



Northern Territory Government

ASSESSMENT REPORT 62

**NORTH POINT & PRINCESS LOUISE OPEN
CUT PROJECT**

BURNSIDE OPERATIONS PTY LTD

**ENVIRONMENTAL ASSESSMENT REPORT
AND
RECOMMENDATIONS**

by the

ENVIRONMENT, HERITAGE AND THE ARTS DIVISION

**DEPARTMENT OF NATURAL RESOURCES,
ENVIRONMENT AND THE ARTS**

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Glossary of acronyms

ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrence (Return) Interval
BOPL	Burnside Operations Pty Ltd
CEMP	Construction Environmental Management Plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CWR	Controller of Water Resources
DPIFM	NT Department of Primary Industry, Fisheries and Mines
ECNT	Environment Centre of the Northern Territory
EHA	Environment Heritage and the Arts Division of NRETA
EPBC	Environment Protection and Biodiversity Conservation Act
HIL(F)	Health-based Investigation Level: F = commercial and industrial sites (NEPC)
MMP	Mining Management Plan
NAF	Non-acid Forming
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
NLC	Northern Land Council
NOI	Notice of Intent
NRETA	NT Department of Natural Resources, Environment and the Arts
PAF	Potentially Acid Forming
PER	Public Environmental Report
PWC	Power and Water Corporation
ROM	Run of mine
URGM	Union Reef Gold Mine

Units / symbols

As	Arsenic
<	Less than
ha	Hectares
Km	Kilometre
L/s	Litres per second
m	Metres
mg/kg	Milligrams per kilogram
mg/L	Milligrams per litre
mm	Millimetres
t	Tonnes

Executive Summary

This report assesses the environmental impacts of the proposal by Burnside Operations Pty Ltd (BOPL) (the proponent) to commence mining for gold at the Princess Louise and North Point mine sites in the Burnside Project Area near Pine Creek in the Northern Territory. Approximately 440,000 tonnes of ore would be mined from the project and transported to Union Reef Gold Mine for processing. The mining campaign would continue for a period of less than one year.

This Assessment Report reviews the Public Environmental Report (PER), public comments and the further information requirements to the PER. Information, comments and advice provided by Northern Territory Government agencies have also been used in the preparation of this report.

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

Major Issues

The primary issues associated with the proposal include:

- Adequacy of surface water management including the capacity to intercept, treat and dispose of contaminated storm water appropriately;
- The lack of background geochemical information in the project area;
- Adequacy of waste rock characterization;
- Adequacy and validity of surface and groundwater quality information;
- The appropriate disposal of mine pit water from dewatering activities;
- Potential groundwater impacts associated with mine pit water quality after mine closure; and
- Adequacy of rehabilitation information and closure criteria.

Conclusions

During the assessment of this project, it has become evident that the proponent perceives the proposed Princess Louise and North Point open cut mines to have a low risk of environmental impact due in part to:

- The short-term nature of the intended mining campaign;
- The limited extent of the mine footprint;
- The transfer of risks associated with ore processing to a different site; and
- Estimates that minimal quantities of problematic waste material are present relative to some other mines in the area.

This perception is reflected by the lack of detailed information in the PER and further information presented by the proponent. The paucity of information on particularly important environmental aspects in the assessment documentation has increased the risk setting of the project, as some of the key assumptions outlined above have not been demonstrated through appropriate studies.

The outcome of the environmental impact assessment for this proposal is that the EHA Division is unable to conclude that the project can proceed without unacceptable environmental impacts. With proper consideration, however, of the key areas identified through this assessment report in its preparation of the mining management plan and associated documents, the proponent has a further opportunity to demonstrate that mining at the site can be managed in an environmentally appropriate manner.

1 Introduction and Background

This Report assesses the environmental impact of the North Point and Princess Louise Open Cut Project, the proposal to extract gold-bearing ore from two mine sites near Pine Creek in the Northern Territory.

This Environmental Assessment Report is based on a review of the Public Environmental Report (PER) and further information requested by the Minister for Natural Resources, Environment and Heritage, and comments from the public and Northern Territory Government agencies on the PER. The PER and Further Information Request response can be viewed on the NRETA website at:

<http://www.nt.gov.au/nreta/environment/assessment/register/burnside/burnside.html>.

1.1 Environmental Impact Assessment Process

One of the major objectives of environmental impact assessment is to fully define those elements of the environment that may be affected by a proposed development and to determine the significance, risks and consequences of the potential impacts of the proposal. The potential impacts are considered at both local and regional levels.

This report evaluates the adequacy of undertakings 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 within the planning framework of a project and include (among other approaches):

- Design and layout of buildings and other infrastructure on the site/s;
- Management of construction activities; and
- Management of processes used in operations of the facility (e.g. inputs and outputs).

A list of commitments made by the proponent in the PER is provided in Appendix 1. Additional safeguards are recommended in this Assessment Report where appropriate.

The contents of this Assessment Report form the basis of advice to the NT Minister for Natural Resources, Environment and Heritage on the environmental issues associated with the project.

1.2 Environmental Impact Assessment History

In July 2006, Burnside Operations Pty Ltd submitted a Mining Management Plan (MMP) to the Department of Primary Industry, Fisheries and Mines (DPIFM) for the development of four mine sites – Rising Tide, Fountain Head, North Point and Princess Louise. Due to the combined scale of the proposal, DPIFM referred the proposal to the then Environment Protection Agency Program, NT Department of Natural Resources, Environment and the Arts (NRETA). The MMP was circulated as a Notice of Intent (NoI) for four separate mining proposals rather than as one mine.

The proposal was referred to the Australian Government in January 2007 and was determined not to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In September 2006, the NT Minister for Natural Resources, Environment and Heritage determined that two of the proposed mines, North Point and Princess Louise, would be assessed at the level of a Public Environmental Report. For ease of assessment and due to the proximity of the locations, the proponent was advised that both proposals could be assessed through the one PER document.

Draft guidelines covering issues to be addressed in the PER were subject to a 14-day public review period. The NT Minister for Natural Resources, Environment and Heritage then directed the proponent to prepare the PER addressing the matters set out in the final guidelines.

The PER was submitted on 23 July 2007 and placed on public review for 28 days. It was also circulated to NT Government advisory bodies for review and comment. One public submission was received within the review period as well as comments from NT Government agencies.

Further information was requested of the proponent during the public review period. The additional information was provided in March 2008.

The PER, the further information, and public and government comments have been taken into account in the preparation of this Assessment Report.

1.3 Regulatory Framework

The project is subject to relevant Northern Territory legislation. In particular, Northern Territory mining projects are regulated by the *Mining Management Act 2001*, administered by the DPIFM. Under this Act, the proponent must submit a Mining Management Plan (MMP), which is the principal administrative document for the management of mine sites and can incorporate environmental conditions created through the environmental approval process. A number of environmental management plans prepared by the proponent will be included as part of the MMP.

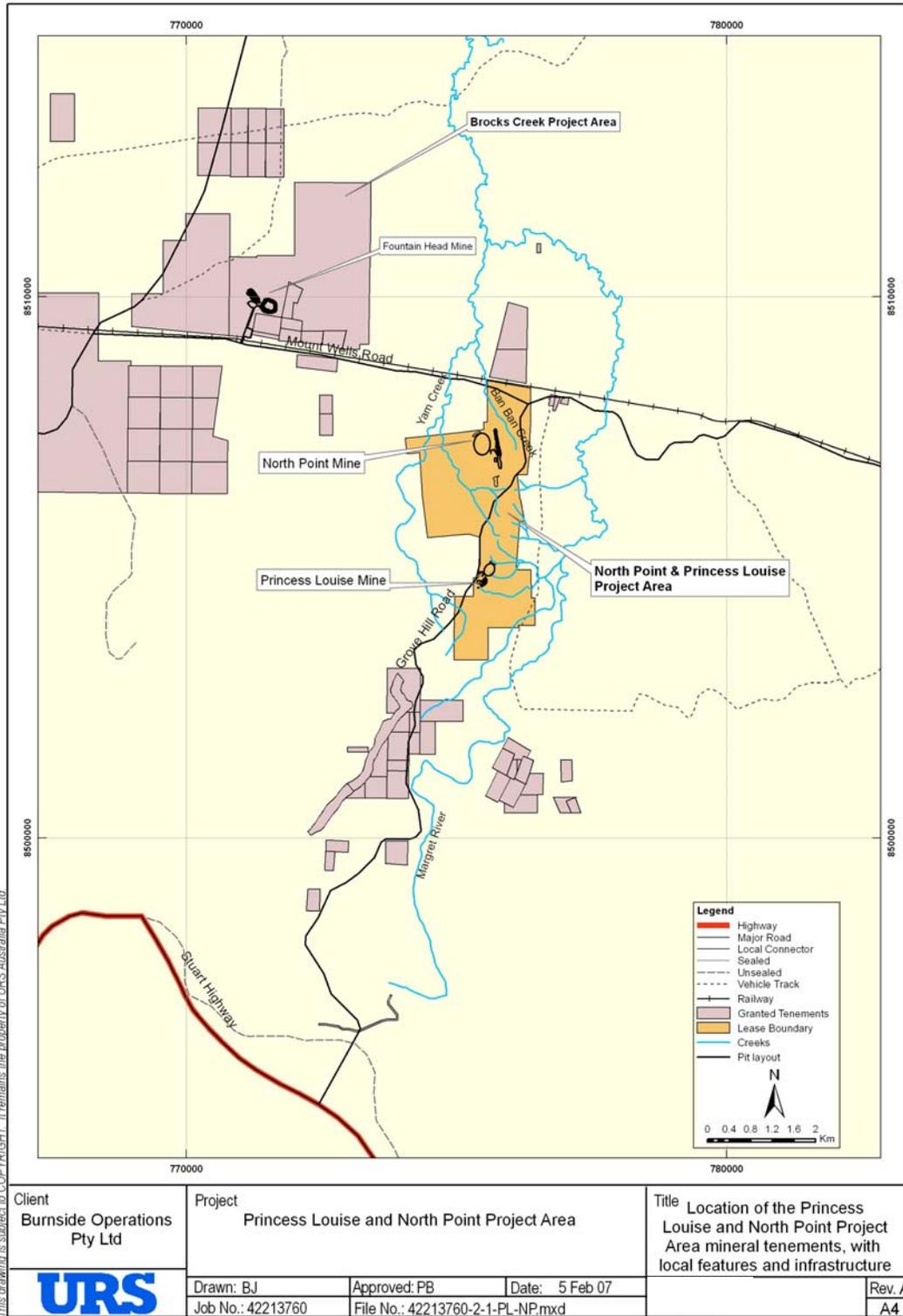
Other Northern Territory statutes associated with the proposal include:

- *Bushfires Act 1980*;
- *Control of Roads Act 2001*;
- *Dangerous Goods Act 1998*;
- *Environmental Assessment Act 1982*;
- *Food Act 2005*;
- *Motor Vehicles Act (MVA) 1959* and *Motor Vehicles (Standards) Regulations*;

-
- *Northern Territory Aboriginal Sacred Sites Act 1989;*
 - *Northern Territory Heritage Conservation Act 1991;*
 - *Pastoral Lands Act 1992;*
 - *Public Health Act 1997;*
 - *Soil Conservation and Land Utilization Act 1969;*
 - *Territory Parks and Wildlife Conservation Act 1976 (TPWC Act);*
 - *Traffic Act 1987;*
 - *Waste Management and Pollution Control Act 1998;*
 - *Water Act 1992;*
 - *Water Supply and Sewerage Act 1983;*
 - *Weeds Management Act 2001;* and
 - *Work Health Act and Regulations 2004.*

The North Point and Princess Louise mineral tenements lie within pastoral lease tenure, Douglas Station (PL903).

Figure 1: Princess Louise and North Point Project Area (URS 2007)



2 Project Description

2.1 The Proponent

The Princess Louise and North Point Open Cut Project are part of the Burnside Project Area, a collection of mine sites all owned and operated by Burnside Operations Pty Ltd (BOPL). These mine sites include Big Howley, Chinese Howley and Cosmo sites in the Cosmo Project Area; and Rising Tide, Zapopan and Fountain Head in the Brocks Creek Project Area. BOPL is wholly owned by GBS Gold International. GBS Gold also owns Terra Gold, which is proposing to mine in the Maud Creek project area near Katherine, and the Union Reef Gold Mine and associated gold processing plant where processing of gold ore is proposed to take place for this project.

2.2 Historical mining activities

The Princess Louise and North Point area is part of the NT Goldfields where gold was first discovered at Yam Creek within the exploration tenements for this project. The project area was mined intermittently from 1872 to 1912 by various mining companies and has not been extensively mined since.

2.3 General description

A detailed description of the proposal is presented in Section 1 of the PER. The following section provides an overview of the proposal. Figure 1 illustrates the project area.

Table 1: Summary of characteristics of the open cut project proposal.

Characteristics	Princess Louise	North Point
Mine life	<1 year	<1 year
Mining method	Blasting & truck and shovel	Blasting & truck and shovel
Depth of pit (m)	25	35
Depth to water table (m)	~25	~14
Dewatering rate (L/s)	4.9	24
Development footprint (ha)	6.7	16.1
Est. Area to be cleared (ha)	3.3	12
Mine pit area (ha)	1.2	3.7
Ore production (t)	113,000	323,000
Waste rock produced (t)	361,000	1,030,000

2.4 Site preparation and infrastructure

The major components that require site preparation for both sites are listed below:

- Laydown area;

-
- Amenities including site office, temporary waste storage area and ablution facilities;
 - Sediment dam for surface water retention;
 - Storage tank for extracted groundwater from pit dewatering;
 - Waste dump pad;
 - Existing access roads widened and upgraded;
 - Temporary refueling area;
 - Power generator area;
 - Open pit areas cleared where necessary; and
 - Run of mine (ROM) pad.

The proponent indicates that material from the upper benches of the open pits will be suitable for construction and will fulfil all construction requirements.

2.5 Mining method

Both North Point and Princess Louise deposits will be mined using conventional open-pit mining techniques, that is, drilling and blasting, and excavation with an 85t excavator. Ore and waste rock will be trucked separately using 50t dump trucks, ore to a ROM stockpile where it will then be transported to Union Reef by road-train for processing, and waste rock to the waste rock dump on site.

2.6 Mine life

There appears to be flexibility in the commencement date proposed, which is dependent on the rate of mill feed delivered to Union Reef from other mines in the region. The PER originally indicated that, pending government approvals, mining would commence in October 2007 but could be deferred to 2008 or a later year. Further information suggests the proponent hopes to begin mining in June 2008.

Once commenced, the PER indicates that mining would be completed within one year.

Although the North Point and Princess Louise project is proposed as stand-alone, exploration will continue and additional mining may be proposed if additional resources are discovered that could potentially be mined. Any future proposal would be subject to a separate development application.

2.7 Mine pits

Pit dimensions are given in Table 1. The mining of each deposit would comprise the following sequence of operations:

- Haul roads constructed to facilitate access to mine components;
- Benches developed by excavators operating in a backhoe configuration to load haul trucks;
- Blasting would alternate between North Point and Princess Louise mine sites; and

-
- In-pit ramps developed within each pit and between mining benches, and the haul roads sheeted with competent, overburden rock.

Pit dewatering activities will be utilised to depressurise pit walls and reduce inflows into working areas. The pit water would be stored temporarily in tanks adjacent to the pit and then used for dust suppression. Excess pit water from North Point is proposed to be stored in the existing Yam Creek pit.

Rehabilitation of the mine pits is proposed to focus on minimising inadvertent public access and ensuring long-term pit stability. There is the possibility that the voids could be used for stock watering purposes in the future but this would depend on the water quality.

2.8 Waste rock

Overburden from excavation of the pit would be disposed of in waste rock dumps adjacent to the open pits. The waste rock dumps are proposed to be ‘store and release’ encapsulation systems designed to prevent the ingress of water and oxygen into the core of the dump to protect any potentially acid-forming (PAF) or arsenic-enriched material.

Geochemical testing was undertaken on drill core samples from both Princess Louise (202 samples) and North Point (151 samples) open pit sites. Preliminary results indicate that the majority of the waste rock is non-acid forming (NAF) while approximately 2-3% could be potentially acid forming (PAF). The latter material is indicated to be restricted to material at depth. Metal levels (arsenic, copper, manganese, nickel, zinc) were found to be present in waste rock at concentrations greater than ANZECC Environmental Investigation Levels and, further, arsenic was detected in some samples at concentrations greater than NEPC (1999) Health-Based Investigation Levels for “commercial and industrial sites”.

2.9 Water sources and use

The proponent expects that water sourced from mine pit dewatering activities can be used for dust suppression. Water would also be required for drinking purposes.

2.10 Transport

It is expected that ore would be transported for processing at Union Reef Gold Mine (URGM), 53 km southeast of the project area, via road-train on the existing Gove Hill Road, Stuart Highway and Ping Que Road. Haulage would occur over a 24-hour period for the life of mining. Similarly, workers would commute from the Cosmo village, 23km from the site, along the Gove Hill Road, Stuart Highway, Dorat Road and Douglas Road in cars and minibuses.

2.11 Workforce

The project is expected to be staffed by approximately 40 employees, who are currently already employed by BOPL. There will be requirements for secondary staff such as cleaners, cooks and maintenance crews, and contractors could be required to carry out works on site and for rehabilitation/maintenance and post-closure phases.

3 Regional Setting

3.1 Physical

Climate

The project area sits in the tropical monsoon belt of northern Australia and experiences hot, humid summers (the 'Wet season') and cooler, dry winters (the 'Dry season'). Average rainfall in the region is 1100 to 1300mm and falls mainly within the period between October and April with the most significant falls in January to March when the region is impacted by tropical cyclones, and associated low-pressure systems and monsoon troughs.

Geology, landform and soils

The project area lies in the upper region of the Adelaide River catchment within the Pine Creek Geosyncline, which is an early Proterozoic intracratonic sedimentary basin. The lithography is described as Gerowie Tuff containing siltstone, phyllite, argillite and tuffaceous chert. Towards North Point there is also an inclusion of Mount Bonnie Formation containing shale, mudstone, siltstone and feldspathic greywacke.

The terrain in the project area is described as strongly undulating with steep, hilly ranges and strike ridges. The three main geomorphic elements are hill slopes and summits, colluvial wash slopes, and alluvial flats and channels. Soils are predominantly loamy lithosols derived from metamorphosed slates and shales with some earthy sands and red/yellow earths. Soils are skeletal and generally acidic.

Hydrology

The majority of surface waters at North Point flow into the Yam Creek catchment to the west with minor easterly shedding to Ban Ban Creek. Surface waters at Princess Louise drain to Ban Ban Creek, a tributary of the Margaret River. All creeks within the project area are ephemeral and flow only during the wet season.

Hydrogeology

Aquifers at North Point and Princess Louise occur primarily from fractured bedrock and vuggy quartz veining. The most significant aquifer occurs within greywacke, with apparent moderate permeability at Princess Louise and high permeability at North Point. Pit dewatering will be required at the estimated flow rates indicated in Table 1.

3.2 Biological

Vegetation

The vegetation on both mine sites is described as Eucalyptus Open Forest with grass understorey, dominated by *Eucalyptus tectifica* (northern box). Mid-storey species include *Petalostigma spp.* (quinine tree), *Gardenia megasperma* and *Terminalia ferdinandiana* (billygoat plum). Other common species in the area include *Eucalyptus miniata* and *E. tetradonta*. A stand of *Melaleuca sp.* is present in a drainage line to the north of the North Point pit.

Terrestrial Fauna and Habitats

Surveys of the project area identified eight native mammal species, 44 bird species, nine reptile species and three native amphibian species. Table 8-1 in the PER provides a more detailed account of faunal species recorded. Of these, the Northern Quoll is currently listed as Endangered under the EPBC Act and as Vulnerable under the *Territory Parks and Wildlife Conservation Act 1999* (TPWC Act). Partridge pigeons, which are listed as Vulnerable under the EPBC Act and Near-Threatened under the TPWC Act, have been recorded in the project vicinity previously but were not recorded during the surveys conducted for this proposal.

In addition to the open forest and grass understorey habitat previously described, there are a number of old mine adits in the project area that provide potential habitat for bats. One of these adits is known to host a colony of ghost bats, *Macroderma gigas*. A significant proportion of the area's natural habitat is indicated as disturbed through previous mining and exploration activities.

The PER does not indicate the presence of any ecologically sensitive habitats.

Feral and Invasive Species

Feral donkeys (*Equus asinus*) and cane toads (*Bufo marinus*) are regularly sighted in the area.

Eight weed species were recorded in surveys, including the declared weed *Hyptis suaveolens*. Other species are presented in Table 7.3 of the PER.

3.3 Cultural / Historical

Aboriginal people have used the land in the past as evidenced by the identification of four Aboriginal archaeological sites and eight background scatters during project surveys. However, the PER indicates that the nearest Aboriginal community to the project area is Kybrook community, approximately 70km from the site, and the land surrounding the project area is not currently used by Aboriginal people. There are no sites of cultural significance within the Princess Louise and North Point project area.

The Princess Louise and North Point mine sites are located in the NT goldfields, a region that has undergone exploration and mining activities since the 1870's. There is abundant evidence of past mining activity, including mineshafts, pits, trenches and background scatters of glass and metal fragments.

3.4 Socio-economic

The two closest towns to the project area are Adelaide River and Pine Creek with small and variable populations. Pine Creek is reliant on mining with a large proportion of the working population involved in mining or related industries. According to the 2006 Census, approximately 39% of the Pine Creek resident population is of Indigenous classification, which includes the population of Kybrook Farm Aboriginal community. The Indigenous representation of the Coomalie region, which includes Adelaide River township, is approximately 18% of the region's population.

Katherine, which is approximately 160km south of the project area and has a population of about 8,500 people, is the regional centre and likely to be of significance to the project with respect to services and project support.

4 Environmental Impact Assessment

4.1 Introduction

The purpose of this Assessment Report is to determine if the proposed mining proposal can proceed without unacceptable environmental impacts. This is achieved by identifying the relevant environmental issues associated with the project and evaluating the likely effectiveness of environmental management measures presented by the proponent.

The environmental acceptability of this project is based on consideration of the following:

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

During the assessment of this project, it has become evident that the proponent perceives the proposed Princess Louise and North Point open cut mines to have a low risk of environmental impact due in part to:

- The short-term nature of the intended mining campaign;
- The limited extent of the mine footprint;
- The transfer of risks associated with ore processing to another site; and
- Estimates that minimal quantities of problematic waste material are present relative to some other mines in the area.

This is reflected by the lack of detailed information in the PER and further information presented by the proponent giving the impression that the minimum work necessary to attain an authorisation was considered appropriate for this project. The paucity of information on particularly important environmental aspects in the assessment documentation has increased the risk setting of the project, as some of the key assumptions outlined above have not been demonstrated through appropriate studies.

The outcome of the environmental impact assessment for this proposal is that the EHA Division is unable to conclude that the project can proceed without unacceptable environmental impacts. With proper consideration, however, of the key areas identified through this assessment report in its preparation of the mining management plan and associated documents, the proponent has a further opportunity to demonstrate that mining at the site can be managed in an environmentally appropriate manner.

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

Recommendation 1

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

- **in the North Point and Princess Louise Open Cut Project Public Environmental Report; and**
- **in this Assessment Report (No. 61)**

All safeguards and mitigation measures outlined in the Public Environmental Report are considered commitments by Burnside Operations Pty Ltd.

Recommendation 2

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

4.2 Summary of issues

The primary issues associated with the proposal include:

- Adequacy of surface water management including the capacity to intercept, treat and dispose of contaminated storm water appropriately;
- The lack of background geochemical information for the project area;
- Adequacy of waste rock characterization;
- Adequacy and validity of surface and groundwater quality information;
- The appropriate disposal of mine pit water from dewatering activities;
- Potential groundwater impacts associated with mine pit water quality after mine closure; and
- Adequacy of rehabilitation information and closure criteria.

The information presented below discusses these issues further, provides conclusions on the sufficiency of the information presented by the proponent and includes information requirements and recommended management measures where relevant.

4.3 Water management

4.3.1 Water balance

Management of water on the mine site is considered to be one of the more critical issues due to the potential for contamination of surface and groundwater systems. The PER guidelines included a requirement for a site water balance to demonstrate that any contaminated water could be contained on-site and appropriately managed. The PER did not include a water balance; therefore, the NT Government requested further information. The proponent has provided separate water balance figures for Princess Louise and North Point mine sites. This information is available within the Further Information Request response on the NRETA website at:

<http://www.nt.gov.au/nreta/environment/assessment/register/burnside/burnside.html>

The design of the surface water management system for both mines is proposed to adequately cater for a one in two year rainfall event for February, the wettest month of the year. The surface water management system consists of the dewatering of mine pits to holding tanks for use in dust suppression; piping of excess mine pit water to Yam Creek mine pit from the North Point pit; and the reporting of surface water runoff from operational surfaces to sedimentation basins. The water balance outlines roughly where predicted water inputs to the mine site would report.

Issues have been identified with the following aspects of the water balance and water management in general, and are addressed in respective sections of this Assessment Report:

- Mine drainage risks associated with the waste rock material (Section 4.3.2);
- Sedimentation basin capacity and containment of contaminated storm water (Section 4.3.3);
- Storm water treatment (Section 4.3.3);
- The use of mine pit water for dust suppression (Section 4.3.4);
- Protection of the groundwater aquifer (Section 4.3.4);
- The water quality of pit voids (Section 4.3.4);
- Implementation of a statistically robust water quality monitoring program to appropriately manage the site water balance (Section 4.5)
- Long-term water quality to secure the catchment for a future drinking-water supply (Sections 4.3.5 and 4.8).

4.3.2 Mine drainage

Several components of both the proposed North Point and Princess Louise mine sites have the potential to create mine drainage issues. These include the open pits during mining and following mine closure, the waste rock dump, and any earthen infrastructure constructed from pit material. Mine pits and dewatering, and the waste rock dump design are discussed in later sections of this report.

The proponent has undertaken studies to characterise the waste rock that would be excavated to reach the ore, as well as the ore itself. In summary, 202 and 151 samples of waste rock and ore, taken at 1m intervals from ten discrete drill cores at Princess Louise and North Point sites respectively, were geochemically tested to determine Net Acid Producing Potential (NAPP), Net Acid Generation (NAG) and NAG capacity. These samples were also tested for metal content and mobility. Detailed methods and test data were not presented in the PER and therefore a comparison with leading practice could not be made and the statistical validity of the testing could not be confirmed.

The PER summary indicated that an estimated 2% (Princess Louise) and 3.5% (North Point) of the waste rock is expected to be Potentially Acid Forming (PAF) and this is restricted to the primary rock types at depth. This equates to approximately 7,220 tonnes of PAF from Princess Louise and 36,050 tonnes from North Point. These tonnages apparently represent worst-case conditions because the calculations include both Low and High Capacity PAF. The proponent anticipates that all weathered rock at depths of less than 20m will be Non-Acid Forming (NAF).

The PER indicates that levels of some metals and metalloids such as copper, manganese, nickel, zinc and arsenic in waste rock could be present at concentrations greater than the recommended ANZECC (1992) Environmental Investigation Level for these elements. The PER also states that arsenic (As) is present in some waste rock at concentrations greater than

the National Environmental Protection Council (NEPC) Health-based Investigation Levels for “commercial and industrial sites” [HIL(F)]. This guideline is scheduled within the National Environmental Protection (Assessment of Site Contamination) Measure (NEPC 1999).

The proponent asserts that the enrichment of metals with respect to normal background concentrations is to be expected because it reflects the natural geochemical enrichment defining the mineral deposit. It follows then that such enriched material associated with mineral sulphides when exposed to air and water through excavation and deposition on the surface, increases the risk of contamination of areas external to the mineral deposit. For this reason, the proponent intends to manage the waste rock with a total As concentration greater than the HIL(F) threshold of 500mg/kg. Since much of the waste rock considered benign will be used as waste rock dump cover and PAF encapsulation material, and possibly other infrastructure on the site, it is important to establish its suitability for purpose with respect to the surrounding environment and to demonstrate the validity of the proposed threshold.

At the time of writing, no geochemical data outside of the pit areas was available and therefore no comparisons between the mineralised zone and soils in the surrounding area could be drawn. Currently there is no data available to suggest that the Princess Louise and North Point mine sites should be considered contaminated sites. Without this information, an assessment could not be made of the appropriateness of the HIL(F) above which the proponent has committed to manage As-enriched waste rock.

The distribution of other elevated metal species in the waste rock and their mobility is unknown. Detailed methods and results for metals analyses were not provided in the PER so it is unclear whether testing was undertaken to determine the potential for circum-neutral drainage. Circum-neutral drainage is the leaching of mineral and salt products remaining from the oxidation process, and elements soluble in near-neutral conditions, from the waste rock into downstream environments where accumulating processes are active. The proponent dismissed the requests for consideration of circum-neutral drainage stating that weathered rock materials have been oxidised and subjected to “rinsing” for thousands of years and the likelihood of emergence of toxic materials is low. The further information provided also states that “residues of oxidation such as sulphate salts cannot be reasonably predicted given that all PAF material will be contained”. The EHA Division does not consider that containment of the PAF material would also isolate oxidised waste with elevated metal concentrations.

The deficiencies in the work that has been undertaken by the proponent to adequately consider the potential for contamination of the project area from mining disturbance need to be addressed. The proponent needs to demonstrate that this can be achieved in the MMP to the satisfaction of DPIFM. Further discussion of the waste rock dump design is included in Section 4.4 of this report.

Conclusion

The information provided does not demonstrate that the potential for contamination of the project area and surrounds from mining activities has been adequately considered.

Prior to commencement of mining, BOPL is to undertake a comprehensive geochemical sampling and testing program to:

- **Properly determine the baseline conditions for metals and arsenic on the mine site and surrounding soils;**
- **Demonstrate that the proposed 500mg/kg guideline for arsenic is appropriate as a threshold for problematic mine waste handling at these mine sites;**
- **Establish a more appropriate arsenic threshold if required; and**
- **Establish triggers for other metal toxicants in the waste rock that are identified as a result of testing.**

The Mining Management Plan must be amended to include threshold values and management responses relevant to these values. Test results and methodologies should be included as an appendix.

4.3.3 Sedimentation basins

The surface water management systems for both mine sites have been designed on the basis of a 1-in-2 year ARI rainfall event. The proposed sedimentation basins would intercept storm water runoff from all operational areas (including those areas that have been managed for dust) and seepage from the waste rock dumps. Controlled off-site release of water is proposed based on water quality monitoring to determine its suitability for discharge. As a contingency, the proponent proposes that storm water flows would be pumped into the mine pits from the sediment basins in the event that the basin capacity was exceeded. A proportion of water from sediment basins would be used for dust suppression if required.

No justification for the selection of the current design criterion has been given despite requests to do so. There have been a number of comments made by PER respondents that the sedimentation basin capacity needs to account for larger flood events than is currently proposed. Subsequent to the PER, the proponent cited a standard that would be followed for water management on the site: the Government of Western Australia's *Water Quality Protection Guidelines No 6 for Mining and Mineral Processing: Minesite Stormwater (2000)*. This standard indicates that storm water controls should be designed to a minimum capacity of a 1-in-20 year ARI flood event in Western Australia. It has been suggested that even this standard may not be sufficient for the Top End, which has generally higher rainfall intensities.

Initial scheduling in the PER indicated that mining activities would commence in October (2007) and continue for a period less than one year. This would have corresponded with the early onset of the wet season (the build-up), which is characterised by storm activity in the Top End; it is not clear whether mining was planned to continue during the wet season in the original schedule. It is also hypothesised that weather patterns are changing from El Niño to La Niña conditions in which it is expected that the wet season commencement will tend to begin earlier: in December rather than mid-January. Further information presented to the EHA Division suggests that mining would only occur in the dry season, therefore, the sediment basins would receive most runoff from closed operational areas after mining ceases. There is no definite mining schedule to confirm this, however, and runoff could still require control and treatment until the site is properly stabilised and rehabilitated.

The site surface water management system might effectively control potentially contaminated runoff in the short-term if the minimum commitments are satisfied:

- Mining activities will occur only in the dry season;
- Mine pits to act as contingent storm water controls should the 1-in-2 year ARI design capacity of the sediment basins be exceeded;
- Active management of the water management system is implemented to prevent off-site flows from operational areas, for example, maintenance of sediment basin function and pumping of excess water to the mine pits; and
- Active management and monitoring continues until such time as the rehabilitation, closure and decommissioning requirements for the site have been met to the satisfaction of DPIFM.

The EHA Division prefers that the capacity of sediment basins be constructed to a minimum 1-in-20 year ARI event in accordance with BOPL's selected mine site stormwater standard, particularly if the proponent revises the proposal to continue mining through the wet season. The EHA Division considers that operating in the wet season with the current design proposal could alter the potential significance of impacts to the extent that a re-referral under the *Environmental Assessment Act* may be necessary.

The MMP must be amended to include detailed design standards for the sedimentation basins including the particle sizes that would be captured and the level and methods of treatment that would be required. This should be based on comprehensive analyses of the biogeochemical nature of mined and in-situ materials along with predicted toxicant production as discussed in Sections 4.3.2 and 4.4 of this report. Contingencies must be provided in the event that discharge becomes unavoidable and water quality monitoring determines that stormwater is unacceptable for discharge. Allowable discharge criteria should be determined based on baseline water quality data and ecological considerations for the local water courses to the satisfaction of the EHA Division. Section 4.5 provides guidance on EHA Division requirements for water quality monitoring. A Waste Discharge Licence may be required under the *Water Act* if discharge to the off-site environment is considered necessary prior to mine closure.

Long-term considerations with respect to surface water management are discussed further in Section 4.8 Mine Rehabilitation and Closure, and Section 4.3.5 Marrakai Dam Catchment.

Conclusion

The proponent has not demonstrated that the current stormwater management system has the capacity to adequately mitigate unacceptable environmental impacts.

If a 1-in-2 year ARI standard for surface water management at both mine sites is to be implemented, BOPL is to commit to:

- **Mining Princess Louise and North Point pits during the dry season only;**
- **Using the mine pit voids as contingent controls for storm water management;**
- **Actively managing stormwater throughout wet seasons to prevent off-site discharges;**
- **Monitoring and managing the water management system until such time as the rehabilitation, closure and decommissioning requirements for the site have been met to the satisfaction of DPIFM.**

BOPL should consider adopting a 1-in-20 year ARI standard as a minimum to reduce the need for active stormwater management.

If the proponent considers operating during the wet season months, taking into account variations in weather patterns, then EHA Division recommends referral of the proposal in accordance with Recommendation 2 of this Assessment Report.

A Waste Discharge Licence under the *Water Act* may be required.

The Mining Management Plan is to be amended to include detailed design information for the water management system including target sediment particle sizes, and methods and levels of treatment.

4.3.4 Mine pit dewatering

Mine pit dewatering activities will be required to relieve pressure on the pit walls and to allow access to working areas. The proponent proposes to install a dewatering system of in-pit sumps or interception bores around the pits. At North Point, it is expected that groundwater will be intercepted at about 14m below the average surface level with a required extraction rate predicted at 24L/s. The groundwater table at Princess Louise varies between 16m and 26m below the general surface level depending on topography and it is expected that pumping rates of about 5L/s will be required to dewater the pit.

Pit water from dewatering activities at Princess Louise and North Point is proposed for dust suppression. Chemical analyses of groundwater within both sites indicate that the water significantly exceeds the National Health and Medical Research Council (NHMRC) drinking water guidelines for arsenic (As) with concentrations recorded from local bores ranging between 0.05mg/L and 0.4mg/L. This remains below the ANZECC guideline value for stock drinking water of 0.5mg/L. The concentration of As is particularly high at North Point. Accumulation of As could occur in the topsoil around the project site wherever dust suppression activities are undertaken. No data indicating the existing soil concentrations of arsenic and other potentially mobile contaminants has been provided and this needs to be rectified; however, the proponent has given assurances that the operating surfaces that would be managed for dust will report to the sedimentation basins in the event of stormwater runoff. This has been discussed in Section 4.3.3.

Another concern with respect to the disposal of pit water relates to the protection of the underlying aquifer. Questions have been raised about the future groundwater quality of the pit voids. Insufficient information was provided on the closure criteria for the pit voids. Oxidation of PAF material in the pit walls during mining could influence pit water quality during mining operations and possibly post-mining, until groundwater recharge submerged the pit walls. This is also a concern for Yam Creek mine pit, which would receive excess pit water from North Point and for sediment basins that would receive runoff water influenced by pit water dust suppression. No information on the current water quality in Yam Creek pit has been provided. The proponent asserts that groundwater quality is unlikely to be affected as the porosity and permeability of the host rock is extremely low. It is essential that arsenic concentrations are carefully monitored and mitigative actions taken where necessary to ensure that mining activities do not boost arsenic levels in the aquifer. Allowing the arsenic concentration to reach the guideline value is not acceptable practice as it would represent a significant increase from pre-mining concentrations, particularly in bore PLPB1 where the quoted dissolved arsenic concentration is 0.053mg/L.

The EHA Division recommends that a comprehensive ground and surface water-quality monitoring program be implemented to continually assess the suitability of pit water disposal options, and pit wall treatment options where necessary. Contingency measures need to be included to ensure appropriate disposal and/or treatment options are available if water exceeds assigned threshold levels and is unable to be pumped into the Yam Creek pit or used for dust suppression. All water extraction activity must be metered and the data reported to the Water Management Branch NRETA. Water quality targets and triggers for management action for pit water disposal will need to be developed in accordance with Section 4.5 of this report. Closure criteria for the pit voids will need to be detailed in the Rehabilitation and Mine Closure Plan.

Conclusion

The information presented by the proponent does not demonstrate that mine pit water quality can be adequately managed and the proposed disposal options for pit water are appropriate to minimise unacceptable impact to ground and surface water systems.

A ground and surface water monitoring program should be implemented in accordance with Section 4.5 of this assessment report.

4.3.5 Marrakai Dam catchment

The mines are located in the catchment of a proposed future drinking water supply for Darwin, the future Marrakai Dam. Power and Water Corporation (PWC) and the Controller of Water Resources, as stakeholders of this future water resource, have requested that BOPL consult with them with regard to present and proposed actions potentially affecting future discharge water quality, especially post-mining. Consultation should occur prior to submission of an amended MMP. Particular focus is requested on the Rehabilitation and

Closure Plan with respect to the continued runoff of storm water from the mine sites and possible groundwater contamination after mining ceases. The plan should demonstrate that a legacy of decreased water quality would not be created for the longer term by mining in this catchment.

Conclusion

The proponent must consult with Power and Water Corporation (PWC), the Controller of Water Resources and DPIFM with respect to the issues associated with long-term catchment protection.

The Rehabilitation and Mine Closure Plan should be provided to PWC and the Controller of Water Resources for review to their satisfaction.

4.4 Waste Rock Dump

Several respondents have raised specific issues relating to the design of the waste rock dump (WRD). The primary concern is that WRD design information and geochemical information for the waste rock is inadequate to determine whether or not long-term mine drainage issues can be mitigated.

BOPL (GBS) have provided the following design details and assurances that the waste rock design is sufficient to mitigate contamination of the environment into the long-term:

- Store and release design with a nominal minimum 2m vegetated cover of permeable (loose dumped) material facilitating through flow and storage of water above the PAF cells and protecting the cells against erosion, root penetration and termite intrusion;
- PAF material encapsulated in low permeability clay material (optimal hydraulic conductivity of 1×10^{-8}), minimum 2m thick on top of the cells to prevent vertical infiltration and loose dumped on the sides of the PAF to a minimum thickness of 2m (Figure 3 – Further Information). No liner or treatment is proposed for the base of the PAF cell;
- PAF cells perched at least 5m above any phreatic surface in the WRD to lower the risk of groundwater mounding impacts to the PAF;
- Runoff and surface drainage from the WRD would be captured in the sedimentation basin, monitored for quality and treated if necessary;
- Monitoring of surface runoff and seepage from WRD would continue until water quality criteria could be consistently met and no significant residual risk to the immediate or downstream environment remained.

The proponent expects that the design of the PAF cells within the waste rock dump will minimise infiltration of water and oxygen to reduce the risk of AMD product formation and seepage; however, the information on waste rock characterisation is insufficient to support the management measures that have been proposed by the proponent. No specific chemical testing appears to have been undertaken on the local soils that are purported to have high clay content to determine their response to salts such as sodium, which could disperse the clay structure and increase the permeability of the PAF capping. Additionally, there has been no apparent analysis to determine if the oxide waste would support plant growth. The proponent has agreed that further characterisation of the oxide material will need to be undertaken to confirm the suitability of the waste rock as cover material including physical and biological analysis, erodibility, sodicity and availability of plant nutrients.

Should the analyses not demonstrate that the oxide material is suitable, the MMP will need to be amended to include the nature and source location of alternative cover materials for the

purpose including environmental management commitments associated with the alternative material source.

Adequate supervision and quality control during WRD construction will be essential to ensure design requirements are fulfilled and performance into the long-term is optimised (Taylor *et al* 2003; TEAM NT 2004). BOPL has made a commitment to institute quality control to ensure that it will be achieved, monitored and remedied where necessary.

Conclusion

The oxide material proposed as cover material for the waste rock dump has not been adequately characterised.

BOPL must amend the Waste Rock and Ore Stockpiling Management Plan to the satisfaction of DPIFM to include:

- **Methods to biogeochemically characterise and selectively handle waste rock;**
- **Demonstration that the oxide material to be used for capping PAF material is sufficient both in quality and quantity for that purpose;**
- **Quality control mechanisms to ensure waste rock dump construction meets optimal construction criteria; and**
- **A monitoring program in accordance with Section 4.5 of this report to ensure that drainage geochemistry does not exceed background concentrations of toxicants.**

All test data to support the management plan should be included as an appendix.

Although previously considered economically unfeasible, BOPL is considering an alternative proposal to dispose of PAF waste by returning the material to the pit voids after completion of mining. The PAF material would be inundated under the natural groundwater cover that is expected to inflow to the pits once dewatering activities cease (see Section 4.3.4 for inflow rates and groundwater depths). The current estimated volumes of PAF material are considered to be reasonably small, although this will be revised as the mining campaign progresses. The exposure time of the PAF waste is expected to be minimal as the sulphide material is more likely to be at depth and would be excavated towards the end of mining. The further information provided by the proponent indicates that this method may be more efficient. The EHA Division considers this a preferred option for PAF management as the water cover would restrict oxygen exposure significantly. Leading practice standards would need to be followed to ensure adequate water depths above the PAF material were maintained to prevent re-suspension of fine sediments, and migration of dissolved oxygen into the PAF material from the water column was minimised (DITR 2007). Long-term management requirements of a water cover as opposed to the WRD PAF cells would be considerably reduced.

Conclusion

BOPL should strongly consider the proposal to return potentially acid-forming (PAF) waste rock to the pit voids once mining activities have ceased. If BOPL intends to implement this option, the Mining Management Plan should be amended to include management options for short-term storage of PAF material and measures to enhance the water cover to minimise oxidation of the waste.

Monitoring of the pit water and groundwater quality should be conducted in accordance with Section 4.5 of this assessment report.

4.5 Environmental monitoring

BOPL has committed to implementing a surface water and groundwater monitoring program for both mine sites with the inclusion of pre-mining baseline measurements. Some of this data has already been provided in the PER and following the Further Information Request. This historical data has been sampled at only one, unspecified site. The data shows high variability over time in concentrations of some elements measured, possibly due to seasonal fluctuations in water levels. The proponent was advised to establish its baseline data program during the 2007/2008 wet season and the data was requested to inform the assessment report. The data received indicated that only one measurement was taken at the same site previously sampled. No additional sites appear to have been established. The EHA Division does not regard this as a statistically robust baseline survey.

The PER indicates that monitoring will include a base source upstream of the disturbed mine sites, points in water holding/releasing structures and points down stream of the mine sites in Yam Creek, Ban Ban Creek and Margaret River. The monitoring points have not been identified for the assessment and it is unclear whether data can and will be collected from these points prior to the commencement of mining as the creeks are ephemeral and cease to flow during the dry season. Monitoring is proposed to continue until water quality release criteria can be consistently met and there is no significant residual risk to the immediate or downstream environment. These criteria are yet to be established and this could be difficult without valid data.

The groundwater monitoring program will incorporate the existing groundwater monitoring bores and any stock wells within the area of mine influence. Again, data needs to be collected prior to mining to inform water quality objectives and hence future management measures during and post-mining. Some data has already been collected from the monitoring bores and could be used in this respect.

As discussed in Section 4.3.4, arsenic levels in groundwater appear to be above NHMRC guidelines for drinking water but below ANZECC guideline levels for stock water. It is unclear whether temporal variability exists given that no details of the monitoring campaign were included in the PER. The sampling appears to provide only a snapshot of groundwater conditions. Other parameters relevant to the ANZECC livestock drinking water guidelines such as mercury, selenium, molybdenum and uranium should be considered in the monitoring program.

Conclusion

The current baseline water quality information from which water quality objectives and triggers for management responses would be developed is inadequate.

A comprehensive, statistically-valid monitoring program is to be implemented to the satisfaction of DPIFM and the EHA Division. The monitoring program should include the following as a minimum:

- **Collection of baseline water quality data accounting for temporal variability in flows within local drainage systems;**
- **The development of water quality objectives, determined in consultation with relevant stakeholders;**
- **Sampling and analysis of the full suite of surface water and groundwater parameters relevant to the geochemistry and water quality objectives of the project area;**
- **Establishment of appropriate thresholds, in consideration of geochemistry and baseline water quality variables, to determine appropriate management actions with respect to all areas of water management on the mine sites;**

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- **A detailed monitoring schedule including a contingency for event-based monitoring. The Mining Management Plan should be amended to include details of the monitoring program and interpreted data included as an appendix.**

4.6 Erosion and sedimentation

Various strategies have been outlined in the PER for the prevention and control of erosion, including:

- Minimising areas of clearing;
- Clearing new areas during the dry season only;
- Progressive rehabilitation of disturbed areas during the wet season;
- Monitoring rehabilitated areas using Ecosystem Function Analysis methodologies;
- Undertaking remedial works and maintenance works on previously rehabilitated areas as required;
- Contour ripping to minimise surface sheet erosion and promote vegetation establishment; and
- Diversion of water around disturbed areas.

An EMP for erosion and sediment control was not included in the PER and the information supplied in the Waste Rock and Ore Stockpiling EMP and the Surface Water EMP contained insufficient erosion management information. The measures employed to manage erosion and sediment control across the whole project proposal are not adequately detailed, particularly with respect to construction of earth works. These deficiencies were identified in earlier correspondence with the Soil Conservation Branch of NRETA.

The MMP should be amended to include an Erosion and Sediment Control Plan for the entire project area. The following issues will need to be addressed in the plan prior to commencement of mining:

- Details of contours (or slope and direction), drainage lines (Yam Creek and Ban Ban Creek in particular) and property boundaries should be included in maps to enable better assessment of erosion and runoff. The ephemeral nature of the creeks in the project area belies their importance within the catchment as maximum runoff and consequent erosion and sedimentation will occur during the wet season when they are flowing.
- The MMP needs to address the overflow from the proposed North Point pit water storage tank that would be directed to Yam Creek mine pit. If this water is allowed to flow over land rather than within an engineered conduit, there is the potential for significant erosion to occur over a distance of 250m.
- A threshold allowance for erosion gullies on disturbed land of <300mm deep over a full wet season is not acceptable. This is considered significant erosion in other primary industries and would not be considered acceptable for other types of development in the NT. Gullies left unmanaged are at strong risk of continued erosion during subsequent wet seasons. The MMP needs to include measures to remediate erosion of this magnitude and revised thresholds developed in consultation with the Soil Conservation Branch.
- BOPL proposed to assess landform stability periodically throughout the rehabilitation process and during the post-mining rehabilitation monitoring and maintenance period. Annual inspections are proposed in the post-mining period. Landform stability and erosion should be assessed more regularly throughout each wet season to effectively combat any erosion issues that may occur. Monitoring should continue for at least 3 years following cessation of mining.

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- BOPL proposes to stabilise both mine sites and carry out rehabilitation ripping and seeding by the second wet season after mining ceases. This should be completed within the first half of the second wet season (by mid-January) in order to take full advantage of the growing season rains, to maximise growth rate and to minimise erosion.
 - Reshaping of slopes to not greater than 1:4 (V:H) is proposed for slope stability. Detail needs to be provided in the MMP to demonstrate how successfully rehabilitated surfaces can resist erosion. Batters of 1:4 may not adequately prevent erosion on newly formed soils on waste rock dumps in the semi-arid tropics.

Conclusion

Information on erosion and sediment control was insufficient to demonstrate that the whole project area can be adequately managed for erosion issues.

The MMP should be amended to include an Erosion and Sediment Control Management Plan that addresses the issues identified in Section 4.6 of this assessment report.

4.7 Flora and fauna

4.7.1 Flora

The PER described the Princess Louise and North Point sites as already considerably disturbed by historical mining and more recent exploration activities, leaving relatively low species diversity and several weed species. Exploration activities have already cleared approximately 33% of the areas requiring clearing [3.5 ha of 6.8 ha at Princess Louise, and 4.1 ha of 16.1 ha at North Point]. Further road widening totalling 0.7 ha over 800m takes the total proposed vegetation footprint for mining and related site infrastructure to 23.6 ha.

Vegetation surveys undertaken in May 2006 and March 2007 (PER Appendix B) described a single vegetation community type spanning all uncleared areas at both sites, of eucalyptus open forest with grass understorey. *Eucalyptus tectifica* (northern box) was reported to dominate, with mid-storey species including *Petalostigma spp.* (quinine tree), *Gardenia megasperma*, and *Terminalia ferdinandiana* (billygoat plum). *E. miniata* (Darwin woolly butt) and *E. tetradonta* (stringybark) were also commonly recorded. This vegetation community type is widely represented in the Northern Territory, estimated to cover 49,875 km².

The vegetation survey findings were based upon one 400m transect at Princess Louise and two x 240m long transects at North Point, within uncleared and relatively undisturbed perimeter areas. Surveys to 50m either side of the lengths of access tracks, were also made. Of the overall 136 terrestrial plant species recorded, none were of registered conservation significance under the *Territory Parks and Wildlife Conservation Act 1999* (TPWC Act) or the Australian Government *Environment Protection and Biodiversity Conservation (EPBC) Act*. Eight introduced species were recorded, including the declared weed *Hyptis suaveolens* (hyptis) at the Princess Louise.

The PER indicates that there are no groundwater dependent ecosystems within the vicinity of the mine sites; however, vegetation mapping or description of vegetation communities outside the proposed mine areas was not presented. As such, an informed assessment could not be made of potential groundwater drawdown or contamination impacts upon sensitive ecological communities beyond the direct footprint of the mine.

Several figures within the PER (PER Fig 5.1 p.5-7 and Figure 1 Appendix F) show apparent wetland or seasonally inundated areas to the north of the North Point site and creeks running down-gradient from the mine site to these areas. A stand of *Melaleuca sp.*, which are typically reliant on water close to the surface or groundwater expression, are evident in photographs taken during a site inspection of North Point. This vegetation appears to be well

within the influence of mine dewatering activities and does not appear to have been evaluated to determine the potential risks of depleting the groundwater. Although dewatering impacts are likely to be relatively short term, further evaluation of these areas needs to be conducted to determine their sensitivity to the project and the possible need for monitoring and management.

4.7.2 Fauna

Fauna surveys for the Princess Louise and North Point sites were carried out concurrently with the flora surveys mentioned above (Flora section). Of the fauna species identified in the surveys of the project area (PER, Table 8-1), species of conservation significance include the Northern Quoll and Partridge pigeon. The Northern Quoll *Dasyurus hallucatus* is listed as Endangered under the EPBC Act, and Critically Endangered under the TPWC Act. The Partridge Pigeon (eastern subspecies) *Geophaps smithii smithii* is listed as Vulnerable under the EPBC Act and the TPWC Act.

Ghost Bats

A number of old mine adits in the project area provide potential habitat for bats. One of these adits is known to host a colony of ghost bats, *Macroderma gigas*.

Although not currently listed as a species of conservation significance under Commonwealth or Territory legislation, the ghost bat has undergone a major population range contraction in recent years; the reason for this decline is unclear (PER s8.1.3).

The original access road survey proposed in the Project's Notice of Intent was proposed to exit the mine site to the east, passing within ~10m of the adit containing the ghost bat colony. The proposed haul road alignment has now changed, to run south to Grove Hill Road. This has greatly reduced the potential impact of noise and vibrations from haul trucks on the ghost bat roost. Activities in the open pit, including regular blasting and vehicle noise, are now likely to be at least 100m away. A 50 m buffer area was recommended by Biological consultants in the PER (Appendix B). The EHA Division is satisfied that mining operations will pose little threat to the ghost bat colony.

Northern Quolls

Spotlighting fauna surveys of the North Point project site in May 2006 recorded a Northern Quoll. This species has declined considerably in many areas of the Top End since the arrival of cane toads, which are recognised as a key threat to the Northern Quoll. Northern Quolls live for a maximum of 2.5 years and cane toads have been in the general survey area for approximately three years. Hence, either the individual recorded at North Point does not attempt to predate upon cane toads or is not adversely affected by cane toad toxin, with the former being the most likely. This individual and any others in the immediate area are therefore very important to the conservation of this species. Their importance is both as remnant individuals and as individuals potentially possessing unique survival adaptation against cane toads that can be passed on to future generations of quolls.

BOPL has recognised the significance of this species and plans to commission a follow up survey and relocation program for any northern quolls in the mining area, before commencing operations at North Point. The proponent has identified a potential relocation site at the Coomalie Farm, near Adelaide River, where existing conservation programs for the northern quoll are in progress in conjunction with Charles Darwin University. The population is probably quite small and there is a high probability that none or a small number of animals will be trapped in a single survey. Therefore, it is suggested that a monitoring program be established at the project area in addition to the attempted relocation. Trapping at a number

of sites every 2-3 months would be adequate. Any sightings of the species should be recorded by the Environmental Officer and lodged with the NRETA fauna database.

Partridge Pigeon

The TPWC Act database contains two records of sightings of the partridge pigeon in the vicinity of the project area. Fauna surveys associated with this project did not record any partridge pigeons inside the project area but noted an incidental sighting within one km of the North Point Site.

Partridge pigeons are susceptible to changes in fire regimes (which impacts on the abundance and distribution of seeding grasses), predation by feral cats and drought conditions that affect local water supplies. The species prefers to feed in habitats with an open ground layer, but roosts in areas with dense ground cover and these habitats are common in the region.

The proponent suggests that the developments will have little impact on this species, as the sighting was not within the proposed mine sites, which have already been cleared or partially cleared.

The operation still has potential to impact on habitat for partridge pigeons through alteration of fire regimes, but has committed to implementing a Fire and Fuel Management Plan that aims to provide a spatial diversity of habitat structures. Appropriate fire regimes for enhancement of suitable partridge pigeon habitat could be beneficial to this local vulnerable species and should be explored.

Other species

Yam Creek is considered to be type locality for an eel-tailed catfish (*Neosilurus mortoni*, a synonym of *Neosilurus hyrtlii*) and therefore has scientific significance, despite its ephemeral characteristic. The proponent has committed to maintaining water quality to an acceptable standard. The development of any discharge criteria for Yam Creek will need to consider the possible presence of this species.

Conclusion

Management measures proposed by BOPL for flora and fauna impacts are generally acceptable.

Evaluation is required of potential wetland areas to the north of the project area with respect to sensitivity to groundwater drawdown and surface water contamination, and management options considered where appropriate.

4.8 Mine rehabilitation and closure

The information presented in the PER provides a framework for rehabilitation of the Princess Louise and North Point mine sites but little detail. The mining campaign is proposed to continue for less than one year, therefore, it is reasonable to expect that closure information would be available during the PER process. The provision of a detailed Rehabilitation and Mine Closure Plan in the initial stages of mine planning is considered essential to ensure that rehabilitation of the site can be undertaken sufficiently to prevent a future legacy of impacts from mining at the site. Closure criteria need to be determined based on baseline data collected prior to the commencement of mining. At the time of writing of this assessment report, serious gaps in baseline information were identified and comments have been made in this report to guide resolution of these issues.

Further advice provided during the PER assessment relevant to rehabilitation strategies for the project includes:

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- Rehabilitation using stockpiles from cleared vegetation should be included in all rehabilitation strategies;
 - The proponent should make every effort to rehabilitate with native tree species of local provenance;
 - Off-road driving should never occur and unavoidable affected areas should be rehabilitated;
 - Photography of rehabilitated areas as part of rehabilitation monitoring should be taken from exactly the same viewpoint every year for accurate comparison;
 - Rehabilitation monitoring should continue for no less than three years in order to ensure sustainable rehabilitation success.

BOPL commits to submitting a Rehabilitation and Mine Closure Plan (RMCP) to DPIFM as part of the proponent's first annual MMP. The RMCP would be finalised when operations commence and developed in consultation with DPIFM and other stakeholders. A respondent is concerned that the development of the RMCP will not be transparent and that if the proponent is serious in its commitments to open consultation and to delivering information to stakeholders in an appropriate and timely manner, then the RMCP should be made available to the public for comment or consideration prior to its inception. It is recommended that BOPL allow key stakeholders of the project the opportunity to review the RMCP prior to cessation of mining.

Under the *Mining Management Act*, the proponent must obtain a closure certificate for the mine site. This is contingent on the proponent satisfying closure criteria, which would need to be developed and included in their RMCP to the satisfaction of DPIFM. The EHA Division considers that an approved RMCP developed in consultation with stakeholders is an appropriate mechanism to ensure the environment in the project area is protected in the long term.

Conclusion

The Rehabilitation and Mine Closure Plan (RMCP) is a critical mechanism to ensuring protection of the environment in the project area in the long term.

The RMCP should be developed in consultation with stakeholders in the Burnside Project Area including the Power and Water Corporation, Northern Land Council, and Controller of Water Resources and provided to these stakeholders prior to commencement of mining.

4.9 Environmental management

A number of Environmental Management Plans have been proposed through the course of the assessment process for the project. All management plans and procedures developed for the project must be approved by, or developed to, the satisfaction of relevant Government agencies, in particular, DPIFM through the Mining Management Plan process. 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 PER and the advice detailed in this Assessment Report.

It is vital to the performance of the project that the requirements in management systems, plans and procedures are incorporated into the proponent's tendering and contracting procedures and that all contractors are fully aware of, and act in compliance with, relevant management plans. Relevant information should be provided to all personnel as part of an induction process.

The proponent has provided frameworks for management plans within the PER and included reference to others; these are listed below:

<u>Management Plan</u>	<u>Relevant NT Government Agency</u>
<ul style="list-style-type: none">• Groundwater;• Surface water;• Flora;• Fauna;• Weeds and pests;• Dust and noise;	EHA Division of NRETA
<ul style="list-style-type: none">• Fire and fuel;• Hazardous substances;• Domestic and industrial waste;• Waste rock and ore stockpiling;• Heritage site protection;• Erosion and sediment control; and	Bushfires NT NRETA
<ul style="list-style-type: none">• Rehabilitation and mine closure.	Northern Land Council, PWC, CWR

Some agencies and stakeholders have requested that particular Environmental Management Plans are referred for review prior to commencement of mining. These NT Government agencies and stakeholders are listed above, adjacent to the specific management plan.

Conclusion

The Mining Management Plan for the North Point and Princess Louise Open Cut Project is to be amended to include and take account of all additional measures for environmental protection and monitoring contained in this Assessment Report, and advice from relevant Northern Territory Government agencies with respect to the proposal. All commitments made by the proponent as outlined in the Public Environmental Report and this Assessment Report need to be addressed in the revised MMP to the satisfaction of DPIFM and the EHA Division.

Particular Environmental Management Plans may be referred to relevant NT Government agencies prior to commencement of mining.

5 References

Australian and New Zealand Conservation Council (ANZECC) (1992), *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*, Canberra.

Department of Industry, Tourism and Resources (DITR) (2007), *Leading Practice Sustainable Development Program for the Mining Industry: Managing Acid and Metalliferous Drainage*, Commonwealth of Australia, Canberra.

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TEAM NT (2004) Northern Territory Minerals Council (INC.) and the Mines and Petroleum Management Division of the Northern Territory Government. *TEAM NT: Technologies for Environmental Advancement of Mining in the Northern Territory: Toolkit*. D.R. Jones & M. Fawcett principal authors.

URS (2007), *North Point and Princess Louise Open Cut Project Public Environmental Report*, prepared for Burnside Operations Pty Ltd July 2007.

Appendix 1

Table of commitments by Burnside Operations Pty Ltd for the Princess Louise and North Point Open Cut Project.

Aspect	Commitment / Safeguard
Rehabilitation and Decommissioning	<p>After commencement of mining, BOPL commits to documenting rehabilitation and closure requirements into a RMCP. This RMCP will be consistent with DPIFM requirements for rehabilitation and closure. An outline of the RMCP will be included in the MMP.</p> <p>On completion of mining, BOPL commits to rehabilitation in accordance with the approved RMCP.</p> <p>After commencement of mining, BOPL commits to consulting with relevant stakeholders during development of the RMCP.</p> <p>On completion of mining, BOPL commits to consulting with relevant stakeholders on the potential use of the pit voids and Yam Creek mine water dam for stock watering, and whether or not to fence the pit voids and mine water dam around the abandonment bunds.</p> <p>After commencement of mining, BOPL commits to calculating security requirements in accordance with DPIFM criteria.</p> <p>After completion of mining, BOPL commits to rehabilitation monitoring and maintenance programs, which include assessments of surface water quality, groundwater quality, rehabilitation success, weed management and fire management.</p>
Soils and Landform	<p>After completion of mining, BOPL commits to re-contouring, ripping and seeding internal haul and access roads, ore stockpile areas, laydown areas and other areas where transportable buildings were located, following closure.</p> <p>During and after mining, BOPL commits to minimising the impact of potentially acid forming (PAF) soils and arsenic (As) generating material.</p> <p>During mining, BOPL commits to geochemically characterising any potentially problematic waste material prior to excavation, and encapsulating any such material within the core of the waste rock dump.</p> <p>BOPL commits to encapsulating any waste rock material with an arsenic concentration greater than 500mg/kg, during mining.</p>
Groundwater	<p>BOPL commits to the monitoring of groundwater quality prior to commencement, during and following the completion of mining activities.</p> <p>On commencement of mining and during operations, BOPL commits to monitoring groundwater level fluctuations to assess any impacts on the groundwater, especially in areas where lowered water table could occur.</p> <p>On commencement of mining, and during operations, BOPL commits to monitoring of groundwater abstraction from the dewatering system.</p>
Surface Water	<p>At commencement of mining, BOPL commits to providing sediment dams to capture runoff water, at each mine site.</p> <p>BOPL commits to pumping runoff water from the sediment dams to the mine pits, if required during high rainfall events while the mines are operational.</p> <p>During and after mining, BOPL commits to monitoring runoff water prior to release. If water treatment is required, this will occur at the sediment dams.</p> <p>BOPL commits to applying for water discharge licences if necessary.</p> <p>During and after mining, BOPL commits to complete the proposed water monitoring schedule and to maintain the records in easily read Excel files, to be provided to DPIFM.</p>

Aspect	Commitment / Safeguard
	BOPL commits to monitoring for a period of at least one year following pit closure, and to continue until the monitoring demonstrates that water quality release criteria can consistently be met and that there is no significant residual risk to the immediate or downstream environment.
Flora	<p>Prior to mining, BOPL commits to the installation of temporary fencing or bunding around stands of native vegetation and large trees that are to be retained prior to any road or site works.</p> <p>On completion of mining, BOPL commits to rehabilitating disturbed area with local native flora species wherever possible.</p> <p>During operations, BOPL commits to implementing a procedure requiring all personnel use existing roads and avoid off-road driving, where practical, to minimise damage to native vegetation.</p> <p>Prior to and during operations, BOPL commits to educating personnel, through inductions, on the protection of stands of native vegetation, and on measures to prevent the spread of weeds, and weed identification and reporting.</p> <p>During mining, BOPL commits to the inspection of operational areas, the general lease area and rehabilitation areas annually by environmental staff for weed infestations, and the implementation of necessary weed control measures when required.</p>
Fauna	<p>BOPL commits to minimising areas of disturbance, in particular where native trees and vegetation exist.</p> <p>BOPL commits to relocating any northern quolls if they are found, prior to mining.</p> <p>During construction, BOPL commits to placing the North Point access road at a distance of more than 50 metres from the known ghost bat roost.</p> <p>BOPL commits to conducting a targeted follow-up survey for ghost bats in the project area during the dry season following commencement of mining, to assess impacts of the mining operation on the local population where possible.</p> <p>During operations, BOPL commits to implementing a Fire Management Plan that aims to provide a spatial diversity of habitat structures.</p> <p>During operations, BOPL commits to implementing a procedure that required the logging of all feral mammal sightings, and managing feral animals as required.</p> <p>BOPL commits to reporting any identified mammal deaths and injuries that result from mining operations and the implementation of mitigation strategies.</p> <p>BOPL commits to assessing the quality of the water in pit voids and the existing Yam Creek pit for their suitability as a water source for livestock and native animals after mine closure, and fencing off any water bodies that are unsuitable for drinking by animals.</p> <p>BOPL commits to appropriate waste management strategies that reduce the attraction of feral animals to the mine site.</p>
Air Quality and Noise Greenhouse Gas Emissions	<p>During mining, BOPL commits to the use of water trucks and sprayers to suppress dust emissions as necessary.</p> <p>BOPL commits to the installation of soundproofing and/or noise abatement devices where necessary.</p> <p>BOPL commits to hearing protection equipment being made available and utilised onsite where required.</p> <p>BOPL commits to providing signs in areas of the operation where hearing protection is required to be worn.</p> <p>BOPL commits to the implementation of appropriate blasting techniques to reduce the likelihood of noise and vibration impacting upon the ghost bat colony.</p> <p>During mining, BOPL commits to monitoring fuel and electricity use on a monthly basis.</p>

Aspect	Commitment / Safeguard
	<p>BOPL commits to investigating options for increased energy efficiency through the life of operations and during decommissioning.</p> <p>During operations, BOPL commits to putting in place reporting systems to track greenhouse gas emissions.</p>
Cultural and Historical Environment	<p>Prior to commencement of operations, BOPL will manage the background scatters located inside the mining footprint at Princess Louise, in accordance with recommendations of Government and Consultant Archaeologists and the requirements of the Heritage Conservation Act 1991 (NT).</p> <p>At commencement of mining, BOPL commits to designating two heritage sites of moderate significant (PL1 and NPshaft1) as 'No- Go' areas by installing temporary fencing or bunting and signage at the site.</p> <p>BOPL commits to implementing a Chance-Find procedure to direct mine staff, contractors and visitors in the event that artefacts are discovered during mine construction or operation.</p>
Traffic and Transport	<p>BOPL commits to ensuring all quad semi-trailers are fitted with high visibility reflective tape as per AS1906.1 and other Australian Standards.</p> <p>BOPL commits to finalising discussions with DPI regarding Stuart Highway and Ping Que Road intersections upgrades.</p> <p>BOPL commits to negotiating and implementing a usage agreement for Grove Hill Road with DPI, during mining operations.</p>
Socio-Economic Environment	<p>BOPL commits to open communication with relevant stakeholders to enable issues to be identified and addressed promptly.</p> <p>BOPL commits to the development of a Local Participation Plan to maximise local employment and procurement opportunities.</p> <p>BOPL commits to the development of a roads strategy to maximise safety on the Stuart Highway and at rail level crossings.</p> <p>BOPL commits to ongoing support of the local community through direct contribution to community activities.</p>
Biting Insects	<p>BOPL commits to advising all workers that pest and disease-carrying mosquito species may be periodically present at the Princess Louise and North Point mine sites. BOPL will also provide advice on appropriate personal protection measures and ensure appropriate personal protection equipment is available in accordance with DHCS guidelines.</p> <p>BOPL commits to ensuring that all water impoundments, access roads, mine waste dumps, sediment traps, pit watering activities, wetland filters and stockpile sites will be constructed and operated in accordance with DHCS guidelines.</p> <p>BOPL commits to treating any equipment sourced from North Queensland, which has previously held rainwater, with a ten per cent chlorine solution or appropriate residual insecticide in order to kill mosquito eggs in accordance with DHCS guidelines.</p> <p>BOPL commits to the periodic inspections of artificial receptacles around the Princess Louise and North Point mine sites in the wet season. Any receptacle that has the potential to pond water will be appropriately disposed of, stored under cover away from rain, be fitted with drainage holes or treated with an appropriate larvicide, to prevent mosquito breeding.</p> <p>After mining, BOPL commits to the rehabilitation of Princess Louise and North Point mine sites in accordance with DHCS guidelines.</p>

Aspect	Commitment / Safeguard
Waste and Hazardous Goods Management	<p>BOPL commits to all waste materials being disposed of in accordance with relevant legislation.</p> <p>BOPL commits to the maintenance of mobile ablution facilities and sewage disposal in accordance with Department of Health and Community Services guidelines.</p> <p>BOPL commits to utilising a mobile fuel tanker in accordance with the Dangerous Goods Act 2003.</p> <p>BOPL commits to handling all hazardous and dangerous goods in accordance with the relevant MSDS. Copies of all relevant MSDS's will be held at both Princess Louise and North Point sites.</p> <p>BOPL commits to training all personnel in the appropriate handling, storage, disposal and containment practises for chemicals and hazardous goods, as relevant to their position.</p> <p>BOPL commits to developing an Emergency Response Procedure to ensure that the appropriate action is taken to minimise the environmental impact caused by incidents involving hazardous materials.</p> <p>BOPL commits to providing all personnel with access to safety equipment required for the correct handling of hazardous materials.</p> <p>BOPL commits to providing spill response kits at both Princess Louise and North Point mine sites.</p> <p>BOPL commits to maintaining a register of all hazardous materials imported to the site or generated as a result of site activities at both Princess Louise and North Point.</p>
Stakeholder Involvement and Consultation	<p>BOPL commits to maintaining stakeholder consultation by continuing to consult throughout the public review period, and through open consultation with stakeholders through the construction, operation and rehabilitation phases of the mining operations.</p> <p>BOPL commits to delivering information to stakeholders in an appropriate and timely manner.</p>
Environmental Management Systems	<p>BOPL commits to conducting regular risk assessments, and to developing appropriate management plans and operational procedures for significant and high risk impacts.</p> <p>BOPL commits to the systematic documentation of risk assessment results in an Environmental Aspects and Impacts Register.</p> <p>BOPL commits to establishing strategic objectives and targets for the significant environmental risks identified in its Environmental Aspects and Impacts Register.</p> <p>BOPL commits to the development of a Legal Register to identify applicable Acts and Standards relating to the environmental aspects of mine operations.</p> <p>BOPL commits to ensuring all personnel complete a site induction program prior to commencing work at the mine sites.</p> <p>BOPL commits to reporting all environmental incidents through its Incident Reporting Procedure.</p> <p>BOPL commits to developing monitoring, inspection and internal audit procedures to ensure the effectiveness of its EMS.</p>