

## **Chapter 3 General Geology and Mining**

### **3-1 Outline of Geology**

Some regional geological survey programs have been conducted in the area by some investigators such as Fries (1960), De Cserna (1965 and 1978) and Campa et al., (1974) and some geological frameworks for the region have been established. Campa et al., (1974, 1978 and 1979), specially, proposed a development history model of the geological structure for an area named "Tierra Caliente" based on description of volcano-sedimentary rocks of the Ixtapan de la Sal area. Coney and Campa (1987) and Sedlok et al., (1993) proposed classifications of geological structure zones (Fig.1-3-1) for the whole area of Mexico respectively. The survey area of this report corresponds to the boundary between the Guerrero Terrene and Mixteco Terrene, based on the classification by Coney and Campa (1987).

De Cserna and Fries (1983), Guerrero et al., (1990, 1991 and 1993), and Elias and Sanchez (1992) demonstrated a very detailed stratigraphic succession and a development history of the geological structure for the volcano-sedimentary rock area. CREMI has started survey programs for massive sulfide ore deposits hosted in the volcano-sedimentary rocks in the area, as a part of "Eje Neovolcanico" project in 1979 for the Tlanilpa-Mamatla-Azulaquez area. Recently Valerie Gold Resources Ltd. was carried out mineral exploration on Mamatla property in 1994-1998.

The survey area is situated in the Teloloapan terrene constituting part of the Guerrero terrene and the Mixteco terrene in the eastern survey area, based on the regional geological structure zone classification.

The stratigraphic succession in the Teloloapan terrene side is the Tejupilco Schist, Villa de Ayala Formation (metavolcanic and sedimentary rocks), Acapetlahuaya Formation, Amatepec Formation (simultaneous difference phase with Acapetlahuaya) and overlying Teloloapan and Pachivia Formations, from the bottom. The Mixteco terrene is consists of the Morelos and Mexcala Formations. These Formatiois are unconformably covered by the Balsas Formation and Tilzapotla Formation of Tertiary age, Cuernavaca Formation of Pliocene and alluvial sediments.

The Guerrero terrene has undergone the Laramide orogeny in early Tertiary time

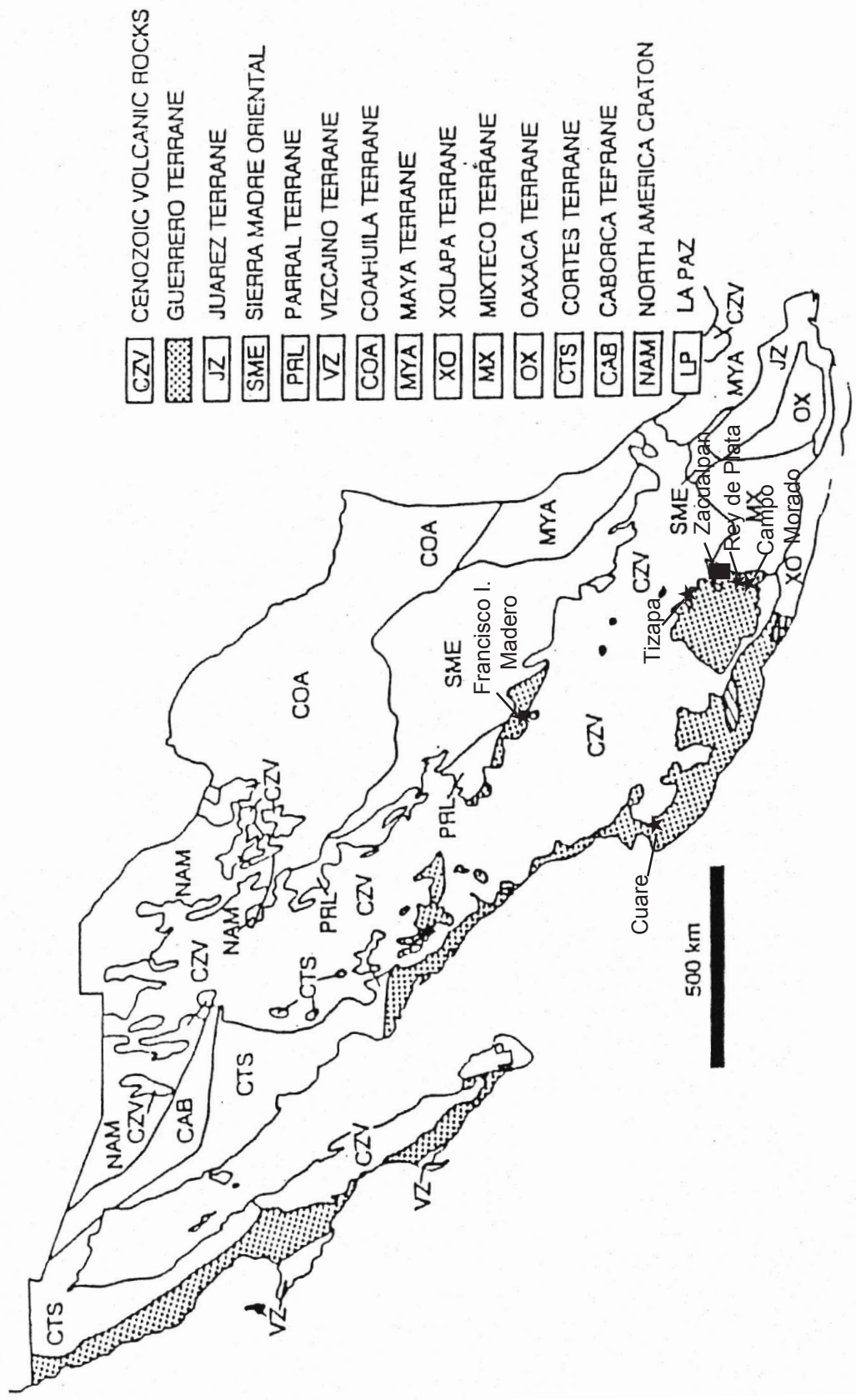


Fig.1 - 3 - 1 Tectonostratigraphic Terranes of Mexico (modified after Coney and Campa, 1987)

(Salinas et al., 1994) and shows ductile deformation, isoclinal folding and thrust faulting extending north to south. Generally it shows an east vergence. On the contrary, the Mixteco terreno shows no ductile deformation, and it is said that the terreno has undergone compaction stress from east to west.

A fault group trending northwest to southeast appears in this area after the Laramide orogeny. It is possible that this fault group has been formed in a tension field from northeast to southwest. Vein type ore deposits nearby Zacualpan are hosted in this fault group.

### **3-2 History of Mining in the Area**

A private company was aggressive for mining activity for the Azulaquez massive sulfide deposit in the area from 1915 to 1920, and it is said that the Aurora, Capire, San Francisco, Guadalupe, Cruz Blanca and San Antonio deposits were developed at that time (Ochoa et al., 1985). These mines were closed because of depletion of ore reserves.

Peñoles Company conducted a geophysical and drilling program in this district in 1975, but they withdrew from the Azulaquez district.

La Campana Company operated the Rey de Plata mine, about 10 kilometers southwest of Teloloapan, applying open-pit and underground mining methods from 1946 to 1949. The main target was silver. Afterward, Peñoles conducted a drilling and underground adit exploration program from 1975 to 1991 and confirmed around 2,000,000 tons of massive sulfide ore reserve after 24,000 meters drilling. Recently Industria Peñoles S.A. de C.V. Dowa Mining Co., Ltd. and Sumitomo Corporation started operation of Rey de Plata mine in October 2000 at a rate of 3,000 tons per month. But it was suspended because of low price of Zn in December 2001.

In Zacualpan, many vein type ore deposits of silver, lead and zinc have been developed since the Spanish colony time, however only the Cuchara and La Alacrán mines are in 350 tons a day operation by El Provenir de Zacualpan S.A. de C.V. at present.