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NORTHUMBERLAND

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Property Name Northumberland Location S___ T___ R___

Published Reserves: Oxide Ore +15 M.T.

Carbonaceous Ore none known

Annual Production: Mill (TPY) _____

Leach (TPY) +900,000

1. Regional Geology (10 mile radius)

A. Structure; faulting, folding, age: Window in Roberts Mtn. thrust w/local thrusting probably related to intrusive stocks - numerous high angle faults. Major NW trending structural weakness controls intrusives and caldera.

B. Intrusives; age, composition, geometry, alterations, mineralization: main stock granodiorite dated 154 m.y. - second intrusive (quartz porphyry or tonalite dated 87 m.y.) w/numerous dikes and sills of tonalite. Both intrusives intruded along NW structural zone (4000' x 2000' in exposure).

C. Volcanics; age, composition, type (flow, tuff, etc.), proximity, depth of mineralization relative to pre-volcanic surface: ~~Extensive~~ Extrusive volcanic center 4 miles to west (Northumberland Caldera) dated at 33 m.y. Minor remnants of unaltered

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and unmineralized ash-fall tuffs covering portions of ore body. Minor flows (tuffs) w/breccia fragments of Paleozoic rock - flows also unaltered.

D. Basement lithology; stratigraphic section - thickness and lithology, known or inferred basement lithology: Silurian thru Ordivician eastern assemblages rocks - total thickness of Ordivician Pogonip unknown (approx. 1400'). Upper plate mapped by U.S.G.S. as Ordivician Vinini.

2. Local Geology (1 mile radius)

A. Host rock(s); age, lithology, porosity, permeability, pyrite (syngenitic) and organic content: Host is Ord. Pogonip - rocks range in composition from massive blue-gray limestone to limy siltstones w/shaly partings. Highest carbon content in siltstones. Carbon is generally remobilized out of ore zones.

B. Structure; folding, faulting, control on mineralization, age(s): Local thrusting along formational contacts (probably related to doming from intrusive) along with numerous high angle faults. Alteration most intense along high angle structures.

C. Igneous rocks; type, chemistry, geometry, age and relationship to mineralization: Granodiorite stock (154 m.y.), along margins of the granodiorite tonalite (87 m.y.) has intruded within NE zone of weakness. Mineralization occurs along northern flank of stock and numerous dikes and sills (generally tonalite

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or qtz porphyry) in the sediments. Some Ore found in altered tonalite and altered granodiorite. Age unknown, probably some time between 87 m.y. and 33 m.y.

3. Geochemistry/Alteration

A. Major elements; % addition/depletion MgO, K_2O, Al_2O_3, SiO_2, minerals, spatial/temporal relationship to gold mineralization: Limestones locally recrystallized and dolomitized (% MgO unknown). SiO_2 flooding along selective horizons in silty limestones forming massive jasperid up to 150 feet thick. Clays (kaolin, sericite) generally restricted to altered intrusive rocks. 20-30% SiO_2 w/minor pyrite found in the siltstones after decarbonatization ~~of the siltstones~~.

B. Minor elements; value range in ppm Hg, As, Sb, W, Ba, Ag, Cu, Pb, Zn or other, mineralogy, zoning with ore: In ore zones; Hg up to 10 ppm, As 2000-4000 ppm, Sb (present but values unknown) W - none detected, Ba up to 1% generally along high angle primary structures (related to better gold mineralization) in jasperoid, Ag average .4 oz/ton w/values up to 210 oz/ton, Cu visably present in intrusives but values unknown, Pb-Zn values unknown - not assayed

C. Principal alteration characterists: 2 periods of alteration; (1) qtz veins w/high grade Ag probably in warming stages of tonalite intrusive. (2) gold mineralization (Epizonal alteration) superimposed over Ag mineralization. Decarbonatization of siltstones as well as outward mobilization of carbon

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B. Speculation as to composition; temperature and pressure of hydrothermal fluid and mechanism of gold precipitation: Epizonal Alteration - with perhaps the intrusives dikes-sills etc. providing heat source and contained water in sediments providing fluid source.

C. Fluid inclusion data: none

D. Possible sources of gold: mobilized out of the altered intrusive at depth? or perhaps mobilized out of the sediments and concentrated.

5. History of Discovery

Minor high grade Ag mining 1880-1890 - Gold discovered in jasperoid outcrops in 1930's. Northumberland Mining Company organized in late 1930's w/300 T.P.D. mill. Mill shut down in 1942 - by government order L-208. 1960-1970 exploration work by P.Joralemon, Kerr McGee and Homestake; all discouraging at $35 gold. Idaho Mining obtained property in 1971 and developed 750,000 tons of shallow leachable material. Cyprus joined Idaho on a joint venture. Cyprus later purchased Idaho Mining's interest.

followed by silicification w/disseminated pyrite (fine grained) approximately 1%. Ba in areas related to high angle primary or feeder structures.

D. Organic carbon; evidence of remobilization, carbon and gold relationships, nature of carbon oxidation, carbon compounds, metallurgical problems: Carbon either mobilized out of system or oxidized - minor recovery problems in selected areas related to silica "locking" and regowth of pyrite. No known relation of gold to carbon, but no X-ray microprobe work done.

E. Silicification; spatial/temporal relation to ore, % jasperoid and % ore in main mineralized area, geochemistry of jasperoid (trace elements): Strong silic. of dolomite and siltstones as basal horizons (jasperoid). Jasperoid from 30 to 150 ft. thick. Best Au mineralization is brecciated jasperoid (up to 1.5 oz/ton Au). Jasperoid contains fine grain pyrite and carbonaceous material. Fractures coated w/FeO and scorodite ($Fe(AsO_4)$). Jasperoid may have formed along local thrust plane?

4. Mineralization

A. Nature of gold; size, distribution, associated carbon, pyrite or clay, types of ore: Gold is micron size and found in all rock types*. Best mineralization is in jasperoid and altered limy siltstones. Au believed associated w/fine grained pyrite

*except Tertiary tuffs.