

EXPLORATION  
NTS: 94F/11E

COMINCO LTD.

WESTERN DISTRICT

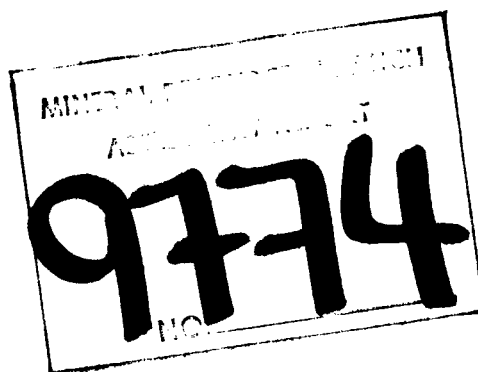
ASSESSMENT REPORT  
GEOLOGY, GEOCHEMISTRY

FERN PROPERTY

OMINECA M.D., BRITISH COLUMBIA

LATITUDE: 57°32'N; LONGITUDE: 125°8'W

WORK PERIOD: AUGUST 17 - 28, 1981



NOVEMBER 1981

B.C. WATERS

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\* \* \*

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\* \* \*

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ASSESSMENT REPORT  
GEOLOGY, GEOCHEMISTRY  
FERN PROPERTY

OMINECA M.D., BRITISH COLUMBIA

I. SUMMARY

The Fern claim group lies around 300 km NW of Mackenzie, B.C. in the Omineca Mining District - 2½ km east of the Cirque deposit. The claim is composed of 16 units in 3 blocks recorded during November, 1979.

Exploration during the 1981 season from August 17 to August 28 involved the collection of 510 soil and silt samples and 25 rock samples for geochemical analysis and the mapping of a 6 km<sup>2</sup> area at a scale of 1:5,000. Total expenditure on the Fern group is estimated at \$21,963.94 for 1981.

Mapping demonstrates the presence of a folded section of Mid to Upper Devonian Gunsteel across the E side of the claims with the W side covering overthrust Silurian siltstone and Ordovician shale. Prospecting and geochemistry have not lead to the discovery of any sulphide mineralization or barite on the claim group.

II. INTRODUCTION

A. Location

The Fern property lies in the Omineca Mining District of B.C., around 30 km east of the Finlay River and 10 km S of the Kwadacha River, within 2½ km of the Cirque (PbZnAg) deposit. The centre of the claim group lies at Latitude 57°32', Longitude 125°08' on NTS 94F/11E.

Field work was carried out from a tent camp located just outside the eastern boundary of the claim, with helicopter support from a Bell 206 B based at Sikanni Chief Lake 80 km to the SE and supplied by float aircraft from Mackenzie.

The area is mountainous with peak elevations at around 2100 m. The Ardvark creek in the headwaters of the Paul River crosses the central part of the permit from E to W and is joined by several small tributaries from N and S producing a marshy area of low relief in the central and western areas. Outcrop averages 5% above the tree line (1700m) with the best exposures confined to ridges or creek beds. Below the tree line outcrop is very rare.

2.

B. History and Previous Exploration

The Fern claims were staked in October 1979 and recorded in November of the same year. They comprise 16 units in 3 blocks.

During 1980 reconnaissance mapping and limited rock and heavy mineral sampling showed that the Ardvark creek drainage and its tributaries are rich in barite and locally in lead and zinc.

C. Ownership

The claim group is 100% owned by Cominco Ltd. The claims are:

<u>Claim No.</u>	<u>Record No.</u>	<u>No. of Units</u>	<u>Recording Date</u>
Fern 1	2315	8	Nov. 15, 1979
Fern 2	2316	4	Nov. 15, 1979
Fern 3	2317	4	Nov. 15, 1979

III. EXPLORATION

The 1981 exploration program from August 17 to August 28 involved soil geochemical sampling and geological mapping. Soil samples were collected at 25 m intervals on 12 cross lines spaced at 200 m intervals and tied in to a base line running roughly NW SE. Lines were surveyed with chain and compass and flagged at regular intervals. Twenty-five (25) rock samples were collected for analysis from several of the Devonian shale sections. Geological mapping and prospecting at a scale of 1:5,000 was done on enlarged reproductions of a 1:15,000 topographic base map prepared from air photographs.

The work was done by B.C. Waters (B.A. 1977) assisted by A. Stanta (B.Sc. 1980), M. Chan and M. Davies.

IV. GEOLOGY

A. Geological Setting (from K.R. Pride, Assessment Report 1980)

"A northwest trending belt of Devonian "Black Clastics" stratigraphy has been outlined by regional mapping programs conducted by the Geological Survey of Canada. The belt is located within the Rocky Mountain thrust and fold belt of the Columbian Orogen and is centered approximately 40 kilometers east of the Rocky Mountain Trench. The Devonian "Black Clastics" are continuous from the Ospika River, northwesterly to Braid Creek, a distance of 200 kilometers. This belt is part of the northwest trending Kechika Trough which may represent a southeasterly extension of the larger Selwyn Basin.

The Devonian "Black Clastics" succession is divisible into a lower proximal to distal turbidite assemblage formally named the Besa River Formation, which is the basinal equivalent of the Devonian Dunedin Formation platformal carbonates, and an upper division

3.

of silver-blue-grey weathering argillite, chert and pyritic carbonaceous black shale informally named the Gunsteel Formation.

The Gunsteel Formation hosts four significant, stratiform barite-lead-zinc occurrences, namely: Driftpile Creek, Mount Alcock, Cirque and Elf. These occurrences are comparable to the Tom and Jason barite-lead-zinc prospects of Selwyn Basin at MacMillan Pass in the Yukon."

#### B. Geology of the Property

A conformable, but folded section of Ordovician shale, silurian calc-silt and Devonian limestone and shale in the NE of the claim strikes in a NW SE direction and is overthrust from the west by a section of folded Silurian calc-silts, which show a NW SE trending anticlinally folded core of Ordovician shale. The geology is shown on Plate 4.

The Ordovician on the claim is a series of dark grey or black silts, silty shales, and minor cherts, with a very pale grey uppermost member showing occasional limestone bands and the Caradoc graptolite *Dicellograptus Morrisi*. Rare laminations of syngenetic pyrite are present locally. A section of orange/brown weathering green-grey andesitic tuff and lava is exposed outside the claims to the east. The Ordovician section is estimated at greater than 600 m, but its base is unknown.

Silurian deposition began with a series of interbeds of silt and dark grey or cherty shale with limestone, locally exposed along the margins of the Ordovician anticlinal fold core on the central/western area of the property. Brown weathering resistant calc silts and sandstones with local pyrite nodules and burrowing structures comprise the greater part of the Silurian section, averaging 400 m in thickness, and these rocks are prominent ridge forming members.

The Devonian section begins with a light grey weathering dark grey reefal limestone (250 m) which contains fossil crinoids and stromatoporoids resting with minor unconformity on Silurian siltstones. This is overlain by the Devonian shale section averaging 400 m in true thickness, which has been synclinally folded producing an outcrop width of around 1 km. Lithologies within the section include black cherts, black carbonaceous shales, minor grey limestone, buff dolomite, dark grey silty shale and black cherty (siliceous) shale, with weathering colours ranging from light grey to dark grey and with common Fe staining.

Recent deposition includes local FeMn cemented breccias probably derived from the weathering of pyritic shales. In some places, enough pyrite was present to have produced minor gossans.

Soil cover in areas of moderate slope shows a deep organic humus layer overlying a well developed "A" horizon of black soil and a lower "B" horizon of brown grey soil which grades down into weathered rock.

## V. MINERALIZATION

Mapping and prospecting across the property did not result in the discovery of any sulphide mineralization and no visible barite was located despite high Ba soil geochemical results across the Devonian shales.

## VI. GEOCHEMISTRY

### A. Procedure

Soil geochemical samples were collected from 12 compass surveyed cross lines tied into a NW SE base line also compass surveyed, chained and flagged. Cross line separation of 200 m and sample separation of 25 m resulted in the collection of 510 soil and silt samples. Sampling covers the entire strike length of the Devonian Gunsteel shales within the permit.

Where possible soil samples were collected from the "B" horizon with a sampling hoe, however in many areas of lower relief and deep organic cover the "B" horizon was not reached and the "A" horizon was therefore sampled. Samples were packed and sent in kraft sample bags to the Cominco Laboratory, 1486 E. Pender Street, Vancouver, B.C., where they are stored. Following sample preparation (sieving to -80 mesh) the samples were digested in perchloric acid and analysed for Pb, Zn and Ag using Atomic Absorption Spectrometry. Analysis was made for Ba using X-ray Fluorescence. Rock samples were prepared by grinding to -200 mesh and analysed by the same methods as above for Pb, Zn, Ba, Ag and Mn.

Data treatment was done using a computer program to establish class limits and plot log transform histograms and cumulative probability plots for each element analysed, both for the grouped values of silts and soils and for rocks as a separate class. Significance levels were determined together with contour intervals from the cumulative probability curves, Table 1 shows these values.

Table 1

### Significance Levels and Contour Intervals

#### Fern Geochemistry

		Pb	Zn	Ba	Ag	Mn	Cu
Soils and Silts	Significant	50 ppm	1000 ppm	1800 ppm	1 ppm	-	100 ppm
	Contour Int.	25 ppm	500 ppm	5000 ppm	1 ppm	-	50 ppm
Rocks	Significant	40 ppm	800 ppm	1600 ppm	1 ppm	250 ppm	30 ppm

5.

B. Results (Plates 1-3)

Lead geochemistry defines a thin, but continuous anomaly of +50 ppm on five lines across the northern sector of the permit, which appears to be linked to black cherts and cherty (siliceous) shales in outcrop on the crest of the NW SE trending ridge. Values reach over 125 ppm on two of these lines.

Zinc geochemistry contoured at over 1000 ppm shows several small irregular anomalies and one larger one, all overlying Gunsteel shales. The largest anomaly lies in an area of low relief and the maximum values of around 2500 Zn may well be linked to a high proportion of humus in the samples.

Ba values over 1800 ppm form an extensive anomaly covering most of the Devonian Gunsteel section. The higher values of Ba (>5000 ppm) seen in the northern part of the permit appear to be closely linked to subcrop of black carbonaceous cherty (siliceous) and occasionally silty shale.

Scattered silver anomalies at >1 ppm Ag with values locally at >2 ppm silver coincide closely with outcrop of black carbonaceous shales and/or cherts and siliceous shales.

Copper is judged anomalous at >100 ppm with one very minor small anomaly located over outcrop of black carbonaceous shale.

VII. CONCLUSIONS

No sulphide or barite mineralization has been located on the Fern claim by the prospecting and mapping conducted during 1981 and results do not suggest the presence of any subcropping mineralization. Further work should involve detailed rock geochemical sampling and stratigraphic measuring.

Report by: B.C. Waters  
B.C. Waters, Geologist

Endorsed by: A.B. Mawer  
A.B. Mawer, Senior Geologist

Approved for  
Release by: G. Harden  
G. Harden, Manager,  
Exploration  
Western District

Distribution:  
Mining Recorder (2)  
Western District (1)  
BCW (1)

APPENDIX A  
STATEMENT OF EXPENDITURES  
FERN CLAIM GROUP  
AUGUST 17 - 28, 1981

Salaries and Wages

B.C. Waters - 2 weeks	\$ 2,228.45
A. Stanta - 2 weeks	1,264.09
M. Chan - 2 weeks	1,200.00

Assays and Geochemical Analysis 4,106.41

Field Equipment and Supplies 1,935.95

Camp Maintenance 1,746.48

Transportation

Fixed Wing	1,726.00
Rotary Wing	4,000.00
Miscellaneous	256.56

Report Writing,  
Drafting 3,500.00

\$21,963.94



APPENDIX B

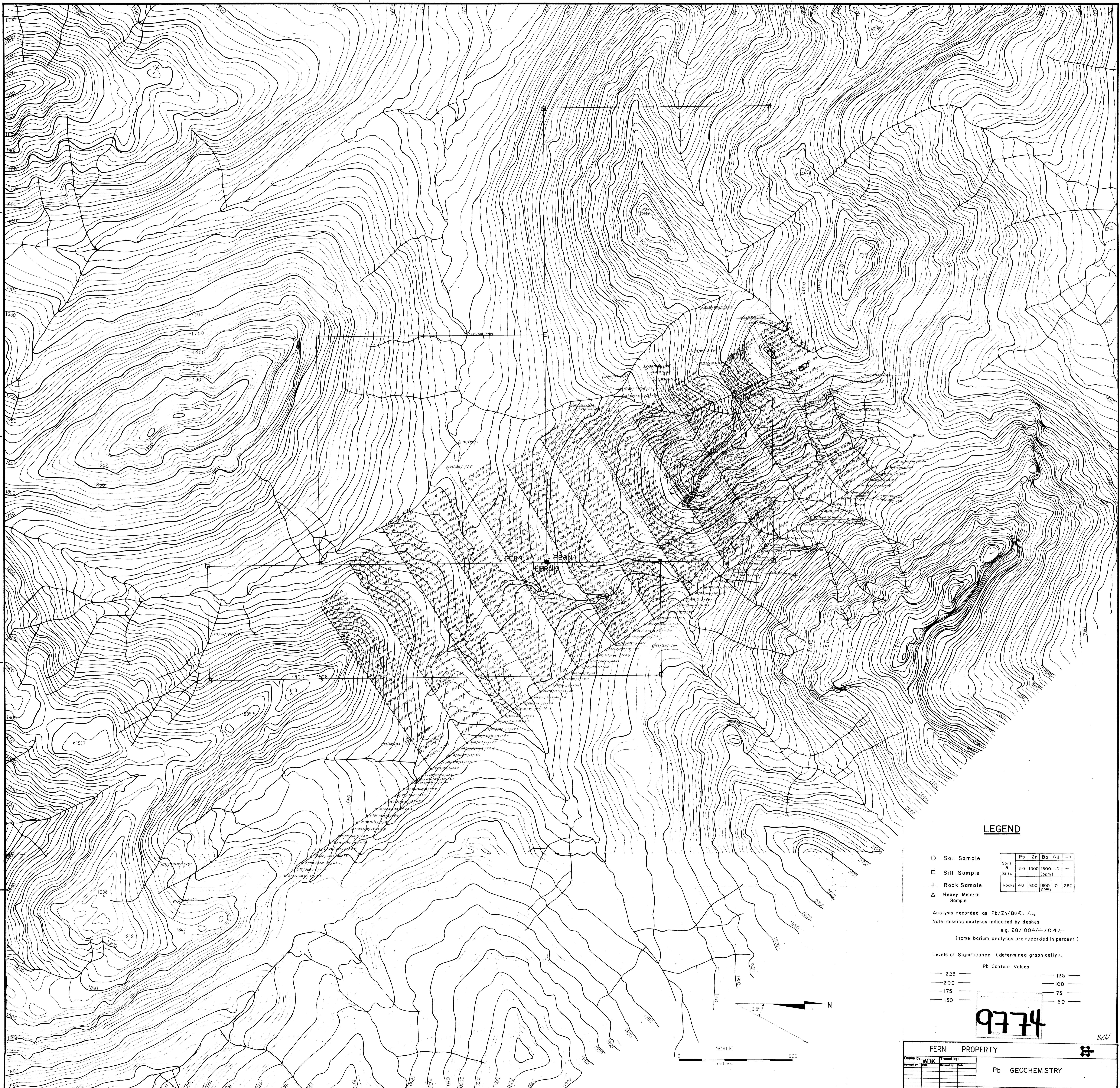
STATEMENT OF QUALIFICATIONS

I, B.C. WATERS, GEOLOGIST, WITH BUSINESS ADDRESS AT 700 - 409 GRANVILLE STREET, VANCOUVER, BRITISH COLUMBIA AND RESIDENTIAL ADDRESS AT 235 W. 4TH, NORTH VANCOUVER, BRITISH COLUMBIA, HEREBY CERTIFY THAT:-

1. THAT I am a graduate in Geological Sciences with a B.A. (Hons.) in 1977 from the University of Cambridge
2. THAT from 1977 to the present I have been employed as a geologist and have been actively engaged in exploration geology and mining geology in Svalbard, Germany, Saudi Arabia, Italy and British Columbia.
3. THAT I personally participated in the field work on the Fern Claim Group and have interpreted all the data resulting from this work.

Signed: B.C. Waters  
B.C. Waters  
Geologist

Dated this 18 day of November, 1981  
at Vancouver, British Columbia



**LEGEND**

- Soil Sample
- Silt Sample
- + Rock Sample
- △ Heavy Mineral Sample

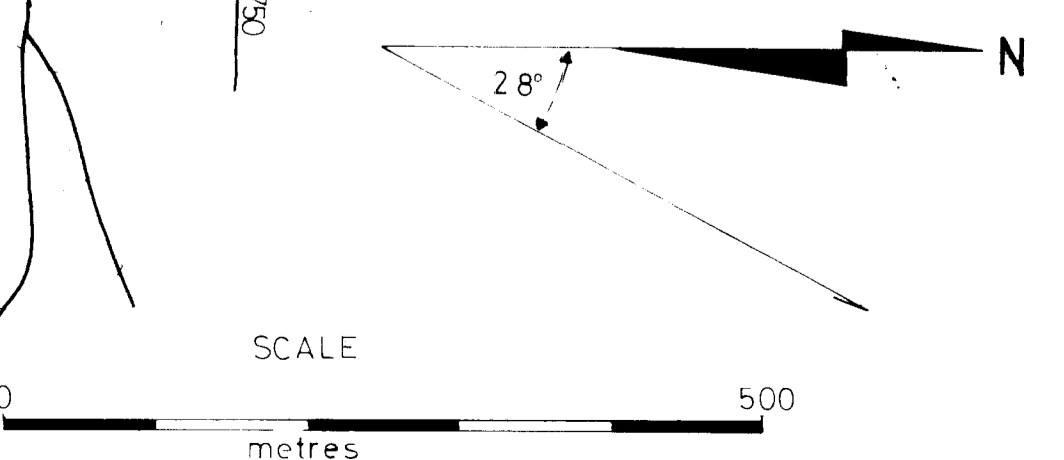
	Pb	Zn	Ba	Ag	Cu
Soils	150	1000	1800	1.0	-
Silts					
Rocks	40	800	1600	1.0	250

Analysis recorded as Pb/Zn/Ba/Ag/Cu  
 Note: missing analyses indicated by dashes  
 e.g. 28/1004/-/0.4/-  
 (some barium analyses are recorded in percent)

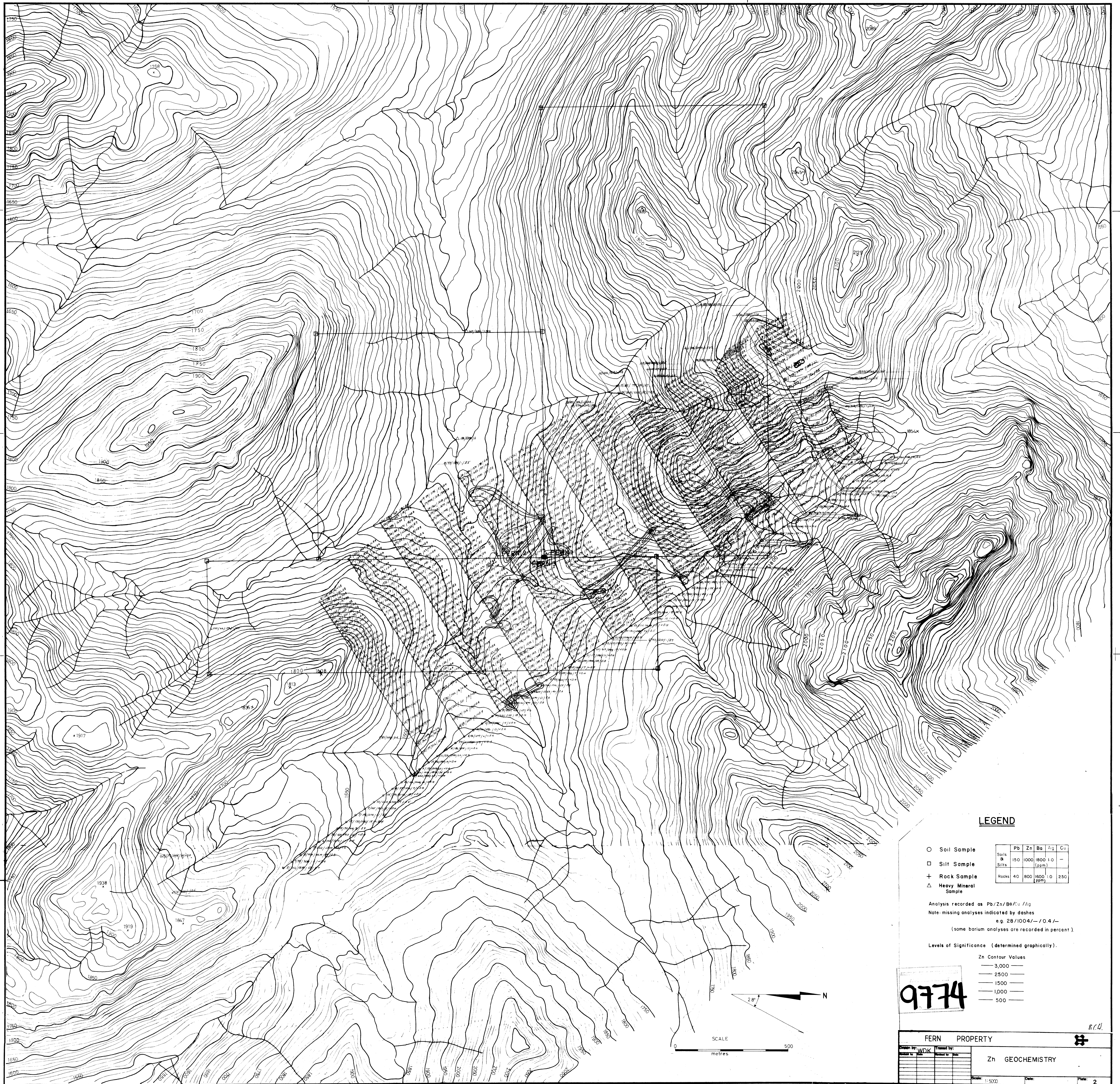
Levels of Significance (determined graphically).

Pb Contour Values	
— 225 —	— 125 —
— 200 —	— 100 —
— 175 —	— 75 —
— 150 —	— 50 —

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FERN PROPERTY		
Drawn by: WDK	Traced by:	
Checked by:	Number of Sites:	
Pb GEOCHEMISTRY		
Scale: 1:5000	Date:	Plate:



**LEGEND**

- Soil Sample
- Silt Sample
- + Rock Sample
- △ Heavy Mineral Sample

	Pb	Zn	Ba	Ag	Cu
Soils	150	1000	1600	1.0	—
Silt	150	1000	1600	1.0	—
Rocks	40	800	1600	1.0	250

Analysis recorded as Pb/Zn/Ba/Cu/Ag  
 Note: missing analyses indicated by dashes  
 e.g. 28/1004/-/0.4/-  
 (some barium analyses are recorded in percent).

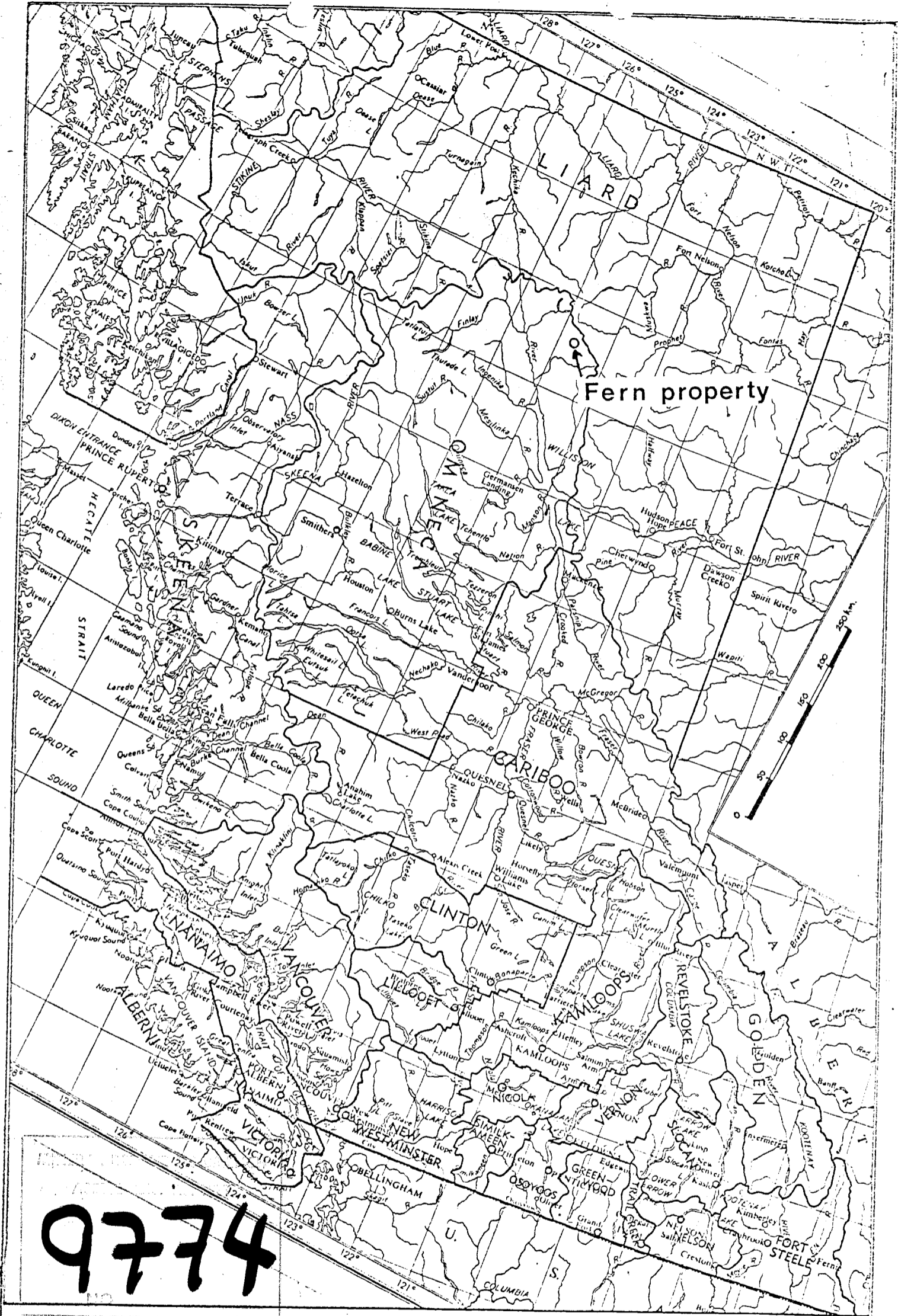
Levels of Significance (determined graphically).

- Zn Contour Values
- 3,000 —
- 2,500 —
- 1,500 —
- 1,000 —
- 500 —

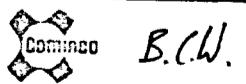
**9774**



FERN PROPERTY		
Drawn by: WDK	Traced by:	
Checked by:	Checked by:	
Zn GEOCHEMISTRY		
Scale: 1:5000	Date:	Page: 2



9774

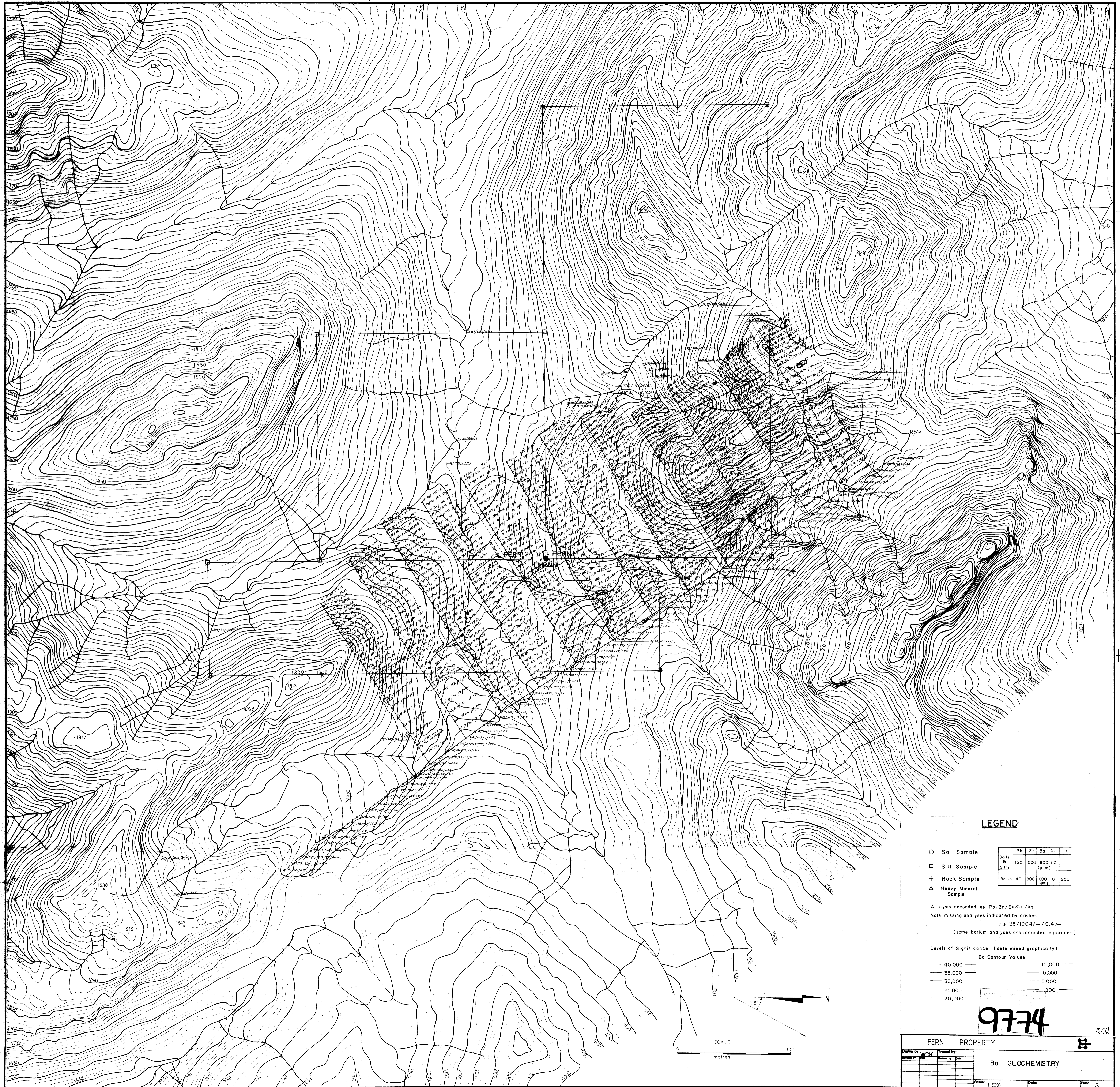


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Revised by	Date	Revised by	Date

LOCATION MAP

Scale: 1:5,300,000 Date: Nov 81 Plate 5





**LEGEND**

- Soil Sample
- Silt Sample
- + Rock Sample
- △ Heavy Mineral Sample

	Pb	Zn	Ba	As	Ag
Soils	150	1000	1800	1.0	—
Silts	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Rocks	40	800	1600	1.0	250
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)

Analysis recorded as Pb/Zn/Ba/As/Ag  
 Note: missing analyses indicated by dashes  
 e.g. 28/1004/-/0.4/-  
 (some barium analyses are recorded in percent)

Levels of Significance (determined graphically).

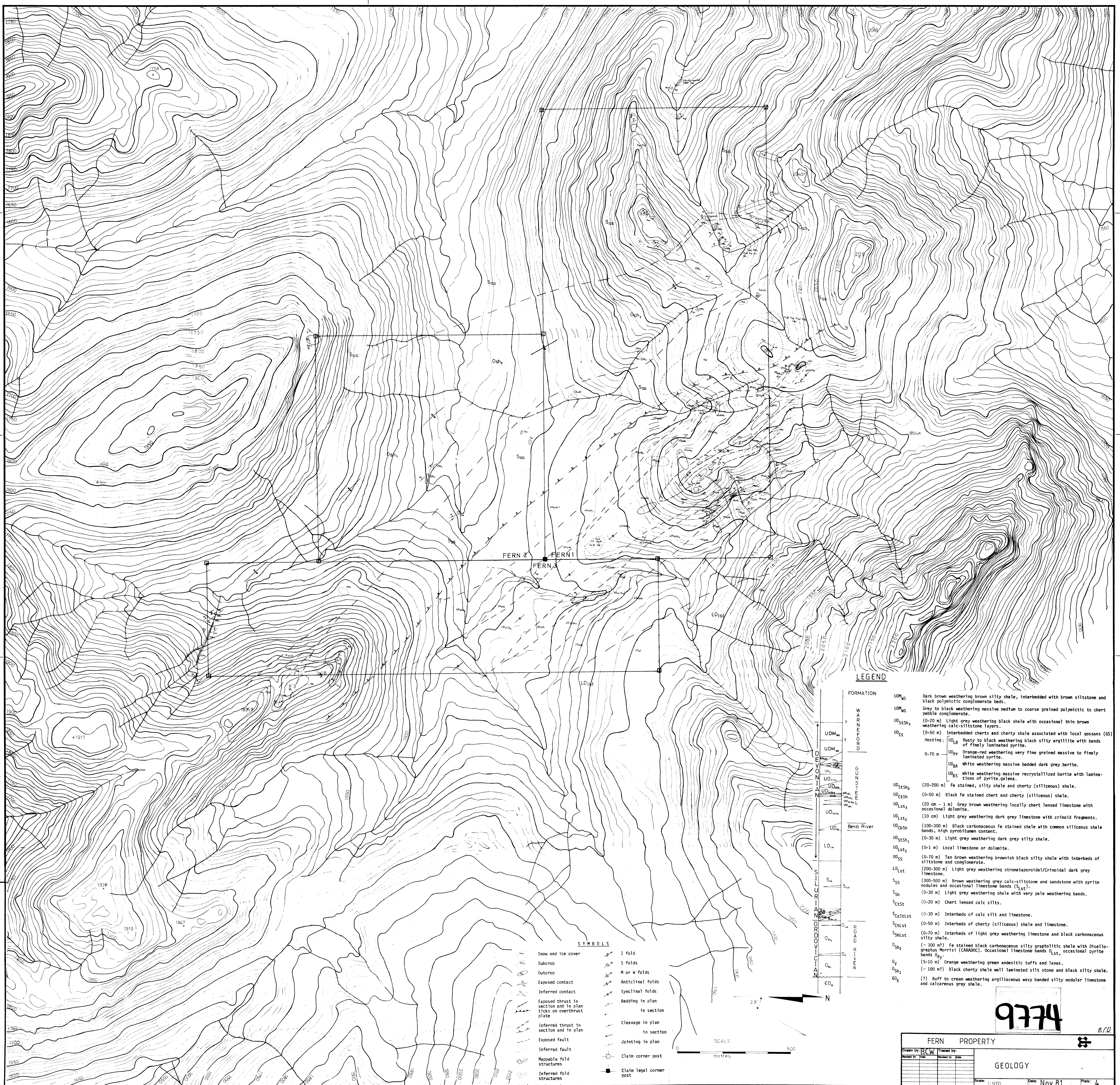
Ba Contour Values	
— 40,000 —	— 15,000 —
— 35,000 —	— 10,000 —
— 30,000 —	— 5,000 —
— 25,000 —	— 1,800 —
— 20,000 —	

**9774**

FERN PROPERTY

Drawn by: WDK	Traced by:
Checked by:	Checked by:

Ba GEOCHEMISTRY



**LEGEND**

FORMATION	DESCRIPTION
UDM <sub>MS</sub>	Dark brown weathering brown silty shale, interbedded with brown siltstone and black polymictic conglomerate beds.
UDM <sub>MG</sub>	Grey to black weathering massive medium to coarse grained polymictic to chert pebble conglomerate.
UD <sub>STSh</sub>	(0-20 m) Light grey weathering black shale with occasional thin brown weathering calc-siltstone layers.
UD <sub>CT</sub>	(0-50 m) Interbedded cherts and cherty shale associated with local gossans (GS) Hosting: UD <sub>LB</sub> Rusty to black weathering black silty argillite with bands of finely laminated pyrite.
UD <sub>BY</sub>	0-70 m Orange-red weathering very fine grained massive to finely laminated pyrite.
UD <sub>BA</sub>	White weathering massive bedded dark grey barite.
UD <sub>BS</sub>	White weathering massive recrystallized barite with laminae of pyrite, galena.
UD <sub>STSh2</sub>	(20-200 m) Fe stained, silty shale and cherty (siliceous) shale.
UD <sub>CTSh</sub>	(0-50 m) Black Fe stained chert and cherty (siliceous) shale.
UD <sub>LSt3</sub>	(20 cm - 1 m) Grey brown weathering locally chert lensed limestone with occasional dolomite.
UD <sub>LSt2</sub>	(10 cm) Light grey weathering dark grey limestone with crinoid fragments.
UD <sub>CSH</sub>	(100-300 m) Black carbonaceous Fe stained shale with common siliceous shale bands, high pyrobitumen content.
UD <sub>STSh1</sub>	(0-30 m) Light grey weathering dark grey silty shale.
UD <sub>LSt1</sub>	(0-1 m) Local limestone or dolomite.
UD <sub>LS</sub>	(0-70 m) Tan brown weathering brownish black silty shale with interbeds of siltstone and conglomerate.
LD <sub>LSt</sub>	(200-300 m) Light grey weathering stromatoporoid/Crinoidal dark grey limestone.
S <sub>SS</sub>	(300-500 m) Brown weathering grey calc-siltstone and sandstone with pyrite nodules and occasional limestone bands (S <sub>LS</sub> )
S <sub>Sh</sub>	(0-30 m) Light grey weathering shale with very pale weathering bands.
S <sub>CTSt</sub>	(0-20 m) Chert lensed calc silt.
S <sub>CaStSt</sub>	(0-30 m) Interbeds of calc silt and limestone.
S <sub>CTSt</sub>	(0-50 m) Interbeds of cherty (siliceous) shale and limestone.
S <sub>ShSt</sub>	(0-70 m) Interbeds of light grey weathering limestone and black carbonaceous silty shale.
O <sub>Sh2</sub>	(~300 m?) Fe stained black carbonaceous silty argillitic shale with <i>Dicellograptus Morrisi</i> (CARADOOC). Occasional limestone bands O <sub>LSt</sub> , occasional pyrite bands O <sub>Py</sub> .
O <sub>Py</sub>	(5-10 m) Orange weathering green andesitic tuffs and lavas.
O <sub>Sh1</sub>	(~100 m?) Black cherty shale well laminated silt stone and black silty shale.
EO <sub>X</sub>	(?) Buff to cream weathering argillaceous wavy banded silty nodular limestone and calcareous grey shale.

**SYMBOLS**

	Snow and ice cover		Z fold
	Subcrop		S folds
	Outcrop		M or W folds
	Exposed contact		Anticlinal folds
	Inferred contact		Synclinal folds
	Exposed thrust in section and in plan ticks on overthrust plate		Bedding in plan
	Inferred thrust in section and in plan		Cleavage in plan
	Exposed fault		Jointing in plan
	Inferred fault		Claim corner post
	Mappable fold structures		Claim legal corner post
	Inferred fold structures		

9774

B.C.U.

<b>FERN PROPERTY</b>	
Drawn by: <b>BW</b>	Traced by:
Checked by:	Reviewed by:
<b>GEOLOGY</b>	
Scale: 1:5000	Date: Nov 81
	Plate: 4