86-~~391~~-518-15090

Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

ASSESSMENT REPORT
TITLE PAGE AND SUMMARY

TYPE OF REPORT/SURVEY(S)	TOTAL COST
Geochemical and Geological	$19 681.11

AUTHOR(S) L.B. Halferdahl SIGNATURE(S) L.B. Halferdahl

DATE STATEMENT OF EXPLORATION AND DEVELOPMENT FILED 1986 07 31 YEAR OF WORK 1983

PROPERTY NAME(S) none - regional reconnaissance

COMMODITIES PRESENT base metals

B.C. MINERAL INVENTORY NUMBER(S), IF KNOWN -

MINING DIVISION Liard NTS 94 K

LATITUDE 58° - 59° N LONGITUDE 124° - 126° W

NAMES and NUMBERS of all mineral tenures in good standing (when work was done) that form the property [Examples: TAX 1-4, FIRE 2 (12 units); PHOENIX (Lot 1706); Mineral Lease M 123; Mining or Certified Mining Lease ML 12 (claims involved)]:

No claims held by operator in area surveyed

OWNER(S)

(1) nil (2)

MAILING ADDRESS

OPERATOR(S) (that is, Company paying for the work)

(1) Coppex Syndicate (2)

MAILING ADDRESS

18, 10509 - 81 Avenue
Edmonton, Alberta T6E 1X7

SUMMARY GEOLOGY (lithology, age, structure, alteration, mineralization, size, and attitude):

Thick deposits of Helikian of complexly faulted sedimentary rocks including argillites, dolomites, and limestones contain steeply dipping veins and breccia zones, some with high-grade chalcopyrite.

Lead-zinc deposits have been explored in some of the overlying Paleozoic sedimentary rocks.

REFERENCES TO PREVIOUS WORK Gorham, J.H. (1982) B.C. Ministry of Mines Assessment Report 10960

(over)

TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	COST APPORTIONED
GEOLOGICAL (scale, area)	1:125 000 regional	none - regional reconnaissance	$ 6 681.11
Ground			
Photo			
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic			
Other			
Airborne			
GEOCHEMICAL (number of samples analysed for ....)			
Soil)	150 samples analyzed for	none - regional reconnaissance	13 000.00
Silt)	Cu, Co, Pb, Zn		
Rock			
Other			
DRILLING (total metres; number of holes, size)			
Core			
Non-core			
RELATED TECHNICAL			
Sampling/assaying			
Petrographic			
Mineralogic			
Metallurgic			
PROSPECTING (scale, area)			
PREPARATORY/PHYSICAL			
Legal surveys (scale, area)			
Topographic (scale, area)			
Photogrammetric (scale, area)			
Line/grid (kilometres)			
Road, local access (kilometres)			
Trench (metres)			
Underground (metres)			
		TOTAL COST	19 681.11

FOR MINISTRY USE ONLY	NAME OF PAC ACCOUNT	DEBIT	CREDIT	REMARKS:
Value work done (from report)				
Value of work approved				
Value claimed (from statement) ALL PAC				
Value credited to PAC account				
Value debited to PAC account				
Accepted .... Date	Rept. No.			Information Class

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SECTION 1.0 INTRODUCTION

The geochemical reconnaissance surveys in the Tuchodi area of northeastern British Columbia, conducted in 1979 and 1980 were continued in 1983 with the collection of 150 soil samples. During this work some geological observations indicated the need for further revisions to some areas shown as Aida Formation on Geological Survey of Canada Map 1343 A: a map showing these revisions and some additions is included. The area surveyed in 1983 is confined to parts of areas drained by Churchill, Delano, Yedhe, and Belcher Creeks. Part coincides with the areas surveyed in 1979 and 1980. Revisions and additions to the map based on the 1979 and 1980 surveys and on work on mineral claims along Gataga River are included to make the map more complete.

Although sections on geographic setting, previous investigations, and regional geology are available in some of the reports listed in the references, brief information on these aspects is repeated here to conform with the regulations.

1.1 Geographic Setting

The Tuchodi area lies in northeastern British Columbia and is centred about 130 km (80 miles) west of Fort Nelson. Fort Nelson is a modern town on the Alaska Highway; it is served by regularly scheduled ariline flights and is a northern terminus of the British Columbia Railway. Access to the Tuchodi area for exploration is mostly by helicopter from Fort Nelson. Ground access also exists for limited parts adjoining the Alaska Highway and by formerly used roads to the Magnum and Davis-Keays copper deposits. A few short airstrips used mostly by outfitters for big-game hunters exist in other parts of the area. The formerly used mine roads require some repairs before they can be used by vehicles.

The part of the Tuchodi area surveyed is within the Rocky Mountains roughly 50 km northeast of the Rocky Mountain Trench. The mountains are rugged and picturesque, with at least one peak higher than 2700 m (9000 feet). Glaciers are found on some of the higher mountains. Treeline is about 1450 m (4800 feet), with permafrost extending to below the treeline locally at least. The ground is generally free enough from snow for geological field work during June, July, and August, but snow may fall in any month particularly at the higher elevations. Summers may be wet or dry. The rivers are rushing mountain streams; most cannot be easily crossed by wading.

1.2 History and Previous Investigations

Copper mineralization was first discovered near Delano Creek in the Tuchodi area in the mid 1940's. Surface exploration and drilling were conducted on the Magnum deposit on a tributary of Delano Creek in 1958 and 1959. Development for production began in 1967 with production ensuing during two periods as the Churchill Mine from April 1970 to October 1971 and again from January 1974 to April 1975. Reserves when production started were 1.0 million tonnes at 3.9 per cent copper.

The Strangward copper deposit on the South Tetsa River was discovered and explored briefly in the early 1950's.

Work began on the Davis-Keays deposit a few kilometres north of the Magnum deposit in 1967. Surface sampling and underground exploration and development to 1971 had outlined reserves of 1.2 million tonnes of 3.3 per cent copper in one vein, but no ore has been produced.

Many other properties were explored during the period 1958 to 1971 with the bulk of the exploration being conducted from 1968 to 1971. Companies active in the area included Alberta Copper and Resources Ltd., Bralorne Resources Limited, Canadian Superior Exploration Ltd., Copperline Mines Ltd., Fort Reliance Minerals Ltd., Largo Mines Ltd., and Windermere Exploration Ltd. Reports of these explorations are listed in the references.

Showings of galena, sphalerite, and barite in Paleozoic strata have been explored from time to time in the Tuchodi area. Significant deposits of lead, zinc, and barite in upper Devonian and Mississippian black shale sequences about 80 km southwest of Tuchodi Lakes have attracted considerable attention in recent years. The Gataga Joint Venture conducted a major drilling program at Driftpile Creek and Cyprus Anvil drilled the Cirque deposit to the southeast. Asarco explored the Chodi claims along Gataga River in 1980 and 1981.

The works of Bell (1966, 1968) and Taylor and Stott (1973) have significantly increased the understanding of the geology of the area, especially the Precambrian rocks present. Preto (1971) and holders of claims contributed to the mapping of smaller sections of the area.

No claims are held by or for the Coppex Syndicate in the area surveyed. It holds or held the Mo and Be claims along and near Gataga River south of the area surveyed in 1983.

1.3 Summary of Work Done

A total of 150 soil samples were collected along 10 geochemical traverses aggregating more than 5 km. A few geological traverses checked parts of the Aida Formation to learn the locations of the already established members and the subdivisions of one of these members noted previously near Gataga River (Gorham, 1982). A four-person crew was based at the Toad River Lodge on the Alaska Highway whence its members were moved to each traverse by helicopter.

SECTION 2.0 SUMMARY OF RESULTS

1. Of the four metals determined in geochemical samples - copper, cobalt, lead, and zinc - anomalous concentrations of zinc and lead were obtained on two traverses near outcrops of lower Paleozoic strata.
2. Scattered anomalous concentrations of copper, cobalt, and lead are present with no identifiable pattern.
3. Parts of the contacts between the Tuchodi and Aida Formations on GSC Map 1343A along the valleys of Racing River, Churchill Creek, Delano and Canyon Creeks, and Yedhe Creek require modification.
4. A copper showing of limited extent was found in a conglomerate near the top of the Tuchodi Formation on the east side of Canyon Creek.

SECTION 3.0 REGIONAL GEOLOGY

The Tuchodi area is underlain by Paleozoic and Proterozoic rocks as summarized in Table 3.1. Rock types are fairly distinctive, and many units exhibit great thicknesses. Besides structural complications, mapping is rendered difficult by better exposures invariably being on precipitous cliffs. The following description has been summarized from published reports listed in the references.

3.1 Stratigraphy

Only the Helikian Formations are pertinent to this investigation and their estimated thicknesses total a minimum of 5900 m. The assignment of a Helikian age to these rocks is tentative only and is based on their lithological similarity to the Purcell or Belt series of southeastern British Columbia and adjacent regions as well as to other areas. They may be bracketed by the age of 1800 million years of the crystalline basement rocks east of the Foothills in northeastern British Columbia,

TABLE 3.1

TABLE OF FORMATIONS
(modified after Bell, 1968 and Taylor and Stott, 1973)

		Approximate Thickness (metres)
Undivided	Mesozoic and Paleozoic rocks	not estimated
	ANGULAR UNCONFORMITY	
Ordovician		
Kechika Group:	limestone, graptolitic shale, turbidites	600-1800
	ANGULAR UNCONFORMITY	
Cambrian		
Atan Group:	limestone, dolomite, shale sandstone, conglomerate	600-1800
	DISCONFORMITY	
Hadrynian		
Unnamed succession:	quartz-chlorite phyllite, meta-sandstone	1200+
	ANGULAR UNCONFORMITY	
Helikian		
Gabbroic dykes		8-80
Gataga Formation:	mudstone, siltstone, minor sandstone	1350
Aida Formation		
Main Member		750-925
	Upper dolomite unit - dolomite, shale, minor sandstone	
	Argillite and limestone unit - shale, limestone, minor dolomite	
	Lower unit - dolomite, limestone, shale	
Carbonaceous Member:	shale siltstone, minor limestone, pyritic	35-50
Chamosite Member:	chamositic shale and siltstone, minor limestone	60-75
Lowest Member:	shale, siltstone, dolomite, limestone	200-250
Tuchodi Formation:	quartzite, dolomite, siltstone	1500+
Henry Creek Formation:	calcareous siltstone, mudstone, sandstone	210-450
George Formation:	limestone, dolomite	360-530
Tetsa Formation:	dark grey mudstone, sandstone	300
	DISCONFORMITY	
Chischa Formation:	dolomite, quartzite	950+

and the apparently younger sequence of greenish-grey, green and grey chloritic phyllites and slates, probably of Hadrynian age, which are in turn overlain by Cambrian strata adequately dated by fossils.

3.2 Intrusions

All formations of Helikian age are cut by steeply dipping diabasic or gabbroic dykes up to 70 m thick but mostly 10 m or so and extending up to 16 km. The dykes trend from northeasterly to northwesterly; at some places they trend in two directions as much as 40^{0} apart. They are very abundant in some places. These dykes do not cut the strata assigned a Hadrynian age.

3.3 Structure

In detail the structure of the Tuchodi area is complex, particularly the penetrative cleavage of the Aida Formation. The broad features are simpler, however. The Precambrian strata were gently folded on more than one occasion in pre-Silurian times. The most obvious structure from these foldings is the Tetsa anticlinorium whose axis extends from Mount St. George to the Tuchodi Lakes, and in whose axial region the oldest Precambrian strata in the area are exposed. In general dips of bedding in the Tuchodi area are shallow to moderate. Laramide faulting consists mostly of northwesterly trending thrust faults, which divide the Precambrian strata into at least five separate northwesterly trending bands. In addition to the major thrust faults, two large normal faults have been recognized. Many other smaller faults are present.

SECTION 4.0 GEOCHEMICAL TRAVERSES

4.1 Sampling

Samples were collected mostly at 40-m intervals along the traverses listed with their locations shown in Fig. 4.1. Locations of traverses were limited by

Traverse	Length	Number of Samples
AF-1	280 m	8
AF-2	160	6
AF-3	560	15
AF-4	480	13
AF-5	840	22
JM-1	120	4
JM-2	400	11
JM-3	600	16
JM-4	1480	38
LH-21	240	17
	5160 m	150

accessible helicopter landing sites and the avoidance of precipitous cliffs.

In many places soils were poorly developed, but an effort was always made to avoid the uppermost humus layer, if one was present. Descriptions of the soil samples are in Appendix 1.

4.2 Analyses

A one-gram sample of the -80 mesh fraction was digested for approximately two hours with a mixture of 70% perchloric acid and 18 N nitric acid, diluted, and analyzed for copper, cobalt, lead, and zinc by standard atomic absorption techniques. The analytical reports are in Appendix 2.

4.3 Distributions of Metals

The commulative frequency distributions of copper, cobalt, lead, and zinc are shown in Fig. 4.2. The statistical method of presentation is that described by Lepeltier (1969). Parameters were generated using all available data from work done by Halferdahl & Associates Ltd. in the Tuchodi area since 1979. The parameters, suitably rounded, follow.

Metal	Number of Samples	Background Concentration (Geometric Mean) ppm	Coefficient of Deviation	Threshold Concentration ppm	Per Cent of Anomalous Samples
Cu	1085	26	0.239	76	3
Co	615	12	0.243	30	5
Pb	908	18	0.210	45	4
Zn	908	78	0.129	200	3½

The curves for copper, cobalt, lead, and zinc show changes of slope typical of groups of samples with anomalous populations. In the Tuchodi area, most weathering of the bedrock is mechanical in nature, with chemical weathering being very limited. Thus anomalous dispersion halos are likely to be of restricted areal extent.

4.4 Geochemically Anomalous Samples

Inspection of the analytical results in Appendix 1 shows very few anomalous concentrations of copper, cobalt, lead, or zinc, but most samples with anomalous concentrations of one of the four metals also have anomalous concentrations of one or more additional metals. Specifically zinc is highly anomalous at the west end of traverse AF-1 and anomalous near the south end of traverse AF-4. At both locations it coincides with anomalous lead concentrations. The source of these anomalous lead and zinc concentrations is likely in the overlying Paleozoic Formations which outcrop at or near these traverses.

Slightly anomalous concentrations of copper and cobalt on traverse AF-4 appear related to those of lead and zinc. A similar but less distinct relation may be present on traverse AF-1. One sample from traverse AF-1 and another from traverse JM-4 show coincident anomalous concentrations of copper and cobalt. Anomalous concentrations in one sample only at these locations may be the result of erosion of formerly overlying rocks, or possibly indicate a nearby vein.

A few other samples contain slightly anomalous concentrations of lead, but without a discernable pattern.

SECTION 5.0 REVISIONS AND ADDITIONS TO GEOLOGICAL SURVEY OF CANADA MAP 1343A

5.1 Tuchodi Formation

Most of the valley of Canyon Creek east of the Roosevelt Thrust mapped as Aida Formation on GSC Map 1343A is actually Tuchodi Formation. Along the bottom of the valley of Canyon Creek, past its mouth, and down Delano Creek joining with the area shown as Tuchodi Formation, outcrops of black and grey-green finely laminated argillite are interbedded with massive to crossbedded grey to white quartzite, minor brownish-white dolomite and a few white or grey siltstone layers and laminations. Some of the surfaces are ripple-marked with wavelengths of 5 to 6 cm and amplitudes of 1 cm. At one place near the confluence of Canyon and Delano Creeks the crests trend at 30^{o} with the northwest slopes slightly lower than the southeast slopes. Dolomite in beds 4 to 40 cm thick with black argillite partings of various thicknesses was observed. Some of the quartzite is sugary white with grains about ¼ mm with impurities virtually absent; other quartzite is less pure. Locally the argillites and siltstones contain up to 3 per cent disseminated pyrite.

Higher up on the east side of Canyon Creek resistant cliffs of massive and crossbedded white quartzite, dolomitic quartzite, and pinkish-brown dolomite in beds up to 2 m thick predominate. The total thickness of resistant quartzite and dolomite is at least 170 m. Near the middle of this sequence several intraformational quartz-pebble conglomerates and breccias were observed. The most prominent, about 1-2 m thick, contains well rounded quartzite cobbles 5-25 cm across in a medium-grained porous sandstone matrix. This unit is abundantly mineralized with malachite, disseminated through the matrix and as coatings and nodules on the cobbles. A few of the nodules contain chalcopyrite cores. This same conglomerate unit was observed about 1 km to the north across a small cirque at an elevation of 2200 m where malachite and chalcopyrite are absent. There the underlying quartzites strike 100° and dip 13°N. Although faulting obscures the upper contact relationships on this ridge, some of the Aida Formation overlies this section but is absent both to the north and south where the Tuchodi Formation is directly overlain by pink arenaceous dolomites and red conglomerates of the basal Cambrian. This may represent either the angular unconformity or topographic relief on the Precambrian erosional surface.

As noted previously (Halferdahl, 1981), other changes involving the Tuchodi Formation are shown on Fig. 4.1. Near traverse H7 the Tuchodi Formation with its predominantly white quartzites extends to the bottom of the cliff-forming Paleozoic strata higher up the slope without any strata of the Aida Formation being exposed there. Near traverse H8 also along Racing River is a zone of black argillite 30 to 50 m thick at an elevation of about 1800 m with at least 150 m of overlying quartzites and sandstones. It is speculated that this black argillite may have been mistaken for the Carbonaceous Member of the Aida Formation by those who prepared GSC Map 1343A.

5.2 Lowest Member - Aida Formation

At traverse G-2 on the west side of Churchill Creek and on the west side of Canyon Creek the Lowest Member is exposed conformably underlying the Chamosite and Carbonaceous Members and is lithologically similar to exposures in the Gataga area, consisting of interbedded grey argillites and limestones with minor dolomite beds. Beds are generally not more than 25 cm thick and mostly thinner. On the north-facing valley slope of traverse G-2 the contact between the Aida and Tuchodi Formations is moved lower in Fig. 4.1.

On the east side of Canyon Creek, the rocks below the Carbonaceous Member are mainly green and grey-green banded argillite, some calcareous. Adjacent to a large diabase dyke they are much sheared and silicified, and may be part of the Chamosite Member. No contact relationships were observed between the underlying Tuchodi dolomites or the overlying Carbonaceous Member.

As noted previously (Halferdahl, 1981) the Lowest Member extends at least to the steep slope at the north end of the ridge just west of Caribou Creek (traverse H 13).

5.3 Carbonaceous Member - Aida Formation

At traverse JM-1 only the top 10 to 15 m of the Carbonaceous Member remains above the Roosevelt Thrust. These beds are dark-grey argillites with some interbedded dolomites, argillaceous dolomites, and chamositic argillites. Farther south in the same valley the sharp lower contact with the Chamosite Member is exposed. At this contact the Carbonaceous Member is black and silty with a few lighter-grey laminae, and contains finely disseminated pyrite in its lowest metre. There it strikes 163° and dips 82° west, with cleavage 90° and 27° south. Higher up section are local layers of sandy dolomite up to ½ m thick. Towards its top the Carbonaceous Member becomes grey, green-grey, black, and buff. It is 40 to 50 m thick here.

At traverse G-2 near Churchill Creek, the Carbonaceous Member is well exposed on two ridges, where it consists of about 25 m of black fissile argillite with rusty-weathering patches. These are the result of small shears. More consistent rust is present for about 1 m at the base and about ½ m about 10 m above the base. It strikes 80° and dips 17° south with cleavage 130° and 40° southwest, and has an abrupt lower contact with the Chamosite Member. Its upper contact is intercalated with maroon-weathering shales and grey limestone across 5 m.

On the west side of Canyon Creek, the Carbonaceous Member is a uniform fissile black shale with laminae from 2 to 10 mm thick. Large areas are exposed on the west side of the ridge because it is approximately a dip slope but the actual thickness varies from 5 to 40 m because of splays from the Roosevelt Thrust just below, which truncate the Carbonaceous Member to the north along the ridge. The black argillites are very uniform and overlie 1½ m of orange-weathering dolomite which separates them from the Chamosite Member which is 6 to 7 m thick. Minor rust stains on joints are widespread. The upper contact is intercalated over 10 m with interbedded grey limestone, buff dolomite, and slate of the Main Member.

On the east side of Canyon Creek very soft fissile black shale in a band dipping southeast appears to belong to the Carbonaceous Member. At the top of the ridge it is cut off at the base by a fault trending about 110°, but to the south it is underlain conformably by a few beds of grey to white quartzite overlying a few metres of green argillite which resemble the Chamosite Member. It is very recessive and both upper and lower contacts appear faulted at the ridge top but to the south the recessive interval with isolated outcrops of black shale may be as much as 100 to 150 m thick. The black shale is overlain abruptly by buff-weathering grey dolomite.

The lack of an intervening argillite-limestone-dolomite sequence suggests that this unit is part of the upper part of the Main Member faulted into place above the Carbonaceous Member.

5.4 Main Member - Aida Formation

A composite section of the Main Member as noted near Canyon Creek, Caribou Creek, and near the head of Belcher Creek follows.

(3)	buff-weathering resistant dolomite with some interbedded quartzite and argillite	200-300 m
(2)	grey-weathering argillite, slate, and argillaceous dolomite (Dolomite content gives buff to grey-brown weathering color at outcrop scale but overall appearance is grey.)	300 m+
(1)	buff- to grey-weathering limestone and dolomite interbedded with grey argillite (fairly resistant; limestone predominates towards the top, giving a buff appearance to whole unit on recessive slopes)	300-400 m

Unit 1 is approximately equivalent to the Limestone, Zebra, and Middle Dolomite Units in the Gataga area (Gorham, 1982). Near Davis-Keays it apparently is truncated to the east by the Precambrian erosion surface. Unit 2 is roughly equivalent to the Argillite and Limestone Unit in the Gataga area. Unit 3 is roughly equivalent to the Upper Dolomite Unit of the Gataga area.

At G-2 the cliff above the Carbonaceous Member is interbedded grey limestone, and maroon to dark-grey argillites with minor dolomite. The beds are generally 5 to 10 cm thick. Lithologically this section most closely resembles the Argillite and Limestone Unit of the Gataga area.

5.5 Structure

The Roosevelt Thrust which runs up the west side of Canyon Creek has been moved lower on the ridge in Fig. 4.1 and probably extends northward across Eagle Creek and over the ridge north of the Davis-Keays minesite repeating the Lowest Member, Carbonaceous Member, and at least part of unit 1, along this ridge. On the ridge north of Davis Keays two recessive intervals with dark argillites are visible. The more northerly has been observed to be the Carbonaceous Member (Halferdahl, 1981), but it dips into the valley too quickly to explain the outcrop of the Carbonaceous Member to the north of Bonanza Creek. Although partly covered, this outcrop seems to connect with the more southerly recessive saddle on the ridge where black argillites were observed from the air.

The thrust shown in Fig. 4 along part of Belcher Creek was observed from the mountain east of its head to extend as a marked angular discordance in the Main Member of the Aida Formation along the west side of the creek to its head, and probably joins the thrust shown to the south near Dieppe Mountain.

A high angle fault observed on the east side of Canyon Creek is subparallel to the Belcher Fault and may be part of a cross-fault system.

Respectfully submitted,

L.B. Halferdahl, Ph.D., P.Eng.

PROVINCE OF BRITISH COLUMBIA ENGINEER
Expiry Date: August 5, 1984

Edmonton, Alberta
1983 12 31

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APPENDIX 1: SOIL SAMPLE DESCRIPTIONS

Sample numbers in each traverse are metres measured from the starting point in the direction indicated, mostly downslope. Weathering profiles are seldom developed in the material sampled: depths and descriptions only are given.

Traverse and Sample Number	Sample Depth (cm)	Description
AF-1	Bearing westerly along spur	
0	30	15-20% angular rock fragments (½-1½ cm) in coarse black sand, no humus
40	30	very jet black carbonaceous scree with 20% small angular fragments of red shale
80	25	very dark black carbonaceous scree with 40% angular rock fragments (½-3 cm), some red shale with disseminated pyrite
120	30	10% angular rock fragments (½-1½ cm) in a dark-black very coarse carbonaceous silt with 5% medium sand
160	30	10% angular rock fragments in dark-black carbonaceous silt with 5% medium sand
	Scree slope of fine-grained bluish-grey dolomite (weathers orange) with abundant calcite at 200 m	
200	20	50% large angular fragments in tan-brown silt with abundant chips to 5 cm
240	20	75% angular rock fragments in tan-brown silt with many chips
280	10	very fine fragments of shale and dark-black dolomite
AF-2	Bearing easterly downhill	
0	30	dark-brown silt with 10% angular rock fragments mostly shale
20	35	medium-tan-brown silt with 10% angular rock fragments, larger ones dolomite, below 15 cm of humus
60	25	dark-brown silt with minor very fine sand and 10% angular rock fragments, below 10 cm of humus
80	25	reddish-brown silt with 10% angular rock fragments, below 15 cm of humus
120	30	red-brown silt with less than 10% angular rock fragments, below 20 cm of humus
160	30	reddish-brown silt with less than 10% angular rock fragments, below 15 cm of humus
AF-3	Bearing northerly up small creek	
0	20	medium-dark-brown silt with 30% angular rock fragments, no humus
40	20	red-brown silt with 40% angular rock fragments, below 5 cm of humus
80	20	medium-brown silt with 5% sand and 10% angular rock fragments
120	25	light-brown silt with 50% angular rock fragments about 1 cm in size with abundant granules, probably from old creek, no humus
160	20	light-brownish-grey silt with 10% angular rock fragments (quartzites, argillite etc.), old creek bed, no humus; outcrop of rusty weathered dolomite with disseminated pyrite

APPENDIX 1: CONTINUED

Traverse and Sample Number	Sample Depth (cm)	Description
200	20	medium-brownish-grey silt with less than 10% angular rock fragments and about 60% small rock chips from old creek bed, no humus
240	15	medium-brownish-grey with 15% angular rock fragments from old creek bed, no humus
280	35	medium-brown silt with less than 10% angular rock fragments with few roots, below 15 cm of humus
320	30	medium-brown silt with less than 10% angular rock fragments and many small chips, below 15 cm of humus
360	30	medium-brown silt with less than 10% angular rock fragments and 10% small chips, below 20 cm of humus
400	25	medium-brown silt with less than 10% angular dolomite fragments, below 20 cm of humus
440	35	medium-dark-brown silt with less than 10% angular dolomite and shale fragments, below 20 cm of humus
480	10	light-greyish-brown silt with 50% angular dolomite fragments, on scree slope
520	35	medium-dark-brown silt with 10% angular rock fragments and 10% somewhat rounded chips, below 15 cm of humus
560	25	dark-brown silt with less than 10% angular rock fragments, below 20 cm of humus; at base of quartzite cliffs locally with disseminated pyrite
AF-4		Bearing northerly along spur from base of cliffs of slightly dolomitic limestone: attitude 90°/30°S
0	15	black silt with 75% chips of weathered black limestone, from cliffs above, no humus
40	15	black silt with 75% fragments and chips of weathered black limestone, no humus
80	5	jet black silt with 75-80% fragments and chips of black limestone, no humus
120	20	black silt with 75-80% fragments and chips of black limestone some weathering rusty, no humus; near base of first saddle
160	15	dark-brown silt with 70% fragments and chips of grey limestone, no humus
190	-	outcorp of reddish-brown weathering dyke about 8 m wide striking about 90°
200	10	dark-brown silt with 60% angular diabase fragments, below 5 cm of humus
240	15	dark-brown silt with 70% angular dolomite fragments and chips, no humus
280	15	dark-brown silt with 80% angular dolomite fragments and chips, no humus; outcrop of grey dolomite
320	15	black silt with 75% angular fragments and chips of black dolomite, below 5 cm of humus
360	25	jet-black coarse silt with 10% angular fragments of black dolomite, no humus; sampled at or near bottom of second saddle

APPENDIX 1: CONTINUED

Traverse and Sample Number	Sample Depth (cm)	Description
400	15	jet-black silt with 50% angular fragments of black limestone, no humus
440	15	dark-black silt with 60% angular limestone fragments, no humus
480	20	jet-black silt with 30% angular fragments of black limestone, no humus; at bottom of third small saddle
AF-5		Bearing northeasterly; higher cliffs to south are mostly dolomite striking east and dipping south
0	20	greenish-grey silt with 50% chips of dolomite, no humus; just below outcrop at cliff
40	20	dark-brown silt with 60% chips of orange-weathered platy dolomite, no humus
80	25	dark-brown silt with 30% angular fragments and chips mostly of orange-weathered limestone, no humus
120	25	dark-brown silt with less than 10% angular rock fragments, no humus; nearest outcrop limestone, no humus
160	15	dark-brown silt with 50% angular limestone fragments, no humus; attitude of nearby beds $90^{o}/40^{o}S$
180	-	diabase outcrop about 10 m wide
200	20	black silt with 10% angular rock fragments, no humus
240	20	black silt with 20% angular fragments and chips of black limestone; no humus
280	20	dark-brown to black silt with 50% angular limestone fragments; no humus
305	-	dolomite outcrop with quartz veins carrying small amounts of chalcopyrite and malachite
320	20	reddish-brown silt with 30% angular fragments and chips of limestone, no humus
350	-	diabase outcrop 5 m across
360	15	dark-brown silt with 40% angular fragments and chips of limestone, no humus
400	20	dark-brown to black silt with 30% angular fragments and chips of limestone, no humus
440	20	dark-brown silt with 30% angular rock fragments and chips, no humus; nearest outcrop is dolomite with quartz veins
480	20	dark-brown silt with 50% angular dolomite fragments and chips, no humus
520	20	dark-brown to black silt with less than 20% angular limestone fragments, no humus
560	15	dark-brown silt with 40% angular rock fragments and chips, less than 5% humus
600	20	dark-brown silt with 40% angular fragments of bluish-grey limestone, no humus
640	20	dark-brown silt with 40% angular dolomite fragments and chips, no humus

APPENDIX 1: CONTINUED

Traverse and Sample Number	Sample Depth (cm)	Description
680	20	dark-brown silt with 30% angular limestone fragments and chips, no humus
720	20	medium-brown silt with 20% angular limestone fragments, no humus
760	20	reddish-brown silt with 30% angular dolomite fragments, no humus
800	20	reddish-brown silt with less than 10% angular dolomite fragments, no humus
840	20	dark-brown silt with 20% angular rock fragments, no humus
JM-1	Bearing northeasterly down slope	
0	20	light-brown silt with angular rock fragments
40	30	light-brown silt with local grey patches, angular rock fragments
80	40	light-brown silt with angular rock fragments
120	30	light-brown silt with grey patches, angular rock fragments
	Base of Carbonaceous Member of Aida Formation	
JM-2	Bearing northerly down slope	
0	20	light-brown and grey clay with angular rock fragments
40	20	light-brown and grey silt with angular rock fragments
80	15	brown silt with 80% angular rock fragments
120	15	tan and minor rusty silt with grey rock fragments
160	15	light-brown silt with pebbles
200	15	light-brown with a purple tint and pebbles
240	25	dark-grey less black minor light-brown silt with pebbles
280	30	light-brown minor black silt with pebbles
320	25	tan silt with pebbles
360	40	black silt with pebbles
400	30	dark-brown silt with pebbles
JM-3	Bearing southerly down slope to Delano Creek	
0	35	light-brown silt with pebbles and rock fragments
40	30	tan silt with pebbles and minor rock fragments
80	25	mostly light-brown silt with admixed grey and black with rock fragments
120	20	tan silt with rock fragments
160	20	orange silt with rock fragments
200	25	orange silt with minor grey, with rock fragments
240	30	light-brown silt with rock fragments
280	25	orange silt with abundant rock fragments
320	25	greyish-orange silt with rock fragments
360	30	orange silt with minor grey, abundant rock fragments
400	25	orange and grey silt with rock fragments
440	25	grey silt with minor brown, rock fragments
480	25	grey silt with minor light-brown, rock fragments
520	30	orange silt with minor grey, rock fragments

APPENDIX 1: CONTINUED

Traverse and Sample Number	Sample Depth (cm)	Description
560	30	dark-brown silt with abundant rock fragments
600	15	medium-brown sandy silt with pebbles and rock fragments; at creek level
JM-4		Bearing northerly along spur
0	15	dark-brown silt with rock fragments
40	20	dark-brown silt with less grey, rock fragments
80	20	dark-brown silt with less light-grey, rock fragments
120	25	light-brown silt mixed with grey, rock fragments
160	15	light-brown silt with rock fragments
200	20	light-brown silt with rock fragments
240	15	light-brown silt with rock fragments
280	25	light-brown silt with minor grey, rock fragments
320	30	light-brown silt with rock fragments
360	40	light-brown silt mixed with grey, rock fragments
400	25	grey silt mixed with light-brown, rock fragments
440	30	mostly dark-grey to black silt with minor light-brown, rock fragments
480	25	light-brown silt with rock fragments
520	25	light-brown and grey silt with rock fragments
560	20	grey silt with rock fragments
600	20	dark-grey silt with rock fragments
640	25	dark-brown silt with rock fragments
680	30	dark-brown silt with minor grey, rock fragments
720	30	dark-brown silt with rock fragments
760	20	dark-brown silt with rock fragments
800	35	dark-brown silt with rock fragments
840	30	dark-brown silt with rock fragments
880	30	dark-brown and minor black silt with rock fragments
920	35	dark-brown silt with rock fragments
960	15	dark-grey and black silt with rock fragments
1000	35	dark-brown and black with minor light-brown silt, rock fragments
1040	30	dark-brown and minor light-brown silt with rock fragments
1080	15	light-brown silt with rock fragments
1120	20	dark-brown with minor light-brown silt, rock fragments
1160	15	dark-brown and sparse light-brown silt, rock fragments
1200	40	mostly dark-brown silt mixed with minor light-brown, rock fragments
1240	25	grey silt with rock fragments
1280	25	light-brown silt with rock fragments
1320	20	dark-brown silt with rock fragments
1360	40	light-brown silt with rock fragments
1400	40	dark-brown silt with less greyish-green, rock fragments
1440	45	light-brown silt with rock fragments
1480	35	light-brown silt with sparse grey, rock fragments

APPENDIX 1: CONTINUED

Traverse and Sample Number	Sample Depth (cm)	Description
LH-21		Bearing easterly along spur
0	15	rubble of black argillite and dark-green-grey silt
		West of 0 m at elev. 2280 m - dark-grey slaty argillite some striped buff and dark; attitude of bedding $343^{0}/44^{0}E$, attitude of cleavage $300^{0}/49^{0}S$
7	10	rubble of black argillite with much rust, local calcite veins to 5 mm wide
12	10	rubble of rusty argillite, no soil
20	10	rubble of rusty black argillite, no soil
30	20	black clay and silt and rock fragments
40	15	rubble of black argillite, spot of malachite in 5-mm calcite vein, no soil
50	30	black clay, silt, and fragments of black argillite
60	25	black silt and granules, minor clay
80	35	black silt, clay, granules, and rock fragments some with rust
100	30	black silt, granules, and rock fragments at bottom of saddle
120	25	black silt and rock fragments with minor clay
140	35	black silt, clay, and rock fragments some rusty
160	30	dark-brown-black clay, silt, and granules
180	20	dark-brown-black clay, silt, and black rock fragments
200	30	dark-brown-black clay, silt, and rock fragments
220	20	brown-grey clay and rock fragments
240	15	brown-grey clay and rock fragments some with rust

APPENDIX 2: CERTIFICATES OF ANALYSIS FOR GEOCHEMICAL SOIL SAMPLES

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T6E 1X7

CERT. # : A8313790-001-A
INVOICE # : I8313790
DATE : 23-AUG-83
P.O. # : NONE

Sample description	Prep code	Cu ppm	Pb ppm	Zn ppm	Co ppm		
AF-1 000	201	40	8	28	15	--	--
AF-1 040	201	33	37	24	22	--	--
AF-1 080	201	720	34	32	74	--	--
AF-1 120	201	78	51	27	15	--	--
AF-1 160	201	55	245	850	10	--	--
AF-1 200	201	22	78	2500	18	--	--
AF-1 240	201	41	270	5000	37	--	--
AF-1 280	203	8	1	52	28	--	--
AF-2 000	201	30	20	73	14	--	--
AF-2 020	201	31	15	71	12	--	--
AF-2 060	201	23	14	75	7	--	--
AF-2 080	201	21	16	78	7	--	--
AF-2 120	201	17	12	69	10	--	--
AF-2 160	201	20	14	86	7	--	--
AF-3 000	201	10	8	45	5	--	--
AF-3 040	201	12	9	44	6	--	--
AF-3 080	201	12	9	47	6	--	--
AF-3 120	201	12	8	51	7	--	--
AF-3 140	201	12	7	53	7	--	--
AF-3 200	201	12	8	45	7	--	--
AF-3 240	201	13	9	45	7	--	--
AF-3 280	201	12	4	47	7	--	--
AF-3 320	201	13	6	53	6	--	--
AF-3 360	201	30	28	67	23	--	--
AF-3 400	201	12	4	50	7	--	--
AF-3 440	201	13	5	49	8	--	--
AF-3 480	201	13	8	65	11	--	--
AF-3 520	201	11	4	51	8	--	--
AF-3 560	201	14	8	60	10	--	--
AF-4 000	201	12	5	51	7	--	--
AF-4 040	201	35	15	310	18	--	--
AF-4 080	201	30	16	62	12	--	--
AF-4 120	201	115	38	440	40	--	--
AF-4 160	201	44	19	82	16	--	--
AF-4 200	201	72	23	155	27	--	--
AF-4 240	201	40	30	32	17	--	--
AF-4 280	201	32	6	64	12	--	--
AF-4 320	201	83	27	500	25	--	--
AF-4 360	201	24	10	45	10	--	--
AF-4 400	201	22	15	49	10	--	--

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CERT. # : A8313790-002-A
INVOICE # : I8313790
DATE : 23-AUG-83
P.O. # : NONE

Sample description	Prep code	Cu ppm	Pb ppm	Zn ppm	Co ppm		
AF-4 440	201	27	39	38	8	--	--
AF-4 480	201	28	13	46	8	--	--
AF-5 000	201	43	47	36	17	--	--
AF-5 040	201	40	24	58	18	--	--
AF-5 080	201	28	20	32	12	--	--
AF-5 120	201	21	21	90	11	--	--
AF-5 160	201	20	13	64	11	--	--
AF-5 200	201	21	21	80	10	--	--
AF-5 240	201	18	11	82	13	--	--
AF-5 280	201	18	14	60	13	--	--
AF-5 320	201	41	10	47	17	--	--
AF-5 360	201	25	12	39	12	--	--
AF-5 400	201	18	9	21	12	--	--
AF-5 440	201	21	7	15	11	--	--
AF-5 480	201	35	23	34	26	--	--
AF-5 520	201	32	13	40	14	--	--
AF-5 560	201	28	21	30	15	--	--
AF-5 600	201	26	12	24	10	--	--
AF-5 640	201	73	82	40	30	--	--
AF-5 680	201	27	15	26	15	--	--
AF-5 720	201	20	4	68	10	--	--
AF-5 760	201	30	13	56	15	--	--
AF-5 800	201	33	12	48	17	--	--
AF-5 840	201	28	6	64	12	--	--
JM-1 000	201	23	6	49	9	--	--
JM-1 040	201	18	1	33	9	--	--
JM-1 080	201	15	5	40	10	--	--
JM-1 120	201	18	5	38	10	--	--
JM-2 000	201	5	7	30	4	--	--
JM-2 040	201	5	5	41	4	--	--
JM-2 080	201	4	5	26	3	--	--
JM-2 120	201	5	5	36	5	--	--
JM-2 160	201	9	6	47	6	--	--
JM-2 200	201	6	2	24	2	--	--
JM-2 240	201	9	8	45	8	--	--
JM-2 280	201	12	8	42	8	--	--
JM-2 320	201	10	7	61	8	--	--
JM-2 360	201	22	5	40	9	--	--
JM-2 400	201	18	5	40	9	--	--
JM-3 000	201	45	15	94	15	--	--

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CERT. # : A8313790-003-A
INVOICE # : I8313790
DATE : 23-AUG-83
P.O. # : NONE

Sample description	Prep code	Cu ppm	Pb ppm	Zn ppm	Co ppm		
JM-3 040	201	20	12	97	14	--	--
JM-3 080	201	18	12	90	7	--	--
JM-3 120	201	15	29	52	13	--	--
JM-3 160	201	17	15	61	9	--	--
JM-3 200	201	13	11	56	8	--	--
JM-3 240	201	14	13	66	14	--	--
JM-3 280	201	10	5	84	17	--	--
JM-3 320	201	22	15	57	13	--	--
JM-3 360	201	21	10	63	11	--	--
JM-3 400	201	12	10	67	9	--	--
JM-3 440	201	4	1	33	1	--	--
JM-3 480	201	7	7	50	4	--	--
JM-3 520	201	11	16	77	7	--	--
JM-3 560	201	47	36	81	23	--	--
JM-3 600	201	18	14	49	9	--	--
JM-4 000	201	16	9	67	8	--	--
JM-4 040	201	16	6	49	7	--	--
JM-4 080	201	17	14	84	8	--	--
JM-4 120	201	13	5	60	6	--	--
JM-4 160	201	14	12	71	8	--	--
JM-4 200	201	23	6	50	8	--	--
JM-4 240	201	26	8	54	8	--	--
JM-4 280	201	20	9	51	5	--	--
JM-4 320	201	19	7	44	5	--	--
JM-4 360	201	19	7	43	6	--	--
JM-4 400	201	31	5	42	6	--	--
JM-4 440	201	36	2	44	7	--	--
JM-4 480	201	20	7	63	7	--	--
JM-4 520	201	20	4	44	5	--	--
JM-4 560	201	20	8	54	6	--	--
JM-4 600	201	14	5	46	9	--	--
JM-4 640	201	31	22	90	17	--	--
JM-4 680	201	27	16	50	15	--	--
JM-4 720	201	31	36	120	13	--	--
JM-4 760	201	65	45	56	13	--	--
JM-4 800	201	45	33	65	19	--	--
JM-4 840	201	26	41	77	15	--	--
JM-4 880	201	30	25	58	10	--	--
JM-4 920	201	32	30	58	15	--	--
JM-4 960	201	23	20	65	10	--	--

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CERT. # : A8313790-004-A
INVOICE # : I8313790
DATE : 23-AUG-83
P.O. # : NONE

Sample description	Prep code	Cu ppm	Pb ppm	Zn ppm	Co ppm		
JM-4 1000	201	30	25	85	15	--	--
JM-4 1040	201	31	18	85	14	--	--
JM-4 1080	201	32	27	71	17	--	--
JM-4 1120	201	28	24	78	16	--	--
JM-4 1160	201	35	55	92	17	--	--
JM-4 1200	201	33	14	65	14	--	--
JM-4 1240	201	24	7	88	8	--	--
JM-4 1280	201	400	6	64	93	--	--
JM-4 1320	201	32	7	57	12	--	--
JM-4 1360	201	23	10	56	10	--	--
JM-4 1400	201	24	9	44	9	--	--
JM-4 1440	201	17	6	58	9	--	--
JM-4 1480	201	14	2	36	7	--	--
LH 21-000	201	21	24	27	35	--	--
LH 21-050	201	32	16	96	17	--	--
LH 21-060	201	48	70	41	20	--	--
LH 21-080	201	53	92	143	15	--	--
LH 21-100	201	24	24	36	9	--	--
LH 21-120	201	40	33	80	13	--	--
LH 21-140	201	29	18	20	7	--	--
LH 21-160	201	52	47	65	13	--	--
LH 21-180	201	39	34	55	10	--	--
LH 21-200	201	42	30	32	13	--	--
LH 21-220	201	44	30	315	22	--	--
LH 21-240	201	50	24	80	13	--	--

MEMBER
CANADIAN TESTING
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A12

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TELEX: 043-52597

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CERTIFICATE OF ANALYSIS

TO : HALFERDAHL & ASSOC. LTD.,
DEPT. 18,
10509 - 81ST AVE.,
EDMONTON, ALTA.
T6E 1X7

CERT. # : A8313791-001-
INVOICE # : I8313791
DATE : 22-AUG-83
P.O. # : NONE

Sample description	Prep code	Cu ppm	Pb ppm	Zn ppm	Co ppm		
LH 21-07	205	14	18	16	9	--	--
LH 21-12	205	14	13	17	14	--	--
LH 21-20	205	20	9	17	10	--	--
LH 21-30	205	52	18	21	25	--	--
LH 21-40	205	26	18	21	16	--	--

CTA MEMBER CANADIAN TESTING ASSOCIATION

Certified by ....

APPENDIX 3: ITEMIZED COST STATEMENT

a)	Wages		
	L.B. Halferdahl, geologist 6 days @ $350 between August 1 and 11, 1983 field work and organization	$2 100.00	
	3½ days report preparation in December 1983	1,225.00	
	J. Gorham, geologist 7 days @ $300 5 days field work between August 5 and 11, 1983 2 days compiling data in December 1983	2 100.00	
	A. Fafard, geological assistant 5 days @ $130 between August 5 and 11, 1983	650.00	
	J. Murasko, assistant 5 days @ $110 between August 5 and 11, 1983	550.00	
			$6 625.00
b)	Food and Accommodation		
	5 men (including helicopter pilot) x 5 days x $45.28		1 131.95
c)	Transportation		
	Helicopter 16 h @ $511 (including fuel & oil) August 5-8, 10, 1983	8 176.00	
	Airfares Edmonton/Fort Nelson/Edmonton 4 x $302.40	1 209.60	
	Express on samples	35.45	
			9 421.05
d)	Instrument rental n/a		
e)	Survey (included above)		
f)	Analyses 150 samples prepared and analyzed for Cu, Co, Pb, Zn @ $5.35		802.50
g)	Report typing, drafting, reproduction, assembly		1 657.00
h)	Long distance telephone		43.61
			$19 681.11

APPENDIX 4: AUTHOR'S QUALIFICATIONS

L.B. Halferdahl obtained degrees in geological engineering and geology from Queen's University and The Johns Hopkins University. He has had more than 30 years' experience as a practising engineer and geologist in research and mining exploration, including consulting since 1969. He is a member of the Canadian Institute of Mining and Metallurgy, and is registered as P. Eng. and P. Geol. in the Association of Professional Engineers, Geologists, and Geophysicists of Alberta, and as P. Eng. in the Association of Professional Engineers of British Columbia.

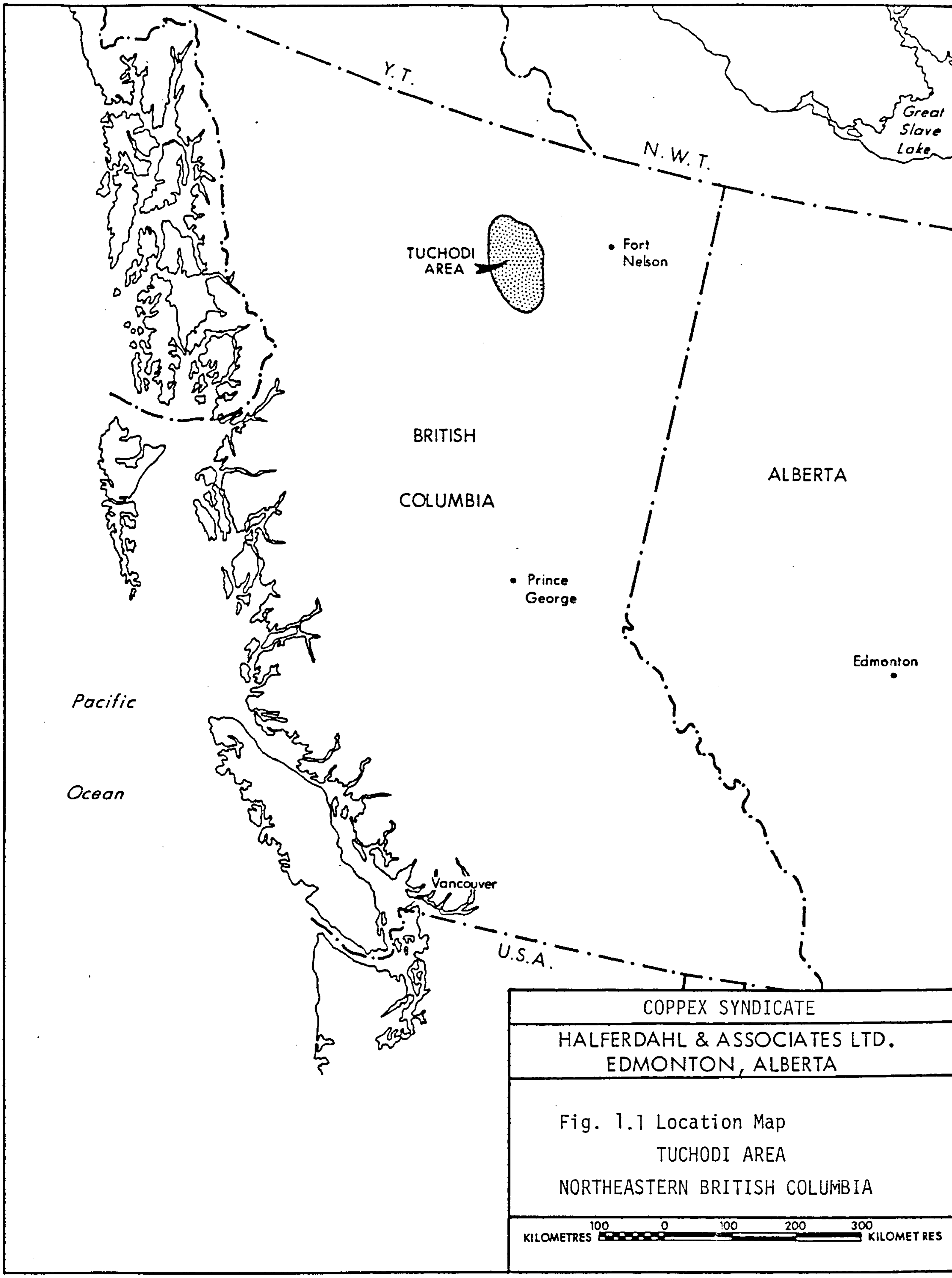

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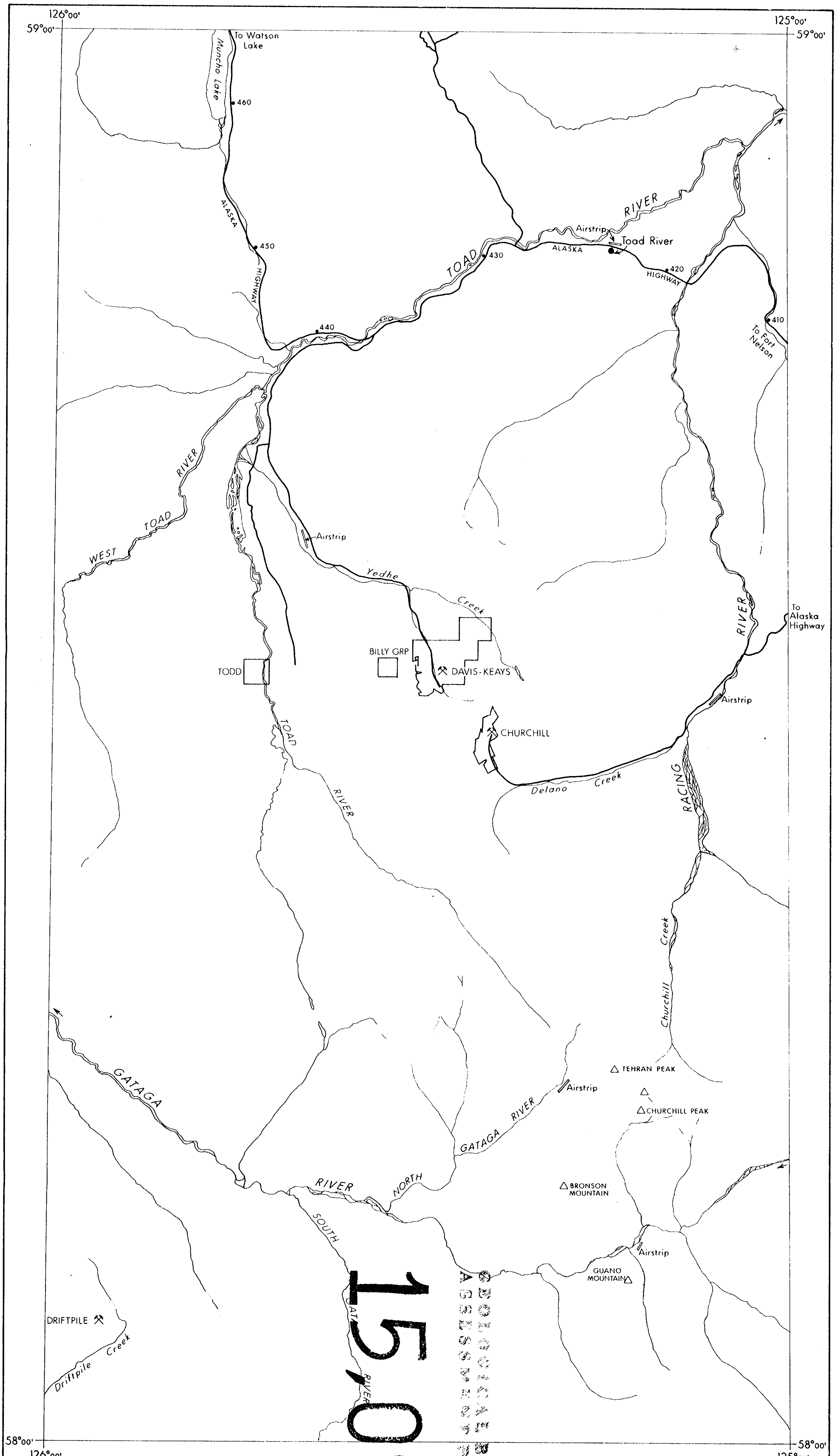
Fig. 1.1 Location Map
TUCHODI AREA
NORTHEASTERN BRITISH COLUMBIA



ABANDONED MINE .... ⚒

ROAD ....

PART OF NTS SHEET 94K

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Fig.1.2 Index Map TUCHODI AREA, B.C.
0 5 Km 10 15
LBH SCALE:1:250 000 1986.08

F2

LEGEND

PALEOZOIC

P	Undivided

PROTEROZOIC
HELIKIAN

Pg	Gataga Formation
Pa	Aida Formation:
Pam	Main Member:
Padu	Upper Dolomite Unit
Paal	Argillite and Limestone Unit
Palm	Lower Unit
Pac	Carbonaceous and Chamosite Members
Pal	Lowest Member
Pt	Tuchodi Formation

SYMBOLS

Geological boundary ....
Thrust fault ....
Normal fault ....
Soil geochemical traverse with number AF-2
Selected geological traverse... G-2

GEOLOGICAL BRANCH
ASSESSMENT REPORT

15,090

Modified after GSC Map 1343A.

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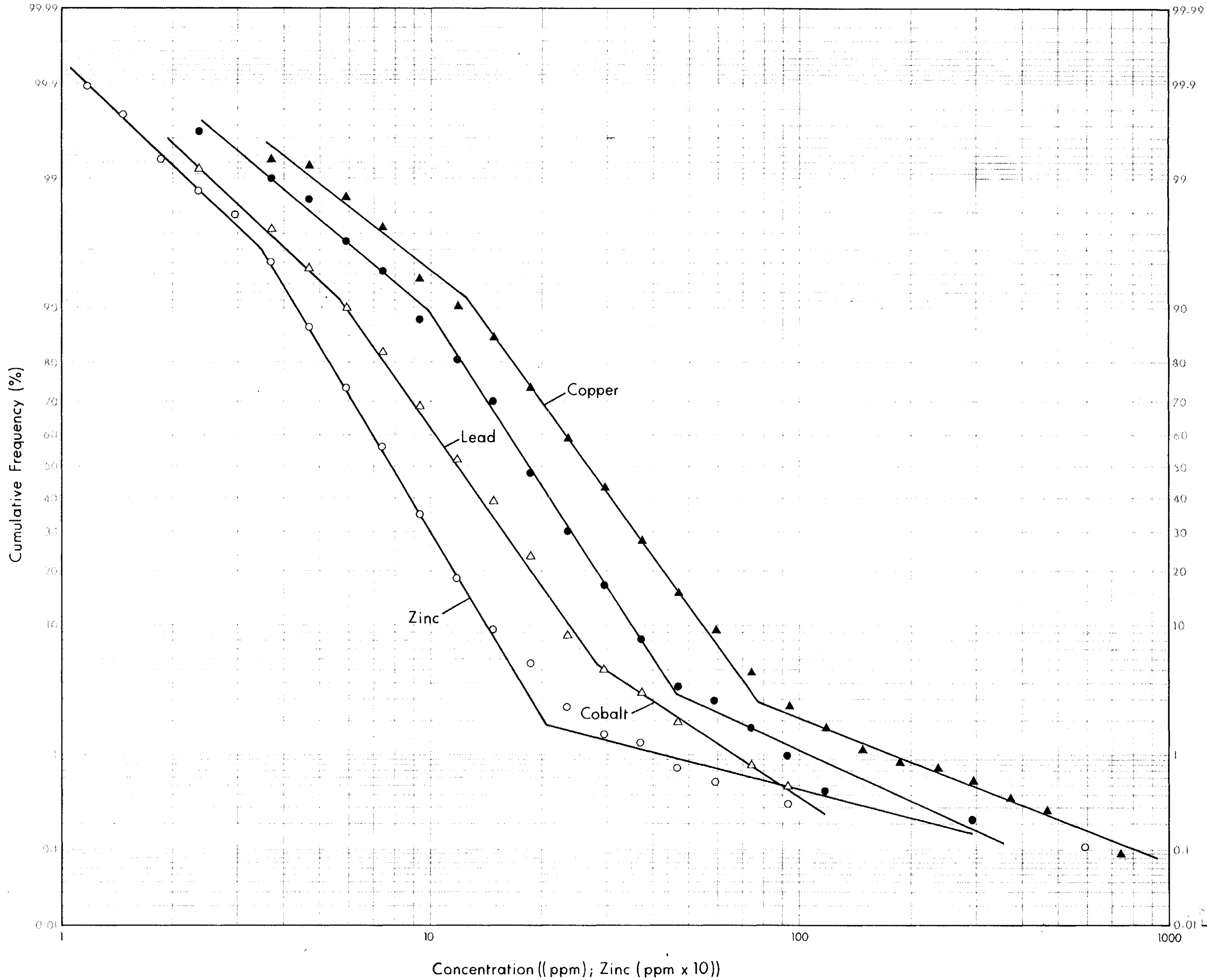
Fig. 4·1 Locations of Geochemical Traverses and Revisions to Part of GSC Map 1343 A.

TUCHODI AREA, B.C.

0 2 4 6 8
KILOMETRES
SCALE: 1:125 000

LBH 1986·08



METAL	SYMBOL	N	BACKGROUND	THRESHOLD
Copper	▲	1085	26 ppm	76 ppm
Cobalt	△	615	12	30
Lead	●	908	18	45
Zinc	○	908	78	200

PROFESSIONAL ENGINEER
L. B. HALFERDAHL
BRITISH COLUMBIA
Expiry Date: August 5, 1984

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Fig. 4.2 Cumulative Frequency Distributions of Copper, Cobalt, Lead, and Zinc.

TUCHODI AREA, B.C.

WM 1986-08

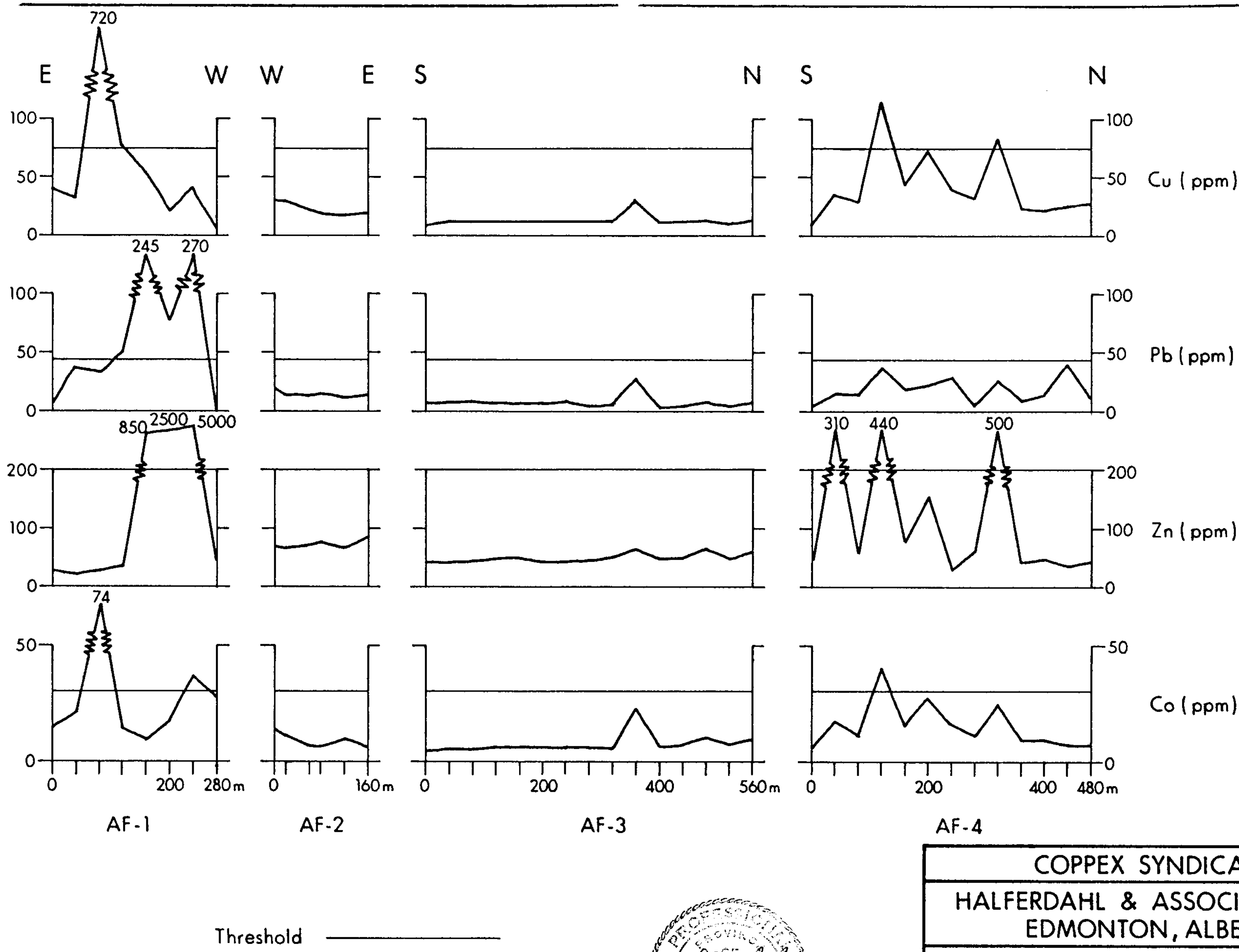

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Fig. 4.3 Geochemical Profiles for Soil Traverse Lines AF-1, AF-2, AF-3, and AF-4.

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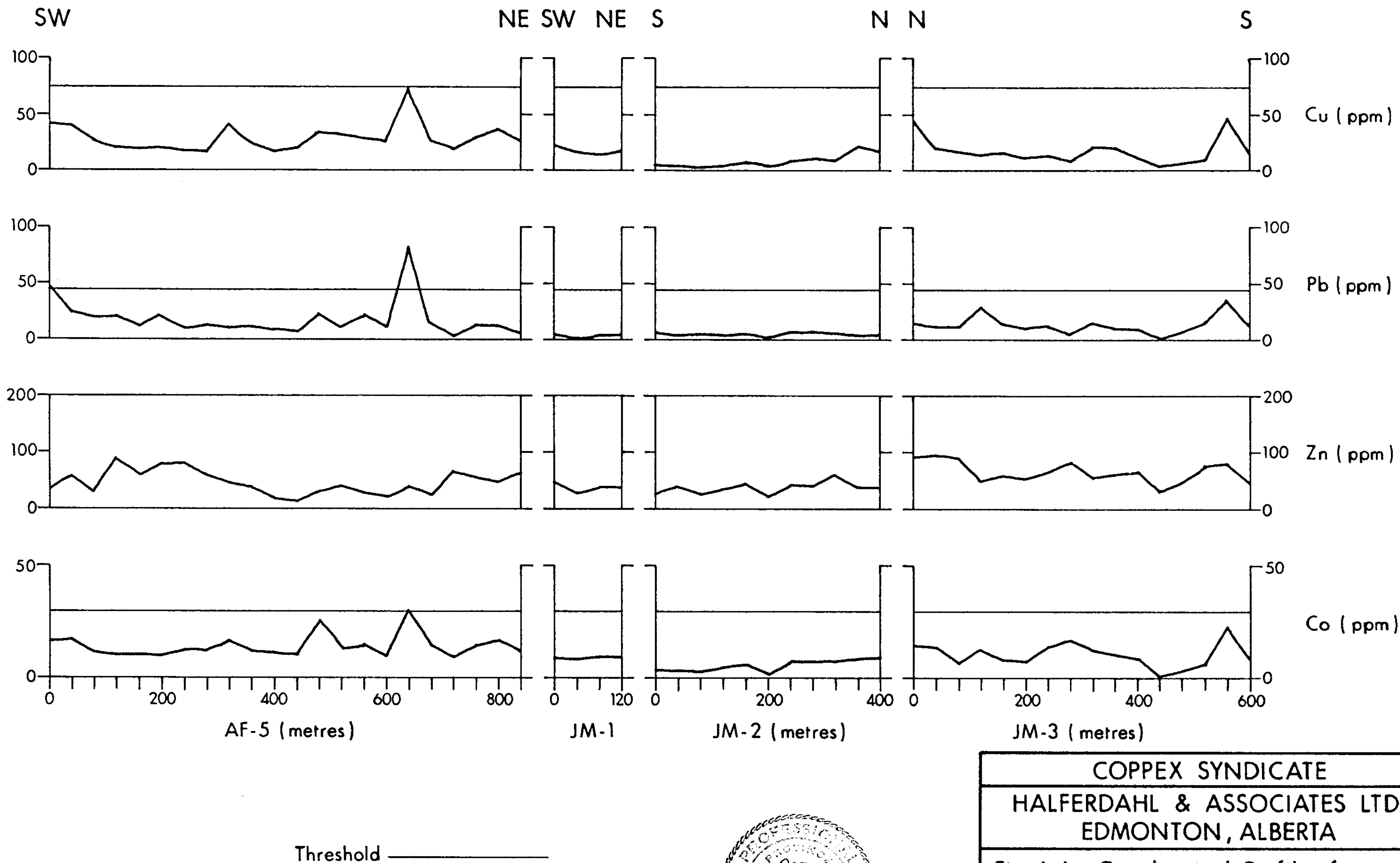

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Fig. 4.4 Geochemical Profiles for Soil Traverse Lines AF-5, JM-1, JM-2, and JM-3.

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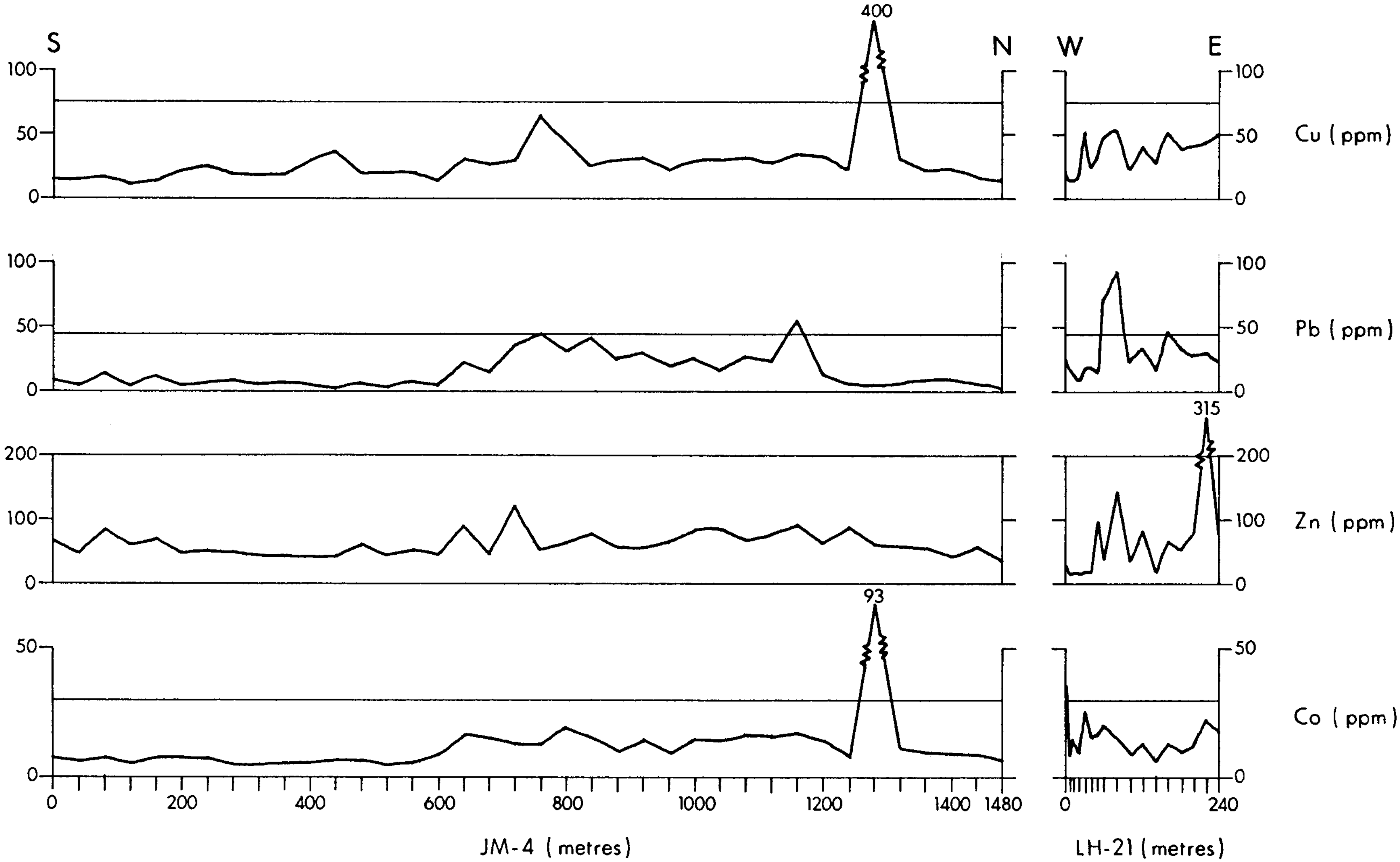

Threshold ————————

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Fig. 4.5 Geochemical Profiles for Soil Traverse Lines JM-4, and LH-21.

TUCHODI AREA, BRITISH COLUMBIA

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