

000

368001

ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED
MINERAL RESOURCES DIVISION

MICROFILMED

D of M	A.O.	G.G.	E.O.	D.S.
D. DIR.	8 AUG 1984			Registered
	DEPT. OF MINES			E & IL
REF. No.	8112/84			

PART EXPLORATION LICENCE NO. 32/83 - PRINCESS

PRINCESS RIVER AREA

PROGRESS REPORT ON EXPLORATION ACTIVITY

1ST OCTOBER, 1983 TO 30TH MARCH, 1984.

REPORT No. T183

OPEN FILE

I. J. MATHISON,
JUNE, 1984.

AMG REFERENCE POINTS ADDED

TABLE OF CONTENTS

<u>TABLE OF CONTENTS</u>	i.
<u>LIST OF FIGURES & APPENDICES</u>	ii
<u>1. INTRODUCTION</u>	1.
<u>1.1. Location</u>	1.
<u>1.2. Previous Exploration</u>	1.
<u>1.3. Topography & Drainage</u>	1.
<u>2. E.Z. EXPLORATION - OCTOBER, 1983 - MARCH, 1984</u>	2.
<u>2.1. Work Completed</u>	2.
<u>2.2. Results Received</u>	2.
<u>2.2.1. STREAM SEDIMENT GEOCHEMISTRY</u>	2.
<u>2.2.2. ROCK CHIP GEOCHEMISTRY</u>	3.
<u>2.2.3. PANNED CONCENTRATES</u>	3.
<u>2.2.4. GEOLOGY</u>	4.
<u>3. INTERPRETATION</u>	4.
<u>4. DISCUSSION AND CONCLUSIONS</u>	5.
<u>5. PROPOSED EXPLORATION</u>	5.
<u>REFERENCES</u>	6.

LIST OF FIGURES AND APPENDICESFIGURES:

PR.1.	Location & Access		
PR.2.	Princess River - Geochemistry	Zn	AO-531-1002
PR.3.		Pb	AO-531-1003
PR.4.		Ba	AO-531-1004
PR.5.	Princess River - Sample Locations		AO-531-1005
PR.6.	Princess River - Geology		AO-531-1006

APPENDICES:

- A. Geochemical Data Sheets - Stream Sediment Samples and Rock Samples.
- B. Panned Concentrates - Summary Sheets and Mineralogical Descriptions.
- C. Preliminary Comments and Recommendations regarding Stream Sediment Samples from the Princess River area, Tasmania.

003

1. INTRODUCTION

1.1. Location (See Fig. 1 & Fig. PR.1.)

The Princess River Basin occupies an area of approximately 20km² around the upper reaches of the Princess River. The basin lies 5km north of the Lyell Highway and 14km east of Queenstown. There is no vehicle access to the area. Access by foot is impractical because of thick titree scrub.

1.2. Previous Exploration

Published geology of the area is based on field mapping by K.O. Reid (1963). Reid mapped the area as part of his B.Sc. honours project. He assigned the rocks of the basin to the Siluro-Devonian Bell Shale - a sequence of dark grey shales and siltstones with occasional thin limestone units and pyritic shales.

In 1967-68, Pickands Mather (Smith, 1968), carried out reconnaissance stream sediment sampling which was followed up by more detailed stream sediment sampling and limited rock chip and soil sampling. Samples were analysed (A.A.S.) for Cu, Pb, Zn, Ni and cold extractable copper. Stream sediment samples returned several elevated lead and zinc values within a high background. Neither the elevated results nor the high background were explained by the soil or rock chip geochemistry.

1.3. Topography & Drainage

The Princess River Basin consists of a central swampy flat area with a surrounding amphitheatre of steep ridges. Minor tributaries form an approximately radial drainage pattern into this swampy plain. These tributaries are steep and fast flowing in the ridges. Across the swampy plain they flow in distinct meandering channels until they join the similarly meandering Princess River. Streams have rocky beds in the ridges but flow over thick sand and gravel across the river flat.

2. E.Z. EXPLORATION - OCTOBER, 1983 TO MARCH, 1984

2.1. Work Completed

In November, 1983 and January, 1984, E.Z. completed a programme of reconnaissance stream sediment sampling and rock chip sampling. Geological observations were noted at all sample points. A total of 33 stream sediment samples, 24 rock chip samples and 16 panned concentrates were collected.

Rock and stream sediment samples were analysed for Cu, Pb, Zn, Ag, Fe, Mn and Ba by Analabs. Early stream sediment samples were also analysed for Sn, W and Ni. Sn, W and Ba were detected by X.R.F. Other elements were determined by A.A.S. following nitric-perchloric digestion. Loss on ignition values were calculated for stream sediment samples.

Panned concentrates were submitted for heavy mineral separation followed by microscopic identification of heavy minerals. One rock sample was thin sectioned and described.

2.2. Results Received

2.1.1. STREAM SEDIMENT GEOCHEMISTRY (See Appendix A & Fig's PR2., PR3 & PR4.)

All stream sediment samples reported elevated Cu, Pb, Zn, Mn, Fe and Ba. L.O.I. (loss on ignition) percentages were also high. Results are summarized below:-

n = 31 (Two sets of duplicate samples were averaged.)

Element	Range	Mean	Anomalous?	No. Anomalous
Copper	35-145	100		
Lead	60-790	200	> 400	3
Zinc	150-1,400	400	> 800	4
Iron	1.70-8.15%	3.0%		
Manganese	0.08%-8.15%	0.5%		
Barium	431-3,500	1,000		
L.O.I.	9.68-25.48%	15%		

An examination of the tabulated data (Appendix A.) reveals several correlations. The following generalisations may be significant.

- 005
- a) High Pb values generally correlate with high Mn, Fe and L.O.I.
 - b) All high Mn, Fe and L.O.I. are accompanied by high lead values and/or high Zn values.
 - c) Zn values do not correlate with Pb values.
 - d) Zn values do not correlate with Mn, Fe or L.O.I. values.

2.2.2. ROCK CHIP GEOCHEMISTRY (See Appendix A. & Fig's PR2, PR3 & PR4.)

Most of the rock chips analysed were of dark grey to black siltstone and shale. Except for one sample (59290) Cu, Pb, Zn, Fe & Ni values reported lie within or close to the values for average shales. Barium contents are considerably higher.

Results are summarised below:

n = 23 - sample 59290 excluded.

Element	Princess River		Avge Shale (Hawkes & Webb, '62)	Avge Shale (Levinson, '80)
	Range	Mean		
Copper	15-55	30	30-150	50
Lead	10-45	25	20	20
Zinc	50-240	120	50-300	100
Nickel*	30-120	55	20-100	70
Iron	1.20-8.70	3.2%	4.3%	-
Manganese	30-2850	760	-	-
Barium			300-600	700

* n = 11

Sample 59290 with Cu 70 ppm, Pb 115 ppm, Zn 370 ppm, Fe 6.65% and Mn 3.25% appears weakly anomalous.

2.2.3. PANNED CONCENTRATES (See Appendix B and Fig. PR5.)

Heavy mineral concentrates from stream sediments of the Princess River Basin consist predominantly of limonite. This occurs as colloform masses, as limonitised fossil wood, and as ferricrete enclosing quartz and siltstone chips. Rounded nodules of monazite are also common. Both the limonite and monazite may be of supergene or surficial origin.

Other minerals which occur in most samples indicate a nearby basic source. The fresh olivine, orthopyroxene, clinopyroxene and magnetite are probably derived from Jurassic dolerites. Minerals from granitic rocks or from high grade metamorphic rocks are rare.

006

The occurrence of oxidised pyritic sulphides in some samples may be significant. These occur in a large tributary flowing into the Princess River from the east. No obviously anomalous base metal geochemistry is associated with these pyritic sulphides.

2.2.4. GEOLOGY (See Appendix A & Fig. PR6.)

Rock types mapped in the Princess River Basin include dark grey to black shales, dark grey to black siltstone, quartz lithic sandstone and silty limestone. Siltstone and shale predominate. These fine grained rocks often display a well developed cleavage. Sandstone and limestone are rare and occur as thin beds within the shales and siltstones.

Only one rock was thin sectioned and microscopically examined. This rock, 60187, was described as a moderately dolomitised very impure limestone to calcareous siltstone (see Appendix A.).

Structural data collected from rock sample sites are compatible with folding around N-S fold axes as mapped by Reid (1963).

3. INTERPRETATION (See Appendix C.).

Geological and geochemical data from the Princess River Basin were forwarded to Dr. A.S. Joyce of Geochempet Services. Preliminary comments and recommendations were requested. Dr. Joyce commented, "There is a distinct possibility that none of the 'anomalous' sediment samples has any relationship to mineralisation within the catchment area." Enrichment of Pb and Zn in bog materials or in ancient organic sediments were suggested. Major recommendations are summarised below.

- i) Obtain a loss on ignition figure for stream sediment samples as a guide to the abundance of organic matter.
- ii) Perform multiple regression analyses of Pb and Zn against Fe, Mn and L.O.I.
- iii) Obtain pH measurements of stream water, spring water, swamp water and ground water.
- iv) Collect bulk stream sediment samples and investigate the distribution of Pb and Zn among various fractions of the sample.

Loss on ignition values have been calculated. The other recommendations form part of the proposed programme for 1984-85.

4. DISCUSSION AND CONCLUSIONS

Interest in this area depends on the significance of the elevated lead and zinc stream geochemistry. Both the high background values and the "anomalous" values may have been produced by enrichment in a muskeg type environment. However this possibility is counter balanced by the following observations.

- i) Stream sediment samples were collected from similar swampy areas during the 1983-84 field season. Values from all these areas were much lower than those from Princess River.
- ii) Most of the stream sediment samples from Princess River were collected away from the present day swamp.
- iii) Levinson (1980, pp445 & 447) reports that bog samples from mineralised areas have significantly higher base metal contents than samples from non mineralised areas.
- iv) Large, economically viable lead-zinc deposits occur elsewhere in similar rocks.

These considerations demonstrate that the cause of the elevated lead and zinc geochemistry in the Princess River Basin is uncertain. There is a possibility that it may be related to mineralisation.

5. PROPOSED EXPLORATION 1984-85

The first objective of further exploration in the Princess River area must be to determine whether the anomalous lead-zinc geochemistry is related to economic mineralisation. The programme outlined below is directed towards this.

Exploration Programme

- i) Extend stream sediment sampling within the Princess River Basin. Collect several bulk samples for fractional analysis.
- ii) Extend stream sediment sampling to nearby drainage systems which also drain parts of the Bell Shale.
- iii) Map and sample selected traverses in detail.
- iv) Soil sample ridges and spurs near anomalous stream sediment samples.
- v) Perform a statistical analysis of the stream sediment geochemistry.

008

REFERENCES

HAWKES, H.E., & WEBB, J.S., 1962

Geochemistry in Mineral Exploration.

LEVINSON, A.A., 1980

Introduction to Exploration Geochemistry (2nd Ed.).

REID, K.O., 1963

The Geology of the Princess River Area.
Hons. Thesis, University of Tasmania.

SMITH, H., 1968

Princess River Area, Queenstown - Detailed Geochemical Sampling
Report on E.L. 12/65 for Pickands Mather & Co.
Tasmanian Mines Department O/F 58/14.

APPENDIX A.

Geochemical Data Sheets - Stream Sediment Samples
and Rock Samples.

C.Z. Co. of Asia Ltd,
ROSEBURY, Tasmania

GEOCHEMICAL SAMPLE DATA SHEET

PROJECT: ... GORDON LIMESTONE
LOCALITY: ... PRINCESS RIVER
GRID NAME:
NOMINAL GRID AZIMUTH:

MATERIAL: Stream Sediments
SAMPLE METHOD: Sieved to 2mm
SAMPLED BY:
DATE: NOV 1983

SIZE FRACTION ANALYSED: .. 80 mesh ..
ANALYSED BY: ... A.M.A.B.S.
METHOD: A.A.S. Sp. W. by X.R.F.
Ba by XRF

SAMPLE NUMBER	SAMPLE LOCATION DATA				STREAM DATA				COMPOSITION DATA				METAL CONTENT (ppm unless specified)											
	GRID LINE NO.		A.M.G. CO-ORDINATES		Str. Order	Direction of Flow	Width	Active Stream Load	Clay	Sand	Rock Frag.	Organic	CONTAM.	Geology	Cu	Pb	Zn	Ag	Au	Fe %	Mn %	Ba	L.O.I. %	
	GRID EASTING	NORTHING	EASTING																					
33443																								
60012						8.0			12570	4					50	160	580	X		5.30	1.25	1780	12.45	
15						1.0			54550	1					105	365	820	X		6.75	2.15	3510	17.78	
16						1.5			53060	5					50	100	380	0.5		4.15	0.44	1360	15.25	
17						1.5			53060	5					100	350	1400	0.5		8.05	6.85	3320	11.5	

368012 011

Electrolytic Zinc Co. of A'asia Ltd.
Rosebery, Tas.

ROCK SAMPLE LEDGER

PROJECT: GORDON LIMESTONE

COLLECTED BY: [REDACTED], S [REDACTED]

DATE: Nov 83

Sample Number	A.M.G.Co-ordinates		Sample Type	Geological Description	Rock-type (Macroscopic)	Thin or Polished Section				Metal Content (p.p.m. unless specified)									
	N	E				T or P	By	Reference	Rock-type (Microscopic)	Cu	Pb	Zn	Ag	Ni	Fe	Mn	Ba		
59300			Rock	Black shale, iron stained and cleaved, minor pyrite cf BSS 59201	BSH							15	35	110	x	30	1.35%	30	
59299			"	Black shale, iron stained and well cleaved in places cf BSS 59201	BSH							55	10	240	0.5	120	5.10%	3100	3130
59298			R.Chip	Black shale, iron stained and well cleaved cf BSS 59205	BSH							40	25	50	x	30	1.55%	60	
59297			Rock	Weathered khaki siltstone, well cld. with sandstone cf BSS 59207	SLT							35	20	155	0.5	75	2.50%	75	
59296			"	Dark grey marly siltstone, trace pyrite and poorly preserved fossils (BSS 59213)	SLT							20	25	95	x	30	1.20%	150	
59295			"	Black calcareous siltstone - almost massive	SLT							25	25	125	0.5	45	30.5%	525	
59294			R.Chip	Black shale cf BSS 59216	BSH							25	20	150	0.5	95	3.15%	650	
59293			"	Dark grey - black laminated siltstone cf BSS 59218	SLT							35	30	110	0.5	55	2.20%	225	
59292			"	Marly siltstone with minor pyrite & thin limestone cf BSS 59219	SLT							15	30	80	0.5	35	1.25%	1100	
59291			Rock	Dark grey massive siltstone cf BSS 59220	SLT							20	35	105	x	30	1.20%	185	
59290			R.Chip	Dark grey - black micaceous siltstone with minor sandstone cf BSS 59201, 2	SLT							70	115	370	1.0	165	6.65%	3.25%	6780
59289			"	Dark grey - black micaceous siltstone cf BSS 59224, 5	SLT							40	45	145	0.5	65	4.40%	2150	1.08%
60190				Black shale minor siltstone cf BSS 60122	BSH							30	10	120	x		2.30%	2000	1210
60189				Tan siltstone minor Fe staining	SLT							20	15	145	x		3.40%	385	1020
60188				?								30	35	135	x		4.05%	2250	1250
60187				Black, finely crystalline limestone, silty with trace pyrite	LST	T	Owner	cms	Dolomitic marl			25	10	75	x		3.10%	1050	773
				(TS & Dolomitic calc = pelite)															

368013 012

Electrolytic Zinc Co. of A'asia Ltd.
Rosebery, Tas.

ROCK SAMPLE LEDGER

PROJECT: GORDON LIMESTONE

COLLECTOR: L.M.

DATE: Jan '84

Sample Number	A.M.G.Co-ordinates		Sample Type	Geological Description	Rock-type (Macroscopic)	Thin or Polished Section			Metal Content (p.p.m. unless specified)									
	N	E				T or P	By	Reference	Rock-type (Microscopic)	Cu	Pb	Zn	Ag	Ni	Fe	Mn	Ba	
60186				Tan to purplish grey siltstone, slightly ferruginous	SLST						45	30	105	x		4.20	365	1920
60185				Black siltstone with conchoidal fracture - massive	SLST						40	35	130	x		4.50	1000	1430
60184				Olive green siltstone, slightly micaceous - poorly bedded	SLST						20	25	125	x		3.25	95	1670
60183				Dark grey to black shale/mudstone, minor Fe staining - no obvious bedding	SH						50	15	155	x		8.70	485	1330
60182				Grey micaceous siltstone	SLST						30	30	125	x		3.50	300	1610
60181				Tan to orange weathered siltstone - many small depressions	SLST						30	25	165	x		4.30	200	1430
60180				Grey laminated shale	SH						25	25	105	x		3.75	250	1090
60014				Dark grey shale - well cleaved - possibly along bedding	SH						25	30	70	x		1.90	110	1830

Sample No.	Classification - Composition	Fabric	Accessories	CENTRAL MINERALOGICAL SERVICES Comments
60187	Dolomitic Calc-Pelite. Microcrystalline calcite, variably replaced by cloudy dolomitic carbonate and weakly corroded silt-sized clastic quartz with varying proportions of carbonaceous matter, minor detrital white mica	Lenticularly banded to vaguely slumped silty clastic. Incipiently sheared.	Traces syngenetic pyrite, clastic leucoxenic semi-opaques. Patchy. Ilmonitic stainings.	Highly impure limestone "grading" into calc-siltstone. Moderately dolomitised and partly weathered, with ilmonitic staining of partly degraded/oxidised ankeritic dolomite.

013
368014

01A

APPENDIX B.

Panned Concentrates - Summary Sheets and Mineralogical
Descriptions.

JOHN F. GILFILLAN & ASSOCIATES PTY. LIMITED

MINERAL EXPLORATION AND GEOLOGICAL CONSULTANTS
PETROLOGY IN ASSOCIATION WITH Dr. B.J. BARRONCommodity Studies
Regional Assessments
Prospect Evaluation
Mineral Exploration
Exploration Management
Mining Geology
PetrologyPostal Address:
P.O. Box 422,
Lane Cove, N.S.W. 2066
AustraliaTelephone:
(02) 436 1056

Our Ref: E3/81

Your Ref: E-Z Order No. 900470

Project: Princess River

DATE	TIME	DATE	TIME	DATE	TIME
- 9 JAN 1984				INDUST	
MET					

MINERALOGICAL EXAMINATION OF EIGHT HEAVY
MINERAL CONCENTRATES

Report No: E3/81/240

30th December, 1983.

For: Electrolytic Zinc Company of Australasia Ltd.

Dr. B.J. Barron,
Petrologist.

016

Sample No. 59202

Heavy Mineral Concentrate A dark brown oxidised concentrate containing unsorted grains ranging in size up to 7 mm across (or pebble sized gravel). The coarser fraction is quite well rounded and only sparse small grains of magnetite are present.

Thin Section This concentrate contains approximately 90% of weathered grains which have been largely converted to red to yellow-brown ferric oxides. These include mainly subrounded to quite well rounded grains, some reaching 4 mm across in which are preserved clear relict textures of fossilised wood patterns including ordered radial and concentric arrangement of cells. In other oxidised clasts small angular silt-sized quartz chips are enclosed in a dense fine grained matrix comprising dense massive red- to yellow-brown limonitic oxides. Still other oxidised grains appear to be zoned and concretionary with strongly birefringent limonitic products peripherally and almost isotropic material centrally. A single grain of oxidised fine grained siltstone is present.

The remaining 10% of the sample comprises the finer grained fraction (mainly less than 2 mm across) including abundant orthopyroxene, sparse grains of an orthopyroxene-clinopyroxene intergrowth, sparse grains of clinopyroxene, topaz and sparse grains of yellow-brown and olive green ?tourmaline. A single grain of well twinned cassiterite is present.

Sample No. 59204

Heavy Mineral Concentrate This dark brown oxidised sample has a variable grain size ranging up to a maximum of about 4 mm across. The larger grains are quite well rounded and only two very small grains of magnetite are present in the small portion tested.

Thin Section As in the previous sample, more than 90% of the present concentrate consists of red-brown oxidised grains, most of which are limonitic material. The latter includes quite massive red- to yellow-brown grains, dense red-brown grains that enclose numerous silt-sized angular quartz

017
chips, zoned limonitic concretionary grains, and some stained organic (woody) fragments.

The finer grained crystal fraction, mostly less than 0.5 mm across, includes scattered grains of orthopyroxene, orthopyroxene-clinopyroxene intergrowth, sparse grains of olive green and brown tourmaline, sparse grains of topaz, several small degraded grains of carbonate, chlorite, sericite, one grain of ?barytes and one grain of partly degraded and clouded ?cassiterite.

Sample No. 59206

Heavy Mineral Concentrate This sample comprises mainly subrounded to quite well rounded grains and broken fragments of red-brown material, and sparse black grains. The grain size ranges up to about 4 mm across (long dimension) and rare small magnetic grains are present.

Thin Section As in the previous samples strongly oxidised red-to yellow-brown grains greatly predominate, and these include dense massive material, spherulitic secondary limonitic oxides, dense oxides which enclose abundant poorly sorted angular quartz chips and limonitic oxides which stain and partly replace cellular woody material.

The very subordinate (less than 5% of the total grains) crystal fraction includes minor quartz, ?clinopyroxene, rare grains of chlorite, and rare opaque oxides (probably magnetite). Other heavy mineral grains (tourmaline, topaz, cassiterite etc.) are notably absent from this sample.

Sample No. 59208

Heavy Mineral Concentrate A mid-brown and (minor) dark grey coloured sample which contains mainly subrounded to well rounded grains ranging in size up to 4 mm across. Very few grains are magnetic.

Thin Section This is a very significant sample which contains

the following phases; strongly oxidised and weathered red- to yellow-brown limonitic oxide-rich grains 40% of the sample; clouded high relief grains with very low (to uniaxial)/axial angle ^{positive} 45% of the sample; and the remaining 15% of the sample includes chlorite, pyroxene, lithic fragments (chlorite-apatite-quartz rock), rare opaque oxide grains and a single irregular shaped sulphide grain.

The limonitic oxide-stained grains include massive types, banded colloform grains, well rounded ferric oxide stained siltstone grains, large elongate clasts in which organic cell-like structures are quite poorly preserved, and cubic shaped grains which almost certainly represent former crystals completely pseudomorphed by limonitic oxides.

The clouded high relief monazite ^{*} grains, which are mainly in the order of 0.3 mm across are quite strongly clouded by dense dusty inclusions, some of which are opaque to red-brown, while others include angular quartz chips. The shapes of the monazite grains are almost invariably well rounded, and rarely such rounded grains appear to be included as "porphyroblasts" or rounded "nodules" in a very fine grained foliated siltstone host lithology. Thus the rounded grains are probably not the result of abrasion during fluvial transport and weathering, but appear to be of fairly local derivation. The origin of these rounded inclusions is uncertain, but it is likely that they are possibly formed by secondary (?metasomatic) processes in a zone of oxidation.

The sparse fresh angular grains of clinopyroxene (?pigeonite) are from a reasonably nearby basic igneous source.

* Note: The poorly defined optical properties of these grains in thin section required X-ray diffraction analysis for accurate identification as a phosphate(monazite). See X-ray diffraction analysis for sample 59217, which is included with this report.

Sample No. 59211

Heavy Mineral Concentrate A red-brown concentrate containing well rounded to subrounded grains ranging in size up to about 3 mm across. The sample is not magnetic.

Thin Section The sample is somewhat similar to the previous concentrate 59208. It comprises mainly subrounded to quite well rounded grains of variable size ranging up to almost 3 mm across. Quite strongly oxidised red-brown grains predominate, accounting for more than 60% of the total sample. These again include massive types, colloform banded concretionary types, and some grains of dense red-brown oxides that enclose numerous angular chips of quartz.

Small (mainly about 0.3 mm across) well rounded grains of dense granular to massive monazite comprise approximately 30% of the sample and are strongly clouded by abundant fine inclusions, including opaque dust, sparse patches of red-brown alteration products and abundant very small chips of angular quartz. These rounded grains appear as inclusions within certain rare clasts which retain small coatings of a foliated fine grained silty host lithology. Again the monazite most likely is derived from a fairly local source area.

The remainder of the sample contains accessory proportions of chlorite, fresh clinopyroxene (from a basic igneous source), minor carbonaceous siltstone, and a single quartz-tourmaline aggregate.

Sample No. 59214

Heavy Mineral Concentrate A red-brown to dark brown coloured sample in which grain size is highly variable up to a maximum of almost 1 cm. Mostly, however the grain size is about 3 to 4 mm with an abundant finer grained fraction. The sample contains very rare small magnetic grains.

Thin Section Subrounded to quite well rounded grains comprise most of this sample, and two distinct size fractions are represented. The

020

coarser fraction includes material about 0.5 mm to nearly 3 mm across, while a finer grained fraction has an average grain size of about 0.3 mm across.

The coarser grained fraction, which accounts for approximately 40% of the material represented in thin section, includes abundant red-brown ferric oxide stained grains of several different types. These include poorly sorted sedimentary clasts with sparse silt-sized and fine sand-sized angular quartz grains scattered throughout a dense ferruginous matrix; massive red-brown oxide-rich grains; sparse red-brown oxide-stained grains which retain recognisable cell structures, clearly of plant origin; and rare opaque oxide grains which have narrow rims of red-brown limonitic oxides.

A distinctly finer grained fraction comprising the remainder of the sample includes very abundant rounded grains of monazite (mostly about 0.3 mm across), which is strongly clouded by dense fine grained inclusions of quartz, red-brown oxide dust, and more rarely recognisable tourmaline chips. As in the previous sample 59211 several similar rounded "nodules" or "porphyroblasts" of monazite are enclosed within a fine grained weakly foliated siltstone matrix. Sparse accessory crystal debris includes angular cleavage fragments of fresh pyroxene which is possibly pigeonite (very low positive axial angle) from a basic igneous source, and an equally fresh clinopyroxene/orthopyroxene intergrowth, possibly from the same basic igneous source.

Sample No. 59217

Heavy Mineral Concentrate A mid-brown coloured poorly size-sorted sample containing subrounded to quite well rounded grains most of which are less than 0.5 mm across, but with several grains reaching up to 8 mm across. The sample contains very few magnetic grains.

Thin Section This sample is fairly similar to the previous sample 59214 in that two distinct size ranges of material are present. The coarser material representing about 35% of the material in the thin section, ranges in size up to nearly 4 mm across and includes grains which are heavily stained by red-brown limonitic oxides. Ferruginous silty material is common, as are

021

grains showing concretionary zonal structures and ferric oxide stained organic grains with recognisable relict cell structures.

By far the majority of the samples in the present section comprises subrounded to well rounded grains of monazite^{*}, mainly in the order of 0.3 mm across. As in the previous samples where this phase is well represented, the clouded grains in the present sample are crammed with minute inclusions of red-brown dusty oxides, angular quartz chips and other material too small to identify accurately. Also present are several such rounded grains enclosed within attached very fine grained weakly foliated pelitic host lithology. Accessory mineral debris includes sparse fresh cleavage fragments of clinopyroxene (?pigeonite), as well as olivine, probably from a very local basic igneous source. Other rare crystal grains include green chlorite, rare opaque oxides, and rare clusters of granular quartz and sericite.

* See attached X-ray diffraction chart.

Sample No. 59223

Heavy Mineral Concentrate A mid-brown coloured concentrate of poorly sorted grains ranging in size up to nearly 5 mm across. The grains have irregular to quite well rounded shapes, and very few are magnetic.

Thin Section This sample contrasts with the previous samples in that abundant monazite is lacking. It consists mainly of red-brown ferric oxide-rich grains which, in the present thin section, range in size up to 3 mm across. These subrounded to irregular shaped grains include massive oxides enclosing only rare small angular grains of quartz (ferricrete), grains which exhibit distinct concretionary textures, and rare opaque oxide grains that are converted marginally to red-brown limonitic oxides (goethite).

Accessory grains include cleavage fragments of relatively fresh clinopyroxene with a very low positive axial angle (probably pigeonite), as well as a single grain of fine grained pyroxene intergrowth. Equally rare lithic fragments comprise poorly sorted silt sized, or fine sand sized angular quartz chips, chlorite flakes, and tourmaline chips, set in a dense, exceptionally fine grained red-brown oxidised matrix. Rare contaminating quartz grains and a single small clear grain of cassiterite is accessory.

022



SGS Australia Pty. Ltd.

NEW SOUTH WALES
74 McEvoy St., Alexandria, Sydney, N.S.W. 2015
Telephone 699 7626 Telex: SGSSYD AA22395

WESTERN AUSTRALIA
80 Railway Parade, Queens Park
Telephone 458 1421 Telex: SGSPTH AA92624

JOHN F. GILFILLAN & ASSOCIATES PTY LIMITED
Mineral Exploration & Geological Consultants
77 Pacific Highway - 3rd Floor
NORTH SYDNEY - NSW 2060

OR P.O. Box 422
Lane Cove 2060

Our refLA.2485.....

Your refE3/3.....

Date received16.12.83.....

Date completed...19.12.83.....

Issued atSYDNEY.....

cc. Mr R. Flossman
School of Applied Geology
UNSW - KENSINGTON - NSW 2033

December 21, 1983

ANALYTICAL REPORT

	Sample Ref.	Dry Wt	Wt Sink
1		g	g
2	S 9202	33.3	10.126
3	04	45.5	3.074
4	06	32.8	0.824
5	08	57.9	1.943
6	11	29.9	1.607
7	14	18.7	6.674
8	17	18.3	2.725
9	23	40.3	13.629
10			
11	T.B.E. Separation		
12			
13			
14			
15			
16			
17			
18			
19			
20			

B. L. Lomon

368024

023
JOHN F. GILFILLAN & ASSOCIATES PTY. LIMITED

MINERAL EXPLORATION AND GEOLOGICAL CONSULTANTS
PETROLOGY IN ASSOCIATION WITH Dr. B.J. BARRON

Commodity Studies
Regional Assessments
Prospect Evaluation
Mineral Exploration
Exploration Management
Mining Geology
Petrology

Postal Address:
P.O. Box 422,
Lane Cove, N.S.W. 2066
Australia

Telephone:
(02) 436 1056

Our Ref: E3/81

Your Ref: E-Z Order No. 900494

Project: Queenstown

MINERALOGICAL EXAMINATION OF
FORTY EIGHT SAMPLES OF HEAVY
MINERAL CONCENTRATES

Report No: E3/81/255

13th April, 1984.

For: Electrolytic Zinc Company of Australasia Ltd.

J. Barron
Dr. B.J. Barron,
Petrologist.

Sample No.

60011 (Princess River)

Description of Concentrate

A poorly size-sorted sample comprising grains ranging in size up to about 7 mm across (pebble sized gravel). Small strongly magnetic grains are quite common.

Thin Section

This sample includes elongate subrounded, to well rounded, as well as quite angular grains generally within the size range 0.23 mm (fine sand), up to 1 mm (coarse sand) with sparse grains which are considerably larger. This material includes abundant opaque oxides, clearly indicating strongly magnetic magnetite (see above), as well as grains which are partly to completely converted to red-brown limonitic oxides. In addition numerous grains exhibit strongly zoned textures, including nodules and vein-like fragments with colloform banding. The strongly birefringent limonitic oxides appear to include goethite which, in rare cubic shaped grains, possibly replaces previous sulphides. Certain strongly altered and oxidised lithic fragments retain relict textures of weakly foliated quartz-bearing siltstone and very fine grained quartz arenite precursors.

Sample No.

60013 (Princess River)

Description of Concentrate

A mid-brown coloured sample of medium to coarse sand sized particles, scattered grains of which are distinctly magnetic.

Thin Section

This sample exhibits a variety of grain sizes with grains up to 1.5 mm across amongst the coarsest represented. The grains also exhibit a wide variety of shapes with subrounded to highly angular material well represented. Red to yellow-brown hematite grains predominate with common clasts of ferricrete enclosing sparse silt-sized angular quartz chips in a fine grained matrix of dense fine grained red-brown ferric oxides. Sparse grains of partly altered magnetite are present, as well as sparse titaniferous oxides in various stages of alteration to white leucoxene.

Rare accessory silicate grains and aggregates are quite angular and comprise largely clinopyroxene and aggregates of clinopyroxene and plagioclase from a basic igneous source. Rare lithic clasts include several of a very fine grained weakly foliated siltstone and a single clast of fine grained carbonate-rich material.

<u>Sample No.</u>	60123 (Princess River)
<u>Description of Concentrate</u>	A red-brown coloured concentrate containing a range of material up to 3 mm or 4 mm across. Sparse small grains are strongly magnetic.
<u>Thin Section</u>	The voluminous coarse grained fraction of this rock comprises grains mainly within the size range 0.3 mm up to 2 mm across and which include the following types; massive fine grained hematite, colloform and concentric banded limonitic oxides and strongly birefringent oxides (probably including goethite), oxide-stained silty and poorly sorted sericite-rich sandy siltstone, rare ?"nodules" of fine grained, strongly clouded <u>monazite</u> , and small lithic clasts which contain subhedral oxidised cubic sulphide grains, set in fine prismatic vein quartz ± chlorite.
	Sparse <u>crystal</u> debris has a grain size rarely exceeding 0.3 mm and includes rare subhedral grains of a brown spinel, orthopyroxene, rare grains of brown tourmaline, rare grains of rutile, fresh pyroxene, as well as equally sparse small subhedral grains of zircon.
<u>Sample No.</u>	60125 (Princess River)
<u>Description of Concentrate</u>	A single reddish-brown ?lithic granule about 4 mm across remains in this sample, together with traces of a fine sand sized fraction also containing dominantly reddish-brown to pale brown material, numerous small grains of which are clearly magnetic.

026

60125 (Cont.)

Thin Section

This sample contains a variety of unsorted material ranging in size up to about 2 mm in the present thin section. Also there is a wide variation in the grain shapes with certain grains which are well rounded while others are strongly elongate or highly angular.

Oxidised, weathered and degraded quartz-bearing siltstone and sandy siltstone predominate, with almost equally abundant clasts of dense, very fine grained red-brown limonitic oxides, concentrically banded and colloform limonitic oxides, cubic ?sulphide crystal sites that are now completely converted to red-brown goethite.

A finer grained fraction containing grains in the order of 0.25 mm (fine to medium grained sand), contains quite abundant well rounded "nodules" of clouded monazite, many of which still reside in narrow selvages of a weakly foliated quartz-bearing siltstone host. Accessory crystal debris includes sparse grains of tourmaline, zircon, ?andalusite and ?epidote.

Sample No.

60127 (Princess River)

Description of Concentrate

A red-brown coloured concentrate comprising a coarse sand to granule sized fraction, as well as fine sand sized material. Numerous scattered grains which are strongly magnetic include partly oxidised red-brown material, as well as dark grey magnetite.

Thin Section

This sample exhibits a wide grain size variation up to a maximum size of about 2 mm across in the present thin section. Grain shapes are also highly variable, with quite angular material most abundantly represented. Sparse scattered grains are quite well rounded, while many of the larger grains have irregular to subrounded shapes.

Approximately 80% of the sample comprises an oxide fraction with most abundant red-brown fine grained massive limonitic oxide grains, equally abundant finely banded colloform types which commonly exhibit alternating layers of isotropic and birefringent ferric oxides, while certain clasts which retain clear cellular relict textures comprise altered

027
60127 (Cont.)

and oxidised plant remains. Sparse opaque oxides clearly include some magnetite (since the rock is quite strongly magnetic), which is partly altered to translucent hematite. Strongly oxidised pyritic sulphide crystals are accessory.

The finer grained fraction of the sample includes small lithic fragments of a weakly foliated fine grained siltstone, many of which enclose somewhat rounded and strongly clouded dusty "nodules" of monazite, most of which enclose numerous small inclusions of the host material. The grains containing monazite account for approximately 5% to 10% of the total number of grains in the thin section. Accessory crystal debris includes well rounded tourmaline crystals, rare angular fragments of fresh clinopyroxene, angular chips of ?andalusite and a single aggregate of pale green chlorite.

Sample No.

60133 (Princess River)

Description of Concentrate

A red-brown coloured sample containing medium to fine sand sized material including numerous small grains which are strongly magnetic.

Thin Section

This sample contains a fairly similar coarse grained fraction to that of the previous sample 60127 and the grains have angular to quite well rounded shapes. These range in size up to about 2 mm across and include types which are massive fine grained red-brown hematite ± sparse small angular silt-sized quartz chips, as well as clasts with fine concentric colloform banding marked by alternating layers rich in isotropic or strongly birefringent material, possibly including goethite. Most opaque oxides have patchy central zones or rims of translucent ferric oxides, and at least some of these appear to include magnetite. Sparse cubic shaped crystals, set in a matrix of fine granular quartz are now pseudomorphed by dense limonitic oxides. Sparse grains comprise aggregates of fine grained spherulites and equally sparse material of plant origin retain poorly preserved fine cellular structures.

Sparse grains are present of a fine grained fraction (material with an average grain size of about 0.23 mm or fine sand size), which includes partly degraded (weathered) clasts of fine grained

028

60133 (Cont.)

quartz-bearing siltstone with a weakly foliated sericite-rich matrix. Several of these enclose somewhat ragged but equant "nodules" of clouded monazite. Separate rounded "nodules" of this phase also are present, together with accessory grains of zircon, tourmaline, sphene and several grains of ?andalusite.

Sample No. 60135 (Princess River)

Description of Concentrate None of the sample remains.

Thin Section This is an exceptionally fine grained sample, with an average grain size of about 0.06 mm (coarse silt), and sparse larger grains up to 0.5 mm (medium sand size).

As in previous samples, the coarser material includes red-brown coloured, strongly oxidised grains of ferricrete, certain of which enclose silt sized quartz particles, while translucent to opaque limonitic oxides appear to replace previous grains of ?magnetite and/or sites of previous cubic sulphides.

The fine grained fraction includes abundant very fine grained weakly foliated siltstone, certain of which enclose small rounded but strongly clouded monazite "nodules". Other accessory phases include sparse grains of tourmaline, rare subhedral prismatic crystals of brown allanite, sparse subrounded crystals of zircon, and a single grain of ?cassiterite and rare angular grains of quartz contaminant.

Sample No. 60137 (Princess River)

Description of Concentrate A poorly sorted red-brown coloured sample containing angular, subrounded to quite well rounded grains ranging in size up to a maximum of about 4 mm across. (coarse granule sized gravel). Numerous small grains are strongly magnetic.

Thin Section The thin section contains material ranging in

029

60137 (Cont.)

size up to about 2.5 mm across which is dominated by various forms of ferric oxides. The larger grains have subrounded to well rounded or irregular shapes while the smaller material tends to be fairly angular. About 95% of grains are ferric oxides, which include almost equal major proportions of dense isotropic ferricrete which encloses abundant scattered angular quartz chips, and birefringent ferric oxides which occur mainly in colloform or concentric bands or nodules. Accessory opaque grains with patchy alteration to translucent material mainly include magnetite.

The fine grained fraction (grains less than 0.3 mm) includes rare rounded grains (or nodules) of monazite, again filled with small dusty inclusions; sparse angular grains of fresh clinopyroxene; and rare grains of tourmaline.

030

APPENDIX C.

Preliminary Comments and Recommendations regarding Stream
Sediment Samples from the Princess River area, Tasmania.

031

368032

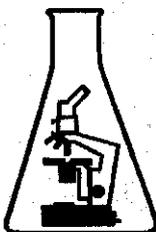
Geochempet Services

PETROLOGICAL and GEOCHEMICAL CONSULTANTS

REGISTERED IN QUEENSLAND

Principal : A.S. Joyce B.Sc.(Hons), Ph.D.
200 Chapel Hill Road
Chapel Hill, Qld. 4069

Telephone: (07) 375 5258
A/H 378 6467



PRELIMINARY COMMENTS AND RECOMMENDATIONS
REGARDING STREAM SEDIMENT SAMPLES
FROM THE PRINCESS RIVER AREA, TASMANIA

prepared for

ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

Ref : I. Mathison/S. Taylor,
Minerals Resources Division

A handwritten signature in cursive script that reads "Stan Joyce".

A. S. Joyce, B.Sc.(Hons), Ph.D.

6th March, 1984.

PRELIMINARY COMMENTS AND RECOMMENDATIONS
REGARDING STREAM SEDIMENT SAMPLES
FROM THE PRINCESS RIVER AREA, TASMANIA

1. INTRODUCTION

Stream sediment samples collected in reconnaissance and follow-up surveys in 1967-68 by Pickins Mather yielded many high Pb and Zn results which contrast with ordinary values in follow-up soils and rock chips. No satisfactory explanation was found for the high values.

Reconnaissance sediment and rock chip sampling by E.Z. in 1983-84 produced similar results.

The following comments and recommendations seek to obtain an explanation of the phenomenon and to lead towards a satisfactory exploration approach for the area.

2. COMMENTS

- 2.1 Field observations reported by Smith (1968) and Mathison (1984) indicate that Siluro-Devonian Bell Shale accounts for most outcrops and is prominent in the stream sediments. However, inspection of the Queenstown 1:250,000 geological map indicates that Upper Carboniferous to Triassic rocks or their derivative soils could be present on ridge tops. Such units could involve carbonaceous to coal-bearing rocks, Tasmanite oil shale and possibly limestone. Perhaps the abundant fossilized wood fragments reported by Barron (1983) in heavy mineral concentrates from the streams is an indication that such units are represented in the sediment load.

Carbonaceous matter, coal and oil shale clasts are likely to contain high Zn and possibly high Ba as original constituents and they are likely to absorb more Pb, Zn and Ba from groundwater or stream water during weathering and transportation.

- 2.2 The presence of quartz gravel and sand in the streams, coupled with the observed abundance of "alluvium" raises the possibility that glacial deposits could be an unrecognized component of the Princess River region. Glacial sediment could have introduced unexpected components to the system, though it is doubtful that till chemistry can explain the high Pb and Zn, particularly since elevated values occur not only in "alluvial" settings, but also upstream in more juvenile and stripped locations.

OK.

- 2.3 Zinc values recorded for 33 sediment sites sampled in 1983-84 over an area of about 6 km² range from 110 to 1400ppm and involve no regular dispersion trains. All values are "anomalously" high in relation to Zn levels commonly encountered in stream sediments. A lithosphere average Zn abundance is about 70ppm and stream sediments unaffected by mineralization are commonly less than 150ppm. It may be significant that abundances for plant ash are given as 170-1800ppm by Brownlow (1979), average 570ppm by Rose et al. (1979) and average 900ppm by Siegel (1974).
- 2.4 Lead values recorded for the 33 sediment sites range from 85 to 790ppm in contrast with a lithosphere "average" of about 13ppm. Abundances in plant ash are listed as 24-480ppm by Brownlow, average 30 by Rose et al. and average 11 by Siegel. Thus, it is difficult to envisage a link between the Pb abundances and a carbonaceous fraction. However, Fe and Mn oxides quite commonly scavenge large amounts of Pb.
- 2.5 Barium values for the 33 sediment sites range from 430 (possibly one sample is 45) to 3510ppm, compared with a lithosphere average of 425ppm. Abundances in plant ash are listed as 270-11,000ppm by Brownlow and average 2800 by Rose et al. Thus, a carbonaceous fraction may be involved in contributing to the Princess River samples.
- 2.6 Copper values appear somewhat elevated compared with commonly encountered stream sediments. They range from 50 to 145ppm and it may be pertinent that plant ash is listed as 50-270ppm by Brownlow, average 130 by Rose et al. and average 200 by Siegel.
- 2.7 Nickel values at 35-105ppm are inconclusive but possibly elevated. Plant matter is unlikely to contribute to any elevation, but Fe and Mn oxides could contribute by scavenging.
- 2.8 Iron and manganese values in the stream sediments are elevated in many, if not most, cases. Values as high as 2 to 8% Mn and 5 to 8% Fe cannot be regarded as normal for stream sediments and some of the lower values are also questionable.

High values of Fe and Mn generally correspond with high Pb values but the relationship to the other indicators is more obscure.

- 2.9 Brief descriptions of the physiography suggest that the area may have features in common with muskeg terrain, in which surface vegetation is underlain by fossilized or partly decomposed peaty material and in which varied hydrologic conditions give rise to peatland, marsh, swamps and bogs. Within such settings the plants which form the peat absorb metals to such an extent that concentrations approaching ore grade can occur, especially for Cu, Zn, U, V, Fe and Mn. The occurrence of humic acids and low pH can assist dissolution and migration of elements in peat waters and then absorption, adsorption or sharp changes in pH within peaty profiles can concentrate the metals.

"Bog iron" and "bog manganese" commonly accumulate in cold humid climates with high water tables and poor drainage. Such regions may not have all the characteristics of formally defined muskeg (e.g. true peat may not be seen) but the processes are analogous. Fe and Mn are reduced by decaying organic matter, moved as soluble bicarbonates, then dumped as limonite on contact with oxygenated water (e.g. Fe-Mn enriched groundwaters coming into contact with oxygenated stream water). The limonite will co-precipitate or adsorb other metals, especially Pb and to a lesser extent Zn, Cu and Ni.

3. CONCLUSIONS

- 3.1 Pb, Zn and Ba values and probably Cu and Ni values are elevated in stream sediments collected from about 6 km² in the Princess River area in Tasmania. Fe and Mn values also are elevated in some, if not all, samples.
- 3.2 The "anomalous" chemistry is likely to be attributable to dispersion processes operating in a muskeg-type environment, within which poor drainage, high water tables and abundant, partly decaying vegetation is important.
- 3.3 Reducing, acid conditions have probably assisted the leaching of Fe, Mn and other elements but their transport in aqueous solutions would be terminated by deposition as limonite upon entry into oxidizing streams, resulting in enhanced values in sediment.
- 3.4 Pb abundances appear to be correlated with Fe and Mn abundances, but Cu, Zn, Ni and Ba do not show an obvious, simple correlation. This may suggest that organic matter, either formed within the streams or eroded from soils, contains a significant fraction of such elements either as essential growth constituents or enhanced by adsorption, chelation etc. after the death of the plants.

It is even possible that some of the carbonaceous load in the streams could be old carbonaceous matter, coal or oil shale, in addition to recent products of rain forests and marshes.

- 3.5 There is a distinct possibility that none of the "anomalous" sediment samples has any relationship to mineralization with the catchment area. Formal interpretation of the results would be best attempted by multiple linear regression of Pb and Zn against Fe, Mn and some measure of organic matter (probably loss on ignition). Confidence in the interpretation would be increased if more information were obtained on the distribution of the elements within the sediment samples (by gravity separations, selective chemical extractions and microscopy). It would also be useful to seek evidence of scattered local "anomalies" in the field by sampling limonitic seeps associated with springs in locations where direct observation can find no evidence of a sulphide source.

4. RECOMMENDATIONS

- 4.1 If residues are available for the 33 samples of stream sediment recently analyzed, obtain a loss on ignition figure for each as a guide to the abundance of organic matter.
- 4.2 Perform a multiple linear regression analysis of Pb, then Zn and Ba, against Fe, Mn and loss on ignition. Anomaly recognition can then be undertaken by looking at the deviation of measured indicator element from the calculated abundance which is obtained by regression analysis and is based on the hypothesis that indicator abundance relates simply to scavenger abundance (limonite and organic matter).

Thirty-three samples just scrapes over the minimum number for reasonable statistical calculation. If you are unfamiliar with the concept of multiple regression or lack the computing facilities, I can perform it quickly in Brisbane once you have loss on ignition figures.

The deviation results should pick any true anomalies because in effect a unique and appropriate background is calculated for each sample site. Small positive and negative deviations are permissible.

- 4.3 If field work is continued in the near future, it would be wise to obtain pH measurements of some stream sites, swampy sites, springs and groundwater in auger holes.

These could be obtained with a meter or quite adequately with "Merck" brand pH sticks (e.g. try 0-7 units with 0.3 graduations, obtainable from Selby Scientific or some other supplier). These measurements would tighten some of the current speculations and would guard against unrecognized effects related to limestone in the terrain.

- 4.4 If field work is undertaken, watch for Fe-Mn stained springs at breaks in slope, sample the deposits and check carefully for any evidence of sulphides up gradient. If "anomalies" occur and no trace of sulphide is found it would reinforce interpretation that the stream sediment anomalies are also false.
- 4.5 It would be informative to investigate how the Pb and Zn is occurring in representative sediment samples. This would be best undertaken on larger than normal samples (say 200-1000g samples) but could possibly be achieved on a selection of existing sample residues. An experiment could be designed to look primarily at
- chemistry of light vs heavy fraction
 - elements tied to organic matter (peroxide or hypochlorite extraction)
 - elements tied to Fe oxides (dithionite or oxalate extraction)
 - elements tied to Mn oxides (perhaps hydroquinone extraction)
 - elements tied to clays (cation exchange)
 - elements in sulphides (optical examination of selective extract)

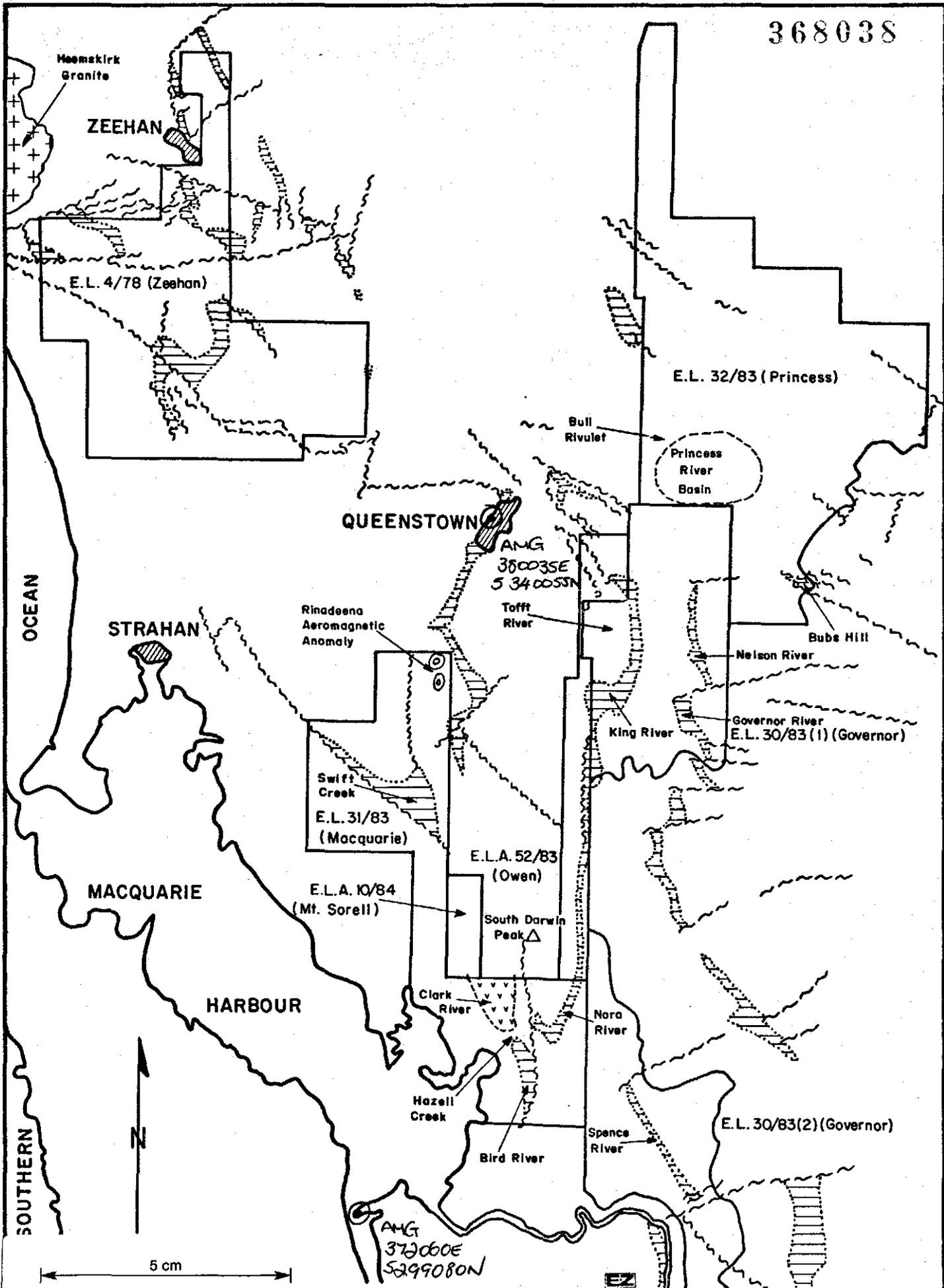
If this is considered to be warranted I can attend to the details and provide a costing. The work is non-standard and consequently costs more than common analytical work, but the cost on a small batch of samples is not prohibitive.

Limited microscopic observation of -80# and possibly coarser material would also be desirable.

- 4.6 Critically reflect on the field area to see whether it fits a muskeg or "bog" style of setting within which a mantle of peaty or other organic-rich soil is likely to be unusually prominent.

037

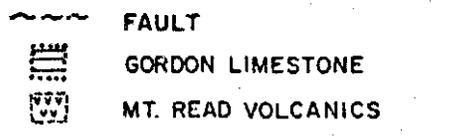
368038



SOUTHERN OCEAN

SOUTHERN

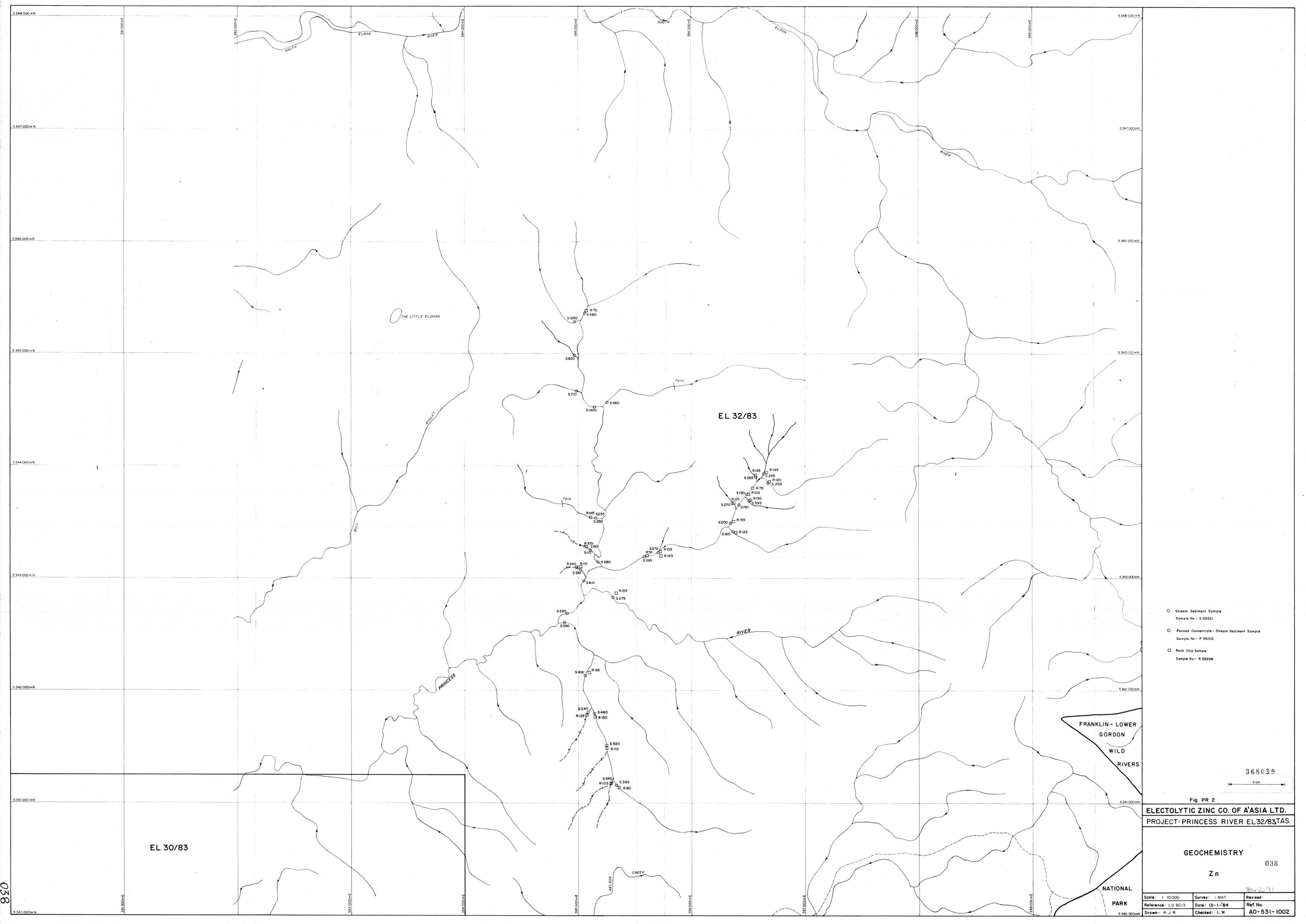
5 cm



SCALE

AMC REFERENCE POINTS ADDED

PROJECT: GORDON LIMESTONE J.V.	
LOCATIONS	
Compiled S.T.	Date
Drawn R.J.R.	Scale
PLAN NO Fig. PR1	



- Stream Sediment Sample
Sample No - S 59221
- Panned Concentrate-Stream Sediment Sample
Sample No - P 59202
- Rock Chip Sample
Sample No - R 59298



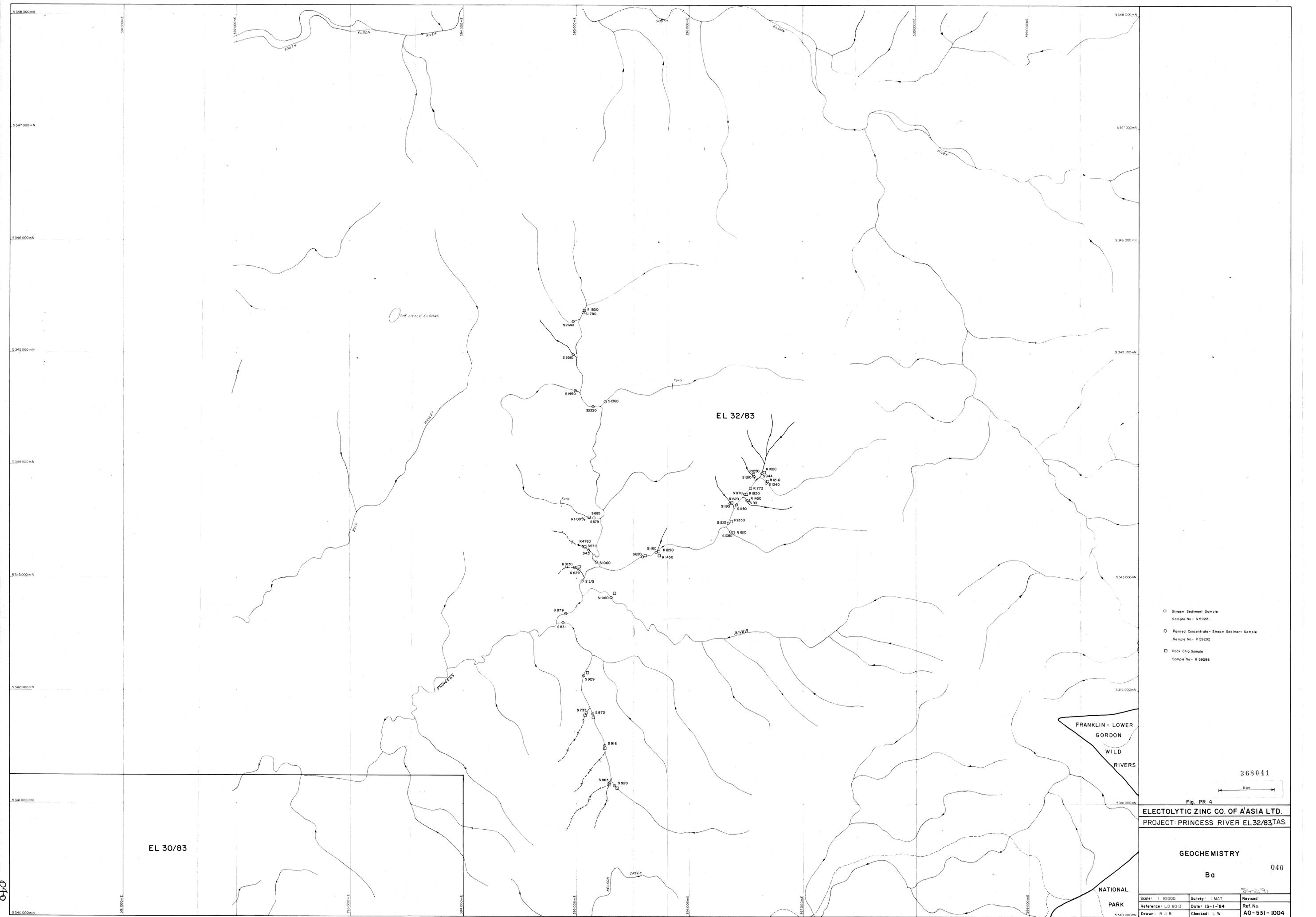
Fig. PR 2

ELECTROLYTIC ZINC CO. OF ASIA LTD.
PROJECT: PRINCESS RIVER EL32/83TAS.

GEOCHEMISTRY
Zn 038

Scale: 1:10000	Survey: 1 MAT	Revised:
Reference: LD 8013	Date: 13-1-84	Ref. No:
Drawn: R. J. R.	Checked: L. W.	AO-531-1002

038



- Stream Sediment Sample
Sample No - S 59221
- Panned Concentrate - Stream Sediment Sample
Sample No - P 59202
- Rock Chip Sample
Sample No - R 59298

368041
5 cm

Fig. PR 4
ELECTROLYTIC ZINC CO. OF ASIA LTD.
PROJECT: PRINCESS RIVER EL 32/83, TAS.

GEOCHEMISTRY

Ba 040

Scale: 1:10000	Survey: I MAT	Revised:
Reference: LD 8013	Date: 13-1-'84	Ref. No:
Drawn: R.J.R.	Checked: L.W.	AO-531-1004

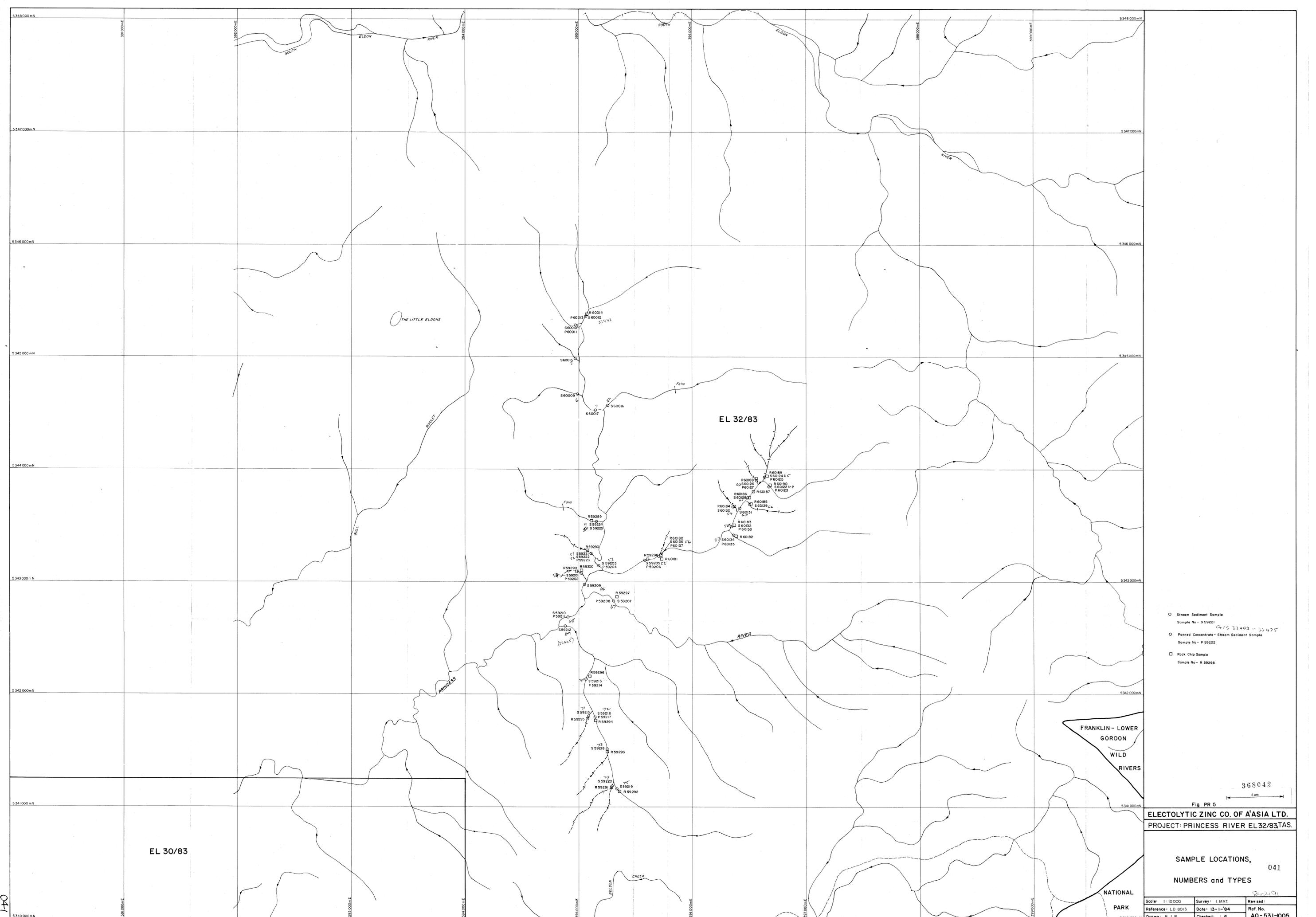
EL 30/83

EL 32/83

FRANKLIN - LOWER
GORDON
WILD
RIVERS

NATIONAL
PARK

040



- Stream Sediment Sample
Sample No - S59221
- Panned Concentrate - Stream Sediment Sample
Sample No - P59202
- Rock Chip Sample
Sample No - R59298

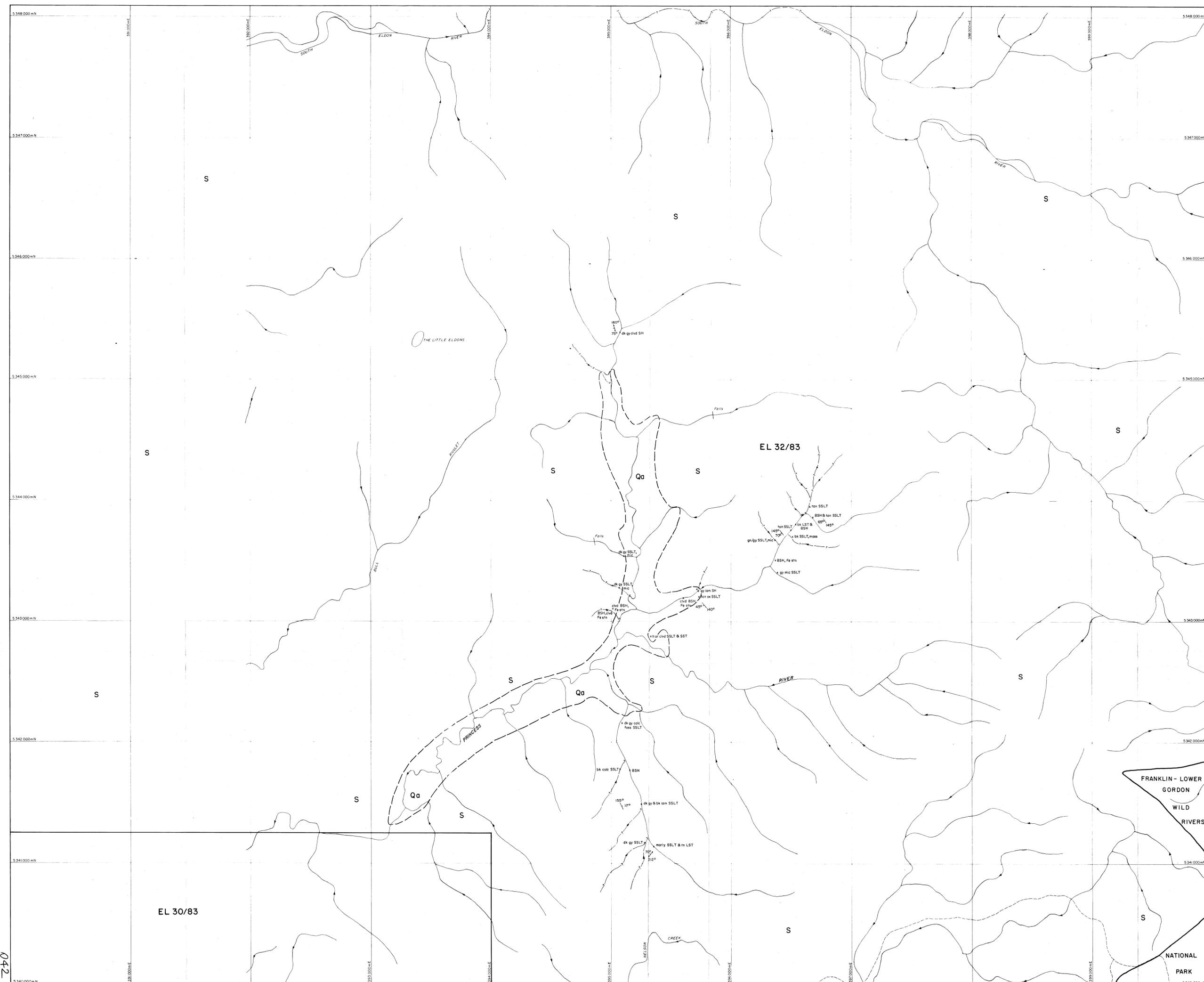
Fig. PR 5
 Scale: 1:10000
 Survey: I MAT
 Reference: LD 8013
 Date: 13-1-'84
 Drawn: R. J. R.
 Checked: L. W.

ELECTROLYTIC ZINC CO. OF ASIA LTD.
 PROJECT: PRINCESS RIVER EL 32/83TAS.

SAMPLE LOCATIONS,
 NUMBERS and TYPES

Scale: 1:10000	Survey: I MAT	Revised:
Reference: LD 8013	Date: 13-1-'84	Ref. No.
Drawn: R. J. R.	Checked: L. W.	AO-531-005

041



LEGEND

COLOUR	wh - white
bk - black	bl - blue
gr - green	yl - yellow
rd - red	or - orange
cr - cream	pl - pale
lt - light	dk - dark

TEXTURE	foss - fossiliferous
fg - fine grained	sil - siliceous
mg - medium grained	mic - micaceous
cg - coarse grained	fer - ferruginous
bd - bedded	int - intense
cld - cleaved	wk - weak
shd - sheared	v - very
colc - calcareous	pb - pebble
carb - carbonaceous	cb - cobble
lam - laminated	tr - trace
abd - cross bedded	in bd - inter bedded
th bd - thin bedded	tblc - tabular
thk bd - thick bedded	frct - fractured
vn - veins, veining	

ROCK TYPE	SST - sandstone	SILT - siltstone
LST - limestone	DLST - dolomite	
BX - breccia	COL - conglomerate	
SH - shale	BSh - black shale	
QZT - quartzite	LIM - limestone	
GRIT - grit	CLV - clay	
PUG - pug	GRA - gravel	

MINERALOGY or ALTERATION	py - pyrite
qt - quartz	sp - sphalerite
gn - garnet	cp - chloropyrite
lim - limestone	sls - silicified
cb - carbonate	
c - calcite	

ORDER

Colour, Texture, Rock Type, Mineralogy or Alteration, Fossils

* S

dk gy mg foss SST or gy calc SH py or pl gy LST s'd

TOPOGRAPHICAL

cut grid lines	090° joint
roads	090° joint - vertical
tracks	090° overturned
tramways	090° bedding
power lines	090° bedding - vertical
rivers, creeks	quarries
swampy area	

INTERPRETED GEOLOGY

QUATERNARY	Qa	Alluvium.
SILURIAN	S	Shale, siltstone and quartz sandstone.

Geological boundary

365043

Fig. PR 6

5 cm

ELECTROLYTIC ZINC CO. OF ASIA LTD.

PROJECT: PRINCESS RIVER EL 32/83, TAS.

GEOLOGY 042

(INTERP.)

Scale: 1:10000	Survey: I.MAT	Revised:
Reference: LD 8013	Date: 10-7-84	Ref. No.
Drawn: R.J.R.	Checked:	AO-531-1006

042