ntepa Northern Territory Environment Protection Authority

REDBANK COPPER MINE – ENVIRONMENTAL QUALITY REPORT

March 2014

Northern Territory Environment Protection Authority
GPO Box 3675
Darwin
Northern Territory 0801

Important Disclaimer

This document has been prepared with all due diligence and care, based on the best available information at the time of publication. Any decisions made by other parties based on this document are solely the responsibility of those parties.

The Northern Territory Environment Protection Authority and Northern Territory of Australia do not warrant that this publication, or any part of it, is correct or complete. To the extent permitted by law, the Northern Territory Environment Protection Authority and Northern Territory of Australia (including their employees and agents) exclude all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and other compensation, arising directly or indirectly from using, in part or in whole, any information or material contained in this publication.

Table of Contents

Table of Figures

Table of Tables

Abbreviations

AAPA	Aboriginal Areas Protection Authority
AHD	Australian Height Datum
AMD	Acid and metalliferous drainage
ANZECC	Australian and New Zealand Environment Conservation Council
ANZECC Guidelines	Australian and New Zealand Environment Conservation Council Guidelines for Fresh and Marine Water Quality 2000
AR	Assessment Report
ASX	Australian Stock Exchange
ASX CGC	Australian Stock Exchange Corporate Governance Council
AWC	Australian Wildlife Conservancy
BUD	Beneficial Use Declaration
CCNT	Conservation Commission of the Northern Territory
DBIRD	Department of Business, Industry and Resource Development
DLPE	Department of Lands, Planning and Environment
DLRM	Department of Land Resource Management
DME	Department of Mines and Energy
DSEWPAC	Department of Sustainability, Environment, Water, Population and Communities
EA Act	*Environmental Assessment Act*
EAA Procedures	Environmental Assessment Administrative Procedures
EC	Electrical Conductivity
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
ERL	Exploration Retention Lease
HDPE	High Density Polyethylene
LS Guidelines	Australian and New Zealand Environmental and Conservation Council Guidelines for Fresh and Marine Water Quality – Livestock drinking water 2000
MEMP	Mine Environmental Management Plan
MLN	Mineral Lease Northern
MMA	*Mining Management Act*
MMP	Mine Management Plan
NLC	Northern Land Council
NOI	Notice of Intent
NRETAS	Department of Natural Resources, Environment, the Arts and Sport

NT EPA	Northern Territory Environment Protection Authority
NT EPA Act	*Northern Territory Environment Protection Authority Act 2013*
PER	Public Environmental Report
RCL	Redbank Copper Limited
RCPL	Redbank Copper Proprietary Limited
RML	Redbank Mines Limited
SFP	Sandy Flat Pit
SOCS	Sites of Conservation Significance
TSF	Tailings Storage Facility
WDL	Waste Discharge Licence
WMP	Water Management Plan
WRD	Waste Rock Dump

Units

km	Kilometre
kms	Kilometres
km^2	Square kilometre
m	Metre
m^3	Cubic metre
mg/kg	Milligrams per kilogram
ML	Mega litres
mS/cm	Milli Siemens per centimetre
tpa	Tonnes per annum
ug/l	Micrograms per litre
uS/cm	Micro Siemens per centimetre

Executive summary

The Northern Territory Environment Protection Authority (NT EPA) is concerned about the ongoing environmental damage caused by legacy mining issues in the Northern Territory.

The Redbank Copper Mine offers a case study to aid understanding of how such situations arise.

The NT EPA has prepared this report to the Minister for Lands, Planning and the Environment (the Minister) as an environmental quality report under section 28 of the *Northern Territory Environment Protection Authority Act* (NTEPA Act).

The objectives of this report are to report to the Minister on:

- The history of the Redbank Mine;
- The key regulatory assessments and approvals applied to the Redbank Mine;
- The current environmental condition of the area impacted by the Redbank Mine; and
- The environmental, economic and regulatory causes of the current situation at the Redbank Mine.

This report will inform separate advice to the Minister on measures identified by the NT EPA and other agencies that could reduce the risk of future instances of inadequate management of mine operations, mine closure and the appropriate management of legacy mine sites.

The Redbank Copper mine project, then known as the Sandy Flat Copper project, underwent an environmental impact assessment process in 1993. The environmental impact assessment process identified information gaps preventing accurate assessment of the environmental impacts of the project. Outstanding matters were to be managed through mining lease conditions.

The Redbank Copper Mine commenced operation as an open cut mine in 1994. The project was considered to be short term and small scale with limited potential for long term environmental problems.

Following a fall in copper prices, mining ceased at the mine in 1996 and the mine was placed in care and maintenance.

Lease conditions were not adequately met and a failure to appropriately consider and manage environmental risks resulted in a poorly constructed tailings dam and other inadequate infrastructure. Mining activities resulted in the uncontrolled release of acid and metalliferous contaminated water to downstream aquatic ecosystems. The discharge of contaminated waters continues today.

A proposed expansion in 2008 required the project to undergo the environmental assessment process for a second time. The assessment process required the mine owner to address environmental legacy issues. These issues have not been addressed, with the Redbank Mine site remaining in care and maintenance since the completion of the assessment.

Waste water discharge from the site has been regulated through Waste Discharge Licences issued under the *Water Act.* Licensing has not been able to achieve an improvement in the quality of water leaving the Redbank Mine site or an improvement in the off-site environment.

Environmental monitoring reveals elevated metals in the downstream aquatic environment extending over 35km from the site. Elevated copper concentrations have been measured at the point where Settlement Creek crosses the Northern Territory-Queensland border approximately 42km downstream of the mine.

Environmental impact from the mine in the downstream aquatic environment is evidenced by substantially lower macroinvertebrate numbers at mine-exposed stream sites compared with upstream reference sites. Visual observations reveal an absence of aquatic life and dead streamside vegetation directly downstream of the mine site.

A number of actions and behaviours have combined to result in the situation observed at Redbank today. These relate to inadequate environmental assessment, a failure to comply with regulatory approvals and a failure of the regulatory framework to effectively manage the impacts at the Redbank Mine site.

The management of legacy environmental issues has been impacted by consecutive mine site owners being financially constrained. The generation of a potential economic return from the mine site has been linked to a future capacity to address the legacy environmental issues at the site.

1 Introduction

The Northern Territory Environment Protection Authority (NT EPA) is concerned about the ongoing environmental damage caused by legacy mining issues in the Northern Territory. The seriousness of this issue is exemplified by the continuing discharge of contaminated water from the Redbank Mine near the Northern Territory-Queensland border.

The issues originate from the inadequate management and closure of the mine, leaving a legacy of partially treated and potentially acid forming material on site. This material has reacted with the environment to form acid and metalliferous drainage (AMD), resulting in contaminated water runoff into the surrounding environment.

Various operators have managed the site and activities have been regulated under a range of legislation (current legislation summarised at Appendix A), yet for a range of reasons the environmental issues remain.

The Redbank Copper Mine offers a case study to aid understanding of how such situations arise.

The NT EPA has prepared this report to the Minister for Lands, Planning and the Environment (the Minister) as an environmental quality report under section 28 of the *Northern Territory Environment Protection Authority Act* (NTEPA Act).

2 Objectives

The objectives of this report are to report to the Minister on:

- The history of the Redbank Mine;
- The key regulatory assessments and approvals applied to the Redbank Mine;
- The current environmental condition of the area impacted by the Redbank Mine; and
- The environmental, economic and regulatory causes of the current situation at the Redbank Mine.

This report will inform separate advice to the Minister on measures identified by the NT EPA and other agencies that could reduce the risk of future instances of inadequate management of mining operations, mine closure and the appropriate management of legacy mine sites.

3 Scope of works

To meet the above objectives, the NT EPA reviewed the following:

- NT EPA records;
- Documents relevant to the 1993 environmental assessment process for the proposed Sandy Flat Pit Copper Mine;
- Documents related to the 2009 environmental assessment process for the expansion of the Redbank Copper operations;
- Approvals under mining legislation, including Mine Management Plans (MMP) and Water Management Plans (WMP);
- Waste Discharge Licences granted for the discharge of wastewaters from the Redbank mine site;

- Environmental Monitoring Reports prepared by Redbank Copper Limited (RCL);
- Environmental monitoring data supplied by the Department of Mines and Energy (DME);
- Annual Reports and other RCL documentation reported to the Australian Stock Exchange (ASX) and/or available on the company website.

An NT EPA officer conducted a site inspection in February 2013 to inform this Report.

This Report focuses on the environmental condition of the Redbank Mine site and surrounding environment and the historical causes. It does not address in detail the social impacts associated with environmental contamination caused by operations at the site. Social impacts have received little attention in the documentation reviewed by the NT EPA and would require a separate investigation.

4 Site location and history

4.1 Site location

The Redbank Copper Mine ("the mine") is located in the north east of the Northern Territory (NT) approximately 30km west of the Queensland/NT border and 70km from the coast of the Gulf of Carpentaria (Figure 1). The location makes it one of the most isolated mines in the Northern Territory.

The mine is located on the Savannah Way which connects the townships of Borroloola in the NT and Burketown in Queensland. The mineral leases associated with the mine are located in the central west of the Wollogorang pastoral lease. The nearest settlement is Wollogorang station homestead and associated infrastructure located approximately 25km east of the mine.

The mine deposits are located in the metalliferous province of the Macarthur Basin/Mt Isa Inlier, which contains a number of world class base metal deposits including copper, cobalt, phosphate, manganese and uranium.

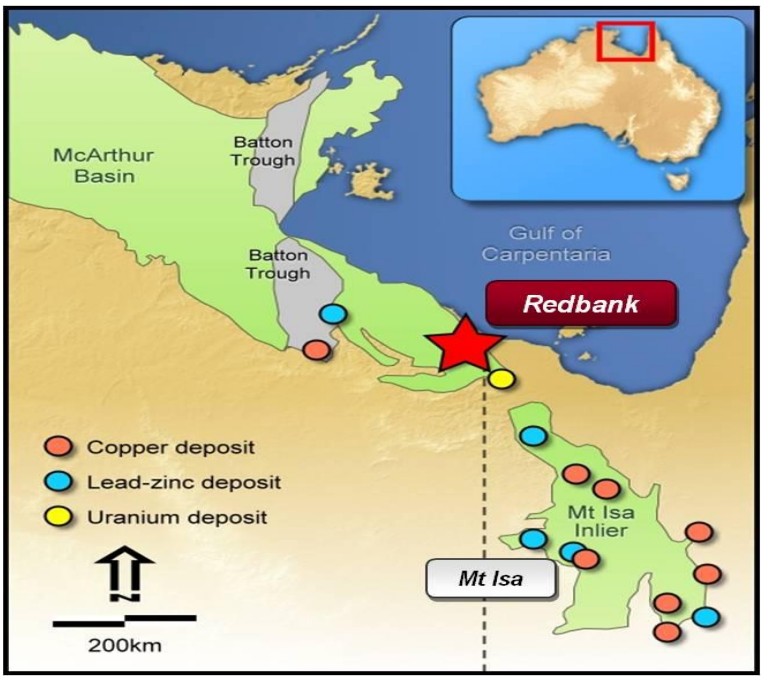


Figure 1: Redbank Mine site showing association with McArthur Basin

Source: <http://www.redbankcopper.com.au/projects-and-resources/redbank-copper-project.html>

4.2 Mining history

Small-scale prospecting and mining commenced at the site in 1916 following the discovery of the Redbank Copper field by William (Bill) Masterton. Masterton discovered the Redbank and Azurite prospects located within the current Exploration Retention Lease (ERL) 94.

Many companies prospected in the area following the discovery of copper. In 1967 Placer Prospecting Pty Ltd applied geophysics to the area in the search for greater reserves. Confirmatory drilling by Harbourside Oil NL in 1970 encountered high grade copper sulphide ore beneath a high grade oxide cap, now known as the Sandy Flat prospect. Extensive drilling and geophysical and geological mapping were undertaken by the Westmoreland-Harbourside-Newaim joint venture during 1971. Hydro-metallurgical test work at the pit was undertaken by Triako-Buka-Amdex companies in 1981.

Sanidine-Restech-Hunter Resources-Vanoxi took control of a reduced area in 1983. ERL94 was established to protect the Sandy Flat area.

Redbank Copper Pty Ltd (RCPL) purchased the tenement group from Sanidine-Vanoxi in 1989. A Preliminary Environment Report was assessed under the *Environmental Assessment Act* (EA Act) in 1993.

Mining regulatory approvals were granted in 1994. A 250 000 tonnes per annum (tpa) capacity processing plant was erected at the mine between 1994 and 1996. The plant was built to process ore from the pit and produce copper concentrate by conventional flotation methods. The plant treated ore from the upper oxide and transition zone (between the oxide and sulphide layers). The acidic nature of the material led to difficulties in operating the processing plant and falling copper prices resulted in closure of the mine in 1996. The mine was placed in care and maintenance[1] and no mining has been undertaken on site since June 1996.

An estimated 54 000 tonnes of partially treated and potentially acid forming material remained on site at the time of mine closure. The majority of this material remains stored at the mine.

Redbank Mines Limited (RML), an ASX listed public company, took over as owner and operator of the mine in early 2006 (VDM Consulting, EcOz Environmental Services 2009a). At this time, the operation consisted of a heap and vat leach extraction process established by the previous owner in 2004. The leach operations involved placing crushed stockpiled oxide ore in lined vats and heap leach pads. The ore was then irrigated with a recycled acidic solution of pH 2-3 to leach the copper. Apart from the small amounts of copper produced from this process there has not been any significant production from the site since 1996.

The mine was placed in care and maintenance for a second time in 2008, and RML renamed itself Redbank Copper Limited (RCL) in 2009 (VDM Consulting, EcOz Environmental Services 2009a).

Between 2008 and 2010 a proposal to expand the mine operations was assessed under the EA Act and the Commonwealth *Environment Protection and Biodiversity*

[1] A phase of temporary closure following suspension of mineral exploration, mining or processing operations when infrastructure remains intact and the site continues to be managed.

Conservation Act 1999 (EPBC Act). RCL proposed to extract and process copper oxide ore from three deposits over a three-year period. An Assessment Report was issued by the then Minister for Natural Resources, Environment and Heritage (Assessment Report 63A) on 12 April 2010. EPBC Act approval was granted 2 May 2011.

The expansion project did not proceed and the site remains in care and maintenance.

4.3 Mining tenements

The Redbank Mine is situated on ERL94 which comprises five Mineral Leases. These are Mineral Lease Northern (MLN) 631, MLN 632, MLN 633, MLN 636 and MLN 1108. The total area of the mine is 65.44ha (Figure 2).

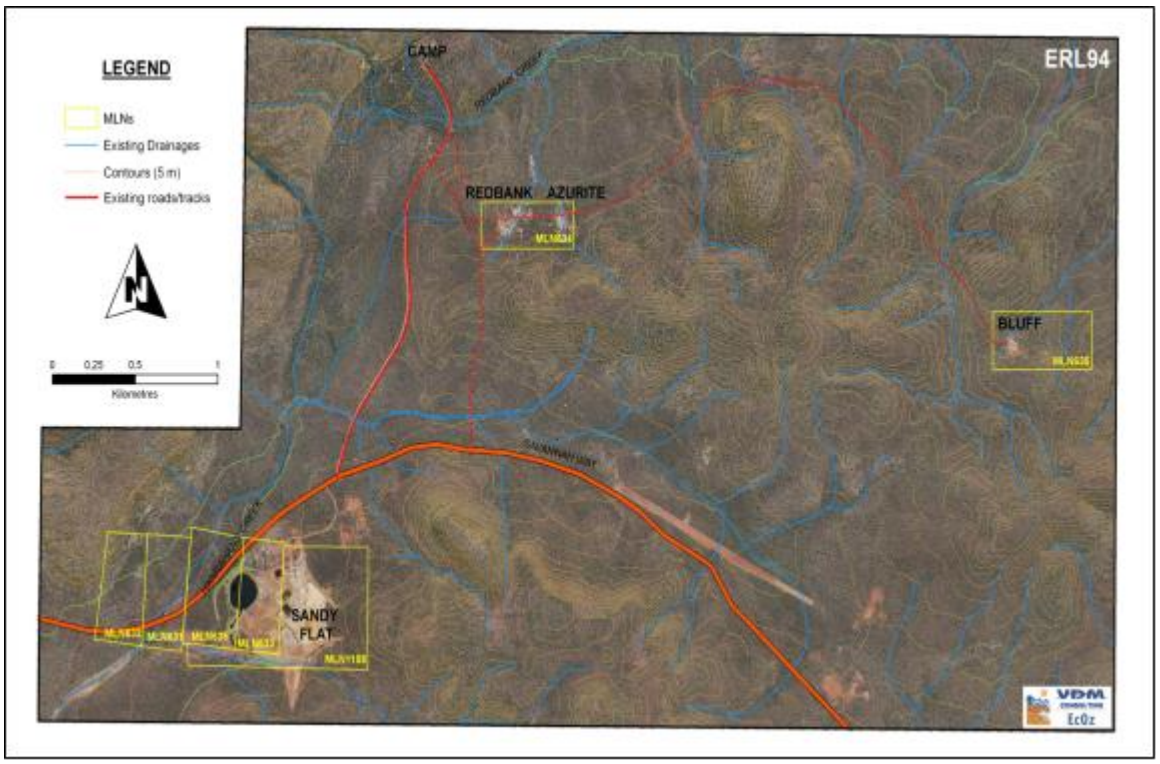


Figure 2: ERL94 Project Area and Mining Leases MLN 632, MLN 631, MLN 636, MLN 633, MLN 1108, MLN 634 and MLN 635

Source: VDM Consulting, EcOz Environmental Services 2009a.

4.4 Site layout

There is one mining pit at the Redbank Mine, the Sandy Flat Pit (SFP). The SFP is approximately 55m deep and has an area of approximately 1.2 to 1.5ha. The water level in the SFP was 166.9m Australian Height Datum (AHD) on 13 August 2013, with a corresponding stored volume of 471 445m^3 (Redbank Copper Limited 2013c).

Mine infrastructure includes a waste rock dump, a tailings storage facility, heap leach ponds, a run of mine and a camp site (Figure 3). The combined total area of these facilities is approximately 27ha.

Figure 3: **Redbank Mine Site showing Sandy Flat Pit, Waste Rock Dump, Leach Ponds and Tailings Storage Facility**

Source: DME

4.5 Legacy mine site

A legacy mine can be defined as “a mine for which the party or parties responsible for the environmental impacts cannot be found, or are unwilling or financially unable to carry out the required remediation measures within an acceptable time frame” (M Fawcett, DME, pers. comm., 2013).

The Redbank Mine is considered a legacy mine site by DME due to the ongoing financial limitations of consecutive mine owners. Respective mine owners have been reliant on generating income through hypothesised further mining activities to remediate the mine site.

5 The surrounding environment

5.1 Surrounding land use

There are two major land uses in the region of the mine: pastoral use and Indigenous land use. Wollogorang Station and a large proportion of surrounding land are used for cattle production. The other major identified land use in the region is traditional Indigenous uses.

In addition to Wollogorang Station, the following NT pastoral properties are located in the area: Calvert Hills, Pungalina and Seven Emu Station. The Waanyi Garawa Indigenous lands are also located within the area. Westmoreland Station in Queensland lies to the east of Wollogorang Station. The Settlement Creek drains water from the Redbank Mine site through Wollogorang and Westmoreland Stations to the Gulf of Carpentaria.

Pungalina Station was recently purchased by the Australian Wildlife Conservancy (AWC) and is managed for conservation. AWC has an agreement with the Indigenous owners of Seven Emu Station whereby it manages a part of that station for conservation.

There is a proposed National Park on the Northern coastal part of Westmoreland Station (VDM Consulting, EcOz Environmental Services 2009a).

5.2 Catchments and watercourses

The mine lies within the Settlement Creek catchment (Figure 4). This catchment spans the NT and Queensland border and covers an area of more than 15 000km^2. The mine is located in the upper Western portion of this catchment. The majority of the catchment lies within Queensland and is made up of many unconnected coastal drainages. There are two main tributaries within the mine area: Redbank Creek and Hanrahan's Creek.

Redbank Creek flows in a North Easterly direction from the Redbank Mine site before reaching Settlement Creek in Queensland approximately 30km from the coast.

Hanrahan's Creek flows South West into Echo Creek approximately 1.5km downstream of the mine (Figure 5). Hanrahan's Creek is a small ephemeral stream with a catchment of 15km^2 of which 9.7km^2 is upstream of the mine. The Echo Creek catchment area upstream of the confluence with Hanrahan's Creek is approximately 19.3km^2.

A further 3.6km downstream from the Echo Creek and Hanrahan's Creek junction a major confluence occurs with 12 Mile Creek. This creek has a catchment of over 89km^2. 12 Mile Creek joins Settlement Creek 12km downstream from its confluence with Echo and Hanrahan's creeks.

Settlement Creek flows past Wollogorang Station and across the border into Queensland before emptying into the Gulf of Carpentaria approximately 120km downstream from the Redbank Mine site.

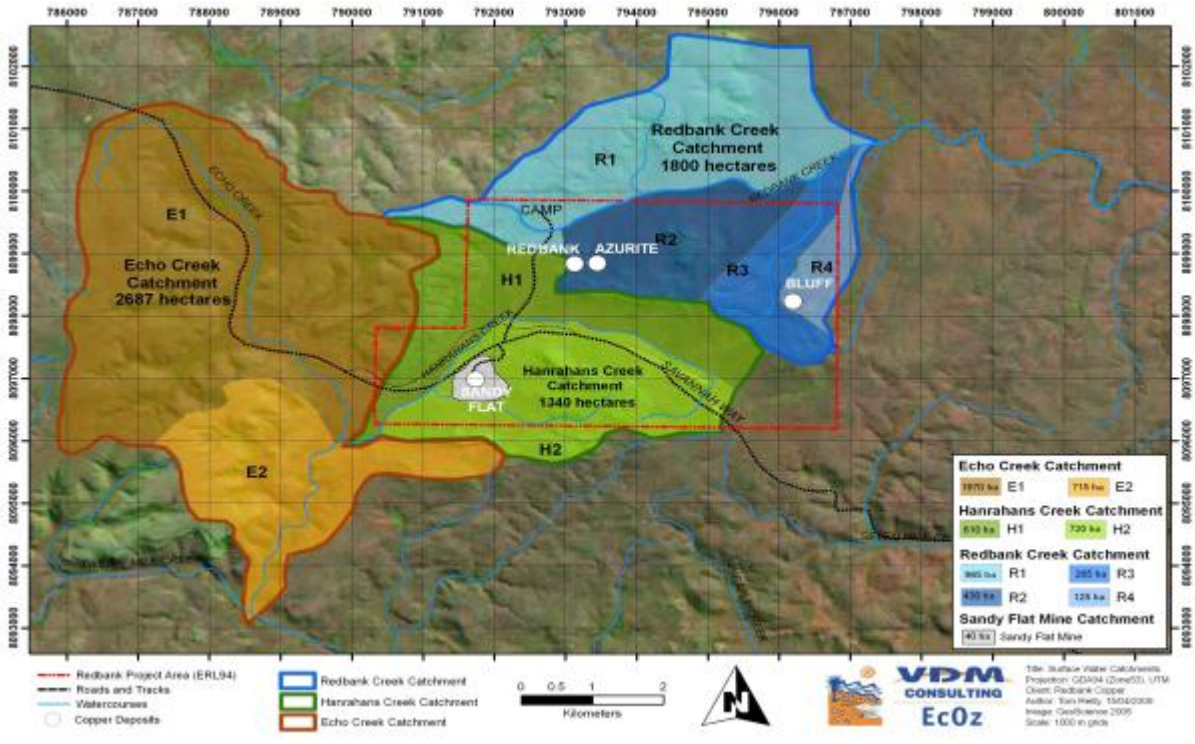


Figure 4: Catchments in and around the Redbank Mine area

Source: VDM Consulting, EcOz Environmental Services 2009a.

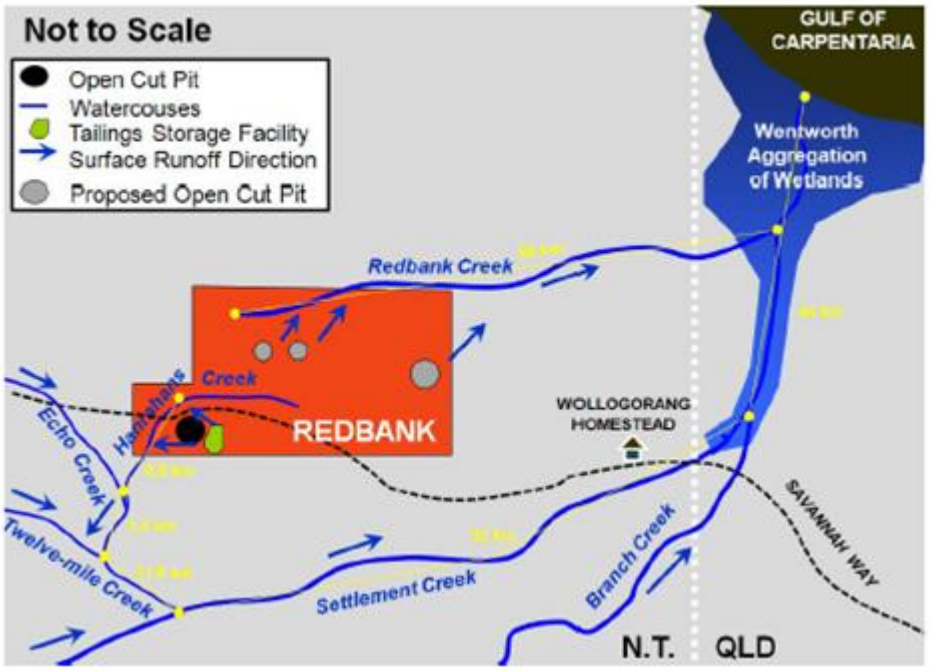


Figure 5: **Schematic Diagram of Redbank showing relationship between water courses, territory/state boundaries and proximity to the Gulf of Carpentaria**

Source: VDM Consulting, EcOz Environmental Services 2009a.

5.3 Beneficial use declaration

5.3.1 Water Act

Section 73(1) of the *Water Act* provides that the Administrator may declare beneficial uses in relation to any waste or class of waste or water or class of water. Section 4(3) of the *Water Act* defines beneficial uses of water to be: agriculture, aquaculture, public water supply, environment, cultural, manufacturing industry and riparian.

The mine is situated in the catchment of Settlement Creek. The beneficial uses for surface waters in the Settlement Creek catchment were declared on 28 February 2003 (NTG S3). The declared Beneficial Uses are: environment, riparian (rural stock and domestic) and cultural uses. These Beneficial Uses represent the outcomes to be achieved in the long term by the restoration of water quality in Settlement Creek and tributaries through reduction, and elimination of contaminated drainage from the mine.

The desired water quality outcomes are determined by reference to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC Guidelines).

5.3.2 ANZECC Guidelines

The ANZECC Guidelines are used as the default water quality guidelines on mine sites where site specific values have not been established. Section 3.1.3 of the ANZECC Guidelines recognises three levels of aquatic ecosystem protection, based on ecosystem condition. For surface waters, 'trigger value' concentrations for various toxicants are provided for three levels of ecosystem protection, as follows:

- High conservation/ecological value (99% species protection);
- Slightly to moderately disturbed ecosystem (95% species protection); and
- Highly disturbed ecosystems (80 – 90%) species protection).

The ANZECC Guidelines state that the level of protection assigned to a particular ecosystem should be based on the decision of key stakeholders in the region, through determination of the management goals and based on the community's long-term desires for the ecosystem.

Water quality downstream of mine sites would generally be in the 'slightly to moderately disturbed ecosystems' category (95% level), but in some cases the 'highly disturbed ecosystems' category (80-90% level) may be appropriate.

Section 3.1.3 of the ANZECC Guidelines recognises a highly disturbed system as being a measurably degraded ecosystem of lower ecological value. The ANZECC Guidelines also recognise that the degraded aquatic ecosystem still retains, or after rehabilitation may have, ecological or conservation values, but for practical reasons it may not be feasible to return them to a slightly to moderately disturbed condition in the short term.

Table 3.4.2 of the ANZECC Guidelines provides a general framework for applying levels of protection to aquatic ecosystems. For ecosystems that can be classified as highly disturbed, the 95% species protection levels can still apply. Depending on the state of the ecosystem, the management goals and the approval of the appropriate state or regional authority in consultation with the community, it can be appropriate to apply a less stringent 90% or 80% species protection level. These protection levels are provided as intermediate targets for water quality improvement (ANZECC 2000).

The aquatic ecosystem downstream of the Redbank Mine site is highly disturbed. It is appropriate that the 80% species protection level (ANZECC 2000, Table 3.4.1) be applied, considering the extent of environmental impact from the Redbank Mine site.

5.4 Sites of conservation significance

The NT Department of Land Resource Management (DLRM) maintains a register of Sites of Conservation Significance (SOCS) identified for their biodiversity significance. The following SOCS information applies to the area in which the mine is located.

5.4.1 Conservation site declarations

The mine is located within the Woologorang and China Wall Sandstone SOCS No 36.

The site includes the extensive sandstone ranges on Wollogorang and surrounding pastoral properties including the headwaters of Settlement Creek and a number of gorges including Echo Gorge and Moonlight Gorge.

Five sites within the Wollogorang sandstone ranges are listed on the Register of the National Estate for their natural values including:

- Bullet Creek Gorge;
- Twelve Mile Creek Thicket;
- Settlement Creek Jungle;
- Banyan Gorge; and
- Nicholson Musselbrook Area.

Sites listed on the Register of National Estate were provided limited statutory protection under the *Australian Heritage Commission Act 1975* (repealed) until national heritage reforms were introduced in 2003. The Register is no longer a statutory list of protected places, but is maintained as a publicly available archive.

5.4.2 Fauna

The fauna in the region is rated to be of National Significance.

Six threatened species reported within the vicinity of the mine site are listed under the EPBC Act and the NT *Territory Parks and Wildlife Conservation Act*.

Common name	Botanical name	Threatened species listing
Australian Bustard	*Ardeotis australis*	Vulnerable (NT)
Carpentarian Grasswren	*Amytornis dorotheae*	Endangered (NT)
Emu	*Dromaius novaehollandiae*	Vulnerable (NT)
Gouldian Finch	*Erythura gouldiae*	Endangered (C'weath/NT)
Carpentarian Rock-rat	Zyzomys palatalis	Endangered (C'wealth) Critically Endangered (NT)
Mertin's Water Monitor	*Varanus mertensi*	Vulnerable (NT)

Table 1: Threatened native animals – Listing at National / Northern Territory level

Source: Harrison, McGuire, Ward, Fisher, Pavey, Fegan, and Lynch 2009

The Carpentarian Rock-rat is restricted to five sites associated with rainforest thickets and sandstone gorges on Wollogorang Station. All are within a radius of 35km of the mine site.

The Carpentarian Grasswren is restricted to sandstone outcrops including the China Wall area. Field searches of all known sites (2005) for this species in the NT have located the species only at two sites, both on Wollogorang Station.

Six plant and three vertebrate species (Sandstone Antechinus, Carpentarian Rock-rat and Alexandria Toadlet) recorded in the SOCS region are endemic to the NT.

Birds Australia has listed Wollogorang Station as an internationally recognised Important Bird Area. The Important Bird Area contains the only existing population of the restricted-range Carpentarian Grass Wren in the NT.

5.4.3 Flora

The SOCS information for the area includes the following:

- The flora in this region is of regional significance.
- Seven plant species have restricted range within the NT.
- The gorges within the Wollogorang sandstone ranges comprise some of the best developed and richest monsoon rainforest patches in the Gulf Falls and Uplands bioregion. Rainforest once covered much of the Gulf but has contracted such that only small and isolated rainforest patches in protected gorges remain, especially within the northern portion of the site.
- Springs feeding into gorges and monsoon thickets in the area are important sources of water in the semi-arid landscape. The resulting perennial pools and streams support locally-important aquatic ecosystems.

5.5 Wild rivers declaration

The Queensland length of Settlement Creek forms part of the Settlement Wild River Declaration 2007 under the *Wild Rivers Act 2005* (Queensland). The declaration specifies:

- the extent of the declared wild river area and its various management;
- caps on resources that can be taken in the declared wild river area;
- rules or limits that must be complied with when undertaking new development activities (such as quarrying, agriculture and mining) in the declared wild river area; and
- development assessment codes that must be applied.

The purpose of the *Wild Rivers Act 2005* is to "preserve the natural values of rivers that have all, or almost all, of their natural values intact" by establishing a framework for the management of wild river areas (section 3(1)(a)). The *Wild Rivers Act 2005* seeks to encourage cross-jurisdictional cooperation and encouragement of the preservation of the wild rivers' natural values in other jurisdictions (section 3(3)(f)).

5.6 Sacred sites

The Aboriginal Areas Protection Authority (AAPA) has issued various Authority Certificates for the Redbank mine site since 1991. Numerous sites have been identified and protected on MLN 631, 632, 633, 634, 635, 636 and 1108 and ERL94. The most current Authority Certificate for mining related works C2009/309 (Appendix B), like its predecessors, is limited spatially to the boundary of ERL94 and the MLN within it. Site protection measures within C2009/309 are therefore also limited to this area and the specified works.

Numerous other sacred sites have been recorded and registered by AAPA downstream from Redbank mine to the Northern Territory-Queensland border. It is understood that these sites have been impacted upon by contamination from the Sandy Flat pit at Redbank. These sites have never been the subject of any Authority Certificates relating to the Redbank mine, presumably because the mine operators did not foresee any impacts extending beyond their leases. AAPA advises that existing Authority Certificates therefore provide no indemnity or protection to past or current mine operators for any impacts on or damage to sacred sites outside of ERL94 and the MLN within it.

AAPA advises that given the number of sacred sites in the drainage system downstream of Redbank, AAPA has advised all future monitoring, sampling and inspection works by government agencies or company representatives should be subject to Authority Certificates. Aboriginal custodians have expressed views that access to sites in the area would be possible under the supervision of relevant custodians.

6 Environmental contamination

6.1 Contamination history

Impacts from the Redbank Mine were first identified in 1995 with evidence of death of vegetation along Hanrahan's Creek and staining along Hanrahan's Creek, Echo Creek and at Moonlight Falls attributed to seepage from the tailings storage dam (Department of Mines and Energy 1999). Staining was significantly more intense in 1998 and 1999 with a corresponding deterioration in water quality (Department of Mines and Energy 1999).

In 1999 anecdotal reports were received by DME that Echo Creek and the upper reaches of 12 Mile Creek did not support fish and other aquatic life.

Figures 6 to 9 present contamination trends over time (2003 to 2012) at the Redbank Mine site and downstream monitoring points, drawn from various sources. The timeframe represents those years where the NT EPA has accessed comparable data. The figures indicate that there is some variation in contamination over time however levels of pH, electrical conductivity (EC) and copper concentrations continually exceed the 80% ANZECC level of species protection downstream of the mine site for a distance of approximately 5km over this timeframe.

Copper trends consistently exceed 80% ANZECC level of species protection for all years at all sites and all locations downstream for a distance of approximately 37kms. For some years, pH and conductivity return to within the 80% ANZECC level of species protection at downstream locations greater than 5kms from the mine site. This result could be attributed to dilution from Wet season rains and other water sources entering the receiving creek system.

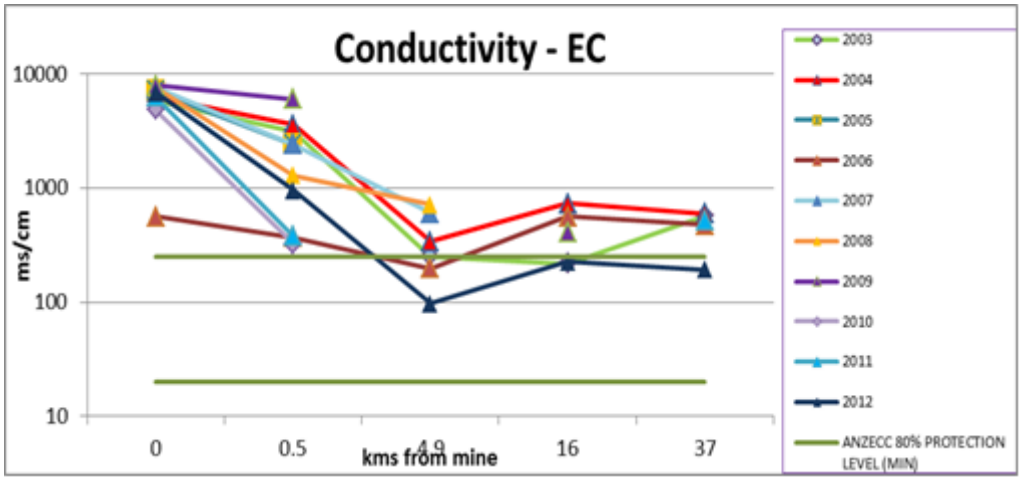


Figure 6: **Conductivity (mS/cm) trends over time (2003 to 2012) at various downstream monitoring locations**

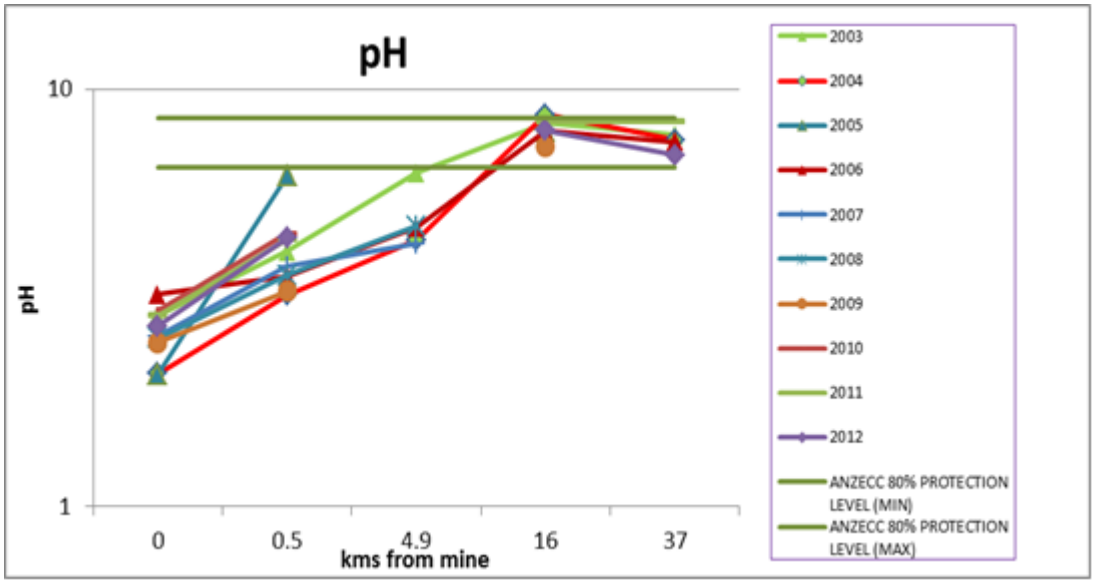


Figure 7: **pH trends over time (2003 to 2012) at various downstream monitoring locations**

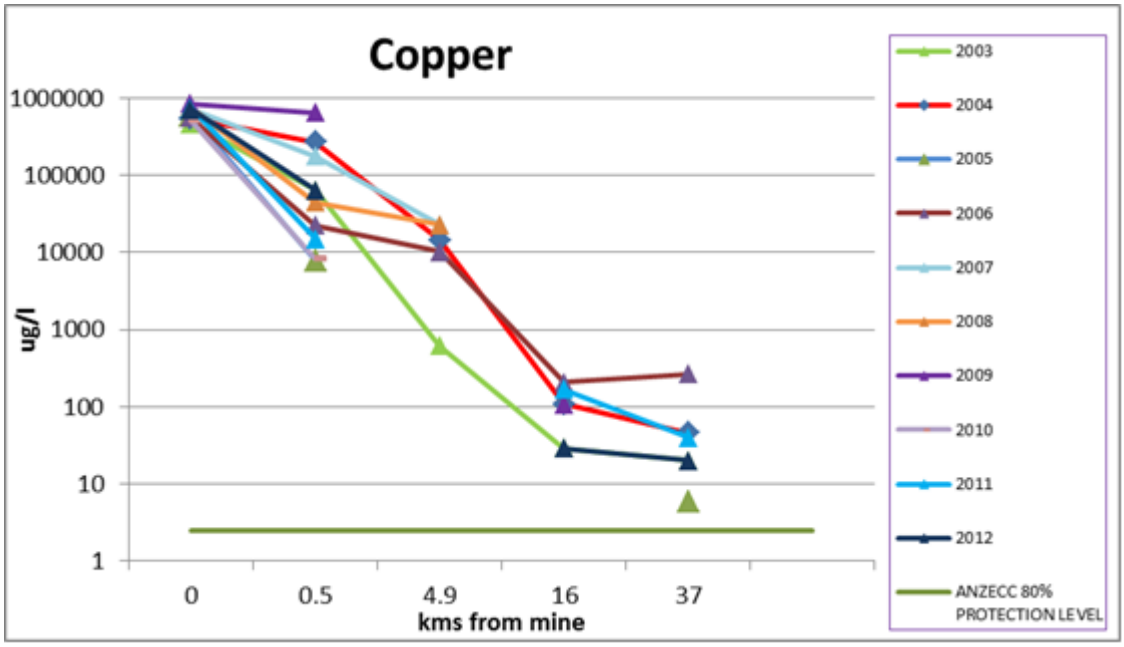


Figure 8: **Copper (ug/l) trends over time (2003 to 2012) at various downstream monitoring locations**

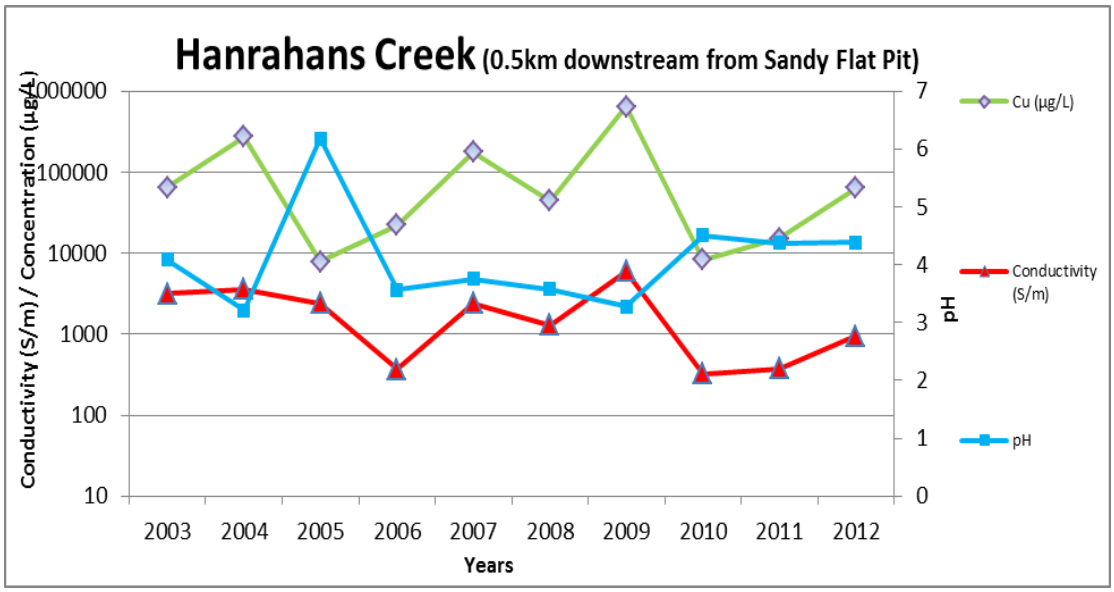


Figure 9: **Copper (ug/l), conductivity (S/m) and pH trends over time (2003 – 2012) at a single monitoring location (Hanrahan's Creek)**

6.2 Current status of contamination

6.2.1 Surface water analysis

Consecutive mine operators have undertaken surface water analysis at the mine site and at upstream and downstream locations.

The RCL 2012 Annual Return for Waste Discharge Licence (WDL) 175-1 (EcOz Environmental Services 2013b) provides a summary of available surface water quality data between 2008 and 2012, concluding that:

- the main contaminants/parameters of concern are copper, aluminium, pH and electrical conductivity;
- water quality at all monitoring sites is adversely affected by the mine;

- water quality is characterised by very low pH, high EC;
- concentrations of copper and aluminium substantially exceed default ANZECC trigger values for 80% species protection level. In many cases exceedances are 2-3 orders of magnitude higher;
- concentrations of trace metals manganese, nickel and zinc generally exceed default ANZECC trigger values for 80% species protection level. In many cases exceedances are 2-3 orders of magnitude higher; and
- some seasonal variability in levels of contamination can be attributed to dilution during the wet season from upstream flows.

To provide an indication of the current surface water quality above, at and downstream of the Redbank Mine site, results of surface water quality monitoring conducted by DME in May 2012 (unless stated otherwise) are presented below.

Data is sourced from the surface water monitoring sites identified in Table 2 and Appendix C.

Sampling location	Distance from mine site (kms)	Reference in Appendix 2
12 Mile (reference site upstream of Echo Creek)	2	Site 5
Sandy Flat Pit	0	Site 17
Hanrahan's Creek at Hanrahan's Pool	0.5	Site 24
Echo Creek at DME logger site	2	NA
Echo Creek upstream of junction with 12 Mile Creek	4.9	Site 7
Settlement Creek downstream of 12 Mile Creek	16	Site 12
Settlement Creek at Borroloola Road Crossing	37	Site 13

Table 2: Surface water sampling locations for DME monitoring May 2012

6.2.1.1 pH

pH field readings are shown in Figure 10. Figure 10 shows that SFP water is highly acidic with a level of 2.7 and shows pH lower than the ANZECC 80% Guideline (6.5 to 8.5) for a distance of approximately 5km downstream of the mine. At a distance of more than 5km downstream, pH returns to within the ANZECC 80% Guideline. This compares to a pH at the reference site of 6.38pH.

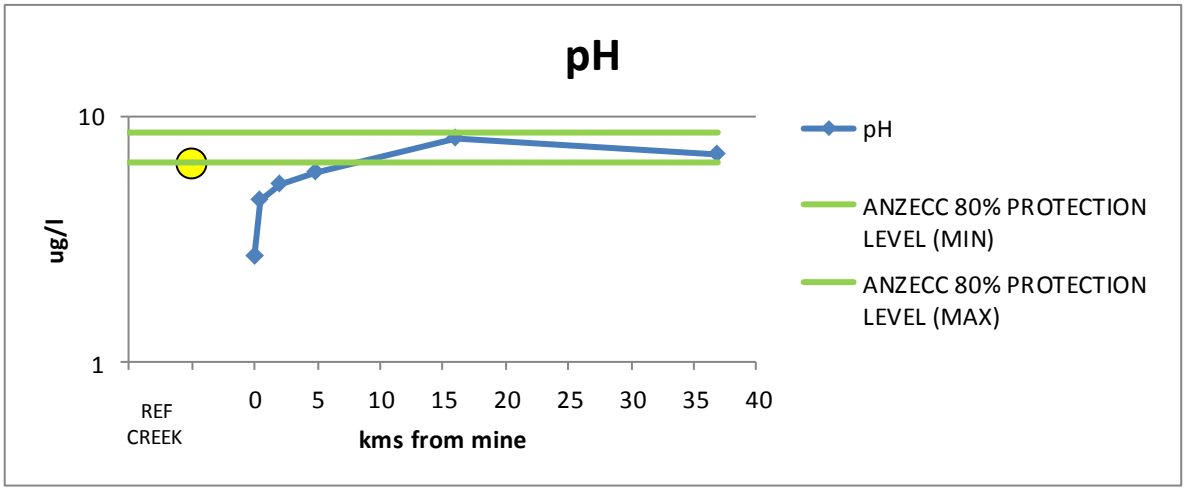


Figure 10: pH concentrations at Redbank Mine monitoring locations on 12 May 2012

Source: DME

6.2.1.2 Electrical conductivity

EC field readings were taken at all downstream points as shown in Figure 11. Figure 11 shows that EC levels are higher than the ANZECC 80% Guideline (20-250mS/cm) for a distance of approximately 5km downstream of the mine. EC returns to within the ANZECC 80% Guideline levels a distance greater than 5km downstream. EC at the reference site was 29.6ms/cm.

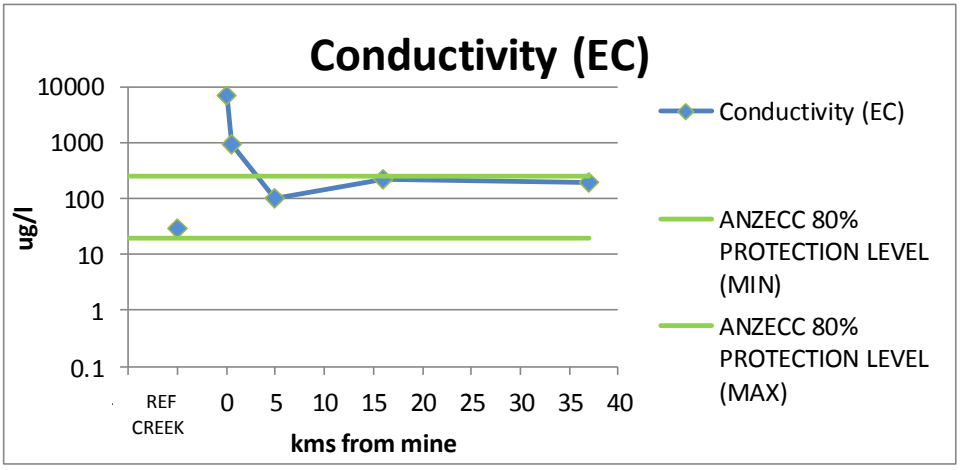


Figure 11: Conductivity (EC) concentrations at Redbank Mine monitoring locations on 12 May 2012

Source: DME

6.2.1.3 Aluminium

No ANZECC Guideline value exists for aluminium where the pH is below 6.5. The ANZECC 80% Guideline for aluminium (150ug/l) where pH is above 6.5 has been used as an indicator.

RCL reports that background aluminium levels are higher than the ANZECC 80% Guidelines. The aluminium level at the reference site was 6.2 ug/l. This may be a result of naturally high mineralisation in the area.

Figure 12 shows the total concentrations of aluminium exceed the ANZECC 80% Guideline (150ug/l) for over 2km downstream. At the mine and Hanrahan's Creek at Hanrahans Pool, approximately 500m downstream of the mine, the aluminium level exceeds the 80% protection level by 2-3 orders of magnitude. Aluminium returns to within the ANZECC 80% Guideline at a distance greater than 2km downstream.

Figure 12 shows that at Settlement Creek at the Borroloola Road crossing, approximately 37km from the mine, aluminium recorded a level of 402ug/l. A high level may be due to the inconsistent nature of the contaminated wastewater flowing down the creek or from high natural mineralisation in the area.

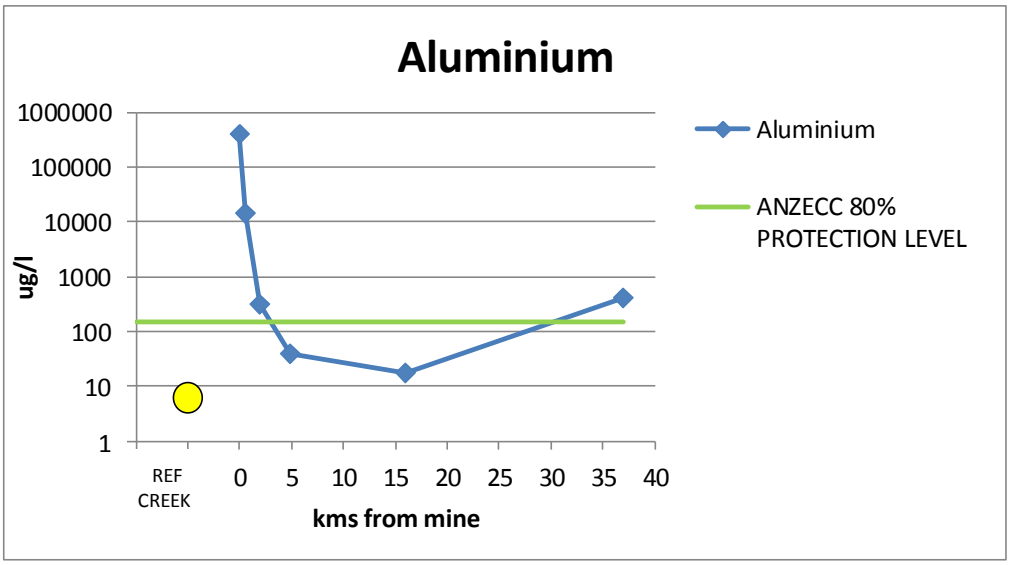


Figure 12: Aluminium (Al) concentrations at Redbank Mine monitoring locations on 12 May 2012

Source: DME

6.2.1.4 Copper

Copper levels exceed the ANZECC 80% Guideline up to 37km downstream of the mine. Figure 13 shows that copper is between 2-6 orders of magnitude higher than the ANZECC 80% Guideline at the SFP and downstream locations. Figure 13 shows the gradient of copper downstream of the mine, compared to a copper level at the reference site of 0.4ug/l.

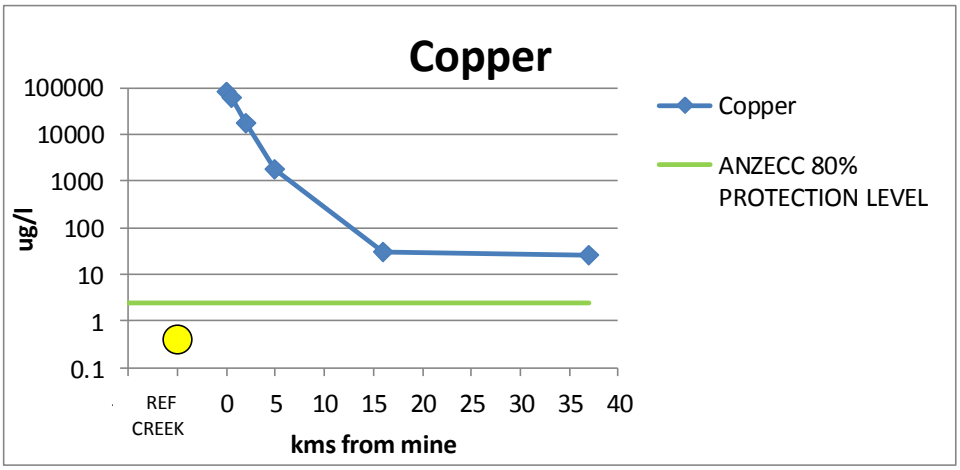


Figure 13: Copper (Cu) concentrations at Redbank Mine monitoring locations on 12 May 2012

Source: DME

DME monitoring in November 2012 measured elevated copper concentrations in water (Figure 14) approximately 42km downstream at the point where Settlement Creek crosses the Queensland border. DME recorded elevated copper concentrations at this site approximately eight times greater than the ANZECC 80% species level of protection (2.5ug/l).

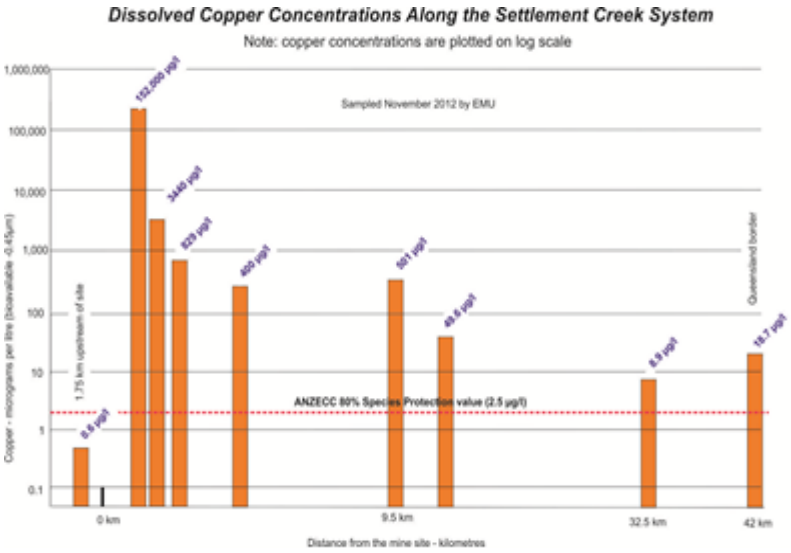


Figure 14: Dissolved copper concentrations along the Settlement Creek system in November 2012

Source: DME

6.2.1.5 Manganese

Figure 15 shows that manganese levels exceed the ANZECC 80% Guideline (3600ug/l) for approximately 500m downstream after which time total manganese levels return within ANZECC 80% Guideline. The manganese level at the reference site was 3.88ug/l.

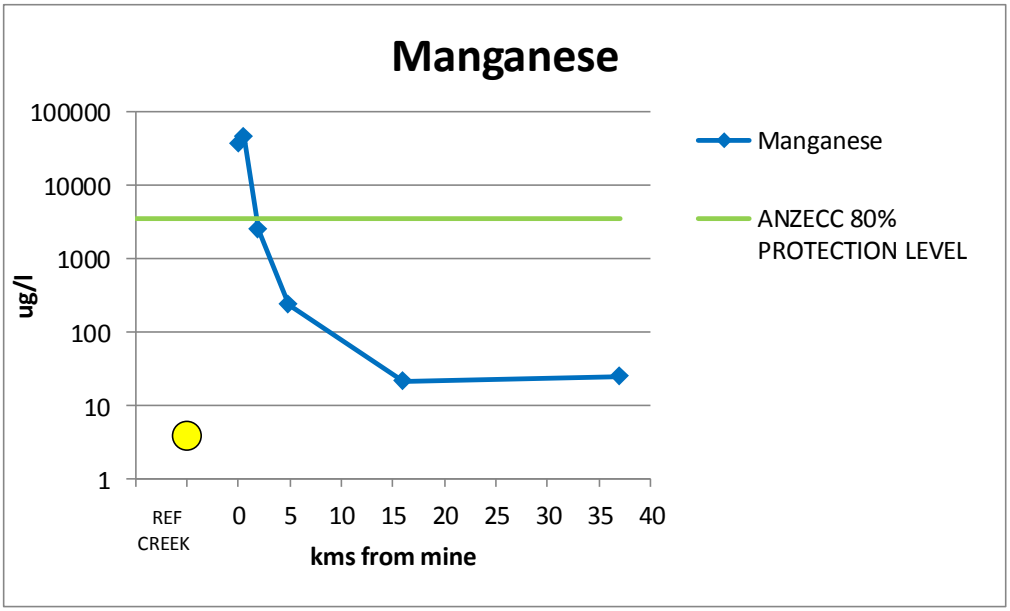


Figure 15: Manganese (Mn) concentrations at Redbank Mine monitoring locations on 12 May 2012

Source: DME

6.2.1.6 Nickel

Figure 16 indicates that elevated nickel exceed the ANZECC 80% Guideline of 17ug/l for over 2km downstream. Nickel levels then return to below the ANZECC 80% Guideline, but above the nickel level at the reference site of 0.25 ug/l.

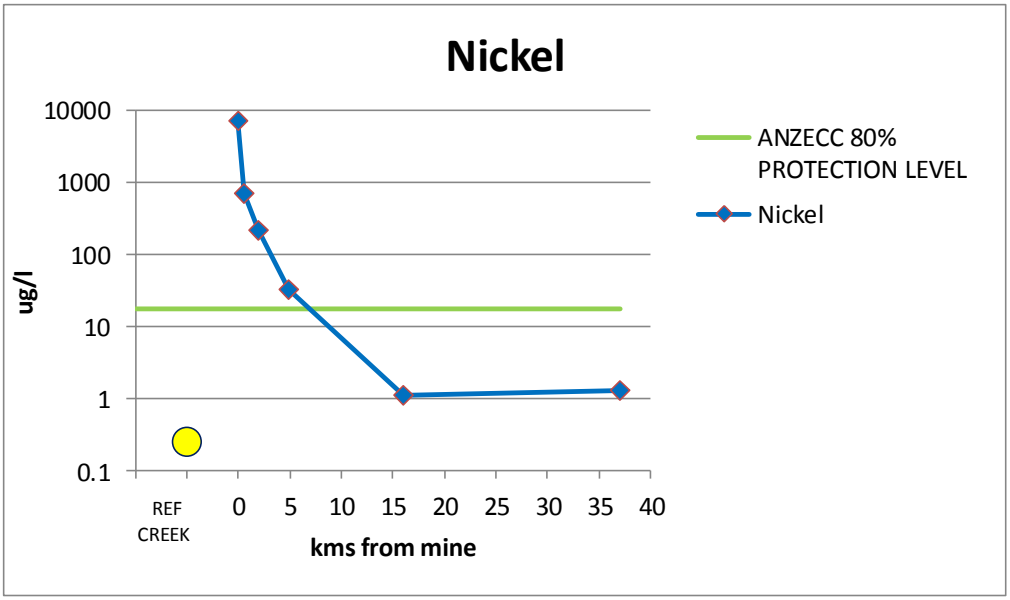


Figure 16: Nickel (Ni) concentrations at Redbank Mine monitoring locations on 12 May 2012

Source: DME

6.2.1.7 Zinc

Figure 17 shows total zinc levels exceed the ANZECC 80% Guideline of 31ug/l for approximately 5km downstream. Zinc levels appear to be within ANZECC 80% Guideline levels after this time and slightly above the zinc level at the reference site of 0.9 ug/l.

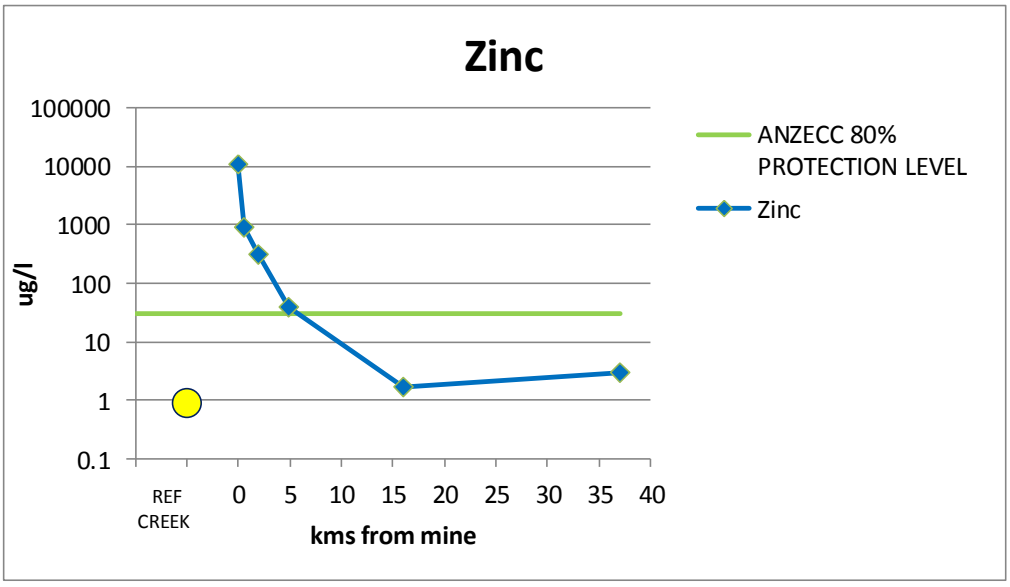


Figure 17: Zinc (Zn) concentrations at Redbank Mine monitoring locations on 12 May 2012

Source: DME

6.2.2 Macroinvertebrate monitoring

RCL commissioned the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (then the Department of Environment, Water, Heritage and the Arts) Supervising Scientist to undertake a macroinvertebrate survey of the receiving environment, downstream of the Redbank Mine in 2008 (Humphrey, Fox, Chandler, Brazier, Camilleri and Hanley 2008).

The summary of the findings are as follows:

- Macroinvertebrate (family level) taxa number and total abundance were substantially lower at mine-exposed stream sites compared with reference sites. There was a general increase (recovery) downstream in taxa number and total abundance such that summary values at Settlement Creek 36kms downstream of Redbank were consistent with those recorded at reference sites.
- Taxa abundance data showed distinct separation of mine impacted and reference sites.
- Macroinvertebrate taxa most influential in separating exposed and reference sites had greatly reduced abundances at the exposed sites.
- Significant negative relationships were observed between community summaries and key metals in water and sediment, indicating the adverse impacts of mine waste water dispersion to receiving water health. The strongest negative relationships were generally found for copper in water and sediment.

Macroinvertebrate monitoring results presented in the report: Redbank Macroinvertebrate Monitoring 2008-2012 (EcOZ Environmental Services 2013a) indicate that although there has been some variability in numbers (abundance) and species diversity (richness) between years at reference macroinvertebrate monitoring sites, there is a clear and consistent trend of comparatively low abundance and species richness at exposed sites downstream of the mine. The report states that the impact on macroinvertebrate communities reflects the consistently very poor water quality downstream of the mine site over time.

The report concludes that a comparison over time of macroinvertebrate communities at exposed and reference sites indicates that the level of downstream impact is increasing. An example of this trend is evidenced at the Settlement Creek, Wollogorang Road Crossing. In 2008, this site had the second-highest overall taxa richness of monitored sites, but was reduced by over 50% in 2011 and 2012.

6.2.3 Livestock and large terrestrial animals

The recognised standard for assessing livestock drinking water quality in Australia is the Australian and New Zealand Environmental and Conservation Council Guidelines for Fresh and Marine Water Quality – Livestock drinking water 2000 (“LS Guidelines”). The Guidelines recommend that if the values specified in the Guideline are exceeded further investigations should be undertaken to determine whether there have been any adverse effects on animal health.

The LS Guidelines provide values for aluminium, copper, lead and nickel. No guideline value is provided for manganese. A comparison of surface water monitoring results against the LS Guidelines on data collected by DME from May 2012 and February 2013 indicates that the LS Guidelines:

- are exceeded for aluminium for approximately 500m downstream of the mine;
- are exceeded for copper for approximately 5km downstream of the mine; and

- are not exceeded for other identified metals outside the mine lease boundary.

The LS Guidelines do not apply to large terrestrial animals such as kangaroos. No specific studies have been undertaken in relation to the potential impacts of mine water on livestock or other large terrestrial animals.

6.2.4 Ground water monitoring

RCL has provided raw groundwater data for the period 2003 to 2012. Environmental Monitoring Bores in close proximity to the SFP show:

- pH exceeds the ANZECC 80% Guidelines; and
- aluminium, copper, lead, manganese, nickel and zinc total and dissolved concentrations continually exceed the ANZECC 80% Guidelines.

The validity of data generated from the environmental monitoring bores is the subject of discussions between RCL and DME. DME reports that bores installed by RCL are poorly located and constructed. While these bores confirm the presence of contamination the source of contamination cannot be confirmed.

6.2.5 Sediment monitoring

Sediment monitoring was commissioned by RCL in 2008 and 2010.

Sediment monitoring was undertaken as part of the 2008 macroinvertebrate study. The findings of this report were:

- The dominant influence on receiving sediments was a mine disturbance gradient associated with elevated copper, manganese, aluminium, cobalt, zinc and nickel.
- Sediment chemistry values from key sampling sites exceeded the current Australian Water Quality Guidelines toxicant triggers for ecosystem health.
- Sediment concentrations for copper, nickel, and zinc were highest 18kms downstream of the mine, on 12 Mile Creek and just upstream of the confluence of 12 Mile Creek with Settlement Creek. This can be explained by the deposition of fine silt and clay contaminant-laden sediment particles dropping out of slack waters following high flow events.

The 2010 sediment sampling and analysis included Redbank Creek upstream of the mine and Hanrahan's Creek in the vicinity of the SFP. This sampling event was initiated in response to recommendations 5 and 7 of Assessment Report 63A, and addressed, in part, the requirements of the Commonwealth EPBC Act Approval.

The findings of the 2010 sampling results were:

- There is a correlation between the results obtained during the sampling events (2008 and 2010).
- Mining has impacted upon sediment in Hanrahan's Creek.
- Differences in some sampling sites may be ascribed to natural distribution patterns common in mineralised geological environments where extensive weathering prevails, however, the different assessments concur that mining impacts on sediment quality through ground water seepage.
- Decreasing pH and high acidity values in sediment in the upper reaches of Hanrahan's Creek indicate that these sediments are acidified with elevated concentrations of readily available metals including copper aluminium, iron and manganese.

- In Hanrahan's Creek copper concentrations increase exceeding the National Environment Protection (Assessment of Site Contamination) Measure Environmental Investigation Levels and ANZECC Interim Sediment Quality Guidelines. Increasing concentrations with a decreasing pH indicate that these sediments are influenced by mining activities.

The RCL 2012 Annual Return for WDL175-1 confirms that in 2010 sediments in Hanrahan's Creek downstream of the mine site were contaminated compared to those upstream (EcOz Environmental Services 2013b).

RCL planned to undertake sediment monitoring at upstream, downstream and reference sites on Hanrahan's, Echo, 12 Mile and Settlement Creeks during the 2013 Dry season, to gain a baseline upon which potential improvements in sediment quality associated with planned site rehabilitation works can be assessed. The proposed sediment sampling did not occur. DME conducted sediment monitoring in 2013.

6.2.6 Monitoring summary

Figures 10 to 17 indicate that at the reference sites, surface water environmental and metal parameters are within ANZECC 80% Guideline levels. Differences in some sampling results for aluminium and copper may be ascribed to natural distribution patterns common in mineralised geological environments where extensive weathering prevails.

Downstream monitoring results show aluminium and copper are the key contaminants of concern.

Aluminium and copper consistently exceed the ANZECC 80% Guideline for all sites for least 5km downstream of the mine. DME also reports major metal concentrations markedly higher than the ANZECC 80% Guideline for up to 17km downstream.

The pH of the wastewater discharged from the SFP is at 2.7 and EC is at 6890 µS/cm. pH levels outside the ANZECC Guidelines of 6.5 to 8.5 continue downstream for over 5km and EC levels up to 633 µS/cm outside of the ANZECC 80% Guidelines for conductivity of 20-250 µS/cm continue downstream for over 2km. It is highly likely that the availability, dissolution and hence toxicity of the key contaminants will be increased by the pH and electrical conductivity. The pH and EC levels may also result in metal precipitation in the wider environment as metal hydroxides and salts.

Visual observations along the creek beds for 2km show a clear bluish appearance, indicative of copper availability with an accompanying lack of aquatic life and stream vegetation.

Macroinvertebrate and sediment sample results from past years also show impact. Macroinvertebrate family-level number and total abundance sampling downstream of the mine site show a significant reduction in macro-invertebrate diversity compared with upstream sites.

The DME Draft Water Quality Report 2011 includes a comparison of company data and DME data for a selection of the main contaminants of concern (Department of Mines and Energy 2011). DME indicates that there is generally a good correlation between DME and RCL data for environmental indicators (pH and EC) and metals analysis.

6.3 Contamination sources

The main sources of contamination at the mine are the SFP, waste rock dumps, the former vat and heap leach facilities and the existing tailings storage facility (TSF).

Sandy Flat Pit

The SFP is in the centre West of ERL94 where the majority of mining activity was focused. The SFP is a receptacle for contaminated surface water and groundwater seepage at the mine and has a capacity of 624 Mega litres (ML).

It is believed that the SFP receives groundwater seepage via a paleochannel (gravel layer) situated under the mine. Figure 18 shows a pictorial cross section of the paleochannel connection between tailings dam, waste rock dump, SFP and Hanrahan's Creek. The paleochannel expresses groundwater to Hanrahan's Creek via a shallow aquifer. This occurs when SFP water levels exceed 380ML, or 164.4m AHD (Redbank Copper Limited 2013d).

The SFP contains water with high metal concentrations including copper and aluminium and trace metals nickel, manganese and zinc, and a low pH (~3pH). SFP water continues to release to the surrounding environment via surface and groundwater.

Contaminated waters in Hanrahan's Creek are diluted by Wet season flows. As Wet season flows subside, the SFP and aquifer continue to provide Hanrahan's Creek with a major source of its flow, resulting in contaminated water remaining in semi-permanent and permanent waterholes for many kilometres down the creek system.

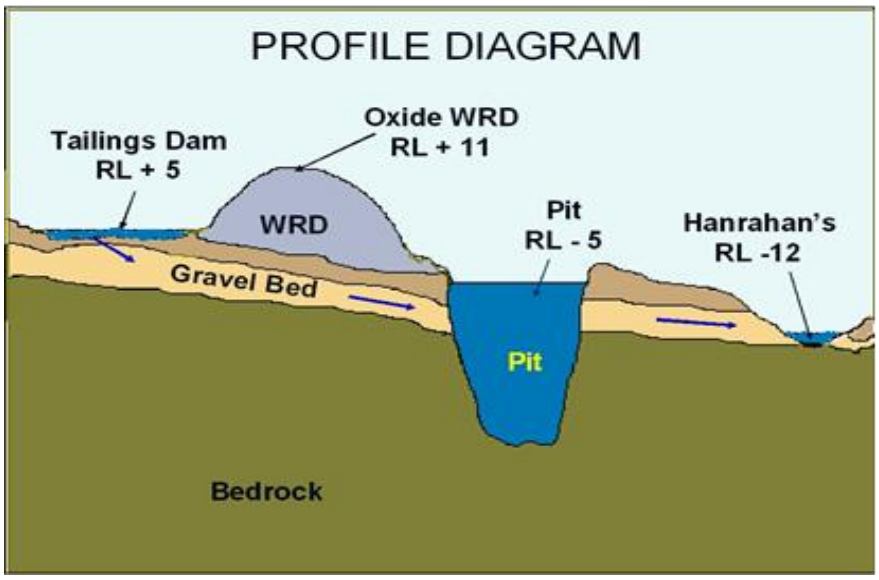


Figure 18: Cross-section of paleochannel in proximity to Tailings Dam, Waste Rock Dump, Sandy Flat Pit and Hanrahan's Creek

Source: DME Mine Water Quality Status Report. Site: Sandy Flat Mine 2008

Waste Rock Dump and Run of Mine

Oxide, transition and sulfidic ores from the pit were disturbed during mining activities. Some of the transition and sulfidic ore material was placed on the Run of Mine pad for processing during the 1994-1996 mining activities. Waste material from the processed ore was placed in the waste rock dumps. Acidic metalliferous drainage from the Run of Mine and waste rock dumps enters the pit.

Heap Leach Facility

The heap leach facility was established to extract copper through acid leaching of the transitional and sulfidic ores. The process involves finely grinding the ore and piling it onto a plastic lined pad. Acid, dissolved in water, is then sprinkled onto the heap via a series of irrigation hoses. The acidic water extracts the copper which then flows to the vat system.

The heap leach liner is not intact causing acidic copper rich water to seep to groundwater. It is believed that contaminated water leaches into the SFP, via the paleochannel.

Tailings Storage Facility

The TSF has been a source of contamination via pooled water seeping through its southern wall and into groundwater below. The southern wall has not been constructed properly, allowing contaminated wastewater to seep between the base and wall of the facility. Wastewater accumulates and seepage occurs under average Wet season conditions. A drainage system is in place to collect seepage and direct it into the SFP.

7 Chronology of events

7.1 1989

Redbank Copper Pty Ltd, which was owned by Alameda Pty Ltd, acquired MLN 631, 632, 633, 634, 635, 636 which includes the Sandy Flat deposit (refer Figure 2).

7.2 1991 – 1992

The Minister for Conservation directed Amalg Syndicate (mine owners at the time) to prepare and submit a Preliminary Environment Report (PER) (now known as a Public Environmental Report) under the EA Act on 12 February 1991 to enable assessment of a proposal to develop and mine the Sandy Flat Copper mine at the Redbank deposit.

The proposal comprised a single open pit (the SFP), a treatment plant for production of copper concentrate and ancillary infrastructure consisting of a waste rock dump, ore stockpile and tailings dam.

7.3 1993

The PER was submitted by RCPL on 8 March 1993 and was circulated to government advisory bodies for review and comment. DME managed the assessment process under administrative arrangements between it and the then Conservation Commission of the Northern Territory (CCNT). DME received and reviewed responses from advisory bodies on behalf of the CCNT and provided advice on the mining aspects of the project.

Additional information was requested from the proponent addressing the tailings dam, water management and acid drainage, including information on the following:

- Geotechnical information on the source of material to construct the tailings dam to allow assessment of the suitability of the material to contain tailings/prevent seepage.
- Additional analysis of rainfall records to ensure maximum likely rainfall events are factored into freeboard for the tailings dam.
- Capacity of the runoff control infrastructure to cater for on and offsite flood regimes.
- Details on runoff control measures for the waste rock dump to the storage dam (diversion drains and sediment structures).
- Details on the groundwater movement around the pit with regard to its capacity to contain the tailings leachate.
- An outline of management strategies for in-situ waste rock characterisation, segregation and handling.

A limited response was received from the proponent that pointed to relevant sections in the PER and the further engineering and design to be pursued as mine construction proceeded (e.g. waste rock dump runoff control measures) in consultation with DME.

DME prepared an Environmental Assessment Report and Recommendations which was provided to the Minister for Conservation through the CCNT.

The Minister for Conservation provided the Sandy Flat Copper Mine Environmental Assessment Report and Recommendations to the Minister for Mines and Energy in May 1993 (Department of Mines and Energy 1993).

The Environment Assessment Report concluded that:

> '*the Sandy Flat Project is a small scale short term operation that is considered to have limited potential to cause any significant long term environmental impact*' and '*assessment of the PER has identified a number of aspects that require additional attention by the proponent. These aspects are best addressed through reviewable Mine Plans and Environmental Management Plans that require formal approval by the Department of Mines and Energy*'.

The Environmental Assessment Report contained four recommendations to address key issues:

> *<u>Waste Rock Management</u>*
>
> *The proponent should prepare a waste management plan to include methods of waste characterisation, selective handling of material, waste dump construction design and a monitoring system for checking on waste placement and potential acid production. This waste management plan should be incorporated into the Environmental Management Plan and reviewed on a routine basis by the Department of Mines and Energy.*
>
> *<u>Water Management</u>*
>
> *The proponent should prepare a more detailed water management plan for incorporation into the EMP. This plan should include:*
>
> - *Classification of waters for management purposes (release/containment);*
> - *Monitoring of water quality and quantity;*
> - *Monitoring of containment structure capacities;*
> - *Review of mine water budget;*
> - *Contingency plan for water release/containment.*
>
> *The water management plan should be reviewed on a regular basis in relation to monitoring results and performance.*
>
> *<u>Tailings Disposal</u>*
>
> *Prior to commencement of tailings disposal in the open cut pit, the proponent shall submit a revised tailings management plan, including supporting information as to the suitability of the pit as a long term tailings repository.*
>
> *<u>Rehabilitation</u>*
>
> *The proponent is to develop a rehabilitation management plan for incorporation into the EMP. This plan should provide a generic strategy of rehabilitation and*

> *report on rehabilitation trials undertaken to assess this strategy. Review of effectiveness will refine rehabilitation techniques and develop a detailed final rehabilitation plan for the mine site.*

The Environmental Assessment Report stated that *'DME will require the proponent to prepare an Environment Management Plan (EMP) for approval. The EMP will address all environmental issues identified as relevant to the Project: waste rock management; water management; tailings management; rehabilitation and environmental monitoring programs.*

The Minister for Conservation made one additional recommendation in his correspondence to the Minister for Mines and Energy:

> *The proponent is to ensure that the proposal is implemented in accordance with the environmental commitments and safeguards identified in the Preliminary Environmental Report and the additional information provided subsequently. Such commitments and safeguards are subject to any modifications which may be determined as necessary by the Department of Mines and Energy as a result of ongoing monitoring and assessment of the mining operations.*

The following reason was provided for the additional recommendation: 'while the PER outlined some commitments and safeguards, it was deficient in detailing a number of important environmental issues and management practices associated with waste rock, water and tailings management, and rehabilitation. To counter the deficiencies and ensure the protection of the surrounding environment whilst maintaining flexibility, the proponent will also need to comply with directions and recommendations from the Department of Mines and Energy'.

RCPL commenced site preparations in June 1993. DME issued approval to commence mining of the 'starter pit' on 1 September 1993 with the removal of topsoil and mining of waste commencing in that month and ceasing in December 1993 for the Wet season.

Mineral Lease Northern (MLN) 1108 was granted on 1 October 1993 under the *Mining Act* (repealed by the *Mineral Titles Act* in 2011). Schedule 1 to the lease set out environmental conditions that reflected the outcomes of the environmental assessment, including the following requirements:

- that RCPL conduct its operations in substantial accordance with the commitments made in the PER and subsequently the EMP, to monitor and protect the local environment and to rehabilitate the project site;
- that RCPL submit a proposed EMP for approval prior to commissioning of the processing plant; and
- submission of an annual environmental report.

Schedule 1 to the lease established a process for approving the EMP. Where DME did not approve the EMP it was required to provide reasons for withholding approval. If not approved, RCPL was required to submit a revision of the EMP and was able to continue operations in accordance with the existing EMP until an amended EMP was approved.

A security was required from RCPL on the granting of MLN 1108, with an additional security required on commissioning of the processing plant.

7.4 1994

Open pit mining commenced in March 1994 and ore processing commenced in September 1994. Both continued until December 1994.

Commissioning of the processing plant occurred in September 1994 and in the same month RCPL submitted an environmental management plan (1994 EMP) (Redbank Copper Pty Ltd 1994). The EMP provided:

- Details regarding variations to the PER including:
    - Major variations: locations of the waste dump and tailings dam and construction of a water storage dam adjacent to the mine area; and
    - Minor variations: location of the contractor's camp, topsoil stockpile and explosives magazine.
- A brief outline of water management measures:
    - Clean run-off water from the mine area will follow the site contours and enter the local creek system.
    - Process water will be held in a PVC lined process water dam.
    - Pit water will be pumped to the tailings dam for settling purposes and recycled to the process water dam.
    - Waste Rock Dump run off will go via a sediment trap in to Hanrahan's creek. The EMP states 'the quantity of runoff and the dilution effects into the local creek system will have no adverse effects'.
    - Plant run off will be diverted and pumped to the tailings dam during operations. Wet season runoff will go into the local creek system and 'no adverse effects are expected from this runoff'.
    - All tailings generated will be contained within the tailings dam.
- Waste management comprising selective placement of sulphide material identified through visual assessment in prepared areas for encapsulation during rehabilitation.
- Two sentences on tailings management to state that 'tailings will be managed in the now constructed tailings dam' and 'the walls of the tailings dam have been keyed into the natural ground'. The tailings dam was constructed from Run of Mine waste material.
- A commitment that rehabilitation will be in accordance with procedures in the PER. The EMP attached the PER Decommissioning and Rehabilitation Statement but did not advance rehabilitation planning in any way.

The 1994 EMP failed to adequately address the recommendations of the 1993 Assessment Report and was considered inadequate by DME (Department of Mines and Energy 1999).

7.5 1995

Processing resumed in January 1995. Modifications were made to the treatment plant to improve metallurgical performance in April, with full operations established in June 1995. The treatment plant operated on blended sulphide and transition ore.

Mining occurred in June and July 1995.

Seepage was observed emanating from the south west side of the tailings dam and entering the local creek system in February 1995 (Department of Mines and Energy 1999). In response an interception trench was excavated across the drainage channel

from which the seepage was emanating. The drainage captured in the trench was pumped back to the tailings dam. The depth and porosity of the ground to the bedrock meant that much of the seepage (with possible contributions from the waste dumps and ore stockpiles) was bypassing the interception trench, both horizontally and vertically and emanating directly upstream of Hanrahan's Pool. The creek contamination resulted in the death of native vegetation along the length of Hanrahan's Creek and staining at Moonlight Falls. At this time, mining personnel flushed Hanrahan's Creek with water from the SFP to reduce contamination concentrations (Department of Mines and Energy 1999).

RCPL engaged a geotechnical engineer from Woodward-Clyde to investigate the seepage and outline possible remedial solutions. Woodward-Clyde observed considerable seepage to the south west of the tailings storage as well as seepage through the southern embankment into the adjacent water dam and reported on this in July 1995. The extent of seepage could not be determined due to the absence of groundwater monitoring bores around the tailings storage.

Both the tailings storage and adjacent water storage dam had been constructed across creek systems and impeded drainage from the catchment to the south east. There was significant water ponding on the tailings dam and the beach profile of the tailings was poorly developed. Seepage from the tailings storage was likely to be the result of flow through the base of the facility into the relatively pervious waste rock material forming the downstream slopes of the storage facility. The Woodward-Clyde report states that the large volumes of seepage suggest that these pathways were well developed and flow was being driven by the head of water within the tailings dam.

Woodward-Clyde made a number of recommendations to address the seepage:

- Water from the seepage interception trench should cease to be returned into the tailings storage and preferably reused in the process plant where possible;
- Longer term management of the storage should include installation of a decant system to recover supernatant water from the facility;
- Installation of an evaporation pond to eliminate excess water;
- Tailing beaching should be controlled to push free water away from the embankments;
- If the water dam is required for water storage its base and embankments should be lined with suitable low-permeability material to prevent seepage and ingress of water both into and from the tailing storage;
- The seepage interception sump downstream of the water storage dam should be extended to ensure capture of all flow from the facility; and
- Develop a network of monitoring bores to monitor potential seepage plumes beneath the storage dam.

RCPL submitted a revised EMP in October 1995 (1995 EMP) (Redbank Copper Pty Ltd 1995). The 1995 EMP had a stated focus on water management strategies. This included expanded details on the surface and ground water monitoring program and the following management commitments:

- Seepage sump water will be returned to the process water dam or redirected to the tailings dam if the process water dam levels are high.
- Pit dewatering bores will operate to keep the pit water under control during operations. Pit water will be pumped to the tailings dam to settle any suspended

solids. This water will then be recirculated through the tailings return pump system.

- Plant run-off water is minimised by a large formed drain to the north of the mine. The drain takes rain water away from the plant area. A flood diversion drain has been constructed to redirect water from run-off north of the pit away from the pit during the Wet season. The 1995 EMP states that the quality of the water accumulated along the northern side of the site is good and presents no problems in the nearby creek system (Hanrahan's Creek), and that the permeability of the ground in this area (silts/sands/lateritic gravels) enables water penetration which then travels horizontally in the bedded strata to ultimately end up in the creek system.

- Run-off from the south side of the waste rock dump will join the creek system which flows to Hanrahan's Creek. Some of the run-off, during low rainfall, will be captured by the seepage interception sump and be pumped back into the process water pond or tailings dump. When rainfall is heavy and sustained, combined flow of the creek and the run-off will be too great for the pump installation. The 1995 EMP states that: 'at this point in time the dilution factor from the creek will be enormous. By the time this water reaches Hanrahan's Creek where further dilution occurs the effect of the run-off and some seepage water will be minimal'.

The Waste Rock Management section of the 1995 EMP details management of oxide and sulphide wastes. The EMP states the following with regard to waste material:

- The ore pad, tailings dam wall and outer waste dump southern wall have all been formed using oxidised waste material.

- The core of the waste dump is waste from the lower levels in the pit – including sulphidic waste.

The 1995 EMP was considered inadequate by DME (Department of Mines and Energy 1999). Other than the commitment to return water from the seepage interception trench to the process water dam (subject to capacity) and noting a breaching of the water storage dam to reduce hydraulic pressure on the tailings dam, the 1995 EMP did not respond to the recommendations from the Woodward-Clyde report.

7.6 1996

RCPL submitted a revised EMP in March 1996 (1996 EMP) (Redbank Copper Pty Ltd 1996). This EMP provided a greater level of information on all environmental impacts expected from the mine site, as well as waste characterisation tests, discharge flows from the tailings dam and water quality results. It was found to be satisfactory by the DME, with the exception of tailings dam management.

The 1996 EMP was approved in accordance with environmental conditions attached to MLN1108 subject to:

- the provision of additional information to demonstrate the suitability of the pit for tailings discharge (as proposed in the PER for 'stage 2' of the project); and

- the provision of further plans to prevent the impact of tailings seepage on Hanrahan's Creek (Department of Mines and Energy 1999).

The 1996 EMP included the following objectives:

- Operate in accordance with best industry practises and standards;

- Protect water quality in both the long and short term;
- Progressively rehabilitate completed areas;
- Not to cause contamination of the surrounding environment;
- Return the site to a self-sustaining vegetation complex consistent with the existing surrounding.

The 1996 EMP included an internal audit to assess compliance against commitments made in the PER and the 1996 EMP. The audit indicates that RCPL was complying with the majority of PER commitments. The audit is reproduced in Table 3 below for those PER commitments where RCPL was not compliant.

PER section	Commitment	Compliant	DME comment
5.2	The tailings dam walls will be constructed of compacted overburden material over packed clay cores to create an impermeable constraint for the tailings	No*	Seepage occurring. TSF walls not keyed in properly.
5.2	No effluent discharge will occur to groundwater or the creek system	No	Seepage occurring. Recovery by pump to process water dam
5.9	A monitoring programme will be developed in consultation with DME prior to mining and processing commencement	Variation	Monitoring programme put in place after the start of operation

* DME assessment. RCPL's self-audit in the 1996 EMP states 'Yes'.

Table 3: Non-compliance with PER commitments

The 1996 EMP states that the seepage from the tailings dam had a pH of approximately 4.5 and while seepage flow was not visible beyond seepage pumps, it has been traced to sites further downstream through water sampling.

Additional works undertaken by RCPL to manage seepage from the tailings storage dam included:

- the installation of a back-up pump in Hanrahan's Creek to return any water not contained in the seepage sump to either the process water dam or the tailings dam;
- processing adjustments aimed at improving the quality of the tailings discharge water; and
- the laying of plastic lining on the tailings wall to separate tailings water from the wall.

The 1996 EMP highlights RCPL's adoption of the majority of the Woodward-Clyde recommendations, with the remaining recommendations addressed by previous actions in breaching the water storage dam.

Mining ceased in July 1996 and processing ceased in August 1996. The mine was placed in care and maintenance due to a fall in the price of copper and a refusal by the take-off customer, Mt Isa Mines, to purchase further concentrate (VDM Consulting, EcOz Environmental Services 2009a).

Approximately 60 000 tonnes of crushed oxide ore and 20 000 tonnes of uncrushed transitional ore remained stockpiled on site (Department of Mines and Energy 2001), although estimates differ according to the source.

A DME taskforce visited the mine in August 1996 to assess the status of the site and the potential for reopening. The taskforce determined the major environmental issues of the site as tailings dam and process water seepage and recommended short term measures to minimise further pollution off the mine site, including pumping ponded tailings water to the SFP. RCPL did not act on any of these recommendations (Department of Mines and Energy 1999).

The DME taskforce recognised that the probability of the mine reopening was 'extremely unlikely' and made long-term recommendations in case the mine did not reopen. RCPL did not act on these recommendations other than to construct a bund around the pit (Department of Mines and Energy 1999).

The Lease Conditions for MLN1108 specified that an environmental report should be submitted to DME each year, to include results of monitoring as specified in the EMP and interpretation of the monitoring results. No such report had been submitted to DME (Department of Mines and Energy 1999).

7.7 1997

At DME's request RCPL submitted a status report on the Sandy Flat site in February 1997. The status report informed that where possible, reagents were removed from the site, copper concentrate was shipped from the site and parts of the rock dump were capped and topsoiled. No reseeding took place.

DME officers visited the Sandy Flat site. Staining in local creeks was evident, but water sampling did not indicate the intensity of impact to Hanrahan's Creek and Moonlight Falls that was later observed during the 1999 sampling program.

A DME Water and Rehabilitation Management System Audit was undertaken for the mine site in June 1997. The main issues raised by the audit were:

- onsite preparation was not reflected in documentation;
- lack of information to support minimal impact from seepage water; and
- lack of planning, documentation and implementation of rehabilitation.

7.8 1998

DME officers visited the Sandy Flat site. Staining of local creeks was once again evident, but water sampling did not indicate the intensity of impact to Hanrahan's Creek and Moonlight Falls that was observed during the 1999 sampling program.

During visits between 1996 and 1998, DME continued to request that RCPL submit plans of earthworks and rehabilitation. RCPL submitted a status of activities at the Sandy Flat Mine to DME in July 1998. The report indicated little advancement had been made on-site with recommended rehabilitation activities. Chemicals and high sulfide ore and remaining small quantities of concentrate had been removed off-site. RCPL ceased providing DME with water monitoring results in December 1998.

RCPL submitted a rehabilitation plan to DME in October 1998. The plan only addressed issues with the tailings dam rather than taking a whole-site approach.

7.9 1999

A complaint was received by the Minister for Lands, Planning and Environment in February 1999. The complaint focussed on concerns about contamination of ground and surface water in the downstream aquatic environment caused by wastewater discharge from the mine.

In response DME and the then Department of Lands, Planning and Environment (DLPE) undertook several site inspections and collected surface water and sediment samples. Laboratory analysis of the samples indicated mine impact was detectable as far as 40km downstream, including elevated copper (316ug/l) above the ANZECC 1992 Guideline value for protection of aquatic ecosystems for copper of 2-5ug/l. It was determined that without further studies, such as fauna surveys, bioassays and chemical speciation, the impact to aquatic ecosystems from mine wastewater could not be ascertained (Department of Mines and Energy 1999).

The sources of contaminated discharge from the mine site were identified as the leaking tailings dam wall and the waste rock dump, with uncertainty as to the contribution from the ore stockpile. Measures to prevent contaminated water flow into Hanrahan's Creek, including an interception trench between Hanrahan's Creek and the tailings dam and waste rock dump, had not been successful due to leachate pumping issues and poor design (Padovan 1999).

As a result of the 1999 monitoring program the state of the Sandy Flat mine site was judged environmentally unacceptable, leaving the company vulnerable to prosecution under the *Water Act* and *Mine Management Act* (Department of Mines and Energy 1999). RCPL commenced discussions with DME on measures that could be adopted. In July 1999 DME directed that the contaminant load to Hanrahan's Creek be minimised.

RCPL submitted a Mine Environmental Management Plan (MEMP) in August 1999. The MEMP detailed strategies for reducing the site impact to the creek system. Despite DME identifying that the MEMP contained a number of deficiencies it was accepted in September 1999 in recognition of the impending Wet season.

The 1999 MEMP contained commitments to:

- construct of a high-flow/low-flow channel, where low-flow water (seepage) is directed to the catchment trench then to the pit. Construct of a diversion channel to allow the high flow (stormwater) to drain to Hanrahan's Creek;
- control seepage from mineralised waste with site drainage interception works;
- remove material from the North face of the water dam to assist water flow;
- construct a high-flow/low-flow control on the North side of the pit to capture surface runoff from the plant area;
- direct drainage from transitional ore to the tailings dam;
- construct an evaporation pond on the existing tailings dam;
- spread topsoil on the breached dam wall and seed; and
- raise the pit bund wall to two metres high.

The MEMP did not take into account the management of ore stockpiles and the rehabilitation of the tailings dam.

A range of earthworks detailed in the MEMP were completed by November 1999 with assistance from DME staff. DME officers visited the site in December. Drainage works are presented in Figure 19.

Actions not undertaken included: rehabilitation planning for the rest of the site; and reinstating the water monitoring program to determine the effectiveness of the measures implemented in reducing contamination.

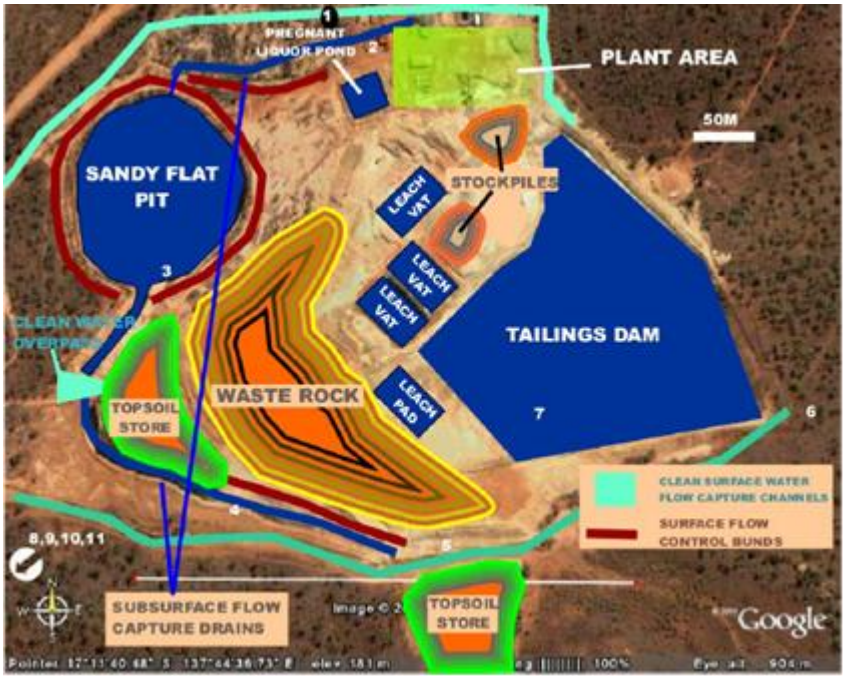


Figure 19: Redbank Mine Diversion Drainage works

Source: Earthsciences Pty Ltd 2007

Rehabilitation of the SFP area undertaken to this point in time included (VDM Consulting, EcOz Environmental Services 2010a):

- Bunding of the pit to a state suitable for decommissioning;
- Installation of the low flow drain system;
- Rehabilitation of some disturbed areas;
- Capping of, and some revegetation of, the waste rock dump;
- Capping of parts of the tailings dam;
- Removal of some plant infrastructure; and
- Ongoing general clean-up.

Site investigations carried out by DME and RCPL in December 1999 revealed that work carried out on site was not as detailed in section 1.4 of the MEMP. The site investigations revealed that substantial improvements could be made to the MEMP.

RCPL subsequently prepared an environmental controls document (Redbank Copper Pty Ltd 1999) to document commitments to rectify and improve works undertaken between 24 September 1999 and 1 December 1999. The document details each commitment made in the MEMP, its current status and actions taken to ensure effectiveness of each commitment.

No further rehabilitation of the mine site has been undertaken since these activities.

7.10 2000

A further sampling event undertaken in May 2000 demonstrated a reduction in copper levels in the downstream aquatic environment compared to the results from 1999, although levels remained higher than those in other un-impacted creeks in the area and above national water quality guidelines. Observations at the time showed an improvement in the condition of the receiving aquatic environment through the presence of aquatic life that was absent in the previous year. This suggested that the drainage system had the capacity to handle seepage and run-off from an average Wet season.

While DLPE considered prosecution under section 16 of the *Water Act* and admissible evidence was collected to support a prosecution, it was decided that prosecution should not proceed against the mine owner at that stage. At the same time a decision was made to issue a Waste Discharge Licence (WDL) under the *Water Act* requiring the mine owner to:

- develop and implement an Environmental Management Plan to reduce the level of copper entering the creek system; and
- monitor the water, sediments and biota in the creek system to demonstrate the effectiveness of the Environmental Management Plan.

A WDL was not issued until 2004 (Refer Section 7.14).

7.11 2001

The 2000/2001 Wet season experienced a total rainfall more than twice the annual average (2125mm). This led to overland flow from the seepage collection trenches into the downstream environment. In response, water in Hanrahan's Creek was treated with lime and pumped back into the SFP early in the 2001 Dry season and plastic liners were placed over the transitional ore stockpiles (Redbank Copper Pty Ltd 2001). A bund wall diversion was constructed to prevent runoff waters entering the tailings dam.

In the 2001 Dry season pit water was pumped to the tailings dam for evaporation. Water levels in the SFP were reduced to 14.5m below surface level.

RCPL submitted the Sandy Flat Mine MMP in September 2001 (2001 MMP). The 2001 MMP included details on the intention to heap leach copper sulphate from the oxide ore stockpile remaining on site. The process would require the establishment of vat leach ore pads and evaporation ponds. RCPL proposed to leach the ore using the vat leach method, with vat leach dams to be constructed and lined with HDPE (high density poly ethylene). Dilute sulphuric acid would be applied to the stacked ore. Leach solution would be pumped to a pregnant liquor pond and from there pumped to the copper extraction plant. The heap and vat leach process was approved by the Department of Business, Industry and Resource Development (DBIRD) on 12 November 2001.

The 2001 MMP makes reference to:

- Site seepage, specifically: acid drainage had been liberated from the site by successive wet seasons and there had been a substantial flow of contaminants through a paleo-channel that underlies the whole site.
- Seepage had been occurring from the tailings dam for some time mainly through the tailings dam walls.
- Copper concentrations had been steadily increasing in the pit possibly because water being pumped from the pit had leached the tails and was recycling back to the pit.

- Seepage that had entered the paleochannel had expressed itself in the pool in Hanrahan's Creek directly downstream of the mine site.
- The formations underlying the whole site appeared to be remarkably permeable and the subterranean water flows appeared complex and unpredictable.

In September 2001 RCPL undertook remedial work in preparation for the upcoming Wet season. The work involved:

- excavating accumulated silt from the northern of flow drain to maintain depth;
- constructing a bund wall diversion at the east end of the tailings dam to prevent runoff waters entering the dam;
- clearing siltation and reinforced the south drain low flow collection area;
- increasing the width of the clean water channel south side, western end to prevent further erosion;
- constructing a vee drain to remove clean water which had previously pooled and seeped into the south drain low flow channel;
- preparing areas of waste dump for seeding; and
- continuing pumping water from the open pit to the tailings dam for evaporation.

7.12 2002

Average rainfall was experienced in the 2001/2002 Wet season and the containment of water on the mine site resulted in a subsequent improvement in downstream water quality early in 2002 compared to the previous year (Department of Mines and Energy – date unknown).

7.13 2003

A high rainfall event in January 2003 resulted in freeboard in the SFP being completely absorbed and a breach and overflow of the southern low flow channel. Water quality in Hanrahan's Creek deteriorated again. The breach was subsequently re-engineered as an emergency spillway.

7.14 2004

The Sandy Flat Mine Mining Management Plan 2004 (2004 MMP) for the treatment of stockpiled ore was submitted to DBIRD in April 2004. The 2004 MMP stated that:

- The site is essentially a small-scale operation involving treatment of a limited ore resource that was initially approved by DBIRD on 12 November 2001.
- A copper extraction process is now in operation following the construction and commissioning of a copper column, vat leach dams, production collection dams and associate infrastructure.

Prior to amendments to the *Water Act* in 2010, waste discharge licences were only issued under the *Water Act* where a Beneficial Use Declaration (BUD) was in place for the receiving waters. The BUD for Settlement Creek came into effect on 28 February 2003, enabling WDL 98 to be issued to Alameda Pty Ltd (as owners of RCPL) on 7 September 2004. WDL 98 was issued for a period of two years and expired 30 September 2006. WDL 98 authorised discharge of wastewater into Hanrahan's Creek.

The WDL required the implementation of environmental monitoring programs including biological, macro-invertebrate and surface water to improve understanding of the potential or real impacts of the wastewater discharge into the Settlement Creek system. It did not set discharge water quality criteria.

Surface water quality required monitoring of field parameters including pH, electrical conductivity and temperature. Metals tested included: lead, zinc, copper and cadmium. The WDL also required a full metal scan of SFP water prior to commencement of the Wet season to characterise the wastewater prior to discharge.

Active discharge from the SFP occurred in February 2004. The 2003/2004 and 2004/2005 Wet seasons again saw the SFP overflow (Earthsciences Pty Ltd 2007).

7.15 2005

RML took ownership of the mine site in 2005 and with it WDL responsibilities.

The Sandy Flat Mine MMP 2005 (2005 MMP) stated the immediate objective of further reducing production of AMD on site and movement off-site. Measures identified in the 2005 MMP included the processing of oxide ore in a copper cement production process and relocation of transitional ore onto HDPE. Closure planning outlined in the 2005 MMP was limited to works associated with the heap leach dams, tailings dam and plant areas.

An amount for general remediation of the mine site to be held as a security bond was calculated.

7.16 2006

In the 2005/2006 Wet season ‘abnormal’ climatic conditions resulted in the loss of 10’s of cubic metres of liquor from the settlement ponds. RML inspections found several holes in the liner of one of the settlement ponds. The amount of liquor lost via seepage to groundwater is unknown (Earthsciences Pty Ltd 2007).

WDL 98 required the licence holder to submit annual reports including an analysis and interpretation of monitoring data results. These reports were outstanding as of December 2006 and do not appear to have been provided to the regulator (the Department of Natural Resources, Environment and the Arts).

RML continued to operate under WDL 98 with consent from the regulator until the issue of a new WDL in 2009.

7.17 2007

Below average rainfall was experienced in the 2006/2007 and 2007/2008 Wet seasons and surface waters were contained on site. RML installed a resin column designed to extract 99% of the copper from water in the SFP for neutralisation using lime (Earthsciences Pty Ltd 2007). Engineering issues were experienced with the resin column prior to its operation and it is not clear from information reviewed whether it commenced operation and, if so, was effective in its operation.

7.18 2008

RML placed the mine site in care and maintenance in 2008 to return the site to an environmentally acceptable state, improve environmental conditions, undertake an aggressive exploration program and progress the environmental impact assessment of the proposed copper oxide operation (VDM Consulting, EcOz Environmental Services 2009b).

DME reports there are no specific requirements under the *Mining Management Act 2002* (MMA) for a mine in care and maintenance. The authorised operator under the MMA is

still required to manage the site “in an environmentally sound manner” and “to the standard and using the skill and resources that would be applied by a prudent mine operator”. This includes water management on the site.

RML submitted a Notice of Intent (NOI) on 24 April 2008, for the Expansion of the Redbank Copper Oxide Operations Project (“the project”) to the then Department of Natural Resources, Environment, the Arts and Sport (NRETAS) for consideration under the EA Act (Redbank Mines Limited 2008).

The proposal comprised the mining of 765 000 tonnes of oxide ore from three new open pits (Redbank, Azurite and Bluff) over three years, construction of two waste rock dumps, an oxide processing plant within the existing Sandy Flat site, and use of the existing TSF for oxide vat leach tailings. Approvals for the mine were anticipated in early 2010, with open pit mining scheduled to commence in the 2010 Dry season.

The project was determined to require assessment under the EA Act at the Environmental Impact Statement (EIS) level on 20 June 2008. The project was declared a controlled action under the EPBC Act by the Commonwealth Government in June 2008 due to its potential to have a significant impact on listed threatened species and communities. The project was assessed under the bilateral agreement between the Northern Territory and Australian Governments.

7.19 2009

In the 2008/2009 Wet season greater than average rainfall (approximately 800mm) was experienced and surface and groundwater water flows to Hanrahan’s Creek occurred.

There was no correspondence between RML and NRETAS between 2006 and 2009. NRETAS made contact with RML in February 2009 following receipt of a complaint regarding stormwater flow into Hanrahan’s Creek. NRETAS was informed by RML that the resin column and lime neutralisation water treatment process that had been installed was not working and RML were investigating other water treatment options.

RML applied for a new WDL in March 2009, proposing the treatment of SFP waters with lime prior to discharge. The intent was to discharge approximately 180ML prior to the Wet season to create sufficient capacity in the SFP to capture surface water from the coming Wet season. RML’s timeframe to commence discharge was not met as assessment of the WDL application required a number of further information requests. WDL 175 was issued on 20 November 2009 on an interim basis, expiring on 20 February 2010 and subsequently extended to 28 March 2010. This was to authorise discharge while enabling RML to gather sufficient data to inform a suitable monitoring program.

WDL 175 only allowed for discharge to occur when discharge waters achieved a pH between 6.5 and 8.0. Other conditions required RML to: implement surface water sampling, develop a groundwater monitoring and ecotoxicological plan, develop site specific trigger values for pH, electrical conductivity, sulphate and copper, undertake annual post Wet season macroinvertebrate sampling and produce an environmental risk assessment report.

WDL 175 incorporated voluntary environmental commitments from RML to: develop a surface water monitoring plan with the objective of characterising the nature and extent of offsite migration of contaminants from the mine lease area; develop options for wastewater treatment; investigate the potential for developing functional wetland systems to assist in the management of wastewater migrating off the site; installing telemetric monitoring; and investigate improved methodology for in-situ assessment of contaminants in surface waters.

There was no active discharge under WDL 175, although uncontrolled discharges occurred through seepage from the TSF, WRD and SFP. None of the requirements in WDL 175 for reporting or providing plans appear to have been met.

RML became Redbank Copper Limited (RCL) on 16 July 2009.

RCL submitted a variation notice under clause 14A of the EAA Procedures to alter the proposal to include the mining and processing of sulphidic ores, which would commence in 2012 (two years after intended commencement of oxide operations) in July 2009. EIS Guidelines were issued to RCL in September 2009 to reflect the amended proposal.

The draft EIS for the project was placed on public exhibition for 28 days on 31 October 2009. Comments received during the exhibition period were to be addressed in the EIS Supplement.

7.20 2010

Under its 2009 MMP RCL treated 255 550m^3 of contaminated water in a lime treatment process. Treated water was then pumped to the TSF between October 2009 and April 2010. This was to reduce water levels in the SFP to a level below the expression point into Hanrahan's Creek to prevent seepages and overflow from the SFP. RCL had commitments to investigate groundwater and the extent of the aquifer fed by the SFP. No active discharge occurred with the only water loss through evaporation and seepage. SFP levels did not reach the required level below Hanrahan's Creek, impacting on RCL's capacity to conduct the proposed investigations. RCL attributed this to a delay in receiving WDL 175 in 2009 (VDM Consulting, EcOz Environmental Services 2010b).

RCL submitted a second variation notice under clause 14A of the EAA Procedures to withdraw the mining and processing of sulphidic ores from the project scope on 29 January 2010. The amendment was requested due to the complex and time consuming studies required to meet the outstanding information requirements associated with assessment of the sulphidic operations.

In addition, RCL emphasised the need to generate income through its proposed oxide operations to fund identified outstanding information requirements of the EIS.

The EIS Supplement (addressing the mining and processing of oxide ores only) was submitted on 2 February 2010. A request for further information was sent to the proponent 18 February 2010. An additional report was supplied by the proponent on 10 March 2010.

Strategies outlined in the EIS to address legacy issues included the diversion of clean water away from the SFP and TSF, using a lime water treatment process to reduce the water in SFP to a level that would allow the pit to contain all inflows and avoid seepage through the paleochannel, and the remaining volume of legacy water to be utilised by the proposed oxide processing circuit.

The EIS contained conceptual decommissioning and rehabilitation plans. It committed RCL to the development of a detailed mine closure plan as an evolving process that identified progressive rehabilitation and rehabilitation trials intended to commence in 2010. The EIS cited the benefits of progressive rehabilitation throughout the life of the project, including the role of progressive rehabilitation in alleviating environmental impacts associated with the risk of sudden closure.

The then Minister for Natural Resources, Environment and Heritage issued Assessment Report 63A to the NT Minister for Primary Industries, Fisheries and Resources, and the Commonwealth Minister for Environment Protection, Heritage and the Arts on 12 April 2010 (Department of Natural Resources, Environment, the Arts and Sport 2010). The

Assessment Report addressed the proposed oxide operations, with the sulphidic operations to be subject to a separate assessment process.

Assessment Report 63A concluded that:

> *the level of information provided in the EIS and quality of responses to the request for further information were not sufficient to enable a comprehensive assessment of the proposal. While the documentation provided commits Redbank to minimising environmental harm and remediate where necessary, the capacity to fulfil these commitments was not demonstrated. This has significantly increased the risk setting of the project.*

It was determined that significant uncertainties associated with the proposal remained at the end of the environmental impact assessment process, specifically:

- Characterisation, mitigation and management of existing legacy environmental issues and contamination sources;
- Management of the existing tailings storage facility with respect to preventing seepage issues and meeting closure requirements;
- Characterisation of legacy groundwater and surface water contamination;
- Management of impacts on groundwater levels and quality;
- Increased risks and management issues for site surface water management;
- Prevention or minimisation of acid and metalliferous drainage into the environment, including management of waste rock and tailings; and
- Protection of flora and fauna in an area listed as a Site of Conservation Significance EPBC Act listed species.

Assessment Report 63A made 39 recommendations to address these issues. These can be broadly categorised as recommendations on the mining and processing of oxide ores, legacy contamination, and investigations required prior to assessment of the proposed sulphide operation.

The environmental impact assessment process for the project was completed on the condition that environmental performance measures to address outstanding information gaps from the EIS would be addressed through the mining approval process via inclusion in Mining Management Plans and Water Management Plans.

RCL accepted that commencing the project would attract a level of residual risk due to the absence of studies and a lack of information provided in the assessment.

Assessment Report 63A acknowledged RCL's position that its investment into addressing legacy issues and future management of the site could only continue and increase when the site was providing an economic return. The assessment of the project was split in two (oxide and sulphide) to allow the oxide operations to commence and produce an economic return.

Assessment Report 63A stated that the environmental situation at Redbank was unacceptable but recognised that remediation works to repair the situation would require the support of a profitable and operating mine. Assessment Report 63A stated that 'during the mining of oxides it is imperative that the legacy issues are further investigated and addressed in the short term to ensure a desirable outcome for all stakeholders'.

An MMP and WMP for the Redbank Mine site were approved by DME in 2010 after Assessment Report 63A had been issued. The 2010 MMP reflects that the mine

remained under care and maintenance while approvals under the EPBC Act were being sought, and therefore does not substantially respond to the recommendations in Assessment Report 63A (VDM Consulting, EcOz Environmental Services 2010a). The 2010 WMP acknowledges the issue of Assessment Report 63A, but states that the majority of the recommendations in Assessment Report 63A relate to an operational MMP and WMP that will require approval prior to mining operations re-commencing (VDM Consulting, EcOz Environmental Services 2010b). New mining operations were still intended for 2011.

RCL's focus until it received EPBC Act approval was stated in the 2010 MMP as resource definition, mine planning, completing approvals, environmental compliance and monitoring and partial dewatering of the SFP.

The 2010 MMP proposed 'hydrogeological testing and pit dewatering to manageable levels this year to minimise ground water seepage and give Redbank a comprehensive understanding of water movements. Both surface water and ground water information will be used to better manage water movements and flows to prevent further contamination of the surrounding waterways.' Pit dewatering involved active and enhanced evaporation.

RCL stated that water management and treatment procedures since November 2009 ensured significant reductions in seepages and runoffs, particularly over the 2009/2010 Wet season. The 2010 WMP stated that monitoring in Hanrahan's Creek observed a substantial improvement in water quality compared to previous years, although monitoring data were not provided in the WMP to support this statement (VDM Consulting, EcOz Environmental Services 2010).

The 2010 WMP stated that continued dewatering of the pit is still a major part of the contingency planning for 2010: '[o]ngoing management will ensure that no future breaches of the SFP will result in surface flows of contained water entering natural water systems. Groundwater expression will also be greatly reduced as a result of the contingency activity on site.'

RCL submitted two applications for a new WDL in November 2010. The first application sought authorisation for the uncontrolled release of seepage from the southern low flow drain that collects seepage from the TSF and WRD which was to be engineered to provide an emergency overflow in extreme events. The licence application stated that 'long term measures to prevent seepages to Hanrahan's Creek are currently under investigation'. The second application sought authorisation for the active discharge of treated water, proposing treatment of the SFP waters with limestone and lime as a contingency should it be required to avoid surface water flows from the SFP.

In the second half of 2010 RCL decided that the three-year life oxide project was too short and carried an unacceptable risk for finance. The oxide project was suspended (Redbank Copper Limited 2011).

7.21 2011

WDL 175-1 was issued on 22 June 2011 to authorise the discharge of waste water from seepage from the southern low flow drain and active discharge from the SFP. The objectives of the licence were to:

- investigate biological impacts of the discharges from the Redbank Copper Mine along a concentration gradient of Hanrahan's, Echo and Settlement Creeks using appropriate biological, ecotoxicological and field water quality data;
- identify through ecotoxicological testing, the key toxicant(s) in the discharge waters from the Redbank Copper Mine; and

- develop site specific trigger values as a baseline against which future improved environmental performance could be measures.

WDL 175-1 contained qualitative discharge limits, including a requirement that discharged waste water must not cause mortality of fish or other aquatic organisms. The licence did not set quantitative discharge water quality limits other than setting a range for pH (5.6 – 8.5).

More stringent reporting requirements were included in WDL 175-1. WDL 175-1 required quarterly monitoring reports, annual reports including a progress report on the derivation of site specific trigger values, biological and sediment monitoring, and a Licence Report at the end of the licence period detailing the derived site specific trigger values including key toxicants, assessment of sediment quality, a detailed interpretation of biological impacts of mine discharges and a site conceptual model.

RCL made a voluntary commitment to provide NRETAS with final remediation measures to improve management of contaminant discharges off the site in surface and ground water.

The primary water management approach was evaporation through sprinklers around the SFP and pumping water to the TSF. RCL aimed to reduce and maintain SFP water levels over 2010/2011 and 2011/2012 to 380ML (below 163.5 mAHD) to reduce flows through the paleochannel, however seepage continued to occur from the SFP into Hanrahan's Creek.

Surface and ground water monitoring programs expanded over the 2008 – 2011 period, but there were issues associated with environmental monitoring bores and the frequency of monitoring and reporting. Groundwater monitoring bores constructed as part of the EIS were not constructed to minimum construction requirements. Water monitoring was not conducted at the frequency committed to in the WMPs.

DME issued directions under the MMA to RCL in 2010 and 2011 regarding the appropriate construction of groundwater bores and the provision of reports on water management. In its correspondence of 25 May 2011, DME advised RCL that a failure to comply with the directions of a Mining Officer is an offence under the MMA.

A delegate of the Commonwealth Environment Minister approved the Expansion of Redbank Copper Oxide Operations project with conditions on 2 May 2011 (Department of Sustainability, Environment, Water, Population and Communities 2011). The approval has effect until 31 May 2018. It places a number of conditions on RCL relating to contaminated wastewater at the site:

- a requirement to develop an Acid and Metalliferous Contamination Management Plan, for approval by the Minister prior to commencement of the action;
- implementation of the Acid and Metalliferous Contamination Management Plan once approved;
- a requirement to develop a Water Quality Monitoring Plan, for approval by the Minister prior to the commencement of the action;
- implementation of the Water Quality Monitoring Plan once approved; and
- a requirement for an independent environmental audit to be undertaken 12 months from the date of commencement of the action, with the auditor and the audit criteria to be approved by DSEWPAC prior to the audit. Audit criteria must include assessment of the following:
    - waste rock disposal;

- processing of ore;
- tailings disposal;
- surface and groundwater management;
- rehabilitation and decommissioning plans for existing and proposed infrastructure; and
- compliance with approved management plans as required under other conditions of the approval.

As the proposed copper oxide mining operation has not commenced, these conditions are yet to be met by RCL.

RCL's report to the Australian Stock Exchange (ASX) noted receipt of DSEWPAC approval and the requirement for an updated MMP prior to oxide production (Redbank Copper Limited 2011).

7.22 2012

WDL175-1 expired on 30 December 2012. The only active water management over the licence period involved pumping of water from the SFP to the TSF to maximise evaporation. This had little benefit, with ongoing seepage from the SFP into Hanrahan's Creek.

In August 2012 the NT EPA alerted RCL that a number of reports under WDL175-1 were outstanding.

Water monitoring by RCL ceased in April 2012 when funding ran out. No WDL reports were received during the licence period.

No Waste Discharge Licence application was received for the 2012-2013 Wet season.

DME conducted a site assessment on 10 October 2012. This was followed by a site visit in November 2012 when extensive water sampling was undertaken along Hanrahan's Creek to the Queensland border.

DME instructed RCL to provide an updated Mining Management Plan, including a Water Management Plan, by 13 September 2013. DME directed RCL under the MMA to undertake a range of measures, including the development of a long-term Remediation Plan in the form of an amended MMP, and a revised WMP, on 29 November 2012. The Remediation Plan is to include measures to improve the quality of water leaving the site to ANZECC 80% species protection levels.

RCL reported the following to the ASX: 'compliance with the environmental obligations is monitored by the Board of Directors. No environmental breaches have been notified to the Company by any government agency during the financial year ended 30 June 2012' (Redbank Copper Limited 2012).

7.23 2013

RCL completed a process of restructuring and refinancing in the first half of 2013. RCL raised $8.23 million through this process. RCL announced on 14 May 2013 that it held $3.9 million in cash after paying off debts totalling $4.3 million (Redbank Copper Limited 2013c).

RCL has advised that it is preparing to embark on an aggressive exploration campaign that aims to double the defined Joint Ore Reserves Committee (JORC) resource (6.24Mt at 1.5% copper for 96 500 tonnes of contained copper) through an increase in both tonnes and grade to pave the way for the start of mining, production and cashflow

(Redbank Copper Limited 2013c). The exploration program is expected to be conducted over the next two to three years (Redbank Copper Limited 2013b).

Media reporting states that RCL will use some of the capital raised to help fix the environmental problems at the Redbank Mine site (ABC 18 September 2013). The extent of RCL's financial commitment to managing and remediating environmental issues is unclear.

No active discharge from the site occurred during the 2012-2013 Wet season. Water monitoring results from the Hanrahan's Creek area by DME from early in 2013 indicate contaminated water was leaving the mine site via groundwater seepage.

The NT EPA formally notified RCL in February 2013 that a failure to report against licence conditions may be considered a breach of WDL175-1 and an offence against the *Water Act*.

RCL again reported the following to the ASX: '[c]ompliance with the environmental obligations is monitored by the Board of Directors. No environmental breaches have been notified to the Company by any government agency during the financial year ended 30 June 2013' (Redbank Copper Limited 2013a).

RCL submitted WDL 175-1 annual reports for the 2011 and 2012 reporting years in July 2013. The WDL175-1 Licence Report was submitted to the NT EPA in October 2013, addressing the remaining outstanding reporting requirements associated with the WDL. The Licensing Report included a report assessing downstream impacts on freshwater macroinvertebrate communities based on annual sampling between 2008 and 2012.

Further site visits have been undertaken by DME in 2013. DME conducted water sampling in March 2013 and sediment sampling in late July / early August 2013.

RCL submitted an updated MMP and WMP to DME in September 2013 that includes RCL's response to the DME direction of 29 November 2012. The documents are currently under review.

RCL maintains that the current level of knowledge of the contamination sources and pathways is inadequate to develop a detailed site remediation plan and has proposed the following to inform a remediation plan: geochemical assessment to better understand the sources and extent of site contamination; hydrogeological and surface hydrology assessment to address knowledge gaps and assess the effectiveness of the current surface water diversion; a remediation materials assessment to inform construction of cover systems; and investigate appropriate off-site disposal locations.

Some of these investigations have been committed to in past MMPs and WMPs and relate to recommendations in Assessment Report 63A: recommendation 9 (strategies to investigate and remediate the WRD); recommendations 11 and 12 (investigate leakage from the TSF) recommendation 19 (demonstrate a thorough understanding of the existing sources of contamination).

A site visit was attended by Traditional Owners, the Minister for Mines and Energy, officials from DME and the Northern Land Council and the Chair of the NTEPA on 16 September 2013. The Minister for Mines and Energy, the Hon Willem Westra Van Holthe MLA committed some of the money raised by the Legacy mines levy to rehabilitation works at Redbank and a transparent process in formulating plans to rehabilitate the site. A Redbank Working Group has been established with representation from traditional owners, the Northern Land Council (NLC), Wollogorang Station, RCL, DME, NT EPA and AAPA.

RCL has decided not to treat contaminated SFP water prior to the 2013/2014 Wet season due to prohibitive costs and the view that treatment would not deliver any long-

term benefit. RCL is considering third party proposals to recover copper from the SFP, treat water for discharge to 80% ANZECC Guideline levels and review the recovery of copper from in situ stockpiles.

On 4 December 2013 RCL submitted a Waste Discharge Licence Application to the NT EPA. The purpose of the application was to authorise the passive discharge of contaminated waste water from the site.

The NT EPA granted WDL175-2 to Redbank Operations Pty Ltd, a subsidiary of RCL, on 23 December 2013. The licence authorises waste water discharge from the Redbank Mine site to Hanrahan's Creek. The licence was prepared with the understanding that little can be done in the short-term to improve the quality of ground and surface water leaving the site, particularly over the 2013-14 Wet season. The main focus of WDL175-2 is to maintain a practical level of off-site environmental monitoring while requiring Redbank Operations Pty Ltd to develop and implement a site remediation plan that will achieve an ANZECC 80% species level of protection at a nominated monitoring point downstream of the Redbank Mine site. This requirement aligns with the direction from DME in 2012. Redbank Operations Pty Ltd is required to make the remediation plan and licence reports available to the public on its website following submission to the NT EPA.

8 Discussion

It is evident that acidic metal-laden waters from the Redbank Mine site have significantly impacted Hanrahan's Creek and connected downstream waterways through a combination of direct surface water discharge in periods of relatively high rainfall and indirect ground water seepage.

These legacy issues have occurred largely as a result of operations by previous owners of the Sandy Flat site. The Sandy Flat project was considered to be short term and small scale with limited potential for long term environmental problems. A failure to appropriately consider and manage environmental risks resulted in a poorly constructed tailings dam and other inadequate infrastructure.

The mine was not economically viable and went into care and maintenance without appropriate management of the environmental risks posed by the site. The limited remediation strategy at the time of installing stormwater containment devices was based on the prospect of future mining at the site, a prospect that has been maintained by subsequent operators. Small scale activities on the Redbank Mine site since have had little impact in mitigating off-site contamination and the security held is not sufficient to address the environmental issues at the site.

DME's rehabilitation security policy and the establishment of a Mining Remediation Fund are important measures in addressing the risks associated with inadequate mine closure and legacy sites. The security policy provides an incentive to operators to appropriately manage a site and ensure closure to an acceptable level, but it is not effective for legacy sites such as Redbank where the existing security is inadequate and there is no guarantee of a future mining approval on which to base a new security calculation. It is in the best interests of government, industry and the community to prevent the occurrence of situations such as that at the Redbank Mine.

A number of actions and behaviours have combined to result in the situation observed at Redbank today.

8.1 Environmental impact assessment

Inadequate information

In both the 1993 and 2010 environmental assessment processes, the respective companies were able to conduct environmental impact assessment processes that failed

to provide sufficient information to enable an adequate assessment of respective project risks. In both cases significant outstanding matters from the assessment were carried over to the mining approvals stage, to be addressed in management plans approved by DME.

For the 1993 assessment, key environmental risks associated with tailings dam construction, waste rock management and water control infrastructure were identified but not adequately responded to in the assessment. The failure to effectively address these risks during the project assessment phase contributed to the offsite contamination that has occurred from the site.

The 2010 assessment concluded that the information provided in the EIS was not sufficient to enable a comprehensive assessment of the proposal. Uncertainties remained with the management of legacy contamination, ground and surface water, the tailings facility and waste rock; the same broad issues that had not been addressed during, or as a result of, the 1993 assessment. The 2010 assessment was completed on the expectation that these uncertainties would be addressed through the mining approval process, with some recommendations to be met while the mine was operating and generating an income. The project has not progressed to mining approvals and this information is largely outstanding.

Inadequate information during an assessment process makes it difficult to rigorously assess risks and make appropriate, targeted recommendations to address them. It does not allow for public scrutiny of information during the assessment process, and places significant pressure on the responsible Minister and his or her agency to appropriately deal with unresolved issues through mining approvals.

Project scheduling

Assessment Report 63A was prepared based on an expectation that mining would commence once MMA and EPBC Act approvals were granted. It anticipated the generation of income to address further studies and site remediation works within the short term and made conclusions on acceptability of the project based on this assumption. EPBC approval was granted in 2011, yet the site remains in care and maintenance without any real likelihood of mining commencing unless additional reserves are established in the vicinity of the site.

The EIS identified the risk of sudden closure, stating that progressive rehabilitation activities and planning by the operator could significantly alleviate the environmental impacts of such an event.

Assessment of the project did not consider the environmental risks associated with the project not proceeding as scheduled, or not proceeding at all. As a consequence commitments and recommendations addressing existing environmental concerns, including the proposed integration of decommissioning and rehabilitation plans into ongoing operations, have not been progressed.

8.2 Environmental regulation

Compliance with mining approvals

The recent history of the Redbank Mine reveals the continuing failure of mining companies to meet the requirements of mining approvals.

RCPL failed to provide an acceptable EMP to DME within the required timeframe (on commissioning of the oxide processing plant in 1994), and it wasn't until five months before operations at the Redbank Mine ceased in 1996 that an EMP was able to be approved by DME, albeit conditionally. Environmental monitoring did not commence until after operations commenced.

Since then there have been repeated failures to meet environmental monitoring and reporting requirements and to respond to Mining Officer directions. A lack of financial capacity has often been cited as contributing to non-compliance.

Public reporting on compliance

Public reporting on compliance with approvals has been either non-existent or of questionable accuracy. Public reporting is essential for transparency to the market and interested parties and can increase the accountability of industry and regulators.

RCL's annual reporting to the ASX on environmental compliance has been limited.

Until recent amendments to the MMA there has been no requirement on mining companies to report publically on compliance with environmental approvals. The MMA now enables the Minister to require an operator to make an environmental mining report available to the public. The intention is that the reporting requirement will be applied to mining operations with high environmental risk.

Since 2012 the NT EPA and its predecessor NRETAS has required companies holding a waste discharge licence to submit an annual audit and compliance report. The report is a company's self-assessment of compliance with its licence. The report is audited by NT EPA officers for accuracy. WDL compliance reports are intended to be made publically available on the NT EPA website, however this practice has not been consistently implemented.

Regulators

The regulatory framework has failed to effectively manage environmental impacts at the Redbank site.

Mining was allowed to commence and continue prior to an approved EMP. This may have been a more acceptable practice under the regulatory regime at the time, but it is a key contributing factor to the current issues at Redbank and demonstrates the risks involved in relying on a weak approvals system to resolve issues outstanding from an inadequate environmental assessment.

Mining regulation has changed since mining commenced at Redbank with the introduction of the MMA in 2002 (refer Appendix B). Under the MMA an application for authorisation to mine must be accompanied by an MMP for approval.

Since mining commenced at Redbank there has been sporadic oversight from regulators and a failure to hold operators to account for violations of approval conditions, regardless of the legislation that has applied.

Regulation of the Redbank Mine site has not received the attention it requires. It has suffered due to its distance from Darwin and the fact that it has not been an active mining operation for many years. This situation has changed recently, with a significant increase in focus from DME on the Redbank Mine site commencing with the site visit in October 2012.

MMPs for care and maintenance have done little to fix problems at the site. Despite recommendations in Assessment Report 63A and commitments in various MMPs and WMPs, investigations into hydrogeology, contamination sources and surface and ground water flows necessary to inform site management or rehabilitation have either not proceeded or require further effort. This is exacerbated by a lack of confidence in the groundwater monitoring data provided by the operator.

The inability of operators to develop a financially viable operating model has left the Government with the choice between bearing the full cost of managing the Redbank

Mine site or working with an existing operator to progress limited options. Choosing the latter option, it appears that regulators have recognised the difficulties faced by operators who have little financial capacity to fix environmental problems and have therefore "cut some slack" for the operator on the basis of commitments made, or actively assisted operators either financially or in-kind.

Government agencies may have been challenged by the tension that can exist between supporting development and ensuring appropriate environmental management, and agencies have operated with little strategic guidance on how best to achieve an appropriate economic and environmental balance.

Regardless of these explanations, the reality is that the framework for mining approvals that has applied to the site, including the MMA designed to provide improved environmental regulation on mine sites, has failed to correct continuing approval violations and effectively address environmental risks.

No enforcement action has been taken against RCL or previous operators for environmental harm or breaches of approvals, other than a fine imposed on RCL for late submission of a security application in 2013. The NT EPA acknowledges the argument that imposing financial penalties on companies with limited financial capacity may ultimately be counter-productive to scarce resources being spent on environmental improvements. It is apparent, however, that the strategies employed by regulators of the Redbank Mine have failed to ensure compliance. Regulators do not appear to have been given clear guidance on when enforcement decisions ought to be considered.

The NT EPA endorsed its Compliance and Enforcement Policy in 2013. The policy aims to ensure a transparent and targeted approach to compliance and enforcement and provides an overarching policy statement and principles to inform decision-making. No publicly available policy exists for regulation of mine sites under the MMA.

Similarly, application of the *Water Act* has failed to address the environmental issues at the site. Waste discharge licence objectives were well-intentioned in seeking an improved understanding of impacts, monitoring of the receiving waters, and investigation of options for water treatment to support continuous improvement against a baseline. These objectives have not been achieved due to a lack of compliance by the licence holders. The level of oversight from the regulator once licences had been issued was low, and may have contributed to the poor compliance.

Enforcement capacity under the *Water Act* for breach of licence conditions is limited to the prosecution of an offence. There is no capacity to issue infringements. This deters enforcement action for minor breaches of licence conditions and limits the capacity of the regulator to pursue compliance.

Project viability and financial capacity

Companies with insufficient resources to appropriately manage the Redbank Mine site and inadequately defined mineral resources to procure investment have been able to gain approvals to operate the site.

Past and current emphasis has been on exploration to sure up a resource to enable investment and mining to provide funds to deal with legacy issues. While this objective has been pursued with regulators providing relief from immediate remediation objectives, the legacy issues have remained and the site has not been appropriately managed, or has been managed in a way that has exacerbated existing issues (e.g. poorly documented mitigation measures such as the use of the tailings dam for evaporation has caused additional environmental impact).

Due diligence and disclosure

There have been a number of companies responsible for the Redbank Mine site since environmental issues were first identified. Management of the site has suffered from a lack of continuity and long term planning.

The transfer of legacy mine Mineral Leases from one company to another has occurred in the absence of appropriate procedures for considering financial capacity and mineral resource assessment.

There appears to have been a lack of due diligence by operators in gaining the information required to make an informed decision to take ownership of the site. Statements in the media from the current operators suggest that the RCL Board did not have a clear understanding of the site and extent of environmental concerns prior to taking over operations, and cast doubts over the management of the site by the previous operator (Jones 2013). The full extent of knowledge of the RCL Board is unknown, and it seems inexcusable that the current RCL Board would not more fully inform itself given the clear coverage of environmental issues facing the site that is documented in the 2010 EIS and Assessment Report 63A when RCL was already in place.

As identified above, there has been limited public disclosure from companies on environmental issues and compliance.

Due diligence and disclosure in the transfer of mineral leases for legacy sites, or the purchase of a company authorised to mine a site by another company, is primarily the responsibility of the companies involved. Yet for sites such as Redbank, it is the NT Government and the community that potentially bear the cost of making good the environmental damage that has occurred. There is a legitimate role for the NT Government to play in ensuring that the transfer of titles occurs with full knowledge of site conditions and associated environmental risks. Security bond requirements and their transfer with title will assist, but only when an adequate security bond is in place which is not the case for Redbank. It is far more preferable to ensure environmental risks are appropriately understood and managed and rehabilitation is completed by mine operators than for Government to rely on a security to undertake necessary works.

The ASX Corporate Governance Council (ASX CGC) issues Corporate Governance Principles and Recommendations that set out recommended corporate governance practices for companies listed on the ASX that ‘are likely to achieve good governance outcomes and meet the reasonable expectations of most investors in most situations’ (ASX Corporate Governance Council 2013). The Principles and Recommendations are not mandatory, but if a company decides not to follow a recommendation, it should explain why in its corporate governance statement.

In 2013 the ASX CGC released a new edition of the Corporate Governance Principles and Recommendations for consultation. One revision in the draft edition aims to address increasing attention being given by the investment community to environmental and social issues and the investment risks they raise. The revision requires a listed entity to disclose whether, and if so how, it has regard to economic, environmental and social sustainability risks. This requires a company to establish a risk management framework to identify and address all material risks and review the framework at least annually.

This proposal from the ASX CGC is welcome, but due to its voluntary nature will not ensure that environmental (and other) risks receive appropriate consideration. Nor does it ensure full disclosure of the management of environmental risks and compliance with approvals.

9 Conclusion

By reviewing the history of the Redbank Mine, this report provides an insight into the environmental, economic and regulatory causes of the current situation at the Redbank Mine.

The failure of mine operators to appropriately assess and manage environmental risks, including a failure to meet the requirements of regulatory approvals, is the primary cause of the environmental impacts downstream of the mine site. The regulatory system of the time allowed mining to commence prior to an approved EMP and despite regulatory changes and improvements since then, regulators have not managed to hold operators to account or effectively address environmental risks. Financial constraints and a lack of transparency, and therefore accountability, to the public and the market have been identified as contributing factors.

This case study will inform separate advice from the NT EPA to the Minister on measures identified by the NT EPA and other agencies that could reduce the risk of future instances of inadequate management of mine operations, mine closure and the appropriate management of legacy mine sites.

References

Australian Stock Exchange Corporate Governance Council 2013, Review of the Corporate Governance Principles and Recommendations – Public Consultation', 16 August 2013

Australian and New Zealand Environment Conservation Council 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, National Water Quality Management Strategy

Department of the Environment, Water, Heritage and the Arts Supervising Scientist 2008, *An assessment of the effects of mine waste waters arising from the Redbank copper mine on downstream macro invertebrate communities, March 2008 for Redbank Mines Ltd*

Department of Mines and Energy (date unknown), Case Study Information for Team NT Technologies Sandy Flat (Redbank) Mine, DRAFT Unpublished

http://www.redbankcopper.com.au/projects-and-resources/redbank-copper-project.html

Department of Mines and Energy 1993, *Sandy Flat Copper Mine Environmental Assessment Report and Recommendations*, Department of Mines and Energy Environment Division, Darwin, Northern Territory.

Department of Mines and Energy 1999, 'Sandy Flat Copper Mine – Investigation of a complaint and follow-up actions', Internal Report (Environmental)

Department of Mines and Energy 2001, Memorandum - Sandy Flat MMP 010918 Comments on Draft.

Department of Mines and Energy 2011, 'Redbank Mine Water Quality Report: Reporting Period: July 2008 – January 201', February 2011. DRAFT

Department of Natural Resources, Environment, the Arts and Sport 2010, 'Assessment Report 63A – Expansion of the Redbank Copper Oxide Operations – Redbank Copper Limited'

Department of Sustainability, Environment, Water, Population and Communities 2011, 'Approval – Redbank Mines Expansion of Copper Oxide Leaching Operations, Savannah Way via Borroloola (EPBC 2008/4260), 2 May 2011', <http://www.environment.gov.au/cgi-bin/epbc/epbc_ap.pl?name=current_referral_detail&proposal_id=4260> accessed 14 March 2013

Earthsciences Pty Ltd 2007, Redbank Copper Operations Water Management Report for the 12 months to March 2007

EcOz Environmental Services 2013a, Redbank Macroinvertebrate Monitoring 2008-12 – Redbank Sandy Flat Mine

EcOz Environmental Services 2013b, Redbank WDL175-1 Annual Return 2012 – Redbank Operations Limited

Harrison, L., McGuire, L., Ward, S., Fisher, A., Pavey, C., Fegan, M. and Lynch, B. 2009, An inventory of sites of international and national significance for biodiversity values in the Northern Territory. Department of Natural Resources, Environment, The Arts and Sport, Darwin, NT

Humphrey C, Fox G, Chandler L, Brazier J, Camilleri C and Hanley J 2008, 'An assessment of the downstream effects of mine wastewaters arising from the Redbank

copper mine on downstream macroinvertebrate communities, March 2008', Australian Government Department of Environment, Water, Heritage and the Arts (Supervising Scientist Division report to Redbank Mines Ltd

Jones R 2013, 'Indigenous leaders want government help to stop copper sulphide leaks at Redbank mine', Australian Broadcasting Commission, 18 September 2013, <http://www.abc.net.au/news/2013-09-18/redbank-copper-legacy-mine-problems-feature-story-ruby-jones/4965356?&section=news> accessed 19 September 2013

Padovan A 1999, 'Final Report on the Inspection of Redbank Copper Mine (Wollogorang Station) and its Effect on the Local Creek Systems', Resource Management Branch, Natural Resources Division, Department of Lands, Planning and Environment. Unpublished

Productivity Commission 2013, *Major Project Development Assessment Processes*, Research Report, Canberra

Redbank Copper Pty Ltd 1994, 'Environmental Management Plan Sandy Flat Operations – September 1994'

Redbank Copper Pty Ltd 1995, 'Revised Environmental Management Plan – October 1995'

Redbank Copper Pty Ltd 1996, 'Sandy Flat Environmental Management Plan – March 1996'

Redbank Copper Pty Ltd 1999, 'Sandy Flat Mine: Environmental Controls'

Redbank Copper Pty Ltd, 2001, 'Remedial Works 2001', Author Unknown

Redbank Copper Limited 2011, Annual Report, <http://www.redbankcopper.com.au/investors-and-media/announcements.html> accessed 4 October 2013

Redbank Copper Limited 2012, 2012 Annual Report, <http://www.redbankcopper.com.au/investors-and-media/announcements.html> accessed 4 October 2013

Redbank Copper Limited 2013a, Annual Report for the year ended 30 June 2013, <http://www.redbankcopper.com.au/investors-and-media/announcements.html> accessed 4 October 2013

Redbank Copper Limited 2013b, 'Quarterly Activities Report for the Quarter ending 30 June 2013, <http://www.redbankcopper.com.au/investors-and-media/announcements.htm> accessed 4 October 2013

Redbank Copper Ltd 2013c, 'Restructured Redbank poised to embark on resource growth strategy after completing $8.2m raising', <http://www.redbankcopper.com.au/investors-and-media/announcements.htm> accessed 4 October 2013

Redbank Copper Limited 2013d, *Sandy Flat Mine Care and Maintenance and Remediation MMP for MLN's 631, 632, 633, 636 and 1108*, 27 September 2013

Redbank Mines Limited 2008, 'Notice of Intent - Expansion of Redbank Oxide Copper Leaching Operations'

VDM Consulting, EcOz Environmental Services 2009a, *Redbank Copper Limited. Draft Environmental Impact Statement, Expansion of Redbank Copper Operations, Volume One: Main Report*

VDM Consulting, EcOz Environmental Services 2009b, *Redbank Mine, Mining Management Plan*, Authorisation Number 0301-02, Prepared for Redbank Copper Ltd

VDM Consulting, EcOz Environmental Services 2010a, 'Redbank Mine, Mining Management Plan, Continuing Care and Maintenance', (DW100401)

VDM Consulting, EcOz Environmental Services 2010b, 'Redbank Mine, Water Management Plan, Continuing Care and Maintenance' (DW100400)

Appendix A: Relevant current legislation

Environmental Assessment Act

The EA Act and its subordinate EAA Procedures establish the framework for the assessment of potential or anticipated environmental impacts of development. The object of the EA Act is to ensure that matters affecting the environment to a significant extent are fully examined and taken into account in decisions by the NT Government.

The scale and complexity of a proposed development, and the significance of potential impacts will determine if assessment is at the level of a Public Environmental Report (PER) or Environmental Impact Statement (EIS). In addition to assessing the potential impacts, the assessment process evaluates the effectiveness of proposed safeguards to mitigate impacts and recommends actions to ensure the construction and operational phases of a project can be managed in an environmentally sound manner.

Assessment at the PER or EIS level culminates in an assessment report being issued by the NT EPA to the Minister for Lands, Planning and the Environment, who provides the assessment report to the minister responsible for authorising the proposed development. The assessment report provides recommendations to inform the authorisation, it does not grant an environmental approval.

The NT EPA is responsible for administering the environmental assessment process in the NT. Prior to the establishment of the NT EPA, this responsibility was held by Northern Territory Government environment department's under various names.

Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and other matters defined in the EPBC Act as matters of national environmental significance.

Proposals that are likely to have a significant impact on matters of national environmental significance require assessment and authorisation under the EPBC Act.

A bilateral agreement has been in place between the Commonwealth and Northern Territory Governments since 2002 that accredits the Northern Territory environmental assessment process for matters of national environmental significance. In practice this means that a proposal that requires assessment under the EA Act and the EPBC Act is assessed by the NT under the EA Act. The assessment report from that assessment is issued to the Commonwealth Environment Minister to inform his or her approval of the project.

Mining Management Act

The *Mining Management Act* (MMA) commenced in 2002, replacing the *Mine Management Act*. It is administered by DME. It provides for the authorisation and appropriate management of mining activities in the Northern Territory. An authorisation is required for activities that will result in substantial disturbance of the ground, as defined in section 35(3) of the MMA. Authorisations are granted to the operator of a mining site.

The obligations of an operator of a mining site are established by section 16 of the MMA. An operator must ensure that the environmental impact of mining activities is limited to what is necessary for the establishment, operation and closure of the site. An operator must establish, implement and maintain an appropriate environment protection management system for the site (section 16(2)(c)); provide adequate resources for the implementation and maintenance of the management system (section 16(2)(d)); and

ensure, by regular assessment, that the management system operates effectively (section 16(2)(e)).

An application for an authorisation requires the submission of a Mining Management Plan (MMP) for approval. At intervals specified in the Mining Authorisation the operator must review and, if necessary, amend the MMP and submit it to the Minister for approval.

The primary purpose of the MMP is to formalise the actions to be taken and strategies to be implemented, that combined, will manage impacts to the environment to acceptable and sustainable limits over both the short and long-term (DME 2013). This is achieved by operators demonstrating that they fully understand the physical and social environment that they will be operating in and have clearly identified and understood all potential risks posed by their operation through a robust risk assessment process.

The MMP is also required to include, where relevant, surface and groundwater management information in a Water Management Plan (WMP), and waste rock characterisation.

Section 43 of the MMA enables the Minister to require a security as a condition of authorisation. A security is required for any of the following:

- an operator's obligation to comply with the MMA or an authorisation;
- payment of costs and expenses in relation to the Minister causing an action to prevent, minimise or rectify environmental harm, or to complete rehabilitation of a mining site.

In 2006 the Department of Primary Industry, Fisheries and Mines introduced the policy that a 100% security for mine site rehabilitation would be applied to all authorisations granted under the MMA.

The MMA was amended in 2013 to introduce an annual 1% levy on mining securities to generate revenue to address legacy mine issues. The revenue generated will support the establishment of a Mining Remediation Fund to be used to reduce the level of impact mining sites have on the environment. The amendments commenced on 1 October 2013.

Water Act

Section 16 of the *Water Act* prohibits a person to cause, directly or indirectly, waste to come into contact with water or water to be polluted unless it is authorised under the *Water Act* or any other law in force in the Territory.

Section 74 of the *Water Act* enables the Controller of Water Resources or his or her delegate to grant a waste discharge licence (WDL) to carry out an action that would otherwise be an offence against the *Water Act*. A WDL authorises waste to come into contact with water or water to be polluted, and enables the regulation of such pollution.

Section 16 of the *Water Act* does not apply where waste comes into contact with water, or water is polluted, as a result of a mining activity if the waste or polluted water is confined within the mining site. If the waste or polluted water is not confined to the mining site, authorisation is required under the *Water Act*.

Appendix B: AAPA Certificate

ABORIGINAL AREAS PROTECTION AUTHORITY
AUTHORITY CERTIFICATE

Issued in accordance with Section 22 of the Northern Territory Aboriginal Sacred Sites Act 1989.

REFERENCE: D89/199; 90/1015 (Doc: 66743) C2009/309

APPLICANT: Redbank Mines Operation Pty Ltd
PO Box Z5037 St Georges Terrace
PERTH WA 6831

SUBJECT LAND: Exploration Retention Licence 94, MLN631, MLN632, MLN633, MLN634, MLN635, MLN636 AND MLN1108, as shown on the map which is annexure 'A' hereto.

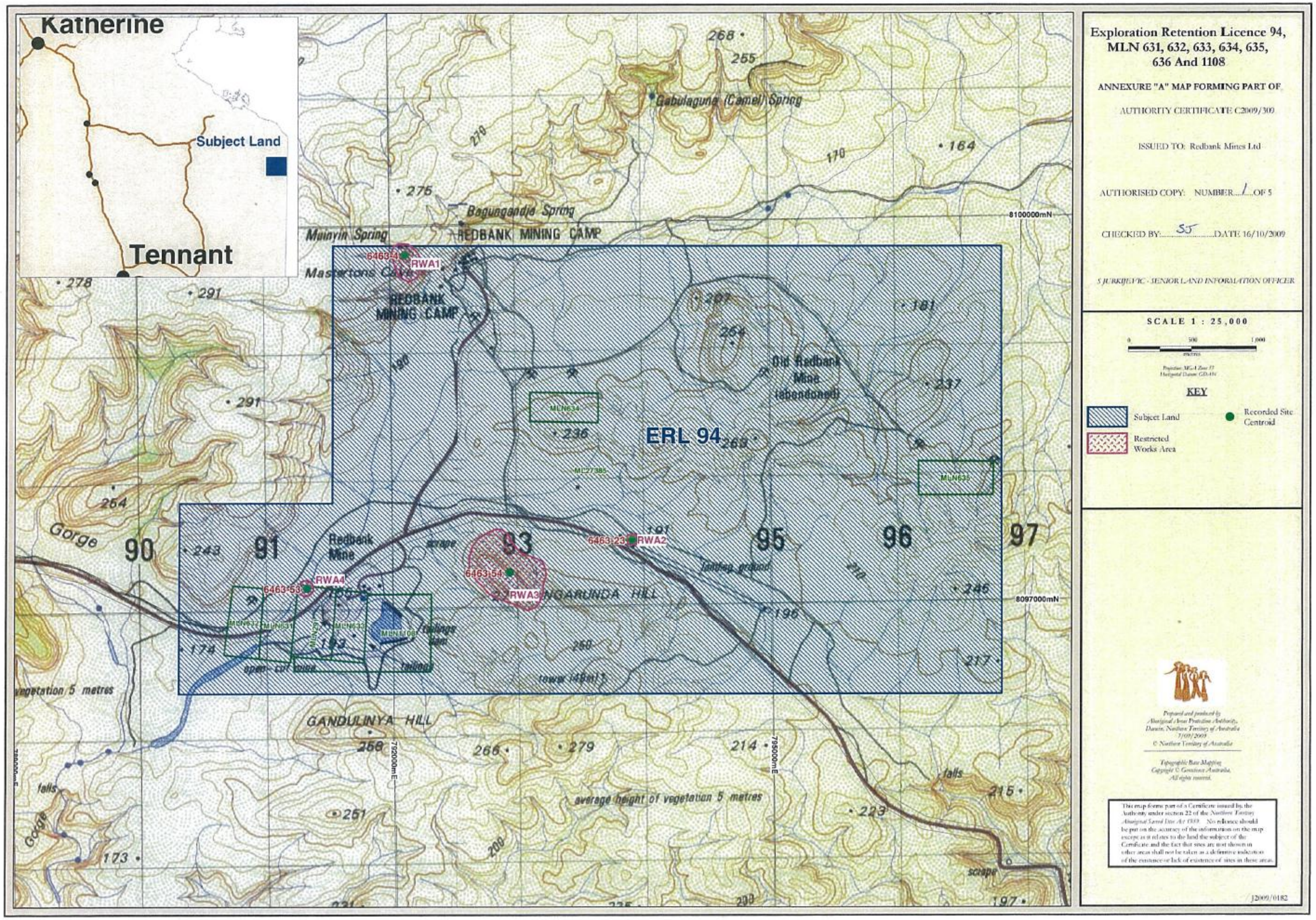
PROPOSED WORK OR USE: Demolition of current infrastructure, and construction of new infrastructure; expansion of the Redbank Oxide Leach Operations

CONDITIONS:

1. The applicant shall ensure that the conditions of this Certificate are included in any subsequent contract or tender documents for the works or use described herein.
2. The applicant shall ensure any agent, contractor or employee is aware of the conditions of this Certificate and the obligations of all persons (who enter on, or carry out works or use land on which there is a sacred site) under Part IV of the *Northern Territory Aboriginal Sacred Sites Act 1989*.
3. This Certificate shall lapse and be null and void if the works in question or the proposed use is not commenced within 24 months of this Certificate.
4. The applicant shall ensure any agent, contractor or employee is aware of the content of section 40(1) of the Northern Territory Sacred Sites Act 1989 which provides that this Certificate does not negate the need for consent, approval or permission for the subject works or use of the land which may be required under another statute.
5. Within the area marked Restricted Works Area 1 (RWA1) on annexure 'A', associated with sacred site 6463-4, no work shall take place and no damage shall occur.
6. Within the area marked Restricted Works Area 2, (RWA2), on annexure 'A', associated with sacred site 6463-23, no work shall take place and no damage shall occur.
7. Within the area marked Restricted Works Area 3 (RWA3), on annexure 'A', associated with sacred site 6463-54, no work shall take place and no damage shall occur.
8. Within the area marked Restricted Works Area 4 (RWA4), on annexure 'A', associated with sacred site 6463-53, no work shall take place and no damage shall occur.

The COMMON SEAL of the
ABORIGINAL AREAS PROTECTION AUTHORITY
was hereto affixed on the 16 day
of October 2009

DR BEN SCAMBARY
Chief Executive Officer


Katherine
Subject Land
Tennant
Gabulaguna (Camel) Spring
Bagungandja Spring
Mainyin Spring
REDBANK MINING CAMP
Masterton's Cave
RWA1
RWA2
RWA3
RWA4
Old Redbank Mine (abandoned)
ERL 94
Redbank Mine
GANDULINYA HILL
NGARUNDA HILL
Gorge
falls
open-cut mine
tailings dam
tower (48m)
average height of vegetation 5 metres
8100000mN
8097000mN
90
91
93
95
96
97
Exploration Retention Licence 94,
MLN 631, 632, 633, 634, 635,
636 And 1108
ANNEXURE "A" MAP FORMING PART OF
AUTHORITY CERTIFICATE C2009/300
ISSUED TO: Redbank Mines Ltd
AUTHORISED COPY: NUMBER 1 OF 5
CHECKED BY: SJ DATE 16/10/2009
S JURKIJEVIC - SENIOR LAND INFORMATION OFFICER
SCALE 1 : 25,000
0
500
1,000
metres
KEY
Subject Land
Recorded Site Centroid
Restricted Works Area
This map forms part of a Certificate issued by the Authority under section 22 of the Northern Territory Aboriginal Sacred Sites Act 1989. No reliance should be put on the accuracy of the information on the map except as it relates to the land the subject of the Certificate and the fact that sites are not shown in other areas shall not be taken as a definitive indication of the existence or lack of existence of sites in these areas.
J2009/0182

Appendix C: WDL surface water monitoring locations