ABBREVIATED EXPLANATION

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

Holocene

MODERN SURFICIAL DEPOSITS

- af — Artificial fill (late Holocene)
- Qw — Wash deposits (late Holocene)
- Qf — Alluvial fan deposits (late Holocene)
- Qa — Alluvial flood-plain 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)
- Qfo — Marine fan deposits (late Holocene)

YOUNG SURFICIAL DEPOSITS

- Qyf — Young alluvial fan deposits (Holocene and late Pleistocene)
- Qya — Young alluvial flood-plain deposits (Holocene and late Pleistocene)
- Qyc — Young colluvial deposits (Holocene and late Pleistocene)
- Qyv — Young alluvial valley deposits (Holocene and late Pleistocene)

Pleistocene

OLD SURFICIAL DEPOSITS

- Qof — Old alluvial fan deposits, undivided (late to middle Pleistocene)
  - Qof_2 — Unit 2
  - Qof_1 — Unit 1
- Qoa — Old alluvial flood-plain deposits, undivided (late to middle Pleistocene)
  - Qoa_7 — Unit 7
  - Qoa_6 — Unit 6
  - Qoa_5 — Unit 5
  - Qoa_{2-6} — Unit 2-6
  - Qoa_{1-2} — Units 1-2
- Qoc — Old colluvial deposits (late to middle Pleistocene)
- Qop — Old paralic deposits, undivided (late to middle Pleistocene)
  - Qop_7 — Unit 7
  - Qop_6 — Unit 6
  - Qop_4 — Unit 4
  - Qop_3 — Unit 3
  - Qop_1 — Unit 1
  - Qop_{6-7} — Units 6-7
  - Qop_{4-6} — Units 4-6
  - Qop_{2-4} — Units 2-4
  - Qop_{1-2} — Units 1-2
  - Qop_{7-8} — Units 7-8
  - Qop_{2-6} — Units 2-6
  - Qop_1-$Qvop_{13}$ — Units Qop_1-$Qvop_{13}$

VERY OLD SURFICIAL UNITS

- Qvof — Very old alluvial fan deposits (middle to early Pleistocene)
- Qvoa — Very old alluvial flood-plain deposits, undivided (middle to early Pleistocene)
  - $Qvoa_{13}$ — Unit 13
  - $Qvoa_{12}$ — Unit 12
  - $Qvoa_{11}$ — Unit 11
- Qvoc — Very old colluvial deposits, undivided (middle to early Pleistocene)
- Qvop — Very old paralic deposits, undivided (middle to early Pleistocene)
  - $Qvop_{13}$ — Unit 13
  - $Qvop_{12}$ — Unit 12
  - $Qvop_{11}$ — Unit 11
  - $Qvop_{10}$ — Unit 10
  - $Qvop_9$ — Unit 9
  - $Qvop_8$ — Unit 8
  - $Qvop_7$ — Unit 7
  - $Qvop_5$ — Unit 5
  - $Qvop_4$ — Unit 4
  - $Qvop_3$ — Unit 3
  - $Qvop_2$ — Unit 2
  - $Qvop_1$ — Unit 1
  - $Qvop_{11-12}$ — Units 11-12
  - $Qvop_{10-11}$ — Units 10-11
  - $Qvop_{9-10}$ — Units 9-10
  - $Qvop_{8-9}$ — Units 8-9
  - $Qvop_{7-8}$ — Units 7-8
  - $Qvop_{2-3}$ — Units 2-3
  - $Qvop_{10-13}$ — Units 10-13

SEDIMENTARY AND VOLCANIC BEDROCK UNITS

- Qps / Qpf — Pauba Formation (early Pleistocene)
  - Qps - sandstone facies
  - Qpf - fanglomerate facies
- Qd — Dripping Springs Formation (early Pleistocene)
- QTso — Undivided sediments and sedimentary rocks in offshore region (Holocene, Pleistocene, Pliocene and Miocene)

Pliocene

- Tta — Temecula Arkose (late Pliocene)
- Tn — Niguel Formation (late Pliocene)
- Tpo — Undivided sedimentary rocks in offshore region (Pliocene)

Miocene

- Tcs / Tct — Capistrano Formation (early Pliocene and late Miocene)
  - Tcs - siltstone facies
  - Tct - turbidite facies
- Tsm — San Mateo Formation (early Pliocene and late Miocene)
- Tvsr — Santa Rosa basalt of Mann (1955) (late Miocene)
- Tda — Dacite stock (Miocene)

Miocene

- Tv — Volcanic rocks, undivided (Miocene)
- Tvt — Basalt of Temecula area (Miocene)
- Tm — Monterey Formation (middle and late Miocene)
- Tso / Tsoss — San Onofre Breccia (middle Miocene)
  - Tso - breccia
  - Tsoss - sandstone
- Tto — Topanga Formation (middle Miocene)
- Tmo — Undivided sedimentary rocks in offshore region (Miocene)
- Tmvo — Undivided volcanic rocks in offshore region (Miocene)
- Tmuo — Undivided volcanic and sedimentary rocks in offshore region (Miocene)—Tmo or Tmvo

Oligocene

- Tsv — Sespe and Vaqueros Formations, undivided (early Miocene, Oligocene and late Eocene)

Eocene

- Trm — Sandstone of Redonda Mesa (Paleogene)
- Tmv — Mission Valley Formation (middle Eocene)
- Tst — Stadium Conglomerate (middle Eocene)
- Tf — Friars Formation (middle Eocene)
- Tt — Torrey Sandstone (middle Eocene)
- Td — Delmar Formation (middle Eocene)
- Tsa — Santiago Formation (middle Eocene)
- Teo — Undivided Eocene rocks in the offshore area (Eocene)

Paleocene

- Tsi — Silverado Formation (Paleocene)

Cretaceous

- Kp — Point Loma Formation (Upper Cretaceous)
- Kwp / Kwsr — Williams Formation (Upper Cretaceous)
  - Kwp - Pleasants Sandstone Member
  - Kwsr - Schulz Ranch Sandstone Member
- Kl — Lusardi Formation (Upper Cretaceous)
- Ktr — Trabuco Formation (Upper Cretaceous)

UNNAMED CRETACEOUS ROCKS OF THE PENINSULAR RANGES BATHOLITH

- Kgp — Granite pegmatite dike (mid-Cretaceous)
- Kg — Granite, undivided (mid-Cretaceous)
- Kmg — Monzogranite, undivided (mid-Cretaceous)
- Kgd — Granodiorite, undivided (mid-Cretaceous)
- Kgdfg — Granodiorite (fine-grained), undivided (mid-Cretaceous)
- Kt — Tonalite, undivided (mid-Cretaceous)
- Kqbd — Quartz-bearing diorite, undivided (mid-Cretaceous)
- Kd — Diorite, undivided (mid-Cretaceous)
- Kgb — Gabbro, undivided (mid-Cretaceous)
- Khg — Heterogeneous granitic rocks (Cretaceous)

NAMED CRETACEOUS ROCKS OF THE PENINSULAR RANGES BATHOLITH

- Kdl — Granite of Dixon Lake (mid-Cretaceous)
- Kbp — Granite of Bottle Peak (mid-Cretaceous)
- Kis — Granite of Indian Springs (mid-Cretaceous)
- Klh — Leucogranodiorite of Lake Hodges (mid-Cretaceous)
- Kvc — Monzogranite of Valley Center (mid-Cretaceous)
- Kmm — Monzogranite of Merriam Mountain (mid-Cretaceous)
- Kwm — Granodiorite of Woodson Mountain (mid-Cretaceous)
- Kjd — Granodiorite of Jesmond Dean (mid-Cretaceous)
- Kbm — Granodiorite of Burnt Mountain (mid-Cretaceous)
- Km — Granodiorite of Mountain Meadows (mid-Cretaceous)
- Krr — Granodiorite of Rimrock (mid-Cretaceous)
- Ki — Granodiorite of Indian Mountain (mid-Cretaceous)
- Kr — Granodiorite of Rainbow (mid-Cretaceous)
- Kpa — Granodiorite of Pala (mid-Cretaceous)
- Kgdf — Granodiorite, undivided within the Elsinore Fault Zone (mid-Cretaceous)
- Kcg — Tonalite of Cole Grade (mid-Cretaceous)
- Kcc — Tonalite of Couser Canyon (mid-Cretaceous)
- Krm — Quartz-bearing diorite of Red Mountain (mid-Cretaceous)
- Kat — Gabbro of the Agua Tibia Mountains (mid-Cretaceous)
- Kwmt — Gabbro of Weaver Mountain (mid-Cretaceous)
- Kgbf — Gabbro, undivided within the Elsinore Fault Zone (mid-Cretaceous)
- Kvsp — Santiago Peak Volcanics (Cretaceous)

Jurassic

PREBATHOLITHIC AND SYNBATHOLITHIC METAMORPHIC ROCKS

- Mzu — Metasedimentary and metavolcanic rocks, undivided (Mesozoic)
- Mzd — Metavolcanic dikes (Mesozoic)
- Mzg — Metagranitic rocks (Mesozoic)
- Mzq — Quartzite and quartz conglomerate (Mesozoic)
- Mzs — Schist with minor amphibolite and marble (Mesozoic)

ONSHORE MAP SYMBOLS

Contact - Contact between geologic units; generally approximately located; 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; dotted where concealed.

Syncline - Solid where accurately located; dotted where concealed.

Kgp - Granite pegmatite dike.

Closed depression - Closed depression in Elsinore fault zone.

Landslide - Arrows indicate principal direction of movement. Queried where existence is questionable.

Strike and dip of beds

- Inclined
- Overturned
- Vertical
- Horizontal

Strike and dip of igneous foliation

- Inclined
- Vertical

Strike and dip of igneous joints

- Inclined
- Vertical

Strike and dip of metamorphic foliation

- Inclined

Strike and dip of sedimentary joints

- Vertical

OFFSHORE MAP SYMBOLS

Contacts

Contact - All contacts are extrapolated from a combination of seismic reflection data, samples and bathymetry, and are approximate in location.

Faults

Fault - Solid where well defined; 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 astride 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 Holocene age
- □ cuts strata of Pleistocene age
- ◪ cuts strata of Quaternary age
- △ cuts Miocene or older strata

Fault zone - Area of extensively sheared rock within a zone defined by multiple faults.

Folds

Anticline - Dashed where inferred. Solid arrow indicates direction of axial plunge.

Syncline - Solid where well defined, dashed where inferred.

Major Structural Features

Structural High - Dashed line is approximate axis of elongated bedrock highs depicted from deep (>2 sec.) seismic reflection data.

Channels

Active - Dash-dot line marks axis, arrow indicates direction of paleo-sediment transport.

Filled - Dash-dot line marks axis, arrow indicates direction of paleo-sediment transport. Channel boundary solid where well defined, dashed where inferred.

Buried - Dash-dot line marks axis, arrow indicates direction of paleo-sediment transport. Channel boundary dotted.

Levees

Levees - Solid where well defined, dashed where inferred.

Landslides

Creep - Solid where well defined, dashed where inferred.

Creep (noted on single survey line) - Arrow indicates apparent direction of sediment movement.

Slump - Solid where well defined, dashed where inferred. Arrows indicate direction of movement.

Slump Scarp - Solid where well defined, dashed where inferred.

Erosional scarp - Solid where well defined. Generally associated with active channels.

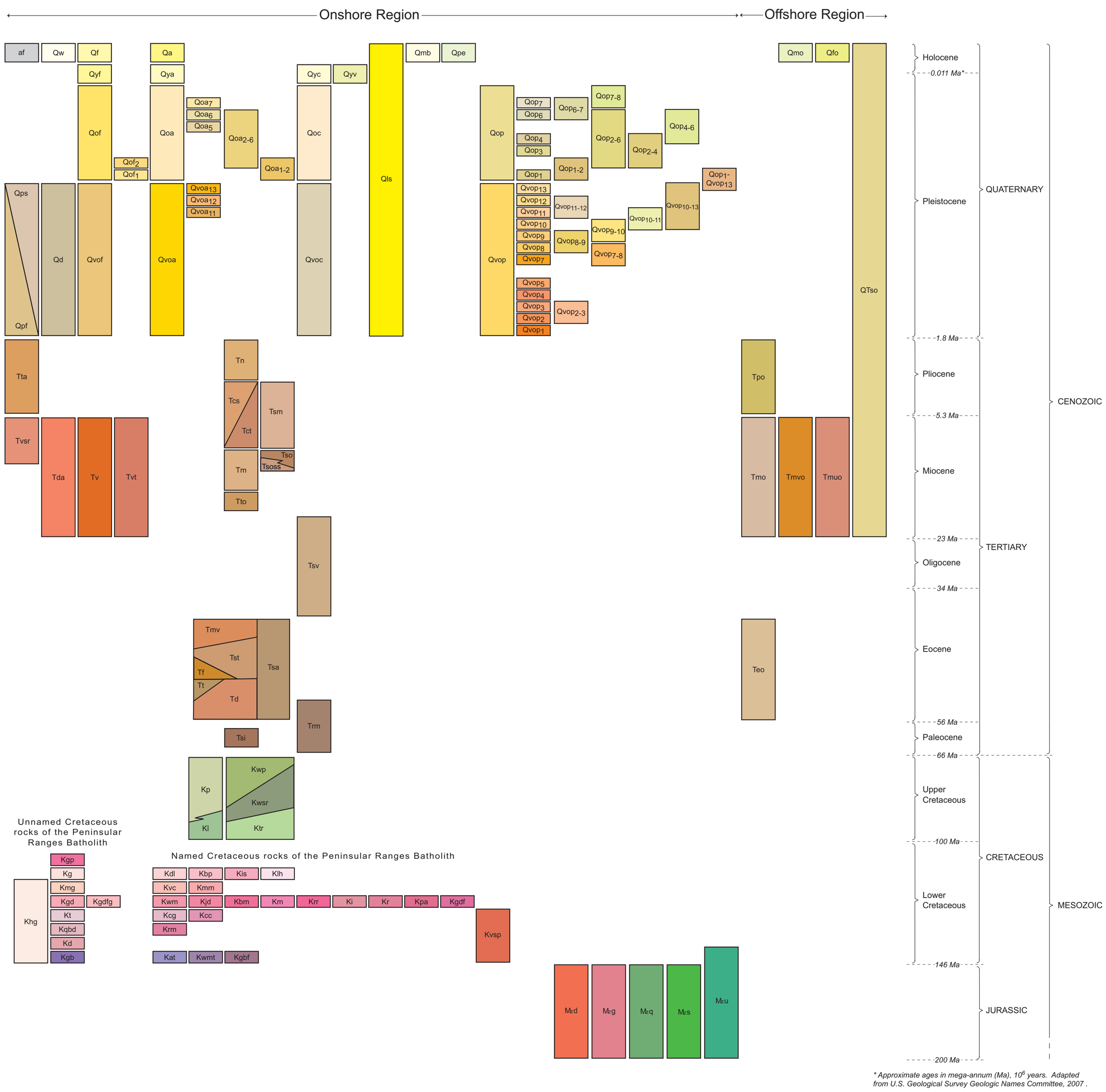
Block Glide - Solid where well defined, dashed where inferred. Arrow indicates direction of movement.

Sediment Flow - Solid where well defined, dashed where inferred. Arrow indicates direction of movement.

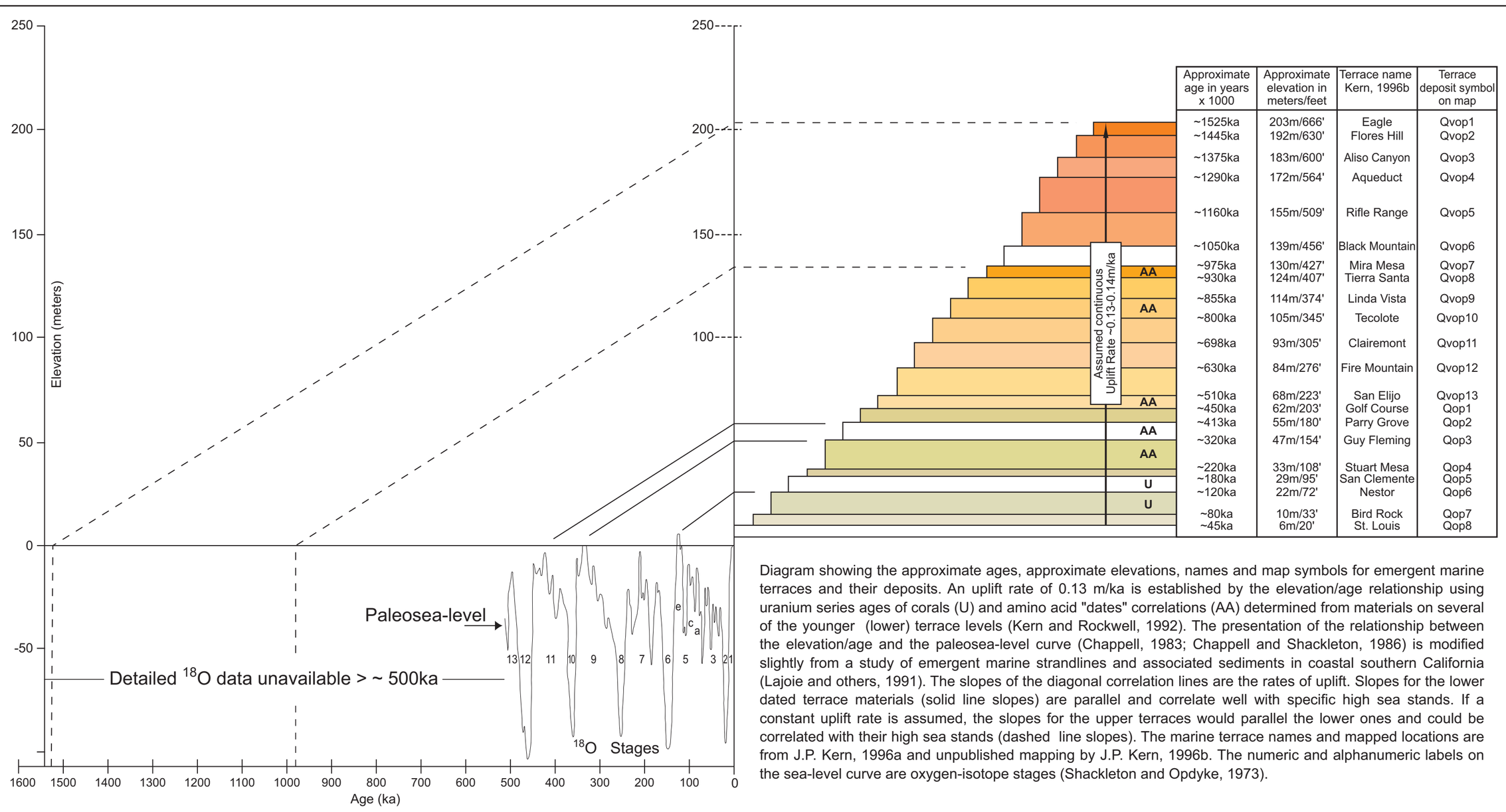
Gas

Oil and/or gas seep

Area of acoustic anomaly (possibly indicating trapped shallow gas) - Solid where well defined, dashed where inferred.



CORRELATION OF MAP UNITS FOR THE GEOLOGIC MAP OF THE OCEANSIDE 30' x 60' QUADRANGLE, CALIFORNIA



Approximate age in years x 1000	Approximate elevation in meters/feet	Terrace name Kern, 1996b	Terrace deposit symbol on map
~1525ka	203m/666'	Eagle	Qvop1
~1445ka	192m/630'	Flores Hill	Qvop2
~1375ka	183m/600'	Aliso Canyon	Qvop3
~1290ka	172m/564'	Aqueduct	Qvop4
~1160ka	155m/509'	Rifle Range	Qvop5
~1050ka	139m/456'	Black Mountain	Qvop6
~975ka	130m/427'	Mira Mesa	Qvop7
~930ka	124m/407'	Tierra Santa	Qvop8
~855ka	114m/374'	Linda Vista	Qvop9
~800ka	105m/345'	Tecolote	Qvop10
~698ka	93m/305'	Clairemont	Qvop11
~630ka	84m/276'	Fire Mountain	Qvop12
~510ka	68m/223'	San Elijo	Qvop13
~450ka	62m/203'	Golf Course	Qop1
~413ka	55m/180'	Parry Grove	Qop2
~320ka	47m/154'	Guy Fleming	Qop3
~220ka	33m/108'	Stuart Mesa	Qop4
~180ka	29m/95'	San Clemente	Qop5
~120ka	22m/72'	Nestor	Qop6
~80ka	10m/33'	Bird Rock	Qop7
~45ka	6m/20'	St. Louis	Qop8

Diagram showing the approximate ages, approximate elevations, names and map symbols for emergent marine terraces and their deposits. An uplift rate of 0.13 m/ka is established by the elevation/age relationship using uranium series ages of corals (U) and amino acid "dates" correlations (AA) determined from materials on several of the younger (lower) terrace levels (Kern and Rockwell, 1992). The presentation of the relationship between the elevation/age and the paleosea-level curve (Chappell, 1983; Chappell and Shackleton, 1986) is modified slightly from a study of emergent marine strandlines and associated sediments in coastal southern California (Lajoie and others, 1991). The slopes of the diagonal correlation lines are the rates of uplift. Slopes for the lower dated terrace materials (solid line slopes) are parallel and correlate well with specific high sea stands. If a constant uplift rate is assumed, the slopes for the upper terraces would parallel the lower ones and could be correlated with their high sea stands (dashed line slopes). The marine terrace names and mapped locations are from J.P. Kern, 1996a and unpublished mapping by J.P. Kern, 1996b. The numeric and alphanumeric labels on the sea-level curve are oxygen-isotope stages (Shackleton and Opdyke, 1973).

CHRONOLOGY OF MARINE TERRACES AND THEIR DEPOSITS