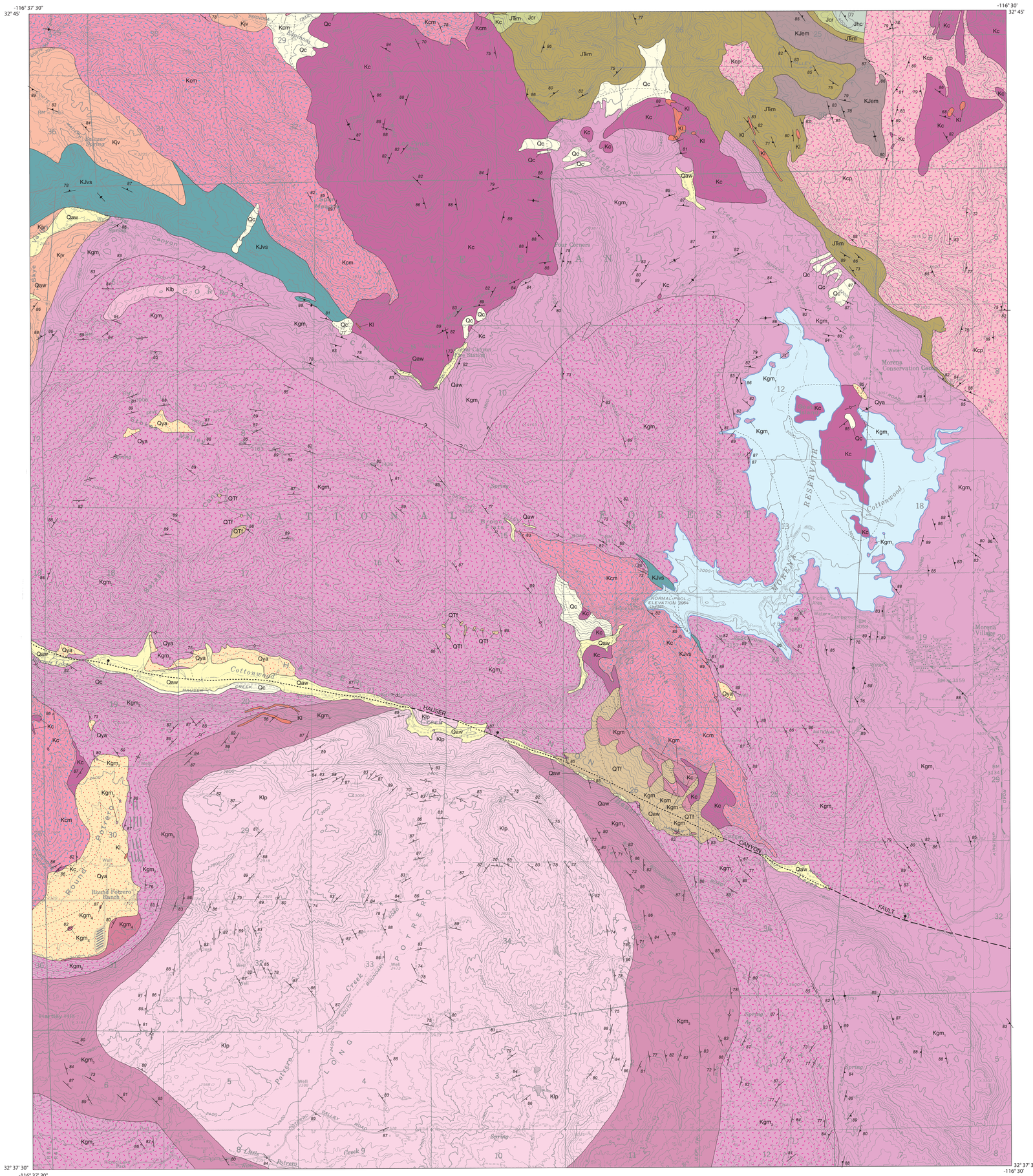
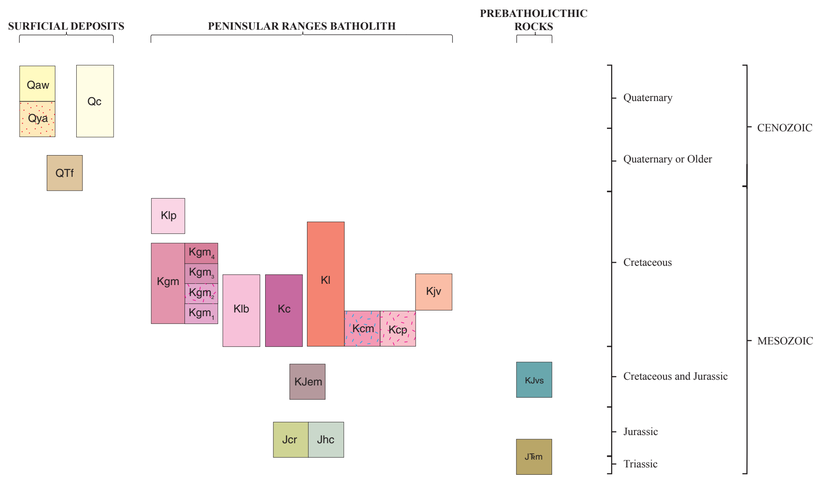
U.S. Department of the Interior
U.S. Geological Survey

**Open-File Report 95–50**
*Pamphlet accompanies map*




## CORRELATION OF MAP UNITS




## DESCRIPTION OF MAP UNITS

Qaw — **Alluvium of active washes (Holocene)**—Sand, silt, and gravel in modern streambeds

Qya — **Younger alluvium (Holocene)**—Well-bedded and poorly bedded, unconsolidated sand, silt, and gravel that occur as moderately dissected terraces in stream valleys

Qc — **Colluvium (Holocene and Pleistocene)**—Sand and gravel of slopewash, debris-flow, and talus deposits; grades locally to younger alluvium

QTf — **Fanglomerate (Pleistocene and older?)**—Weakly indurated, poorly sorted conglomeratic sandstone and fanglomerate of local derivation; grades locally to younger alluvium

Klp — **Tonalite of La Posta (Late Cretaceous)**—Leucocratic hornblende-biotite tonalite, trondhjemite, and granodiorite; bipyramidal quartz, euhedral biotite, scattered K-feldspar oikocrysts, and pale-yellow euhedral sphene are characteristic. Weakly foliated to massive

Kgm — **Tonalite of Granite Mountain (Cretaceous)**—Biotite-hornblende tonalite, and hornblende-biotite tonalite and granodiorite; euhedral-subhedral hornblende prisms (as much as 2 cm) are characteristic; variable mafic inclusions. Foliation weak to protoclastic, gneissic

$Kgm_4$ — **Tonalite of Granite Mountain, subunit 4 (Cretaceous)**—Subidiomorphic, mafic biotite-hornblende tonalite, scattered poikilitic biotites, moderate to strong foliation

$Kgm_3$ — **Tonalite of Granite Mountain, subunit 3 (Cretaceous)**—Hornblende-biotite tonalite and granodiorite, weak to moderate magmatic foliation, large oval biotites ± small acicular hornblendes

$Kgm_2$ — **Tonalite of Granite Mountain, subunit 2 (Cretaceous)**—Idiomorphic biotite-hornblende tonalite, weak to moderate magmatic foliation

$Kgm_1$ — **Tonalite of Granite Mountain, subunit 1 (Cretaceous)**—Marginal biotite-hornblende tonalite, strong subsolidus foliation, finer grained and more mafic than interior

Klb — **Tonalite of Las Bancas (Early Cretaceous)**—Homogeneous, inclusion-free hypersthene-biotite tonalite, with lesser quartz gabbro, quartz diorite, and granodiorite; evenly distributed, poikilitic biotite grains (as much as 2.5 cm) are characteristic. Moderately foliated; scarce cumulate layering

Kc — **Cuyamaca Gabbro (Cretaceous)**—Interiors of large gabbro plutons: hornblende-bearing troctolite, gabbronorite, olivine gabbro, and anorthositic gabbro. Interiors of smaller plutons and dikes and margins of large plutons: hornblende gabbro and diorite. Moderate to strong foliation

Kl — **Leucocratic Dikes (Cretaceous)**—Composed of leucogranite, granophyre, alaskite, pegmatite, and aplite

Kcm — **Monzogranite of Corte Madera (Early Cretaceous)**—Leucocratic biotite monzogranite, granodiorite, and syenogranite with scarce hornblende relics. Weakly to strongly foliated

Kcp — **Monzogranite of Chiquito Peak (Early Cretaceous)**—Hornblende-biotite monzogranite and granodiorite, lesser trondhjemite; mafic inclusions scarce to abundant. Weakly to strongly foliated

Kjv — **Tonalite of Japatul Valley (Early Cretaceous)**—Hornblende-biotite tonalite and granodiorite with variably abundant mafic inclusions (commonly, weathering out in relief). Moderately to strongly foliated

KJem — **Quartz diorite of East Mesa (Cretaceous and Jurassic)**—Heterogeneous biotite-hornblende tonalite and quartz diorite; fine-grained, porphyritic biotite-hornblende quartz diorite and tonalite; lesser diorite, granodiorite, quartz monzodiorite, and gabbro. Strongly foliated to mylonitic

KJvs — **Metavolcanic and metasedimentary rocks (Cretaceous and Jurassic)**—Quartzite and pelitic schist, meta-tuff(?), calc-silicate rocks, and mega-breccia interlayered with amphibolite and fine-grained gabbro. Interpreted as deposits of a back-arc basin

Jcr — **Granodiorite of Cuyamaca Reservoir (Jurassic)**—Biotite and hypersthene-biotite granodiorite and tonalite ± actinolitic amphibole ± hornblende. Strongly foliated, gneissic to mylonitic

Jhc — **Gneiss of Harper Creek (Jurassic)**—Biotite granodiorite and tonalite with lesser monzogranite; accessory cordierite, muscovite, sillimanite, and rare garnet. Inclusions of metasedimentary rocks and orthoamphibolite (10 cm to several meters long) are characteristic. Gneissic to mylonitic

J'Jm — **Julian Schist (Jurassic and Triassic)**—Screens of quartzofeldpathic schist and gneiss and rare metaconglomerate interlayered with amphibolite; marine flysch deposits

## EXPLANATION OF MAP SYMBOLS

**Contact**—Dashed where approximately located, queried where location is questionable, dotted where concealed

**High-angle fault**—Dashed where approximately located or inferred, dotted where concealed. Bar and ball on downthrown block

**Strike and dip of foliation in metamorphic rocks and protoclastic plutonic rocks**

81 **Inclined**

**Vertical**

**Strike and dip of magmatic foliation in plutonic rocks**

83 **Inclined**

**Vertical**

Base from U.S. Geological Survey
Morena Reservoir 7.5' quadrangle, 1960
(photorevised 1982)

UTM zone 11, North American Datum 1927

APPROXIMATE MEAN DECLINATION, 2016

SCALE 1:24 000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

CALIF.
MAP LOCATION

Geology mapped by Victoria R. Todd, 1975-1981, using United States Dept. of Agriculture 1:24,000 scale aerial photographs

GIS database and digital cartography by Susan C. Hollis, Douglas M. Hirschberg, and Jordan G. Matti

# Geologic Map of the Morena Reservoir 7.5-Minute Quadrangle, San Diego County, California

By
**Victoria R. Todd**

**2016**

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