

680394

# James Askew Associates, Inc.

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Resource # <sup>460 370 8.</sup> 217MM  
NSR Value \$20/T.  
10000 TPD  
3.1 yrs  
? NEED 3x or 10yrs

**ASARCO**  
Incorporated

TASEKO PROJECT -  
BRITISH COLUMBIA, CANADA  
PRE-FEASIBILITY STUDY

- Road
- Camp
- Power
- Labour
- Shipping
- Swing shifts

Prepared By:

James Askew Associates, Inc.  
5600 South Quebec Street, Suite 312A  
Englewood, Colorado, 80111

Strip ratio 6:1

February, 1991

? Pit walls 55°

\* LOWER ZONE  
HAS CONTINUITY  
& THICKNESS

# ASARCO

Taseko Project

JAA 140 February, 1991

## EXECUTIVE SUMMARY

### General

In November, the Denver-based Exploration Acquisitions Department of ASARCO Incorporated [ASARCO] requested James Askew Associates, Inc. [JAA, Inc.] to conduct a Pre-feasibility Study of the Taseko Project in British Columbia, Canada. A visit was made to Vancouver in December, 1990 by Edward R. May, Principal Geological Engineer for JAA, Inc. and meetings were held with Canadian personnel responsible for the collection of data. Westpine Metals Ltd. [Westpine], a company formed in March, 1989 to manage the property, is ASARCO's joint venture partner.

### Location

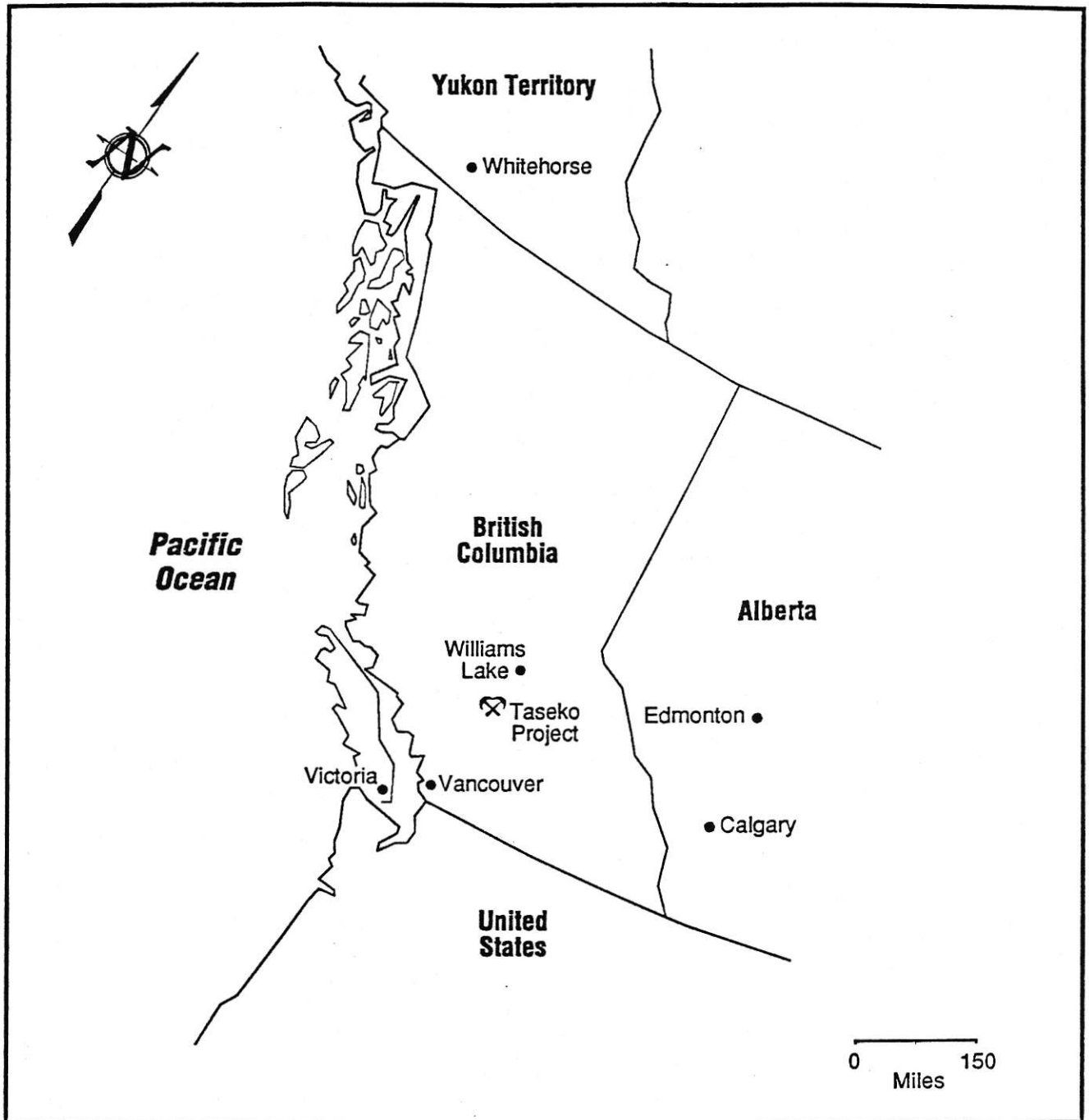
The Taseko Project site is located in southwestern British Columbia approximately 225 miles [mi] northeast of Vancouver as shown on Figure A. The area has been previously explored by various Canadian and American companies for copper and molybdenum. Large rock alteration zones, favorable mineralized contacts and structures and float containing high grade chalcopyrite and magnetite mineralization occur in the region.

### Exploration History

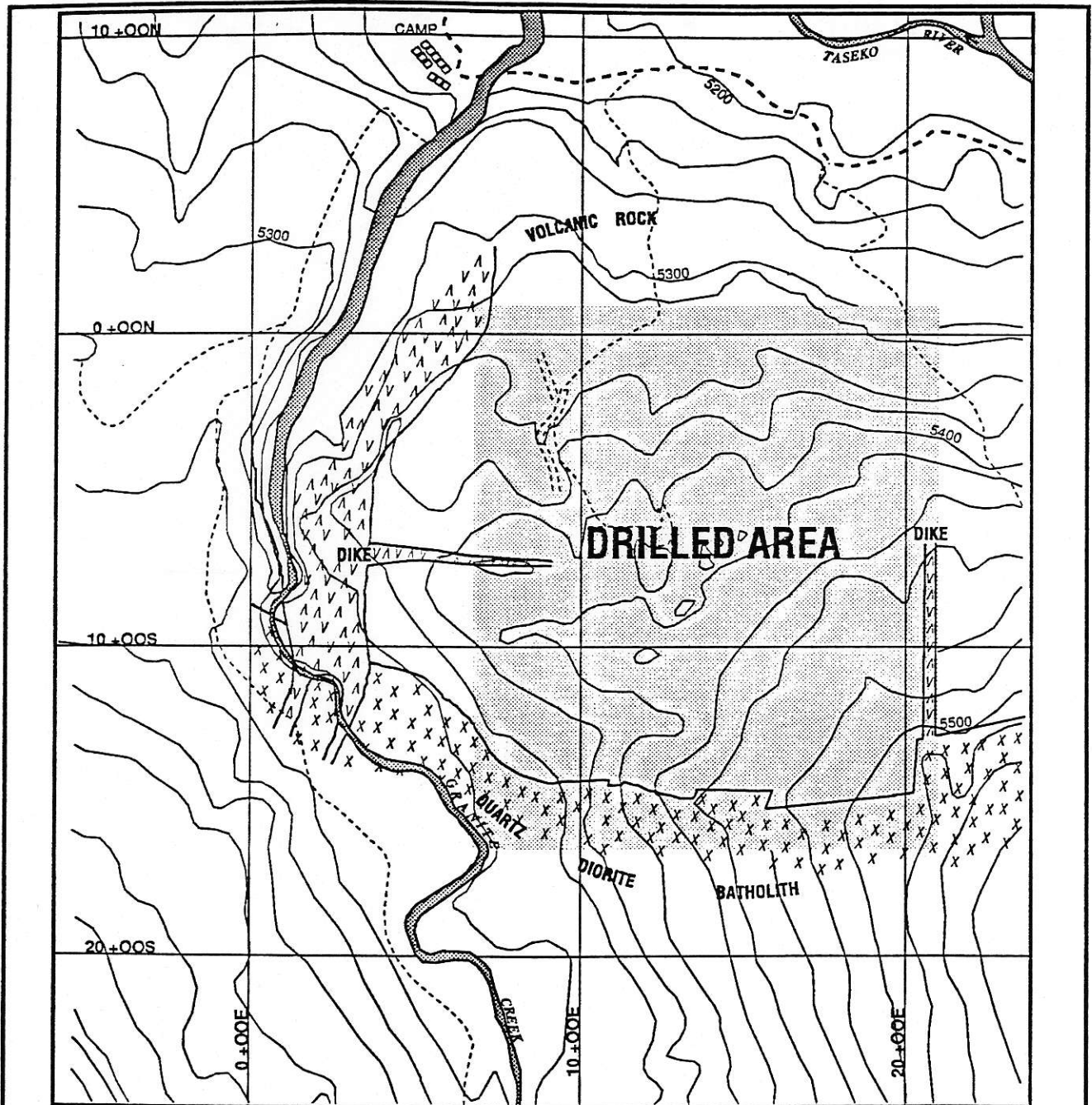
Copper-gold mineralization has been known since the 1960's in the Empress Area which is located at the confluence of Granite Creek with the Taseko River as shown on Figure B. Most of the exploration up to 1990 was concentrated in delineating shallow copper-gold reserves. This mineralization is controlled within northeast striking structural zones or within a vent breccia. One diamond drill hole, Hole 76-2, drilled in 1976 did, however, penetrate deeper copper-gold mineralization 550 feet [ft] to 700 ft below the surface. The results of this hole encouraged ASARCO in 1990 to further explore for deep mineralization within the highly altered volcanic rock of the Late Cretaceous-age Kingsvale Formation.

### Geology and Mineralization

The project site is underlain by 500 ft to 700 ft of volcanic rock which has been highly altered. This volcanic rock is generally gently dipping [less than 10 degrees [°] although there is some evidence that the volcanic rock dips increase towards the quartz-diorite contact. The contact strikes east-west across the southern edge of the study area and post intrusive faulting has either emplaced or structurally complicated preexisting copper-gold mineralization.



Drawn GKS	Date 02/12/91	<b>James Askew Associates, Inc.</b>  Taseko Project — British Columbia, Canada Project Location Map	Figure N <sup>o</sup> A
Approved ERM	02/12/91		Job N <sup>o</sup> 140
Revision			Scale: 1 in to 150 mi



Drawn GKS	Date 02/12/91	<b>James Askew Associates, Inc.</b>  Taseko Project — British Columbia, Canada Location of The Empress Area	Figure N <sup>o</sup> B
Approved ERM	02/12/91		Job N <sup>o</sup> 140
Revision			Scale: 1 in to 500 ft

## Geology and Mineralization [Continued]

Underlying the volcanic rock is either a quartz diorite shelf which forms a shallow basin beneath the mineralized volcanic rock, or a thick quartz-diorite sill. It has been previously interpreted that the quartz diorite batholith is probably the source of copper-gold mineralization. Several north-south and east-west dikes associated with the batholith intrude the volcanic rock.

Structurally, the volcanic rock contains three steeply dipping fracture sets which strike in a northwest, northeast and north-south direction.

Three zones of copper-gold mineralization are known in the Taseko Deposit, located beneath the drilled area within the Empress Area. These zones are the 76, Shallow North and Deeper North and are shown on Figure C. Significant amounts of copper-gold mineralization has been drill penetrated in the Deeper North Zone, the top of which is 350 ft to 500 ft below surface. Maximum vertical thickness of 180 ft has been cored averaging 1.41 percent [%] copper. Copper-gold mineralization is geologically correlated over an area of 900 ft north-south and 500 ft east-west. Construction of variograms, however, was not successful because of insufficient drilling.

The 76 and Shallow North Zones are structurally much more complicated and contain patchy mineralization.

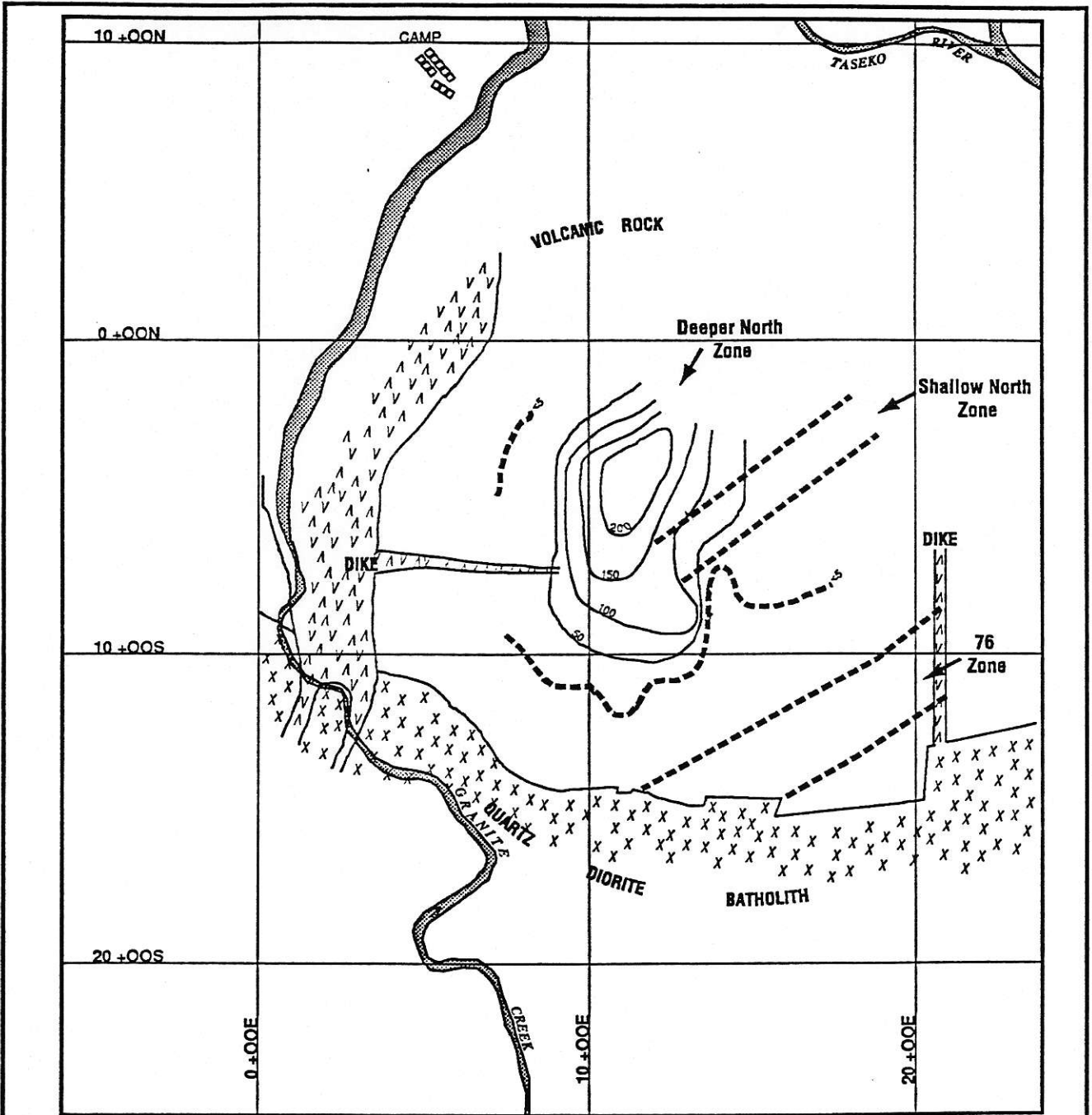
## Drilling and Sample Interpretation

The three mineralized zones have been diamond drilled using vertical and inclined holes. A total of 44 holes have been collared although to date only 13 holes have penetrated the Deeper North Zone. Drilling since 1976 totals 21,458 ft which has generally been sampled on an average width of seven feet. Drill hole collar locations are shown on Figure D.

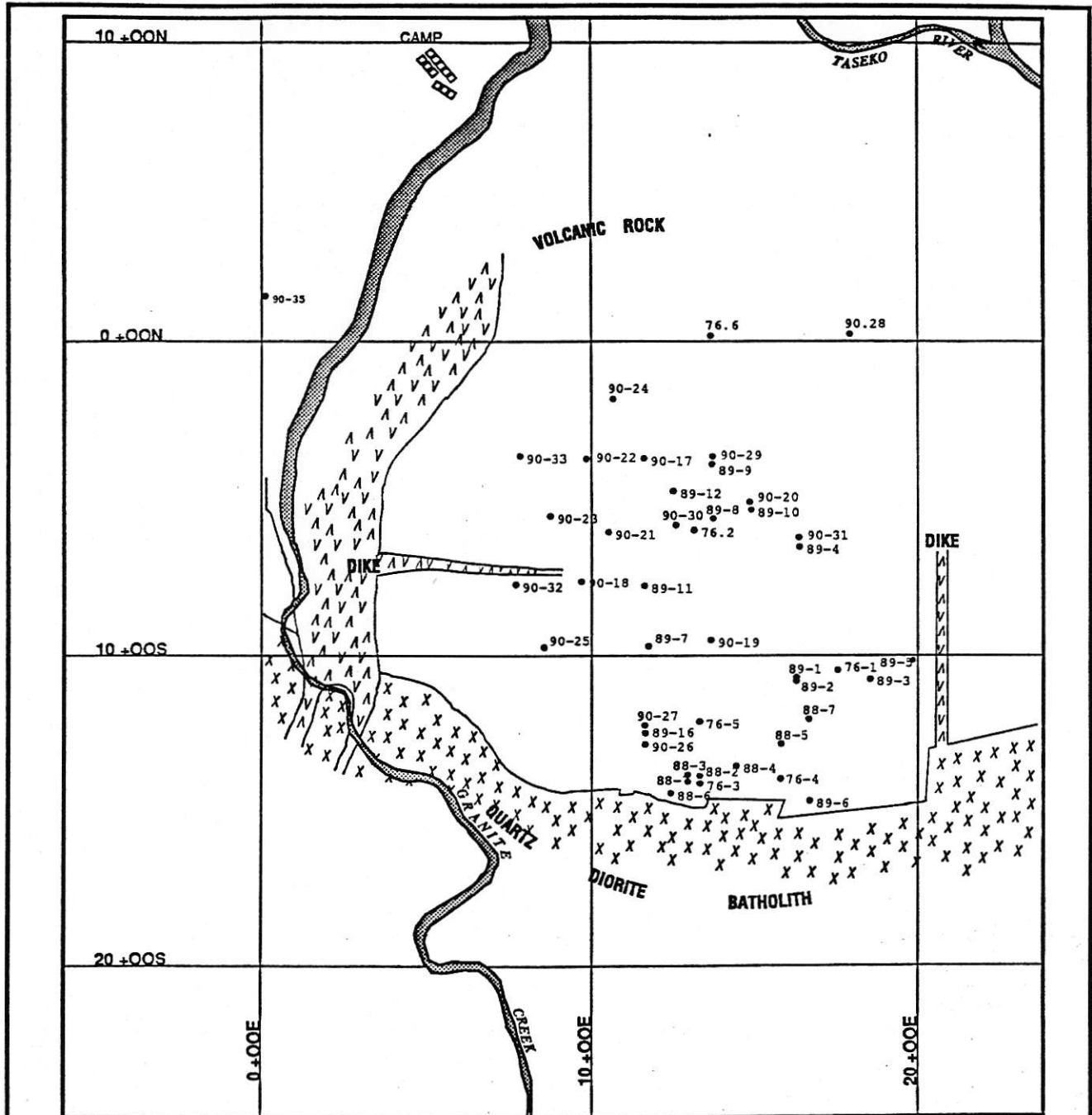
JAA, Inc. considers the Taseko Deposit to be under-drilled since drill hole spacing on the north-south grid is 275 ft and 150 ft in an east-west direction.

A set of north-south and east-west sections to a scale of one inch [in] to 50 ft has been prepared. The north-south sections were used as base maps from which copper and gold grade contour maps were produced.

In addition, JAA, Inc. prepared plan maps of copper grades and a copper grade times thickness plan of the Deeper North Zone mineralization.



Drawn GKS	Date 02/12/91	<b>James Askew Associates, Inc.</b>	Figure N <sup>o</sup> C
Approved ERM	02/12/91		Job N <sup>o</sup> 140
Revision			Scale: 1 in to 500 ft
		Taseko Project — British Columbia, Canada Zones of Mineralization	



Drawn GKS	Date 02/12/91	<b>James Askew Associates, Inc.</b>  Taseko Project — British Columbia, Canada Existing Drill Hole Collar Locations	Figure N <sup>o</sup> D
Approved ERM	Date 02/12/91		Job N <sup>o</sup> 140
Revision			Scale: 1 in to 500 ft

# ASARCO

Taseko Project

JAA 140 February, 1991

## In Situ Reserves/Resources

JAA, Inc. estimated In Situ Resources manually by the polygonal method from the north-south constructed sections as shown in Table A.

Table A  
ASARCO Incorporated — Taseko Project,  
British Columbia, Canada

### In Situ Resources

Tons [t]	Copper [%]	Gold [oz/t Au]	Metal Content	
			Copper [lbs]	Gold [oz]
11,078,000	0.61	0.023	135,394,100	254,550

*\$110MM*  
*\$107MM*  
*\$203MM Resource cost*

*\$9.93 CAN + \$9.62 CAN = 20.55 19.55 NSR*

The parameters supplied by ASARCO for calculating In Situ Resources were:—

- (i) a copper cut-off grade of 0.40%; *\$7 + Au*
- (ii) copper and gold recoveries of 90% and 80%, respectively; and *90% 70%*
- (iii) metal forecast prices of \$400 per ounce of gold and \$1.00 per pound [lb] copper

*5000 TPD*  
*1.8 MM T/yr*  
*6.2 yrs*

*37260 gpy*

The copper parameters result in a cut-off value of \$7.20 per ton. [The gold value equivalent of \$7.20 is 0.022 ounces per ton [oz/t]].

### Conceptual Open Pit Designs

Two conceptual open pit designs, Case 1 and Case 2, were prepared using the In Situ Resources as a basis and applying 10% dilution at 0.20% copper and 0.015 oz/t Au.

*325 620 945 NSR*

The Case 1 pit would recover the entire In Situ Resources identified within the three mineralized zones. Pit walls were designed with a slope of 55° except on the south wall where pit slopes were designed parallel to the quartz-diorite contact which averaged about 48°.

Case 2 eliminated some of the narrower copper-gold mineralization at the perimeter of the known Deeper North Zone but otherwise used the same design parameters.

*mining #7*  
*mill #3 only room for #3*

- Road
- CANAD
- POWER
- AIRSTRIP
- SWING SHIFTS



**Conceptual Open Pit Designs [Continued]**

The resultant Mineable Reserves/Resources recovered in each case are shown on Table B.

**Table B**  
**ASARCO Incorporated — Taseko Project,**  
**British Columbia, Canada**

**Mineable Reserves/Resources**  
**Conceptual Open Pit Tons and Grade**

Case	Tonnage [millions]	Grade		Pounds Copper [pounds, millions]	Ounces of Gold	Waste Tonnage [tons, millions]	Stripping Ratio
		Copper [%]	Gold [oz/t]				
1	12.186	0.574	0.022	139.825	271,200	82.790	6.8:1
2	10.474	0.582	0.022	122.028	236,700	62.081	5.9:1

### Underground Mining

JAA, Inc. examined the feasibility of underground mining in the Deeper North Zone with access to the zone from a development ramp driven from the surface or from the bottom of an open pit located in the 76 Zone. As reserves/resources in this 76 Zone open pit are limited to only 400,000 t, this option was not pursued.

Long Hole Open Stopping [LHOS] was selected as the mining method because of the apparent rock competence in and around the Deeper North Zone. Mining rates are based on a seven year mine life and average 3,000 tons per day [t/d] for 300 days per year. A comparison of capital costs, operating costs and recoverable reserves is shown below in Table C.

**Table C**  
**ASARCO Incorporated — Taseko Project**

**Comparison of Open Pit and Underground Mining Costs  
and Recoverable Reserves**

	Open Pit	Underground
Recoverable Reserves and Resources [Mt]	10.47	6.70
Capital and Pre-production Costs [\$M]	13.17	20.85
Operating Costs [\$/t of ore]	6.20	7.80

Operating costs in Table C are strictly related to mining and do not include costs for administration, milling, refining, marketing and financing.

**Exploration Potential**

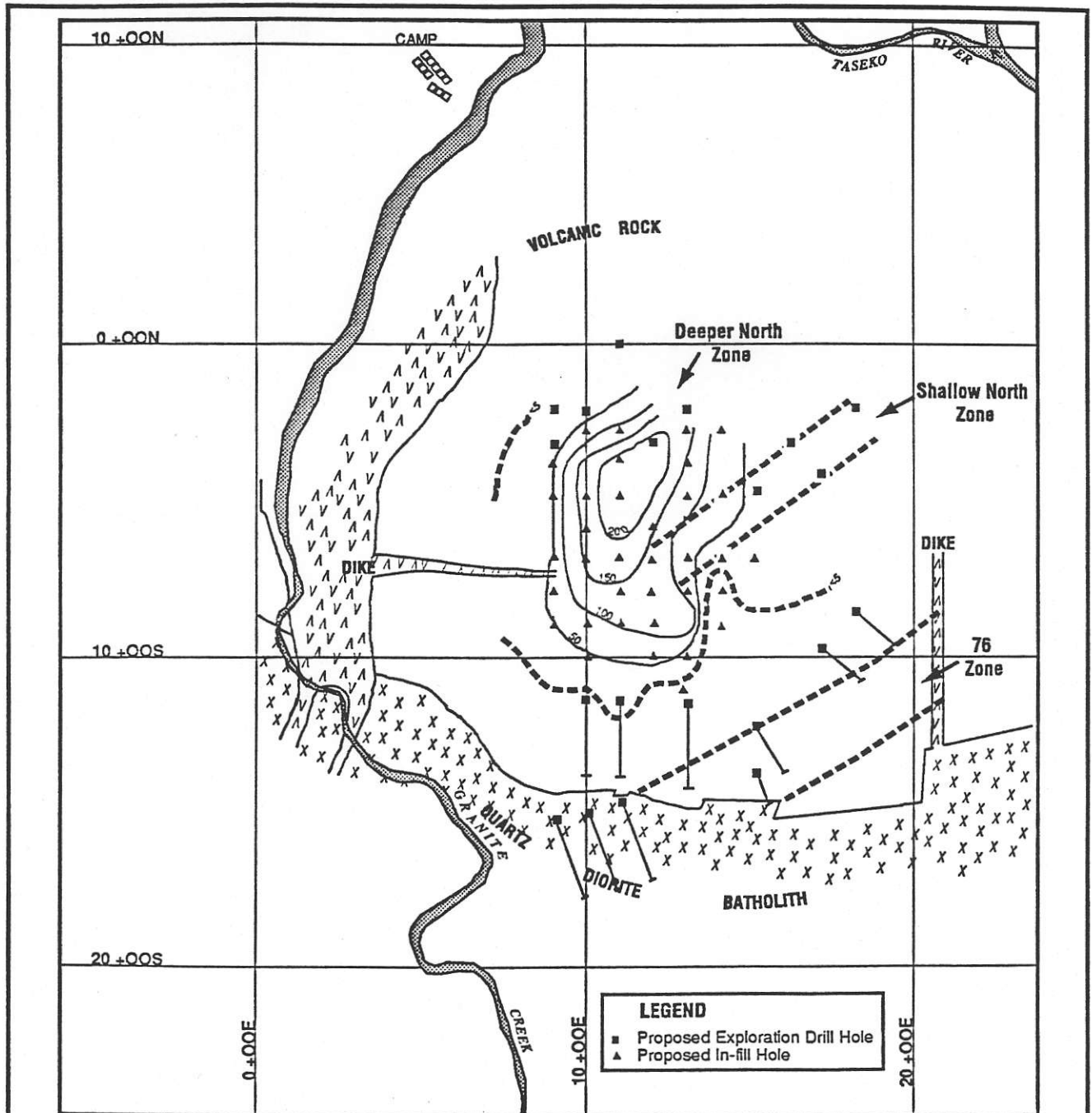
OP SIZE ?

The three mineralized zones remain open and further drilling is required. Both the shallow zones are untested in the northeast direction and the 76 Zone also to the southwest. The best directions for exploring the Deeper North Zone appear to be to the north and northeast. The proposed exploration and in-fill drill holes are shown on Figure E.

**Conclusions and Recommendations**

Open pit mining is preferred to underground mining for the Taseko Deposit because of lower capital and operating costs and a substantially higher recovery of the reserves.

Additional in-fill and exploration drilling is also required to further delineate mineralization. It is recommended that the exploration program be conducted first, as the results may impact the scope of the in-fill program.



Drawn GKS	Date 02/12/91	<b>James Askew Associates, Inc.</b>  Taseko Project — British Columbia, Canada Proposed Exploration and In-fill Drill Hole Locations	Figure N <sup>o</sup> E
Approved ERM	Date 02/12/91		Job N <sup>o</sup> 140
Revision			Scale: 1 In to 500 ft