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SML 199

FREELING HEIGHTS – MOUNT ADAMS AREA

PROGRESS REPORTS FOR THE PERIOD 10/6/1968 TO 9/12/1969

Submitted by
Kennecott Explorations (Australia) Pty Ltd
1970

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Government of South Australia
Primary Industries and Resources SA

0070

KENNECOTT EXPLORATIONS (AUST.) PTY. LTD.

WESTERN DISTRICTS

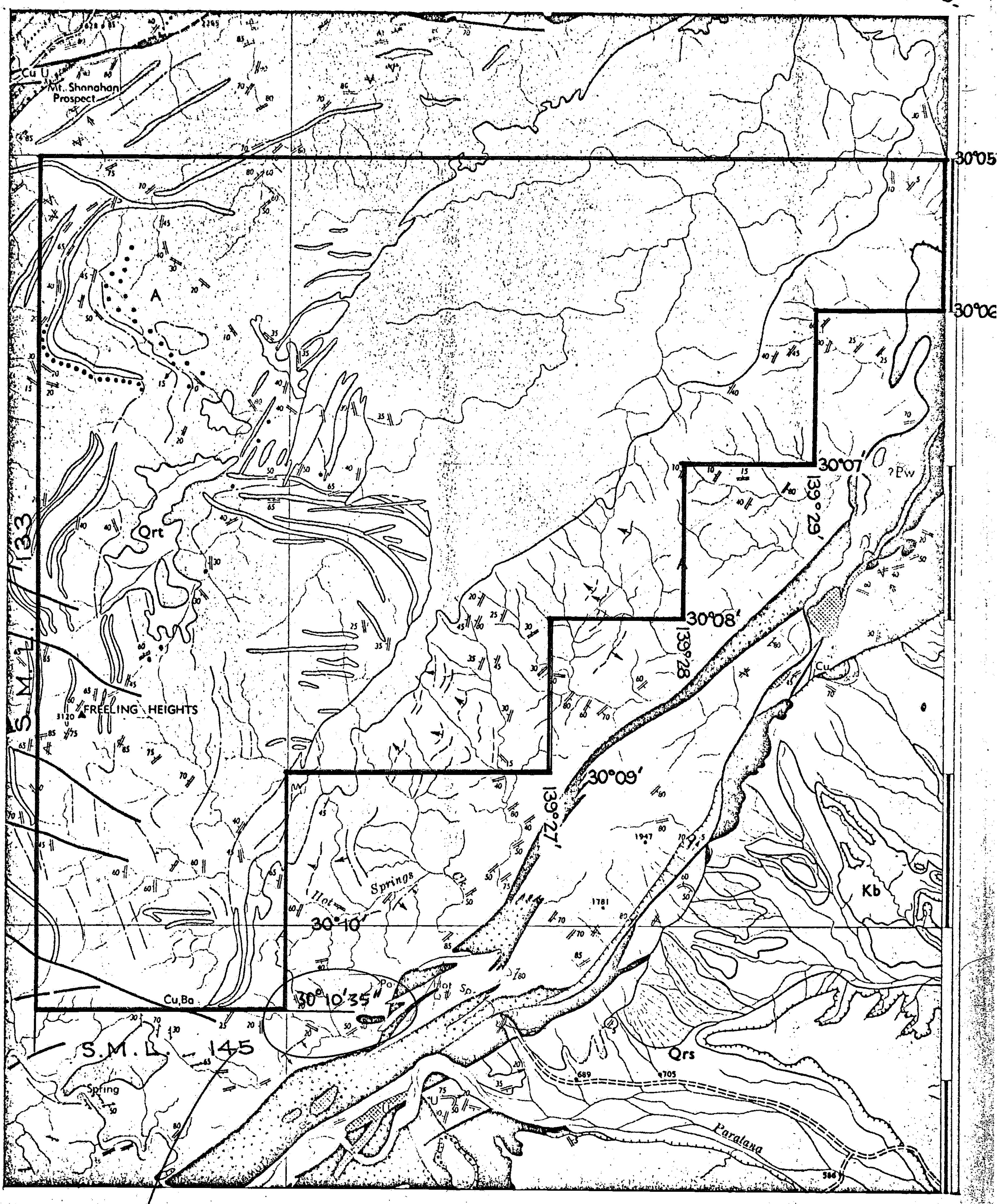
M T. P A I N T E R D I S T R I C T

INTERIM REPORT ON SML's 190, [redacted]

by

R.L. DEELEY & G.D. MAYNE

ADELAIDE,
January, 1969.



UMBERATANA 1:63360

KENECOTT EXPLORATIONS (AUST) PTY. LTD

copley

Originated on application plan in DM. 474/70 (Exoil N.L.)

DM.812/68

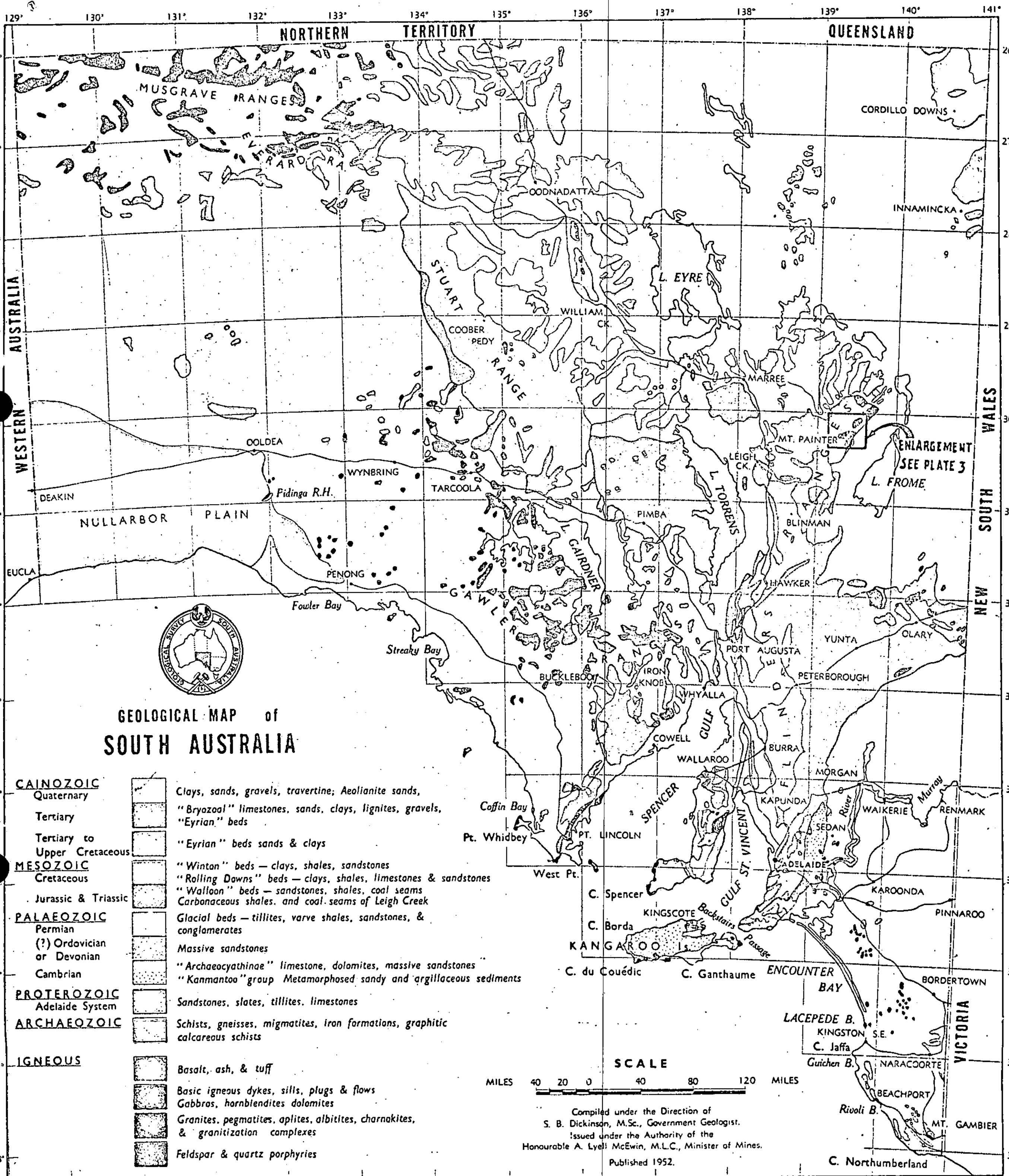
S.M.L. 199

CONTENTS

LIST OF PLATES

0073 **PLATE 1**

LOCATION : MOUNT PAINTER REGION



0074

SUMMARY

Three Special Mining Leases were taken up by E.Z.A. in the Mt. Painter District during 1968 to evaluate known copper-uranium occurrences and to search for new occurrences.

S.M.L.'s 199 and 215 were investigated with an airborne gamma-ray spectrometer and the major anomalous areas evaluated by ground scintillometer surveys and geological appraisal.

High grade uranium veins in calc-silicate rocks in the Shamrock area of S.M.L. 250 were investigated by ground scintillometer surveys, detailed mapping and diamond drill sampling.

0075

INTRODUCTION

The Mt. Painter district in the north-eastern Flinders Ranges comprises a group of basement rocks overlain by Proterozoic sediments and metasediments and intruded by Ordovician granites. The region has been extensively faulted.

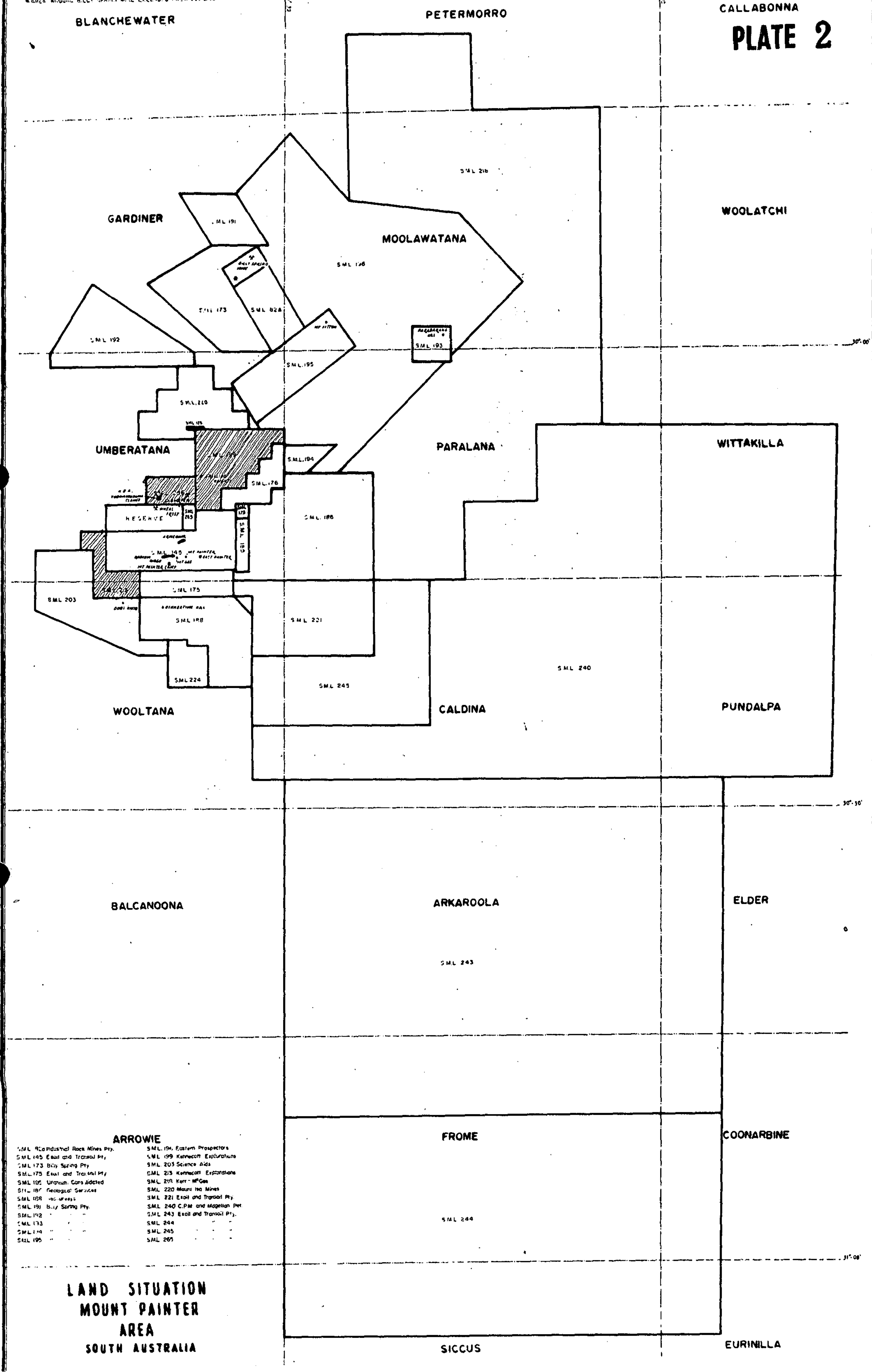
Copper and uranium mineralisation is known throughout the district chiefly associated with fault breccia zones, breccia pipes and shear veining. The mineralisation is possibly related to a phase of intrusion of the Ordovician granite.

Significant uranium mineralisation has recently been proved in the Mt. Painter-Radium Ridge area. Published figures to December 1968 are 3 million tons of 2.0 lbs U_3O_8/ton and 5 million tons of better than 1 lb. U_3O_8/ton.

S.M.L.'s 199 and 213 were taken out with the aim of searching for uranium and associated copper-molybdenum mineralisation. S.M.L. 236 was taken out to secure the ground surrounding four mineral claims held by E.S.A. which cover portion of a copper-mineralised fault zone presently being tested, to evaluate known high grade uranium mineralisation associated with copper and to investigate a number of copper-uranium occurrences.

This report presents a summary of work carried out on these three S.M.L.'s to 1st January, 1969.

PLATE 2



LAND SITUATION
MOUNT PAINTER
AREA
SOUTH AUSTRALIA

0077

LOCATION & ACCESS

The Mt. Painter area is situated in the North Eastern Flinders Ranges approximately 400 miles north of Adelaide (See Plate 1). Graded roads exist only to the perimeter of the area, and station tracks suitable for four wheel drive vehicles allow access to portion of the area. Much of the area is rugged, and can be reached only on foot. The nearest township is Copley, some 60 miles to the west on the standard gauge Leigh Creek - Pt. Augusta railway line. Pt. Augusta, the nearest sea port, is approximately 200 miles south of Copley.

LEASING

A total of approximately 37 sq. miles is held in the Special Mining Leases. S.M.L. 199 was granted on 10th June, 1968, for a period of 6 months, S.M.L. 215 on 1st July, 1968, also for a period of 6 months, and S.M.L. 250 on 1st October, 1968, for a period of 12 months. Extensions for a further 6 months have been obtained on 199 and 215. The location of these leases and the surrounding leases is shown on Plate No. 2

0079

REGIONAL GEOLOGY

The Mt. Painter Region is composed of a block of crystalline basement rocks, which is unconformably flanked by Adelaide System (Upper Proterozoic) sediments and metasediments to the west and south, and by mesozoic and younger sediments to the east (see Plate 3).

The basement block consists of Lower Proterozoic (?) or Archean metamorphosed sediments (Radium Creek Metamorphics) intruded by a succession of granite rocks of two main phases. The "older" granites are dated at about 1,600 m.y. and the "younger" granite at Ordovician. The older granite appears to be a laccolith intrusion which was partially eroded to the south, and almost entirely eroded to the north, before deposition of the Adelaide System.

The basal beds of the Adelaide System (<u>Callanna Beds</u>) are calc-silicate rocks, volcanics and minor quartzites. The calc-silicate beds often show diapiric habit. The Callanna Beds are best developed to the south and thin to the north, possibly as a result of erosion prior to deposition of the overlying Burra Group.

The <u>Burra Group</u>, also restricted to the south-western portion of the region, is a shallow-water sequence dominated by dolomite and magnesite beds with lesser shales and quartzites. These are unconformably overlain and overlapped by the sediments of the Umberatana Group.

0080

The lower portion of the Umberatana Group is comprised of a fluvioglacial sequence that thickens to the north as it overlaps the Burra Group. This is followed by a thick sequence of shales, siltstones and dolomites. A further sequence of fluvioglacial beds occurs at the top of the Group.

The Wilpena Group follows with a regional angular unconformity, and is characterised by a dominant shale-siltstone sequence, with minor dolomite. The uppermost bed exposed is the Pound Quartzite. Cambrian sedimentation is not recorded in the region.

Movements occurred within the Mt. Painter Complex during the deposition of the Adelaide System as evidenced by the major overlapping of the sedimentary sequences, particularly in the northern portion of the region. However, Coats (1966) has shown that there was only minor folding of the basement complex before deposition of the Adelaide System.

A period of major diastrophism occurred in the Middle Palaeozoic and was responsible for the major structural feature of the Adelaide System. The intrusion of the "younger" granite and associated pegmatites into the Mt. Painter Block appears to be related to this period of diastrophism. This produced extensive zones of metasomatism and contact metamorphism, particularly in the more receptive carbonate rocks near the base of the Adelaide System. Impure dolomites (?) were converted to calc-silicate rocks, and pelitic sediments were strongly replaced by K-feldspar.

Two periods of deformation can be recognised in the Lower

Adelaide System rocks which had attained the biotite grade of regional metamorphism, before contact metamorphism. The basement rocks have a more complicated metamorphic history and, according to Coats (op. cit.) have reached the sillimanite-almandine subfacies of the amphibolite facies of metamorphism.

MINERALISATION

There are numerous occurrences of copper and copper-uranium mineralisation throughout the Mt. Painter District. Mining on a small scale took place at various periods between the 1860's and 1920. In the Daly-Yudnamutana area, the largest mining field, it is estimated that ore containing about 600 tons of copper was extracted. All mining was restricted to high grade carbonate ore.

Mineralisation occurs in fault breccias, shear zones and breccia pipes, either within the Mt. Painter Complex or in the overlying rocks adjacent to the basement unconformity. Major shear-breccia faults such as the Jubilee-Old Noll-Sir Dominick zone contain 1/10ths copper throughout (at surface) whereas the variety of rock types cut by the fault contain normal background copper. Copper-uranium mineralisation in the Shamrock area is restricted to thin breccia veins cutting calc-silicate rocks. Uranium mineralisation in the immediate area around Mt. Painter occurs in breccia pipes and breccia zones. Molybdenite has been observed associated with this mineralisation.

In addition to copper-uranium mineralisation minor silver, gold, bismuth and arsenic have been recorded in the district.

AIRBORNE GAMMA-RAY SPECTROMETER SURVEY

Both S.M.L.'s 100 and 513 cover extremely rugged ground, most of which is inaccessible to vehicles. In places steep ridges are separated by incised valleys with relief of over 1000 feet and access on foot becomes slow and difficult. For this reason the only economical method in the search for uranium sources is to use airborne techniques to locate specific area for ground follow-up.

The survey was flown on north-south lines at approximately 1/10th mile line separation. All of S.M.L. 100 and 513 were covered with at least a one mile extension outside the lease boundaries. The western extension of the 100 survey covered the eastern half of the adjoining S.M.L. 550. The survey totalled approximately 550 line miles of recording.

The work was carried out under contract by Geophysical Resources Development Company using a Cessna 206. The recording instrument was a Scintrex G.I.S. A-3 system gamma ray spectrometer which recorded four channels of radioactivity, a total gamma count and three separate energy bands corresponding to maxima of energy levels of potassium, uranium and thorium emission of gamma rays. The gamma ray responses from each channel were recorded as separated continuous profile traces.

The separation of potassium, uranium and thorium counts aids in the interpretation of the source of an anomaly, and is particularly important where granites, pegmatites, sediments and metasediments are all present in the one area.

In order to orientate the instrument responses, two lines were flown over a known large radioactive source in the area and a third line flown from east to west down the Shamrock valley over a known small high grade uranium occurrence.

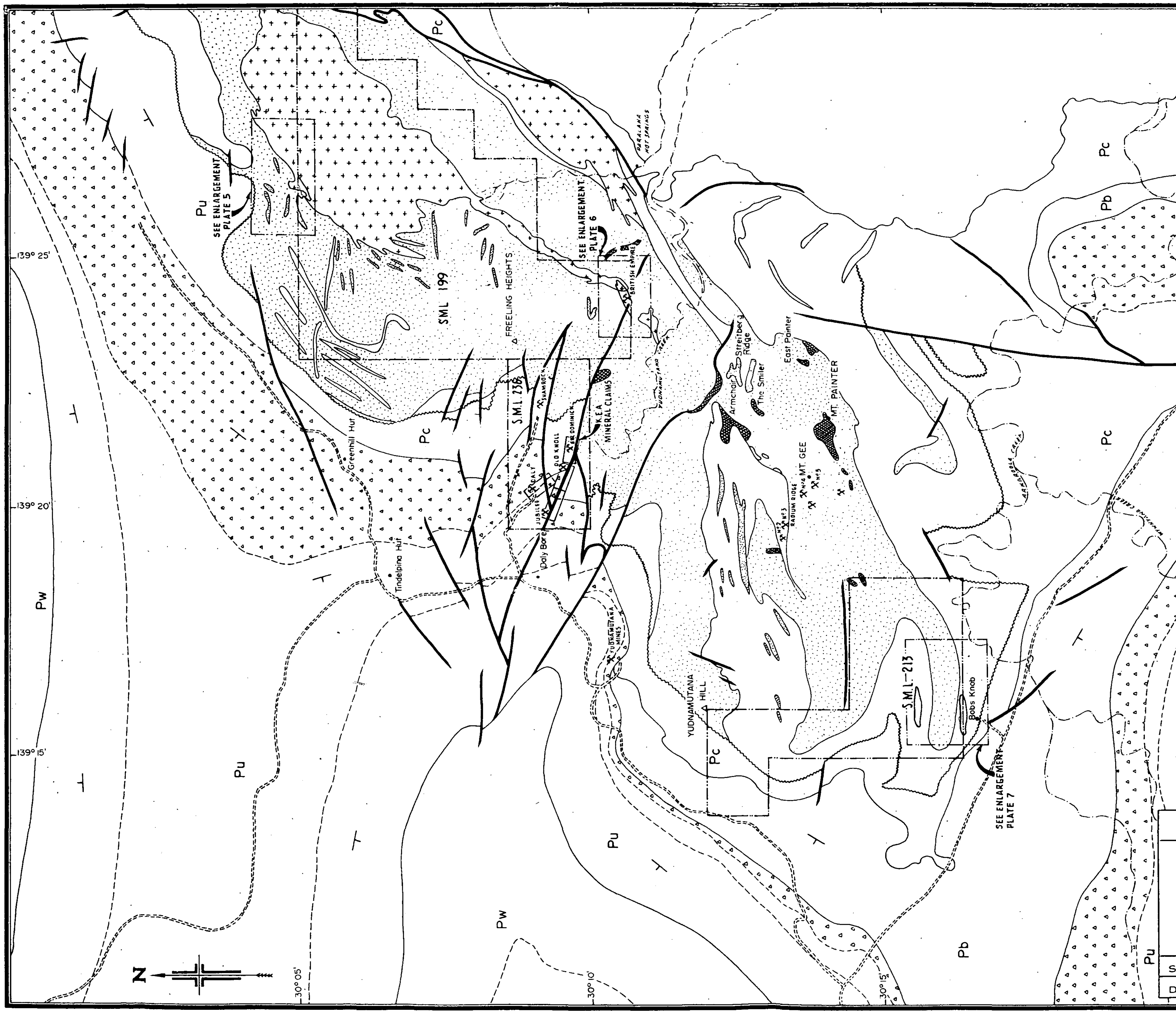
The height of the aircraft above the ground surface was recorded on a continuous altimeter trace. Heights varied from 200 feet to 2,000 feet due mainly to the nature of the terrain.

The area covered by the survey is shown on Plate 4. The flight line locations are presented on transparent overlays to photomosaics on a scale of approximately 1 inch to 1,000 feet. These overlays and photomosaics together with the discriminating channel profiles have been retained in the Adelaide office of this Company. They are available for inspection by Mines Department personnel and will be forwarded to the Mines Department for storage when the S.M.L.'s are relinquished.

Anomalous radioactive zones detected by the airborne survey and areas of ground investigation are shown on Plate 4. The major anomalous areas and one less well defined anomalous trend were detected in S.M.L. 199 associated with the margins of the Ordovician granite. A series of ill-defined anomalies were detected on remnants of the older granite of the Mt. Painter complex to the west of S.M.L. 199 and in the eastern portion of S.M.L. 230. Similarly a series of ill-defined anomalies occur along ridges of older granite in the southern portion of S.M.L. 213.

The known high grade uranium in 1 foot veins at the Shamrock area was not detected as an anomalous reading on either the north-south grid (approximately 500 feet above the outcrop) or on a special east-west traverse at lower levels along the Shamrock valley (approximately 600 feet above the outcrop). This indicates that small high grade veins will not be detected by this instrument at levels above 500 feet. However, massive low grade uranium occurrences were detected at levels of 600 feet.

0083

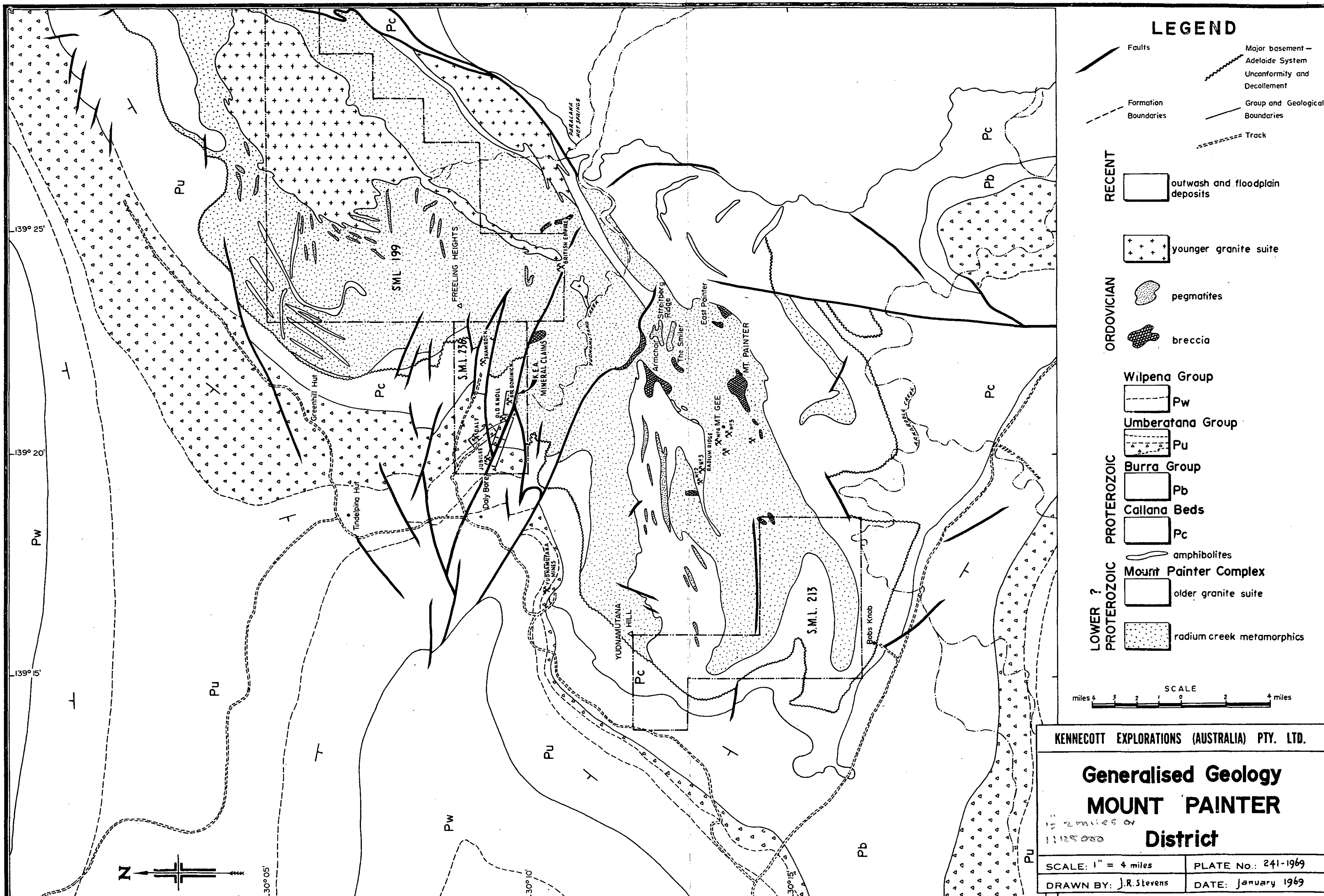


KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.

LOCATION OF RADIOMETRIC ANOMALIES, AND AREAS OF GROUND INVESTIGATION

MOUNT PAINTER DISTRICT, SOUTH AUSTRALIA

SCALE: 1" = 4 miles	PLATE No.: 241-1969
DRAWN BY: J.R. Stevens	DATE: January 1969


LEGEND
Faults
Major basement — Adelaide System Unconformity and Decollement
Formation Boundaries
Group and Geological Boundaries
Track
RECENT
outwash and floodplain deposits
ORDOVICIAN
younger granite suite
pegmatites
breccia
PROTEROZOIC
Wilpena Group
Pw
Umberatana Group
Pu
Burra Group
Pb
Callana Beds
Pc
amphibolites
LOWER ? PROTEROZOIC
Mount Painter Complex
older granite suite
radium creek metamorphics
SCALE
miles 4 3 2 1 0 2 4 miles
KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.
Generalised Geology
MOUNT PAINTER
District
SCALE: 1" = 4 miles
PLATE No.: 241-1969
DRAWN BY: J.R. Stevens
DATE: January 1969
SML 199
FREELING HEIGHTS
S.M.L. 236
S.M.L. 213
PARALANA HOT SPRINGS
BRITISH EMPIRE
K.E.A. MINERAL CLAIMS
YUDNAMUTANA CREEK
Streitberg Ridge
Armchair
The Smiler
East Painter
MT. PAINTER
MT. GEE
RADIUM RIDGE
YUDNAMUTANA HILL
YUDNAMUTANA MINES
Bobs Knob
Greenhill Hut
Tindelpina Hut
Daly Bore
JUBILEE
DALY
OLD KNOLL
SHAMROCK
139° 25'
139° 20'
139° 15'
30° 05'
30° 10'
30° 15'
N
Pc
Pb
Pu
Pw

GROUND GEOLOGICAL AND RADIOMETRIC INVESTIGATIONS

S.M.L. 199

Two major anomalously radioactive areas in S.M.L. 199, one in the northern portion and one in the southern portion (see Plate 4) were followed up by ground investigations. A third less distinctive anomalous trend occurs near the eastern margin of the S.M.L. but access to this area is difficult in the extreme and ground follow up was not completed in the period covered by this report.

Northern area

During the airborne survey a series of distinctive high radiometric counts was recorded which forms an elongated zone some 4,000 feet in length and up to 1,000 feet wide within the S.M.L. The ground follow up survey confirmed and outlined the zones of high radioactivity (see Plate 5). They are associated with what is thought to be the upper contact of the younger granite batholith. The rocks in contact with the granite are mainly quartzites and quartz rich metasediments of the Mt. Painter complex.

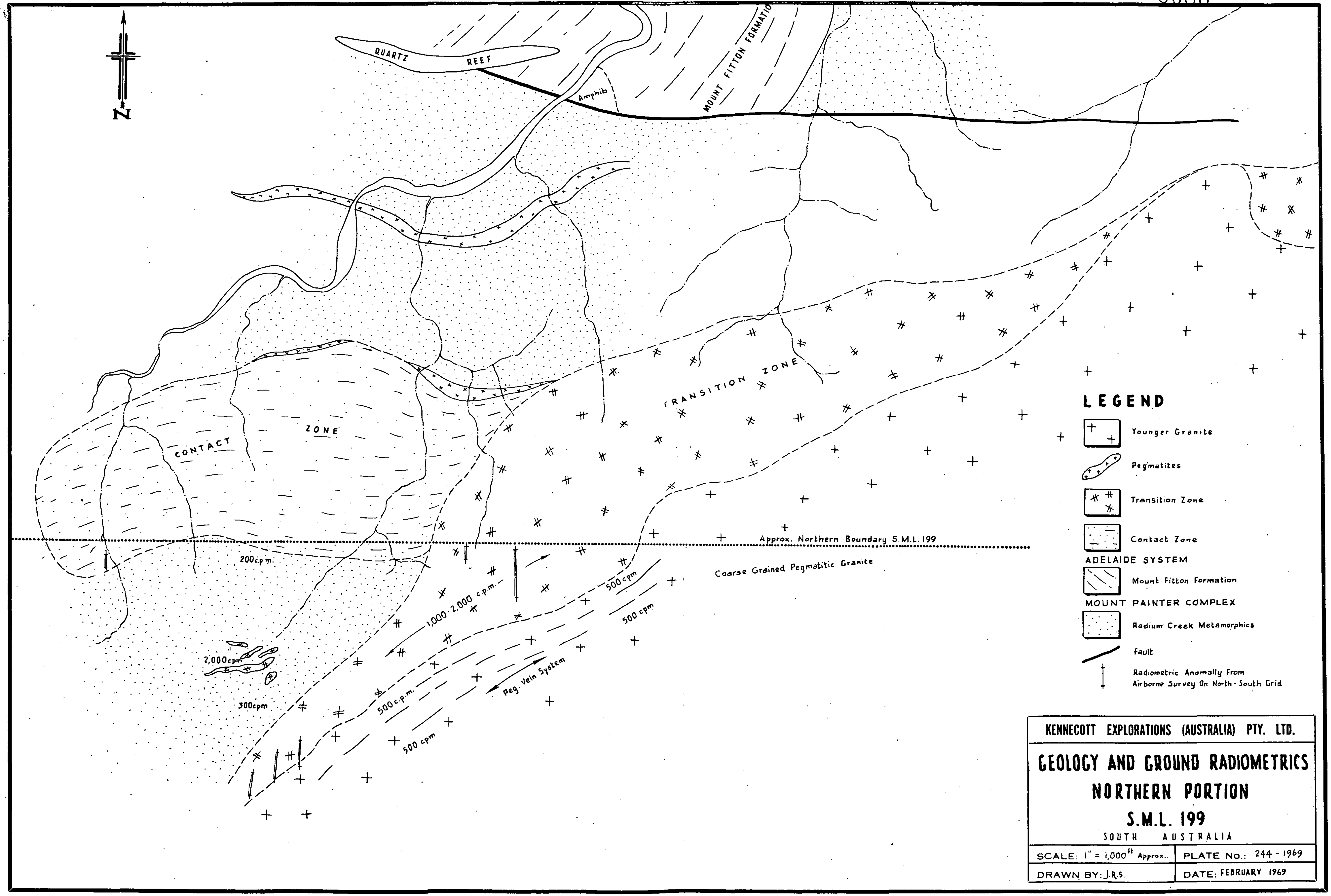
Two zones of high radioactivity could be distinguished, a transition zone composed of fine grained granite masses interspersed with pegmatites, and a contact zone composed of feldspathised and epidotised micaceous quartzite.

In the transition zone only the fine grained granite masses contain anomalous radioactivity (1,000 - 2,000 C.P.M.) while the pegmatites have low count rates (100 - 200 C.P.M.). The fine-grained granite to pegmatite ratio is approximately two to one.

This zone would appear to coincide with the contact of the granite. The main granite mass is composed of coarse grained pegmatitic granite in which approximately one third of the mass is made up of pegmatitic veins (quartz-feldspar) 2 - 3 feet wide and parallel to the margins of the granite. Throughout the granite mass count rates were approximately 500 C.P.M. Two samples from the fine grained granite giving approximately 2,000 C.P.M. assayed 0.65 lbs. U_3O_8/ton, and 0.26 lbs/ton. This rock is weathered with limonite stains developed, and could possibly have portion of its original uranium content leached.

The contact zone is distinguished by the development of potassium feldspar and epidote in micaceous quartzites. Minor pegmatites within this zone have low radioactivity. A sample typical of the zone (2,000 C.P.M.) assayed 0.2 lbs U_3O_8/ton. This rock type appears to be little weathered.

Both the transition zone and contact zone are characterised by having uniformly high radioactivity and no localised "hot" spots.


N
QUARTZ REEF
Amphib
MOUNT FITTON FORMATION
CONTACT ZONE
TRANSITION ZONE
Approx. Northern Boundary S.M.L. 199
Coarse Grained Pegmatitic Granite
200c.p.m.
1,000-2,000 c.p.m.
500 cpm
500 cpm
2,000cpm
300cpm
500 c.p.m.
Peg. Vein System
500 cpm
LEGEND
Younger Granite
Pegmatites
Transition Zone
Contact Zone
ADELAIDE SYSTEM
Mount Fitton Formation
MOUNT PAINTER COMPLEX
Radium Creek Metamorphics
Fault
Radiometric Anomally From Airborne Survey On North - South Grid
KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.
GEOLOGY AND GROUND RADIOMETRICS
NORTHERN PORTION
S.M.L. 199
SOUTH AUSTRALIA
SCALE: 1" = 1,000 ft Approx.
PLATE No.: 244 - 1969
DRAWN BY: J.R.S.
DATE: FEBRUARY 1969

0093

GROUND GEOLOGICAL AND RADIOMETRIC INVESTIGATIONS

S.M.L. 109

Southern Area

A group of anomalous recordings by the airborne survey are located in the most south eastern portion of the S.M.L. They occur on a high ridge in the vicinity of the British Empire mine. The follow up ground investigation proved the presence of high radio-activity and uranium mineralisation (see Plate 6).

Two zones of high radioactivity are present, one in a fine to medium-grained granite and the other in brecciated and altered zones extending southwards from the granite.

The granite is the southern elongation of the younger granite mass which has intruded schists and gneisses of the Mt. Painter Complex. (Corundum Creek Schist Member). The granite body of high radioactivity (10 times background) was traced over an area of 1,500 feet by 500 feet. A random sample assayed 0.2 lbs U_3O_8/ton. High radioactivity is uniform throughout this body with no localised "hot" spots. Weathering appears to be only minor.

To the south and west of the granite the Corundum Creek schists are altered and brecciated and contain copper-uranium mineralisation. At the British Empire mine veins of malachite and torbernite are developed. The torbernite has been partially weathered and leached, indicating it was formed during a weathering cycle that was different from the present conditions. Samples of a yellow radioactive mineral were collected from boulders in the vicinity of the mine.

The mineral was identified by X-ray methods as being kasolite, a basic lead uranyl silicate, $Pb(UO_2)\ SiO_3(OH)_2$. A sample of granite from the adit face (some 72 feet long) is reported by Blissett (S.A. Mines Dept. unpublished) to assay 0.56% Copper, 2,000 p.p.m. lead, 120 p.p.m. zinc, 15 p.p.m. silver. Gold content was less than the detection limit of 3 p.p.m.

The limits of extent of uranium mineralisation in this area have not yet been determined. This area was not previously known as a uranium occurrence.

0089

R E F E R E N C E S

Blissett, A.H., 1964 - The Geology and Mineralisation of the Daly-Yudnamutana Copper Field. Report S.A. Dept. of Mines (unpublished)

Coats, R.P., 1960 - The Geology and Petrology of the Mt. Painter Complex. Report S.A. Dept. of Mines (unpublished)

Dickinson, S.B. et al. 1954 - Uranium Deposits in South Australia. Bull. Geol. Surv. of S.A. 30

Woodmansee, W., 1955 - Pitchblende Prospects at the Shamrock Mine, Yudnamutana Mining District. Report S.A. Dept. of Mines (unpublished)

Woodmansee, W. & Johnson, J., 1956 - Mineral Investigations in the Mt. Painter Region: Progress Report. Report S.A. Dept. of Mines (unpublished)

INSTRUMENTATION: APPENDIX

1. The gamma ray spectrometer used was a Scintrex G.I.S.A-4 system incorporating a 6" x 4" thallium activated sodium iodide crystal and 5" photomultiplier assembly. Four channels of radio-activity were presented:-

Channel 1 - The total gamma count above the energy level 100 KeV.

Channel 2 - Counts arising from the window centred on 1.46 MeV equivalent to Potassium 40 (energy band covered 1.3 - 1.6 MeV)

Channel 3 - Counts arising from the window centred on 1.76 MeV - the bismuth 214/uranium series nuclide (energy band covered 1.6 - 2.0 MeV.)

Channel 4 - Counts arising from window centred on 2.62 MeV - the thallium 208/thorium series nuclide (energy band covered 2.0 - 3.0 MeV).

2. Recording of radiometric data was effected on a multi-channel brush recorder fitted with dual event marking system.

3. The actual track flown by the aircraft was recorded by a 35 mm. single frame camera fixed to the aircraft not mounted in gymbals.

4. The height of the aircraft as it traversed over the ground was continuously monitored by a Bonzer TRN.70 Radar Altimeter; this information being continuously recorded by an Esterline Angus Recorder on a 6" chart roll.

1006 I

0003

KENNECOTT EXPLORATIONS (AUST.) PTY. LTD.

WESTERN DISTRICTS

INTERIM REPORT ON S.M.L. 199

MT. PAINTER DISTRICT

PERIOD JANUARY 1969 TO 10TH JUNE 1969

By

R.B. BESLEY & S.B. WARNE

ADELAIDE
June 1969.

CONTENTS

LIST OF PLATES

S U M M A R Y

Areas of previously detected high radioactivity were more accurately outlined by a low level airborne spectrometer survey, and a major helicopter programme to sample anomalous zones and collect stream sediments was carried out.

The north and south boundaries of the S.M.L. were accurately surveyed on the ground.

Chip line sampling has indicated large tonnages of very low grade uranium and thorium mineralisation at two anomalies bordering the younger granite of the Mt. Painter Complex.

Sampling in the area of the British Empire Mine has shown irregular uranium mineralisation to be centred on fractures with very little uranium distributed within the intervening country rock.

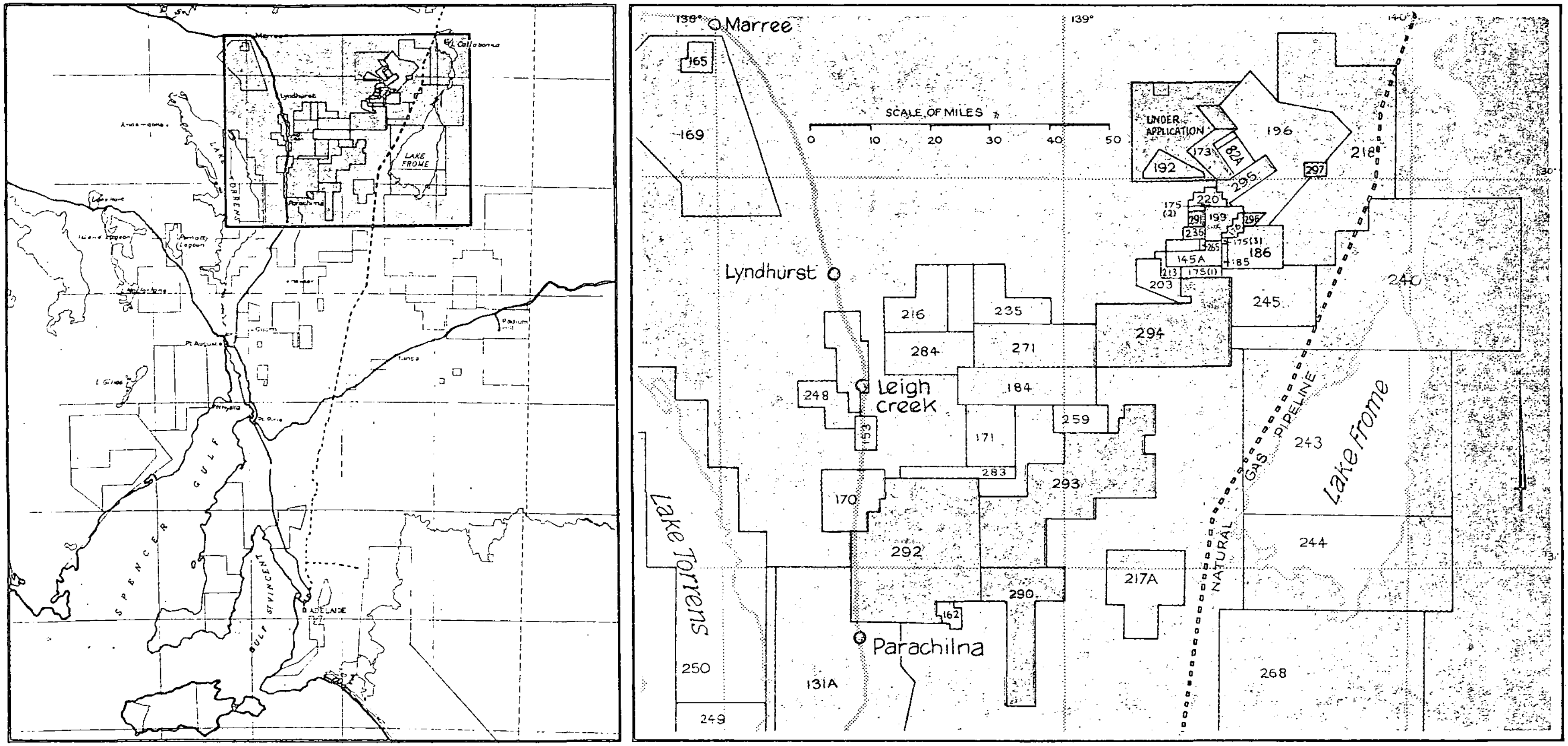
Stream sediment sample assays detected one zone of anomalous copper values in an area not previously known to carry copper mineralisation.

INTRODUCTION

Special Mining Lease 199 is one of three leases taken up in the Mt. Painter District during 1968. Sporadic uranium, copper and minor molybdenum mineralisation is known throughout the district. Preliminary investigations indicated that the mineralisation was associated with an intrusion of Ordovician granite into the Pre-Cambrian Mt. Painter Complex, mainly occurring in faults and breccia pipes adjacent to the granite. The lease was taken out to cover the major portion of this granite outcrop not already held under title at that time.

As the area is rugged and accessible only by foot a major airborne spectrometer survey was first carried out. Two anomalous areas were outlined and followed up by brief ground evaluations. The results of this work are given in Besley & Warne (January 1969).

This report covers further follow up work carried out on this S.M.L. to June 10th, 1969.



KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.

LEASE LOCATION PLAN

82A	Industrial Rock Mines Pty. Ltd.
131A	Mines Exploration Pty. Ltd.
145A	Exoil N.L., Transoil N.L. & W. JOHNSON
153	Electrolytic Zinc Co. of A/asia Ltd.
162	Noranda Australia Ltd.
165	Noranda Australia Ltd.
169	Mt. Isa Mines Ltd.
170	Mt. Isa Mines Ltd.
171	Mt. Isa Mines Ltd.
175(1)	Exoil Pty. Ltd. & Transoil Pty. Ltd.
175(2)	Exoil Pty. Ltd. & Transoil Pty. Ltd.
175(3)	Exoil Pty. Ltd. & Transoil Pty. Ltd.
176	Exoil Pty. Ltd. & Transoil Pty. Ltd.
184	Electrolytic Zinc Co. of A/asia Ltd.
185	Uranium Consolidated N.L.
186	Exoil N.L. & Transoil N.L.
196	Eastern Prospectors Pty. Ltd.
199	Kennecott Explns. (Aust.) Pty. Ltd.
203	Science Aids (Aust.) Pty. Ltd.
213	Kennecott Explns. (Aust.) Pty. Ltd.
216	Electrolytic Zinc Co. of A/asia Ltd. & Newmont P/L
217A	Electrolytic Zinc Co. of A/asia Ltd. & Newmont P/L
218	Kerr McGee Australia Ltd.
220	Mt. Isa Mines Ltd.
235	Flinders Mining and Explan. Co. N.L.
236	Kennecott Explns. (Aust.) Pty. Ltd.
240	Central Pacific Minerals N.L. & Magellan Petroleum (N.T.) Pty. Ltd.
243	Exoil N.L., Transoil N.L. & Petromin N.L.
244	Exoil N.L., Transoil N.L. & Petromin N.L.
245	Exoil N.L., Transoil N.L. & Petromin N.L.
248	Electrolytic Zinc Co. of A/asia Ltd.
249	Delhi Australian Petroleum Ltd.
250	Delhi Australian Petroleum Ltd.
259	C.R.A. Exploration Pty. Ltd.
265	Exoil N.L. & Transoil N.L.
268	Eric A. Rudd Pty. Ltd.
271	Shandon Concessions Pty. Ltd.
283	Electrolytic Zinc Co. of A/asia Ltd.
284	M. J. Ross
290	*North Flinders Mines N.L.*
291	*North Flinders Mines N.L.*
292	*North Flinders Mines N.L.*
293	*North Flinders Mines N.L.*
294	*North Flinders Mines N.L.*
295	*North Flinders Mines N.L.*
296	*North Flinders Mines N.L.*
297	*North Flinders Mines N.L.*

0008

PLATE 1

LOCATION AND ACCESS

S.M.L. 199 is in the Mt. Painter District, Northern Flinders Ranges, South Australia, approximately four hundred miles north of Adelaide (see Plate 1). The nearest township is Copley, some eighty miles to the west on the standard guage Leigh Creek - Port Augusta railway line. Port Augusta, the nearest sea port, is approximately two hundred miles south of Copley.

Station tracks suitable to 4-wheel drive vehicles come within a few miles of the area but access within the S.M.L. is by foot or helicopter. Helicopter landing sites are limited due to the rugged terrain, dense low bush, spinifex, and stunted tree growth. Helicopter pads can be readily cut by ground parties.

Road access to the northern section of the S.M.L. could be gained by bulldozing and blasting four to five miles of track utilising ridges and creek beds east of Valley Bore approximately nine miles north-east of the Shamrock Valley Prospect.

Track access to areas of interest on the eastern side of the S.M.L. would be more difficult due to more severe grades, numerous rock outcrops and poor soil development within an area of rugged terrain.

L E A S I N G

a. Lease Situation

S.M.L. 199 was granted on 10th June, 1968, for a period of six months with a six monthly extension obtained from 10th December, 1968. A further extension for twelve months from 10th June, 1969 has been granted. This lease in relation to the surrounding leases is shown on Plate 1.

b. Expenditure Commitments

The original expenditure commitment was not less than $5,000 for the first six months. The six month extension did not require any further commitment. To the 10th June, 1969 a sum of $21,670 was expended on the area. The extension for a further twelve months from 10th June, 1969 was granted with an expenditure commitment of not less than $15,000.

c. Lease Boundaries

The southern boundary of the S.M.L. is defined as being an east-west line, one and a half miles north of Yudnamutana Hill while the remaining boundary lines are defined on longitude and latitude. As mineralisation was found in the vicinity of both the northern and southern boundaries it was necessary to know the position on the ground of those two lines. Points adjacent to the two boundary lines were accurately surveyed by J.D. O'Callaghan, licensed surveyor, between 26th May, and 1st June, 1969, utilising a helicopter to gain access to the required survey points. His report and results are given in Appendix I.

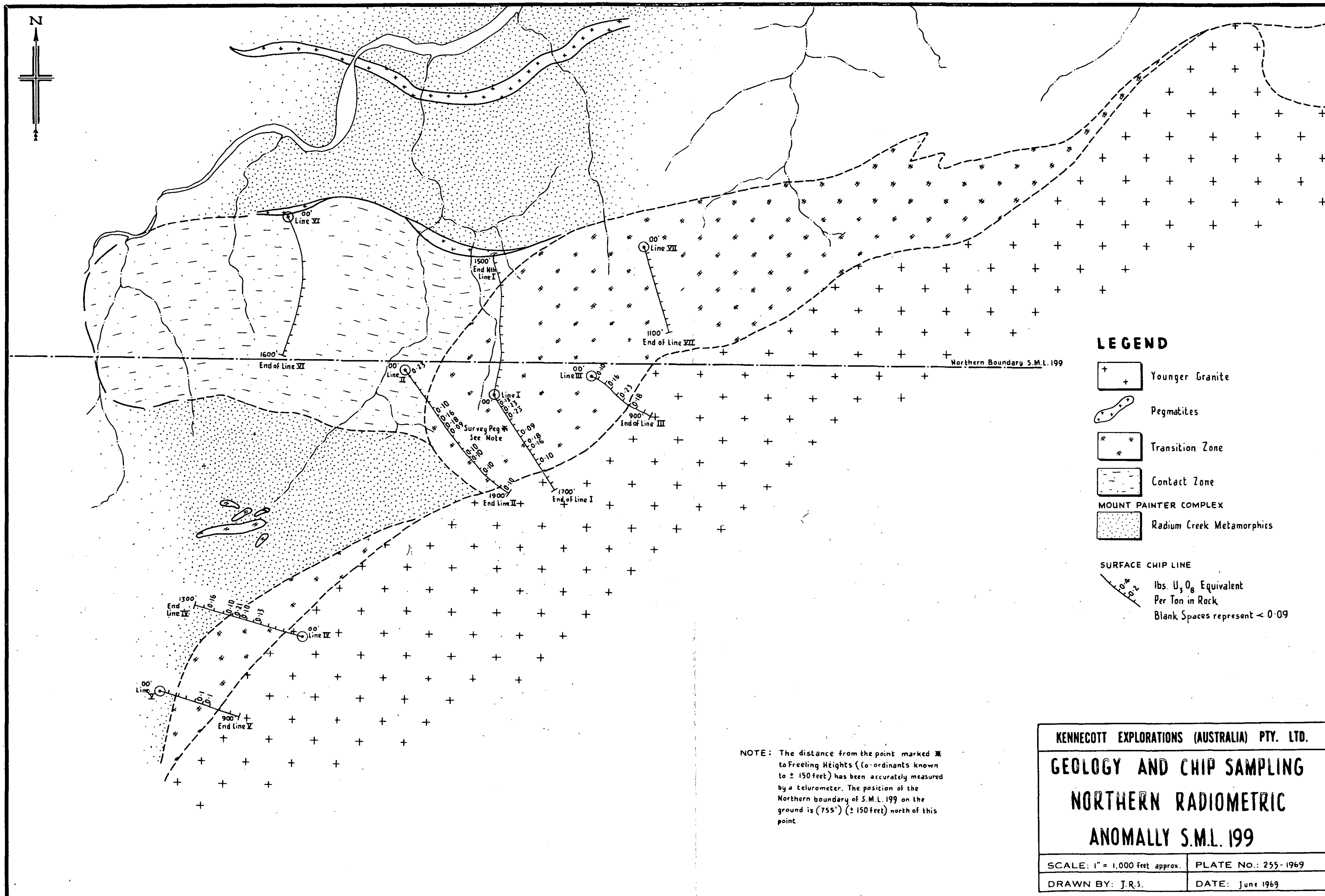
GENERAL GEOLOGY

The regional geology of the Mt. Painter District is described in Besley & Warne (Interim Report, January 1969). The general geology of the area of S.M.L. 199 is shown in Plate 2.

Ordovician (or "Younger") granite outcrops through the central portion of the S.M.L. and is flanked by the Proterozoic Radium Creek Metamorphics of the Mt. Painter Complex. The bulk of the granite is coarse grained and composed essentially of potassium feldspar, quartz and lesser muscovite. Pegmatitic segregations of these three components are common throughout the granite mass and within the adjacent metamorphics. Towards the contact with the metamorphics the granite becomes finer grained with increasing developments of biotite and, to a lesser extent, hornblende. Granodiorite has developed in places near the margin of the main granite mass and appears to be the result of reaction between the granite and the overlying Radium Creek Metamorphics. Pegmatites are strongly developed along the western boundary of the granite and invade the country rock for considerable distances from the contact but are generally absent from the eastern margin. In addition the granite contact and the overlying formations are domed to the west but straight to the east. It thus appears that the intrusion is in the form of a laccolith with its base to the east, dipping to the west and plunging to the south.

The Radium Creek Metamorphics intruded by the granite in this area are composed of quartzites, micaceous quartzites and minor biotite-schist bands. The contact between the metamorphics and granite is gradual, varying from fine grained granite with minor xenoliths of quartzite near the contact to metasomatised quartzites and micaceous quartzites invaded by pegmatites and fine grained granites in outer zones.

The only major fracture zone detected to date within the S.M.L. is in the vicinity of the British Empire Mine, where fracturing and brecciation occur along a major fault.



N
00' Line VI
1600' End of Line VI
1500' End Nth Line I
00' Line VII
1100' End of Line VII
Northern Boundary S.M.L. 199
00' Line II
00' Line III
Line I
Survey Peg * See Note
900' End of Line III
1900 End Line II
1700' End of Line I
1300' End Line IV
00' Line IV
00' Line V
900 End Line V
LEGEND
Younger Granite
Pegmatites
Transition Zone
Contact Zone
MOUNT PAINTER COMPLEX
Radium Creek Metamorphics
SURFACE CHIP LINE
lbs. U_3O_8 Equivalent
Per Ton in Rock
Blank Spaces represent < 0·09
NOTE: The distance from the point marked * to Freeling Heights (Co-ordinants known to ± 150 feet) has been accurately measured by a telurometer. The position of the Northern boundary of S.M.L. 199 on the ground is (755') (± 150 feet) north of this point
KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.
GEOLOGY AND CHIP SAMPLING
NORTHERN RADIOMETRIC
ANOMALLY S.M.L. 199
SCALE: 1" = 1,000 feet approx.
PLATE NO.: 255-1969
DRAWN BY: J.R.S.
DATE: June 1969

LOW LEVEL AIRBORNE SPECTROMETER SURVEY

The results of the initial airborne spectrometer survey and follow up ground investigations revealed two areas of high radioactivity and uranium mineralisation occuring near the edge of the Ordovician granite. A third lower order anomaly was detected along the eastern edge of the granite but was not visited by a ground party.

As the whole of S.M.L. 199 is rugged and accessible only by foot it was decided to test the feasibility of a low level low speed, airborne radiometric survey to accurately outline limits of anomalous radioactivity and to check the perimeter of the granite for possible further anomalies not detected by the initial higher level survey.

This survey was carried out on the 5th, 6th, and 7th February, 1969, using a Piper PA/18 (Super-Cub) aircraft carrying a McPhar T.V. 3-A scintillometer. The aircraft was capable of carrying pilot and observer at speeds of fifty to sixty knots at one hundred feet above tree top level in this area.

Several lines were flown along the granite margins and in the areas of known high radioactivity. Results were plotted directly onto air photographs. The limits of anomalous radioactivity were successfully outlined at the Northern, Eastern and British Empire anomalies, but no further anomalies were detected near the granite margins.

SAMPLING AND EVALUATION
NORTHERN RADIOMETRIC ANOMALY

The preliminary investigation of this region indicated an area of the order of one square mile of anomalous radioactivity from which character samples assayed between 0.2, and 0.6 lbs U_3O_8/ton.

The further follow up work including the accurate surveying of the northern boundary of S.M.L. 199 has outlined an area of one third of a square mile of anomalous radioactivity within our S.M.L. The surveyed position on the ground of the northern boundary is approximately six hundred feet north of that shown in the previous report (Besley & Warne, January 1969).

Seven chip lines were sampled to indicate the surface grades within the area of high radioactivity. These varied from nine hundred feet to one thousand nine hundred feet in length and were sampled over one hundred feet intervals taking chips of surface rock every two to three feet. Outcrop was generally good along all lines although much of the surface rock was partially weathered. These lines were plotted on aerial photographs.

The chip lines and uranium assays values are shown on Plate 3.

The full results for uranium and thorium are given in Appendix II.

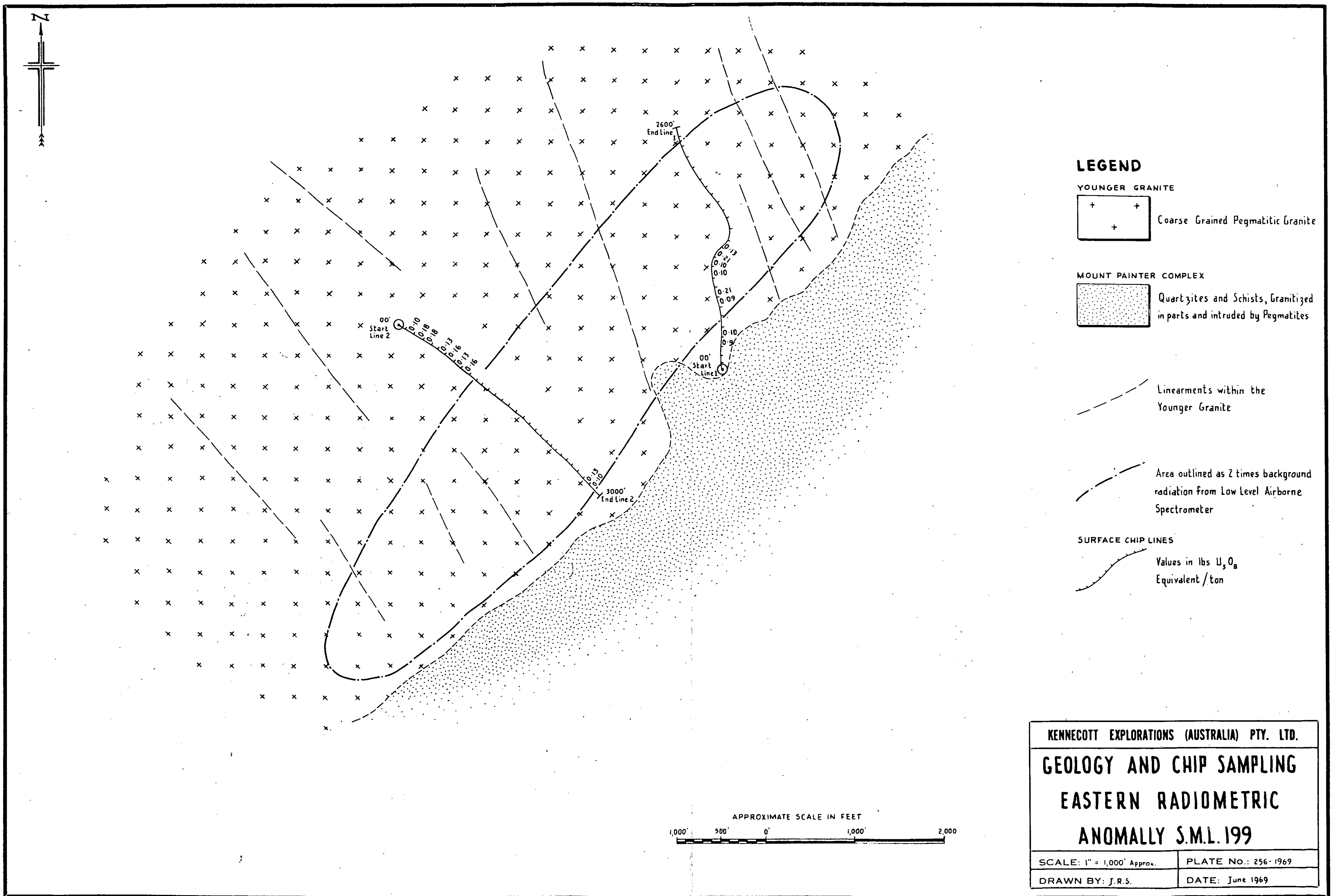
Assaying was carried out by A.M.D.L. using a radiometric technique.

The results indicate that much of the high radioactivity within the anomalous zone is due to thorium rather than uranium.

Only two thirds of the samples taken within the anomalous zone contain detectable uranium (limit of detection 0.09 lbs U_3O_8/ton) whereas many of the samples containing low uranium have a high thorium content of up to 400 p.p.m. Some samples taken in areas of lower radioactivity contained up to 0.2 lbs U_3O_8/ton, but no detectable thorium (limit 50 p.p.m.).

The highest uranium assay obtained over one hundred foot was 0.42 lbs U_3O_8/ton. The overall results to date indicate a reserve within our S.M.L. boundary approximating three hundred and fifty thousand tons per vertical foot of 0.1 lbs U_3O_8/ton. Within this volume is included twenty thousand tons per vertical foot of 0.2 lbs U_3O_8/ton. This figure is made up of two areas, one two thousand five hundred feet long and one thousand feet wide, and the other two thousand feet long and one thousand feet wide.

Line 7, to the north of the S.M.L. boundary, was the only line taken in relatively fresh rock. This line averaged 0.37 lbs U_3O_8/ton over nine hundred feet and is of the order of twice the uranium content of the other lines that were in more weathered rock.


N
LEGEND
YOUNGER GRANITE
Coarse Grained Pegmatitic Granite
MOUNT PAINTER COMPLEX
Quartzites and Schists, Granitized in parts and intruded by Pegmatites
Lineaments within the Younger Granite
Area outlined as 2 times background radiation from Low Level Airborne Spectrometer
SURFACE CHIP LINES
Values in lbs U3O8 Equivalent / ton
00' Start Line 2
3000' End Line 2
00' Start Line 1
2600' End Line 1
0.10
0.18
0.18
0.13
0.16
0.13
0.16
0.13
0.10
0.13
0.21
0.10
0.10
0.21
0.09
0.10
0.9
APPROXIMATE SCALE IN FEET
1,000'
500'
0'
1,000'
2,000
KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.
GEOLOGY AND CHIP SAMPLING
EASTERN RADIOMETRIC
ANOMALLY S.M.L. 199
SCALE: 1" = 1,000' Approx.
PLATE No.: 256-1969
DRAWN BY: J.R.S.
DATE: June 1969

SAMPLING AND EVALUATION
EASTERN RADIOMETRIC ANOMALY

A weak anomalous trend was first detected in this area by the major airborne spectrometer survey carried out in 1968. This was confirmed and outlined by the later low level airborne survey indicating an area of approximately eight thousand feet long by one thousand five hundred feet wide yielding twice background radiation. This area occurs within the granite near the eastern contact.

Two surface chip lines were sampled across the anomalous zone on one hundred foot intervals. These lines and the uranium results are shown on Plate 4; the complete assays are given in Appendix III.

In line I, twelve of the twenty-six samples (one hundred foot intervals) contained greater than 0.09 lbs U_3O_8/ton, the highest being 0.26 lbs U_3O_8/ton. A twelve hundred foot section averaged 0.15 lbs U_3O_8/ton.

In line II only nine of the thirty samples contained greater than 0.09 lbs U_3O_8/ton, the highest being 0.18 lbs U_3O_8/ton. An eight hundred foot section averaged 0.12 lbs U_3O_8/ton.

Thorium values are low throughout both lines, the highest assay over one hundred feet being 100 p.p.m.

The tonnage potential in this area is of a similar order to that of the northern anomaly but there are insufficient sample lines to completely outline the extent of the mineralisation.

BRITISH EMPIRE RECONNAISSANCE MAPPING AND SAMPLING

a. Location (see Plate 2)

The British Empire Mine is located near the south eastern boundary of S.M.L. 199 two and a half miles west of Paralana Hot Spring, providing the divide between steep sided youthful stream valleys with numerous interlocking spurs, some water-falls and boulder strewn dry stream beds.

Access by foot is possible from Yudnamutana Creek via a series of narrow sloping ridges. Under good weather conditions the uphill journey takes two hours carrying moderate pack loads of thirty to forty pounds.

A helicopter pad is situated a short distance from the Mine adit on a ridge just wide enough to provide a landing point suitable for a Bell 47 G3B1 machine. Due to wind eddies around the hill slopes, landing at this point requires care and some ground indication of wind direction (e.g. masking tape tied to a dead tree or a smoky fire) is essential.

b. Previous Investigations

The British Empire Mine mineralisation was apparently first discovered about 1909 and South Australian Mines Department records indicate seven hundred and fifty tons of copper bearing rock had been mined from the adit between 1909 and 1921 by the 'Great Northern Eclipse Pty. Gold and Silver Mine' syndicate.

Winton (1921) visited the Mine and reported that three samples taken assayed 0.6%, 9.9%, and 2.3% copper respectively with no values for gold, bismuth, lead or arsenic. A value of twelve pennyweights silver per ton was found with the highest copper assay sample.

M. Blissett (1968) observed that the joint and fracture planes in and about the mine were coated with haematite, malachite and azurite with 'small, scattered veins and pockets of haematite and copper carbonates in the adit'.

Blissett described the 'host rocks' as forming part of the Corundum Creek Schist member of the Freeling Heights Quartzite (considered as lower Proterozoic in age) consisting of schists and gneisses derived from an arkosic and quartzitic sequence intruded by Palaeozoic granites and pegmatites'.

A sample taken from the adit face, described by Blissett as a pegmatitic alkali granite containing microcline perthite was reported to assay 0.56% copper, 2000 p.p.m. lead, 120 p.p.m. zinc, 15 p.p.m. silver, 250 p.p.m. barium and less than 3 p.p.m. gold.

Blissett concluded that 'the difficult access and erratic distribution of copper bearing minerals did not encourage further work on the prospect'.

In 1968 an airborne scintillometer survey undertaken by Kennecott Explorations Australia Pty. Ltd. over S.M.L. 199 indicated anomalous radioactivity derived from a uranium source in the vicinity of the British Empire Mine. A ground reconnaissance of the area disclosed high grade uranium mineralisation in fractured zones at the British Empire Mine and along the north slope of a steep, craggy, ridge approximately one thousand feet south of the mine.

Selected samples from various locations at and near the British Empire Mine were assayed. The results are given in Table 1, Appendix IV.

These assays coupled with ground scintillometer traverses indicated: -

(1) anomalous radioactivity associated with uranium mineralisation over an area approximately four hundred feet by two hundred feet in the vicinity of the British Empire Mine.

(2) anomalous radioactivity associated with uranium mineralisation on the ridge, near the southern S.M.L. boundary, approximately one thousand feet south of the British Empire Mine, over an area approximating three hundred feet by six hundred feet.

(3) more intense radioactivity coincided with the visible uranium minerals kasolite and malachite stained relics of torbernite between fault planes and on joints.

(4) that as the observed uranium mineralisation was of a secondary nature a sampling technique was needed to:

    (a) define the source of the mineralisation

    (b) define the areas of rock carrying significant primary uranium minerals.

c. Sampling

The steep slopes, craggy, bare rock outcrops coupled with their fractured and altered nature in the British Empire Mine area presented a sampling problem.

Sample lines were run over rock outcrops wherever possible in directions which roughly right angled the main cleavage direction. The cleavage direction was noted to be comparable to major fault strikes and the strike of relic current bedding structures occasionally observed in the altered quartzite rocks.

The lines sampled formed a nearly parallel pattern over the areas of anomalous radioactivity with some deviations by-passing outcrop too steep to climb.

Chip samples of the same visually estimated size were taken over one or two foot intervals along twenty-five foot taped ground distances.

The beginning of each line and, where possible at points along the lines, location positions were marked by white painted crosses. The crosses were later located and their elevations determined using a theodolite. The theodolite work coupled with compass bearings and slope readings taken as the lines were sampled gave excellent control over direction and true distance in this difficult area.

In order to negate high metal values associated with fracture infillings large samples were taken with a sledge hammer and the sample trimmed to obtain a fresh rock specimen without fracture surfaces or weathered outer edges.

A complete record of samples taken and the assay values are listed in Table 2, Appendix IV.

The locations of the assayed samples together with the uranium assay values are listed in Plate 5.

The assay values show some interesting mineral associations. Of the assays giving uranium values: -

61% were associated with an anomalous copper value.
82% were associated with an anomalous lead value.

In all cases, except two, anomalous molybdenum values were coupled with a uranium value.

Although incomplete notes were taken of geology during sampling, uranium assay values were noted to be associated with fractures in 53% of the cases, with barytes in 33% of the cases and haematite 47% of the cases.

Therefore, from a study of the assays, uranium occurs with anomalous lead, copper and molybdenum values associated with fractures carrying haematite and barytes.

d. Geology (see Plate 5)

The dominant rocks of the mine vicinity are metamorphosed impure quartzites carrying considerable amounts of secondary muscovite.

These rocks, appear to be a section of an upper member of the Freeling Heights Quartzite sequence of the Radium Creek Metamorphics rather than a part of the Corundum Creek Schist Member as suggested by H. Blissett.

Severe faulting of the quartzites has produced complete brecciation three hundred feet north of the British Empire Mine while in the near mine area these rocks are faulted, strongly fractured and jointed. The completely brecciated zone consists of large angular quartzite blocks with interstitial chlorite. The edge of the quartzite breccia mass merges into a development of haematite and barytes forming a separate quartzite-haematite breccia body on the east side with a coarsely crystalline barytes border.

Two small quartz-felspar pegmatite intrusives occur located in shears; one immediately west of the haematite breccia and the other at the west end of the mine adit.

Pegmatisation within the quartzites was found to occur on the north side of the prospect area; this appeared to be the southern limit of an extensive zone of pegmatisation flanking the younger granite.

i) Petrology

Five rock samples collected from the British Empire Mine area were thin sectioned and described by

H.W. Fander of Central Mineralogical Services. These descriptions are recorded in Appendix V.

ii) Mineralisation

A light green very thin malachite staining on exposed joint and fracture faces at the British Empire Mine exaggerates visually the extent of mineralisation.

Mapping, petrology and sample assays indicate that although anomalous base metal values may occur in the metamorphosed quartzite the main mineralisation was introduced through and is essentially confined to faults.

The main minerals identified in the fault fissures and on joint surfaces are malachite ($CuCo_3$, $Cu(OH)_2$), brochantite ($CuSo_4$, $3Cu(OH)_2$), chrysocalla ($CuSiO_3$, H_2O), kasolite ($Pb(UO)_2SiO_3(OH)_2$) and pyromorphite ($(Pb.Cl)\ Pb_4(PO_4)_3$). Relic pseudomorphous, hollow centred malachite plates possibly after torbernite occur in one highly radioactive fissure which also carries high thorium values from another unidentified secondary mineral.

Despite quite high zinc assay values from some areas, no zinc minerals have been observed.

Irregular poddy developments of haematite and veinings of barytes occur in, and adjacent to, all major fault fissures.

The two small quartz-feldspar pegmatites gave the highest uranium assay values (i.e. greater than 1 lb U_3O_8/ton) of any width.

The most westerly pegmatite was examined closely to trace the source mineralisation. It was found that although copper staining was general between felspar cleavage surfaces, the intensity of copper mineralisation was greatest adjacent to a shear passing through the pegmatite. Similarly, scintillometer readings indicated that the radioactivity of the pegmatite was low on its outer edges, but intense along the shear, particularly, on the fracture face. Since no minerals other than quartz and felspar composed the pegmatite and no voids existed in the rock to indicate the weathering of copper or uranium source minerals it was concluded that secondary mineralisation derived from a primary source was migrating from the shear outwards and not vice versa. The same situation was noted in the pegmatite of the British Empire adit. In both cases metaquartzites adjacent to the pegmatites showed no signs of primary minerals or void relics of them.

The widespread greisening phase experienced by the sediments of the area indicate the spread of active pneumatolytic solutions through fracture and joint fissures from a deep source. It appears likely that mineralising solutions were introduced into fractures as a final post pneumatolytic phase and due to the unreactive nature of the host rocks the mineralisation remained largely confined within the fractures. Assays and field scintillometer traverses show that some dispersal of mineralisation into wall rocks adjacent to major fractures occurred but to only a limited extent.

STREAM SEDIMENT SAMPLING

The association of copper and molybdenum with uranium mineralisation in the Mt. Painter District and the apparent relationship between contacts of the "Younger granite" and uranium occurrence indicated that this 'permissive' environment should be prospected for copper-molybdenum occurrences.

The rapid mechanical nature of weathering and the close spacing of streams indicate that sampling of sediments from streams draining the granite margins should detect any large ore bodies occurring in this environment.

A total of eighty-three samples were collected and the -20 mesh fraction analysed for copper, lead, zinc, and molybdenum. Sample positions and results for copper, lead and zinc are shown on overlays to Plate 2. All molybdenum values were less than 4 p.p.m.

Two anomalous areas were located, one in streams draining the known copper, lead uranium mineralisation at the British Empire, and the second in the North-East corner of the S.M.L.

SUPPLY DUMPS

The helicopter was utilised during the latest programme to dump food and camping supplies for possible future programmes. One major dump was placed at the northern anomaly and another in the British Empire adit.

The dump at the northern anomaly is located at the survey peg (see Plate 3) and includes a tent, food and water supplies sufficient to support three men for two weeks, while the British Empire dump is located in the adit and includes sufficient supplies to last three men for one month.

Two small food and water reserves were also dumped; one adjacent to the start of chip line II, eastern anomaly (see Plate 4) and the other two and a half miles north of British Empire. The positions of these dumps are plotted on aerial photographs used for field work and held at Adelaide Office.

A P P E N D I X I

Surveyors Report

on

establishing S.M.L. Boundaries

J. D. O'CALLAGHAN, L.S., M.I.S.Aust.
LICENSED SURVEYOR
ENGINEERING SURVEYOR

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97 KING WILLIAM STREET
ADELAIDE, S.A. 5000
Phone: 51 5748
Residence: 96 7776

PORT LINCOLN:
78 Tasman Tce., S.A. 5606
P.O. Box 727 Phone: 958

BERRI: William St. S.A. 5333
P.O. Box 220 Phone: 76

17th June, 1969.

The Manager,
Western District,
Kennecott Explorations (Aust.) P/L.,
P.O. Box 46,
UNLEY. S.A. 5061.

Dear Sir,

Special Mining Lease No. 199 - Boundary Definition.

The survey to define the boundaries of Special Mining Lease No. 199 has been completed, and the co-ordinates of the cairns established are indicated on the plan attached.

The results of this survey show that the cairn now known as Sams Point is 71.22 yards south of the southern boundary of S.M.L. No. 199, and the cairn now known as Northern Cairn is 285.21 yards south of latitude 30° 05' which is the northern boundary of S.M.L. No. 199.

The southern boundary of this Lease is defined as being a line originating at Yudnamutana Hill going 7 miles due east, then 1½ miles due north, and then 3 miles due east.

The method of calculation and field procedure for the establishment of these boundaries was as follows:-

The co-ordinates of Yudnamutana Hill and Freeling Heights were supplied by the Department of Lands, and these co-ordinates originated from Mt. Lyndhurst which is a First Order Trig Station.

The Department then used the most recent survey data available which was a trigonometrical survey carried out during 1857 to calculate the co-ordinates of Yudnamutana Hill and Freeling Heights. These co-ordinates are on the Transverse Mercator Projection Zone 6.

We found two identical hills, each with an old survey cairn on the top, in the vicinity of Yudnamutana Hill. We adopted the most southerly hill as being the true hill.

The distance between the southerly hill and Freeling Heights we measured as 14,508 yards, and the distance between the northern hill and Freeling Heights we measured as 13,752 yards.

The distance between Yudnamutana and Freeling Heights as supplied by the Dept. of Lands was 14,408 yards.

We adopted this southern hill as being the correct hill as the 100 yards difference between the calculated and measured distances is as good as could be expected considering the data used to calculate the distance.

As the boundary to be established originated from Yudnamutana Hill the actual co-ordinates of this point are of no great consequence as it is the actual cairn on the ground that defines the boundary.

If in the future Yudnamutana Hill is tied in more accurately to the First Order Triangulation System and its co-ordinates are amended it will not affect the actual location of the hill with relation to the lease boundary.

For this reason the bearing from Yudnamutana to Freeling Heights and the co-ordinates of Yudnamutana as supplied by the Dept. of Lands have been adopted.

Our field procedure was then to measure distances and angles to points now known as Northern Cairn, British Empire, Sam's Point and New Hill.

All distances were measured with a Tellurometer, Model M.R.A. 1, on hire from the B.H.P., Whyalla Office, and the angles were read with a Watts 1" Thoedolite.

We then calculated the co-ordinates from the new points thus established and the co-ordinates for the north and south boundaries of Special Mining Lease No. 199.

The plan attached sets out the location of the points established and their co-ordinates.

We are also forwarding the original plus two prints of the Stadia Survey carried out within the vicinity of the British Empire addit.

Thank you for the opportunity of assisting in this project, and we would be pleased to carry out any further work for your company.

Yours faithfully,

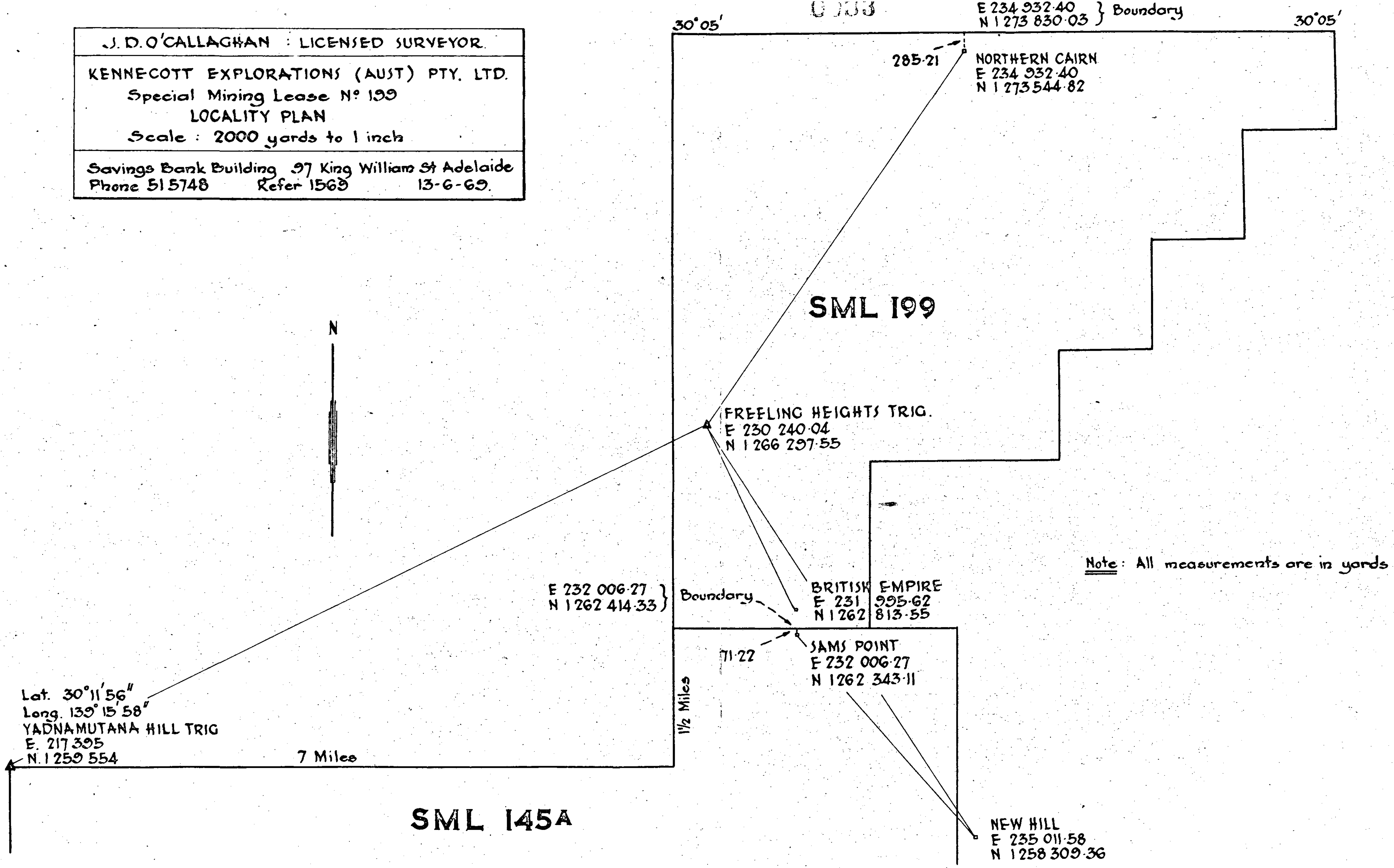
J.D. O'CALLAGHAN.

1569.

J. D. O'CALLAGHAN : LICENSED SURVEYOR

KENNECOTT EXPLORATIONS (AUST) PTY. LTD.
Special Mining Lease Nº 199
LOCALITY PLAN
Scale : 2000 yards to 1 inch

Savings Bank Building 97 King William St Adelaide
Phone 51 5748 Refer 1569 13-6-69.



APPENDIX II

0034

Chip line Uranium and Thorium Results

Northern Anomally S.M.L. 199

LINE I SOUTH

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
C41851 A	0-100	50	0.13	300	
B	100-200	50	0.13	400	
52 A	200-300	90	0.23	240	
B	300-400	90	0.23	< 50	
53 A	400-500	< 30	-	160	0.1 lb U_3O_8 per ton over 1300'
B	500-600	< 30	-	350	
54 A	600-700	30	0.09	350	
B	700-800	< 30	-	200	
55 A	800-900	70	0.18	220	
B	900-1000	60	0.16	140	
56 A	1000-1100	< 30	-	< 50	
B	1100-1200	< 30	-	< 50	
57 A	1200-1300	40	0.10	< 50	
B	1300-1400	< 30	-	< 50	
58 A	1400-1500	< 30	-	< 50	
B	1500-1600	< 30	-	< 50	
59 A	1600-1700	< 30	-	< 50	

LINE I NORTH

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
36076	0-100	80	0.21	350	
77	100-200	70	0.18	400	
78	200-300	40	0.10	400	
79	300-400	100	0.26	220	
80	400-500	40	0.10	120	0.15 lb U_3O_8 per ton over 1400'
81	500-600	60	0.16	160	
82	800-900	50	0.13	350	
83	900-1000	30	-	450	
84	1000-1100	100	0.26	200	
85	1100-1200	50	0.13	260	
86	1200-1300	<30	-	400	
87	1300-1400	50	0.13	200	
88	1400-1500	<30	-	350	

LINE II

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
C41859 B	0-100	90	0.23	240	
60 A	100-200	< 30	-	350	
B	200-300	< 30	-	400	
61 A	300-400	< 30	-	350	
B	400-500	< 30	-	280	
62 A	500-600	< 30	-	350	
B	600-700	40	0.10	240	
63 A	700-800	60	0.16	160	
B	800-900	70	0.18	220	
64 A	900-1000	70	0.18	< 50	
B	1000-1100	30	0.09	70	0.1 lb U_3O_8
65 A	1100-1200	30	0.09	< 50	per ton over 1300'
B	1200-1300	< 30	-	200	
66 A	1300-1400	40	0.1	160	
B	1400-1500	40	0.1	180	
67 A	1500-1600	< 30	-	180	
B	1600-1700	40	0.1	< 50	
68 A	1700-1800	< 30	-	180	
B	1800-1900	40	0.1	80	

LINE III

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
C41869 A	0-100	40	0.1	< 50	
B	100-200	<30	-	< 50	
70 A	200-300	60	0.16	160	0.1 lb U_3O_8 per ton over 700'
B	300-400	< 30	-	280	
71 A	400-500	90	0.23	50	
B	500-600	< 30	-	350	
72 A	600-700	70	0.18	180	
B	700-800	< 30	-	160	
73 A	800-900	< 30	-	< 50	

LINE IV

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
C41873 B	0-100	< 30	-	50	
74 A	100-200	< 30	-	50	
B	200-300	< 30	-	50	
75 A	300-400	< 30	-	50	
B	400-500	< 30	-	50	
76 A	500-600	50	0.13	50	0.1 lb U_3O_8 per ton over 700'
B	600-700	< 30	-	80	
77 A	700-800	40	0.1	70	
B	800-900	80	0.21	140	
78 A	900-1000	40	0.1	100	
B	1000-1100	< 30	-	140	
79 A	1100-1200	60	0.16	70	
B	1200-1300	< 30	-	240	

LINE V

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
C41880 A	0-100	< 30	-	< 50	
B	100-200	< 30	-	< 50	
81 A	200-300	< 30	-	< 50	
B	300-400	< 30	-	< 50	
82 A	400-500	40	0.1	50	0.1 lb U_3O_8
B	500-600	40	0.1	< 50	per ton over 200'
83 A	600-700	< 30	-	< 50	
B	700-800	< 30	-	60	
84 A	800-900	< 30	-	< 50	

LINE VI

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
36089	0-500	< 30	-	180	
90	500-700	60	0.16	160	0.14 lb U_3O_8 per ton over 1100'
91	700-800	< 30	-	450	
92	800-900	70	0.18	280	
93	900-1000	< 30	-	400	
94	1000-1100	120	0.31	160	
95	1100-1200	90	0.23	160	
96	1200-1300	< 30	-	280	
97	1300-1400	40	0.10	260	
98	1400-1500	< 30	-	220	
99	1500-1600	40	0.10	260	

LINE VII

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
C36103	0-100	100	0.26	200	
4	100-200	90	0.23	200	
5	200-300	140	0.36	200	
6	300-400	140	0.36	220	
7	400-500	30	0.09	300	0.24 lb U_3O_8 per ton over 1100'
8	500-600	70	0.18	160	
9	600-700	70	0.18	50	
10	700-800	120	0.31	260	
11	800-900	160	0.42	180	
12	900-1000	< 30	-	240	
13	1000-1100	100	0.26	240	

A P P E N D I X III

0043

Chip line Uranium and Thorium Results

Eastern Anomally S.M.L. 199

LINE I

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
C36051	0-100	< 30	-	< 50	
2	100-200	< 30	-	< 50	
3	200-300	< 30	-	< 50	
4	300-400	30	0.09	50	
5	400-500	40	0.10	< 50	
6	500-600	< 30	-	< 50	
7	600-700	< 30	-	70	
8	700-800	30	0.09	50	
9	800-900	80	0.21	< 50	
60	900-1000	< 30	-	< 50	
61	1000-1100	40	0.1	< 50	0.15 lb U_3O_8 per ton over 1200'
62	1200-1300	40	0.1	< 50	
63	1300-1400	80	0.21	< 50	
64	1400-1500	50	0.13	< 50	
65	1500-1600	80	0.21	< 50	
66	1600-1700	80	0.21	< 50	
67	1700-1800	100	0.26	< 50	
68	1800-1900	< 30	-	60	
69	1900-2000	50	0.13	< 50	
70	2000-2100	< 30	-	< 50	
71	2100-2200	< 30	-	< 50	
72	2200-2300	< 30	-	90	
73	2300-2400	< 30	-	50	
74	2400-2500	< 30	-	50	

LINE II

Sample No	Footage	p.p.m. U	lbs U_3O_8 per ton	p.p.m. Th	Average
C41885 A	0-100	< 30	-	100	
B	100-200	40	0.1	< 50	
86 A	200-300	70	0.18	< 50	0.12 lb U_3O_8 per ton over 800'
B	300-400	70	0.18	< 50	
87 A	400-500	< 30	-	90	
B	500-600	50	0.13	< 50	
88 A	600-700	60	0.16	< 50	
B	700-800	50	0.13	< 50	
89 A	800-900	60	0.16	< 50	
B	900-1000	< 30	-	< 50	
90 A	1000-1100	< 30	-	< 50	
B	1100-1200	< 30	-	< 50	
91 A	1200-1300	< 30	-	100	
B	1300-1400	< 30	-	< 50	
92 A	1400-1500	< 30	-	< 50	
B	1500-1600	< 30	-	< 50	
93 A	1600-1700	< 30	-	< 50	
B	1700-1800	< 30	-	< 50	
94 A	1800-1900	< 30	-	< 50	
B	1900-2000				
95 A	2000-2100	< 30	-	< 50	
B	2100-2200	< 30	-	< 50	
96 A	2200-2300	< 30	-	< 50	
B	2300-2400	< 30	-	< 50	
97 A	2400-2500	< 30	-	< 50	
B	2500-2600	< 30	-	< 50	
98 A	2600-2700	< 30	-	80	
B	2700-2800	< 30	-	60	
99 A	2800-2900	50	0.13	< 50	
B	2900-3000	40	0.1	< 50	

A P P E N D I X   IV

0046

Tables of Assay Results

British Empire Area

T A B L E 1

ASSAYS OF SAMPLES - BRITISH EMPIRE MINE AREA INITIAL RECONNAISSANCE

Sample No	Location	Rock Type	U_3O_8 lbs/ton	Cu p.p.m.	Pb p.p.m.	Zn p.p.m.	Mo p.p.m.	Ag oz/ton
C 43206	Ridge 1000' South of British Empire Mine.	Meta sediment, irregular fracture face.	24.0	-	-	-	-	-
C 43207	Haematite section of fault zone above British Empire adit. 2000 c.p.m.	Rock chip samples near fault plane.	0.78	20,500	320	35	18	0.6
C 43208	South edge British Empire Mine outcrop.	Rock chip samples meta quartzite with kasolite and copper staining on joints.	81.0	30,300	59,000	620	5	0.5
C 43209	Barytes section of fault zone above British Empire adit.	Rock chip samples. Baryte meta sediment, minor copper staining.	1.34	1,800	110	45	12	<1 p.p.m.
C 43210	British Empire adit Last 20', south wall.	Channel sample Copper stained pegmatite.	< 0.1	6,000	480	270	3	<1 p.p.m.

ASSAYS OF SAMPLES - BRITISH EMPIRE MINE AREA INITIAL RECONNAISSANCE (CONT)

Sample No	Location	Rock Type	U_3O_8 lbs/ton	Cu p.p.m.	Pb p.p.m.	Zn p.p.m.	Mo p.p.m.	Ag oz/ton
C 43211	South of British Empire.	50' rock chip across meta quartzites.	0.1	240	290	65	5	<1 p.p.m.
C 43212	South end British Empire outcrop.	Quartz-mica rock with kasolite on joints and cracks.	0.33	400	160	45	3	<1
C 36220	Highly radioactive fracture south east of adit.	Malachite, pyromorphite, torbernite relics.	29.9	270,000	46,000	300	12	-

TABLE 2

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES

Sample No	Chip Line	Footage ft.	Sample Interval ft.	U lbs/ton	U p.p.m.	Th p.p.m.	Cu p.p.m.	Notes
C 36294	A	0 - 25	1	-	< 30	< 50	270	Metaquartzite; minor Cu stains
C 36295	A	25 - 50	1	-	< 30	< 50	480	Metaquartzite
C 36296 6	A	50 - 75	1	-	< 30	60	430	Sheared zone, biotite, malachite
C 36297	A	75 - 100	1	-	< 30	60	230	Metaquartzite Cu staining
C 36298	A	100 - 125	2	0.21	80	< 50	1500	Cu stained meta quartzite
C 36299	A	125 - 150	2	-	< 30	< 50	1500	Cu stained meta quartzite
C 36300	A	150 - 175	2	-	30	60	1800	Cu stained meta quartzite
C 36201	A	175 - 200	2	0.09	30	< 50	240	Meta quartzite
C 36202	A	200 - 225	2	-	<	< 50	85	Meta quartzite

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES (CONT)

Sample No	Chip Line	Footage ft.	Pb p.p.m.	Zn p.p.m.	Co p.p.m.	Ni p.p.m.	Mo p.p.m.	Notes
C 36294	A	0 - 25	170	340	5	5	< 3	Metaquartzite; minor Cu stains.
C 36295	A	25 - 50	170	420	5	10	< 3	Metaquartzite.
C 36296	A	50 - 75	130	200	5	5	< 3	Sheared zone, biotite, malachite.
C 36297	A	75 - 100	330	270	5	5	3	Metaquartzite Cu staining.
C 36298	A	100 - 125	850	500	15	10	5	Cu stained metaquartzite.
C 36299	A	125 - 150	540	140	10	10	3	Cu stained metaquartzite.
C 36300	A	150 - 175	250	90	5	10	3	Cu stained metaquartzite.
C 36301	A	175 - 200	5	60	5	10	3	Metaquartzite.
C 36302	A	200 - 225	55	40	5	5	3	Metaquartzite.

TABLE 2 (CONT)

Sample No	Chip Line	Footage ft.	Sample Interval ft.	U lbs/ton	U p.p.m.	Th p.p.m.	Cu p.p.m.	Notes
C 36251	B	0 - 25	1	-	<30	80	200	Fractured metaquartzite weak Cu stains.
C 36252	B	25 - 50	2	-	<30	80	350	Metaquartzite, high count fracture 44' weak Cu stains.
C 36253	B	50 - 75	2	0.13	50	50	5600	Stronger fracturing, haematite veinlets Cu staining.
C 36254	B	75 - 100	2	-	<30	60	5500	Fractured quartzite, Cu in fault with biotite 2' wide.
C 36255	B	100 - 112	2	-	<30	50	490	Fractured quartzite weak Cu stains.
C 36256	C	112 - 120	Continuous 2 Channel	-	<30	100	19000	Biotite with malachite azurite in shear.
C 36257	C	120 - 145	2	-	<30	50	300	Metaquartzite, minor Cu.

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES (CONT)

Sample No	Chip Line	Footage ft.	Pb p.p.m.	Zn p.p.m.	Co p.p.m.	Ni p.p.m.	Mo p.p.m.	Notes
C 36251	B	0 - 25	80	80	5	5	< 3	Fractured metaquartzite, weak Cu stains.
C 36252	B	25 - 50	1200	230	10	10	8	Metaquartzite, high count fracture 44' weak Cu stains.
C 36253	B	50 - 75	200	40	5	10	25	Stronger fracturing, haematite veinlets. Cu staining.
C 36254	B	75 - 100	230	80	20	25	3	Fractured quartzite, Cu in fault with biotite 2' wide.
C 36255	B	100 - 112	100	35	5	5	3	Fractured quartzite. Weak Cu stains.
C 36256	C	112 - 120	980	180	25	70	4	Biotite with malachite, azurite in shear.
C 36257	C	120 - 145	80	35	20	5	5	Metaquartzite, minor Cu.

TABLE 2 (CONT)

Sample No	Chip Line	Footage ft.	Sample Interval ft.	U lbs/ton	U p.p.m.	Th p.p.m.	Cu p.p.m.	Notes
C 36258	C	145 - 170	2	-	< 30	< 50	770	Metaquartzite. Rare Cu staining.
C 36259	C	170 - 195	2	-	< 30	< 50	340	Metaquartzite with chlorite, haematite. Rare Cu staining.
C 36260	C	195 - 215	2	0.09	30	< 30	420	Metaquartzite with haematite.
C 36261	C	215 - 240	2	-	< 30	< 50	230	Metaquartzite, minor Cu staining.
C 36262	C	240 - 265	2	-	< 30	< 50	110	Metaquartzite.
C 36263	C	265 - 290	2	-	< 30	< 50	25	Metaquartzite, barytes veinlets.
C 36264	C	290 - 315	2	-	< 30	< 50	170	Metaquartzite with chlorite, haematite fault at 315'
C 36265	C	315 - 340	2	-	< 30	< 50	40	Quartzite with barytes veinlets.

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES (CONT)

Sample No	Chip Line	Footage ft.	Pb p.p.m.	Zn p.p.m.	Co p.p.m.	Ni p.p.m.	Mo p.p.m.	Notes
C 36258	C	145 - 170	160	35	5	5	3	Metaquartzite. Rare Cu staining.
C 36259	C	170 - 195	110	80	10	5	3	Metaquartzite with chlorite, haematite. Rare Cu staining.
C 36260	C	195 - 215	200	50	5	5	3	Metaquartzite with haematite.
C 36261	C	215 - 240	150	20	5	5	3	Metaquartzite, minor Cu staining.
C 36262	C	240 - 265	120	20	5	5	3	Metaquartzite.
C 36263	C	265 - 290	35	5	5	5	3	Metaquartzite, barytes veinlets.
C 36264	C	290 - 315	65	420	10	5	3	Metaquartzite with chlorite, haematite fault at 315'
C 36265	C	315 - 340	25	15	5	5	3	Quartzite with barytes veinlets.

TABLE 2 (CONT)

Sample No	Chip Line	Footage ft.	Sample Interval ft.	U lbs/ton	U p.p.m.	Th p.p.m.	Cu p.p.m.	Notes
C 36266	C	340 - 365	2	0.10	40	50	1200	Quartzite with baryte veins carrying haematite developments
C 36267	C	365 - 390	2	-	<30	<50	30	Quartzites thin barytes mass on edge breccia pipe.
C 36268	C	390 - 415	2	0.10	40	< 50	70	Haematite quartzite breccia, barytes at first.
C 36221	D	Continuous chip sample over outcrop 30'		1.3	500	120	7500	Pegmatite with mineralised shears, malachite.
C 36215	E	0 - 10'	1/2	-	< 30	140	3000	Fault zone, barytes, malachite.
C 36216	F	0 - 33'	2	0.16	60	140	6200	Fault zone, pegmatite, malachite.
C 36213	G	0 - 28	1	-	< 30	< 50	470	Directly above adit. Metaquartzite, minor Cu stains.

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES (CONT)

Sample No	Chip Line	Footage ft.	Pb p.p.m.	Zn p.p.m.	Co p.p.m.	Ni p.p.m.	Mo p.p.m.	Notes
C 36266	C	340 - 365	75	15	5	5	12	Quartzite with baryte veins carrying haematite developments.
C 36267	C	365 - 390	25	10	5	5	5	Quartzites then barytes mass on edge breccia pipe.
C 36268	C	390 - 415	740	15	5	5	40	Haematite quartzite breccia, barytes at first.
C 36221	D	Continuous chip	220	130	5	5	< 3	Pegmatite with mineralised shears, malachite.
C 36215	B	0 - 10'	190	90	10	5	8	Fault zone, barytes, malachite.
C 36216	F	0 - 33'	760	270	10	10	5	Fault zone, pegmatite, malachite.
C 36213	G	0 - 28	110	80	< 5	10	3	Directly above adit. Metaquartzite, minor Cu stains.

TABLE 2 (CONT)

Sample No	Chip Line	Footage ft.	Sample Interval ft.	U lbs/ton	U p.p.m.	Th p.p.m.	Cu p.p.m.	Notes
C 36214	G	28 - 43	1	-	<30	<50	1900	Above adit. Malachite in pegmatite.
C 36218	H	0 - 11	Contin-uous chip	1.3	500	<50	23000	Fault with haomatite, pegmatite with malachite.
C 36219	I	0 - 7'	Contin-ueus chip	0.21	80	100	2300	Fault with haomatite barytes, pegmatite with malachite.
C 36269	J	0 - 25	1	0.31	120	<50	810	Shear zone to 14' then metaquartzite.
C 36270	J	25 - 50	1	-	<30	<50	180	Metaquartzite.
C 36271	J	50 - 75	1	-	<30	<50	140	Metaquartzite.
C 36272	J	75 - 100	1	-	<30	<50	350	Metaquartzite.
C 36273	J	100 - 125	1	-	<30	<50	40	Metaquartzite.
C 36274	J	125 - 150	1	-	<30	60	110	Metaquartzite.

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES (CONT)

Sample No	Chip Line	Footage ft.	Pb p.p.m.	Zn p.p.m.	Co p.p.m.	Ni p.p.m.	Mo p.p.m.	Notes
C 36214	G	28 - 43	210	60	< 5	< 5	< 3	Above adit. Malachite in pegmatite.
C 36218	H	0 - 11	1800	140	10	5	3	Fault with haematite, pegmatite with malachite.
C 36219	I	0 - 7'	530	150	20	10	3	Fault with haematite, barytes, pegmatite with malachite.
C 36269	J	0 - 25	230	90	5	< 5	< 3	Shear zone to 14' then metaquartzite.
C 36270	J	25 - 50	410	40	5	5	< 3	Metaquartzite.
C 36271	J	50 - 75	220	55	5	< 5	3	Metaquartzite.
C 36272	J	75 - 100	220	95	5	5	< 3	Metaquartzite.
C 36273	J	100 - 125	160	30	< 5	< 5	< 3	Metaquartzite.
C 36274	J	125 - 150	380	70	< 5	5	3	Metaquartzite.

TABLE 2 (CONT)

Sample No	Chip Line	Footage ft.	Sample Interval ft.	U lbs/ton	U p.p.m.	Th p.p.m.	Cu p.p.m.	Notes
C 36275	J	150 - 175	1	-	< 30	< 50	35	Metaquartzite.
C 36276	J	175 - 200	1	-	< 30	< 50	35	Metaquartzite.
C 36285	K	0 - 25	1	0.26	100	< 50	8900	Adjacent to high grade U fracture then metaquartzites with minor kasolite, Cu.
C 36286	K	25 - 50	2	-	< 30	< 50	230	Metaquartzites, minor Cu stains.
C 36287	K	50 - 75	2	-	< 30	< 50	130	Metaquartzites with minor kasolite on joint
C 36288	K	75 - 100	2	0.09	30	70	230	Metaquartzites with minor kasolite on joint
C 36289	K	135 - 160	2	-	< 30	60	370	No outcrop 100 - 135' Metaquartzites.
C 36290	K	160 - 185	2	-	< 30	< 50	310	Metaquartzites.
C 36291	K	185 - 210	2	0.57	220	< 50	500	Metaquartzites with kasolite. Fracture barytes.

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES (CONT)

Sample No	Chip Line	Footage ft.	Pb p.p.m.	Zn p.p.m.	Co p.p.m.	Ni p.p.m.	Mo p.p.m.	Notes
C 36275	J	150 - 175	290	30	< 5	5	3	Metaquartzite.
C 36276	J	175 - 200	120	35	5	< 5	3	Metaquartzite.
C 36285	K	0 - 25	400	290	5	< 5	3	Adjacent to high grade U fracture then meta-quartzites with minor kasolite, Cu.
C 36286	K	25 - 50	80	120	< 5	< 5	4	Metaquartzites, minor Cu stains.
C 36287	K	50 - 75	75	70	< 5	5	< 3	Metaquartzites, with minor kasolite on joints.
C 36288	K	75 - 100	140	60	< 5	5	< 3	Metaquartzites with minor kasolite on joints.
C 36289	K	135 - 160	340	80	5	5	< 3	No outcrop 100 - 135' Metaquartzites.
C 36290	K	160 - 185	150	80	< 5	< 5	< 3	Metaquartzites.
C 36291	K	185- 210	640	95	10	5	5	Metaquartzites with kasolite fractures, baryte

TABLE 2 (CONT)

Sample No	Chip Line	Footage ft.	Sample Interval ft.	U lbs/ton	U p.p.m.	Th p.p.m.	Cu p.p.m.	Notes
C 36203	L	0 - 50	2	-	< 30	< 50	75	
C 36204	L	50 - 100	2	0.10	40	< 50	70	
C 36205	L	100 - 150	2	-	< 30	< 50	60	
C 36206	L	150 - 200	2	-	< 30	< 50	60	
C 36207	L	200 - 250	2	-	< 30	< 50	60	Fractured Metaquartzites.
C 36208	L	250 - 300	2	-	< 30	120	30	
C 36209	L	300 - 350	2	-	< 30	240	60	
C 36210	L	350 - 400	2	-	< 30	160	30	
C 36211	L	400 - 450	2	-	< 30	450	50	
C 36212	L	450 - 500	2	-	< 30	70	25	

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES (CONT)

Sample No	Chip Line	Footage ft.	Pb p.p.m.	Zn p.p.m.	Co p.p.m.	Ni p.p.m.	Mo p.p.m.	Notes
C 36203	L	0 - 50	55	60	5	5	4	
C 36204	L	50 - 100	400	55	< 5	5	5	
C 36205	L	100 - 150	15	50	< 5	5	5	
C 36206	L	150 - 200	35	30	5	5	5	
C 36207	L	200 - 250	25	30	< 5	5	< 3	Fractured Metaquartzites.
C 36208	L	250 - 300	130	15	5	5	3	
C 36209	L	300 - 350	120	40	5	5	12	
C 36210	L	350 - 400	120	30	< 5	< 5	15	
C 36211	L	400 - 450	160	20	5	5	5	
C 36212	L	450 - 500	95	20	5	5	5	

TABLE 2 (CONT)

Sample No	Chip Line	Footage ft.	Sample Interval ft.	U lbs/ton	U p.p.m.	Th p.p.m.	Cu p.p.m.	Notes
C 36277	ADIT	0 - 10		0.13	50	< 50	2000	Fault. Crushed metaquartzite with Cu stains.
C 36278	ADIT	10 - 20	Contin- uous Channel of South Wall	-	< 30	< 50	1700	
C 36279	ADIT	20 - 30		-	<30	250	940	
C 36280	ADIT	30 - 40		-	< 30	250	2500	Fractured Metaquartzite.
C 36281	ADIT	40 - 50		-	< 30	160	2100	
C 36282	ADIT	50 - 60		-	< 30	70	6900	
C 36283	ADIT	60 - 70		0.10	40	< 50	7100	Quartz-felspar pegmatite with malachite.
C 36284	ADIT	70 - 74		0.09	30	< 50	7700	

BRITISH EMPIRE MINE AREA - CHIP LINE ASSAY VALUES (CONT)

Sample No	Chip Line	Footage ft.	Pb p.p.m.	Zn p.p.m.	Co p.p.m.	Ni p.p.m.	Mo p.p.m.	Notes
C 36277	ADIT	0 - 10	620	360	5	5	<3	Fault. Crushed metaquartzite with Cu stains.
C 36278	ADIT	10 - 20	270	240	5	10	3	Fractured Metaquartzite.
C 36279	ADIT	20 - 30	280	80	5	5	5	
C 36280	ADIT	30 - 40	260	190	5	5	3	
C 36281	ADIT	40 - 50	220	80	5	5	4	
C 36282	ADIT	50 - 60	260	95	10	5	3	
C 36283	ADIT	60 - 70	490	270	5	5	< 3	Quartz-felspar pegmatite with malachite.
C 36284	ADIT	70 - 74	430	310	5	< 5	< 3	

APPENDIX V

Petrological Descriptions

British Empire Area

Sample Number	:	36224
Location	:	X6
Identification	:	Metaquartzite
Hand Specimen Description	:	Coarsely granular ? feldspathic metaquartzite with malachite films on fracture surfaces.
Microscopic Description	:	Fairly coarsely granular; strained quartz forms the bulk of the rock with irregular interstitial patches of cryptocrystalline silica and fine sericite (white to pink in hand specimen). Sub parallel patches and laths of chlorite with opaque inclusions (altered biotite), and muscovite laths (which may be secondary), are scattered through the rock. Detrital heavy minerals occur sparingly (e.g. Ziron, sphene). Some quartz contains small euhedral feldspar crystals, indicating a felsic igneous origin. Opaques consist of magnetite (martitised) and haematite.
A.M.D.L. Assay values in p.p.m.	:	U 30, Cu 3400, Pb 480, Zn 50, Co 5, Ni 5, Mo 3.

Sample Number	:	36225
Location	:	Adjacent to fracture face east of centre sample line L.
Identification	:	Ferruginous, micaceous metaquartzite.
Hand Specimen Description	:	Dark, ferruginous metaquartzite with muscovite flakes.
Microscopic Description	:	The rock consists mainly of large strained mosaics of quartz, with patches of fine sericite aggregates pseudomorphous after ? feldspar, and laths and aggregates of chlorite (with opaque inclusions) representing altered biotite.

Irregular, porphyroblastic growths of secondary muscovite occur these represent a late greisening stage.

Detrital heavy minerals (especially zircon and rutile) are not uncommon.

Some quartz contains feldspar inclusions indicating a felsic igneous provenance.

A.M.D.L. Assay values in p.p.m. : U 350, Cu 390, Pb 460, Zn 290, Co 35, Ni 10, Mo < 3.

Sample Number : 36222

Location : X5

Identification : Greisenised Metaquartzite

Hand Specimen Description : Pale metaquartzite with muscovite.

Microscopic Description : A muscovitised metaquartzite consisting of mosaics of strained quartz, occasional detrital heavy minerals and rare fragments of feldspar. Secondary muscovite has developed as semi-continuous, sinuous patches containing numerous fine needles of an unidentified transparent, colourless mineral (most probably sillimanite), which have also grown in the quartz grains adjacent to the muscovite.

This type of metasomatism involving the growth of muscovite is typical of greisening.

A.M.D.L. Assay value : U < 30, Cu 280, Pb 140, Zn 20, Co 5, Ni 10, Mo < 3.

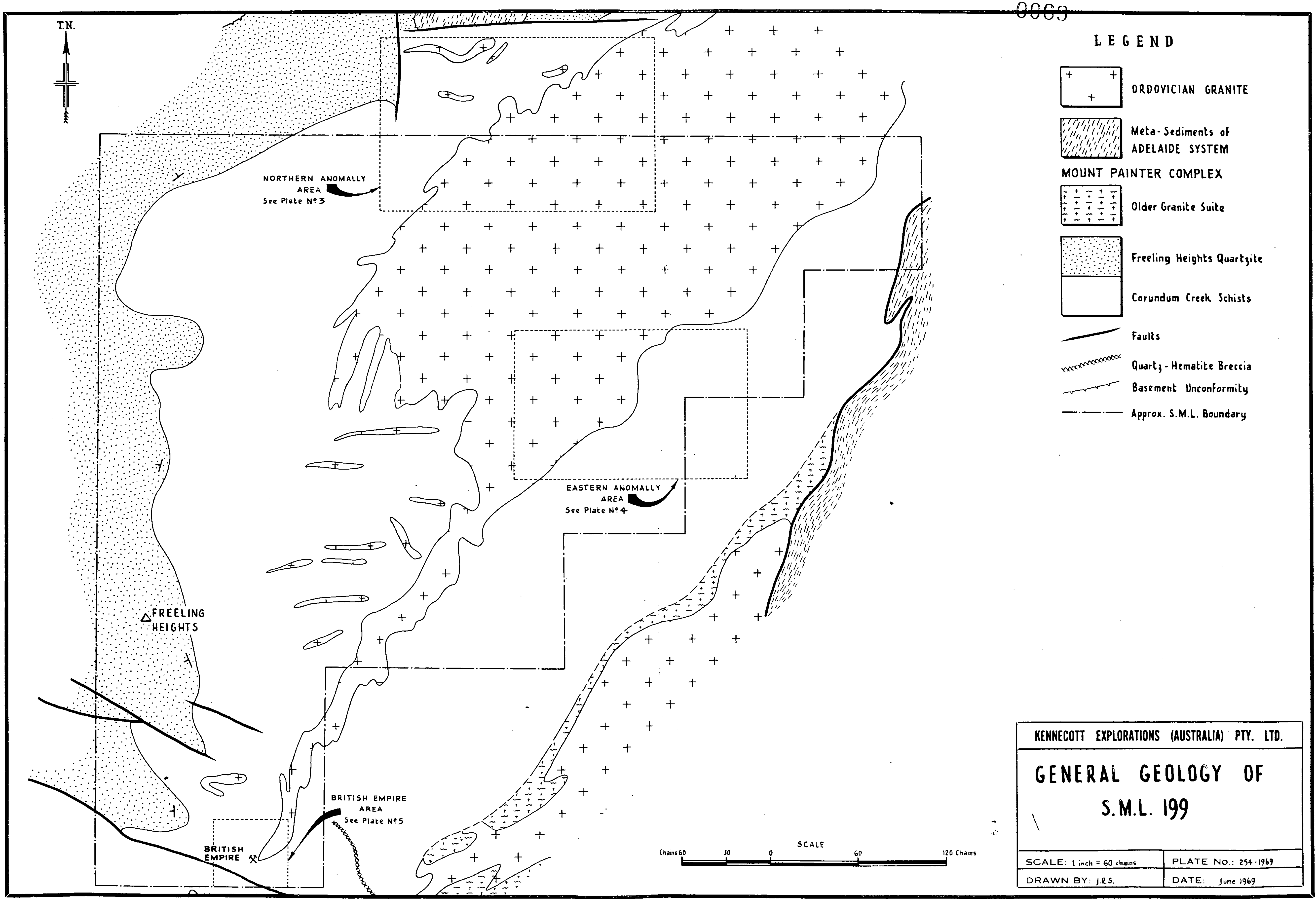
Sample Number : 36223

Location : X16

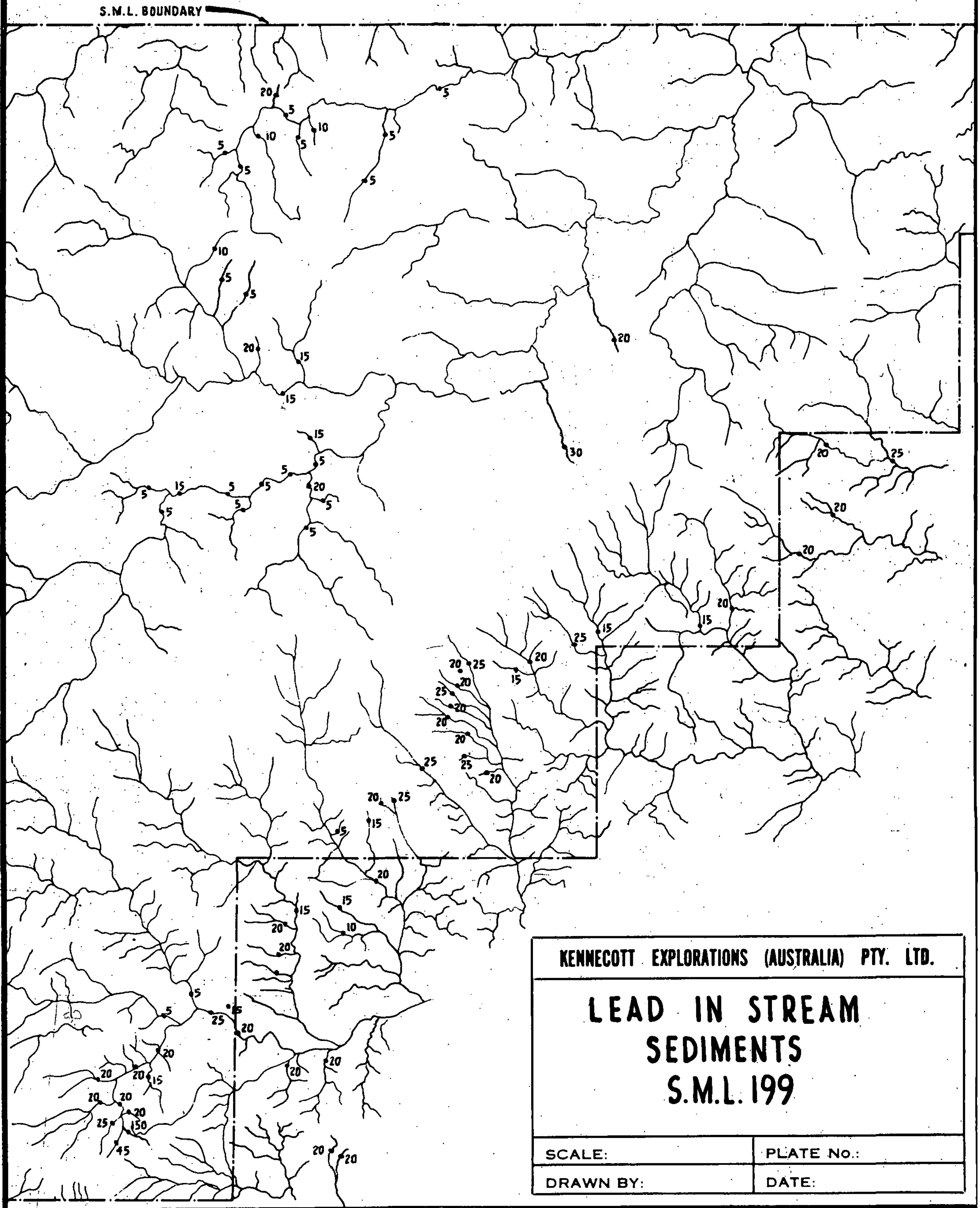
Identification : Metaquartzite

Hand Specimen Description : Micaceous, pale metaquartzite.

Microscopic Description	:	A meta quartzite consisting of sutured, strained quartz grains with small bundles of fine ? sillimanite needles, flakes of chlorite (altered biotite) and small patches of secondary muscovite which developed interstitially. Oxide opaques occur sporadically and there are occasional grains of detrital heavy minerals. The presence of ?sillimanite in this sample and in 36222 suggests a high metamorphic grade.
A.M.D.L. Assay values in p.p.m.	:	U 40, Cu 300, Pb 470, Zn 300, Co 5, Ni 5, Mo 3.
Sample Number	:	36217
Location	:	Pegmatite below quartz-haematite breccia
Identification	:	Greisenised pegmatite
Hand Specimen Description	:	Decomposed graphic quartz and feldspar with occasional thin films of pearly malachite.
Microscopic Description	:	This is a coarse, graphic intergrowth of quartz and microcline perthite. The components are stressed and there has been introduction of secondary muscovite. This can be regarded as a greisening phase. The films of green mineral are composed of finely fibrous malachite.


T.N.
LEGEND
ORDOVICIAN GRANITE
Meta-Sediments of ADELAIDE SYSTEM
MOUNT PAINTER COMPLEX
Older Granite Suite
Freeling Heights Quartzite
Corundum Creek Schists
Faults
Quartz - Hematite Breccia
Basement Unconformity
Approx. S.M.L. Boundary
NORTHERN ANOMALLY AREA See Plate Nº 3
EASTERN ANOMALLY AREA See Plate Nº 4
BRITISH EMPIRE AREA See Plate Nº 5
BRITISH EMPIRE
FREELING HEIGHTS
SCALE
Chains 60 30 0 60 120 Chains
KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.
GENERAL GEOLOGY OF S.M.L. 199
SCALE: 1 inch = 60 chains
PLATE No.: 254-1969
DRAWN BY: J.R.S.
DATE: June 1969

TO OVERLAY PLATE Nº2

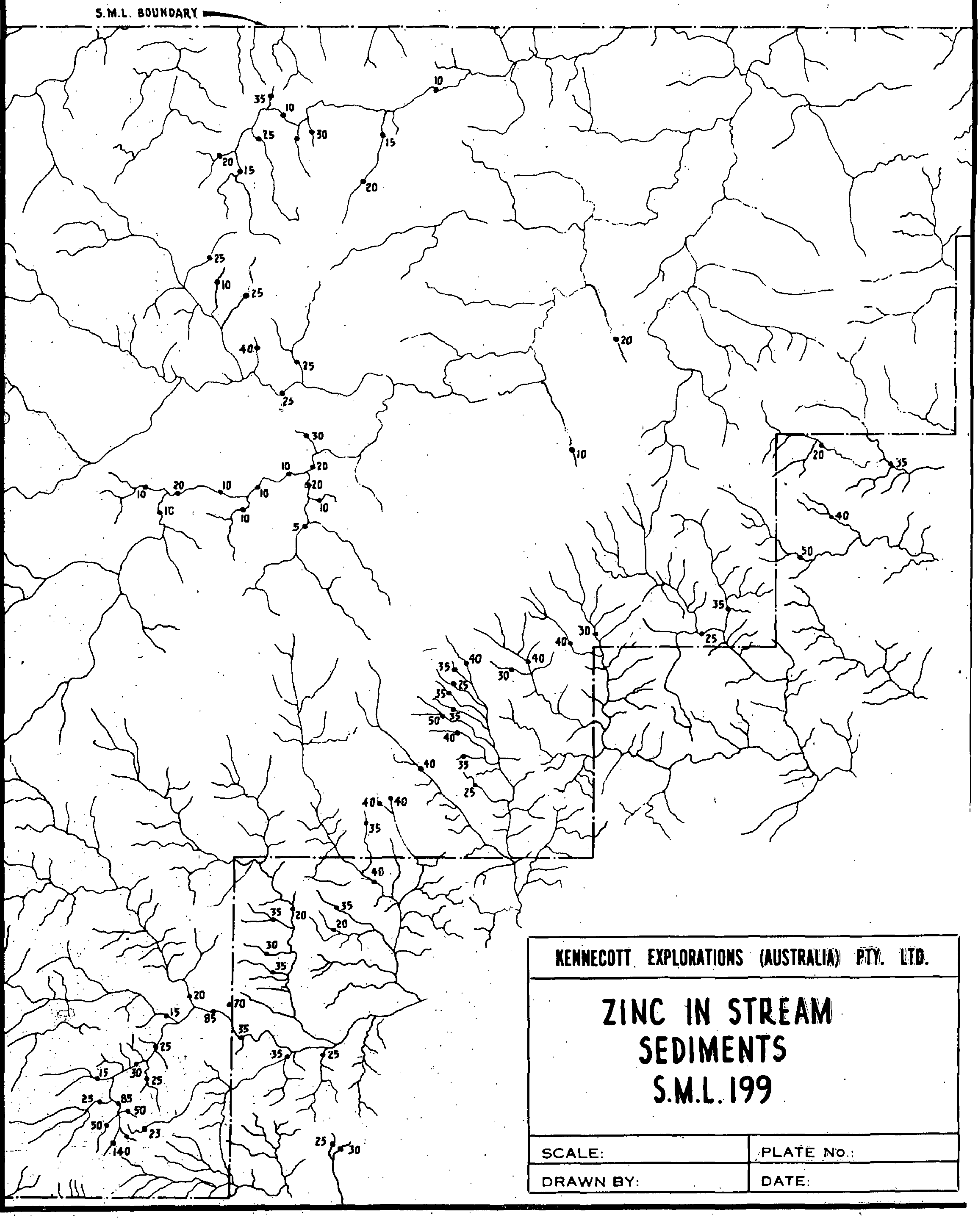


KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.

LEAD IN STREAM SEDIMENTS S.M.L. 199

SCALE:	PLATE No.:
DRAWN BY:	DATE:

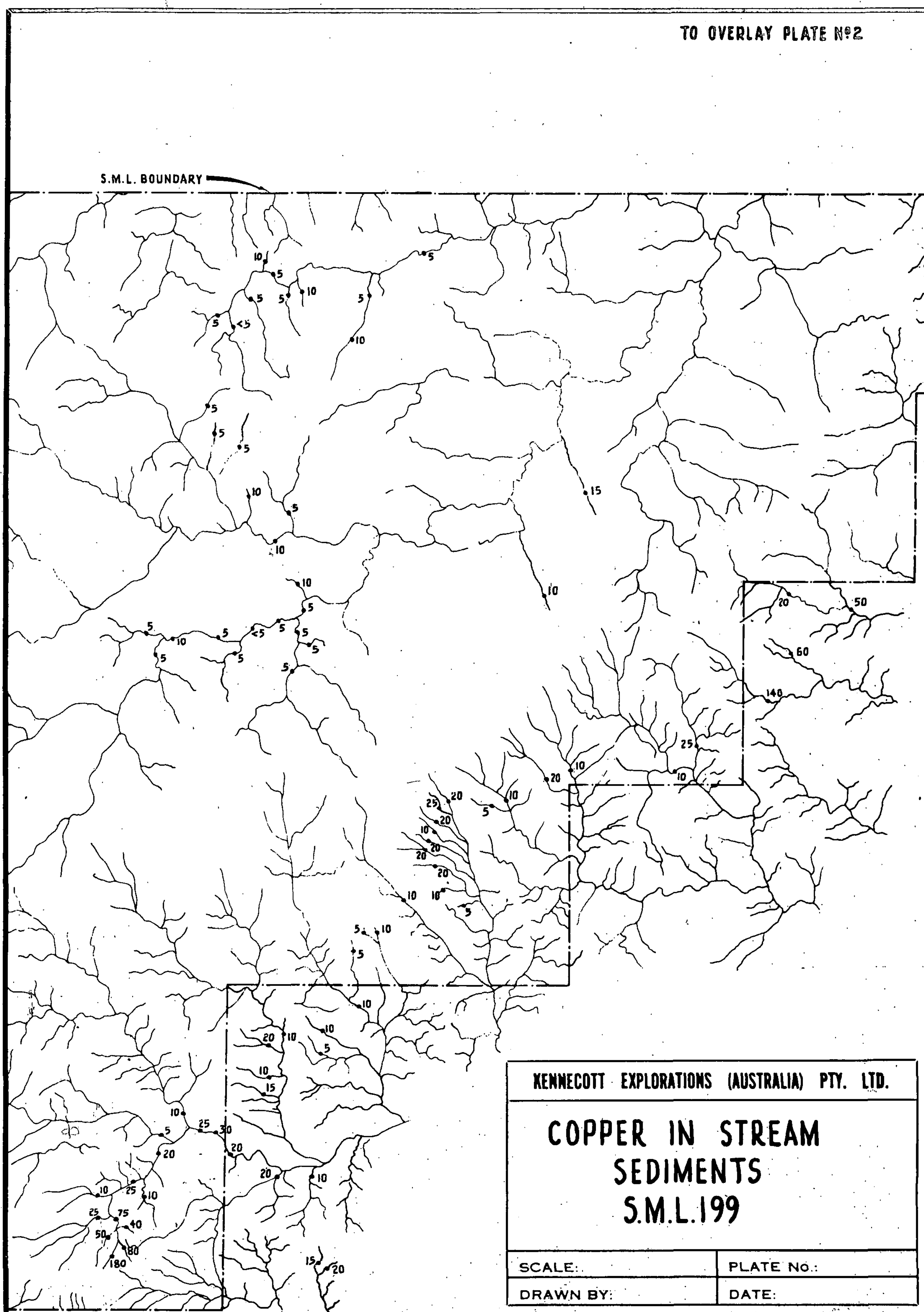
TO OVERLAY PLATE No. 2



KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.

ZINC IN STREAM SEDIMENTS S.M.L. 199

SCALE:	PLATE No.:
DRAWN BY:	DATE:

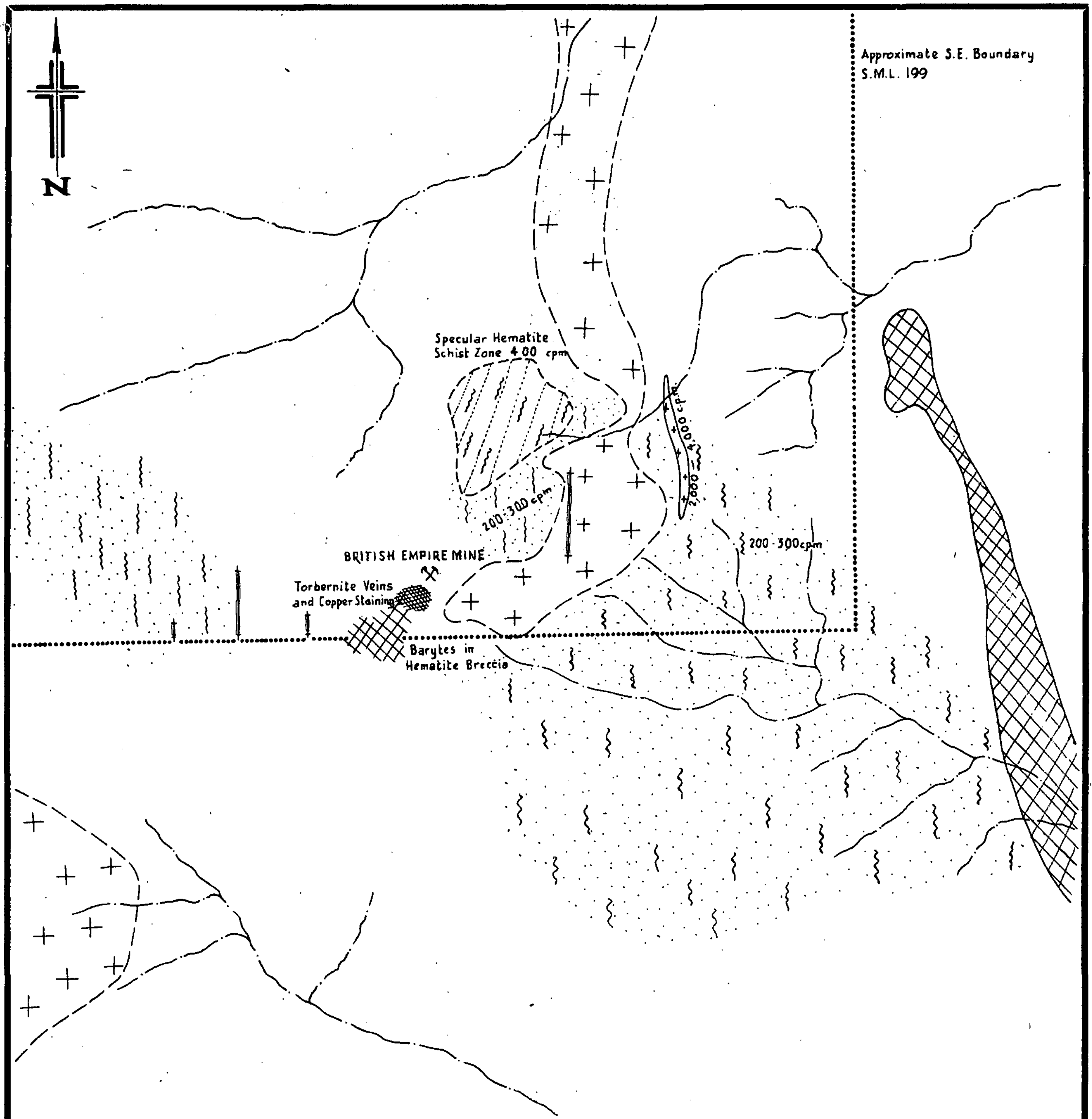


KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.

COPPER IN STREAM SEDIMENTS S.M.L.199

SCALE:	PLATE No.:
DRAWN BY:	DATE:


N
BOULDER SCREE
BOULDER SCREE
BOULDER SCREE
SCREE
SCREE
SCREE
SCREE
SCREE
SCREE
SCREE
some subcrop
Lease Boundary
Quartzite
MetaQuartzite Sample
0·09 lbs U3O8/ton
100 ppm Th
Biotite with Malachite
in shear zone
Pegmatite Sample
140 ppm Th
ADIT
BRITISH EMPIRE MINE
MetaQuartzite Sample
0·10lb U3O8/ton
<50 ppm Th
Sample from fracture
29·9 lbs U3O8/ton
850 ppm Th
(Torbernite)
Metaseds
CAMPSITE
Quartz-Felspar Pegmatite
extensively intruding Siliceous
Metasediments
Foot track
Pegs. intruding Metasediments
Heli-Pad
1800
1850
1900
1950
2000
LEGEND
Quartz-Felspar Pegmatite with Malachite staining and Torbernite. Highly Radioactive
Low to moderate Radioactivity in defined zones
Quartzite Breccia
Haemetite-Quartzite Breccia with Barytes veins and pods slightly radioactive
Barytes veins and plugs
Approx. Edge of main outcrop
Observed Fault
Approx. boundaries of zones of higher R/A as defined by McPhar TV1 scintillometer T2 scale readings
Approx. contours of area; largely interpolated; 50' interval
Chip sample locations. Assay values in U3O8 equivalent in lbs/ton
Strike and dip of cleavage
Cu Visible copper staining as Malachite, Azurite
U Visible Uranium minerals as Kasolite or Torbernite
H Specular Haematite occurring as small massive pods on fault footwalls.
B Barytes occuring as thin irregular veins, and scattered cavity in fillings in faulted zones
Pb Visible Pyromorphite
Sr Celestite
Sample Lines
Ringed letter indicates end of line
Figures represent lbs U3O8 /ton
No figures indicate < 0·09 lbs U3O8/ton
SCALE
feet 50 40 30 20 10 0 50 100 150 feet
1006-1
KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.
BRITISH EMPIRE MINE AREA
GEOLOGY AND CHIP LINE ASSAY VALUES
Field Mapping by S.B. Warne.
SCALE: 50 FEET = 1 INCH
PLATE NO. 257-1969
DATE BY: J.R.S.
DATE: JUNE 1969



LEGEND

- YOUNGER GRANITES AND PEGMATITES
- QUARTZ HEMATITE BRECCIAS
- BRECCIA AND ALTERATION ZONES WITH URANIUM MINERALISATION
- SCHISTS AND QUARTZITES OF THE MOUNT PAINTER COMPLEX
- RADIOMETRIC ANOMALLIES FROM AIRBORNE SURVEY ON N-S GRID

KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.

GEOLOGY AND GROUND RADIOMETRIC SURVEY, SOUTHERN PORTION S.M.L. 199 S.A.

SCALE: 1" = 1,000ft approx.	PLATE No.: 244-1969
DRAWN BY: J.R.S.	DATE: FEBRUARY 1969

Mines Dept ENV 1006

Sample	Cu	Pb	Zn
2031 0017	29	25	40
18	14	23	37
19	10	20	[illegible]
20	14	23	[illegible]
21	13	20	[illegible]
22	14	20	25
23	13	20	31
24	13	20	35
25	16	20	30
26	12	20	26
27	12	16	20
28	12	16	30
29	20	23	36
30	56	16	31
31	10	20	31
32	10	22	31
33	15	20	47
34	10	20	39
35	10	16	52
36	11	20	34
37	9	20	29
38	12	20	38
39	10	20	32
40	6	16	20
41	7	12	24
42	9	20	30
43	14	16	34
44	12	12	31

Sample	Cu	Pb	Zn
2201 0045	9	23	30
46	8	15	35
47	11	20	36
101	10	10	34
102	20	20	35
103	15	20	35
104	10	20	40
105	12	20	39
106	12	16	29
107	12	16	30
108	18	16	44
109	17	16	35
110	16	13	30
111	11	20	34
112	9	16	23
113	12	20	21
114	10	20	30
115	16	16	30
116	9	13	20
117	9	13	34
118	6	20	18
119	18	16	20
120	20	15	33
121	8	16	65
123	5	12	46
124	18	23	40
125	18	23	40
126	8	12	50

Sample	Cu	Pb	Zn
9261 0127	13	20	46
128	6	20	87
129	13	16	48
130	8	10	234
131	6	20	68
132	3	12	61
133	5	8	60
134	6	26	58
135			
136			
137	6	10	40
138	13	23	46
139	6	10	70
140	8	20	52
141	8	20	39
142	10	30	131
143	8	30	70
144	10	28	70
145	10	30	103
146	10	20	60
147	6	20	40
148	10	13	50
149	10	30	46
150	8	20	32
151	20	23	38
152	23	20	74
153	31	27	63
154	31	36	36

Sample	Cu	Pb	Zn
2251 0155	64	52	109
156	28	27	56
158	35	23	61
159	30	27	80
160	39	27	61
161	30	23	60
162	35	[illegible]	58
1202			
1203			
1204			
1205			
1206			
1207			
1208			
1209			
1210			
1211			
1212			
1213			
1214			
1215			
1216			
1229			
1451	8	13	94
1452	10	4	56
1453	24	8	33
1454	10	12	26
1455	6	13	32

Sample	Cu	Pb	Zn
2251 1456	12	8	37
1457			
1458			
1459			
1460			
1461			
1462			
1463			
1464			
1465			
1466			
1467			
1470	12	18	42
1471	8	13	32
1472	6	10	30
1473	6	7	25
1474	10	18	30
1475	6	20	33
1476	10	13	42
1478	8	7	33
1479	13	13	40
1480	12	25	44
1481	6	10	36
1482	6	13	37
1483	6	18	30
1484	6	10	29
1485	10	13	38
1486	10	13	42

Sample	Cu	Pb	Zn
3961 1487	10	13	37
1488	24	16	43
1490	15	23	63
1491	12	13	59
1492	13	25	45
1493	6	16	27
1494	12	20	41
1495	8	16	34
1496	8	13	34
1498	10	16	34
1499	6	15	39
1500	10	16	39
1600	23	15	63
1601			
1602			
1604			
1603			
1800			
1801	8	13	33
1803	5	10	30
1804	6	7	25
1805	8	10	30
1810	15	10	54
1811	15	14	30
1812	12	16	27
1813	8	10	22
1814	13	13	23
1815	17	12	38

Sample	Cu	Pb	Zn
3251 1816	17	10	35
1817	26	12	29
1818	13	16	33
1819	16	25	57
1820	10	57	35
1821	13	16	34
1823	14	14	30
1824	8	13	16
1825	13	14	29
1826	9	16	18
1827	0	13	33
1828	8	16	30
1829	14	10	34
3801	13	2	31
3802	20	13	61
3803	11	9	40
3804	13	17	45
3805	8	5	27
3806	17	13	40
3807	Sample missing		
3808	20	9	56
3809	15	9	49
3810	13	15	52
3811	18	9	43
3812	23	15	61
3813	9	17	48
3814	13	13	56
3815	7	13	31

Sample	Cu	Pb	Zn
3251 3816	14	13	44
3817	36	20	59
3818	37	20	76
3819	37	53	50
3820	24	23	45
3821	24	33	54
3822	28	33	66
3823	30	30	64
3824	17	16	36
3825	13	20	46
3826	13	7	37
3827	15	10	41
3828	13	13	60
3829	20	10	44
3830	16	10	59
3831	17	13	60
3832	13	13	41
3833	23	18	37
3835	16	11	42
3836	30	13	46
4013	18	33	42
4014	10	27	54
4015	15	37	58
4016	11	23	27
4017	14	23	30
4018	14	27	30
4019	15	25	35
4020	15	20	20

Sample	Cu	Pb	Zn
2251 4021	15	27	17
4022	15	16	40
4024	11	27	43
4025	9	20	30
4026	14	27	46
4027	9	20	32
4028	10	35	50
4029	15	23	54
4030	20	27	60
4032	17	43	54
4033	15	16	43
4034	19	25	40
4035	15	27	50
4036	13	40	63
4037	17	30	56
4038	13	27	60
4039	12	28	50
4040	13	23	42
4041	10	36	53
4042	12	27	43
4043	15	47	54
4044	46	140	41
4045	33	37	40
4046	14	30	32
4047	25	37	56
4048	34	37	30
4049	36	40	60
4050	24	37	45

Sample	Cu	Pb	Zn
2201 4051	15	33	47
4052	20	30	40
4053	14	37	35
4054	15	42	30
4055	13	35	32
4056	27	42	32
4057	30	43	31
4058	30	34	36
4059	9	26	27
4060	13	27	50
4061	14	35	30
4062	13	37	32
4063	14	30	36
4064	17	22	30
4065	240	37	67
4066	27	20	35
4067	30	32	33
4068	20	27	35
4069	10	30	32
4070	13	50	56
4071	16	35	54
4072	15	37	44
4073	14	43	40
4074	13	53	40
4075	240	30	40
4076	13	57	41
4077	26	33	41
4078	32	27	41

Sample	Cu	Pb	Zn
3251 4079	41	30	59
4080	28	33	43
4081	29	37	41
4082	36	55	83
4083	33	23	30
4084	29	27	34
4085	29	35	46
4086	39	33	49
4087	34	37	61
4088	23	53	42
4089	30	43	57
4090	17	33	41
4091	46	37	82
4092	50	40	57
4093	37	32	58
4094	26	55	53
4095	15	27	14
4096	16	29	31
4097	38	37	41
4098			
4099			
4100			
5 4101			
4102			
4103			
4104			
4105			
4081	30	33	61

Sample	Zn	Pb	Cu
4982	43	33	67
4983	30	23	56
4984	18	30	34
4985	24	30	41
4986	33	33	46
4987	35	33	60
4988	30	33	58
4989	43	27	76
4990	63	53	57
4991	30	33	63
4992	29	30	30
4993	37	27	39
4994	47	30	42
4995	30	23	83
4996	72	23	42
4997	27	17	58
4998	26	13	64
4999	19	20	64
5000	36	16	30

0106

N 101

102

103

104

105

106

107

108

109

110

111

112

113

Missing Numbers.

139

136

1202 - 1213

1329

4098 - 4103

1457 - 1469

1501, 3, 4

U 101 - U 113

ENV 1006 0108

GRD. GEOPHYSICAL SURVEY

Magnetometer Sensitivity -

Scintillation Sensitivity TOT. 3K CPS; U/TH/K 300 CPS

Altimeter Recording Scale 100 - 2500'

Pilot W. HAY | Airplane VH - DSU | Job No. 1918

Co-Pilot | Airport LEIGH CK. | Flight 4

Operator D. LYUS | Take Off 14.00 | Date 24.11.1968

Doppler Control Coordinate | Land 17.15 | Altitude 300 MTC

Flight Time 3.15 | Fiducial Interval 2 SEC.

Line No.	Fiducials Start	Fiducials End	Local Time Start	Local Time End	Doppler From	Doppler To	Record Quality	Remarks	Mi. Kms.
T. 1 S	2983	3119							
T. 2 N	3120	3243				AREA "B"			
T. 3 S	3244	3357							
T. 4 N	3358	3461							
T. 5 S	3462	3576							
T. 6 N	3577	3685							
T. 7 S	3686	3794							
T. 8 N	3795	3908							
T. 9 S	3909	4028							
T. 10 N	4029	4146							
T. 11 S	4147	4262							
T. 12 N	4263	4375							
T. 13 S	4376	4500							
T. 14 N	4532	4645							
T. 15 S	4646	4763							
T. 16 S	4870	4994							
T. 17 N	4995	5104							
T. 18 N	5206	5320							

Closure error ___ R-L ___ Field Office

	Field	Office		Field	Office
miles flown this flight			miles flown to date		
miles void this flight			miles void to date		
miles accepted this flight			miles accepted to date		
mag. record check			diurnal record check		
step length			flight path check		

GRD. GEOPHYSICAL SURVEY

Magnetometer Sensitivity -

Scintillation Sensitivity TOT 3K CPS; U TH K } 300 CPS

Altimeter Recording Scale 100 - 2500'

Pilot W. HAY

Airplane VH - DSU

Job No. 1918

Co-Pilot

Airport LEIGH CK.

Flight 5

Operator D. LYUS

Take Off 07.55

Date 25. 11. 1968.

Doppler Control Coordinate

Land 12.10

Altitude 300' MTC

Flight Time 4.15

Fiducial Interval 2 SEC.

Line No.	Fiducials Start	Fiducials End	Local Time Start	Local Time End	Doppler From	Doppler To	Record Quality	Remarks	Mi. Kms.
PROF. "E" W	173	202							
T. 19 N	203	319				AREA "B"			
T. 20 S	320	444							
T. 21 N	445	552							
T. 22 S	553	662							
PROF. "C" SW	695	754							
PROF. "D" NE	755	811							
T. 23 N	812	917							
T. 24 S	939	1040							
T. 25 S	1136	1248							
T. 26 N	1249	1351							
T. 27 S	1352	1462							
T. 28 N	1463	1570							
T. 29 S	1571	1684							
T. 30 N	1685	1793							
T. 31 S	1794	1910							
T. 32 N	1911	2020							
T. 33 S	2021	2134							
T. 34 N	2135	2247							
T. 35 S	2248	2367							

Closure error ___ R-L ___

	Field	Office		Field	Office
miles flown this flight - -			miles flown to date - - - - - - -		
miles void this flight - -			miles void to date - - - - - - -		
miles accepted this flight			miles accepted to date - - - - - -		
mag. record check - - - - -			diurnal record check - - - - - -		
step length - - - - -			flight path check - - - - - -		

GRD. GEOPHYSICAL SURVEY

0110

Magnetometer Sensitivity ______ Scintillation Sensitivity ______ Altimeter Recording Scale ______

Pilot ______ Airplane ______ Job No. 1918

Co-Pilot ______ Airport ______ Flight 5 cont.

Operator ______ Take Off ______ Date ______

Doppler Control Coordinate ______ Land ______ Altitude ______

Flight Time ______ Fiducial Interval ______

Line No.	Fiducials Start	Fiducials End	Local Time Start	Local Time End	Doppler From	Doppler To	Record Quality	Remarks	Mi. Kms.
T. 36 N	2368	2483							
T. 37 S	2484	2606							
T. 38 N	2607	2718							
T. 39 S	2719	2821							
T. 40 N	2822	2918							
T. 41 S	2919	3025							
T. 42 N	3026	3120							
T. 43 S	3121	3217							
T. 44 N	3218	3305							
T. 45 S	3331	3429							
T. 46 N	3430	3520							
T. 48 N	3619	3716							
T. 47 S	3717	3817							

Closure error ____ R-L ____ Field Office

	Field	Office		Field	Office
miles flown this flight			miles flown to date		
miles void this flight			miles void to date		
miles accepted this flight			miles accepted to date		
mag. record check			diurnal record check		
step length			flight path check		

SHEET .. / ..

0111

GRD. GEOPHYSICAL SURVEY

...er ...ty –

Scintillation Sensitivity TOT. 3K CPS; U, TH, K } 300 CPS

Altimeter Recording Scale 100 – 2500'

... W. HAY

Airplane VH – DSU

Job No. 1918

Pilot

Airport LEIGH CK.

Flight 6

Operator D. LYUS

Take Off 14.00

Date 25. 11. 1968

Doppler Control Coordinate

Land 18.25

Altitude 300' MTC

Flight Time 4.25

Fiducial Interval 2 SEC

Line No.	Fiducials Start	Fiducials End	Local Time Start	Local Time End	Doppler From	Doppler To	Record Quality	Remarks	Mi. Kms.
T. 49 N	071	162							
T. 50 S	163	253				AREA "B"			
T. 51 N	254	347							
T. 52 S	348	444							
T. 53 N	445	535							
T. 54 S	536	621							
T. 55 N	622	716							
T. 56 S	717	800							
T. 57 N	801	882							
T. 58 S	883	971							
T. 59 N	972	1066							
T. 60 S	1067	1139							
T. 61 N	1140	1210							
T. 62 S	1211	1280							
T. 63 S	1347	1421							
T. 64 N	1422	1489							
T. 65 S	1490	1555							
T. 66 N	1556	1623							
T. 67 S	1624	1690							
T. 68 N	1691	1758							

Closure error ____ R–L ____ Field Office

	Field	Office		Field	Office
miles flown this flight			miles flown to date		
miles void this flight			miles void to date		
miles accepted this flight			miles accepted to date		
mag. record check			diurnal record check		
step length			flight path check		

GRD. GEOPHYSICAL SURVEY

0112

Magnetometer Sensitivity ______ Scintillation Sensitivity ______ Altimeter Recording Scale ______

Pilot ______ Airplane ______ Job No. 1918

Co-Pilot ______ Airport ______ Flight 6 cont.

Operator ______ Take Off ______ Date ______

Doppler Control Coordinate ______ Land ______ Altitude ______

Flight Time ______ Fiducial Interval ______

Line No.	Fiducials Start	Fiducials End	Local Time Start	Local Time End	Doppler From	Doppler To	Record Quality	Remarks	Mi. Kms.
T.69S	1759	1826							
T.70N	1827	1892							
T.71S	1893	1961							
T.72N	1962	2025							
T.73S	2053	2111							
T.74N	2112	2174							
T.75S	2175	2231							
T.76N	2232	2286							
T.77S	2287	2342							
T.78N	2343	2391							
T.79S	2392	2447							
T.80N	2448	2483							
T.81S	2484	2521							
T.82S	2543	2582							
T.83N	2583	2624							
T.84S	2625	2666							
T.85N	2667	2713							
T.86S	2714	2761							
T.87N	2762	2795							
T.88S	2796	2831							

Closure error ____ R-L ____ Field Office

	Field	Office		Field	Office
miles flown this flight - -			miles flown to date - - - - - - - -		
miles void this flight - -			miles void to date - - - - - - - -		
miles accepted this flight			miles accepted to date - - - - - -		
mag. record check - - - - -			diurnal record check - - - - - - -		
step length - - - - -			flight path check - - - - - - -		

GRD. GEOPHYSICAL SURVEY

0113

[...]etometer
[...]sitivity ______ Scintillation Sensitivity ______ Altimeter Recording Scale ______

Pilot ______ Airplane ______ Job No. 1918

Co-Pilot ______ Airport ______ Flight 6 cont

Operator ______ Take Off ______ Date ______

Doppler Control Coordinate ______ Land ______ Altitude ______

Flight Time ______ Fiducial Interval ______

Line No.	Fiducials Start	End	Local Time Start	End	Doppler From	To	Record Quality	Remarks	Mi. Kms.
T.89N	2832	2869							

Closure error ____ R-L ____ Field Office

	Field	Office		Field	Office
miles flown this flight - -			miles flown to date - - - - - - -		
miles void this flight - -			miles void to date - - - - - - -		
miles accepted this flight			miles accepted to date- - - - - -		
mag. record check - - - - -			diurnal record check - - - - - -		
step length - - - - -			flight path check - - - - - -		

Donkeys were used in an effort to transport portable drilling equipment to the site of a radiometric anomaly on Freeling Heights, a very rugged, inaccessible plateau area in the northern most section of the Flinders Ranges in South Australia.

The donkeys were obtained from Nepabunna Mission where their owner, Morris Johnson, keeps them to pull a cart he uses when trapping rabbits.

The closest approach to the drill site from the plains was by way of a boulder strewn dry stream bed for six miles then approximately one mile up a steep spur to the drill-site.

The donkeys found no moving difficulty along the stream bed after the first journey as they followed precisely the initial trail.

Lack of water in the stream bed however became critical as small soaks were quickly depleted by the animals, and were drying up rapidly in the summer heat anyway.

By the time all the equipment had been transported to a point in the stream bed below the ascent spur, the donkeys had to pack in their own water supply.

On the first ascent an impatient tug by a field assistant over balanced one donkey causing it to roll downhill two hundred feet into a gully.

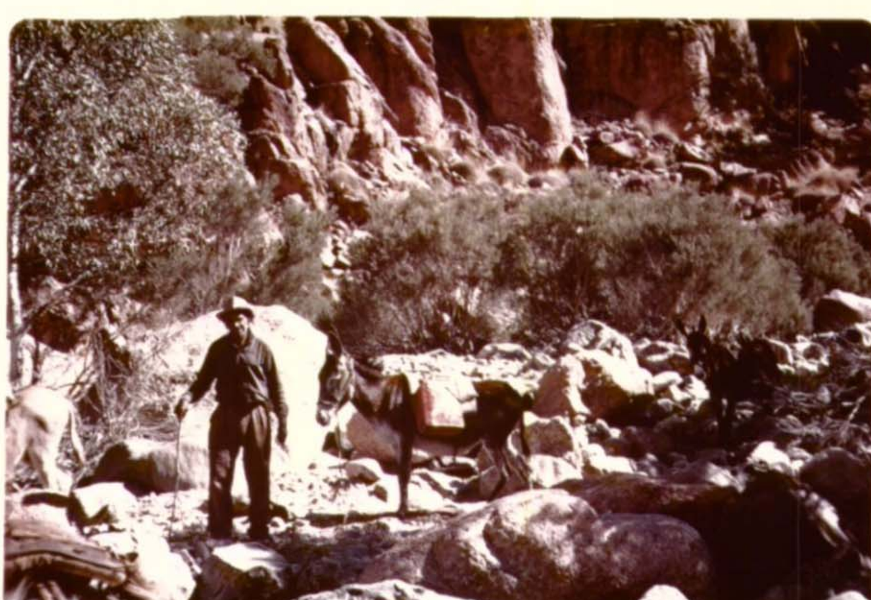
This accident coupled with the extreme lack of water led to the abandonment of transport by donkeys.

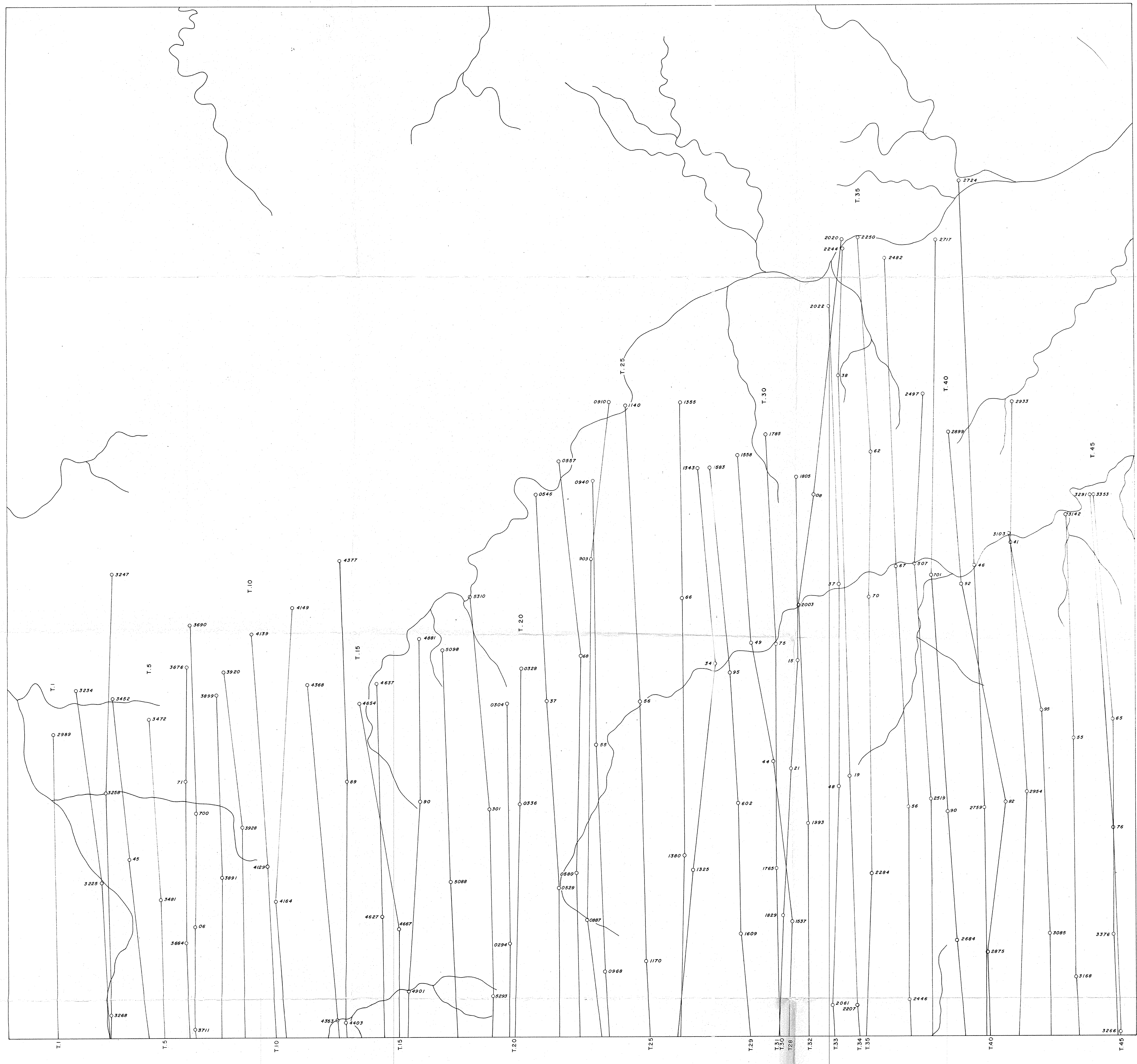
It should be pointed out that under better weather conditions and with a more adequate water availability the project would have been successful. The donkeys adequately proved their suitability for transport over rocky and steep ground.

The transport of the drill equipment to the anomaly site was soon after completed by helicopter using slings.

Granite rock pools 1500 to 3000 feet from the drill-sites provided adequate drilling water. To prevent the evaporation of these pools before the drill was on site 1500, plastic bags capable of holding approximately six gallons of water each were airdropped and filled with pool water by a ground party. The filled bags were tied and allowed to float in the remaining pool water. The storage of water in these bags was found to be highly successful, and was sufficient to complete the three planned holes of one hundred to one hundred and fifty feet depths.

Photo 1	Morris Johnson approximately 1½ miles on trail.
Photo 2	Morris Johnson approximately 3 miles on trail.
Photo 3	P. Harbutt, contractor, followed by his assistant and M. Johnson.
Photo 4	Returning to start point. Tom Jarvis, S.A. Mines Dept. driller in the rear. Tom has now been on four difficult drilling sites with Kennecott during the past eighteen months. The others were Shamrock Valley Prospect, Shamrock Shaft Prospect and Old Knoll Prospect all in the Flinders Ranges. He was the right man for the job in every case.





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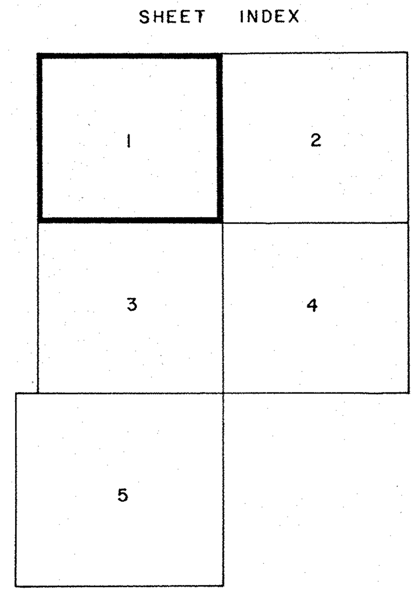
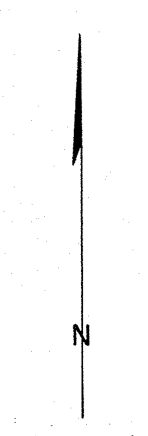




FLIGHT LINE OVERLAY

AIRBORNE RADIOMETRIC SURVEY
MOUNT PAINTER AREA — S.A.

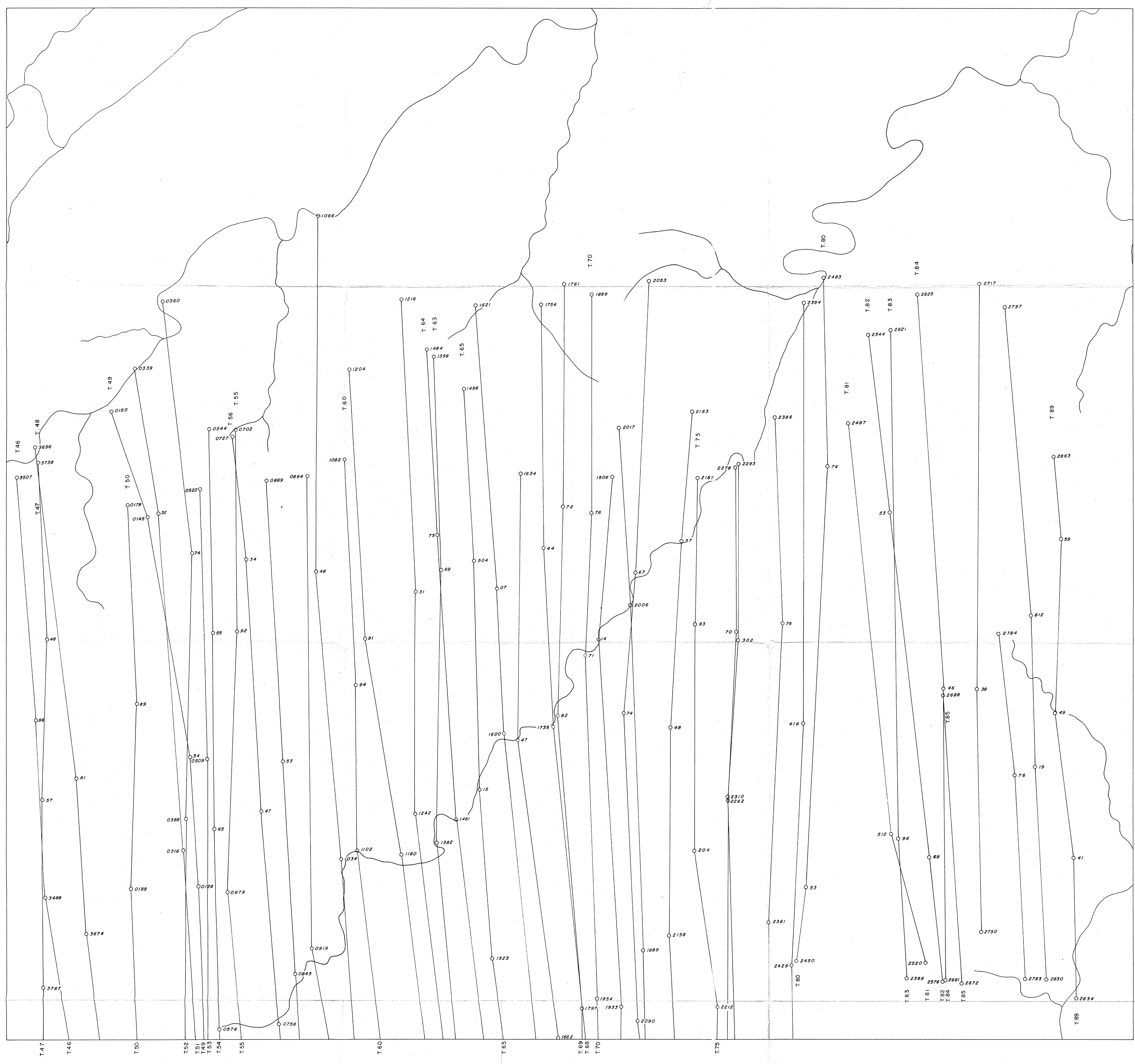
KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.

SCALE 1" = 1000' (APPROX.)

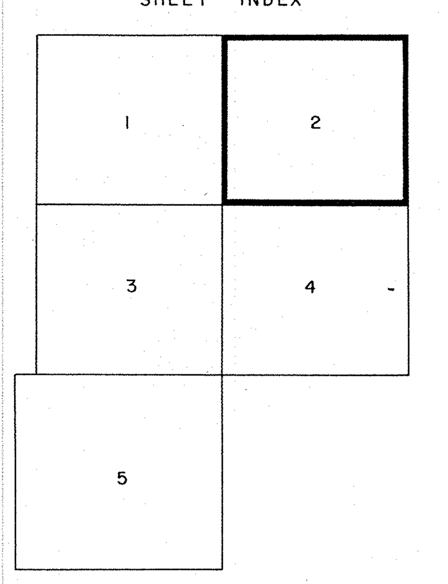
GRD SURVEYED AND COMPILED 1968 BY GEOPHYSICAL RESOURCES DEVELOPMENT CO. RAMSGATE, N.S.W.

SML199 SHEET 1

ENV 1006-2



SHEET INDEX



FLIGHT LINE SPACING — 1/10 MILE
FLIGHT ALTITUDE — 300 FEET M.T.C.

HORIZONTAL CONTROL BASED ON PHOTO ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO, RAMSGATE, N.S.W.

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(APPROX.)

FLIGHT LINE OVERLAY

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MOUNT PAINTER AREA — S.A.

KENNECOTT EXPLORATIONS (AUSTRALIA) PTY. LTD.

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SML 199 SHEET 2

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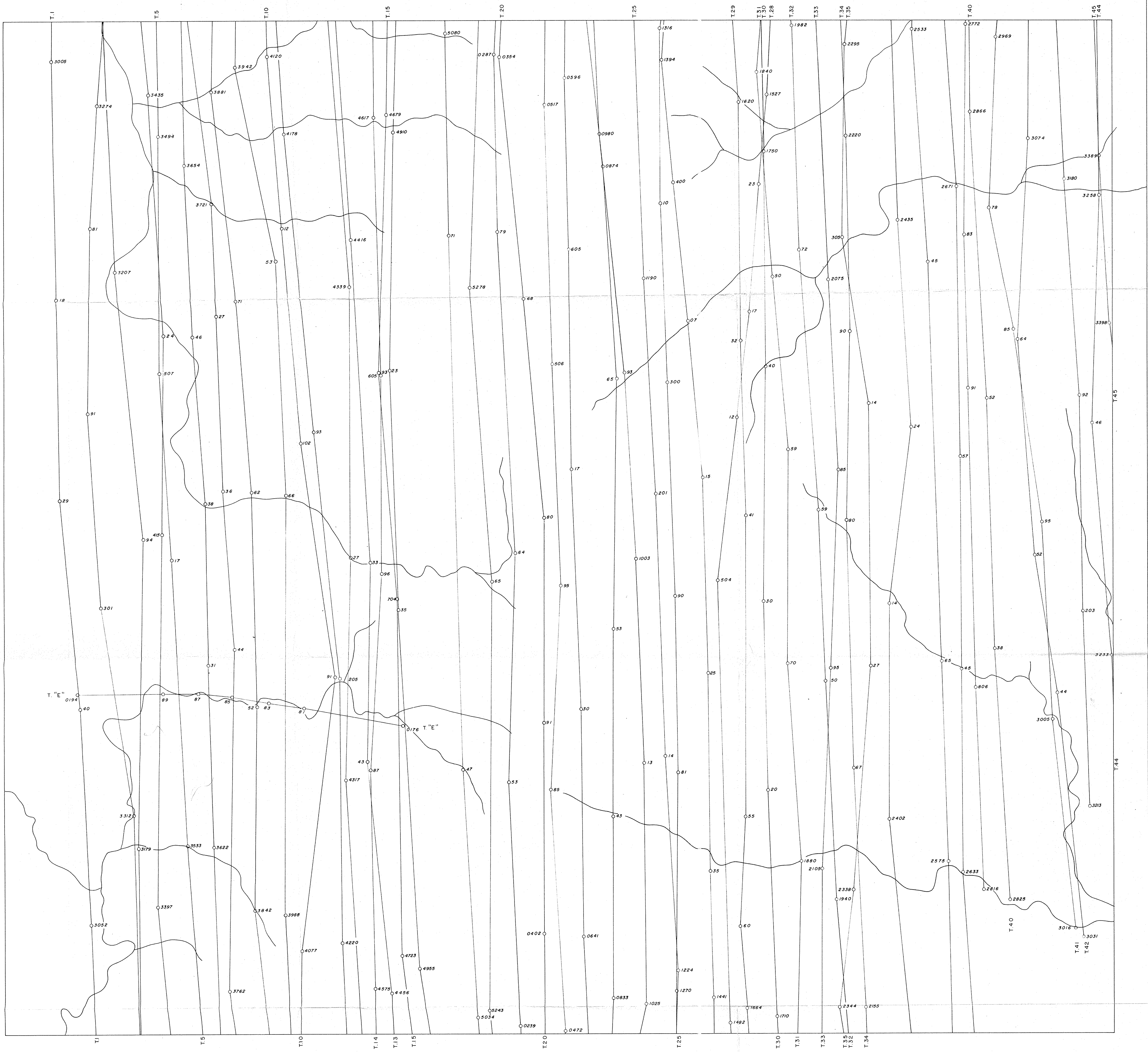

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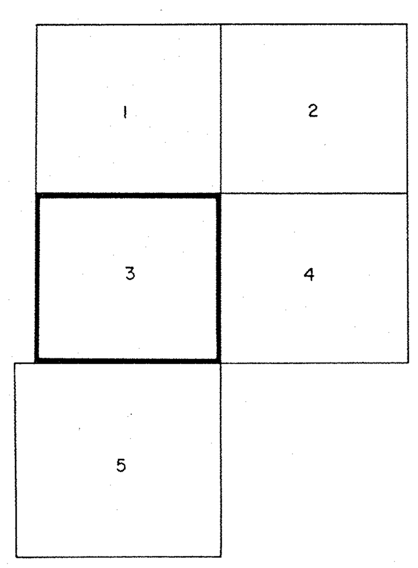

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HORIZONTAL CONTROL BASED ON PHOTO ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO., RAMSGATE, N.S.W.

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GRD

SML199 SHEET 3

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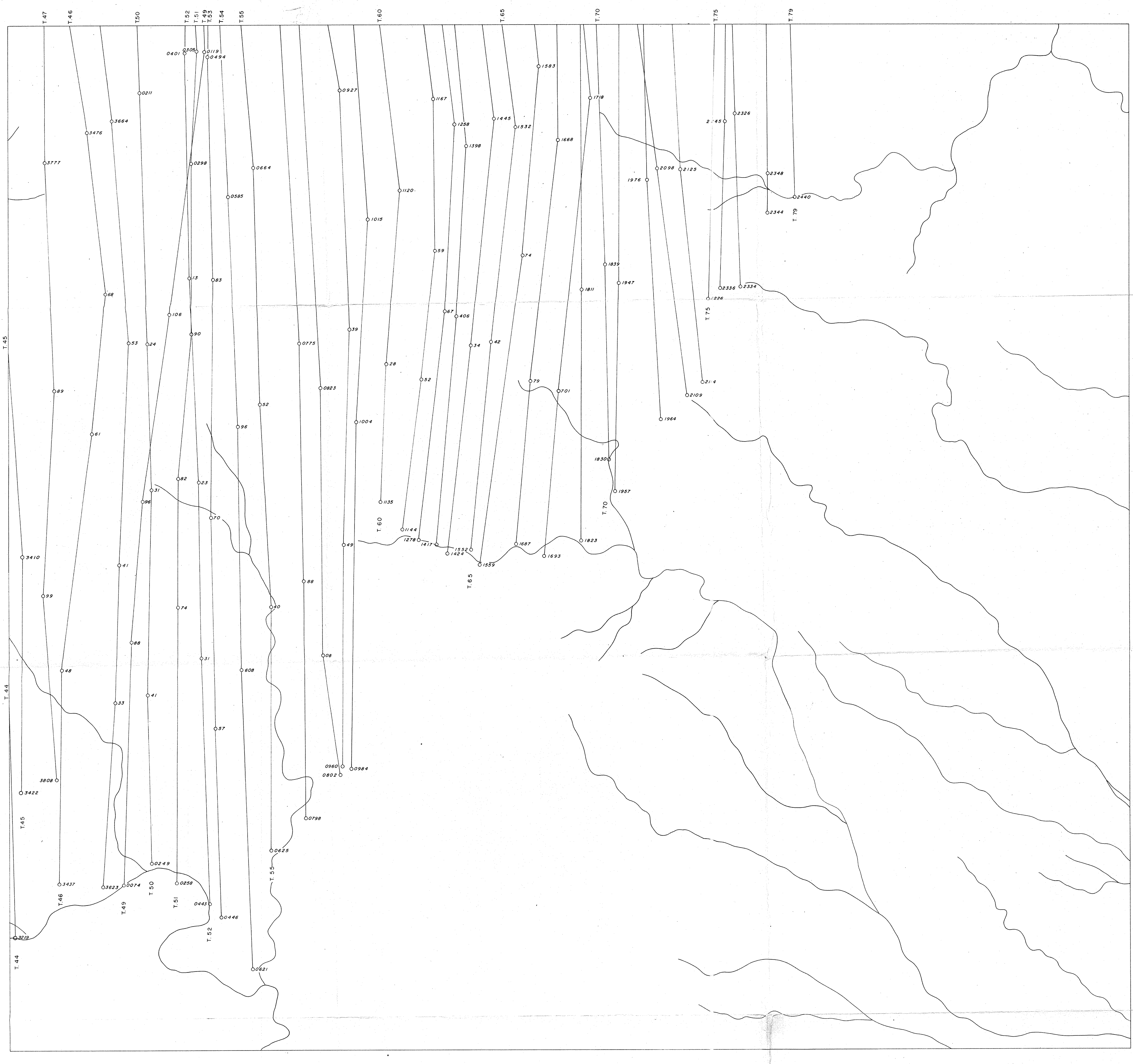

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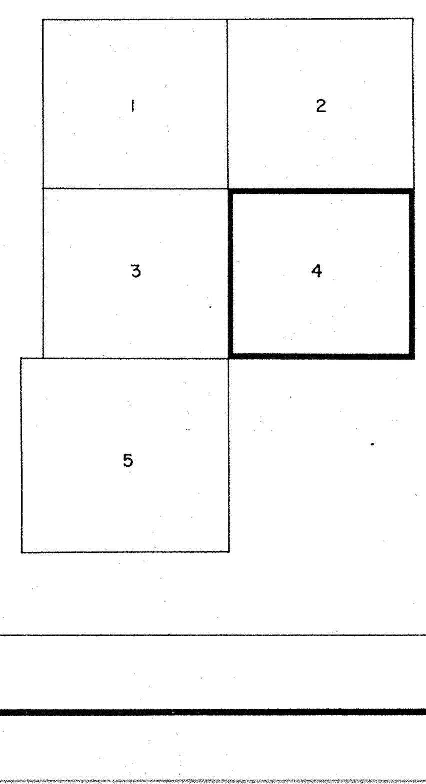
SHEET INDEX



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(APPROX.)

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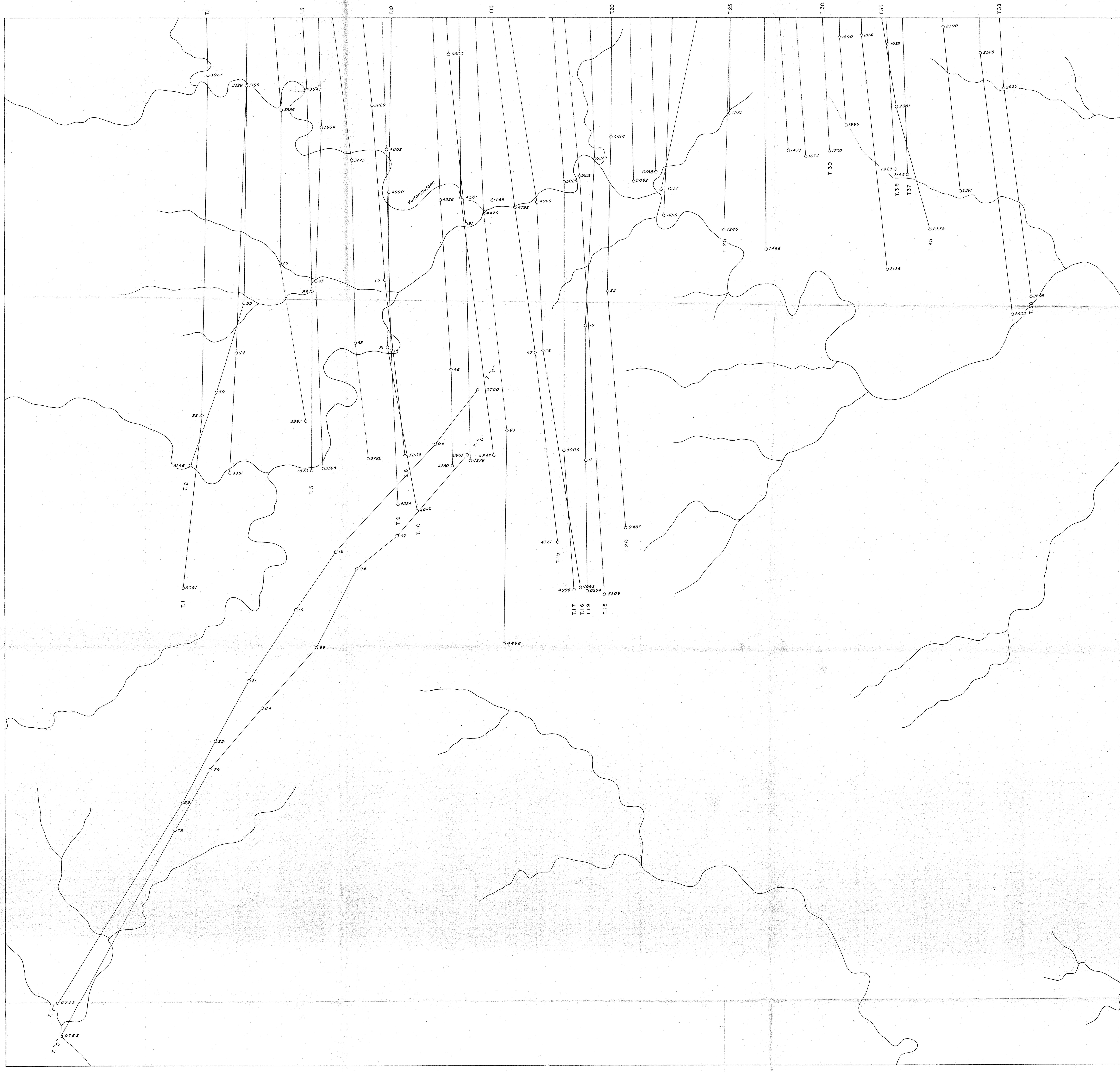

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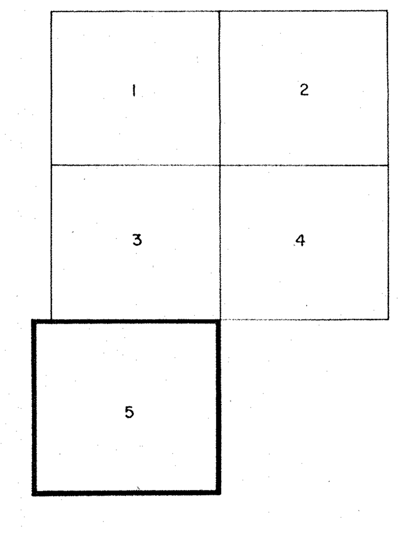

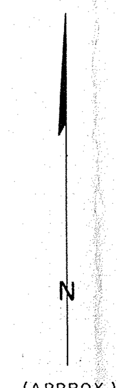

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