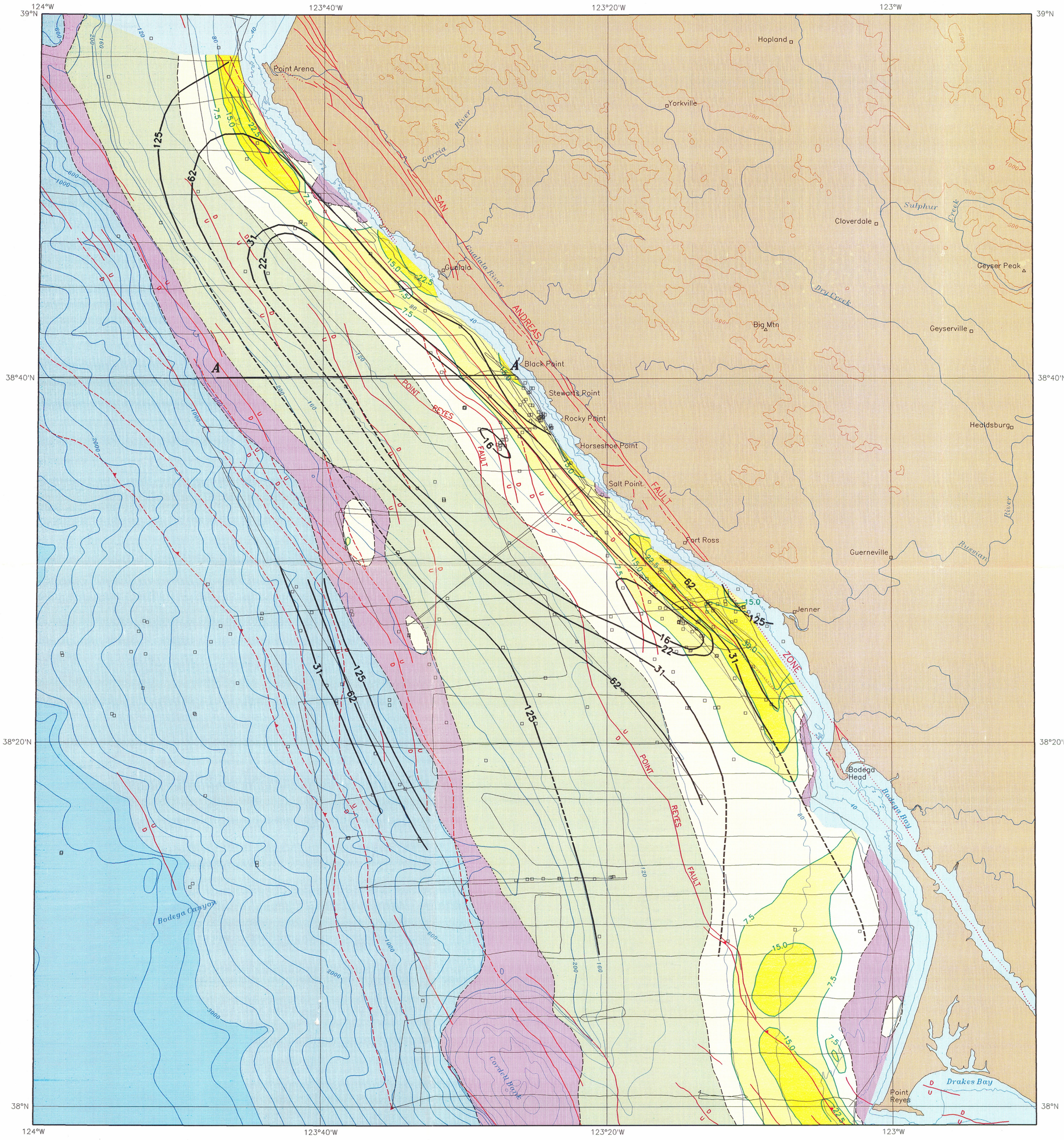
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
U.S. OFFICE OF NAVAL RESEARCH

OPEN-FILE REPORT 92-338



Transverse Mercator projection

Coastline and bathymetric contours digitized from National Oceanic and Atmospheric Administration (NOAA) charts, most at scales of 1:250,000. This information is not intended for navigational purposes.
Topographic contours are from USGS–NOAA Joint Office for Mapping and Research (JOMAR) digital data library. River courses digitized from USGS topographic–bathymetric map of the Santa Rosa, California, 1° x 2° quadrangle, scale 1:250,000 (1980).

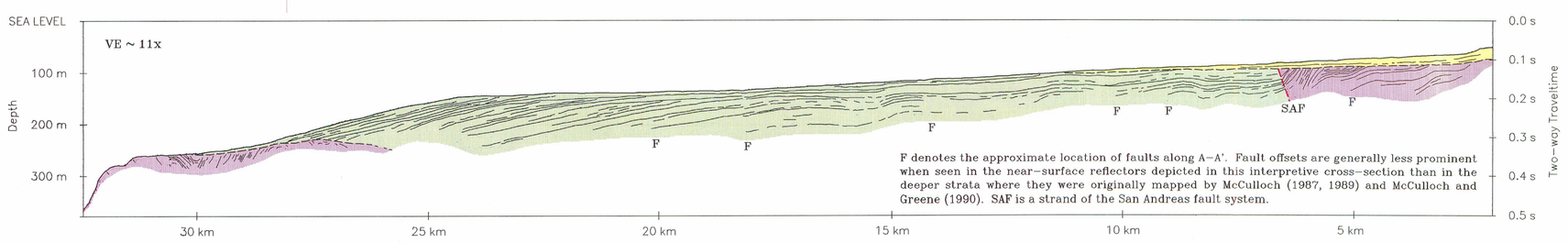
SCALE 1:250 000

5 0 5 10 15 NAUTICAL MILES
5 0 5 10 15 20 KILOMETERS

TOPOGRAPHIC CONTOUR INTERVAL 500 METERS
BATHYMETRIC CONTOUR INTERVALS: 20 METERS TO 200 METER DEPTH, 200 METERS TO MAXIMUM DEPTH
DATUM: MEAN LOW WATER

Sediment thickness and mean grain size mapped in 1991.

Cross Section West of Black Point



F denotes the approximate location of faults along A–A'. Fault offsets are generally less prominent when seen in the near-surface reflectors depicted in this interpretive cross-section than in the deeper strata where they were originally mapped by McCulloch (1987, 1989) and McCulloch and Greene (1990). SAF is a strand of the San Andreas fault system.

Horizontal distance on this profile is measured from the coastline and is expanded 3x from the map scale.

HOLOCENE SEDIMENT MAP OF THE CENTRAL CALIFORNIA CONTINENTAL SHELF

By

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1992

EXPLANATION

Holocene sediment deposits—Thickness, in meters

- 1 to < 7.5
- 7.5 to < 15.0
- ≥ 15.0

Pleistocene shelf and coastal deposits—Locally overlain by 0.1 to < 1 m of Holocene silt

Outcrops of pre-Quaternary strata and basement rocks—Irregular relief; locally overlain by 0 to 0.5 m of Holocene silt

Land area

Water depth—In meters

- 0 to 199
- 200 to 2999
- ≥ 3000

Holocene sediment thickness contour—In meters

Isopleth of mean grain size of surface (upper 2 cm) samples—In microns (125 micron = 0.125 mm); dashed where approximately located

Contact—Long-dashed where approximately located; short-dashed where inferred

Fault—Solid where defined, dashed where inferred, and dotted where buried. Barbs shown on upper plate of thrust fault. Relative offset is shown by D and U on downthrown and upthrown sides, respectively. Fault data from McCulloch (1987, 1989) and McCulloch and Greene (1990).

Trackline

Topographic contour—In meters

Bathymetric contour—In meters

Sample site

HOLOCENE DEPOSITS

Shelf deposits identified as Holocene in age on this map are interpreted to have formed during rising sea level and during the present highstand of sea level. The Holocene age is inferred from two lines of evidence. First, radiocarbon dates on shelf muds and inner-shelf shells from the upper 1 to 3 m of sediment all have ages of 5000 yr BP or less (M.E. Field, unpublished data). Second, the deposits overlie and onlap a prominent erosional unconformity, indicating deposition following transgressive erosion and during present sea-level conditions. The Holocene deposits thin seaward, and, at about the 110-m isobath, cannot be resolved on the high-resolution seismic reflection records. This indicates that they have a thickness of 1 m or less.

Deposits thicker than 15 m are found in three different locations: an elongate coastal deposit south of Point Arena, a deltaic deposit adjacent to the Russian River, and an elongate, fault-bounded coastal deposit off Point Reyes. Thinner deposits are found adjacent to small coastal embayments.

The total compacted volume of Holocene sediment on the shelf is about 15 x 10^9 m^3. A very large percentage of that volume is siliciclastic sediment, chiefly silt grains, transported to the shelf by the Russian River.

PLEISTOCENE SHELF AND COASTAL DEPOSITS

Pleistocene shelf and coastal deposits on the central California shelf consist primarily of downlapping sequences of sedimentary strata separated by erosional unconformities. The deposits result primarily from sedimentation during sea-level fall and lowstand position; minor thicknesses were deposited during sea-level rise. These deposits are broadly interpreted as having a shelf and coastal origin; some embayment/estuarine facies may be present as well. At water depths greater than about 110 m, these deposits are essentially exposed on the sea floor. Sampling shows that in many areas a thin veneer (at most 0.1 to 1 m) of Holocene sediment is present at the surface.

OUTCROPS OF PRE-QUATERNARY STRATA AND BASEMENT ROCKS

The entire shelf margin from Point Reyes to Point Arena is bordered by exposures of deformed and uplifted pre-Quaternary strata (McCulloch, 1987). In places the strata are thinly veneered with Holocene mud or remnants of Pleistocene deposits. The outcrops typically have a raised, irregular surface. On the inner shelf, outcrops are common adjacent to most headlands; only the larger ones are shown on the map. The rocks exposed west of Point Reyes appear to be sedimentary and granitic, based on bedding planes and jointing patterns, respectively, observed with side-scan sonar. Quaternary and pre-Quaternary rocks are juxtaposed along an offshore strand of the San Andreas fault system (SAF in profile A–A').

GRAIN SIZE

Mean grain size was measured from surface sediment samples obtained at the sample locations shown on the map. The values are reported in microns; those larger than 62 indicate sand is the dominant component, and those less than 62 indicate that silt is the dominant component. Contours are at whole size-class intervals, with the exception of 22 microns (midway between 16 and 31 microns on a log scale). The dominant mean grain size of the Holocene mid-shelf mud deposit is between 16 and 22 microns.

ACKNOWLEDGMENTS

Field data collection and laboratory analyses were significantly aided by George Tate and Grace Fong. Sam Clarke and Herman Karl provided constructive reviews of the draft maps. This map results from a U.S. Geological Survey-U.S. Office of Naval Research (USGS-ONR) study of Sediment Transport Events on the Shelf and Slope (STRESS) under partial funding by ONR (R&T project code 4253022).

REFERENCES CITED

McCulloch, D.S., 1987, Regional geology and hydrocarbon potential of offshore central California, *in* Scholl, D.W., Grantz, A., and Vedder, J.G., editors, Geology and resource potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 353-402.

McCulloch, D.S., 1989, Geologic map of the north-central California continental margin, *in* Greene, H.G., and Kennedy, M.P., editors, California Continental Margin Map Series: California Division of Mines and Geology, Map No. 6A (Geology), area 6 of 7, sheet 1 of 4, scale 1:250,000.

McCulloch, D.S., and Greene, H.G., 1990, Geologic map of the central California continental margin, *in* Greene, H.G., and Kennedy, M.P., editors, California Continental Margin Map Series: California Division of Mines and Geology, Map No. 5A (Geology), area 5 of 7, sheet 1 of 4, scale 1:250,000.

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