U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

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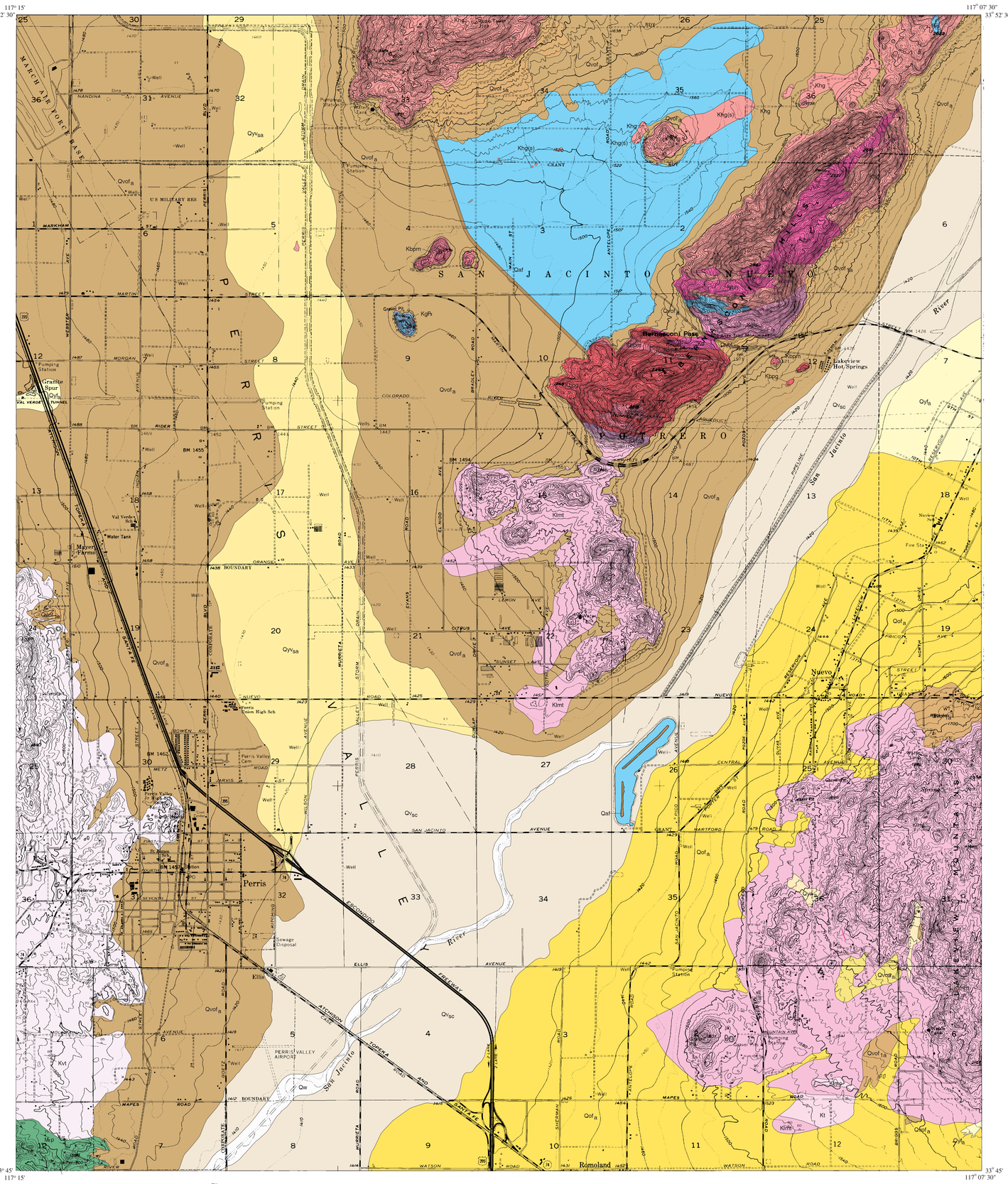
OPEN-FILE REPORT 03-270




Base from U.S. Geological Survey
7.5 Perris quadrangle, 1967
Polyconic projection

Geology mapped by D.M. Morton, 1991, 1995 and 1996.

GN
MN
15°

SCALE 1:24,000

1 ½ 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

# PRELIMINARY GEOLOGIC MAP OF THE PERRIS 7.5' QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA

Version 1.0

By

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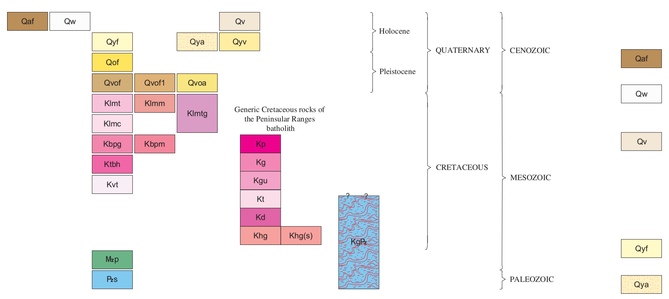
LOCATION MAP

## CORRELATION OF MAP UNITS




On some SCAMP geologic map plots, including the Perris 7.5' quadrangle, characteristic grain size information is displayed using subscripted alpha characters (e.g., $Qyf_g$, $Qoa_{ag}$, after the unit label), where the characters conform to the following definitions:

a - arenaceous; sand or sand bearing (very coarse sand through very fine sand)
b - boulders or containing boulders (>25mm)
g - gravel or containing gravel (cobble through granule gravel)
s - silt or silty
c - clay or clay bearing
m - marl
p - peat

Where a unit label has more than one subscripted character, in all cases, the first character modified the second (e.g., $Qyf_{ag}$ indicates arenaceous gravel).

In the **Description of Map Units**, the Ma following U/Pb ages has an attached subscript; $Ma_d$ for isotope dilution analyses, and $Ma_{ip}$ for ion probe analyses.

**Contact**—Solid where located within ±15 meters

**Kp**—Granite pegmatite dikes

**Kg**—Granite dikes

**Strike and dip of igneous foliation**

**Inclined**

**Vertical**

**Strike and dip of igneous joints**

**Inclined**

**Vertical**

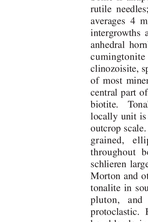
**Strike and dip of metamorphic foliation**

**Inclined**

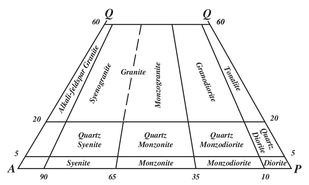
**Vertical**

**Bearing and plunge of metamorphic lineations**

**Inclined**




*SURROUNDING 7.5' QUADRANGLES*




Classification of plutonic rock types (from IUGA, 1973, and Streckeisen, 1973). A, alkali feldspar; P, plagioclase feldspar; Q, quartz.

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code. Any use of trade, firm, or product names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Government.

This map was printed on an electronic plotter directly from digital files. Dimensional calibration may vary between electronic plotters and between X and Y directions on the same plotter, and paper may change size due to atmospheric conditions; therefore, scale and proportions may not be true on plots of this map.

Digital files available on World Wide Web at http://geopubs.wr.usgs.gov/open-file/of03-270/

## DESCRIPTION OF MAP UNITS

**MODERN SURFICIAL DEPOSITS**—Sediment recently transported and deposited in channels and washes, on surfaces of alluvial fans and alluvial plains, and on hillslopes. Soil-profile development is non-existent. Includes:

Qaf — **Artificial fill (late Holocene)**—Deposits of fill resulting from human construction or mining activities; restricted to dam at Perris Reservoir and dikes east of Perris

Qw — **Active-wash deposits (late Holocene)**—Deposits of active alluvium; confined to main channel of San Jacinto River. Consists mostly of unconsolidated sand and gravel in ephemeral river channel. Sediment subject to localized reworking mainly during winter months.

Qv — **Active valley deposits (late Holocene)**—Active and recently active fluvial deposits along valley floors; gravel, sand, and silt; unconsolidated. Occupies broader channel flanking main channel of Santa Ana River

**YOUNG SURFICIAL DEPOSITS**—Sedimentary units that are slightly consolidated to cemented and slightly to moderately dissected. Alluvial-fan deposits (**Qyf** series) typically have high coarse:fine clast ratios. Younger surficial units have upper surfaces that are capped by slight to moderately developed pedogenic-soil profiles (A/C to A/AC/$B_{cambric}C_{ox}$ profiles). Includes:

Qyf — **Young alluvial-fan deposits (Holocene and late Pleistocene)**—Gray-hued sand and cobble- and gravel-sand deposits. Restricted to limited areas along east and west edges of quadrangle

Qya — **Young axial-valley floor deposits (Holocene and late Pleistocene)**—Gray, unconsolidated alluvium consisting of coarse-grained sand and lesser gravel and silt. Restricted to two small areas in western Lakeview Mountains

Qyv — **Young alluvial-valley deposits (Holocene and late Pleistocene)**—Silty to sandy alluvium on valley floors; gray, unconsolidated. Underlies large area along axis of Perris Valley

**OLD SURFICIAL DEPOSITS**—Sedimentary units that are moderately consolidated and slightly to moderately dissected. Older surficial deposits have upper surfaces that are capped by moderately to well-developed pedogenic soils (A/AB/B/C$_{ox}$ profiles and Bt horizons as much as 1 to 2 m thick and maximum hues in the range of 10YR 5/4 and 6/4 through 7.5YR 6/4 to 4/4 and mature Bt horizons reaching 5YR 5/6). Includes:

Qaf — **Old alluvial-fan deposits (late to middle Pleistocene)**—Indurated, sandy alluvial-fan deposits. Covers extensive area surrounding western Lakeview Mountains; commonly at base of steep bedrock slopes. Most of unit is slightly to moderately dissected and reddish-brown. Some **Qof** includes thin, discontinuous surface layer of Holocene alluvial fan material

**VERY OLD SURFICIAL DEPOSITS**—Sediments that are slightly to well consolidated to indurated, and moderately to well dissected. Upper surfaces are capped by moderate to well developed pedogenic soils (A/AB/B/C$_{ox}$ profiles having Bt horizons as much as 2 to 3 m thick and maximum hues in the range 7.5YR 6/4 and 4/4 to 2.5YR 5/6)

Qvof — **Very old alluvial-fan deposits (early Pleistocene)**—Mostly well-dissected, well-indurated, reddish-brown sand deposits. Commonly contains duripans and locally silcretes. Forms large area flanking Perris Valley and west side of San Jacinto River Valley. Typically flanks steep bedrock slopes

Qvof1 — **Very old alluvial-fan deposits, Unit 1 (early Pleistocene)**—Mostly well-dissected, well-indurated, reddish-brown sand deposits. Commonly contains duripans and locally silcretes. Restricted to several small areas in Lakeview Mountains and one area north of Perris Reservoir. Distinguished from **Qvof** on basis of geomorphic form

Qvoa — **Very old axial-channel deposits (early Pleistocene)**—Gravel, sand, and silt; reddish-brown, well-indurated, surfaces well-dissected

*Rocks of the Peninsular Ranges batholith*

**Lakeview Mountains pluton (Cretaceous)**—Chiefly biotite-hornblende tonalite, but includes genetically related bodies of distinctly different compositions. Originally termed Lakeview quartz-hornblende diorite by Dudley (1935), and then Lakeview Mountain tonalite by Larsen (1948). Larsen's usage of Lakeview Mountain tonalite included much granitic and metamorphic rock in Mount Eden area to the east, and a variety of granitic rocks within San Jacinto Mountains and in area south of Hemet. Morton (1969) redefined usage of name, and restricted it to pluton which underlies most of Lakeview Mountains and southern part of Bernasconi Hills, more closely approximating original usage by Dudley (1935). Pluton underlies about 125 $km^2$, mostly in surrounding quadrangles. It is steep-walled and tear-dropped shaped in plan, markedly concordant with surrounding rock bodies, but conspicuously deviating from northwest structural grain of older rocks in this part of Peninsular Ranges. Contact with surrounding rocks is relatively sharp and well located, but in quadrangle to north it is gradational zone several meters wide.

Abundant, steeply dipping, planar and curvilpanar schlieren characterize most of pluton; some are wispy and irregular shaped, and some folded. All range in composition from nearly pure quartz-plagioclase rock to pure hornblende-biotite rock. Schliere approaching these two end member compositions are commonly juxtaposed. Strike of most schlieren in outer parts of pluton mimic outer form of pluton; inward, orientation is progressively more random. Intersecting schlieren are rare, but where found, show inconsistent cross-cutting age relationships. Pluton subdivided into:

Kimt — **Tonalite**—Gray, medium- to coarse-grained, massive to foliated, biotite-hornblende tonalite; contains no potassium feldspar. Average color index about 25. Mineralogically, tonalite ranges from 34 to 70 percent plagioclase, 13 to 32 percent quartz, 4 to 29 percent hornblende, and 7 to 22 percent biotite. Plagioclase is subhedral to anhedral, faintly to intensely zoned andesine ranging in composition from $an_{32}$ to $an_{48}$. Some is antiperthitic. Quartz is anhedral, generally containing minute rutile needles; some highly oriented. Anhedral to subhedral biotite averages 4 mm in length, locally as large as 1.5 cm. Rarely has intergrowths and overgrowths of sphene. Subhedral stout prisms to anhedral hornblende occurs; some contain small colorless masses of cummingtonite in cores. Accessory minerals include epidote, clinozoisite, sphene, magnetite-ilmenite, apatite, and zircon. Grain-size of most minerals is uniform throughout pluton, increasing slightly in central part of pluton, roughly coincident with appearance of poikilitic biotite. Tonalite is characterized by ubiquitous, abundant schlieren; locally unit is all schlieren, rendering rock extremely heterogeneous at outcrop scale. In addition to schlieren, tonalite contains relatively fine-grained, ellipsoidal, biotite-hornblende melanocratic inclusions throughout body; color index of inclusions averages 35. Some schlieren large enough to map at 1:24,000 scale (Morton, 1969, 1972; Morton and others, 1969). Thin, highly elongate septa of fine-grained tonalite in southernmost part of pluton are parallel to outer margin of pluton, and have foliated, megacrystic texture interpreted as protoclastic. Rock in these septa is dark-gray, containing stumpy black hornblende in fine-grained granoblastic matrix of plagioclase, quartz, and biotite, which appears to have undergone extreme grain-size reduction and moderate recrystallization. Some hornblende is bent, fractured, and recrystallized as is fine-grained quartz. Concordant U/Pb age on zircon is 100 $Ma_{id}$ and 98 $Ma_{ip}$; $^{40}Ar/^{39}Ar$ age on hornblende is 99.6Ma (compare to contoured conventional K/Ar ages in diagram below)

Kimm — **Melanocratic tonalite**—Lenticular masses of nearly black rock ranging from 50 to 100 percent biotite and hornblende; scattered throughout most of pluton, but concentrated in central and northeast part. In this quadrangle, unit appears once in southeast corner of map. Have similar relationship to tonalite forming main part of Lakeview Mountains pluton as leucocratic masses do; appear to be very large scale schlieren

Kimtg — **Tonalite and granodiorite, undifferentiated**—Intermixed tonalite and granodiorite. Restricted to small area at north end of pluton, 1 km south of dam

Kimc — **Comb-layered gabbro**—Gabbro, comb-layered. Found along south margin of Lakeview Mountains pluton

Kbpg — **Monzogranite of Bernasconi Pass (Cretaceous)**—Biotite and biotite-hornblende monzogranite; pale tan- to tan-weathering, medium grained, hypidiomorphic-granular or porphyritic, foliated. Includes:

Kbpm — **Migmatitic rocks within monzogranite of Bernasconi Pass (Cretaceous)**—Monzogranite containing abundant masses of mafic rock

Kbbh — **Tonalite of Bernasconi Hills (Cretaceous)**—Biotite hornblende tonalite; gray, medium-grained, hypidiomorphic-granular, massive to indistinctly foliated. Differs from Lakeview Mountain tonalite by presence of K-feldspar, smaller grain size, and lack of schlieren

Kvt — **Val Verde pluton (Cretaceous)**—Relatively uniform pluton composed of biotite-hornblende tonalite. Termed Perris quartz diorite by Dudley (1935), Val Verde tonalite by Osborn (1939), and included within Bonsall tonalite by Larsen (1948). Name Val Verde adopted by Morton (1999) based on detailed study of Osborn (1939) near Val Verde, a former settlement and railway siding midway between Perris and Riverside. Apparently steep-walled Val Verde pluton is eroded to mid-pluton level. Emplacement age of the pluton is 105.7 $Ma_{ip}$. $^{40}Ar/^{39}Ar$ age of hornblende is 100 Ma, biotite 95 Ma and potassium feldspar 88.5 Ma. Includes:

Kp — **Granite Pegmatite dikes (Cretaceous)**—Leucocratic, mostly tabular, pegmatitic-textured granitic dikes

Kg — **Granite dikes (Cretaceous)**—Tabular leucocratic coarse- to very coarse-grained granitic textured dikes. Biotite and muscovite are common minor minerals

Kgu — **Granite, undifferentiated (Cretaceous)**—Leucocratic fine- to coarse-grained massive granite and biotite monzogranite. Most is equigranular and consists of quartz and alkali feldspars. In leucocratic granite, biotite is a widespread varietal mineral. Forms elongate dike-like band northeast of El Cerrito

Kt — **Tonalite, undifferentiated (Cretaceous)**—Gray, medium-grained biotite-hornblende tonalite, typically foliated. Restricted to small area in southeastern part of quadrangle

Kd — **Diorite, undifferentiated (Cretaceous)**—Mostly fine- to medium-grained, massive, dark gray to black hornblende diorite. Limited exposures on Bernasconi Pass

Khg — **Heterogeneous granitic rocks (Cretaceous)**—Heterogeneous mixture of granitic rocks containing some schist and gneiss. Granitic rocks range in composition from hornblende-rich quartz diorite to leucocratic tonalite and from potassium feldspar-free rocks to granodiorite and quartz diorite. Most are medium-grained and have textures ranging from hypidiomorphic-granular to xenomorphic-granular. Some rocks are inequigranular having mafic minerals slightly, but distinctly, finer grained than quartz and feldspar. Plagioclase is zoned, sodic to intermediate andesine ranging from 1 to 4 mm in length. Potassium feldspar, where present, is untwinned and microcline-twinned, anhedral and interstitial grains mostly under 2 mm in size. Quartz content is distinctly lower than in tonalite units to the south, less than 10 percent in most rocks; occurs as anhedral, strained, interstitial grains. Hornblende generally less abundant than biotite; subhedral to anhedral, irregular-shaped grains ranging in size from 0.3 to 2.5 mm. Biotite occurs as plates and irregular to poikilitic grains, some partly altered to chlorite. In leucocratic rocks, primary muscovite is sparse constituent 0.5 mm long, mostly intergrown with biotite. Accessory minerals include apatite, sphene, zircon, and magnetite-ilmenite. Unit forms extensive, but discontinuous body south of quadrangle. Most abundant non-granitic fraction of this unit is mesocratic, fine- to medium-grained, massive to foliated mafic rock composed of about 50 percent hornblende and biotite. Rock is even grained, though locally contains porphyroblasts of plagioclase; white quartz-feldspar-rich layers are widespread. Some of these leucocratic layers are oriented parallel to foliation, some cut foliation at high-angles, and some are ptygmatically folded. Labeled **Khg(s)** where submerged in Lake Perris

*End rocks of Peninsular Ranges batholith*

Mzp — **Phyllite and schist (Mesozoic)**—Dark gray to black, fissile phyllite, well-foliated fine-grained biotite schist, and impure quartzite. Contains relatively pervasive lineation in the phyllite and schist produced by streaks of biotite. Restricted to the southwest corner of the quadrangle. Unit is extensively exposed in the Romoland and Lake Elsinore quadrangles to the south and southwest

KgPz — **Mixed metamorphic rocks and granitic rocks (Cretaceous and Paleozoic?)**—Metasedimentary rocks intruded by variable amounts of massive to foliated granitic rocks. Metamorphic rocks predominate over granitic rocks

Pzs — **Biotite schist (Paleozoic?)**—Medium-to dark-gray, fine-grained biotite schist and biotite-quartz-feldspar schist. Locally contains sillimanite and cordierite. Commonly includes minor amounts of quartzite and calc-silicate hornfels. Limited exposures in the Bernasconi Hills

## GEOLOGIC SUMMARY

The Perris quadrangle is located in the northern part of the Peninsular Ranges Province within the central part of the Perris block, a relatively stable, rectangular in plan area located between the Elsinore and San Jacinto fault zones.

The quadrangle is underlain by Cretaceous age and older basement rocks. The Cretaceous plutonic rocks are part of the composite Peninsular Ranges batholith. A wide variety of intermediate composition granitic rocks are located in the quadrangle. These rocks are mainly of tonalitic composition but range from monzogranite to diorite. Most rock is faintly to intensely foliated. Many are heterogeneous and contain varying amounts of meso-and melanocratic discoidal-shaped inclusions. Some rocks are composed essentially of inclusion material and some are migmatitic. Included within these granitic rocks are a few septa of Paleozoic(?) schist of upper amphibolite metamorphic grade.

Metamorphic rocks of probable Mesozoic age occur in the southwest corner of the quadrangle. Most of these rocks are well-foliated phyllite of Mesozoic age. The metamorphic grade of these rocks is greenschist or sub-greenschist. Rocks of probable Paleozoic age occur as scattered masses within plutonic rocks in the northern part of the quadrangle. These rocks are of amphibolite grade and include cordierite and sillimanite biotite schist.

In the center and southeast quarter of the quadrangle, biotite-hornblende tonalite of the Lakeview Mountains pluton is characterized by ubiquitous schlieren and by a lack of potassium feldspar. Masses of leucocratic and melanocratic rock occur scattered throughout the pluton. Mesocratic-to melanocratic discoidal-shaped inclusions are oriented parallel to the schlieren. A small body of comb-layered gabbro is located with the tonalite near the southern margin of the pluton. The tonalite contains rare-earth bearing, zoned pegmatite dikes.

Biotite-hornblende tonalite located in the southwest part of the quadrangle is part of the Val Verde pluton. This tonalite is similar to that of the Lakeview Mountains pluton but lacks the ubiquitous schlieren and contains potassium feldspar.

Diagonally crossing the quadrangle is the channel and flood plain of the ephemeral San Jacinto River. Most of the alluviated area west of the San Jacinto River consists of Pleistocene age fluvial deposits, which have a degraded upper surface that is preserved in some places near the contact with granitic rocks. The upper part of these deposits form the Paloma surface of Woodford and others (1971). A modern-to Holocene-age drainage channel is within these older Pleistocene deposits. Younger Pleistocene alluvial fans emanate from the Lakeview Mountains east of the San Jacinto River.

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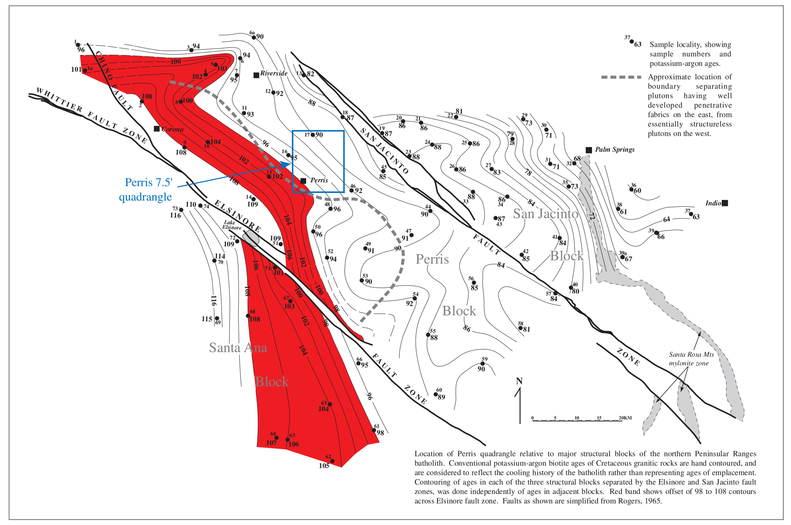


Location of Perris quadrangle relative to major structural blocks of the northern Peninsular Ranges batholith. Conventional potassium-argon biotite ages of Cretaceous granitic rocks are hand contoured, and are considered to reflect the cooling history of the batholith rather than representing ages of emplacement. Contouring of ages in each of the three structural blocks separated by the Elsinore and San Jacinto fault zones, was done independently of ages in adjacent blocks. Red hand shows offset of 98 to 108 contours across Elsinore fault zone. Faults as shown are simplified from Rogers, 1965.