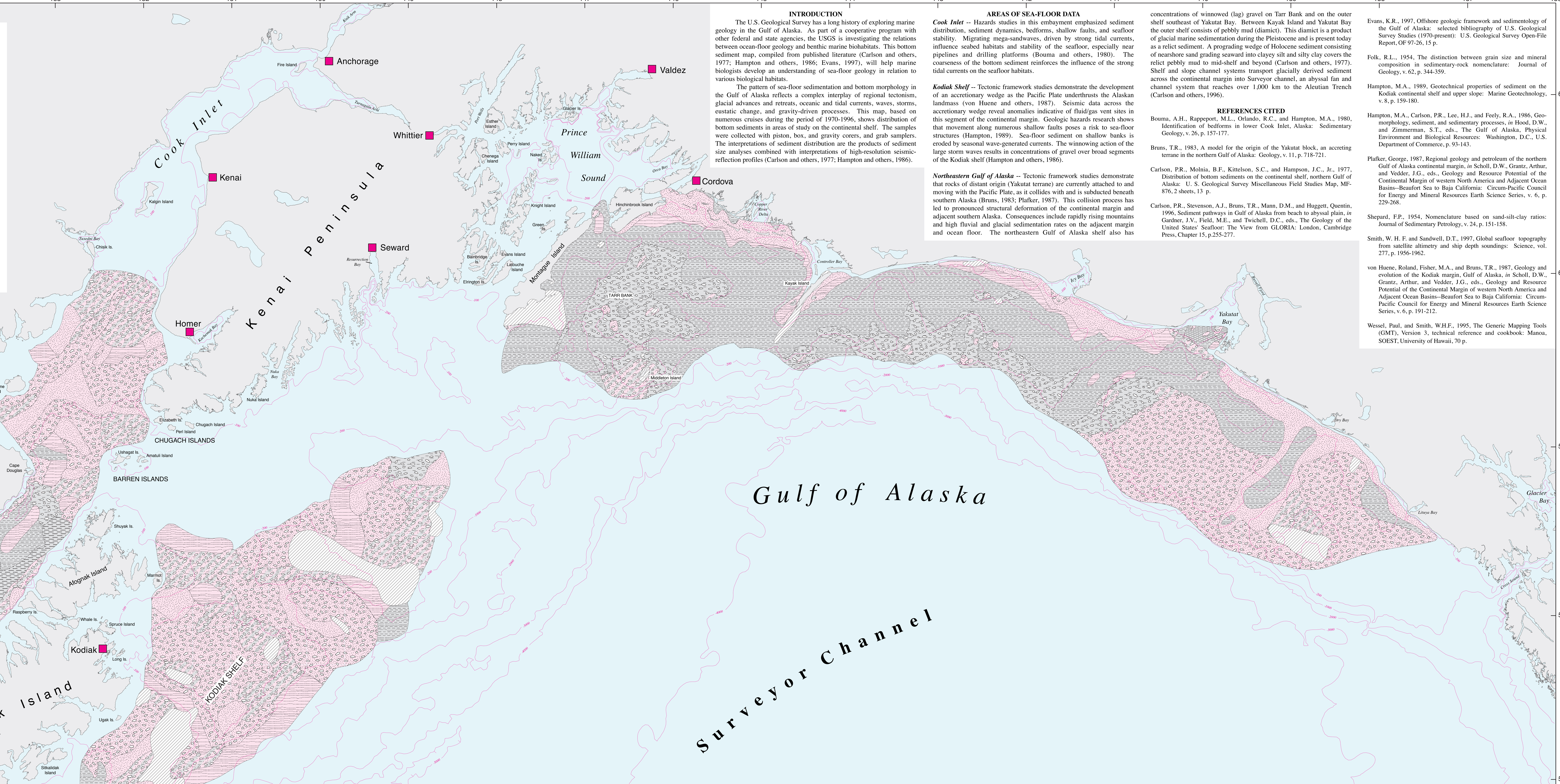
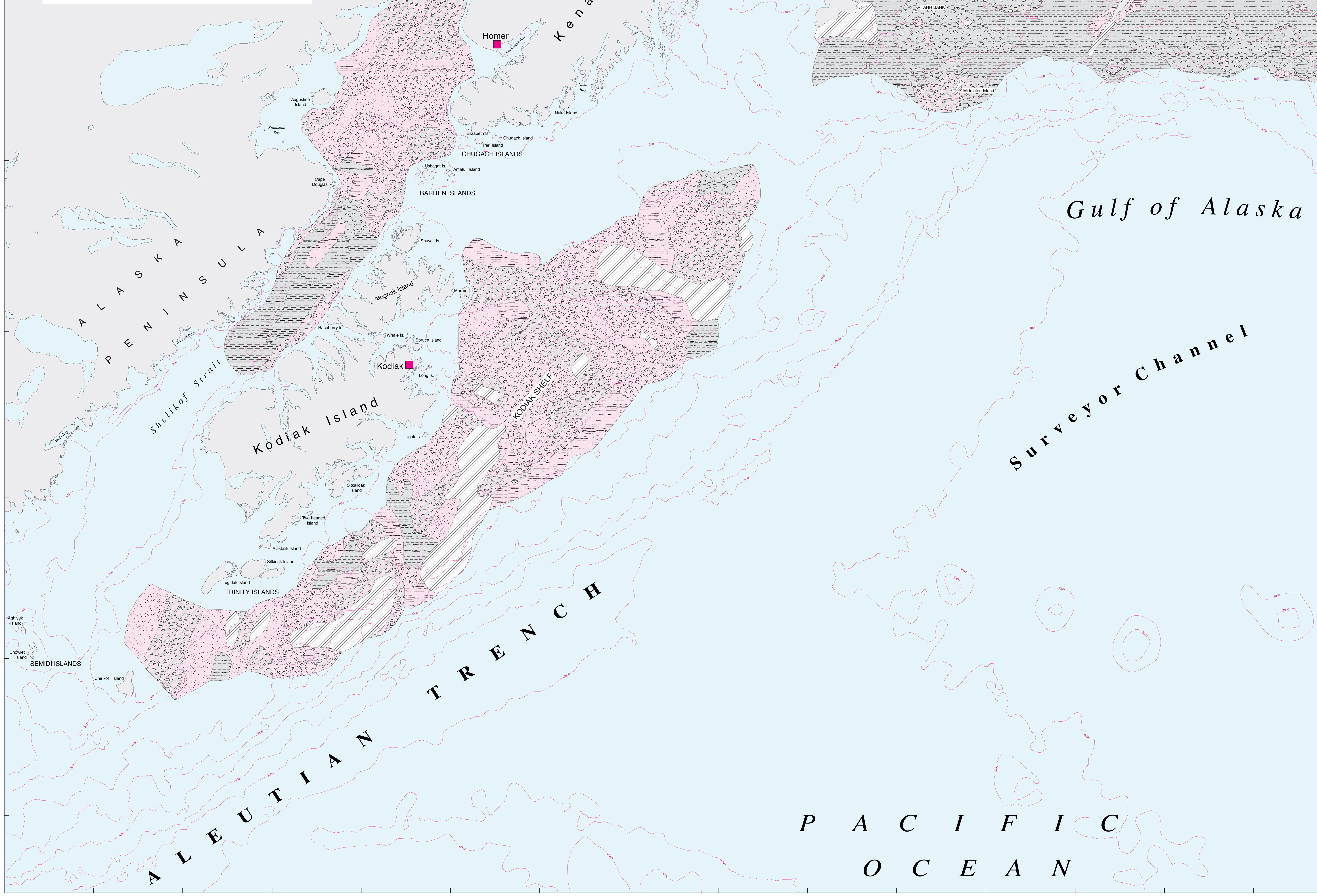
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

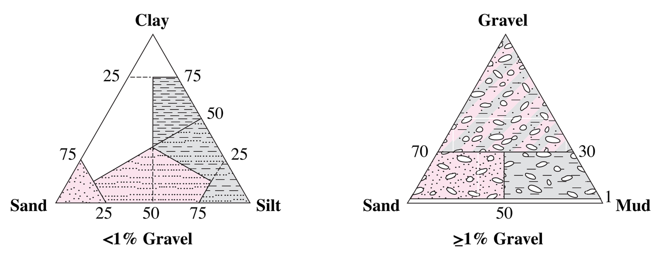
MISCELLANEOUS FIELD STUDIES
MF-2335, Version 1.0

EXPLANATION

- Gravelly sand
- Muddy to sandy gravel
- Gravelly mud
- Sand
- Sandy silt to silty sand
- Clayey silt to silt
- Silty clay
- Bedrock

The sediment categories, shown at left, are organized according to grain size and sorting. Grains are classified by their maximum dimension. Gravel includes particles larger than 2.0 mm in diameter, sand grains range from 0.0625 to 2.0 mm across, silt ranges from 0.039 to 0.0625 mm across, and clay includes all particles smaller than silt. Mud consists of silt plus clay. Sorting was determined through sieve analyses. The ternary diagrams below, based on classification schemes modified from Shepard (1954) and Folk (1954) illustrate the proportional relationships of sediment sizes to the key sediment textures. Blank area at bottom of triangle on right represents sediment with less than 1% gravel, as shown in triangle on left.



INTRODUCTION

The U.S. Geological Survey has a long history of exploring marine geology in the Gulf of Alaska. As part of a cooperative program with other federal and state agencies, the USGS is investigating the relations between ocean-floor geology and benthic marine biohabitats. This bottom sediment map, compiled from published literature (Carlson and others, 1977; Hampton and others, 1986; Evans, 1997), will help marine biologists develop an understanding of sea-floor geology in relation to various biological habitats.

The pattern of sea-floor sedimentation and bottom morphology in the Gulf of Alaska reflects a complex interplay of regional tectonism, glacial advances and retreats, oceanic and tidal currents, waves, storms, eustatic change, and gravity-driven processes. This map, based on numerous cruises during the period of 1970-1996, shows distribution of bottom sediments in areas of study on the continental shelf. The samples were collected with piston, box, and gravity corers, and grab samplers. The interpretations of sediment distribution are the products of sediment size analyses combined with interpretations of high-resolution seismic-reflection profiles (Carlson and others, 1977; Hampton and others, 1986).

AREAS OF SEA-FLOOR DATA

Cook Inlet -- Hazards studies in this embayment emphasized sediment distribution, sediment dynamics, bedforms, shallow faults, and seafloor stability. Migrating mega-sandwaves, driven by strong tidal currents, influence seabed habitats and stability of the seafloor, especially near pipelines and drilling platforms (Bouma and others, 1980). The coarseness of the bottom sediment reinforces the influence of the strong tidal currents on the seafloor habitats.

Kodiak Shelf -- Tectonic framework studies demonstrate the development of an accretionary wedge as the Pacific Plate underthrusts the Alaskan landmass (von Huene and others, 1987). Seismic data across the accretionary wedge reveal anomalies indicative of fluid/gas vent sites in this segment of the continental margin. Geologic hazards research shows that movement along numerous shallow faults poses a risk to sea-floor structures (Hampton, 1989). Sea-floor sediment on shallow banks is eroded by seasonal wave-generated currents. The winnowing action of the large storm waves results in concentrations of gravel over broad segments of the Kodiak shelf (Hampton and others, 1986).

Northeastern Gulf of Alaska -- Tectonic framework studies demonstrate that rocks of distant origin (Yakutat terrane) are currently attached to and moving with the Pacific Plate, as it collides with and is subducted beneath southern Alaska (Bruns, 1983; Plafker, 1987). This collision process has led to pronounced structural deformation of the continental margin and adjacent southern Alaska. Consequences include rapidly rising mountains and high fluvial and glacial sedimentation rates on the adjacent margin and ocean floor. The northeastern Gulf of Alaska shelf also has concentrations of winnowed (lag) gravel on Tarr Bank and on the outer shelf southeast of Yakutat Bay. Between Kayak Island and Yakutat Bay the outer shelf consists of pebbly mud (diamict). This diamict is a product of glacial marine sedimentation during the Pleistocene and is present today as a relict sediment. A prograding wedge of Holocene sediment consisting of nearshore sand grading seaward into clayey silt and silty clay covers the relict pebbly mud to mid-shelf and beyond (Carlson and others, 1977). Shelf and slope channel systems transport glacially derived sediment across the continental margin into Surveyor channel, an abyssal fan and channel system that reaches over 1,000 km to the Aleutian Trench (Carlson and others, 1996).

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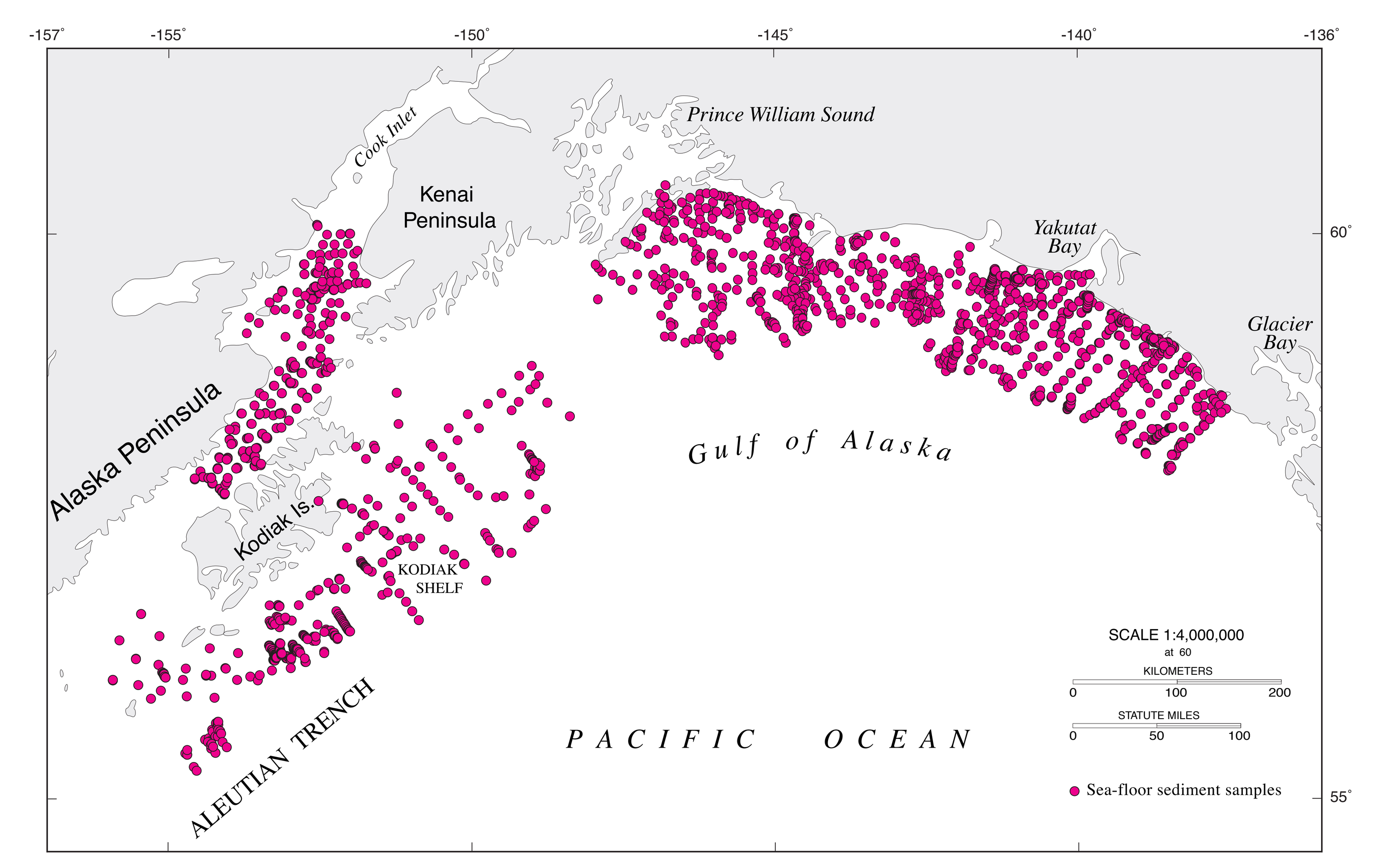

Figure 1. Map showing locations of samples collected by the USGS and used to determine distribution of sea-floor sediments.

Alaskan coastline, alaska.cst (USGS), http://walrus.wr.usgs.gov/infobank/bear/poly/ak/alaska.cst

Bathymetry modified from Etopo2 database (Smith and Sandwell, 1997).

Base grid plotted with Generic Mapping Tools, Version 3.0 (Wessel and Smith, 1995).

Mercator projection

NOTE: THIS MAP IS NOT INTENDED FOR NAVIGATION

MAP OF DISTRIBUTION OF BOTTOM SEDIMENTS ON THE CONTINENTAL SHELF, GULF OF ALASKA

By

Kevin R. Evans, Paul R. Carlson, Monty A. Hampton, Michael S. Marlow, and Peter W. Barnes

2000

INDEX MAP SHOWING LOCATION OF MAP AREA

SCALE 1:1,000,000 at 60

KILOMETERS 10 0 20 40 60 80 100

STATUTE MILES 10 0 50

Isobath contours shown in meters (100, 200, then 1000s)

ISBN 0-607-93854-4

Distribution of bottom sediments digitized by K.R. Evans, 1997, from Carlson and others (1977) and Hampton and others (1986).

The authors gratefully acknowledge the assistance given by Carolyn Degnan for geographic and bathymetric basemaps, and by Christina Gutmacher for final editing changes in preparation for publication.

This map was printed on an electronic plotter directly from digital files. Dimensional calibration may vary between electronic plotters and between X and Y directions on the same plotter, and paper may change size due to atmospheric conditions; therefore, scale and proportions may not be true on plots of this map.

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