REPORT

Maud Creek Open Pit
Water Quality Determination

Prepared for

Terra Gold Mining Ltd

PO Box 447
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URS

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Introduction

SECTION 1

Terra Gold Mining Ltd (Terra Gold) are planning to dewater the Maud Creek open pit so further mining can be undertaken. It is planned to commence mining in 2006 by initially extending and deepening the open pit after which underground mining is proposed. Ore mined will be trucked to an off site processing plant.

Prior to mining, it will be necessary to dewater the open pit and dispose of the water. Options for disposing of this water include evaporation onsite, supply to horticultural users and discharge into local drainages. The water quality needs to be determined prior to considering any of these options.

Terra Gold requested URS Australia Pty Ltd (URS) to determine the quality of the water and the approximate volume of water stored in the pit. The Maud Creek open pit is located about 20 km east-south-east of Katherine on Maud Creek Station in the Northern Territory (Figure 1). The open cut was last mined in 2000.

Water samples were collected from two traverse lines along the pit. Water quality profiles were taken at five metre depth intervals every 20 metres along the traverses. Depth measurements were also taken at these locations. Water Samples were collected where changes in physical parameters were noted.

The field work was undertaken between 21 and 23 September 2005.

2.1 Climate

The Maud Creek area is located in a tropical savannah climate with monsoon (wet) and dry seasons. Mostly all rainfall events occur between December and March which has an annual average of 976 mm (at Katherine Station 014902). Average annual maximum daily temperature at Katherine is 34.2°C with all months exceeding an average maximum temperature of 30°C. Monthly average evaporation exceeds rainfall between March and November.

Table 1
Climatic Averages - Katherine

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
Rainfall (mm)	235.0	216.5	161.3	32.9	5.7	2.1	1.0	0.5	5.9	29.2	88.2	197.7	976.1
Evaporation (mm)	162	156	171	195	168	135	159	189	213	204	210	180	2142
Min Temp (°C)	24.0	23.7	22.9	20.4	17.1	14.1	13.2	15.5	19.6	23.6	24.7	24.4	20.2
Max Temp (°C)	35.0	34.3	34.5	34	32.1	30.0	30.1	32.5	35.4	37.7	38.0	36.5	34.2

2.2 Topography and Drainage

The terrain in the southern and south-western area of the site comprises mainly of low rises with marginal slopes typically in the range 1-3%. Central portion of the site has an extensive broad depression to near flat plain with an overall slope of about 1%. Along the eastern and northern boundaries of the site, the slope steepens to 5 to 15% with local higher dissected hilly lands with slopes up to 40% or more.

Site drainage is generally to the north via three tributary catchment drainage systems which flow intermittently into Maud Creek through the north-eastern site boundary. The largest of the tributary drainage systems is Gold Creek which flows through the south-eastern sector of the site near where the main pit is located. Relatively narrow flat to gently sloping alluvial/colluvial terraces occur adjacent to Gold Creek where it flows through the south-eastern part of the site. These alluvial flats become more extensive and flood prone in the vicinity of the confluence of Gold Creek with Maud Creek in the central north-eastern sector of the site.

Both Gold and Maud Creek are ephemeral creeks, which do not generally flow during the dry season although remnant water holes do exist.

2.3 Soil Types

Main soil types within the site area vary according to the lithology of the parent rock and with their topographic position in the landscape. The main soil types include:

- Skeletal soils and lithosols (20%);

- Red earths and red clay soils (34%);
- Brown clay soils (15%);
- Solodic soils (6%); and
- Grey-bown (cracking) clay soils (25%).

The red earths and cracking clay soils are co-dominant across the site and represent over 60% of the soils on site. Grey-brown cracking clays occur mainly in the lower-lying central sector of the site. Uniform brown clays or thin loamy soils occur on some gentle to moderate intermediate and lower slopes to drainages. Solodic soils occur on the alluvial flats adjacent to drainage lines. Skeletal soils are generally located in the northern site area.

2.4 Description of the Open Pit

The Maud Creek open pit was mined 2000 and the ore treated at an off site treatment plant.

The pit is about 200 metres long and about 100 metres wide and up to 26 metres deep. The northern half of the pit has an average depth of 10 to 12 metres with the deepest section in the southern half. The estimated volume is 300,000 kL although this will vary depending on the seasons.

The Maud Creek open pit is flooded. Little data was available on the dimensions and depth of the open pit. To obtain representative water samples, two traverses were planned along the pit. Steel stakes were driven into the sides of the open pit at each end, about 20 metres apart at the northern end and 40 metres apart at the southern end. A rope, marked every 20 metres was then stretched between the stakes. An aluminium boat was used for the monitoring and sampling at each sampling point (i.e. 20 metre intervals). The depth was measured using an echo sounder. A portable probe was used to measure electrical conductivity (EC) temperature, dissolved oxygen, pH, redox potential and turbidity at approximately 5 metre depth intervals. Sample locations are presented in Figure 2.

The initial reading was taken at 1 metre with subsequent measurements at 5, 10, 15 etc or to just above the bottom of the pit.

Water samples were collected using a small battery powered electric pump. Sampling locations were selected to obtain representative samples of the water quality in the pit. Samples were also collected where changes in physical parameters were noted, such as changes in dissolved oxygen or redox potential.

Water samples were collected for analysis of major ions and metals. Samples were chilled and stored in eskies from site and for dispatch to NTEL for analysis. Standard URS Chain of Custody procedures were used for sample dispatch.

The results indicate that the pit water is fresh with a salinity that ranges between 420 and 470 mg/L TDS. Magnesium and sulphate are the dominant ions. The water is weakly alkaline with a pH range of 8.0 to 8.6. Arsenic concentrations are elevated ranging from 185 to 201 µg/L.

Results of the chemical analysis is presented in Appendix A.

The composition of all samples is relatively consistent with depth and along the sample transects. This implies little stratification of water within the pit.

From the sampling results a comparison was made between the chemical composition and trigger values for freshwater aquatic systems for slightly to moderately disturbed systems (ANZECC 2000 Guidelines for Fresh and Marine Water Quality). This comparison is presented in Table 2.

Table 2
ANZECC 2000 Water Quality Guideline Comparison for Aquatic Ecosystems

Chemical	95% Trigger Value	80% Trigger Value	Pit Sample Max	Pit Sample Min	Above Trigger Value
pH	6.5 - 7.5	6.5 - 7.5	8.0	8.6	Yes
TDS (mg/L)	20-180	20-180	420	470	Yes
As (µg/L)	13	140	185	201	Yes
Cd (µg/L)	0.2	0.8	<0.02	<0.02	No
Cu (µg/L)	1.4	2.5	0.5	0.82	No
Mn (µg/L)	1900	3600	0.008	14.9	No
Pb (µg/L)	3.4	9.4	0.01	0.02	No
Se (µg/L)	11	34	<0.02	0.02	No
Zn (µg/L)	8.0	31	0.4	1.3	No

From the key criteria, the pit water exceeds fresh water trigger values for pH, TDS and arsenic only.

A comparison between the chemical composition and trigger values for agricultural irrigation based on the ANZECC 2000 Guidelines for Fresh and Marine Water Quality and found pH to be slightly over the short term trigger value. The comparison of the results is presented in Table 3.

Table 3
ANZECC 2000 Water Quality Guideline Comparison for Agricultural Irrigation

Chemical	Long Term Use Up to 100 Years	Short Term Use Up to 20 Years	Pit Sample Min	Pit Sample Max	Above Short-Term Trigger Value
pH	6 - 8.5	6 - 8.5	8.0	8.6	Yes
TDS (mg/L)*	600 (for clay soil)	600 (for clay soil)	420	470	No
As (µg/L)	100	2000	185	201	No
Cd (µg/L)	10	50	<0.02	<0.02	No
Cu (µg/L)	200	5000	0.5	0.82	No
Mn (µg/L)	200	10000	0.008	14.9	No
Pb (µg/L)	2000	5000	0.01	0.02	No
Se (µg/L)	20	50	<0.02	0.02	No
Zn (µg/L)	2000	5000	0.4	1.3	No

*Lowest average root zone salinity for all crops

Terra Gold are planning to dewater the Maud Creek open pit so further mining can be undertaken, initially by extending and deepening the open pit after which underground mining is proposed. However before mining, can commence it will be necessary to dewater the open pit and dispose of the water. Options for disposing of this water include;

- Evaporation onsite,
- Horticultural use onsite, and
- Discharge into local drainages.

Prior to considering any of these options the water quality needed to be determined.

Water samples were collected between 21 and 23 September 2005 from two traverse lines along the pit. Depth measurements and water quality profiles were taken at five metre depth intervals every 20 metres along the traverses. Samples were collected where changes in physical parameters were noted.

The pit is about 200 metres long and about 100 metres wide and up to 26 metres deep. The estimated volume is 300,000 kL although this will vary depending on the seasons.

The water in pit water is fresh with a salinity that ranges between 420 and 470 mg/L TDS. Magnesium and sulphate are the dominant ions. The water is weakly alkaline with a pH range of 8.0 to 8.6. Arsenic concentrations are elevated ranging from 185 to 201 µg/L.

From the sampling results a comparison was made between the chemical composition and trigger values for freshwater systems for slightly to moderately disturbed systems (ANZECC 2000 Guidelines for Fresh and Marine Water Quality). From the key criteria, the pit water exceeds fresh water trigger values for pH, TDS and arsenic only.

From the available discharge options, the following should be considered prior to selection of the discharge options.

- Evaporation onsite - Based on average pan evaporation and rainfall measurements at Katherine, annual evaporation, less rainfall equates to approximately 1.1m/yr. From approximate estimates of the pit volume (300,000 kL), an approximate evaporation pond of approximately 500 x 500 m may be required to evaporate the pit volume over a year. The actual evaporation pond size may be larger as groundwater inflows have not been included in this very approximate estimate.
- Discharge of the pit water to local drainages - This would require a Waste Water Discharge Licence which is issued by the Office of Environment and Heritage (OEH) as well as stakeholder consultation. As Gold and Maud Creeks are ephemeral, discharges could only occur during flow events as dilution is required to meet ANZECC 2000 trigger value guidelines, especially with respect to pH, TDS and Arsenic. Maud Creek is a tributary of the Katherine River from which some of Katherine's water supply is sometimes drawn on, a detailed risk assessment may also be required.

- Horticultural use onsite – As the pit water quality is within recommended guideline trigger values for short term irrigation (less than 20 years), this option would appear to be the most appropriate as there is no requirement for discharge offsite or construction of evaporation ponds. Feasibility for the crop type and irrigation methods should be considered for pit dewatering. Depending on the crop type and use, bacterial analysis of the pit water may have to be considered as part of the assessment.

Limitations

SECTION 7

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Terra Gold Mining Ltd and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 5 September 2005.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between 24 and 26 October 2005 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

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