

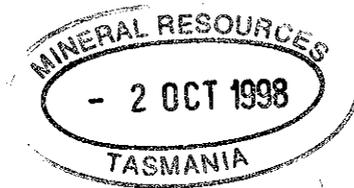
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Mineral Resources Tasmania
STORYS CREEK
PRECIPITATE DAM DRILLING
REPORT

29 September 1998

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965295

Mineral Resources Tasmania : Storys Creek
precipitate dam drilling report / John Miedecke
and Partners Pty Ltd 1998



1.0 INTRODUCTION

The Precipitate Dam is located near the abandoned workings of the mine, at Storys Creek. The dam, which is believed to have been operated from the 1960's to the early 1980's, has been constructed on the eastern bank of the creek. The dam has had incidences of overtopping and spillage during flood events.

In 1994 the dam was capped with clay and attempts made to revegetate the surface.

Monitoring of groundwater levels at two standing piezometers have subsequently shown that the capping has been ineffective in reducing infiltration and that water levels in the dam remain high, and respond to seasonal influences. While monitoring data on flows is not sufficient to make a comparison, it is also believed that leakage from the dam has continued at a similar rate and that the seepage remains a major point source load of metals to Storys Creek.

The location of the dam close to the Creek, with subsequent continued risk from flooding and possible erosion of the embankments, and the lack of room for any effective treatment of the leachates, has lead to the further consideration of relocation of the dam and contents.

As a result, MRT have funded a program of drilling , geological logging, geochemical testing and survey of the dam .

This report documents the results of these investigations.

2.0 DRILLING PROGRAM

A total of seven holes were drilled using a Stacpoole Drilling Mobile B40 drilling rig with hollow flight augers. A rock road way was constructed onto the dam surface and a road reconstructed from the main Story's Creek road.

The location of the seven holes are illustrated on Figure 1 and the reduced level (to an arbitrary datum) surveyed. Each hole was logged and the results are shown in Table 1. The bottom of each hole was noted for quantity survey purposes. Composite samples were taken of representative materials throughout the profile for geochemical testwork.

The drill logs are consistent with a typical tailings dam with a mixture of coarser (sand size) and fine (slimes) tailings materials. This is attributed to the spiggotting of tailings from various locations around the embankment which is believed to be

Date

23/9/98

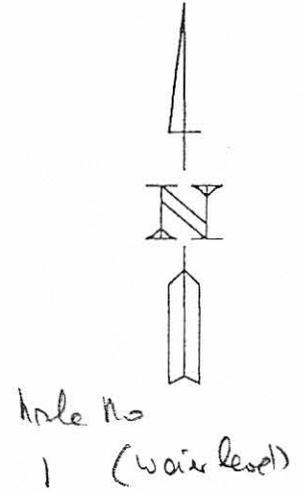
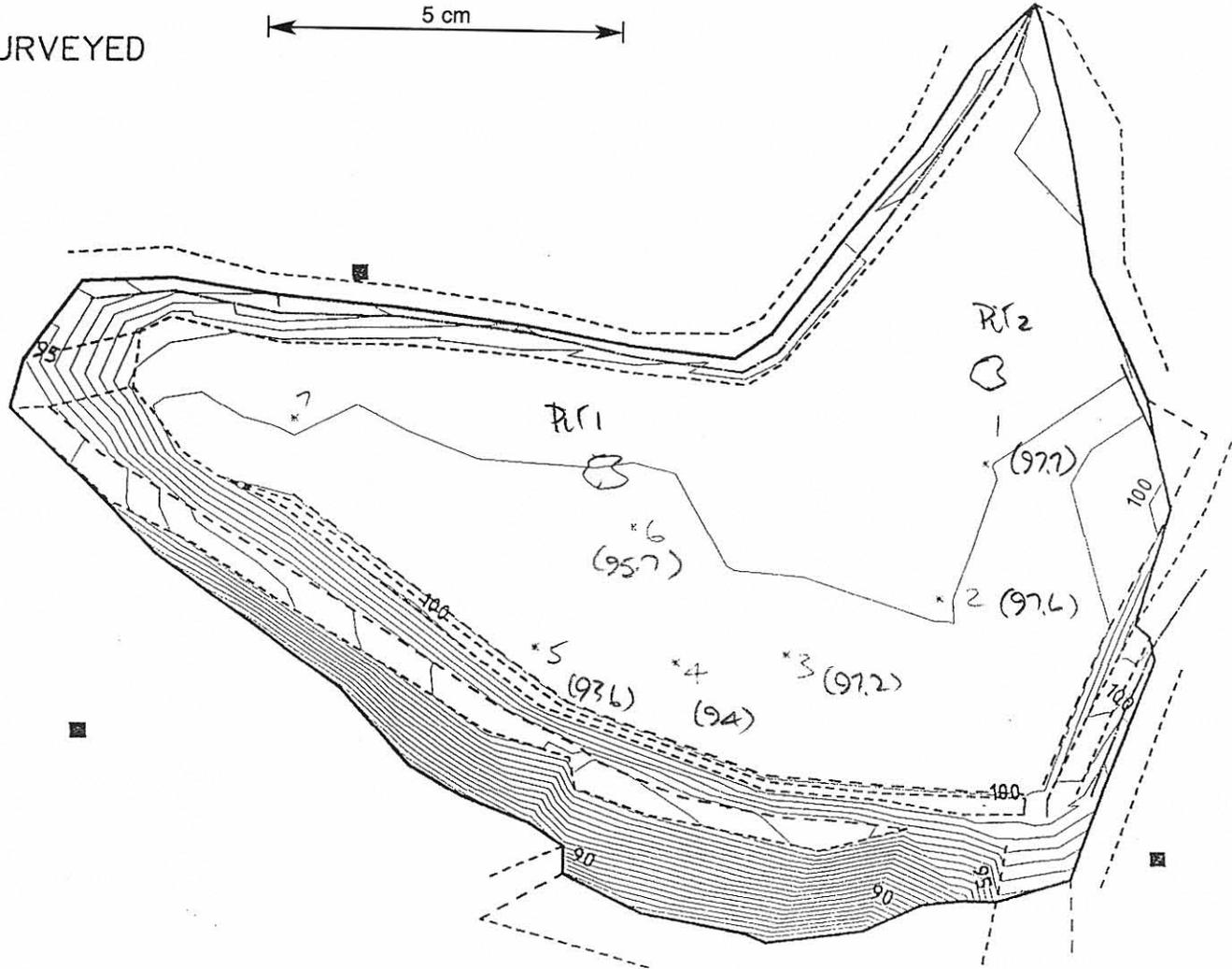
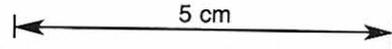
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Interval 0.5 interval

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SHAPE AS SURVEYED



Storys Creek Precipitate Dam
Auger Drilling Location Plan

john miedecke and partners pty ltd.

**Table 1 Story Creek Precipitate Dam
Auger Drilling**

Hole No	
1	
Depth	
0 -0.6	Clay cap
0.6 -1.5	soft brown grey sludge
1.5 - 3	brown sludge sandy water sat
3.0 - 4	sand
4.0 - 5	sand
5.0 - 6	sand soft grey sludge
6.0 -7.10	sand
7	end of hole
2	
Depth	Description
0 -0.7	Clay cap
0.7 -1.5	soft brown grey sludge
1.5 - 3	grey sludge ext soft gravel bands
3.0 - 4.5	grey sludge ext soft gravel bands
4.5 - 6	grey sludge ext soft gravel bands
6.0 -7.0	grey sludge ext soft
7	end of hole soil and vegn
3	
Depth	Description
0 -0.6	Clay cap
0.6 -1.5	grey brown silt/clay firm
1.5 - 3	grey sludge soft
3.0 - 4.5	grey sludge soft sandy
4.5 - 6	grey sludge ex soft sandy
6.0 -7.5	grey sand, some grey sludge
7.5 - 12.2	grey sand, some grey sludge
12	end of hole
4	
Depth	Description
0 -0.7	Clay cap
0.7 -1.5	firm brown clays and silts, gritty
1.5 - 3	grey sludge and bron clay soft
3.0 - 7.5	grey sludge ex soft sandy
9 - 10.5	grey sand
11	end of hole
5	
Depth	Description
0 -0.7	Clay cap
0.7 -1.5	yellow and brown soft sludge
1.5 - 3	yellow soft sludge
3.0 - 7.5	grey sandy sludge mod wet
7.5 - 10	grey sandy sludge
10	end of hole
6	
Depth	Description
0 -0.66	Clay cap
0.66 -1.5	yellow sludge ex soft
1.5 - 3	grey sand dry
3.0 - 4.5	grey sand moist
4.5 - 10	grey sandy sludge mod wet
10	end of hole
7	
Depth	Description
0 -0.7	Clay cap
0.7 -1.5	yellow and grey sludge ex soft
1.5 - 3	grey sludge ex soft
3.0 - 4.5	grey sandy sludge mod wet
3.0 - 7	grey sandy mod wet
7	end of hole

the method of construction. These tailings materials are capped with a shallow (approx 0.7m) layer of fine residue which is believed to be from the caustic soda neutralisation of the Story Creek mine waters and the recently placed approx. 0.5m clay cap.

The water table within the storage was monitored by measuring the standing level in the boreholes (water levels are noted in Figure 1). This indicates that the tailings dam phreatic level is quite deep near the embankment, but rises sharply away from it. This is consistent with a dam constructed by spigotting tailings from the embankment. Water movements are expected to be through the storage, and expressed as the leakage at the base of the dam wall.

3.0 EXCAVATOR PITS

Two pits were excavated by a 30 tonne excavator at the locations shown in Figure 1.

Pit 1 was to a maximum depth of approximately 6 metres, the depth of the excavator boom, and Pit 2 to a depth of approximately 3.5metres when natural surface was reached.

Pit 1 was comprised of sand sized tailing particles, with damp materials (presumably the water table) nearly at the bottom of the pit. A this layer of clay was underlain by a 300mm layer of fine residue (caustic soda precipitate) . Underneath this material was a consistent coarse tailing material. Photograph 1 shows the pit.

Pit 2 consisted of a similar upper horizons, but with finer tailings saturated materials at depth, with subsequent wall failure (Photograph 3).

A water sample was taken from this pit and the results of the analyses are shown in Table 2, with the leachate water quality. Water quality is poor with high metal concentrations.

4.0 GEOCHEMICAL TESTWORK.

49 samples of wet sediment, comprising in situ tailings and applied capping material, were obtained from the site by seven shallow percussion drill holes (DH 1-9) and two excavation pits (EP 1-2) (Figure 1).

The field samples were logged and classified into 3 material types from which 10 composite samples were produced for analytical work by EGi to determine their acid generating characteristics.

Table 2: Precipitate Dam Water Quality
(mg/L)

LOCATION	4	4	4
PARAMETER (mg/l)	Oct-97 PPT Dam outflow 976000	Aug-98 PPT Dam outflow	Aug-98 PPte dam Pit
SAMPLE DATE	2-Oct	19-Aug	19-Aug
FLOW L/sec	1		
pH L	3.4	3.4	6.1
pH F	3.6		
Acidity (CaCO3)	227	174	158
Alkalinity (CaCO3)	<1	<1	49
Cond μ S/cm L	908	881	606
Cond F	826		
TDS	692	606	479
NFR (suspended solids)	59	45	337
DOC mg/L	1.8		
Hardness (CaCO3)	197		
Ca T	44.0		69.5
Cl	17.0		
F	12.00	9.40	6.00
K T	0.9	0.9	1.6
Mg T	21.0	25.1	23.9
Na T	4.0	3.7	2.7
SO4	498.00	420.00	240
Metals			
Al T	10.0	6.8	2.7
Al F	9.0	6.6	0.8
Cd T	2.550	1.390	2.600
Cd F	2.450	1.280	2.520
Cr T	0.005	0.004	0.004
Cr F	0.003	0.001	<0.001
Cu T	5.620	3.830	0.426
Cu F	5.420	3.640	0.089
Fe T	30.0	26.7	7.7
Fe F	8.0	1.3	0.02
Mn T	6.0	5.4	6.3
Mn F	6.0	4.9	5.9
Ni T	0.087	0.066	0.146
Ni F	0.076	0.064	0.128
Pb T	0.110	0.690	0.093
Pb F	0.102	0.6	0.001
Zn T	61.800	3.9.2	75.600
Zn F	58.400	39.000	67.10

The composite samples were grouped so that the acid generating capacity of the site could be evaluated in segments.

The ten composite samples taken from the drill holes, were submitted for geochemical testing by EGi Sydney.

Their report and results are attached in Appendix A.

Basically the materials are not highly acidic and addition of agricultural lime and a simple cover would be adequate for relocation.

5.0 QUANTITY SURVEY

Cromer and Associates, surveyors, prepared a plan of surface and assumed bottom contours. They have estimated a volume of 64,000m³. Their plan is attached as Appendix B.

6.0 CONCLUSIONS

The Precipitate Dam is composed approximately 95% of spiggotted tailings from the original processing of the ore. Only a shallow layer of acid water neutralisation precipitates caps these materials, which in turn is capped by clay.

The volume of the dam has been estimated at 64,000m³, which includes the outer wall and the enclosed materials. The tailings are free digging, but the rear of the storage will contain saturated materials which will contain significant quantities of waters which will have elevated metal concentrations. These materials should ideally be left to drain and blended with drier materials for cartage.

Geochemical testwork has shown that the tailings materials are not acid generating and therefore the source of the acid leachate is uncertain. It is possible that the waste rock placed as a buttress to the wall is the source, or some other materials which were not sampled within the storage.

Relocation and disposal will not therefore require a sophisticated cover.

Water quality of the contained waters are poor and will require neutralisation to raise the pH and precipitate metals prior to release to Storys Creek.

Photograph 1 Precipitate Dam Storys Creek, showing wall and surface

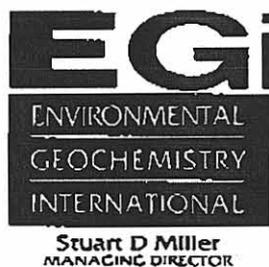


Photograph 2 Precipitate Dam Pit 1



Photograph 3 Precipitate Dam Pit 2





TO : John Miedecke and Partners

ATTENTION : John Miedecke

FROM : Stuart Miller/Theresa Donohue

SUBJECT : Storys Creek Tailings Dam Sampling

DATE : 30th September, 1998

PAGES (including this page) : 3

John,

Ten composite samples were provided to EGi on 3rd September, 1998 for pH, electrical conductivity and acidity. The purpose of this test work is to determine the immediate lime requirement to neutralise existing acidity and precipitate any metals prior to relocation of the tailings to the new storage facility. The results of these analyses are provided below.

Analyses

The samples were analysed in their 'as received' condition. pH and electrical conductivity (EC) was measured on a 1:2 (sample: deionised water) extract left to equilibrate for at least 12 hours. This provides an indication of the inherent acidity and salinity of each sample. The water extract was then filtered and a 50 ml aliquot of the liquor titrated initially to pH 7 and then to pH 8.3 to determine the existing acidity of the tailings materials. This acidity result determines the amount of alkali required to bring the sample to pH 7 and pH 8.3.

Results

Table 1 gives the results of the testwork carried out as well as a description of the composite tailings samples. The 'as received' moisture content of each sample has been provided for your information.

The results show that all samples had pH results between 6.6 and 6.8. These results indicate that the samples have a near neutral pH. Electrical conductivity ranged from 0.28 to 0.51 dS/m which shows that the tailings materials are moderately saline. Determinations on the tailings samples indicated an acidity of nil to pH 7 and between 8 to 70 mg CaCO₃/kg to pH 8.3.

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02 69

Storys Creek Project

2

Precipitate Dam water quality results on pit water sampling carried out by ~~KE Morrison~~ ^{JMR} ~~PLD~~ on 19th August 1998 confirm the measured pH and EC results and indicate that sulphate is the major anion with Ca, Zn and Mg the major cations. The data provided also indicates a high Cd solubility. The reported acidity for the pit water was 158 mg CaCO₃/L which is most likely due to the dissolved zinc.

The pit water quality results also show that the pH of leachate flowing out of the base of the tailings dam wall is acidic. As the tailings samples collected were near pH neutral, it is probable that the material contained in the dam wall embankment zone has developed acid conditions and is the source of the acid drainage.

Based on the 10 composite tailings samples analysed, there is no lime requirement to elevate the samples to pH neutral (*i.e.* pH 7). However, lime will be required to raise the pH of the material to near pH 8.3 in order to precipitate the Zn and Cd. To effect immediate precipitation of the metals a readily available alkali source such as lime (CaO, Ca(OH)₂) or caustic soda (NaOH) will be required. Agricultural lime (CaCO₃) is unlikely to be immediately effective but would provide longer term buffering.

Please call to discuss the implications of these findings for tailings relocation and management.

Regards



Stuart Miller

Table 1: Results of Testwork Performed on Old Tailings Dam Samples - Storys Creek Project

EGi Sample Code	Composite Sample Code	Composite Sample Description	Composite Sample Composition	pH#	E.C. (dS/m)#	Acidity * to pH 8.3 (mg CaCO ₃ /kg dry weight)	Moisture Content % (dry weight)
SC/12061	1	Surficial brown-orange silty sludge	DH-1, -2, -3	6.6	0.42	70	37
12062	2	(from caustic soda treatment of acid mine water)	EP-1, DH-4, -5, -6, -7	6.7	0.51	18	26
12063	3	Coarse sandy wet and dry tails (typical tailings)	EP-2, DH-1	6.7	0.28	19	14
12064	4		DH-2, -3	6.7	0.35	20	18
12065	5		EP-1, DH-6, -7	6.8	0.41	13	8
12066	6		DH-4, -5	6.8	0.38	19	15
12067	7	Fine wet slime tails	DH-1, -2	6.8	0.37	14	30
12068	8		DH-2, -3	6.8	0.35	8	42
12069	9		DH-6, -7	6.6	0.32	33	28
12070	10		DH-4, -5	6.6	0.41	18	29

#pH and EC on 1:2 (sample:deionised water)

Cromer & Associates

Registered Consulting Surveyors

PO Box 1240 Rosny Park, 7018

Phone 62 447275

Fax. 62 450899

Rear dam slope assumed to be same as cut batter

Rear dam slope extended to intercept dam depth

as per depths provided by client at bore holes.

Dam base is estimated per the above and likely

shape pre-construction

Plan of Contours

VOLUME ESTIMATED TO BE 64,000 m³

Datum..... Arbitrary
0.5 interval

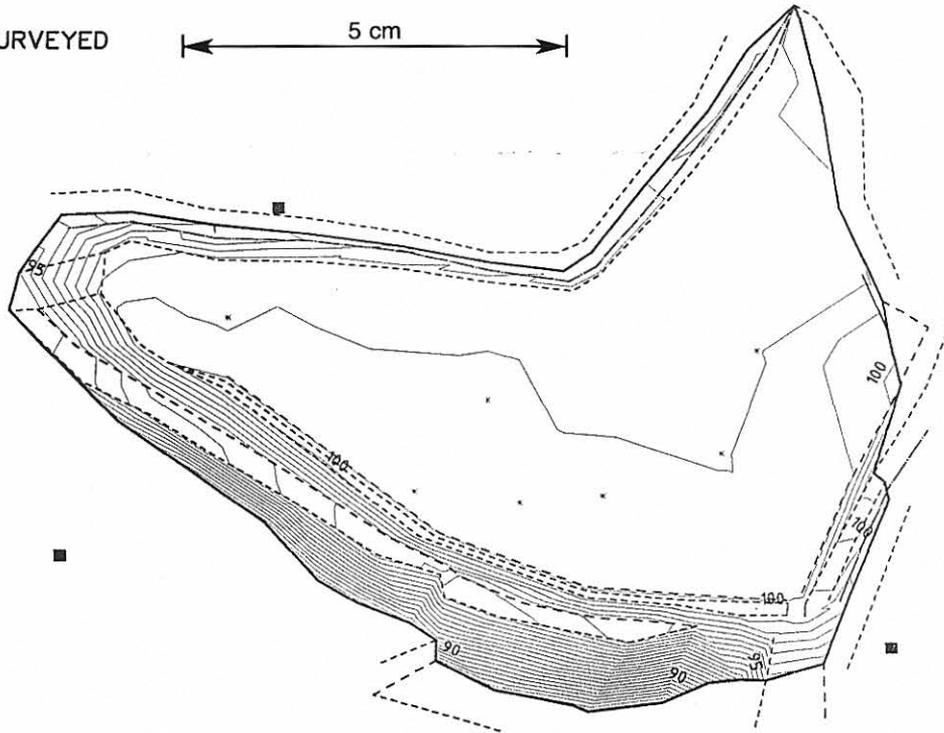
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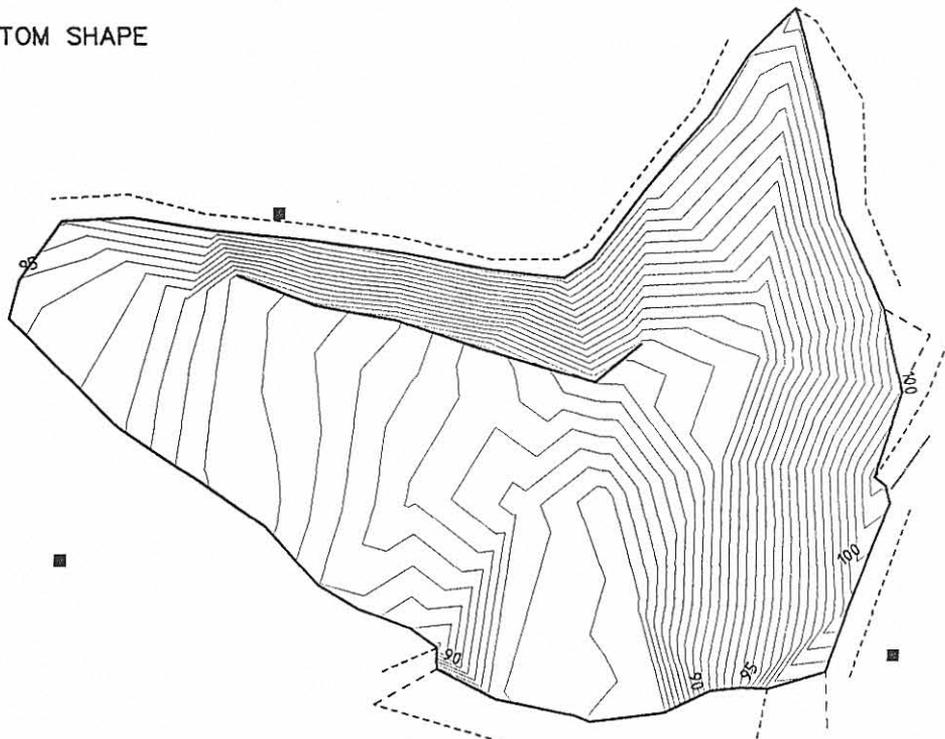
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SHAPE AS SURVEYED

5 cm



ASSUMED BOTTOM SHAPE



■ Reference Point Placed