Geologic Map of the East Half Santa Barbara 30' x 60' Quadrangle, California

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Introduction

The *Geologic* ***Map of the East Half Santa Barbara 30'x60' Quadrangle, California*** was compiled from new and existing geologic mapping covering the area between 34° and 34°30' N. latitude and 119° and 119°30' W. longitude. This map was prepared by the Department of Conservation, California Geological Survey (CGS) and was supported in part by the U.S. Geological Survey (USGS) STATEMAP award No. 07HQAG0143. New geologic mapping by the CGS was completed in eleven 7.5' quadrangles during the period July 2002 to June 2006 under STATEMAP funding awards 02HQAG0018, 03HQAG0085, 04HQAG0074, and 05HQAG0080. This map is an interim product of an ongoing geologic mapping effort to complete a seamless geologic map of onshore and offshore geology along the central California coast and represents a cooperative effort between the CGS and the USGS.

Base Material

The base materials for the east half Santa Barbara 30' x 60' quadrangle consists of shaded-relief and topographic digital data. The onshore portion of the base consists of hypsography, transportation, hydrography, and place name layers. The transportation and hydrography layers were derived from data acquired from Environmental Systems Research Institute, Inc. (ESRI), ESRI Data & Maps, 2000. Place names were generated from data obtained from the U.S. Board on Geographic Names GNIS website at http://geonames.usgs.gov/domestic/ download_data.htm. Carlos Gutierrez (CGS) generated the onshore shaded-relief image and hypsography contours from 30-meter resolution elevation data obtained from the National Elevation Dataset (NED) at http://ned.usgs.gov/. The offshore bathymetric contours were derived from data obtained from the National Oceanic and Atmospheric Administration - http://www.ngdc.noaa.gov/ mgg.

DESCRIPTION OF MAP UNITS

Approximate stratigraphic relationships; see Figure 1 for detailed correlation.

SURFICIAL DEPOSITS

af **Artificial fill (Holocene)** – May be engineeered and/or non-engineered.

alf **Artificial levee fill (Holocene)** – May be engineered and/or non-engineered.

Qb **Active beach deposits (Holocene)** – Composed mainly of loose sand, well-sorted, fine- to coarse-grained. Includes coarse sand and volcanic cobble to boulder gravel along the beaches of Anacapa Island.

Qe **Active coastal eolian (sand dune) deposits (Holocene)** – consists of loose sand and silt.

Qes **Active coastal estuarine deposits (Holocene)** – Composed of submerged/saturated silty clay.

Qw **Active wash deposits within major river channels (Holocene)** – Composed of unconsolidated silt, sand and gravel. **Qw_1** - historically active wash deposits.

Qhw **Wash deposits (Holocene)** – Composed of unconsolidated silt, sand, and gravel. **Qhw_3** - associated with units Qht_3 and Qha_3; **Qhw_2** - associated with unit Qha_2; and **Qhw_1** – associated with units Qht_1 and Qha_1

Qhfy **Alluvial fan deposits (latest Holocene)** – Latest Holocene age is indicated by historical inundation or the presence of youthful braid bars and distributary channels. Composed of moderately to poorly sorted and bedded gravel, sand, silt, and clay.

Qhf **Alluvial fan deposits (Holocene)** – Includes active fan deposits, deposited by streams emanating from mountain canyons to the north onto the alluvial valley floor. Deposits originate as debris flows, hyperconcentrated mudflows, or braided stream flows. Composed of moderately to poorly sorted and moderately to poorly bedded sandy clay with some silt and gravel.

Qhff **Alluvial fan deposits, fine facies (Holocene)** – Fine-grained alluvial fan and flood plain overbank deposits on very gently sloping portions of the valley floor; composed predominantly of clay with interbedded lenses of coarser alluvium (sand and occasional gravel).

Ql **Lacustrine deposits (Holocene)** – Upstream of artificial dam, composed of moderately to poorly sorted, and moderately to poorly bedded clayey silt and sand with some gravel.

Qls **Landslide deposits (Holocene to Pleistocene)** – Includes numerous active landslides, composed of weathered, broken up rocks and soil; extremely susceptible to renewed landsliding.

Qha **Alluvial and colluvial deposits, (Holocene)** – Deposited as overbank material associated with unit Qw, recognized by scour and incised channeling features; composed of unconsolidated, poorly sorted sandy clay with some gravel. May include terrace deposits (Qht) and colluvium. **Qha_3** - associated with unit Qhw_3; **Qha_2** - associated with unit Qhw_2; **Qha_1** - associated with unit Qhw_1.

Qht **Stream terrace deposits (Holocene)** – Deposited in point bar and overbank settings associated with unit Qhw_1; composed of unconsolidated, poorly sorted clayey sand and sandy clay with gravel. **Qht_3** - associated with unit Qhw_3; **Qht_1** - associated with unit Qhw_1.

Qhps **Paralic deposits of the Sea Cliff marine terrace (Holocene)** – Composed of semi-consolidated sandy clay with some gravel; 1800 to 5800 years old (Lajoie, and others, 1982)

Qf **Alluvial fan deposits (late Pleistocene)** – Deposited on gently sloping, relatively undissected alluvial surfaces where deposits might be of either late Pleistocene or Holocene age, composed of moderately to poorly sorted sand, gravel, silt and clay.

Qppp **Paralic deposits of Punta Gorda marine terrace (Pleistocene)** – Consists of consolidated clayey sand with gravel lenses; 40,000 to 60,000 years old (Lajoie, and others, 1982).

Qpmw **Undivided mass-wasting deposits (Pleistocene)** – Consists of unconsolidated and consolidated silt, sand, clay and gravel.

Qpa **Alluvial deposits, undivided (late Pleistocene)** – Consists of unconsolidated and consolidated silt, sand, clay and gravel. **Qpa_1** indicates younger level than **Qpa_2**.

Qpf **Alluvial fan deposits (late to middle Pleistocene)** – Semi-consolidated poorly sorted gravel, sand, silt and clay; often form elevated, slightly tilted terraces on hill slope areas. **Qpf_2** indicates younger level than **Qpf_1**.

Qoa **Older Alluvial deposits (early to middle Pleistocene)** – Moderately to deeply dissected undivided alluvial deposits where topography often consists of gently rolling hills with little or none of the original planar surface pre-served, or tilted surfaces along active range fronts. Composed of moderately to poorly sorted and bedded gravel, sand, silt and clay as well as some boulder size material. Includes older alluvial deposits of volcanic gravel deposited on wave-cut terraces on Anacapa Island.

Qca **Casitas Formation (Pleistocene)** – Poorly consolidated sandstone and siltstone.

Qs **Saugus Formation (Pleistocene)** – Weakly consolidated alluvial deposits composed of sandstone and siliceous shale, gravel and cobbles in sandy matrix; moderately susceptible to landsliding.

Qlp **Las Posas Formation (Pleistocene)** – Weakly consolidated sandstone, with some gravelly sand units; highly susceptible to landsliding.

Qsb **Santa Barbara Formation (Pleistocene)** – Poorly consolidated claystone, locally contains Monterey Formation shale fragments; highly susceptible to landsliding.

Qsbc **Santa Barbara Formation, conglomerate (Pleistocene)** – Portion of the Santa Barbara Formation consisting of conglomerate, sandstone and claystone.

SEDIMENTARY AND VOLCANIC BEDROCK UNITS

Tp **Pico Formation, undivided (Pliocene)** – Composed of claystone, siltstone, and sandstone; locally pebbly; generally susceptible to landsliding.

Tps **Pico Formation, sandstone (Pliocene)** – Portion of Pico Formation containing sandstone; generally susceptible to landsliding.

Tpsc **Pico Formation, sandstone and conglomerate (Pliocene)** – Contains sandstone and conglomerate; generally resistant to landsliding.

Tsq **Sisquoc Formation (Pliocene-Miocene)** – Silty shale and claystone; generally susceptible to landsliding.

Ta **Andesite sill (Miocene?)** – Composed of fractured volcanic breccia, andesite, silicified shale, sandstone and breccia.

Tcvai **Conejo Volcanics, andesitic (middle Miocene)** – Intrusive andesitic rocks.

Tcvdi **Conejo Volcanics, dacitic (middle Miocene)** – Intrusive dacitic rocks.

Tcvb **Conejo Volcanics (middle Miocene)** – Basaltic flows with some flow breccias. **Tcvbs** – interbedded with sandstone and siltstone layers. Includes tuffaceous sandstone and siltstone on Anacapa Island.

Tcvbb **Conejo Volcanics (middle Miocene)** – Basaltic flow breccias with some flows.

Tcvab **Conejo Volcanics (middle Miocene)** – Andesitic flow breccias with some flows.

Tcvdb **Conejo Volcanics (middle Miocene)** – Dacitic flow breccias with some flows.

Tcvadb **Conejo Volcanics middle Miocene) –** Mixture of andesitic and dacitic flow breccias with some flows. Includes basaltic and andesitic flows and breccias on Anacapa Island.

Tdb **Undivided diabase and mafic hypabyssal intrusive rocks (Miocene)** – Hypabyssal intrusive rocks of gabbroic and dioritic composition.

Tmy **Monterey Formation (Miocene)** – Consists of siliceous and diatomaceous shale and some sandstone and limestone, generally susceptible to landsliding. **Tmyl -** lower section, containing punky thin-bedded shale; **Tmyu** -

upper section, composed of platy brittle siliceous thin-bedded shale.

Tm **Modelo Formation (Miocene)** – Consists of siliceous and diatomaceous shale and some sandstone and limestone, generally susceptible to landsliding. **Tmb** - burnt rock of the Modelo Formation.

Tr **Rincon Shale (Miocene)** – Composed of shale and siltstone; generally susceptible to landsliding.

Tt **Topanga Formation, undivided (middle to early Miocene)** – Consists of interbedded siltstone, sandstone and shale; generally susceptible to landsliding.

Tts **Topanga Formation (middle to early Miocene)** – Composed dominantly of sandstone; generally resistant to landsliding.

Tv **Vaqueros Sandstone, undivided (early Miocene)** – Bedded siltstone, shale, and sandstone; consists of similar lithology as the Topanga Formation (Tt); generally susceptible to landsliding.

Tvs **Vaqueros Formation, sandstone (early Miocene)** – Portion of Vaqueros Formation mostly containing sandstone; similar lithology as the sandstone portion of the Topanga Formation (Tts); generally resistant to landsliding.

Ts **Sespe Formation (Oligocene)** – Composed of sandstone; locally pebbly, siltstone and claystone; rocks are generally reddish in color.

Tcw **Coldwater Sandstone (late Eocene)** – Composed of hard arkosic sandstone with siltstone and shale interbeds; locally reddish in color, similar to appearance of Sespe Formation. **Tcwsh** consists predominantly of shale.

Tcd **Cozy Dell Shale (late Eocene)** – Consists of micaceous shale with arkosic sandstone interbeds; generally susceptible to landsliding.

Tma **Matilija Sandstone (middle to late Eocene)** – Composed of hard arkosic sandstone with micaceous shale interbeds. **Tmash** - consists predominantly of micaceous shale with thin sandstone interbeds.

Tj **Juncal Formation (early to middle Eocene)** – Consists of micaceous shale with arkosic sandstone interbeds; generally susceptible to landsliding.

Tjs **Juncal Formation (early to middle Eocene)** – Dominantly arkosic sandstone with minor shale interbeds.

Ku **Unnamed conglomerate (Late Cretaceous)** – Conglomerate with arkosic sandstone and micaceous shale interbeds.

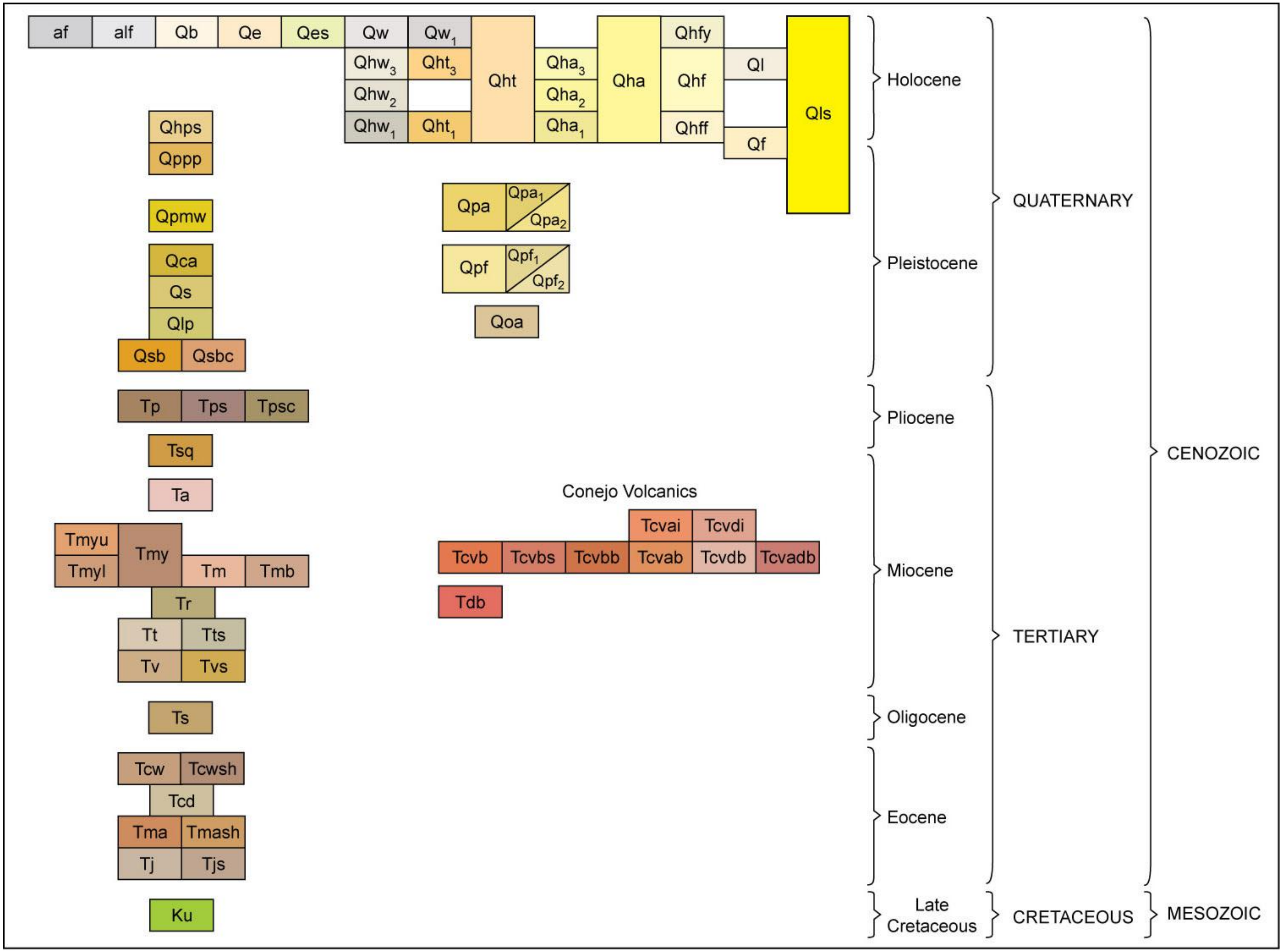

Figure 1. Correlation of map units for the east half of the Santa Barbara 30' x 60' quadrangle.

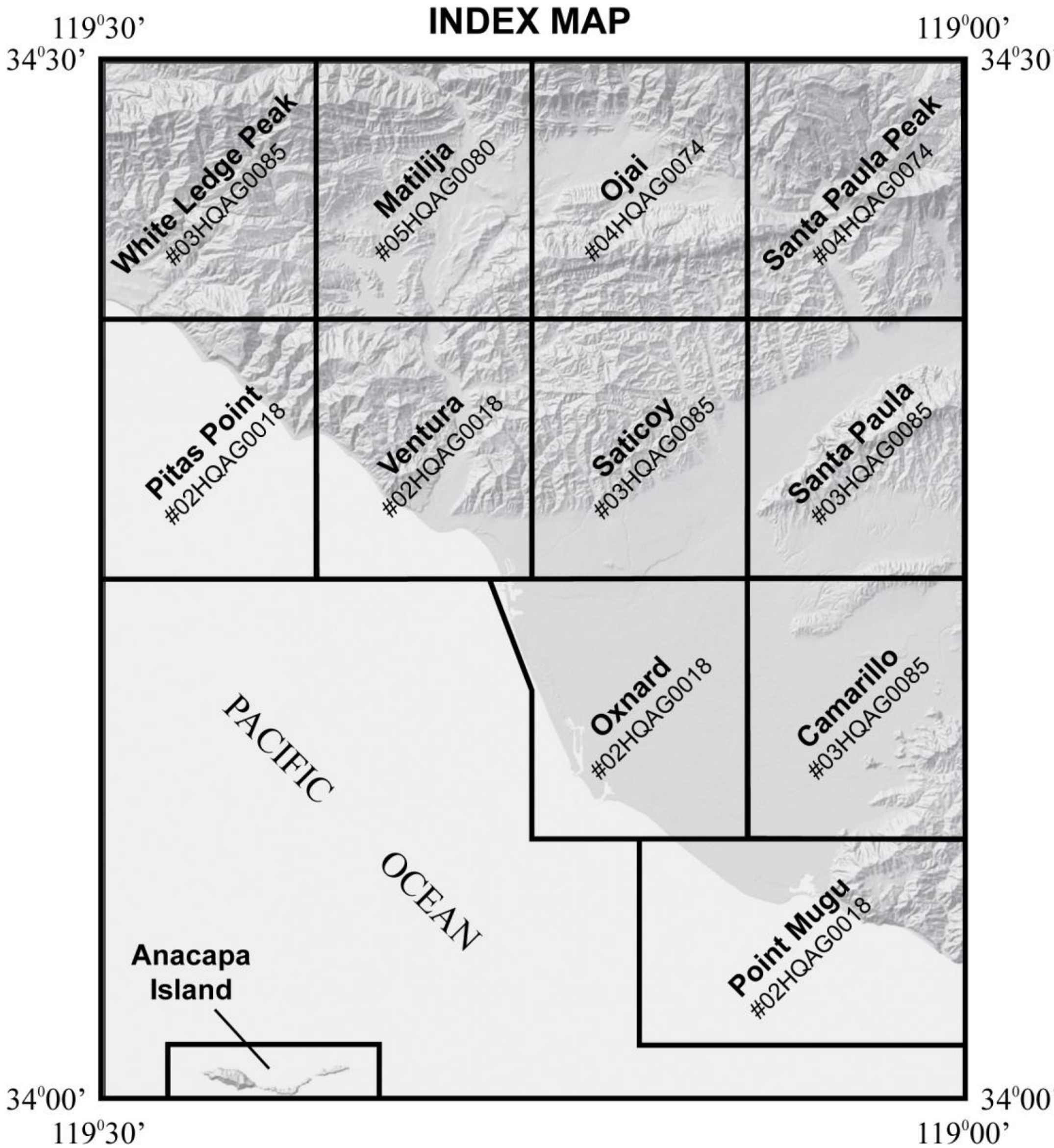

Figure 2. Index map showing the 7.5-minute quadrangles in the east half Santa Barbara 30' x 60' quadrangle and the U.S. Geological Survey STATEMAP award numbers for quadrangles mapped under that funding source. DEM from U.S. Geological Survey.

Sources of mapping for the East Half Santa Barbara 30' x 60' quadrangle and individuals who digitized the geologic mapping. For complete citation see the reference section following this list.

Anacapa Island

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Camarillo

Bailey, 1951; Dibblee and Ehrenspeck, 1990a; Gamble, 1957; Hitchcock and others, 2000; Jakes, 1979; Pasta, 1958; Tan and others, 2004a; Williams, 1977. *Digital preparation by*: Carlos I. Gutierrez[1] and Marina T. Mascorro[1].

Matilija

Barnard, 1979; Dibblee, 1987a; Moser and Frizzell, 1983; Tan and Jones, 2006; Weber and others, 1973; William Lettis and Associates, 2001. *Digital preparation by*: Carlos I. Gutierrez[1].

Ojai

Dibblee, 1987b; Morton, 1976; Moser and Frizzell, 1983; Tan and Irvine, 2005a; Weber and others, 1973; William Lettis and Associates, 2000. *Digital preparation by*: Carlos I. Gutierrez[1].

Oxnard

Clahan, 2003; Hitchcock and others, 2000; McCoy and Sarna-Wojcicki, 1978; Sarna-Wojcicki and others, 1976. *Digital preparation by*: Marina T. Mascorro[1].

Pitas Point

Dibblee, 1988; Hitchcock and others, 2000; Tan and others, 2003a. *Digital preparation by*: Lauren T. English[2].

Point Mugu

Dibblee and Ehrenspeck, 1990b; Gamble, 1957; Hitchcock and others, 2000; Tan and Clahan, 2003. *Digital preparation by*: April E. Mertz[2].

Santa Paula

Bailey, 1951; Dibblee, 1992a; Hitchcock and others, 2000; Jakes, 1979; Lung, 1958; Morton, 1976; Pasta, 1958; Tan and others, 2004b; Weber and others, 1973. *Digital preparation by*: Marina T. Mascorro[1] and Carlos I. Gutierrez[1].

Santa Paula Peak

Dibblee, 1990; Morton, 1976; Tan and Irvine, 2005b; Weber and others, 1973; William Lettis and Associates, 2000. *Digital preparation by*: Carlos I. Gutierrez[1].

Saticoy

Dibblee, 1992b; Hitchcock and others, 2000; McCoy and Sarna-Wojcicki, 1978; Morton, 1976; Sarna-Wojcicki and others, 1976; Tan and others 2004c; Weber and others, 1973; Yerkes and others, 1987. *Digital preparation by*: Carlos I. Gutierrez[1] and Marina T. Mascorro[1].

Ventura

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White Ledge Peak

Dibblee, 1982, 1987c; Moser and Frizzell, 1983; Tan and Clahan, 2004; Upson, 1951. *Digital preparation by*: Carlos I. Gutierrez[1] and Marina T. Mascorro[1].

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2. U.S. Geological Survey, Department of Earth Sciences, University of California, Riverside

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http://www.conservation.ca.gov/cgs/rghm/rgm/Pages/preliminary_geologic_maps.aspx