



## Chapter 12

# Geology and Mineralization of the Navidad Ag-Pb-Cu-Zn District, Chubut Province, Argentina

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### Abstract

The Navidad district, Argentina, is an advanced exploration project with an estimated measured and indicated resource of 19,670 tons (t; 632 million ounces) Ag, 1.32 Mt Pb, and significant contents of Cu and Zn in eight separate to semicontinuous deposits. The mineralization is hosted by volcanic and sedimentary rock units of the Middle to Late Jurassic Cañadón Asfalto Formation and formed in an active continental rift environment.

Navidad is an intermediate sulfidation epithermal silver deposit, which is located at the center of a north-east-trending belt of polymetallic deposits within the northern Patagonia Massif. The generally stratiform mineralization is localized within permeable horizons that are abruptly capped by impermeable units. The mineralization is zoned at the district scale about well-defined hydrothermal upflow zones defined by phreatic breccia and greater intensity of intermediate argillic alteration mineral assemblages. Proximal mineralization to the upflow zones is characterized by fine-grained, Ag- and Pb-bearing pyrite, complex sulfide textures, and Ag/Pb ratios as low as 6.6. Proximal mineralization precipitated due to rapid cooling of the hydrothermal solutions and by mixing between acid-sulfate and bicarbonate waters, as evidenced by the presence of hypogene kaolinite, alunite, barite, and abundant calcite. Distal deposits were formed following the lateral migration of hydrothermal fluids for as much as several kilometers from the central upflow zones. Distal mineralization is characterized by fine- to medium-grained sulfide mineralization with acanthite as the most important silver-bearing mineral in a medium- to coarse-grained calcite-barite gangue. The Ag/Pb ratio for distal mineralization is as high as 187.8. No gold occurs within the Navidad deposits.