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GOLD MINERALIZATION ASSOCIATED WITH ALKALI TRACHYTE BRECCIA IN THE GALLINAS MINING DISTRICT, LINCOLN COUNTY, NEW MEXICO

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Abstract—A widespread rock-chip and soil gold anomaly with up to 183 ppb gold is present in an area of brecciated trachyte sills intrusive into the Permian Yeso Formation in the northern part of the Gallinas mining district. There is pervasive silicification, argillic alteration, and iron-oxide staining of the trachyte. Five trachyte breccia pipes are also found in the Gallinas district; a rock-chip sample of one of these pipes contained 44 ppb gold. By analogy with economic deposits in other parts of the New Mexico alkalic gold belt, these anomalies may be indicative of additional mineralization at depth. Gold exploration targets in the Gallinas district include the brecciated sills, exposed breccia pipes, and an inferred breccia pipe at depth beneath the mineralized sills.

INTRODUCTION

The Gallinas mining district lies within a north-trending belt of mid-Tertiary, alkalic intrusions related to gold mineralization (Fig. 1). This belt extends from the Elizabethtown-Baldy district on the north to the Orogrande (Jarilla, Silver Hill) district on the south and has produced at least 1,142,500 oz of gold (North and McLemore, 1988; Lasky and Wootton, 1933; Segerstrom and Ryberg, 1974) in addition to substantial copper and silver. The New Mexico alkalic belt is part of a larger province extending from southwest Texas to north-central Montana that is characterized by gold deposits associated with alkalic saturated to undersaturated igneous rocks. Gold resources in the New Mexico alkalic belt include 1,000,000 oz in the Carache Canyon and Lukas Canyon deposits in the Ortiz (Old Placers, Dolores) district (Maynard et al., 1990) and 150,000 oz at the Great Western deposit in the Nogal-Bonito district (Thompson, 1991).

The Gallinas district is in the Gallinas Mountains about 19 km west of the village of Corona. These mountains are underlain by Permian strata of the Abo, Yeso and Glorieta Formations and by hypabyssal, generally concordant, trachyte, latite and rhyolite intrusions of Tertiary age (Perhac, 1970). Two intrusions interpreted by Perhac (1970) to be laccoliths have domed the overlying strata. There are five trachyte breccia pipes (Fig. 2) that are up to 70 m in diameter and consist mainly of fragments of trachyte in a trachyte matrix. Less abundant breccia clasts of shale, sandstone, limestone, andesite(?) and granite (Perhac, 1970) are also present.

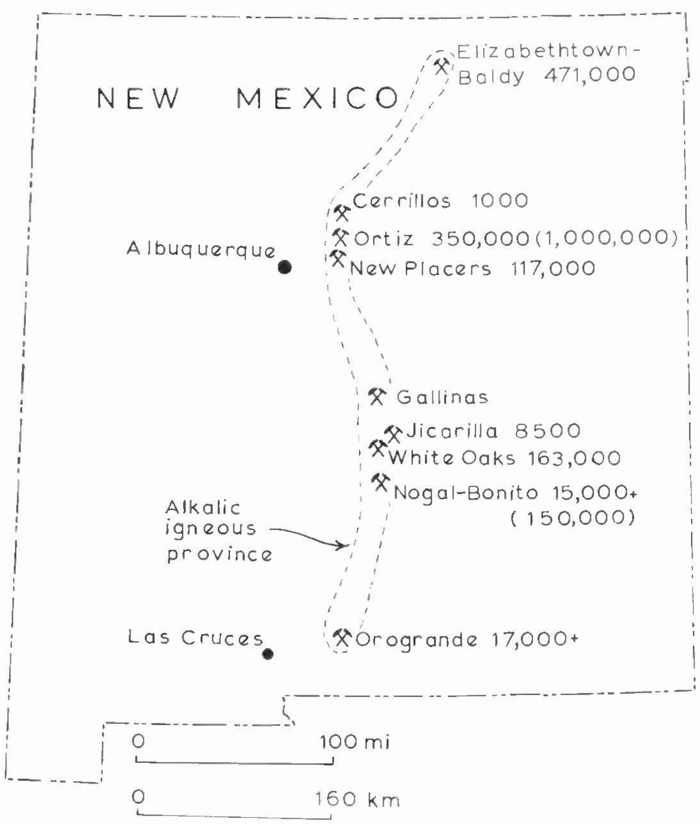

FIGURE 1. Mining districts of the New Mexico alkalic belt with gold production (in troy ounces) and resources in parentheses.

A few high-angle faults, mostly trending northwesterly (Fig. 2), are present. Northeast, north and east-west faults are less common. Two small outcrops of Precambrian granite are exposed along the major northwest-trending fault (Fig. 2). The age of deformation is probably Tertiary.

The most productive deposits in the Gallinas district have been fluorite-copper in veins and breccias, and iron replacements in limestone at intrusive contacts. Trachyte and Yeso Formation sandstones host the fluorite-copper deposits. In addition to fluorite and copper these deposits have produced lead, silver, gold and the rare-earth (cerium-lanthanum) carbonate bastnaestite (Perhac and Heinrich, 1964). Analyses of rock chip samples indicate that up to 0.03 oz/ton of gold and 3.5 oz/ton of silver are present in high-grade fluorite deposits. Total production from the district is not known, but was probably small, as Griswold (1959) estimated that less than 2000 tons of fluorite was shipped.

The most comprehensive reports concerning the district are by Griswold (1959) and Perhac (1970). Other reports involving the district are by Lindgren et al. (1910), Lasky and Wootton (1933), Anderson (1957), Soulé (1946), Rothrock (1946), Kelley (1949) and Kelley et al. (1946).

Brecciated trachyte sills of this report have not been noted previously. They are located in secs. 10, 11, 14, and 15, T1S, R11E in Sawmill Canyon in the northern part of the Gallinas district (Fig. 3).

ROCKS

Soda-rich, peralkaline trachyte sills intrude sandstone of the Permian Yeso Formation (Fig. 3). Trachyte is white to light gray and is mostly porphyritic with feldspar phenocrysts comprising about 10 to 20% of the rock. The phenocrysts are dominantly anorthoclase that is sub- to euhedral, 0.3 to 1.5 mm in length, and moderately argillized and sericitized. Albite phenocrysts are much less abundant and are partly replaced by anorthoclase. The groundmass is composed mostly of moderately to well-aligned feldspar laths marking well-defined trachytic texture. Some of the trachyte is equigranular, consisting mainly of argillized, anhedral anorthoclase that is 0.1 to 1.0 mm across. Minor albite is partly replaced by the anorthoclase. A K-Ar date of 29.2 Ma for a feldspar phenocryst from trachyte of the Gallinas district was reported by Perhac (1970, p. 30). This middle Tertiary age is about the same as radiometric dates for intrusive rocks in other parts of the alkalic belt of New Mexico (Bachman and Mehnert, 1978; Thompson, 1972).

The Yeso Formation is composed of fine- to medium-grained, feldspathic, buff to pink sandstone in beds 0.3 to 1.3 m thick. A few dolomitic limestone interbeds are present.

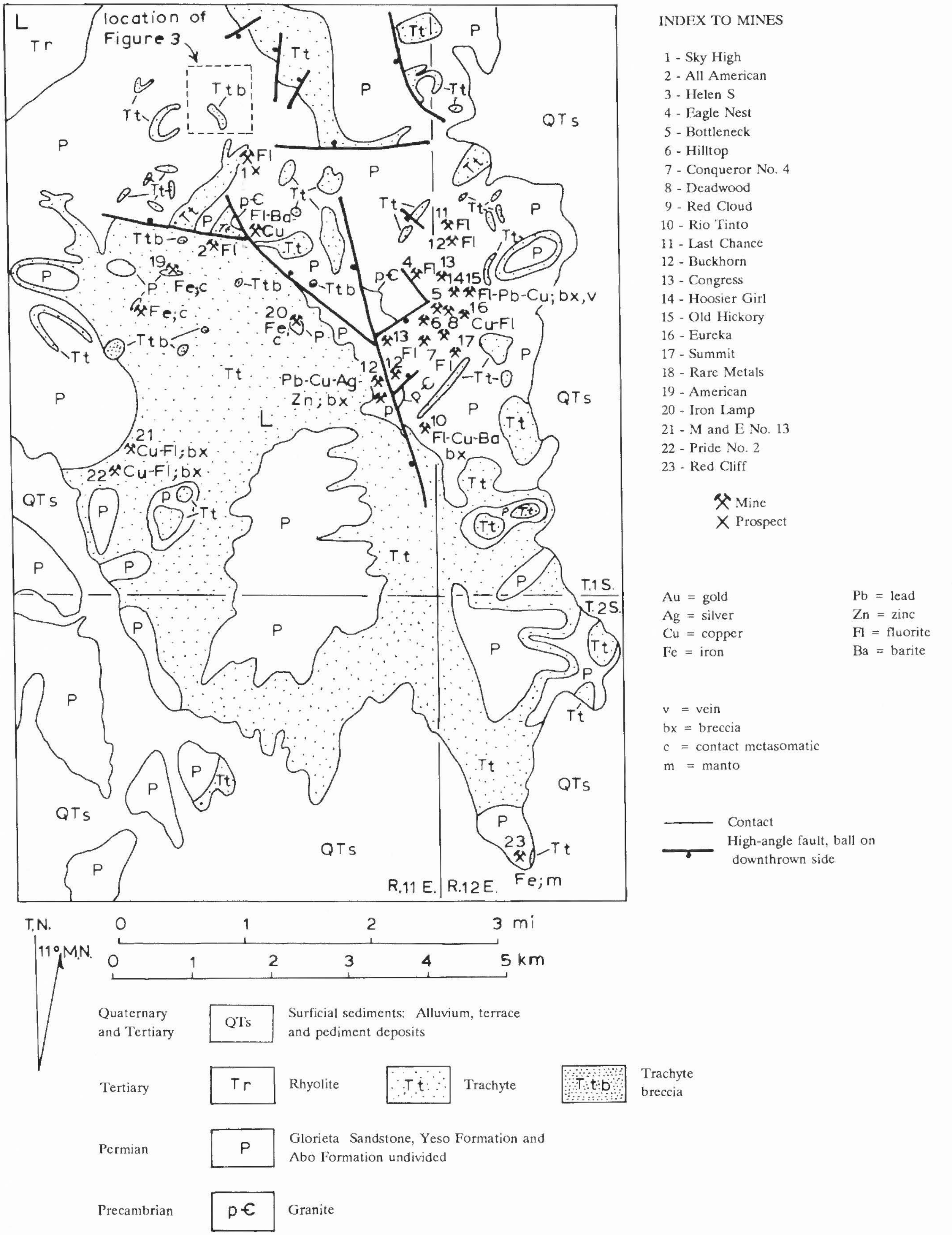

FIGURE 2. Generalized tectono-metallogenic map of the Gallinas mining district (modified from Perhac, 1970). L = laccolithic center.

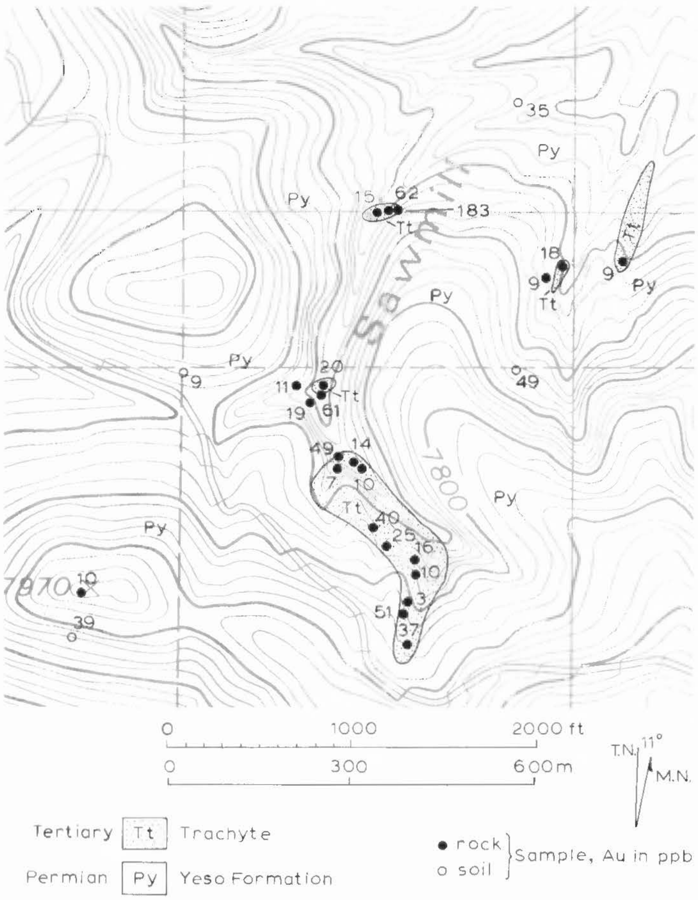

FIGURE 3. Geologic map of the brecciated trachyte sills in the Gallinas district showing anomalous gold analyses in parts per billion (ppb).

STRUCTURE

The brecciated trachyte sills lie in a structural and topographic sag between two laccoliths that have domed Permian strata. In this area the strata are nearly flat lying and have been intruded by a trachyte sill or perhaps several sills. The sill at the largest outcrop (Fig. 3) is at least 12 m thick, as the base of the intrusion is not exposed. The upper contact of the main trachyte body (Fig. 3) is extensively brecciated, as is the adjacent sandstone of the Yeso Formation. These sills are located at the intersection of two topographic and air photo linears that trend northwest and northeast.

MINERALIZATION AND ALTERATION

Trachyte in the area of the prospect is pervasively argillized, silicified, vuggy, and is fractured to strongly brecciated, with iron oxides along fractures, in vugs, and between breccia clasts. Sandstones of the Yeso Formation are mostly brecciated and stained with iron oxides adjacent to the intrusions.

A stream sediment anomaly of 40 ppb gold led to discovery of the brecciated and altered rocks. Seventeen of 20 rock chip samples of the intrusive rocks and adjacent sandstone have anomalous gold contents ranging from 10 to 183 ppb, marking a main anomaly at least 450 m long and 45 to 120 m wide. Soil samples were mostly low in gold although three samples yielded 35, 39, and 49 ppb. These anomalous soil samples are underlain by sandstone (Fig. 3), suggesting potential for gold mineralization of the sedimentary rocks as well as the intrusive bodies.

SUMMARY AND CONCLUSIONS

Brecciated trachyte sills that intrude the Yeso Formation in the northern part of the Gallinas mining district have anomalous gold contents up to 183 ppb in rock chip samples and are characterized by pervasive silicification, argillic alteration, and iron-oxide staining. The gold anomaly is at least 450 m long and is 45 to 120 m wide.

These brecciated and altered sills are similar to rocks hosting economic gold deposits in the Ortiz (Old Placers), White Oaks, and Nogal-Bonito mining districts (Fig. 1). In particular, the geologic environment is somewhat analogous to the Carache Canyon deposit (in the Ortiz district) where exploration has revealed a collapse-breccia pipe in a sill complex containing 5,000,000 tons of rock grading 0.094 oz/ton gold (Maynard, 1989; Maynard et al., 1990). The discovery at Carache Canyon occurred by drilling soil gold anomalies.

The area of gold mineralization at the brecciated trachyte sills in the Gallinas district may also have a breccia pipe at depth. This interpretation is supported by the presence of five breccia pipes exposed in more deeply eroded parts of the Gallinas district. Perhac (1970, p. 23) interpreted these as eruptive breccia pipes. A rock chip sample from one of these pipes contained 44 ppb gold.

Gold exploration targets in the Gallinas district include brecciated trachyte sills, exposed breccia pipes, and an inferred breccia pipe at depth beneath the mineralized sills. These target concepts can be tested by geophysical investigations and drilling.

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The Old Abe mill, northwest of White Oaks, had just been completed when C. W. Marks made this view in circa 1893. The Old Abe shaft is hidden in the structure behind the mill. Note that the boiler is not yet closed in from the elements and windows are yet to be installed on the mill building. At least one person preferred the bicycle to the horse when traversing the two miles between the Old Abe and White Oaks. New Mexico Bureau of Mines collection No. 1666, courtesy of Dr. Richard H. Jahns and John Kelt.