Ni, Pb, Zn). Baseline sampling of these locations should be undertaken prior to commencement of construction;
- Water within pits should be regularly sampled and analysed to a specified schedule, including water from dewatering activities; and
- Surface water monitoring should be conducted at the Bing Bong facility including at a minimum, sediment ponds, local surface water and off the coast immediately adjacent to land.

Details of parameters, analytes and specific criteria should be agreed with DME prior to sampling. The surface water monitoring plan should inform and be part of the water management plan, which will be included as part of the MMP to be approved by DME.

Recommendation 7

The surface water monitoring plan should be updated to include additional baseline monitoring locations, sampling and analysis as outlined in this Assessment Report 70 and agreed with the Department of Mines and Energy. The plan should be included as part of the Mining Management Plan for approval by the Department of Mines and Energy.

4.5.2 Groundwater

Concerns were raised about the representativeness of the groundwater monitoring array proposed by the Proponent.

In response, the Proponent proposed in the Supplement to extend the monitoring network and program to include several more bores targeting the shallow aquitard and deeper aquifer systems separately. The new monitoring bores proposed by the Proponent would be located around mine infrastructure such as WRDs (predominantly shallow bores), Plant and Stockpiles (predominantly shallow bores), Pits and the Stream Realignment (combination of nested bores targeting shallow and deep systems separately).

A review of the Supplement by DME determined that the proposed additional bores were possibly within the area likely to be influenced by the cone of depression from pit dewatering. DME indicated that there was little confidence that the number, location and construction method of the bores would be suitable for a complete baseline snapshot of groundwater prior to commencement of operations.

DME require the following improvements:

- Establishment of additional bores located further away but in conjunction with the proposed bores to enable assessment of gradient and direction of flow, and to track any off-site contaminant migration;
- Installation and monitoring of the additional bores to provide a baseline prior to commencement of operations; and
- Construction of bores to account for multiple aquifers using the new 2012 standard: *Minimum construction requirements for water bores in Australia – 3rd Edition*.

The water management plan should be amended to include the additional information on baseline groundwater conditions and submitted as part of the MMP for approval.

Recommendation 8

The water management plan should be updated to include additional baseline groundwater information as outlined in this Assessment Report 70 and to the satisfaction of the Department of Mines and Energy. The plan should be included as part of the Mining Management Plan for approval by the Department of Mines and Energy.

4.6 Biodiversity impacts

4.6.1 Freshwater

Key concerns in draft EIS submissions regarding freshwater systems relate to potential impacts on aquatic health and fish due to water quality deterioration and hydrological changes at the mine site and along the haul road.

Erosion and AMD are considered to be the key factors in reducing water quality. The mine site, which is located on a flood plain, would require a significant amount of vegetation clearing and soil disturbance to excavate the pits, establish ore and waste storage structures, and water management controls. Some of the overburden, waste rock and lower grade ore, which would be used for construction or stored for

extended periods, has the potential to generate AMD. The Proponent's risk assessment assigns a 'high' risk of impact to downstream aquatic health from sedimentation and turbidity as a result of soil erosion, and an 'extreme' risk from AMD, in the absence of appropriate management and mitigation measures. AMD is discussed in more detail in Section 4.4 of this Report.

The Proponent's risk assessment ascribed a 'high' inherent risk of impacts to aquatic environments due to hydrological impacts from stream crossings along the proposed haul road and changes in hydrology and habitat losses from the proposed permanent realignment of the Towns River through the mine site.

Haul Road

The key impacts of the haul road on aquatic biodiversity are considered by stakeholders to be the potential for high sediment loads in rainfall runoff flowing into rivers and streams from vegetation clearing, changes to flow velocities and potential loss of connectivity due to stream crossing designs or poorly maintained crossings.

One stakeholder was particularly concerned about the maintenance of fish passage and sought greater certainty that existing water flows and passages in the rivers, streams, wetlands and flood out areas crossed by the proposed haul road would be allowed for. The stakeholder's submission stated that upstream movement of fish and aquatic life through the road alignment could only be provided for if river and stream crossings did not become restriction points. Restrictions could occur due to width constraints or where the longitudinal in-stream profile under bridges and in culverts and pipes was built up higher than the existing stream profile forming barriers to fish movement. Similar impacts could occur at the various catch drains, check dams, diversion channels, sediment fences and other structures through design issues.

The EIS stated that further assessments would be undertaken of the presence of fish habitats upstream of the haul road crossings to determine the need for fish passage where no permanent water and/or suitable habitat was evident. The EIS indicated that in most cases flow velocities would be maintained as appropriate. This is encouraged as it is considered that natural, Wet season flows should be maintained wherever possible irrespective of the presence of permanent water or suitable habitat for fish.

The Proponent has committed to monitoring the integrity of culvert installations prior to the start of each Wet season, to ensure that there are no impediments to fish passage.

The Proponent prepared a high-level Erosion and Sediment Control Plan (ESCP) for the haul road including a maintenance and monitoring program to limit the potential for significant sediment contamination of streams along the haul road route. Development of an ESCP suitable for construction purposes would be completed in conjunction with detailed civil design.

Provided that the Proponent undertakes all actions committed to in the EIS and implements the recommendations in this Report, the risks associated with surface water quality and its implications for aquatic health downstream of the mine and haul road are considered to be manageable.

Mine site

One stakeholder's submission stated that the current uncertainty about the PAF characteristics of the ore and rock in the mine area made it very difficult to be confident that the current river diversion and mining plans would not result in acid

mine drainage from the in-stream pit and wider mine site into the Towns River with consequent impacts to fish downstream.

Several stakeholders requested that detailed studies of the PAF characteristics of all rock and ore in the mine area where run off and drainage channels enter the Towns River and the diversion should be completed to inform the Supplement. No further information on the characteristics of material within the mineable resource was provided in the Supplement.

As discussed in Section 4.4.1 of this Report, the Proponent will need to undertake further, more-detailed investigations prior to and during the mining campaign to better characterise excavated material and ensure it is managed appropriately to minimise AMD risk, in accordance with Recommendation 5 of this Report. The Proponent has committed to implementing a water management plan for the life of the mine. This would need to be informed by results from further geochemical investigations and baseline water quality data.

This water management plan will require approval as part of the MMP in accordance with Recommendations 7 and 8 of this Report.

Several respondents were concerned about the potential impacts on fish movement from the incorporation of Pit 3 into the river channel. Of particular concern with respect to fish passage, in the short term at least, was the potential changed hydrologic regimes during low flows such as at the beginning of the Wet season before the pit was full or in subsequent dry years with below average rainfall. Flows from the upper catchment of the Towns River in these circumstances would be delayed. More detail on the predicted flows from Pit 3 is provided in Appendix C of the Supplement and summarised in Section 4.2.1 of the Supplement.

The Supplement was unable to provide confidence that significant delays in Wet season flows in the Towns River below the mine could be dealt with sufficiently. The draft EIS states that natural flow patterns within the constructed channel and discharge (i.e. volumes, velocities and timing) to downstream areas would be maintained as close as possible to current conditions.

The following Pit 3 outflow sequence was predicted in the Supplement from a seasonal assessment of flow impacts for several flow/rainfall scenarios:

- During a very dry year, and also during an average Wet season, there may be impacts on stream flow downstream of the pit lake due to interception of flows during filling of Pit 3;
- After the pit lake has filled, the ongoing impacts on downstream flows would be reduced considerably and the pit lake would reach a full level early the following Wet season, even during drier than average years; and
- During the Dry season, as the pit storage level naturally falls there will be no flow downstream of the pit. These reaches of the Towns River generally do not have flows in the Dry season.

Appendix C of the Supplement allows for the option to manage filling of the pit lake using pumped augmentation of downstream flows to mitigate the impact of flow lags from pit lake interception, particularly during a drier than average Wet season. There is no commitment by the Proponent to implement this management option.

The Supplement asserts that any delays in flows would not have much of an impact on the river in its present biological state. It states that the current lack of large permanent waterholes in the middle and upper catchment make it unlikely that the upper reaches would have importance for migratory species (e.g. barramundi,

tarpon), and the flow regimes of Yumanji and Magaranyi Creeks would be unaffected by mining and continue to deliver water to the lower reaches of the catchment.

A stakeholder was concerned that the flooded pit would act as an obstacle to fish passage due to steep sides and the lack of suitable fish habitat.

The Supplement indicated that when full, the pit would have shallow edges as the flood protection bunds would be pushed in to fill the first pit benches. The Proponent stated that this would present a more natural habitat to facilitate fish movement.

The stakeholder requested that the issue of fish movement in the Towns River and its realignment through the mine site be studied and, if necessary, plans modified to accommodate the issue. The EPA considers that there is currently insufficient information in the EIS to predict the likely impacts on fish passage from the realignment and supports the stakeholder's request.

The Proponent has committed to further studying fish assemblages in the Towns River. An initial study would need to be undertaken in 2012 prior to construction of Pit 3 and the realignment, to determine a baseline for species that may migrate upstream through the mining lease. This information should be used to inform strategies to minimise impacts to fish passage once the realignment has been established.

Recommendation 9

A study of fish assemblages up and down stream of the mine site should be undertaken during full flow events in the Towns River prior to the commencement of construction.

Outcomes of this study should inform strategies to ensure fish migration is not significantly affected by the realignment, and monitoring of fish assemblages should be undertaken annually to confirm their effectiveness.

4.6.2 Marine

The draft EIS lacked site-specific baseline information to inform the assessment of potential impacts on significant marine species from the proposed development, and did not assess the adequacy of the available data to inform the development of an on-going marine health condition assessment program relating to port usage. A sound assessment of the potential risk to significant marine species and the development of monitoring and mitigation measures requires adequate data.

The EPA raised the issue as it believed that not all existing data were presented. The port facility has been established and operational for an extended period. There was an expectation that information relating to habitat distribution for marine species should have been available, together with information on the frequency and intensity of habitat use by significant species. These data would underpin a robust risk assessment and development of meaningful monitoring programs.

The draft EIS reviewed and summarised the existing knowledge of the marine biodiversity and current marine monitoring in and near the study area. It acknowledged that the study was not comprehensive and that further work would be required. The knowledge gaps identified included knowledge of regional species and habitat assemblage, the relative significance of the immediate area to each of these

species, the effectiveness of the proposed mitigation measures and the comprehensiveness of the existing monitoring program.

In response to concerns, the Supplement reported that a risk assessment concluded that the proposed hazards were either not significant at the regional scale or were mitigated to a lower risk class. The Supplement noted that there was still a need for additional knowledge of the local species assemblage, regional habitats and the impacts on these from this Project and others.

Baseline surveys were considered by the Proponent but not conducted. The Proponent has committed to conducting a risk assessment and developing a management and monitoring program post-approval with engagement of known experts on regional species. The Proponent considered this to be a more strategic and meaningful approach to filling knowledge gaps, clarifying risks and ensuring that risks have been appropriately mitigated and monitored for these species and habitats. The Proponent provided assurances that this would be an integrated process driven by the Proponent in partnership with MRM to ensure that the cumulative impacts of both the McArthur River Mining Pty Ltd (MRM) expansion and the Proponent's proposal would be appropriately assessed and mitigated. The Proponent has committed to undertake any further investigations that arise from this process, including any further studies, mitigation measures and monitoring as required.

The EIS proposed that a review of current knowledge, quantification of risk to significant marine biota and development of mitigation measures and monitoring would be undertaken post-approval, and would 'most likely' be developed through an expert workshop.

If recommendations from appropriate experts, subject to broad peer review, are incorporated into the authorised activity, then the EPA considers it likely that mitigation and monitoring measures can adequately address the risks.

Recommendation 10

A comprehensive assessment of risks to significant marine species and their habitats should be completed prior to commencement of construction of Project marine components, including any further studies required to address information gaps identified during the risk assessment. The development of an integrated marine management and monitoring program to the satisfaction of the Environment Protection Agency should be informed by the outcomes of the risk assessment.

Where relevant, improved information on local and regional populations of significant species should be used to refine mitigation and monitoring for acoustic disturbance and increased boat traffic.

4.6.3 EPBC Act matters

Threatened floral species

The level of information on flora along the haul road route, particularly threatened flora, is considered to be inadequate for assessment of risks. The paucity of data for the country through which the haul road is proposed to traverse presents challenges for the Proponent and regulatory authorities in determining the level of risk associated with impacts to threatened species along the route. It is considered that

there is a risk that construction of the haul road could significantly impact listed threatened species in the absence of such information.

In its submission, the EPA noted that the draft EIS lacked an adequate level of detail, particularly for haul road waterway crossings and areas of sensitive riparian vegetation, as the exact route of the haul road and all associated works were not finalised.

The Proponent argued that the draft EIS identified only a single threatened flora species that may be found within the development area: the Thorny Solanum *Solanum carduiforme*. This species was identified through a desktop study. The closest location at which this species has been recorded to the development is at Limmen Gate, approximately 40km south of the haul road.

There does not appear to have been additional survey work undertaken for the Supplement to provide any improvement in the level of information available to assess the potential risk of the haul road to threatened plant species.

The amount of existing information on the region's flora is limited. For example, based on a search of the NT flora database the total number of records within 40 km of the proposed haul road is 8542, which equates to one record for every 180 ha. The likelihood of detecting threatened flora species that may occur within the vicinity of the haul road is considered low with this level of survey effort.

Threatened flora species are often distributed sparsely in the landscape and occur in low numbers, and are relatively difficult to detect. The most reliable method of detecting threatened species is for suitably qualified personnel to conduct comprehensive on-ground flora surveys. The Proponent has not conducted such flora surveys along the route of the proposed haul road or during their assessment of riparian vegetation at the river and creek crossings (only structural and dominant species assessed). It is noted that the exact location of the proposed haul road was not known at the time of the assessment.

The haul road construction could have very significant impacts on a restricted population of a threatened plant species. Consequently, without an adequate assessment of the risk or appropriate mitigative strategies, the risk is considered to be unacceptable.

The Proponent stated that a survey for *Solanum carduiforme* would be undertaken along the haul road route prior to road construction. This is strongly supported, however, it is unclear how potential impacts will be mitigated if the species is determined to be present.

Recommendation 11

The Proponent should conduct a comprehensive flora survey along the haul road route, following the methods described in the 'Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping' (Brocklehurst *et al.* 2007) at a representative number of sites, as well as targeting sensitive and significant habitat types.

An assessment of any threatened species that may be impacted by the proposed haul road should be conducted and appropriate management actions implemented to the satisfaction of the Environment Protection Agency and the Australian Government prior to construction of the proposed haul road.

Freshwater Sawfish

The risk assessment conducted for the draft EIS ascribed a 'high' inherent risk of impacts to aquatic environments due to hydrological impacts from stream crossings along the proposed haul road and changes in hydrology and habitat losses from the proposed permanent realignment of the Towns River through the mine site. The draft EIS goes on to say that alterations to stream hydrology and habitats could affect migration patterns of some aquatic species, such as the freshwater sawfish (*Pristis microdon*). The Proponent evaluated the risk of AMD impacting water quality and aquatic ecosystem health for a considerable distance downstream as 'extreme' in the absence of appropriate management.

The Australian Government questioned the potential for freshwater sawfish to be present in the vicinity of the mine site and therefore the potential for this species to be impacted by mining activities. The EIS stated that freshwater sawfish may occur in the downstream habitats of the mine site and are likely to occur within several waterways that the haul road crosses.

The main threats for sawfish from the Project are considered to arise from surface water contamination and erosion/sedimentation. Typical freshwater sawfish habitat was not identified close to the mine site. The Towns River is reported to be ephemeral in the reaches proximal to the mine site. The closest suitable habitat is believed to be 20km downstream from the mine site within the perennial sections of the Towns River. The draft EIS provided a potential 'worst-case' scenario for mine site impacts to downstream aquatic health citing the former Rum Jungle mine in the NT, where significant ecological impairment was recorded for a distance of up to 15km downstream and a measurable effect for a distance of up to 30km downstream. This suggests that there is potential for impacts to occur to this species if significant issues occur with the Project.

The draft EIS stated that little is known about breeding habits of sawfish and therefore it could not be confirmed if sawfish would travel upstream to the mine site during the Wet season. Fish surveys did not detect the species.

The Proponent should take a precautionary approach in managing the mine site and haul road construction to mitigate potential impacts to this and other aquatic species. A number of relevant actions have been recommended in this Report that may help in managing potential impacts to the freshwater sawfish, including:

- Demonstration by the Proponent that the realigned channel of the Towns River, particularly through the mine pit, will not have long-term impacts on aquatic health of the Towns River system (Recommendation 4);
- Further geochemical characterisation of waste rock and overburden to inform management of PAF materials (Recommendation 5);
- Enhanced water monitoring and management programs to detect migration of contaminants, supported by appropriate management strategies (Recommendations 7 and 8); and
- Further investigations required to inform improved management options for delayed flows through the realigned channel due to water deficit in Pit 3 (Recommendation 9).

If the Proponent implements the recommendations in this Report appropriately and meets its commitments in the EIS and obligations under the *Mining Management Act*, the EPA considers that potential impacts to the freshwater sawfish can be adequately mitigated.

4.6.4 Environmental offsets

The Supplement has not provided sufficient detail to satisfy requirements of the NT and Australian Government environmental offsets policies. There is no specific statement of residual detriment (as outlined in the draft Guidelines) or actions associated with the residual detriment that will provide clear environmental benefits for matters of national environmental significance.

The establishment of a greenfield mine site in a near-pristine area with its associated disturbance, uncertainty regarding the potential impacts of the Towns River realignment, and the cleared corridor formed by the haul road dividing the Limmen National Park, are likely to create significant impacts in the medium and possibly long term. In the absence of evidence to suggest otherwise and in adopting a precautionary approach, it is considered that the residual impacts of this development on regional ecology and matters of National Environmental Significance (NES) merit an environmental offset.

The Proponent has put forward an offsets proposal which has been identified as more appropriate for the Community Benefits Package. The Proponent argues that the social benefits that might be created by its proposal could also bring about significant benefits to the physical and biological aspects of the environment, consistent with the principles of ESD.

While the emphasis on involving local Indigenous communities in delivering management actions associated with environmental offsets is supported, the Proponent is requested to provide more detail on specific programs that will deliver measurable environmental benefits and engage with the NT and Australian Governments to demonstrate the appropriateness of these offsets in compensating for residual detriment to ecological communities and NES matters created by the Project. It is understood that any offsets would be included in the Project Facilitation Agreement.

Recommendation 12

The Proponent should engage with the NT and Australian Governments (where required) to provide detail regarding the appropriateness of its proposed offsets to compensate for residual detriment of the Project to ecological communities and matters of National Environmental Significance.

4.7 Dust and spills

4.7.1 Product spills and dust formation

One stakeholder raised the issue of product spills and dust generation from product handling and, in particular, loading activities from barges to OGVs offshore. The stakeholder requested that loading activities be undertaken using covered systems to minimise dust.

The draft EIS indicates that iron ore is not toxic to marine organisms in most circumstances, given that iron ore is virtually insoluble in sea water. Further, if fugitive dust emissions occur, the dust would likely settle on the substrate, which may lead to physical effects of smothering and change in substrate type. Finally, such an

impact in theory would lead to increased metal levels in benthic biota and subsequent uptake in higher order level consumers.

The draft EIS goes on to state that any potential impacts from dust to the marine environment would be negligible given the dust and other procedural controls proposed in Chapter 5. The Supplement included the following measures to minimise dust, relevant to the OGV loading operation:

- The ore will be transferred from barge to OGV by using the ship gear and grabs. Specifically, the Proponent would need to make sure that grabs are not overloaded and that the ship's gear would be suitable for the required lifting operation; and
- Ore will be continuously maintained at the Dust Extinction Moisture (DEM) Level to reduce the likelihood of dust generation.

The Proponent made a series of commitments in the draft EIS to monitor for dust and indicated that dust suppression measures would be implemented as specified in Chapter 5 of the draft EIS. With the exception of maintaining ore at the DEM level, none of the other measures listed in Chapter 5 were considered relevant or adequate for preventing dust and spills from trans-shipment of product offshore.

While the dust and spill controls are considered to be insufficient for the ship loading operation, it is accepted that the risk to the marine environment from DSO product is likely to be relatively low. The Proponent will need to give further consideration to improving product handling at sea to prevent spills and dust as far as reasonably practicable.

4.7.2 Haul road dust emissions

The NT Parks and Wildlife Commission were satisfied the haul road would be sealed following a review of the draft EIS. However, upon reading the Supplement, which indicated that the road *“will not be sealed until after the first Wet season”* and *“spray seal of the road is anticipated after the first Wet season”*, there were concerns that the road would not be properly sealed at all. This concern may have stemmed from the failure of the Supplement to respond adequately to a submission from DME regarding timelines for sealing of the road. The Parks and Wildlife Commission expressed the following concerns with the proposed road:

- Ongoing extraction of road materials – A non-sealed road will have a higher maintenance requirement and a higher demand for more rock, gravel and water for repairs and maintenance than the sealed road that was proposed in the draft EIS;
- Dust impact on visitors – where the haul road runs through the park an unsealed road will have a greater impact on visitors than a sealed road;
- Dust impact on vegetation – The adverse impact of dust on vegetation near the road will be greater with an unsealed road.

The EPA has since clarified with the Proponent that the haul road will eventually be fully bituminised. The Proponent should provide a clear schedule showing the timeframes in which bituminising the road will commence and be completed.

The EPA would prefer that the haul road be effectively sealed prior to commissioning to mitigate potential dust impacts on water quality and vegetation. If the spray seal method is to be used in the interim, further detail should be provided on this method in the MMP.

Recommendation 13

The Proponent should commit to sealing the haul road prior to its commissioning and use. A schedule for bituminising the haul road should be provided in the MMP.

4.8 Rehabilitation and mine closure

In its submission on the draft EIS, DME indicated that mine closure planning should be treated as an essential part of mine development planning and that an approval would not be issued until a closure plan was provided demonstrating that ecologically sustainable closure was achievable. The Proponent had an opportunity to include a conceptual closure plan in the Supplement. Instead, the Proponent argued that rehabilitation and mine closure planning had been taken into account during all stages of project development but that demonstrating ecologically sustainable closure prior to any disturbance and therefore rehabilitation trials and tests was not possible and could not be expected.

The Proponent must demonstrate that ecologically sustainable closure can be achieved. The Proponent will need to provide a conceptual closure plan using the WA Mine Closure Guidelines as a reference. The conceptual closure plan is expected to address the following:

- Conceptual landform designs;
- Closure objectives at the time of writing (the Department accepts that these may be amended as stakeholder expectations change);
- Conceptual closure criteria by which the success of rehabilitation/ closure can be measured;
- Costs of adequately closing the site upon completion of the DSO operation (not proceeding to BFO project) including costs for appropriate post-closure monitoring to allow the Proponent to account for the predicted dollar value of the environmental liability post-mining. This should consider the potential risks associated with large quantities of PAF BFO in storage facilities;
- Post closure monitoring plans to assist the Proponent in predicting the length of time closure will take;
- Contingency planning for unplanned cease of operations;
- Targets for progressive closure activities (this will allow the Proponent to monitor progressive rehabilitation and closure activities and ensure that they are carried out in accordance with the overall closure objectives of the site); and
- Commitments to increasing the Proponent's understanding of the site and surrounding environment.

Recommendation 14

The Proponent must provide a conceptual closure plan to the Department of Mines and Energy for approval under the *Mining Management Act*.

Haul road

The Proponent stated in the EIS that at the cessation of the project it will *look to the NT Government for advice as to their preferences regarding decommissioning*. The NT Government advised that, at the current time, the haul road provides little

advantage to it in terms of its strategic location once the mining operation ceases, and maintenance of the road infrastructure in this remote location is already challenging. Any additional roads in this area would need to be supported by an appropriate budget for ongoing maintenance.

Consideration will need to be given to proposed, alternative uses or closure and rehabilitation of the haul road once its use is no longer required for mine operations.

Pit Closure

The Proponent stated that the current preferred pit management option is to flood the pits. Benchmarking activities in Pit 3 would assist in defining long term pit management options and these might include pit backfilling. The Proponent advised that as a bulk commodity is being mined, there would not be sufficient material to backfill the pits to the original levels.

The difficulties in achieving underground burial to minimise long-term AMD during the DSO Project are understood. Consideration will need to be given to eventually burying the material in pits, potentially during the anticipated BFO project if it is authorised in future.

Recommendation 15

The Proponent should commit to in-pit burial of PAF material and backfilling of pits when it is practicable to do so and if it can be demonstrated that environmental risks are acceptable.

Towns River alignment

A number of stakeholders requested that the Proponent discuss reverting the Towns River to its original course following completion of DSO mining. This would require all relevant pits to be backfilled and stabilised.

The Proponent provided a number of reasons in the EIS for not pursuing the reversion of the Towns River to its original flow path, including:

- The pits would be “filled with material that is less consolidated than the undisturbed areas. This will result in greater management risks in regard to stability and the potential for water loss into the unconsolidated sediments.”
- To construct a channel in an in filled pit would offer a significant engineering risk, which adds significant environmental risk to such an endeavour.
- The timing of [a river channel reversion] would most likely occur during closure, rather than during the operational phase, meaning that there would be fewer resources available to monitor and manage the channel post operations.

One stakeholder requested more detail on the option to make the decision clearer and argued that if the alternative to revert the stream was found to represent the best rehabilitation outcome, then whatever monitoring and management resources may be required should be provided.

The Proponent should reconsider the options for the Towns River channel alignment when all relevant information is obtained to determine the long-term viability of its realignment plans. The Proponent will need to demonstrate that the proposed alignment option will not significantly impact on the health of the downstream aquatic environment, in accordance with Recommendation 4 of this Report. Additionally, the Proponent must ensure that a comprehensive monitoring program is undertaken to inform alignment options at mine closure. The monitoring program should include

sampling of all relevant meteorological and hydrological parameters to establish a dataset for determining stream flows and flood levels for the mine site.

Recommendation 16

During Phase 1 mining, the Proponent should undertake investigations to fully inform the most appropriate option for the Towns River alignment within the mining lease at mine closure.

4.9 Environmental Management Program

A number of management plans have been proposed through the course of the assessment process for the Project. All management plans will become part of the MMP to be approved by DME. Relevant plans specified in this Report should be developed to the satisfaction of the EPA, in consultation with key stakeholders.

These approved plans and procedures will be one of the primary tools by which the Proponent will implement management and monitoring commitments made in the EIS and the recommendations detailed in this Report.

An important consideration for any Project is transparency and accountability in impact management. Amendments to the *Mining Management Act* came into effect on 1 July 2012. Details of the amendments can be viewed on the DEM website at:

[http://www.nt.gov.au/d/index.cfm?newscat1=&newscat2=&header=Amendment s%20to%20the%20Mining%20Management%20Act](http://www.nt.gov.au/d/index.cfm?newscat1=&newscat2=&header=Amendment%20to%20the%20Mining%20Management%20Act)

Under the amended *Mining Management Act*, operators conducting mining activities on a mining lease are required to publicly report the site's level of environmental performance on an annual basis. The Environmental Mining Report (EMR) will form a component of an operator's annually submitted MMP and would be released following the MMP approval. The Act does not allow for public availability of the MMP in its entirety. Third parties wishing to access information contained in an MMP, which is not detailed in a company's annually released EMR, can contact the company directly to request a copy, or lodge a request under the NT's *Information Act*.

The Proponent is encouraged to make the final management plans available to the wider public as well as seeking engagement with key stakeholders in the preparation of these management plans prior to MMP approval.

Similarly, the Proponent is encouraged to continue to engage and inform local communities as development progresses, not just on an annual basis as required. It is expected that this would include reporting of monitoring outcomes and ongoing management actions to minimise impact as construction and mining progresses.

Management plans would be included as part of the MMP, which would be submitted to DME for approval prior to commencement of construction and mining activities.

Recommendation 17

All management plans for the Roper Bar Iron Ore Phase 1 Project are to be submitted to the Department of Mines and Energy for approval under the *Mining Management Act* prior to commencement of any works for which the plans apply.

In preparing each plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report and Recommendations. The plans shall be referred to relevant Northern Territory Government agencies and key stakeholders for review prior to finalisation.

The proponent should provide regular reporting of monitoring outcomes and ongoing management actions to key stakeholders as construction and mining progresses.

5 Conclusion

This Project assessment is unable to conclude that the matters that may cause significant impacts to the environment have been fully assessed.

The assessment of the environmental risks, potential impacts and proposed management measures of this green field mine site has been restricted by limited baseline information and an unfounded risk assessment. This has increased the probability that the monitoring programs and management strategies proposed are based on inadequate findings.

It is acknowledged that the Roper River region has experienced very little development activity and therefore has not been well studied. It is the responsibility of the Proponent and its consultant when planning for projects of this magnitude and future potential to demonstrate to stakeholders and the regulator that there is sufficient understanding of the environment in which the Project is proposed to operate, and that risks are well understood to ensure that identified risks can be managed appropriately. The Proponent was unable to demonstrate this in all aspects during the EIA.

The Proponent's documentation contains high level commitments to minimising environmental impact. This requires Government, particularly the regulator, and community stakeholders to place a significant degree of trust in the Proponent to ensure works are undertaken in accordance with those commitments and other safeguards that have been recommended in this assessment process.

It is an expectation of stakeholders to this process that the Proponent now demonstrate that it can work within the framework required to conduct business in accordance with ESD principles and existing regulatory requirements.

Information gaps remaining from the EIA process require the Proponent, Government and the regional community to rely on intensive, post-assessment data collection, analyses and monitoring to determine the significance of, and appropriate responses to, key impacts. These requirements are largely captured in the commitments made by the Proponent and recommendations in this Report. The ongoing risk analysis, environmental monitoring and management required from the Proponent must demonstrate that environmental impacts from the Project are no greater than those predicted in this assessment.

The information requirements in this assessment must be addressed and appropriate management procedures implemented through the Proponent's Mining Management Plan. The EPA is of the opinion that the Project can proceed in an environmentally acceptable manner, provided that the environmental commitments, safeguards and recommendations detailed in the EIS, this Assessment Report and in the final management plans approved by the Department of Mines and Energy, are implemented and subject to regular reporting and compliance auditing.