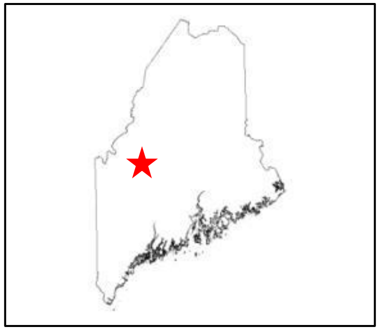
Maine Geologic Facts and Localities

November, 2005

Alder Pond Massive Sulfide Deposit
Will mining return to Maine???



45° 19' 49.82" N, 70° 12' 55.69" W

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Introduction

In the northwestern Maine woods, underlying an area in Lower Enchanted Township, lies a metal ore deposit that one day, along with several other known ore deposits (Bald Mtn. and Mt. Chase), may spark the reemergence of Maine's mineral industry. This deposit is identified as the Alder Pond ore deposit, due to its location directly alongside Alder Pond (Figure 1). Whether mining will occur at this location or others will depend on the economics and size of the deposits and the environmental aspects of the operations.

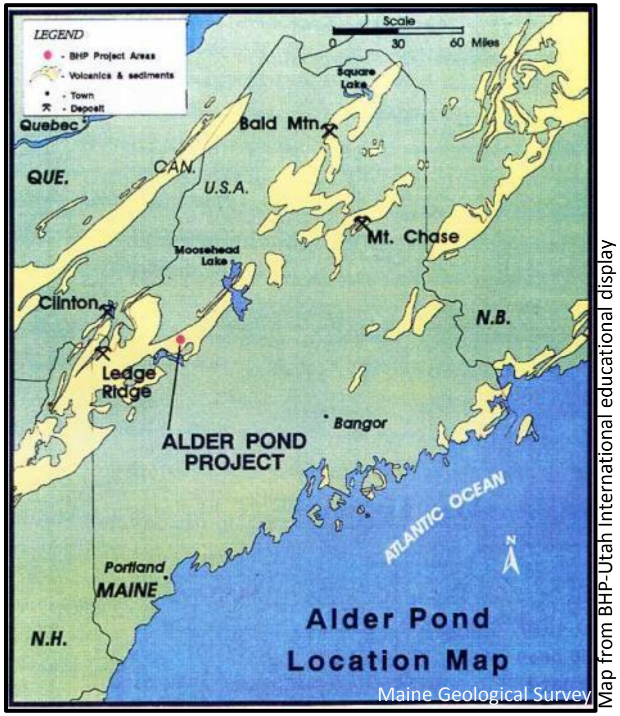


Figure 1. Location map of Alder Pond project.

Economic Geology

The Appalachian region has had a long history of metal mining dating back to pre-Revolutionary times (Feiss and Slack, 1989). Of the numerous mineral deposit types that have been mined over this period, massive sulfide deposits, historically valued for their base- and precious-metal, sulfur, and gold contents, are the most sought after economically. Many massive sulfide deposits formed on the ancient seafloor through submarine/hydrothermal processes and are major sources of copper, lead, and zinc. The convective genetic model for these deposits stipulates that metalliferous hydrothermal fluids were generated primarily in the sub-seafloor through heating of down-welling seawater and leaching of metals from the volcanic and sedimentary sub-strata (Franklin and others, 1998).

Map from BHP-Utah International educational display

Figure 2. Alder Pond project site, aerial view looking north.

Economic Geology

Massive sulfide deposits typically form lenticular or tabular bodies that range from several meters to tens of meters in thickness, and can extend laterally for hundreds to thousands of meters. They can be classified into several categories on the basis of host-rock compositions and metal contents (Franklin and others, 1998). In the Appalachian region, Kuroko-, Besshi-, and Noranda-type massive sulfide deposits are the most common. Kuroko- and Noranda-type deposits are characterized by host-rock packages dominated by bimodal submarine volcanic rocks with subordinate amounts of marine sedimentary rocks; they form in island-arc settings. The mineralogy of Noranda-type deposits is similar to that of Kuroko-type deposits, but can have higher proportions of chalcopyrite, and pyrrhotite may constitute a major phase (Duval and others, 2001). The primary rock types of the Noranda-type massive sulfide deposits are marine rhyolite, dacite, and subordinate basalt and associated sediments, principally organic-rich mudstone or shale (Cox and Singer, 1986).

Massive sulfide deposits are found throughout the Appalachian orogen in Proterozoic and Paleozoic rocks from Alabama to Maine, and northeast into Maritime Canada. Notable deposits in Maine include the unmined Noranda-type deposits at Bald Mountain, Mt. Chase, Ledge Ridge,and Alder Pond (Duval and others, 2001).

Location

The Alder Pond deposit is located in a remote area of Somerset County in the western part of Maine (Figure 1, Figure 3). It is located in Lower Enchanted Township, near the shore of Alder Pond, 13 miles west of Route 201, and just north of Flagstaff Lake. Six streams and Alder Pond are located in the immediate watershed, and Alder Pond drains directly into the Dead River.

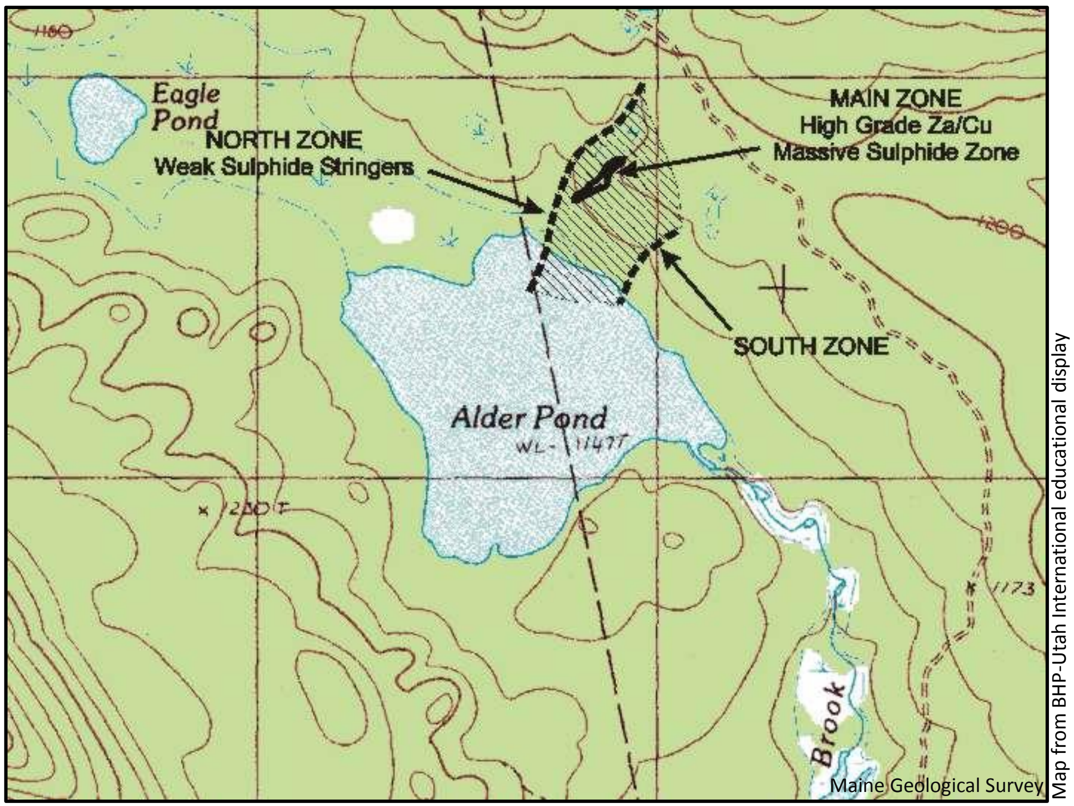


Figure 3. Ore deposit location map.

Exploration History

BHP-Utah International, a division of Broken Hill Properties Ltd., an Australian mining company, began preliminary exploration of the site, located on land owned by International Paper, Inc., in 1982, and drilled an initial "discovery hole" in 1985. After drilling 45 more exploration holes (Figure 4), their preliminary analyses showed a 3.4 million ton massive sulfide orebody containing marketable quantities of zinc and copper.

Map from BHP-Utah International educational display

Figure 4. Mineral exploration drill rig drilling a slanted hole into an ore deposit.

Exploration History

Due to the geologically complex nature of the orebody, BHP's mining project envisioned a two-phased operation. Phase one was to be an advanced exploration operation to enable BHP to confirm the size and grade of the orebody through drilling and testing. If results showed that it was economically feasible, a small mine would be constructed; if, of course, all permitting for said operation met all of Maine's environmental rules and regulations. The economics showed that it would be a marginally profitable operation, and at that time the price for zinc and copper were in a depressed state.

Over time, BHP maintained their 50% interest in the property, with GCO Minerals, a wholly owned subsidiary of International Paper, holding the other 50%. In the late 1990's, BHP made an agreement with Prospectors Alliance Corp., a Canadian company, for Prospectors Alliance to do more exploratory work on the Alder Pond deposit, with the ultimate goal of Prospectors Alliance taking over BHP's 50% interest. Prospectors Alliance Ltd. completed a stepout drilling program early in 1998. The drilling was done by Prospectors Alliance Corporation of Toronto in joint venture with International Larder Minerals, Inc.

Exploration History

This exploratory work discovered the following reserves (Figure 3) (Prospectors Alliance Corp., 1998):

- Main zone - orebody size: 560,000 tons
  - 2.2% copper
  - 9.0% zinc
  - 0.5% lead
  - 3 oz. silver per ton

- Within the main zone, a higher grade core of 184,000 tons exist:
  - 3.4% copper
  - 17.1% zinc
  - 1.0% lead
  - 6.3 oz. silver per ton

Again, after looking at all aspects of opening a mine operation, Prospectors Alliance abandoned their plans at the end of 1998, and the exploration permit was allowed to expire. At the present time, GCO Minerals holds 100% of the mineral rights to the deposit, and no further exploration is currently planned.

Geology

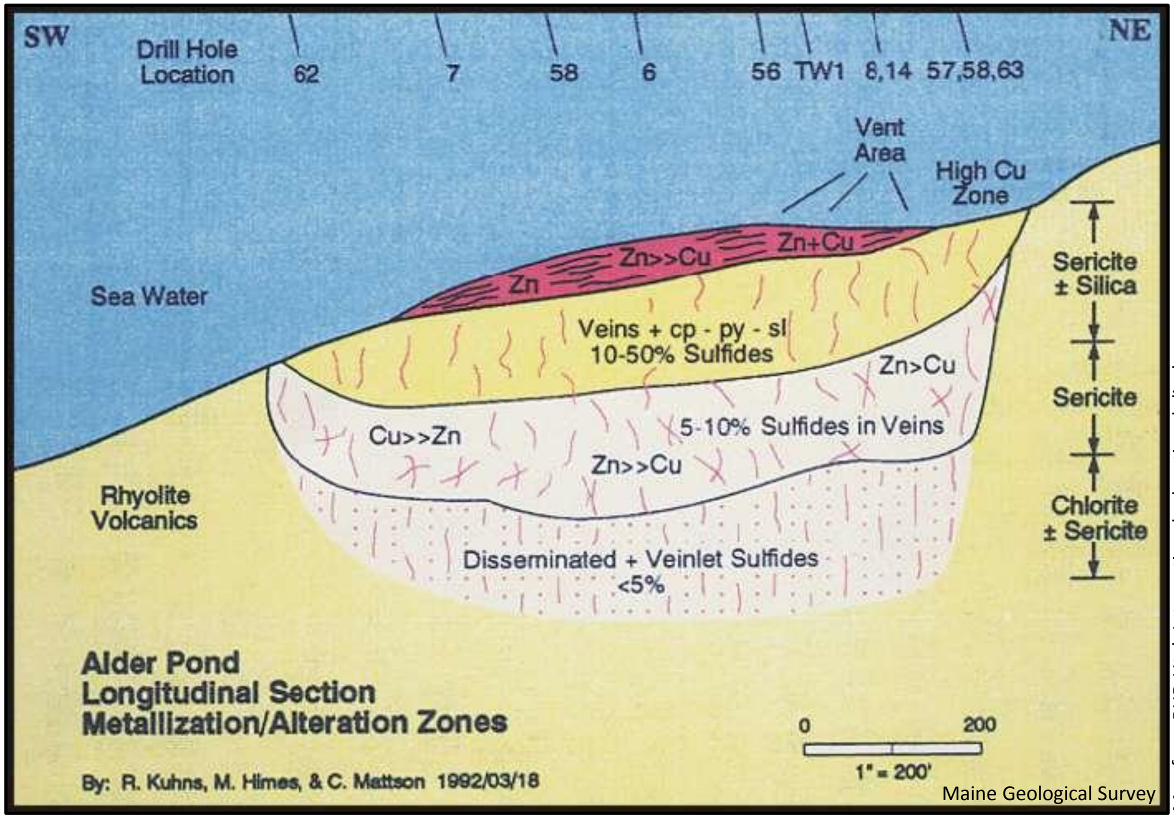
The Alder Pond ore deposit occurs within the Cambrian-Ordovician age Jim Pond Formation, which is part of the Lobster Mountain anticlinorium (Boone, 1985). The formation of these geologic units is attributed to the Penobscottian event, a collisional event involving deformation, metamorphism, and volcanic activity which occurred during Late Cambrian/Early Ordovician time within Iapetus, an ocean which preceded the modern Atlantic Ocean (Maine Geological Survey, 2002). The Jim Pond Formation includes clastic sediments and a volcanic member. The Alder Pond deposit, within the Jim Pond Formation, is believed to lie within the volcanic member. This unit is comprised of pillowed and massive greenstone basalts, mafic and felsic pyroclastics, flow breccia, quartz feldspar porphry flows and interbedded volcaniclastics and chert (BHP-Utah International, Inc., 1990).

Volcanic and sedimentary units of the Lobster Mountain anticlinorium crop out discontinuously as a northeast-trending belt from the New Hampshire/Quebec border to the north of Moosehead Lake in Central Maine. Volcanogenic mineral deposits (Bald Mt., Mt Chase, and Alder Pond) in the Northern Appalachians occur within a few well defined belts characterized by distinct assemblages of volcanic and sedimentary rocks (Figure 1).

In the vicinity of the Alder Pond deposit, the rocks include three major rock types which form a thick, predominantly volcanic sequence with less than one percent iron or base metal sulfides. The basaltic and volcanic sequences are stratigraphically above the ore and sulfide bearing units and are composed of interlayered sequences of basalt, rhyolite porphry, and a dark green to black meta-tuff.

Geology

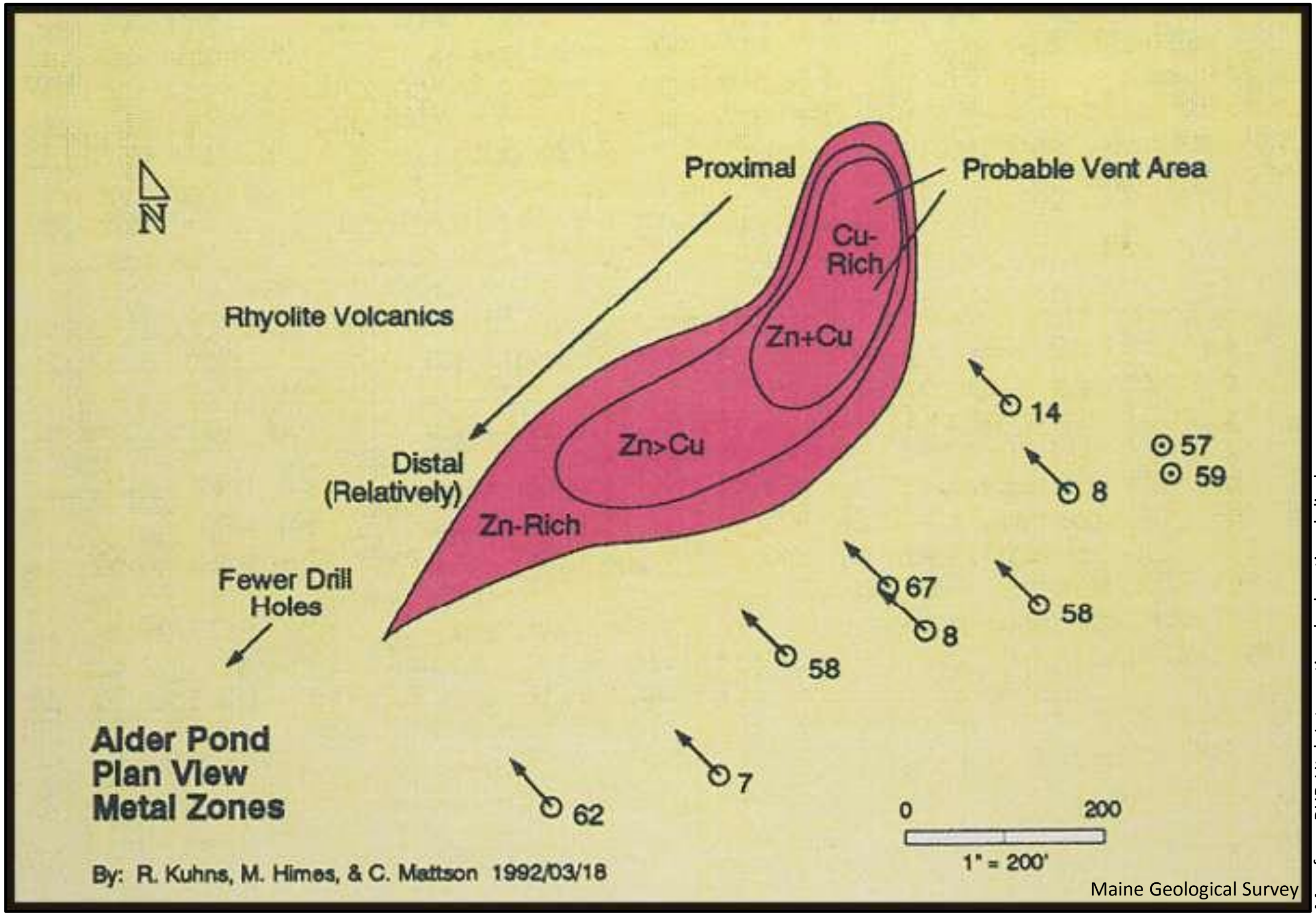
The mineralization in the main zone of the orebody shows a zinc-rich zone in the southwest quadrant of the orebody grading through a zinc-copper zone into a copper-rich zone in the northeast quadrant. Figure 5 shows this zonation in both a plan view and a cross-sectional view of the ore deposit.



Map from BHP-Utah International educational display

Figure 5. Mineralization zonation of the Alder Pond deposit. Longitudinal section of metallization/alteration zones.

Geology



Map from BHP-Utah International educational display

Figure 6. Mineralization zonation of the Alder Pond deposit. Plan view of metal zones.

Prospects for the future: Economic and environmental hurdles

If mining of the Alder Pond and other Maine ore deposits is to begin, the primary hurdle, besides the one of whether a mine of this size would be economically profitable, would be the environmental one. The major environmental hurdle to overcome would be the water quality issue, and the need to contain any contamination to the local water system. The fact is, 80% of the ore taken out of the ground would be left behind as tailings. These tailings would contain sulfide minerals that, when combined with water, form sulfuric and other acids which can leach back into local water systems. To prevent this leaching, the tailings are usually stored in a pit lined with a non-permeable liner (clay and/or synthetic material) and then capped to keep out precipitation.

Whether these environmental factors and the economics (primarily whether the price of metals is high enough to produce a profit) can all be met, will determine the future of mining within the state of Maine.

References and Additional Information

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