

Box 4

GEOCHEMICAL REPORT
SUMMARY OF SOIL SAMPLING ON BANKS ISLAND
Falconbridge Nickel Mines Ltd.
1963-64 and 1973-74
S. Zastavnikovich May, '75.

103-a

1112 West Pender, Vancouver, B.C.

INTER-OFFICE MEMORANDUM

DATE: May 15, 1975.

TO: J. J. McDougall

COPIES TO: B. Manchuk, I. L. Elliott, S. N. Charteris, File.

FROM: S. Zastavnikovich.

SUBJECT: SUMMARY OF GEOCHEMICAL WORK DONE IN 1963 AND 1973-74 ON BANKS ISLAND

Total geochemical work done to date on Banks Island gold property consists of four separate surveys:

1.) An extensive heavy-metals soil survey done in 1963 over a dozen geophysical grids in order to help distinguish between legitimate and graphite-caused self-potential anomalies. The samples were analyzed in the field and the results summarized in S. N. Charteris' Geochemical Report of '64. The heavy-metals anomalies, together with the S.P. conductors, are presented on two overlapping 500-scale Map Sheets #1 & 2.

2.) After a ten-year dormant period an isolated soil survey was performed in June '73 by R. Samuelson over a geophysical Mag. and E. M. grid on the GRO Claim Group in the Foul Bay area. Some 200 'B' horizon soils were collected at 100 foot intervals and analyzed for Zn, Pb, Ag, and As by our lab in Vancouver; the results are summarized by I. L. Elliott in an Assessment Report of July '73. The Arsenic anomalies, which generally seems to be the most useful, are presented (together with the E. M. anomalies) on Map Sheet #1.

During 1974 two separate geochemical pilot - studies were completed on Banks Island by the author with much help from K. Christensen, R. Essen, B. Downing, and B. Manchuk. Being the most recent these are discussed in greater detail and their implications for the major geochemical program to be done this summer are enumerated.

3.) In May '74 the survey consisted of intense sampling of soils across the three known ore zones on the property- the Discovery, Kim, and Bob zones- at ten-foot picketed intervals. Six 200-300-foot long lines were sampled, two over each mineralized zone. At every site the 'A' horizon was sampled, and the 'B' or 'C' horizons where available, in order to discover the optimum sampling procedure to be followed this summer in search of additional gold mineralization. Some 350 samples were collected which, by composting to yield sufficient material for analysis, resulted in 216 samples being analyzed by our Vancouver lab for Zinc, Silver, Arsenic and Mercury. To establish the relationship between Gold and the pathfinder elements twenty selected samples were analyzed for gold by Bondar-Clegg laboratories. The analytical results from this pilot study are summarized by I. L. Elliott in an Assessment Report of June '74, and are presented here on three small separate Maps #3, 4 & 5.

4.) During October '74 further geochemical work consisted of collecting 370 'A' horizon samples at 25-foot intervals along 13 lines 400-1000-feet long

and 400 feet apart. The grid is an extension of the original Crossbreak grid and runs parallel to a major fault to the north until it connects with the Bob zone grid one mile westward. The samples were analyzed in our Vancouver lab for Zinc, Silver and Arsenic; the analytical results are presented on Map #6 and the contoured anomalies are shown on Map #7.

DISCUSSION

Each of the surveys is discussed in turn:

A.) The heavy-metals survey done ten years ago, though able to eliminate the graphite-caused S. P. anomalies, did not distinguish between barren pyritic horizons of metasedimentary bands and near quartz veins in the intrusives (both containing low but significant zinc), and the zones of gold-bearing sulfides. Also, one occurrence of an auriferous pyritic showing escaped detection.

— With a very small number of total samples (200-300) it is now possible to resample several occurrences of each of these types of mineralization and analyze the samples for several pathfinders, especially Arsenic, plus Silver and possibly Zinc and Molybdenum and from their relative abundances and inter-element ratios discover the most promising indicator patterns for gold mineralization. For example, arsenic should be less influenced by the zinc content alone than the heavy-metals values as the sulfur in sphalerite is the least likely to be replaced by arsenic among the common sulfides (Goldschmidt, page 471). Also, various degrees of chemical attack could be experimented with at the lab until some distinguishing characteristics of auriferous mineralization are isolated from these experimental samples.

B.) In the July '73 Assesment Report on the GRO Goup claims I. L. Elliott recommended sampling extensions of the strongest arsenic anomalies (which had silver and zinc support) along strike. The goal of this survey was to sample the 'B' horizon, which was mostly unobtainable; this lack of sampling homogeneity is reflected in poor correlation among the Zn, Pb, Ag and As anomalies, and the results should be considered as incomplete. Thus further uniform sampling is necessary before this area can be fully evaluated.

C.) I. L. Elliott's June '74 Geochemical Assesment Report summarizes the results of the pilot survey done over the three known gold occurrences, the Discovery, Kim and Bob zones. The most important findings include:

1. Usefulness of sampling the 'A' Horizon- it is readily available and generally contains greater amounts of all the elements analyzed, Zinc, Silver, Arsenic and Mercury, than the 'B' or 'C' horizons.

2. Arsenic and Silver are more preferable indicators of Gold mineralization than Zinc and Mercury, the last one being abundant but too erratic to be useful.

3. Arsenic shows strong positive correlation with Gold values, hence it is a very useful, yet relatively inexpensive (compared to analyzing for gold itself), pathfinder for auriferous mineralization on Banks Island. Table #1 illustrates this correlation.

— The concentration of elements in horizon 'A' vs. horizon 'B' (or 'C') at sample sites where both were sampled is illustrated on logarithmic scale in Graph #1. Most of the ratios fall below and to the right of the diagonal line (along which the ratios are 1:1) indicating greater abundance in the

'A' horizon- however, definite exceptions do occur. This reversal usually happens near and over mineralized veins, which is to be expected (where concentration varies with depth, though mercury is the last one to reverse), but it also occurs over background areas such as the southern end of line D2, Map #3, where all elements except mercury are enriched in the 'B' horizon, though zinc values are unusually low.

-- From limited correlations with geology, soil samples collected over limestones seem to be exceptionally low in zinc values in the 'A' horizon and probably enriched in zinc, silver and arsenic in horizon 'B'. Thus interpretation of this summer's geochemical results must be closely correlated with geological mapping.

-- Of interest are the several sample sites near the south end of Line D1 which are anomalous in all elements, and extremely anomalous in mercury. At that point the line skirts a kink in the metasedimentary band and may well indicate narrow mineralization independent of the original Discovery zone.

-- Gold itself is concentrated in the 'B' horizon- one site where both horizons were tested for gold showed 6X greater value in 'B', though 'A' was richer in all other elements. Follow-up sampling must include the 'B' horizon as a portion of anomalous samples may be done for gold. In a search for disseminated gold in southern B.C. H. Warren & J. Hajek (Western Miner, Oct. '73) showed definite concentration of gold occurs in the 'B' horizon, even though mercury was consistently higher in the top 'A' horizon from the same locations.

D.) The 'Crossbreak to Bob Zone' 'A'-horizon soil-sample grid done last fall illustrates the advantages and the limitations of reconnaissance sampling:

-- Even though no sampling line ran directly over the Bob Zone, the survey successfully showed up the zone and indicated its possible extension.

-- The anomaly on Line 12W, which contains the highest zinc values with good arsenic and silver support, indicates that the geophysical and the heavy-metals surveys did not extend far enough westward, as both stopped at Line 11W. Field observations noted that these samples contained great amounts of large-flaked brown weathered biotite, though not all such samples were anomalous in zinc.

-- However, the widely spaced lines and absence of geological mapping dictate that the contours on Map #7 are only tentative, and may even be misleading in absence of fill-in sampling. Still, the survey did eliminate large portions of barren territory.

-- As some 75-80 % of silver and arsenic values are at or below the detection limits and zinc showed multiple non-anomalous populations, no cumulative-frequency diagrams are presented and the contoured values are used primarily as trend indicators.

-- Disappointingly, the survey indicates little mineralization in the Crossbreak zone. The recently obtained results from samples along Line 4E (not shown on map) collected by B. Manchuk several weeks ago indicate a very weak extension of the silver anomaly north of the creek

on Line OW, and show up no new high values in any element.

— An alternate method of sampling along the break itself will be considered, and if successful, can be extended to other faults. Three to four samples could be collected across the break at ten-foot intervals every 100-200 feet along the fault and analyzed for molybdenum as well as zinc, silver and arsenic. The strong correlation between Mo anomalies and faults reported by G. Woodsworth in his regionally-relevant sediment survey in Prince Rupert area including Banks Island (Econ. Geol., Vol 66) suggests this elements abundance in structural breaks in this area. This experiment may show where along the fault the mineralization, if present, is concentrated.

— In his study Woodsworth obtained extensive Mo anomalies in streams draining Banks to Waller lakes and one of the only two Cu anomalies on the island. There were no Zn or Cu anomalies, suggesting lack of massive sulfides and their resultant chemical weathering in the area.

— The strong but narrow arsenic anomaly on lines 20W and 24W shows why the sampling interval along a line must not exceed 25 feet, even in a reconnaissance survey. The cause of this anomaly should be investigated, though its extension lies under the lake.

SCOPE OF '74 SUMMER GEOCHEMICAL WORK

To help discover additional gold mineralization on the property a larger sampling program has been organized for this summer. Based on detailed considerations of favorable structural features B. Manchuk has outlined some 30 line-miles of reconnaissance grids to be sampled. To accomplish this with a minimum of samples on initial basis the lines will be 400 feet apart and sampled at 25-foot intervals along the line. Only the 'A' horizon soils will be taken, resulting in 6000-6500 samples, and analyzed for Arsenic, Silver and Zinc. For initial surveys this was found to be the most useful combination of horizon and pathfinders for gold.

— Follow-up work on the resulting anomalies must include sampling of the 'B' horizon as well, especially when sampling over limestones. The existing anomalies from previous surveys will be sampled in detail.

— The reconnaissance grids to be sampled are shown on Maps #1 & 2 as dashed lines. These will be cut and picketed at 100-foot intervals prior to sampling.

— Some guidelines on sample-collecting technique based on previous sampling in the area include:

- a. Shovels with short, split-end handles should be used instead of grubhoes; this makes for speedier collection of sufficient, uncontaminated, 'A' horizon samples.
- b. Instead of the usual writing of numerous details on the sample bag at each site, more useful information is obtained if a profile of each line sampled is drawn in pencil in the sampler's notebook. Such a profile sketch should show relative land elevations, type of terrain- swamp, woodland, creek, bear!, etc., and sample locations to scale. It is time-saving (especially in rain) yet gives valuable information about the samples.

- c. Sample bags with pleated sides hold more soil and should be used when collecting 'A' horizon samples.
- d. An average of 50-65 samples per day per sampler can be expected, resulting in a daily load of some 60-80 lbs. Depending on distance from base-camp, each sampler will be able to collect more samples than he can carry home. Extra packing trips, rather than stock-piling, should be allowed for.
- e. Since drilling may start before follow-up work is complete, it is essential that analytical results be obtained and returned to the field as fast as possible. To this end, partial drying of samples at the base-camp will be attempted, in order to reduce at the lab the usual one week's drying time of these typically soggy samples.
- f. Different rock types on the island give different average concentrations of metals, especially zinc, in the soils. Geological mapping of the areas sampled will be necessary for complete interpretation of results.

of Jastrow

Graph #1. - "A" HORIZON vs "B" and/or "C" HORIZON

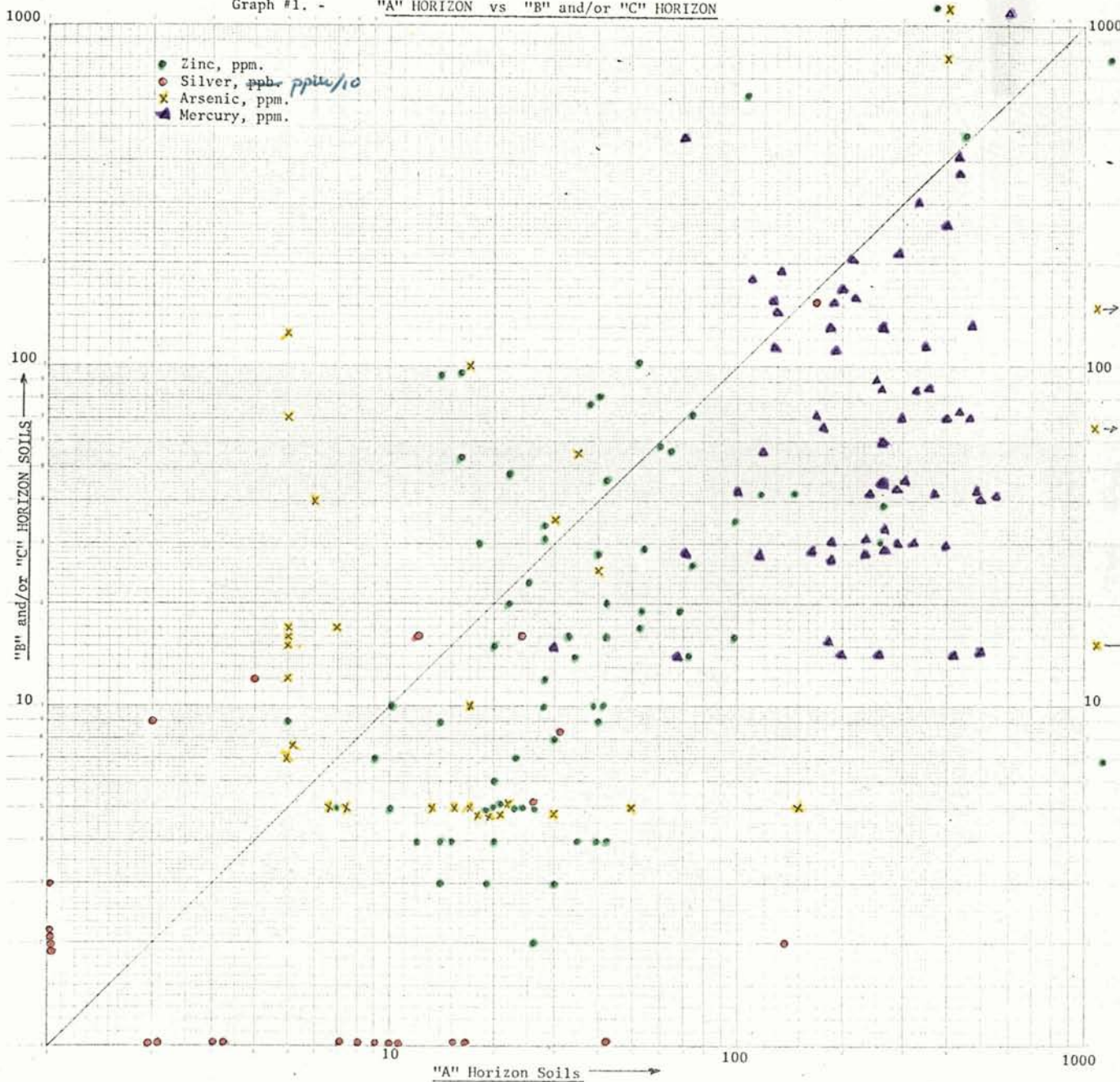


TABLE 1

<u>Sample No.</u>	<u>Sample Wt. gms.</u>	<u>Gold p.p.b.</u>	<u>Arsenic p.p.m.</u>
34,103	10.7	< 10	5
34,109	50.6	5	17
34,117	12.4	120	450
34,123	30.6	100	400
34,127	11.6	< 10	15
34,131	19.5	< 5	5
34,139	12.5	10	17
34,121	38.4	490	1,100
34,133	32.5	10	15
34,291	27.0	2,000	200
34,286	38.9	11,600	5,200
34,418	12.1	10	70
34,417	119.0	< 5	40
34,114	10.1	65	5
34,023	21.2	110	10,000
34,027	10.3	17,000	10,000
44,033	19.6	9,400	10,000
34,037	15.8	2,300	10,000
34,344	56.2	90	25
34,345	13.2	15	40
34,343	57.0	40	15
34,349	32.9	5	70

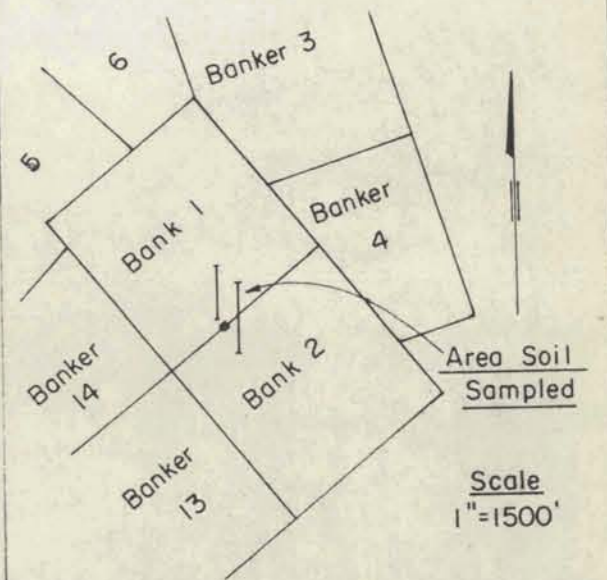
Relation between gold and arsenic in organic soil.

Soil Sample Sites

Soil Horizon	Zn	Ag	As	Hg	Au
	(in p.p.m.)				(in ppb)
A	53	3	5	356	100

H20 Δ Survey Station

Survey stations and control established by chain and transit.



FALCONBRIDGE NICKEL MINES LTD.

PROPERTY: Banks Island

LOCATION: Discovery Zone

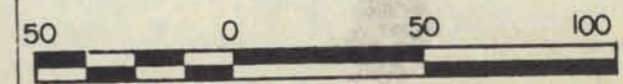
TYPE OF MAP: Soil Geochemistry

BASED ON: Sampling by S.Z.

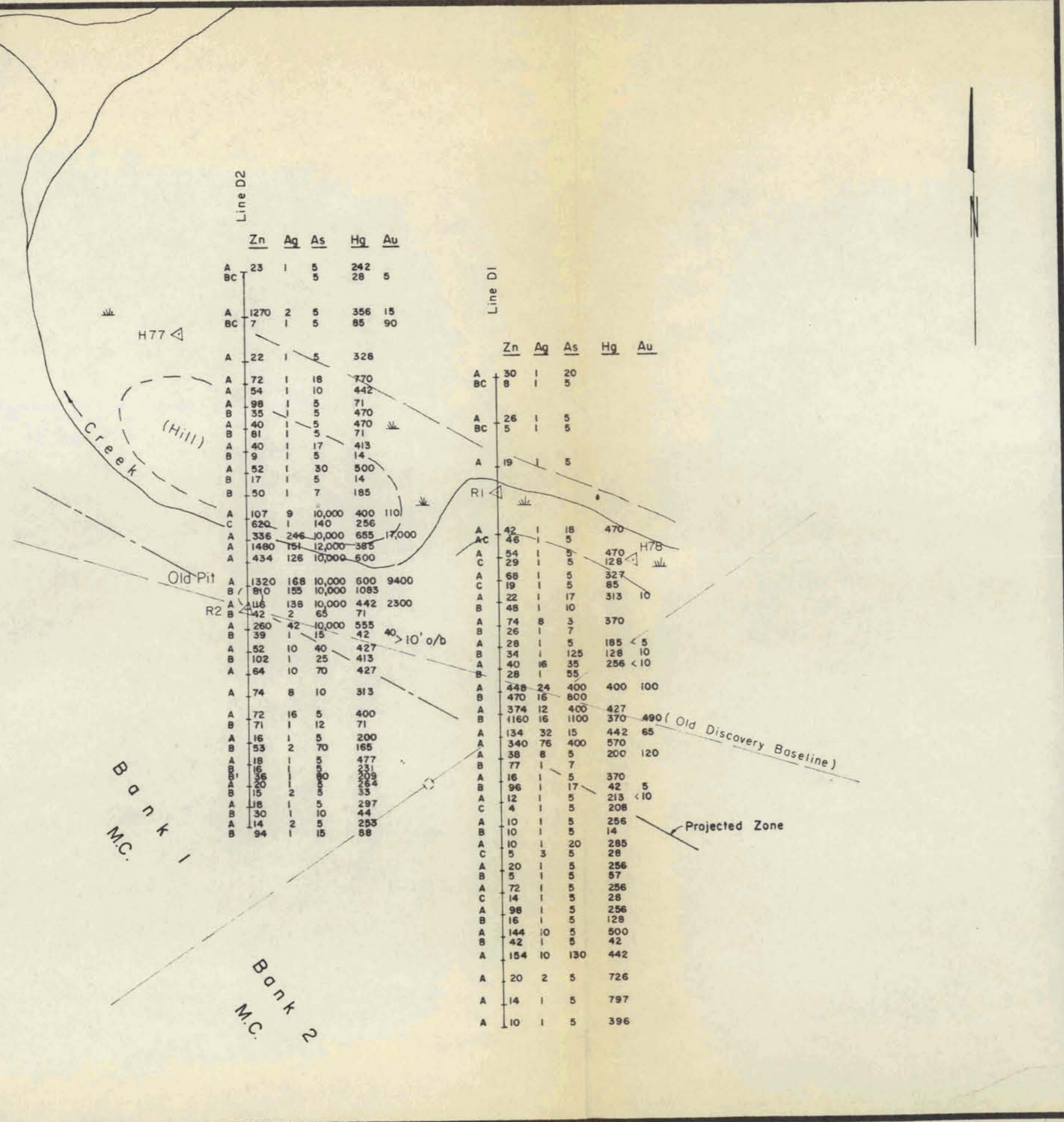
DATE OF WORK: May / 74

DATE: June 15/ 74

DRAWN BY: RJE




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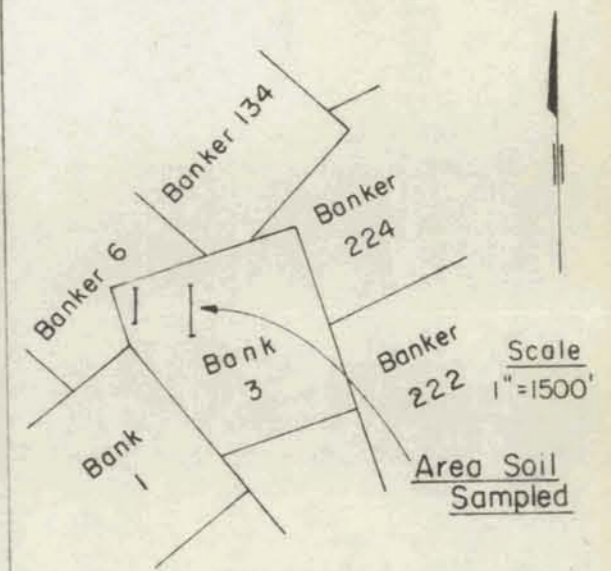
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 N.T.S.: 103 G/8

Soil Sample Sites

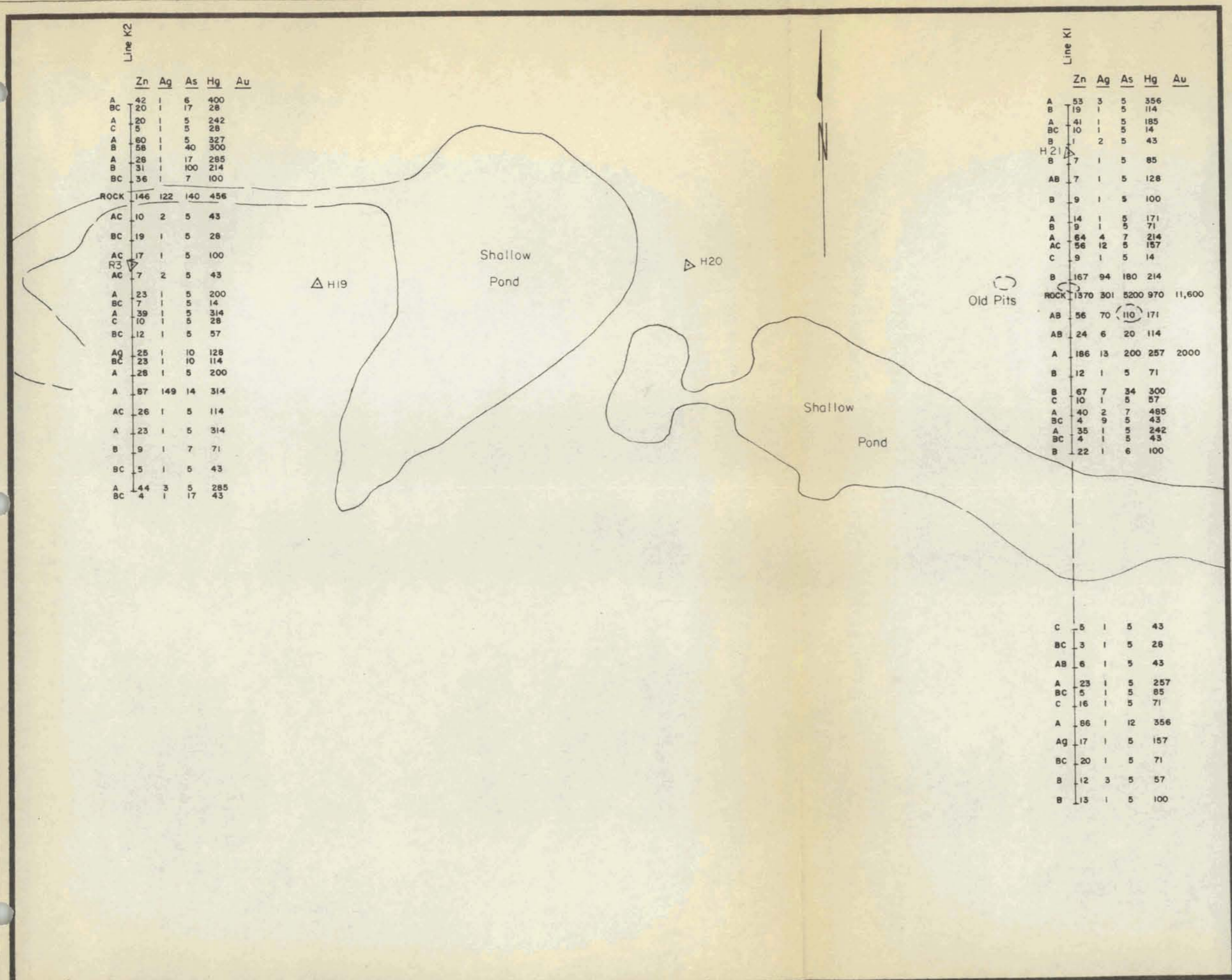
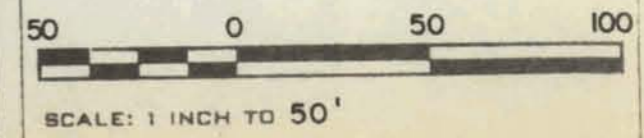
Soil Horizon	Zn (in p.p.m.)	Ag (in p.p.m.)	As (in p.p.m.)	Hg (in p.p.b.)	Au (in p.p.b.)
A	53	3	5	356	100

H20  Survey Station

Survey stations and control established by chain and transit.



FALCONBRIDGE NICKEL MINES LTD.
 PROPERTY: Banks Island
 LOCATION: Kim Zone
 TYPE OF MAP: Soil Geochemistry
 BASED ON: Sampling by S.Z.
 DATE OF WORK: May / 74
 DATE: June 15 / 74
 DRAWN BY: R.J.E.



Line K2

	Zn	Ag	As	Hg	Au
A	42	1	6	400	
BC	20	1	17	28	
A	20	1	5	242	
C	5	1	5	28	
A	60	1	5	327	
B	58	1	40	300	
A	26	1	17	285	
B	31	1	100	214	
BC	36	1	7	100	
ROCK	146	122	140	456	
AC	10	2	5	43	
BC	19	1	5	28	
AC	17	1	5	100	
R3	7	2	5	43	
AC	7	2	5	43	
A	23	1	5	200	
BC	7	1	5	14	
A	39	1	5	314	
C	10	1	5	28	
BC	12	1	5	57	
AG	25	1	10	128	
BC	23	1	10	114	
A	26	1	5	200	
A	87	149	14	314	
AC	26	1	5	114	
A	23	1	5	314	
B	9	1	7	71	
BC	5	1	5	43	
A	44	3	5	285	
BC	4	1	17	43	

Line K1

	Zn	Ag	As	Hg	Au
A	53	3	5	356	
B	19	1	5	114	
A	41	1	5	185	
BC	10	1	5	14	
B	1	2	5	43	
H21	7	1	5	85	
B	7	1	5	128	
AB	7	1	5	128	
B	9	1	5	100	
A	14	1	5	171	
B	9	1	5	71	
A	64	4	7	214	
AC	56	12	5	157	
C	9	1	5	14	
B	167	94	180	214	
ROCK	1570	301	5200	970	11,600
AB	56	70	110	171	
AB	24	6	20	114	
A	186	13	200	257	2000
B	12	1	5	71	
B	67	7	34	300	
C	10	1	5	57	
A	40	2	7	485	
BC	4	9	5	43	
A	35	1	5	242	
BC	4	1	5	43	
B	22	1	6	100	

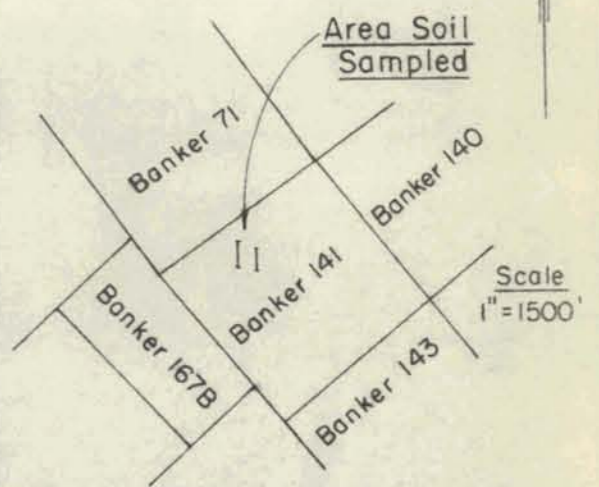
C	5	1	5	43
BC	3	1	5	28
AB	6	1	5	43
A	23	1	5	257
BC	5	1	5	85
C	16	1	5	71
A	86	1	12	356
AG	17	1	5	157
BC	20	1	5	71
B	12	3	5	57
B	13	1	5	100

Soil Sample Sites

Soil Horizon	Zn	Ag	As	Hg	Au
	(in p.p.m.)				(in ppb)
A	53	3	5	356	100

H₂O Δ Survey Station

Survey stations and control established by chain and transit.



FALCONBRIDGE NICKEL MINES LTD.

PROPERTY: Banks Island

LOCATION: Bob Zone

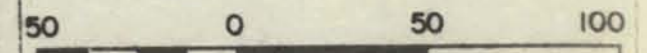
TYPE OF MAP: Soil Geochemistry

BASED ON: Sampling by S.Z.

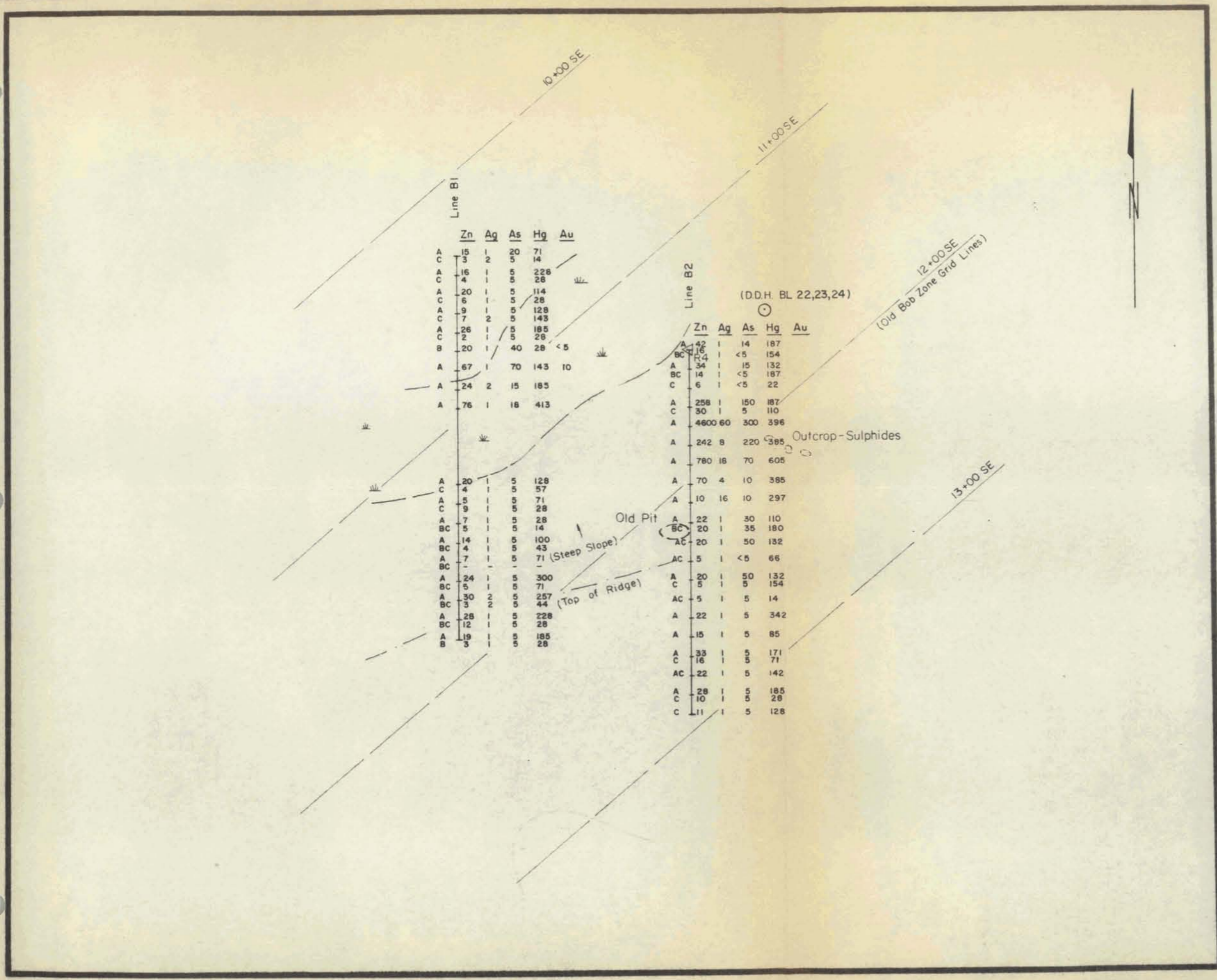
DATE OF WORK: May / 74

DATE: June 15 / 74

DRAWN BY: RJE.



SCALE: 1 INCH TO 50'



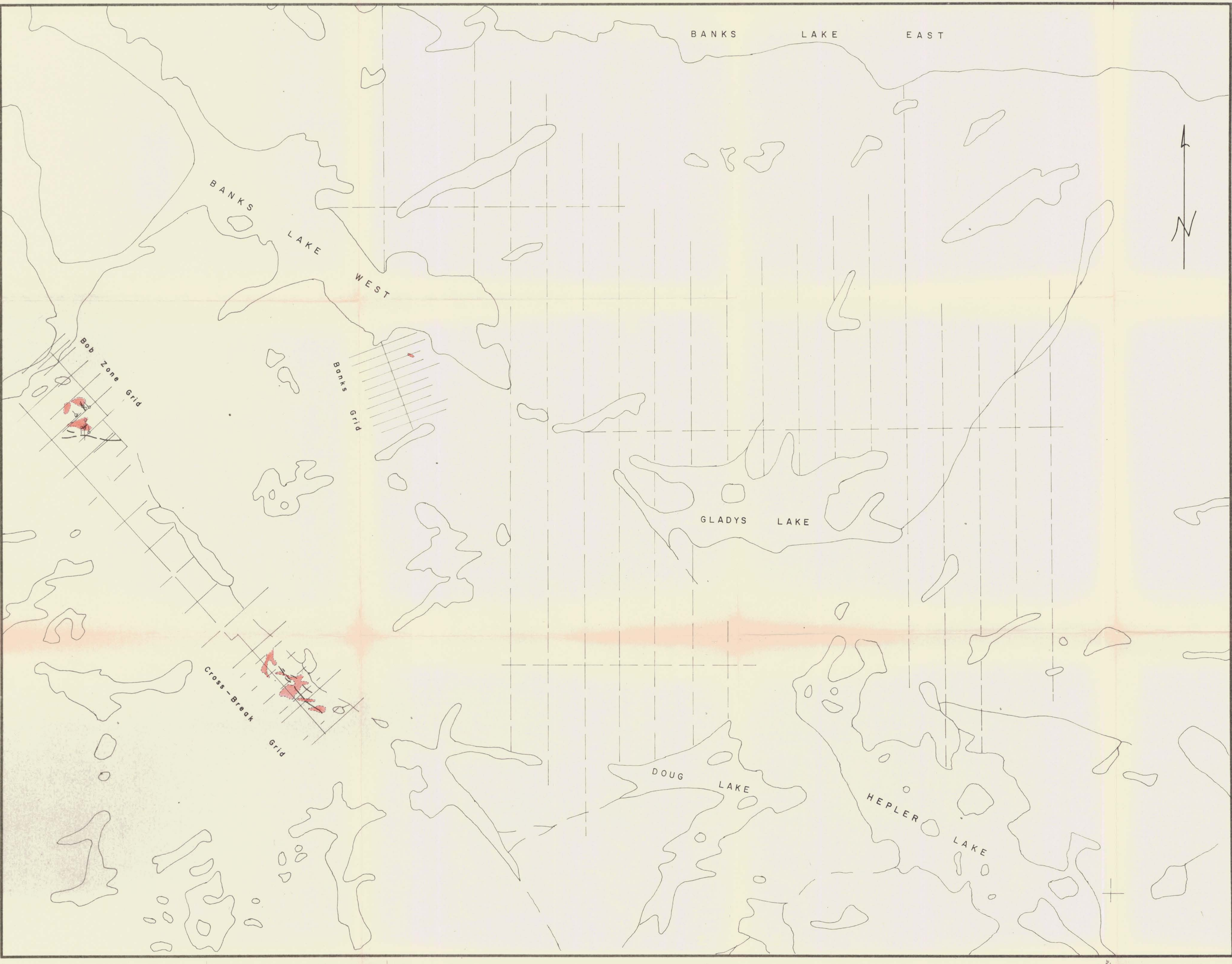


LEGEND



- SOLID LINES - Old Grids
- DASHED LINES - Proposed Grids
-  - Heavy Metals Anomaly
-  - Self-Potential Anomaly
-  - E.M. Conductors St. 18.6
17.8
-  - Arsenic Anomaly

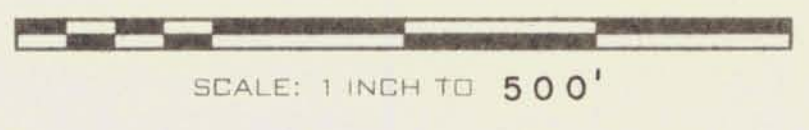


FALCONBRIDGE NICKEL MINES LIMITED	
PROPERTY:	BANKS ISLAND
LOCATION:	SOUTH-EAST SHEET
TYPE OF MAP:	GEOCHEMICAL SOIL GRIDS
WORKING PLACE:	
BASED ON:	B. Manchuk
DATE OF WORK:	1964 & '74
MAP REF. NO.:	
FIG. NO.:	1
DRAWN BY:	S. Z.
DATE:	March, '75.
N.T.S. NO.:	

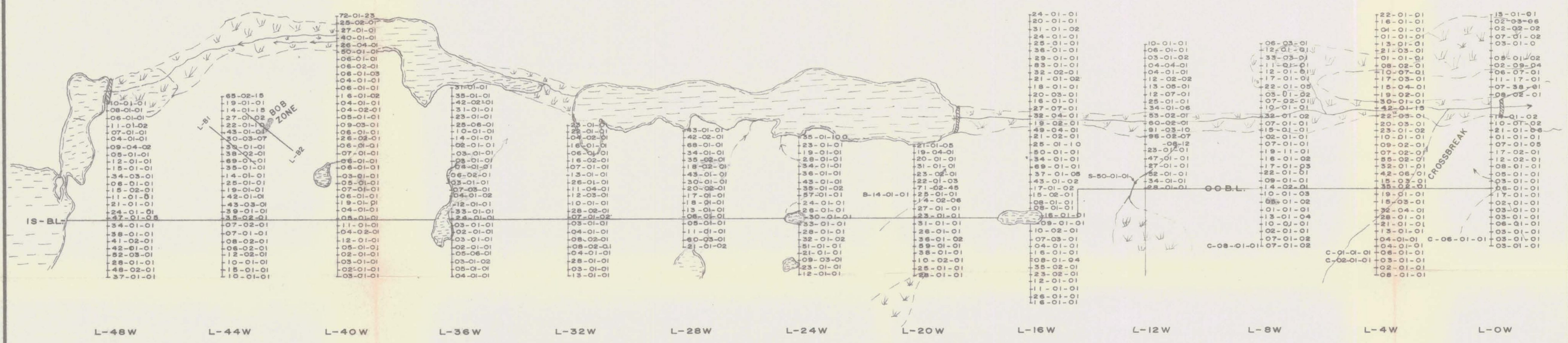
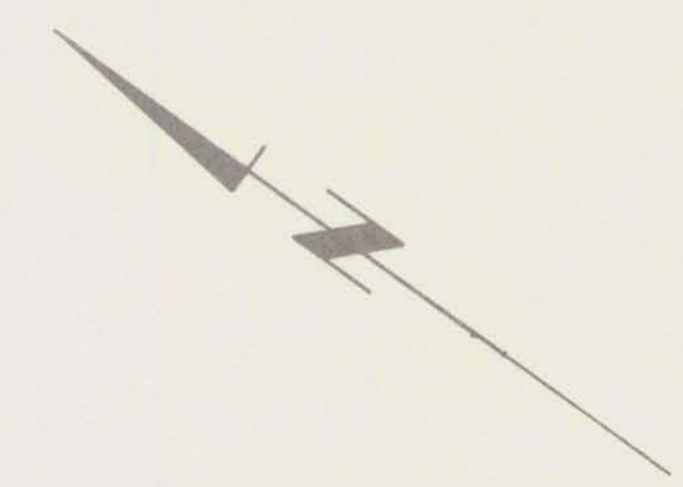


LEGEND

- SOLID LINES - Old Grids
- DASHED LINES - Proposed Grids
-  - Heavy Metals Anomaly
-  - Self-Potential Anomaly

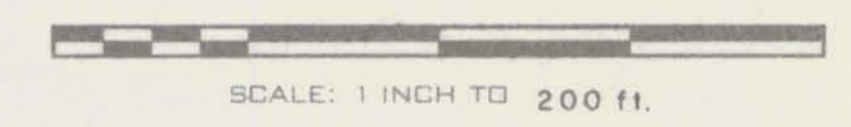


FALCONBRIDGE NICKEL MINES LIMITED		
PROPERTY: BANKS ISLAND		
LOCATION: NORTH - WEST SHEET		
TYPE OF MAP: GEOCHEMICAL SOIL GRIDS		
WORKING PLACE:		
BASED ON: B. Manchuk		
DATE OF WORK: 1964 & '74.	MAP REF. NO.:	FIG. NO.:
DRAWN BY: S. Z.		2
DATE: March, '75.	N.T.S. NO.:	

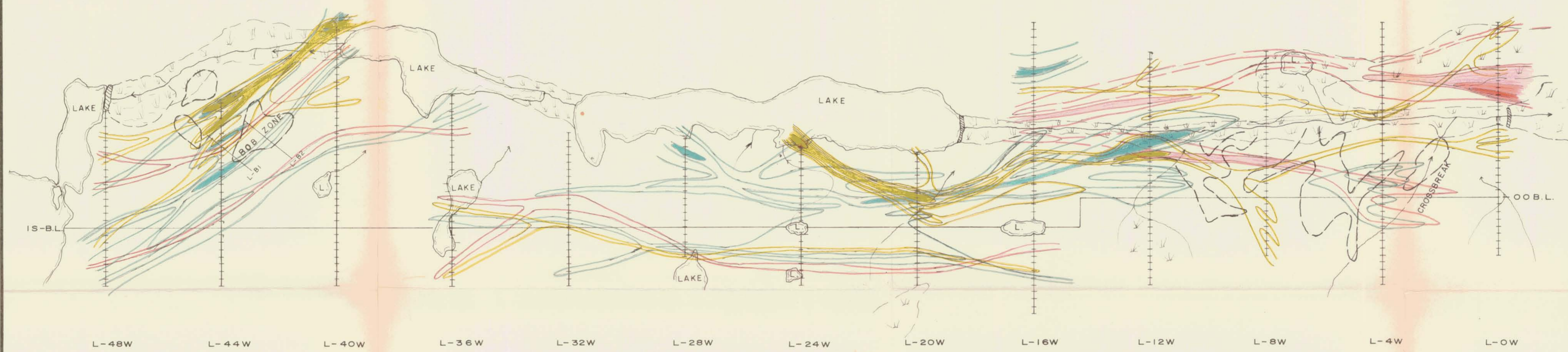
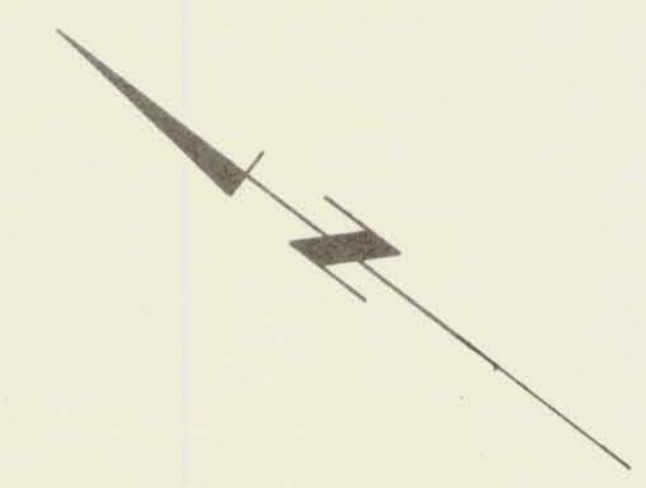


LEGEND

- SILVER, *ppm* / 10
 23-04-07
- ZINC, *ppm*
- ARSENIC, *ppm*
- LAKE
- SWAMP
- PIT
- DAM



FALCONBRIDGE NICKEL MINES LIMITED		
PROPERTY: BANKS ISLAND		
LOCATION: CROSSBREAK TO BOB ZONE		
TYPE OF MAP: GEOCHEMICAL - 'A' HOR. SOILS		
WORKING PLACE:		
BASED ON:		
DATE OF WORK: OCT. '74.	MAP REF. NO.:	FIG. NO.:
DRAWN BY: S.Z.		6
DATE: FEB. '75.	N.T.S. NO.: 103-G-8	



LEGEND

CONTOUR INTERVALS:

Arsenic, ppm.
 — 2 - 5
 — 6 - 10
 — 11 - 20
 — 21 - 50
 V 50

Silver, ppb, ppm/10
 — 3 - 6
 — 7 - 15
 — 16 - 25
 V 25

Zinc, ppm.
 — 25 - 40
 — 41 - 65
 — 66 - 90
 V 90

— Anomalies are Shaded

○ - TOTAL HEAVY METALS ANOMALIES

SCALE: 1 INCH TO 200 FT.

FALCONBRIDGE NICKEL MINES LIMITED		
PROPERTY: BANKS ISLAND		
LOCATION: CROSSBREAK TO BOB ZONE		
TYPE OF MAP: GEOCHEMICAL - As, Ag, Zn, SOIL ANOMALY		
WORKING PLACE:		
BASED ON:		
DATE OF WORK: OCT. '74	MAP REF. NO.:	FIG. NO.:
DRAWN BY: S. Z.		7
DATE: FEB. '75,	N.T.S. NO.: 103-G-8	