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GREAT PLAINS DEVELOPMENT
COMPANY OF CANADA, LTD.

PROJECT YEAREND REPORT

# GEOLOGICAL RECONNAISSANCE OF THE MACKENZIE MOUNTAINS EASTERN YUKON AND NORTHEAST BRITISH COLUMBIA

N.T.S. 94, 95, 96, 105, 106

B.D. Farion

October, 1973

CONTENTS



ATTACHMENTS

## SUMMARY AND RECOMMENDATIONS

During the period between August 13 to September 23, 1973, Great Plains Development Company of Canada, Ltd. carried out a geological reconnaissance program in northeastern British Columbia and the Mackenzie Mountains as outlined in the joint venture agreement with Kerr Addison Mines Ltd. The reconnaissance program was designed to familiarize company personnel with the geology of the Rocky Mountains north of the Peace River and the Mackenzie Mountains in the Northwest Territories.

Mr. W. B. Brady, a consulting geologist with many years of experience in the joint venture area, was hired to familiarize company personnel with locations of facies fronts, unconformities and mineral showings. A Hughes 500 helicopter was used to cover the area in as short a time as possible. As a result, the project personnel rapidly received an understanding of the depositional history and formation relationships of the joint venture area.

Several formations have been chosen as being favorable hosts for ore bodies. These formations carry significant lead-zinc and copper mineralization. The areas in which these formations outcrop should be subjected to intensive exploration in the next field season.

The most reliable method of exploration in carbonate sequences is by prospecting up valleys and streams. The high pH of the waters inhibits mobilization of metals for geochemical exploration. Mineralized

float can be traced to its source. Then a portable packsack drill and trenching could be used to sample any significant mineral occurrences.

## INTRODUCTION

### 1. Operations Summary

The area included in the project is situated in northeastern British Columbia and in the southwest portion of the Mackenzie District, Northwest Territories. The area is covered by N.T.S. map sheets 94, 95, 96 SE and SW, 106 SE and SW.

Mr. W. B. Brady, a consulting geologist, served as a guide. Mr. Brady has worked in the area since 1960 and is personally familiar with the location and geological descriptions of facies fronts, unconformities, and structures.

Great Plains personnel include C. B. Ko and B. D. Farion.

Mr. Ken MacDonald was the pilot of the helicopter, a Hughes 500-C, which was supplied by United Helicopters of Calgary.

The first phase of the project was worked out of Norman Wells, Fort Simpson and Fort Nelson. Mr. Brady showed the company personnel facies fronts, unconformities, and structures and described the structural and stratigraphic relationships in the study area. He could also answer any questions presented on the spot. During the second phase, the company personnel moved back to Fort Simpson to conduct a more intensive investigation of areas selected during the first phase of the project.

### 2. Physiography

The study area may be divided into two areas. The southern portion

includes northeastern British Columbia and the portion of the Northwest Territories south of the Liard River. The northern portion takes in the area north of the Liard River.

Three major physiographic subdivisions are recognized in northeastern British Columbia:

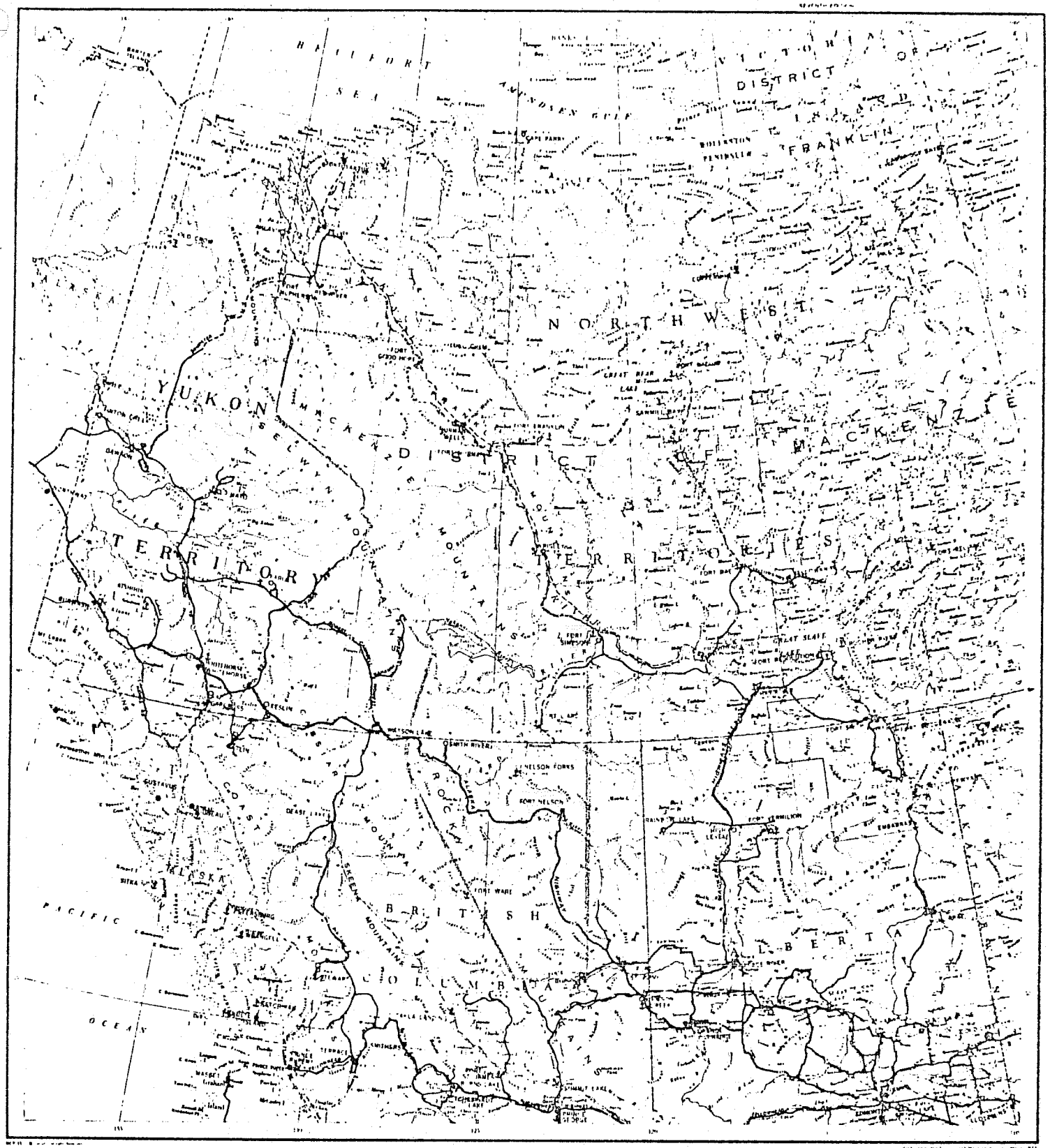
1. the Rocky Mountains, underlain by middle Paleozoic and older carbonates, are characterized by high peaks with average summit elevations of 8,000 feet. This belt is deeply dissected, glaciated and largely devoid of vegetation above the treeline at about 4,500 feet;
2. the Foothills, consisting of low linear, founded, wooded hills in the east, and higher, generally elongate, isolated hills in the west, are underlain by clastic rocks of late Paleozoic and Mesozoic ages, and;
3. the Interior Plains, characterized by high, tree topped mesas of Cretaceous sandstone.

The Mackenzie Plains and Mountains are separated from the Rocky Mountains by a structural feature called the Liard line. Although there is no direct surface evidence for the existence of the Liard line, it is suggested that the Liard line marks the southern edge of a mobile block. The basement was more stable to the south of the line than it was to the north. This produced a more varied stratigraphic section to the north of the Liard line than the equivalent section to the south.

The Mackenzie Plains range from less than 500 feet in elevation along the Mackenzie River to more than 2,000 feet on large plateau-like hills. The plains are heavily wooded and mantled by glacial debris.

The Mackenzie Mountains appear suddenly at the edge of the plains as cuestas. The Ram Plateau, found within the Mackenzie Mountains, is a large dissected dome-shaped element. The mountain ranges consist of resistant Paleozoic carbonate thrust ridges 4,000 to 6,000 feet high. Trees are restricted to valley floors.

CANADA
ENERGY, MINES AND RESOURCES
SURVEYS AND MAPPING BRANCH




TRANSPORTATION FACILITIES - 1972

# NORTHWESTERN CANADA

REFERENCE

SAW TIMBER
SMALL TIMBER

## LOCATION AND ACCESS

Norman Wells and Fort Simpson are located on the Mackenzie River in the western part of the Northwest Territories. Fort Nelson is located on the Alcan Highway and Nelson River in northeast British Columbia.

The major rivers in the area, the Nelson River, the Mackenzie River and the Liard River, are amenable to transport by barges and tugs. These may be used to drop fuel and heavy equipment at Nahanni Butte and Camsell Bend. An unserviceable road exists between Camsell Bend and the Cadillac property on Prairie Creek.

All three communities are serviced by scheduled airlines. Helicopters and light aircraft are available for casual charter. Lodgings and supplies can also be obtained locally.

Several small dirt airstrips have been constructed in the area. None are marked on charts. The strips are in poor condition but could be repaired if required. Two strips are located on Prairie Creek. A float aircraft can land on Sundog Creek, Iverson Lake, Trench Lake, Little Doctor Lake, Wrigley Lake and Dal Lake.

## PREVIOUS WORK

The Geological Survey of Canada mapped the southwestern District of Mackenzie, Northwest Territories in 1957. Preliminary reports by the Geological Survey of Canada were released in 1960. Most of these are now out of print and difficult to obtain. Final reports should be available within the near future.

Oil companies have gathered and released stratigraphic data on the joint-venture area. Several of these reports have been used in the compilation of this report.

The Geological Survey of Canada mentions mineral showings in their reports and on their maps. They do not describe them in detail.

A follow-up report will detail landholdings, mineral shows and stratigraphic and structural relationships.

1. Redstone Mines Ltd. 95-L-1

History: Discovered and staked - 1960

Diamond drilling - 1963 (?)

Argentiferous galena and sphalerite occur in a thin bedded, grey, fine-grained limestone having an approximately east-west strike. Mineralization appears to be a pyrite - galena - sphalerite replacement of limestone beds. Drill results proved disappointing. (Department of Mines and Technical Surveys)

2. Broken Skull River 95-L-5

History: G.S.C. Report - 1968

Status: Unknown

"Considerable zinkenite float was noted on a ridge four miles west of the mouth of the Broken Skull River. The mineral occurs in carbonate rocks....." (Gabrielse et al 1965, p.28)

3. Cadillac Explorations 95-F-10, 7

History: Staked - 1959 by Nahanni (1959) Syndicate

Mapping - 1959-60

Incorporated - 1961

Cadillac Explorations Incorporated - 1966

Underground - 1968-69

Drilling - 1969

Penarroya joint-venture - 1970

Camp closed - September 1973

Argentiferous galena and sphalerite in a gangue of quartz and calcite is associated with a north-trending fault. The mineralization is reported to assay 30 percent lead, 15 percent zinc, and 13 ounces per ton in silver over a width of four feet. The mineralized zones have been traced over a length of 33,000 feet. (Department of Energy, Mines and Resources)

4. Mackenzie Creek (Redstone Mines) 95-L-15

History: Discovered - 1954

Trenched and sampled - 1960

Restaked - 1965

Cyprus Exploration Corporation option - 1966

The showing occurs in Paleozoic limestone. An irregular body of calcite, about 40 feet across, replaces the limestone beds. Replacing two-foot wide, sugary, crystalline limestone beds and also extending into the calcite body are lenses of galena and sphalerite. Mineralization is traceable for about 40 feet along strike. A grab sample assayed 2.04 ounces per ton in silver, 13.18 percent lead, and 9.46 percent zinc.

5. Cominco (Wrigley) 95-O-4

History: Discovered and staked by L. Norwegian - 1967

Further staking by Cominco - 1970

I. P. survey - 1970

Drilling - 1973

Lead-zinc mineralization occurs in the form of galena, sphalerite, smithsonite and cerussite in fractures within the Nahanni Formation limestones. The fracture zones strike approximately parallel to the major anticlinal axis in the area and are usually bordered by a narrow silicified and dolomitized zone. Limited testing to date has shown the mineralization to be erratic in both grade and distribution. A grab sample taken by Great

Plains (WT-1) assayed 1.38 ounces per ton in silver, .01 percent copper, 12.62 percent lead, and 2.86 percent zinc.

6. Churchill Copper 94-K-6

History: ?

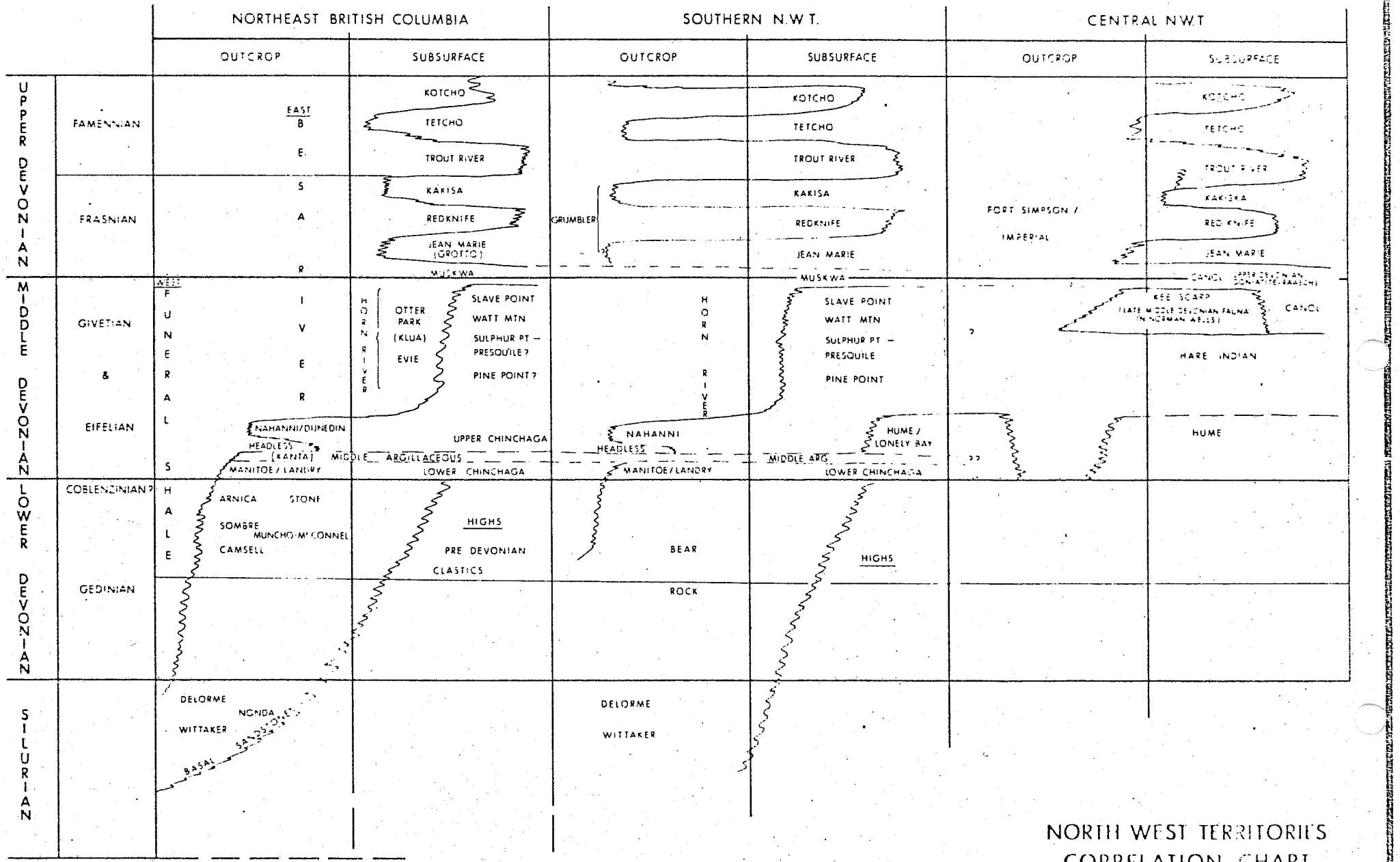
Bornite and chalcopyrite are associated with basic dikes intruding the Helikian Aida Formation. The Aida consists of calcareous and dolomitic mudstones and siltstones. Total reserves were 1.178 million tons of 3.9 percent copper. The mine is located at the base of Mount Roosevelt, British Columbia. (Taylor and Stott Memoir 373, p.34)

7. Barite-Fluorite 94-M-4

History: ?

Barite-fluorite occurs in fractures in the Dunedin and basal Stone Formations in northeastern British Columbia. A small deposit of barite-fluorite occurs in a fracture east of 110 Creek on the Alcan Highway. A large deposit* occurs as a replacement of basal Stone dolomites and is related to a tear fault. The deposit is located on Sulfur Creek east of Muncho Lake. Both deposits have been staked. A grab sample taken by Great Plains personnel assayed 83 percent barite. (Taylor and Stott, Memoir 373, p.34)

* Reported to be 5-6 million tons (pers. comm., W. B. Brady)


NORTHEAST BRITISH COLUMBIA
SOUTHERN N.W.T.
CENTRAL N.W.T
OUTCROP
SUBSURFACE
OUTCROP
SUBSURFACE
OUTCROP
SUBSURFACE
UPPER DEVONIAN
MIDDLE DEVONIAN
LOWER DEVONIAN
SILURIAN
FAMENNIAN
FRASNIAN
GIVETIAN & EIFELIAN
COBLENZINIAN?
GEDINIAN
EAST
B
E.
S
A
R
KOTCHO
TETCHO
TROUT RIVER
KAKISA
REDKNIFE
JEAN MARIE (GROTTO)
MUSKWA
GRUMBLER
FORT SIMPSON / IMPERIAL
KEE SCARP
CANOL
HARE INDIAN
HUME
WEST
FUNERAL SHALE
I
V
E
R
OTTER PARK (KLUA)
EVIE
HORN RIVER
SLAVE POINT
WATT MTN
SULPHUR PT — PRESQUILE?
PINE POINT?
PINE POINT
NAHANNI/DUNEDIN
NAHANNI
HEADLESS (KANTA)
MANITOE / LANDRY
MIDDLE ARGILLACEOUS
UPPER CHINCHAGA
LOWER CHINCHAGA
HUME / LONELY BAY
ARNICA
STONE
SOMBRE
MUNCHO-MCCONNEL
CAMSELL
HIGHS
PRE DEVONIAN CLASTICS
BEAR ROCK
DELORME
NONDA
WITTAKER
SANDSTONE
BASAL
NORTH WEST TERRITORIES
CORRELATION CHART

## REGIONAL GEOLOGY

Sediments were deposited in two main depositional environments which have tended to persist since the beginning of the Paleozoic Era. The Cordilleran geosyncline lay to the west along the present day location of the Cordilleran Belt. Relatively stable shelf conditions were present in the Interior Plains. During the Paleozoic Era, carbonates, clastics, and evaporites were deposited in dominantly marine environments. Marine shale and sandstone accumulated during the Mesozoic Era.

### 1. Precambrian

Approximately 495 feet of Precambrian sediments have been thrust over Cretaceous shales in the Cap Mountain area, northeast of Wrigley. The section is predominantly red, gray and black shales with 70 feet of hematite, red conglomerate and sandstone (Hume 1924). A section of green argillite occurs on a Precambrian high west of the Beaver River in the southeast corner of Yukon Territory. Precambrian strata of the Purcell group sediments have been thrust up in the back ranges of the Rocky Mountains of northern British Columbia.

### 2. Cambrian

Approximately 1200 feet of Cambrian shales and quartzite occur on Cap Mountain. Two thousand feet of Middle and Upper Cambrian silty carbonates occur at the headwaters of the South Nahanni River.

3. Ordovician-Lower Devonian

Several facies changes occur in the Ordovician to Lower Devonian in the joint-venture area. The Upper Ordovician to Lower Devonian sections have not as yet been divided into formations. The Middle Ordovician Sunblood limestones however are easily recognized in the field by the bright red-orange weathering characteristics. These are shallow water, silty limestones and shales which exhibit mudcracks. A shale basin formed in the area along the Yukon and Northwest Territories border. These basin shales are called the Road River shales and are Ordovician to Lower Devonian in age. The Whittaker Formation changes from a dolomitic shale near Cap Mountain to a dolomite and limestone in the Mackenzie Mountains. The Whittaker Formation is of Ordovician and Silurian age.

The Delorme limestones and dolomites, Nonda dolomite and quartz sandstone and the Delorme shales are of Silurian and Devonian age. These are shelf and shelf edge deposits.

The Bear Rock Formation limestone breccia is found in the north half of the joint-venture area. There is some dispute as to whether the dolomite sequences should be included in the formation. The breccia is a collapse breccia caused by the removal by solution of Lower Devonian evaporites. This formation is equivalent to the Camsell, Sombre and Arnica Formations in the southern Mackenzie Mountains and Muncho-McConnel and the Stone Formations in northeast British Columbia. These units are predominantly dolomites with minor silty and shaly units.

These units formed the platform for the building of the Manitoe reefs.

4. Middle Devonian

The Funeral Formation consists of basin shales and limestones. It is equivalent to and forms rapid vertical facies changes with the Manitoe Reef fronts. The Landry Formation is a backreef limestone unit overlying the Manitoe platform dolomites and occurs in vertical facies changes with the lagoonal side of the Manitoe reefs. The Manitoe reefs are coarse grained, vuggy to cavernous, porous dolomites. An argillaceous unit, the Deadman Member, overlies the Manitoe, and is a part of the Nahanni, Headless, Dunedin platform limestones and shales.

During upper Middle Devonian time, the Hare Indian Formation shales and Hume Formation limestones formed a base for further reef growth. At the junction of Landry Creek and Root River, an isolated bioherm occurs on the Nahanni. The Kee Scarp platform limestones provided a base for the Kee Scarp reef limestones. This formation contains the Norman Wells oil field. The Kee Scarp is overlain by the Canol shales.

5. Upper Devonian

The Upper Devonian consists of the Imperial sandstones and shales to the northwest, the Fort Simpson shales in the Mackenzie Mountains and Plains, and the Fort Simpson shales interfingered with the Jean Marie

reefs, and Kakiska and Tetcho reefoidal platforms between Fort Nelson and Fort Providence.

6. Mississippian and Younger

Mississippian strata are eroded and absent in the Mackenzie Mountains but Mississippian to Triassic formations occur in northeastern British Columbia. Several syenite plugs intrude these basin sediments in the southeastern corner of the Yukon. These formations are of little economic interest at present. The plugs may be of interest if they can be found to intrude porous carbonates.

## STRUCTURAL GEOLOGY

The Rocky Mountain Trench, the Rocky Mountains, the Foothills and the Alberta Basin all terminate northward against a linear element herein termed the Liard line.

The Liard line is delineated by the following:

1. a prominent topographic and lateral offset which occurs between the Rocky Mountains and Mackenzie Mountains;
2. several regional structural units which terminate against the Liard line, and
3. stratigraphic units which terminate on the Liard line.

The Liard line is believed to mark a prominent transverse zone, along which there has been differential movement during geologic time. The movements had a marked influence on the depositional and structural history of the region. The Liard line probably marks a zone of basement faults.

The structure of the Mackenzie Mountains is very different from that of the Rocky Mountains and Foothills, in that the stratigraphic section is thicker and more varied. It is suggested that the Liard line marks the southern edge of a mobile block which subsided during the early Paleozoic, allowing transgression of the early Paleozoic seas on the craton. The basement was much more unstable than in the Alberta Basin to the south.

Baadsgard et al (1960) postulated a widespread Caledonian orogenic episode between Late Silurian and Early Devonian.

There is no direct surface evidence for the existence of the northeasterly trending Liard line, but there is indirect evidence for this feature. The Shell Liard #2 test hole lies directly on the inferred Liard line and encountered the Precambrian basement at the shallow depth of 1,885 feet. The rocks encountered at this depth are igneous rocks and are presumed to be Archeozoic. It should be noted, however, that Baadsgard et al (1960) believe these igneous rocks to be part of a mid-Paleozoic intrusion. Hage (G.S.C. Paper 45-22, p.31) reports a silicified dike on the south shore of Liard River twenty-eight miles below the mouth of the Nahanni River which contains 1.9 feet of altered feldspar porphyry and cuts Silurian shales.

The Rocky Mountains in northeastern British Columbia experienced structural deformation that may be divided into five "packets" (Taylor and Stott, 1973). The first "packet" includes all pre-Silurian strata which were intensely and repeatedly deformed during earlier pre-Laramide periods of tectonism. This has, in effect, produced a pseudo-basement where bedding has been destroyed as a single, directionally preferred element of anisotropy. This structural "packet" was first deformed during the Ordovician and again during the Laramide Orogeny. The second structural event produced a series of large asymmetric folds with the east limbs of the anticlines commonly impinging on their adjacent synclines along steep reverse faults.

Unconformably overlying this first "packet" is a 7,000 foot-thick

blanket of Silurian to Devonian shallow water carbonates forming the second discrete packet of rocks. Within this "packet" numerous bedding plane thrust faults are developed. These thrusts rise out of a detachment near the base of the Nonda Formation and disappear in a zone of detachment low in the Besa River Formation.

The principal structural element in the southern Mackenzie and Franklin Mountains (Camsell Bend, Root River) is the fold. Its axial surface may dip on either side of the vertical, with a corresponding change in symmetry. The folds appear to approximate parallel folds with rounded flanks. They are commonly thrust faulted on their flanks and the stratigraphic section is thickened or thinned, depending on the attitude of the fault surface with respect to bedding.

Many of the folds are linked en echelon and hence trend obliquely to the principal structures so that the major fold elements of which they are a part of are commonly disguised. Both zig-zag and elliptical linkages are evident, although the former are prevalent.

Many thrust faults are secondary structural elements, particularly where they are closely associated with the folds. The fault surface may dip either east or west; commonly the relative displacement of hanging-wall beds is in the direction of the asymmetry of the fold. Relative movement has been largely updip but many faults appear to have significant strike-slip components. (Douglas and Norris Paper 61-13, p.24)

The principal structural elements in Virginia Falls and Sibbeston

Lake map areas are dominantly north trending and consist of homoclinas thrust sheets, faulted folds, and broad, elongate uplifts and depressions. The area as a whole exhibits a remarkable structural symmetry; major thrust faults dip either east or west, and large folds have axial planes dipping in either direction. (Douglas and Norris Paper 60-19, p.25)

Several of the major thrust sheets have been plotted on the stratigraphic section location sheet.

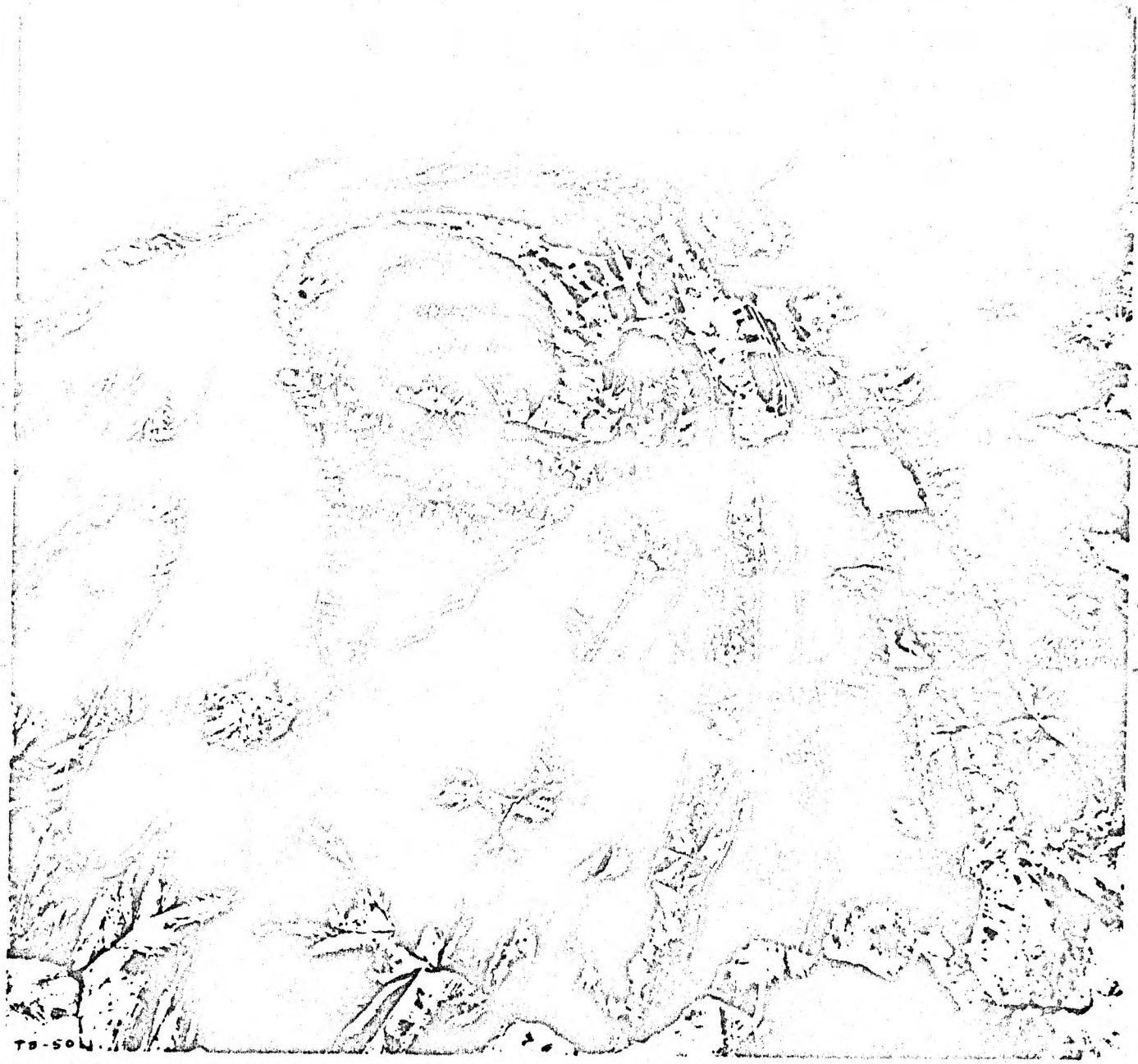


PLATE VIII-4. Whittaker and Iverson Ranges, southern Mackenzie Mountains, Northwest Territories. Looking north at easternmost structure of Mackenzie Fold Belt and conformable succession from Middle Ordovician to Upper Devonian more than 15,000 feet thick. Width of Whittaker anticline is 10 miles.

## FORMATIONS FAVORABLE FOR ORE DEPOSITS

### 1. Iron Formation

An iron formation occurs in the Precambrian sediments on Cap Mountain northeast of Wrigley and twelve miles from the Mackenzie River. The iron occurs as hematite in conglomerate and sandstone. A sample assayed 40 percent Fe. At present Giant Yellowknife has the area under permit. The formation would deserve some attention if the ground came open in the future.

### 2. Ordovician-Sunblood Formation

Chalcopyrite and chalcocite occur at the base of the uppermost limestone unit in the Sunblood Formation. The limestone appears to have been laid down in an intertidal zone which may have been raised above sea level intermittently to produce a redbed (?) sequence. Goetite and quartz-carbonate veins are common in the lower units.

The Sunblood is exposed in a plunging anticlinal dome (see photograph). Fractures in the core are approximately at right angles to each other and contain quartz-carbonate veins from 0.5 feet to 3 feet wide. The limestone contains some vugs with quartz and calcite crystals. Most of the larger goetite crystals are associated with the lower units in the core of the dome. The goetite appears to be secondary after pyrite.

The copper mineralization appears to be localized into small zones. Prospecting around the dome revealed samples that would assay less than 0.1 to 0.2 percent copper.

The oblique photograph indicates the size of the anticline. The mineralized bed is in the upper Sunblood Formation. The possibility of a large low grade ore deposit exists and the area would warrant more prospecting and some trenching.

The Cadillac ore body on Prairie Creek is related to a carbonate vein in the Sunblood Formation and is related to a fault system. A sample of a quartz-carbonate vein with copper-lead-zinc-silver mineralization was taken from a trench in the Sunblood Formation and assayed (CT-1). .Mineralization has been traced for 33,000 feet along Prairie Creek. The deposits may be related to a pre-Laramide fault, possibly associated with hingeline faulting during the Devonian.

The Sunblood Formation would be an excellent horizon for further exploration. The limestones were initially very porous. Secondary calcite reduced the porosity after deposition. The areas near the westerly margin of the Mackenzie Mountains would be favorable horizons for deposition of hydrothermal fluids originating in the Yukon volcanic sequences.

3. Devonian Formations

Several facies fronts occur in the Mackenzie Mountains. Reef outcrops occur on the Ram River and near Iverson Lake. An isolated reef system occurs west of the barrier reef system at Cathedral Mountain. The reefs are bounded by a black basinal shale sequence that could serve as an origin for minerals. The Iverson reef contains argentiferous galena in a quartz vein.

During the evolution of a sedimentary basin, compaction will force fluids to migrate from the shale basin. Ore bodies are found where regional permeable porous trends, acting as a "plumbing system" for escaping basinal saline connate waters that carry ore metals, traverse local $H_2S$-bearing carbonate reservoirs. Hydrogen sulfide tends to form and accumulate in carbonate reservoirs, and it subsequently acts as a precipitant of metallic sulphides. (Jackson and Beales, 1967)

The Manitoe Formation consists of coarse-grained, vuggy to cavernous porous dolomites. In order to have a deposit similar to Pine Point, a conduit would be required to allow the basinal brines to escape, allowing precipitation of lead-zinc minerals somewhere within the conduit, possibly in the Manitoe reef which has sufficient porosity and size to form a large deposit.

On Nahanni Butte, the Nahanni Formation is cut by two silicified veins approximately 100 feet across. Malachite and azurite occur on Turner Mountain. Lead-zinc has been reported at the base of the mountain. A similar silicious vein system occurs at Wrigley and contains silver-lead-zinc.

If the Wrigley and Nahanni Butte veins are related to Laramide folding during thrust movement, then these vein systems would be hosts for small vein-type deposits. If the veins are related to faulting during the Upper Devonian, then a conduit is available to allow basinal fluids to flow through the reefs from the shale basin updip through fractures and escape into the overlying Upper Devonian.

Another conduit for the escape of the basinal fluids may be postulated

if the porous Manitoe platform was lifted up by the Liard High or the Tathlina High. This would allow formation fluids the flow updip and provide a plumbing system for the deposition of Pine Point ore bodies.

Pine Point ores carry negligible amounts of silver. All mineral showings in the Mackenzie Mountains do carry silver. Therefore, a source for mineralizing fluids may be intrusives on the east side of the geosyncline. However, such intrusives would show up as highs on seismic records and would have been drilled by oil companies. Or, the fluids may have originated from the Laramide volcanics in the Yukon and travelled along fractures across the geosyncline until they were precipitated in the carbonates of the Mackenzie Mountains.

## JOINT-VENTURE AGREEMENT

The joint-venture agreement was signed to allow Great Plains Development Company of Canada, Ltd. and Kerr Addison Mines Ltd. to participate in a mineral exploration program in the Mackenzie Valley area. Each party will pay 50 percent of the costs of the program and receive 50 percent of any interests in lands obtained as a result of the exploration. Great Plains Development Company of Canada, Ltd. will act as the operator of the exploration program.

## CONCLUSIONS AND RECOMMENDATIONS

The Sunblood Formation in the Whittaker Dome would require more prospecting and trenching. Since this section is mineralized, an intensive study of the structural unit would provide a guide to new areas for exploration in the Ordovician.

The Devonian reefs and mineralized structural units require intensive study. An isolated bioherm of Kee Scarp age occurs at the junction of Landry Creek and the Root River. Pyritic float found at the base of the unit carries anomalous values of silver (BDF 313, .24 ounces per ton; BDF 314, .14 ounces per ton). The Manitoe reef system provides a host for Pine Point type lead-zinc deposits. These units require intensive prospecting to determine structural and stratigraphic relationships to mineralization.

The Devonian unconformity in the Funeral Formation is similar to the unconformity in the Stone Formation at Robb Lake. This stratigraphic unit should be mapped and prospected. Mapping the Funeral Formation would aid in outlining the Manitoe-Funeral facies fronts.

## APPENDIX I

## ASSAY LOCATIONS

| | | |
|---|---|---|
| BDF | 300 | Kee Scarp reef outcrop in quarry at Norman Wells. |
| | 301 | Kee Scarp reef outcrop in quarry at Norman Wells. |
| | 302 | Quartz carbonate vein on Iverson Ridge. |
| | 303 | Facies contact on Iverson Ridge. |
| | 304 | Gossan on Iverson Ridge. |
| | 305 | Carbonate vein on Prairie Creek. |
| | 306 | Lower limestone at Whittaker Dome. |
| | 307 | Float in Whittaker Dome |
| | 308 | Soil sample at Ram River reefs. |
| | 309 | Soil sample at Ram River reefs. |
| | 310 | Whittaker Dome |
| | 311 | Cuttings from all drill holes on Horn River reef. |
| | 312 | Cuttings from all drill holes on Horn River reefs. |
| | 313 | Bioherm at Landry Creek and Root River |
| | 314 | Bioherm at Landry Creek and Root River |
| K | 11, 12, 13 | Willow Ridge Anticline |
| | 16 | Cap Mountain |
| | 25 | Landry Creek and Root River |
| | 37 | Nahanni Butte |
| | 45 | Sulfur Creek north of Muncho Lake, B.C. |
| | 57, 58, 59, 62, 63, 64, | Whittaker Dome |
| CT | 1 | Caddilac trench on Prairie Creek. |
| WT | 1 | Cominco trench at Wrigley |

To: GREAT PLAINS DEVELOPMENT
COMPANY OF CANADA LTD.,
6th Floor, 736-8th Ave. S.W.
Calgary, Alta.

ATTN: Mr. Vern Johanson

File No. 6998
Date September 24, 1973
Samples Chip

# Certificate of ASSAY

## LORING LABORATORIES LTD.

-1-

| SAMPLE No. | OZ./TON SILVER | % Cu | % Pb | % Zn | % Fe |
|---|---|---|---|---|---|
| K- 5 | - | .01 | .005 | .01 | - |
| K- 7 | - | Trace | .005 | .005 | - |
| K-10 | - | Trace | Trace | .005 | - |
| K-11 | - | - | .01 | .005 | - |
| K-12 | Trace | - | .01 | .005 | - |
| K-13 | - | - | Trace | Trace | - |
| K-16 | Trace | .005 | Trace | .01 | - |
| K-19 | - | - | Trace | .005 | 40.93 |
| K-25 | .06 | .01 | .07 | .11 | - |
| K-37 | .04 | .62 | .01 | .54 | - |
| K-45 | - | - | .07 | .01 | - |
| K-57 | .04 | .39 | .01 | .005 | - |

**I Hereby Certify** THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

A. J. Loring

Licensed Assayer of British Columbia

To: GREAT PLAINS DEVELOPMENT COMPANY OF CANADA LTD.,
6th Floor, 736-8th Ave. S.W.,
Calgary, Alta.
ATTN: Mr. Vern Johanson

File No. 6998
Date September 24, 1973
Samples Chip

# Certificate of ASSAY

## LORING LABORATORIES LTD.

-2-

| SAMPLE No. | OZ./TON GOLD Silver | % Cu | % Pb | % Zn | % Fe |
|---|---|---|---|---|---|
| K-58 | - | .14 | .01 | .005 | - |
| K-59 | - | .15 | Trace | .01 | - |
| K-62 | - | .01 | Trace | .005 | - |
| K-63 | - | .01 | Trace | .005 | - |
| K-64 | Trace | .01 | .005 | .005 | - |
| BDF-300 | - | - | .16 | .05 | - |
| 302 | .18 | - | 4.21 | .005 | - |
| 303 | - | - | .04 | .005 | - |
| 304 | - | - | .01 | .005 | - |
| 305 | - | - | .01 | .01 | - |
| CT-1 | 2.40 | .21 | 2.58 | 9.45 | - |
| WT-1 | 1.38 | .01 | 12.62 | 2.86 | - |

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

A. J. Loring

Licensed Assayer of British Columbia

To: GREAT PLAINS DEVELOPMENT
COMPANY OF CANADA LTD.,
6th Floor, 736-8th Ave. S.W.,
CALGARY, Alta.

ATTN: Mr. Vern Johanson

File No. 6993
Date September 24, 1973
Samples Chip

# Certificate of ASSAY

## LORING LABORATORIES LTD.

-3-

| SAMPLE No. | PPM Cu | PPM Pb | PPM Zn |
|---|---|---|---|
| BDF-301 | 31 | 42 | 165 |

**I Hereby Certify** THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

Licensed Assayer of British Columbia

To: GREAT PLAINS DEVELOPMENT COMPANY
OF CANADA LTD.,
6th Floor, 736-8th Ave. S.W.,
Calgary, Alta.
ATTN: Mr. B. Farion

File No. 7025
Date September 26, 1973
Samples Chip

# Certificate of ASSAY

## LORING LABORATORIES LTD.



| SAMPLE No. | % Cu | % Pb | % Zn |
|---|---|---|---|
| BDF-306 | - | .07 | .01 |
| BDF-307 | .01 | .01 | .005 |

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

Licensed Assayer of British Columbia

To: GREAT PLAINS DEVELOPMENT
COMPANY OF CANADA LTD.,
5th Floor, 736-8th Ave. S.W.,
CALGARY, Alta.
ATTN: Mr. B. Farion

File No. 7025
Date September 26, 1973
Samples Geo-chems

# Certificate of ASSAY

## LORING LABORATORIES LTD.



| SAMPLE No. | PPM Cu | PPM Pb | PPM Zn |
|---|---|---|---|
| BDF-308 | 4 | 40 | 71 |
| 309 | 4 | 26 | 60 |
| 310 | 20 | 29 | 14 |
| 311 | 8 | 29 | 13 |
| 312 | 8 | 68 | 31 |

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

Licensed Assayer of British Columbia

To: GREAT PLAINS DEVELOPMENT COMPANY
OF CANADA LTD.,
6th Floor, 736-8th Ave. S.W.,
CALGARY, Alta.

ATTN: Mr. Bill Farion

File No. 7050
Date September 27, 1973
Samples Chip

# Certificate of ASSAY

## LORING LABORATORIES LTD.

| SAMPLE No. | OZ./TON SILVER | % Cu | % Pb | % Zn |
|---|---|---|---|---|
| BDF - 313 | .24 | .06 | .02 | .005 |
| BDF - 314 | .14 | .01 | .02 | .005 |

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

Licensed Assayer of British Columbia

To: GREAT PLAINS DEVELOPMENT
COMPANY OF CANADA LTD.,
6th Floor, 736-8th Ave. S.W.
CALGARY, Alta.

ATTN: Mr. Bill Farion

File No. 7074
Date October 1, 1973
Samples Pulp

# Certificate of ASSAY

## LORING LABORATORIES LTD.

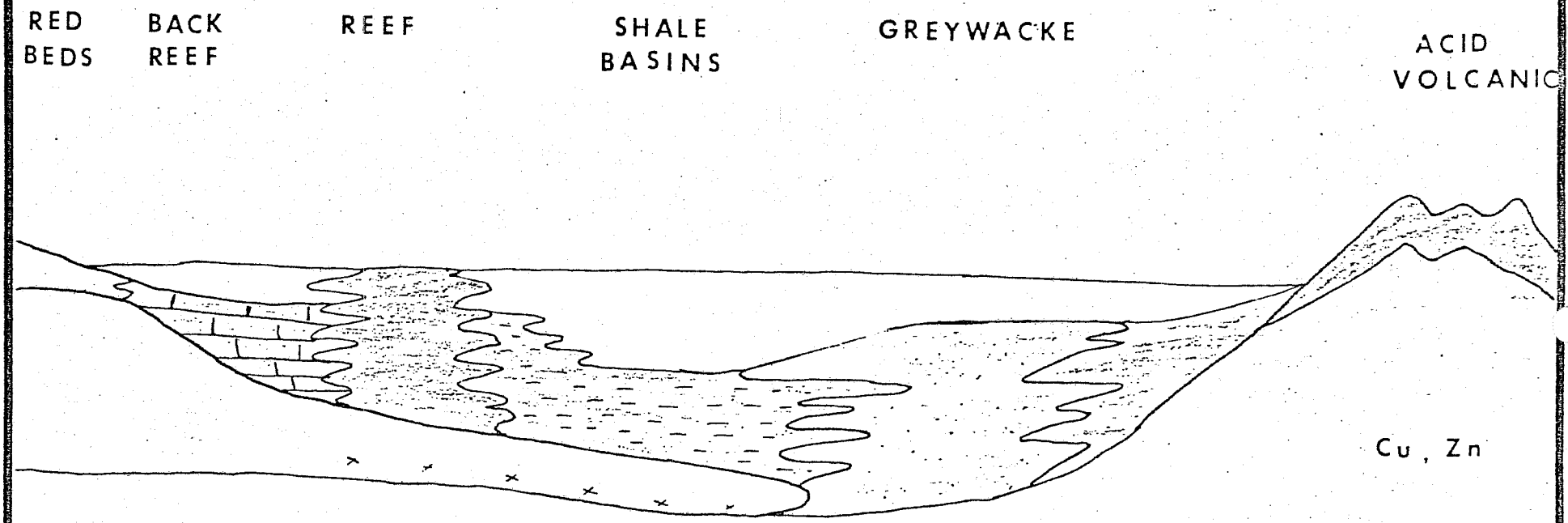
| SAMPLE No. | % BaSO4 |
|---|---|
| K-45 | 83.70 |

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

Licensed Assayer of British Columbia




after D.F. SANGSTER

GREAT PLAINS DEVELOPMENT COMPANY OF CANADA, LTD

# FACIES AND MINERAL RELATIONSHIPS

B. FARION

SEPT. 1973

# APPENDIX II

## FACIES AND MINERAL RELATIONSHIPS

The drawing shows the mineral relationships generally found in different facies. The acid volcanic and reef deposits are the most common on a worldwide basis with a few deposits in the other facies. Minerals in brackets are minor.

The acid volcanics produce a deposit which is usually up to 80% sulphide. The sulphide content in sedimentary facies decreases to 10 to 15% due to the decrease in pyrite content. The sulphides in the sedimentary facies generally have a low iron content.

# PROGRESS REPORT - SEPTEMBER 1973

## MACKENZIE VALLEY AREA

An angular unconformity in the Funeral Formation was examined at the headwaters of the Ram River. According to W.B. Brady this is a similar environment to the Robb Lake B.C. lead-zinc deposit.

The Cadillac deposit was visited and several trenches examined. The mineralization is in the Sunblood Formation limestones and is related to a fault underlying Prairie Creek.

Cathedral Mountain reefs were examined. A facies front occurs here with Manetoe Reef dolomites abutting Funeral Formation shales in a vertical contact. Bad weather prevented an examination of the facies front.

The Cominco lead-zinc property at Wrigley was examined. The mineralization occurs in dolomitized and siliceous alteration zones in fractures. The fractures were formed during folding of the Nahanni Formation limestones. The sphalerite occurs in large crystals. The galena is crystalline and disseminated. Core that was examined showed 20 feet of 2-3% sphalerite and 1-2% galena; and 6 feet of 4-2% sphalerite and 2-3% galena.

The Horne River Reef and Kakiska Formation reefoidal limestones were examined. These reefs are poor prospects at present.

A facies front between the Manetoe Reef and Besa River shales; two syenite plugs intruding sediments; and a Precambrian outcrop were examined in the eastern corner of the Yukon. Canex and Union Oil are actively exploring this area at present.

Sections at the Robb Lake lead-zinc occurrence and Sikinnani River were examined. At Robb Lake, a lead-zinc deposit occurs in Stone Formation limestones in an unconformity.

This completed the examination of geologic sections of interest. W.B. Brady was released and Great Plains personnel moved back to Fort Simpson to prospect favorable areas which had been examined earlier.

Copper mineralization which had been reported in a G.S.C. publication, Paper 61-13, was examined in the Whittaker Dome. Prospecting the mineralized horizon showed that the mineralization is localized in small sections in the talus. This area would warrant further surface exploration before staking.

Reefs on the Ram River, Root River and North Nahanni Rivers were prospected. Mineralized float consisting of pyrite, was found at the Root River.

On September 23rd, the field crews returned to Calgary. A report on the joint venture program is now being prepared.