KAOLIN AND SILICA RESOURCES IN ADVANCED ARGILLIC (ACID SULPHATE) ALTERATION ZONES, NORTHERN VANCOUVER ISLAND, BRITISH COLUMBIA, CANADA.

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Large Scale Advanced argillic (acid sulphate) alteration zones have been known for many years (Clapp, 1915) at Monteith Bay in Kyuquot Sound. More recently Panteleyev *et al*. (1993; 1994) described numerous large alteration zones on the north side of Holberg Inlet.

In 1999, Monteith Bay Resources Ltd., a wholly owned subsidiary of Lehigh Cement (formerly Tilbury Cement), put the high grade silica portion of the Monteith deposit into production as a silica source for the Cement Plant in Delta, British Columbia. In 2000, Homegold Resources Ltd. excavated a large bulk sample from the PEM100 quarry, Apple Bay Project on the north side of Holberg Inlet, which was barged to the Cement Plant in Delta. The material from the PEM100 is termed Chalky Geyserite, and a typical assay would be 83.26% SiO_2, 12.90% Al_2O_3 and 0.02% SO_3, 1% Fe_2O_3, 1.3% CaO, 0.24% MgO, 1% LOI; the trace element content is shown in table 1.

Large areas of clay-altered, and locally intensely acid leached siliceous rocks, occur in the belt of Jurassic Bonanza volcanic rocks that lie north of Holberg Inlet. The area of most intense hydrothermal alteration, including advanced argillic assemblages, is located in the region from Apple Bay westward to the headwaters of Hushamu Creek. The area is 15 to 30 kilometres west-northwest of the Island Copper Deposit. The alteration is most evident in the blanket-like rhyolitic Bonanza map units; however, it also occurs in the immediately underlying feldspar-phyric basic to intermediate volcanic rocks and, to a lesser extent, in some of the adjoining intrusive bodies of the Island Plutonic Suite. The relationship between regional stratigraphic map units and the hydrothermally altered rocks is discussed in Nixon *et al.* (1994).

Advanced argillic alteration zones are characterized by the presence of kaolinite, dickite, alunite and pyrophyllite. Other associated minerals confirmed by X-ray diffraction analysis are abundant quartz; diaspore [AlO(OH)]; zunyite [$Al_{13}Si_5(OH,F)_{18}Cl$]; various micas, including sericite, muscovite and illite; lesser smectite; paragonite; gypsum; anhydrite; natroalunite; sulphur; rutile; and minor topaz, meta-halloysite, arenian alunite (schlossmacherite) and tridymite (Panteleyev and Koyanagi, 1993).

All clay-rich hydrothermal alteration assemblages contain silica. Most of the quartz is residual but some silica has been added. Main alteration assemblages are: quartz+kaolinite; quartz+dickite±pyrophyllite and/or kaolinite, all with or without alunite, diaspore, zunyite and minor mica; and quartz+alunite±kaolinite. The alumina content of blanket-like PEM100 deposit varies substantially. This content varies from less than 4% to more than 25% Al_2O_3. Zones with greater than 10% Al_2O_3 are relatively soft and non-abrasive.

Strongly altered rocks are bleached and chalky looking. Relict clay-altered plagioclase at Monteith Bay suggests that the PEM100 deposit was derived from tuffaceous basaltic to andesitic protoliths. Alteration in both feldspar-phyric and rhyolitic rocks is more intense than a tuffaceous basaltic to andesitic protolith and creates a mottled rock with grey-buff-pink clay patches in a grey, fine-grained to microcrystalline siliceous groundmass. The mottling consists of uneven, but generally equant, clay patches that range in size from a few millimetres to a few centimetres in diameter. In thin section, they consist of aggregates of fine-grained clay minerals, dominantly kaolinite. In some outcrops, the rocks consist, in large part, of quartz stockworks, veins and patches of pervasive silica replacement. The most intensely leached rocks are vuggy and consist almost entirely of quartz (>98%). Similar vuggy silica characterizes the siliceous residuum of intensely acid-

TABLE 1. TRACE ELEMENT CONTENT OF CHALKY GEYSERITE

Mo	Na%	Ni	P	Pb	S%	Sb	Sc	Sr	Ti%	Tl	U	V	W
2	<0.01	1	110	24	0.02	<2	<1	33	<0.01	<10	<10	3	<10

Zn	Ag	As	B	Ba	Be	Bi	Cd	Co	Cr	Cu	Ga	Hg	Mn
<2	0.2	6	<10	60	<0.5	<2	<0.5	<1	12	12	<10	<1	<5

*ppm except where indicated

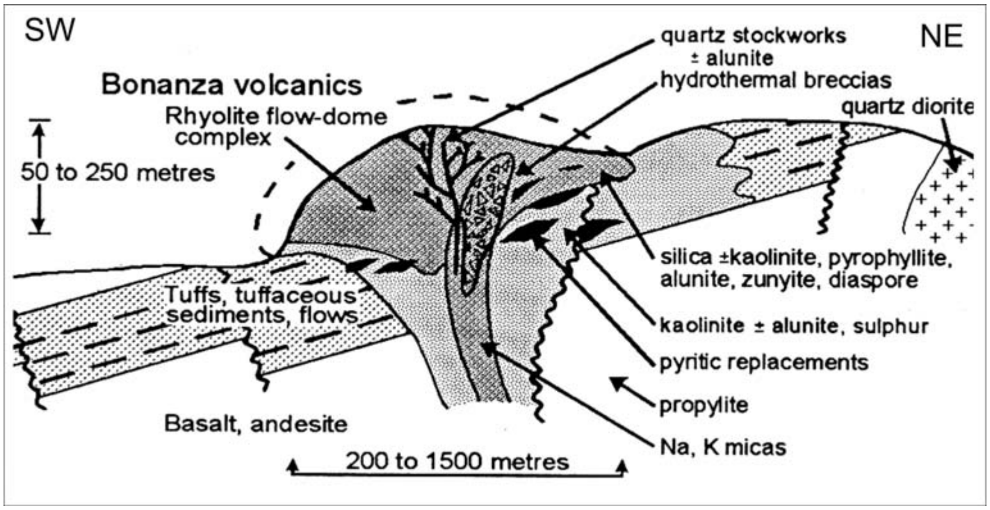

Figure 1. Schematic relationships between permeable lithologies, volcanic structures, hydrothermal conduits and mineralization in the Pemberton Hills area (Panteleyev and Koyanagi, 1993).

leached rocks in high sulphidation epithermal systems. These highly porous rocks (10 to 30% voids) consist of fine, granular, interlocking, crystalline quartz grains.

There are 9 other major zones of advanced argillic alteration within the Apple Bay Project area. Further diamond drilling and mine planning are scheduled for 2001. The PEM100 Quarry is in the final stages of mine permitting. A Memorandum of Understanding has been signed with the Quatsino First Nation.

Panteleyev and Koyanagi (1993) presented a diagram showing the schematic relationships between permeable lithologies, volcanic structures, hydrothermal conduits and mineralization in the Pemberton Hills area (Figure 1). Tuffaceous rocks in this geological setting are often deposited in a graben or similar fault-bounded basin, a caldera or series of nested calderas along the trend of the andesitic volcanic arc. In Pemberton Hills, the rhyolite assemblage that overlaps the structurally bounded, tuff-inundated basins comprises several thick flow-dome complexes with flanking welded and coarse pyroclastic deposits. Within this structural setting, the inherently high permeability of coarse subaerial pyroclastic and volcaniclastic rocks provides the most important control on movement of hydrothermal fluids and on alteration.

High and low-angle faults, the extensive systems of fractures and hydrothermally brecciated and porous leached rocks acted as effective fluid conduits.

For more information, a detail report is posted at http://www.HomegoldResources.com.

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