

ALASKA LEGISLATURE COMMITTEE FILES 1999-2000 8672

10036 HOUSE TRANSPORTATION

# MINTO PROPERTY

## Minto Explorations Ltd.

President: Lutz Klingmann

### Corporate headquarters

6411 Imperial Avenue  
West Vancouver, British Columbia V7V.

Phone (604) 921-7570  
Fax (604) 921-9446  
E-mail [mintoexpl@telus.net](mailto:mintoexpl@telus.net)  
Web site [www.mintomining.com](http://www.mintomining.com)

## PROJECT STATUS

Under construction; production expected in late 2000 or early 2001



### Location

240 km northwest of Whitehorse

### Ownership:

Minto Explorations Ltd., Asarco Inc.

### Commodities

Copper, silver, gold

### Ore type

Sulphide

### Mineable reserves

6,510,000 tonnes

Copper: 2.13%

Silver: 9.3 grams/tonne

Gold: 0.62 grams/tonne

### Geological reserves

8,818,000 tonnes

Copper: 1.73%

Silver: 7.5 grams/tonne

Gold: 0.48 grams/tonne

### Mining method

Open-pit and underground, 360 days per year

### Mine life

12 years

### Employees

79

### Power

2 MW, diesel generation at the mine

## HISTORY

Anomalous copper concentrations were first detected during a program of stream sediment sampling in the Minto area in 1970. The MINTO claim group was staked by Asarco Inc./Silver Standard Mines Ltd. (The Dawson Range Syndicate) in 1971. The DEF claim group was staked to the north of, and adjoining, the MINTO claim group by an exploration consortium managed by United Keno Hill Mines Ltd., also in 1971. Both properties were explored from 1972 to 1974. The first significant drill intersection was made in July, 1973 and subsequent extensive diamond drilling outlined an ore deposit. A feasibility study was completed under the joint direction

of Asarco Inc. and United Keno Hill Mines Ltd. in 1976, but the project did not proceed at that time due to poor indicated financial returns. Drill programs were conducted in 1984 and 1985 by United Keno Hill Mines. (The UKHM holdings were acquired by Falconbridge Limited.)

Minto Explorations Ltd. was incorporated in April, 1993 specifically for the acquisition of the Minto property interests held by Asarco Inc. and Teck Corp. (the MINTO claims and leases) and by Falconbridge Limited (the DEF claims and leases) and for the further exploration and development of the Minto property. Teck Corp. and Asarco each sold their interest in the MINTO claims to Minto Explorations for shares in the company, and provided initial working capital of \$375,000 by

purchasing further shares. An agreement was signed with Falconbridge Ltd. for the acquisition of the DEF claims and leases on June 9, 1993. The essence of the agreement is that a cash payment of \$1 million will be made to Falconbridge Ltd. after a production decision has been made and project financing secured. The agreement has a term of 30 months.

### 1996 construction

The initial 16 km of access road along the west side of the Yukon River, and the bridge across Big Creek, were constructed in September and October.

### 1997 construction

The remaining 12.8 km of access road were constructed, with only final grading and minor cleanup to be done after the 1998 spring break-up.

The site for the permanent camp was excavated in September. A water well to supply domestic water for the camp for drilled to a depth of 72 m, tested and equipped. A set of septic tanks was installed and a leach field was constructed. A camp services unit was built in Whitehorse during the winter months and this was then moved to the site. The unit includes a water purification system and water storage for both fire protection and domestic purposes.

In October, the mill site was excavated and various on-site roads and the pit perimeter for the first phase of mining were constructed. Two used grinding mills were purchased in the United States, dismantled and shipped to the Yukon and across the Yukon River.

### 1998 construction

Detailed engineering was completed in 1998. The mill footings were constructed in September. Ketz Construction Corp. of Whitehorse placed a total of 1,688 m<sup>3</sup> of concrete over a period of eight weeks.

The company purchased a used, eight-unit, 42-person camp and a new, seven-unit kitchen-diner-changehouse complex. These units were erected and all services, such as sewage disposal, potable water supply and power distribution for the camp, were installed.

Final grading, minor clean-up and reclamation were done along the 28.8-km long access road. The road is now in excellent condition and approximately 60 loads of freight were hauled to the site during the three months of construction.

A grout curtain, designed to control seepage through the foundation of the tailings-water dam, was also completed.

The two mill motors were reconditioned and placed in storage in Okanagan Falls, B.C.

### 1999 construction

A short construction program was completed in September. The two grinding mills were moved to the site, mill components were cleaned, sandblasted and painted, and the two mills were assembled. Svedala Canada Inc. completed a detailed inspection of the mills and a proposal for final installation has been submitted. Some roadwork and preparations to permit construction to continue through the coming winter were also completed.

### Cost of construction

The following are the construction costs in Canadian and American dollars.

	Canadian \$	American \$
1996	909,294	657,765
1997	2,557,106	1,849,758
1998	3,585,663	2,390,515
1999	426,102	282,745
Total to date	7,471,166	5,180,783
Numbers rounded off	7,471,000	5,181,000
To the start of production, 2001	19,816,000	13,475,000
<b>Total</b>	<b>27,287,000</b>	<b>18,656,000</b>
Contingency		1,500,000
Feasibility study estimates (May, 1995)	25,822,000	19,127,400

The permitting process for the Minto project was completed, with the granting of a Type A water use licence in 1998 and a production licence in 1999. Due to continued low copper and gold prices in 1999, and delays in receiving the Type A Water Licence, start-up of operations is now expected in late 2000 or early 2001. The Minto project is viable under current market conditions.

## PROJECT SUMMARY

Minto Explorations Ltd. is proposing to develop the Minto property located approximately 240 km northwest of Whitehorse, on the west side of the Yukon River. The orebody is located in the upper reaches of the Minto Creek watershed, approximately 10 km upstream of the Yukon River confluence, at an elevation of 2,660 to 2,900 feet. Access is by barge across the Yukon River from Minto Landing, then via road.

The Minto project will employ 76 people. Approximately 70% of the positions are expected to be filled by residents of Whitehorse, 15% by residents of Carmacks and the Little Salmon First Nation, 10% by residents of Pelly Crossing and the Selkirk First Nation and 5% by residents of Faro. The Minto project is situated on traditional Selkirk First Nation land. The Selkirk First Nation selected an area surrounding the property as Category A Settlement Land under an agreement negotiated with the Government of Canada and the Government of the Yukon. The title to the mining claims and leases and the access road right-of-way held by Minto Explorations Ltd. are protected under the Umbrella Final Agreement and the Selkirk First Nation Final Agreement respectively. The Selkirk First Nation actively supports the project and a comprehensive co-operation agreement was signed with Minto Explorations Ltd. on September 16, 1997.

## GEOLOGY, MINERALOGY AND ORE RESERVES

The Minto deposit is hosted in a flat-lying, tabular zone of foliated biotite granodiorite and quartzofeldspathic gneisses enclosed in a Klotassin granodiorite. The main ore zone is 335 m long, 247 m wide and 6 to 61 m thick, with an average width of 30 m. The principal ore minerals are chalcopyrite and bornite in variable proportions with

significant gold and silver values. The in-situ geological reserve for the deposit above a cut-off grade of 0.50% copper is 8,818,000 tonnes with 1.73% copper, 0.48 grams/tonne gold and 7.5 grams/tonne silver. The reserve contains 336 million pounds of copper, 140,500 ounces of gold and 2.176 million ounces of silver. The ore that will be mined as per the current mine design is 6,510,000 tonnes with 2.13% copper, 0.62 grams/tonne gold and 9.3 grams/tonne silver.

## MINE PLAN

The proposed Minto project would entail an open pit and underground operation, waste rock stockpiles, a tailings storage facility and a conventional copper flotation mill. These facilities will occupy an area of approximately 141 hectares. The stripping ratio is 4.9:1. The mill will be designed to process 550,000 tonnes per year. Ore will be treated by conventional flotation to produce annually up to 35,000 tonnes of copper concentrate which will contain, on average, 28.5 million pounds of payable copper, 11,000 ounces of gold, and 155,000 ounces of silver during the first five years of production. The tailings impoundment will be located within the Minto Creek valley, approximately 850 m east of the mill and will have a capacity of 6.5 million tonnes. Concentrate will be trucked on a daily basis to the Port of Skagway, or to Fort Nelson, for shipment to smelters. To bring the Minto deposit into production, Minto Explorations Ltd. signed a joint venture agreement on June 17, 1996 with Asarco Inc., where Asarco Inc. will acquire 70% interest in the project in consideration for providing up to US\$25 million for project development. Minto Explorations Ltd. retains a 30% interest in the project and is the operator.

ASARCO Inc. and Grupo Mexico, S.A. de C.V. announced a merger in October, 1999, where Grupo Mexico would acquire all outstanding shares of ASARCO Inc.

# MOUNT NANSEN PROPERTY

## BYG Natural Resources Inc.

### PROJECT STATUS

Federal government is maintaining mine site



#### Location

60 km west of Carmacks

#### Commodity

Gold, silver

#### Ore type

Sulphide

#### Geological reserves

Brown-McDade Zone

Oxide reserve: nearly depleted

Sulphide reserve: 220,000 tonnes grading  
6.8 grams/tonne Au and 57 grams/tonne Ag

#### Flex Zone

Oxide mineable reserve: 81,700 tonnes grading  
7.37 grams/tonne Au and 312 grams/tonne Ag

#### Webber Zone

Oxide reserve: 102,500 tonnes grading 7.83  
grams/tonne Au and 466.4 grams/tonne Ag

#### Huestis Vein

Mineable sulphide reserve: 148,600 tonnes  
grading 11.75 grams/tonne Au and 79.7 grams/  
tonne Ag

#### Mining method

Open-pit and underground, 365 days per year

#### Processing method

Conventional mill, 365 days per year

#### Mine life

4 years

#### Employees

65

#### Power

2 MW, on-site diesel generation

## HISTORY

Placer gold was originally discovered on Nansen Creek in 1899. The first recorded lode gold discovery on the current Mount Nansen property was made by prospectors Brown and McDade in 1943.

The first underground work was conducted on the Brown-McDade zone in 1947 by the Spud Huestis Syndicate. After a few years of mine development, mapping, surface

trenching and sampling, the property remained inactive until 1962 when the Mount Nansen Syndicate acquired the Brown-McDade, Webber and Huestis deposits and conducted additional exploration. Mount Nansen Mines Ltd. was acquired by Peso Silver Mines Ltd. which conducted exploration over the next three years on all three deposits. A 270-tonne per day floatation mill was constructed during 1967-68. A total of 14,500 tonnes of development muck produced during 1967-68 had an

## MOUNT NANSEN PROPERTY

estimated average grade of 7.8 grams/tonne Au and 162 grams/tonne Ag, while mill feed of 5,236 tonnes produced from stopes during 1969 had an estimated average grade of 11.7 grams/tonne Au and 282 grams/tonne Ag. Low gold recovery rates, estimated at 60% to 65% led to the mine closure in April, 1969. In late 1975, a total of 5,450 tonnes at an estimated grade of 16.8 grams/tonne Au and 248.8 grams/tonne Ag was produced from the Huestis deposit and processed during May, 1976, but the mine once again shut down shortly after. As of 1976, over 4,572 m of underground development was completed on the three veins. Approximately 22,680 tonnes of ore were treated in the flotation mill in 1975 and 1976.

In 1984, BYG Natural Resources Inc. (BYG) acquired the properties and combined them with additional claims to form the current property. BYG and Chevron Minerals Ltd. carried out an exploration program from 1985 to 1987. Over \$5 million was expended on geological mapping, geochemical and geophysical surveys, trenching, 2,605 m of diamond drilling (41 holes) and 1,283 m of rotary percussion drilling (17 holes). During 1988, BYG continued exploring on its own by carrying out surface trenching and 85 holes (5,397 m) of diamond drilling. A previously unrecognized near-surface oxide zone was discovered and the underground sulphide reserves were expanded. Metallurgical testing, mill flow sheet designs, tailings disposal and environmental impacts were studied at this time, and commercial gold production began on January 1, 1997. Production continued intermittently until February, 1999, when all mining and operations ceased.

BYG owns 100% of the Mount Nansen project, subject to royalties.

Between 1994 and 1997, BYG conducted exploration consisting of diamond drilling on the Brown-McDade and Flex (990 m, 12 holes in 1994), Flex and Huestis (1,490 m, 21 holes in 1995), Webber and Flex (780 m, 10 holes in 1996) and Vince Vein (745 m, 9 holes in 1997). During 1997, a program of overburden stripping and excavator trenching was completed on the Flex zone. During 1998, a further 16 holes (1,092 m) were drilled on the Flex Zone.

In May, 1999, BYG Natural Resources went into receivership (D. Manning and Associates) and was convicted of violating its water license. In July, 1999, the federal government took over mine-site maintenance.

## PROJECT SUMMARY

The Mount Nansen mine is located 60 km west of the village of Carmacks, Yukon and is accessible by a gravel road from Carmacks to the minesite. The property consists of 257 mining claims and 30 mining leases covering an area of 53 square km. There are another 524 mining claims owned by BYG immediately surrounding the main Mount Nansen property. It is an open-pit mine with a three-year mine life based on reserves from the Brown-McDade zone which is expected to be extended by the discovery of additional oxide ore reserves in the Webber and Flex zones. It is expected that the mine life could be extended if viable metallurgical processes are developed for potential sulphide ore on the property.

## GEOLOGY, MINERALOGY AND ORE RESERVES

The Mount Nansen district is underlain by metamorphosed intrusive, sedimentary and volcanic rocks of the Yukon-Tanana terrane. These rocks are intruded by Early Cretaceous felsic plutonic rocks and overlain by Mid-Cretaceous Mount Nansen mafic to intermediate volcanic rocks and related sub-volcanic feldspar porphyry dykes and plugs.

The Mount Nansen property is host to four distinct gold deposits: Brown-McDade, Webber, Huestis and the Flex Zone. The zones are situated in a series of anastomosing veins in northwesterly trending faults or shear zones. The gold and silver mineralized structures consist of fault-shear-hosted veins and associated clay-rich and bleached alteration zones. The veins occur in a 2.5-km wide corridor which has been traced over a strike length of 15 km. Clay-rich leach zones near the surface are underlain by blankets or lenses of gold-rich supergene ores.

### Brown-McDade Zone

The Brown-McDade Zone lies at the southeasterly end of the belt. It is 55 m long by 200 m wide and consists of quartz veins and associated feldspar porphyry dykes. The oxide ore of the Brown-McDade is currently being mined by a small open pit. A mineable open-pit reserve of 110,000 tonnes grading 12.33 grams/tonne gold and 78 grams/tonne silver was outlined in the open pit, with an additional 80,000 tonnes of low-grade mineralization. Most of this was mined out by late 1998. Underground resources are estimated at 222,000 tonnes grading 6.8 grams/tonne gold and 57.0 grams/tonne silver below the open pit.

**Webber Zone**

A diluted oxide reserve of 102,500 tonnes grading 7.83 grams/tonne gold and 466.4 grams/tonne silver has been established in the Webber deposit from extensive trenching, drilling and underground development.

**Huestis Vein**

Mineable sulphide reserves of 148,600 tonnes grading 11.75 grams/tonne gold and 79.7 grams/tonne silver have been defined on the Huestis vein by trenching, diamond drilling and detailed underground sampling. The ore is sulphide-rich and refractory.

**Flex Zone**

A preliminary, shallow open-pit design encloses a calculated mineable resource of 81,700 tonnes grading 7.37 grams/tonne gold and 312.5 grams/tonne silver.

There is a geological sulphide reserve on the Flex Zone of 599,247 tonnes grading 8.88 grams/tonne gold and 190 grams/tonne silver.

**PRODUCTION**

The initial capacity of the mill was 700 tonnes per day.

Gold production from surface oxide ores commenced during the week of October 18, 1996 and the company poured the first bar of gold on November 23, 1996. Commercial production began on January 1, 1997. The mill was established to process 700 tonnes per day; intended yearly production is 50,000 ounces of gold. The gold was sold through Gerald Metals Inc.

In January, 1997, the company produced 2,700 troy ounces of gold and 13,000 troy ounces of silver. Ore throughput increased to 450 tonnes per day which is 64% of design capacity. Recoveries averaged 88% and the head grade averaged 0.235 ounces equivalent gold/tonne.

The unanticipated presence of clay-alteration minerals in the ore forced the daily milling rate down to less than 325 tonnes during the first nine months of operations. The problem was solved by installing a semi-autogenous grinding mill (SAG). Also, record rainfall aggravated existing difficulties milling the gold-rich, clay-altered ores and restricted capacity to 36%. The SAF mill was operational by the end of August, 1997. During July and August, 1997, the mill operated largely on stockpiled ores leaving the high-grade open-pit clay-altered ores to be mined and processed when the SAG mill became operational.

Unseasonably heavy rainfall created a water imbalance problem in late 1997. There was inadequate provision for run-off of the rainfall, which led to an environmental discharge danger. BYG engineered a water treatment system in the spring of 1997 by transporting facilities from the Canamax mine controlled by YGC. The treatment facility enabled the company to meet water quality discharge levels.

The mine re-started production at the end of January, 1998 and delivered its first gold and silver for sale in April, 1998. At first, production was limited to 50% of the mill's 700 tonne per day capacity, then installation of new pumping facilities allowed the mill to operate at full capacity. BYG estimated that it would be able to produce gold at an operational cost of \$160 per ounce.

The company downsized in 1998 and carried out exploration and drilling programs to delineate additional oxide ore reserves on the Mount Nansen mine property, particularly on the nearby Flex Zone. The mine shut down in the spring of 1999

**Total production in 1998**

472 kg (15,190 ounces) gold • 1,208 kg (38,849 ounces) silver

# MOUNT SKUKUM/SKUKUM CREEK GODDELL PROPERTIES

## Omni Resources

President: Jon Bergvinson

Corporate headquarters  
#910-700 West Pender Street  
Vancouver, British Columbia V6C 1G8

Phone (604) 688-6477

Fax (604) 688-9530

## PROJECT STATUS

Reserve delineation ongoing



## HISTORY

The Wheaton River area first received attention in the early 1890s when prospectors discovered gold-bearing quartz-stibnite veins. With the completion of the White Pass and Yukon Route Railroad in 1903, the area became more accessible to prospecting and numerous other gold and silver occurrences were located between that year and 1906. Stibnite mineralization was discovered

### Location

40 km west of Carcross

### Ownership

Omni Resources, Arkona Resources,  
Trumpeter Yukon Gold

### Commodity

Gold, silver

### Ore type

Mount Skukum: quartz-carbonate

Skukum Creek: quartz-sulphide

Goddell: breccia

### Mineable reserve (November, 1997)

Rainbow Zone-Skukum Creek: 956,949 tonnes

Silver: 193.5 grams/tonne

Gold: 6.3 grams/tonne

Kuhn Zone-Skukum Creek: 148,781 tonnes

Silver: 167.70 grams/tonne

Gold: 8.78 grams/tonne

Goddell Shear Zone: 900,000 tonnes

Gold: 7.0 grams/tonne

### Mining method

Underground, 365 days per year

### Mine life

8 years

### Processing method

Conventional mill, 365 days per year

### Employees

80

### Power

3 MW, on-site diesel generation

approximately 11 km east of Mount Skukum at Goddell Gully in 1909, and in 1922, gold-silver mineralization was discovered on the southeast side of Skukum Creek approximately 5.3 km southeast of Mount Skukum.

Exploration activity slowed with the beginning of World War One and did not resume until the 1960s when activity increased and stibnite veins in the Goddell Gully, Becker-Cochrane, Wheaton River and Skukum Creek areas were re-examined. During the 1970s, most of the exploration

activity in the Wheaton River District was carried out in search of copper, molybdenum and uranium.

In 1981, exploration activity peaked in the Wheaton River District due to an increase in the price of gold and the discovery of gold-bearing quartz-carbonate veins in the Mount Skukum volcanic complex by AGIP. The project became the site of the Mount Skukum Gold Mine which, from 1986 to 1988, mined 223,439 tons of ore and recovered 77,796 ounces of gold by underground methods. In 1986, Omni Resources Inc. reported geological reserves of 745,000 tonnes grading 7.9 grams/tonne gold and 305 grams/tonne silver on their Skukum Creek property. From 1985 to 1988, Berglynn Resources Inc. carried out an exploration program on the Goddell Gully property located at the southeast corner of the Mount Skukum property and adjoining ground held by Omni Resources Inc. This program led to the intersection of high-grade gold mineralization in drill core. The Omni, Berglynn and Mount Skukum Gold Mine properties were dormant from 1991 to the mid-1990s.

Omni Resources completed a drill program on the Goddell gold project in 1995. The five-hole, 2,820 m diamond-drill program confirmed a large, well-mineralized shear zone. The shear zone is open to extension in depth and length. Omni Resources completed a 620-m decline in December, 1996 at the Goddell Shear Zone. Underground crews have extended the decline by 600 feet to the east and established drill stations at 50-m intervals.

## PROJECT SUMMARY

The Mount Skukum and Skukum Creek deposits are located approximately 65 km southwest of Whitehorse at the termination of the Annie Lake Road. The Goddell Shear Zone, part of the Skukum Creek property, is under option from Arkona Resources Inc. and 276 Taurus Ventures. In April, 1996, Omni Resources entered into an agreement with Trumpeter Yukon Gold whereby Trumpeter would finance Omni through equity over one year to earn a 50% joint interest in Omni's holdings. Trumpeter Yukon Gold is a company controlled by BYG Natural Resources of Carmacks. The agreement further provides the opportunity for Trumpeter to enter into a 50/

50 joint venture with Omni on the Mount Skukum properties. In October, 1997, Omni Resources announced that they had purchased a 100% interest in the RACA claim group which lies on strike and northeast of the Skukum Creek deposit.

## MOUNT SKUKUM DEPOSIT

Mineralization on the Mount Skukum property consists of gold within epithermal quartz carbonate veins hosted in an Eocene volcanic caldera complex. Underground mine production began on the Main Cirque body in 1986, at a rate of 300 tonnes per day and continued until August, 1988, when that orebody was exhausted. Approximately 223,400 tons of ore were mined and 77,796 ounces of gold were recovered. The mineral processing facility remains on site. It is a conventional Merrill-Crow crushing, grinding, cyanidation, zinc precipitation circuit with cyanide destruction using the Inco SO<sub>2</sub> system. It is estimated that about 98,885 tonnes of oxide ore grading 14.75 grams/tonne gold remain at the Lake Zone. There has been no development on Mount Skukum since 1989.

## SKUKUM CREEK AND GODDELL DEPOSIT

The Skukum Creek property was originally staked in 1922 and obtained by Omni Resources in 1984. Exploration and development proceeded quickly on the property from 1985 to 1988. The program, financed largely through flow-through share funding, included more than 24,000 m of surface and underground diamond drilling and 2,200 m of underground development on the 1300 and 1350 levels. The Skukum Creek orebody includes the Rainbow and Kuhn sulphide-rich veins which contain moderate gold and significant silver values. Several attempts to bring the property into production have failed. The Goddell gold-bearing breccia, part of the Skukum Creek property, was drilled in 1995 and 1996. The Omni-Trumpeter joint venture has spent \$4.4 million on exploring and developing the Goddell Shear Zone, which was purchased from Arkona Resources Inc. (60%) and 276 Taurus Ventures (10%). The mineralized strike length of the Goddell Shear Zone is now over 1,100 feet and is still open to the east and at depth. A final feasibility study was planned for 1998 for mining Omni's Skukum Creek deposit. Production rates are anticipated at 500 to 700 tons per day. The feasibility study is on hold pending economic conditions.

# SA DENA HES PROPERTY

## Cominco Ltd.

President: David Thompson

**Corporate headquarters**  
500 - 200 Burrard Street  
Vancouver, British Columbia V6C 3L7

Phone (604) 682-0611  
Fax (604) 685-3019  
Web site [www.cominco.com](http://www.cominco.com)

## PROJECT STATUS

Care and maintenance



### Location

50 km northeast of Watson Lake

### Ownership

Cominco Ltd. (25%), Teck (25%),  
Korea Zinc (50%)

### Commodity

Lead, zinc, silver

### Ore type

Sulphide

### Geological resource

3.2 million tonnes

Lead: 3.70%

Zinc: 12.90%

Silver: 57 grams/tonne

### Mineable reserve

1.4 million tonnes

Lead: 2.3%

Zinc: 10.2%

Silver: 44 grams/tonne

### Mining method

Underground, 365 days per year

### Processing method

Conventional mill, 365 days per year

### Employees

100

### Power

6 MW, on-site diesel generation

## HISTORY

Mineralization was discovered on the Sa Dena Hes property in 1962 by the Frances River Syndicate. The property was worked on at various times by Atlas Explorations, Cima Resources, and Canamax Resources. Curragh Resources (80%) and Hillsborough Resources Limited (20%), as joint venture partners, acquired the property in 1989 from Canamax Resources. Between April, 1989 and August, 1990, the Joint Venture spent a further \$5.3 million on a field program of geological exploration and diamond drilling. Following completion of the detailed geological assessment, the Joint Venture

decided to proceed with construction of the project and work commenced in October, 1990.

In early 1991, a socio economic agreement was signed by the Joint Venture, the Kaska Dena First Nation, the Town of Watson Lake and the Government of the Yukon. The objective of the agreement was to ensure that business and employment opportunities were available to local residents on a preferential basis. In addition, an agreement between the Joint Venture and the Kaska extended business, employment, and training opportunities to the Kaska, as well as an option to purchase a 10% interest in the mine.

The Sa Dena Hes mine began production in August, 1991 and ceased operations in December, 1992 because of low metal prices. In September, 1993, the Ontario Court appointed Coopers & Lybrand as the interim receiver acting for the Bank of Nova Scotia for the Sa Dena Hes and Stronsay (Cirque) assets.

The Sa Dena Hes and Stronsay (Cirque) lead-zinc properties were bought by Teck (25%), Cominco (25%), Korea Zinc (40%) and Samsung (10%) in December, 1993. The four partners paid an estimated \$43 million for the Sa Dena Hes and the Stronsay (Cirque) properties. There has been no production at Sa Dena Hes since closure in 1992.

### **PROJECT SUMMARY**

The Sa Dena Hes lead-zinc mine is located approximately 45 km north of Watson Lake. It is owned by Teck Resources (25%), Cominco (25%), and Korea Zinc (50%). The property covers approximately 5,600 hectares.

Production began at the Sa Dena Hes mine in August, 1991 and ceased operations in November, 1992 due to low zinc prices. During the 14 months of operation, the mine produced 607,500 tonnes of concentrate containing 374,400 tonnes of payable zinc and 290,200 tonnes of lead. Infrastructure on site includes the underground mine, ore handling facilities, a 1,500 tonne per day

conventional mill, loadout facilities, tailings and reclamation system, shops, warehouse, security and first-aid office, a 200-person camp, administration building, and a 6.2 MW power plant.

### **GEOLOGY, MINERALOGY AND ORE RESERVES**

The mineable reserve on the property is estimated to be 1.4 million tonnes grading 2.5% lead, 10.2% zinc, and 44 grams/tonne silver.

### **EXPLORATION AND PRODUCTION PLANS**

In August, 1997, Cominco announced that Sa Dena Hes might open in the second quarter of 1998. Pre-operational work, including contract tenders for road upgrading and underground rehabilitation, was initiated. Cominco, Teck and Korea Zinc upgraded the mine's infrastructure and prepared for the mid-1998 start. However, due to poor market conditions, the re-opening was cancelled in December, 1997.

At full production, the operation would produce 75,000 tons per year of zinc concentrates and 15,000 tons per year of lead concentrates. Output would be sold into Asian markets, with Korea Zinc the most likely smelter.

In October, 1997, Cominco and the Liard First Nation signed a socio-economic participation agreement related to the Sa Dena Hes mine.

## SILVERTIP PROPERTY

### Silvertip Mining Corporation/ Imperial Metals Corporation

President: Pierre Lebel

Corporate headquarters  
420-355 Burrard Street  
Vancouver, British Columbia V6C 2G8

Phone (604) 659-8959  
Fax (604) 687-4030  
Web site [www.imperialmetals.com](http://www.imperialmetals.com)

### PROJECT STATUS

Exploration for additional reserves



### HISTORY

The Silvertip deposit was first discovered in 1982, at which time it was thought to be a shale-hosted zinc-lead deposit. When spectacular silver-rich mineralization was intersected in the underlying limestone formation, the property became classified as a major precious-base metal deposit. Over the next three years over \$15 million was spent on intensive exploration that attempted to define the mineral reserve. Underground exploration took place in 1985, 1989 and 1990, revealing that the mineralization was deposited in a network of irregularly-shaped cave systems.

In 1997, exploration was focused on the expansion of known ore bodies. Two new zones of high-grade massive sulphide mineralization were discovered through geological mapping, seismic surveying and 8,000 m of follow-up drilling. The zones are known as the Silver

#### Location

Northern British Columbia, 80 km west of  
Watson Lake

#### Ownership

Silvertip Mining Corp. (subsidiary of Imperial  
Metals Corp.)

#### Commodities

Silver, lead, zinc, gold

#### Ore type

Sulphide

#### Mineable reserves

2.57 million tonnes

Silver: 325 grams/tonne

Lead: 6.4%

Zinc: 8.8 %

Gold: 0.63 grams/tonne

#### Mining method

Open-pit for the first 2 years then  
underground, 365 days per year

#### Mine life

4-5 years

#### Employees

Approximately 140 when operational

Creek Extension Zone and the Discovery North Zone. A 1998 geophysical exploration program identified several additional anomalies, outside of the known deposit.

In April, 1999, Imperial optioned a 60% interest in Silvertip to Peruvian Gold Limited whereby Peruvian must spend \$5 million over three field seasons with a minimum commitment of \$450,000 in 1999. Imperial retains operatorship throughout the option period, preserving cash and offsetting the risk associated with deep drilling, and retains the right to buy back a 20% interest in the property by making subsequent expenditures of \$2 million.

A total of 5.65 line/km of CSAMT survey was completed in July, 1999 as part of phase one. The survey revealed three well defined areas exhibiting anomalously conductive signatures. A 2,000-m drill program to test the anomalies was completed in the fall of 1999. Results were most

encouraging with one hole intersecting 31 m grading 318 grams/tonne silver, 8.65% zinc and 5.53% lead. A decision was made to proceed immediately with underground drilling. Existing underground openings were dewatered in December and drilling will commence in January, 2000.

## PROJECT SUMMARY

Silvertip Mining Corporation, a wholly owned subsidiary of Imperial Metals Corporation, has applied to the B.C. government to develop the Silvertip property. The property is located in northern British Columbia, 80 km west of Watson Lake, Yukon. Access is by a 25-km two-wheel drive gravel road from kilometre 1,128 of the Alaska Highway. The property covers approximately 227 square km.

The company submitted an environmental assessment application in 1998.

## GEOLOGY, MINERALOGY AND ORE RESERVES

The Silvertip prospect is located south of the Midway Deposit on a branch of the Tootsee River called Silvertip Creek.

"The deposits occur in a carbonate and clastic sedimentary sequence of the Cassiar terrane, which has been intruded into the west by the mid-Cretaceous Cassiar batholith. The sediments include the Kechika, Sandpile, McDame and Earn groups. The deposits are situated on the west limb of a broad, open, northwest trending synclorium, the core of which is occupied by volcanics, sediments and ultramafic rocks of the Devonian-Triassic Sylvester Allochthon. Massive sulphide zones in the Midway deposits occur in limestones of the upper part (Unit MLS) of the mid-Devonian McDame Group. This unit is unconformably overlain by clastic sediments of the Upper Devonian-Mississippian Earn Group, which consists of two upward-coarsening sequences of turbiditic flows. Several exhalative horizons, consisting of fine-grained massive to laminated silica and/or barite, with pyrite,

sphalerite and minor galena occur in the Earn Group sediments. Two of these, the Upper and Discovery zones, occur near the base of the second cycle, and contain lead-zinc-silver mineralization. Sulphides within the exhalite zones are restricted in extent although exhalites are widespread and may be stratigraphically correlatable." (from B.C. Minfile 1040 038)

"Galena, sphalerite, and tetrahedrite replacement mineralization occur in highly oxidized zones in the Mid-Devonian McDame Group limestone just west of a fault zone separating McDame carbonates from a down-dropped block of Upper Devonian to Mississippian Earn Group clastic sediments. A sulphide zone 12 m in length was exposed underground, but surface mineralization is generally oxidized, with residual galena and minor sphalerite. Stannite has been identified in the sulphide assemblage, and a magmatic-hydrothermal source is suspected." (B.C. Minefile, 093M 055)

The deposit contains a total resource of 2.57 million tonnes of high-grade silver-lead-zinc-gold massive sulphide mineralization grading 325 grams/tonne silver, 6.4% lead, 8.8% zinc and 0.63 grams/tonne gold.

## PRODUCTION

The project will employ up to 150 people during the construction stage, and approximately 140 people during operation. The first two years of production will remove 0.74 million tonnes of ore by open-pit mining. The remaining 1.83 million tonnes will be removed by underground mining throughout the following two to three years.

The Goldstream Mill from Revelstoke, B.C., will be moved to the Silvertip site and upgraded. A crushing and dense media separation (DMS) circuit will then be added and the mill will treat 1,500 to 2,000 tonnes of ore per day. Conventional crushing, grinding and flotation processes will be used. Waste rock will be stored underwater either in the flooded open pit or in a storage facility that will be built in the Silvertip Creek valley. Seven to 10 daily truck-loads of concentrated ore, each containing 40 to 50 tonnes, will be transported to either Skagway, AK, Stewart, B.C., or Fort Nelson, B.C.

## TOM PROPERTY

### Hudson Bay Exploration and Development

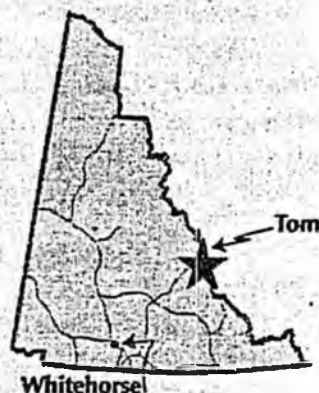
President: Edward Yarrow

Corporate headquarters  
#405, 470 Granville Street  
Vancouver, British Columbia V6C 1G8

Phone (604) 684-1454

#### PROJECT STATUS

Inactive



#### Location

13 km southeast of Macmillan Pass

#### Ownership

Hudson Bay Exploration and Development

#### Commodities

Lead, zinc, silver

#### Ore type

Sulphide

#### Mineable reserves

9,283,700 tonnes

7.5% zinc

6.2% lead

69.4% silver

### HISTORY

Extensive work has been carried out on the Tom property since it was first staked by Hudson Bay Mining and Smelting in 1951. It was explored with mapping and hand trenching in 1951, and 37 drill holes (5,435 m) between 1951 and 1953. From 1966 to 1979, additional exploration work, including 1809 m of drifting and 75 underground drill holes (3,617 m), were completed. Hudson Bay Mining and Smelting completed part of a major feasibility study between 1980 and 1982 including additional underground work, engineering and environmental studies. A joint feasibility study with Aberford Resources Ltd., which included the nearby Jason deposit, was completed in 1985. At this point, a total of 3,523 m of underground development, 4,970 m of underground diamond drilling and 14,630 m of surface drilling had been completed on the property.

In July, 1988, Cominco Ltd. optioned the Tom property for a 60% interest through expenditures of \$5.5 million and cash payments totalling \$4 million before the end of

1993. Cominco remapped the property and drilled four holes (2,226 m) in 1988, four holes (2,175 m) in 1989, seven holes (3,578 m) in 1990 and eight holes (2,882.7 m) in 1991. Cominco dropped its option in 1992.

### PROPERTY SUMMARY

The Tom deposit is located about 13 km southeast of Macmillan Pass on the Yukon-Northwest Territories border and is accessible via the North Canal Road. A 700-m airstrip is situated midway between the Tom and Jason properties.

### GEOLOGY, MINERALOGY AND ORE RESERVES

The Tom property is underlain by fine-grained black clastic rocks of the Devonian-Mississippian Earn Group. Mineral consists mainly of galena, sphalerite and barite and is concentrated in three zones: Tom East, Tom West

and Tom Southeast. The Tom West zone is a tabular body 1,200 m long and up to 40 m thick which dips 70 degrees west. It extends down-dip for 360 m. The Tom East zone consists of fault-bounded pods of high-grade laminated barite, chert, sphalerite and galena near the hinge of an anticline. The Tom Southeast zone is thinner and higher grade than most of the Tom West zone. It

consists of a tabular body 400 m long and 0.5 to 6.0 m thick, which dips 60 to 70 degrees east.

Mineable reserves for the Tom East and West zones are published at 9,283,700 tonnes grading 7.5% lead, 6.2% zinc and 69.4% silver using a 7% zinc + lead cutoff, a 15% dilution factor and 90% recovery.

*Summary of tonnage and grades, Tom deposit.*

	Tonnes	Silver grams/tonne	Zinc %	Lead %
<u>Tom West Zone</u>				
Geological reserves	13,385,400	28.5	6.53	3.19
Mining reserves	6,864,800	42.6	7.16	4.44
<u>Tom East Zone</u>				
Geological reserves	2,337,100	167.3	9.68	12.8
Mining reserves	2,418,900	145.4	8.42	11.13
<u>Tom Deposit - Total</u>				
Geological reserves	15,722,500	49.1	7.00	4.61
Mining reserves	9,283,700	69.4	7.49	6.19
(1) geological reserves - 5% zinc + lead cut-off				
(2) mining reserves - 7% zinc + lead cut-off, 15% dilution factor, 90% recovery				

# TULSEQUAH CHIEF PROPERTY

## Redfern Resources Ltd.

President: Terence Chandler

### Corporate headquarters

900-999 West Hastings Street  
Vancouver, British Columbia V6C 2W2

Phone (604) 669-4775

Fax (604) 669-5330

E-mail [chandler@redfern.bc.ca](mailto:chandler@redfern.bc.ca)

## PROJECT STATUS

Permitting complete



### Location

100 km south of Atlin, B.C.

### Ownership

Redfern Resources Ltd. (100%)

### Commodities

Copper, lead, zinc, gold, silver

### Ore type

Sulphide

### Geological resource

8.93 million tonnes

Copper: 1.31%

Lead: 1.24%

Zinc: 6.61%

Silver: 107.56 grams/tonne

Gold: 2.53 grams/tonne

### Mineable reserve

7.56 million tonnes

Copper: 1.32%

Lead: 1.23%

Zinc: 6.63%

Silver: 105.2 grams/tonne

Gold: 2.51 grams/tonne

### Mining method

Underground, 343 days per year

### Processing method

Conventional mill, 365 days per year

### Mine life

9 years minimum

### Employees

199

### Power

12 MW, on-site diesel

## HISTORY

In 1923, W. Kirkham of Juneau, Alaska discovered the Tulsequah Chief deposit while prospecting in the Tulsequah River valley. The initial discovery of a highly mineralized showing located above the present 6,500 level adit (400 m above sea level) initiated a wave of

prospecting activity in the area. The ensuing years of intensive prospecting efforts culminated in the 1929 discovery of the Big Bull deposit some seven km to the south. The Sparling, Banker and Polaris-Taku deposits were also discovered in 1929. The Tulsequah and Big Bull deposits were acquired by Cominco in 1946 and were put into production by 1951. For six years, both deposits

were mined at an average rate of 482 tonnes/day. In 1957, due to low metal prices, Cominco was forced to close its operations with substantial reserves in place. From 1957 until 1971, the mine site lay dormant and unexplored.

During operations in the 1950s, the Tulsequah Chief deposits were considered to be shear-zone controlled. In 1971, re-examination of the local geology by Cominco geologists led to identification of volcanogenic massive sulphide (VMS) mineralization. Ten years passed before the next wave of exploration commenced. In 1981, 1:250,000 and 1:50,000 mapping was conducted. This work was followed in 1982 by airborne Dighem and Questor Input AEM geophysical surveys conducted by Cominco and Redfern Resources Ltd., respectively. The 1:50,000 mapping work was originally published in 1984 and then in 1987 it was further refined and re-published for Cominco.

In 1987, ongoing discussions between Cominco and Redfern led to an agreement whereby Redfern acquired the right to earn up to a 40% interest in the Tulsequah Chief deposits. Redfern secured a 100% interest in 1992 and continued exploration until 1994. All work since 1994 has been focused on feasibility and permitting. Redfern has spent \$24 million on exploration, delineation drilling, metallurgical testing, environmental work, engineering design and feasibility studies on the property since 1987.

## PROJECT SUMMARY

The Tulsequah Chief project, 100% owned by Redfern Resources Ltd., is a former base and precious metal producing mine hosting copper, lead, zinc, gold and silver mineralization. The project site is located in the British Columbia Coastal Mountain Range near the Alaska border, some 64 km northeast of Juneau, Alaska. Access to the property is currently by helicopter or fixed wing from Atlin or Juneau. Redfern is proposing a 160-km access road to be constructed from the minesite to the existing road near Atlin and operated as a restricted access road under the B.C. Mining Right-of-Way Act. The project will employ about 200 people. The crews will be flown in from either Vancouver, Smithers or Whitehorse and the workers will reside in a mine camp. Power requirements are estimated at about 12 MW. Redfern has completed all environmental baseline studies begun in May, 1994. The Tulsequah Chief project completed its

environmental review and received approval from the B.C. government in 1998. In May, 1999, the project also received a Special Use Permit (SUP) for the construction of the access road. Construction is contingent on metal prices and financing.

## GEOLOGY, MINERALOGY AND ORE RESERVES

The Tulsequah Chief property is predominately underlain by folded, faulted and metamorphosed pre-Permian, volcano-dominated rocks of the Mount Eaton Group as well as intrusive rocks of the coast Plutonic Belt. The Tulsequah Chief property contains Kuroko-type volcanogenic massive sulphide deposits which are believed to have precipitated on the sea floor adjacent to fumaroles associated with felsic submarine volcanism. Sulphide mineralization consists of thin-banded to massive pyrite with lesser amounts of sphalerite, chalcopyrite and galena. The mineable ore reserve is estimated to contain 7.6 million tonnes grading 1.32% copper, 1.23% lead, 6.63% zinc, 2.51 grams/tonne gold and 105.2 grams/tonne silver. This reserve is open to expansion.

## PRODUCTION PLANS

Underground mine production is estimated at 2,466 tonnes per day over a minimum nine-year mine life. The proposed milling plan involves gravity concentration within the grinding circuit, followed by differential flotation to recover free gold and to produce separate copper, lead and zinc concentrates. It is estimated that in full production, the mine will deliver 52,620 ounces of gold and 2,655,000 ounces of silver per year. Redfern Resources is proposing construction of a year-round 160 km access road to be constructed from the minesite to the existing road near Atlin, B.C. From here concentrate would be hauled to port facilities in Skagway, Alaska.

Redfern has been meeting with smelter representatives in Asia and North America seeking buyers for the copper and zinc concentrates from the Tulsequah project and concurrently has been reviewing options for project financing. Letters are in hand from smelters in Japan and Canada expressing an interest in buying 100% of the bulk copper-lead, plus precious metal concentrates. Redfern is also conducting discussions with certain operating mining companies which have expressed an interest in participation, either through joint venturing or via corporate merger.

# UNITED KENO HILL PROPERTY

## United Keno Hill Mines Ltd.

President and Chief Executive Officer: Gerald Gauthier

### Corporate headquarters

8<sup>th</sup> Floor, 350 Bay Street  
Toronto, Ontario M5H 2S6

Phone (416) 360-5575

Fax (416) 360-4419

### Elsa Mine

Elsa, Yukon Y0B 1J0

## PROJECT STATUS

On hold



## HISTORY

Silver and lead mineralization was first discovered on the property in 1903. Treadwell Yukon Company Limited acquired the better showings in the area and began shipping hand-cobbed ore in 1921. Treadwell mined the deposits from 1921 to 1941; a total of 1.5 billion grams of silver were produced during this time. In 1945, Frobisher Exploration Company Ltd. and Conwest Exploration Company Ltd. formed Keno Hill Mining Company Ltd. United Keno operated the mine from 1946 until 1988. A strike from September, 1980 to May, 1981 severely curtailed production. Low silver prices forced the mine to close from July, 1982 to August, 1983. In January, 1989, the mine was closed due to low silver prices. From 1946 to 1988 about 5.08 billion grams of silver were produced from the Hector-Calumet, Galkeno, Bellekeno, Elsa, Keno (No. 3 & 9), Lucky Queen, Silver King, Sadie-Ladue and

### Location

Elsa

### Ownership

United Keno Hill Mines Ltd.

### Commodities

Silver, lead

### Ore type

Sulphide

### Mineable reserve

520,000 tonnes

Lead: 6.64%

Zinc: 4.95%

Silver: 1049 grams/tonne (32.77 ounces per ton)

### Geological resource

944,000 tonnes

Lead: 4.80%

Zinc: 3.90%

Silver: 930 grams/tonne

### Mining method

Underground, 365 days per year

### Processing method

Conventional mill, 365 days per year

Husky mines. In 1990, Archer, Cathro and Associates mined over 100 tonnes of high-grade ore from open-pits on the Lucky Queen, Keno #3 and Keno #9 veins.

In July, 1990, BLM Mines Inc., a unit of Bharti Laamanen Mining Inc. (BLM) of Sudbury, Ontario, purchased the 44.8% interest in United Keno Hill Mines Ltd. formerly held by Falconbridge Ltd. In 1991, Romith Investments and Stephen Powell each acquired directly or indirectly, 50% of the issued and outstanding common shares of BLM. In September, 1993, United Keno Hill retained mine engineers Watts, Griffis and McQuat Ltd. (WGM) of Toronto to undertake a complete review of its Elsa area properties, geological reserves and mine plans. A surface drilling program was completed in the Silver King, Husky SW and Bellekeno areas during the summer of 1994. From mid-October, 1994 to April, 1995, underground drilling and rehabilitation were conducted on the

Bellekeno and Silver King mines. A feasibility study on the property was completed in October, 1996, and a merger with NDU Resources was completed in March, 1998. Since then, the company has attempted to raise financing to re-open the mine.

## PROJECT SUMMARY

The United Keno Hill silver vein deposits are located in Elsa, approximately 354 km north of Whitehorse. The property is owned by United Keno Hill Mines Limited (UKHM) and consists of several underground and open-pit silver-lead-zinc mines in the Keno Hill-Galena Hill area. The Elsa operations have been in production since the initial discovery of silver in 1906. Between 1947 and 1989, United Keno Hill Mines produced 148 million ounces of silver, 482 million pounds of lead and 4 million pounds of cadmium from the Elsa operations.

## GEOLOGY, MINERALOGY AND ORE RESERVES

More than 65 mineral deposits and prospects have been identified within the Keno Hill district. All of the mineable silver veins to date occur in an area 26 km long and one to 6.4 km wide. The deposits consist of mineralized vein faults 0.3 to 30 m wide in the Keno Hill quartzite. Underground mineable reserves, mostly in the Bellekeno and Silver King veins, stand at 520,000 tonnes grading 1049 grams/tonne silver (32.77 ounces/ton), 6.64% lead, and 4.95% zinc. Geological reserves are 944,000 tonnes grading 930 grams/tonne silver, 4.8% lead and 3.9% zinc.

## PRODUCTION PLANS

United Keno Hill Mines Ltd. has been conducting surface and underground exploration with the goal of increasing existing reserves to support an initial five-year mine life at a historic average grade of approximately 1,300 grams/tonne silver. The company hired Watts, Griffis and McOuat Ltd. of Toronto to oversee the 1994-1995 exploration programs and to undertake a complete review of its Elsa area properties, geological reserves and mine plans. A surface drilling program was completed in the Silver King, Husky SW and Bellekeno areas during the summer of 1994. From mid-October, 1994 to April, 1995 an underground drilling (\$5 to \$8 million) and rehabilitation program was conducted on the Bellekeno and Silver King mines, which increased reserves at both mines. A Type B Water License from the Yukon Water

Board was issued for this work. Water treatment facilities were constructed in the fall of 1994 for three of the mine sites, and the Bellekeno and Silver King mines are now substantially rehabilitated. New 5 kV lines and transformers provide a modern electrical system in each mine, and new compressors and re-engineered ventilation deliver the necessary underground working environment. The underground program was halted in April, 1995 to compile and assess the data and plan the next step.

In 1996, the company resumed the underground exploration and development program on the Bellekeno and Silver King Mines in an effort to increase reserves and establish mineable ore reserves. Environmental fieldwork and background data gathering also continued.

Rescan Engineering completed a feasibility study on the property in October, 1996. The feasibility study supports the company's view that it can reduce costs and increase efficiency. The effectiveness of the proposed mining methods and mine development strategies has been confirmed and the feasibility study suggests substantial improvement over historic operating costs and recoveries. United Keno Hill Mines adopted the recommendations of the feasibility study and, based on its conclusions, plans to implement a program of rehabilitation and development intended to permit the recommencement of commercial production from Elsa in 1998. In March, 1997, United Keno Hill Mines ceased work on the property pending raising capital.

In July, 1997, United Keno Hill Mines, NDU Resources Ltd., (Marg and Blende properties) and Yukon Gold and Mineral Development Company entered into letters of intent respecting the reactivation of UKHM's mines and mill at Elsa, and the evaluation of the merits of a joint operation between UKHM and NDU involving a common milling facility and related infrastructure utilizing UKHM's present facilities at Elsa. The agreement with Yukon Gold and Mineral Development was terminated in December, 1997, leaving NDU Resources and United Keno Hill Mines to complete their merger.

The Yukon Water Board issued a water license to United Keno Hill Mines in August, 1997. The water license has been signed by DIAND. The company is now attempting to raise the production capital necessary to complete surface rehabilitation and mine development.

United Keno Hill Mines Ltd. plans to resume production at Elsa at an average rate of 500 tons per day. First year production is forecast at approximately 6,000,000 ounces

## UNITED KENO HILL PROPERTY

---

of silver at an average cost of approximately US\$3 per ounce. Once production has resumed, initial activities will concentrate on further expansion of the mineral resources at Elsa, and then on establishing the feasibility of the Marg deposit and the economics of a new 2,500 to 3,000 tons per day mill to be constructed at Elsa. Pre-production and working capital is estimated at \$15 million. A bus in and out operation on a rotational schedule with on-site bunkhouse accommodation is contemplated.

In August, 1998, United Keno Hill Mines Ltd. accepted a proposal from Procon Mining and Tunnelling Ltd. for the provision of contract rehabilitation, development and

mining services at Elsa. These services are expected to reduce capital requirements by approximately 40%.

In October, 1999, United Keno Hill Mines Ltd. acquired the Clear Lake lead, zinc, silver deposit in the central Yukon from Energold Minerals Inc. through issuance of shares. Energold has agreed to provide United Keno with up to \$2 million in working capital financing subject to certain terms and conditions relating to security.

# WELLGREEN PROPERTY

## Northern Platinum Ltd.

President: John McGoran

### Corporate headquarters

#206-837 West Hastings Street  
Vancouver, British Columbia V6C 1B6

Phone (604) 669-3522

Fax (604) 669-3522

### PROJECT STATUS

Exploration ongoing



## HISTORY

The Wellgreen deposit was discovered in 1952 by the Yukon Mining Corporation Limited and optioned to Hudson Bay Mining and Smelting Ltd. From 1952 to 1955, Hudson Bay explored with 4,267 m of drifting and raising from four levels, two internal shafts and 19,815 m of surface and underground drilling. The property was transferred in 1955 to Hudson-Yukon Mining Company Ltd. They conducted a Turam survey in 1968, drilled 762 m, prepared a feasibility study in 1969, and arranged a marketing agreement with Sumitomo in 1970. Due to underground problems, initial production from the 544 tonne/day mill was delayed from September, 1971 to May, 1972, and was suspended in July, 1973 after treating only 171,652 tonnes. Total production was 33,853 tonnes of concentrate grading 7.4% nickel and 6.6% copper.

The property was optioned in June, 1986 by the Kluane Joint Venture which carried out grid soil sampling,

### Location

125 km northwest of Haines Junction

### Ownership

Northern Platinum Ltd.

### Commodities

Copper, nickel, platinum, palladium

### Ore type

Sulphide

### Geological resource

50,032,466 tonnes

Copper: 0.35%

Nickel: 0.36%

Platinum: 0.54 grams/tonne

Palladium: 0.34 grams/tonne

### Mining method

Open-pit, 365 days per year

### Processing method

Conventional mill, on-site smelter

### Mine life

12 years

### Power

35 MW

mapping, prospecting, bulldozer trenching and test geophysical surveys. Hudson-Yukon was purchased by Galactic Resources Ltd. in June, 1986 and merged with All-North Resource Ltd. in November, 1986. In 1987, additional soil sampling, bulldozer trenching, geophysical surveys, underground rehabilitation and 4,932 m of diamond drilling in 45 holes were carried out. In 1988, the 4,250 level was rehabilitated and 34 underground holes were drilled totaling 5,500 m. On surface, bulldozer trenching and 37 holes totalling 6,073 m were drilled in addition to bulldozer trenching. Metallurgical tests and a preliminary feasibility study were carried out in 1988 and 1989.

J.P. Sheridan and Northern Platinum optioned the property in June, 1994 from All-North Resources. All-North Resources granted an option to earn an 80% interest to Sheridan in return for \$80,000 cash and a commitment to spend \$4 million on exploration by November 30, 2002. Sheridan, in turn, assigned the

## WELLGREEN PROPERTY

option to Northern Platinum, retaining back-in rights for half of that company's interest at the feasibility stage. Sheridan is a director of Northern Platinum. Northern Platinum has been carrying out reserve evaluation drilling, underground sampling and exploration.

In the summer of 1999, Northern Platinum Ltd. received Vancouver Stock Exchange approval to purchase Kaieteur Resource Corp. (formerly named All-North Resources Ltd.) and J. Patrick Sheridan's 20% interest in the Wellgreen property for \$25,000 cash and 150,000 Northern Platinum shares. Northern Platinum now owns 100% interest in Wellgreen, subject to a 1.5% net smelter return in favour of Hudson Bay Mining and Smelting Co. Ltd. Upon completion of a positive feasibility study, Belleterre Quebec Mines Limited has the right to back into the project for a 50% interest upon paying 50% of Northern Platinum costs.

### PROJECT SUMMARY

The Wellgreen platinum group metal (PGM) rich, copper-nickel deposit is located in the southwestern Yukon, approximately 317 km northwest of Whitehorse and 125 km northwest of the town of Haines Junction. The property consists of 91 claims held under a renewable 21-year mining lease which expires December 5, 1999. An intensive underground sampling program took place on the Wellgreen deposit during the winter of 1997-98. The goal of the program was to determine the grade and tonnage of massive sulphides which could quickly be extracted if a mining operation was to commence.

### GEOLOGY, MINERALOGY AND ORE RESERVES

Mineralization on the Wellgreen property occurs within a variably serpentinized, 20-km-long ultramafic body, known as the Quill Creek Complex, that intrudes Permian sedimentary and volcanic rocks. Three main zones of PGM-enriched copper-nickel mineralization have been

outlined on the Wellgreen property, the East Zone, the West Zone and the North Zone. Proven and probable reserves are estimated to be 50.03 million tonnes grading 0.35% copper, 0.36% nickel, 0.54 grams/tonne platinum, and 0.34 grams/tonne palladium.

Northern Platinum did not conduct any exploration on the property during 1995. During the 1996 program, a total of 57 holes were drilled. The drill results confirmed previous tonnage and grade calculations, and several zones of higher grade material were indicated. A mining plant, complete with compressors, generators, office facilities, bunk house and cook house facilities has been established near the portal of the adit.

During the summer of 1997, drilling took place on the Linda claims, southeast of the Wellgreen deposit. Assays over 1.3 m of massive sulphides returned average grades of 4.12% Ni, .89% Cu, .06 ounces/ton Pt and .043 ounces/ton Pd. The lower showing is disseminated to semi-massive sulphides over a width of 20 feet of broken rock ranging from 2.94% Cu and 3.02% Ni, with platinum and palladium assays as high as 0.13 ounces/ton Pt and 0.40 ounces/ton Pd. Drilling in the vicinity of the lower showing intersected sulphide mineralization grading 0.175 % Cu and 0.187 % Ni over 20 feet.

### PRODUCTION

A 1989 preliminary feasibility report by consultants Watts, Griffis and McQuat proposed open-pit mining at 10,000 tonnes per day (3.65 million tonnes per year) at an average stripping ratio of 3.5:1; processing by conventional mill producing a concentrate with approximately 15% combined copper and nickel as well as PGMs and the cobalt, gold and silver in the ore; and, a Noranda reactor type smelter to reduce the shipping cost. The smelter would produce a 40% copper-nickel matte on site. Capital costs were estimated at \$228 million and operating costs were thought to be about \$18.61 per tonne ore. The power requirements are expected to be about 35 MW and the project should employ 400 to 500 people.

# WOLF PROPERTY

## Atna Resources Ltd.

President: Peter DeLancey

Corporate headquarters  
#1550, 409 Granville Street  
Vancouver, British Columbia V6C 1T2

Phone (604) 684-2285

Fax (604) 684-8887

Toll free 1-800-789-ATNA

E-mail atna@atna.com

Web site www.atna.com

## PROJECT STATUS

Exploration planned



## HISTORY

The first recorded discovery of mineralization on the Wolf property was in 1955, but it wasn't until 1966 that Newmont Mining Corp. staked claims, constructed a tote road and carried out mapping, soil sampling and hand trenching. Hescra Resources Ltd. restaked the property in 1972 and drilled two X-ray holes in 1974. Newmont and Asamera restaked in 1976 and explored in 1977 and 1978 with geochemical, geophysical and mapping surveys, trenching and drilling. Amax, who transferred its interest to Canamax Resources in 1982, staked in 1982 and carried out surface work in 1983.

YGC Resources Ltd. staked the Wolf claims in 1990 and Cominco surrounded the Wolf claims a few days later with the Fox claims. YGC tied on the Lynx claims in 1991. Later in 1991, Cominco optioned the Wolf and Lynx claims from YGC and performed mapping, geochemistry

## Location

90 km southeast of Ross River

## Ownership

Joint venture between Atna Resources Ltd. (65%) and YGC Resources Ltd. (35%)

## Commodities

Zinc, lead, silver

## Ore type

Sulphide

## Inferred resource

4.1 million tonnes

Zinc: 6.2%

Lead: 1.8%

Silver: 84 grams/tonne

and geophysics. The option was dropped and in 1995, YGC then optioned the Wolf claims to Atna Resources. Atna carried out lithochemical sampling and reconnaissance geological mapping in 1995 and 1996, followed by three diamond drill holes (399 m) in 1996. The three holes intersected significant, but subeconomic zinc, lead and silver. In 1997, Atna carried out a C\$400,000 drill program (nine holes, 2,956 m) and intersected massive sulphide mineralization. Continued drilling (30 holes, 6,625 m) in 1998 located the down-dip extension of the mineralized upper horizon. A total of 31 diamond drill holes over a 600 m strike length and a 500 m down-dip width into the deposit have been completed. The property was dormant in 1999. Atna has completed its option requirements (65% interest for expenditures of \$1.5 million over a five-year period) and the Wolf property is now managed by a joint venture between Atna and YGC Resources.

### **PROJECT SUMMARY**

The Wolf property is located approximately 90 km southeast of Ross River, Yukon, on NTS map sheets 105G/5 and 6 in the Finlayson Lake volcanogenic massive sulphide camp. The property is 45 km west of Cominco's Kudz Ze Kayah deposit and 65 km from the Wolverine deposit. The property, as of early 1999, consists of 23 mineral claims covering an area of 481 hectares. Access is by helicopter from Ross River or from the Hoole airstrip, located on the Hoole River, 22 km north of the property.

### **GEOLOGY, MINERALOGY AND ORE RESERVES**

The Wolf property is underlain by Devonian to Mississippian volcanic rocks, including felsic tuffs, pyroclastic flows, trachyte flows, mudstones, and carbonates which form an arcuate belt nearly 5 km wide and 130 km long. The belt lies within the Pelly Mountains and hosts numerous volcanogenic massive sulphide showings.

The Wolf deposit is hosted in one of four stratigraphic levels of volcanogenic massive sulphide and exhalative barite mineralization. The deposit is a tabular massive sulphide horizon across a 600 m strike length and approximately 500 m in the down-dip direction. Most of the mineralization is hosted in a higher grade "keel" that has a strike length of 125 m, a down-dip length of 400 m, an average thickness of 12 m and dips 45 degrees to the south. The stratigraphy may have been overturned.

The Wolf deposit has an inferred resource of 4.1 million tonnes grading 6.2% zinc, 1.8% lead and 84 grams/tonne silver.

The Wolf deposit is open along strike and down-dip. Discovery of the East Slope Zone, 1200 m east of the Wolf deposit has enhanced the exploration potential of the property.

# WOLVERINE PROPERTY

## Expatriate Resources Ltd.

President and Chief Executive Officer:  
Harlan Meade

### Corporate headquarters

#1016, 510 West Hastings Street  
Vancouver, British Columbia V6B 1L8

Phone (604) 688-2568  
Fax (604) 688-2578  
E-mail [expat@expatriateresources.com](mailto:expat@expatriateresources.com)  
Web site [www.expatriateresources.com](http://www.expatriateresources.com)

## Atna Resources Ltd.

President: Peter DeLancey

### Corporate headquarters

#1550, 409 Granville Street  
Vancouver, British Columbia V6C 1T2

Phone (604) 684-2285  
Fax: (604) 684-8887  
Toll free 1-800-789-ATNA (2862)  
E-mail [atna@atna.com](mailto:atna@atna.com)  
Web site [www.atna.com](http://www.atna.com)

## PROJECT STATUS

Metallurgical studies in progress; drilling is planned

### Location

130 km southeast of Ross River

### Ownership

Joint venture between Expatriate Resources Ltd. (60%) Atna Resources Ltd. (40%)

### Commodities

Zinc, copper, lead, silver, gold

### Ore type

Sulphide

### Geological (drill-indicated) resource

6.237 million tonnes

Zinc: 12.66%

Copper: 1.33%

Lead: 1.55%

Silver: 370.9 grams/tonne

Gold: 1.76 grams/tonne



## HISTORY

The property was originally staked as the Fetish claims in July, 1973 by Finlayson JV (Chevron Canada Limited, Union Oil Company of Canada Ltd., and Marietta Resources International Ltd. and Messrs. L.T. and Harris Clay), which conducted grid soil sampling, mapping and trenching later in the year and drilled two holes. Additional Fetish claims were staked in August, 1974. The property was restaked as the Kink claims in September, 1982 by Archer, Cathro and Associates and optioned briefly to Esso Mineral Limited, who conducted airborne and geophysical surveys later in the year.

By July, 1993, only one Kink claim remained and the rest of the property was restaked as the Foot 1-20 claims by Atna Resources, which later added the Pak and Toe

claims. Atna explored with prospecting, geological mapping, and soil and silt geochemistry in September, 1993. The property was optioned by Westmin Resources Limited and a drill program in 1995 resulted in the discovery of the Wolverine deposit on the Kink claims. By the end of 1995, Westmin had earned a 60% interest in the project and entered into a 60/40 joint venture, with Westmin as operator.

In February, 1998, Boliden Limited acquired the assets of Westmin Resources Limited. In May, 1998, Boliden Westmin Ltd. entered into a letter of intent with Expatriate Resources Ltd. to sell its interest in mineral properties and assets in the Finlayson Lake area, including Boliden Westmin's 60% interest in the Wolverine project. Expatriate completed the sale agreement with Boliden in March, 1999 and became the operator of the Wolverine

# CORRECTION

THE FOLLOWING DOCUMENT(S)  
HAVE BEEN REFILMED TO  
ASSURE LEGIBILITY OR PAGINATION



Rev. 6/98

Central Microfilm Services  
Department of Education & Early Development  
State of Alaska

# WOLVERINE PROPERTY

## Expatriate Resources Ltd.

President and Chief Executive Officer:  
Harlan Meade

**Corporate headquarters**  
#1016, 510 West Hastings Street  
Vancouver, British Columbia V6B 1L8

Phone (604) 688-2568  
Fax (604) 688-2578  
E-mail [expat@expatriateresources.com](mailto:expat@expatriateresources.com)  
Web site [www.expatriateresources.com](http://www.expatriateresources.com)

## Atna Resources Ltd.

President: Peter DeLancey

**Corporate headquarters**  
#1550, 409 Granville Street  
Vancouver, British Columbia V6C 1T2

Phone (604) 684-2285  
Fax: (604) 684-8887  
Toll free 1-800-789-ATNA (2862)  
E-mail [atna@atna.com](mailto:atna@atna.com)  
Web site [www.atna.com](http://www.atna.com)

## PROJECT STATUS

Metallurgical studies in progress; drilling is planned

## HISTORY

The property was originally staked as the Fetish claims in July, 1973 by Finlayson JV (Chevron Canada Limited, Union Oil Company of Canada Ltd., and Marietta Resources International Ltd. and Messrs. L.T. and Harris Clay), which conducted grid soil sampling, mapping and trenching later in the year and drilled two holes.

Additional Fetish claims were staked in August, 1974. The property was restaked as the Kink claims in September, 1982 by Archer, Cathro and Associates and optioned briefly to Esso Mineral Limited, who conducted airborne and geophysical surveys later in the year.

By July, 1993, only one Kink claim remained and the rest of the property was restaked as the Foot 1-20 claims by Atna Resources, which later added the Pak and Toe

### Location

130 km southeast of Ross River

### Ownership

Joint venture between Expatriate Resources Ltd. (60%) Atna Resources Ltd. (40%)

### Commodities

Zinc, copper, lead, silver, gold

### Ore type

Sulphide

### Geological (drill-indicated) resource

6.237 million tonnes

Zinc: 12.66%

Copper: 1.33%

Lead: 1.55%

Silver: 370.9 grams/tonne

Gold: 1.76 grams/tonne



claims. Atna explored with prospecting, geological mapping, and soil and silt geochemistry in September, 1993. The property was optioned by Westmin Resources Limited and a drill program in 1995 resulted in the discovery of the Wolverine deposit on the Kink claims. By the end of 1995, Westmin had earned a 60% interest in the project and entered into a 60/40 joint venture, with Westmin as operator.

In February, 1998, Boliden Limited acquired the assets of Westmin Resources Limited. In May, 1998, Boliden Westmin Ltd. entered into a letter of intent with Expatriate Resources Ltd. to sell its interest in mineral properties and assets in the Finlayson Lake area, including Boliden Westmin's 60% interest in the Wolverine project. Expatriate completed the sale agreement with Boliden in March, 1999 and became the operator of the Wolverine

## WOLVERINE PROPERTY

joint venture. Boliden currently has a 42% equity interest in Expatriate.

In 1999, joint venture partners Expatriate Resources and Atna Resources spent \$200,000 conducting metallurgical and marketing investigations on the Wolverine ore. Results indicate that two of the metallurgical processes investigated would provide saleable products and are economically attractive.

Cost benefit analysis and planning for the start of the pre-feasibility study and a review of exploration and permitting requirements is in progress.

### PROJECT SUMMARY

The Wolverine property is located approximately 130 km southeast of Ross River and 20 km east of Cominco's Kudze Kayah project. The volcanogenic massive sulphide deposit has a mineral resource of over 6 million tonnes of zinc, copper, lead, silver and gold. In 1996, an airstrip was constructed near the Wolverine deposit. Environmental, geotechnical and metallurgical work is continuing. In May, 1997, metallurgical concerns regarding the selenium content in the sulphide minerals were reported. The selenium content is greater than what is normally treated by copper and zinc smelters; however, the joint venture partners have received positive results from metallurgical investigations, conducted in 1999.

Discussions with the Ross River Dena Development Corp. were initiated in 1997 to negotiate a socio-economic agreement with members of the local First Nation community.

### GEOLOGY, MINERALOGY AND ORE RESERVES

The Wolverine deposit is a high-grade volcanogenic massive sulphide (VMS) body. The zinc-copper-lead-silver-gold mineralization is hosted within a thick sequence of felsic volcanic rocks interbedded with argillaceous and epiclastic sedimentary rocks of probable Devonian age within the Yukon-Tanana terrane. The main sulphide minerals in the deposit, in decreasing order of abundance, are pyrite, sphalerite, chalcopyrite and galena. Most of the silver occurs with argentian

tetrahedrite, with the remainder occurring in galena and electrum.

The 1996 field program, which cost an estimated \$6 million, commenced with construction of an air strip near the Wolverine deposit. Drilling started in mid-March and was completed in October. The known Wolverine Zone was expanded to the northwest with the discovery of the Lynx Zone immediately to the west. Exploration was also done on the Fisher Zone and Toe Claims. The 1996 drilling program significantly expanded the known area of mineralization at Wolverine and brought the number of massive sulphide intersections from 15 in 1995 to 49 to the end of the 1996 program. Systematic geological and geochemical evaluation of the numerous airborne geophysical targets on the remainder of the claims was also carried out in 1996.

During the 1997 program, the Sable Zone was discovered 1.6 km southeast of the Wolverine Zone by recognition of the footwall-type alteration zone in a drill hole. Thin zones of high-grade massive sulphides were intersected in two holes along with significant alteration. Chalcopyrite and pyrrhotite veins in chlorite-altered footwall rocks suggest feeder-style alteration associated with a massive sulphide deposit.

Drilling in 1997 of the Wolverine deposit took place on the margins of the deposit as outlined by the 1995 and 1996 drilling. Of the 22 successfully completed holes drilled in the Wolverine deposit during 1997, 19 intersected ore grade mineralization. In January, 1998, a new mineral resource estimate for Wolverine was released: 6,237,000 tonnes at a grade of 12.66% Zn, 1.55% Pb, 1.33% Cu, 370.9 grams/tonne Ag and 1.76 grams/tonne Au. Most of the tonnage (5.9 million tonnes) is in the main Wolverine and Lynx lenses. The mineral resource within these lenses is classified as indicated; 44% of the estimated tonnage occurs within 25 m from a drill intersection, 48% of the estimated tonnage occurs between 25 and 50 m from a drill intersection and 8% of the estimated tonnage occurs between 50 and 75 m from a drill intersection. The average thickness of 5.1 m decreased slightly as a consequence of the 1997 drilling taking place largely on the edges of the lenses. The deposit is now effectively delimited along strike but is open down-dip to the edge of the joint venture claim.

## APPENDIX: YUKON MINERAL DEPOSITS

The following tables list Yukon mineral deposits which have reserves. These deposits are listed numerically on the Yukon mineral deposits map on page A-2 to 3.

The tables are comprised of information gathered from a variety of sources including Yukon Minfile, company press releases and web sites, DIAND and Yukon Geology Program publications, and other historical sources of information.

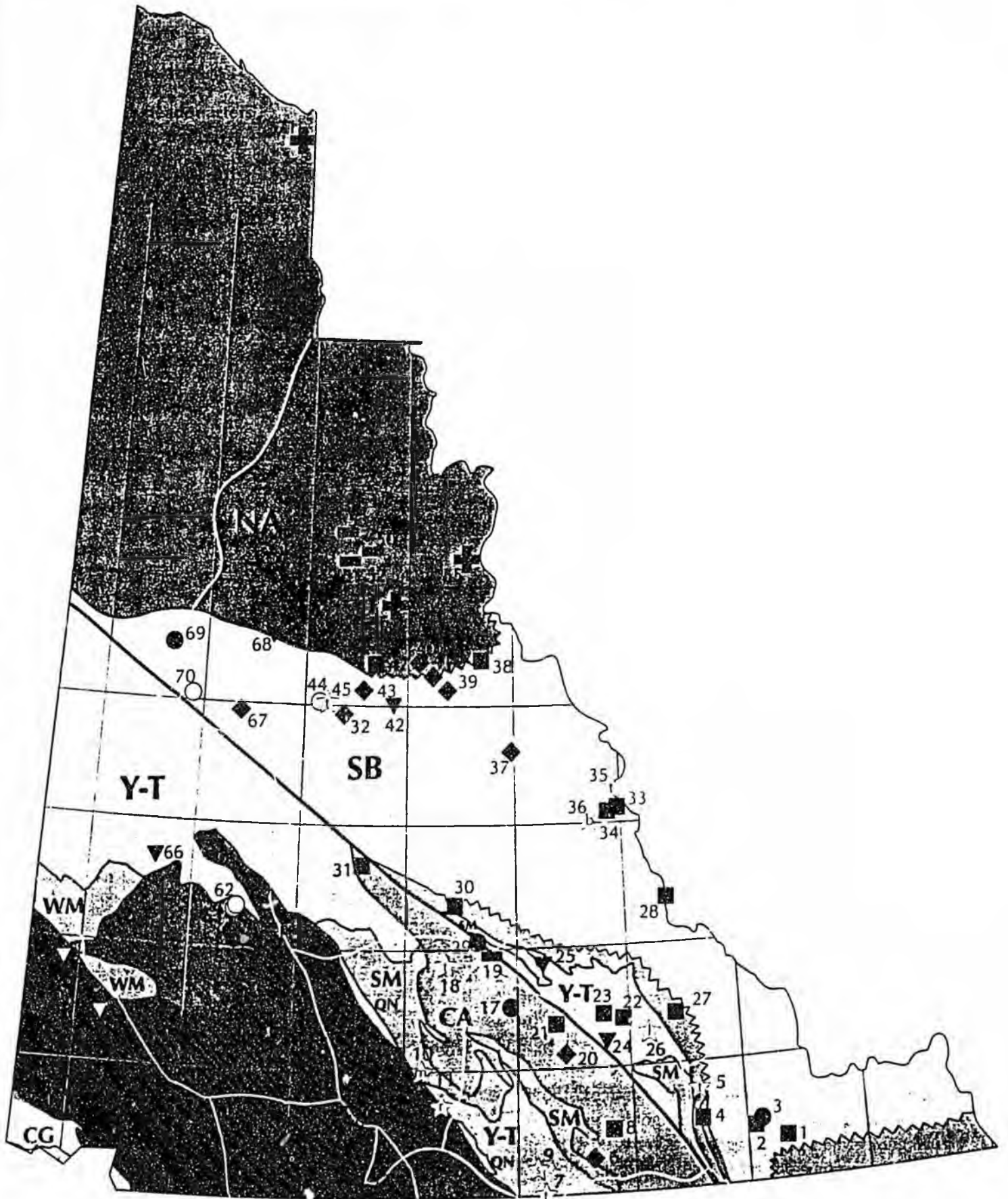
The tables are divided into commodities.

- Copper
- Gold
- Lead-zinc
- Silver
- Tungsten
- Other
- Coal

Each table contains the following information.

- Name of deposit
- Corresponding number on Yukon mineral deposits map
- Other names the deposit is known by
- Owner or contact
- Commodity or commodities
- Yukon Minfile reference number
- N.T.S. map sheet
- Latitude and longitude
- Location
- Reserves in tonnes
- Grade
- Comments

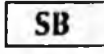
# YUKON MINERAL DEPOSITS - Map



# YUKON MINERAL DEPOSITS - Legend


## CRATON

 Platforms


 Selwyn Basin


## TERRANES

 Cassiar

 Yukon-Tanana

 Nisling

 Slide Mountain

 Cache Creek

 Stikinia

 Windy-McKinley

 Alexander

 Wrangellia

 Chugach

 Undivided metamorphics

○ Au

● Au (±Ag, ±Cu, ±Pb, ±Zn, ±Mo)

◆ Ag (±Pb, ±Zn, ±Cu, ±Au)

■ Pb-Zn (±Ag, ±Au, ±Cu, ±Ba)

▼ Cu (±Mo, ±Au, ±Ag, ±Pb, ±Zn)

▽ Ni-Cu

■ Coal

⊕ Iron

t<sup>-</sup> b = barite

t = tungsten

m = moly

r = rhodonite

j = jade

s = tin

- |                             |  |  |
|-----------------------------|--|--|
| 1. Mel                      | 26. King Arctic                              | 50. Garlic Ring                          |
| 2. McMillan                 | 27. Matt Berry                               | 51. Illtyd (Bonnet Plume Coal)           |
| 3. Hyland Gold              | 28. Howard's Pass                            | 52. Pan Ocean (West Illtyd)              |
| 4. Sa Dena Hes              | 29. Grew Creek                               | 53. Deslaurier                           |
| 5. Bailey                   | 30. Faro, Grum, Vangorda, Grizzly (DY), Swim | 54. Spaceship                            |
| 6. Hart                     | 31. Clear Lake                               | 55. Crest                                |
| 7. Logtung                  | 32. United Keno Hill                         | 56. Wellgreen                            |
| 8. Logan                    | 33. Tom                                      | 57. Canalask                             |
| 9. JC                       | 34. Jason                                    | 58. Division                             |
| 10. Red Mountain            | 35. Mactung                                  | 59. Williams Creek                       |
| 11. Mariin                  | 36. Samovar (Tea)                            | 60. Minto/Dei                            |
| 12. Venus                   | 37. Plata/Inca                               | 61. Tantalus                             |
| 13. Skukum                  | 38. Coz                                      | 62. Laforma                              |
| 14. Goddell                 | 39. Craig                                    | 63. Brown-McDarde                        |
| 15. Mt. Reid (Skukum Creek) | 40. Vera                                     | 64. Mount Nansen (Webber, Huestis, Flex) |
| 16. Whitehorse Copper       | 41. Val                                      | 65. Antoniuuk                            |
| 17. Ketza                   | 42. Marg                                     | 66. Casino                               |
| 18. Risby                   | 43. Clark                                    | 67. Zeta                                 |
| 19. Whiskey Lake            | 44. Dublin Gulch                             | 68. Hart River                           |
| 20. Tintina (Eagle)         | 45. Garnet (Ray Gulch)                       | 69. Marn                                 |
| 21. Wolf                    | 46. Pagisteel                                | 70. Brewery Creek                        |
| 22. Wolverine Lake          | 47. Blende                                   | 71. Boundary                             |
| 23. Kudz Ze Kayah           | 48. Marathon (Airstrip)                      |  |
| 24. Fyre                    | 49. Pole (Wernecke)                          |  |
| 25. Ice                     |  |  |

Canada

 YUKON  
GEOLOGY PROGRAM

 Yukon  
Government

## YUKON MINERAL DEPOSITS

## COPPER

<b>WHITEHORSE COPPER [16]</b> Coyne H. & Sons, and others	<i>Commodity:</i> Copper (Cu, Au, Ag)	<i>Minfile:</i> 105D 053 <i>Map:</i> 105D/11 60°40'N; 135°05'W Whitehorse	<i>Reserves:</i> 2,982,000 <i>Grade:</i> 1.0% Cu	<i>Status:</i> Inactive, former producer. Discovered in 1887. Mine operated intermittently from 1900 to 1982 and a total of 10,130,000 tonnes was mined with an average grade of 1.5% Cu. Approximately 177,000 oz Au and 2.6 million ounces of Ag were extracted. Total value of production in 1993 was C\$496 million. 1990-91: 500 m of rotary drilling in 7 holes, geophysical survey and trenching.
<b>FYRE [24]</b> Pacific Ridge Exploration Ltd.	<i>Commodity:</i> Copper (Cu, Au, Co)	<i>Minfile:</i> 105G 034 <i>Map:</i> 105G/02 61°14'N; 130°31'W 160 km NW of Watson Lake	<i>Reserves:</i> 15,400,000 (drill-indicated) <i>Grade:</i> Within the 15.4 million, 8.2 million tonnes grade 2.1% Cu, 0.73 g/t Au and 0.11% Co	<i>Status:</i> Inactive. Discovered in 1960. 1996: extensive geological, geochemical and geophysical surveys, 71 diamond-drill holes (9,532 m). 1997: 44 diamond-drill holes (13,500 m). Preliminary scoping study and preliminary metallurgical tests complete.
<b>ICE [25]</b> Expatriate Resources Ltd.	<i>Commodity:</i> Copper (Cu, Au, Ag, Co)	<i>Minfile:</i> 105G/118 <i>Map:</i> 105G/14 61°52'N; 131°21'W 65 km E of Ross River	<i>Reserves:</i> 4,561,863 tonnes (drill-indicated) <i>Grade:</i> 1.48% Cu	<i>Status:</i> Under active exploration. Discovered in 1995. 1996: airborne magnetics/electromagnetics, ground geophysics, geochemistry, mapping and prospecting, followed up by a diamond-drill program. 1997: 7,880 m diamond-drill program. 1998: ore-reserve calculations completed. Includes open-pit resources.
<b>MARG [42]</b> United Keno Hill Mines Ltd.	<i>Commodity:</i> Copper (Cu, Zn, Pb, Ag, Au)	<i>Minfile:</i> 106D 009 <i>Map:</i> 106D/01 64°01'N; 134°28'W 50 km ENE of Elsa	<i>Reserves:</i> 6,092,000 (geological) <i>Grade:</i> 1.76% Cu, 4.6% Zn, 2.46% Pb, 62.7 g/t Ag, 1.0 g/t Au	<i>Status:</i> Inactive. Discovered in 1965. 1987: airstrip construction and road building. 1990: 4,119 m diamond drilling in 10 holes. 1995-96: 29 drill holes. 1997: winter road into site completed to facilitate development. 1996 reserves are drill-indicated. Deposit limits have not been defined.
<b>WILLIAMS CREEK [59]</b> (Carmacks Copper) Western Copper Holdings Ltd.	<i>Commodity:</i> Copper (Cu, Ag, Au)	<i>Minfile:</i> 115I 008 <i>Map:</i> 115I/07 62°21'N; 136°42'W 28 km NW of Carmacks	<i>Reserves:</i> 14,100,000 (mineable); 22,400,000 (geological) <i>Grade:</i> 14,100,000 at .99% Cu, 0.51 g/t Au 22,400,000 at 1.1% Cu	<i>Status:</i> Permitting stage. Discovered in 1970. 1993: construction of test facility for heap leaching during cold winter months. Test plant results are positive. Feasibility study completed in November, 1994. Three studies submitted to RERC and the property is in the final stages of the permitting process. 1995: additional geotechnical work completed. 1999: project review continuing under the EARP process.
<b>MINTO (Def) [60]</b> Minto Exploration Ltd.	<i>Commodity:</i> Copper (Cu, Ag, Au)	<i>Minfile:</i> 115I 021 <i>Map:</i> 115I/11 62°37'N; 137°14'W 80 km NW of Carmacks	<i>Reserves:</i> 8,818,000 (geological); 6,510,000 (mineable) <i>Grade:</i> 8,818,000 at 1.73% Cu, 7.54 g/t Ag, 0.48 g/t Au; 6,510,000 at 2.13% Cu, 9.26 g/t Ag, 0.62 g/t Au	<i>Status:</i> Mine development. Discovered in 1971. 1972: airstrip construction. 1974: winter road construction. 1995: diamond drilling in new zones, geotechnical drilling in area of reserves. Reserves are based on exploration to the end of 1992. Received a class A water licence in 1998. Production license received in 1999. Proposed open pit followed by underground mining operation using conventional mill. Company has completed a feasibility study and plans final construction in late 2000 or early 2001.
<b>CASINO [66]</b> Great Basin Gold Ltd.	<i>Commodity:</i> Copper (Cu, Mo, Au, Ag)	<i>Minfile:</i> 115J 028 <i>Map:</i> 115J/10 62°44'N; 138°50'W 150 km NW of Carmacks	<i>Reserves:</i> 675,000,000 (geological), 178,200,000 (mineable) <i>Grade:</i> 675,000,000 at 0.25% Cu, 0.02% Mo, 0.48 g/t Au; 178,200,000 at 0.303% Cu, 0.028% Mo, 0.376 g/t Au	<i>Status:</i> Inactive. Feasibility stage. Discovered in 1967. 1994: extensive infill and geotechnical diamond drilling, metallurgical, environmental, engineering studies. No exploration in 1995, baseline environmental studies continue. Detailed project prefeasibility study completed with open-pit mining proposed. 1997: environmental studies continue.
<b>HART RIVER [68]</b> (Mark) Inco Limited	<i>Commodity:</i> Copper (Cu, Zn, Pb, Au, Ag)	<i>Minfile:</i> 116A 009 <i>Map:</i> 116A/10 64°38'N; 136°51'W 100 km NW of Elsa	<i>Reserves:</i> 523,454 <i>Grade:</i> 1.45% Cu, 3.65% Zn, 0.87% Pb, 1.37g/t Au, 50 g/t Ag	<i>Status:</i> Inactive. Discovered in 1955. 1969: construction of winter road and underground development. Feasibility study completed in 1969. 1994: 6 diamond-drill holes totalling 1,653 m. Reserves are proven and also additional 544,322 tonnes probable ore at similar grade.
<b>CASH [72]</b> Cash Resources Ltd.	<i>Commodity:</i> Copper (Cu, Mo, Au, Ag, Pb, Zn, Sn)	<i>Minfile:</i> 115I 037 <i>Map:</i> 115I/05 62°25'N; 136°42'W 80 km NW of Carmacks	<i>Reserves:</i> 36,300,000 (geological) <i>Grade:</i> 0.17% Cu, 0.018% MoS <sub>2</sub> , 0.2 g/t Au, 0.4-9.1 g/t Ag	<i>Status:</i> Inactive. Discovered in 1969. 1974: airstrip construction. 1989: construction of access road. 1993: linecutting. Reserves are drill-indicated from 1977.

## GOLD

<b>HYLAND GOLD [3]</b> (Porker, Piglet, Quiver, Sow) Adrian Resources Ltd., Cash Resources Ltd.	<b>Commodity:</b> Gold (Au, Pb, Ag)	<b>Minfile:</b> 95D 011 <b>Map:</b> 95D/12 60°31'N; 127°51'W 65 km NE of Watson Lake	<b>Reserves:</b> 6,750,000 <b>Grade:</b> 2.0 g/t Au	<b>Status:</b> Inactive. Discovered in 1954. 1954-1986: intermittent exploration. 1988: bulldozer trenching, soil sampling, 4 holes (376 m), road construction. 1989: winter access road construction. 1990: 41 reverse circulation percussion holes drilled (3,800 m). 1995: 3 diamond-drill holes (439.2 m). Reserves are based on trench assays. This is a low-grade oxide gold deposit with open-pit potential.
<b>VENUS [12]</b> United Keno Hill Mines Ltd.	<b>Commodity:</b> Gold (Au, Ag, Pb, Zn)	<b>Minfile:</b> 105D 005 <b>Map:</b> 105D/02 60°10'N; 134°38'W 15 km S of Carcross	<b>Reserves:</b> 100,000 <b>Grade:</b> 8.37 g/t Au, 247 g/t Ag, 2.09% Pb, 1.49% Zn	<b>Status:</b> Inactive, former producer, mill. Discovered in 1901. Minor production 1910-11, 1925, and 1968-69. 1979: mill construction. Operations suspended, October, 1981, pending higher metal prices. 1987-88: some surface exploration work. 1994: feasibility study on remediation of mine tailings under Federal Arctic Environmental Strategy. Reserves are proven and calculated across a 1.5 m width.
<b>SKUKUM [13]</b> (Mount Skukum) Omni Resources Ltd.	<b>Commodity:</b> Gold (Au, Ag)	<b>Minfile:</b> 105D 158 <b>Map:</b> 105D/03 60°12'N; 135°28'W 40 km W of Carcross	<b>Reserves:</b> 98,885 (oxide ore) <b>Grade:</b> 14.75 g/t Au	<b>Status:</b> Inactive, former producer, mill. Discovered in 1981. Operated from 1986 to 1988 and produced 29,622,270 g Au from 201,461 tonnes of Cirque Zone ore, with an average grade of 13.0 g/t Au. Silver grades are not reported.
<b>GODDELL [14]</b> Omni Resources Ltd., Arkona Resources, Trumpler Yukon Gold	<b>Commodity:</b> Gold (Au, Sb, Ag)	<b>Minfile:</b> 105D 025 <b>Map:</b> 105D/03 60°12'N; 135°17'W 85 km SSW of Whitehorse	<b>Reserves:</b> 900,000 (mineable) <b>Grade:</b> 7.0 g/t Au	<b>Status:</b> Active exploration. Discovered in 1906. Around 1906, trenching and a short adit. 1986: road construction, trenching and mapping. 1987: VLF-EM surveys. 1988: 4 diamond-drill holes (1,976 m). 1990: 7 diamond-drill holes (1,540 m). 1997: underground adit extended 182 m, over 8,500 m of underground drilling (37 holes). 1998: geochemistry, geophysics and diamond drilling.
<b>MT. REID [15]</b> (Skukum Creek) Omni Resources Ltd.	<b>Commodity:</b> Gold (Au, Ag)	<b>Minfile:</b> 105D 022 <b>Map:</b> 105D/03 60°11'N; 135°25'W 35 km W of Carcross	<b>Reserves:</b> Rainbow Zone, 956,949 (mineable); Kuhn Zone, 148,781 (mineable) <b>Grade:</b> Rainbow Zone, 6.3 g/t Au, 193.5 g/t Ag; Kuhn Zone, 8.78 g/t Au, 167.70 g/t Ag	<b>Status:</b> Active exploration. Discovered in 1922. 1985-88: Omni/Skukum Gold J.V., extensive surface and underground exploration and development. Bio-leach tests were positive. Metallurgical tests returned recoveries of 92% for Au and 94.5% for Ag. 1996: 15 hole underground drilling program. 1997: surface drilling around deposit. 1998: geochemistry, geophysics and diamond drilling.
<b>KETZA [17]</b> (Ketza River) YGC Resources Ltd.	<b>Commodity:</b> Gold (Au, Ag)	<b>Minfile:</b> 105F 019 <b>Map:</b> 105F/07 61°30'N; 132°16'W 50 km S of Ross River	<b>Reserves:</b> 234,000 (mineable) <b>Grade:</b> 10.9 g/t Au	<b>Status:</b> Former producer, mill. Discovered in 1954. Production from 1988 to 1990 of over 100,000 ounces of gold. The 1995 exploration program identified new oxide reserves (Fork Zone) of unreported proportions. 1996: detailed geological mapping, prospecting, core-relogging and diamond-drill program. 1997: diamond drilling in the McGiver, Nu and B-mag zones.
<b>GREW CREEK [29]</b> A. Carlos	<b>Commodity:</b> Gold (Au, Ag)	<b>Minfile:</b> 105K 009 <b>Map:</b> 105K/02 62°10'N, 133°08'W 35 km W of Ross River	<b>Reserves:</b> 773,012 (geological) <b>Grade:</b> 8.9 g/t Au, 33.6 g/t Ag	<b>Status:</b> Inactive. Discovered in 1984. 1995: drilling program 1996 17-hole (1,560 m) drill program. Reserves are from 1989 study. Contains a higher grade reserve of 184,947 tonnes grading 12.1 g/t Au.
<b>DUBLIN GULCH [44]</b> New Millennium Mining Ltd.	<b>Commodity:</b> Gold (Au)	<b>Minfile:</b> 106D 025 <b>Map:</b> 106D/04 64°02'N, 135°43'W 20 km NW of Elsa	<b>Reserves:</b> 50,400,000 (mineable), 98,900,000 (geological) <b>Grade:</b> 0.93 g/t Au, 1.19 g/t Au (geological)	<b>Status:</b> Feasibility study phase. First explored in 1970. 1995: diamond drilling (24,500 m in 151 holes), metallurgical testing, engineering studies, economic evaluations and environmental baseline studies. 1998: permitting under CEEA, continued environmental monitoring and baseline studies, results of feasibility study positive with gold recovery of 80% and a stripping ratio of 0.8:1; reserves for an open-pit mineable deposit.
<b>LAFORMA [62]</b> (Mount Freegold) FM Resources Corp.	<b>Commodity:</b> Gold (Au)	<b>Minfile:</b> 115I 054 <b>Map:</b> 115I/07 62°16'N; 137°06'W 50 km NW of Carmacks	<b>Reserves:</b> 152,261 <b>Grade:</b> 5.62 g/t Au	<b>Status:</b> Former producer. Discovered in 1931. 1939-40: 1,286 tonnes milled 1995: continued diamond drilling and trenching. 1995: rehabilitation of the C3 adit for a bulk test.
<b>BROWN-MCDADE [63]</b> (Big Thing, Dome) B.Y.G. Natural Resources Inc.	<b>Commodity:</b> Gold (Au, Pb, Cu, Sb, Zn, Fe, As)	<b>Minfile:</b> 115I 064 <b>Map:</b> 115I/03 62°03'N; 137°17'W 45 km W of Carmacks	<b>Reserves:</b> Open pit mined out, 220,000 (underground) <b>Grade:</b> 6.8 g/t Au, 57 g/t Ag	<b>Status:</b> Past, open-pit producer. Discovered in 1943. 1994-95: diamond drilling, topographic survey, geotechnical drilling, tailings storage study, road construction, tailings dam stripping, construction and rehabilitation of mill and mine buildings. 1996: BYG received a class A water license; production rates at the end of year reached 600 tonnes/day. 1999: mine shut down. Federal government is maintaining the mine site.

## YUKON MINERAL DEPOSITS

## GOLD (continued)

<b>MOUNT NANSEN [64]</b> (Webber, Huestis, Flex) B.Y.G. Natural Resources Inc.	<i>Commodity:</i> Gold (Au, Ag)	Minfile: 1151 065 Map: 1151/03 62°03'N; 137°08'W 45 km W of Carmacks	Flex Zone Geological Reserve 220,000 tonnes Grade 6.8 g/t Au, 57 g/t Ag Webber Zone Mineable Reserve 102,500 tonnes Grade 7.83 g/t Au, 466.4 g/t Ag Huestis Vein Mineable Reserve 148,600 tonnes Grade 11.75 g/t Au, 79.7 g/t Ag	<i>Status:</i> Under active exploration, former producer, mill. Discovered in 1945. Production from Brown-McDade: 1945-47, 1966-67, 1996-99, and from Webber, Huestis: 1968-69, 1976. 1995: expansion and rehabilitation of the existing mill. Flex zone was slated for production after depletion of the Brown-McDade.
<b>ANTONIUK [65]</b> (Mount Freegold) FM Resources Corp.	<i>Commodity:</i> Gold (Au)	Minfile: 1151 111 Map: 1151/06 62°16'N; 137°05'W 50 km NW of Carmacks	Reserves: 4,200,000; 136,000 Grade: 4,200,000 at 1.2 g/t Au; 136,600 at 1.62 g/t Au	<i>Status:</i> Inactive. Discovered in 1931. 1987: the 4.2 million tonne reserve calculated using 0.5 g/t cutoff grade and a 0.8:1 stripping ratio. Cyanide leach test shows that mineralization is amenable to heap leaching.
<b>MARN [69]</b> Battle Mountain	<i>Commodity:</i> Gold (Au, Ag, Cu, W)	Minfile: 116B 147 Map: 116B/07 64°29'N; 138°48'W 55 km NE of Dawson	Reserves: 275,000-330,000 Grade: 8.6 g/t Au, 1% Cu, 0.1% W, 17 g/t Ag	<i>Status:</i> Inactive. Discovered in 1914. 1979: mapping and geochemical sampling. 1980: mapping, sampling, 8 holes drilled (1,004 m). 1981: mapping, surveying, hand trenching, 8 holes (950 m). 1982: mapping, 1983: 13 holes (1,617 m). 1985: Control Source Audio Magnetotellurics survey, 2 holes (867 m). 1993: geological mapping, geochemistry and geophysical surveys. 1996: geology, geochemistry and geophysics program.
<b>BREWERY CREEK [70]</b> Viceroy Resource Corporation	<i>Commodity:</i> Gold (Au)	Minfile: 116B 160 Map: 116 B/01 64°03'N; 138°14'W 57 km E of Dawson City	Reserves: 11,800,000 Grade: 1.13 g/t Au	<i>Status:</i> Production stage. Discovered in 1987. Began heap leach production in Nov. 1996. Reserve figure proven and probable as of Sept. 30, 1999. Forecast 1999 production of 55,000 oz. gold. Ore consists of 8 low-grade oxide gold deposits. On-minesite exploration to increase reserves.
<b>NUCLEUS [75]</b> ATAC	<i>Commodity:</i> Gold (Au)	Minfile: 1151 006 Map: 1151/06 62°20'N; 137°20'W	Reserves: 4,170,000 Grade: 4,170,000 at 1.06 g/t Au including 211,900 at 3.16 g/t Au	<i>Status:</i> Inactive. Discovered in 1968. 1991: 739 m diamond drilling in 5 holes. Large reserve calculated in 1974 and the small higher grade reserve was calculated in 1988. Deposit open to the north and east. Could be developed as an open-pit-mining, heap leach operation.

## LEAD-ZINC

<b>MEL [1]</b> (Jean) International Barytex Resources Ltd.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Barite)	<b>Minfile:</b> 95D 005 <b>Map:</b> 95D/06 60°21'N; 127°24'W 80 km NE of Watson Lake	<b>Reserves:</b> 6,778,000 <b>Grade:</b> 7.1% Zn, 2.03% Pb, 54.69% BaSO <sub>4</sub>	<b>Status:</b> Under active exploration. Discovered in 1967. 1985: airstrip construction. Reserves are drill-indicated and calculated in 1989. 1994: deep drilling totalling 3,123 m, resulting in increasing the drill-indicated inventory. 1995: diamond drilling and geophysical work. 1998: development work conducted.
<b>McMILLAN [2]</b> (Quartz Lake) Noranda Inc.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag)	<b>Minfile:</b> 95D 006 <b>Map:</b> 95D/12 60°32'N; 127°50'W 64 km NE of Watson Lake	<b>Reserves:</b> 1,500,000 <b>Grade:</b> 6.54% Zn, 5.6% Pb, 102.5 g/t Ag	<b>Status:</b> Inactive. Discovered in 1930. 1990: soil sampling, trenching (7 trenches, 810 m) to test gold potential of property. 1993: reclamation program.
<b>SA DENA HES [4]</b> (Mount Hundere) Cominco	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag)	<b>Minfile:</b> 105A 012 <b>Map:</b> 105A/10 60°31'N; 128°53'W 50 km NE of Watson Lake	<b>Reserves:</b> 3,200,000 (geological); 1,400,000 (mineable) <b>Grade:</b> 3,200,000 at 12.90% Zn, 3.7% Pb, 57 g/t Ag; 1,400,000 at 10.2% Zn, 3.5% Pb, 44 g/t Ag	<b>Status:</b> Inactive, former producer, mill. Discovered in 1962. Curragh Resources and Hillsborough Resources brought the property into production in September 1991. Production was halted in December, 1992 due to low metal prices. Cominco acquired the property and has the mine on care-and-maintenance.
<b>LOGAN [8]</b> Energold Minerals Inc.	<b>Commodity:</b> Lead-Zinc (Zn, Ag)	<b>Minfile:</b> 105B 099 <b>Map:</b> 105B/07, 10 60°30'N; 130°27'W 110 km WNW of Watson Lake	<b>Reserves:</b> 12,247,000 <b>Grade:</b> 6.17% Zn, 26.4 g/t Ag	<b>Status:</b> Inactive. Discovered in 1979. 1988: geochemical survey, IP survey, trenching, 6,771 m diamond drilling in 44 holes. Reserves are drill-indicated and lie within 200 m of surface (open-pit). Deposit is unusual in that it contains zinc and silver but no significant lead.
<b>WOLF [21]</b> YCC Resources Ltd.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Cu, Ag, Au)	<b>Minfile:</b> 105G 008 <b>Map:</b> 105G/05 61°20'N; 131°30'W 110 SE of Ross River	<b>Reserves:</b> 4,100,000 (inferred) <b>Grade:</b> 6.2% Zn, 1.8% Pb, 84 g/t Ag	<b>Status:</b> Active exploration. Discovered in 1955. 1967: road construction to within 2 km of showing, mapping, soil sampling and hand trenching. 1976-77: geochemistry, EM and mag surveys, mapping, hand trenching, bulldozer trenching and 3 drill holes (528 m). 1991-92: contour and grid soil sampling, geological mapping and UTEM and magnetic surveys. 1998: 30 diamond-drill holes (6,625 m).
<b>WOLVERINE LAKE [22]</b> (Fetish, Kink) Expatriate Resources Ltd., Atna Resources Ltd.	<b>Commodity:</b> Lead-Zinc (Cu, Pb, Zn, Au, Ag)	<b>Minfile:</b> 105G 072 <b>Map:</b> 105G/08 61°26'N; 130°08'W 135 km SE of Ross River	<b>Reserves:</b> 6,237,000 (drill-indicated) <b>Grade:</b> 1.3% Cu, 1.5% Pb, 12.7% Zn, 1.76 g/t Au, 371 g/t Ag	<b>Status:</b> Active exploration. Discovered in 1973. 1973-93: grid soil sampling, mapping, trenching, 2 drill holes (24.9 m), airborne and Max-Min EM surveys, prospecting, soil and silt geochemistry. 1995: mapping, sampling and geophysical surveys, 24 diamond-drill holes (6,442 m). 1996: 64 drill holes (18,810 m), airborne geophysical survey, regional mapping, geochemical surveys, and airstrip construction. 1997: drilled 22 holes. Metallurgical studies underway.
<b>KUDZ ZE KAYAH [23]</b> (Abm, Tag) Cominco Ltd.	<b>Commodity:</b> Lead-Zinc (Cu, Pb, Zn, Ag, Au)	<b>Minfile:</b> 105G 117 <b>Map:</b> 105G/07 61°27'N; 130°36'W 115 km SE of Ross River	<b>Reserves:</b> 11,300,000 (mineable) <b>Grade:</b> 5.9% Zn, 1.5% Pb, 0.9% Cu, 133 g/t Ag, 1.3 g/t Au	<b>Status:</b> Inactive. Discovered in 1994. 1994: airstrip construction 1995 construction of tote road. 15,000 m of diamond drilling (120 holes), sampling, and engineering and environmental activities. Environmental permitting complete. Class A water licence signed. Open-pit.
<b>MATT BERRY [27]</b> (Barb) International Barytex Resources Corp.	<b>Commodity:</b> Lead-Zinc (Ag, Pb, Zn)	<b>Minfile:</b> 105H 021 <b>Map:</b> 105H/06, 11 61°28'N; 129°25'W Frances Lake	<b>Reserves:</b> 533,434 (drill-indicated) <b>Grade:</b> 103 g/t Ag, 6.1% Pb, 4.8% Zn	<b>Status:</b> Inactive. Discovered in late 1930s. Reserves were calculated in 1989. 1993: 53 km of line cutting.
<b>HOWARD'S PASS [28]</b> (Summit Lake, XY, Anniv, Op) Placer Dome Inc.	<b>Commodity:</b> Lead-Zinc (Zn, Pb)	<b>Minfile:</b> 105I 012 <b>Map:</b> 105I/06 62°28'N; 129°13'W 55 km NW of Cantung	<b>Reserves:</b> 113,400,000 (geological) including 8,200,000 (drill-indicated) <b>Grade:</b> 113,400,000 at 5.4% Zn, 2.1% Pb; 8,200,000 at 10.6% Zn, 5.5% Pb	<b>Status:</b> Inactive. Discovered in 1972. 1974: building of winter road, airstrip and tote roads. 1977: access road built. 1980-81: adit. 1982: drill indicated geological reserves are for both the Howard's Pass and Anniv deposits. 1991 cleanup work. The second reserve quoted is drill-indicated, diluted high grade ore from the core area of the Howard's Pass deposit. In addition, inferred reserves for both deposits are in excess of 362.9 million tonnes.

## YUKON MINERAL DEPOSITS

## LEAD-ZINC (continued)

<b>FARO PIT [30]</b> Interim Receivership: Deloitte and Touche Inc.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag, Au)	<b>Minfile:</b> 105K 061 <b>Map:</b> 105K/06 62°21'N; 133°22'W Faro	<b>Reserves:</b> No reserves, mined out	<b>Status:</b> Former producer, mill. Discovered in 1965. Production began in September, 1969 under Cyprus Anvil Mining Corporation. A total of 32.8 million tonnes grading 5.48% An, 3.6% Pb and about 32 g/t Ag were milled to the end of 1982 when operations ceased due to depressed metal prices. Mining resumed in 1986 under Curragh Resources. Underground mining began within the pit in January, 1990. The Faro orebody was mined out in 1992 and the tailings were diverted to disposal in the Faro pit. About 23.74 million tonnes grading 4.42% Zn, 2.98% Pb and 36.6 g/t Ag were milled from 1986 to 1992. Total production from the Faro orebody was 56.58 million tonnes grading 5.03% Zn, 3.34% Pb, and 33.93 g/t Ag.
<b>VANGORDA [30]</b> Interim Receivership: Deloitte and Touche Inc.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag, Au)	<b>Minfile:</b> 105K 055 <b>Map:</b> 105K/06 62°15'N; 133°12'W Faro	<b>Reserves:</b> mined out	<b>Status:</b> Former producer, mill. Discovered 1953. Stripping of deposit began in 1989 under Curragh Inc. and mining commenced in 1990. Mining ceased in 1993. Anvil Range resumed production from Vangorda Sept., 1995 to the end of 1996. Original reserves were 6.29 million tonnes grading 4.56% Zn, 3.46% Pb, 48 g/t Ag and 0.65 g/t Au.
<b>SWIM [30]</b> Interim Receivership: Deloitte and Touche Inc.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag, Au)	<b>Minfile:</b> 105K 046 <b>Map:</b> 105K/06 62°13'N; 133°02'W Faro	<b>Reserves:</b> 4,750,000 (drill- indicated) <b>Grade:</b> 4.7% Zn, 3.8% Pb, 42 g/t Ag	<b>Status:</b> Discovered 1963. Drill-indicated reserves are within 18-million-tonne deposit of massive sulphide roughly 460 m long and 150 m wide, average thickness of 21 m.
<b>GRUM [30]</b> Interim Receivership: Deloitte and Touche Inc.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag, Au)	<b>Minfile:</b> 105K 056 <b>Map:</b> 105K/06 62°16'N; 133°13'W Faro	<b>Reserves:</b> 16,900,000 (mineable) <b>Grade:</b> 4.9% Zn, 3.0% Pb, 47 g/t Ag	<b>Status:</b> Discovered 1973. Mining commenced under Anvil Range Mining in August, 1995. Production ceased January 16, 1998.
<b>GRIZZLY (Dy) [30]</b> Interim Receivership: Deloitte and Touche Inc.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag, Au)	<b>Minfile:</b> 105K 101 <b>Map:</b> 105K/03 62°14'N; 133°09'W Faro	<b>Reserves:</b> 21,356,000 (probable and possible) <b>Grade:</b> 7.33% Zn, 5.54% Pb, 81.1 g/t Ag, 0.87 g/t Au	<b>Status:</b> Discovered 1976 as Dy deposit. Renamed Grizzly deposit in 1996. Reserves calculated using 9% Pb+Zn cutoff grade. Underground mining only, more exploration needed. Prefeasibility completed in 1996 by Anvil Range.
<b>CLEAR LAKE [31]</b> United Keno Hill Mines Ltd.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag)	<b>Minfile:</b> 105L 045 <b>Map:</b> 105L/14 62°47'N; 135°08'W 80 km NW of Faro	<b>Reserves:</b> 6,100,000 (drill- indicated) <b>Grade:</b> 11.34% Zn, 2.15% Pb, 40.8 g/t Ag	<b>Status:</b> Inactive. Discovered in 1965. 1993: program tested coincident gravity and magnetic anomalies peripheral to the known mineralized area. Also, 1,364 m diamond drilling in 6 holes, gravity and magnetometer surveys, auger-assisted soil testing. Reserve geological, using a cutoff grade of 7% combined Pb-Zn.
<b>TOM [33]</b> Hudson Bay Mining and Smelting	<b>Commodity:</b> Lead-Zinc (Pb, Zn, Ag, Ba)	<b>Minfile:</b> 115O 001 <b>Map:</b> 105O/01 63°08'N; 130°06'W MacPass	<b>Reserves:</b> 9,283,700 (mineable) <b>Grade:</b> 7.5% Pb, 6.2% Zn, 69.4 g/t Ag	<b>Status:</b> Inactive. Discovered in 1951. 1979-81: underground work. 1980-82: feasibility study. 1991: 2,883 m diamond drilling in 7 holes. Reserve calculated using a 7% Zn+Pb cutoff, 15% dilution, 90% recovery.
<b>JASON [34]</b> MacPass Resources Ltd.	<b>Commodity:</b> Lead-Zinc (Pb, Zn, Ag, Ba)	<b>Minfile:</b> 105O 019 <b>Map:</b> 105O/01 63°10'N; 130°10'W MacPass	<b>Reserves:</b> 14,100,000 (geological) <b>Grade:</b> 7.09% Pb, 6.57% Zn, 79.9 g/t Ag	<b>Status:</b> Inactive. Discovered in 1974. 1991: 2553 m diamond drilling in 8 holes. Camp was cleaned up and 88 fuel barrels removed. Reserves (geological) calculated using a cutoff grade of 8% Zn+Pb. Mineralization occurs in 3 zones.
<b>GOZ [38]</b> (Goz Creek) Fairfield Minerals Ltd.	<b>Commodity:</b> Lead-Zinc (Zn)	<b>Minfile:</b> 106C 020 <b>Map:</b> 106C/07 64°26'N; 132°31'W 150 km ENE of Elsa	<b>Reserves:</b> 1,400,000 (drill- indicated) <b>Grade:</b> 10.0% Zn sulphide, 3.5% Zn oxide	<b>Status:</b> Inactive. Discovered in 1973. 1975: 4,208 m diamond drilling in 35 holes. Upper dolomite is considered to have a potential for 10.9 million tonnes grading 8% Zn.
<b>BLENDE [47]</b> United Keno Hill Mines Ltd.	<b>Commodity:</b> Lead-Zinc (Zn, Pb, Ag)	<b>Minfile:</b> 106D 064 <b>Map:</b> 106D/07 64°25'N; 134°40'W 70 km NE of Elsa	<b>Reserves:</b> 19,400,000 (geological) <b>Grade:</b> 3.04% Zn, 2.81% Pb, 55.9 g/t Ag	<b>Status:</b> Inactive. Discovered in 1961. NDU Resources conducted a 596 m drill program over 7 holes during 1994. Water quality studies continuing. Drill-indicated open-pit geological resource based on 1991 drilling. Mineralization is still open to the west, where it projects beneath talus cover.

## SILVER

<b>HART [6]</b> (CMC) W. Hyde	<i>Commodity:</i> Silver (Ag, Pb, Zn)	<i>Minfile:</i> 105B 021 <i>Map:</i> 105B/07 60°20'N; 130°44'W 120 km NW of Watson Lake	<i>Reserves:</i> 97,000 <i>Grade:</i> 1025 g/t Ag	<i>Status:</i> Inactive. Discovered in 1947. 1987: extensive trenching, detailed fracture analysis, 609.6 m drilling in 4 holes on TM zone. Reserves calculated in 1987.
<b>TINTINA [20]</b> (Eagle) Tintina Mines Ltd.	<i>Commodity:</i> Silver (Ag, Zn, Pb)	<i>Minfile:</i> 105G 006 <i>Map:</i> 105C/03 61°09'N; 131°09'W 115 km SE of Ross River	<i>Reserves:</i> 90,900 <i>Grade:</i> 686 g/t Ag, 10.0% Zn, 6.0% Pb	<i>Status:</i> Inactive. Discovered in 1961. 1962: winter road construction and underground work. 1987: 1,712 m diamond drilling in 15 holes, trenching. Reserves were calculated in 1979 and are drill-indicated and inferred.
<b>UNITED KENO HILL [32]</b> United Keno Hill Mines Ltd.	<i>Commodity:</i> Silver (Au, Ag, Pb, Zn)	<i>Minfile:</i> 105M 001 <i>Map:</i> 105M/13, 14 63°55'N; 135°30'W Elsa	<i>Reserves:</i> 520,000 (mineable), 944,000 (geological) <i>Grade:</i> 520,000 at 6.64% Pb, 4.95% Zn, 1049 g/t Ag; 944,000 at 4.8% Pb, 3.9% Zn, 930 g/t Ag	<i>Status:</i> Former producer, mill. Discovered in 1903. From 1921-1988, there has been 4.8 million tonnes milled which produced 6.9 million grams of Ag, 322 million kg of Pb, and 198 million kg of Zn. Operations suspended in January, 1989. 1994: diamond and reverse circulation drilling, geophysics on the Silver King, Husky SW and Bellekeno areas, and a winter (1995) program of rehabilitation and de-watering of the Bellekeno and Silver King mines, as well as underground diamond drilling and ore delineation. 1997: placed on care-and-maintenance.
<b>PLATA/INCA [37]</b> Big Blackfoot Resources Ltd.	<i>Commodity:</i> Silver (Ag, Pb, Au)	<i>Minfile:</i> 105N 003 <i>Map:</i> 105N/09 63°53'N; 132°02'W 180 km N of Ross River	<i>Reserves:</i> 206,000 <i>Grade:</i> 3.3 g/t Au, 267.5 g/t Ag	<i>Status:</i> Under active exploration. Past, open-pit producer. Discovered in 1969. 1973: construction of winter road, bush airstrip and 25 km of tote roads, grid soil sampling, detailed mapping and bulldozer trenching. 1976, 1983, 1984, 1990: 450, 1360 tonnes mined and shipped to smelter. 1984-85: 260 m cross-cut driven 100 m vertically below no. 2 vein open pit, drilled 13 holes. 1987: 670 m of holes drilled and mined from no. 4 and no. 6 veins. 1998: 16 drill holes (200 m)
<b>CRAIG [39]</b> Manson Creek Resources	<i>Commodity:</i> Silver (Ag, Zn, Pb)	<i>Minfile:</i> 106C 073 <i>Map:</i> 106C/03 64°09'N; 133°20'W 105 km NE of Elsa	<i>Reserves:</i> 964,000 (drill-indicated) <i>Grade:</i> 13.5% Zn, 8.5% Pb, 112 g/t Ag	<i>Status:</i> Active exploration, feasibility study phase. Discovered in 1976. 1986: hand trenching. 1998: exploration of several showings within the area.
<b>VERA [40]</b> (Rusty Mountain) Manson Creek Resources	<i>Commodity:</i> Silver (Ag, Pb, Zn)	<i>Minfile:</i> 106C 083 <i>Map:</i> 106C/05 64°18'N; 133°44'W 70 km NE of Elsa	<i>Reserves:</i> 850,000 (drill-indicated) <i>Grade:</i> 306 g/t Ag, 3.7% Pb + Zn	<i>Status:</i> Active exploration. Discovered in 1978. 1984: 12 holes diamond drilling, environmental studies. Reserves calculated in 1981. The 1984 drilling expanded the potential reserves to 1.36 million tonnes. 1998: re-evaluation work.
<b>VAL [41]</b> Manson Creek Resources	<i>Commodity:</i> Silver (Ag, Pb, Zn, Cu)	<i>Minfile:</i> 106C 085 <i>Map:</i> 106C/05 64°16'N; 133°41'W 95 km NE of Elsa	<i>Reserves:</i> 66,000 <i>Grade:</i> 1030 g/t Ag	<i>Status:</i> Active exploration. Discovered in 1978. 1978: mapping, geochemistry surveys, hand trenching and drilled 10 holes (456 m). 1979: explored with mapping, geochemistry surveys, trenching and 39 drill holes (3,157 m), 9 holes (1,304 m) in 1980 and 16 holes (630 m) in 1981. 1982: trenching and prospecting. 1988: drilling and environmental studies along the proposed road route, re-evaluation work.
<b>CLARK [43]</b> 15966 Yukon Inc.	<i>Commodity:</i> Silver (Ag, Pb, Zn)	<i>Minfile:</i> 106D 011 <i>Map:</i> 106D/02 64°07'N; 134°57'W 80 km NE of Mayo	<i>Reserves:</i> Above adit level - indicated 129,350, above adit level - inferred 65,400, below adit level - indicated 85,500, below adit level - inferred 46,800 <i>Grade:</i> Above adit level - indicated 220 g/t Ag, 4.99 g/t Pb, 4.58 g/t Zn; above adit level - inferred 192 g/t Ag, 4.54 g/t Pb, 4.61 g/t Zn; below adit level - indicated 304 g/t Ag, 6.51 g/t Pb, 4.45 g/t Zn; below adit level - inferred 350 g/t Ag, 7.36 g/t Pb	<i>Status:</i> Inactive. Discovered in 1967. 1968: prospecting, soil sampling, road construction and bulldozing. 1970-1988: exploration consisted of bulldozer trenching, 11 winkle hole (164 m), geochemistry and geophysical surveys, 59 diamond-drill holes totalling 6,121 m, 455 m of cross cutting and drilling 100 m below the surface at 1,000 m elevation.

## YUKON MINERAL DEPOSITS

## SILVER (continued)

ZETA [67] R. Berdahl	Commodity: Silver (Ag)	Minfile: 115P 047 Map: 115P/14 63°59'N; 137°17'W 105 km E of Dawson	Reserves: 980,000 Grade: 557.6 g/t Ag	Status: Inactive. Discovered in 1983. 1984: trenching, mapping, mag, VLF EM, geochemistry surveys and 10 holes (883 m) drilled. 1988: 4 holes drilled (138 m).
GROUNDHOG [73] (Jeff, Lorne) St. Cyr Mineral Explorations Ltd.	Commodity: Silver (Ag, Pb, Zn)	Minfile: 105F 029 Map: 105F/10 61°37'N; 132°52'W 50 km SSW of Ross River	Reserves: 200,951 Grade: 91.9 g/t Ag, 4.01% Zn, 3.18% Pb	Status: Inactive. Discovered in 1956. 1978: road construction. 1979-80: shipped 1,010 tonnes of hand-sorted galena ore. 1988: shipped 21 tonnes bulk sample. 1991: trenching. Reserves are probable and drill-indicated for seven separate deposits.
LOGJAM [74] 7188 Yukon Ltd.	Commodity: Silver (Ag, Au, Zn, Pb)	Minfile: 105B 038 Map: 105B/04 60°02'N; 131°36'W 65 km E of Teslin	Reserves: 69,854 Grade: 392 g/t Ag, 3.01 g/t Au, 3.0% Zn, 2.0% Pb	Status: Inactive. Discovered in 1944. 1965-67, 1981: underground work, road construction. 1987: surface geology, geochemistry, 601 m of diamond drilling in 9 holes, underground development. 1988: road construction. Reserves are probable with an additional equal tonnage of possible ore.
PESO/REX [76] M.J. Moreau	Commodity: Silver (Ag, Pb)	Minfile: 106D 021 Map: 106D/04 64°00'N; 135°54'W 60 km NW of Carmacks	Reserves: 139,373 Grade: 717 g/t Ag, 3.7% Pb	Status: Inactive. Discovered in 1910. 1991: Aurum Geological Consultants conducted a small sampling and evaluation program. Proven and probable reserves in the Rex and No. 1 veins.

## TUNGSTEN

<b>FAILEY [5]</b> (Pat, Morning Star) North American Tungsten Ltd.	<i>Commodity:</i> Tungsten (W, Cu, Mo)	<i>Minfile:</i> 105A 017 <i>Map:</i> 105A/15 60°46'N; 128°51'W 80 km N of Watson Lake	<i>Reserves:</i> 272,160 <i>Grade:</i> 0.96% WO <sub>3</sub>	<i>Status:</i> Inactive. Discovered in 1963. 1992: reconnaissance prospecting and geochemical sampling. Mineralization located in 3 zones over a strike length of 4 km. Reserves from B-zone.
<b>LOGTUNG [7]</b> Nordac Resources Ltd.	<i>Commodity:</i> Tungsten (W, Mo)	<i>Minfile:</i> 105B 039 <i>Map:</i> 105B/04 60°01'N; 131°37'W 65 km E of Teslin	<i>Reserves:</i> 229,000,000 (geological) <i>Grade:</i> 0.14% WO <sub>3</sub> , 0.05% MoS <sub>2</sub>	<i>Status:</i> Active exploration. Discovered in 1976. 1977-81: Canamax option, road construction. 1993: NDU Resources has the right to earn 50% interest by spending \$1 million over 3 years and granting 50% interest in adjacent NDU claims. 1993: work program to assess Au by prospecting, geochemical surveys, and 2 diamond-drill holes (234 m). Open-pit mineable. 1998: Nordac acquired claims, conducts exploration south of deposit.
<b>JC [9]</b> (Fis, Fur, Fxe, Viola) Placer Dome Inc., Cominco Ltd.	<i>Commodity:</i> Tungsten (W, Sn, Cu, Zn)	<i>Minfile:</i> 105B 040 <i>Map:</i> 105B/04 60°12'N; 131°42'W 65 km E of Teslin		<i>Status:</i> Inactive. Discovered in 1967. 1968: bulldozer trenching. 1974: drilled two holes (38.1 m). 1978-80: mapping and geochemistry sampling, trenching. 1978: magnetic surveys. 1979-80: 8 holes (804.7 m).
<b>RISBY [18]</b> Ron Berdahl	<i>Commodity:</i> Tungsten (W)	<i>Minfile:</i> 105F 034 <i>Map:</i> 105F/14 61°52'N; 133°23'W 45 km S of Faro	<i>Reserves:</i> 2,700,000 <i>Grade:</i> 0.81% WO <sub>3</sub>	<i>Status:</i> Inactive. Discovered in 1968. 1979-82: geological mapping, geochemical and geophysical surveys, and 5,971 m diamond drilling in 40 holes. Reserves are estimated.
<b>MACTUNG [35]</b> North American Tungsten Ltd.	<i>Commodity:</i> Tungsten (W)	<i>Minfile:</i> 105O 002 <i>Map:</i> 105O/08 63°17'N; 130°09'W MacPass	<i>Reserves:</i> 57,200,000 <i>Grade:</i> 0.95% WO <sub>3</sub>	<i>Status:</i> Inactive. Discovered in 1962. 1970: tote road. Western world's largest tungsten deposit. 1973, 1979, 1985: underground work. 1985: road construction. Engineering, environmental and feasibility studies essentially complete, awaiting higher tungsten prices.
<b>GARNET [45]</b> (Ray Gulch) New Millennium Mining Ltd.	<i>Commodity:</i> Tungsten (W)	<i>Minfile:</i> 106D 027 <i>Map:</i> 106D/04 64°02'N; 135°45'W 20 km NNE of Elsa	<i>Reserves:</i> 7,260,000 including 3,600,000 <i>Grade:</i> 7,260,000 at 0.87% WO <sub>3</sub> ; 3,600,000 at 0.93% WO <sub>3</sub>	<i>Status:</i> Inactive. First staked in 1942. 1963-64: bulldozer trenching. 1978-79, 1981: extensive geochemistry and geophysical surveys. 1981: trenching. Diamond drilling: 21 holes (2,423 m) in 1979, 64 holes (11,278 m) in 1980, 3 holes (751 m) in 1982. Mapping, geochemistry and VLF-EM surveys and trenching in 1982. 1991: mapping, geochemistry, geophysics and 16 diamond-drill holes (2,500 m). 1992: 1,129.9 m of reverse circulation drilling. 1993: 10 reverse-circulation drill holes (2,079 m), and several test pits.

**YUKON MINERAL DEPOSITS**
**OTHER**

<b>PAGISTEEL [46]</b> Archer, Cathro & Associates (1981) Ltd.	<i>Commodity:</i> Iron (Fe)	Minfile: 106D 049 Map: 106D/16 64°50'N; 134°17'W 115 km NE of Elsa	Reserves: 9,100,000 Grade: 29.2% soluble iron	<i>Status:</i> Inactive. Discovered in 1898. First staked in 1962. 1967: winter road and airstrip construction, magnetometer survey and 15 holes (1448.7 m). 1980-82: radiometric and rock geochemical surveys, prospecting and hand trenching. 1989: mapping and relogging and sampling drill core. Reserves based on drill results.
<b>CREST [55]</b> (Snake River) Chevron Resources Canada	<i>Commodity:</i> Iron (Fe)	Minfile: 106F 008 Map: 106F/2, 3, 5, 7 65°15'N; 133°02'W Yukon/NWT border	Reserves: 5.5 billion Grade: 46% Fe	<i>Status:</i> Inactive, feasibility study phase. Discovered in 1961. 1963-64: 2 bulk samples totalling 110 tonnes were shipped out for metallurgical test; feasibility study completed. Stripping ratio less than 1:1. This reserve figure includes 18.2 billion tonnes, at slightly higher ratios, averaging 46% Fe, 25% SiO <sub>2</sub> and 0.35% phosphorous.
<b>BOUNDARY [71]</b> Withdrawn from Staking	<i>Commodity:</i> Iron (Fe)	Minfile: 117A 072 Map: 117A/09 68°30'N; 136°31'W 150 km W of Inuvik		<i>Status:</i> Gem stone occurrence first noted in 1971. Spectacular suite of approximately 30 unusual phosphate minerals, including lazulite and kulanite.
<b>KING ARCTIC [26]</b> (Easy, Frances, Lind, Mary Elizabeth, Snow) M. Rosequist	<i>Commodity:</i> Jade	Minfile: 105H 014 Map: 105H 03 61°06'N; 129°25'W 120 km N of Watson Lake		<i>Status:</i> Inactive, former open-pit producer. Discovered in 1964. 1989-90: shipped 70 tonnes and 40 tonnes. 1991-94: road building and jade production.
<b>RED MOUNTAIN [10]</b> Tintina Mines Ltd.	<i>Commodity:</i> Molybdenum (Mo)	Minfile: 105C 009 Map: 105C/13 60°59'N; 133°45'W 80 km NE of Whitehorse	Reserves: 187,300,000 including 21,300,000 Grade: 187,300,000 at 0.167% MoS <sub>2</sub> ; 21,300,000 at 0.293% MoS <sub>2</sub>	<i>Status:</i> Inactive. Discovered in 1967. 1978-82: 21,391 m diamond drilling, and metallurgical studies. Drill-indicated geological reserves calculated in 1982. Large reserve calculated using a 0.10% MoS <sub>2</sub> cutoff and smaller reserve used a cutoff of 0.25% MoS <sub>2</sub> . 1994: 6 diamond-drill holes (243 m).
<b>STORMY [77]</b> Open	<i>Commodity:</i> Molybdenum (Mo, W)	Minfile: 105F 011 Map: 105F/07 61°30'N; 132°48'W 60 km SW of Ross River	Reserves: 13,608 Grade: 0.73% Mo	<i>Status:</i> Inactive. Discovered in 1955. 1989: old drill core reassayed. Two separate mineralized zones, one molybdenum, one tungsten. Reserves are probable and calculated in 1959.
<b>WELLGREEN [56]</b> (Quill Creek) Northern Platinum Ltd.	<i>Commodity:</i> Nickel (Ni, Cu, P.C.E., Au, Ag)	Minfile: 115G 024 Map: 115G/05 61°28'N; 139°32'W 35 km NW of Burwash Landing	Reserves: 50,032,466 (geological) Grade: 0.36% Ni, 0.35% Cu, 0.54 g/t Pt, 0.34 g/t Pa	<i>Status:</i> Active exploration, former producer. Discovered in 1952. Produced from 1972 to 1973. 1988: 4,250 level rehabilitated, 5,500 m underground diamond drilling (37 holes), metallurgical testing, preliminary feasibility studies. Reserves released in 1989. Deposit also contains significant amounts of rhodium, indium, osmium and gold. 1996: 57 rotary percussion drill holes (3,900 m). 1977: rehabilitation and resampling of underground workings. 1998, geology and geochemistry.
<b>CANALASK [57]</b> Expatriate Resources Ltd.	<i>Commodity:</i> Nickel (Ni, Cu, P.C.E.)	Minfile: 115F 045 Map: 115F/15 61°57'N; 140°32'W 50 km S of Beaver Creek	Reserves: 390,235 (main zone) Grade: 1.35% Ni	<i>Status:</i> Inactive. Discovered in 1952. 1994: diamond-drill program (6 holes) and metallurgical testing. 1995: continued drilling. Main zone has a length of 107 m, a width of 15 m and is cut off at the west by a fault. Two other zones are also present but of lower grade. Deposit remains open along strike and to depth. 1997: 10 holes totalling 1,203 m.
<b>MARLIN [11]</b> (Eve, Evelyn Creek) Sidrock	<i>Commodity:</i> Rhodonite	Minfile: 105C 017 Map: 105C/11 60°47'N; 133°20'W 70 km NNW of Teslin		<i>Status:</i> Open-pit producer. Discovered in 1955. 1987-88: road upgraded. 27.3 tonnes shipped out in 1987, 20 tonnes 1988, 60 tonnes in 1989. 1992 repaired road, mapping at 1:5,000 scale and mined 40 tonnes. Exploration trenching 1992. 1998: 35 tonnes mined.
<b>SAMOVAR [36]</b> (Tea, Brock) Coyne H. & Sons Ltd.	<i>Commodity:</i> Baryte (Ba)	Minfile: 105O 020 Map: 105O/02 62°21'N; 130°36'W Jeff Lake	Reserves: 250,000 Grade: S.G. 4.24	<i>Status:</i> Open-pit producer. Discovered in 1975. Deposit amenable to open pit mining with no stripping ratio. 1998: production of 3,000 tonnes.
<b>WALT [78]</b> (Cathy) Coyne H. & Sons Ltd.	<i>Commodity:</i> Baryte (Ba)	Minfile: 105O 021 Map: 105O/07, 08 63°17'N; 130°33'W MacPass	Reserves: 450,000 Grade: S.G. 4.25	<i>Status:</i> Inactive. Discovered in 1973. 1993: mapping, prospecting and bulk sampling. Reserves based on 1980 drilling within main (Cathy) zone.

## COAL

<b>WHISKEY LAKE [19]</b> Nadahini Mining Corporation	<b>Commodity:</b> Coal	<b>Minfile:</b> 105F 048 <b>Map:</b> 105F/15 61°58'N; 132°32'W 5 km SW of Ross River	<b>Grade:</b> Low-volatile bituminous to semi-anthracite, calorific value 12,920 G. BTU	<b>Status:</b> Former open-pit producer. Discovered in 1964. 1980: 13 percussion holes drilled (1520 m). 1986: small open-pit mine opened. Approximately 101,000 tonnes of coal mined between 1986 and 1992. 1987: 730 m of reverse-circulation drill holes. 1988: 15,240 m of drilling was completed.
<b>MARATHON [48]</b> (Airstrip) Pan Ocean Limited	<b>Commodity:</b> Coal	<b>Minfile:</b> 106E 013 <b>Map:</b> 106E/03 65°13'N; 135°17'W 145 km N of Elsa	<b>Reserves:</b> 18,000,000 (inferred) <b>Grade:</b> High-volatile bituminous C non-coking	<b>Status:</b> Inactive. Discovered in 1905. 1979: mapping and 1 hole drilled (111 m). One hole drilled in 1980 (276 m). Specifications of coal: yield 70.4%; moisture 4.8%, ash 18.9%, volatiles 30.8%, fixed carbon 45.1%; specific energy 9,500 BTU/lb.
<b>POLE [49]</b> (Wemecke) Pan Ocean Limited	<b>Commodity:</b> Coal	<b>Minfile:</b> 106E 021 <b>Map:</b> 106E/01 65°12'N; 135°01'W 145 km NNE of Elsa	<b>Reserves:</b> 105,000,000 indicated; 29,000,000 inferred <b>Grade:</b> High-volatile bituminous C non-coking	<b>Status:</b> Inactive. Discovered in 1977. 1978: mapping and 1 hole drilled (117 m). 1980: 2 holes drilled (660 m). Specifications of coal: yield 67.8%; moisture 4.6%, ash 11.1%, volatiles 36.0%, fixed carbon 48.4%; specific energy 10,700 BTU/lb.
<b>GARLIC RING [50]</b> Pan Ocean Limited	<b>Commodity:</b> Coal	<b>Minfile:</b> 106E 032 <b>Map:</b> 106E/07 65°20'N; 134°51'W 160 km NNE of Elsa	<b>Reserves:</b> 9,000,000 indicated; 6,000,000 inferred <b>Grade:</b> High-volatile bituminous C non-coking	<b>Status:</b> Inactive. Acquired in 1977. 1980: diamond-drill program, 2 hole: (484 m). Two seams which average 2.6 m and 3.4 m thick. Reserves based on 1980 drilling.
<b>ILLYD [51]</b> (Bonnet Plume Coal) Abermin Corporation	<b>Commodity:</b> Coal	<b>Minfile:</b> 106E 035 <b>Map:</b> 106E/06, 07 65°15'N; 135°00'W 160 km N of Elsa	<b>Reserves:</b> 37,700,000 (mineable) <b>Grade:</b> High-volatile bituminous C non-coking (Thermal)	<b>Status:</b> Inactive. Discovered in 1977. 1977-79: geological mapping, diamond drilling, mining, environmental and thermal power plant studies. Saleable reserves are open-pit table coal based on stripping ratio of 10m <sup>3</sup> of waste per tonne of coal. The coal has the following characteristics: yield: >23%; moisture 5.1%, ash 17%, volatiles 33.6%, fixed carbon 44.2%, sulphur <0.5%; specific energy 9,500 BTU/lb and ash fusion temp. >1316°C.
<b>PAN OCEAN [52]</b> (West Ilyd) Pan Ocean Limited	<b>Commodity:</b> Coal	<b>Minfile:</b> 106E 036 <b>Map:</b> 106E/03 65°14'N; 135°01'W 145 NNE of Elsa	<b>Reserves:</b> 48,000,000 <b>Grade:</b> High-volatile bituminous C non-coking	<b>Status:</b> Inactive. Discovered in 1977. 1980: mapping and 2 holes (555 m).
<b>DESLAURIER [53]</b> Pan Ocean Limited	<b>Commodity:</b> Coal	<b>Minfile:</b> 106E 037 <b>Map:</b> 106E/02 65°26'N; 135°26'W 210 km N of Mayo	<b>Reserves:</b> Indicated 61 million, inferred 44 million <b>Grade:</b> yield 72.3%, ash 11.2%, volatiles 33.3%, fixed carbon 51.2%, moisture 4.2%	<b>Status:</b> Inactive. First acquired in 1977. Coal grade high volatile bituminous. 1979-80: diamond drilling, 3 holes, for a total of 612 m. Four seams correlated with Ilyd deposit 106E 035. The upper seam is 8.0 m thick and the lower seam is 5.0 m thick. Deposit occurs within a monocline and is separated into two blocks by a fault.
<b>SPACESHIP [54]</b> Pan Ocean Limited	<b>Commodity:</b> Coal	<b>Minfile:</b> 106E 038 <b>Map:</b> 106E/02 65°13'N; 134°55'W 150 km NNE of Elsa	<b>Reserves:</b> Inferred 158,000,000 <b>Grade:</b> High-volatile bituminous C non-coking	<b>Status:</b> Inactive. First acquired in 1977. 1980: mapping and 2 holes (689 m) drilled.
<b>DIVISION [58]</b> (Division Mountain) Cash Resources Ltd.	<b>Commodity:</b> Coal	<b>Minfile:</b> 115H 013 <b>Map:</b> 115H/08 61°20'N; 136°05'W 90 km N of Whitehorse	<b>Reserves:</b> 52,900,000 (drill-indicated) <b>Grade:</b> 8% moisture, 12.2% ash, 27.6% volatile matter, 52.1% fixed carbon, 0.5% sulphur, calorific value 6170 calories/g	<b>Status:</b> Advanced exploration. Property discovered in 1907. 1970-71 road construction. 1995: large-diameter diamond drilling (2,000 m) and excavator trenching. Environmental, archaeological and sociological studies have been initiated in preparation for permitting. An initial submission to the federal government is in progress. 1997-98: program of excavator trenching and diamond drilling. Reserves drill-indicated and open-pit table.
<b>TANTALUS [61]</b> (Tantalus Butte)	<b>Commodity:</b> Coal	<b>Minfile:</b> 115I 003 <b>Map:</b> 115I/01 62°07'N; 136°16'W 5 km N of Carmacks	<b>Grade:</b> High-volatile bituminous B non-coking	<b>Status:</b> Inactive, past underground producer. First discovered in 1905. 1923 development commenced with an a.o.c. Production averaged about 454 tonnes per year until 1938. Mine reopened in 1948 until 1967, total production for this period approximately 119,000 tonnes. Mine reopened in 1969 and mined 109,770 tonnes to the end of 1976. 1977: 42 percussion holes (3,476.8 m), resistivity, IP, gravity and downhole EM surveys. Underground fire in 1978 caused the mine to be sealed and production was shifted to the surface. 1978: 31 percussion holes drilled (1,535.9 m) and bulldozer trenching.
<b>WHITEHORSE COAL [79]</b> Whitehorse Coal Corp.	<b>Commodity:</b> Coal	<b>Minfile:</b> 105D 042 <b>Map:</b> 105D/06, i1 60°30'N; 135°15'W 25 km SW of Whitehorse	<b>Reserves:</b> 458,000 <b>Grade:</b> High-ash anthracite	<b>Status:</b> Inactive. Discovered in 1901. 1942: minor production. 1988: 2,721 tonne bulk sample for testing. Reserves are drill-indicated. Coal ranked as a meta-anthracite with 3.5% moisture, 38.2% ash and a calorific content of 19,765 KJ/kg.

# Section 7:

Remarks to the conference by **Don Lowell**,  
Alaska Transportation Consultants,  
and ... abstract by **Dr. Paul A. Metz**,  
University of Alaska Fairbanks



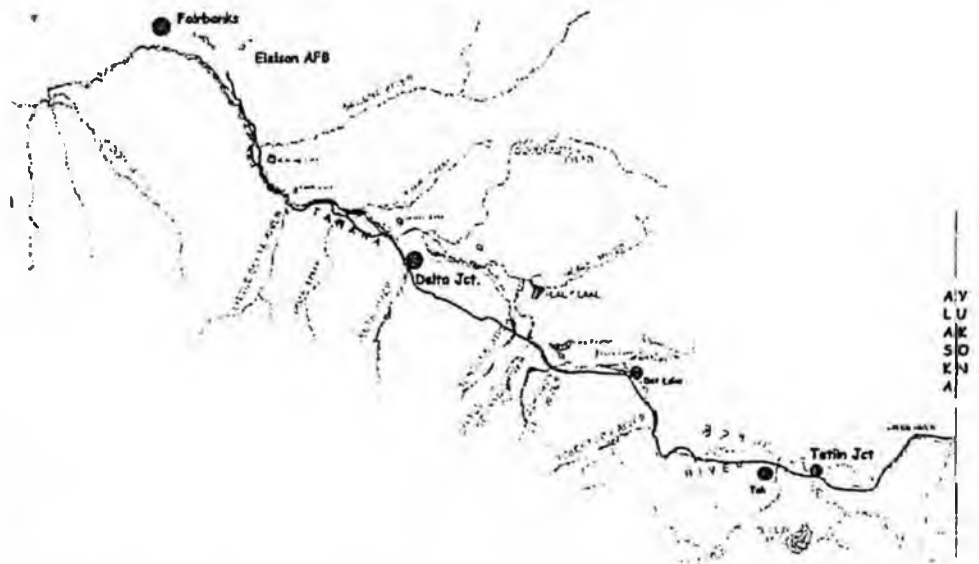
P.O. Box 71114  
Fairbanks, Alaska 99707  
Ph: (907) 488-2879  
Fax: (907) 488-2545

**PROPOSAL TO UPDATE THE ENVIRONMENTAL ASSESSMENT  
EXTENDING THE ALASKA RAILROAD FROM FAIRBANKS, ALASKA TO THE CANADIAN BORDER**

**Background**

In 1983 the State of Alaska completed an environmental assessment of a railroad corridor between Eielson Air Force Base, near Fairbanks, and the Yukon border. Constrained by geometric standards and geological features, the route identified left the

existing track near Eielson, crossed the Tanana River to its south bank near Harding Lake and proceeded to where it crossed the Delta River at Delta Junction. Following the Tanana River valley, the route departed the drainage near Tetlin Junction and crossed over into the Ladue River valley where it proceeded to the Alaska/Yukon Border.



This study specifically did not address the economic feasibility of extending the railroad system to the border but instead, concentrated on the identification of a practical route that was environmentally acceptable. Some of the many topics studied included agriculture, wildlife, water quality, wetlands, archaeological resources, land use, 4(f) properties, construction costs and maintenance considerations.

Since 1983, the U.S. Dept. of the Interior, as trustee for the Alaska Native Corporation land selections, has identified and transferred ownership of many lands along the route. In addition environmental concerns focused on sensitive species or environments that could impact the routing or eventual construction of a railroad need to be reassessed and the route needs to be reviewed and modified to comply with updated railroad geometric standards and rolling stock considerations.

Proposal

Alaska Transportation Consultants, a non-profit corporation dedicated to expanding Alaska's transportation systems, proposes to update this environmental assessment because it is essential to those determining the feasibility of connecting Alaska's railroad to the Canadian system. The updated study would address all of the geometric, geological and environmental aspects presented in the original report and would include current estimates for construction along the proposed route.

The final reassessment will be coordinated with State and Federal agencies and private concerns as required and will be submitted for endorsement to the State Administration.

The estimated cost to complete this comprehensive update is \$100,000.

**Mineral Resource Potential and Engineering Geology along the Proposed Route of  
the Extension of the Alaska Railroad from Healy Alaska to the Yukon Territory,  
Canada**

**Abstract**

**By**

**Paul A. Metz, Ph.D., P.G.  
Associate Professor of Geological Engineering  
Department of Mining and Geological Engineering  
University of Alaska Fairbanks,  
Fairbanks, Alaska**

The proposed extension of the Alaska Railroad to the Canada will follow the southern margin of the Yukon-Tanana Uplands Schist Terrain from just north of Healy, Alaska to the Canadian Border near Beaver Creek, Yukon Territory. The Yukon-Tanana Uplands Schist Terrain and the Wrangell Terrain to the south have been important past producing areas of precious and base metals. The Yukon-Tanana Uplands Schist Terrain in Alaska has yielded at least 18 million ounces of placer gold and approximately 1.5 million ounces of lode gold during the 20<sup>th</sup> Century. The Yukon-Tanana Terrain in the Yukon Territory has produced approximately the same amount of placer gold during the same time period and major amounts of lead, zinc, and silver. The Wrangell Terrain produced over one billion pounds of copper in the first half of the 20<sup>th</sup> Century in Alaska and significant amounts of copper and gold in the Whitehorse Mining District, Yukon Territory in the later half of the century.

Today the Yukon-Tanana Schist Terrain is host to drill indicated reserves of at least 40 million troy ounces of gold. The terrain is one of the most active gold exploration areas of North America. The terrain is host to a variety of surface mineable gold deposit types and has great potential for the discovery of vein gold, gold skarn, and precious metal enriched massive sulfide deposit types that will be extracted by underground mining methods.

The Wrangell Terrain is host to Porphyry Cu, Porphyry Cu-Mo, and Porphyry Mo type mineral deposits. These are potentially very large tonnage base metal deposits that would require either local smelting of the sulfide concentrates or the availability of rail transportation of the concentrates to smelters as a prerequisite for their development. The terrain has good potential for future development of base and precious metal skarn deposits. Minerals deposit in the Fairbanks, Bonifield, Richardson, Delta, Fortymile, Nabesna, and Tok Mining Districts are tabulated by deposit type and distance to the proposed rail-link.

The engineering geology of the right-of-way of the proposed rail-link contains significantly less geologic hazards than the existing right-of-way of the Alaska Railroad. The rail-link could provide a significant alternate transportation route for interior Alaska in the event of a major earthquake such as 1964 event that halted road and rail transport in south-central Alaska. The proposed route of the extension in Alaska avoids the major seismic zones south of the Alaska Range. The route in Alaska is within the non-glaciated Yukon-Tanana Uplands Schist Terrain and thus avoids the unstable glacial deposits and over-steepened U-shaped valleys with their inherent slope stability problems that dominate the right-of-way of the existing Alaska Railroad.

# Section 8:

Remarks to the Conference by Bill Woolf, staff to  
Senator Frank Murkowski

Alaska Canada Rail Link Conference  
Vancouver, B.C., Canada  
January 20, 2000

"Rails to Resources"

William B. Woolf  
Legislative Assistant for Natural Resources & Transportation  
Office of Senator Frank H. Murkowski  
United States Senate

First, thank you all for being willing to dream big dreams.

Dreaming big dreams is what railroading is all about. Railroad stories and myths of railroading appeal to the romantic in us -- from Casey Jones' wild ride to stories about the characters who still ride the rails today.

And the history of railroads in North America is the history of a really big dream -- the development of an entire continent.

The railroad part of it is characterized by a phrase now used by NASA for the space program -- "faster, better, cheaper."

"Faster, better, cheaper" has been the thread running throughout our railroad history.

Steam power blew open the doors to huge changes -- larger loads, bigger cars, and higher speeds.

Steam also made humans far more mobile than they had been before. Instead of taking weeks, a businessman could get from Montreal to Atlanta in days instead of weeks.

It made face-to-face business possible over long distances, reducing both the time -- and the dangers -- of business travel. For the 19th century, that was as stunning a change as telecommunication brought to the 20th.

In the U.S., railroad builders tied down the safety valves after our Civil War. Growth was phenomenal, in part because the government hit on the policy of providing railroad companies with land to defray their costs and give them an instant economic base.

That was first tried in 1856, to help build a railroad from Chicago to Mobile, Alabama. It was so successful that it became general policy after the war, supercharging an age of rail expansion that continued into the early 1900s.

And technological development kept pace -- bigger locomotives, faster trains and heavier cargos.

And because those inevitably brought increased safety risks, rail lines also developed new ways to solve problems, with better couplers and braking systems, standardized track gauge, improvements in communication and switching, and, of course, standard time zones so engineers would know if they were on clear track or not.

But that's all history -- technology not from the last century, but the one before that! Why talk about railroads today?

The fact is there is still no other transportation technology that can do what railroads can. You know that. You wouldn't be here if it wasn't.

Alaska and the Yukon share many similarities, not the least of which is being treated like less-than-desirable relatives from the wrong side of the tracks.

You can chalk that up to any number of causes, up to and including regional economic rivalries, but the fact is that both Alaska and the Yukon, and the United States and Canada as whole nations, are getting shortchanged by the distance -- both literal and figurative -- between these two great regions and the rest of the continent.

Another notable similarity is that both Alaska and the Yukon are both "land poor."

We have the resources, but we can't get the full benefit because "new" territories lack the amenities of older, more populous areas -- especially the transportation options.

We like to think that our "first-world" countries are moving from manufacturing to service economies, and we like to boast about the benefits of our electronically connected businesses, but the truth is that our society still depends on getting material objects -- food, iron ore, lumber or whatever -- from one place to another.

And because Alaska and the Yukon lack the means to do just that efficiently, both our nations are a little poorer than they have to be.

Imagine how both countries would benefit if the resources of Alaska and the Yukon were as accessible as those of Ontario or Illinois....

The Yukon-Tanana Uplands stretch from Faro to north of Fairbanks. The entire region has incredible resource potential. That's been known since the gold rush days along the Yukon River.

Gold is still a draw, but the uplands also contain tremendous amounts of silver, tungsten, copper, lead, zinc, and other ores. But today the area remains mostly as it was then: inaccessible and undeveloped.

Think about this: one of the most productive gold mines in the United States is Fort Knox, just outside of Fairbanks. It produces over 1,000 ounces of gold per day. Fairly soon, we hope to be producing from the 5.2 million ounce reserves of the Pogo deposit, a little east of there.

What's the difference between these two mines and the major deposits deeper in the Yukon-Tanana region? Above all -- it's transportation.

If anything, the Yukon may be even more interesting to miners. 1998 mineral production exceeded \$100 million, and the industry continues to play the single largest role in the private sector economy of the territory. But here as well, access plays a huge role in whether a mine can make it or not.

And what about wood products?

# CORRECTION

THE FOLLOWING DOCUMENT(S)  
HAVE BEEN REFILMED TO  
ASSURE LEGIBILITY OR PAGINATION



Rev. 6/98

Central Microfilm Services  
Department of Education & Early Development  
State of Alaska

Alaska Canada Rail Link Conference  
Vancouver, B.C., Canada  
January 20, 2000

"Rails to Resources"

William B. Woolf  
Legislative Assistant for Natural Resources & Transportation  
Office of Senator Frank H. Murkowski  
United States Senate

First, thank you all for being willing to dream big dreams.

Dreaming big dreams is what railroading is all about. Railroad stories and myths of railroading appeal to the romantic in us -- from Casey Jones' wild ride to stories about the characters who still ride the rails today.

And the history of railroads in North America is the history of a really big dream -- the development of an entire continent.

The railroad part of it is characterized by a phrase now used by NASA for the space program -- "faster, better, cheaper."

"Faster, better, cheaper" has been the thread running throughout our railroad history.

Steam power blew open the doors to huge changes -- larger loads, bigger cars, and higher speeds.

Steam also made humans far more mobile than they had been before. Instead of taking weeks, a businessman could get from Montreal to Atlanta in days instead of weeks.

It made face-to-face business possible over long distances, reducing both the time -- and the dangers -- of business travel. For the 19th century, that was as stunning a change as telecommunication brought to the 20th.

In the U.S., railroad builders tied down the safety valves after our Civil War. Growth was phenomenal, in part because the government hit on the policy of providing railroad companies with land to defray their costs and give them an instant economic base.

That was first tried in 1856, to help build a railroad from Chicago to Mobile, Alabama. It was so successful that it became general policy after the war, supercharging an age of rail expansion that continued into the early 1900s.

And technological development kept pace -- bigger locomotives, faster trains and heavier cargos.

And because those inevitably brought increased safety risks, rail lines also developed new ways to solve problems, with better couplers and braking systems, standardized track gauge, improvements in communication and switching, and, of course, standard time zones so engineers would know if they were on clear track or not.

But that's all history -- technology not from the last century, but the one before that! Why talk about railroads today?

The fact is there is still no other transportation technology that can do what railroads can. You know that. You wouldn't be here if it wasn't.

Alaska and the Yukon share many similarities, not the least of which is being treated like less-than-desirable relatives from the wrong side of the tracks.

You can chalk that up to any number of causes, up to and including regional economic rivalries, but the fact is that both Alaska and the Yukon, and the United States and Canada as whole nations, are getting shortchanged by the distance -- both literal and figurative -- between these two great regions and the rest of the continent.

Another notable similarity is that both Alaska and the Yukon are both "land poor."

We have the resources, but we can't get the full benefit because "new" territories lack the amenities of older, more populous areas -- especially the transportation options.

We like to think that our "first-world" countries are moving from manufacturing to service economies, and we like to boast about the benefits of our electronically connected businesses, but the truth is that our society still depends on getting material objects -- food, iron ore, lumber or whatever -- from one place to another.

And because Alaska and the Yukon lack the means to do just that efficiently, both our nations are a little poorer than they have to be.

Imagine how both countries would benefit if the resources of Alaska and the Yukon were as accessible as those of Ontario or Illinois....

The Yukon-Tanana Uplands stretch from Faro to north of Fairbanks. The entire region has incredible resource potential. That's been known since the gold rush days along the Yukon River.

Gold is still a draw, but the uplands also contain tremendous amounts of silver, tungsten, copper, lead, zinc, and other ores. But today the area remains mostly as it was then: inaccessible and undeveloped.

Think about this: one of the most productive gold mines in the United States is Fort Knox, just outside of Fairbanks. It produces over 1,000 ounces of gold per day. Fairly soon, we hope to be producing from the 5.2 million ounce reserves of the Pogo deposit, a little east of there.

What's the difference between these two mines and the major deposits deeper in the Yukon-Tanana region? Above all -- it's transportation.

If anything, the Yukon may be even more interesting to miners. 1998 mineral production exceeded \$100 million, and the industry continues to play the single largest role in the private sector economy of the territory. But here as well, access plays a huge role in whether a mine can make it or not.

And what about wood products?

One normally doesn't think of the far north as a source of timber, but possibilities abound in both regions.

Within just 15 miles of the corridor from the Yukon to Fairbanks lie 1.4 billion board feet of hardwood pole timber and almost 1.7 billion board feet of mixed pole timber.

Lower grades timber is also plentiful. The Ladue River valley alone could supply a good-size chipping industry.

In the Yukon, the Alaska Highway has allowed a modest forest products industry outside of Watson Lake, but it's still just a hint of what's readily possible -- but only with transportation.

Timber supply shortages in the Pacific Northwest, combined with demand in both Asian and domestic markets, should be driving new developments for the timber industry -- but it doesn't help to have the products if you can't get them to market.

What else could move by rail? Well, what about agricultural products? The other day I heard from a very excited farmer in Alaska. He wanted us to know that rail transportation of feed and fertilizer coming to Alaska, and rail shipment of his products to market, would be a huge boost to his business.

How much do you want to bet that almost every farmer and would-be farmer in Alaska and the Yukon would feel exactly the same way?

Our land is fertile, and our long days can produce tremendous harvests. But we still need to get supplies in and production out at a reasonable cost. Rail can do that.

What about seafood? That's another big one for Alaska. We harvest fully half of the total United States' seafood production, most of it frozen -- and with most of the frozen product going to Asia by ship.

A gigantic new seafood plant producing finished entrees is just starting operation in Anchorage, and much of its product will also travel by sea. But it doesn't have to be that way.

What if there were an inexpensive way to move large amounts of high-quality frozen seafoods directly to markets in the midwest and the east? I think we'd see a huge price boost in the industry as those markets began to compete directly with our more traditional customers.

And what about fuel products? Coal -- natural gas -- refined fuels. All of those can be moved by rail, and all would find very receptive audiences in the overcrowded, overpriced eastern half of the continent.

In the late 1800s, railroad tycoon Edward H. Harriman visualized a world-girdling railroad from from the United States through Alaska to Siberia, then across Asia to the capitals of Europe. That plan still has many supporters, but first things first. And the first thing is to complete the system on our own continent.

One route has already been surveyed. During World War II, with Japanese forces in the Aleutians and U-boats sinking convoys in the North Atlantic, we needed a better way to get war materials to our Russian allies. Frederic Delano, a

relative and confidant of Franklin Roosevelt, proposed a rail link. With Roosevelt's support, the U.S. Army Engineers successfully surveyed a very feasible route from Prince George to the Arctic coast in 1942.

But the wartime steel shortage delayed the project, the highway was completed later that year, and by late spring of 1943, Japan had lost its grip on the Aleutians and Germany had suspended U-boat operations in the North Atlantic. And the link through Canada lost its urgency.

We may not be at war today, but that doesn't mean we cannot dust off those old plans and see if they would fit with today's economic conflicts.

Who knows -- they might even fit in with protecting us from another kind of conflict.

As many of you know, the U.S. is studying a possible anti-missile defense, and one possible site is not far from Delta. The huge amounts of material required could most effectively be moved by rail.

So maybe it's time to remember that the Alaska Railroad was originally envisioned by Congress as having up to 1,000 miles of track, but was stopped at least 300 miles short.

That 300 miles would not only get us to Delta, it would get us all the way to the border.

We should not be afraid to think seriously about big projects. Just because they're big doesn't mean they are bad.

I suspect that in today's economy, an Alaska-Yukon link would take far less of either the U.S. or Canada GDP than the first transcontinental links of the 1800s.

And another thing: this is an age of great concern for the environment. If one assumes -- as I do -- that the resources of Alaska and the Yukon inevitably will be developed at some point in the future, then rail looks like a very healthy way to make it possible.

A rail corridor offers controlled access, for one thing. The big objection to transportation projects in wild areas is usually a reaction to the threat of uncontrolled access.

Rail systems can avoid that problem in the simplest possible way -- they don't stop. Nobody gets on, nobody gets off. About the only "impact" is a little noise when the train goes by, and then -- nothing at all.

A rail corridor can also include other things that would lessen the overall impact of future development and allow larger areas to be held in their present pristine form.

Take for example a situation where the movement of energy is a hot ticket item. Rather than building willy-nilly across the countryside, pipelines or power transmission lines could be co-located with a rail line in one corridor just a few hundred yards wide. This makes sense economically, but even more sense environmentally.

It's clear that environmental considerations should -- and will -- play a very large role in the task of deciding on whether, where and how to construct a rail system.

We need to be clear-eyed -- to recognize that development will occur sometime, and when it does, we should be planning to do it right.

The perfect rail route would minimize both environmental risks and construction costs. It would try to come as close as possible to areas of resource abundance, but avoid areas identified as environmentally sensitive. It could provide access to some communities -- and bypass others that preferred a greater degree of isolation.

What's really needed is a comprehensive feasibility study. It should look at possible routes from all those perspectives and more. It should look at cost projections. It should look at revenue potential and traffic forecasts. And it should look at all those factors with independence and impartiality.

One way to organize such a study is to put it in the hands of a commission. This is the path Senator Murkowski suggested last fall to the Canadian-American Border Trade Alliance. I'm here to renew that offer today.

The Senator's proposal was this: if there is a significant showing of support, he will introduce enabling legislation in Congress.

Such legislation would suggest parameters for a bilateral U.S.-Canada commission to oversee a comprehensive feasibility study. It would also establish a process for the appointment of commissioners on the U.S. Side, and could authorize the appropriation of funding for the commission's operations. This would get the ball rolling.

Reciprocal action would also have to be taken by the Government of Canada.

Perhaps this is a good point in which to emphasize that this effort must be impartial; as a bilateral government effort it cannot favor any particular plan, proposal or company, either American or Canadian. If any person or company wants to dig deep and come up with the private financing for a railroad, more power to them, but the commission's job must be to develop the best, most objective analysis possible.

As I envision it, the commission would have to include business leaders, academicians, and representatives of the First Nations and Alaska Natives.

It would also need the ability to take on staff members -- with the expertise to ensure that its consultants deliver. We'd need the very best in rail operations, construction engineering, economics, environmental science and other disciplines.

Finally, it should have a date certain by which it would report back to both governments.

A bill could be introduced in Congress by spring. And I know there are members of Parliament who will support the idea on the Canadian side.

We can be the conductor, but you must be the engineer.

It's true that the recent history of North American railroading is one of consolidation instead of expansion... but maybe little more expansion is not a bad thing.

Shall we finish the job of building a TRULY transcontinental system?

Is the track clear? Is the signal green? Then let's get our steam up and get moving!

Thank you.

. . .

# Section 9:

Other Information,  
HJR 51 (wording of conference resolution)

**HOUSE JOINT RESOLUTION NO. 51****IN THE LEGISLATURE OF THE STATE OF ALASKA****TWENTY-FIRST LEGISLATURE - SECOND SESSION****BY REPRESENTATIVES JAMES, Dyson, Harris, Whitaker, Foster, Masek, Kott, Coghill, Davies, Croft, Murkowski, Hudson, Therriault****Introduced: 1/31/00****Referred: House Special Committee on World Trade and State/Federal Relations, Transportation****A RESOLUTION**

1 **Expressing support for a cooperative United States-Canada feasibility study on**  
2 **extending the North American rail system through British Columbia and the**  
3 **Yukon Territory to Alaska.**

4 **BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:**

5 **WHEREAS** rail transportation is the most cost-effective long distance method of  
6 overland transportation; and

7 **WHEREAS** rail transportation is an essential component of the North American inter-  
8 modal transportation system; and

9 **WHEREAS** rail transportation is energy efficient, capable of moving goods three to  
10 nine times farther per unit of fuel than highway transportation; and

11 **WHEREAS** rail transportation emits lower levels of carbon monoxide, carbon dioxide,  
12 nitrogen oxides, and volatile organic compounds per ton of freight moved than other modes  
13 of freight transportation; and

14 **WHEREAS** rail transportation systems allow controlled access to and reduced overall  
15 effects on environmentally sensitive regions; and

16 **WHEREAS** rail transportation remains an important component of national and

1 continental defense planning; and

2       **WHEREAS** the North American rail transportation system will not be complete until  
3 it extends to all states, provinces, and territories on the continent; and

4       **WHEREAS** the State of Alaska recently enacted legislation to reauthorize the  
5 delineation and acquisition of a rail transportation corridor from the present terminus of the  
6 Alaska Railroad to the border between Alaska and the Yukon Territory; and

7       **WHEREAS** Alaska, the Yukon Territory, and British Columbia contain extensive oil  
8 and gas, mineral, and timber resource reserves that currently are inaccessible, and bilateral  
9 cooperation in the development of a freight transportation infrastructure would facilitate the  
10 utilization of these resources for the benefit of the United States and Canada; and

11       **WHEREAS** a northern rail system may significantly benefit the visitor industry by  
12 facilitating the comfortable movement of passengers over long distances while minimizing the  
13 effect of such movement on the surrounding environment; and

14       **WHEREAS** ongoing research and advancements in rail technology continue to  
15 increase the efficiency of rail transportation and ensure rail safety and decrease the effect of  
16 rail transportation on the environment;

17       **BE IT RESOLVED** that the Alaska State Legislature respectfully requests the  
18 government of the United States and the government of Canada to engage in a cooperative  
19 feasibility study to examine the costs and benefits of constructing a rail connection to link  
20 Alaska and the Yukon Territory by way of northern British Columbia with the existing North  
21 American rail transportation system; and be it

22       **FURTHER RESOLVED** that the Alaska State Legislature respectfully requests the  
23 government of the United States and the government of Canada to establish a bilateral  
24 commission representing local governments, business interests, and aboriginal stakeholders to  
25 define the goals and objectives for the cooperative feasibility study and to report the results  
26 of the study to the appropriate governmental entities of the United States and Canada; and be  
27 it

28       **FURTHER RESOLVED** that the Alaska State Legislature respectfully requests that  
29 funding for operation of the bilateral commission and for the conduct of the cooperative  
30 feasibility study be considered a priority for the governments of the United States, Canada,  
31 British Columbia, the Yukon Territory, and the State of Alaska.

1           **COPIES** of this resolution shall be sent to the Honorable Jean Chretien, Prime  
2 Minister of Canada; the Honorable David Collenette, Minister of Transport, Transport Canada;  
3 the Honorable Dan Miller, Premier of the Province of British Columbia; the Honorable Piers  
4 McDonald, Government Leader, Yukon Territory; the Honorable Bill Clinton, President of the  
5 United States; the Honorable Madeleine K. Albright, United States Secretary of State; the  
6 Honorable Rodney E. Slater, United States Secretary of Transportation; the Honorable Strom  
7 Thurmond, President Pro Tempore of the U.S. Senate; the Honorable Jesse Helms, Chair of  
8 the Committee on Foreign Relations of the U.S. Senate; the Honorable John McCain, Chair  
9 of the Committee on Commerce, Science, and Transportation of the U.S. Senate; the  
10 Honorable J. Dennis Hastert, Speaker of the U.S. House of Representatives; the Honorable  
11 Benjamin A. Gilman, Chair of the Committee on International Relations of the U.S. House  
12 of Representatives; the Honorable Bud Shuster, Chair of the Committee on Transportation and  
13 Infrastructure of the U.S. House of Representatives; and to the Honorable Ted Stevens and the  
14 Honorable Frank Murkowski, U.S. Senators, and the Honorable Don Young, U.S.  
15 Representative, members of the Alaska delegation in Congress.

1/29/00

NEWS  
MINER

Fairbanks Daily News-Miner, Saturday, January 29, 2000

# Murkowski urges lawmakers to develop state's resources

The Associated Press

JUNEAU. — Sen. Frank Murkowski urged the Legislature on Friday to promote development of Alaska's natural resources, saying the nation's booming economy is bypassing the state.

Murkowski also urged warned lawmakers about depending too much on aid from the federal government.

"There are some who seem to think that a substantial permanent fund and a strong congressional delegation are substitutes for a vibrant, sustainable private sector economy," Murkowski said in his annual speech to the Legislature. "That really isn't the case."

Murkowski said government employs 27.4 percent of Alaska's work force—the highest of any state—while the Alaska lags behind the rest of the nation by other economic measures.

"This dependence on government will never produce the type of prosperous economy that is fundamental as a prerequisite to meeting our social, educational and environmental obligations."

Murkowski said the state's per

capita income has declined from the highest in the nation 20 years ago to 20th today. And in the last 10 years, he noted, the state has lost 25,000 timber jobs, 2,220 oil and gas jobs, 1,900 mining jobs, and 3 percent of its fish processing employment.

To counter these losses, Murkowski said, the state needs to put state-owned lands into private hands, extend and improve the transportation system, entertain new ideas for developing the North Slope's vast natural gas fields, and exploit Alaska's position as a transportation hub that can serve Asia, Europe and North America.

As an example, he suggested building a railroad between the Red Dog mine north of Kotzebue and a massive coal deposit at Point Lay. The railroad would provide the mine with a source of energy to expand its operations as well as a port for exporting the rest of the coal.

Such a project, Murkowski argued, could be accomplished by the state working with local Native corporations with little involvement by the federal government.

Murkowski suggested extending the Alaska Railroad to the Ambler district's rich mineral deposits and linking the railroad to the Canadian rail system.

He also warned lawmakers against trying to raise more money from oil taxes, as two minority Democrats have proposed.

"This would be a mistake because what is most important, particularly now, is certainty about our business climate," Murkowski said, adding that the industry is already unsettled by the long-running negotiations over BP Amoco's proposed takeover of Atlantic Richfield Co.

Murkowski criticized the Federal Trade Commission for delaying the BP Amoco-Arco deal. The commission is scheduled to meet next week on the deal.

"While some may view the FTC as a friend standing in the way of a bad deal, the disturbing reality for Alaska's economic future is that few new investment decisions are being made during this time where we're hung up, little new exploration is under way, virtually everything is on hold," Murkowski said.

"The federal government

'dragon' is moody," Murkowski said. "Sometimes it's schizophrenic with respect to Alaska," burning the state by halting timber harvests, shutting down mines, limiting access and shutting down fisheries, "but on the other it is helping us with rural sanitation, education, health care, and transportation."

Murkowski said he, Sen. Ted Stevens and Rep. Don Young, all Republicans, still have a list of goals in congress, including:

- Fighting the Clinton administration's policy against road-building in national forests.

- Keeping Glacier Bay open to commercial fishing.

- Defending access to federal land.

- Thwarting any effort to permanently close the Arctic National Wildlife Refuge to oil development.

Murkowski also pledged to introduce federal legislation to protect the Inside Passage from wastewater dumping by cruise ships, an issue that rose to prominence last year when Royal Caribbean Cruise Line admitted dumping oil-contaminated water and other pollutants.

# "The ultimate goal is to connect North America with Asia and Europe by way of a rail tunnel under the Bering Sea"

ALASKA STATE REP. JEANNETTE JAMES

1/24/00  
Traffic World

## Today Alaska, Tomorrow the World

BY LINDA REID

### Alaskans, Canadians push railroad linking area with south, then Asia-Europe via Bering Strait

The icy wilderness on the Alaska-Yukon border could be called "the forgotten trade route"—not much used since the last Gold Rush and without much traffic except for the occasional sled dog team. But some Alaskans and Canadians want to change that by building an arctic railway linking Alaska and Canada's Yukon Territory with southern markets.

Sound like a pipe dream? So did Alaska's oil pipeline. And the proposed rail link has gained significant support. The state House of Representatives unanimously voted to establish a right of way for the rail route last year.

Proponents of the north-south link met in Vancouver Jan. 20 to drum up support for their plans. The meeting, sponsored by Alaska State Rep. Jeannette James, a Republican from North Pole, U.S. Sen. Frank H. Murkowski, R-Alaska, and the British Columbia Chamber of Commerce, attracted interested groups from both sides of the border. Murkowski is seeking support for a resolution in Congress that would establish a bilateral commission to study the concept.

If the arctic railway were to go ahead, it would link two of North America's northernmost constituencies with rail networks covering the United States and Canada, providing an outlet for northern

resources, reducing the costs of goods and products in the north and forming the basis for a burgeoning tourism industry, its proponents claim.

The primary driving force behind the idea is James, who has championed the idea of an Alaska rail link throughout her eight years in the state legislature.

Murkowski, head of the Senate Energy and Resources Committee, also pushed the concept of an arctic railway at the Sept. 14, 1999, meeting of the Canada-U.S. Interparliamentary Group in Quebec City. At that meeting Murkowski said future growth in the Alaska and Yukon must be aided by a major transportation corridor for pipelines, railways and transmission lines. And he recommended that work should begin to find a route for such a corridor.

The proposed railway would cover a distance of approximately 1,200 miles from Eielson Air Force Base in Alaska to the northern community of St. James, British Columbia.

If there is sufficient interest in the idea, Murkowski said a joint commission would be created to study costs, potential routes, engineering and to undertake an environmental impact study.

James has estimated the cost of surveying and building the railway at \$3 billion and hopes construction can

begin within six years.

She bases these hopes on the fact that the U.S. government plans to site an antiballistic missile base near Fairbanks and a rail line would facilitate this effort. Also, she says mining companies in Alaska are backing her plan.

Finally, a route on the Canadian side of the Alaskan border already has been mapped out by Canadian Arctic Railway, a startup British Columbia company owned by David Broadbent, son of the former general manager of the Pacific Great Eastern Railway, which is now crown-owned B.C. Rail.

However, plans for an arctic railway are only part of James' grander scheme. The other part of her plan would see the construction of a Bering Strait Tunnel linking Russia to the United States and Canada.

"The ultimate goal is to connect North America with Asia and Europe by way of a rail tunnel under the Bering Sea," she said in a letter from the state legislature. "There is growing international interest in this project, first suggested in the late 1890s."

And you thought Canadian National's plans for Burlington Northern Santa Fe were ambitious.

— Reid is a freelance writer in Vancouver, British Columbia.

USA

6/9/99

LAYING A SPUR TO THE LOWER 48

# Alaska's monster railroad: bane or boon?

By Abraham McLaughlin  
Staff writer of  
The Christian Science Monitor

**ANCHORAGE** - There's a big idea floating around up here in Alaska - and it could forever change the face and feel of America's last great frontier.

It's something people have been dreaming about for decades. Now it's rumbling toward reality.

The plan is to build a railroad from Fairbanks - through 850 miles of icy wilderness - down to the Lower 48.

Today just one highway connects Alaska to its southern siblings, so this \$3-billion-or-more project would be a big new avenue for trade and tourism.

But more than just a new set of rails, it symbolizes the think-big, can-do spirit thriving in Alaska today.

This is the state that built an 800-mile oil pipeline. It's the state that considered building a massive aquaduct to transport water from melting glaciers to thirsty California.

Yet there's another spirit that runs strong here, too. It revels in the state's natural beauty - and isolation. Minnesota may have 10,000 lakes, but Alaska has 3 million. There are more caribou here than people.

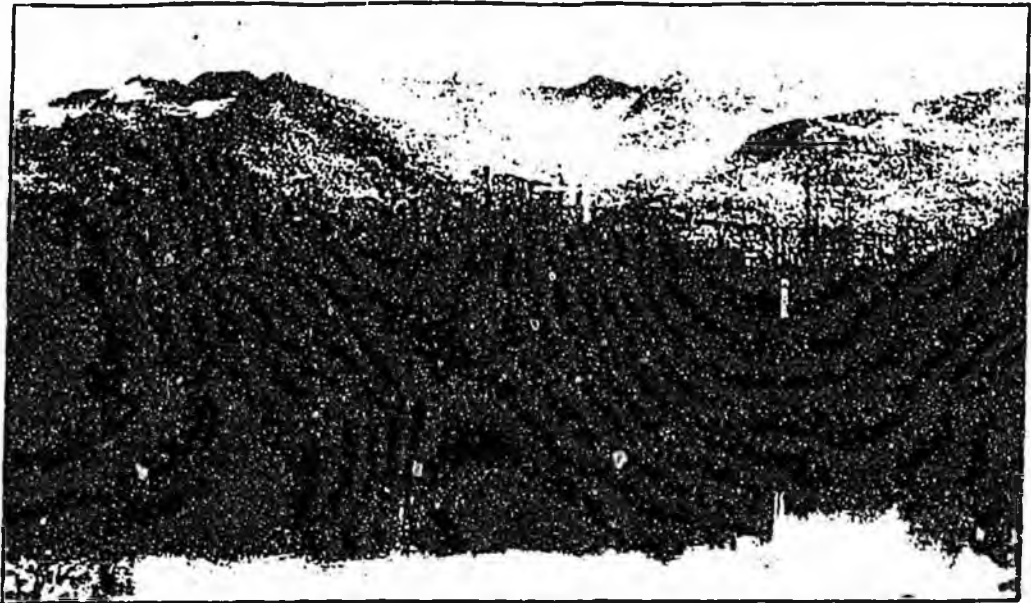
Yes, it's environmentalism. But many people came to Alaska to escape congestion. They like being disconnected from the nation - and want to keep it that way.

It's these two attitudes that largely define the state - and that a big project will have to reconcile to become reality.

And the tension between them won't end with the Lower-48 rail link.

### To connect or not to connect

There's a plan to carve out a 55-mile rail tunnel under the Bering Strait to Russia - at a cost of at least \$15 billion. It's still a pipe dream, but with global trade growing, it's gaining momentum. Indeed, the tunnel would link much of the world by rail: Trains could run from New York to Beijing and Moscow and



MELANIE STETSON FREEMAN - STAFF FILE

**RAIL RUMBLES:** Proposals are afloat for a railroad linking Alaska to the Lower 48. In Fairbanks it could meet up with the Alaska Railroad, helping to transport visitors and commercial goods. But not all Alaskans want people to have easy access to the isolated paradise.

fense - or "star wars" - base near Fairbanks. A rail link would help in building the facility.

Second, many mining companies back the plan - and would use trains to get their products to market more efficiently.

Third, the Canadian Arctic Railway, a start-up company in British Columbia, has mapped out a route for the Canadian section. President David Broadbent says

bald eagles, which, in some places up here, seem as common as sparrows.

Take the waterfront town of Valdez, home of one of the nation's busiest oil-loading ports. Like the rest of Alaska, its dependence on oil is fading. Revenues from the port aren't as high as in the past.

But tourism is speeding ahead. Visitors come to fish for halibut and salmon. Or they take sea kayaks out to Prince William Sound, their paddles plying the waters once sullied by the Exxon Valdez's spilled black goo. It's a sign of the times for this town. Oil is still king, but tourism is challenging.

Unlike oil, "tourism is a renewable resource," says Joe Leahy, a kayak guide in Valdez. "The more tourists the better."

### Compared with a road ...

Yet supporters of the rail-link plan are mindful of getting skeptics on board. One selling point is that with a railway - as opposed to a road - access is "controlled," meaning not just anyone with a car can jump on.

"The fewer roads we build, the better off we are," says Ms. James. Some environmentalists have given their backing to the plan.

But other Alaskans will be harder to convince. They see more links to the



rb the problem says Siebel. g operation by Michigan. Local would enter a upon. One of the wanted to kill y a weapon be- offense. Instead. : gun in an elab- affair was video- ments of one was doing was cials couldn't be he operation. ner's findings are ATF prosecuted if the federal gun falsifying records lated people. the time - this is ho re should be in road- ashington. also planning to t to communities dustry. He hopes elude local deal- : guns. the gun industry clip them in their use of Senator It proves what we m the outset: In rs are active par- t allows the com- s to people who says Dan Abel. a f Gauthier Down- g the city of New if gunmakers. nufacturers argue should not be in-

is the first time en compiled and mong the findings: vauker, Wis., sold rines committed Another dealer in source of 1,176 that time period. it gun stores (17) at least 50 guns ted last year. Nine 10 guns traced to tates are Indiana alifornia with 12, d Texas with 10. ll the most guns a located in sub- low crime rates. gun dealers sold es. dealers are also dealer in Tafford. 3 guns linked to 1 1998.

could forever change the face and feel of America's last great frontier.

It's something people have been dreaming about for decades. Now it's rumbling toward reality.

The plan is to build a railroad from Fairbanks - through 850 miles of icy wilderness - down to the Lower 48.

Today just one highway connects Alaska to its southern siblings, so this \$3-billion-or-more project would be a big new avenue for trade and tourism.

But more than just a new set of rails, it symbolizes the think-big, can-do spirit thriving in Alaska today.

This is the state that built an 800-mile oil pipeline. It's the state that considered building a massive aquaduct to transport water from melting glaciers to thirsty California.

Yet there's another spirit that runs strong here, too. It revels in the state's natural beauty - and isolation. Minnesota may have 10,000 lakes, but Alaska has 3 million. There are more caribou here than people.

Yes, it's environmentalism. But many people came to Alaska to escape congestion. They like being disconnected from the nation - and want to keep it that way.

It's these two attitudes that largely define the state - and that any big project will have to reconcile to become reality.

And the tension between them won't end with the Lower-48 rail link.

**To connect or not to connect**

There's a plan to carve out a 55-mile rail tunnel under the Bering Strait to Russia - at a cost of at least \$15 billion. It's still a pipe dream, but with global trade growing, it's gaining momentum. Indeed, the tunnel would link much of the world by rail: Trains could run from New York to Beijing and Moscow and London.

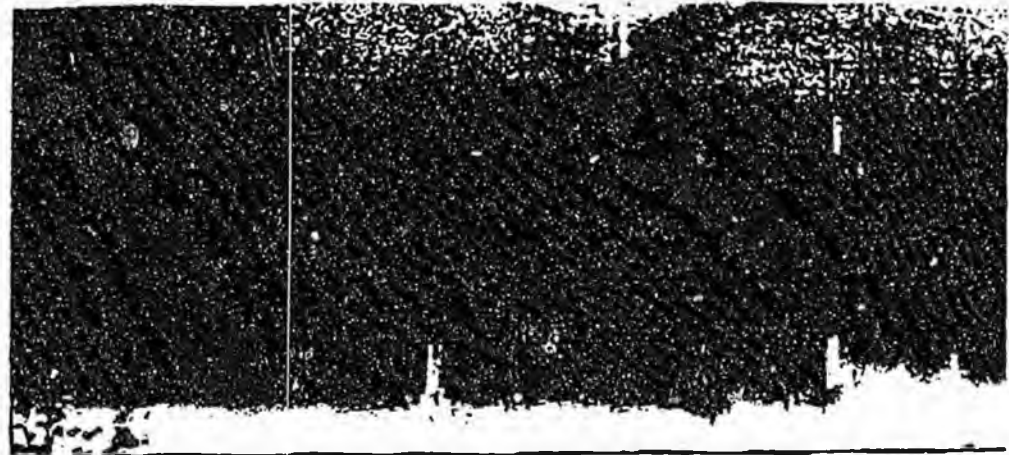
But first things first. Last month, the state House of Representatives gave its unanimous consent to establish a right of way for the rail route down south.

Soon proponents will gather to plot the next steps.

"It's pretty revved up now," says Jeanette James, the state representative who's spearheading the idea. "We in the legislature are moving ahead. And there's lots of private money itching to do something."

She hopes construction will start within six years. Several things make that time frame seem realistic.

First, the US government is moving toward putting an antiballistic missile de-



MELANIE STETSON FREEMAN

**RAIL RUMBLES:** Proposals are afloat for a railroad linking Alaska to the Lower 48. In Fairbanks could meet up with the Alaska Railroad, helping to transport visitors and commercial goods. Not all Alaskans want people to have easy access to the isolated paradise.

fense - or "star wars" - base near Fairbanks. A rail link would help in building the facility.

Second, many mining companies back the plan - and would use trains to get their products to market more efficiently.

Third, the Canadian Arctic Railway, a start-up company in British Columbia, has mapped out a route for the Canadian section. President David Broadbent says

bald eagles, which, in some places here, seem as common as sparrows.

Take the waterfront town of Kodiak, home of one of the nation's busiest fishing ports. Like the rest of Alaska, dependence on oil is fading. Refueling from the port aren't as high as in the past.

But tourism is speeding ahead. Visitors come to fish for halibut and salmon. Or they take sea kayaks out to the coast. In William Sound, their paddles ply waters once sullied by the Exxon Valdez spilled black goo. It's a sign of the times for this town. Oil is still king, but tourism is challenging.

Unlike oil, "tourism is a renewable resource," says Joe Leahy, a kayak guide in Valdez. "The more tourists the better."

**Compared with a road ...**

Yet supporters of the rail-link project are mindful of getting skeptics on board. One selling point is that with a railway proposed to a road - access is "controllable" meaning not just anyone with a car can jump on.

"The fewer roads we build, the better off we are," says Ms. James. Some environmentalists have given their backing to the plan.

But other Alaskans will be hard to convince. They say more links to the Lower 48 will further compromise Alaska's independence.

"We've already got highway barges and boats and airplanes" bringing too many tourists in their wheelchairs, says Paul Converse, a longtime resident.

There's an old native word, *atun*, that means "newly arrived." Cheechakos is what Alaskans call tourists - when they're being polite.

Yet, this struggle between old and new is between connection and isolation. In this vast, enticing wilderness, age-old one is in this vast, enticing wilderness. And with the idea of a rail link bringing steam, Alaskans have another way to strike a balance between them.



DAVE HERBING - STAFF

he already has several New York investors interested in funding the project.

**Tourism taking off**

Fourth, tourism is growing fast. The number of annual tourist visits to Alaska has doubled to more than 1 million in the past decade.

People come to see melting glaciers or

01/19/00

Fairbanks Daily News Miner

# Rails from trails—the dream continues

## Trans-Alaska route still inspires visionaries

The recent Alaska Railroad status report before the Fairbanks Chamber of Commerce drew sustained applause. The presentation was timely, informative, concise, and upbeat, a positive contribution to understanding the mission of the railroad, its current usage, its successes and limitations.

Of particular interest was the presentation of planning for the future improvement of equipment, and services, elimination of hazards, and possible extension of the rail line itself.

Planning is under way to re-route the extension from Fairbanks to the North Pole Refinery and Eielson Air Force Base. The intent is to eliminate the hazards of the existing 14 rail crossings in 22 miles or so, probably using overpasses for highway traffic at key points.

A second thrust, it was announced, will be to extend the railroad from Eielson AFB to Fort Greely/Delta Junction should the pending national missile defense site be authorized for that area.

All members of our Alaska congressional delegation have indicated this to be a likely prospect. Word released from Washington this week suggests that the president now considers the national missile defense project to be in the urgent necessity category.

Also mentioned by John Binkley, a railroad board member, was the long-held hope to extend the railway to Whitehorse and beyond ultimately to link with the Canadian rail system.



William R. Wood

For me this triggered open the gate to a train of memories. I recalled the time in the early '60s when Charles Sargent, dean of engineering at the University of Alaska, showed me a copy of a U.S. Corps of Engineers report on the Defense of Alaska: Trans-Canada and Alaska Western Railroad Survey, 1942. Sargent, a professional civil engineer, and Lee Linck, well-known Fairbanks architect, both participated in doing the field work on that report. A copy is on file at the Rasmuson Library complex, according to one of its able and helpful archivists, Gretchen Lake.

When I talked by phone with Dean Sargent, now retired in Coeur d'Alene, Idaho, he told me of working on field studies for four segments of the proposed trans-Canada/trans-Alaska route: (A) Wood River to Delta; (B) Mouth of the White River to Whitehorse; (C) Stikine Pass area, British Columbia; (D) the Seward Peninsula.

The survey covered a proposed rail route from Teller, Alaska, on the Bering Sea coast to Prince George, British Columbia, and a Pacific ocean port, at Prince Rupert.

But the survey was only a part of the big dream of linking continents together by highway and rail as well as by sea and air.

I recalled Gov. Walter Hickel's North Commission (Northern

Operation: Rail Transportation and Highway) created to study Alaska's transportation needs in the mid-'60s.

I have a great recollection of coming from Anchorage to Fairbanks by train with the commission at the beginning of the Great Flood of '67. By chance my seat partner was Bill Lear, inventor and builder of the Lear Jet aircraft, main plant at Reno, Nev. Lear was a visionary with a very practical down-to-earth twist. He could dream, dare, and do. He got the good things done. I found him a most stimulating, thought-provoking conversationalist.

Gov. Hickel brought along to show the commission the silver punch bowl commemorating the Harriman Expedition to Alaska, 1899. I was told by the governor the famous memento is now in the state museum at Juneau.

While there is no mention of trans-Alaska in the expedition's report, the originator and host of the expedition, one of the turn-of-the-century world's wealthiest people, owner of some 20,000 miles the U.S. transcontinental rail system, was an early and strong advocate of the big dream of joining continents together by rail to promote development of resources and bringing diverse peoples together in peace.

The concept of a trans-continental USA system joined to a trans-Canada, including the trans-Yukon-Territory and trans-Alaska, segments to join with the trans-Siberian and on to the trans-Eurasian segment, the Orient Express route was the big dream.

Donald MacDonald of Fairbanks, head of the Alaska Road Commission and called by many "the father of the Alaska Highway," was a strong voice in advocacy of the big dream. A

splendid account of this is Kay Kennedy's article in *Alaska Life*, volume I, No. 7, August 1938. So also was the czar of Russia.

But the vision did not begin with Harriman, the czar of Russia, Donald MacDonald, Dean Sargent or Lee Linck. Its origin is credited to William Gilpin, first territorial governor of Colorado. The concept was featured in his book published in 1891, "The Cosmopolitan Railway, Compacting and Fusing Together All The Worlds Continents."

John Gilpin was not only a visionary, but a thinker with an extraordinary range of experience, a strong executive and innovator in handling public affairs. He was insightful, personable, courteous, and effective.

Terrence Cole, head of the UAF History Department and noted author, tells much more of the story of William Gilpin and his dream of an around-the-world rail system in a well illustrated article, "Bridging the Strait," appearing in the Nov. 19, 1989, issue of *Heartland*, the magazine section of the Fairbanks Daily News-Miner. "The vision William Gilpin and others, that somehow bridging the Bering Strait can be a sign and even a cause of world peace, is still alive today."

And now you have a bit of the rest of the story of a dream that does not die but runs on and on generation after generation. Bringing people and their products together not only by sea and by air but also by land.

The proposed extension of the Alaska Railroad to the east and to the west is a small but real part of a dream that persists.

William R. Wood is a retired president of the University of Alaska now volunteering his time as executive director of Festival Fairbanks. His columns appear every other Wednesday on the Opinion page.

# An Alaska pipedream

3/11/99

No big transportation project has ever 'been a bad idea'

By **Charlie Anderson**  
Staff Reporter

Alaskan politician Jeannette James has a twinkle of a railway in her eye — from Fairbanks to Washington state, through B.C.

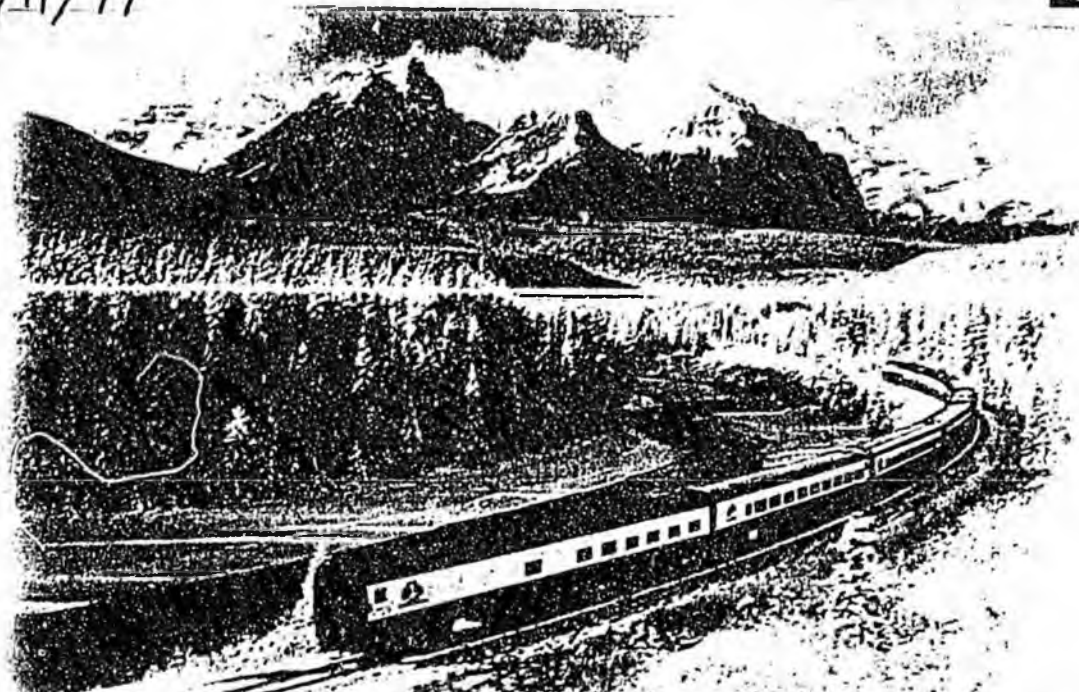
The representative of North Pole, Alaska, has permission from her state legislature to draw a railway line on the map.

And an even grander vision calls for a railway under the Bering Straits and on to Moscow and Beijing.

"There's been a lot of folks talking about it, I want to be able to do something about it," said James, 69, who has been working on the idea in the seven years she's spent in the state House of Representatives.

"We've had interest from Australia and other places if we were ever to go into Russia," said James. "There has been no big transportation project that's been a bad idea. Even the Panama Canal or all those kinds of things are hard to get to happen. But when they're done, they work."

The first part of James' dream is a 1,450-kilometre line from Fairbanks through the Yukon and down to Chimounk B.C. which sits at the end of B.C.'s rail system, 240 km northwest of Fort. St. James.



Rep. James' vision would open up Yukon, Northern B.C., she says. Freight would pay the way.



The Alaska House of Representatives has just passed a bill authorizing the marking of a right-of-way to the border with the Yukon.

James believes the railway would open up the area by allowing the easier shipping of raw materials from Alaska, the Yukon and Northern B.C.

"This is an area that needs an economic boost and certainly this would really do it," said James, who calculates the cost of surveying and building such a railway would be about \$3 million US per mile. That doesn't include the cost of acquiring land or any environmental and land-claim issues.

Any such enterprise would have to be a partner-

ship between state and federal governments.

"With railways, the freight pays the way, with tourism as the frosting on the cake," said James. "Once you have other industries that will create and support the infrastructure, then tourism is a little extra. It piggybacks on the back of real industry."

Carol Lee of BC Rail said she had been alerted to Alaska's idea by a brief call from one of James' staff: "We don't discount the possibility off the cuff, there's always the possibility," said Lee. "We'd have to take a look at the business case. We won't make any commitment without it being economically justifiable."

12/99

# A Rail Connection Across Canada

*Building a railroad that links Alaska to the Lower 48 is a dream that just may become a reality.*

BY RICHARD F. SCHMITZ

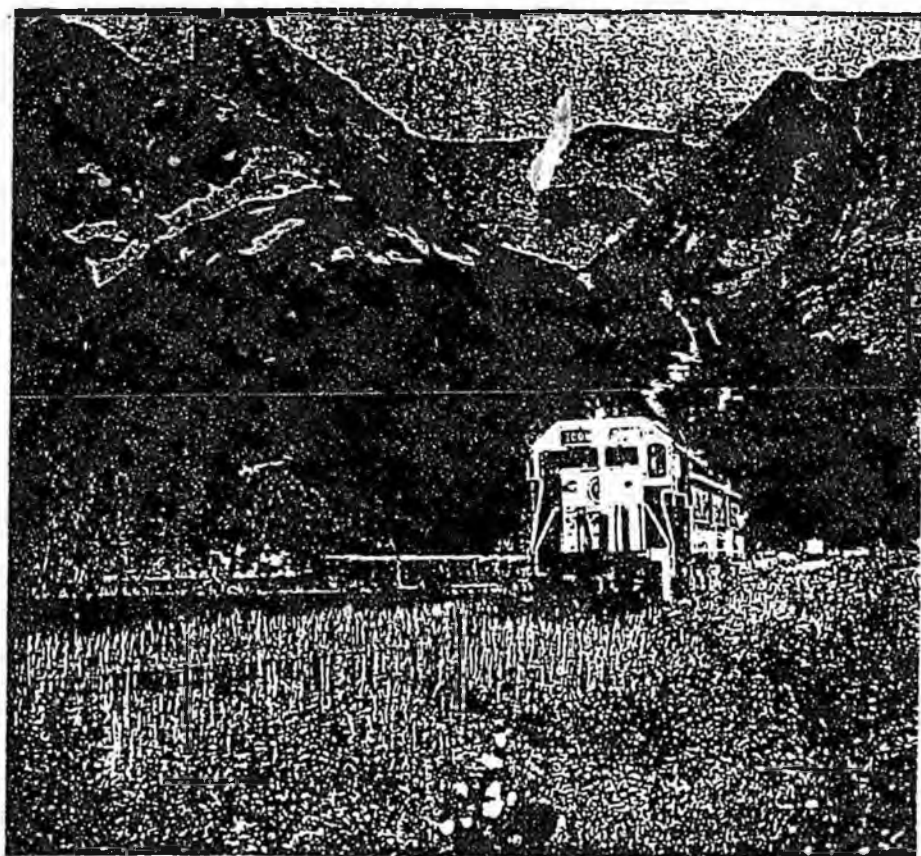
Less than a two day's drive separates the Alaska Railroad, at its easternmost, from the British Columbia railroad, at its northwesternmost, and closing that gap has, in the past year or so, caught the attention of a number of entrepreneurs, legislators and just plain dreamers in Alaska, Yukon and British Columbia.

Foremost among supporters of connecting Alaska with the Lower 48 by rail is North Pole Republican Representative Jeannette James. During the past legislative session James introduced and passed HB 12, which allows for delineation of a rail corridor from existing Alaska Railroad tracks to the Canadian border. Last summer James worked to pass resolutions of support by the state Chamber of Commerce, as well as chambers in Fairbanks, Delta Junction and Dease Lake, B.C.

James has long backed rail development in Alaska, and sees connecting the Alaska Railroad with the rest of the North American rail network as a huge key to insuring a bright—and diverse—future for the state's economy in the new millennium.

"The very first benefit to having surface transportation from the Lower 48 to Alaska will be a reduction in the cost of living. A railroad will allow us to open up resource development that's not possible now because of the high cost of transportation," James said. "A railroad will lead to value-added industries and increased cooperation between Alaska and the northern part of Canada."

How?



Clark James Maher

## Another Transportation Option

The Alaska Railroad estimates construction cost for new track in Alaska at \$2.5 million to \$3 million per mile. With 270 miles separating Eielson Air Force Base from the border, the cost of building that part of the railroad is about \$675 million to \$810 million. An additional 900 miles of track would be needed to connect existing tracks in Canada to new track in Alaska.

James said tourism, agriculture and mining would get an immediate lift from a rail connection to the Lower 48. Using Delta Junction's agricultural area as an example, James said fertilizer and

other supplies could be brought in to farmers while produce could be shipped directly to market—in and out of Alaska.

"I think the critical thing is that a railroad will allow Alaskan growers to supply Alaskan consumers. Alaska's economic future depends on our ability to have value-added industries, such as a freezing plant for produce," James continued. "The financial benefit a state gets from value-added industry is close to five times greater than what it gets from exporting a raw material."

One person who's convinced James is on the right track is U.S. Sen. Frank Murkowski, who's taking an active stand

in support of the issue. "We think it's well worth exploring," said Murkowski aide Bill Woolf.

The first step Murkowski's office is taking is to seat an informal committee, which James will chair, to identify potential users of a railroad to the Lower 48. "A project such as this is of tremendous magnitude. We need to do, what attorneys would call, 'due diligence,'" Woolf said. "We need to look at possible users; we need to look at resources; we need to look at engineering, possible routes and environmental factors."

The goal of this panel, James explained, is to write and pass a resolution and then present it to Murkowski at a meeting with British Columbia and Yukon officials and legislators in late January in Vancouver, B.C. If there is public support for this railroad project, Sen. Murkowski said he will introduce legislation to create a bilateral commission to further study the issue, Woolf said.

### Not a New Idea

Opening a rail connection to Alaska has been considered since the first ties of the Alaska Railroad were laid. "Back in the

1970s there was a cursory review," said Alaska Railroad Vice President Jim Blasingame. "It was about a 15- to 20-page report. The province of British Columbia was quite supportive of the idea.

"Rail is still the best way to move bulk matter from point A to point B. It's a basic premise," Blasingame said.

About 270 miles separates the Alaska Railroad at Eielson from the Alaska-Canada border. The British Columbia railroad has a rail bed in place as far north as Dease Lake, less than 100 miles from the southern Yukon community of Watson Lake, although it has been abandoned a little north of Fort Saint James since the 1980s.

Reopening that line is a top priority for Canadian entrepreneur David Broadbent, CEO of the Canadian Arctic Railway. The Canadian Arctic Railway has no locomotives or rolling stock now—but it is betting it will in two or three years, Broadbent said.

"The grade and bridges are there. They're just sitting out there growing weeds," Broadbent said of the 172-mile stretch into Northern B.C. "Our



Sen. Frank Murkowski

**If there is public support for this railroad project, Sen. Frank Murkowski said he will introduce legislation to create a bilateral commission to further study the issue.**

### TRANSPORTATION

intention is to open it up and possibly run it as a short line, and then extend it to Whitehorse in six years."

Broadbent gained his railroad experience working 29 years for the British Columbia Railroad. He began as a laborer and worked his way up to engineer of standards and project manager. Later, he founded the North American Rail and Steel Tie Corp., which supplies parts and equipment to railroads, including the Alaska Railroad. Broadbent said he recently sold the company in order to devote his energies full time to the Canadian Arctic Railway.

Broadbent said he has seen a surge of interest in building a railroad to Alaska. "Too many people see railroads as a thing of the past. But that's only true in North America. Elsewhere in the world railroads are expanding. China is committed to building 1,000 kilometers (620 miles) of new track a year.

"When I talk to business people, I get a 'what, are you crazy?' look—at first. But when I explain the good economic sense railroads make, I see a quick change in their attitude," Broadbent continued. "Highways will never open up Northern

Canada or Alaska. The Alaska Highway was built 57 years ago, and very little has developed along it since."

Railroads, on the other hand, can attract development. "Traditionally, in the West, railroads would find entrepreneurs and help finance them because that development meant revenue for the railroad as raw materials were brought in and finished products shipped out," Broadbent explained.

Broadbent said two factors must be addressed before any rail connection can be made to Alaska: aboriginal land claims and environmental issues. "Native councils and corporations must be brought in as full partners from the start. I don't mean offering Natives a few jobs—I mean offering them a full and equal partnership," Broadbent said. "As for environmental concerns, railroads have a big advantage over other forms of development because access to sensitive areas can be tightly controlled."

Taking rivers as another example, Broadbent said piers and modular or pre-fab bridge spans can be put in place without ever touching the water flowing below. Railroad construction is

relatively low impact, he added. "You could build the railroad to Alaska with 300 to 400 men. You won't need camps every few miles or access roads. That keeps costs down—and it also keeps the environmental impact low."

### Expanding Alaska's Reach

Rep. James conceded barge and trucking firms might be less than enthusiastic about bringing a major competitor on board. But James said, "business generates business." Having a rail connection to the rest of North America will be good for all Alaska transportation sectors.

"Goods could come to Alaska by rail and be shipped to Asia from Seward or Anchorage. Having a railroad connection to the Lower 48 will provide an excellent opportunity for Alaska to become a shipping hub to Asian nations. There's tremendous potential there."

James points out that any railroad to the Lower 48 will particularly improve Alaska's connection with Midwest and East Coast states.

"But the overall goal is to develop our own resources. The way I see it, rail is way

TECHNOLOGY

ahead of roads or air on this issue. There's less cost; it's more environmentally sound; and rail is just a lot more dependable in bad weather," James said. "Snow, wind, sleet just doesn't affect a train the way it does an airplane or a truck.

"Transportation costs are basically front-loaded," James said. "The more something is handled, the more it costs to ship. That's why, over the long haul, railroad has a big advantage."

**"The very first benefit to having surface transportation from the Lower 48 to Alaska will be a reduction in the cost of living. A railroad will allow us to open up resource development that's not possible now because of the high cost of transportation."**

Jeannette James  
North Pole Republican Representative

James said the Red Dog Mine is a good example of an Alaska enterprise that could benefit from a railroad. At present, ore must be taken from the mine site to the coast where it is put on a lighter and then transferred to a freighter anchored offshore. "Sixty percent of that ore is refined in Alberta. Imagine how much easier—and more cost-effective—it would be to take that ore by rail directly to the refiner."

"If it proves out ... if we someday have that rail connection, Alaska's economy will benefit in a very different way than it did from the pipeline," said Woolf of Murkowski's office. "It will be more than construction. A rail system can go through parts of Alaska where there is no transportation option, and that could give the state a big economic boost. A mine that wasn't feasible will suddenly become feasible."

Rep. James said railroads pay for their own maintenance, while roads and airports are maintained by taxpayers. "With rail, the cost of maintenance is borne by rail users. In comparison, the public pays for maintenance for roads and airports. Rail takes care of its own."

James also points to great potential for growth in tourism that a rail

connection will bring. "A railroad will open up Alaska to a whole new group of folks, and it could also greatly increase winter tourism. It certainly will help the tourism industry in Alaska."

The military is yet another sector that could benefit from a rail connection. Of immediate interest is the new missile defense system, which if eventually approved, could be set up at Clear Air Force Station, near Healy, or at Fort Greeley, near Delta Junction. "Certainly if Alaska is chosen (as a missile site), rail transportation is one of the options for

moving material. Since such construction would require a great deal of material, obviously a rail component will be looked at," Woolf said.

The last time a new rail line was opened in Alaska was the 1950s when a 180-mile spur was completed from Fairbanks to Eielson. Today that spur carries out products of the North Pole refinery. If Rep. James sees her vision fulfilled, the trains rumbling past her North Pole home will be headed for points much further south than an Air Force base a few miles away. □

# Agenda

## Alaska Canada Rail Link Conference

January 20, 2000  
Vancouver, B.C. Canada

- 7:30 a.m.                    **Registration; Continental Breakfast**
- 9:00 a.m.                    **Opening: Barbara Cotting, Chief of Staff to Rep. James John Winter, B.C. Chamber of Commerce  
Pam LaBolle, Alaska State Chamber of Commerce  
Hugo Llorens, United States Consul General**
- 9:25 a.m.                    **Representative Jeannette James, Conference MC**
- 9:30 a.m.                    **First Panel: Peter Fraser, moderator**  
15 min.: Peter Fraser, Pacific Corridor Enterprise Council  
20 min.: Hal Cooper, Cooper Consulting  
15 min.: Don Lowell, Alaska Transportation Consultants  
20 min.: David Broadbent, et.al. Canadian Arctic Railway  
20 min.: Question-answer session with panel  
  
5 min.: Scott Robart, Can-Al Rail Link
- 11:05 a.m.                   **Coffee break**
- 11:20 a.m.                   **Bill Woolf, Transportation Aide for Sen. Frank Murkowski**
- 11:40 a.m.                   **Question-answer session: Bill Woolf**
- 12 Noon:                    **Lunch**  
**Steve Hites, tourism, entertainment**
- 1:00 p.m.                    **Second Panel: Rep. Jeannette James, moderator**  
20 min.: Milt Wiltse, Alaska Dept. of Natural Resources  
20 min.: Jesse Duke, Mining Facilitator, Govt. of Yukon  
20 min.: Dr. Paul Metz, University of Alaska Fairbanks  
30 min.: Question-answer session with panel
- 2:30 p.m.                    **Gil Carmichael, Intermodal Transport Institute**
- 3:00 p.m.                    **Coffee break**  
**Questions for Gil Carmichael**
- 3:15 p.m.                    **Plenary Session, Resolution**
- 4:15 p.m.                    **Wrap-Up**
- 4:30 p.m.                    **Conclusion**

**[www.repjames.org](http://www.repjames.org)**

Published by the office of Representative Jeannette James, February 2000  
Compiled by Richard F. Schmitz