Structural controls and vein paragenesis of the Efemçukuru low-sulfidation epithermal deposit, western Turkey*

Corresponding author: Kaleb S. Boucher, MDRU, University of British Columbia, boucher.kaleb@gmail.com

The Tethyan-Eurasian metallogenic belt, stretching nearly 10,000 km across southern Europe through Anatolia and beyond into Asia is host to a wide variety of mineral deposits, particularly porphyry and epithermal style mineralization. The Efemçukuru low sulfidation, vein-hosted, epithermal gold deposit located southwest of Izmir, western Turkey is one such deposit and contains a measured and indicated resource of 5.89 Mt grading at 8.71 g/t Au. The deposit comprises two separate mineralized quartz-rhodochrosite veins: Kestanebeleni and Kokarpınar which dip moderately E- to NE, respectively. The veins are hosted in an Upper Cretaceous ophiolitic mélangé sequence (Bornova Flysch) which is metamorphosed to phyllite and schist on the deposit scale, and occur adjacent to fine-grained quartz phenocrystic rhyolite dikes that dip to the NE. An aureole of hornfelsed phyllite and schist occurs within a 250-500 m wide zone around to the veins and rhyolite dikes.

The vein mineralogy is variable but consists primarily of colloform-banded quartz, rhodonite (commonly replaced by rhodochrosite), adularia, and axinite with sulfide assemblages comprising pyrite, sphalerite, galena, chalcopyrite, and minor tetrahedrite. Alteration related to epithermal veins is variable depending on the host rock type, but is typically dominated by muscovite, chlorite, and halloysite in the schist and phyllite, actinolite, and epidote within the hornfelsed rocks, and minor illite in the rhyolite dikes. Four main styles of Kestanebeleni veining are identified on the basis of mineralogy and texture, each with several subclasses and distinct paragenetic sequence. Gold is found in the later stages of rhodonite veins and as inclusions in disseminated pyrite and galena in late-staged sulfide and sulfide base metal veins. The southern part of the Kestanebeleni vein contains significantly more quartz and rhodonite with lesser, and narrower sulfide and base metal veinlets. The central and northern segments of Kestanebeleni typically have more rhodonite while sulfide veins are wider, coarser-grained, and more dominant at depth. Structural mapping of the area identified two main sets of normal faults: (I) NE-dipping faults often with SW-dipping conjugate faults and (II) cross-cutting NW-dipping faults associated with SE-dipping conjugate faults. Several distinct structural domains of foliation direction (S1) can be explained by local scale folding and syn- to post-mineralization faulting. The difference in strike direction between the two main mineralized veins can be explained by relay zones linking major faults during progressive regional extension. The structural geometry and mineralization style of the Efemçukuru system may be analogous to other potential epithermal systems within the regional extensional regime.