MAP I-561

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE CALIFORNIA DIVISION OF MINES AND GEOLOGY

GEOLOGIC MAP OF THE TWENTYNINE PALMS QUADRANGLE SAN BERNARDINO AND RIVERSIDE COUNTIES, CALIFORNIA

By
T. W. Dibblee, Jr.

MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-561

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DESCRIPTION OF MAP UNITS*

CENOZOIC SEDIMENTARY DEPOSITS

Surficial sediments

Unconsolidated and undissected sediments of valley areas and flood plains of canyons; sediments derived from adjacent highlands. In most large valleys, sediments presumably as thick as 100 feet, gradational downward into the older alluvium; elsewhere thinner and unconformable on older formations. Age, very late Pleistocene and Recent. Composed of the following units:

Windblown sand.--Loose fine sand deposited by prevailing westerly winds as dunes or thin cover over alluvium or over older alluvium.

Alluvium.--Detrital sediments ranging from subangular boulders and cobbles in small alluvial fans adjacent to mountains, through pebbly arkosic sand down slope, to arkosic sand and silt in valleys; includes sand and gravel of stream washes.

Clay.--Light-gray generally alkaline clay and some micaceous silt of playa lakes.

Dissected alluvial fan gravel

Slightly dissected gravel and sand deposited as alluvial fan and derived from granitic rocks of mountain to west; similar to, and may be in part equivalent to the older alluvium, but most is probably younger.

Older surficial sediments

Old weakly consolidated alluvial deposits that fill valley and former valley areas; dissected where elevated. May be as thick as a thousand or more feet. Composed of the following units:

Older alluvium.--Light-gray, poorly bedded to nonbedded, fine to coarse arkosic sand and minor admixtures of pebble-cobble gravel; in places a little micaceous silt or clay. In northern part of quadrangle (except in secs. 21 and 22, T. 2 N., R. 9 E.) contains pebbles and cobbles derived from granitic rocks, gneissic rocks, quartzite, and basalt exposed in San Bernardino Mountains west of quadrangle. In southern part of quadrangle, contains fragments derived from granitic rocks exposed in adjacent mountains. Where deeply dissected, surface exposures are as much as 200 feet thick; where buried in northern part of quadrangle, 600 feet or more thick as indicated by well logs; probably gradational downward into or locally unconformable on the older gravel and sand. Age, presumably Pleistocene.

Older gravel and sand.--Mostly light-gray, poorly bedded gravel, with minor fanglomerate and sand; gravel composed of subrounded cobbles and pebbles in matrix of coarse arkosic sand; clasts mostly of granitic rocks, few of quartzite, gneissic rocks, and hornblende diorite or gabbro. Some gravel and sand beds locally cemented by calcite. On Campbell Hill, east of Twentynine Palms, 700 feet of this unit exposed; lower part contains a few interbeds of light-reddish to greenish clay, several thin layers of gray-white marl, and bedded, friable yellow-buff sandstone. Age, presumably Pleistocene, possibly in part Tertiary. Base not exposed in quadrangle.

MESOZOIC VEIN ROCK

Quartz

Milky-white quartz; pervasively fractured. Quartz forms many veins and veinlets in pre-Tertiary rocks, but only the largest vein, as wide as 10 feet, in quartz monzonite southwest of Indian Cove, is shown. Age, presumably Mesozoic.

MESOZOIC PLUTONIC AND HYPABYSSAL IGNEOUS ROCKS

Quartz monzonite

White to gray-white, massive (nongneissoid) homogeneous granitic rock composed of quartz, potassic feldspar, and plagioclase (oligoclase) in generally equal proportions; about 2-6 percent biotite (mostly as small euhedral plates); and a total of less than 1 percent sphene, zircon, apatite, and iron oxides. Grains generally sharply bounded, without complex intergrowths. Rock generally hard, but readily disintegrates, by mechanical separation of grains, to arkosic sand. Intrusive into all other igneous and metamorphic rocks in quadrangle. Age, Mesozoic, probably Cretaceous, possibly as young as 83 million years, as suggested by Lanphere (1964, p. 394-395). The following two facies were mapped:

Medium-grained quartz monzonite.--Equigranular, medium- to fine-grained (average grain size from 1 to 2 mm). Mapped as part of Palms Quartz Monzonite (unit C) by Rogers (1954; 1961, p. 16).

Coarse-grained quartz monzonite.--Subequigranular, coarse- to medium-grained (average grain size 2 to 5 mm). Mapped as White Tank Quartz Monzonite (unit 2) by Rogers (1954; 1961, p. 18-23).

*Potassic and sodic-calcic (plagioclase) feldspar content of igneous rocks determined by chemical staining of sawed surface of samples by M. B. Norman.

Dike rocks

Massive, silicic to mafic dikes ranging from a few feet to 10 feet thick; generally vertical and parallel to each other; intrusive into the older granitic rocks and gneissic rocks. Similar to Mesozoic dike rocks in Ord Mountain area northwest of quadrangle, which intrude the older granitic rocks but not the quartz monzonite (Dibblee, 1964a, b). Composed of the following units:

Mafic (dioritic to andesitic) dikes.--Dike rocks that range from black very fine grained diorite to dark-gray microcrystalline andesite; composed mainly of plagioclase and hornblende(?); commonly contain a few small phenocrysts of plagioclase and hornblende.

Felsite dikes.--White to light-gray, very hard, microcrystalline silicic rocks composed mostly of sodic plagioclase; minor amounts of potassic feldspar and quartz; a few minute flakes of biotite.

Older granitic rocks

White to light-gray granitic rocks intrusive into the gneissic rocks and intruded by the quartz monzonite. In San Bernardino Mountains west of quadrangle, intrusive into Paleozoic metasedimentary rocks; age, therefore, presumably Mesozoic, probably Jurassic to Early Cretaceous. Composed of the following units:

Leucocratic quartz monzonite.--(Mapped as units A and B of Palms Quartz Monzonite by Rogers, 1954; 1961, p. 14-16). Light-gray to nearly white, massive to faintly gneissoid granitic rock. Composed of quartz, potassic feldspar, and plagioclase (oligoclase) in generally equal proportions; 2-5 percent biotite as minute flakes; and a total of less than 1 percent muscovite, sphene, zircon, apatite, and iron oxides. Rock fine to coarse grained, but mostly medium-grained inequigranular; fine to medium and, locally, coarse grains of potassic feldspar and plagioclase are complexly intergrown. Rock generally hard, resistant, strongly coherent, but closely jointed; forms jagged light-gray exposures. Intrusive into the monzonite porphyry.

Granodiorite to quartz monzonite.--Light-gray to white, buff-weathering, massive to somewhat gneissoid, fine- to medium-grained granitic rocks. Composed of quartz, potassic feldspar, and plagioclase (oligoclase) in proportions that range from nearly equal to predominance of plagioclase over potassic feldspar; 3-8 percent biotite (as numerous evenly distributed small flakes); and a total of about 1 percent sphene, zircon, apatite, and iron oxides. In many places biotite flakes oriented parallel to each other give rock a crude gneissoid foliation. Rock not in contact with other older granitic rocks; therefore, age relationships not known.

Biotite-rich quartz monzonite.--Light- to medium-gray, massive to locally gneissoid, medium-grained, commonly porphyritic granitic rock. Composed of quartz, potassic feldspar, and plagioclase (oligoclase-andesine) in proportions that range from nearly equal to slight predominance of plagioclase; 5-20 percent biotite (as clusters of minute flakes that form small dark patches); and a small percentage of hornblende, sphene, and iron oxides. Abundant to scarce phenocrysts (as long as 2 cm) composed of potassic feldspar (orthoclase) that contains minute poikolitic inclusions of plagioclase. All feldspars are gray. Rock hard, coherent, resistant but closely jointed; forms medium-gray rugged exposures.

Ferruginous quartz monzonite.--Dark-gray, massive to somewhat gneissoid granitic rock generally similar in composition to biotite-rich quartz monzonite but highly stained by iron oxides to brownish gray. Rock generally fine grained, nonporphyritic to slightly porphyritic. Appears to be a phase of the biotite-rich quartz monzonite severely affected by hydrothermal(?) action. Gradational into the biotite-rich quartz monzonite.

Monzonite porphyry.--Light-gray, massive to weakly gneissoid, porphyritic granitic rock. Composed of about 30 percent large (from ½ inch to 6 inches long) subhedral and euhedral phenocrysts of potassic feldspar (orthoclase) and some smaller ones of plagioclase, in a medium-grained groundmass of potassic feldspar, plagioclase, quartz (generally less than 10 percent), biotite (as dark clusters of numerous minute flakes) or hornblende (or, rarely, both of these minerals), and a total of less than 1 percent sphene, apatite, and iron oxides. Potassic feldspar phenocrysts contain numerous minute inclusions of plagioclase; largest phenocrysts commonly Carlsbad-twinned. In a few places phenocrysts are oriented parallel to each other to give rock crude gneissoid structure. Rock mapped and described as monzonite porphyry by Rogers (1954; 1961, p. 16-18); appears to be a highly porphyritic facies of the biotite-rich quartz monzonite.

Dioritic rocks

Dark plutonic rocks composed mainly of plagioclase and mafic minerals; form small masses associated with the gneissic rocks and masses engulfed in granitic plutonic rocks. Age, presumably Mesozoic, younger than the gneissic rocks but older than, or possibly the same age as, some of the older granitic rocks. Composed of the following types:

Biotite diorite.--Medium- to dark-gray, massive to faintly gneissoid, medium-grained dioritic rock composed mainly of plagioclase and biotite with a total of generally less than 15 percent quartz, potassic feldspar, hornblende, and iron oxides. Gradational into the gneissic rocks near east border of quadrangle.

Hornblende diorite-gabbro.--Dark-gray to black, massive (nongneissoid), medium to coarsely crystalline dioritic rock ranging from diorite to gabbro. Composed mainly of hornblende and plagioclase (andesine-labradorite) in variable but more or less equal proportions; small amounts of biotite, chlorite, augite(?), iron oxides (mainly magnetite), and, rarely, olivine. Secondary epidote commonly present, mostly as veinlets. Mapped and described as Gold Park Gabbro-Diorite by Rogers (1954; 1961, p. 13-14).

PRECAMBRIAN(?) METAMORPHIC ROCKS

Gneissic rocks

Variable dark- to light-gray, fine- to medium-grained gneissic rocks that range from prominently laminated gneiss through indistinctly laminated gneiss to gneissoid granitic rocks. Composed mostly of quartz and lesser amounts of plagioclase (albite-oligoclase-andesine) and biotite; some gneiss contains minor amounts of potassic feldspar, muscovite, and(or) hornblende. Gneiss made up of white to light-gray laminae rich in quartz or quartz and feldspar alternating with dark-gray to nearly black, commonly foliated laminae rich in biotite and gray laminae composed of all three

minerals. Laminae of gneiss slightly to moderately undulating, locally contorted or lineated. Gneissoid granitic rocks composed of quartz, feldspar, and biotite; of medium-grained homogeneous texture; unlaminated, but orientation of biotite flakes gives rock gneissoid structure. Gneiss recrystallized, probably in Precambrian or possibly in Paleozoic or Mesozoic times, from metasedimentary rocks of Precambrian(?) age. Most of laminae may represent relict stratification. Gneissoid granitic rocks may have crystallized in part from lit-par-lit magmatic injections in which gneissoid structure may be flow structure. Precambrian(?) age suggested by unconformable relationship with overlying Paleozoic rocks in San Bernardino Mountains west of quadrangle (Dibblee, 1964c, d). Gneissic rocks previously mapped as Pinto Gneiss (Miller, 1938; Rogers, 1954; 1961, p. 11-13).

Mines and prospects

All workings within quadrangle presumably were made in search of gold many years ago; no production recorded.

A. Prospects in N½ sec. 12, T. 1 N., R. 7 E. Three adits from 15 to 40 feet along north-trending iron-stained fracture zones in gneissic rocks.

B. Prospects in N½ sec. 19, T. 1 N., R. 8 E. Several pits and shallow adits in wide shear zone that trends northwest, dips steeply southwest, between ferruginous quartz monzonite to northeast and biotite-rich quartz monzonite to southwest.

C. Prospect in SE¼ sec. 20, T. 1 S., R. 9 E. Shaft 50 feet or more deep in thin quartz veins in gneissic rocks near contact with quartz monzonite.

D. Prospect in S½ sec. 22, T. 1 S., R. 9 E. Shaft about 10 feet deep in thin quartz vein in quartz monzonite.

E. Prospect in NW¼ sec. 32, T. 1 S., R. 9 E. Shaft about 20 feet deep in thin quartz stringer in quartz monzonite.

F. Prospect in SW¼ sec. 35, T. 1 S., R. 8 E. Two adits in biotite-rich gneiss; southwest adit driven north about 100 feet or more in iron-stained quartz-pegmatite veins; northeast adit driven northwest about 80 feet in thin iron-stained quartz vein.

G. Prospect in SE¼ sec. 35, T. 1 S., R. 8 E. Shallow workings in iron-stained quartz stringers in hornblende diorite and biotite diorite.

H. Prospect in NE¼ sec. 10, T. 2 S., R. 8 E. Adit driven south and trench along iron-stained quartz vein striking southwest in gneissic rocks.

J. Desert Queen mine. SW¼ sec. 5, T. 2 S., R. 9 E. Quartz stringers with oxide stains of copper, iron, and manganese along zone striking northeast, dipping 60° SE., in fine-grained leucocratic quartz monzonite. Worked from two adits driven northeast into zone--one at bottom of canyon, another about 150 feet above canyon and driven more than 100 feet--and two inclined shafts sunk on zone from surface to upper adit. Small mill site.

K. Prospects in W½ sec. 8, T. 2 S., R. 9 E. Shallow shaft and many shallow pits in thin quartz-pegmatite veinlets in quartz monzonite and leucocratic quartz monzonite.

L. Prospects in N½ sec. 14, T. 1 S., R 9 E. Shallow shaft; adit driven east and several trenches in quartz veins in leucocratic quartz monzonite.

Feldspar crystals

Large Carlsbad-twinned orthoclase phenocrysts with poikolitic inclusions, in monzonite porphyry, south of Twentynine Palms. Best formed phenocrysts, some as long as 8 inches, found weathered out in alluvium below outcrops, especially in S½ sec. 31, T. 1 N., R. 9 E.

Test well drilled for oil or gas

Oro Negro Oil Co. Onoco No. 1 W½SE¼ sec. 28, T. 2 N., R. 8 E. Drilled in 1962; depth, 2,106 feet, reportedly in sand and gravel to bottom (H. S. Cook, Los Angeles, oral commun., 1964).

Water wells

Only those of known depth are shown on map. Depth in feet indicated; all penetrated sand, gravel, and clay of the alluvium and older alluvium; none entered pre-Tertiary rocks, according to data from F. B. Pickett, Joshua Tree, Calif. (oral commun., 1964).

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