

**ABBREVIATED EXPLANATION**  
Approximate stratigraphic relationships only; see pamphlet and CMU (Plate 2) for more detailed information

**MODERN SURFICIAL DEPOSITS**

- af Artificial fill (late Holocene)
- Qw Wash deposits (late Holocene)
- Qls Landslide deposits, undivided (Holocene and Pleistocene)
- Qmb Marine beach deposits (late Holocene)
- Qpe Paralic estuarine deposits (late Holocene)
- Qmo Undivided marine deposits in offshore region (late Holocene)
- Qof Canyon fill deposits in offshore region (late Holocene)

**YOUNG SURFICIAL DEPOSITS**

- Qya Young alluvial flood-plain deposits (Holocene and late Pleistocene)
- Qyc Young colluvial deposits (Holocene and late Pleistocene)
- Qot Undivided canyon terrace deposits in offshore region (Holocene and Pleistocene)

**OLD SURFICIAL DEPOSITS**

- Qoa Old alluvial flood-plain deposits, undivided (late to middle Pleistocene)
- Qop Old paralic deposits, undivided (late to middle Pleistocene)
- Qop7 Unit 7
- Qop6 Unit 6
- Qop2-4 Units 2-4, undivided

**VERY OLD SURFICIAL UNITS**

- Qvpa Very old alluvial flood-plain deposits, undivided (middle to early Pleistocene)
- Qvop Very old paralic deposits, undivided (middle to early Pleistocene)
- Qvop7 Unit 7
- Qvop6 Unit 6
- Qvop5 Unit 5
- Qvop4 Unit 4
- Qvop3 Unit 3
- Qvop2 Unit 2
- Qvop1 Unit 1
- Qvop13 Unit 13
- Qvop12 Unit 12
- Qvop11 Unit 11
- Qvop10 Unit 10
- Qvop9 Unit 9
- Qvop8 Unit 8
- Qvop11a Unit 11a
- Qvop10a Unit 10a
- Qvop9a Unit 9a
- Qvop8a Unit 8a

**SEDIMENTARY AND VOLCANIC BEDROCK UNITS**

- Qto Undivided sediments and sedimentary rocks in offshore region (Holocene, Pleistocene, Pliocene and Miocene)
- Tsd San Diego Formation (early Pleistocene and late Pliocene)
  - Tsd - undivided
  - Tsdg - transitional marine and nonmarine pebble and cobble conglomerate
  - Tsdss - marine sandstone
- Tm Basaltic-andesite dike (Miocene)
- Tmo Undivided sedimentary rocks in offshore region (Miocene)
- Tmvo Undivided volcanic rocks in offshore region (Miocene)
- Tmvo Undivided volcanic and sedimentary rocks in offshore region (Miocene)
- To Olay Formation (late Oligocene)
- Tp Pomerado Conglomerate (middle Eocene)
  - Tpm - Miramar Sandstone Member
- Tm Mission Valley Formation (middle Eocene)
- Tsl Stadium Conglomerate (middle Eocene)
- Tf Friars Formation (middle Eocene)
- Tsc Scripps Formation (middle Eocene)
  - Tscu - upper unit
- Ta Ardath Shale (middle Eocene)
- Tt Torrey Sandstone (middle Eocene)
- Td Delmar Formation (middle Eocene)
- Td+ff Delmar Formation and Friars Formation, undivided (middle Eocene)
- Tms Mount Salada Formation (middle Eocene)
  - Tmsa - sandstone
  - Tmsc - cobble conglomerate
- Te Undivided Eocene rocks in offshore region (Eocene)
- Kcs Caballo Formation (Upper Cretaceous)
  - Kcsa - sandstone
  - Kcsc - cobble conglomerate
- Kl Point Loma Formation (Upper Cretaceous)
- Kl Lusardi Formation (Upper Cretaceous)
- Kl Undivided rocks of the Rosarion Group in the offshore area (Upper Cretaceous)

**UNNAMED CRETACEOUS ROCKS OF THE PENINSULAR RANGES BATHOLITH**

- Kgu Granodiorite and tonalite, undivided (mid-Cretaceous)
- Kgd Granodiorite, undivided (mid-Cretaceous)
- Kt Tonalite, undivided (mid-Cretaceous)
- Kd Diorite, undivided (mid-Cretaceous)
- Kgh Hypabyssal rocks, undivided (mid-Cretaceous)

**JURASSIC AND CRETACEOUS METAMORPHOSSED AND UNMETAMORPHOSSED VOLCANIC AND SEDIMENTARY ROCKS**

- Mu Metamorphosed and unmetamorphosed volcanic and sedimentary rocks, undivided (Mesozoic)
- Mo Undivided metamorphic rocks in offshore region (Mesozoic)

**ONSHORE MAP SYMBOLS**

- Contact - Contact between geologic units; dotted where concealed.
- Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.
- Anticline - Solid where accurately located; dashed where approximately located; dotted where concealed. Arrow indicates direction of axial plunge.
- Syncline - Solid where accurately located; dotted where concealed. Arrow indicates direction of axial plunge.
- Landslide - Arrows indicate principal direction of movement. Queried where existence is questionable.
- Strike and dip of beds
- Inclined
- Strike and dip of igneous joints
- Inclined
- Strike and dip of metamorphic foliation
- Inclined

**OFFSHORE MAP SYMBOLS**

- Contacts
- Contact - All contacts are extrapolated from a combination of seismic reflection data, seafloor samples and bathymetry, and are approximate in location.
- Faults
- Fault - Solid where well defined; dashed where approximately located; short dash where inferred; dotted where concealed; queried where uncertain. Where fault offsets sea floor, age symbol is shown on bar on downthrown side. Where age was determined, age symbol is shown outside fault and relative offset, if known, is shown by "D" and "U" on downthrown and upthrown sides. Ages of faults are indicated as follows:
  - cuts strata of late Quaternary age
  - cuts strata of Quaternary age
  - cuts Miocene or older strata
- Folds
- Anticline - Solid where well defined; short dash where inferred.
- Syncline - Solid where well defined; short dash where inferred.
- Channels
- Active - Dash-dot line marks axis, arrow indicates direction of sediment transport.
- Leaves
- Leaves - Dashed where inferred.
- Landslides
- Creep - Dashed where inferred.
- Creep (noted on single survey line) - Arrow indicates apparent direction of sediment movement.
- Slump - Dashed where inferred, queried where uncertain. Arrows indicate direction of movement.

**ABBREVIATED INDEX TO GEOLOGIC SOURCE DATA**  
(Primary compilation sources shown in bold type)  
See pamphlet for complete citation

**Del Mar Quadrangle**  
Kennedy, 1975; Kern, 1968a,b; Tan and Giffen, 1995.

**Imperial Beach Quadrangle**  
Kennedy and others, 1975; Kennedy and Tan, 1977; Kern, 1996a,b; Tan, 1995.

**La Jolla Quadrangle**  
Kennedy, 1975; Kennedy and others, 1975; Kern, 1996a,b; Tan, 1995.

**La Mesa Quadrangle**  
Kennedy and Peterson, 1975; Kennedy and others, 1975; Kern, 1996a,b; Tan, 1995.

**National City Quadrangle**  
Kennedy and others, 1975; Kennedy and Tan, 1977; Kern, 1996a,b; Tan, 1995.

**Point Loma Quadrangle**  
Kennedy, 1975; Kennedy and Clarke, 1999a,b; Kennedy and others, 1975; Kern, 1996a,b; Tan, 1995.

**Poway Quadrangle**  
Kennedy and Peterson, 1975; Kern, 1996a,b; Tan and Giffen, 1995.

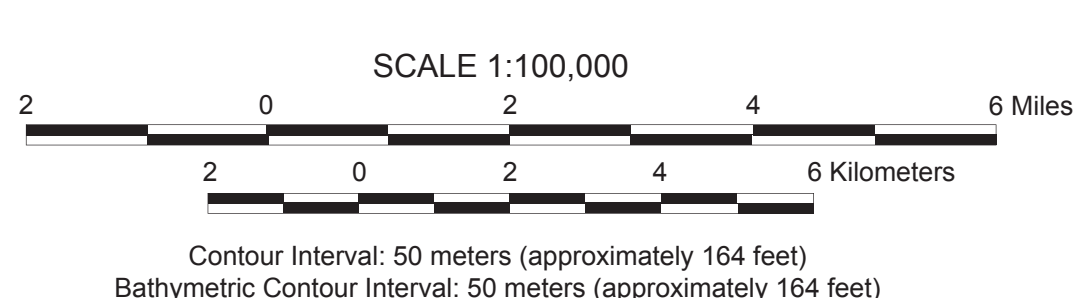
**Offshore Region 1**  
Clarke and others, 1987; Ryan and others, (in press).

**Offshore Region 2**  
Clarke and others, 1987; Kennedy and others, 1980b; Ryan and others (in press).

**Offshore Region 3**  
Clarke and others, 1987; Kennedy and others, 1980a; Ryan and others (in press).

**Offshore Region 4**  
Kennedy and Weiday, 1980.

Onshore base (topography, hydrography, and transportation) from U.S.G.S. digital line graph (DLG) data. San Diego 30' x 60' metric quadrangle. Shaded topographic base from U.S.G.S. digital elevation models (DEMs). Offshore bathymetric contours and shaded bathymetry from N.O.A.A. single and multibeam data. Projection is UTM, zone 11, North American Datum 1927.



**USGS** science for a changing world

**USGS CALIFORNIA SCAMP** Southern California Areal Mapping Project

This map was funded in part by the U.S. Geological Survey National Cooperative Geologic Mapping Program, STATEMAP Award no. 98HQAG2049.

Prepared in cooperation with the U.S. Geological Survey, Southern California Areal Mapping Project.

Copyright © 2008 by the California Department of Conservation. All rights reserved. No part of this publication may be reproduced without written consent of the California Geological Survey.

The Department of Conservation makes no warranties as to the suitability of this product for any particular purpose.



## GEOLOGIC MAP OF THE SAN DIEGO 30' x 60' QUADRANGLE, CALIFORNIA

By  
Michael P. Kennedy<sup>1</sup> and Siang S. Tan<sup>1</sup>  
2008

Digital preparation by

Kelly R. Bovard<sup>2</sup>, Anne G. Garcia<sup>2</sup>, Diane Burns<sup>2</sup>, and Carlos I. Gutierrez<sup>1</sup>

<sup>1</sup> Department of Conservation, California Geological Survey  
<sup>2</sup> U.S. Geological Survey, Department of Earth Sciences, University of California, Riverside

