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Title: PROGRESS TOWARDS UNDERSTANDING THE VARIABILITY IN STYLE OF EPITHERMAL AU-AG DEPOSITS OF THE HAURAKI GOLDFIELD, COROMANDEL VOLCANIC ZONE, NEW ZEALAND

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Abstract: The Hauraki Goldfield in the Coromandel Volcanic Zone, North Island, New Zealand, is a premier epithermal Au-Ag province that is notable for a large number (c. 50) of closely spaced deposits in a relatively small area (<2900 km2). The deposits collectively exhibit a variety of mineralization styles within a broadly similar package of volcanic and underlying meta-sedimentary rocks. Significant differences are reflected in vein structure, metal grade, ore mineralogy and metal inventories.

The goldfield has produced 316,000 kg Au and 1.5 million kg Ag between 1852 and 2005. Ninety seven percent of the Au production was from deposits hosted in Miocene andesite and dacite of the Coromandel Group, even though this unit represents only 61 percent of the rocks exposed in the goldfield. The deposits consist mainly of extensional quartz±calcite vein systems 0.5 to 4.5 km long within alteration zones up to 20 km2 in size. They have been mined over vertical intervals of 170 to 330 m, but up to 575 m at

Martha and 700 m at Karangahake. Electrum and acanthite are the main ore minerals, although pyrite, sphalerite, galena, chalcopyrite, sulfosalt minerals, and Te- and Se-bearing minerals are present in some deposits. Stibnite and cinnabar occur locally as late minerals, and some deposits contain late massive calcite veins.

The epithermal deposits can be broadly subdivided into northern, southern and eastern groups based on their host rocks, age, variability of vein strike direction, Au:Ag ratios, occurrence or relative abundance of key minerals such as adularia, calcite and arsenopyrite, the grain size of vein quartz, and differences in vein textures. Early (ca. 14-12 Ma), steeply dipping planar quartz veins, lacking in adularia, occur in the oldest andesite and dacite in the northern part of the goldfield, but some of these are bonanza-grade veins that contained significant gold resources. Larger veins, typically with well-developed crustiform textures and minor adularia, formed in andesite and dacite in the southern part of the goldfield at ca. 7 to 6 Ma, and these have contributed most of the Au and Ag that has been recovered from the goldfield. In contrast, rhyolite in the eastern part of the goldfield has smaller, less well-developed quartz±adularia veins plus stockworks and has produced the least amount of Au and Ag. The small size of the rhyolite-hosted deposits is attributed to the rheological properties of rhyolitic rocks, which have precluded the development of large and continuous vein structures.

The change in style of epithermal mineral deposits through time, reflects changes in volcanic activity (from andesite and dacite dominant to rhyolite dominant), and more speculatively, tectonic and structural history and setting. Localization of the deposits may be related to major deep seated structures and intrusive/volcanic centers.