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High Sulfidation Epithermal Au and Porphyry Cu-Au Mıneralizatıon at the Karaayı Target, Bıga Peninsula, Northwestern Turkey

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The Biga Peninsula in northwestern Turkey hosts a large number of high- and low-sulfidation epithermal gold-silver-(copper) and associated copper-gold porphyry deposits and prospects, associated with voluminous, Eocene-Miocene calc-alkaline volcanism and plutonism. In this area, 20 to 50 Ma intermediate to felsic volcanic and volcaniclastic strata overlie metamorphosed basement rocks of the Çamlıca Group. The volcanic sequence is variably altered over an area covering several hundreds of square kilometers, including argillic, advanced argillic, and massive to vuggy residual quartz alteration, the latter present at the tops of many of the higher-elevation peaks in the area. Moderate- and high-angle normal and oblique faults are common in the area and influenced the distribution of mineralization. While gold mineralization associated with these high-sulfidation epithermal systems and flanking low-sulfidation epithermal systems has long been recognized, the existence of porphyry roots to these systems was not fully appreciated until the discovery of the Halilağa porphyry in 2008.

In the southern part of the TV Tower property, low relief areas consist of schist and serpentinite intruded by the Kuşçayir pluton, a composite, ~40 Ma intrusion that averages quartz diorite in composition. Highest-elevation areas are underlain by intermediate volcanic and volcaniclastic rocks. The northern edge of the pluton, at low to intermediate elevations, consists of at least six intrusions of similar age and composition that differ primarily in degree of porphyritic texture and phenocryst quartz content. The intrusions are parsed into pre-syn- and late-synmineral phases with respect to hydrothermal alteration related to at least two Au-Cu porphyry centers, Valley and Hilltop. The porphyry systems are overlain and, to some degree, overprinted by high-sulfidation alteration and mineralization. The porphyry/high-sulfidation system was subjected to weathering and oxidation, giving rise to a supergene copper blanket that lies near the transition from the high-sulfidation into the porphyry environment.

Alteration associated with the porphyry systems includes chlorite-magnetite-actinolite, K-feldspar-biotite-quartz-magnetite-hematite (“potassic”), and, at higher elevations, overprinting quartz-sericite (“phyllic”) alteration. Quartz stockwork veining is ubiquitous in the phyllic and potassic assemblages, and includes quartz-K-feldspar “A” veins, quartz-sulfide “B” veins, pyrite-quartz “D” veins, and quartz-magnetite “M” veins. Copper mineral assemblages range from bornite-chalcopyrite to chalcopyrite-pyrite and chalcopyrite-chalcocite or chalcocite-covellite-digenite in the supergene zones. High-sulfidation epithermal mineralization is dominantly oxidized and consists of residual vuggy and massive quartz, alunite, pyrophyllite, and iron oxides.

The first Au-Cu porphyry deposit defined in the Biga Peninsula was the Halilağa porphyry system, located 15 km to the east. With the discovery of the Hilltop, Valley, and

Columbaz porphyries at TV Tower, as well as two other nearby discoveries, it is becoming clear that ca. 40 Ma porphyry systems are common in the Biga under and lateral to the high-sulfidation epithermal systems.