

# DECEMBER 2009 CUMO MO-CU-AG DEPOSIT, A 21ST CENTURY MEGA-DEPOSIT

DYKES, BALL AND GARSHELIS, PRESENTATION TO 2009 NWMA ASSOCIATION CONFERENCE

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#### <u>Abstract</u>

#### Cumo Mo-Cu-Ag Deposit, a 21st Century Mega-Deposit

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Containing 2.89 billion pounds of molybdenum oxide the CUMO deposit is currently the largest un-mined open pit molybdenum deposit in the world with only 20% of the identified mineralized zone drilled. It is located 37 miles (60 km) northeast of Boise, Idaho, USA., in the Grimes Creek Mining camp where extensive logging and mining has occurred since the 19<sup>th</sup> century. The Grimes Creek Camp produced a total of 2.8 million ounces of gold from numerous lode and placer gold operations;. Molybdenum-coppersilver mineralization was first discovered by Amax Exploration in 1963, following up Amax appropriately named the deposit CUMO anomalous stream sediment samples. after its main component metals - Cu and Mo. Between 1964 and 1981 it was explored by several companies: including Curwood Mining Company, Midwest Oil Corporation (later Amoco Minerals Company), Amax and then Climax Molybdenum Company, a subsidiary of Amax Inc. The work culminated in the calculation of an inferred historic resource of 1.36 billion tonnes at 0.056% Mo (0.092% MoS<sub>2</sub>) With the fall in molybdenum prices in the early 1980's, Climax eventually dropped the property and it sat idle until 1998 when it was staked by Cumo Molvbdenum Mining Inc., who in turn optioned it to Mosquito Consolidated Gold Mines Ltd in 2004. Since 2004, Mosquito has completed 9,323.8 meters (30,590 feet) of drilling in 14 diamond drill holes and completed a 43-101 complaint resource estimation on CUMO. This brought the total drilling to 20,304.5 meters (66,616 feet) in 37 diamond and 3 air rotary holes.

The CUMO deposit is located at the southwestern end of the Idaho-Montana Porphyry Belt within the Atlanta Lobe of the Idaho Batholith. Igneous complexes in this belt are interpreted to be related to an Eocene, intra-arc rift, and are characterized by alkalic rocks in the northeast, mixed alkalic and calc-alkalic rocks in the middle, and calc-alkaline rocks in the southwest. The CUMO deposit is typical of large, dispersed, low-grade molybdenum  $\pm$  copper porphyry deposits that are associated with hybrid magmas typified by fluorine-poor, differentiated monzogranite igneous complexes. In terms of potential total contained molybdenum, CUMO ranks third among all current porphyry Mo resources, after Pebble in Alaska (underground and open pit) and Climax in Colorado (already extensively mined, underground and open pit).

The local geologic setting is a series of Tertiary igneous rocks ranging in composition from quartz monzonite to rhyolite porphyry that intrude the Idaho Batholith,. All phases with the exception of the rhyolite appear to be co-magmatic and contain molybdenum mineralization. The deposit appears to be located at the intersection of two regional structural trends: a northeast structural trend, characteristic of the trans-Challis fault system, and an east –west trend that contains a Tertiary dyke system. Faults and mineralized structures identified to date dominantly trend to the northeast

Mineralization on the CUMO property occurs in fractures and veinlets developed within various porphyry units and surrounding country rock of the batholith. The mineralization

is associated with quartz monzonite porphyries, but high grade sections often occur within the older Idaho Batholith quartz monzonite adjacent to or within porphyry bodies. Molybdenite (MoS<sub>2</sub>) occurs in quartz veins, veinlets and vein stockworks, with individual veins ranging in size from hairline fractures to banded veins up to ten centimeters in width. Chalcopyrite occurs in the upper portion of the deposit and is associated with fracture-controlled secondary biotite alteration, and early-stage patches and fracturecontrolled dark chlorite-epidote-magnetite +/- pyrite alteration. Molybdenite mineralization generally becomes stronger at depth where the secondary biotite alteration gives way to subtle K-feldspar alteration. Minor tungsten in the form of scheelite is common (40ppm) and closely parallels the distribution of molybdenum. All phases have been variably overprinted by extensive and deeply penetrating argillic alteration characterized by chlorite, smectite +/- kaolinite and calcite. The deposit as a whole is sulphide-poor and pyrite is generally very minor.

Mosquito's work has revealed the presence of three distinct metal zones within the deposit. Interpretation of down-hole histograms for Cu, Ag and Mo suggests the metal zones are part of a single, large, concentrically zoned system with an upper copper-silver zone, underlain by a transitional copper-molybdenum zone, in turn underlain by a lower molybdenum-rich zone. Three-dimensional modeling of the above zonation indicates the current area being drilled is located on the north side of a large system extending 4.5 km (15,000 feet) in diameter, of which only a small part (1 km or 3000 feet) has been drilled.

The resource estimation was based on results up to the end of 2007, including 31 diamond drill holes with 3,972 assays for  $MoS_2$ , Ag, W and Cu. Erratic high values for Cu, Ag, W and Mo S<sub>2</sub> were capped. The deposit was subdivided into three mineral domains based on the drill hole data: a Cu-Ag zone, a Cu-Mo zone and a Mo zone. As no metallurgy had been completed and no recoveries were available at the time, the results are presented at a Cu Cutoff for the Cu-Ag zone and at a MoS<sub>2</sub> cutoff in the Cu-Mo and Mo zones. Due to the wide spacing and low number of exploration drill holes, the resource is classified as Inferred at this time. At a 0.10 % Cu cutoff grade there are 293 million tons averaging 0.016 % MoS<sub>2</sub> and 0.14 % Cu within the upper Cu-Ag zone. Within the Cu-Mo and Mo Zones at a 0.04 % MoS<sub>2</sub> cutoff there are 1.72 billion tons averaging 0.091 % MoS<sub>2</sub> and 0.075 % Cu. Overall the deposit currently contains

- 2.89 billion pounds of molybdenum oxide(MoO<sub>3</sub>),
- 3.41 billion lbs of Copper (Cu),
- 149.8 million ounces of silver (Ag) and
- 185.3 million lbs of tungsten(W)

within an Inferred Mineral Resource of  $\mathbf{\tilde{2.01}}$  billion tons(1.83 billion metric tons).

The CUMO resource is contained within an area measuring 8,000 by 7,000 feet. The mineralization outcrops at surface or is blanketed by a thin veneer of oxidized rock (100 feet thick) and extends to >2600 feet depth.

Recently completed metallurgical studies indicate excellent recoveries within all three zones:

Cu-Ag Zone: 64% Cu ,82.2% Mo and 71.6% Ag recoveries;

Cu-Mo Zone:	88.6% Cu, 93.7% Mo and 80.0% Ag and
Mo Zone:	81.8% Cu, 96.2% Mo and 59.3% Ag.

In addition, the flotation concentrates contain significant quantities of Rhenium. Further work is currently underway to determine if tungsten and gallium are economically recoverable from the tailings product. Finally, preliminary acid-base accounting tests indicate the tailings are potentially acid neutralizing.

Overall, the Cumo deposit is a large Mo-Cu-Ag porphyry system formed at the intersection of two major structural trends, as a result of multiple tertiary co-magmatic intrusions into the older Idaho batholithic rocks. Metal and alteration zonation show a close affiliation with the intrusion system and drilling continues to define the relationships.

Mosquito is currently drilling the deposit and performing the engineering, environmental and other studies required with the aim of producing a feasibility study and a plan of operations by July 2010 with production scheduled for late 2012 or early 2013 at a rate of 125,0000 to 150,000 tons per day





## **CUMO Infrastructure**

- 60 miles from Thompson Creek a mine which supports one of the richest county in Idaho and has won several environmental awards.
- CUMO located in one of the poorest counties in Idaho – mine would greatly benefit county
- Extensive logging and mining throughout the area
- Easy access using state highways and forestry service roads
- Extensive downstream (40 km) of gold placer tailings below project.
- Power and water accessible near site
- Boise, Idaho 35 miles away, a major economic centre and industrial centre





Proterozoic & Phanerozoic sedimentary rocks

Mesozoic accreted arcs

Cretaceous volcanic rocks



Eocene volcanic rocks

Miocene - Recent volcanic rocks

Foster et al, 2005



### www.mosquitogold.com

Lucky Peak

Lake











## **CUMO History**



## **CUMO Rock Types**



Cretaceous Quartz Monzonite (Kqm) Idaho Batholith

**Tertiary Biotite-Quartz Monzonite Porphyry phases (Tbqmp)** 



Tbqmp1



Tbqmp4



**Tertiary Rhyolite(Tr)** 



Tbqmp2



### Tbhqmp



**Tertiary Lamprophyre (TI)** 



Tbqmp3



Tbx



**Tertiary Andesite (Ta)** 

# **CUMO** Mineralization

Iron rich veins on surface



MoS<sub>2</sub> vein on surface

#### MoS2 bearing Quartz Veins







### MoS2 bearing Stockwork





Late Quartz Veins with remobilized MoS2

ice





#### MoS2 with CPy









## **CUMO Alteration**

Oxidization





#### **Chlorite alteration**

Green Argillic Alteration (montmorillonite, kaolinite, smectite, sericite, chlorite



White Argillic Alteration (montmorillonite , kaolinite)



#### K Feldspar vein envelope



#### **Pervasive K Feldspar**



#### Pervasive Silica & K Feldspar







# **CUMO Metal Zonation**

### • Vertical metal zonation well developed and in every hole.

Hole 27 (Kobex)

### Hole 30 (Mosquito)





NOSQUITO CONSOLIDATED Cumo 2008 Model - Bench Plan - 5000 foot Elevation





### Cumo 2008 Model - Bench Plan - 5000 foot Elevation







### Cumo 2008 Model - Cross Section - Section F- F







### Cumo 2008 Model - Longitudinal Section - Section B - B





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# **CUMO Project View looking South East**









## **Metallurgy Summary**

- Excellent recoveries of Mo, Cu, Ag, even from low grade material
- Cleaner Concentrate Recoveries:

Cu-Ag zone:97.5% Mo, 64.0% Cu and 64.9% AgCu-Mo zone:93.7% Mo, 85.5% Cu and 76.8% AgMozone:94.9% Mo, 91.1% Cu and 93.9% Ag

- No problematic minerals such as pyrite, clay or talc.
- Straight forward flotation mill flow sheet, low reagent consumption and thus low operating cost.
- Preliminary tests indicate tailings are acid neutralizing (non-acid generating), which will result in substantial cost savings and faster permitting.
- Able to produce two concentrates : Cu with Ag (>20% Cu) and Mo (>50%)
- Cu concentrate sold to smelter, Mo concentrate roasted at CUMO controlled facility.
- Tungsten and Gallium recoveries currently being investigated.
- By-product rhenium and sulphuric acid quantities are recoverable







### CUMO: The World's Largest Un-mined Open Pit Molybdenum Deposit

A 21st century Mega-Deposit