



MOUNTAINEER MINES LTD. - PAN OCEAN OIL LTD.

JOINT VENTURE

PRELIMINARY GEOLOGICAL REPORT

ON THE

RAD 1-24 MINERAL CLAIMS
BREAK 1-32 MINERAL CLAIMS
N.T.S. 106-E-1
106-D-16

65°00'N 134°20'W

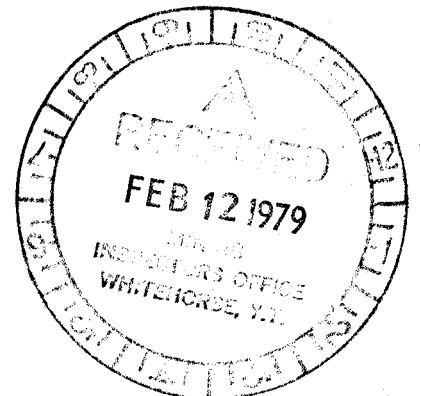
YUKON TERRITORY

January, 1979

by

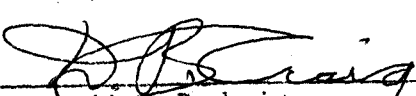
R. Yorston - Geologist
D. Yeager - Geologist
C. K. Ikona - P.Eng.

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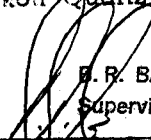
This report has been examined by the Geological Evaluation Unit and is recommended to the Commissioner to be considered as representation work in the amount of

\$ 5600.00


~~Assistant Geologist or~~
~~Resident Mining Engineer~~

22/2/79

Considered as representation work under Section 53 (4) Yukon Quartz Mining Act.


E. R. BAXTER
Supervising Mining Recorder

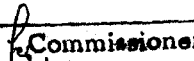

Commissioner of Yukon Territory

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1.0 INTRODUCTION

The RAD 1-24 and BREAK 1-32 mineral claims were staked during the summer of 1976 by Harman Management Ltd. to cover uranium and copper showings discovered during a regional prospecting program carried out for Mountaineer Miners Ltd. A brief investigation of the property was conducted by Harman Management Ltd. subsequent to staking the ground.

Pan Ocean Oil Ltd. of Calgary acquired majority interest in the claims in the fall of 1976.

During the period June 1 to September 2, 1977, preliminary geologic mapping and additional prospecting were carried out in the claims area by Pamicon Developments Ltd.

From June 1 to August 31, 1978, additional mapping, prospecting, and geochemical sampling was done by Pamicon Developments Ltd.

2.0 LIST OF CLAIMS

<u>CLAIM NAME</u>	<u>STAKING DATE</u>	<u>RECORDING DATE</u>	<u>GRANT NO.</u>
RAD 1-24	Aug. 6, 1976	Aug. 19, 1976	YA6443-6466 incl.
BREAK 1-32	Sept.16/76	Sept. 24/76	YA7104-7135 incl.

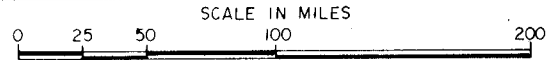
Claim posts examined by the author appear to conform with the Yukon Quartz Mining Act regulations.

3.0 LOCATION AND ACCESS

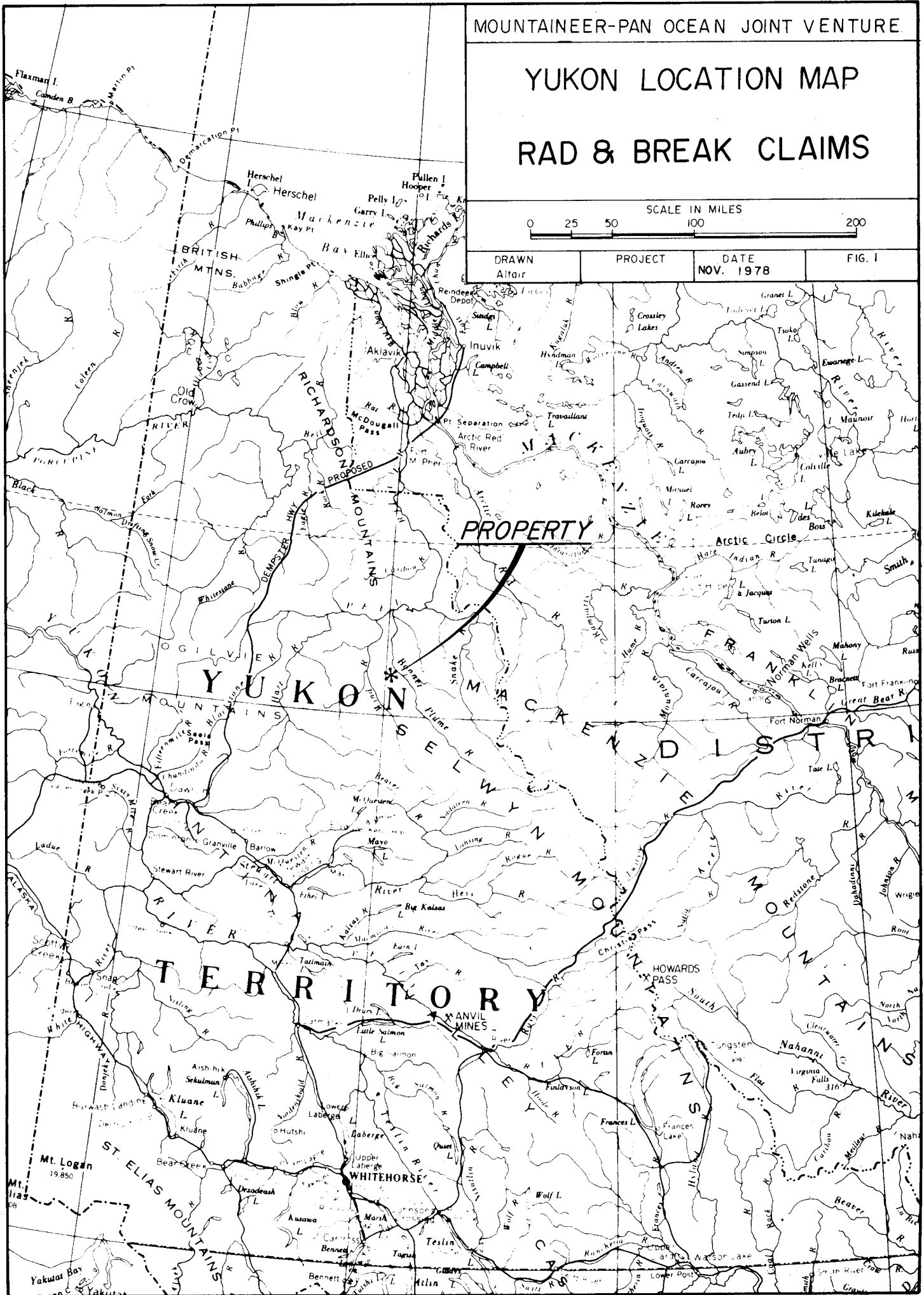
The RAD/BREAK claims are located on N.T.S. sheets 106-E-1 and 106-D-16, approximately eight miles south-southeast of Quartet Lakes in the northeastern Yukon Territory. Approximate

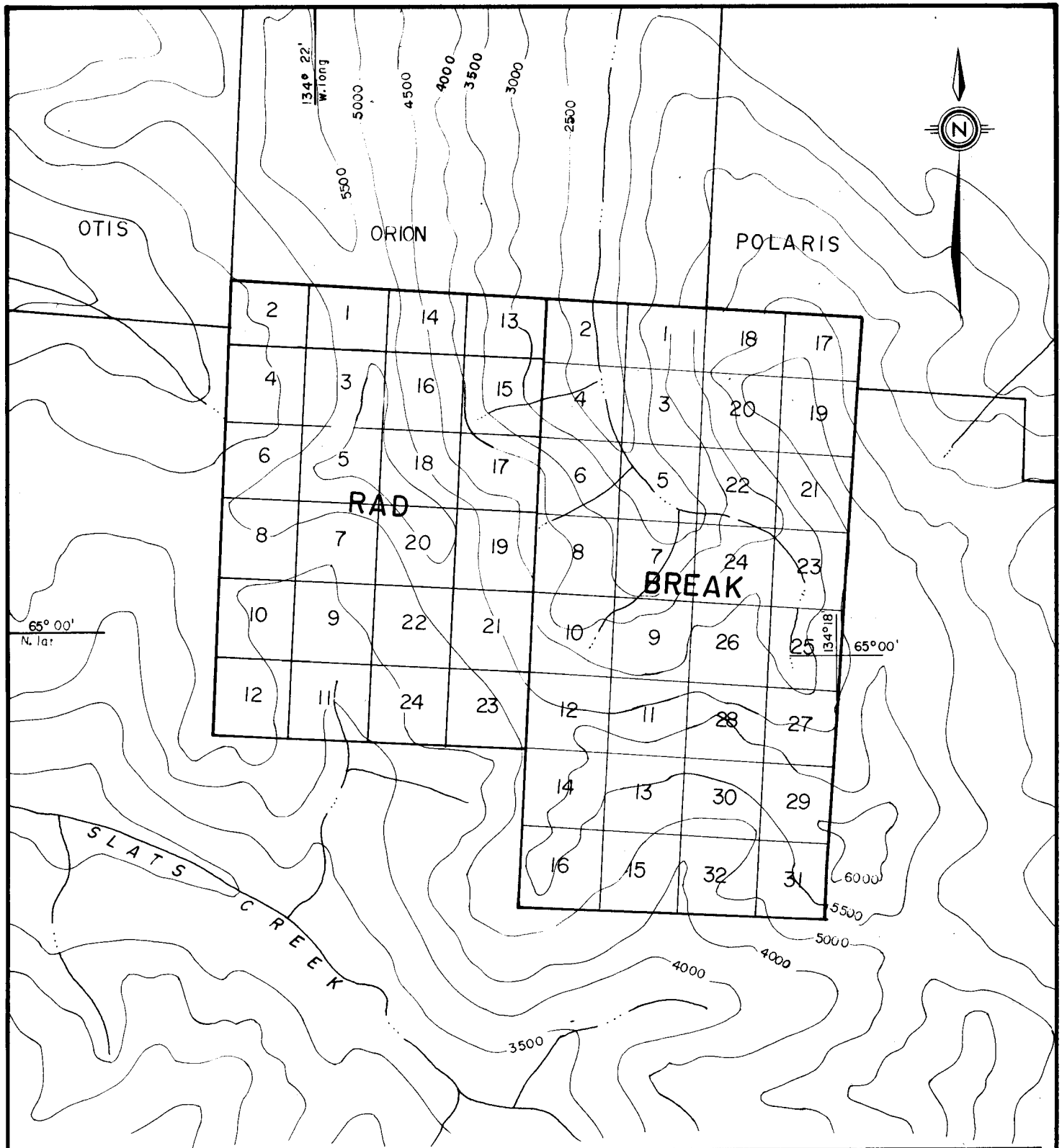
2..

YUKON LOCATION MAP RAD & BREAK CLAIMS



DRAWN Altair	PROJECT	DATE NOV. 1978	FIG. 1
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MOUNTAINEER-PAN OCEAN JOINT VENTURE			
RAD & BREAK CLAIMS CLAIM MAP 106-E-1 QUARTET LAKES AREA YUKON TERRITORY			
SCALE IN MILES			
DRAWN Alfair	PROJECT	DATE NOV. 1978	FIG. 2

co-ordinates of the claim group are 65°00'N latitude, 134°20'W longitude.

Access to the property is by fixed wing aircraft from Mayo to Quartet Lakes, a distance of 120 miles, then by helicopter to the property. Both helicopter and fixed wing aircraft as well as full expediting services are available in Mayo.

4.0 TOPOGRAPHY AND VEGETATION

Elevations on the property range from 2,500 feet to 5,500 feet A.S.L. and topography is rugged over the entire property. Exposure is good on most of the ground although large areas are obscured by talus cover.

The entire group lies above tree line so vegetation consists entirely of lichens, low grasses and moss.

Snow cover is extreme on the higher levels; often staying into July and usually falling in late August. This factor should be considered in planning any work programs.

5.0 REGIONAL GEOLOGY

The Quartet-Fairchild region lies in the Wernecke Mountains of the north eastern Yukon Territory. In the general area, the Werneckes consist of local ranges which include the Rackla Range, Bonnet Plume Range and Knorr Range. Topography is normally moderate to rugged with

elevations ranging from 2,000 to 6,500 feet. The major river valleys are broad, timbered and extensively overburden covered, while most mountain slopes present greater than 60% outcrop above the 4,000 foot level.

The entire area has been mapped by the Geological Survey of Canada and three separate publications are presented. The following memoir and open file reports give 1" = 4 miles geological coverage of the Nash Creek, Nadaleen River, Wind River and Snake River map areas.

- (1) Geology of Nash Creek, Larsen Creek and Dawson Map-Area, Yukon Territory by L.H. Green 1972 (Memoir 364).
- (2) Open File 205 (Geology of Nadaleen River and Bonnet Plume Lake Map sheets by S. Blusson) 1975.
- (3) Open File 279 (Geology of Snake River and Wind River sheets by D.K. Norris) 1975.

In the Quartet-Fairchild-Gillespie Lakes region Helikian rocks are exposed over an area of some 1,500 sq. miles in a roughly circular fashion centered near longitude 134°00'W and latitude 65°00'N.

These rocks have been described as Units 1 & 2 by L. Green on the Nash Creek Sheet.

Recent G.S.C. stratigraphic work by Bell and Delaney (1976) has redesignated Units 1a, 1 and 2 (Green 1972) as Units A, B, and C respectively. The unit designations as established by Bell and Delaney will be used in this report.

Unit A whose base is not exposed, is composed of a thick succession of moderately metamorphosed fine grained clastic sediments with interbedded carbonates. The overlying Unit B consists of thinly interbedded slates and argillites with occasional quartzite beds.

Unit C, which conformably overlies the uppermost slate-quartzite section of Unit B, consists mainly of thickly bedded orange weathering dolomites. The base of the unit is marked by a series of transitional beds of alternating buff weathering dolomites and interbedded slates and quartzites.

Erratically distributed throughout the Proterozoic metasediments are irregularly shaped breccia bodies. The breccia zones vary from tens of feet to several thousand feet in size and appear as cross cutting pipe-like features at all levels in the stratigraphic column. Several varieties exist, but all exhibit an assortment of angular clasts derived from rock types common to the area. Hornfels margins observed at several localities indicate an intrusive origin.

A common association with many of the breccia bodies are zones of veining or locally pervasive feldspar alteration seen as internal features within the breccias or in host rocks adjacent to them.

The alteration zones are pink in colour due to either K-spar or strong hematization and in some instances contain varying amounts of specularite, chalcopyrite and minor uranium mineralization.

5.1 Structure

Two major periods of deformation have taken place within the Wernecke Mountain region. During the first period or Racklan Orogeny, the Proterozoic rocks of Units A, B, and C underwent intense folding and faulting. Folds are tight to isoclinal with the development of strong axial plane cleavage and commonly an almost vertical foliation.

A major unconformity of Lower Hadrynian age forms the upper contact of Unit C. In many localities, erosion beneath this unconformity has resulted in the complete removal of Unit C and the strong angular relationship between the relatively flat lying Cambrian and younger rocks directly overlying Units A and B is apparent.

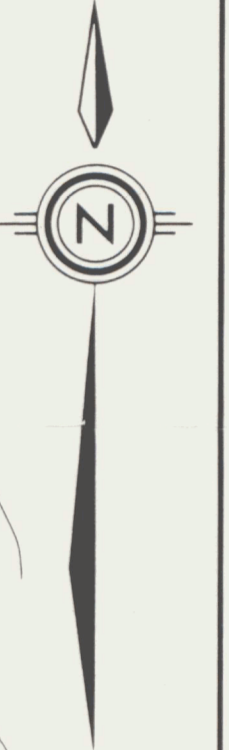
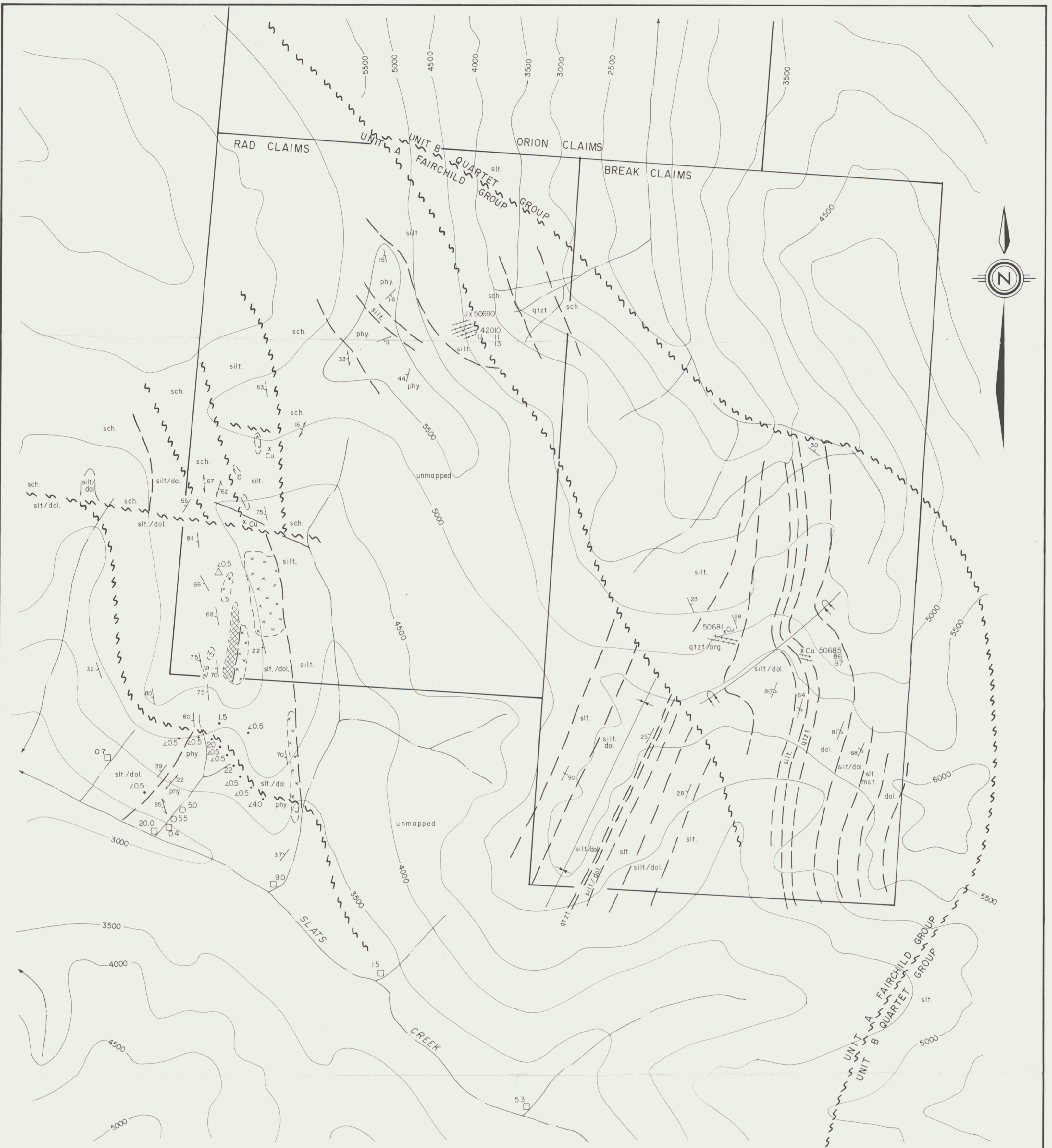
Further unconformities near the Upper Hadrynian, Lower Cambrian and Upper Cambrian margins leave Devonian carbonates directly over the Helikian section.

The second period of deformation, which involves both Paleozoic and Proterozoic strata, is weak compared to the first. This is particularly evident in the younger Carbonate sections to the west and southwest where deformation consists mainly of broad open folding and minor overthrusting.

6.0 GEOLOGY

6.1 Introduction - Rad claims

Preliminary mapping of the RAD claims was carried out at a scale of 1 inch to 1/2 mile in 1976 and 1977. The 1978 mapping was at 1 inch to 1,000 feet (See Figure 3). The



LEGEND

- Dykelet swarm
- Vein swarm
- Bedding attitude: inclined, vertical, overturned
- Fault
- Geologic contact
- Outcrop limit
- Fold axis upright syncline, overturned syncline
- Copper showing
- Uranium showing

LITHOLOGY

- UNIT B
 - Bslt BLACK SHALE
- UNIT A
 - mst. MUDSTONE
 - silt. SILTSTONE
 - dol. DOLOMITE
 - qtz. QUARTZITE
 - arg. ARGILLITE
 - slt. SLATE
 - phy. PHYLLITE
 - sch. SCHIST

mst/dol INDICATES THAT FIRST ROCK TYPE IS INTERBEDDED WITH LESSER AMOUNTS OF SECOND ROCK TYPE.

- Intrusive Breccia
- Diorite

Classification of Geochemical Samples

	soils	silts	waters
Background	<0.8ppm.	<5 ppm.	<1.3 ppb.
1st order anomalous	0.8-3.3ppm.	5-35ppm.	1.3-9.0ppb.
2nd order anomalous	>3.3 ppm.	>35ppm.	>9.0ppb.

MOUNTAINEER-PAN OCEAN JOINT VENTURE

RAD-BREAK CLAIMS
N.T.S. 106-E-1
YUKON TERRITORY
GEOLOGY AND GEOCHEMISTRY

PAMICON DEVELOPMENTS LIMITED



DRAWN: Altair	PROJECT: Fairchild	DATE: Jan, 1979	FIG.: 3
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property is underlain by a variety of rock types, all assigned to map Unit A of the geologic column. Several intrusive phases were mapped as well as several major faults. Uranium and copper mineralization appear to be related to both the intrusive and structural events present.

6.2 Lithology - RAD

The northeast portion of the property is underlain by a light green chlorite biotite schist, presumably lying much lower in Unit A than the rest of the rocks on the property. The degree of metamorphism is high for the region with prophyroblasts of biotite, chlorite, and chloritoid(?) up to 3/16" in size noted. A several hundred foot thick band of light grey weathering, fine grained siliceous material lies partway through the schist section.

The unit overlying the metamorphic section, in the north central portion of the claims, is composed mainly of slatey to phyllitic dark green mudstones and siltstones. The rocks are heavily chloritized and become noticeably more phyllitic near the central portion of the claims. Where phyllitic, the metasediments have a crenulated texture and are a light green-grey colour.

Lying along the western boundary of the claims is a prominent, white weathering, bluff forming siltstone unit. Local brecciation has occurred within the light grey siltstone. Fragments in the breccias range from <1 m.m. to 1.5 ft. in size and are composed mainly of two rock types: a thinly laminated, partly silicified, light grey siltstone and an

inter-laminated dolomite/mudstone, both of which are derived locally. The siltstone unit is relatively unbrecciated and becomes more calcareous near the contacts with adjoining units.

Also noted in the area were: a grey to black locally slaty shale in the south central portion of the property, a light grey to tan phyllite with dolomite lenses and segregations in the southwestern portion of the property, and an orange to brown weathering dolomite immediately south of the claims.

6.3 Structure and Stratigraphy - RAD

All the rocks seen on the property belong to map Unit A.

The metamorphic section in the northeast part of the property is apparently flat lying; although the identical appearance of the schists lying above and below the fine grained siliceous unit suggests the existence of a recumbent isoclinal fold cored by the siliceous material. Over 500 vertical feet of the metamorphic section is exposed.

The overlying phyllite/siltstone/mudstone unit is basically flat lying but the variety of bedding attitudes indicates extensive folding within the unit itself. The rest of the sedimentary rocks on the property generally strike north-south and dip moderately to steeply to the west.

Faulting appears to have been the most common structural feature. Two major faults occur on the property and alteration associated with them consists of chloritization,

bleaching and calcification; with slickensides and fracturing along fault traces.

The first fault, separating the schists from the mudstone/ phyllite rocks in the northeastern part of the property, is a northwesterly trending, southwesterly dipping, high angle reverse fault. An intensely sheared and slickensided outcrop of chloritized mudstone lying near the fault trace at the northern edge of the claims exhibits well defined shear planes with attitude $145/57^{\circ}\text{SW}$. This is presumed to be approximately parallel to the fault plane. This fault appears to extend some eleven miles to the WNW of the property.

The second fault brings the light grey siltstone in fault contact with the underlying units, and within the RAD claims thrusts the siltstone over the mudstone/phyllite and the black shale. Fracturing is particularly intense in the siltstone and is commonly accompanied by small scale cross faulting trending generally east-west.

6.4 Mineralization - RAD

Several local uranium occurrences were discovered on the RAD claims. The mineralization appears to be structurally controlled by shearing within and/or adjacent to fault zones. These structures likely provide channelways for hydrothermal solutions and injections carrying and/or localizing the uranium minerals.

Uranium mineralization occurs within a portion of the dark green phyllitic mudstones lying above the fault in the

northeast part of the claims. In this area the mudstones are intruded by a felsic pegmatite dykelet swarm which hosts the radioactive material. The dykelets, which exhibit a common orientation of approximately $042/76^{\circ}S$, range in width from 2 inches to 2 feet and are spaced from 6 inches to several feet apart. The composition of the dykelets is mainly quartz and K-feldspar with inclusions of wallrock altered to chlorite and sericite. The dykelet swarm extends over a width of approximately 400 feet and is visible intruding some 150 to 200 feet in elevation into the cliffs above. Mineralization occurs as sporadic grains of brannerite ranging from 1 m.m. to 4 m.m. in size and occasionally as crystalline masses of a pinkish brown unidentified radioactive mineral. Mineralization was seen only within the dykelets. Due to the extreme nature of the cliffs in the showing area, the entire dykelet swarm was not inspected. However, it was possible to view the lower 50 feet of the showing from which it was evident that all the pegmatite dykelets are mineralized to some extent.

Minor brannerite was also seen within the light grey siltstone approximately 4,000 feet southwest of the pegmatite swarm. The mineralization in the siltstone is apparently associated with an east-west trending cross fault. Very little brannerite was seen and the occurrence is non-continuous on the surface. Other minerals present in the same area include

minor chalcopyrite, pyrite, and hematite.

Table 6.4.1 - Assays - RAD, 1976, 1977

<u>Sample No.</u>	<u>% U₃O₈</u>	<u>Description</u>
42010	0.002	Grab sample of dykelet material showing disseminated alteration haloes; from south end of dykelet swarm.
42011	0.057	Grab sample of chlorite, sericite schist material from dykelet walls in southern portion of dykelet swarm.
42012	0.081	Grab sample from feldspar flooded breccia material in light grey siltstone unit in western portion of claims.
42013	0.016	Grab sample from dykelet material showing albite/hematite alteration and exhibiting moderate radioactivity. Sample from southern portion of pegmatite swarm.
50690	0.047	Grab sample of altered, radioactive dykelet material from northern portion of pegmatite swarm.
62557	0.256	Continuous chip sample across 4 feet of outcrop taken from light grey metasiltstones in western portion of claims.

6.5 Introduction - BREAK Claims

Preliminary mapping of the BREAK claims was carried out at a scale of 1 inch to 1/2 mile in 1976 and 1977. The 1978 mapping was done at 1 inch to 1,000 feet (See Figure 3). The property is underlain by a variety of rock types, all assigned to map units A and B of the Proterozoic.

6.6 Lithology - BREAK Claims

The northern portion of the claims is underlain by limonitic black slates corresponding to the lowermost pyritic black shale sequence at the base of Unit B. The slaty cleavage generally has developed parallel to bedding but was seen intersecting bedding at several localities.

The Unit A rocks in the southern two thirds of the claims consist mainly of siltstones and slaty siltstones, interbedded siltstone and dolomite, and dolomite. The siltstones and slaty siltstones generally weather dark grey to black and exhibit bedding thicknesses from 1/4 inch to 2 inches. The interbedded siltstone/dolomite units weather grey-brown in colour and have bedding thicknesses in the 1/4" to 1/2" range. The siltstone/dolomite units usually deform easily and in the vicinity of the fold axes are minor folded to the point where original bedding features are lost. The dolomite units weather rusty brown and are generally thick bedded; with thicknesses ranging from 3 inches to 1 foot. A grey weathering chert bed was noted at several localities on the property and ranged from 5 feet to 12 feet in thickness.

6.7 Structure and Stratigraphy - BREAK Claims

The property geology is roughly divided into three parts by two southeasterly trending faults that cross the claim group. The southernmost fault is a southwesterly dipping, high angle reverse fault felt to be an extension of a major reverse fault shown on the G.S.C. map of the area to extend some twelve miles to the WNW of the property. Evidence seen to the northwest on the adjoining RAD claims indicates that the fault strikes 145° and dips approximately 57° SW. Lying to the southwest of the fault is a sequence of thin bedded slate and interbedded mudstone/dolomite units approximately 1,500 feet thick. The sequence is folded about a northeasterly striking synclinal fold axis. The eastern limb of the fold dips approximately 25° to the northwest and the western limb dips vertically.

The presence of the northernmost fault is inferred from the topography and the sudden change in lithology and bedding attitudes evident in the northern portion of the claims. No direct evidence indicating directions of relative movement was seen. Lying to the north of the fault is a large area of intensely deformed limonitic black slates.

Lying between the two faults is a thick sequence of sedimentary rocks including mudstones, siltstones, dolomites, argillite, quartzite, chert, and slates. The sequence is folded about a northeasterly trending synclinal fold axis. The northern limb of the fold strikes northwesterly and dips 23° to 38° to the northeast. Bedding in the southern limb

is overturned, striking northeasterly and dipping 64° to 81° to the northwest. This folded sedimentary sequence is intruded by a vertical quartz/calcite/dolomite vein swarm trending approximately 105° . Copper mineralization was seen associated with the vein swarm in two locations on the property.

6.8 Mineralization - BREAK Claims

The westernmost showings occur in interbedded grey quartzites and argillites in the BREAK 11 area. The quartzites are massive and thick bedded; and are alternately interbedded with thinly laminated, thin bedded argillites. The rock is heavily fractured at $105/90^{\circ}$ and is intruded by quartz/calcite/dolomite veins associated with chlorite and sericite alteration. Veins range in width from hairline to 6 inches and the entire vein swarm is 20' to 25' in width. Vein spacing averages approximately 6 inches to 1 foot. Chalcopyrite mineralization has occurred in the veins, in the vein walls, and as leakages into the surrounding host rocks. Malachite and azurite were noted on weathered outcrops.

The second showing occurs in the BREAK 28 area in a 10' to 15' thick light grey quartzite bed approximately 2,000' E of the west showing. The quartzite is heavily fractured by the vein swarm and shattering in some of the vein walls has led to the formation of 6 inch wide quartzite breccia bands. Breccia fragments range up to 1/2 inch in size. Chalcopyrite occurs in the veins, in the vein walls, and in the quartzite breccia matrixes.

Table 6.4.1 - Assays BREAK, 1976

<u>Sample #</u>	<u>% Cu</u>	<u>Description</u>
60581	0.90	Continuous rock chip sample across 5' of bedding. Sample taken in interbedded quartzite/argillite intruded by quartz/calcite/dolomite vein swarm. West showing.
50685	1.48	Random chip sample across 15' thick quartzite bed intruded by quartz/calcite/dolomite vein swarm. East showing.
50686	1.80	Continuous rock chip sample across top 7.5' of 15' thick quartzite bed intruded by vein swarm. Sample location: 30' north along strike from sample 50685 in East showing.
50687	1.22	Continuous rock chip sample across 7.5' of 15' thick quartzite bed intruded by vein swarm. Sample location: 30' north along strike from sample 50685 in East showing.

7.0 GEOCHEMISTRY

During the 1977 program, four water geochemistry samples were taken from streams draining the southern portion of the property. The samples were collected in numbered, acid cleansed plastic sample bottles. The samples were sent for analysis to Chemex Labs. Ltd. in North Vancouver, B.C. and upon receipt were analysed for uranium using standard flourometric procedures (see Appendix II for complete descriptions of procedures).

The four samples were first order and second order anomalous in uranium and indicated the need to further investigate the southern portions of the property.

In 1978, a total of two water samples, two silt samples, twelve soil samples, and one rock geochemistry sample were taken in a geochemical study of one of the anomalous drainages on the south end of the group. (See Figure 3). The results showed a second order anomalous high of 22 parts per million uranium in soil, a first order anomalous value of 5.5 parts per million uranium in silts and background levels of uranium in waters. The rock geochemistry sample also contained background levels of uranium. The remaining three anomalous drainages were not investigated.

8.0 DISCUSSION AND CONCLUSIONS

The 1977 and 1978 assessment programs on the RAD and BREAK claims have indicated the presence of anomalous (first and second order) amounts of uranium in stream waters, silts and soils in streams draining the south end of the property. Geologic mapping to date has confirmed that the property is underlain by favourable upper Unit A strata and that structures adequate for the mobilization and deposition of uranium exist within the claims boundary. It is felt that further work is needed to evaluate the RAD/BREAK claims.

9.0 RECOMMENDATIONS

1. Detailed geochemical sampling should be carried out in streams draining the south end of the property.
2. Detailed geologic mapping and assay sampling should be undertaken on all mineralized showings.

3. Geologic mapping at 1,000 feet = 1 inch should be completed for the entire property.

4. Contingent on the results of the foregoing recommendations, hand trenching should be done on any showings requiring such additional work.

Respectfully submitted,

R. Yorston - Geologist

David A. Yeager

D. Yeager - Geologist

C. K. Ikona - P.Eng.

C. K. Ikona

