# GEOLOGY AND GEOCHEMISTRY

# OF THE

# CLO CLAIMS



N.T.S.: 105F/9

Lat.: 60°40'N
Long.: 132°18'W

Claims: CLO 1-20

Watson Lake Mining District
Yukon Territory

090 628

by:
Eric James Sacks, M.Sc.

Work Completed July 30 and August 1, 1979 [illegible] examined by the Geolog[illegible] and is recommended to the [illegible] be considered as [illegible] the amount of

$ 5000

[signature]

[illegible] or

Resident [illegible] Engineer

Considered as [illegible] work under Section 53 (4) Yukon Quartz Mining Act.

B. R. BAXTER
Supervising Mining Recorder

[signature]

Commissioner of Yukon Territory

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## APPENDICES



## TABLE



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## SUMMARY

The CLO Claims are located at 132°18'W, 60°40'N within N.T.S. Sheet 105F/9, Yukon Territory, approximately 20 miles (32 km) southeast of Ross River. The claims were staked for Canadian Occidental Petroleum Ltd. on June 22, 1979, to cover a Geological Survey of Canada - Uranium Reconnaissance Program stream sediment lead-zinc-silver-barium anomaly released in Open File Report 564 on June 15, 1979. On July 30, 1979, Canadian Occidental Petroleum Ltd. conducted mapping and geochemistry surveys over the claims.

The CLO Claims are underlain by a complexly structured, Cambrian to Silurian, greenstone-dolomite assemblage which has been thrust over Mississippian siliceous volcanics and fragmental volcanics. The allochthon and autochthon were folded together about easterly trending axes in post-Mississippian time. The allochthon now occupies a synclinal structure adjacent to an anticline in the underlying autochthonous material.

Rock geochemistry reveals above normal copper, lead and silver contents within dolomitic volcanic breccia. These rocks act as the source for a strong, heavy mineral molybdenum-lead-zinc anomaly and weak lead-molybdenum anomaly in stream bed material derived from these rocks. Secondary dispersion is primarily mechanical in nature due to steep topography and high pH which inhibits solution and transport of base metals.

Potential mineralization is not obvious but may include copper-zinc sulphides in greenstone, lead-zinc-silver sulphide replacements and veins in dolomite and to a lesser extent, copper-molybdenum porphyry and/or stockwork vein mineralization in fractured volcanics.

## I. INTRODUCTION

The CLO Claims were staked on June 22, 1979, to cover a G.S.C.-U.R.P. stream sediment Pb-Zn-Ag-Ba anomaly released as part of O.F.R. 564. On July 30, 1979, CanadianOxy conducted preliminary geology-prospecting-geochemistry surveys over the claims. This report presents the results of that survey.

## II. LOCATION AND ACCESS

The CLO Claim Group is located at 132°18'W, 61°40'N within NTS map sheet 105F/9. The claim group comprises 20 individual claims covering an area of approximately 1.6 $mi.^2$ (4.1 $km^2$) and lies within the Watson Lake Mining District, Yukon Territory. (Figure 1, 2)

The claim group lies along the west side of Cloutier Creek, approximately 20 mi. (32 km) S-SW of the town of Ross River and 10 mi. (16 km) due south of the Robert Campbell Highway. Access to the claims is via helicopter, approximately 15 minutes from Ross River. A dirt road runs south from the Robert Campbell Highway along the Ketza River to within 2 mi. (3.2 km) east of the claim group.

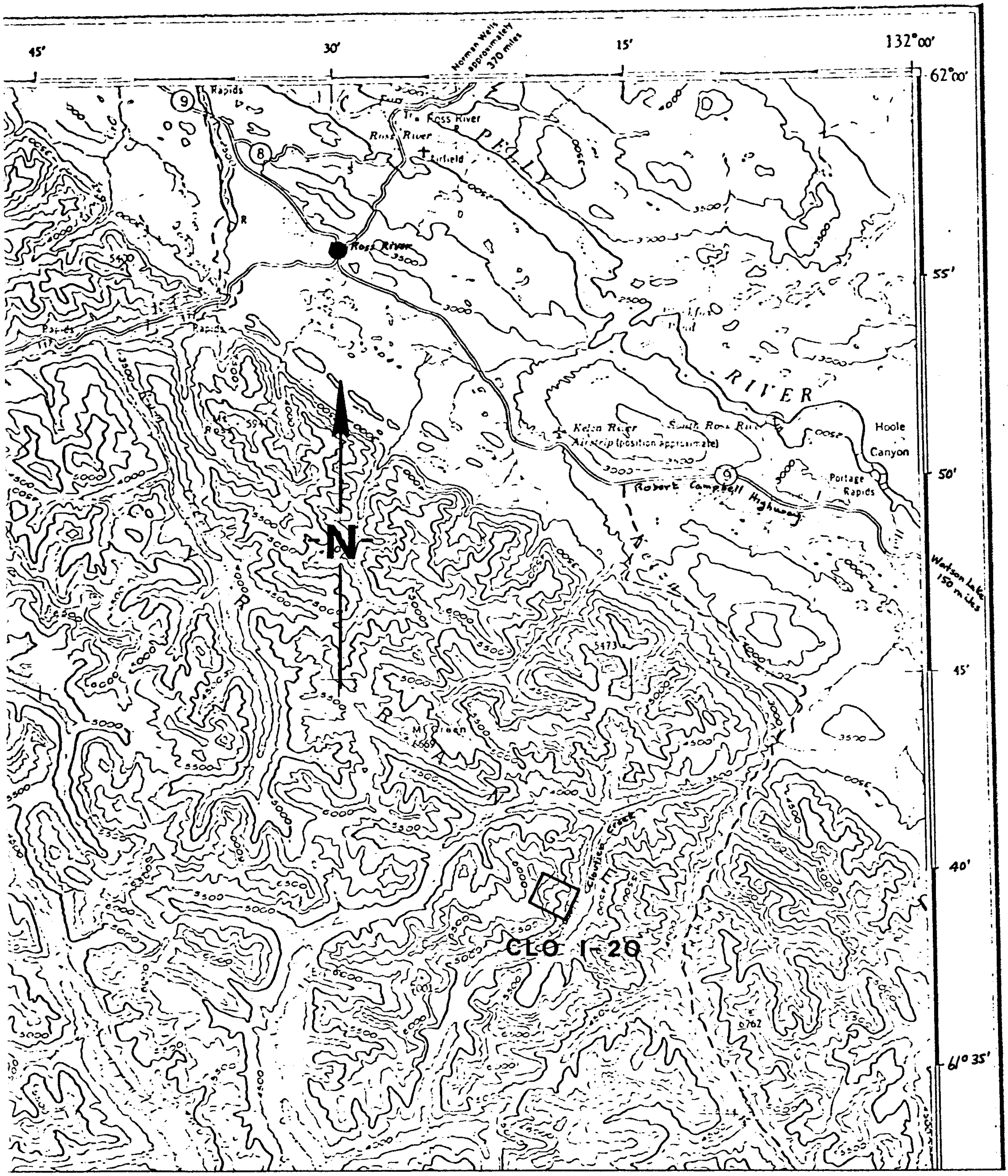
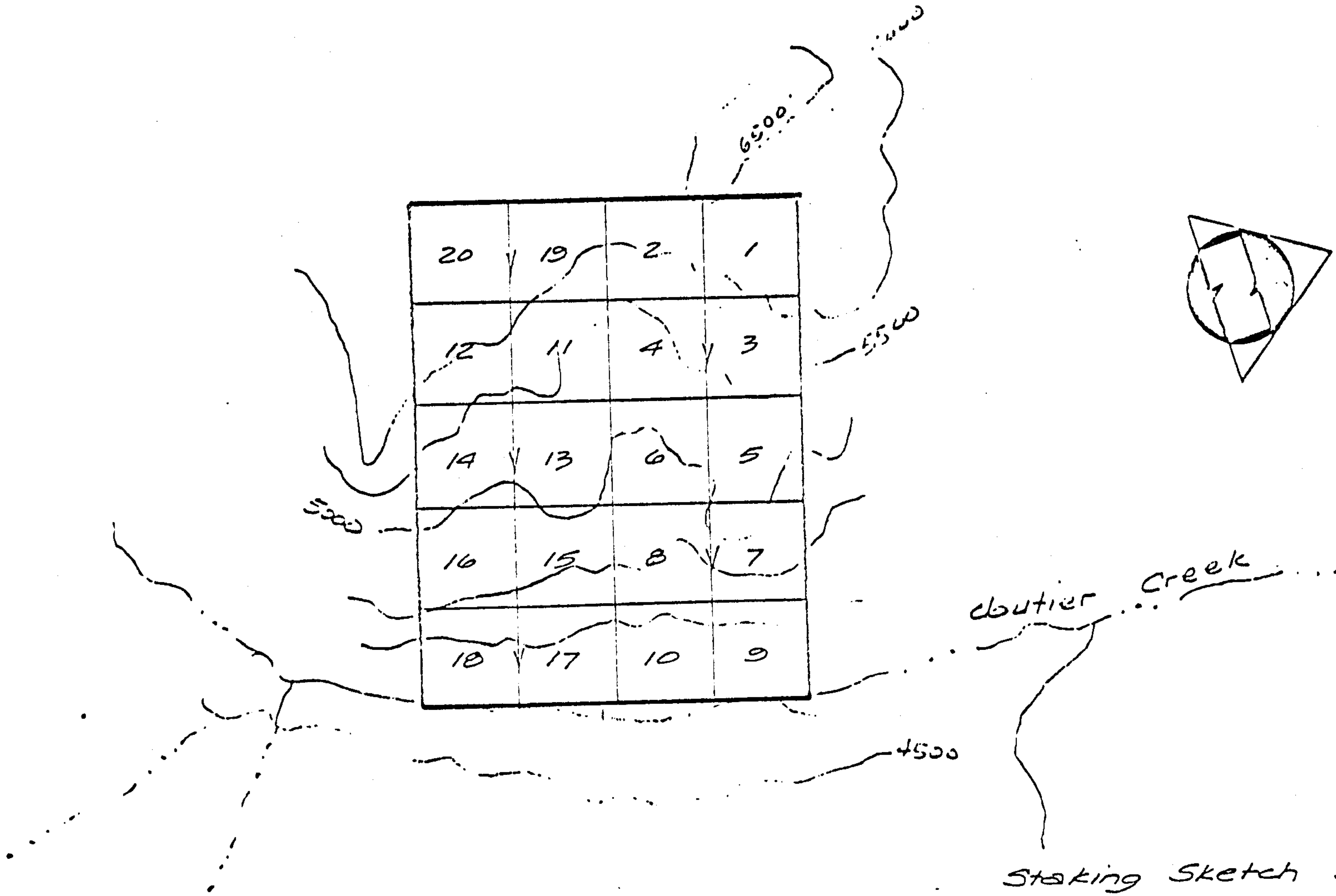



Figure 1

Location and Access of CLO 1-20 Claims

Scale: 1:250,000




Staking Sketch Showing

CLO 1-20

MINERAL CLAIMS

Watson Lake Mining District

Map Sheet 105 F/9

Figure 2

## III. PHYSIOGRAPHY AND VEGETATION

Relief over the CLO Claims is 2500 ft. (760 m) between elevations of 6300 ft. and 3800 ft. (1920 m and 1158 m) above sea level. The topography is extremely rugged. A NE-SW trending rocky ridge crosses the extreme western part of the claim group and drops off into steep talus covered cirques which run to the east down to Cloutier Creek.

The entire claim group lies above the treeline, however, the lower parts of the claims below 5000 ft. are covered with very thick buckbrush which makes walking quite difficult.

## IV. PREVIOUS WORK

No evidence of previous work was found. The entire Quiet Lake map sheet was geologically mapped by numerous G.S.C. geologists between 1956 and 1977. Numerous mineral occurrences have been located in the vicinity.

In 1978 the G.S.C. conducted stream sediment and water sampling as part of the U.R.P. coverage of the southern Yukon. Data was released as O.F.R. 564 on June 15th, 1979 and the CLO Claims were staked to cover the headwaters of a stream sediment Pb-Zn-Ag-Ba anomaly (2.1% Ba, 225 ppm Pb, 610 ppm Zn and 0.6 ppm Ag).

## V. WORK COMPLETED - 1979

### 5.1 Staking

The CLO Claims were staked on June 22nd, 1979 by MBW Surveys of Whitehorse, Yukon Territory, for Canadian Oxy. A total of 20 individual claims were staked.

## 5.2 Geological Mapping

Sacks and Hooper conducted semi-reconnaissance mapping and prospecting over the CLO Claims on July 30th, 1979. Sacks, Wallis and Hooper visited the CLO Claims on August 1st, 1979. (see Appendix IV.). A total of 2.9 man days of work were performed.

## 5.3 Geochemistry

A total of 1 heavy mineral, 8 rock, 9 stream sediment, 9 stream water and 2 soil samples was collected over the CLO Claims by Jermakowicz of Canadian Oxy on July 30th, 1979. All samples were sent to Chemex Labs Ltd. in Vancouver B.C. for geochemical analysis. Analytical results are presented in Appendix I. A total of 1 man-day of work was performed.

## 5.4 Summary of Work Completed

| Type of Work | Man Days | No. Samples | Cu | Mo | Pb | Zn | Ag | U | Th | Sn | W | F | As | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Geological mapping | 2.9 | | | | | | | | | | | | | |
| Geochemistry | 1.0 | | | | | | | | | | | | | |
| i) Rock | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | - | - | 72 |
| ii) Heavy Min. | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - | - | 9 |
| iii) Sediment | | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | - | - | - | - | 63 |
| iv) Water | | 9 | - | - | - | - | - | 9 | - | - | - | 9 | 9 | 27 |
| v) Soil | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | 14 |
| Helicopter | 3.6 Hrs. | | | | | | | | | | | | | |
| TOTAL: | 3.9 | 29 | | | | | | | | | | | | 185 |

### 5.5 Names and Addresses of Personnel

| | |
|---|---|
| Dr. R.H. Wallis<br>Canadian Occidental Petroleum Ltd.<br>Minerals Division<br>311-215 Carlingview Drive<br>Rexdale, Ontario<br>M9W 5X8 | Chief Geologist |
| E.J. Sacks, M.Sc.<br>Same address as above | Project Geologist |
| J. Hooper<br>Same Address as above | Senior Assistant |
| E. Jermakowicz<br>Same address as above | Junior Assistant |
| C. Pelletier<br>Same address as above | Junior Assistant |
| B. Zayachivsky<br>Same address as above | Junior Assistant |
| Dr. C.F. Gleeson<br>C.F. Gleeson and Associates<br>764 Belfast Road<br>Ottawa, Ontario | Consulting Geochemist |

## VI. GEOLOGY

### 6.1 General Geology

Mapping by G.S.C. geologists (Tempelman-Kluit, 1977, Wheeler, et al, 1960) and CanadianOxy personnel shows the CLO Claims to be underlain by a highly complex stratigraphic assemblage. Upper Cambrian and Ordovician chlorite-muscovite phyllite and greenstone is overlain by Silurian and Devonian dolomite and dolomitic sandstone. This entire assemblage has been thrust from the southwest over Mississippian lapilli tuff, breccia and flow rock which is often highly pyritic. The entire sequence has been folded about east-west trending axes. The allocthonous rocks now occupy a synclinal structure adjacent to an anticlinal structure in the underlying autochthonous volcanics (see Plan 1, 1a). CanadianOxy mapping has supported the interpretation of Tempelman-Kluit (1977) above, however, has shifted contacts and fault traces somewhat to the north.

6.2 Table of Formations (Plan 1)

| Units | Description |
|---|---|
| 3 | Rhyolite, lapilli tuff; pyritic |
| 2 | Dolomite, dolomitic breccia, dolomitic sandstone |
| 1 | Schistose volcanics, greenstone |

6.3 Description of Rock Units (Plan 1)

Descriptions of individual rock samples are presented in Appendix II and their locations may be found by referring to Plan 3. All units consist of highly variable rock-types and all rock samples (Appendix II) are currently undergoing thin section examination.

Unit 1 - Schistose volcanics, greenstone

This unit comprises schistose, fissile siliceous volcanic rock (ES-CLO-3). Augen texture is developed in which the volcanic material is fragmented and the fragments stretched into teardrop shapes aligned parallel to schistosity and surrounded by thin filaments of chlorite and manganite. Abundant limonite boxworks are disseminated in the unit and do not appear to be confined either to shear planes or to volcanic fragments. It is possible that this material is a sheared equivalent of Unit 3 (rhyolite, lapilli tuff) in the plane of the thrust. A scintollometer response of 400 cps (BGS-4) was noted.

Unit 2 - Dolomite, dolomitic breccia, dolomitic sandstone

This is a very complex unit comprising massive dolomite, dolomitic breccia in which volcanic fragmerts and detrital quartz are cemented by dolomite (ES-CLO-4,5,6A) and areas of intercalated flow rock. The unit weathers to an orange colour which may be mistaken for gossan. It appears that explosive volcanism was ongoing in the vicinity of carbonate deposition and contributed fragments to be cemented by the still unlithified carbonate. At the same time detrital material entered the system (note rounded quartz grains in ES-CLO-4) and slumping within the dolomite may have further contributed to brecciation. A scintillometer response of 175 cps was noted.

Unit 3 - Rhyolite, lapilli tuff; pyritic

This unit comprises light green, highly siliceous volcanics. Most rocks contain small (1-2 mm) welded lapilli which are most visible on weathered surfaces.

Pyrite is abundant, either as disseminated cubic crystals (ES-CLO-1A) or as fine, anhedral grains in quartz-filled, stockwork of fractures. Bright orange gossan consisting of limonite and goethite, these reflect the pervasive pyrite content. In most cases the lapilli appear to be stretched and lineated and occasionally the entire rock appears to be brecciated. A scintillometer response of 400 to 500 cps was noted.

6.4 Structure (Plan 1,la)

The structural interpretation presented in Plan 1 and la is modified from the work of Tempelman-Kluit (1977) and confirmed by CanadianOxy mapping. Units 1 and 2 have been interpreted as being older than Unit 3 by previous mapping and Units 1 and 2 overlie Unit 3, hence thrusting has occurred. The actual thrust plane has not been identified but may be illustrated by the schistose volcanics which appear to be equivalent to the lapilli tuff and rhyolite (Unit 3). Thrusting is of post-Mississippian age.

An east-west trending anticlinal structure crosses the south-central portion of the claims. Tempelman-Kluit has interpreted an E-W trending synclinal structure to the north of the claims which is occupied by the allochthonous Units 1 and 2. If this interpretation is correct, folding post-dates thrusting (see Plan la).

Fractures can be resolved into sets at 00T-010T/ $20^{\circ}$W to $90^{\circ}$ and 160T/$60^{\circ}$SW to $90^{\circ}$. Shearing at 110T in the schistose volcanics may define the thrust plane.

6.5 Metamorphism

Cataclastic metamorphism probably related to thrusting has resulted in alignment of lapilli in the volcanic unit (Unit 3) and augen development within the schistose volcanics (ES-CLO-3).

Tempelman-Kluit (1977) shows Upper Cambrian to Ordovician greenstone and rhyolite (Unit 2) forming the base of the thrust sheet, thus a period of greenschist facies regional metamorphism would have preceded thrusting and would represent the last regional metamorphic event. At this time it is uncertain whether the schistose volcanics (ES-CLO-3) are sheared equivalents of authochthonous Mississippian volcanics or Cambro-Ordovician greenstones which have been further cataclastically deformed during thrusting.

### 6.6 Alteration

Surficial weathering appears to be the only alteration. Limonite boxworks after pyrite are common.

### 6.7 Economic Geology

With the exception of pyrite occurring as disseminated crystals or accompanying quartz fracture fillings, no mineralization was seen.

Possibilities for potential mineralization on the CLO Claims include Cu-Zn-Ag sulphide mineralization in greenstones (Tempelman-Kluit, pers.comm.), Pb-Zn-Ag sulphide replacement bodies in dolomite and to a much lesser extent Cu-Mo porphyry or vein mineralization in fractured siliceous volcanics (note quartz-pyrite stockworks).

## VII Geochemistry

The originally anomalous G.S.C. sample site is located at the base of the stream draining the centre of the CLO Claims. This stream was resampled for stream sediments, water and a heavy mineral sample. Rock samples from the ridge drained by this stream have been geochemically analysed. Soils were collected from talus fines at the base of the ridge (Plan 4).

Mean, possibly anomalous and probably anomalous levels for each element in sediments, waters and heavy minerals were determined at the 50th, 84th and 97th percentiles of cumulative frequency distributions constructed from the Project WATSU regional follow-up data. In the case of soils the combined data from all Project WATSU claim group surveys were used. These data levels are presented in Table 1. All analytical data are listed in Appendix I. Sampling and laboratory procedures are presented in Appendix III.

7.1 Rock Geochemistry (Plan 2,3)

A total of 8 rock samples were collected and analysed for Cu, Mo, Pb, Zn, Ag, U, Th, Sn and W.

1. 98 ppm Cu occurs in one sample of dolomitic breccia (ES-CLO-4). This is approximately 2 times the Cu content for this type of rock (Levinson, 1974).

2. 120 ppm Pb and 2 ppm Ag occur in a second sample of dolomitic breccia (ES-CLO-5). This represents up to 5 times normal Pb and 10 to 20 times normal Ag contents of this type of rock.

7.2 Heavy Mineral Geochemistry (Plan 4,5,6)

One heavy mineral sample was collected at the break in slope at the base of the main ridge and analysed for Cu, Mo, Pb, Zn, Ag, U, Th, Sn and W.. 64 ppm Cu, 16 ppm Mo, 300 ppm Pb, 312 ppm Zn and 0.4 ppm Ag occur in the sample. The Mo and Pb values are particularly anomalous.

## TABLE 1

### Mean, Possibly Anomalous and Probably Anomalous Levels - Soils, Sediments, Waters, Heavies.

Note: levels chosen from cumulative frequency curves at 50th, 84th and 97th percentiles, respectively.

A. Heavy Minerals

| | ppm Cu | ppm Pb | ppm Zn | ppm Ag | ppm Mo | ppb Au | ppm Sn | ppm W | ppm U | ppm Th |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 24 | 17 | 75 | .05 | 1.5 | <10 | 2.3 | 15 | 3.8 | 44 |
| Poss. Anom. | 63 | 89 | 200 | .38 | 3.5 | 19 | 38 | 60 | 26 | 330 |
| Prob. Anom. | 165 | 280 | 440 | .95 | 8.5 | 3150 | 300 | 160 | 120 | 1200 |

B. Stream Sediments

| | ppm Cu | ppm Pb | ppm Zn | ppm Ag | ppm Mo | ppm Sn | ppm W | ppm U | ppm Th |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 11 | 5 | 58 | <.1 | <1 | <1 | <1 | 2.5 | 13 |
| Poss. Anom. | 28 | 21 | 115 | <.1 | 3 | 2 | 5 | 17 | 29 |
| Prob. Anom. | 54 | 59 | 320 | 1 | 11 | 5 | 16 | 38 | 50 |

C. Soils

| | ppm Cu | ppm Pb | ppm Zn | ppm Ag | ppm Mo | ppm Sn | ppm W | ppm U | ppm Th |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 8 | 8 | 48 | <.1 | <1 | <1 | <1 | 2 | 14 |
| Poss. Anom. | 22 | 32 | 115 | .1 | 2.5 | 1 | 7.5 | 7 | 36 |
| Prob. Anom. | 120 | 150 | 270 | .8 | 5 | 2 | 40 | 30 | 75 |

D. Stream Waters

| | ppb U | ppb F | m.mhos/cm S.C. |
|---|---|---|---|
| Mean | .25 | 19 | 18 |
| Poss. Anom. | .85 | 100 | 46 |
| Prob. Anom. | 2.5 | 210 | 100 |

7.3 Stream Sediment Geochemistry (Plan 4,7,8)

Stream sediment samples were collected at 500 ft. (150 m) intervals over the entire length of the originally anomalous stream. Sample site number 79-WT-1533 approximately duplicates the originally anomalous G.S.C. sample. All samples were analysed for Cu, Mo, Pb, Zn, Ag, U and Th.

1. 2 to 5 ppm Mo occurs over a length of 3000 ft. down to Cloutier Creek. These are weakly anomalous values. 22 to 32 ppm Pb accompanies the Mo contents over the lower 1200 ft. of the stream, and are also weakly anomalous.

2. The G.S.C. sample contained 225 ppm Pb, 6100 ppm Zn and 0.6 ppm Ag. Sample 79-WT-1533 which duplicates the G.S.C. site contains only 22 ppm Pb, 82 ppm Zn and 0.2 ppm Ag, thus does not replicate the G.S.C. anomaly although the Pb and the contents are weakly anomalous.

3. The sediment collected at the heavy mineral site did not contain even weakly anomalous Cu, Mo, Pb, Zn or Ag as did the heavy mineral, hence dispersion is primarily mechanical with high pH in the stream (8.4-8.5) inhibiting movement of the base metals in solution. Why the G.S.C. site exhibited base metal anomalies is an open question.

7.4 Stream Water Geochemistry (Plan 4,9)

Water samples were collected at each sediment site and analysed in the field for pH and specific conductivity (S.C.) and in the laboratory for U, F and As.

1. Weakly anomalous U (0.6 to 1.2 ppb) accompanies anomalous S.C. (200-250 m.mohs/cm) over the entire stream,

but there is no obvious source for U in the rocks ( 0.5 to 1.0 ppm U).

2. pH over the entire stream is high (8.3 to 8.5) reflecting the dolomite being drained.

7.5 Soil Geochemistry (Plan 4,10,11)

Two duplicate soil samples were collected from talus fines at the base of the ridge and define the source for stream waters and sediments. Samples were analysed for Cu, Mo, Pb, Zn, Ag, U and Th.

1. There is excellent duplication of values for all elements.

2. The soils contain only weakly anomalous Mo (3 ppm). They do not seem to define the source of anomalous Pb in sediments but do define the source for anomalous Mo in sediments.

## VIII CONCLUSIONS

1. The CLO Claims are underlain by a complexly structured Cambrian to Silurian greenstone-dolomite assemblage thrusted over Mississippian siliceous volcanics and fragmental volcanics. The entire assemblage, including both the autochthon and allochthon has been folded in post-Mississippian times about east-west axes, resulting in a syncline which is

occupied by the allochthon adjacent to an anticline in the underlying volcanics.

2. No mineralization was seen, however, the autochthonous volcanics are highly pyritic and are overlain by extensive gossans.

3. A heavy mineral sample draining the main ridge is highly anomalous in Mo and Pb and less anomalous in Cu, Zn and Ag. Accompanying stream sediments are only weakly anomalous in Mo and Pb. Soils from talus fines which define the source for stream bed material are very weakly anomalous in Mo only. It appears that secondary dispersion on the CLO Claims is primarily mechanical due to the extreme topography and the high pH in waters draining the dolomite which inhibit solution and transport of the base metals. This does not explain, however, why duplication of the original anomalous G.S.C. stream sediment site did not replicate high Pb, and Ag values. Above normal Pb, Cu and Ag contents in dolomitic breccia appear to be the sources for the geochemical anomalies.

4. Potential mineralization on the CLO Claims is not obvious but may include Cu-Zn sulphide mineralization in greenstones, Pb-Zn-Ag sulphide replacements and veins in the dolomites and to a lesser extent, Cu-Mo porphyry or stockwork vein mineralization in fractured siliceous volcanics.

## IX RECOMMENDATIONS

1. Systematic geological mapping and prospecting at a scale of 1" - 400' using airphoto blowups. Due to topography,

the establishment of picket lines will be difficult.

2. Systematic soil sampling along E-W traverses downslope from the main ridge. A N-NE trending baseline could be established along the ridge (western claim boundary) and airphotos used as guides for traversing.

3. If possible the exact G.S.C. site should be located and retested with sediment, water and heavy mineral samples. It is possible that, due to plotting error on the G.S.C. O.F.R. 564 data maps, the anomalous G.S.C. site may in fact lie in Cloutier Creek. If so, it must be determined whether the site is up or downstream from the junction with the stream draining the CLO Claims.

4. Extensive gossan was noted immediately to the south and west of the CLO Claims. This area should be prospected and sampled. Tempelman-Kluit (1977) reports the presence of black shales in this area (potential sulphide mineralization).

Respectfully submitted,

Eric James Sacks

Eric James Sacks, M.Sc.

Toronto, Ontario

December, 1979

# APPENDIX I

## ANALYTICAL RESULTS

# CHEMEX LABS LTD.

212 BROOKSBANK AVE.
NORTH VANCOUVER, B.C.
CANADA V7J 2C1
TELEPHONE: [redacted] 984-0221
AREA CODE: 604
TELEX: 043-52597

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

## CERTIFICATE OF ANALYSIS

CERTIFICATE NO. 49361
INVOICE NO. 31943
Th-32440
RECEIVED Aug. 3/79
ANALYSED Aug. 16/79

TO: Canadian Occidental Petroleum Ltd.,
Minerals Division,
Ste. 311 - 215 Carlingview Dr.,
Rexdale, Ont.

ATTN: WATSU-Rock CC. E. Sacks

| SAMPLE NO. : | PPM Cu | PPM Mo | PPM Pb | PPM Zn | PPM Ag | PPM U | PPM Th | PPM Sn | PPM W |
|---|---|---|---|---|---|---|---|---|---|
| JH-OXY-1 | 52 | 1 | 1 | 16 | 0.2 | 1.0 | < 1 | 1 | 1 |
| 2 | 8 | 2 | 4 | 22 | 0.2 | 1.0 | < 1 | 1 | 1 |
| 3 | 6 | 1 | 1 | 52 | 0.4 | < 0.5 | < 1 | 1 | 3 |
| 4 | 2 | 1 | 2 | 16 | 0.1 | < 0.5 | < 1 | 1 | 1 |
| 5 | 46 | 2 | 2 | 28 | 0.1 | 23.0 | 6 | 1 | 1 |
| 6 | 4 | 1 | 4 | 40 | 0.1 | 4.5 | 51 | 3 | 1 |
| 7 | 26 | 1 | 4 | 62 | 0.1 | 6.5 | 6 | 1 | 3 |
| 8 | 8 | 1 | 10 | 10 | 0.1 | 14.0 | 39 | 1 | 3 |
| 9 | 62 | 1 | 2 | 28 | 0.1 | < 0.5 | 3 | 1 | 1 |
| 9a | 28 | 1 | 4 | 52 | 0.1 | < 0.5 | 4 | 2 | 1 |
| JH-OXY-10 | 8 | 1 | 16 | 40 | 0.1 | 9.0 | 40 | 1 | 1 |
| ES-CLO-1a | 4 | 2 | 4 | 8 | 0.1 | < 0.5 | 31 | 1 | 1 |
| 1b | 4 | 3 | 12 | 8 | 0.1 | 0.5 | 30 | 1 | 1 |
| 2 | 12 | 1 | 16 | 4 | 0.1 | < 0.5 | 21 | 1 | 1 |
| 3 | 10 | 2 | 10 | 8 | 0.4 | 1.0 | 35 | 1 | 1 |
| 4 | 98 | 2 | 2 | 50 | 0.2 | 0.5 | 4 | 1 | 1 |
| 5 | 16 | 1 | 120 | 8 | 2.0 | 1.0 | 14 | 1 | 1 |
| 6a | 52 | 1 | 4 | 22 | 0.1 | 0.5 | 2 | 1 | 1 |
| ES-CLO-6b | 8 | 1 | 2 | 50 | 0.1 | 0.5 | 5 | 1 | 1 |
| JH-Tier-1 | 2 | 3 | 16 | 2 | 0.2 | 0.5 | 16 | 1 | 2 |
| 2 | 102 | 1 | 4 | 88 | 0.1 | 0.5 | 4 | 1 | 1 |
| 3 | 82 | 2 | 2 | 46 | 0.2 | 1.0 | 4 | 1 | 1 |
| 4 | 6 | 2 | 10 | 74 | 0.2 | 6.5 | 77 | 1 | 4 |
| 5 | 4 | 2 | 14 | 8 | 0.1 | 1.5 | 35 | 1 | 2 |
| 6a | 6 | 2 | 26 | 14 | 0.4 | 0.5 | 11 | 1 | 2 |
| 6b | 4 | 1 | 2 | 24 | 0.1 | 1.5 | 2 | 1 | 1 |
| 7 | 2 | 1 | 1 | 6 | 0.1 | 1.5 | < 1 | 1 | 1 |
| 8 | 4 | 1 | 8 | 6 | 0.2 | 0.5 | 4 | 1 | 1 |
| 9 | 40 | 1 | 10 | 50 | 1.0 | 0.5 | 6 | 1 | 1 |
| 10 | 4 | 1 | 2 | 2 | 0.2 | < 0.5 | 2 | 1 | 1 |
| JH-Tier-11 | 4 | 4 | 48 | 6 | 1.2 | 1.5 | 9 | 1 | 1 |
| JH-Bigox-1 | 6 | 1 | 2 | 60 | 0.2 | 2.0 | 21 | 1 | 1 |
| 2 | 4 | 1 | 1 | 90 | 0.1 | 1.5 | 19 | 1 | 1 |
| 3 | 2 | 1 | 8 | 28 | 0.2 | 3.5 | 54 | 2 | 200 |
| 4 | 2 | 1 | 4 | 28 | 0.2 | 7.5 | 38 | 2 | 2 |
| 5 | 2 | 1 | 6 | 14 | 0.1 | 10.0 | 30 | 1 | 1 |
| JH-Bigox-6 | Missing | - | next page | | - | - | < 1 | - | - |
| Bigox-1 | 4 | 1 | 4 | 20 | 0.1 | 1.5 | 33 | 1 | 8 |
| 2a | 2 | 1 | 8 | 10 | 0.1 | 9.0 | 39 | 1 | 20 |
| ES-Bigox-2b | 6 | 2 | 14 | 22 | 0.6 | 25.5 | 40 | 1 | 20 |

MEMBER CANADIAN TESTING ASSOCIATION

CERTIFIED BY: Hart Bichler

# CHEMEX LABS LTD.

212 BROOKSBANK AVE.
NORTH VANCOUVER, B.C.
CANADA V7J 2C1
TELEPHONE: [redacted] 984-0221
AREA CODE: 604
TELEX: 043-52597

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## CERTIFICATE OF ANALYSIS

CERTIFICATE NO. 49351
INVOICE NO. 32463
RECEIVED Aug. 3/79
ANALYSED Sept. 7/79

TO: Canadian Occidental Petroleum Ltd.,
Minerals Division,
Ste. 311 - 215 Carlingview Dr.,
Rexdale, Ont.

ATTN: WATSU-CLO-Heavy Minerals E. Sacks

| SAMPLE NO. : | PPM Cu | PPM Mo | PPM Pb | PPM Zn | PPM Ag | PPM Sn | PPM W | PPM U | PPM Th |
|---|---|---|---|---|---|---|---|---|---|
| 79 WT 1527 | 64 | 16 | 300 | 312 | 0.4 | 1 | 1 | 8.0 | N.S.S |

| | Total | -10 fraction | -10 magnetic | -10 Non mag. |
|---|---|---|---|---|
| 79 WT 1527 | 891 | 564 | 0.02 | 1.85 |

CTA MEMBER CANADIAN TESTING ASSOCIATION

CERTIFIED BY: Hart Bichle

212 BROOKSBANK AVE.
NORTH VANCOUVER, B.C.
CANADA V7J 2C1
TELEPHONE: [redacted] 984-0221
AREA CODE: 604
TELEX: 043-52597

# CHEMEX LABS LTD.

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## CERTIFICATE OF ANALYSIS

CERTIFICATE NO. 49344

TO: Canadian Occidental Petroleum Ltd.,
Minerals Division,
Ste. 311 - 215 Carlingview Dr.,
Rexdale, Ont.

INVOICE NO. 31920

Th-32448

RECEIVED Aug. 3/79

ANALYSED Aug. 16/79

ATTN: WATSU-CLO-Stream Silts CC. E. Sacks

| SAMPLE NO. : | PPM Cu | PPM Mo | PPM Pb | PPM Zn | PPM Ag | PPM U | PPM Th |
|---|---|---|---|---|---|---|---|
| 79 WT 1523 | 20 | 2 | 6 | 62 | 0.1 | 3.0 | 5 |
| 1526 | 14 | 2 | 10 | 42 | 0.1 | 3.0 | 5 |
| 1527 | 16 | 2 | 8 | 52 | 0.1 | 0.5 | 5 |
| 1528 | 14 | 1 | 8 | 46 | 0.1 | 1.0 | 5 |
| 1529 | 26 | 5 | 18 | 66 | 0.2 | 0.5 | 19 |
| 1530 | 24 | 4 | 20 | 66 | 0.1 | 1.0 | 23 |
| 1531 | 16 | 2 | 8 | 44 | 0.1 | < 0.5 | 5 |
| 1532 | 28 | 4 | 32 | 90 | 0.1 | 2.0 | 21 |
| 79 WT 1533 | 26 | 4 | 22 | 82 | 0.2 | 1.5 | 22 |



CERTIFIED BY: ....................

212 BROOKSBANK AVE.
NORTH VANCOUVER, B.C.
CANADA V7J 2C1
TELEPHONE: [redacted] 984-0221
AREA CODE: 604
TELEX: 043-52597

# CHEMEX LABS LTD.

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

## CERTIFICATE OF ANALYSIS

CERTIFICATE NO. 49354
INVOICE NO. 31746
RECEIVED August 3, 1979
ANALYSED August 10, 1979

TO: Canadian Occidental Petroleum Ltd.,
Minerals Division
311 - 215 Carlingview Dr.,
Rexdale, Ont.
ATTN: M9W 5X8

WATSU - CLO - WATERS
c.c. Penticton

| SAMPLE NO. : | PPB U | PPB F | PPB As |
|---|---|---|---|
| 79 WT 1523 | 0.6 | 20 | <2 |
| 1526 | 0.6 | 20 | <2 |
| 1527 | 0.8 | 20 | <2 |
| 1528 | 0.8 | 40 | <2 |
| 1529 | 1.0 | 50 | <2 |
| 1530 | 1.0 | 70 | <2 |
| 1531 | 1.0 | 70 | <2 |
| 1532 | 1.0 | 70 | <2 |
| 79 WT 1533 | 1.2 | 65 | <2 |

CTA
MEMBER
CANADIAN TESTING
ASSOCIATION

CERTIFIED BY: ............

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212 BROOKSBANK AVE
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TELEPHONE: [redacted] 984-0221
AREA CODE: 604
TELEX: 043-52597

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## CERTIFICATE OF ANALYSIS

CERTIFICATE NO. 49326
INVOICE NO. 31828
Th-32440
RECEIVED Aug. 3/79
ANALYSED Aug. 13/79

TO: Canadian Occidental Petroleum Ltd.,
Minerals Division,
Ste. 311 - 215 Carlingview Dr.,
Rexdale, Ont.

ATTN: WATSU-CLO-Soils CC. E. Sacks

| SAMPLE NO. : | PPM Cu | PPM Mo | PPM Pb | PPM Zn | PPM Ag | PPM U | PPM Th |
|---|---|---|---|---|---|---|---|
| 79 WT 1524 | 10 | 3 | 30 | 20 | 0.1 | 0.5 | 3 |
| 79 WT 1525 | 10 | 3 | 30 | 24 | 0.1 | 0.5 | 1 |

CTA MEMBER CANADIAN TESTING ASSOCIATION

CERTIFIED BY: ..........

# APPENDIX II

## Rock Descriptions and Trace Element Contents

| Sample No. (Scint.cps BGS-4) | Name | Description | Cu | Mo | Pb | Zn | Ag | U | Th | Sn | W |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Analyses (ppm) | | | | | | | | |
| ES-CLO-1A (400-500) | Pyritic siliceous volcanic (lapilli tuff?) | Aphanitc, slightly lineated, light green; disseminated pyrite cubes up to 1/8" in size (2-3%) - surface weathering reveals lapilli which are lineated | 4 | 2 | 4 | 8 | .1 | <.5 | 31 | 1 | 1 |
| 1B (-) | Siliceous volcanic (lapilli tuff?) | Aphanitic, lineated, light green; appears to consist of welded quartz-feldspar fragments which have been stretched to form a lineation; GOSSAN coating fractures (limonite, geothite) | 4 | 3 | 12 | 8 | .1 | .5 | 30 | 1 | 1 |
| -2 (500) | Rhyolite (lapilli tuff?) | Aphanitic, light green; quartz-pyrite stockwork fractures (limonite boxworks after pyrite); possible more siliceous rounded fragments slightly stained by lt. | 12 | 1 | 16 | 4 | .1 | <.5 | 21 | 1 | 1 |
| -3 (400) | Schistose felsic volcanic | Thinly foliated, crenulation of foliation, abundant lt boxworks after pyrite, ht, manganite fracture coatings. | 10 | 2 | 10 | 8 | .4 | 1 | 35 | 1 | 1 |
| -4 (175) | Fragmental volcanic in dolomite cement; some detrital component | Rounded quartz grains and black volcanic? frags in dolomite-limonite cement; well developed penetrative cleavage iwth black frags aligned; dolomite precipitate on fracture surfaces. | 98 | 2 | 2 | 50 | .2 | .5 | 4 | 1 | 1 |

APPENDIX II

Rock Descriptions and Trace Element Contents

| Sample No. (Scint.cps BGS-4) | Name | Description | Analyses (ppm) Cu | Mo | Pb | Zn | Ag | U | Th | Sn | W |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ES-CLO-5 (-) | Siliceous volcanic fragments in dolomite | Rounded and semi-rounded fragments of siliceous volcanic rock in orange-green, spongy textured dolomite matrix; streaks of highly limonitic dolomite | 16 | 1 | 120 | 8 | 2 | 1 | 14 | 1 | 1 |
| 6A (-) | Dolomite breccia | Chert and volcanic frags. up to 1" and angular in orange weathering dolomite matrix. | 52 | 1 | 4 | 22 | .1 | .5 | 2 | 1 | 1 |
| 6B (-) | Fragmental schistose siliceous volcanic | Very hard, stretched siliceous fragments in fine-grained, somewhat softer matrix (c.b. chert); quartz and dolomite filled gashes slightly stained by limonite | 8 | 1 | 2 | 50 | .1 | .5 | 5 | 1 | 1 |

Specimen No. - ES-CLO-1A

Rock name - sericitised and carbonatised trachytic lava

Mineralogy - carbonate ) very abundant
sericite )
acid feldspar )
quartz - moderately common
iron oxides (leucoxene and limonite) - small amounts
pyrite - trace

Description - This rock is a pervasively altered acid volcanic rock, with a well developed trachytic texture. It is non-porphyritic. It consists predominantly of finely disseminated, and intermingled, secondary carbonate and sericite through which can be discerned the remnants of feldspathic laths. Small, interstitial, patches of quartz occur in relatively small proportions (probably less than 10% of the rock). There is also a little finely scattered leucoxene and limonite, and one or two relatively large crystals of pyrite.

Despite the alteration, the remnants of the original trachytic texture can be clearly distinguished. The original rock appears to have consisted essentially of felted masses of plagioclase laths averaging about 0.5 - 1.0 mm in length. These are now shadowily visible through the covering of very finely disseminated sericite and carbonate. Carbonate is somewhat in excess of sericite. Quartz occurs in tiny anhedra, and patches of anhedra, which occur interstitially to the plagioclase laths. Some of the free quartz may have been produced during the alteration of the rock. No ferromagnesian minerals, or pseudomorphs, were identified in this rock. Leucoxene and limonite occur in small amounts, as scattered irregularily shaped, and often diffuse, patches interstitial to the feldspathic laths. The only other mineral identified was pyrite, which forms occasional, relatively large, euhedral crystals. Sericite and carbonate make up around 50-60% of this rock at the present state of alteration.

Specimen No. - ES-CLO-1B

Rock name - pervasively sericitised trachytic lava

Mineralogy - sericite - extremely abundant
quartz - sparse
feldspar - sparse
limonite - very sparse
amorphous yellowish mineral (along cracks)

Description - This rock is similar to ES-CLO-1A, but differs from it in having a greater degree of alteration; the alteration is to sericite only, rather than to sericite and carbonate; and the proportion of quartz present is lower.

This rock was originally fine grained, non-porphyritic, with a typically trachytic texture and probably a trachytic composition. It has now been pervasively replaced by sericite, which forms an extremely fine grained mat of tiny flakes which make up probably about 90% of the rock. The alignment of the sericite flakes, and the distribution of 'clean' and 'dirty' patches, pseudomorphs the original trachytic texture, although the pseudomorphs are frequently cut by narrow, wandering, 'rivulets' of sericite. In a few places the feldspar laths are not completely replaced, and shadowy remnants of feldspar are visible, confirming the suspicion that the rock was originally essentially composed of felted feldspar laths. Occasional tiny patches of extremely fine grained quartz anhedra are scattered through the rock, and there are scattered, rather diffuse, clots of limonite. The thin section is cut by a network of fine, undulating, fractures, which are marked by films of a dirty looking material. On inspection under high power, and strong illumination, this is seen to consist of a yellowish, amorphous, material.

Specimen No. - ES-CLO-2

Rock name - sericitised feldspar porphyry (? originally a trachytic lava)

Mineralogy - phenocrysts - acid plagioclase

| | | |
|---|---|---|
| groundmass | - | sericite - very abundant |
| | | feldspar - abundant |
| | | quartz - sparse |
| | | carbonate - very sparse |
| | | iron oxides (limonite and leucoxene) and pyrite |
| veinlets | - | quartz |
| | | carbonate |
| | | iron oxides |

Description - This rock is fine grained, with medium grained plagioclase phenocrysts. The groundmass is composed predominantly of extremely fine grained sericite, through which cryptocrystalline feldspathic material is shadowily visible. Small irregular patches and crystals of quartz are dotted through the groundmass, and there are occasional diffuse patches of carbonate. There is a fair amount of disseminated limonite, and partially limonitised pyrite, along with a little leucoxene. Occasional small, compact, quartz filled patches, surrounded by a thin marginal zone of sericite, may represent the former presence of occasional vesicles.

The plagioclase phenocrysts are euhedral to subhedral in form, usually tabular, and up to about 4 mm long. They show patchy alteration to carbonate, sericite and quartz, these minerals occurring along cracks in the crystals, or as patches of inclusions, rather than being disseminated through the phenocrysts. The remnant feldspar usually has a rather blotchy appearance, and it was not possible to determine its composition, apart from ascertaining that it is fairly acid.

The groundmass is extremely fine grained, and appears to have been originally largely feldspathic, and probably cryptocrystalline, with an indefinite texture. It now consists of a shodowy feldspathic base throughout which there is disseminated a high proportion of extremely fine grained sericite. The sericite makes at least 60% of the groundmass. Dotted through this sericite/feldspar mixture there is a moderate amount of fine grained quartz, in the form of irregular anhedra which are somewhat coarser than the feldspar, and have rather indistinct margins. The proportion of quartz is noticeably higher than in specimens ES-CLO-1 (A andB).

(continued overleaf)

ES-CLO-2 (continued)

There are occasional rather diffuse patches of secondary carbonate in this rock, but they are not very large in extent. The rock contains fair amount of disseminated limonite, both in the form a stains around crystal margins, and in small cubic patches some of which show remnants of pyrite in the cores. There is also a little leucoxene.

The thin section is cut by a number of irregular fractures, and discreet veinlets. The veinlets are filled by quartz and/or carbonate. In some parts the carbonate is quite heavily limonite stained. Many of the irregular cracks are filled by partially limonitised pyrite, and there are occasional irregular patches very rich in fine grained limonitised pyrite intermngled with quartz.

Specimen No - ES-CLO-3

Rock name - pervasively sericitised (?) trachytic tuff

Mineralogy - sericite - very abundant
limonite - abundant
leucoxene - sparse
quartz - very sparse

Description - This rock is extremely fine grained, laminated, and has a rather patchy appearance. It now consists almost entirely of extremely fine grained matted masses of sericite, intermingled with irregular masses and stringers of limonite, so that it is difficult to determine the original nature of the rock. There are occasional compact areas of relatively 'clean' looking sericite which probably represent the former sites of feldspar crystals. Quartz is extremely sparse. The most likely origin for this rock appears to be a trachytic tuff, which contained occasional feldspar crystal fragemnts.

The 'feldspar pseudomorphs' are of very variable size. Very occasionally they reach up to about 4 mm across, but more typically they are around 0.5 mm across. The smaller pseudomorphs tend to occur in stringers, lying within the plane of the laminations. The larger ones are randomly scattered. Some of the larger pseudomorphs show some indication of crystal form. They are now in the form of 'relatively clean' sericitic material which tends to have a slightly lower birefrigence than the mica of the surrounding matrix. One small quartz crystal fragment was also noted.

The matrix is composed almost entirely of sericitic material, intermingled with rather patchily distributed limonitic material, and a little leucoxene. A very little cryptocrystalline quartzose material was noted within the matrix, intermingled with the sericite. The limonite forms irregular patches, and streaks and stringers which parallel the plane of the laminations and help to mark them. In some cases the limonitic stringers are in the form of masses of tiny cubic crystals, probably pseudomorphic after pyrite. There are occasional patches within the matrix, of somewhat different appearance, notably a slightly higher proportion of extremely fine grained quartzose material mingled with disseminated limonite. These may represent rock fragments of slightly different original composition to that of the main part of the rock.

Specimen No. - ES-CLO-4

Rock name - altered pumiceous lava, probably originally of rhyolitic composition. It is heavily limonitised, and impregnated by carbonate.

Mineralogy -
- cryptocrystalline quartzo-feldspathic material
- sericite - abundant
- carbonate - abundant (in vesicles)
- limonite - abundant (rimming vesicles)
- leucoxene - abundant (disseminated)
- pyrite - rather sparse (disseminated)
- quartz - very sparse in vesicles

Description - This rock is extremely fine grained, with a highly pumiceous character. Vesicles make up about 30% of the rock, and are filled by relatively coarse grained carbonate and rimmed by limonitic material. The rock itself is composed of cryptocrystalline quartzo-feldspathic material, flecked by minute crystals of sericite. Occasionally the quartzo-feldspathic material shows slight inidcations of a spherulitic structure. Diffuse aggregates of very fine grained leucoxene occur patcily in the rock, as do diffuse areas of tiny pyrite crystals, often partially limonitised.

The vesicles are of very irregular shape and size, and are frequently interconnected. The carbonate which fills them is clear and clean looking, and has a grain size of around 0.5 mm in many cases. Very occasionally a little quartz also occurs within vesicles. Limonitic material occurs disseminated throughout the rock, but is particularily noticeable in the form of rims which mark the edges of the vesicles.

The cryptocrystalline quartzo-feldspathic material which makes up the rock itself is extremely fine grained and confused looking, and partly obscured by finely disseminated sericitic material and iron oxides. It is characterless over most of the rock, but in a few places an indication of incipient spherulitic structure is discernible. A rather swirling pattern in the quartzo-feldspathic material gives an indication of the presence of flow structures. Both leucoxene and very fine grained pyrite are present in the rock, in patches of finely disseminated tiny crystals. The pyrite, in particular, is very noticeable in some parts of the section.

Specimen No - ES-CLO-5

Rock name - (?) altered trachytic tuff

Mineralogy - fragments - altered acid volcanics (probably trachytic)

matrix - quartz - abundant
sericite - abundant
barite - relatively sparse
limonite - patchily abundant
fluorite - sparse

Description - This rock is extremely confused and patchy looking, and contains a large proportion of irregular voids giving it a rather pumiceous appearance. There are scattered fragments of acid volcanics, with distinct margins. These are separated by a rather variable matrix composed mainly of quartz and sericite, along with occasional crystals of barite, some of which are relatively large. The rock is patchily limonitised. The probable origin for this rock is as a tuff, probably with trachytic fragments which are now heavily altered. The voids may represent leached out matrix material, such as carbonate, since the rock has a heavily weathered appearance.

The acid volcanic fragments are angular, and up to about 1.5 cm across. Some now consist entirely of extremely finely matted, usually rather dirty looking, sericitic material which usually shows a fairly well developed preferred orientation. This probably reflects an original flow structure in the fragment. Other fragments are somewhat less altered, and consist of cryptocrystalline feldspathic, or quartzo-feldspathic, material flecked by varying amounts of sericite. Occasional fragments contain a few small feldspar phenocrysts. In addition to the well defined fragments, there are irregularily shaped shreds and patches in the matrix, of similar composition to the volcanic fragments, which probably represent smaller fragments which may have been soft at the time of deposition.

The matrix surrounding the volcanic material is composed of very patchy material which consists predominantly of quartz and sericite. The quartz is of very variable grain size, and sometimes shows a 'comb' structure. It is intermingled with flakes and shreds of the sericite. Dotted through the matrix there are occasional crystals of barite, usually intermingled with the quartz. Barite crystals occasionally reach up to 3 mm across, and have a very irregular form. Limonitisation of this rock is extremely patchy. Some parts are very heavily limonitised, while others are virtually unaffected. Some areas which are unaffected by limonitisation contain clusters of small cubes of fluorite.

Specimen No. - ES-CLO-6B - Continued

Carbonate is considerably more abundant in this fine lamina than in the coarser part of the section.

The rock is criss crossed by numerous veinlets, mostly at a high angle to the lamination plane. These are of very variable width, up to about 5 mm wide, and are filled by quartz of varying grain size, usually intermingled with some carbonate. Some of the narrower veinlets are filled only by carbonate.

Specimen No. - ES-CLO-6B

Rock name - laminated, hematite rich, feldspathic tuff (trachytic)

Mineralogy - fragments - plagioclase
feldspathic acid volcanics

matrix - limonite
hematite
carbonate
quartz (in veinlets)

Description - This rock is fine grained, and laminated. It represents a fine grained tuff in which the detrital fragments are fairly well sorted, and well packed, with the different laminae representing differing sizes of fragments. The fragments consist of plagioclase crystals, and very fine grained trachytic volcanic rocks, and they are surrounded by a matrix which is largely obscured by iron oxides, in the form of both limonite and hematite. No detrital quartz fragments were noted. sericitisation is extremely slight in this rock, but there are variable amounts of disseminated carbonate, particularily in the finer grained laminae. The rock is criss crossed by numerous carbonate-quartz veinlets.

The detrital fragments are angular, and up to about 0.5 mm across in the coarser laminae. The trachytic rock fragments greatly outnumber the feldspar crystal fragments, although the latter are very abundant also. The rock fragments are extremely fine grained, and usually impregnated by fine iron oxides, but a distinct trachytic texture can be distinguished in many of them. The feldspar crystal fragments are quite fresh looking, and only occasionally contain a few flakes of sericite, while a little sericitisation is visible in some of the rock fragments. The matrix between the fragments consists of smaller fragments, often largely obscured by iron oxides. Both limonite and hematite are extremely abundant, particularily in the coarser material. Limonite tends to be finely disseminated in streaks, patches and stringers, while hematite tends to occur in more compact masses, or impregnating certain rock fragmnets in which it outlines feldspar laths. A low proportion of carbonate, in occasional relatively large irregularily shaped crystals, is scattered through the coarser laminae.

The fine grained laminae, one of which cuts across the middle of the thin section, are relatively lacking in iron oxides. This lamina consists of a base of extremely fine grained feldspathic material in which scattered chips of feldspar crystals can be distinguished. There is a low proportion of extremely finely disseminated iron oxides, but this lamina is distinguished by a moderate amount of scattered rhombs of carbonate, much coarser than the feldspathic base.

## Appendix III - Sampling and Laboratory Procedures

### I. SAMPLING PROCEDURES

#### A) Heavy Minerals

1. A sample site is selcted which exhibits maximum sorting of stream bed material. Active (below water) or previously active (dry now but previously below water) sites may be chosen. Leading edges or sides of gravel bars with large boulders are most attractive. In practice, the ideal case is rare and one chooses the best possible site.

2. Gravel and cobble material is shoveled into a large (18" to 24") gold pan into which 1/4" holes have been drilled. The material is vigourously shaken in still water so that - 1/4 in. material passes the screen into a second, matching pan. Enough -1/4 in. material is collected to fill an 18" x 24" poly bag (usually one large pan or two smaller ones). The -1/4" material is returned to camp.

3. The - 1/4 in. material is panned to achieve a concentrate of heavy minerals and aggregates containing heavy minerals. Approximately 80% of the original material (20 - 25 lbs) is discarded while a 1 - 2 lb. concentrate is obtained. The concentrate is sealed in a plastic or cloth bag (cloth is preferred as it allows

the sample to dry, thus reducing shipping weight) and then sent to the laboratory for geochemical analysis.

B) <u>Stream Sediment</u>

1. A presently or previously active stream site is selected which exhibits minimum sorting ie. quiet water, and accumulation of fine sandy and silty material. If the stream is too active, material can be obtained from bank-moss which acts as a trap, or by digging out the lee of large boulders.

2. Three to four handfuls of material is collected and after squeezing to remove excess water is placed in high wet-strength, heavy duty, prenumbered kraft envelopes. The samples are dried in the field and then sent to the laboratory for geochemical analysis.

C) <u>Stream Water</u>

1. A 4 oz. poly bottle is rinsed with the sample site water at least three times then filled fully and tightly capped. The sample is tested in the field for pH and specific conductivity, then sent to the laboratory for geochemical analysis.

2. Care should be taken to avoid contamination by always collecting waters up-stream from a heavy mineral or sediment sample site.

D) Soil

1. 'B' horizon or talus fine material is sampled.

2. Three to four handfuls of material are collected into heavy duty, high wet-strength kraft envelopes which are dried in the field and then sent to the laboratory for analysis.

E) Sample Site Information Card

1. At each soil or stream sample site, an 80 column field data card is completed. The sampler records such information as sample number, location and type, depth of stream, sample composition, vegetation, drainage, etc. Separate cards are used for stream and soil samples in order to record pertinent information.

## II. Laboratory Procedures

### A. Sample Preparation

#### i) Heavy Minerals

1. Samples dried and weighed.

2. Screen - 10 mesh material from sample and weigh; weigh and retain +10 mesh material left on screen.

3. Use -10 mesh fraction for heavy liquid separation.

4. Transfer -10 mesh (fine) fraction into a 1000 ml. separatory funnel containing 200 mls. of tetrabromoethane (S.G. 2.96).

5. Shake sample gently in heavy liquid. Particles of fines adhering to sides of the separatory funnel can be washed into the heavy liquid by slowly rotating the funnel at an oblique angle. The "heavies" (S.G. $>$2.96) will slowly settle to the bottom of the heavy liquid.

6. Drain the "heavies" into a small filter funnel. Drain excess heavy liquid and light materials into a separate filter funnel. Collect all heavy liquid into a waste receiving bottle.

7. Save light minerals (S.G. $<$2.96). Wash "heavies" fraction with methanol to remove residual tetrabromoethane. Use the same procedure on light minerals fraction. Dry both fractions and weigh. Retain the "lights" in a suitable sealed container. Save 0.5 gm of "heavies" in a plastic vial for visual examination.

8. Pulverize the remaining "heavies" in an agate mortar and pestle and homogenize before weighing for analyses.

9. Analyse the "heavies" powder for appropriate elements. The number of elements analysed for is determined by the amount of "heavy" material obtained in separation.

ii) Stream Sediments

1. Samples are sorted and dried at 50°c for 12 to 16 hours.

2. Dried material is then screened to obtain the -80 mesh (177 micron) fraction. The rest of the material is discarded.

3. -80 mesh fraction material is weighed and analysed for appropriate elements.

iii) Soils

Same procedure as for stream sediments.

iv) Rocks

1. Entire sample is crushed.

2. If necessary (>250 gms.). The sample is split on a Jones splitter, the reject is retained for a short period.

3. The split fraction is pulverized in a ring grinder such that 90% passes a 200 mesh (74 micron) sieve.

4. The -200 mesh material is weighed and analysed for the appropriate elements.

v) Waters

See individual element descriptions for U and F.

B. Elemental Analyses

i) ppm Copper, Lead, Zinc, Silver, Molybdenum (Atomic Absorption)

1. A 1.0 gm portion of -80 mesh soil or stream sediment or -200 mesh rock flour or pulverized "heavies" is digested in concentrated, hot, perchloric - nitric acid ($HClO_4$-$HNO_3$) for 2 hours.

2. Digested sample is cooled and made up to 25 mls. with distilled water.

3. Solution is mixed and solids allowed to settle.

4. Cu, Pb, Zn Ag and Mo are determined by atomic absorption, using background correction for Pb and Ag analyses.

| Element | Bkgd. Corr. | Flame Type | Wave Length hm | Detection Limit | Chemex Standard | ± 1 Std. Deviation |
|---|---|---|---|---|---|---|
| Cu | No | A | 324.7 | 1 ppm | 71 ppm | ± 3 |
| Pb | Yes | A | 217.0 | 1 ppm | 59 ppm | ± 1 |
| Zn | No | A | 213.8 | 1 ppm | 52 ppm | ± 3 |
| Ag | Yes | A | 328.1 | 0.2 ppm | 8.5 ppm | ± 0.5 |
| Mo | No | N | 313.3 | 1 ppm | 25 ppm | ± 1 |

A = Air acetylene flame.

N = Nitrous oxide - acetylene flame.

ii) ppm Tin (Sn) (Atomic Absorption)

1. A 1.0 gm sample of -80 mesh soil or stream sediment, -200 mesh rock flour or pulverized "heavies" is scintered with ammonium iodide.

2. The resulting tin-iodide is leached with a dilute HCl - ascorbic acid solution.

3. The TOPO complex is then extracted into MIBIC (Methyl isobutyl ketone) and anaylsed via atomic absorption.

4. Detection limit: <u>1 ppm Sn</u>

iii) <u>ppm Tungsten (W) (Colourimetric)</u>

1. 0.5 gm of -80 mesh soil or stream sediment, -200 mesh rock flour or pulverized "heavies" is fused with potassium bisulfate and leached with HCl.

2. The reduced form of W is complexed with toluene 3, 4 dithiol and extracted into an organic phase.

3. The resulting colour is visually compared to similarly prepared standards. <u>(Colourimetric method)</u>

4. Detection limit: <u>2 ppm W</u>

iv) <u>ppb Gold (Au) (Atomic Absorption)</u>

1. A 5 gm sample of -200 mesh rock flour or pulverized "heavies" is ashed at 800$^{o}$c for 1 hour.

2. Ashed material is digested with aqua regia twice to dryness.

3. Digested material is taken up in 25% HCl.

4. Au is extracted as the bromide into MIBK and analysed via atomic absorption.

5. Detection limit: <u>10 ppb Au</u>

v) <u>ppm Thorium (Th) (Neutron Activation)</u>

1. 1 gm of -80 mesh soil or stream sediment, -200 mesh rock flour or pulverized "heavies" is weighed into a polyethelene vial and heat sealed.

2. Samples, along with standards, are then irradiated

for sufficient periods to receive a neutron dose of 1-3 X $10^{10}$ to $10^{15}/cm^2$.

3. Following irradiation, samples are cooled for at least one week and thorium determined by the measurement of its characteristic gamma ray, using a semiconductor (Ge (Li)) detector.

4. Detection limit: 1 ppm Th

vi) Uranium (U) (Fluorimetry)

A) Uranium in soils, stream sediments, "heavies", rocks.

1. 1 gm of -80 mesh soil or stream sediment, -200 mesh rock flour or pulverized "heavies" is digested with hot, $HClO_4$-$HNO_3$ to strong fumes of $HClO_4$ for approximately 2 hours.

2. The digest is diluted to volume and mixed.

3. An aliquot is extracted into MIBK with the acid of an aluminum nitrate-tetrapropyl ammonium hydroxide salting solution. (TPAN)

4. Uranium in the MIBK is determined by evaporating a portion of the MIBK in a platinum dish and fusing with a mixture of $Na2CO_3$-$K_2CO_3$-NaF.

5. The fluorescence of the fused flux is measured to determine the uranium content.

6. Detection limit: 0.5 ppm U

B) Uranium in Water

1. A portion of the sample is filtered to remove sediment (if necessary), is acidified and then evaporated to dryness.

2. Residue is leached with a small volume of $HCO_3$.

3. Uranium in the leachate is extracted into MIBK, with the aid of TPAN salting solution.

4. Uranium is determined as for solid materials, above by fluorimetry.

5. Detection limit: 0.2 ppb U

vii) Fluorine (F) (Specific Ion Electrode)

A) F in soils, stream sediments, rocks, "heavies".

1. 0.25 gm of -80 mesh soil or stream sediment, -200 mesh rock flour or pulverized "heavies" is fused with a 2:1 $NaCO_3$-$KNO_3$ mixture.

2. The melt is leached with water and citric acid, adjusted to pH 5.5 and the activity measured with a fluoride specific ion electrode.

3. Detection limit: 10 ppm F

B) F in Waters (Potentiometric)

1. An aliquot of the sample is filtered and treated with an equal volume of Total Ionic Strength Adjustment Buffer (TISAB) consisting of glacial acetic acid, sodium chloride and cyclohexanediamine tetraacetic acid.

2. The resulting solution is stirred for 3 minutes to allow the fluoride electrode to stabilize.

3. The F concentration is read from a specific ion meter which is calibrated frequently with freshly prepared standard fluoride solutions.

4. Detection limit: 0.02 ppb F

viii) ppb Arsenic (As) (Atomic Absorption)

a) As in waters

1. An aliquot of water is acidified with HCl and then reduced with potassium iodine to reduce As (V) to As (III).

2. A portion of this solution is further reduced with sodium borohydride to arsine, $AsH_3$.

3. The volatile arsine is swept into a heated cell in an atomic absorption spectrophotometer and decomposed to free arsenic to determine the arsenic concentration.

4. Detection limit: 2 ppb As

ix) pH

1. pH in waters was determined in the field, using a portable pH meter.

2. The meter was standardized by means of buffer solutions, every 10th sample to minimize meter drift.

x) Specific Conductivity (S.C.)

1. S.C. in waters was determined in the field, using a portable S.C. meter.

2. The electrode was washed in a standard water, after each determination, to minimize and standardize contamination.

APPENDIX IV

Comments of R.H. Wallis - examination of CLO Claims

<u>CLO Claims (1-20) 105F</u> August 1, 1979

Commodity (Ag-Mo-F-Zn-Pb) RHW, EJS and JH

Relief over 2500' and looks like it! rocky crags at top, long steep talus slopes, down into nasty buckbrush at low ground;

According to Tempelman-Kluit(1977) both in detail and in general a very complex geology. An anticline with uDMs core and Mra flanks, has syncline of SDdq core and uCOslv flanks thrust over it.

The SDdq = Silurian and ?Lower Devonian, resistant, medium grey to buff weathering, medium to thick bedded dolomite, sandy dolomite and dolomitic sandstone. Transitional to Sq = ?Silurian orthoquartzite with dolomite cement, or to SDA = resistant, light grey, buff light orange, laminated dolomitic mudstone.

SDdq can be underlain by Sv = Silurian, orange weathering, recessive, lapilli tuff, volcanic breccia and dolomite.

SDdq is generally underlain by uCOslv = ?Upper Cambrian and Ordovisian?, medium grey, recessive, chlorite-muscovite-quartz phyllite with lenses of greenstone.

This is underlain by thrust surface.

Below the thrust surface lies Mra = hetergeneous rusty, black, white, orange weathering lapilli tuff, breccia and flow rock, from trachyte to andesite; plus slate and "chert", crystalline limestone; often highly pyritic and commonly strongly foliated.

This is underlain by uDMs = black, recessive weathering, rusty streaks, thin bedded, siliceous slate and chert granule grit.

RHW, EJS, JH traversed a short length of upper ridge, from uCOslv to SDdq, and indeed saw thin and thickly bedded orange and grey dolomites, dolomitic shales, black and orange shales and every other possible varient. Lots and lots of pyrite was observed.

The property is difficult terrain and potential for mineralization not all obvious.

# APPENDIX V

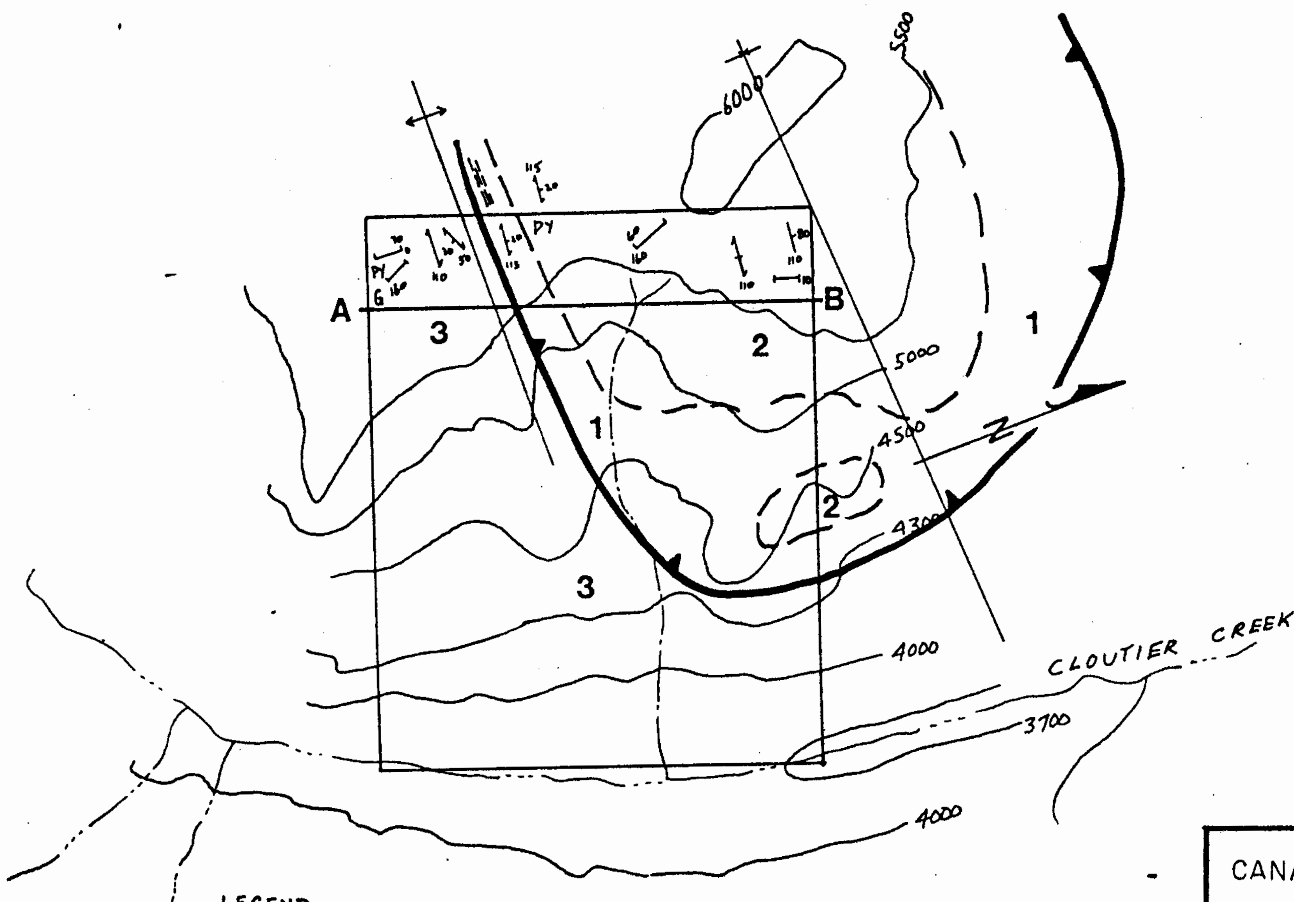
## References

1. G.S.C. (1979): Regional Stream Sediment Reconnaissance Sampling Survey, Quiet Lake 105F, Yukon Territory; G.S.C. O.F.R. 564.

2. Levinson, A. (1974): Introduction to Exploration Geochemistry; Applied Publishing, Calgary.

3. Tempelman-Kluit, D.J. (1977): Geology of Quiet Lake (105F) and Finlayson Lake (105G); G.S.C. O.F.R. 486.

4. Wheeler, J., Roddick, J. and Green, L. (1960): Geology of Quiet Lake, Yukon Territory, Sheet 105F; G.S.C. Map 7-1960, Preliminary Series.




LEGEND

3 : Rhyolite, lapilli tuff

2 : Dolomite, dolomitic breccia; dolomitic sandstone

1 : Schistose volcanics, greenstone

- Geological contact (assumed)
- Thrust Fault (assummed)
- Fold axis - assummed (anticlinal, synclinal)
- Bedding (inclined)
- Foliation (vertical, inclined)
- Jointing (vertical, inclined)
- Shear Zone

G Gossan

Py Pyrite

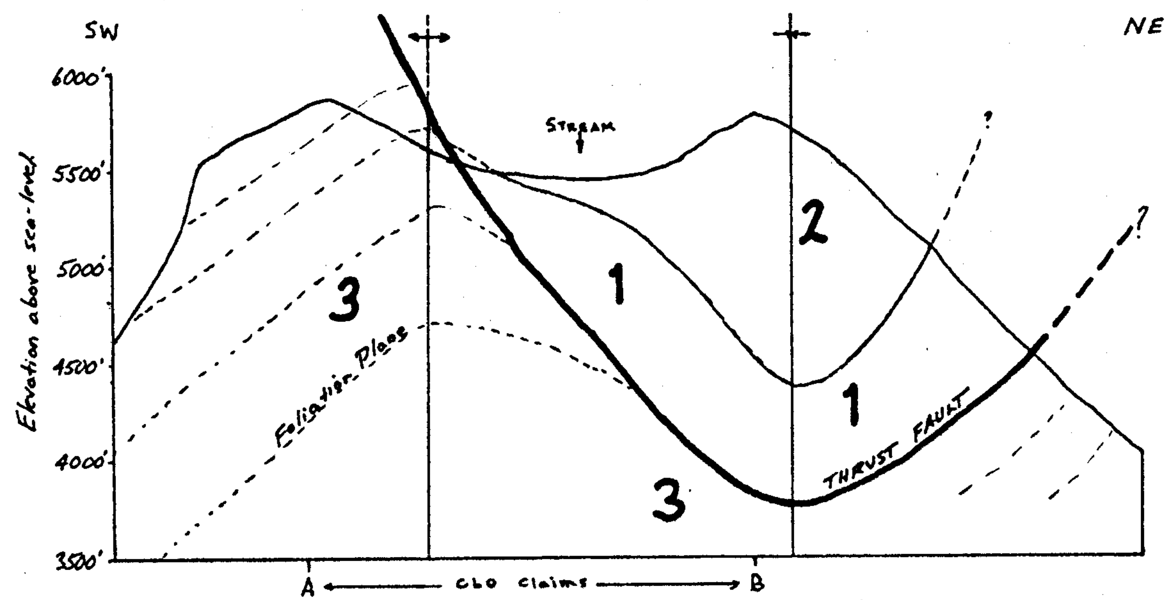
© Geology modified from Templeman-Kluit (1977)

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU
CLO 1-20 CLAIMS
YUKON TERRITORY

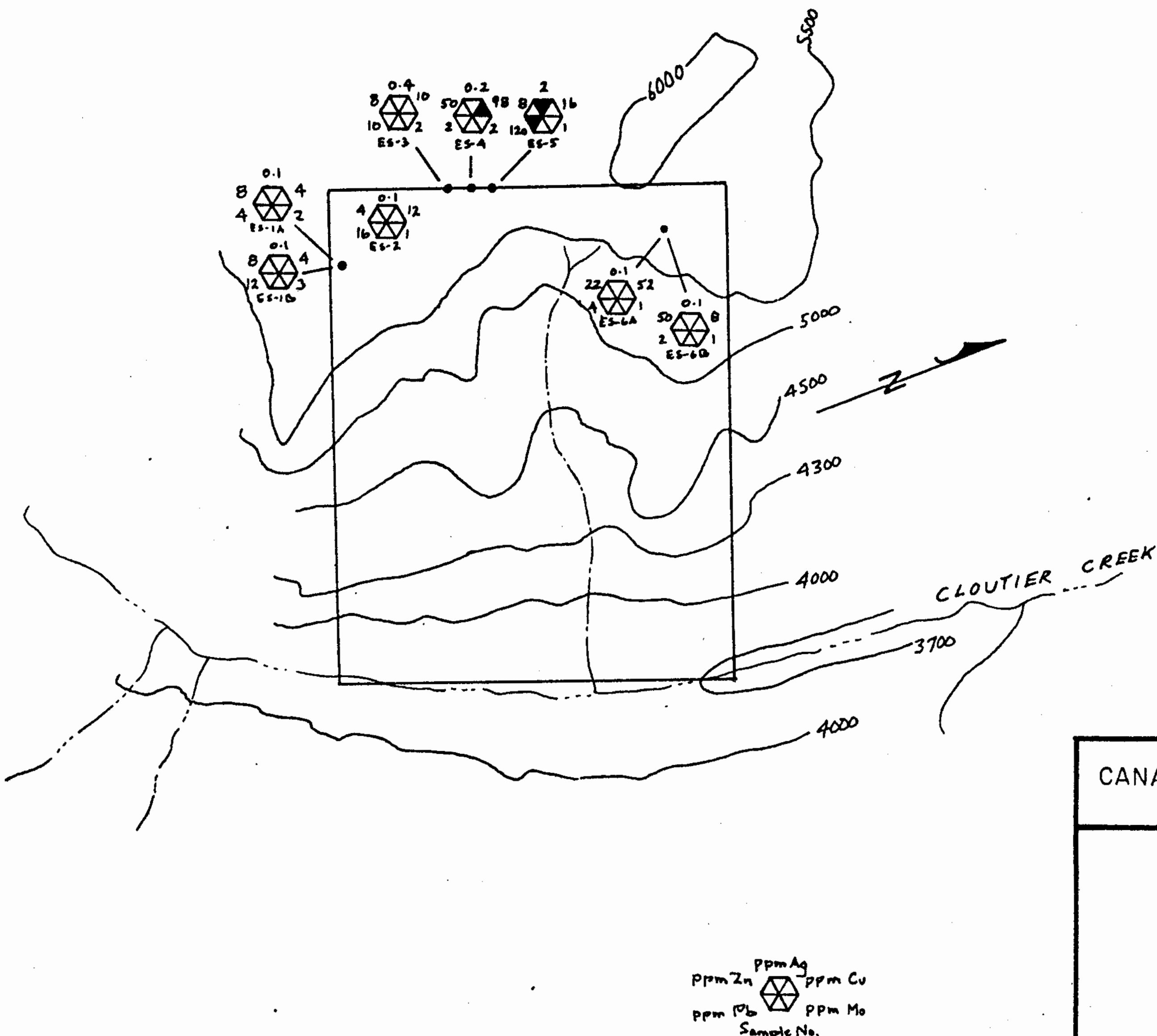
GEOLOGY

Scale: 1" = 2640' (1/2 mile) PLAN I Septmber, 1979




PLAN 1a - Schematic Vertical Section A-B (SW-NE) Across CLO Claims
Geology is modified from Templeman-Kluit (1977). For descriptions of rock units see PLAN 1.

Horozontal Scale: 1" = 2,640'




CANADIAN OCCIDENTAL PETROLEUM LIMITED
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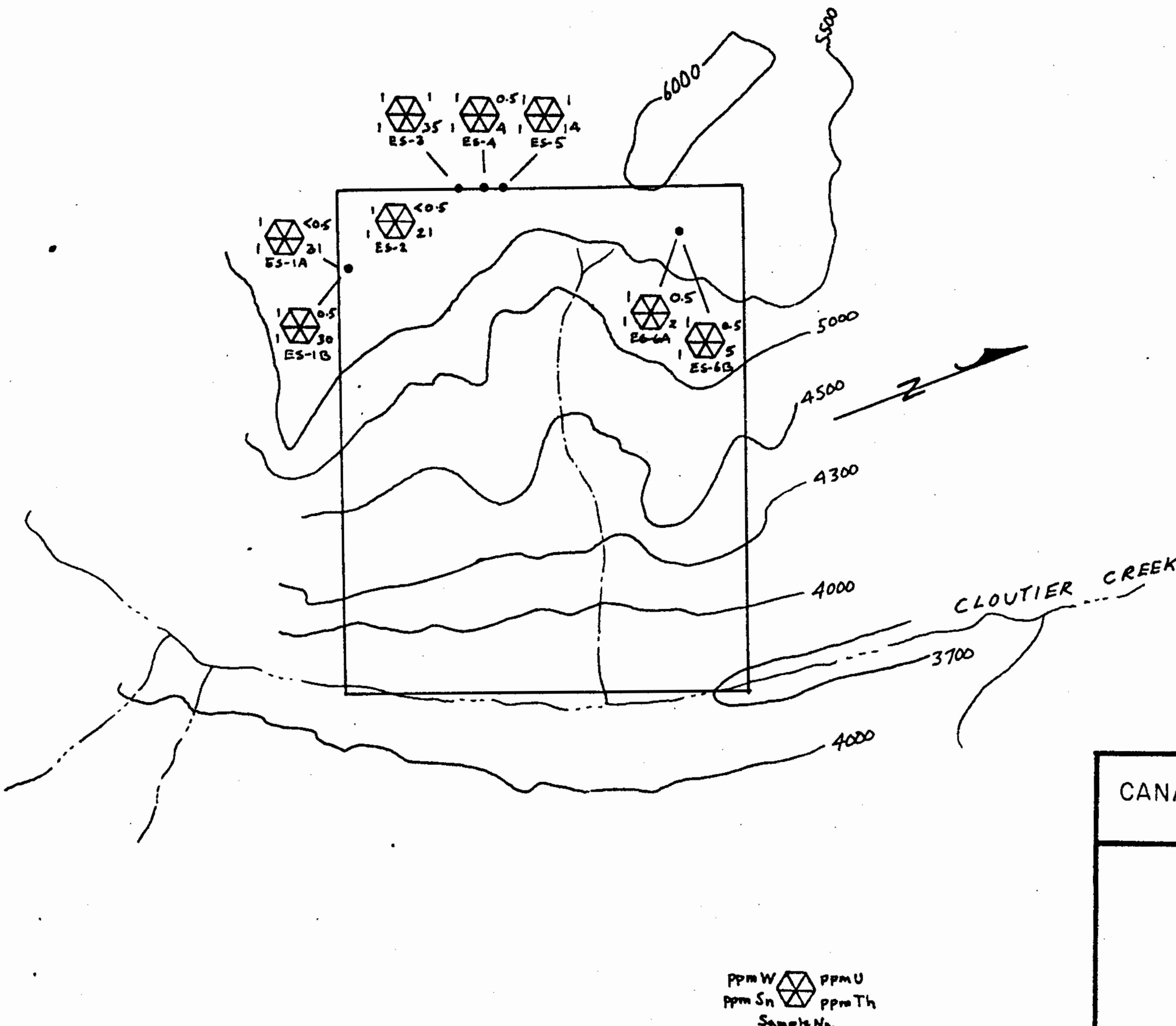
PROJECT WATSU
CLO 1-20 CLAIMS
YUKON TERRITORY

ROCK GEOCHEMISTRY

Cu - Mo - Pb - Zn - Ag

Scale: 1" = 2640' (1/2 mile) PLAN 2 Septmber, 1979



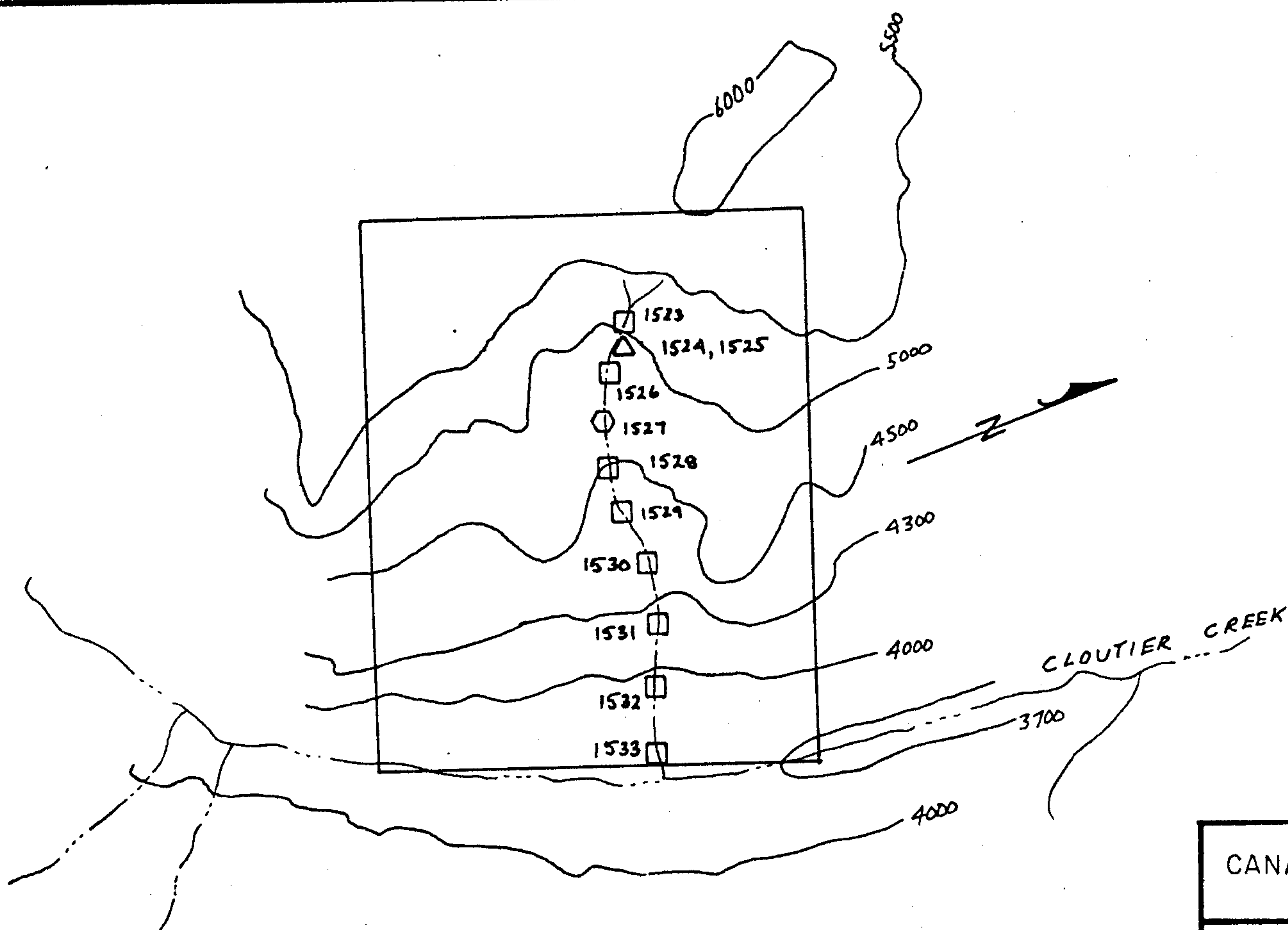

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU
CLO 1-20 CLAIMS
YUKON TERRITORY

ROCK GEOCHEMISTRY

U - Th - Sn - W

Scale: 1" = 2640' (1/2 mile) PLAN 3 Septmber, 1979




LEGEND

△ Soil

□ Sediment & water

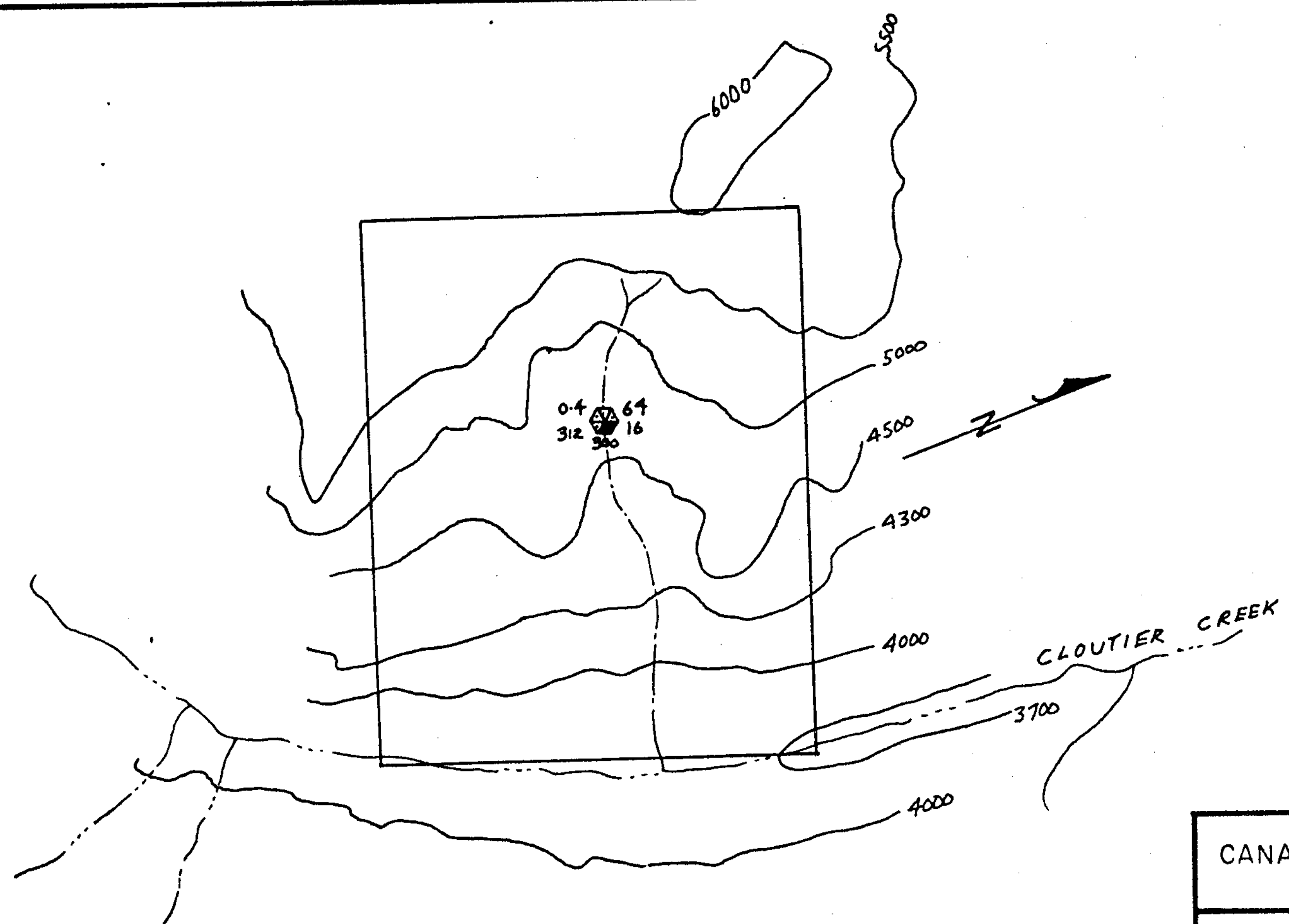
⬡ Heavy mineral & sediment & water

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU
CLO 1-20 CLAIMS
YUKON TERRITORY

SAMPLE LOCATIONS

Scale 1" = 2640' (1/2 mile) PLAN 4 Septmber, 1979




| | Cu | Mo | Pb | Zn | Ag | |
|---|---|---|---|---|---|---|
| Poss. Anomalous | 63 | 3.5 | 89 | 200 | 0.4 | |
| Prob. Anomalous | 165 | 8.5 | 280 | 400 | 0.95 | |

PLAN 5

LEGEND

ppm Ag, ppm Zn, ppm Cu, ppm Mo, ppm Pb

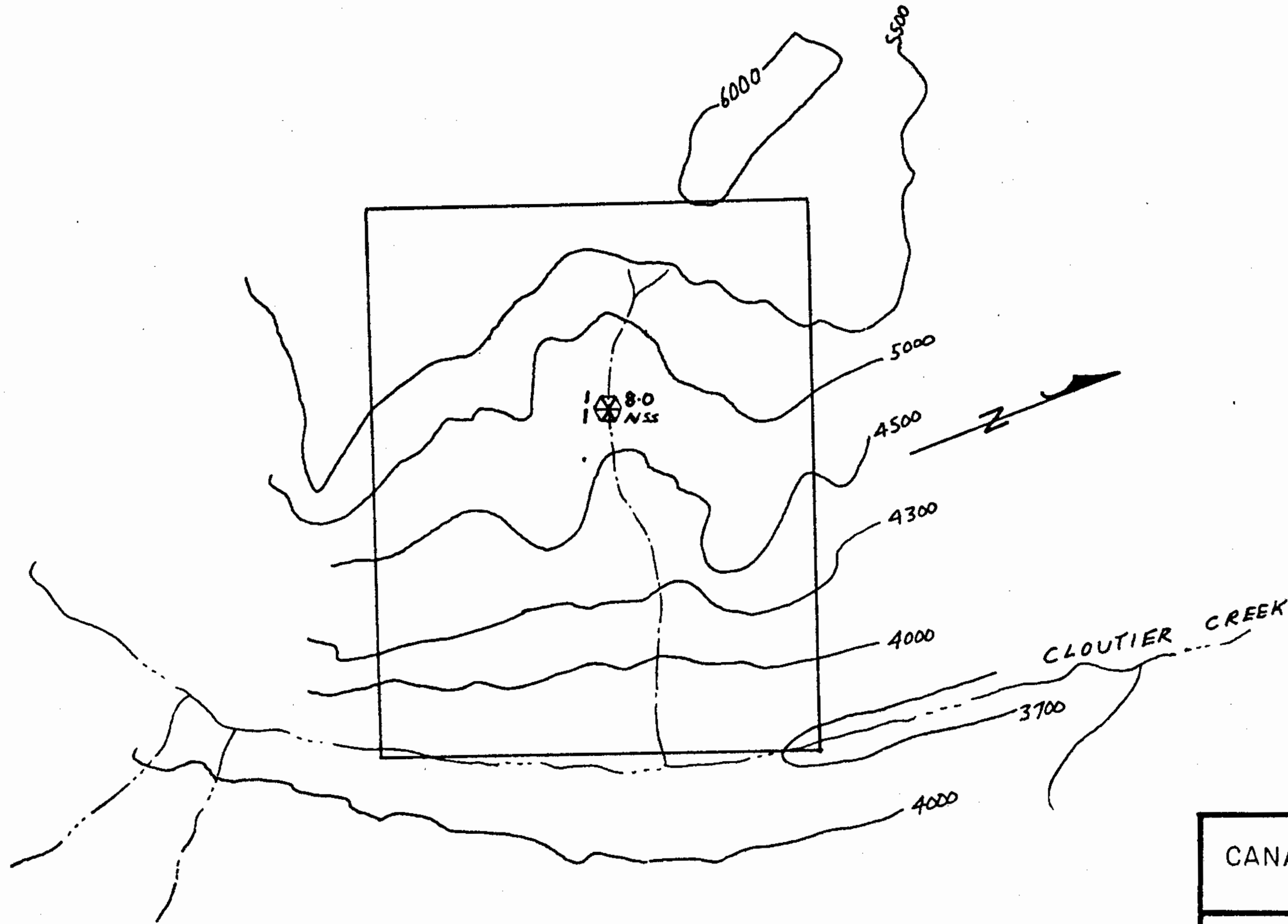
CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU
CLO 1-20 CLAIMS
YUKON TERRITORY

STREAM HEAVY MINERALS GEOCHEMISTRY

Cu - Mo - Pb - Zn - Ag

Scale: 1" = 2640' (1/2 mile) Septmber, 1979




| | U | Th | Sn | W | | |
|---|---|---|---|---|---|---|
| Poss. Anomalous | 26 | 330 | 38 | 60 | | |
| Prob. Anomalous | 120 | 1200 | 300 | 160 | | |

**LEGEND**

ppm W ppm Sn ⊛ ppmU ppm Th

N.S.S. - Not Sufficient Sample

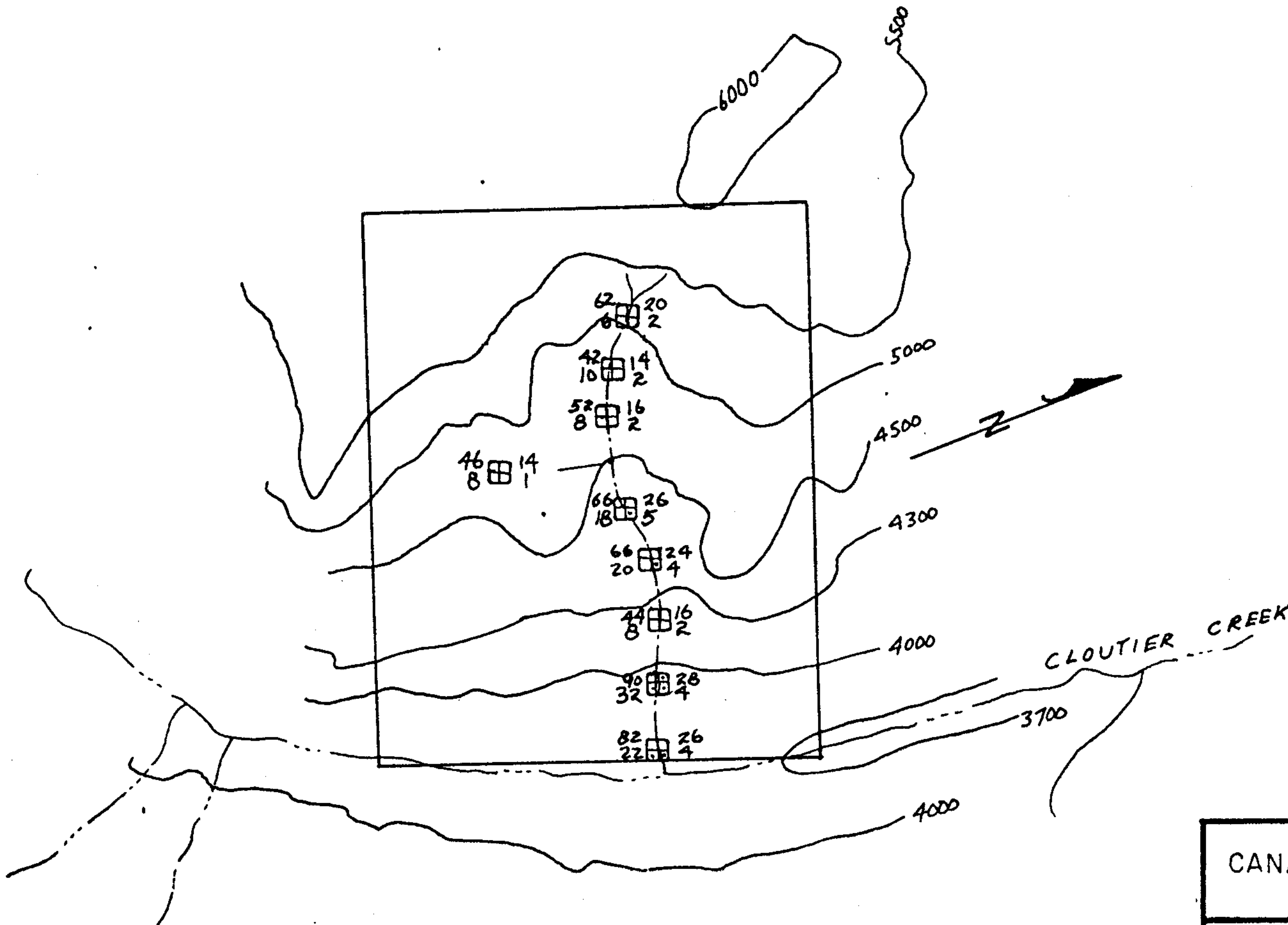
PLAN 6

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU
CLO 1-20 CLAIMS
YUKON TERRITORY

STREAM HEAVY MINERALS GEOCHEMISTRY
U - Th - Sn - W

Scale 1" = 2640' (1/2 mile) Septmber, 1979




| | Cu | Mo | Pb | Zn | | |
|---|---|---|---|---|---|---|
| Poss. Anomalous | 28 | 3 | 21 | 115 | | |
| Prob. Anomalous | 54 | 11 | 59 | 320 | | |

**LEGEND**

ppm Zn / ppm Pb ⊞ ppm Cu / ppm Mo

PLAN 7

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

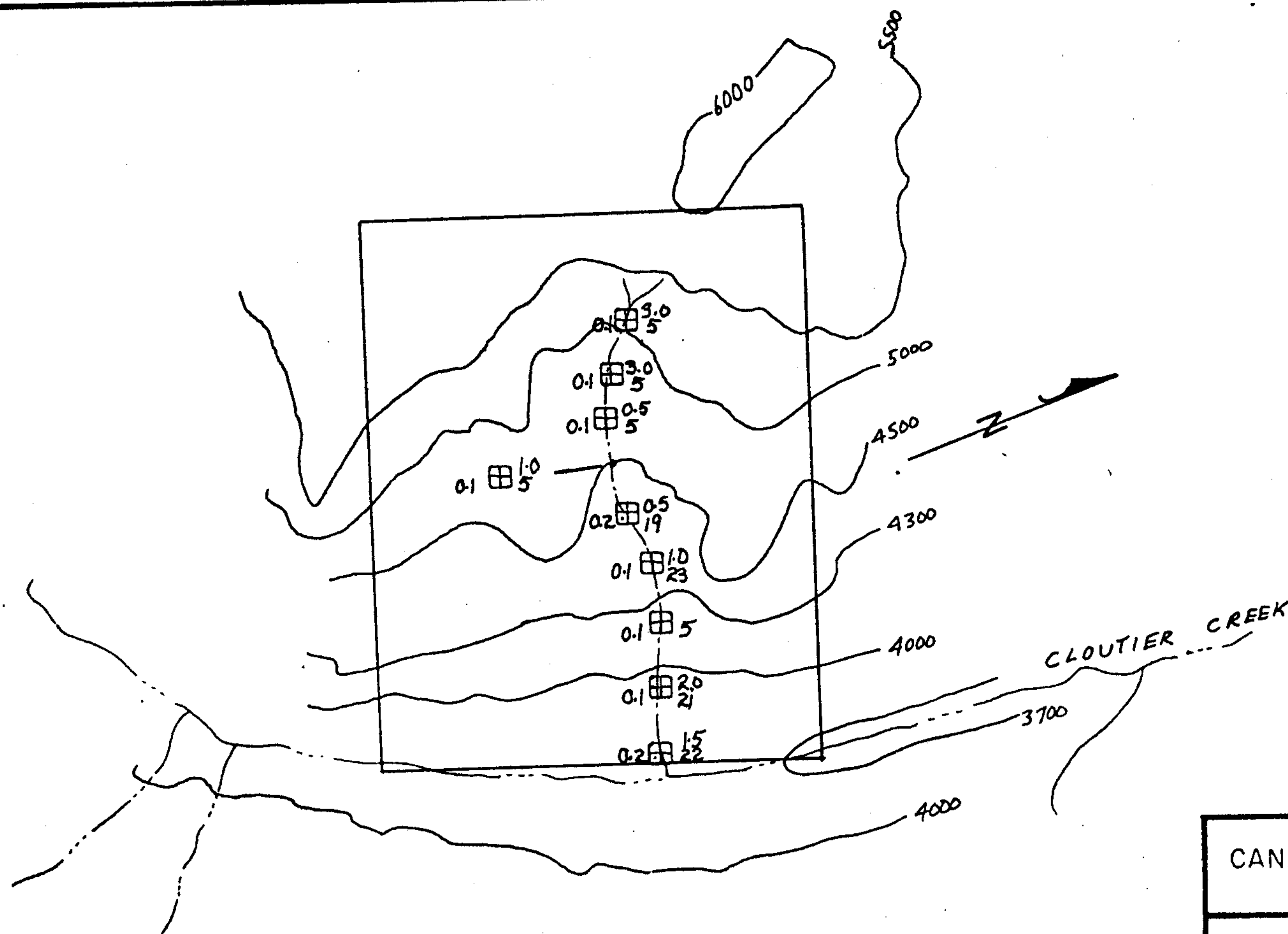
PROJECT WATSU
CLO I-20 CLAIMS
YUKON TERRITORY

**STREAM SEDIMENT GEOCHEMISTRY**

**Cu - Mo - Pb - Zn**

Scale: 1" = 2640' (1/2 mile)

Septmber, 1979




| | U | Th | Ag | | | |
|---|---|---|---|---|---|---|
| Poss. Anomalous | 17 | 29 | <·1 | | | |
| Prob. Anomalous | 38 | 50 | 1 | | | |

LEGEND

ppm Ag ⊞ ppm U / ppm Th

PLAN 8

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

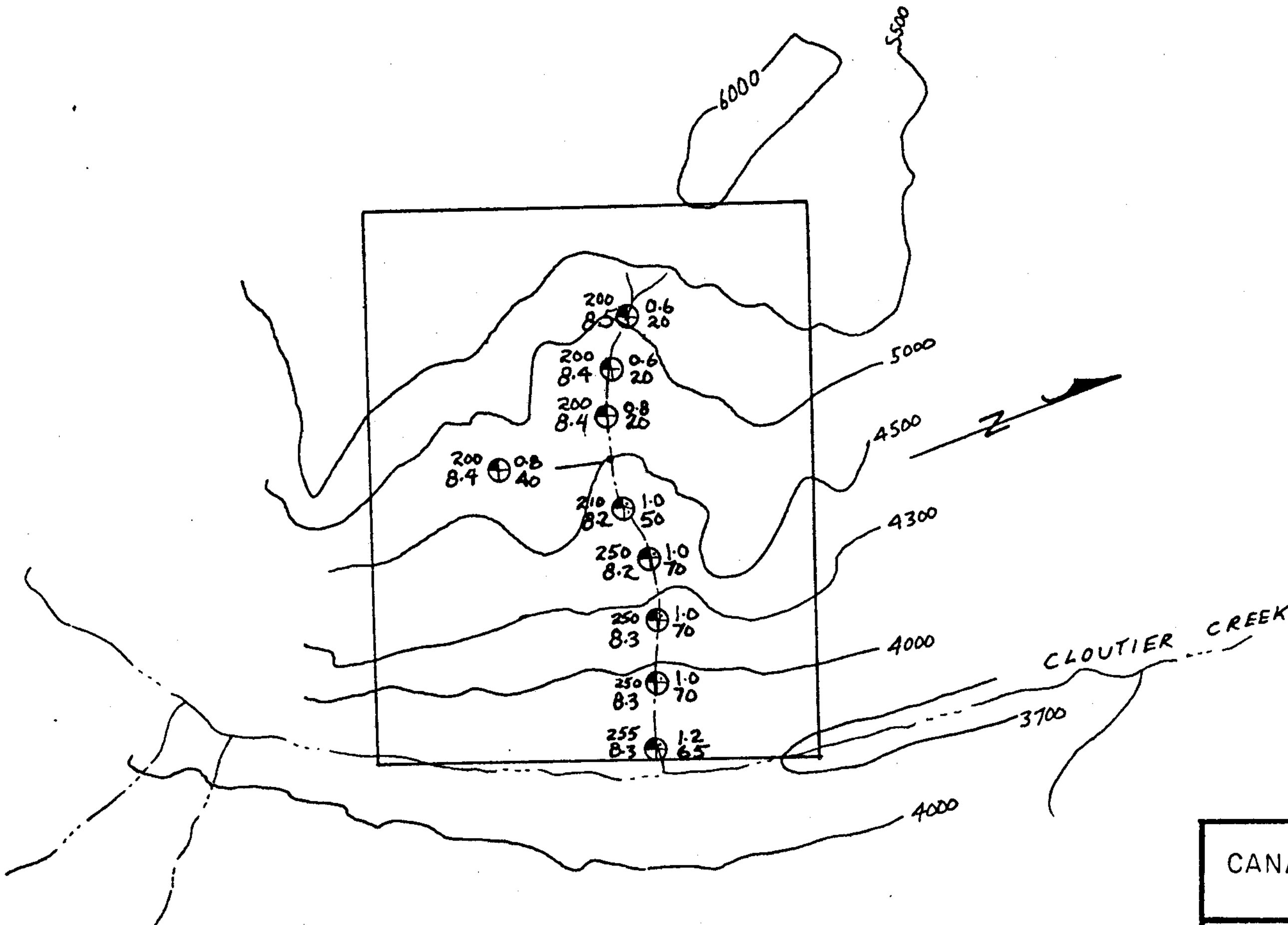
PROJECT WATSU
CLO 1-20 CLAIMS
YUKON TERRITORY

STREAM SEDIMENT GEOCHEMISTRY

U - Th - Ag

Scale: 1" = 2640' (1/2 mile)

Septmber, 1979




| | | U | F | As | S.c. | | |
|---|---|---|---|---|---|---|---|
| Poss. Anomalous | ◢• | 0.9 | 100 | - | 46 | | |
| Prob Anomalous | ◢ | 2.5 | 210 | - | 100 | | |

PLAN 9

**LEGEND**

SC pH ⊕ ppb U ppb F ; All As < 2ppb

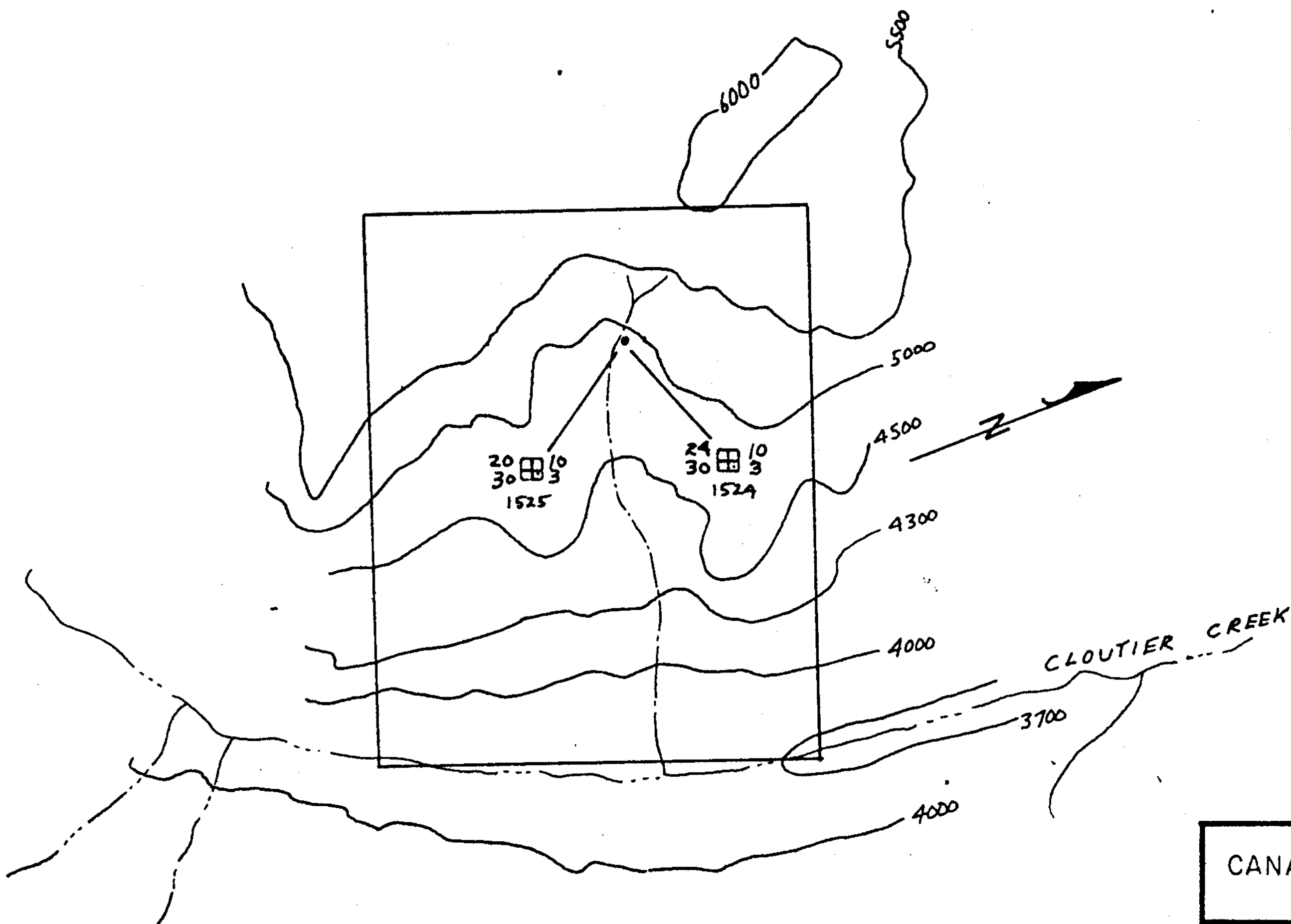
CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU
CLO I-20 CLAIMS
YUKON TERRITORY

**STREAM WATER GEOCHEMISTRY**

**U - F - As - pH - S.C.**

Scale .1" = 2640' (1/2 mile) Septmber, 1979




| | Cu | Mo | Pb | Zn | | |
|---|---|---|---|---|---|---|
| Poss. Anomalous | 22 | 2.5 | 32 | 115 | | |
| Prob. Anomalous | 120 | 5 | 150 | 270 | | |

LEGEND

ppm Zn ⊞ ppm Cu
ppm Pb ⊞ ppm Mo
Sample No.

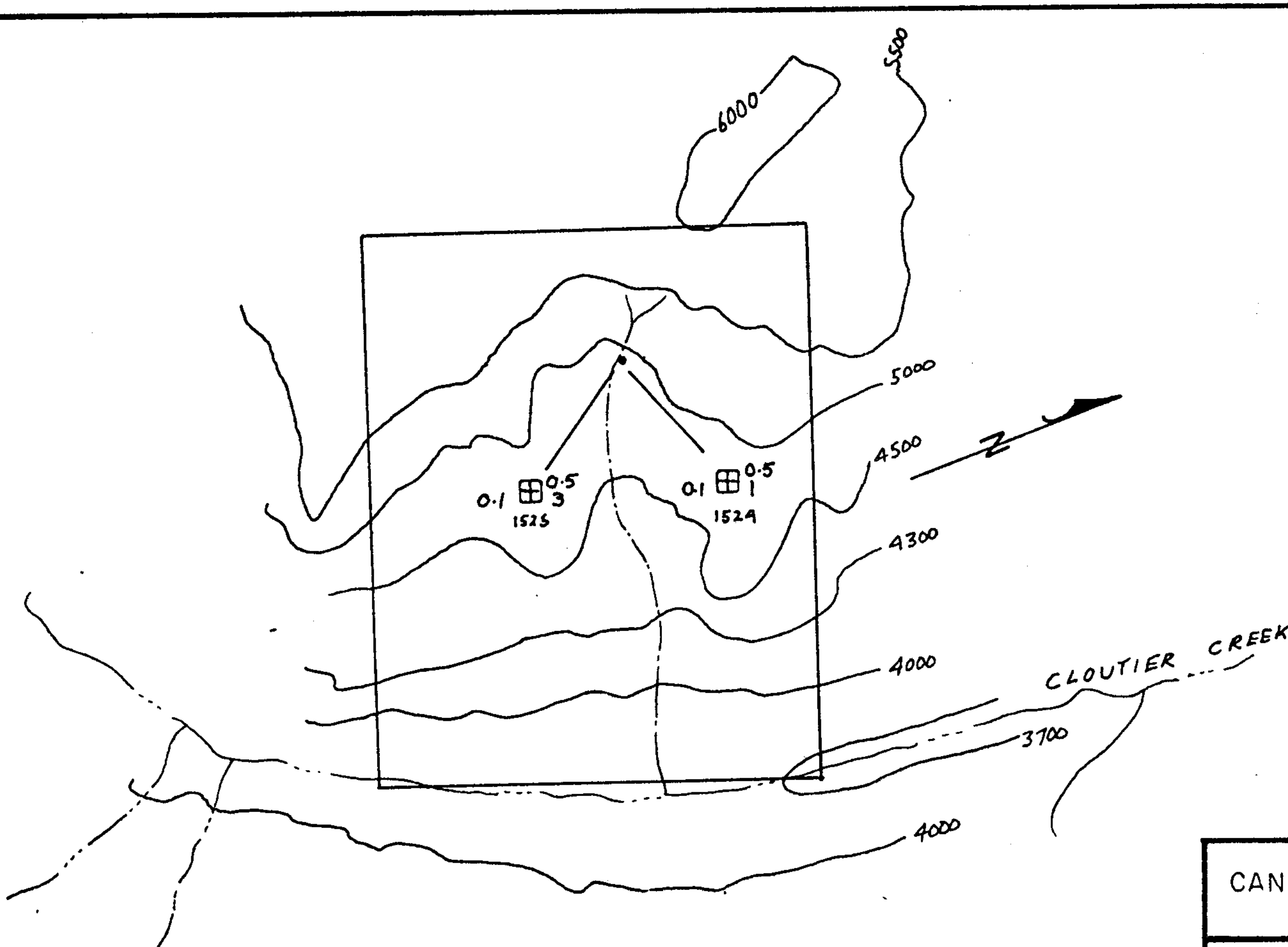
PLAN **10**

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU
CLO I-20 CLAIMS
YUKON TERRITORY

SOILS GEOCHEMISTRY
Cu - Mo - Pb - Zn

Scale: 1" = 2640' (1/2 mile) Septmber, 1979




| | U | Th | Ag |
|---|---|---|---|
| Poss. Anomalous | 7 | 36 | ·1 |
| Prob. Anomalous | 30 | 75 | ·8 |

LEGEND

ppm Ag ⊞ ppm U / ppm Th

Sample No.

PLAN 11

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU

CLO 1-20 CLAIMS

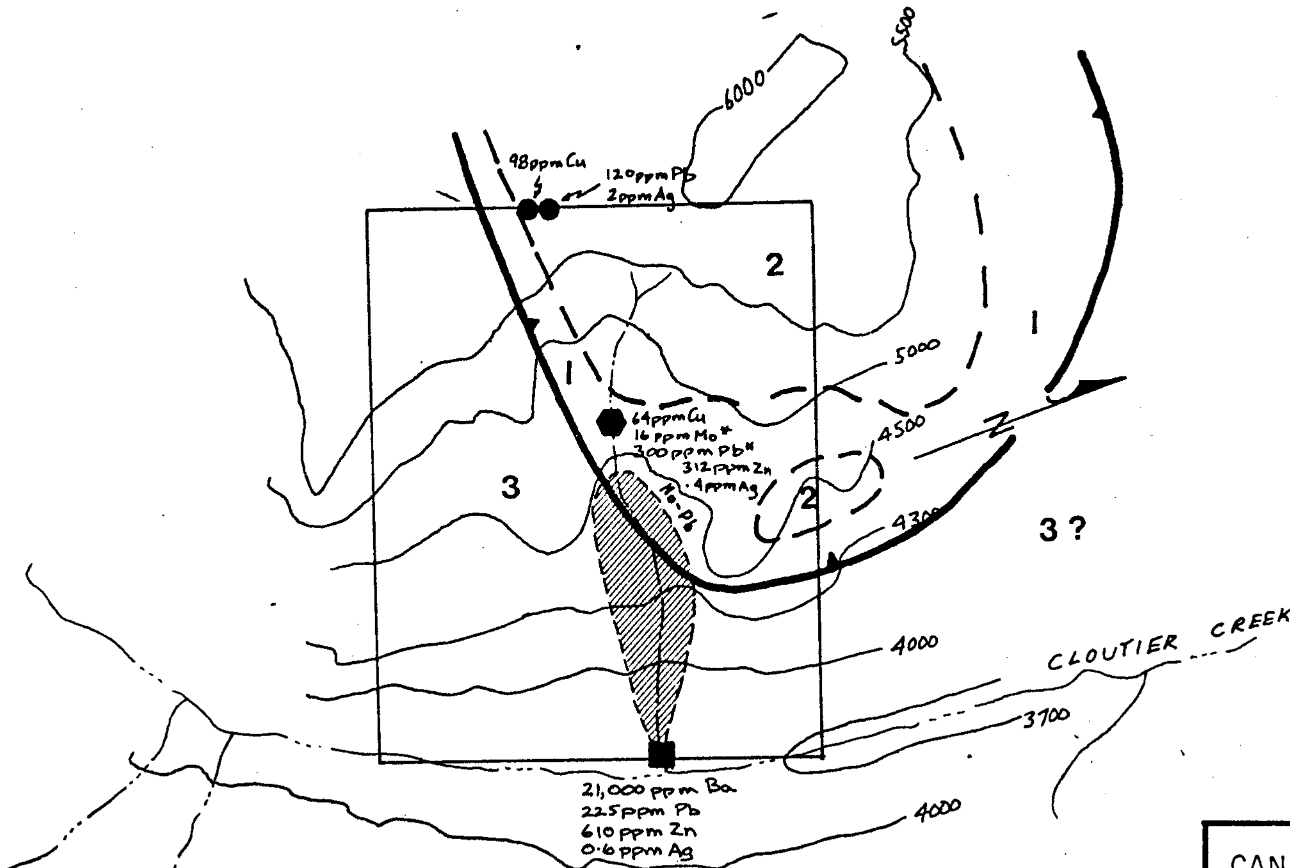
YUKON TERRITORY

SOILS GEOCHEMISTRY

U - Th - Ag

Scale: 1" = 2640' (1/2 mile)

Septmber, 1979




LEGEND

Geology

3 : Rhyolite, lapilli tuff

2 : Dolomite, dolomitic breccia, dolomitic sandstone

1 : Schistose volcanics, greenstone

— — — Geological Contact

▲ Thrust fault (Inclined)

Geochemistry

Stream Sediment Anomaly: Mo>3ppm; Pb>21ppm

● 1979 Rock Geochemistry

⬢ 1979 Heavy Mineral Geochem.

■ 1978 G.S.C. Stream sediment

CANADIAN OCCIDENTAL PETROLEUM LIMITED
MINERALS DIVISION

PROJECT WATSU
CLO 1-20 CLAIMS
YUKON TERRITORY

COMPILATION OF GEOLOGY & GEOCHEMISTRY

Scale: 1" = 2640' (1/2 mile) PLAN 12 Septmber, 1979

# Author's Qualifications

Eric J. Sacks

Education - Graduated Queen's University, Kingston, Ontario
M.Sc. in Geology, 1978
- Graduated University of Toronto, Toronto, Ontario
B.Sc. in Geology, 1977

Work Experience - Employed as field exploration geolgist with Canadian Occidental Petroleum Ltd., Minerals Division, Toronto, Ontario since 1978. Carried out and supervised mineral exploration programs in B.C. and Yukon.

Statement of Expenditures

Claims CLO 1-20

Record Numbers YA 44642 - YA 44661

| | | | Pro-rated[1] Costs |
|---|---|---|---|
| Salaries and Benefits | | | $1,149.25 |
| Travel and Accommodation | | | 400.52 |
| Drafting and Reproduction | | | 246.11 |
| Consultant | | | 345.33 |
| Camp costs and Supplies | | | 788.87 |
| Rental of Equipment | | | 131.47 |
| Other Work | | | 336.16 |
| | Sub-total | | $3,697.71 |
| Helicopter 3.6 hr. at $340/hr. | $1,224.00 | 2 | |
| Geochemical 185 analyses | 316.96 | 3 | $1,540.96 |
| | Total | | $5,238.67 |

Notes

[1] Pro-rated on basis of 3.9 man-days worked on claims conducting geological/geochemical/geophysical surveys out of a total of 115.6 man-days spent on these surveys during Project Watsu (see attached breakdown on following sheet).

[2] Helicopter flying completed by Associated Helicopters Ltd.

[3] Geochemical analyses completed by Chemex Labs, Vancouver, B.C. (see attached Cost Breakdown).

PROJECT 1

| BC CLAIM GROUPS | TOTAL NO. OF MAN DAYS | PRO-RATED COSTS: SALARIES & BENEFITS | TRAVEL & ACCOMMODATION | DRAFTING & REPRODUCTION | CONSULTANTS | CAMP COSTS & SUPPLIES | EQUIPMENT RENTAL | OTHER WORK | SUB-TOTAL "A" | REAL COSTS: HELICOPTER at $310/hr | hrs. | GEOCHEMISTRY cost | # ana | SUB-TOTAL "B" | TOTAL "A" + "B" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALLEN | 4.3 | 1267.12 | 772.36 | 271.35 | 380.75 | 869.78 | 144.96 | 370.63 | 4076.95 | 620.00 | 2.0 | 617.80 | 385 | 1237.80 | 5314.75 |
| ASP | 5.0 | 1473.40 | 898.10 | 315.53 | 442.73 | 1011.38 | 168.56 | 430.97 | 4740.67 | 682.00 | 2.2 | 627.28 | 396 | 1309.28 | 6049.95 |
| COT | 3.0 | 884.04 | 538.86 | 189.32 | 265.64 | 606.83 | 101.13 | 258.58 | 2844.40 | 620.00 | 2.0 | 378.24 | 201 | 998.24 | 3842.64 |
| KAZ | 5.0 | 1473.40 | 898.10 | 315.53 | 442.73 | 1011.38 | 168.56 | 430.97 | 4740.67 | 527.00 | 1.7 | 854.64 | 454 | 1381.64 | 6122.31 |
| MAR | 1.0 | 294.68 | 179.62 | 63.11 | 88.55 | 202.28 | 33.71 | 86.20 | 948.15 | 310.00 | 1.0 | 62.40 | 18 | 372.40 | 1320.55 |
| NEED | 5.0 | 1473.40 | 898.10 | 315.53 | 442.73 | 1011.38 | 168.56 | 430.97 | 4740.67 | 837.00 | 2.7 | 966.36 | 560 | 1803.36 | 6544.03 |
| PLATE | 5.4 | 1591.27 | 969.94 | 340.77 | 478.15 | 1092.29 | 182.04 | 465.45 | 5119.91 | 961.00 | 3.1 | 793.24 | 464 | 1754.24 | 6874.15 |
| RAN | 5.4 | 1591.27 | 969.94 | 340.77 | 478.15 | 1092.29 | 182.04 | 465.45 | 5119.91 | 1209.00 | 3.9 | 775.28 | 524 | 1984.28 | 7104.19 |
| SHAR 1&2 | 5.4 | 1591.27 | 969.94 | 340.77 | 478.15 | 1092.29 | 182.04 | 465.45 | 5119.91 | 1023.00 | 3.3 | 639.36 | 402 | 1662.36 | 6782.27 |
| SHAR 3&4, 9 | 5.4 | 1591.27 | 969.94 | 340.77 | 478.15 | 1092.29 | 182.04 | 465.45 | 5119.91 | 1488.00 | 4.8 | 480.04 | 619 | 2268.04 | 7387.95 |
| SHAR 5&6 | 5.4 | 1591.27 | 969.94 | 340.77 | 478.15 | 1092.29 | 182.04 | 465.45 | 5119.91 | 899.00 | 2.9 | 750.36 | 469 | 1649.36 | 6769.27 |
| SHAR 7&8 | 5.4 | 1591.27 | 969.94 | 340.77 | 478.15 | 1092.29 | 182.04 | 465.45 | 5119.91 | 837.00 | 2.7 | 749.28 | 460 | 1586.28 | 6706.19 |
| SUB-TOTAL (1) | 55.7 | 16413.66 | 10004.78 | 3514.99 | 4932.03 | 11266.77 | 1877.72 | 4801.02 | 52810.97 | 10013.00 | 32.3 | 7994.28 | 4952 | 18007.28 | 70818.25 |
| YUKON CLAIM GROUPS | | | | | | | | | | at $340/hr | | | | | |
| BIG OX | 5.6 | 1650.21 | 1005.87 | 353.39 | 495.86 | 1132.74 | 188.78 | 482.69 | 5309.54 | 1020.00 | 3.0 | 879.76 | 541 | 1899.76 | 7209.30 |
| BORDER | 1.1 | 324.15 | 197.58 | 69.42 | 97.40 | 222.50 | 37.08 | 94.81 | 1042.94 | 204.00 | 0.6 | 165.16 | 101 | 369.16 | 1412.10 |
| CLO | 3.9 | 1149.25 | 400.52 | 246.11 | 345.33 | 788.87 | 131.47 | 336.16 | 3697.71 | 1224.00 | 3.6 | 316.96 | 185 | 1540.96 | 5238.67 |
| CO | 2.2 | 648.30 | 395.16 | 138.83 | 194.80 | 445.01 | 74.16 | 189.63 | 2085.89 | 918.00 | 2.7 | 535.24 | 372 | 1453.24 | 3539.13 |
| GOAT | 5.5 | 1620.74 | 987.91 | 347.08 | 487.01 | 1112.51 | 185.41 | 474.07 | 5214.73 | 782.00 | 2.3 | 1266.48 | 807 | 2048.48 | 7263.21 |
| ICE | 4.2 | 1237.66 | 754.40 | 265.04 | 371.90 | 848.56 | 141.59 | 362.32 | 3982.47 | 782.00 | 2.3 | 798.64 | 351 | 1280.64 | 5263.11 |
| LICK | 5.2 | 1532.34 | 934.02 | 328.15 | 460.44 | 1051.83 | 175.30 | 448.21 | 4930.29 | 748.00 | 2.2 | 920.36 | 546 | 1668.36 | 6598.65 |
| MOX | 5.9 | 1738.61 | 1059.75 | 372.32 | 522.43 | 1193.42 | 198.90 | 508.54 | 5593.97 | 1292.00 | 3.8 | 1205.04 | 705 | 2497.04 | 8091.01 |
| OXY | 4.6 | 1355.53 | 826.25 | 290.29 | 407.31 | 930.47 | 155.07 | 396.49 | 4361.41 | 884.00 | 2.6 | 732.44 | 449 | 1616.44 | 5977.85 |
| PISA | 5.6 | 1650.21 | 1005.87 | 353.39 | 495.86 | 1132.74 | 188.78 | 482.68 | 5309.54 | 714.00 | 2.1 | 757.96 | 512 | 1471.96 | 6781.50 |
| SAL | 5.6 | 1650.21 | 1005.87 | 353.39 | 495.86 | 1132.74 | 188,78 | 482.78 | 5309.54 | 1190.00 | 3.5 | 497.12 | 411 | 1687.12 | 6996.66 |
| TIER | 4.9 | 1443.93 | 880.15 | 309.21 | 433.91 | 991.10 | 165.18 | 422.71 | 4645.46 | 1156.00 | 3.4 | 750.76 | 438 | 1906.76 | 6552.60 |
| WOX | 5.6 | 1650.21 | 1005.87 | 353.39 | 495.86 | 1132.74 | 188.78 | 482.69 | 5309.54 | 952.00 | 2.8 | 841.08 | 579 | 1793.08 | 7102.62 |
| SUB-TOTAL (2) | 59.9 | 17651.35 | 10759.22 | 3780.01 | 5303.97 | 12116.23 | 2019.28 | 5162.98 | 56793.41 | 11866.00 | 34.9 | 9367.00 | 5997 | 21233.00 | 78026.41 |
| TOTALS (1+2) | 115.6 | 34065.00 | 20764.00 | 7295.00 | 10236.00 | 23383.00 | 3897.00 | 9964.00 | 109604.00 | 21879.00 | 67.2 | 17361.28 | 10949 | 39240.28 | 148844.66 |

THE CLO CLAIM GROUP

GEOCHEMICAL COST BREAKDOWN

| INVOICE #[1] | # OF SAMPLES | DESCRIPTION | COST[2] |
|---|---|---|---|
| 31943 | 8 | Cu, Mo, Pb, Zn, Ag, U, Sn, W | $114.80 |
| 32440 | 10 | Th | 50.00 |
| 32463 | 1 | Cu, Mo, Pb, Zn, Ag, Sn, W, U, Th | 25.60 |
| 31920 | 9 | Cu, Mo, Pb, Zn, Ag, U | 63.45 |
| 32448 | 9 | Th | 45.00 |
| 31746 | 9 | U, F, As | 83.25 |
| 31828 | 2 | Cu, Mo, Pb, Zn, Ag, U | 14.10 |
| | | SUB-TOTAL | $396.20<br>less 20% |
| | | TOTAL | $316.96 |

1 - all invoices from Chemex Labs unless otherwise noted
2 - cost includes preparation of samples