NUMBER 6989

EL 1458 GIDDI GIDDINNA CREEK

PROGRESS REPORTS FOR THE PERIOD
7/12/87 TO 6/6/88

Submitted by

Delrico Pty Ltd
1988

ENVELOPE 6989

TENEMENT: EL 1458, Giddi Giddinna Creek

TENEMENT HOLDER: Delrico Pty Ltd

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QUARTERLY REPORT ON GIDDI GIDDINNA CREEK EL1458, SOUTH AUSTRALIA, FOR THE PERIOD ENDING 6th MARCH, 1988

BY L.C. BARNES
Exploration Manager

20th April, 1988

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26 APR 1988
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SECURITY

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PLANS

INTRODUCTION

EL1458, granted on 7th December, 1987 is held by Delrico Pty. Ltd., a subsidiary of Ausmintec Corp. Limited, to investigate the potential of magnesium and sodium sulphate minerals occurring near surface in Bulldog Shale of Early Cretaceous age.

The EL, of 469 km2, adjoins the north eastern boundary of the Coober Pedy Precious Stones Field, the southern boundary of the EL is about 20 km. north of Coober Pedy township. The main Coober Pedy - Oodnadatta road traverses EL1458 providing ready access to most areas, except after moderate to heavy rainfall.

EL1458 was formerly EL1254 jointly held by CRAE Exploration Pty. Ltd. (CRAE) and Evaporite Minerals (S.A.) Pty. Ltd., (E.M.S.A.) who carried out mapping and costeaning to determine areas of sulphate mineralisation. E.M.S.A. is now a wholly owned subsidiary of Ausmintec Corp. Limited.

Scott (1984) defined three main areas of sulphate mineralisation, (Fig. 1), totalling 6.96 m. tonnes of $MgSO_4$ at an average grade of 7.3%.

Investigations by Delrico are designed to:

- confirm the areas and mineralisation grades as previously defined
- outline additional areas of sulphate mineralisation
- determine if magnesium and sodium sulphates can be economically extracted from mudstone
- investigate the economic potential of montmorillonitic mudstone (bentonitic shale)

Ausmintec Corp. Limited is actively seeking supplies of magnesium, sodium and potassium sulphate minerals for use in fertilizers and newly developed magnesium cements. Markets have been developed for these commodities both within Australian and overseas.

FIELD INVESTIGATIONS

Because of the extreme summer temperatures experienced in this area between December and March, field work was limited to a brief inspection in early December. Lengthy delays in receiving all data collected by CRAE and E.M.S.A. had delayed commencement of field work.

During a two day inspection of southern areas of the EL, samples were collected from three sites outside the areas of mineralisation as defined by CRAE/E.M.S.A., (Fig. 1). Epsomite mineralisation was previously noted in these areas by A.McCormack (Contractor, Coober Pedy) and R.G.Douglas-Hill (Ausmintec Corp. Limited).

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LABORATORY INVESTIGATIONS

Acid soluble magnesium contents of eight samples from sites shown on Fig. 1 were determined by Mineral Research & Development Pty. Ltd., (M.R.&D.) using A.A.S. techniques. Analytical results are included in Appendix A. Additional chemical analyses were carried out on screened fractions on one of these samples.

Two samples, M2168 and M2172, were submitted to C.S.I.R.O. Division of Soils for mineralogical and chemical analyses; results comprise Appendix B.

RESULTS

Acid soluble magnesium contents as determined by M.R.&D. range from 0.4% to 3.6%, most being in the range 1.8% to 2.6%. Sample M2172 contains 0.43% acid soluble magnesium (M.R.&D.) while MgO content as determined by C.S.I.R.O. is 1.85% (1.12%) mg) suggesting either most magnesium is in non acid soluble (silicate) form or that the M.R.&D. determination is in error. M.R.&D. and C.S.I.R.O. determinations for magnesium content of M2168 are in agreement.

X-Ray diffraction studies by C.S.I.R.O. (Appendix B) and previous work have established that magnesium sulphate is present in many forms including:

- anhydrous MgSO4

- kieserite MgSO4.H20

- pentahydrite

- hexahydrite

  and

- epsomite MgSO4.7H20

Some magnesium is also present in sodium, magnesium sulphate minerals such as bloedite (common) and loeweite (rare). The percentage of magnesium sulphate mineral(s) and mixed sodium magnesium sulphate mineral(s) present in any one sample probably lies between the calculated values for anhydrous MgSO4 and epsomite as shown on Appendix A.

The presence of magnesium sulphate in concentrations similar to those determined by CRAE/E.M.S.A. shows the mineral(s) to be extremely widespread across the southern part of the EL. However, distribution is somewhat erratic, CRAE/E.M.S.A. costeans near the recently sampled areas showed little mineralisation probably largely due to variation in the degree of water saturation of the bentonitic mudstone host between sample sites, and over time.

The erratic nature of the mineralisation means that beneficiation and separation trials must be based on samples sufficiently large to represent ore grades obtainable in any future mining operation.

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BENEFICIATION, SEPARATION TRIALS

The brittle, finely crystalline nature of the sulphate minerals suggested separation from the massive, blocky montmorillontic mudstone host could be achieved by vigorous screening. Laboratory screening trials on Bulk Sample 1 (M2162 - M2167, Appendix A) showed that although finer fractions contained significantly higher quantities of magnesium sulphate the mineralisation was too evenly distributed for screening to be considered a viable separation technique.

A sub-sample of composite sample M2169 was agitated with distilled water for 30 minutes. The montmorillonite clay settled rapidly and completely after agitation allowing a relatively clear solution containing 2.26% Mg [22.9% Mg SO4.7H20 equivalent] to be drawn off. This corresponds to 87% of the original magnesium content of the sample.

Results to date suggest that provided water can penetrate the sulphate bearing mudstone, magnesium sulphate minerals can be quickly and completely leached. Accordingly simple, heap leaching techniques followed by concentration in solar evaporation pans should be viable.

FUTURE WORKS

Work for the next period is planned to include,

1) Collection of additional large samples from various parts of the EL to confirm grades established by CRAE/E.M.S.A. and to carry out laboratory scale heap leaching trials.

2) Collection of large bulk samples (about 50 tonnes each) to enable pilot scale heap leaching and solar evaporation trials to be conducted.

3) Market evaluation of magnesium sulphates in fertilizers and magnesium cements.

4) Market evaluation of montmorillonitic clay.

L.C. Barnes

Exploration Manager

Delrico Pty. Ltd.

REFERENCE

Scott, A.K., 91984) First quarterly report on Giddi Giddinna Creek E.L. 1254, South Australia, for the period ending 23rd December, 1984.

CRA Report No. 13072 (unpublished)

EXPENDITURE

Expenditure for the period totalled $2,598.80 as detailed below:

Field Expenses:

	$
Salaried Staff	
4 days @ $250.00 / day	1,000.00
Vehicle Hire	
4 days @ $ 65.00 / day	220.00
Petrol and Oil	111.00
Accomodation Coober Pedy	258.80

Office Expenses:

Collating and evaluation data obtained from E.M.S.A.	
3 days @ $250.00 / day	750.00
Laboratory Expenses	259.00
Total	$2,598.80

APPENDIX A

Chemical analyses of magnesium sulphate -
shale samples from EL1458, Coober Pedy area.

[Mineral Research & Development Pty. Ltd.]

For sample locations refer Figure 1

Sample No	Type of Sample	Size Fraction	Analysis [ppm]											Insoluble Residue %	% $MgSO_4$	% Epsomite [$MgSO_4.7H_2$
			Mg	Ca	Na	K	Mn	Fe	Co	Cu	Zn	P	SO_4			
M 2108	Composite	>1mm (40%)	23 000	1900	11 500	2600	102	29 000	8.5	91	37	1100	61 500	84.7	11.4	23.3
		<1mm (60%)	36 000	17 500	23 500	3400	255	29 500	18	310	46	2000	121 500	70.5	17.8	36.5
M 2109	Selected	Whole rock	12 600	59	4900	2210	23	9710	6.5	28	160	150	15 600	86.9	6.2	12.8
M 2162	Bulk Sample 1	>2mm (14.8%)	16 800	-	-	-	-	-	-	-	-	-	-	-	8.31	17.0
M 2163	"	<2mm >1mm (20.2%)	17 900	-	-	-	-	-	-	-	-	-	-	-	8.86	18.1
M 2164	"	<1mm >710μm (12.7%)	20 300	-	-	-	-	-	-	-	-	-	-	-	10.1	20.6
M 2165	"	<710μm >500μm (10.8%)	20 500	-	-	-	-	-	-	-	-	-	-	-	10.2	20.8
M 2166	"	<500μm >212μm (34%)	24 800	-	-	-	-	-	-	-	-	-	-	-	12.3	25.1
M 2167	"	<212 μm (7.4%)	25 500	-	-	-	-	-	-	-	-	-	-	-	12.6	25.9
M 2168	Composite	Whole rock	23 000	6 600	-	-	-	-	-	-	-	-	107 900	69.7	11.4	23.3
M 2169	Composite Creek bank	Whole rock	26 000	-	-	-	-	-	-	-	-	-	-	62.65	12.9	26.4
M 2170	Selected lower, blocky Shale with white material	Whole rock	20 000	2700	-	-	-	-	-	-	-	-	-	74.97	9.9	20.3
M 2171	Selected - mid level shale	whole rock	24 000											-	11.9	24.3
M 2172	Selected Upper shale	Whole rock	4 300											90.29	2.1	4.4

APPENDIX B

Mineralogical and chemical analysis of two bentonite samples
from EL1458 Coober Pedy area.

C.S.I.R.O. Division of Soils - Technical Memorandum No. 95/1987

CSIRO DIVISION OF SOILS

TECHNICAL MEMORANDUM NO. 95/1987

MINERAL ASSAY OF TWO BENTONITE SAMPLES SUPPLIED BY MINERAL RESEARCH & DEVELOPMENT PTY LTD

M.D.RAVEN, P.G. FAZEY & A.R. MILNES

Two samples labelled M2168 and M2172 were supplied for semi-quantitative mineral assay. M2168 was a bulk sample in the form collected from the field, whereas M2172 had been milled.

Sample Preparation

A small amount of M2168 was dried in an oven at 105°C for 1 hour before hand grinding in a mortar and pestle. For determining bulk mineralogical compositions, both samples were then pressed into aluminium holders to achieve nominally random orientation of particles.

A sub-sample of M2168 (as-received) was washed with water to remove soluble mineral salts. The supernatant solution was evaporated to dryness and the product was pressed into an aluminium holder for XRD analysis. The water insoluble residue was also dried, pressed into an aluminium holder and analyzed. Separation of the <2μ clay fraction from the water insoluble residue was carried out by dispersion and sedimentation in a water column. The clay was saturated with calcium using 1M $CaCl_2$ solution, dried and pressed into an aluminium holder. A re-dispersed sub-sample of the clay was sucked onto a ceramic plate under vacuum to prepare an oriented mount which was then saturated with magnesium (using 1M $MgCl_2$) and glycerol to aid identification of the components.

X-ray diffraction patterns of all samples were recorded with a Philips PW1710 microprocessor-controlled diffractometer using a cobalt target, a variable divergence slit and a graphite monochromator. The diffraction patterns were recorded in steps of 0.05° with a 1 second counting time per step. The patterns were logged to permanent files on a DCW1123 computer (Self *et al* 1987) and were subsequently transferred to an IBM-compatible PC for analysis (Raven & Self 1987).

The major element composition of each sample and the various sub-samples was determined by X-ray fluorescence spectrometry using a modification of the fusion method of Norrish & Hutton (1969).

Results

X-ray diffraction data show that the major phase in M2172 is a **smectite** with a basal spacing of 15.8Å in the air-dried, as-received sample. Approximately 10% of the sample is **quartz**, with detectable amounts of **gypsum, kaolinite, mica** (10Å basal spacing), **feldspar** and other minor phases. The major element composition of M2172 given in Table 1 is consistent with the mineralogy.

The major element composition of sample M2168 shows high levels of sodium, magnesium and sulphur (Table 1). X-ray diffraction analysis of the same sample reveals **hexahydrite** [$MgSO_4.6H_2O$], and **bloedite** [$Na_2Mg\ (SO_4)_2.4H_2O$], with small amounts of **loeweite** [$Na_{12}Mg_7\ (SO_4).15H_2O$]. **Quartz, smectite** and a 10Å **mica** are also present. XRS analyses confirm that the water-soluble salts in sample M2168 are dominantly sodium and magnesium sulphates.

Table 1: *Major element composition of samples by XRS*

	Fe_2O_3	CaO	K_2O	SiO_2	Al_2O_3	MgO	Na_2O	SO_3
M2172 as-received	7.41	1.10	2.08	59.2	17.4	1.85	0.29	0.83
M2168 as-received	6.30	0.58	1.94	52.4	13.3	4.36	2.30	9.19
M2168 water soluble	0.00	1.01	0.23	0.00	0.00	17.47	11.89	49.5
M2168 water insoluble	7.06	0.18	2.67	62.5	14.3	1.69	0.74	1.81
M2168 <2µ clay	6.51	1.85	1.35	58.3	18.2	1.77	0.23	0.04

XRD analysis indicates that the water-insoluble residue contains **smectite** (15.0Å basal spacing in air-dried condition), **quartz, mica (muscovite), feldspars** and **jarosite**, with other minor phases including a trace of **kaolinite**. XRS data including significant SO_3 and K_2O values are consistent with this result.

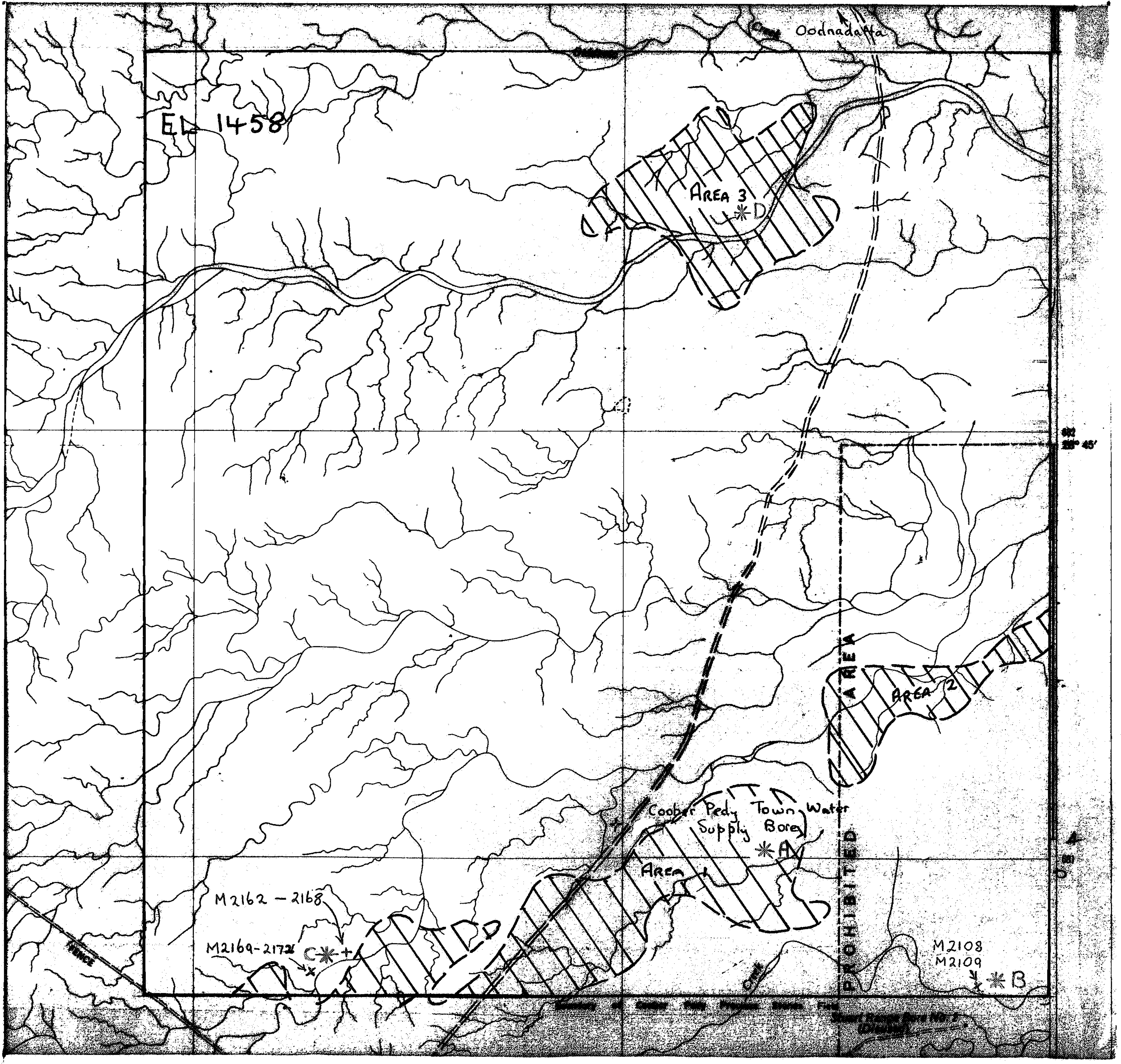
The <2µ clay fraction separated from the water-insoluble material in M2168 is dominantly (>90%) **smectite**, with some **quartz** (approximately 7%) and a trace of **feldspar**. Muscovite is not present in the clay fraction, and so is evidently coarser than 2µ in this sample. The smectite has a basal spacing of 16.2Å in the pressed powder sample (Ca-saturated, air-dried). XRS data suggest that the smectite is aluminous and contains significant iron and some magnesium. The CaO values reflect Ca-saturation during sample preparation, but the relatively high K_2O value (1.35%) is not easily explained. Some K_2O may be assigned to the trace of feldspar detected in the diffraction pattern; the remainder may indicate that the smectite incorporates some mica in a mixed-layer structure. In the oriented sample of the clay fraction, Mg-saturation and glycerolation cause the basal spacing of the smectite to change to 20.9Å, but the state of hydration was not closely controlled. Further work will be required if there is a need to characterize the smectite in detail.

References

Norrish, K. & Hutton, J.T. 1969. An accurate X-ray spectrographic method for the analysis of a wide range of geological samples. ***Geochim. Cosmochim. Acta* 33**, 431-453.

Raven, M.D. & Self, P.G. 1987. Procedures for the collection and manipulation of X-ray powder diffraction data from remote locations, based on a Philips PW1710 diffraction control system. II. Handling procedures for data from the PW1710. Version 1.0. CSIRO Division of Soils ***Tech. Mem. No. 91/1987.*** 10pp.

Self, P.G., Pickering, J.G., Raven, M.D., Rosser, H. & Stone, P.A. 1987. Procedures for the collection and manipulation of X-ray powder diffraction data from remote locations based on a Philips PW1710 diffraction control system. 1. Automatic control of the diffractometer - user manual. CSIRO Division of Soils ***Tech. Mem. No. 75/1987.*** 24pp.



▨ Areas of $MgSO_4$ mineralisation as defined by CRA Exploration.

× M2108 Sample site Delrico P/L December 1987.

✳ B Proposed bulk sample site. (with order of priority)

1 0 1 2 3 4 5

SCALE
[Km]

DELRICO PTY. LTD.

EL 1458

GIDDI GIDDINA CK – COOBER PEDY, STH. AUST.

SAMPLE LOCATIONS AND PROPOSED BULK SAMPLE SITES

Fig. 1.

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QUARTERLY REPORT ON

GIDDI GIDDINNA CREEK EL 1458

SOUTH AUSTRALIA

FOR PERIOD ENDED 6TH JUNE 1988

by

L.C. Barnes

EXPLORATION MANAGER

Delrico Pty. Ltd.

25th July 1988

DEPT. OF MINES & ENERGY
DIRECTOR GENERALS
OFFICE
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- 3 AUG 1988

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3 AUG 1988
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6989

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PLANS

INTRODUCTION

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- confirm the areas of mineralisation grades as previously defined.

- outline additional areas of sulphate mineralisation

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- investigate the economic potential of montmorillonitic mudstone (bentonitic shale)

Ausmintec Corp. Limited is actively seeking supplies of magnesium, sodium and potassium sulphate minerals for use in fertilizers and newly developed magnesium cements. Markets have been developed for these commodities both within Australia and overseas.

FIELD INVESTIGATIONS

In the period 10th April 1988 to 15th April 1988 the writer accompanied by S. Powell (Technical Assistant) obtained a total of 10 bulk samples from scattered locations throughout the EL. These samples were subsequently used for small scale heap leaching trials. All areas of mineralisation defined by CRA Exploration were inspected and numerous shallow trenches dug both within these areas and elsewhere to confirm the presence, or otherwise of $MgSO_4$ mineralisation. A number of mineral samples were collected in an attempt to define the mineral species present.

In general, mineralisation was observed to be more widespread than reported by CRAE, particularly in the southern part of the licence area $MgSO_4$ was abundant in the extreme south east corner of the EL and to the west of Area 1 as defined by CRAE (Fig.1)

Prior to field work at Coober Pedy an informal seminar held at the N.T. Department of Mines and Energy, Alice Springs, was attended. The seminar examined the occurrence of evaporite minerals in central Australia, with particular reference to lakes South of Alice Springs. At this seminar the opportunity was taken to discuss the Coober Pedy occurrences with Dr. A. Arakel (Queensland Institute of Technology) who had carried out some of the preliminary assessments for CRAE.

MINERALOGY

There is continuing debate over the nature of magnesium sulphate mineralisation within Bulldog Shale in the Giddi Giddinna area. Throughout their investigation CRAE referred to the dominant magnesium sulphate as epsomite ($MgSO_4.7H_2O$). X-ray diffraction studies by both Amdel Ltd. and C.S.I.R.O. define the main magnesium sulphate present as hexahydrite ($MgSO_4$ $6H_2O$) with minor amounts of pentahydrite, bloedite (Na_2 $Mg(SO_4)_2.4H_2O$) and loeweite ($2Na_2SO_4.2MgSO_4.5H_22O$)

Determination of the main magnesium sulphate mineral is required so that total sulphate content can be calculated from the Mg assay. To assist this identification relatively clean samples of ice clear, prismatic crystals (sample M2350) and white, slightly curved, brittle prismatic crystals (sample M2351) were collected from a creek bank east of the Town Water Bore. White prismatic crystals (sample M2352) were also collected from the `discovery' site, a few hundred metres south of the southern boundry of EL 1458 (Fig.1).

Data presented by Seymour (1983) suggested that the clear crystals were bloedite while the white crystals were epsomite or hexahydrite. There is only minor variation in the chemical composition of these

Data presented by Seymour (1983) suggested that the clear crystals were bloedite while the white crystals were epsomite or hexahydrite. There is only minor variation in the chemical composition of these three mineral samples (Appendix A). All three are dominantly magnesium sulphate with minor amounts of sodium and calcium sulphate (probably bloedite and gypsum, or less probably glauberite). These minor sulphate minerals may represent relicts of earlier minerals that have been largely replaced by magnesium sulphate. The theoretical minerologies of the 3 mineral samples are calculated below assuming all Ca is in the form of gypsum, all Na is as bloedite and all remaining Mg is present as epsomite.

M 2350 - Mg = 8.82% ; Ca = 0.43% Na = 0.8% SO_4 = 38.9%
Gypsum = 1.8%
Bloedite = 5.8%
Epsomite = 84.7%

M 2351 - Mg = 8.75% ; Ca = 0.05% Na = 0.13% SO_4 = 36.4%
Gypsum = 0.2%
Bloedite = 0.95%
Epsomite = 87.7%

M 2352 - Mg = 8.76% Ca = 0.91% Na = 1.15% SO_4 = 39.2%
Gypsum = 3.9%
Bloedite = 8.4%
Epsomite = 82.3%

The markedly different appearance of minerals M2350 and M2351 suggested that they may be different hydrated forms of magnesium sulphate ie. epsomite vs hexahydrite.

Combined water content of these two samples was determined as below :
M2350 - clear crystals = 43.9
M2351 - white crystals = 41.4

Combined water contents are similar and consistent with both minerals being hexahydrite.

XRD analysis of a suite of samples, natural and artificially crystallised is planned to assist resolution of the nature of the magnesium mineralisation.

BENEFICIATION/SEPARATION TRIALS

Small scale heap leaching trials have been conducted adjacent to the Mineral Research and Development Laboratory, Hendon.

Four heaps were constructed, with run-off from heaps being directed into 2, plastic lined evaporation ponds.

Heap	Sample Composites	Total Weight (kg)	Av. grade Mg	Av. grade Hexahydrite(%)
A	M2340 M2341	27.7	1.87	17.6
B	M2342 M2343 M2344	38.3	1.58	14.8
C	M2345 M2346	26.8	2.28	21.
D	M2347 M2348 M2349	31.5	2.91	27.3

Over the period 13th May 1988 to 10th June 1988 heaps were sprayed with mains water then allowed to dry before being sprayed again. Because of rain heaps remained damp from 15th May to 28th May 1988.

Heaps A and B were sprayed until run-off commenced then spray strength was reduced so that only a small amount of clay free run-off into a common evaporation pond. Heaps C and D were sprayed continuously resulting in vigorous run-off of clay - water slurry into an evaporation pond.

When dried, all heaps displayed spectacular growth of white acicular and prismatic crystals of magnesium sulphate on the surface. Crystal growth proceeded within the heaps as they dried.

A sample of this surface material, light, fluffy, dry shale impregnated with white crystallites was taken from the surface of heap C on 10th June 1988. This sample assayed 5.92% Mg, equivalent to 56.2 hexahydrite, ie a 3 fold concentration. On the same date samples of bitterns were taken from the two evaporation ponds and showed relatively low levels of Mg. The Mg/Ca ratio of the bitterns was 7:1.

Although the ponds have not yet evaporated to dryness the following conclusions can be drawn from the heap leaching trials.

(1) $MgSO_4$ in the clay is readily dissolved by application of water but the resulting $MgSO_4$ solution is largely absorbed into the clay, only minor magnesium sulphate is present in run-off into evaporation ponds. Only when the clay is slurried is there measurable run-off of $MgSO_4$ into the ponds.

(2) Gradual slurrying of clay into an evaporation pond is not practicable because of the huge quantities of water that would be required. The high water absorbancy of the clay compounds this problem particularly if clay partially, or completely, dries out between water sprays.

(3) Within evaporation ponds montmorillontic clay settles quickly, within minutes under still conditions.

(4) Within the ponds $MgSO_4$ bitterns must be decanted into a separate pond otherwise clay will absorb $MgSO_4$ rich solutions and as evaporation proceeds epsomite will crystallise within the clay, not as a separate species.

Consequently heap leaching is not considered a viable method of separating $MgSO_4$ from montmorillonitic clay. However, the complete and rapid dissolution of $MgSO_4$ minerals when sprayed with water, and the rapid settling of montmorillonite from clay - water slurry suggest other separation techniques may be more successful.

FUTURE WORK

Samples of magnesium sulphate (averaging 50 - 60% hexahydrite) have been scraped from the surface of each dried heap. Using this concentrate laboratory trials are proposed to determime if:

- this material can be used as is in the fertilizer industry
- $MgCl_2$ can be produced from this concentrate by reaction with Ca, Na or K Chloride

If either of the above are possible the economics of transporting an easily obtained 50 - 60% magnesium sulphate concentrate to Adelaide will be investigated.

Bulk samples have been stockpiled at two sites and following transportation to Adelaide the following trials are planned.

(1) Heap "leaching" to produce magnesium sulphate concentrate.

(2) Slurrying and pumping into evaporation ponds with progressive decanting to produce a clay free bittern for evaporation.

(3) Wet seiving and decanting of the resultant $MgSO_4$ solution.

(4) Slurrying and hydrocycloning, or filtering, to separate clay from bitterns.

This work should commence in August 1988.

L.C. Barnes.
Exploration Manager
Delrico

REFERENCE

Seymour, D. L., 1983 Progress report: Magnesium and sodium sulphate project, Coober Pedy District, South Australia, EL 1155. Aminco and Associates (unpublished)

EXPENDITURE

	$
From previous period.	2598.80
Field Expenses	
Salaried Staff	
8 days @ 250/day	2000.00
Weekly paid staff	
5 days @ 100/day	500.00
Vehicle Expenses	320.00
Petrol & oil	580.00
Accommodation and meals - Coober Pedy	690.00
Office Expenses	
Salaried staff - report preparation	
2 days @ 250/day	500.00
Heap Leaching Trials	
Weekly paid staff - sample preparation, construction and monitoring of leach heaps, sampling	
5 days @ 100/day	500.00
Miscellaneous Expenditure	65.00
Laboratory Expenses	
10 samples @ 25.30 ea	253.00
6 samples @ 52.30 ea	313.80
1 sample @ 34.30	34.30
1 sample @ 20.00	20.00
2 samples @ 10.00 ea	20.00
Total Expenditure for period 6/3/88 - 6/6/88	5796.10
Total Expenditure on EL 1458	8394.90

APPENDIX A

Chemical analyses of rock and mineral samples from EL 1458. Analyses by Mineral Research and Development. For sample locations see Figure 1.

TABLE ONE.

CHEMICAL ANALYSIS EL 1458

RESULTS

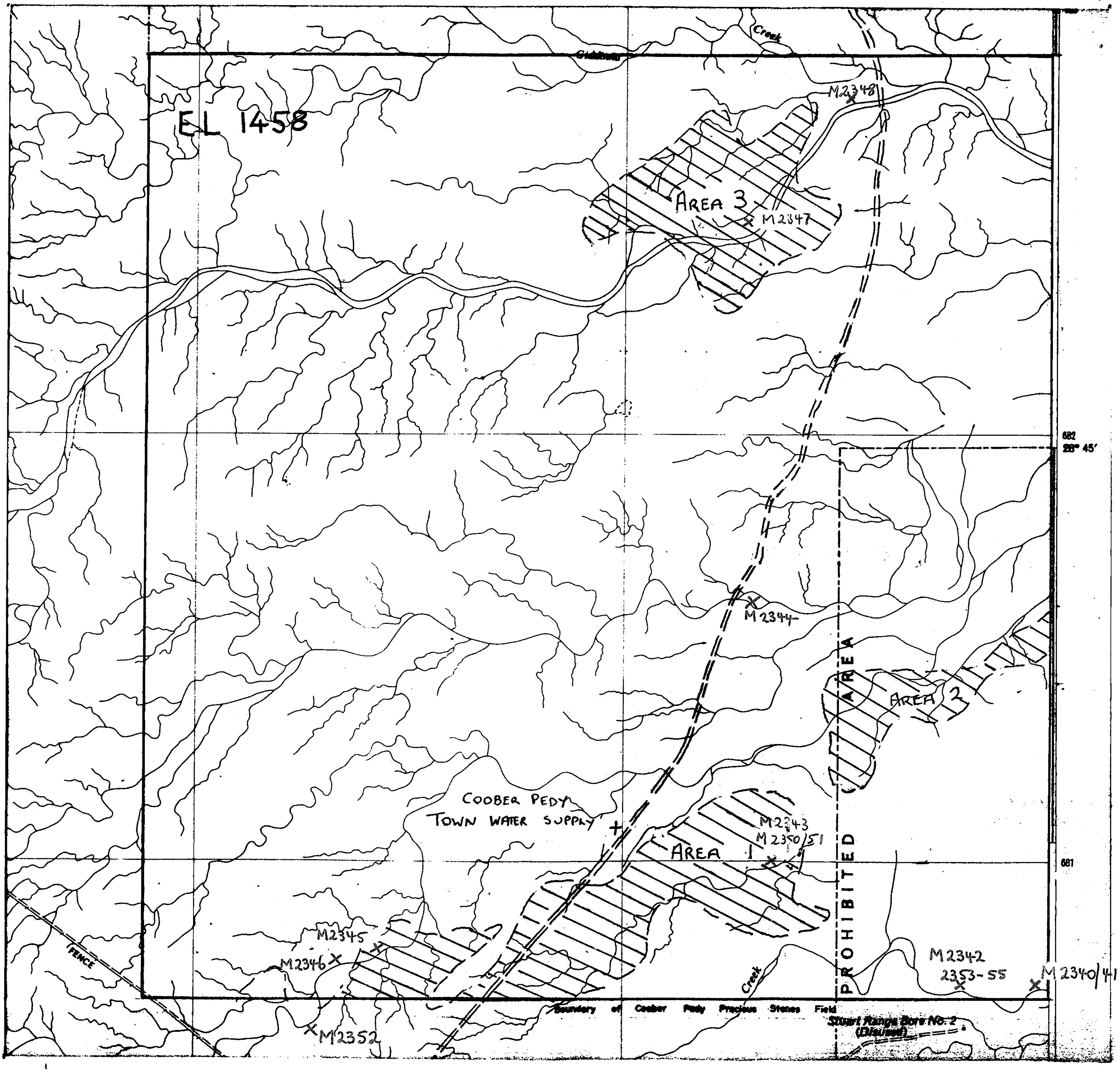
SAMPLE NO.	DESCRIPTION	%			p.p.m.							Hexahydrite %
		Mg	Ca	SO_4	K	Na	Mn	Fe	Co	Cu	Zn	
M 2340	Bulk Sample	1.41	0.5									13.2
M 2341	Bulk Sample	2.49	1.3									23.4
M 2342	Bulk Sample	1.63	0.9									15.3
M 2343	Bulk Sample	1.9	0.5									17.8

TABLE TWO.

CHEMICAL ANALYSIS EL 1458

RESULTS

SAMPLE NO.	DESCRIPTION	%			p.p.m.							Hexahydrite %
		Mg	Ca	SO_4	K	Na	Mn	Fe	Co	Cu	Zn	
M 2350	Selected Sample Clear Prismatic xtls	8.82	0.43	38.9	260	8000	51	1400	8	4	12	
M 2351	Selected Sample White, curved Prismatic crystals	8.75	0.05	36.4	440	1300	150	1900	11	4	16	
M 2352	Selected Sample. White prismatic xtls	8.76	0.91	39.2	250	11500	41	775	12	7	35	
M 2353	Selected Sample White prismatic crystals ? after Gypsum	0.5	16.7	53.5	125	75	590	5400	12	8	20	
M 2354	Selected Sample Limestone Concretion		18.2	27.6	375	450	7000	10000	60	8	900	
M 2355	Selected Sample White encrustion on gypsum plate	0.02	20.23	54.6	220	200	31	1300	15	7	11	



▨ AREA 3 Areas of $MgSO_4$ mineralisation as defined by CRA Exploration.

× M 2344 - Sample location with laboratory identification number

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FIGURE 1. SAMPLE LOCALITY PLAN.