

Chapter 4

High-Sulfidation Epithermal Au and Porphyry Cu-Au Mineralization at the Karaayi Target, Biga Peninsula, Northwestern Turkey

Moira T. Smith,^{1,†} William A. Lepore,¹ Tolga Incekaraoğlu,² Hakan Boran,² April Barrios,¹ Graham Leroux,³ Katherina Ross,⁴ Alper Büyüksolak,² Ali Sevimli,² and Ken Raabe¹

¹ *Pilot Gold Inc., Suite 1900, 1055 West Hastings Street, Vancouver, British Columbia, Canada V6E 2E9*

² *Pilot Gold, Nilgun Sokak 14/15, Cankaya, Ankara, Turkey 06680*

³ *Mineral Deposits Research Unit, University of British Columbia, Vancouver, British Columbia, Canada V6T 1Z4*

⁴ *Panterra Geoservices, 14180 Greencrest Drive, Surrey, British Columbia, Canada V4P 1L9*

Abstract

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, 50 to 20 Ma intermediate to felsic volcanic and volcanoclastic 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 Halılağa porphyry in 2008.

In the southern part of the TV Tower property, low relief areas consist of schist and serpentinite intruded by the Kuşçayır pluton, a composite, ~40 Ma intrusion that averages granodiorite in composition. Intermediate volcanic and volcanoclastic rocks are exposed in the highest elevation areas. 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 mineralization phases with respect to hydrothermal alteration and mineralization related to at least two Au-Cu porphyry centers, Valley and Hilltop. The porphyry systems occur below and are 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 enrichment 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-muscovite (“phyllitic”) 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-chalcocopyrite to chalcocopyrite-pyrite, and chalcocopyrite-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.

New U-Pb dates for the Kuşçayır pluton and Hilltop and Valley intrusions range from 38 to 40 Ma, consistent with other Cu-Au porphyry systems in the region, whereas most dated high-sulfidation epithermal deposits in the region formed at roughly 29 Ma, coeval with an Oligocene suite of intrusions. It is possible that the epithermal-porphyry relationship at Karaayi is one of overprinting of two unrelated hydrothermal systems.

† Corresponding author: e-mail, msmith@pilotgold.com