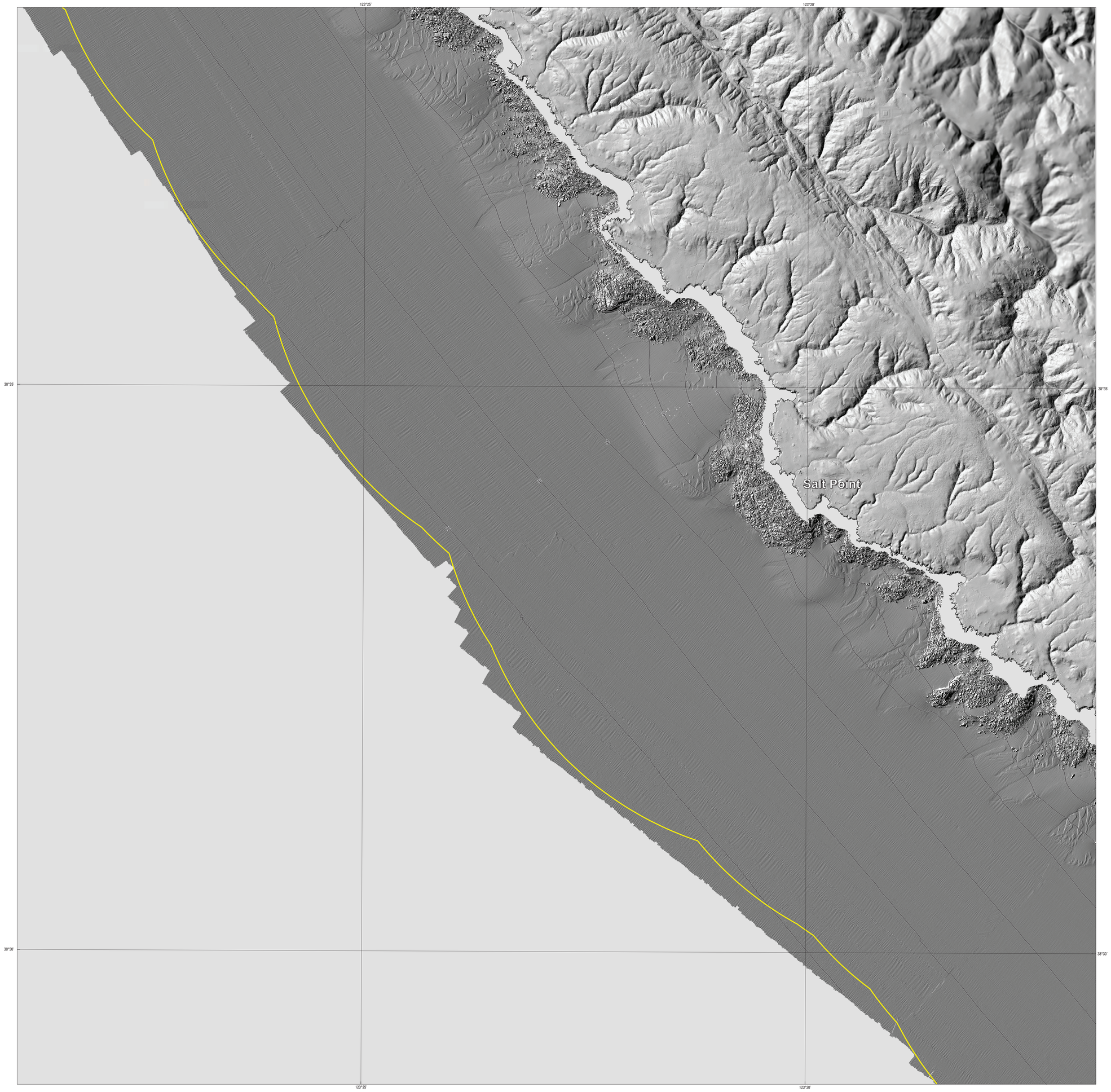
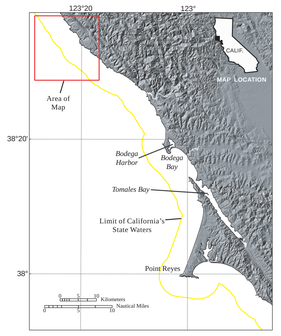
U.S. Department of the Interior
U.S. Geological Survey

Open-File Report 2015–1098
Sheet 2 of 10
Pamphlet accompanies map





DISCUSSION

This shaded-relief bathymetry map of the Offshore of Salt Point map area in northern California was generated from bathymetry data collected by Fugro Pelagos and by California State University, Monterey Bay (CSUMB) (fig. 1). Mapping was completed between 2007 and 2010, using a combination of 200-kHz and 400-kHz Reson 7125 and 244-kHz Reson 8101 multibeam echosounders, as well as a 468-kHz SEA SWATHplus bathymetric sidescan-sonar system. These mapping missions combined to collect bathymetry data from about the 10-m isobath to beyond the 3-nautical-mile limit of California's State Waters.

During the mapping missions, an Applanix POS MV (Position and Orientation System for Marine Vessels) was used to accurately position the vessels during data collection, and it also accounted for vessel motion such as heave, pitch, and roll (position accuracy, ±2 m; pitch, roll, and heading accuracy, ±0.02°; heave accuracy, ±5%, or 5 cm). To account for tidal-cycle fluctuations, CSUMB used NavCom 2050 GPS receiver (CNAV) data, and Fugro Pelagos used KGPS data (GPS data with real-time kinematic corrections); in addition, sound-velocity profiles were collected with an Applied Microsystems (AM) SVPlus sound velocimeter. Soundings were corrected for vessel motion using the Applanix POS MV data, for variations in water-column sound velocity using the AM SVPlus data, and for variations in water height (tides) using vertical-position data from the KGPS receivers

Processed soundings from the different mapping missions were exported from the acquisition or processing software as XYZ files and bathymetric surfaces. All the surfaces were merged into one overall 2-m-resolution bathymetric-surface model and clipped to the boundary of the map area. An illumination having an azimuth of 300° and from 45° above the horizon was then applied to the bathymetric surface to create the shaded-relief imagery. Note that the ripple patterns and parallel lines that are apparent within the map area are data-collection and processing artifacts. In addition, lines at the borders of some surveys are the result of slight differences in depth, as measured by different mapping systems in different years. These various artifacts are made obvious by the hillshading process.

Bathymetric contours were generated at 10-m intervals from the merged 2-m-resolution bathymetric surface. The merged surface was smoothed using the Focal Mean tool in ArcGIS and a circular neighborhood that has a radius of between 20 and 30 m (depending on the location). The contours were generated from this smoothed surface using the Spatial Analyst Contour tool in ArcGIS. The most continuous contour segments were preserved; smaller segments and isolated island polygons were excluded from the final output. The contours were then clipped to the boundary of the map area.

The onshore-area image was generated by applying the same illumination (azimuth of 300° and from 45° above the horizon) to 2-m-resolution topographic-lidar data from OpenTopography (available at http://www.opentopography.org/), and to 10-m-resolution data from the U.S. Geological Survey's, National Elevation Dataset (available at http://ned.usgs.gov/).

EXPLANATION

Amount of illumination

Illuminated (facing false sun)

In shadow (facing away from false sun)

Direction of illumination from false sun—Position of false sun is at 300° azimuth, 45° above horizon [arrow included in explanation for illustration purposes only; not shown on map]

Area of "no data"—Areas near shoreline not mapped owing to insufficient high-resolution seafloor mapping data; areas beyond 3-nautical-mile limit of California's State Waters were not mapped as part of California Seafloor Mapping Program

3-nautical-mile limit of California's State Waters

10 **Bathymetric contour (in meters)**—Derived from modified 2-m-resolution bathymetry grid. Contour interval: 10 m

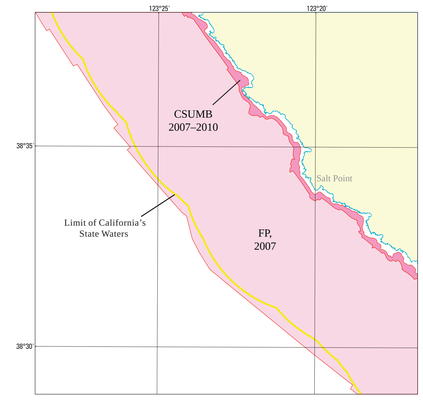


Figure 1. Map showing areas of multibeam-echosounder and bathymetric sidescan surveys (pink shading) and onshore topographic data (yellow shading). Also shown are data-collecting agencies (CSUMB, California State University, Monterey Bay, Seafloor Mapping Lab; FP, Fugro Pelagos) and dates of surveys if known.

Onshore elevation data from National Aeronautics and Space Administration and U.S. Geological Survey, available at http://www.opentopography.org/, and from U.S. Geological Survey, National Elevation Dataset, available at http://ned.usgs.gov/.
California's State Waters limit from NOAA Office of Coast Survey
Universal Transverse Mercator projection, Zone 10N

NOT INTENDED FOR NAVIGATIONAL USE

SCALE 1:24 000

1 1/2 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

BATHYMETRIC CONTOUR INTERVAL 10 METERS
ONE MILE = 0.869 NAUTICAL MILES

Shaded-relief bathymetry by Peter Dartnell, 2013 (data collected by Fugro Pelagos in 2007 and by California State University, Monterey Bay, Seafloor Mapping Lab in 2007 - 2010). Bathymetric contours by Mercedes D. Erdey, 2013
GIS database and digital cartography by Nadine E. Golden
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Shaded-Relief Bathymetry, Offshore of Salt Point Map Area, California

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