

GEOPEKO

A DIVISION OF PEKO WALLSEND OPERATIONS LIMITED

A.C.N. 000 081 434

EL 45/89 SAVAGE RIVER

ANNUAL REPORT

DECEMBER 1991 - DECEMBER 1992

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FILE	EL 45/89
	8
DESCRIPTION	
	See covering letter
	EL 45/89 File
	Folio 126
RECORDED	DATE
TO	

David Gardner
Ian Mathison
December, 1992

T278

Distribution: Geopeko, Parkes
Geopeko, Devonport
Department of Mines, Hobart

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1.0 Introduction

1.1 Location and Access

EL 45/89, Savage River (Fig. 1), is located in NW Tasmania approximately 5 km north of the township of Luina.

Access within the EL is reasonable and is provided by old exploration tracks and unsealed logging roads.

1.2 Tenure and Land Usage

EL 45/89 of 239 km² was granted to Peko Exploration Ltd in January 1990. Part of the EL was relinquished in June 1992 (Fig. 2).

The EL consists predominantly of The Savage River RAP with the eastern edge being Deferred Forest Land. Approximately 30 km² on the southern edge is Multiple Use Forest Land. The EL includes part of the Savage River Australian Heritage Area.

1.3 Regional Geology

The Arthur Project area lies within the Rocky Cape Region of NW Tasmania (Fig. 3). The most interesting rocks in the area are those of the Precambrian Arthur Lineament. The Arthur Lineament is a north-east trending metamorphic belt consisting of highly deformed sediments, basic volcanics and dolomite. To the west of this belt lies the Rocky Cape Group, a thick shallow marine shelf sequence. The Rocky Cape Group contains Precambrian dolerite/gabbro dykes which have been emplaced into north-north west trending faults.

Rocks assigned to the Oonah Formation and the Cleveland Waratah Association lie to the east of the Arthur Lineament. The Precambrian Oonah Formation is predominantly comprised of turbiditic quartz wacke and siltstone. The south eastern corner of the area (which includes EL 45/89) is underlain by rocks of the Cleveland-Waratah Association that lie within the Dundas Trough. These rocks have been correlated with the Crimson Creek Formation and consist of basaltic, andesitic and tholeiitic lavas and volcanoclastic sediments of Eo-cambrian age.

The Precambrian-Cambrian rocks along the eastern edge of the area are in places overlain by Permian fluvio-glacial sediments and/or Tertiary basalt.

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SCALE 1 : 250 000

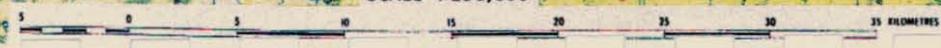
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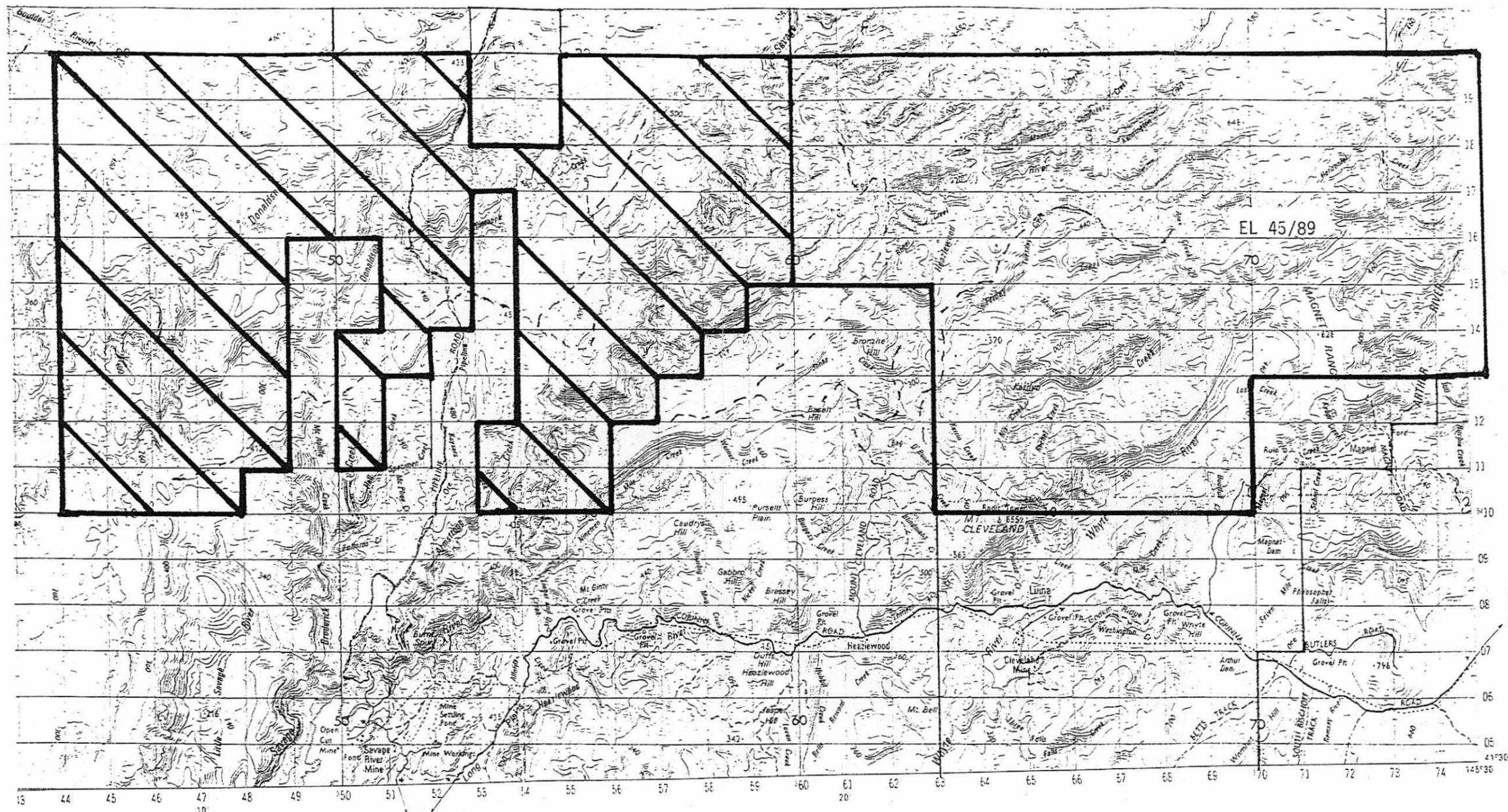
**ARTHUR RIVER PROJECT
LOCALITY MAP**

Date:
Geologist:
Checked:
Drawn:
Amendments:

Map Ref:

Base: **TASMANIA**

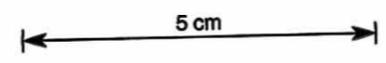




EL 45/89

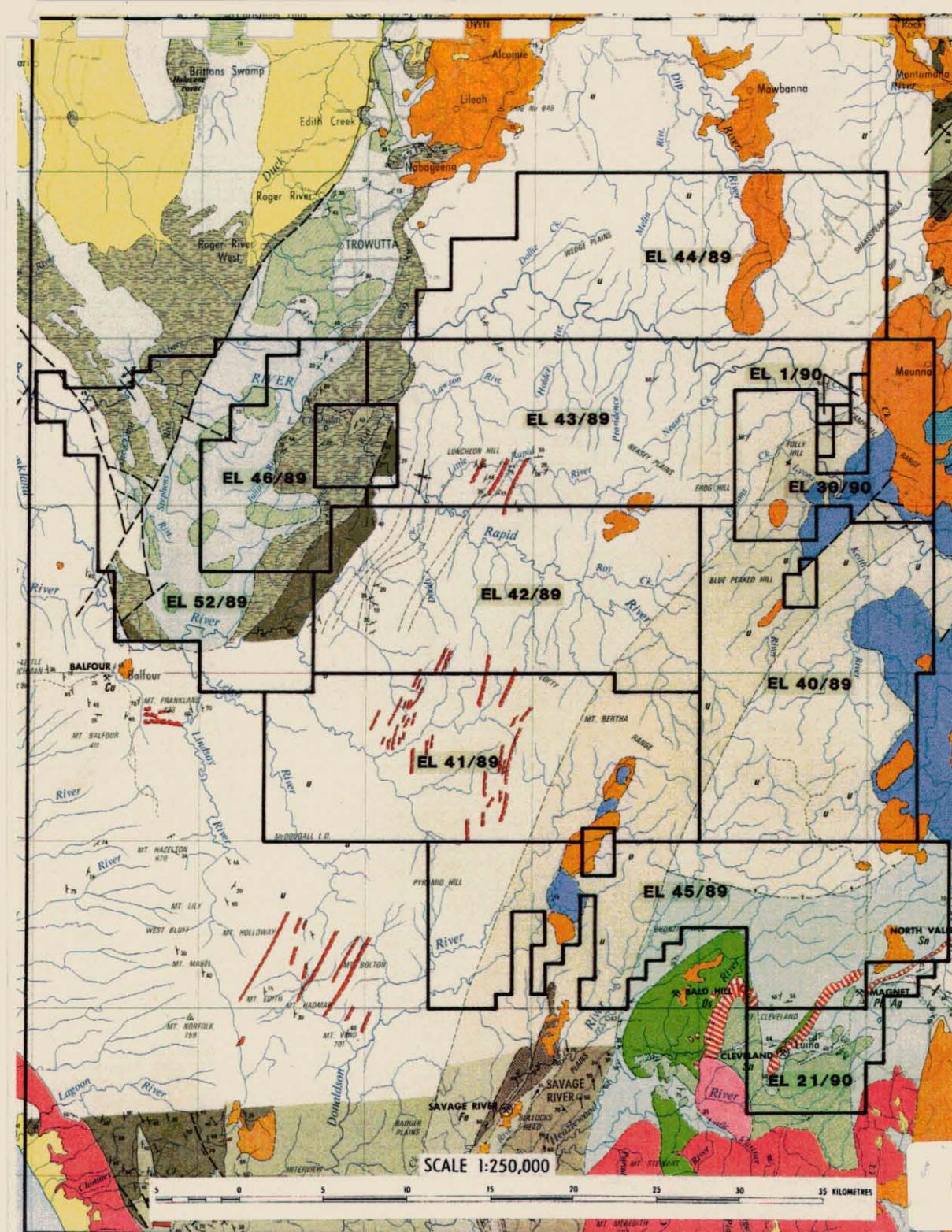
Savage River 2 km

SCALE 1:100000



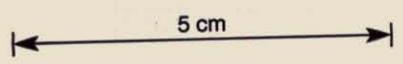
AREA RELINQUISHED

	GEOPEKO A DIVISION OF PEKO	
	A.C.N. 000 081434 WALLSEND OPERATIONS LTD	
EL 45/89 - SAVAGE RIVER		
Geo.	AREA RELINQUISHED	
Date	JUNE 1992	
App.		
Drawn.	Boss	DEVONPORT TAS. No. Fig. 2



HOLOCENE		Alluvium, sand, gravel and talus.
PLEISTOCENE		Till, fluvioglacial, periglacial and associated deposits. Erosional surface.
TERTIARY		Non-marine sequences (light); marine limestone (dark) basalt and related igneous rock types (orange).
TRIASSIC		Low angle unconformity.
PERMIAN		Fluvio-lacustrine sequences of sandstone, siltstone, mudstone (light) with carbonaceous sequences indicated (dark) Fresh water sequence with some coal measures.
UPPER CARBONIFEROUS		Upper glacio-marine sequence of pebbly mudstone, pebbly sandstone and limestone Fresh water sequence with some coal measures. Lower glacio-marine sequence of pebbly mudstone, pebbly sandstone, minor limestone, Tasmanite oil shale and basal tillite.
CAMBRIAN		Middle-Upper Cambrian fossiliferous usually greywacke turbidite sequences (horizontally lined overprint); acid with intermediate volcanic and associated rocks dominant (dark), and horizon with fossiliferous Upper Cambrian shallow water deposits (vertically lined overprint); basic-intermediate volcanic and associated rocks dominant (diagonally lined overprint); probably Cambrian unfossiliferous usually greywacke turbidite sequences (light); probably Cambrian unfossiliferous orthoquartzite sequence (dotted).
PRECAMBRIAN		Usually unconformity attributed to Penguin Orogeny but apparent conformity at Smithton and Pieman River.
PRECAMBRIAN		Comparatively unmetamorphosed sequences. Mudstone-sandstone sequences ('u') - dominantly mudstone (light), dominantly orthoquartzite (dark), quartzwacke turbidite successions (small dot over-print), conglomerate (large dot over-print); dolomite (horizontally lined over-print); basalt lava (vertically lined over-print).
PRECAMBRIAN		Metamorphic rocks. Pelitic sequences (dark); metaquartzite sequences (light) with some platy quartzite units indicated (vertically lined over-print); amphibolite (diagonally lined over-print). Garnet bearing rocks are indicated (g).
IGNEOUS ROCKS		
CAMBRIAN		Dominantly adamellite-granite.
LOWER CARBONIFEROUS - UPPER DEVONIAN		Coarser grained basic rocks.
PRECAMBRIAN		Serpentinite, peridotite and associated rocks.
PRECAMBRIAN		Dolerite.

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Date:	SCALE 1 : 250 000	No Fig 3
Geologist	ARTHUR RIVER PROJECT	
Checked	REGIONAL GEOLOGY	
Drawn:	Man Ref:	Base: TASMANIA



038006

1.4 Known Mineral Deposits/Occurrences

There are a number of metallic mineral occurrences adjacent to the western, eastern and southern EL boundaries of Geopeko's Arthur River Project. (Green et Al 1988).

The deposits range from small, relatively insignificant workings, e.g. Victory Mine, Atlas Leases to large world class ore bodies e.g. Mt Bischoff, Savage River. In most cases, extensions of the prospective host formations can be continued into Geopeko's Arthur River EL's.

1.5 Previous Exploration

Geopeko report T251 (Virgoe and Mathison, 1990) summarizes previous exploration and describes results of Geopeko's 1990 Exploration program. Report T265 (Mathison, 1991) details 1991 exploration activity. Report T272 (Mathison and Gardner, 1992) details work in the relinquished part of the EL, and T276 (Gardner, 1992) describes the overall Water sampling program.

1.6 Scope of this report

The aim of Geopeko's exploration of EL 45/89, is to use water sampling, rock chip sampling, geological mapping and the results of previous exploration to delineate prospective and geochemically anomalous areas within the EL. Areas worthy of further investigation are to be followed up with more detailed exploration.

Due to major problems with the DMMR's analytical techniques for stream water geochemistry, little work was carried out in EL 45/89 in 1991. It was felt necessary to suspend exploration until these problems were corrected and consequently a waiver of expenditure commitment was sought and granted. Reconnaissance water sampling recommenced in December 1991 and was completed in February 1992. A temporary extension of the licence was negotiated to allow the results of 1992 sampling to be evaluated. A large part of the Arthur River Project area was selected for relinquishment after this interpretation. This report details exploration activity in the retained portion of EL 45/89 from December 1991 to December 1992.

2.0 Work Completed

2.1 Water Sampling Program

Water sampling and analytical techniques developed by Angela Giblin (CSIRO Div. of Exploration Geoscience) were used for this seasons fieldwork. (Gardner 1992).

Water samples were collected from streams with a drainage area between 1 and 5 km². Occasional check samples were collected from streams with drainage areas up to 10 km² including two or more other samples. At each sample site pH of the water, water colour, float geology, outcrop geology, and vegetation type were recorded. Possible contamination from roads, forestry operations, mines, or farms was noted. Sample sites were marked with numbered aluminium tags and flagging tape. Three water samples were collected from each site:

1. A 100 ml sample of raw stream water was collected in a new 125 ml polyethylene sample bottle. Cu, Pb, Cd and Zn were determined by ICP-MS and As by graphite furnace AAS.
2. Au was extracted from one litre of water in the field onto a sachet of activated charcoal. Au was determined by neutron activation at Becquerel Laboratories.
3. Cu, Pb and Cd were pre-concentrated on site by coprecipitation from one litre of water. Metal values were determined by CSIRO using voltammetry.(PDV)

All sample bottles were washed many times in the stream water before treating or collecting samples. 49 water samples were collected from EL 45/89 as part of a set of 195 collected in the 1991-1992 season from the Arthur Project Area.

Geological observations of both outcrop and float were recorded at water sample points. Additional observations were recorded when changes in rock type or any possibly mineralized rocks were seen. These observations were plotted on a 25,000 scale base and used as the basis for a geological interpretation.

41 rock samples were collected for reference purposes. five of these were selected for analysis. Ag, As, Bi, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, P, V and Zn were determined by ICP - OES after perchloric digestion at Classic Labs, Adelaide. Au was determined by fire assay. Results are given in Appendix 2.

2.2 Data Compilation

Results of Comstaff's regional stream sediment (-80#) and panned concentrate sampling were obtained from the Mines Department, computerized and plotted on 1:25000 bases (Plans 2315A,B,C). Because of the different bases used by Comstaff and Geopeko there is a systematic shift of sample locations from the stream sampled of 200-300 metres. Rectification has not yet been attempted. The existing maps are quite useful and major drainage systems can be identified easily.

3.0 Results

3.1 Water Sampling

Water sample descriptions and assays are given in Appendix 1. Cumulative frequency plots were made for PDV.Cu, PDV.Pb, ICPMS.Zn and GFAAS.As using the results of almost 200 samples from the whole project area. The following anomalous levels were selected using inflexion points.

Element (DL)	1. Possibly Anomalous	% <1	2. Probably Anomalous	% <2
Cu (0.1)	1.5 ppb	85	3.0 ppb	95
Pb (0.05)	0.75 ppb	90	1.4 ppb	97
As (0.01)	0.16 ppb	80	0.30 ppb	97.5
Zn (0.1)	1.7 ppb	85	3.0 ppb	95
Au (0.1)	0.1 ppt	?		

Between 2.5 and 5% of the samples are considered probably anomalous in only one element. Most samples were below detection levels for gold and no statistical analysis was possible. All above detection gold values were considered interesting. The results can be summarised as below for 49 samples.

Element	Possibly anomalous	Probably anomalous
Cu	19	5
Pb	4	0
Zn	10	0
As	8	2
Au	5 values above detection	

3.2 Rock Chip Sampling

Of the five rock chip samples submitted for analysis (appendix 2), two (22109 and 22120) have elevated Cu values and two (22120 and 22128) have elevated Zn. All were described as greenstones, mafic volcanics or intrusives now metamorphosed and chlorite rich. 22128 contained pyrite and the other two samples are strongly Fe and Mn stained.

3.3 Geology

The reconnaissance mapping of creeks that were sampled gives a limited geological picture of the area. Separation of Precambrian and Cambrian rocks into stratigraphic units was not possible and only a lithological map is presented here (plan 2057B).

The Precambrian-Cambrian rocks in the Arthur Project area fall into broad NNE trending zones. To the west (in the relinquished part of EL 45/89, Mathison and Gardner, 1992) are thinly bedded siltstones, slates and phyllites. Bedding and foliation strike NNE-NNW and have a variable dip. These were only seen on the Little Donaldson River and have been previously mapped as Rocky Cape Group.

Moving east from the slates and phyllites the rocks are more mafic being greenschists, greenstones and volcanics as well as quartz mica schists and phyllites. The foliation in the rocks is very strong and strikes NE to NW dipping steeply. This zone is the Arthur Lineament or Arthur Metamorphic complex which lies just west of the retained part of EL 45/89. No mappable units, within the broadly more mafic rocks, were defined (further south the Bowry Member a discrete unit with mafic volcanics and carbonates, hosts mineralization at a number of sites including Savage River). It is difficult even to put a boundary on either side of this zone, and the relationship between the lineament and the flanking rocks is probably complicated (see Leaman 1990).

The terms greenschist and greenstone are used here to denote metamorphic rocks that show intermediate to mafic affinities. In the field this is usually inferred from significant chlorite or iron staining. Rarely, in fresher rocks, feldspars and mafic minerals are seen with no quartz.

To the east of the greenschist/greenstone zone (and occupying the northwest part of EL45/89) is a parallel belt of quartz mica schists and quartzite with shales and slates. This roughly mirrors the situation to the west of the zone with more schistose looking rocks closer to the greenschists/greenstones tending more to slates, black shales and quartzites moving away from it.

The situation on the eastern side of the lineament is however not as simple as to the west (plan 2057B). The Heazlewood Ultramafic Complex outcrops between the lineament and the Precambrian-Cambrian rocks to the east. Trending NE away from the ultramafics, are greenstones and greenschists, that may or may not have affinities to the main Arthur Lineament. Possibly this is another slice of more mafic rocks caught in a larger (than previously mapped) metamorphic complex that may also include slices of basement rocks.

In the far south east of the mapped and sampled area is a series of greywacke outcrops (samples 22182,83). There is a possible volcanic component in the clasts and strong

development of secondary mica. These rocks look significantly less deformed than most of the rocks seen and are probably of later origin, possibly belonging to the Cambrian Dundas Group?

The geology of the whole Arthur Project area (particularly the Arthur Lineament) is poorly understood. The DMMR is about to start mapping for the new 1:50 000 sheet, but this work may take several years.

3.4 Data Compilation

Anomalism found by Comstaff stream sediment sampling (plans 2315A,B,C) broadly agrees with that from the water sampling, identifying areas around

364500mE	5413700mN
365000mE	5415500mN
368000mE	5415700mN

as being of particular interest. Comstaff followed up some of this work with grid based A_o soil sampling and ground magnetics, but little of this data is available (P. Jones Appendix 3).

Jones' report identifies some areas not looked at by Comstaff, notably the Monday Ck. drainage (around 364500mE 5413700mN). He also notes the existence of areas identified by Leaman (1990) as having interesting magnetic character.

3.5 Discussion

The most obvious and interesting results from this years are the anomalous creeks draining ridges around 365000mE 5413700mN. The water sampling produced a group of 4 samples with anomalous (above detection) Au values (samples 22007,08,12, and 13) all draining this area. Only 9 samples out of 195 were above detection. Sample 22012 is of the same order of magnitude as creeks draining Au mineralisation at Rosebery (taken during orientation trials). The samples also have some weakly elevated Cu.

This area is also highlighted in Comstaffs regional stream survey by high Cu and Zn values. Jones (Appendix 3) notes that no follow-up work appears to have been done.

A lot of samples from EL 45/89 have elevated Cu assays (23 out of 49 samples). This may reflect the dominantly mafic lithologies compared to other ELs in the project area. A number of these samples however form coherent groups around ridges and have supporting Pb, Zn, or As. Areas drained by samples

22028, 22301, 22302
22085, 22084
22086
22374, 22372
22006, 22009

all look interesting and require further work.

Around 368500mE 5417000mN is an area with some Cu anomalism in dominantly greenschist lithologies. Leaman (1990) notes 'patchy' magnetic anomalies here worthy of investigation. Comstaff mapped dolomites in this area.

Leaman also notes anomalies possibly reflecting local alteration around 369000mE 5413000mN. Samples 22372 and 22373 drain this area and have elevated As values.

The geology has been patchily mapped due to the time constraints of water sampling. However significant differences are noted between this mapping and previous Comstaff and Mines Dept. maps. Traverses along tracks and creeks as part of a follow-up program should start to produce a coherent picture.

4.0 Recommended Program

- 1 Follow-up rockchip and soil sampling of ridges draining into samples 22007,08,12,13
- 2 Reconnaissance mapping and sampling of ridges draining other anomalous water samples and in areas of interesting magnetic character.
- 3 Gridding and detailed sampling of resulting anomalies to determine sources/drill targets.
- 4 At the end of the 1992-93 field season the water sampling technique its effectiveness and the potential of the Arthur Project area should be assessed in conjunction with the CSIRO.

5.0 Environmental Disturbance and Rehabilitation

Exploration conducted by Geopeko has caused minimal environmental disturbance. Semi permanent samples markers left at sample sites are considered to be valuable reference points for future exploration. Walking tracks were cut to DMMR guidelines and should regenerate naturally. No rehabilitation has been necessary.

References

- GARDNER, D., VANZINO, L., MATHISON, I., (1992) - Arthur River Project Technical Report on Fieldwork December 1991 - February 1992. Unpublished Geopeko report T276.
- GREEN, G.R., BOTTRILL, R.S., BACON, C.A., TURNER, N.J. (1988) - Mineral Deposits and Metallogenic Map of Tasmania 1:50 000, Tas. DMMR
- LEAMAN, D. E., (1990) - Geophysical - Structural Review Rocky Cape Block NW Tasmania. Unpublished Report for Geopeko.
- MATHISON, I.J., VIRGOE, K. (1990) - Savage River EL 45/89 - Report on Exploration Activity - January 1990 to November 1990. Unpublished Geopeko report T251.
- MATHISON, Ian (1991) - EL 45/89 Savage River - Report on Exploration Activity December 1990 to November 1991. Unpublished Geopeko report T265.
- MATHISON I.J., GARDNER D. (1992) - EL 45/89 Savage River - Partial Relinquishment Report. Unpublished Geopeko report T272.

APPENDIX 1
WATER GEOCHEMISTRY
SAMPLE DESCRIPTIONS AND RESULTS

Abbreviations usedTertiary Basalt

Tb

Carboniferous - Permian Wynyard Tillite

C-Pwt

Precambrian - Cambriansediments

Ssst	sandstone
Sgwk	greywacke
Sslt	siltstone
Sdol	dolomite
Ssha	shale

metamorphics

Msch	schist
Mphy	phyllite
Mgnst	greenstone
Mgnsch	greenschist
Hsla	slate

volcanics

Volc	volcanic
tuff	tuff

others

U/m	ultramafic
int	intrusive

Mineralogy

qtz	quartz
fs	feldspar
Fe	iron
py	pyrite
ser	sericite
chl	chlorite
si	siliceous

Textures

vn	vein
lam	laminated
stn	stain
wth	weathered
clvd	cleaved
foln	foliation
mas	massive
bx	brecciated
strg	strongly
m	medium

Colour

bk	black
wh	white
gn	green
gy	grey
yl	yellow
bn	brown
dk	dark
pl	pale

ARTHUR RIVER PROJECT
 WATER GEOCHEMISTRY - 1991-92 SAMPLES - CSIRO ANALYSES
 EL 45/89 - WARATAH SHEET

SAMPLE NUMBER	-----ICPMS - RAW WATER -----				-P5V - Preconcentrated-			GF AAS	NAA	ICPAES	LOCATION	
	Cu ug/l	Pb ug/l	Cd ug/l	Zn ug/l	Cu ug/l	Pb ug/l	Cd ug/l	As ug/l	Au ng/l	Zn ug/l	EL	MAP
22001	-0.50	-0.50	-0.50	0.80	0.20	-0.05	-0.05	-0.05	1.70	-10	45/89	WARATAH
22002	-0.50	-0.50	-0.50	1.80	0.34	-0.05	-0.05	0.09	-1.00	-10	45/89	WARATAH
22003	1.90	-0.50	-0.50	2.70	1.50	0.03	-0.05	-0.05	-1.00	-10	45/89	WARATAH
22004	-0.50	-0.50	-0.50	1.00	0.26	-0.05	-0.05	0.11	-1.00	-10	45/89	WARATAH
22005	-0.50	-0.50	-0.50	0.80	0.18	-0.05	-0.05	0.14	0.20	-10	45/89	WARATAH
22006	1.10	0.70	-0.50	2.50	13.00	1.10	-0.05	0.12	-1.00	-10	45/89	WARATAH
22007	-0.50	-0.50	-0.50	-0.50	1.50	-0.05	-0.05	0.15	0.50	-10	45/89	WARATAH
22008	0.70	-0.50	-0.50	1.40	6.49	-0.05	-0.05	0.14	2.40	-10	45/89	WARATAH
22009	2.50	0.70	-0.50	2.10	4.10	0.09	-0.05	0.17	-1.00	-10	45/89	WARATAH
22010	-0.50	-0.50	-0.50	-0.50	6.85	-0.05	-0.05	-0.05	-1.00	-10	45/89	WARATAH
22011	1.10	-0.50	-0.50	1.50	2.00	0.20	-0.05	0.12	-1.00	-10	45/89	WARATAH
22012	0.50	-0.50	-0.50	1.10	1.10	0.15	-0.05	0.11	4.30	-10	45/89	WARATAH
22013	0.70	-0.50	-0.50	0.60	1.00	0.11	-0.05	0.08	0.90	-10	45/89	WARATAH
22014	-0.50	-0.50	-0.50	-0.50	0.80	0.14	-0.05	0.09	-1.00	-10	45/89	WARATAH
22015	-0.50	-0.50	-0.50	0.50	0.48	0.26	-0.05	-0.05	-1.00	-10	45/89	WARATAH
22016	0.50	-0.50	-0.50	0.50	1.00	0.06	0.15	0.06	-1.00	-10	45/89	WARATAH
22017	1.30	-0.50	-0.50	0.80	1.40	0.20	-0.05	-0.05	-1.00	-10	45/89	WARATAH
22020	0.52	-0.50	-0.50	-0.50	0.85	0.54	-0.05	0.08	-1.00	-10	45/89	WARATAH
22021	1.00	1.20	-0.50	1.20	1.70	0.22	-0.05	0.18	-1.00	-10	45/89	WARATAH
22022	0.90	-0.50	-0.50	0.90	2.60	0.35	-0.05	0.12	-1.00	-10	45/89	WARATAH
22023	1.10	-0.50	-0.50	0.69	1.70	0.25	-0.05	0.07	-1.00	-10	45/89	WARATAH
22024	0.50	-0.50	-0.50	-0.50	2.50	0.41	-0.05	0.07	-1.00	-10	45/89	WARATAH
22025	0.60	-0.50	-0.50	-0.50	2.80	0.10	-0.05	0.08	-1.00	-10	45/89	WARATAH
22026	-0.50	-0.50	-0.50	-0.50	1.80	0.15	-0.05	-0.05	-1.00	-10	45/89	WARATAH
22027	0.70	-0.50	-0.50	-0.50	2.30	0.30	-0.05	0.08	-1.00	-10	45/89	WARATAH
22028	1.10	-0.50	-0.50	-0.50	2.00	0.20	-0.05	0.16	-1.00	-10	45/89	WARATAH
22061	0.56	-0.50	-0.50	2.00	1.50	0.40	-0.05	0.13	-1.00	-10	45/89	WARATAH
22071	0.80	-0.50	-0.50	1.00	0.76	0.23	0.48	0.14	-1.00	-10	45/89	WARATAH
22072	1.00	-0.50	-0.50	1.20	0.70	0.25	0.20	0.13	-1.00	-10	45/89	WARATAH
22073	0.61	-0.50	-0.50	0.81	1.10	0.33	-0.05	0.11	-1.00	-10	45/89	WARATAH
22084	0.64	-0.50	-0.50	0.92	2.50	1.00	-0.05	0.18	-1.00	-10	45/89	WARATAH
22085	0.59	-0.50	-0.50	0.98	1.80	0.34	0.25	0.21	-1.00	-10	45/89	WARATAH
22086	0.70	0.67	-0.50	1.70	2.00	0.20	0.30	0.42	-1.00	-10	45/89	WARATAH
22087	0.52	-0.50	-0.50	2.60	1.60	0.15	0.12	0.02	-1.00	-10	45/89	WARATAH
22088	0.52	0.85	-0.50	2.10	1.30	0.35	0.18	0.19	-1.00	-10	45/89	WARATAH
22089	-0.50	-0.50	-0.50	1.60	0.52	0.33	0.15	0.15	-1.00	-10	45/89	WARATAH
22301	1.10	-0.50	-0.50	0.80	3.00	0.20	-0.05	0.09	-1.00	-10	45/89	WARATAH
22302	0.90	-0.50	-0.50	0.90	9.00	0.38	-0.05	0.08	-1.00	-10	45/89	WARATAH
22303	0.90	-0.50	-0.50	-0.50	3.80	0.70	-0.05	0.10	-1.00	-10	45/89	WARATAH
22304	1.30	-0.50	-0.50	0.60	2.40	0.70	-0.05	0.09	-1.00	-10	45/89	WARATAH
22305	1.50	-0.50	-0.50	1.10	2.00	1.10	-0.05	0.08	-1.00	-10	45/89	WARATAH
22306	0.90	-0.50	-0.50	-0.50	1.00	0.55	-0.05	0.10	-1.00	-10	45/89	WARATAH
22307	1.30	-0.50	-0.50	-0.50	1.40	0.50	-0.05	0.11	-1.00	-10	45/89	WARATAH
22366	0.88	-0.50	-0.50	0.77	2.10	0.22	0.20	0.18	-1.00	-10	45/89	WARATAH
22367	0.55	-0.50	-0.50	0.88	0.92	0.19	0.30	0.06	-1.00	-10	45/89	WARATAH
22368	0.62	0.55	-0.50	1.90	0.77	0.32	0.30	0.13	-1.00	-10	45/89	WARATAH
22372	-0.50	-0.50	-0.50	-0.50	0.97	-0.05	-0.05	0.32	-1.00	-10	45/89	WARATAH
22373	-0.50	0.65	-0.50	-0.50	0.40	0.06	-0.05	0.26	-1.00	-10	45/89	WARATAH
22374	-0.50	-0.50	-0.50	1.80	0.27	0.10	-0.05	0.12	-1.00	-10	45/89	WARATAH

ARTHUR RIVER PROJECT - 1991-92 WATER SAMPLES

EL 45/89 - WARATAH SHEET

SAMPLE NUMBER 22374

DATE 20/02/1992

EL45/89

MAP WARATAH

AMG COORDS. 367300 mE 5413250 mN

VEGETATION RAIN FOREST

STREAM FLOW SLOW
 LEVEL LOW
 WIDTH 1.0m
 DIRECTION 235°

CONTAMINATION FROM NONE
 WATER COLOUR
 PH 0.00
 DRAINAGE AREA 0.4 km²

GEOLOGY
 OUTCROP

FLOAT 0 % Mslt bx
 50 % Sgwk
 40 %

06/01/1993

APPENDIX 2
ROCK SAMPLING
SAMPLE DESCRIPTIONS AND RESULTS

ROCKCHIP SAMPLE ASSAY RESULTS

EL 45/89 WARATAH SHEET

-----Assays by I.C.P.-----|Fire Assay

NUMBER	Ag ppm	As ppm	Bi ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Mn ppm	Mo ppm	Ni ppm	Pb ppm	P ppm	V ppm	Zn ppm	Au ppm
22109	-1	-3	-5	-2	42	46	250	8.55	1660	-3	52	15	860	220	150	0.01
22115	-1	5	-5	-2	4	25	64	1.97	155	-3	52	15	860	220	20	0.00
22120	-1	-3	-5	-2	52	60	530	1E1	2000	-3	86	5	940	360	290	0.00
22128	-1	-3	-5	-2	35	50	50	1E1	1720	-5	32	5	1440	135	250	0.00
22204	-1	10	-5	-2	16	190	12	5.75	420	9	19	10	185	30	195	0.00

ARTHUR RIVER PROJECT

ROCK SAMPLE DESCRIPTIONS - EL 45/89 WARATAH SHEET

SAMPLE	TYPE	AMG COORDS		LITHOLOGY	DESCRIPTION
		EAST	NORTH		
22101	OC	361455	5412205	u/m	Mafic-u/m shallow intrusive m-dk gn. Fs Xl.
22102	F	361151	5413468	u/m	Mafic-u/m, mas-strg fol.
22103	OC	361407	5413269	u/m	Mafic - u/m shallow intrusive bk mas.
22104	F	362009	5412940	u/m and Msst	Mafic-u/m intrusive, some strg fol Msst-slt.
22105	F	363118	5412579	Msst	M sediments mas and bedded dol? in places?
22106	F	364251	5413312	Mslt	Mslt red-gn "cherty" some chloritic greenstone?
22107	OC	364530	5412947	Mmst	Mmst red-gn cherty sometimes interbedded with clay.
22108	OC	364703	5412946	Mmst	Mmst cherty, chloritic? in places.
22109	OC	363627	5414223	Mafic intrusive?	Mafic shallow intrusive/volc? dk gn chl strg Fe stn.
22110	OC	363788	5414425	u/m	Serpentinite and chl schists fol 230/56NE.

ARTHUR RIVER PROJECT

ROCK SAMPLE DESCRIPTIONS - EL 45/89 WARATAH SHEET

SAMPLE	TYPE	AMG COORDS		LITHOLOGY	DESCRIPTION
		EAST	NORTH		
22111	F	364538	5414615	Mgnst and Msst	Greenstones, fg chl and some cherty gn meta sediments.
22112	F	364588	5414504	Mgnst and Mqzt	Greenstones and bedded quartzite.
22113	OC	363200	5415318	Mgnsch?	Schists bn earthy chl? v wth micaceous fol 045-065/90-75SE.
22114	F	363200	5415318	Volc? Mslt Msch	Andesitic volcanics, cherty metasediments and chl ser schists.
22115	OC	363385	5415460	Mgnsch	Chlorite sericite schist m-dk gn qtz vn and Fe stn fol 045/40SE
22116	OC	363586	5415471	Mgnst	Greenstone, mas, m-dk gn, fqtz vn fol 045/45SE.
22119	F	366994	5415180	Msst, Msha, Mgnst	Msediments, greenstones, some blackshales.
22120	OC	367165	5415403	MGnst Volc?	Greenstone/intermediate-mafic volcanic? chl, Fe + Mn stn.
22121	OC	367368	5415271	Sslt - sha	Shaley siltstone yl-bn v wth fol 090/90.

ARTHUR RIVER PROJECT

ROCK SAMPLE DESCRIPTIONS - EL 45/89 WARATAH SHEET

SAMPLE	TYPE	AMG COORDS		LITHOLOGY	DESCRIPTION
		EAST	NORTH		
22122	F	367368	5415271	Mmst-slt	Meta sediments, silicified, dolomitised?
22123	F	367474	5415389	-	Greenstone, Mslt-mst red-gn, silicified, dol? sediments.
22124	F	368562	5416587	-	Cherty metasediments, green intermediate volc?
22125	OC	368562	5416587	Mgnst	Greenstone mas dk gn-bk. Fe stn intrusive? or volc?
22126	F	368671	5416724	-	Greenstones, metasediments.
22127	OC	368555	5416838	Ssst	Ssst felsic soft red-bn fol 140/50NE.
22128	OC	367859	5417014	Mgnst	Greenstone chloritic mafic intrusive (volcanic?), and pyrite.
22129	F	367859	5417014	Quartz Porphyry	Quartz porphyry, quartz to 3mm.
22130	OC	364677	5416968	Sslt	Sslt red-bn cleaved fol 050/90.
22131	F	364677	5416968	-	Greenstones, Msst, Mphy.

ARTHUR RIVER PROJECT

ROCK SAMPLE DESCRIPTIONS - EL 45/89 WARATAH SHEET

SAMPLE	TYPE	AMG COORDS		LITHOLOGY	DESCRIPTION
		EAST	NORTH		
22180	OC	362293	5418350	Msst	Metasandstone quartz rich bedding + fol? 050/75SE
22181	OC	362264	5418286	Msst	Meta Meta sandstone some graphite layers.
22181	F	362264	5418286	-	Some cleaved volc? (ser).
22182	OC	367813	5413346	Sgwk	Greywacke lithic, qtz, Fs grains secondary mica, no cleavage?
22182	F	367813	5413346	-	Mslt, Sgwk.
22183	OC	366998	5413047	Sgwk	Greywacke lithic, qtz, Fs grains, secondary mica.
22184	OC	364962	5412598	Mslt	Mslt mas. bedded 030-060/90 bx, vn.
22201	F	365068	5415206	Mphy	Weakly foliated highly sericitised. Contains altered felspar? and possibly very fine sulphides.
22202	F	365678	5415384	Mphy	Pale brown, fine grained, moderate foliation.
22203	F	365613	5415544	Mmst cherty	Mid to dk green grey, cryptocrystalline.

ARTHUR RIVER PROJECT

ROCK SAMPLE DESCRIPTIONS - EL 45/89 WARATAH SHEET

SAMPLE	TYPE	AMG COORDS		LITHOLOGY	DESCRIPTION
		EAST	NORTH		
22204	OC	366843	5417065	Volc mafic	Dk grey, fine to medium crystalline, 8% pyrite as distinct dots. Qtz veining, minor vughs.
22205	OC	366985	5417366	Msla	Dk grey, well cleaved, minor qtz veining and Fe staining.
22206	F	367633	5417293	Mslt	Mid grey, hard, massive.
22207	F	367558	5416955	Mgnsch	Clayey, tan coloured, weathered.

APPENDIX 3

REVIEW OF COMSTAFF DATA

P. Jones

REVIEW OF COMSTAFF DATA
FRIDAY CREEK AREA
FOR
GEOPEKO EXPLORATION
EL 45 / 89
WARATAH

P.A. JONES
Phil Jones & Associates

November 1992

CONTENTS	PAGE
SUMMARY AND CONCLUSIONS	1
RECOMMENDATIONS	2
EXPLORATION TARGETS	3
DESCRIPTION OF THE PROPERTY & OWNERSHIP	4
LOCATION & ACCESS	5
PREVIOUS EXPLORATION	6
REGIONAL GEOLOGY	7
WORK CONDUCTED ON FRIDAY CREEK & AJAX CREEK AREAS	9
EXPLORATION POTENTIAL	12

ENCLOSURE 1. COMPOSITE INTERPRETIVE GEOLOGY PLAN - 1: 10,000

SUMMARY AND CONCLUSIONS

EL 45 / 89 is situated approximately 10 kilometres west of Waratah the service town for the Hellyer Mine and Mt Bischoff. It has an area of 120 square kilometres and is current to 12th January 1993.

Phil Jones was contracted to review the Comstaff work completed over the Friday Creek area. To this end some 21 reports were reviewed for which three related to the area in question. However, these reports were incomplete and both magnetic and geochemical data was missing making a comprehensive review impossible.

Data shows the licence has potential for hosting volcanogenic massive sulphides of Hellyer type associated with spillitic basalt and andesites. Further potential may exist for gold mineralization associated with sulphidic cherts found interstitial to pillowed basalts.

Comstaff completed two grids in the Friday Creek area covering zones of anomalous stream geochemistry. The grids were geologically mapped, part surveyed with ground magnetics and soil sampled. Anomalous Cu - Zn and to a lesser extent Pb values were returned from contact zones between andesites and sediments. No definite hydrothermal alteration pattern was observed and minor hornfelsing and silicification was more apparent from the eastern grid (HAC).

RECOMMENDATIONS

As very little written data has been preserved from the HAB & HAC grids it will be necessary to carry out 're-hash' programmes to adequately test the areas potential. A0 sampling on the HAB grid would invariably have to be checked by 'C' horizon sampling and stream results from the Monday Creek area also need to be followed up to ascertain their source. To quickly assess this and other areas ridge and spur sampling and mapping could be carried out although mapping may be hindered by lack of outcrop going on the mapping of the HAB grid.

EXPLORATION TARGETS

The licence would appear to have potential for hosting volcanogenic massive sulphides of the Hellyer type as well as possible gold potential associated with the sulphidic cherty interstitial sediment packages occurring within the basic / intermediate volcanic piles.

As the area is quite remote and relatively inaccessible for mechanical means it will require detailed geological thinking to assess the areas potential using what limited data is available. Hellyer type targets should manifest themselves with some form of geochemical or geophysical signature unless they are buried too deeply at which time geological thinking and theorizing comes into its own.

DESCRIPTION OF THE PROPERTY AND OWNERSHIP

EL 45 / 89, Waratah is situated approximately 10 kilometres west of the township of Waratah, North West Tasmania. It was granted on 12 January 1989 to Geopeko Exploration Pty Ltd and totalled 120 square kilometres. The licence is current to 12 January 1993.

The licence has been subject to approximately 20 years of modern systematic exploration and prior to this some 80 - 100 years of prospecting, yet the area still maintains its temperate forest mantle intact.

LOCATION AND ACCESS

Exploration Licence 45 / 89 covers an area of 120 square kilometres and is located north of Luina in Western Tasmania.

Access for the tenement is poor with some Comstaff four wheel drive tracks being trafficable the remainder being used by tracked vehicles or motor bike only. Reasonable access is gained to the southern portion of the EL via the Telecom road to the repeater station on Mt Cleveland.

The area is very heavily forested with steeply incised topography and generally thick undergrowth hampers ground movement.

PREVIOUS EXPLORATION

The area was originally part of EL 1 / 68, held by Comstaff Pty Ltd, who carried out a comprehensive stream sediment sampling programme in 1972 - 73. During this survey, reconnaissance geological mapping of streams was completed outlining two lithological successions. Some low order copper - zinc anomalies were returned from the stream sampling.

A major Dighem / aeromagnetic survey was carried out by Comstaff during the late 1970's outlining a significant number of anomalies. Some of these were ground checked using detailed geophysical mapping surveys. Two were diamond drilled to test coincident geochemistry / geophysical responses and Precambrian black shales (graphitic and pyritic) were intersected. Elevated zinc levels at surface from one hole failed to be encountered at depth.

Billiton completed a cursory re-examination of the airborne EM and aeromagnetic data in an attempt to isolate possible 'Cleveland Style' replacement tin signatures. Minor grid based examination of the Rachel magnetic anomaly was completed with no encouragement and the licence was relinquished.

REGIONAL GEOLOGY

Comstaff has completed regional mapping of the licence area at a scale of 1: 10,000 and a composite plan of the interpreted geology at the same scale is appended in this report. The mapping includes areas gridded and mapped in more detail such as at Friday Creek and Ajax Creek however, many of these results were biased by float mapping.

Two major sequences, the Precambrian Oonah Formation and the Cambrian Hazlewood Complex are observed in the tenement and these are described in more detail below.

Precambrian Rocks - These rocks correlated with the Oonah Formation, consist of a fairly monotonous sequence of folded quartz sandstones, siltstones, carbonaceous mudstone, shale and minor dolomite. To the west of the licence these rocks pass in to the Arthur Lineament. Rocks exposed in the Mount Bischoff inlier to the east are lithologically and structurally very similar to those outcropping within the tenement.

Cambrian Rocks - Possible Crimson Creek correlates comprising spilitic basalts, andesites, breccias, volcanoclastic lithicwackes, micaceous sandstones, shale, siliceous mudstones, cherts and minor carbonates occupy the major of the southern two thirds of the tenement. The sequence overlies the Precambrian Oonah Formation and forms part of the Cleveland - Arthur River Sub basin or trough. The units are folded into a north easterly trending syncline formed between the two precambrian geanticlines mentioned previously. Possible early rifting in the troughs development may have given rise to the development of spilitic lavas and pillow basalts and andesites.

As the sequences abut the Heazlewood Igneous complex to the west, it is no surprise to find significant occurrences of serpentinitised material, gabbroic, dioritic and pyroxenitic intrusives as well as some micro doleritic outcrop occurring near this western section of the tenement.

A tertiary outlier of alkaline olivine basalt occurs near the northern portion of the Comstaff HAB grid where it appears to occur as massive vesicular flows.

Recent quartz and quartzite gravels are found mainly in the large rivers and may relate to recent erosion of tertiary accumulations.

WORK CONDUCTED ON FRIDAY CREEK AND AJAX CREEK AREAS

Comstaff completed fairly detailed stream sediment sampling during the early 1970's the results of which showed that Friday Creek with its two tributaries ; Monday and Tuesday Creeks, was anomalous for Cu Zn Ni and Ag. A second concentration of Cu Ni Zn was outlined near the headwaters of the Hazlewood River and its tributaries including Ajax Creek.

Both these areas were subsequently gridded, geologically mapped, & geophysically and geochemically surveyed. Grid HAB which covers the Friday Creek area is 2.8Km long x 1.4 Km wide and is oriented approximately 10° east of AMG. All lines were geologically mapped although much of the detailed data is infact float material only and therefore somewhat less reliable.

Three distinct lithological units occur within the gridded area.

- a) Tertiary Basalts in the central northern portion, showing minor flow structures
- b) Mixed sediments including greywackes, mudstones, siltstones and quartzites along the western edge of the grid. These units are cut by dunitic intrusives appearing as serpentinites microgabbros and dolerite sills.
- c) The remainder of the grid is underlain by basaltic / andesitic lavas and breccias, minor dacitic rocks, tuffs interspersed with sediments the later sometimes showing some silicification and hornfelsing.

Disseminated pyrite is often found at volcanic sediment contacts but no definite pattern of hydrothermal alteration or significant mineralization was revealed.

Magnetometer surveying was carried out only on lines 200 to 800N and 2200 to 2800N from 0 to 1400 E. No data or plan was presented with the report or any subsequent report with the only comment made that the remainder of the grid should be completed to allow for the accurate delineation of some of the geological boundaries.

As sampling was completed over the grid yet like the magnetic data, was not reported to the Mines Department. Comstaff did discuss some of the data and indicated that the highest Cu - Zn levels coincide with the contacts of volcanics and sediments. The distribution of Pb values does not show the same outlining pattern for the volcanic regime; however, the highest values also seem to indicate the contact areas of volcanics and underlying sediments. Comstaff stated that the values for the various elements are at a maximum 10% above lithological average abundance values, thus not necessarily indicating mineralization.

Grid HAC covers the headwater section of the Heazlewood River and Ajax tributary and was pegged from 200N to 1000N at 200 metre intervals from 0E to 1200E. All lines were geologically mapped and two distinct lithological units were identified.

a) A mixed sediment sequence of greywacks, mudstones, and quartzites appear in the E and SE portion of the grid. These units are hornfelsed and silicified to a higher grade than the equivalent rocks on the HAB grid. These indicators of contact metamorphism are widespread over the grid and give some insight into the nature of possible underlying igneous sequences - in particular the massive ultramafic complex as described by Dr Leaman.

b) Basaltic and andesitic lavas, tuffs and breccias overlie the sedimentary sequences in the central and western parts of the grid.

It would appear that no magnetic surveying was carried out but soil sampling was. No results for the later in raw data or plan form were cited and it is assumed once again that the Department of Mines failed to be supplied with a copy. It should also be noted that no significant mineralization was observed whilst the surveys were being completed.

Billiton reassessed Comstaff's aeromagnetic and EM data for the general area to test for the presence of sulphide replacement tin mineralization. Secondary targets were veined / stockwork tin - tungsten deposits related to granite emplacement.

Five anomalies were examined and modelled, four of which were 'written off' as either bedrock sources ie. gabbro or black shale or as deeper sources, possibly related to the ultramafic complex. The remaining anomaly designated the Rachel Anomaly, was ground checked using geophysical, geochemical means. No obvious magnetic source was located along the grid line yet readings along the Telecom road are high in association with outcropping basalts.

I am not confident that Billiton actually assessed the magnetic zone and am less confident that I have plotted their work accurately as there would appear to be large errors in distances to known points and the AMG coordinates don't appear to be right either.

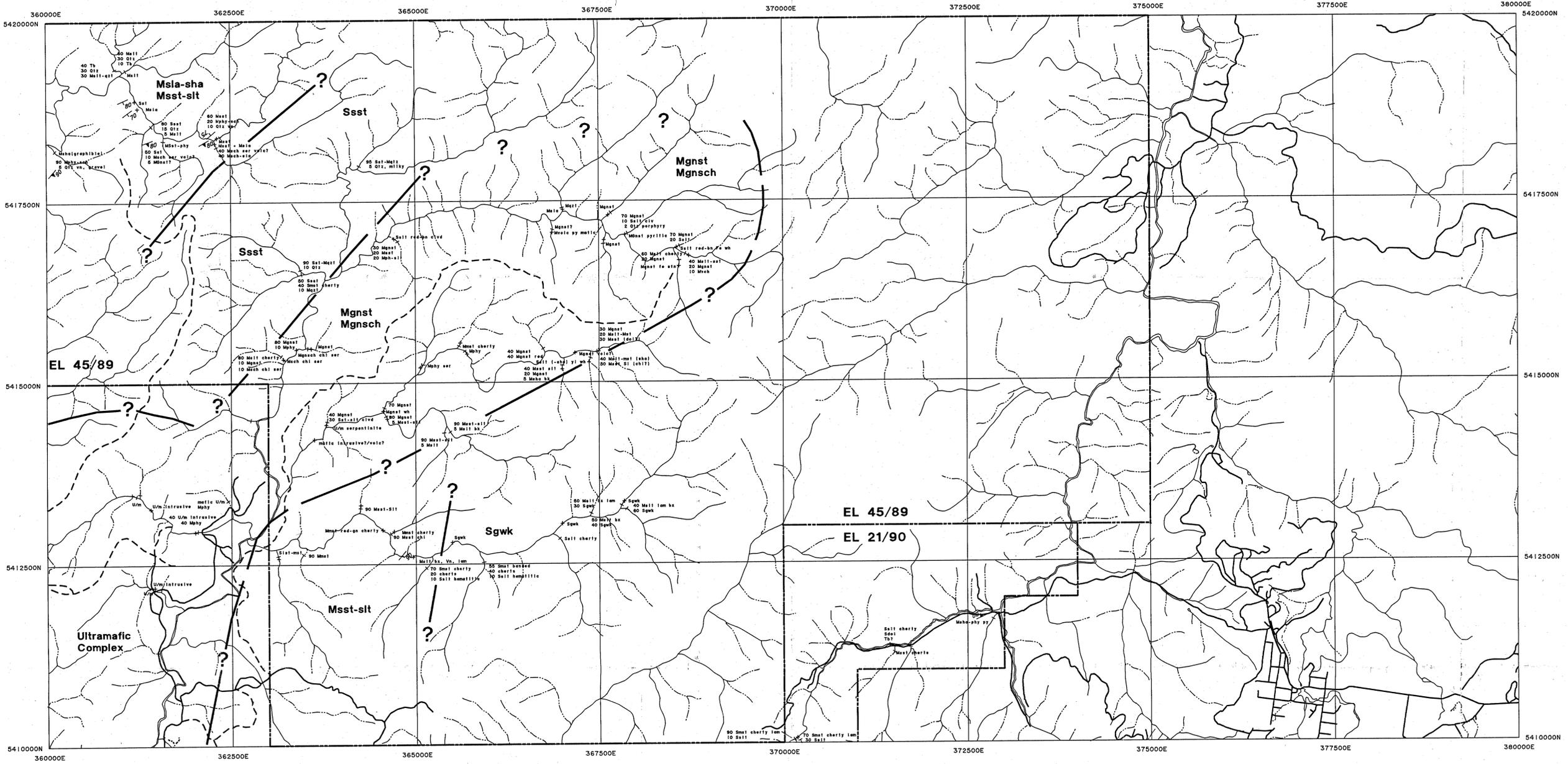
No EM or magnetic anomalies of significance lie within the gridded areas of Friday and Ajax Creeks, however, a major magnetic anomaly lies south of the HAC grid in undifferentiated Crimson Creek Formation rocks. Stream sediments draining a portion of the zone show weak Cu Zn Ni anomalism warranting a reconnaissance appraisal being made.

Dr Leaman has completed a more regional evaluation of the magnetics and gravity and describes a major north east trending belt of buried ultramafics stretching from the Corinna Road near the Savage River to just north west of the Waratah (18 - 20 strike kilometres). The zone outcrops as the Heazlewood layered mafic igneous complex but plunges shallowly to the north east beneath the Crimson Creek Formation and part of the Oonah Formation.

EXPLORATION POTENTIAL

Potential exists for volcanogenic style basemetal(+ gold) deposits in association with the spillitic basalts and andesites not unlike those found at Hellyer. To date there has been little direct encouragement to explorers with no readily discernible hydrothermal alternation pattern or zone of mineralization however, the lithologic assemblage would appear to equivalent to that required and a similar geological history would seem to have occurred. Notwithstanding this it should also be noted that little to no work has been completed in the catchment to Monday Creek, one of the better stream sediment anomaly sites. This should be examined in detail.

An additional target worthy of limited exploration is gold mineralization associated with sulphides in the intravolcanic cherty sediments



GEOLOGICAL LEGEND

- TERTIARY**
Tb Basalt
- CARBONIFEROUS - PERMIAN**
C-Pwt Wynyard Tillite
- PRE CAMBRIAN -**
- | | | | |
|------------------|---------------------|----------------|---|
| SEDIMENTS | METAMORPHICS | COLOURS | LOCATION SYMBOLS |
| Ssst sandstone | Msch schist | bk black | + Location of outcrop with description |
| Sgwk greywacke | Mphy phyllite | wh white | |
| Sslt siltstone | Mgnst greenstone | gn green | { 40 Mst Location of stream float with percentages of each float type in stream |
| Sdol dolomite | Mgnsch greenschist | gy grey | |
| Ssha shale | Mqzt quartzite | pl pale | |
| | Msla slate | dk dark | |
| | | bn brown | |
-
- | | |
|------------------|----------------|
| VOLCANICS | OTHER |
| Volc volcanic | U/m ultramafic |
| tuff tuff | |
-
- | | | |
|-------------------|------------------|---------------------|
| MINERALOGY | TEXTURES | STRUCTURES |
| qtz quartz | Vn vein, veining | bedding |
| fs feldspar | lam laminated | foliation |
| Fe iron | stn stain | definite contact |
| py pyrite | wth weathered | approximate contact |
| ser sericite | clvd cleaved | possible contact |
| chl chloride | foln foliation | |
| sl siliceous | mas massive | |



038058

1:25000 SHEET LAYOUT

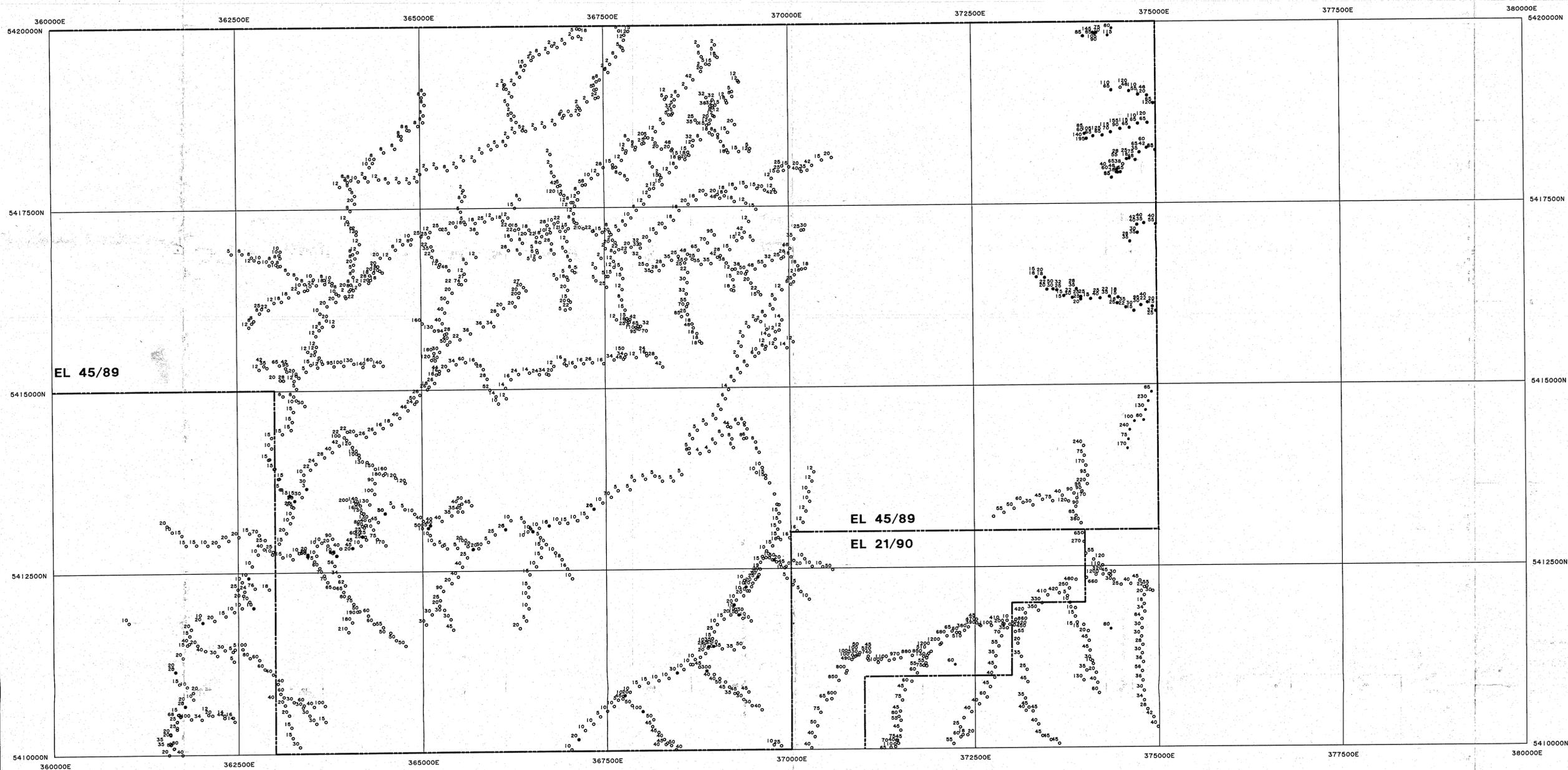
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3440	3640	3840

GEOPEKO A DIVISION OF PEKO WALLSEND OPERATIONS LTD
A.C.N. 000 081 434

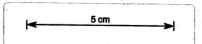
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PARRES Project / Taurus
Rep. Client. D.G.
Carto. R.M.N.
Checked
Date 12/3/92
Appended
Job No. 82_92 100k Sheet 7915 DWG No. 2057B

WARATAH 3641
FACT GEOLOGY & INTERPRETATION
93-3409.



038059



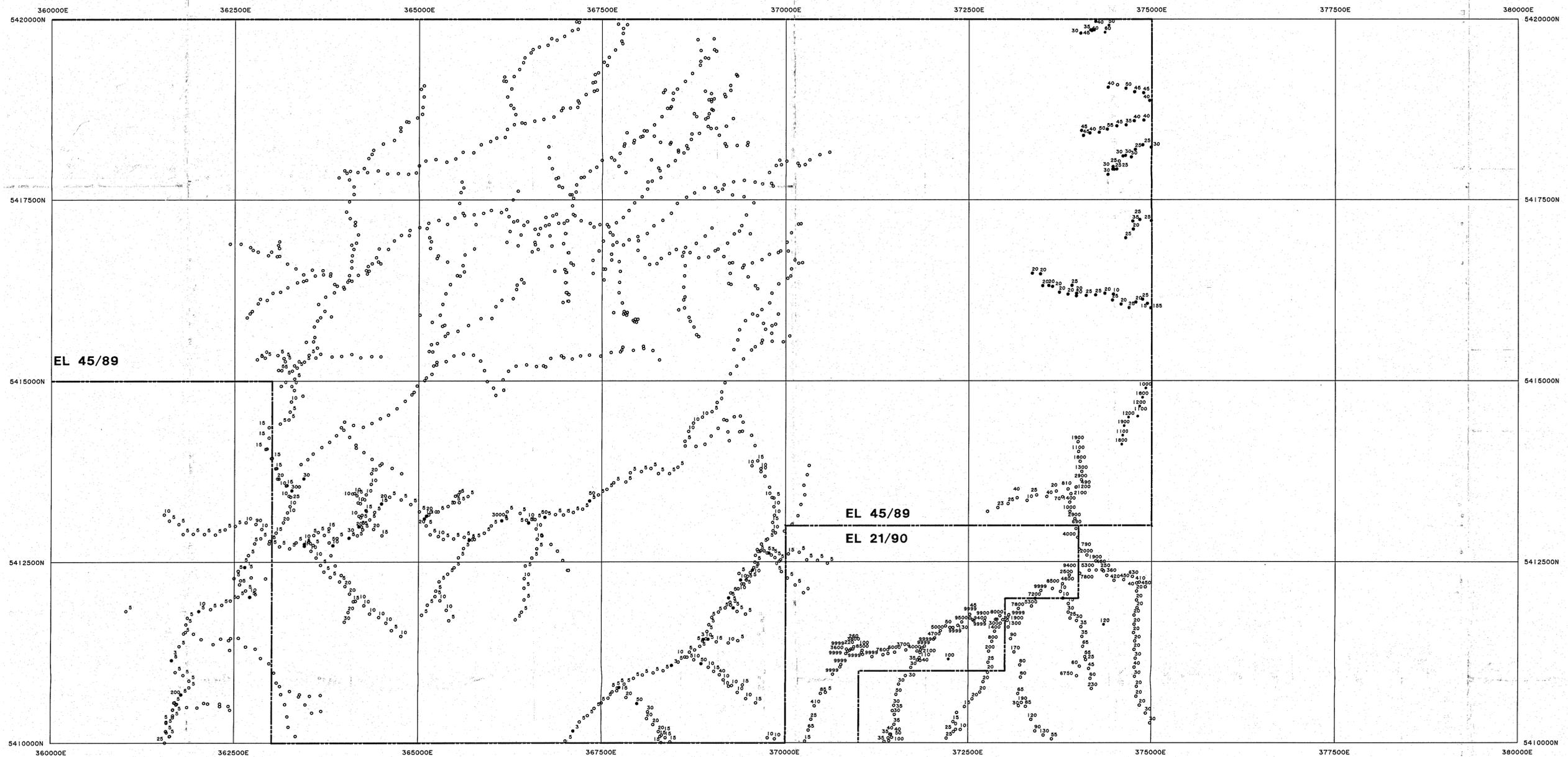
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- Location of Panned Concentrate sample
 - Location of Stream Sediment sample
- Note: 9999 equals >10000ppm

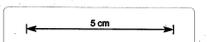
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3441	3641	3841
3440	3640	3840

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		Scale 1:25000 	
Project / Tissue		WARATAH 3641 COMSTAFF STREAM SEDIMENT SAMPLING 93-3409	
Geo. Client.	D. G.	Date 25/6/92 Appended	
Carto.	R. M. N.	Job No. 201_92 100k. 7915 DWG No. 2315A	



C38060



SAMPLE LEGEND

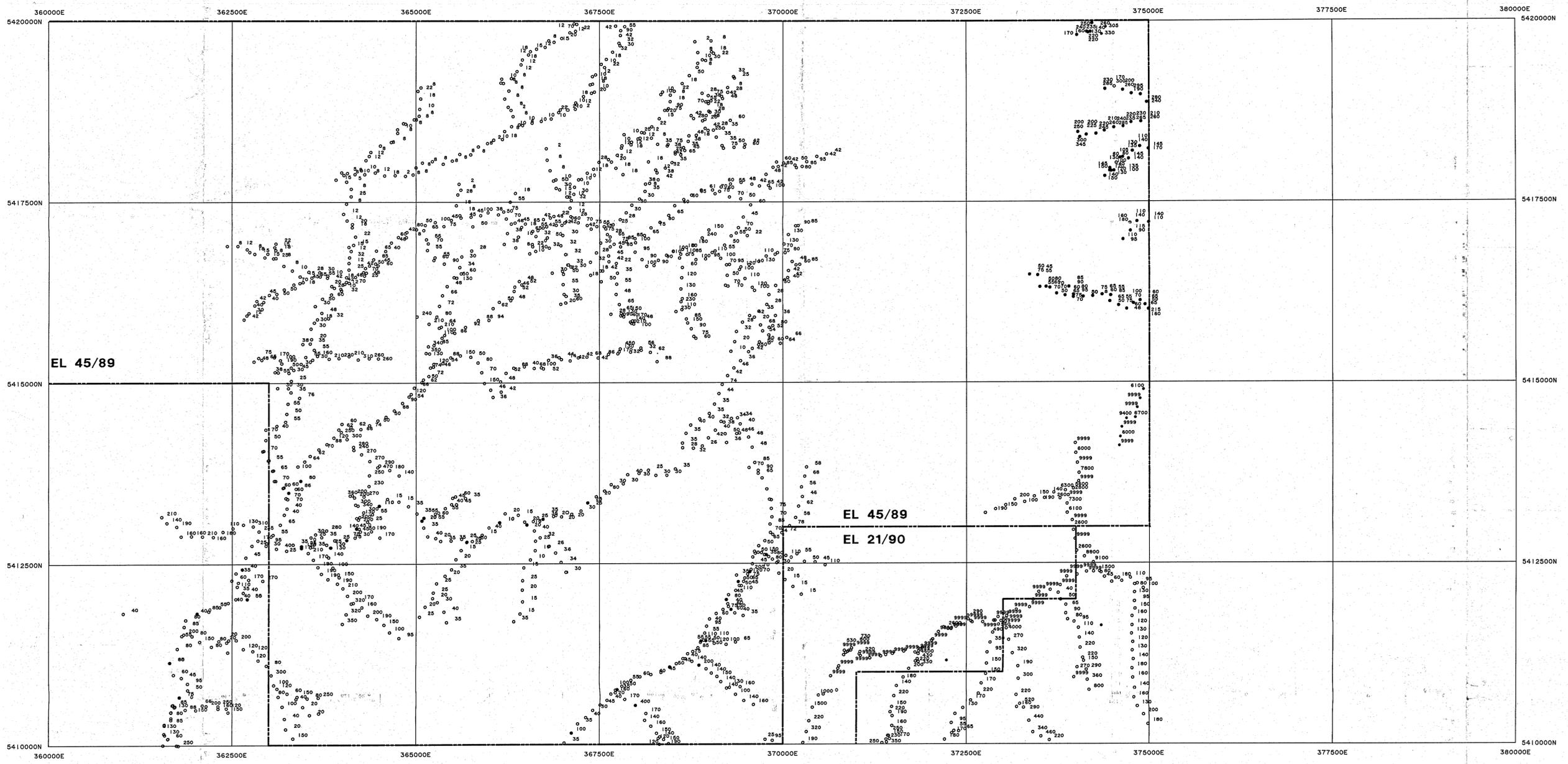
- Location of Panned Concentrate sample
 - Location of Stream Sediment sample
- Note: 9999 equals >10000ppm

1:25000 SHEET LAYOUT

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3441	3641	3841
3440	3640	3840

		GEOPEKO <small>A DIVISION OF PEKO WALLSEND OPERATIONS LTD A.C.N. 000 081 434</small>	
		Scale 	Project / Tenure
Geo. Client. D. G.	Carto. R. M. N.	WARATAH 3641 COMSTAFF STREAM SEDIMENT SAMPLING LEAD (ppm) 6072-26	
Date 25/6/92	Appended	Job No. 201_92	DWG No. 2315B

93-3409



EL 45/89

EL 45/89
EL 21/90

SAMPLE LEGEND

- Location of Panned Concentrate sample
 - Location of Stream Sediment sample
- Note: 9999 equals >10000ppm

1:25000 SHEET LAYOUT

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3441	3641	3841
3440	3640	3840

PARKES
Geo. D. G.
Carto. R. M. N.
Checked
Date 25/6/92
Appended
Job No. 201_92
Sheet 7915

GEOPEKO
A DIVISION OF
PEKO WALLSEND OPERATIONS LTD
A.C.N. 009 081 434

Scale 1:25000
500 0 500 1000 1500 2000 2500m

WARATAH 3641
COMSTAFF STREAM SEDIMENT SAMPLING
ZINC (ppm)

DWG No. 2315C

038061

93-3409.