MAR 19690008: POTTS LAKE

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19690008

Report

on a

HYDROGEOCHEMICAL SURVEY
POTTS LAKE (PERMIT 31)
NORTHERN ALBERTA

to

Trigg Woollett & Associates Ltd.,
612 Tegler Building
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on behalf of

Radex Minerals Limited
#907 - 100 Adelaide Street
Toronto, Ontario

by

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Vancouver, B.C.

September 15, 1969
Our Report: 69VF1-3

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SUMMARY

A geochemical water survey was carried out in the Potts Lake district of northern Alberta on June 30, 1969. Sixty samples were collected from lakes giving a sample density of approximately one per square mile. The samples were tested in Uranium City for radon ^{222} and for uranium and copper in the Vancouver laboratories of Bondar-Clegg & Company Ltd.

The analytical data were classified giving backgrounds of 4.5 pc/l, 0.1 ppb, and < 5 ppb respectively for radon ^{222}, uranium and copper. Selection of anomalous categories based on regional contents of these elements suggests several possibly anomalous values. The distribution of these anomalous values with respect to other elements determined reflect background contents in bedrock on a regional basis with limited outcropping or subcropping outline.

INTRODUCTION

General:

Bondar-Clegg & Company Ltd. were commissioned by Trigg Woollett and Associates Ltd. to carry out a hydrogeochemical survey on the Radex Minerals permit in the Potts Lake area of northern Alberta. The permit occupies an area of some 60 square miles.

The principles upon which the survey was based were taken largely from the work of Smith and Dyck (International Geochemical Symposium Quarterly, Colorado School of Mines, Vol. 64, No 1, 1969) in the Bancroft area of Ontario and Gatineau area of Quebec.

The results reported below draw heavily on Smith and Dyck's observations on radon and upon the writer's experience in similar water surveys for uranium.

Location:

Permit 31 is location in the northeastern quadrant of Alberta at Latitude $59^{o}45'$N and Longitude $110^{o}30'$W. The area can only be reached by air transport, a distance of some 60 miles west of Uranium City, Saskatchewan. (Appendix I)

Physiography:

The Potts Lake area in which the geochemical water survey was carried out possesses a relief of approximately 100 to 200 feet. The area is heavily wooded.

Drainage in this area was such as to provide adequate sample coverage using a density of one sample per square mile. The streams in the area reflect a mature cycle of erosion with little sediment volume transported. In large part the drainages flow into Potts Lake and its drainage system. Stagnant conditions are largely absent as evidenced by the lack of swamps and bogs.

Geology:

The permit encloses an area of Precambrian meta-sedimentary schists and gneisses, granite-gneiss and two small areas of porphyroblastic feldspar gneiss near the northern and soutwestern boundaries. (See Map 12 - 1960; Fort Fitzgerald, Alberta; G. C. Riley - G. S. C. - 1959.) The western half of the permit is largely made up of bands of metasedimentary rocks separated by areas of gneisses and granitic rocks alone with mylonite bands up to 1000 feet wide. Granite-gneiss covers the eastern half of the permit, with some sediments and metasediments being found in the vicinity of St. Agnes Lake.

Geology: Cont'd.

G. C. Riley (1959) reported no mineralization within the permit boundary, however, a radioactive pegmatite in metasediments was trenched in 1958 at Spider Lake, 4 miles northeast of the permit, scattered counts of more than twice background were measured in the metasediments.

GEOCHEMISTRY

Theory:

Radon: Radon ^{222} is the sixth disintegration product in the uranium 238 series. It is a radioactive inert gas which decays with the emission of alpha particles and possesses a half-life of 3.82 days. In contrast to many other metallic elements which enter natural water systems in ionic form or as finely suspended solids, radon ^{222} readily enters the aqueous phase as a gas. Because radon ^{222} is a radioactive inert gaseous isotope it is readily removed from the aqueous phase and determined at extremely low concentration levels by monitoring alpha particle emission. A detection limit of one pico curie per liter is possible with most field instruments. This is equivalent to microgram levels of uranium in equilibrium with its decay products.

While radon is an inert gas, its parent element, radium, is rather reactive, readily accumulating in organic and hydrolysate phases and continually generating radon. Radon, therefore, may or may not be a measure of proximate uranium concentrations but should serve at least as a rough guide.

Theory:

Uranium: Uranium minerals are all relatively soluble under surface oxidizing environments both acidic and alkaline. They readily hydrolyze in the hexavalent form and travel as hydrolyzed cations probably of the species $UO_2(OH)^{+1}$. In the presence of the carbonate ion the relatively stable form uranyl carbonate complex $UO_2(CO_3)OH^{-1}$ is predominant. The uranyl ion is readily removed from solution by organic matter, clays, manganese and ferric oxides. The uranium content of waters in any given environment is a function of the above factors as well as the more excessive environmental conditions of low oxidation potential.

Interpretation of the uranium potential of any given region requires a knowledge of the mobility of uranium and of supply-removal phenomena. Several regions of Canada, United States and Russia have been subjected to hydrogeochemical surveys for uranium with a relatively large degree of success.

Field Methods:

Transport to and from the sampling area was accomplished with the use of a Bell 3B helicopter. A fuel cache was located

Field Methods: Cont'd.

on Potts Lake in order to minimize refuelling problems and increase the workable time of the helicopter. Because of easy maneuverability, the Bell 3B helicopter was preferred over a fixed wing aircraft to carry out the sampling. The range of the helicopter is approximately two hours and forty to fifty samples could be taken in this time.

Sampling was carried out using a one sample per square mile system with special emphasis on the location of the sample taken as to stream inlet, centre of lake, in muskeg, on stream, etc. Because of easy accessibility by helicopter and the continual supply of new water, stream inlets were preferred over other possible locations. Where stream inlet samples could not be taken, lake centers, sides or outlets were sampled.

In the field special emphasis was put upon the adequate sampling of all drainage systems in the area. Possible sample locations were chosen before going into the field and pre-numbering of the sample bottles was found to be a profitable time saver. Any changes in the existing drainage systems or basins were noted on a field map while the survey was being carried out and were later plotted on the base map.

Field Methods: Cont'd

A total of 60 water samples were taken in the Potts Lake area giving a sample density of one per square mile. With the exception of six surface samples taken in shallow water all samples were taken with the use of a water pump mounted on the helicopter. It is noted that further research into this technique has shown that this pump need only be used in rough weather when there is a possibility of degassing at the surface due to rough water or during and after a heavy rain when there is a possibility that the waters may be stratified with respect to radon. To prevent loss of radon, the water samples were collected in glass bottles and filled to capacity before capping. A sample volume of 650 mls was taken to permit a second determination on high radon samples.

Data recorded at the time of collection included: sample number; location of sample with respect to inlet, on stream, in bay, in muskeg; the colour of the sample using a system of 1 for clear, 2 for off-clear, and 3 for a very noticable colouration; the time the sample was taken and any other pertinent information such as outcrop, rock stain, water velocity, drainage conditions, etc. The field and analytical data are recorded in Appendix II.

Field Methods: Cont'd.

Precision was continually monitored during the reconnaissance survey by taking 5% check samples.

Analytical:

The radon laboratory originally designed by the Geological Survey of Canada has been slightly modified for field use by Bondar-Clegg & Company Ltd. (Smith & Dyck, 1969).

Essentially, 250 mls of sample are transferred into an evacuated Pyrex gas washing bottle and degassed by passing air through a fritted disc inside the bottle. Radon removed this way from the sample is passed through a small drierite unit into a 130 ml evacuated cell coated inside with Ag activated ZnS. Finally, radon was measured by detection of photons developed by the Ag activated ZnS due to alpha particle bombardment through radon decay. Results are reported in pico curies/liter to a detection limit of 1 pico curie/liter. Approximately 70 samples can be analyzed per day.

Precision of the radon analysis was measured by replicate sampling on a routine basis to check the analysis; and resampling of anomalous locations. The mean percentage

Analytical: Cont'd.

deviation of the replicate analysis is 25 and that of the overall field and analytical is 35. These figures meet with specification for reconnaissance surveys.

The uranium analysis was carried out in the Vancouver laboratories of Bondar-Clegg & Company Ltd. utilizing fluorimetric techniques. Analytical sensitivity is 0.1 ppb. Copper was determined to a detection limit of 5 ppb by direct aspiration in an atomic absorption spectrophotometer. Precision of the uranium analysis at the 0.5 ppb level is $\pm$ 0.2 ppb. Precision of the copper analysis at the 10 ppb level is $\pm$ 5 ppb.

Classification and Presentation of Data:

Histograms were constructed to classify the analytical data (Appendix III). Background was taken from the modal class where the modal class was significantly higher than the detection limit. Anomalous categories were established on the basis of Permit 31 data, other regional surveys of a similar nature and from the geochemistry of the elements.

Classification and Presentation of Data: Cont'd.

The classification of data is shown on Table I and on Map I. The anomalous categories on Map I are illustrated by a colour code.

Interpretation of Results:

The radon distribution in Appendix II shows a distinctly symmetrical form indicative of variation around a central background value. Definitely anomalous values are absent on the basis of comparison with other regional results. Changing of the classification to include more samples in the anomalous categories would increase the probability of incorporation of analytical errors or random values.

Uranium and copper distributions show a strong tendency to cluster about the respective background values. The regional background of uranium is 0.1 ppb and the Potts Lake data confirm this value. All copper values are less than 5 ppb, the copper background is about 2 ppb and so is below the detection limit of the analysis, however, anomalous values are readily detected. As with radon, no definitely anomalous values were encountered.

TABLE I

Classification of Radon and Uranium in waters, Potts Lake Permit 31, Alberta.

Class	Rn(pc/L)	U(ppb)	Cu(ppb)
Negative	ND - 8	ND - 0.3	ND
Possibly Anomalous	9 - 12	0.4- 0.6	--
Probably Anomalous	13 - 16	----	--
Definitely Anomalous	16+	----	--

Interpretation of Results: Cont'd.

A total of 13 samples were possibly or probably anomalous in radon, three samples anomalous in uranium and no samples anomalous in copper. Sporadic values are common in water surveys and most favourable results are those which display patterns within a drainage basin.

Samples RM 0004 and RM 0005 are possibly anomalous in radon, sample RM 0002 is possibly anomalous in uranium, (Anomaly 1, Map 1). All these samples drain the same general area and suggest fracture controlled uranium or possibly a source at some distance from the sample locations. South of Anomaly 1, samples RM 0055 and RM 0056 are possibly anomalous in radon only. In general, the radon results suggest the southeastern sector of Permit 31 as most favourable.

CONCLUSION

Hydrogeochemical surveys indicate the most favourable part of Permit 31 to be the southeastern sector. Regional results suggest this area to have a low priority for further uranium or copper exploration.

RECOMMENDATIONS

1. Conduct a stream sediment survey in the area of samples RM 0002, RM 0004 and RM 0005, scintillometer measurements to be made while sampling.

2. Further recommendations contingent on results of 1).

APPENDIX I

Location Map

APPENDIX I.V

Personnel

- Personnel -

Hydrogeochemical Survey of

Potts Lake (Permit 31) Northern

Alberta

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Pickering, Ontario

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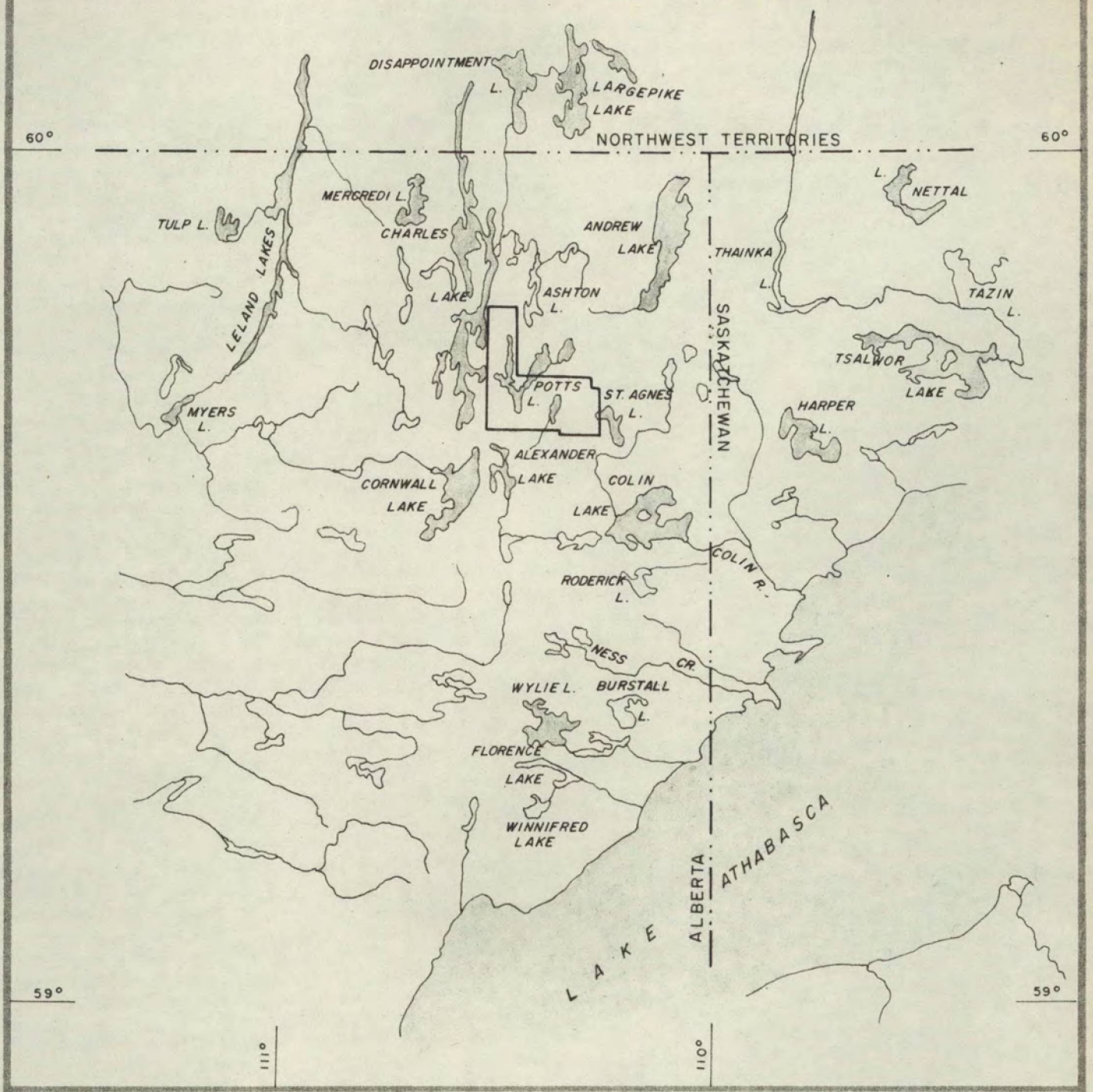
North Vancouver, B. C.

19690008 Figure 1

VERSATILE DRAFTING LTD.



RADEX MINERALS LIMITED

LOCATION MAP

PERMIT 31

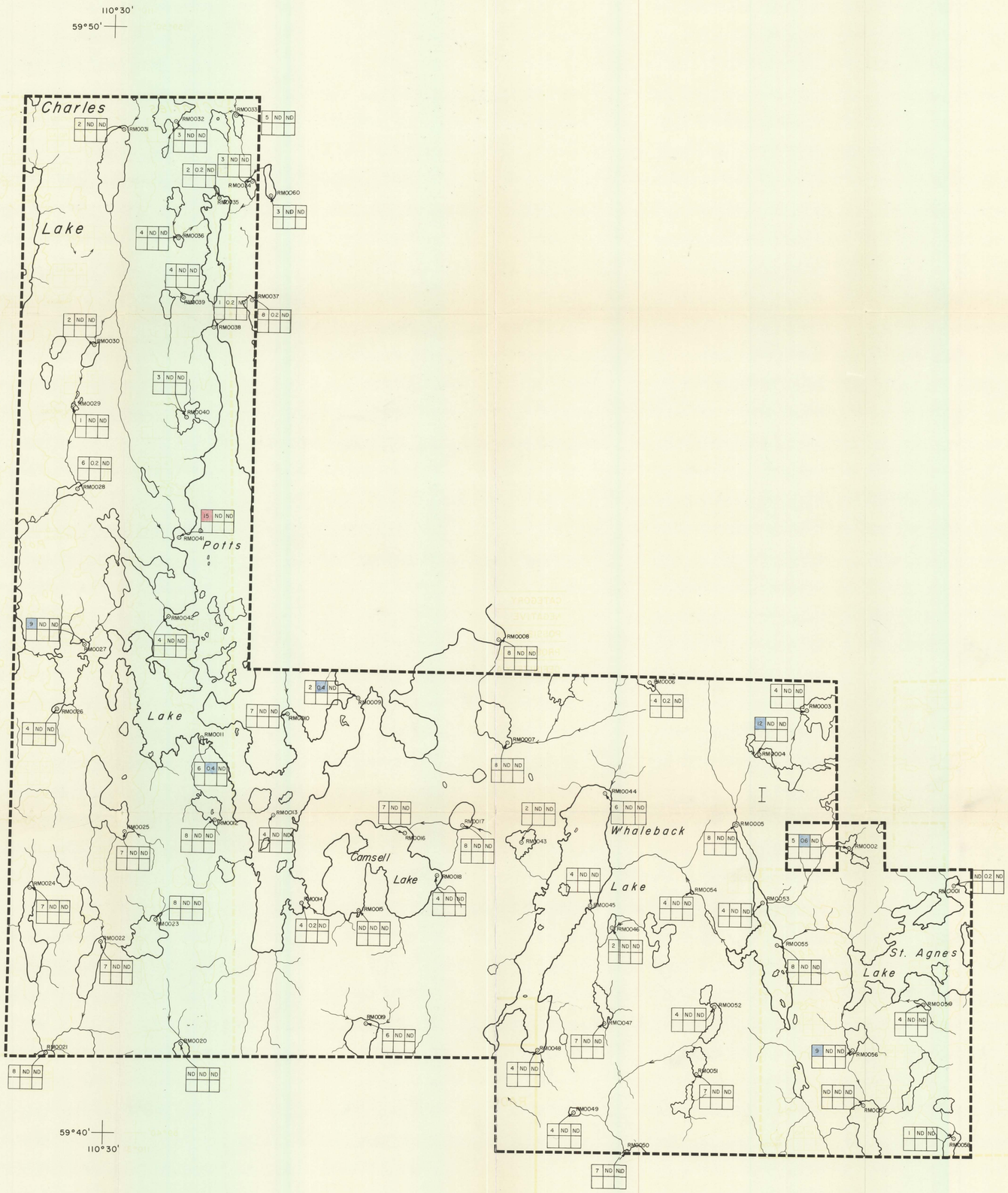
POTTS LAKE, ALBERTA

12 0 12 24

APPROXIMATE SCALE IN MILES

BONDAR-CLEGG COMPANY LTD.

SEPT. 15, 1969



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SCALE : 1" = ½ MI.

GENERAL LEGEND:

- DRAINAGE DIRECTION
- BOUNDARY LINE OF PERMIT
- ⊙RM - 0001 LAKE AND STREAM SAMPLE LOCATION

GEOCHEMICAL LEGEND:

CLASSIFICATION OF DATA

CATEGORY	Rn(pc/l)	U(ppb)	Cu(ppb)	SYMBOL
NEGATIVE	ND - 8	ND - 0.3	ND	
POSSIBLY ANOMALOUS	9 - 12	0.4 - 0.6	-	
PROBABLY ANOMALOUS	13 - 16	-	-	
DEFINITELY ANOMALOUS	16 +	-	-	

DATA PRESENTATION

RM0002 — 5 | 0.6 | ND

DETAIL OF DATA PRESENTATION

(222) Rn(pc/l)	U (ppb)	Cu (ppb)

ANOMALY - I

RADEX MINERALS LIMITED

MAP 1

RADON, URANIUM AND COPPER CONTENTS OF WATER

HYDROGEOCHEMICAL SURVEY PERMIT 31

POTTS LAKE, ALBERTA

CONSULTANTS	GEOCHEMISTRY	CARTOGRAPHY	DATE
TRIGG, WOOLETT & ASSOCIATES LTD.	BONDAR CLEGG COMANY LTD.	GEOPHOTO SERVICE LTD.	SEPT. 15, 1969.

1167003

APPENDIX II

Field and Analytical Data

BONDAR-CLEGG & COMPANY LTD.

WATER SURVEY DATA

COLLECTOR D R Boyle PROJECT TRIGG-Woolle Heath WEATHER Cloudy

DATE 30/6/69 AREA RADEX PERMIT 31 PHYSIOGRAPHY

SAMPLE NO.	LOCATION	STREAM SIZE	LAKE ~~SIZE~~ Posn	COLOUR	REMARKS	~~pH~~ H_2O Time	ANALYTICAL Rnpdb	Upph	Cuppb
RM-0001			AT Inlet	2		10.00	ND	0.2	ND
02			"	1	SURFACE Sample		5	0.6	ND
03			"	1			4	0.1	ND
04			"	2			12	0.1	ND
05			"	2			8	ND	ND
06			END OF LAKE	1			4	0.2	ND
07			AT INlet	2			8	0.1	ND
08			"	1			8	0.1	ND
09			IN STRAITS	1			2	0.4	ND
RM-0010			AT INlet	1		10.30	7	0.1	ND
11			"	1		11.00	6	0.4	ND
12			END OF LAKE	2	SURFACE Sample		8	0.1	ND
13			CENTRE	1			4	ND	ND
14			AT INlet	1			4	0.2	ND
15			"	2			ND	0.1	ND
16			"	2		11.30	7	ND	ND
17			"	2			8	0.1	ND
18			"	2			4	0.1	ND
19			"	3			6	0.1	ND
RM-0020			"	3			ND	0.1	ND
21			"	2	SURFACE SAMPLE		8	ND	ND
22			"	2			7	ND	ND
23			"	2			8	0.1	ND
24			"	2	SURFACE SAMPLE		7	ND	ND
25			"	2		12.00	7	ND	ND

BONDAR-CLEGG & COMPANY LTD.

WATER SURVEY DATA

COLLECTOR D. R. Boyle PROJECT TRIGG - Woollett Lake WEATHER Cloudy

DATE 30/6/69 AREA RADEX PERMIT 31 PHYSIOGRAPHY

SAMPLE NO.	LOCATION	STREAM SIZE	LAKE ~~SIZE~~ Pos'n	COLOUR	REMARKS	~~pH~~ ~~H_2O~~ Time	ANALYTICAL Rnpd¹	Upp b	Cupp
M-0026			END OF LAKE	1			4	ND	ND
27			AT Inlet	1			9	0.1	ND
28			"	3			6	0.2	ND
29			"	3			1	ND	ND
M-0030			"	3			2	0.1	ND
31			"	2			2	ND	ND
32			"	1		12.00	3	ND	ND
33			"	3			5	ND	ND
34			"	2			3	ND	ND
35			END OF LAKE	1			2	0.2	ND
36			CENTRE	2	SURFACE Sample		4	ND	ND
37			END OF LAKE	1			8	0.2	ND
38			AT Inlet	1			1	0.2	ND
39			"	2			4	0.1	ND
M-0040			CENTRE	1			3	0.1	ND
41			AT Inlet	1		13.00	15	0.1	ND
42			"	1		13.03	4	0.1	ND
43			CENTRE	2		13.40	2	0.1	ND
44			AT Inlet	1	SURFACE Sample		6	ND	ND
45			"	1			4	ND	ND
46			"	3			2	ND	ND
47			"	2			7	ND	ND
48			"	1			4	ND	ND
49			CENTRE	2		14.00	4	ND	ND
M-0050			AT Inlet	2			7	ND	ND

BONDAR-CLEGG & COMPANY LTD.

WATER SURVEY DATA

COLLECTOR D R Boyle PROJECT TRIGG - Woollett WEATHER cloudy

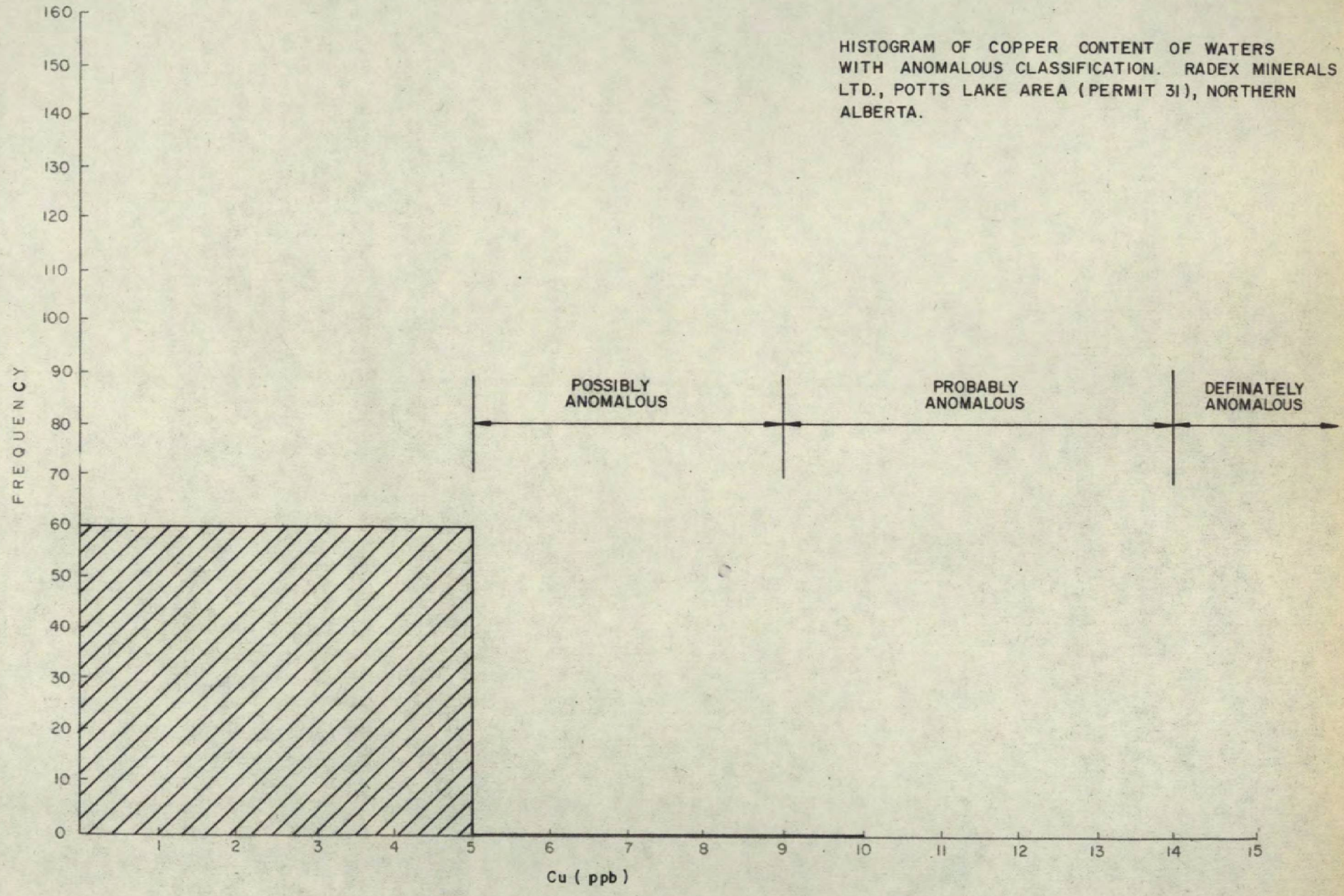
DATE 30/6/69 AREA RADEX PERMIT 31 PHYSIOGRAPHY

SAMPLE NO.	LOCATION	STREAM SIZE	LAKE ~~SIZE~~ Posn	COLOUR	REMARKS	~~pH~~ ~~H_2O~~ Time	ANALYTICAL Rn pc/l	U ppb	Cu ppb
M-0051			AT INlet	2			7	0.1	ND
52			"	1			4	0.1	ND
53			"	1			4	ND	ND
54			"	1			4	ND	ND
55			"	1			8	ND	ND
56			AT outlet	2			9	0.1	ND
57			AT INlet	1		14.30	ND	ND	ND
58			"	2			1	ND	ND
59			CENTRE	3		14.40	4	0.1	ND
RM-0060			AT INlet	1			3	0.1	ND

APPENDIX III

Histograms of Analytical Data

HISTOGRAM OF COPPER CONTENT OF WATERS WITH ANOMALOUS CLASSIFICATION. RADEX MINERALS LTD., POTTS LAKE AREA (PERMIT 31), NORTHERN ALBERTA.



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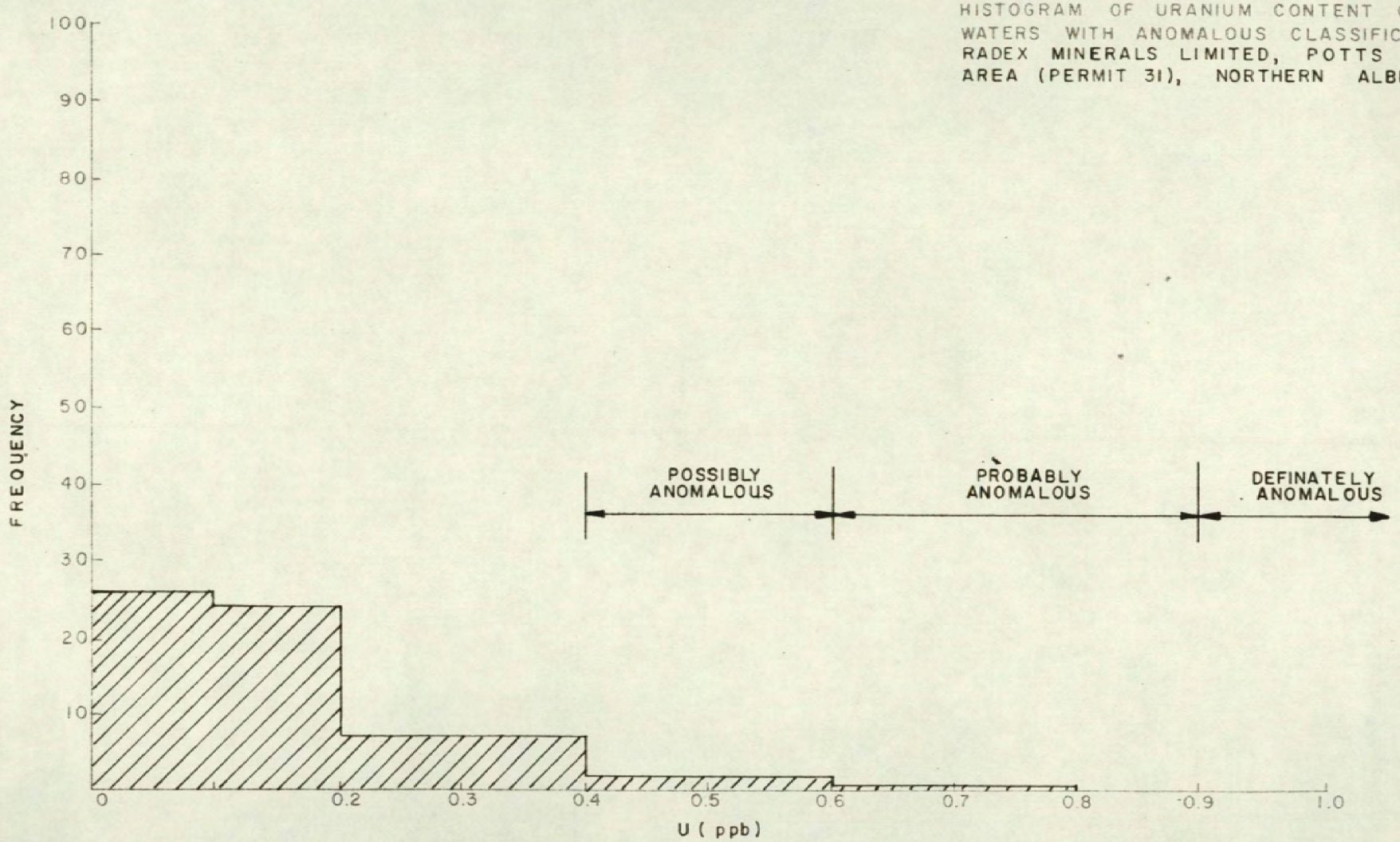
HISTOGRAM OF URANIUM CONTENT OF WATERS WITH ANOMALOUS CLASSIFICATION RADEX MINERALS LIMITED, POTTS LAKE AREA (PERMIT 31), NORTHERN ALBERTA.



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HISTOGRAM OF RADON^{222} CONTENT OF WATERS WITH ANOMALOUS CLASSIFICATION. RADEX MINERALS LIMITED, POTTS LAKE AREA (PERMIT 31), NORTHERN ALBERTA