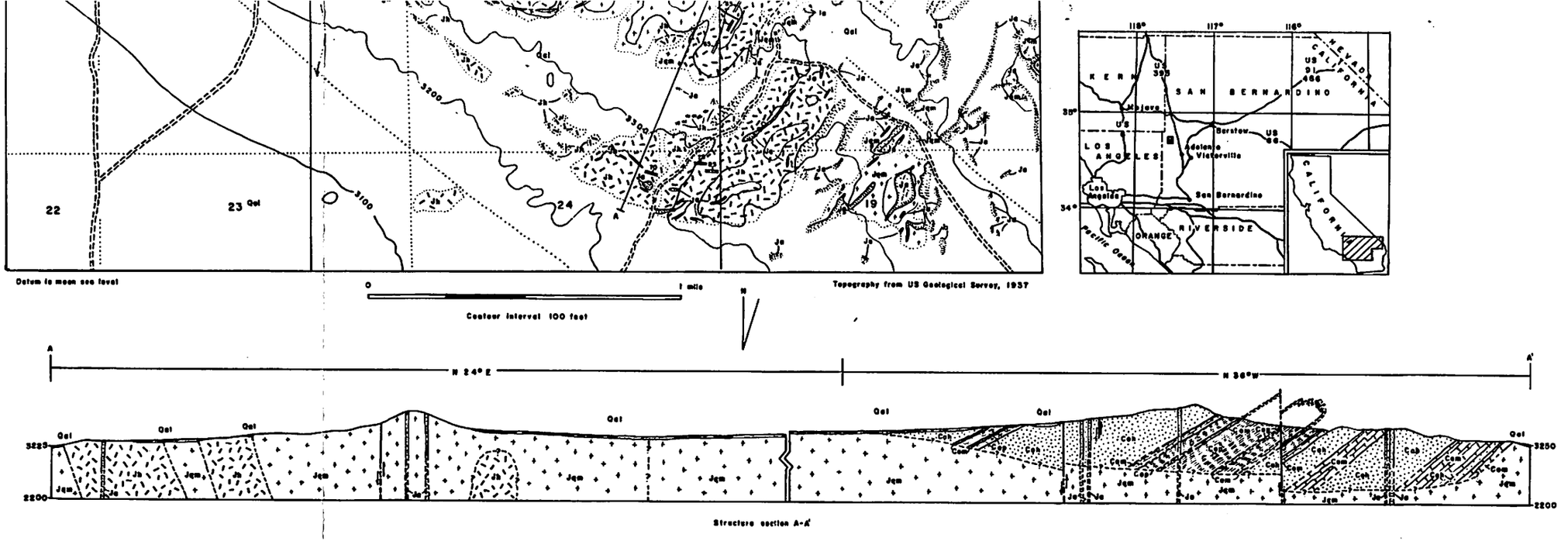

DIVISION OF MINES
BULLETIN 170
GEOLOGY OF SOUTHERN CALIFORNIA

MAP SHEET No. 15

GEOLOGY OF A PART OF THE SHADOW MOUNTAINS WESTERN SAN BERNARDINO COUNTY

By Bennie W. Troxel *

INTRODUCTION

The Shadow Mountains, a group of low hills in western San Bernardino County, are underlain chiefly by a series of Paleozoic metasedimentary rocks and various intrusive rocks of probable late Jurassic to early Cretaceous age. The metasedimentary rocks form the main part of the hills in the north half of the area mapped. They exist as roof pendants in the quartz monzonite, which underlies the flanks of the hills and generally is concealed beneath a thin cover of Quaternary alluvium. This alluvial capping lies upon pediment surfaces of low relief that slope outward from the flanks of the more resistant rocks.

The hills contain commercial deposits of scheelite and of white carbonate rocks that are crushed and marketed for use as roofing granules. No published geologic maps of the Shadow Mountains exist, but similar or identical formations have been mapped and described in nearby areas (Hershey, 1902; Miller, 1944; Bowen, 195-).

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ROCK UNITS

Metasedimentary Rocks. Marine metasedimentary rocks are exposed in the northern half of the area mapped. They consist mainly of unfossiliferous massive crystalline carbonate rocks (chiefly limestone), massive quartz-muscovite hornfels, and platy lime-silicate hornfels. Quartz-biotite schist, chert, and quartzite form a minor part of the series. Deformation has caused such extreme thickening and thinning of beds that an accurate measurement of the section is not practical. These rocks resemble strata of the Oro Grande (Carboniferous) series (Bowen, 1954) exposed in nearby areas to the east; fossils have been obtained from the lower part of the series.

These metamorphic rocks formerly existed as an apparently conformable series of alternating mudstone, limestone, sandy limestone, sandstone, and shale. It is estimated that they are between 3,500 and 5,000 feet thick in the area mapped. Schist and quartzite are the oldest strata exposed. They are overlain by platy lime-silicate hornfels and carbonate rocks. The upper one-half to two-thirds of the section is composed of alternating carbonate rocks and quartz-muscovite hornfels in nearly equal proportions. Metamorphism is principally dynamothermal, but in addition some rocks have been subjected to contact metamorphism. These latter rocks are composed principally of coarsely crystalline silicate minerals, most commonly wollastonite, calcite, garnet, idocrase, and epidote.

Intrusive Rocks. The intrusive rocks exposed in the Shadow Mountains are mostly biotite quartz monzonite and hornblende diorite. Quartz monzonite underlies most of the mountains, as well as the major part of the western Mojave Desert. It erodes easily and in general is poorly exposed. In the western part of the area mapped the intrusive contacts between the quartz monzonite and the metsedimentary rocks are sharp. Xenoliths of metasedimentary rocks in the quartz monzonite generally are less than 2 feet in diameter.

The hornblende diorite occurs principally as arcuate bodies which are as much as 900 feet thick. These appear to be dikes that intrude the quartz monzonite. It occurs also as thin dikes intrusive into metasedimentary rocks.

Granite aplite and pegmatite, in dikes and sills as much as 10 feet thick, are common throughout the Shadow Mountains.

Quaternary Rocks. The Quaternary rocks consist of a thin series of dissected older alluvial fanglomerate and terrace deposits, and alluvium of the present stream channels. In most places the fanglomerate probably does not exceed 20 feet in thickness.

STRUCTURAL FEATURES

An east-trending isoclinal anticline that is overturned to the north is the principal structural feature of the Paleozoic rocks. The anticline plunges gently westward, and its western tip is bent southward. Strong lineation plunges about 30° south at nearly every point where it was observed. Minor folds are a few inches to a few feet in average width. The south trend and plunge of the linear features coincide with the general structural grain of the western Mojave Desert. The east-trending fold probably developed in early Mesozoic time. This is based on the assumptions (1) that the metasedimentary rocks are Upper Paleozoic in age, and (2) that the aplite dikes, which cut the fold and are not markedly deformed, are of Mesozoic age.

The arcuate bodies of hornblende diorite form a discontinuous circular structure, apparently a ring dike, that is about 2 miles in diameter. Some of the hornblende diorite exhibits planar structures or layers parallel to the walls of the bodies. Some of the layering is caused by alternation of mafic and felsic minerals, and some is caused by differences in grain size. The dip of the layers ranges from vertical to 70° toward the center of the ring dike. A small swarm of vertical aplite dikes is intrusive into the hornblende diorite on the west side of the ring dike.

Three of several possible explanations for the formation of the circular structure are: (1) it is a ring dike composed of hornblende diorite intrusive into quartz monzonite, (2) it is a relict structure encompassing an older granitic igneous mass and intruded by quartz monzonite, (3) it is a feature of granitization. Further study of the structure is planned.

At least four northwest-trending faults traverse the mapped area. The component of apparent horizontal movement is small, and it appears to be of both right- and left-lateral displacement. Vertical displacement along at least two of the faults may be measured in hundreds of feet. The principal movement has probably been post-Cretaceous and pre-Quaternary.

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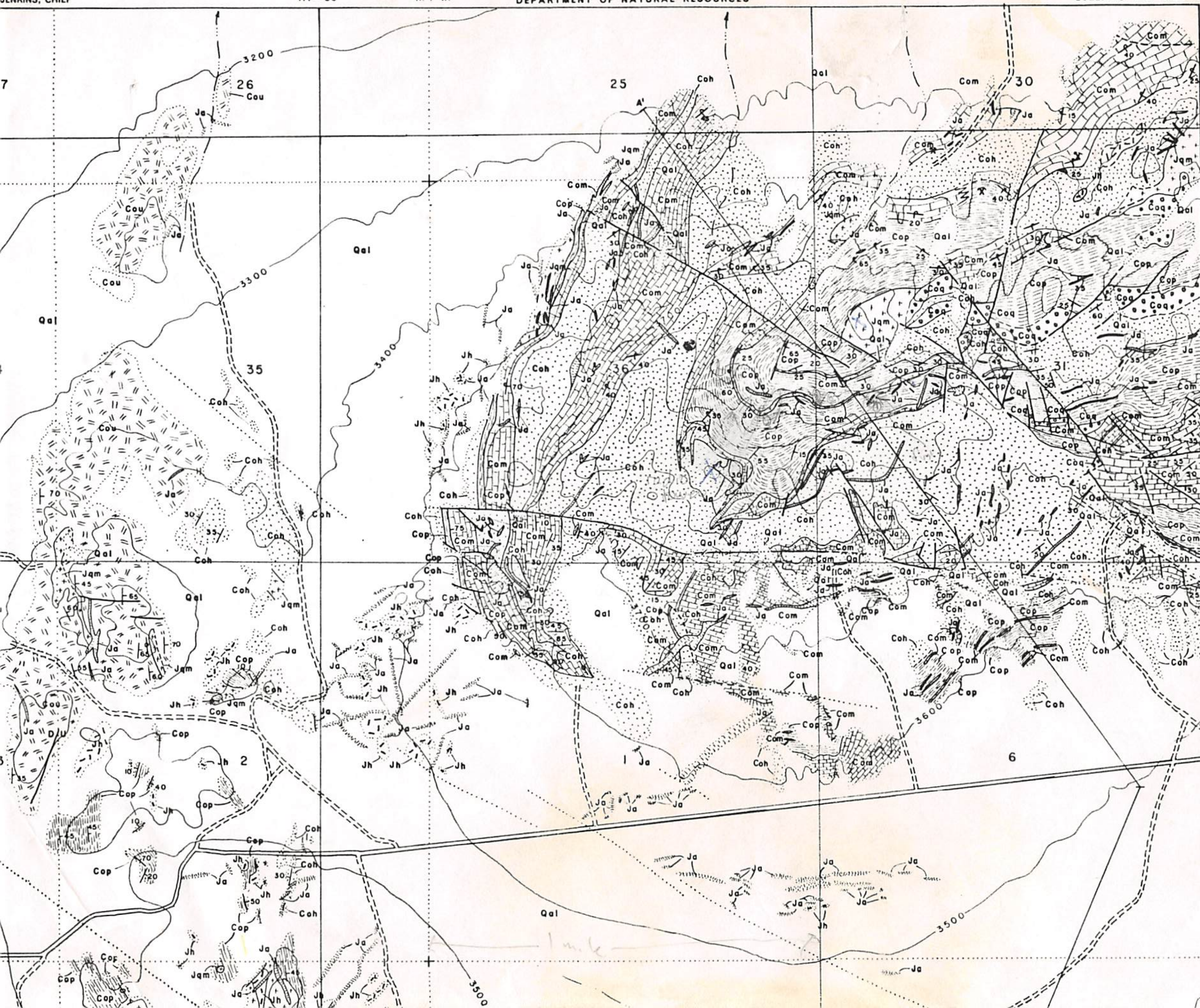

GEOLOGIC MAP OF PART OF THE SHADOW MOUNTAINS, WESTERN SAN BERNARDINO COUNTY, CALIFORNIA

Bennie W. Troxel

EXPLANATION

Sedimentary Rocks

Quaternary

Qal — Recent stream alluvium; Pleistocene fanglomerate and terrace deposits

Carboniferous — Oro Grande series

Coh — Massive to poorly-bedded, brown, quartz-muscovite hornfels

Com — Gray to white marble (mostly calcite)

Cop — Platy lime-silicate hornfels and schist; includes thin beds of marble and quartzite

Coq — Massive to well-bedded quartzite, commonly feldspathic

Cou — Undifferentiated marble, hornfels, schist, and tactite

Plutonic Rocks

...or Lower Cretaceous

Ja — Granite aplite and pegmatite, in dikes

Jh