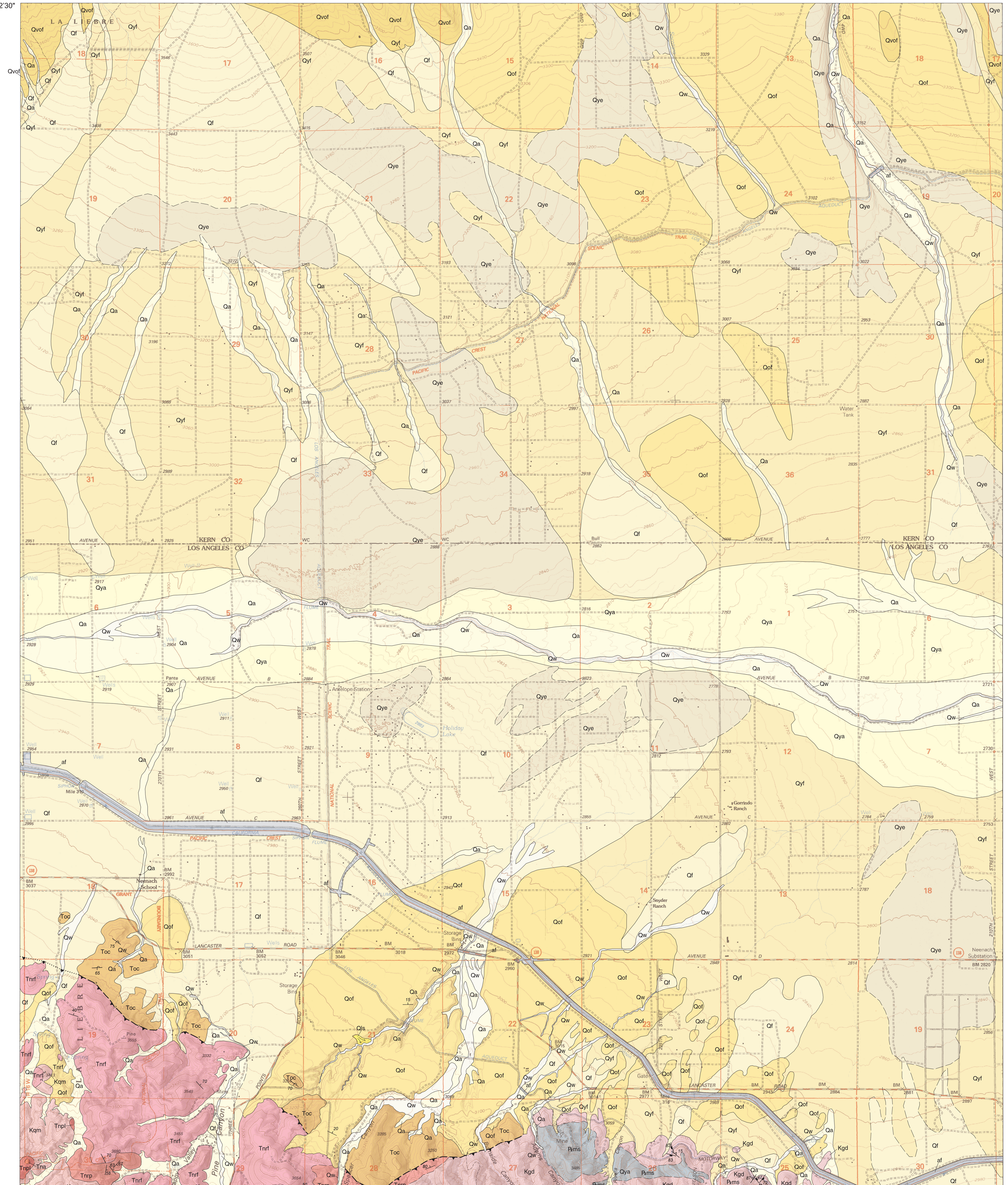

Coordinate System:
Universal Transverse Mercator, Zone 11N
North American Datum 1927

Topographic base from U.S. Geological Survey
Neenach School 7.5-minute quadrangle, 1965, photo revised 1974.
Shaded relief image derived from USGS Lidar DEM, 2017

Scale 1:24,000

Contour Interval 40 Feet
Dotted Lines Represent 20-Foot Contours
Contour Inrerval on River Surface 5 Feet
National Geodetic Vertical Datum of 1929

Approximate Mean Declination, 2022 (11.90°)

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, Statemap Award no. G21AC10701.

Professional Licenses and Certifications:
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Publication Title: "Preliminary Geologic map of the Neenach School 7.5′ Quadrangle, Los Angeles and Kern Counties, California: California Geological Survey Preliminary Geologic Map 22-07, scale 1:24,000".

PRELIMINARY GEOLOGIC MAP OF THE NEENACH SCHOOL 7.5' QUADRANGLE LOS ANGELES AND KERN COUNTIES, CALIFORNIA

VERSION 1.0

By
Francesca N. Valencia, Brian P.E. Olson, and Janis L. Hernandez

Digital preparation by
Francesca N. Valencia, Brian P.E. Olson, and Deshawn A. Brown Jr.

2022

Preliminary Geologic Maps available from:
https://www.conservation.ca.gov/cgs/maps-data/rgm/preliminary

California Department of Conservation
California Geological Survey

DESCRIPTION OF MAP UNITS

SURFICIAL UNITS

af — **Artificial Fill (Holocene)—**Consists of man-made deposits of earth-fill soils derived from local sources. Mapped primarily along the California Aqueduct and various road alignments.

Qw — **Wash deposits (late Holocene)—**Unconsolidated sand and gravel deposited in recently active stream channels. Deposits are generally derived from local bedrock or reworked from other local Quaternary sources. Subject to localized reworking and new sediment deposition during storm events.

Qf — **Modern alluvial fan deposits (late Holocene)—**Unconsolidated to weakly consolidated, weakly cemented, poorly sorted, brown (10YR 4/3 to 5/3) silt and fine- to medium-grained sand with pebbly gravel layers form active, undissected alluvial fans. Includes small to large cones at the mouths of stream canyons and broad aprons of coarse debris adjacent to mountain fronts. Gravel clasts are derived from local up-slope sources and typically unweathered with little to no oxidation.

Qa — **Modern alluvium (late Holocene)—**Unconsolidated to weakly consolidated, mostly undissected, light yellowish-brown to brownish-yellow (10YR 6/4 to 6/6) silt and fine- to coarse-grained sand with sparse pebbly gravel. Recently deposited within narrow stream valleys and within alluvial flats of larger river valleys.

Qls — **Landslide deposits (Holocene)—**Unconsolidated to moderately well-consolidated jumbled sediment or rock debris consisting of surficial failures resulting from soil and rock creep or debris flows.

Qye — **Young eolian and dune deposits (late Pleistocene to Holocene)—** Unconsolidated to slightly consolidated, undissected to slightly dissected wind-blown sands. Light yellowish-brown to yellowish-brown (10YR 6/4 to 5/4), clean fine- to medium-grained sand with subrounded grains. These deposits typically occur as relatively thin sand sheets mantling alluvial deposits. Abundant Yucca trees locally enhance wind-blown sand accumulation and can emphasize the dune topography.

Qya — **Younger alluvium (late Pleistocene to middle Holocene)—**Slightly to moderately consolidated, poorly sorted, vaguely stratified, slightly to moderately porous, pale brown (10YR 6/3 to 6/2) fine- to medium-grained sand, silt, and fine gravel with some coarse- to pebble gravel, deposited at the distal ends of Qyf and in axial valleys.

Qyf — **Younger alluvial fan deposits (late Pleistocene to middle Holocene)—**Unconsolidated to weakly consolidated, undissected to slightly dissected, yellowish-brown to dark yellowish-brown (10YR 5/4 to 4/4) silty fine- to medium-grained arkosic sand with pebbles and cobbles; moderately to well stratified.

Qof — **Older fan deposits (middle to late Pleistocene)—**Slightly to moderately consolidated, moderately cemented, slightly to moderately porous, poorly sorted and slightly stratified. Brown to yellowish-brown (10YR 5/3 to 5/4), silty pebbly sand with coarse subrounded to subangular gravel. Surfaces are slightly to highly dissected.

Qvof — **Very old alluvial fan deposits (early to middle Pleistocene)—**Moderately to well-consolidated, poorly sorted, medium- to coarse-grained sand with abundant gravel and cobbles, elevated and dissected surfaces. Deposits are generally less than 50 meters thick and lack geomorphic connection to their original source areas.

TERTIARY SEDIMENTARY UNITS

Toc — **Oso Canyon Formation (late Miocene)—**Poorly sorted, massive, pebble to boulder fanglomerate with friable, very light-gray arkosic sandstone matrix, interbedded with moderately sorted pebble to cobble conglomerate, white- to light-red coarse-grained arkosic sandstone, conglomeratic sandstone with cross bedding and channeling, and greenish-gray to reddish micaceous siltstone and pebbly siltstone. Named by Dibblee (1967) based on the type section at Oso Canyon near the eastern margin of the Lebec quadrangle; up to 1,675 m thick. Described by Wiese and Fine (1950) to be unconformably adjacent to the Neenach Volcanics Formation by a southwestern dipping thrust fault. Clasts are typically subrounded and dominated by granitic lithologies and flow-banded rhyolite fragments derived from the Neenach Volcanics Formation. Previously mapped as continental deposits and in part as the Santa Margarita Formation by Weise and Fine (1950). Description modified from Dibblee (1967) and Olson and Swanson (2019).

TERTIARY VOLCANIC UNITS

Neenach Volcanics Formation (late Oligocene to early Miocene)—Series of calc-alkaline andesitic, dacitic, and rhyolitic flows interbedded with pyroclastic and volcaniclastic sediments, which were deposited unconformably on the Cretaceous quartz monzonite (Kqm). Subdivided by Matthews (1973b) into six distinct members. The volcanic flows vary in age from about 18 to 24 Ma (Turner, 1970; Weigand and Swisher, 1991; Sims, 1993). Previously interpreted to correlate with the Pinnacles Volcanic Formation located to the northwest near San Benito in the Coast Ranges of California, based on striking chemical, petrographic, and stratigraphic similarities. This connection forms the basis to interpret approximate 315 km of post-Miocene, right-lateral slip on the San Andreas Fault (Matthews, 1973a; 1973b; 1976).

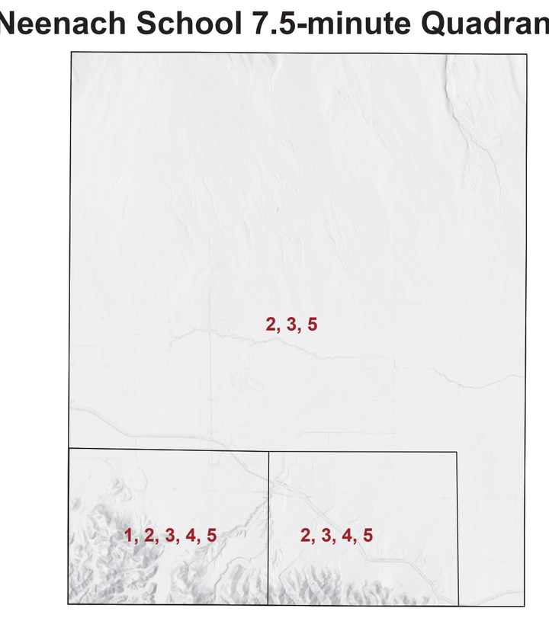
Tna — **Andesite member—**Consists of four petrographic varieties: hypocrystalline hypersthene andesite, holocrystalline hypersthene andesite, augite-olivine andesite, and andesite tuff. Due to poor exposure, alteration, and faulting, these varieties are mapped as a single unit by Matthews (1976). The hypocrystalline hypersthene andesite contains orthopyroxene, plagioclase, quartz, and rare clinopyroxene phenocrysts in a hyalopilitic groundmass. The holocrystalline hypersthene andesite consists of local phenocrysts of orthopyroxene and plagioclase in a groundmass of randomly oriented plagioclase laths. Euhedral to subhedral orthopyroxene fills the spaces between laths. The augite-olivine andesite contains abundant olivine and scattered clinopyroxene and plagioclase phenocrysts in a devitrified groundmass, locally scoriaceous with abundant amygdules of chalcedony, quartz, and zeolites. Olivine is altered to microcrystalline silica in the cores, optical properties indicate the clinopyroxene phenocrysts are euhedral augite, and larger plagioclase phenocrysts have clear cores with clouded rims. (description modified from Matthews, 1976)

Tnpl — **Pumice lapilli tuff member—**White- to grayish-beige, and yellowish-green to grayish-green where altered, pumice lapilli tuff and tuff. Pumice fragments are up to 3 cm in maximum dimension, averaging 2 to 3 mm in diameter, and decreasing in diameter down-section. Angular fragments of flow-banded rhyolite from 1 to 3 mm in diameter are rare to abundant (Matthews, 1973b). Vaguely bedded with most beds less than 2 meters thick. Crystal fragments from granitic rocks are abundant in the lower portion (modified from Olson & Swanson, 2019). "Locally vesicular, with vesicles up to 1mm in diameter. Texture varies from massive to chaotic, with brecciated lensoidal lapilli that are locally altered. Brecciated zones consist of green welded tuff clasts in a pink to purple matrix with local micro-brecciated lapilli. Unaltered zones of Tnpl are observable in the hills east of Sacombre Road along the dirt road and are colored with yellowish residue on weathered minerals that give a speckled look in outcrop. Small anhedral garnets up to 1mm or less in size are disseminated in unaltered zones and are clustered adjacent to local quartz veins.

Tnrp — **Rhyolite member, perlite unit—**Varying colors of black to brown-black, grayish-white to dusky greenish-gray, and tan to brown (where weathered) flow-banded perlite with alternating bands of clear and cloudy obsidian from 1mm to 1.5cm thick. Perlite is non-porphyritic with vitreous to waxy to resinous luster and inclusions of red, devitrified rhyolite (Matthews, 1976). Outcrops are jagged and distinctly visible in aerial imagery. Weathering occurs along foliation, jointing, and along quartz veins. Fractures conchoidally with sharp thin edges. Gradational lower contact with map unit Tnrf. Unit is cut by many white to smoky quartz veins that display a range of translucent, semi-transparent to opaque properties. Micro-druzy quartz veins common. Characteristic outcrops are exposed near the southwest corner of the quadrangle, off Pine Canyon Road.

Tnrf — **Rhyolite member, flow-banded unit—**White- to pale yellowish-orange (weathered) and pale-red, yellowish-gray, and grayish-purple (fresh) aphanitic flow-banded rhyolite. Banding is continuous over several meters and defined by color variations, planar to locally undulatory or warped banding ranging from <1 mm to >1 cm in thickness. Rhyolite is aphanitic (Matthews, 1976). Outcrops can appear massive at a distance where flow bands are thin and pale. Bands of subrounded to subangular microbrecciated aphanitic rhyolite in fine-grained reddish-purple matrix are common. Soils on Tnrf slopes have abundant granule to pebble sized angular clasts and "popcorn" soil texture is common where outcrops are intensely weathered. Local alteration observed in dirt road outcrops in the hills adjacent to Sacombre Road.

Neenach School 7.5-minute Quadrangle

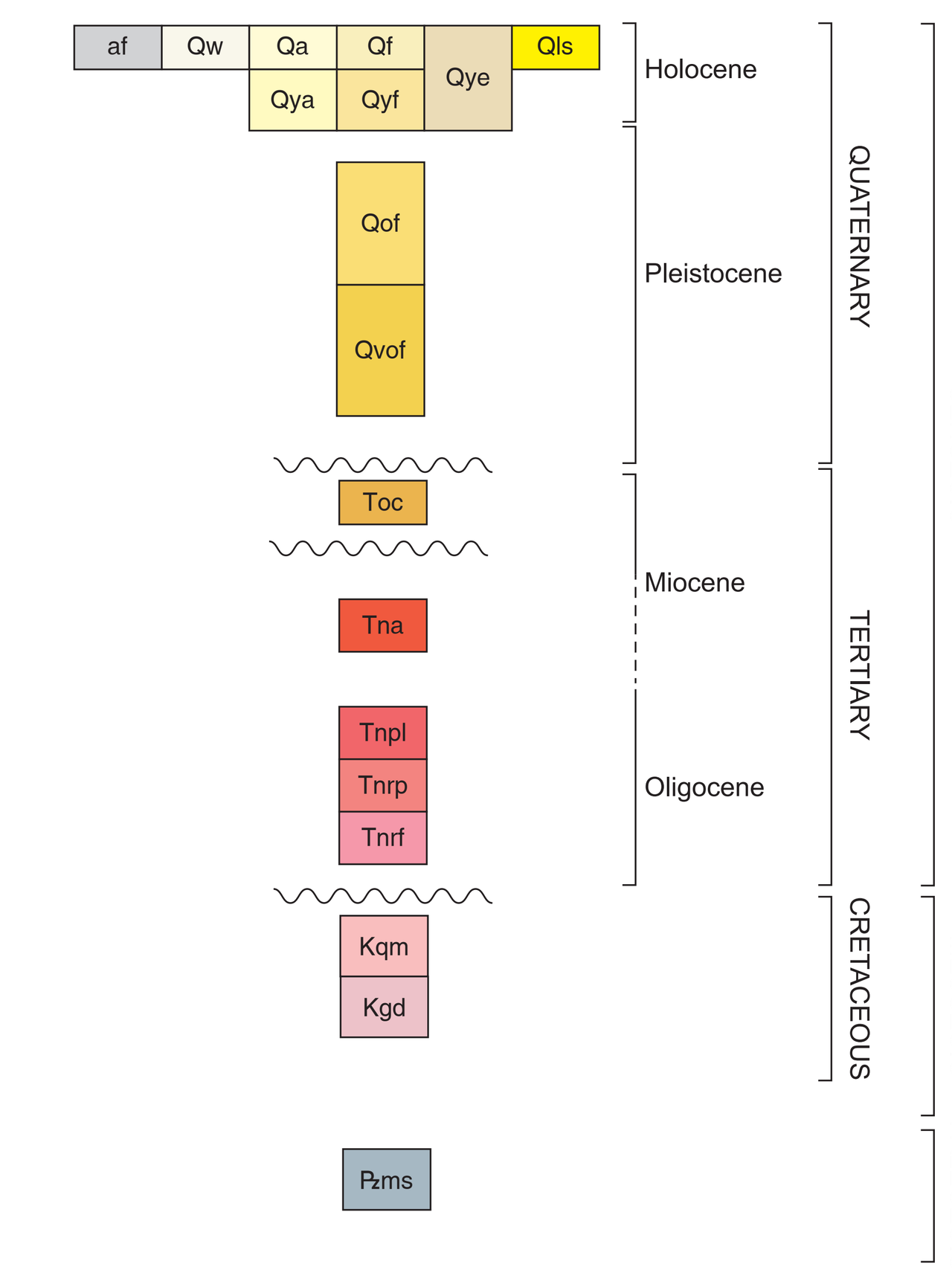


SOURCES OF MAP DATA

1. Matthew, 1973
2. Dibblee, 2002*
3. Lancaster and others, 2012*
4. Wiese and Fine, 1950
5. Valencia, Olson, and Hernandez, 2022*

*Data source covers entire quadrangle

CORRELATION OF MAP UNITS



SAN GABRIEL MOUNTAIN BASEMENT COMPLEX

MESOZOIC INTRUSIVE ROCKS

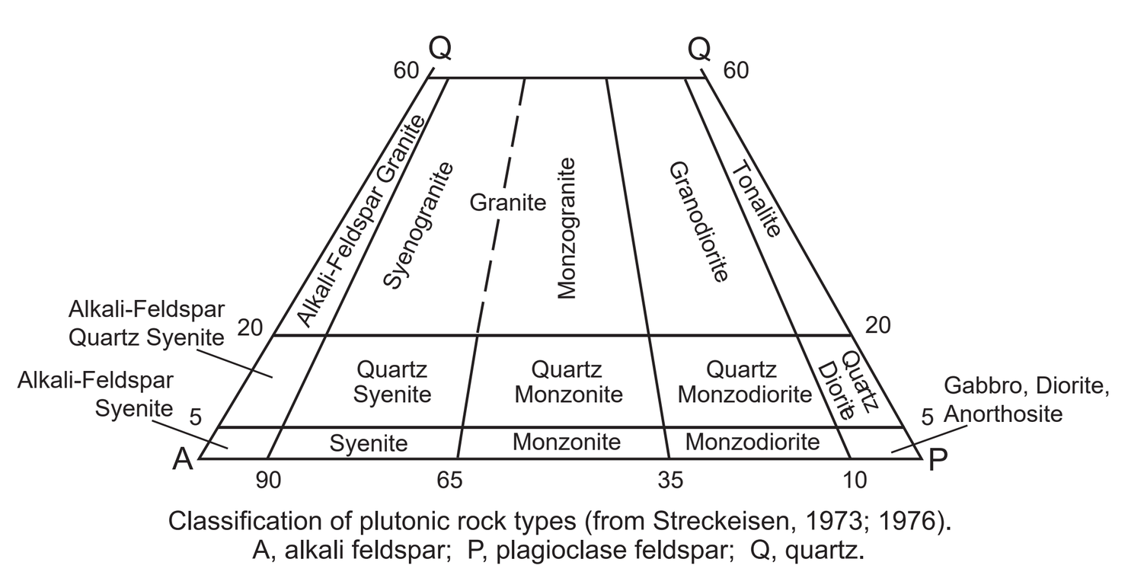
Kqm — **Quartz monzonite (Late Cretaceous)—**Medium-grained to locally coarse-grained, massive to very weakly foliated quartz monzonite. Approximate mineral percentages of hand sample consist of 5% hornblende, 10% biotite, 10% quartz, 35% orthoclase, and 40% plagioclase. Weathers buff to white with brown speckles of weathered hornblende and biotite, forming rounded hills where natural exposures are rare. Unit varies locally to granodiorite and granite and contains subordinate, but widespread felsite and pegmatite veins and local diorite pods. New U-Pb dating of quartz monzonite on the La Liebre Ranch Quadrangle to the west produced a preliminary early Late Cretaceous age of about 92 Ma. Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2019). (description modified from Olson and Swanson, 2019)

Kgd — **Granodiorite to Granite (Late Cretaceous)—** Dominantly composed of medium- to coarse-grained, biotite granodiorite and granite; previously mapped as quartz monzonite by Dibblee (1967; 2002). Granodiorite composition grades to granite as orthoclase content increases from eastern edge of the quadrangle (from Lake Hughes area) westward towards Pine Canyon Road. Increase in orthoclase content is gradual, and pink color varies in saturation and transparency across the unit. Crystals of orthoclase and plagioclase range up to 1 cm in maximum dimension. Biotite crystals are disseminated to concentrated as medium- to coarse crystal books; commonly aligned along weakly to moderate primary foliation. Isolated zones with mafic inclusions ranging from 4 to 10 cm. Inclusions are oriented subparallel to parallel with the mineral foliation; cut by few leucocratic aplite and pegmatite dikes. Local large intensely weathered mafic diorite enclaves cut by pegmatite dikes and quartz veins are exposed along the Los Angeles County Aqueduct in the southeast portion of the quadrangle. Several small mines and prospects have pursued gold from the granodiorite within the Neenach School Quadrangle and the Burnt Peak Quadrangle to the south. New U-Pb dating of the granodiorite produced an early Late Cretaceous age of 94.7 +/-0.5 [1.9] Ma (age +/-internal 2SE uncertainty; [total 2% uncertainty]); MSWD = 5.1. Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2022).

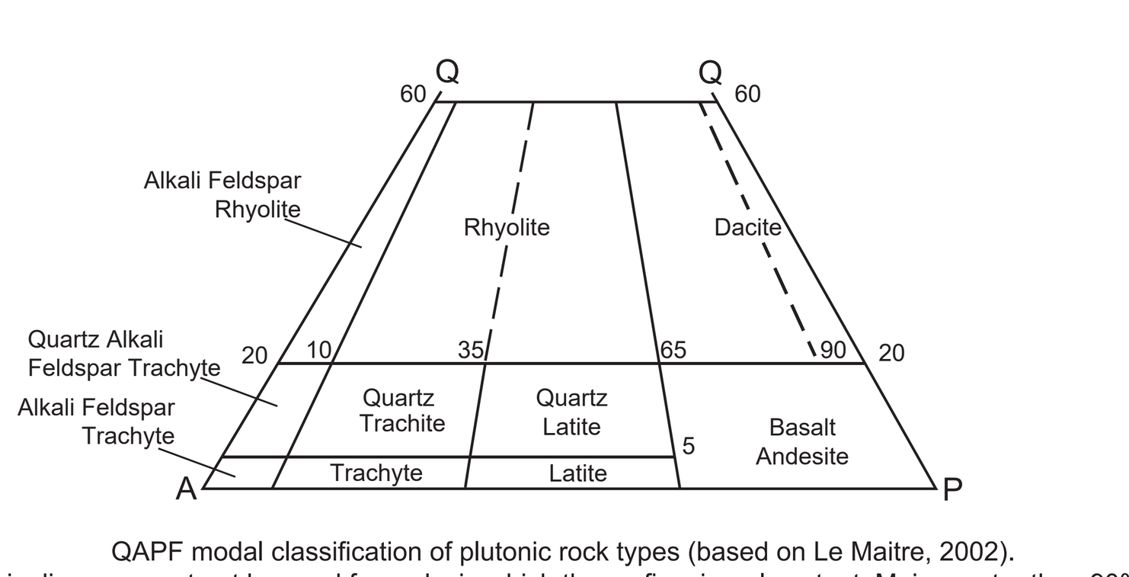
PALEOZOIC METAMORPHIC ROCKS

Pzms — **Undifferentiated metasedimentary unit (Paleozoic?)—**Originally mapped by Wiese and Fine (1950) as Paleozoic marble and limestone with minor quartzite and hornfels. This deposit is associated with gold mining from the Rivera Mining Company which was active during the mid- to late-1930s. According to Wiese and Fine (1950), the gold deposits occur in quartz along the contact between the igneous unit (map unit Kgd) and this metasedimentary unit (Pzms), with minor pyrite and other unnamed sulfides also associated with this unit. Wiese and Fine (1950) suggest a weak correlation of these metasedimentary xenoliths to the less-metamorphosed limestone west of Cottonwood Canyon in the central northwest of the adjacent La Liebre Ranch Quadrangle. In aerial imagery, slopes of Pzms display a softer topography than the adjacent granodiorite (Kgd), in addition to a sharp color contrast. Map unit Pzms appears orangish-brown with patches of light-gray or white-beige, compared to the adjacent granodiorite, which appears grayish-brown to grayish-pink in aerial imagery.

*The matrix color of surficial materials amd their pedogenic soils is classified according to the Munsell soil-color chart (Munsell, 2019).



Classification of plutonic rock types (from Streckeisen, 1973; 1976). A, alkali feldspar; P, plagioclase feldspar; Q, quartz.



QAPF modal classification of plutonic rock types (based on Le Maitre, 2002). This diagram must not be used for rocks in which the mafic mineral content, M, is greater than 90%. A, alkali feldspar; P, plagioclase feldspar; Q, quartz

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IMAGERY

DWR, 2016, Lidar-based 0.25m DEM and Ortho Imagery, for State Water Project Aqueduct area.

Mosaic, generated 2021: LiDAR 1 m DEM: OCM Partners, 2020: 2015 - 2016 LARIAC Lidar DEM: Los Angeles Region, CA, https://www.fisheries.noaa.gov/inport/item/55257; LiDAR 1m DEM: USGS GPSC, 2018, Southern California Wildfire QL2 Lidar.

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MAP SYMBOLS

Contact between map units—Solid where accurately located; long dash were approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain.

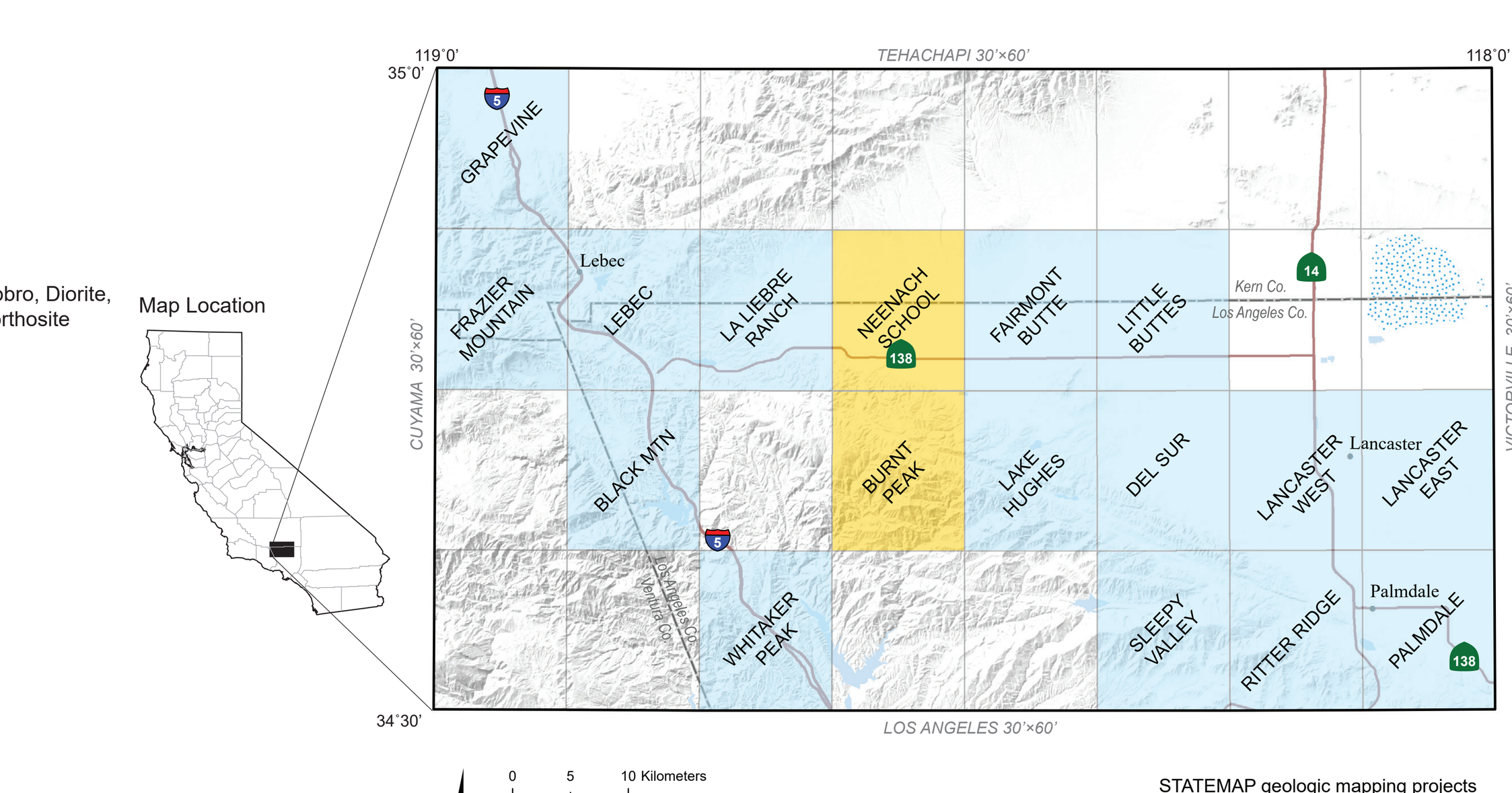
Thrust Fault—Barbs on lower plate; solid where accurately located; long dash where approximately located; dotted where concealed; queried where identify or existence is uncertain. Arrow and number indicate direction and angle of dip of fault plane.

Landslide—Arrows indicate principal direction of movement

Strike and dip of geologic structure; number indicates dip angle in degrees.

- 25 Bedding
- 85 Overturned bedding
- 40 Primary foliationn
- 80 Inclined joint

Map Location



STATEMAP geologic mapping projects within the Lancaster 30'x60' Quadrangle
- STATEMAP '21-22 projects
- Previously completed projects

Suggested citation:
Valencia, F.N., Olson, B.P.E., Hernandez, J.L., 2022, Preliminary Geologic map of the Neenach School 7.5′ Quadrangle, Los Angeles and Kern Counties, California: California Geological Survey Preliminary Geologic Map 22-07, scale 1:24,000.

AUTHORSHIP DOCUMENTATION AND PRODUCT LIMITATIONS

PUBLICATION TITLE: Preliminary Geologic Map of the Neenach School 7.5' Quadrangle, Los Angeles and Kern Counties, California
Preliminary Geologic Map 22-07

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This authorship document accompanies the geologic map with the following citation:

Valencia, F.N., Olson, B.P.E., Hernandez, J.L., 2022, Preliminary Geologic Map of the Neenach School 7.5' Quadrangle, Los Angeles and Kern Counties, California: California Geological Survey Preliminary Geologic Map 22-07, scale 1:24,000.