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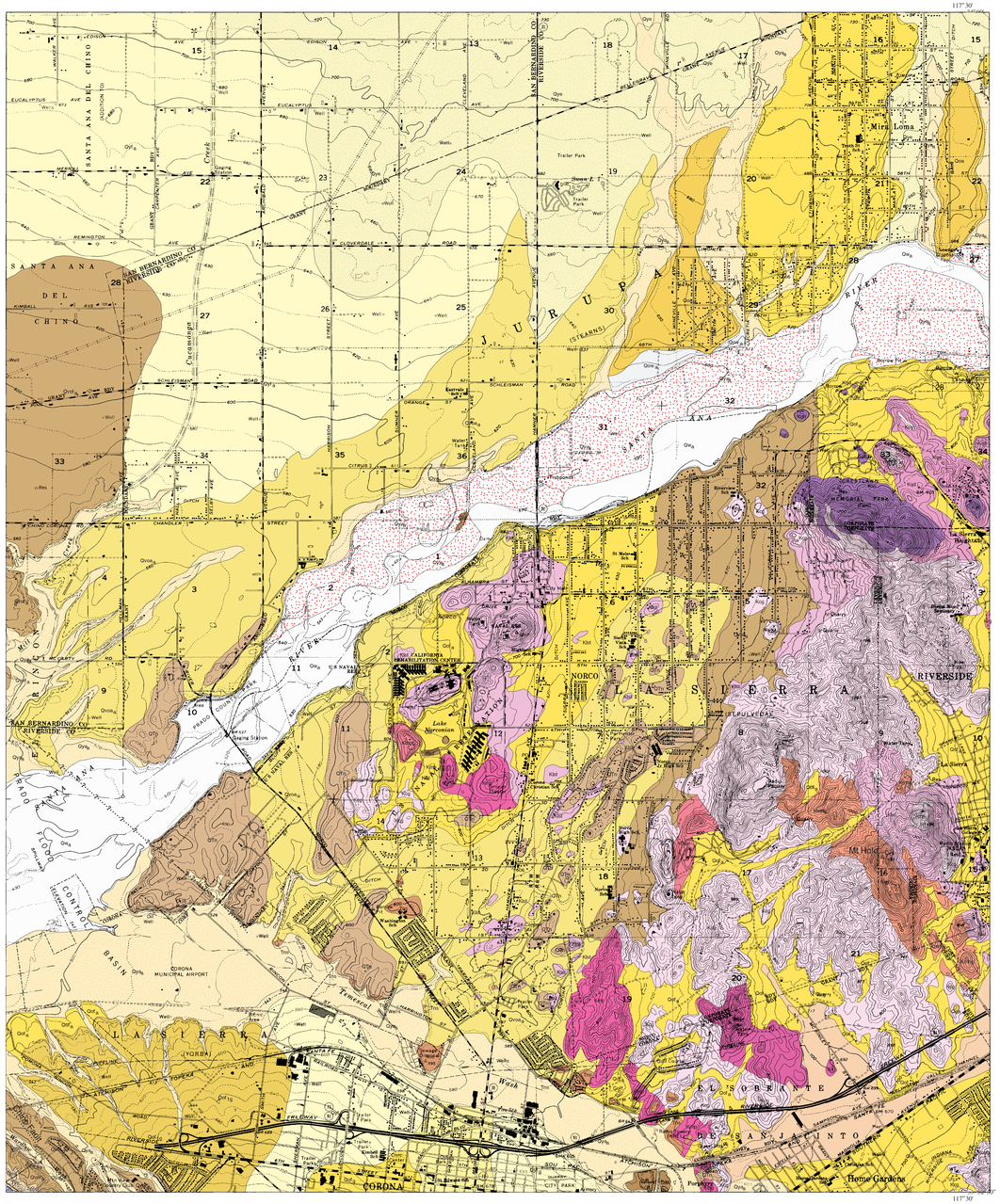
OPEN-FILE REPORT 02-



GEOLOGIC MAP OF THE CORONA NORTH 7.5' QUADRANGLE, RIVERSIDE and SAN BERNARDINO COUNTIES, CALIFORNIA

Version 1.0

By

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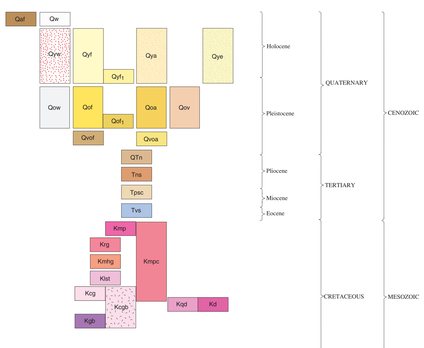
CORRELATION OF MAP UNITS



On many SCAMP geologic map plots, including the Corona North 7.5' quadrangle, characteristic grain size information is displayed using subscripted alpha characters (e.g. Qya_s, Qoa_g), where the characters heretoin to the following definitions:

a - arenaceous (very coarse sand through very fine sand)
b - boulder gravel (>25mm)
g - gravel cobble through granule gravel)
s - silty
c - clayey
m- marl
p - peat

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

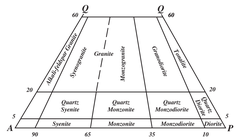
Contact—Generally located within ±15 meters

Fault—High angle. Strike-slip component on all faults is right-lateral; dip-slip component is unknown, but probably reflects valley-highland relations. Dashed where located within ±30 meters; dotted where concealed; queried where existence questionable.

Strike and dip of beds

70 **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

DESCRIPTION OF MAP UNITS

Qalf

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:

Artificial fill (late Holocene)—Deposits of fill resulting from human construction or mining activities; restricted to three noncontiguous areas (1) south of 91 Freeway, (2) on Norco Navel Reservation, and (3) sand and gravel mining in Santa Ana River channel

Qw

Very young wash deposits (Holocene)—Deposits of active alluvium; confined to main channel of Santa Ana River. Consists mostly of unconsolidated sand and gravel in river channel. Sediment subject to localized reworking mainly during winter months.

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/BC_{ox} profiles). Includes:

Qyfc

Young wash deposits (Holocene and late Pleistocene)—Sand, gravel and boulder deposits.

Qyf

Young alluvial fan deposits (Holocene and late Pleistocene)—Gray-hued sand and cobble- and gravel-sand deposits derived from lithic diverse sedimentary units. Deposits north of Santa Ana River (Qyf_g) consist of gray-hued, unconsolidated, arkosic sand derived from varied metamorphic and granitic lithologies in San Gabriel and San Bernardino Mountains north and east of quadrangle. May contain lesser interdigitated sedimentary wedges from Peninsular Ranges sources to south. Unit shows slight coarsening toward mountains to north. South of Temescal Wash, unit is mostly cobble- to granule- sized gravel. Locally, young alluvial fan deposits are divided into subunits based on sequential terrace development and other factors; one such unit is found in quadrangle:

Qyf1

Young alluvial fan deposits, Unit 1 (Holocene and late Pleistocene)—Consists of pale-gray, unconsolidated, cobble- to granule- sized gravel. Restricted to single fan flanked by two younger Qyf fans in southern part of quadrangle. Forms older part of Qyf unit

Qya

Young alluvial channel deposits (Holocene and late Pleistocene)—Gray, unconsolidated alluvium consisting of medium- to fine-grained sand and lesser silt flooring Temescal Wash and several of its tributaries in the southwestern part of quadrangle. North of Santa Ana River, includes sediments in Mill Creek drainage

Qye

Young eolian deposits (Holocene and late Pleistocene)—Sand dune deposits, inactive except for very minor amount of sediment movement during Santa Ana wind storms. Chiefly unconsolidated, moderately well sorted, fine- to medium-grained sand

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/BC_{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:

Qow

Old wash deposits (late to middle Pleistocene)—Consists chiefly of sand. Gray to reddish-brown, unconsolidated to slightly indurated. Restricted to single occurrence flanking north side of Santa Ana River southwest of Mira Loma

Qof

Old alluvial fan deposits (late to middle Pleistocene)—Indurated, sandy alluvial fan deposits, except south of 91 Freeway in south-central part of quadrangle where unit is predominantly gravel. Covers extensive areas south of Santa Ana River, commonly at base of steep bedrock slopes. North of Santa Ana River, found in and east of Mira Loma. Most of unit is slightly to moderately dissected and reddish-brown. Some Qof includes thin, discontinuous surface layer of Holocene alluvial fan material. Includes:

Qof1

Old alluvial fan deposits, Unit 1 (middle Pleistocene)—Indurated, gravely alluvial fan deposits. Most are slightly to moderately dissected; reddish-brown. Some deposits include thin, discontinuous surface layer of Holocene alluvial fan material. In quadrangle, restricted to single 5 km^2 fan west of Corona

Qoa

Old alluvial channel deposits (late to middle Pleistocene)—Alluvial deposits consisting mainly of sand, but containing minor gravel and silt. Gray to reddish-brown, unconsolidated to indurated. Generally slightly dissected. Restricted to two isolated occurrences east and west of Mira Loma on north side of Santa Ana River

Qov

Old alluvial valley deposits (late to middle Pleistocene)—Fluvial deposits along valley floors. Consists of moderately indurated, commonly slightly dissected sandy alluvium, containing lesser silt, and clay-bearing alluvium. Some deposits include thin alluvial deposits of Holocene age. Restricted to area between La Sierra and Home Gardens in southeastern part of quadrangle

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/BC_{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 east of Norco generally flanking steep bedrock slopes. North of Santa Ana River, forms broad area that is part of fans emanating from Puente Hills west of quadrangle

Qvoa

Very old alluvial channel deposits (early Pleistocene)—Gravel, sand, and silt; reddish-brown, well-indurated, surfaces well-dissected. Underlies large area between Santa Ana River and Temescal Wash

QTn

Late Cenozoic sedimentary rocks in Norco area (early Pleistocene to late Pliocene?)—Moderately indurated sandstone, conglomeratic sandstone, and conglomerate. In Norco area, unit includes locally derived clasts as well as clasts derived from San Bernardino Mountains. Found in and west of Norco, on both sides of Santa Ana River

Tms

Sandstone of Norco area (Pliocene)—Poorly exposed, unnamed, marine sandstone. Forms isolated areas of outcrop south of Norco and north of Temescal Wash. Unconsolidated, greenish-yellow sandstone having sparse conglomerate lenses. Locally contains abundant, poorly preserved shallow marine fossils including *Anadara* cf. *A. trilineata* (Conrad), *Chione* sp., *Lucinoma* cf. *L. annulata* (Reeve), and *Diodora* sp. (J.D. Mount, per. commun., 1973). Unit may represent shallow-water eastward extension of Fernando Formation. Sparse conglomerate lenses include clasts of exotic silicic volcanic rocks. In places, ash of Taylor Canyon (per. commun., A.M. Sarna-Wojcicki, 1990) at base of formation is nonconformably buttressed against granitic rock. Ash deposited on granite are interpreted be tide pool deposits. Age of ash is 2.6 Ma

Tpsc

Puente Formation (early Pliocene and Miocene)—Marine sandstone, siltstone, and shale. Named by Eldrige and Arnold (1907) for exposures in Puente Hills. English (1926) extended distribution of Puente Formation to area south of Puente Hills, subdividing three units, from youngest to oldest, (1) shale, sandstone, and conglomerate (2) sandstone, and (3) shale. Daviess and Woodford (1949) subdivided Puente Formation in northwestern Puente Hills into four members, from youngest to oldest, (1) Sycamore Canyon Member, (2) upper siltstone ember, (3) sandstone member, and (4) lower siltstone member. Schoellhamer and others (1954) later designated formalized member names that are in current usage. Only Sycamore Canyon Member found in quadrangle; restricted to single locality in southwestern corner:

Sycamore Canyon Member (early Pliocene and Miocene)—Predominantly sandstone and pebble conglomerate. Sycamore Canyon Member is laterally variable, composed of varying amounts of pale gray, thick-bedded to massive, medium- to coarse-grained, friable sandstone; pale gray, thin-bedded, siliceous siltstone; pale gray, poorly bedded siltstone, and brownish-gray, massive conglomerate. Elsewhere contains bathyal-depth foraminiferal fauna (Yerkes, 1972)

Tvs

Vaqueros and Sespe Formations, undifferentiated (early Miocene, Oligocene, and late Eocene)—Interbedded marine and nonmarine sandstone and conglomerate assigned to the Vaqueros and Sespe Formations. Occurs only in southwestern corner of quadrangle. In Santa Ana Mountains to southwest, marine fossil-bearing strata of Vaqueros Formation are bed-by-bed interlayered with nonmarine rocks of Sespe Formation to degree that formations cannot be mapped as separate units. Undifferentiated unit locally includes boulder conglomerate (Woodford and others, 1973)

Kmp

Micropegmatite granite of Gavilan Ring Complex (Cretaceous)—Fine-grained, pink-tinted, leucocratic granite having distinctive micropegmatitic texture. Restricted almost entirely to Corona North quadrangle. Forms elongate band of outcrops between Corona and Norco. Underlies about 3 km^2

Kmpc

Micropegmatite and granodiorite of Cajalco pluton, undifferentiated (Cretaceous)—Mixed unit of micropegmatite and massive granodiorite to monzogranite. Micropegmatite is fine grained and granodiorite to monzogranite is medium to coarse grained. Found southwest and southeast of Norco. Rocks probably related to, but not mapped as part of Cretaceous Cajalco pluton

Krg

Granite of the Riverside area (Cretaceous)—Medium- to coarse-grained, massive- to faintly-foliated, leucocratic biotite granite. Contains about 1 to 3 percent biotite. Inclusions are sparse or absent except locally in western part of body where granite contains 2 to 8 percent biotite and sparse to abundant inclusions of quartz diorite, granodiorite, and fine-grained mafic rock. At Mount Rubidoux, east of quadrangle, rocks contain sparse hypersthene and fayalitic olivine and moderately abundant equant inclusions of dark-gray fine-grained rock. Rock at Mount Rubidoux termed "fine leucogranite of Rubidoux Mountain" by Larsen (1948). Restricted to a single outcrop at east edge of quadrangle south of La Sierra Heights

Kmhg

Mount Hole Granodiorite (Cretaceous)—Massive, hornblende-biotite granodiorite. Medium- to coarse-grained; structureless. Moderately leucocratic compared to most hornblende-bearing rocks in region. Weathers to form large boulders of disintegration. Named by Larsen (1948) for exposures at Mount Hole, east of Norco. Forms narrow, roughly tabular body several kilometers long between Norco and La Sierra, and a smaller body 0.7 km to the east

Klst

La Sierra Tonalite (Cretaceous)—Massive biotite tonalite. Fairly dark-colored compared to other units in region containing no hornblende, but alteration found in much of rock tends to darken it. Medium- to coarse-grained; structureless. Much of tonalite is altered to secondary minerals, especially epidote and chlorite, and contains localized zones that are thoroughly altered to epidote, quartz, and chlorite; some highly altered rocks contain tourmaline and sulfide minerals. Large body exposed west of La Sierra and larger mass, partly covered by Quaternary deposits, underlies Norco area. Named by Larsen (1948) for exposures in vicinity of La Sierra.

Cajalco pluton (Cretaceous)—Mostly biotite and hornblende-biotite monzogranite and granodiorite. Informally named for exposures in Cajalco area, Lake Mathews 7.5' quadrangle (Morton, 1999). Rocks of Cajalco pluton were included within Cajalco quartz monzonite by Dudley (1935) and within Woodson Mountain granodiorite by Larsen (1948). Body is composite, shallow-level pluton emplaced by magmatic stoping within largely volcanic and volcanoclastic rocks. It was tilted eastward and eroded to progressively greater depths from west to east. Southeast of quadrangle, upper part of pluton contains very prominent halo of highly tourmalinized rock. Zircon ages are 109.5 Ma_{id} and 112.6 Ma_{ip} (pers comm Premo, 1998). Within quadrangle includes:

Kcg

Monzogranite—Western part of pluton, including rocks in Corona North quadrangle, typically is medium-grained, equigranular, hypautomorphic-granular to subporphyritic monzogranite and subordinate granodiorite. Includes irregularly variable amounts of angular inclusions mostly, if not entirely, derived from stoping of Cretaceous Estelle Mountain volcanics. Number, size, and reliability of identity of inclusion parent rock increases from east to west. In western part of pluton, included masses of volcanic rock comprise large volume of pluton. In northern and northeastern part of pluton stoped masses of hornblende gabbro are abundant.

Kcgb

Granodiorite and gabbro, undifferentiated—Mixed granodiorite and gabbro. In quadrangle, restricted to single area of exposure near southeastern corner where granitic rock contains high concentrations of stoped hornblende gabbro. In some areas, including Corona North quadrangle, granite and gabbro are intimately intermixed producing very heterogeneous rock

Kgd

Quartz diorite (Cretaceous)—Medium- to coarse-grained biotite-hornblende quartz diorite. Most is slightly to well foliated and contains discoidal to pancake-shaped melanocratic inclusions in foliation plane. Grades into diorite and biotite-hornblende tonalite. Exposed around and north of La Sierra Heights

Kd

Dioritic, undifferentiated (Cretaceous)—Mostly fine-to medium-grained, massive, dark gray to nearly black hornblende diorite. Forms approximately 1 km^2 mass northwest of Home Gardens in southeastern part of quadrangle

Kgb

Gabbro (Cretaceous)—Mainly hornblende gabbro. Includes Virginia quartz-norite and gabbro of Dudley (1935), and San Marcos gabbro of Larsen (1948). Typically brown-weathering, medium-to very coarse-grained hornblende gabbro; very large poikilitic hornblende crystals are common, and locally gabbro is pegmatitic. Much of unit is quite heterogeneous in composition and texture. Includes noritic and dioritic composition rocks. Exposed west of La Sierra Heights

GEOLOGIC SUMMARY

The Corona North quadrangle is located near the northern end of the Peninsular Ranges Province. All but the southwestern tip of the quadrangle is within the Perris block, a relatively stable, rectangular in plan, area located between the Elsinore and San Jacinto fault zones. The southwestern tip of the quadrangle is marginally within the Chino fault zone.

Cretaceous plutonic rocks that are part of the composite Peninsular Ranges batholith underlie most of the quadrangle. These rocks are exposed in a roughly triangular-shaped area bounded on the north by the Santa Ana River and on the south by Temescal Wash, a major tributary of the Santa Ana River. A variety of mostly intermediate composition granitic rocks occur in the quadrangle, mainly monzogranite and granodiorite, but ranging from micropegmatite granite to gabbro. Most rock units are massive and contain varying amounts of meso-and melanocratic, equant-shaped enclaves. The most widespread granitic rock is monzogranite of the Cajalco pluton, a large composite intrusion that extends some distance south and east of the quadrangle. North of Corona is a body of micropegmatite that appears to be unique in the batholith rocks,

Diagonally bisecting the quadrangle is the Santa Ana River. North of the Santa Ana River alluvial deposits are dominated by the distal parts of alluvial fans emanating from the San Gabriel Mountains north of the quadrangle. Widespread areas of the fan deposits are covered by a thin layer of wind blown sand.

Alluvial deposits in the triangular-shaped area between the Santa Ana River and Temescal Wash are quite varied, but consist principally of locally derived older alluvial fan deposits. These deposits rest on remnants of early Quaternary to late Tertiary age, nonmarine sedimentary deposits that were derived from both local sources and sources as far away as the San Bernardino Mountains. These deposits in part were deposited by an ancestral Santa Ana River. Several non-contiguous remnants of late Tertiary (Pliocene) marine sandstone that include some conglomerate lenses are scattered through the area between Norco and Temescal wash. Clasts in the conglomerate lenses include siliceous volcanic rocks exotic to this part of southern California. This sandstone was deposited as the southeastern-most part of the Los Angeles sedimentary marine basin and were deposited along a rocky shoreline developed in the granitic rocks much like the present day shoreline at Monterey, California. Most of the sandstone and granitic paleoshoreline features have been removed by quarrying and grading in the area between Perphyry and Highway 91. However, excellent exposures of the paleoshoreline features are in highway road cuts on the north side of Highway 91 just east of the 91-15 interchange and on the east side of U.S. 15 just north of the interchange.

South of Temescal Wash, a series of both younger and older alluvial fan deposits emanate from the Santa Ana Mountains southeast of the quadrangle. In the southwestern corner of the quadrangle is a small exposure of sandstone and pebble conglomerate of the Sycamore Canyon member of the Puente Formation of early Pliocene and Miocene age and sandstone and conglomerate of undivided Vaqueros and Sespe Formations of early Miocene, Oligocene, and late Eocene age.

REFERENCES

Daviess, S.N., and Woodford, A.O., 1949, Geology of the northwestern Puente Hills, Los Angeles County, California: U.S. Geological Survey Oil and Gas Investigation, Preliminary Map 83.

Dudley, P.H., 1935, Geology of a portion of the Perris block, southern California: California Jour. of Mines and Geology. v. 31, no. 4, p. 487-506.

Eldridge, G. H., and Arnold, R., 1907, The Santa Clara Valley, Puente Hills, and Los Angeles oil districts, southern California: U.S. Geol. Survey Bull. 309, 266 p.

English, W.A. 1926, Geology and oil resources of the Puente Hills Region, California: U.S. Geol. Survey Bull. 768. 110 p.

Larsen, E.S., 1948, Batholith and associated rocks of Corona, Elsinore, and San Luis Rey quadrangles, southern California: Geol. Soc. of America Mem. 29, 182 p.

Morton, D. M., 1999, Preliminary digital geologic map of the Santa Ana 30' X 60' quadrangle, southern California: U.S. Geological Survey Open-File Report 99-172, 61p., scale, 1:100,000

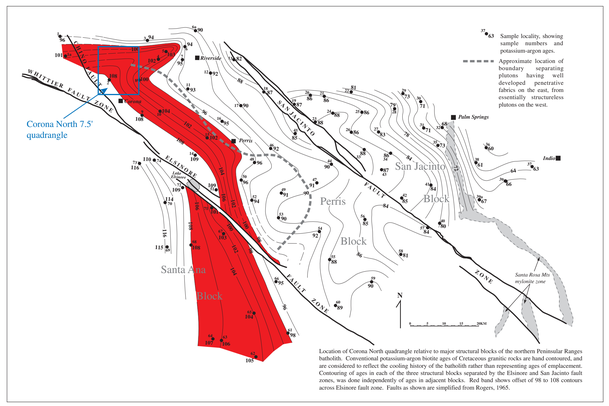
Rogers, T.H., 1965, Santa Ana sheet: California Division of Mines and Geology geologic map of California, scale, 1:250,000.

Schoellhamer, J.E., Kinney, D.M., Yerkes, R.F. and Vedder, J.G., 1954, Geologic map of the northern Santa Ana Mountains, Orange and Riverside Counties, California: U.S. Geol. Survey Oil and Gas investigations Map OM 154, scale, 1:24,000.

Streckeisen, A.L., 1973, Plutonic rocks—Classification and nomenclature recommended by the IUGA Subcommission on Systematics of Igneous Rocks: Geotimes, v. 18, p. 26-30.

Woodford, A.O., McCulloh, T.H., and Schoellhamer, J.E., 1973, Paleographic significance of metatuff boulders in middle Tertiary strata, Santa Ana Mountains, California: Geol. Soc. America Bull. v. 83, no. 11, p. 3433-3436.

Yerkes, R.F., 1972, Geology and oil resources of the western Puente Hills area, southern California: U.S. Geol. Survey Prof. Paper 420-C, 63 p.



Location of Corona North 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.