

COMINCO LTD.

EXPLORATION DIVISION

WESTERN DISTRICT

6444

REPORT ON GEOLOGICAL MAPPING AND GEOCHEMICAL SURVEY

ST. JOE CLAIM GROUP

Fort Steele Mining Division

82G/5SW

Submitted by:

E.W. BATCHELOR

Cominco Ltd.
2450 Cranbrook Street
Cranbrook, B.C.

Under the supervision of:

D.W. HEDDLE
P. Eng.

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT

NO. _____

COMINCO LTD.

EXPLORATION DIVISION

WESTERN DISTRICT

1.00 SUMMARY

This report describes geological mapping and geochemical surveys conducted on optioned St. Joe claims Nos. 1 to 6 inclusive, which total 21 units. The work was undertaken to explore for Cu/Pb/Zn deposits in the Aldridge Formation.

The mapping and two phases of soil sampling were completed between April 13 and July 21, 1977. A total of 807 soil samples were collected.

Total expenditures on mapping and soil geochemistry were \$8,865.55. An "Affidavit on Application to Record Work", which includes these expenditures was filed on September 7, 1977, with the Mining Recorder in Cranbrook, B.C.

2.00 INTRODUCTION

2.10 Status of Ownership

The St. Joe claims are owned by G.A. Pommier and L.E. Pommier, 204 - 3rd Street South, Cranbrook, B.C. The claims are under option to Cominco Ltd.

Details of individual claims in the group are as follows:

| <u>Claim Name</u> | <u>Record No.</u> | <u>Expiry Date</u> |
|-----------------------|-------------------|--------------------|
| St. Joe 1 (1 unit) | 32 | October 24, 1977 |
| St. Joe 2 (2 units) | 33 | October 24, 1977 |
| St. Joe 3 (9 units) | 34 | October 24, 1977 |
| St. Joe 4 (6 units) | 36 | October 27, 1977 |
| St. Joe 5 (1 unit) | 66 | September 7, 1977 |
| St. Joe 6 (2 units) | 67 | September 7, 1977 |
| <u>21 units</u> Total | | |

2.20 Location and Access

Mining Division: Fort Steele
N.T.S.: 82G/SSW

Long: 115° 59'
Lat: 49°29'

The St. Joe claim group is located approximately 10 km WSW of Cranbrook, B.C. Access is via the secondary road to Jim Smith Lake Provincial Park and from there via the old bush road leading to Kiakho Creek. Within the claim group, old logging roads and skid trails provide excellent access.

2.30 Topography and Vegetation

The St. Joe claim group covers an area of moderate relief which ranges in elevation from 1040 m to 1330 m A.S.L. The area has been extensively logged in the past and is forested by immature stands of larch, lodgepole pine and Douglas fir.

2.40 Objectives

To explore the property for Cu/Pb/Zn deposits in the Aldridge Formation by soil geochemical surveys and detailed geological mapping.

3.00 GEOLOGICAL MAPPING

The claim group was mapped at a scale of 1:10,000 on an orthophoto contoured at 10 m intervals. The orthophoto and the topographic base map on which the geology was compiled were prepared for Cominco Ltd. by McElhanney Engineering Ltd., Vancouver, B.C.

Exposure is poor on the northern half of the property because of extensive glacial till cover.

3.10 Property Geology (Plate 6)

Bedrock formations in the claim area consist of Proterozoic clastic sediments, Moyie intrusives and Mesozoic intrusives.

3.11 Table of Formations

| <u>Age</u> | <u>Formation Name</u> | <u>Lithology</u> |
|--------------------|-----------------------|---|
| Mesozoic (L.Cret?) | Kiakho Lake Stock | granodiorite, quartz, monzonite, feldspar porphyry. |
| Proterozoic | Creston | grey-green Argillite |
| Proterozoic | Moyie Intrusives | diorite-gabbro sills |
| Proterozoic | Middle Aldridge | high rank turbidites, argillites, minor conglomerate. |

3.12 Lithological Descriptions

Middle Aldridge

The Middle Aldridge is typified by quartzose, high rank greywacke turbidites alternating with thinner beds of laminated argillite or siltstone. The turbidite beds range up to 1.2 meters in thickness and average 0.6 m thick. They commonly have flame structures, minor slump features, load casts, and current laminations. The turbidites are typically light grey in colour. The turbidites are composed primarily of quartz and feldspar grains with interstitial quartz, sericite, biotite and chlorite.

The interturbidite argillite beds average 10 to 15 cm in thickness and frequently have up to 3% pyrrhotite disseminated along bedding planes. They are usually medium to dark grey in colour on a fresh surface and have a rusty weathering surface.

In the vicinity of the old St. Joe trenches and adit, two lenticular bodies of slump conglomerate are exposed. The larger lens has a thickness of 3 m and a strike length of approximately 100 m. The maximum size of clasts is approximately 8 cm.

Moyie Intrusives

Moyie intrusives are widespread throughout the Lower and Middle Aldridge. On the St. Joe property a single sill, approximately 25 m thick, is known in the Middle Aldridge.

The sill has the composition of a meta-gabbro and is composed of plagioclase feldspar, hornblende, biotite, chlorite and minor quartz. Chlorite appears to be developing as a result of the deuteritic alteration of hornblende and biotite.

The contacts of the sills are generally conformable over distances of several km. Contact metamorphism is restricted to the development of fine-grained biotite hornfels over a width of one meter.

Creston Formation

The Creston Formation outcrops just north of the northern boundary of the St. Joe claim group where it is in fault contact with the Middle Aldridge.

The formation is composed of grey and green argillite with abundant mud cracks and cross-bedding and was deposited in a shallow water environment.

Kiakho Lake Stock

This Stock has an exposed area of approximately 1 sq. km and outcrops on the northwest boundary of the St. Joe property. It appears to range in composition from quartz monzonite to granodiorite. Two feldspar porphyry dykes have been mapped on the property and are interpreted as being genetically related to the Stock.

The Stock is surrounded by an aureole of recrystallized Middle Aldridge sediments several tens of meters wide. Small quartz veins and medium-grained secondary biotite are common in this zone.

On the basis of age dating and regional mapping of similar intrusive bodies, the Kiakho Stock is considered to be Lower Cretaceous in age.

3.13 Structure

The Middle Aldridge rocks and the Moyie sill dip uniformly to the NE or E at 5 to 25° and strike varies from 130 to 175°.

A regional scale fault just north of the property brings the Middle Aldridge Formation in contact with the Creston Formation. This fault which strikes E-W near the St. Joe property, is a high angle normal fault with the northern side dipped down. Its vertical displacement must be in excess of 1000 ft. because Upper Aldridge is faulted out.

The fault zone has been silicified over a width of approximately 50 m.

3.14 Mineralization

Galena and sphalerite mineralization on the property is restricted to scattered grains in narrow quartz veins. The largest vein observed is approximately 0.20 m wide and 15 m long. A selected specimen of this mineralization assayed 5.5% Pb; 0.29% Zn; and 2.7 oz/ton Ag.

4.00 GEOCHEMISTRY

4.10 Sampling Procedure

4.11 Grid #1

A detailed soil geochemical survey was conducted over an area of 1.5 km by 2.5 km. A north-south baseline was blazed and flagged and sample lines were established at 100 m intervals. The sample interval along each line was 100 m. Samples were collected from the "B" horizon of the soil profile, at an average depth of 15 cm; and were stored in wet strength kraft bags. A total of 416 samples were collected on this grid.

4.12 Grid #2

After erratic high Pb/Zn soil values were obtained from a small area of Grid #1, this area was resampled in greater detail.

A new baseline, with azimuth 122^o, was established for more detailed follow-up sampling. The new line spacing was 50 m and the sample spacing along lines was 25 m. The same sampling procedure was used as on Grid #1. A total of 391 samples were collected on Grid #2.

4.20 Sample Preparation and Analysis

All samples were dried at atmospheric temperature and were sieved through a -80 mesh nylon screen. The samples were then shipped to Cominco's Exploration Research Lab in Vancouver for analysis.

Two grams of the -80 mesh fraction were digested in concentrated HCl and HNO₃ by heating on a hot plate. The sample was then taken up in 10% HCl and bulked to 100 ml with distilled water. The samples were then analyzed by atomic absorption.

Grid #1 samples were analyzed for Cu/Pb/Zn but Grid #2 samples were only analyzed for Pb and Zn.

4.30 Interpretation and Results

Plates 1, 2, 3 are maps of Cu, Pb and Zn in ppm, from soil samples collected from St. Joe Grid #1. Similarly, plates 4 and 5 are maps for Pb and Zn, in ppm, from soil samples collected from St. Joe Grid #2.

Figures 1, 2 and 3 are graphs of cumulative frequency vs concentration in ppm for Pb, Zn and Cu respectively.

The Cu graph is a straight line, indicating a single population of background values. The Pb and Zn graphs each have a single inflection point. Consequently, tentative threshold values of 350 ppm for Zn and 400 ppm for Pb were selected.

Figures 4 and 5 are similar graphs for Pb and Zn soil values from Grid #2. Both graphs are straight lines indicating a background population.

The few erratic high values of Pb and Zn obtained in both surveys are thought to reflect the small quartz veins containing minor galena and sphalerite.

The uniformly low values obtained in the northern half of Grid #1 probably reflects the extensive till cover, and greater depth to bedrock in that area.


5.00 STATEMENT OF EXPENDITURES

An "Affidavit on Application to Record Work" was filed with the Mining Recorder in Cranbrook, B.C., on September 7, 1977. Geochemical work, costing \$5,040.55 and geological mapping, costing \$3,825.00 were recorded as assessment work. These expenditures relate to the work described in this report.

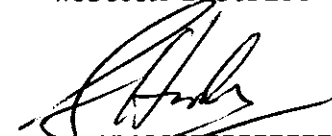
SUBMITTED BY:


E.W. BATCHELOR

ENDORSED BY:


D.W. HEDDLE, P. Eng.
Assistant Manager
Western District

APPROVED FOR
RELEASE BY:


G. HARDEN,
Manager
Western District

COMINCO LTD.

EXPLORATION DIVISION

WESTERN DISTRICT

STATEMENT OF QUALIFICATIONS

E.W. BATCHELOR graduated from U.B.C. during 1966 with a BAsC degree in Geological Engineering.

Since that time he has been employed in various phases of base metal exploration.



D.W. HEDDLE

P. Eng.

Assistant Manager, Exploration,
Western District

IN THE MATTER OF THE

B.C. MINERAL ACT

AND

IN THE MATTER OF A GEOCHEMICAL, GEOLOGICAL AND
AIRBORNE GEOPHYSICAL PROGRAMME

CARRIED OUT ON THE ST. JOE MINERAL CLAIM

KIAKHO CREEK

in the Fort Steele Mining Division
of the Province of British Columbia

More Particularly N.T.S. 82G/5SW

A F F I D A V I T

I, I.D. McCARTNEY, of the City of Cranbrook, in the Province of British
Columbia, make Oath and say:

1. That I am employed as a Geologist by Cominco Ltd.
and as such, have a personal knowledge of the facts
to which I hereinafter depose:
2. That annexed hereto and marked as Exhibit "A" to this
my Affidavit is a true copy of expenditures incurred
on a physical, geochemical and airborne geophysics
programme, on the Mineral Claim St. Joe.
3. That the said expenditures were incurred between the
20th day of April 1977 and the 29th day of August, 1977,
for the purpose of mineral exploration on the above
noted claim.

Sworn Before Me at Cranbrook)
 in the Province of British Columbia, this)
6 day of September, 1977.)

I.D. McCartney
 I.D. McCARTNEY

Marilynn A. Ferguson)
 A Commissioner for taking Affidavits)
 in the Province of British Columbia.)

EXHIBIT "A"

Statement of Expenditures

St. Joe Group (21 units)

Fort Steele Mining Division

SCHEDULE A - GEOCHEMICAL

St. Joe Geochemical Work

1. Grid 1.

Sampling, Sieving, Draughting

| | | | |
|--|----------------------------|---------------------|--------------------|
| G. McDonald | April 20, 26-29; May 10-13 | 9man days @ \$35 | \$ 315.00 |
| D. MacDonald | " " " | 9man days @ \$25.83 | 232.47 |
| D. Byford | " " May 11-13 | 8man days @ \$25.83 | 206.64 |
| B. Fisher | " " " | 8man days @ \$25.83 | 206.64 |
| Domicile - 34 man days @ \$10/day | | | 340.00 |
| Transportation - rental, gas, repairs @ \$32/day | | | 288.00 |
| Analysis - 416 samples @ \$2.50 | | | 1,040.00 |
| Materials - flagging, bags, shipping, etc. | | | 150.00 |
| TOTAL. | | | <u>\$ 2,778.75</u> |

2. Grid 2. - 323 samples out of 418 on St. Joe property.

Sampling, sieving

| | | | |
|--|----------------------------|---------------------|--------------------|
| G. McDonald | June 17 | 1 man day @ \$35 | 35.00 |
| D. MacDonald | June 17, July 12-15, 18-21 | 9man days @ \$25.83 | \$ 232.47 |
| D. Byford | " " " | " " | 232.47 |
| B. Fisher | July 13, 20-21 | 3man days @ \$25.83 | 77.49 |
| S. Reeves | " " | " " | 77.49 |
| Draughting | | | |
| J. Haskins | Aug. 26-27 | 2man days @ \$57 | 114.00 |
| Domicile - 25 man days @ \$10/day | | | 250.00 |
| Transportation - 9 days @ \$32/day | | | 288.00 |
| Analysis - 418 samples @ \$2.00 | | | 836.00 |
| Materials - flagging, bags, shipping, etc. | | | 150.00 |
| TOTAL. | | | <u>\$ 2,292.92</u> |

ST. JOE SHARE. 1,771.80

3. Supervision

| | | |
|----------------|----------------|--------|
| D. Lancaster | 2 days @ \$85 | 170.00 |
| E.W. Batchelor | 2 days @ \$100 | 200.00 |

4. Report Preparation

| | | |
|------------|---------------|------------------|
| J. Haskins | 2 days @ \$60 | 120.00 |
| | | <u>\$ 490.00</u> |

GEOCHEMICAL TOTAL. \$ 5,040.55

EXHIBIT "A" - continued -

St. Joe

SCHEDULE B - Geological

1:10,000 scale mapping

Field Work:

| | | |
|--|--------------------|-------------------|
| J. Haskins | 16 days @ \$60 | \$ 960.00 |
| B. Broster | 1 day @ \$70 | 70.00 |
| J. Livingstone | 1 day @ \$50 | 50.00 |
| E.W. Batchelor | 8 days @ \$100 | <u>800.00</u> |
| | | \$1,880.00 |
| Supervision: E.W. Batchelor | 4 days @ \$100 | 400.00 |
| Domicile - 18 man days | @ \$10/day | 180.00 |
| Transportation | 16 days @ \$32/day | 512.00 |
| General Expense | | 100.00 |
| Purchase of 1:10,000 scale orthophotos | | |
| | St. Joe portion | 273.00 |
| Geologic Report, mapping | | |
| J. Haskins | 3 days @ \$60 | 180.00 |
| E.W. Batchelor | 3 days @ \$100 | <u>300.00</u> |
| | TOTAL GEOLOGICAL | <u>\$3,825.00</u> |

SCHEDULE C - Airborne Geophysical


790 miles @ \$55/mile \$ 434.50

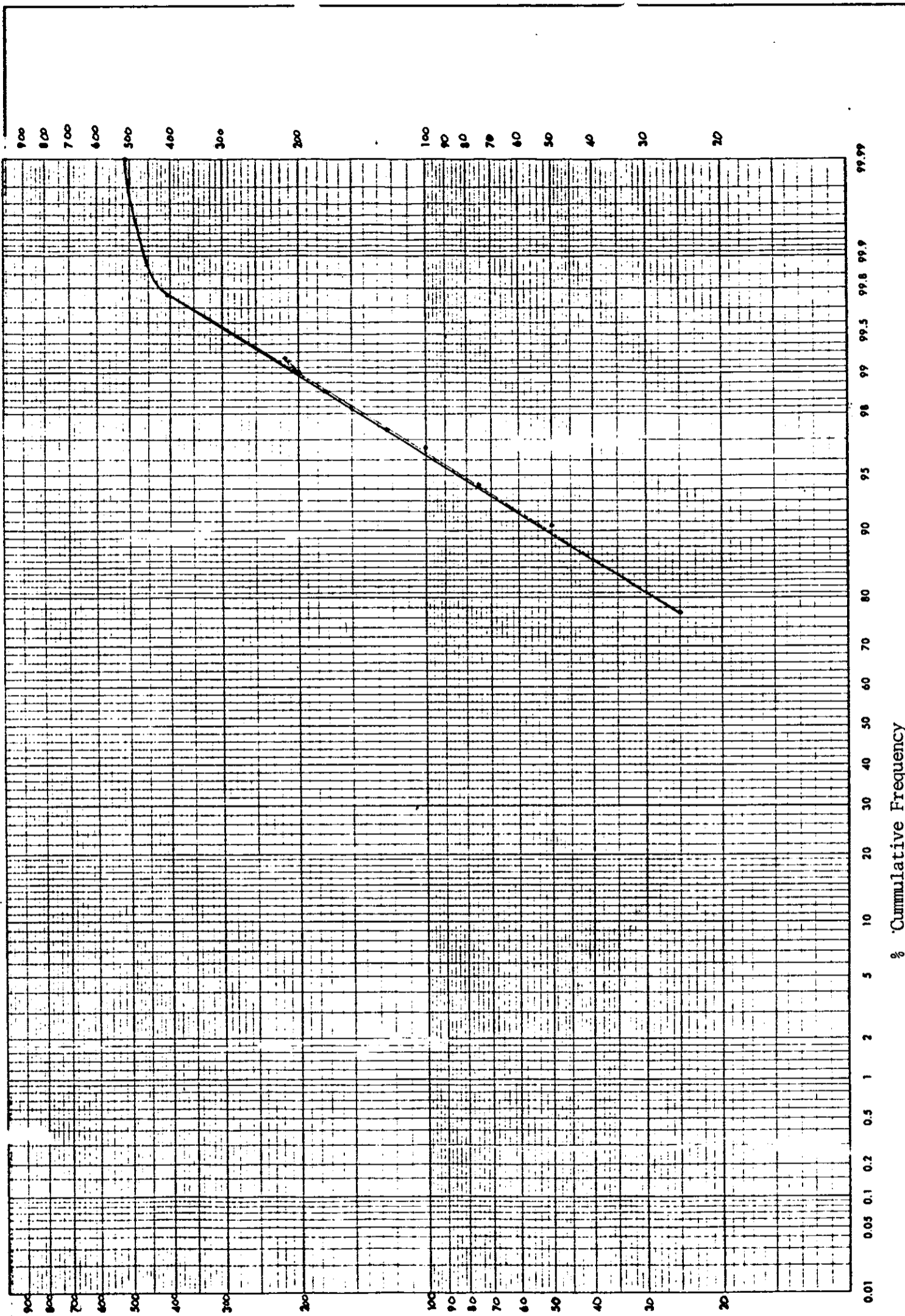
GRAND TOTAL \$9,300.05

SIGNED:


I.D. McCARTNEY

This is Exhibit "A" to the Statutory Declaration of I.D. McCartney declared before me this 6 day of September, 1977.


A Commissioner for taking Affidavits for the Province of British Columbia.



Pb ppm

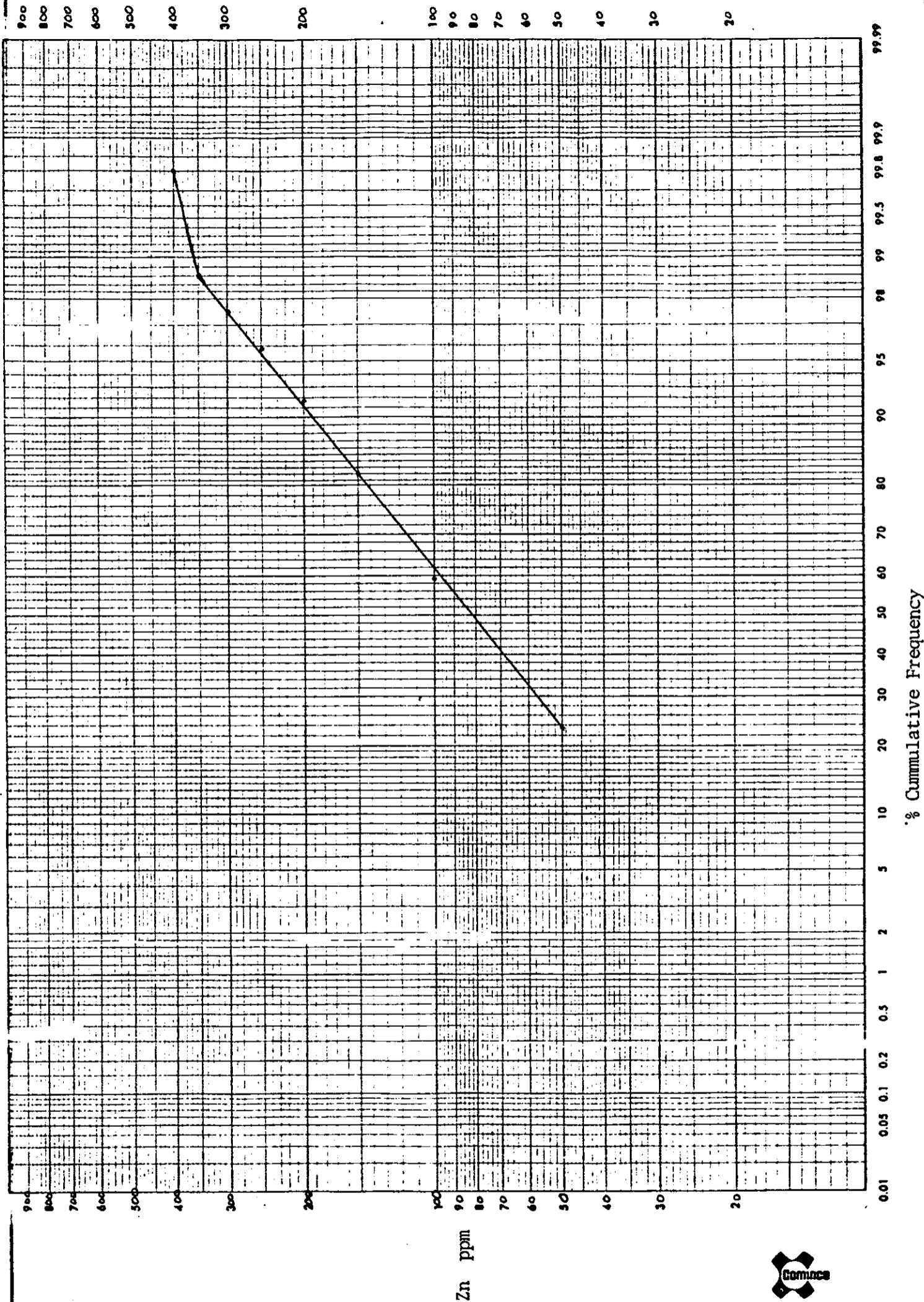


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| | | | |

FIGURE 1
Pb - Cumulative Frequency Distribution
ST. JOE PROPERTY - Grid 1

82G/5SW

| | | |
|--------|----------------------|--------|
| Scale: | Date: Sept. 26, 1977 | Plate: |
|--------|----------------------|--------|



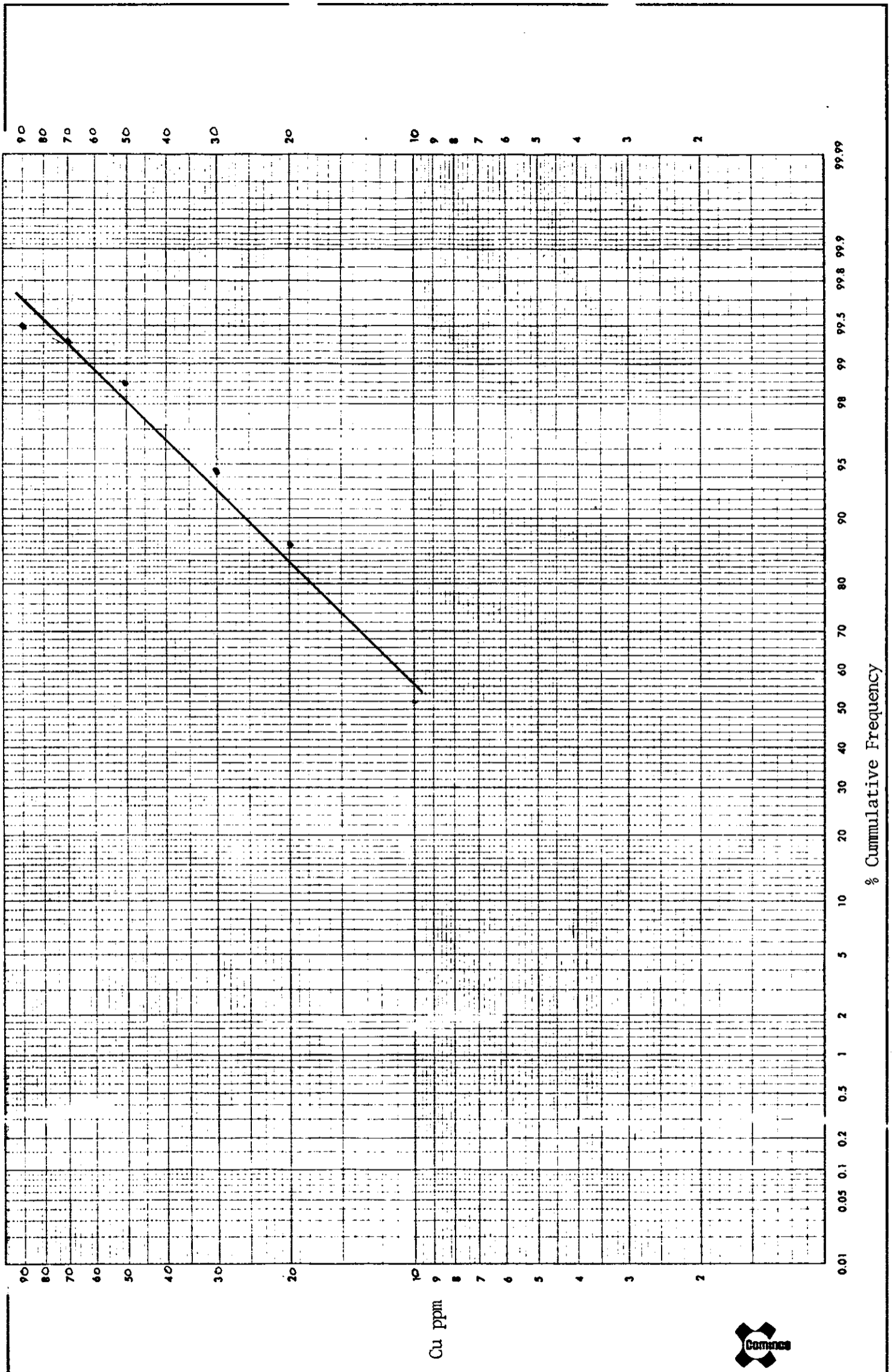
Zn ppm



| | | | |
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| Revised by | Date | Revised by | Date |
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| | | | |

FIGURE 2
 Zn - Cumulative Frequency Distribution
 ST. JOE PROPERTY - Grid 1
 82G/5SW

Scale: _____ Date: Sept. 26, 1977 Plate: _____



| | | | |
|------------|------|------------|------|
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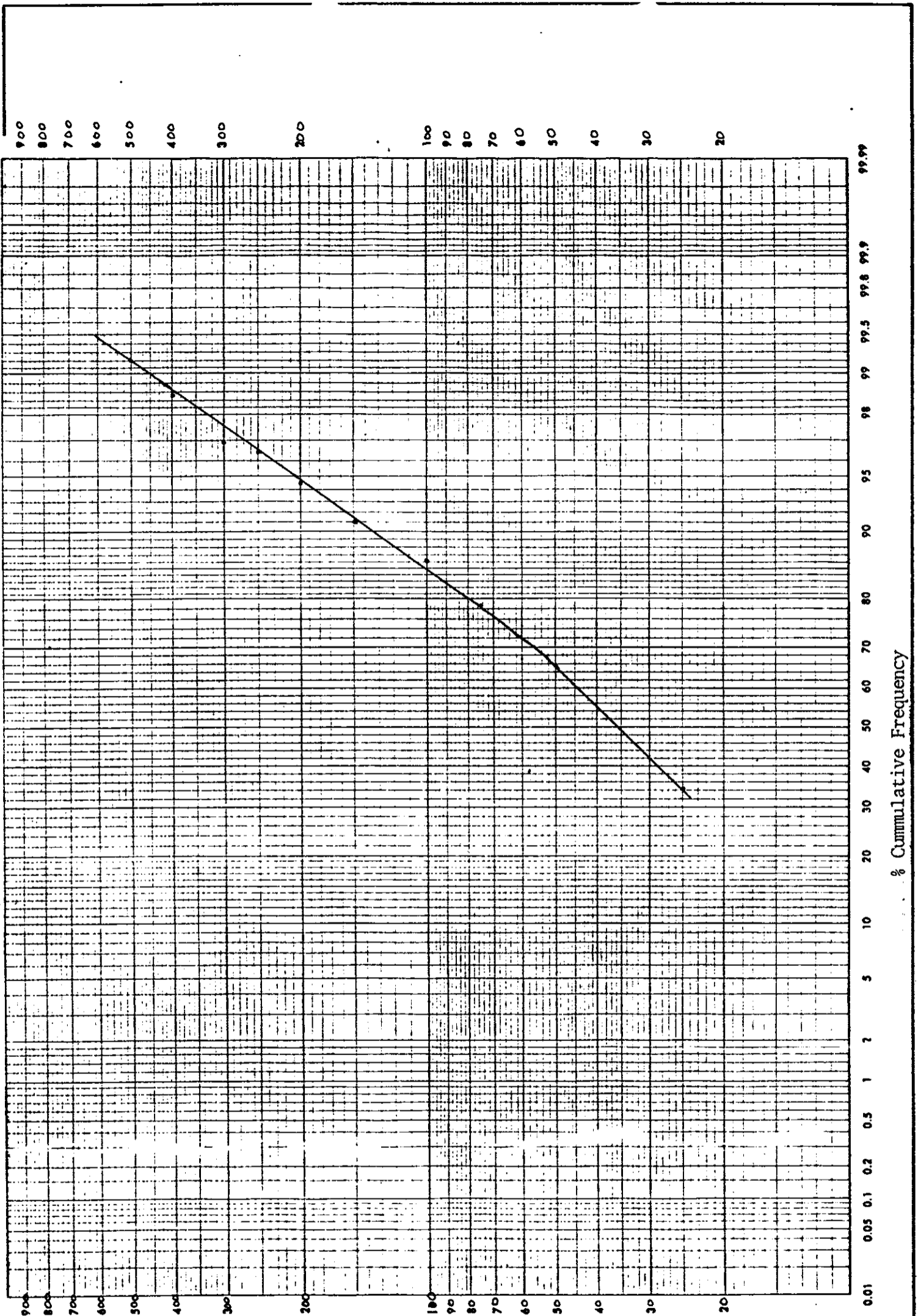
FIGURE 3
Cu - Cumulative Frequency Distribution
ST. JOE PROPERTY - Grid 1

82G/5SW

Scale:

Date: Sept. 26, 1977

Plate:



Pb ppm



| | | | |
|------------|------|------------|------|
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| Revised by | Date | Revised by | Date |
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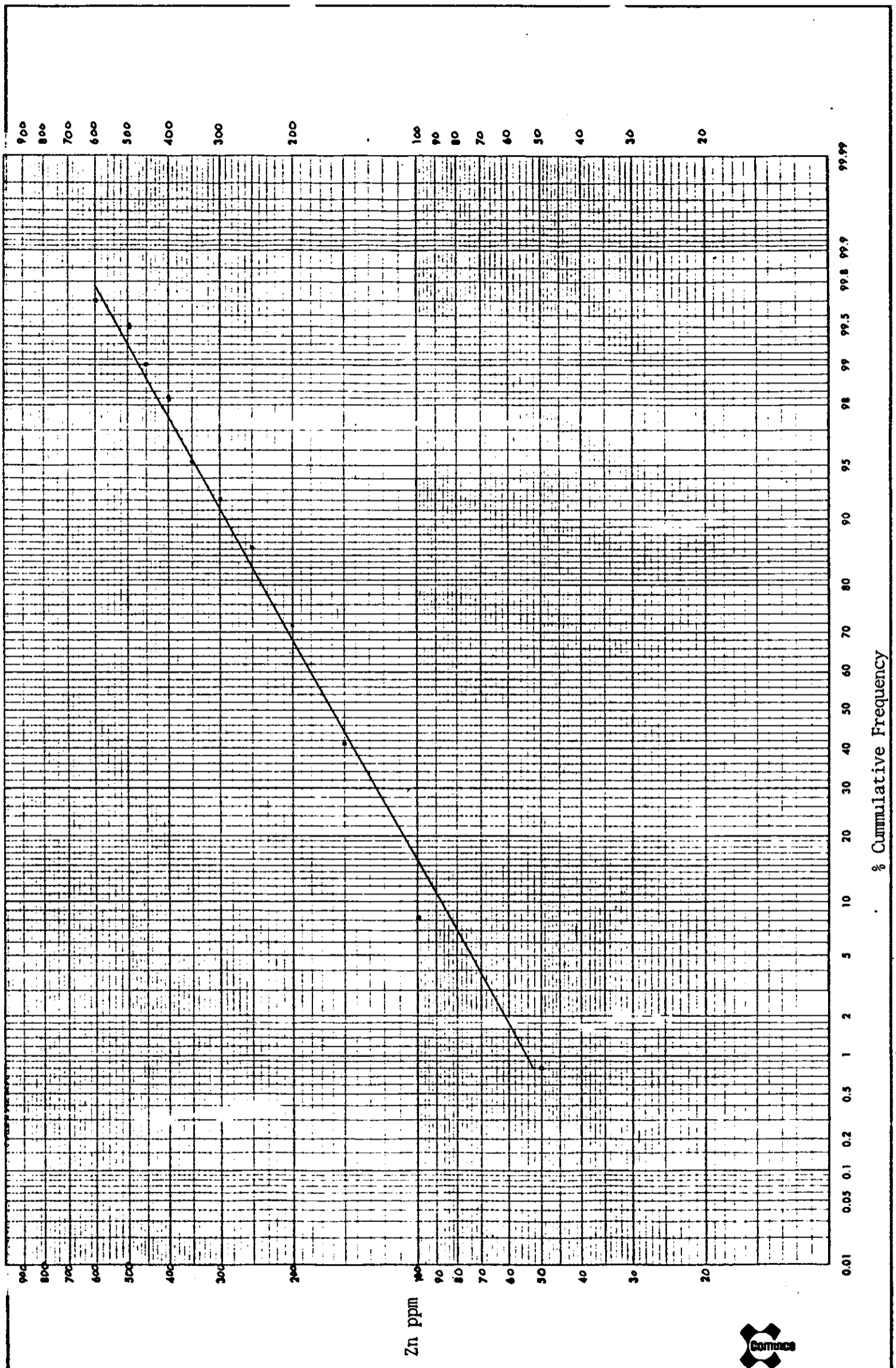
FIGURE 4
Pb Cumulative Frequency Distribution
ST. JOE PROPERTY (Grid 2)

82G/5SW

Scale:

Date: Sept. 26, 1977

Plate:



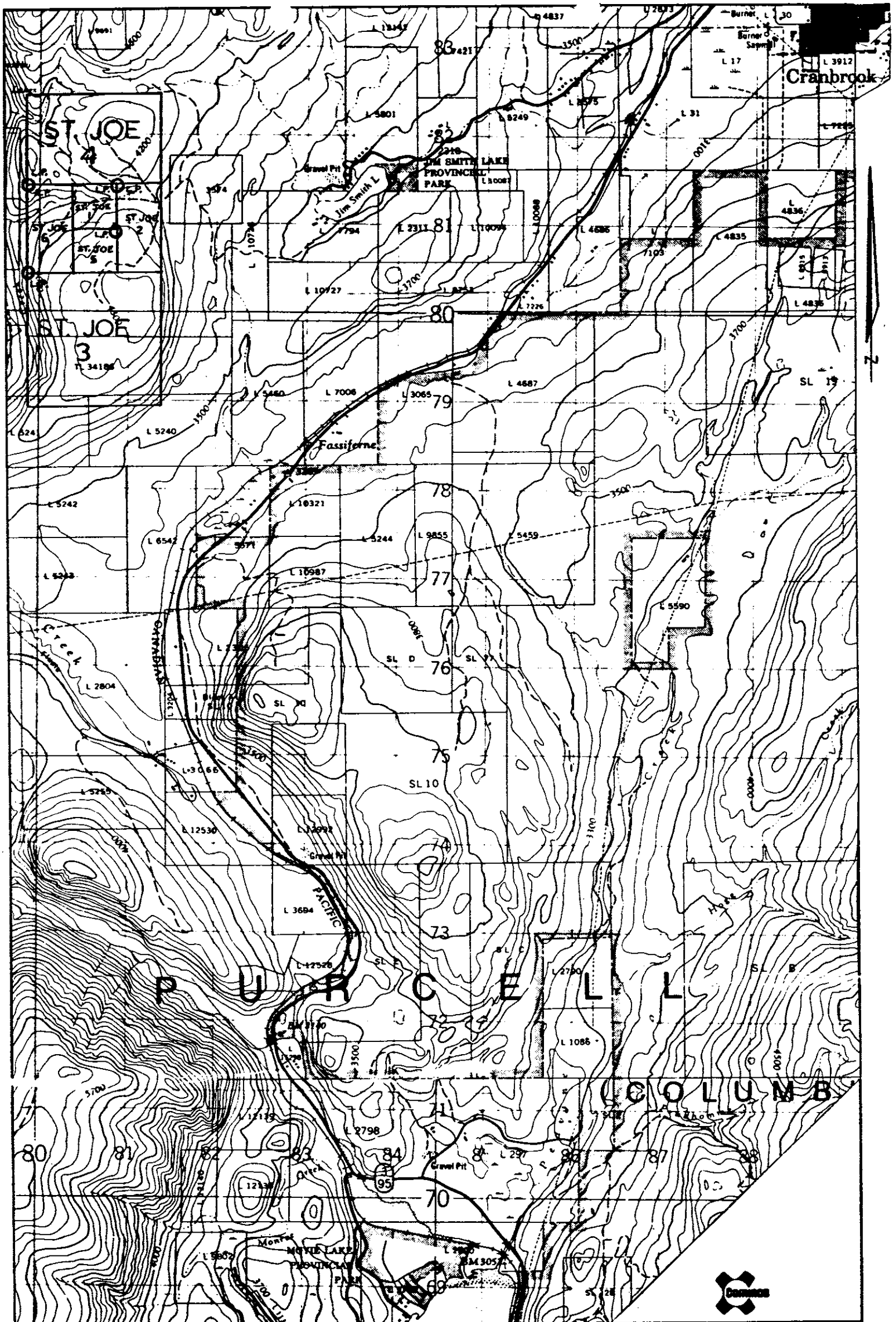
Zn ppm



| | | | |
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| Revised by | Date | Revised by | Date |
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| | | | |

FIGURE 5
 Zn - Cumulative Frequency Distribution
 ST. JOE PROPERTY - Grid 2
 82G/SSW

Scale: _____ Date: Sept. 26, 1977 Plate: _____

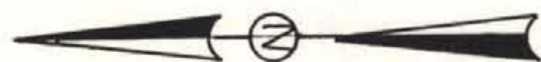


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LOCATION MAP ST. JOE CLAIMS



Scale: 1 : 50,000 Date: 05 OCT 77 Plate: NTS 82G/5



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 NO. **6444**

ST JOE GROUP



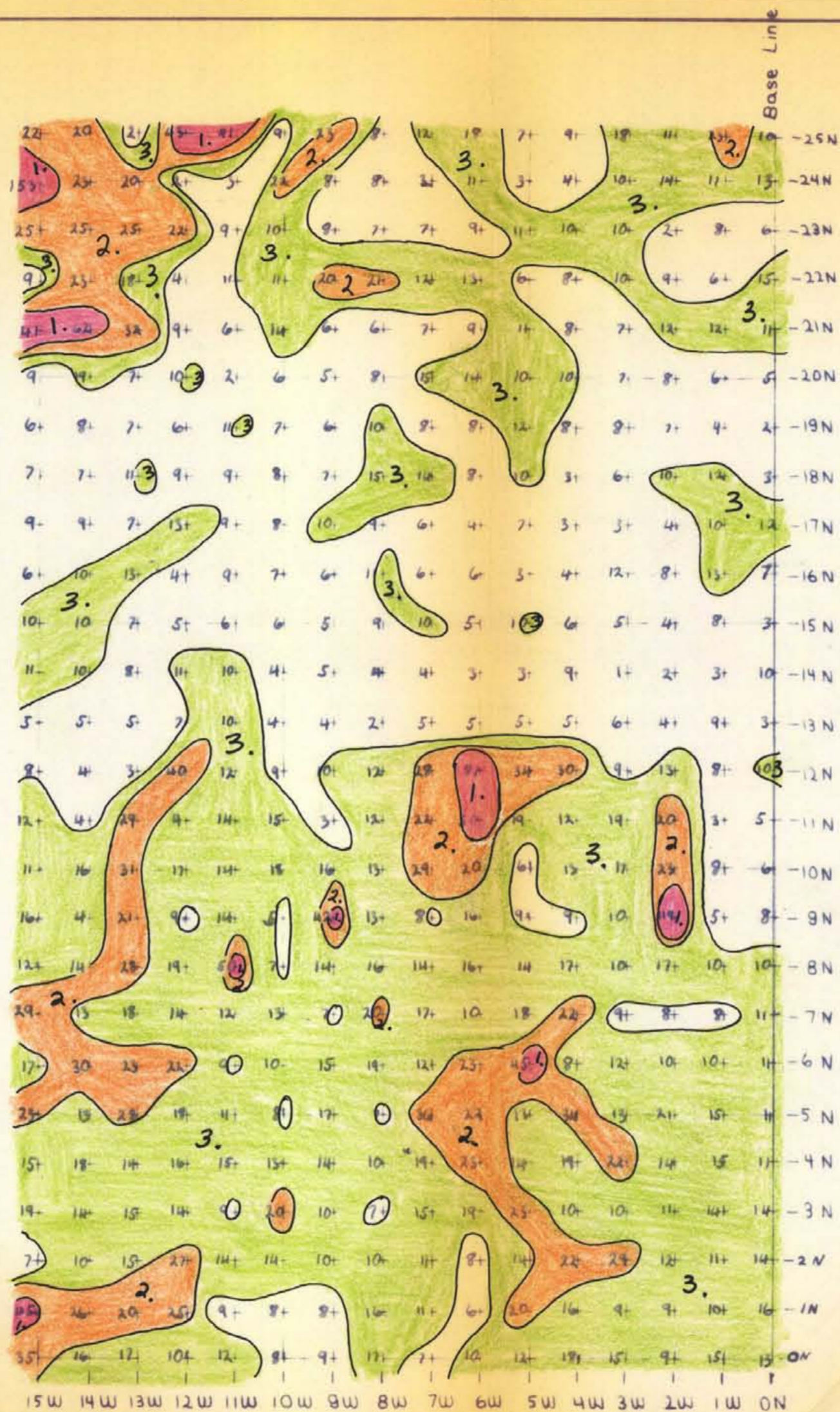
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ST JOE CLAIM BOUNDARIES AND SOIL GRID

Scale: 1:10,000

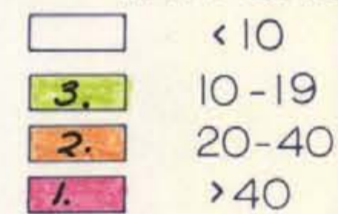
Date: Sept 27 1977

Plate:



CONTOUR INTERVALS

IN PPM COPPER

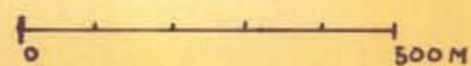


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NO.

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GRID # 1

COPPER (PPM)



Drawn by GMM Traced by

Revised by Date Revised by Date

ST. JOE GEOCHEMICAL SURVEY

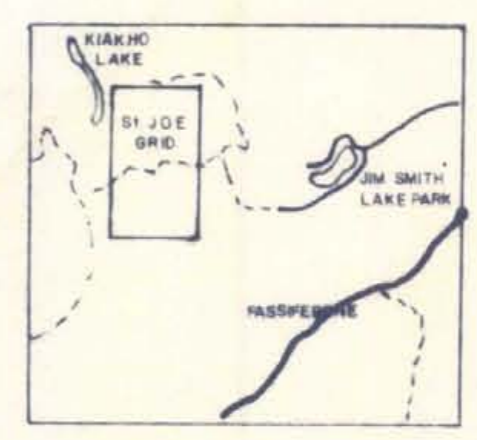
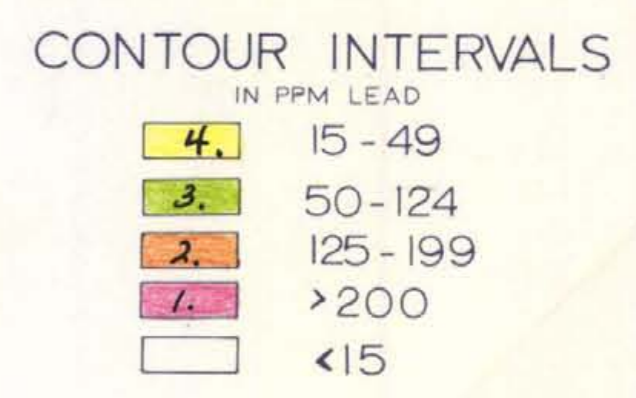
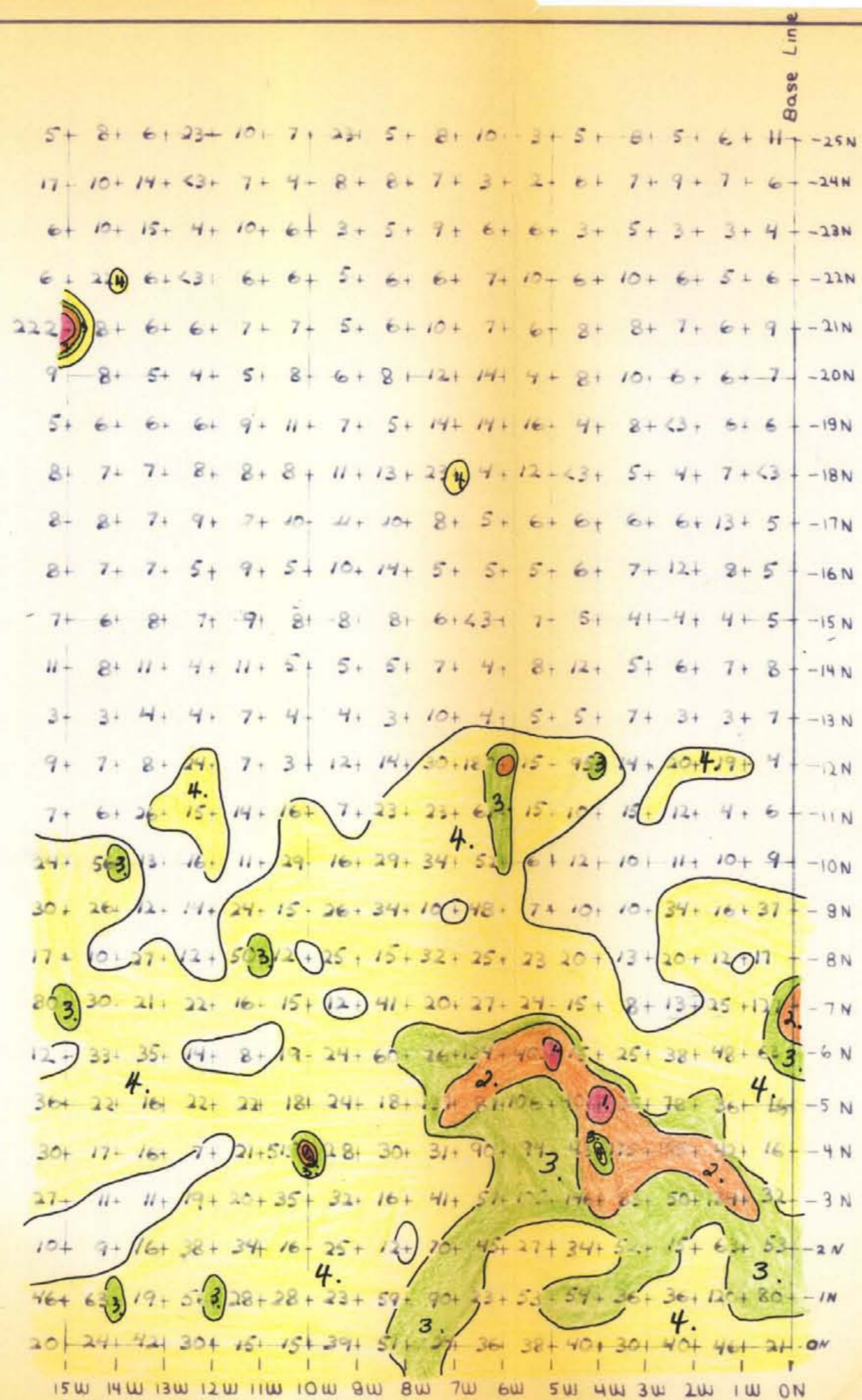
"B" SOIL HORIZON

Scale 1 : 10,000

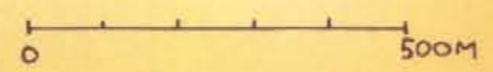
Date MAY 2, 1977

NTS B2G/5

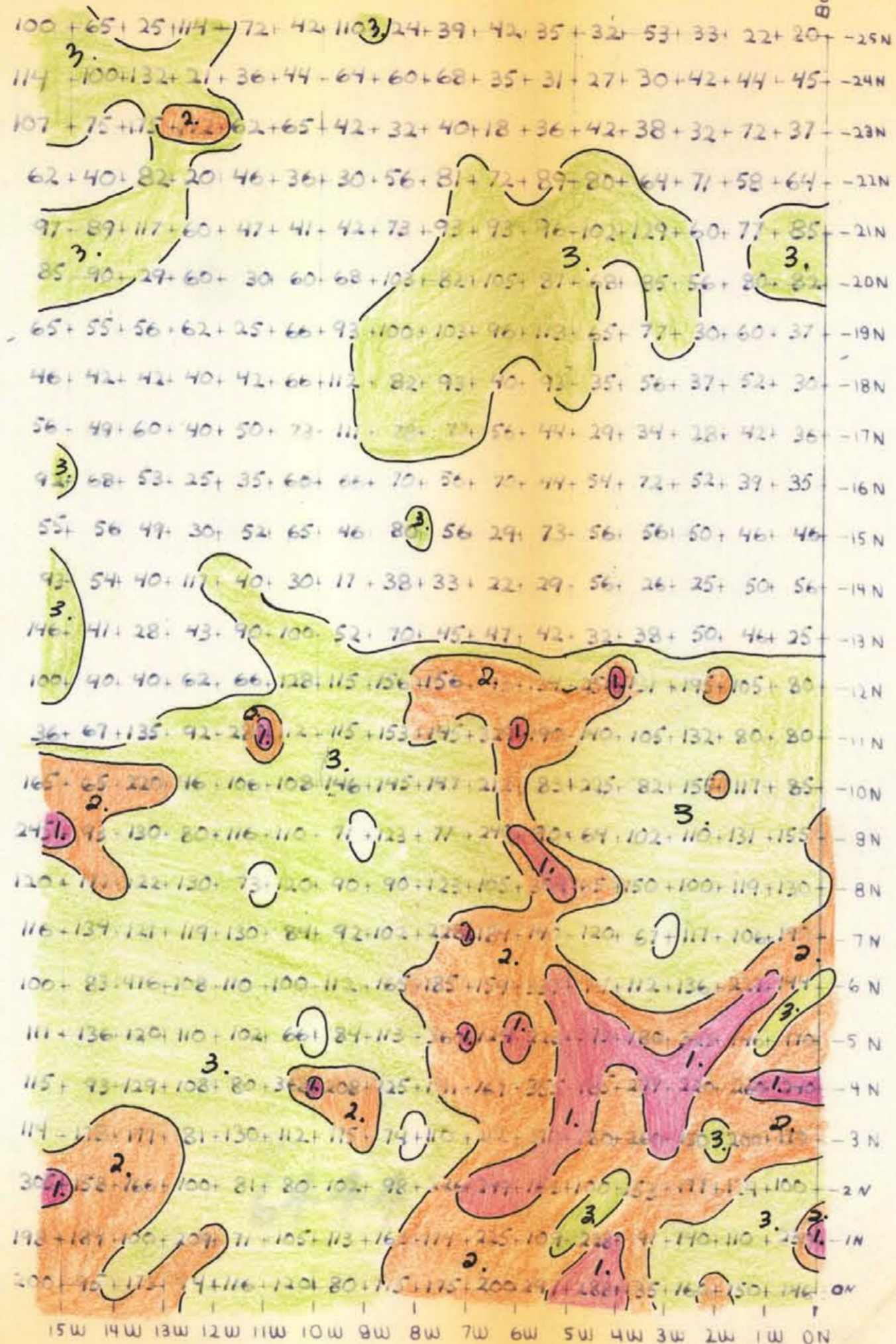
Plate StJ-1-77



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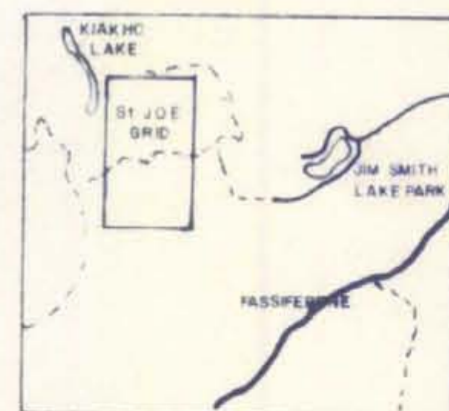
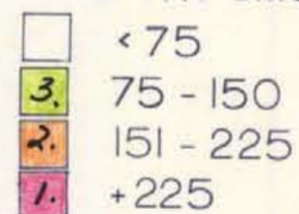


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|----------------------------|------|------------------|------|-----------------------------|
| GRID # 1 | | LEAD (PPM) | | |
| ST. JOE GEOCHEMICAL SURVEY | | "B" SOIL HORIZON | | |
| Drawn by | GMM | Traced by | | |
| Revised by | Date | Revised by | Date | |
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| Scale 1:810,000 | | Date MAY 2, 1977 | | NTS 82G/5 Plate StJ-1-77 |



CONTOUR INTERVALS

IN PPM ZINC



MINERAL RESOURCES BRANCH
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NO. **6444**



GRID # 1

ZINC (PPM)



Drawn by GMM Traced by

ST. JOE GEOCHEMICAL SURVEY

Revised by Date Revised by Date

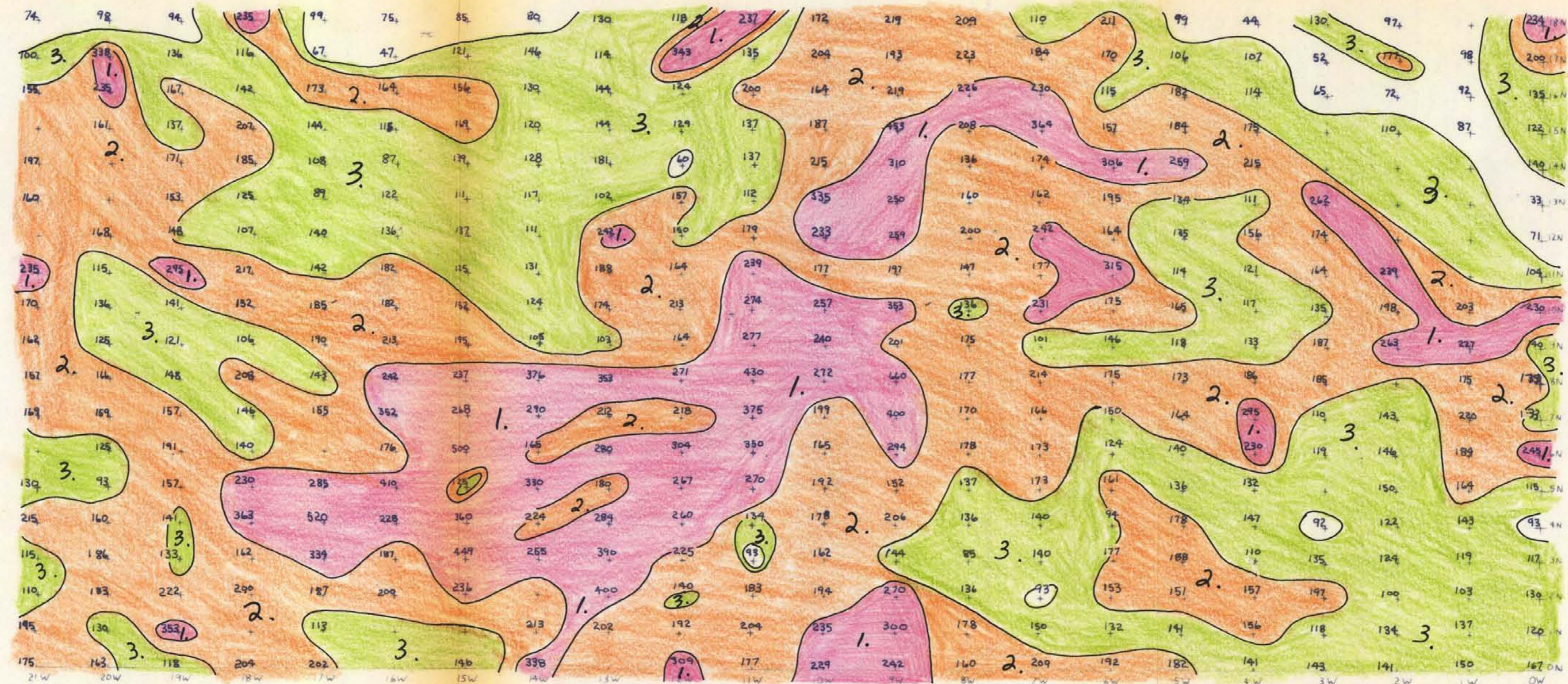
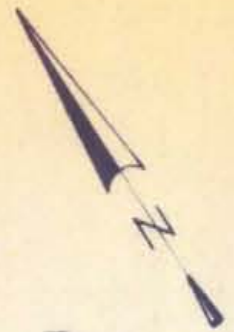
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Scale 1 : 10,000

Date MAY 2, 1977

NTS 82G/5

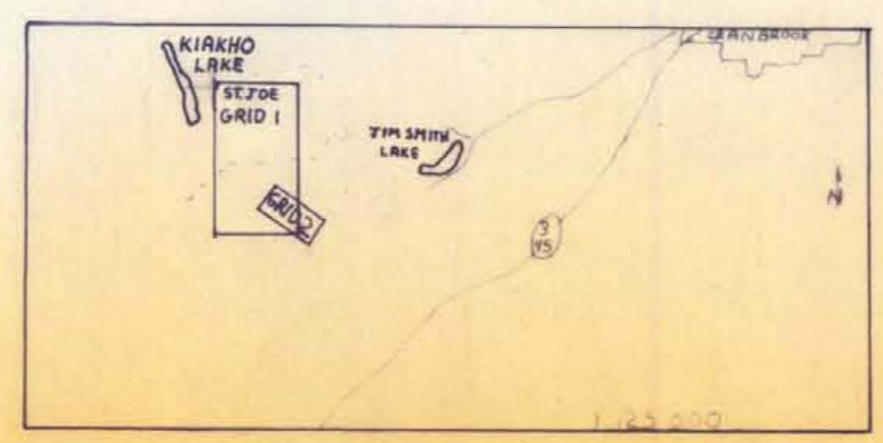
Plate StJ-1-77



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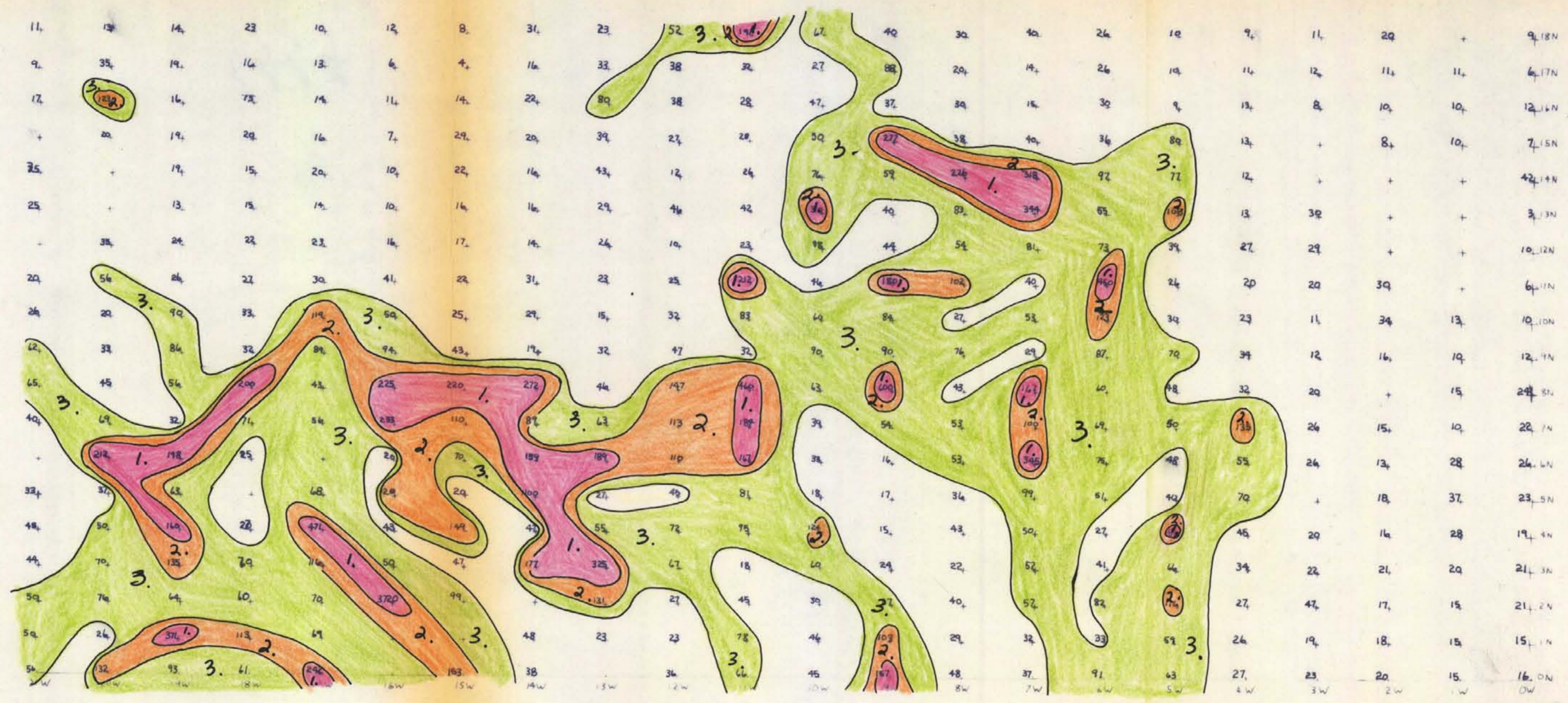
CONTOUR INTERVALS
IN PPM ZINC

| | |
|--|---------|
| | <100 |
| | 100-150 |
| | 151-225 |
| | >225 |



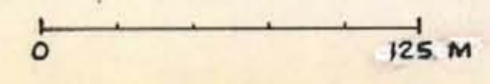
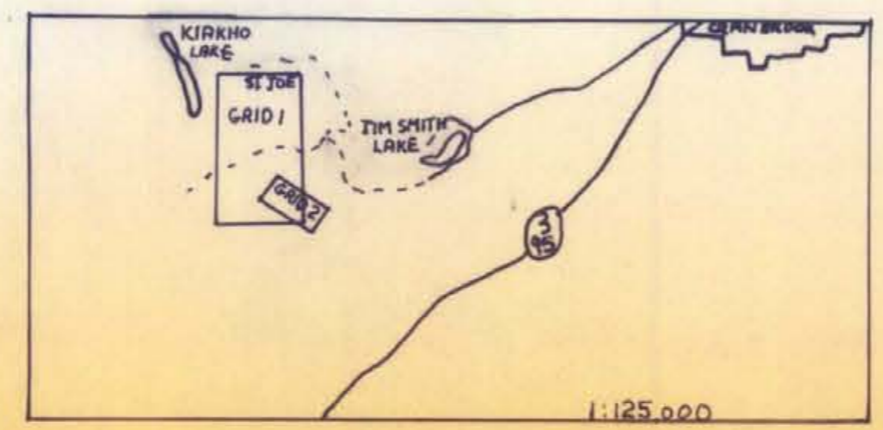
MINERAL RESOURCES BRANCH
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6444
NO. 6444

| | | | | |
|---------------|-------------|---------------------------|--|--|
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| Drawn by: JCH | Traced by: | ST JOE GEOCHEMICAL SURVEY | | |
| Revised by: | Revised by: | "B" SOIL HORIZON | | |
| Scale: 1:2500 | | | | |



CONTOUR INTERVALS
IN PPM LEAD

- < 50
- 3. 50-99
- 2. 100-149
- 1. > 150



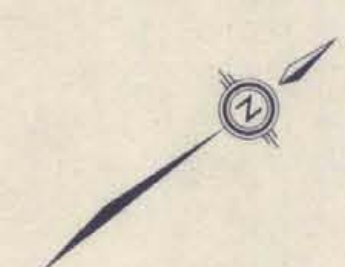
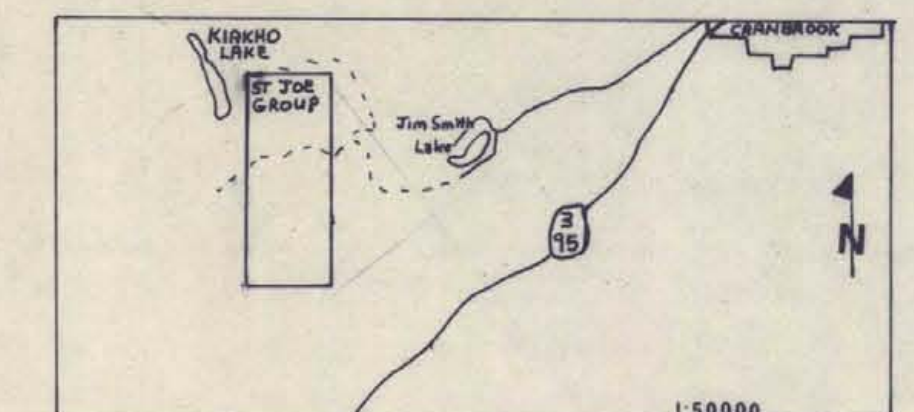
MINERAL RESOURCES BRANCH
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NO. **6444**

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|-----------------|------------|---------------------------|--|-----------|
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| Drawn by: JOH | Traced by: | ST JOE GEOCHEMICAL SURVEY | | |
| | | "B" SOIL HORIZON | | |
| Scale: 1:25,000 | | Date: AUG 25 '97 | | NTS 82G/5 |

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LEGEND

- 4 MIDDLE ALDRIDGE PROT. Quartzose Turbidites, Argillite Interbeds, up to 45 Pyrrhotite CONGLOMERATE PHASE
- 3 MOYIE INTRUSIVES PROT. Diorite to Gabbro Sills
- 2 CRESTON PROT. Shallow Water Argillite to Quartzite
- 1 QUARTZ MONZONITE CRET. Stock and Feldspar Porphyry Dykes
- BEDDING
- QUARTZ VENE



MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 6444

ST JOE GEOLOGY

Drawn by JCH Traced by _____
 Revised by _____
 ST. JOE GROUP (1-6)

FT. STEELE M.D. Date: _____ NTS 82G/5
 Scale: 1:10,000 10m Plate: 6
 SEPT 16 1977

CRANBROOK 9 KM