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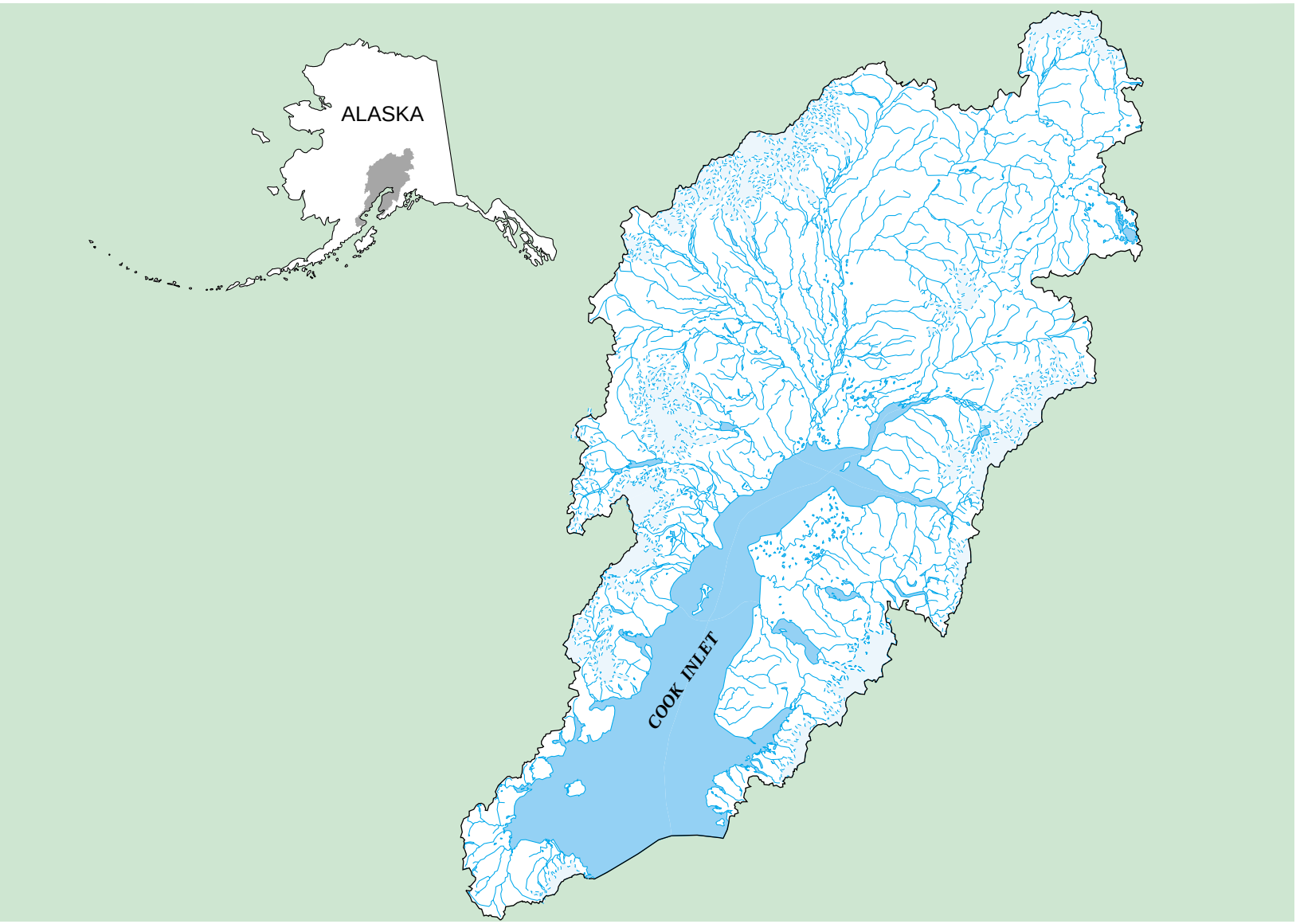
Water-Quality Assessment of the Cook Inlet Basin, Alaska—Summary of Data Through 1997

Water-Resources Investigations Report 99-4116

National Water-Quality Assessment Program



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

Water-Quality Assessment of the Cook Inlet Basin, Alaska—Summary of Data Through 1997

By Roy L. Glass

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 99-4116

Prepared as part of the

NATIONAL WATER-QUALITY ASSESSMENT PROGRAM

Anchorage, Alaska
1999

U.S. DEPARTMENT OF THE INTERIOR
BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY
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FOREWORD

The mission of the U.S. Geological Survey (USGS) is to assess the quantity and quality of the earth resources of the Nation and to provide information that will assist resource managers and policymakers at Federal, State, and local levels in making sound decisions. Assessment of water-quality conditions and trends is an important part of this overall mission.

One of the greatest challenges faced by water-resources scientists is acquiring reliable information that will guide the use and protection of the Nation's water resources. That challenge is being addressed by Federal, State, interstate, and local water-resource agencies and by many academic institutions. These organizations are collecting water-quality data for a host of purposes that include: compliance with permits and water-supply standards; development of remediation plans for specific contamination problems; operational decisions on industrial, wastewater, or water-supply facilities; and research on factors that affect water quality. An additional need for water-quality information is to provide a basis on which regional- and national-level policy decisions can be based. Wise decisions must be based on sound information. As a society we need to know whether certain types of water-quality problems are isolated or ubiquitous, whether there are significant differences in conditions among regions, whether the conditions are changing over time, and why these conditions change from place to place and over time. The information can be used to help determine the efficacy of existing water-quality policies and to help analysts determine the need for and likely consequences of new policies.

To address these needs, the U.S. Congress appropriated funds in 1986 for the USGS to begin a pilot program in seven project areas to develop and refine the National Water-Quality Assessment (NAWQA) Program. In 1991, the USGS began full implementation of the program. The NAWQA Program builds upon an existing base of water-quality studies of the USGS, as well as those of other Federal, State, and local agencies. The objectives of the NAWQA Program are to:

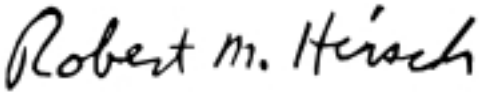
- Describe current water-quality conditions for a large part of the Nation's freshwater streams, rivers, and aquifers.
- Describe how water quality is changing over time.
- Improve understanding of the primary natural and human factors that affect water-quality conditions.

This information will help support the development and evaluation of management, regulatory, and monitoring decisions by other Federal, State, and local agencies to protect, use, and enhance water resources.

The goals of the NAWQA Program are being achieved through ongoing and proposed investigations of 59 of the Nation's most important river basins and aquifer systems, which are referred to as study units. These study units are distributed throughout the Nation and cover a diversity of hydrogeologic settings. More than two-thirds of the Nation's freshwater use occurs within the 59 study units and more than two-thirds of the people served by public water-supply systems live within their boundaries.

National synthesis of data analysis, based on aggregation of comparable information obtained from the study units, is a major component of the program. This effort focuses on selected water-quality topics using nationally consistent information. Comparative studies will explain differences and similarities in observed water-quality conditions among study areas and will identify changes and trends and their causes. The first topics addressed by the national synthesis are pesticides, nutrients, volatile organic compounds, and aquatic biology. Discussions on these and other water-quality topics will be published in periodic summaries of the quality of the Nation's ground and surface water as the information becomes available.

This report is an element of the comprehensive body of information developed as part of the NAWQA Program. The program depends heavily on the advice, cooperation, and information from many Federal, State, interstate, Tribal, and local agencies and the public. The assistance and suggestions of all are greatly appreciated.



Robert M. Hirsch
Chief Hydrologist

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CONVERSION FACTORS, VERTICAL DATUM, AND ABBREVIATIONS

Multiply	by	To Obtain
inch (in.)	2.54	centimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
square mile (mi^2)	2.590	square kilometer
cubic foot (ft^3)	0.02832	cubic meter
cubic yard (yd^3)	0.7646	cubic meter
barrel, oil (42 U.S. gallons)	158.9873	liter
foot per mile (ft/mi)	0.1894	meter per kilometer
inch per year (in/yr)	25.4	millimeter per year

Temperature can be converted to degrees Fahrenheit (°F) or degrees Celsius (°C) by the equations:

$$°F = 9/5\ (°C) + 32$$

$$°C = 5/9\ (°F - 32)$$

VERTICAL DATUM

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929—A geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

ABBREVIATIONS AND WATER-QUALITY UNITS

mm, millimeter

Water quality: Chemical concentrations and water temperature are given in metric units. Chemical concentration is given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. For concentrations less than about 7,000 mg/L, the numerical value is the same as for concentrations in parts per million. Specific conductance is reported in microsiemens per centimeter at 25 degrees Celsius (µS/cm). Fecal indicator bacteria are reported in fecal coliform colonies per 100 milliliters of water (col/100 mL).

WATER YEAR

Water year is the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1998, is called the "1998 water year."

MAP NUMBERING SYSTEM

The map numbers of stream water-quality sites on the tables and figures in this report generally follow the map numbering system for stream-gaging stations in the NAWQA environmental setting report (Brabets and others, 1999). Because water-quality conditions are not discussed for each of the stream-gaging stations numbered in the environmental setting report, this water-quality summary contains gaps in the map numbers and the numbers are not sequential (see appendix 1).

Water-Quality Assessment of the Cook Inlet Basin, Alaska—Summary of Data Through 1997

By Roy L. Glass

ABSTRACT

Among the first activities undertaken in each National Water-Quality Assessment (NAWQA) investigation are the compilation, screening, and statistical summary of available data concerning water-quality conditions in the study unit. The water-quality conditions of interest are those that are representative of the general ambient water quality of a given stream reach or area of an aquifer. This report identifies which existing water-quality data are suitable for characterizing general conditions in a nationally consistent manner and describes, to the extent possible, general water-quality conditions in the Cook Inlet Basin in southcentral Alaska. The study unit consists of all lands that drain into Cook Inlet, but not the marine environment itself.

Surface-water-quality data are summarized for 31 sites on streams. Ground-water quality data are summarized for four regions using analyses from about 550 wells that yield water from unconsolidated glacial and alluvial deposits and analyses from 17 wells in western Cook Inlet, some of which may yield water from coal or weakly consolidated sandstone or conglomerate. The summaries focus on the central tendencies and typical variations in the data and use nonparametric statistics such as frequencies and percentile values.

Few surface- and ground-water sites have long-term water-quality records and very few data are available for dissolved oxygen, nutrients, metals, trace elements, organic compounds, and radionuclides. In general, most waters in streams and wells have small concentrations of major inorganic constituents, nutrients, trace elements, and organic compounds.

Most streams have water that is generally suitable for drinking-water supply, the growth and propagation of cold-water anadromous fish, and water-contact recreation. However, suspended-sediment concentrations in glacier-fed streams are naturally high and can make water from glacier-fed streams unsuitable for many uses unless the water is treated to remove the suspended sediment. Several streams and lakes in Anchorage have fecal coliform bacteria concentrations higher than allowed for drinking or water-contact recreation.

Ground water in the major withdrawal regions is generally suitable for drinking and most other purposes, but some wells yield water having nitrate, iron, or arsenic concentrations higher than drinking-water criteria. Ground-water quality has been degraded in several areas as the result of leaks or spills of petroleum products.

INTRODUCTION

In 1991, the U.S. Congress appropriated funds for the U.S. Geological Survey (USGS) to implement the National Water-Quality Assessment (NAWQA) Program. The long-term goals of the program are to (1) provide a nationally consistent description of current water-quality conditions for a large part of the Nation’s water resources; (2) define long-term trends (or lack of trends) in water quality; and (3) identify, describe, and explain, to the extent possible, the major natural and human factors that affect measured water-quality conditions and trends (Leahy and others, 1990). In meeting these goals, the program provides information useful to policy makers and managers concerned with the Nation’s water resources.

The NAWQA Program is based primarily on investigations of both ground- and surface-water quality conducted in 59 study units nationwide. Collectively, the study units incorporate 60 to 70 percent of the Nation's water use as measured by total withdrawal and population served by public-water supplies. The assessment of the Cook Inlet Basin in southcentral Alaska began in 1997. Two initial activities undertaken in the investigation were to describe the environmental setting of the study unit, including the natural and human factors that may affect water quality, and to compile, screen, and statistically summarize available data concerning water-quality conditions in the study unit. The physical, hydrologic, and aquatic-biological characteristics of the major streams and rivers that flow into Cook Inlet and how these characteristics affect water quality are described in an environmental setting report by Brabets and others (1999).

The purposes of this report are to identify existing water-quality data and to describe, to the extent possible, general ambient water-quality conditions in the Cook Inlet study unit. The report includes (1) a description of the sources of water-quality data that are available, (2) a description of the approach used for screening available data to identify a subset of the data suitable for summary and comparisons, (3) a presentation of statistical and graphical summaries of water-quality conditions, and (4) a comparison of water-quality conditions to established Federal and State water-quality criteria where applicable. The summaries focus on the central tendencies and typical variation in the data, and use nonparametric statistics such as frequencies and percentile values.

The author thanks the many agencies and organizations for their cooperation in providing information and data used to prepare this report. Special thanks are given to the members of the Cook Inlet Basin Liaison Committee who provided useful guidance for conducting this data evaluation. Participating members of this committee include representatives from the Alaska Department of Fish and Game (ADFG), Alaska Department of Natural Resources (ADNR), Cook Inlet Keeper, Municipality of Anchorage (MOA), National Park Service (NPS), The Nature Conservancy, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency (USEPA), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service, University of Alaska, and Unocal.

DESCRIPTION OF THE COOK INLET BASIN

The lands that drain into Cook Inlet cover about 39,325 mi^2 in southcentral Alaska (fig. 1). Five physiographic regions are represented within the study unit (Frenzel, 1997; Brabets and others, 1999). Forty-nine percent of the study unit is moderately high rugged mountains; 18 percent plains and lowlands; 15 percent low mountains, generally rolling; 9 percent extremely high rugged mountains; and 9 percent plateaus and highlands of rolling topography and gentle slopes. Altitude ranges from sea level to 20,320 ft, the highest point in North America at Mount McKinley. Forests cover about 30 percent of the study unit, shrubs cover about 27 percent, snowfields and glaciers cover about 20 percent, and lakes and wetlands cover about 12 percent. Parts of Denali, Katmai, Kenai Fjords, and Lake Clark National Parks; Kenai National Wildlife Refuge; and Chugach National Forest lie within the Cook Inlet Basin (fig. 1). Less than 0.5 percent of the study unit is used for agricultural purposes (excluding logging). Even though the Cook Inlet Basin is the most populated part of the State and is projected to be the area of most population and industrial growth in the future, the total urban land cover is less than 1 percent of the study unit. As of 1996, about 347,000 people lived in the study unit, of which about 254,000 lived in the Municipality of Anchorage; about 51,000 lived in the Matanuska-Susitna Borough; and about 42,000 lived in the Kenai Peninsula Borough. Local political

boundaries are shown in figure 2. The few communities in the study unit that are in western Cook Inlet are not accessible by road. These communities are small and have few or no public utilities. One community, Tyonek, has about 150 residents and receives its water supply from a nearby lake.

Numerous rivers drain into Cook Inlet and this report divides them into four separate hydrologic units based on major drainage networks (fig. 3) (Lamke and others, 1995): drainages on Kenai Peninsula (fig. 4), drainages in the Anchorage/Matanuska area (fig. 5A, 5B), the Susitna River Basin (fig. 6), and drainages in western Cook Inlet (fig. 7). These rivers are used for propagation of fish and wildlife, public and industrial water supplies, transportation, and recreation. Surface waters from Eklutna Lake (fig. 5A) and Ship Creek (fig. 5B) are the sources of about two-thirds of the water used by the public water-supply system in Anchorage. Residents and businesses in Homer (fig. 4) and Tyonek (fig. 7) also utilize surface water for their water supply.

Ground water is also important to area residents. About one-third of the public-water supply for Anchorage is from wells and almost all water used for commercial, industrial, and domestic uses outside of the Anchorage, Homer, and Tyonek public water-distribution systems is from wells. An extensive aquifer system consisting of unconsolidated glacial-outwash and alluvial deposits underlies much of the lowlands surrounding Cook Inlet (Miller and others, 1997, p. N8-9) (fig. 8). Most wells obtain water from this Cook Inlet aquifer system, but in upland areas where saturated unconsolidated deposits are thin or absent, wells obtain their water from saturated fractures in bedrock. Ground water is also important to aquatic-biological resources because groundwater discharge provides most of the water in streams during winter.

Natural resources are abundant in the study unit and include oil, natural gas, fish, forests, coal, gold, and sand and gravel. The marine and freshwaters of the basin support the State's largest recreational fishery and one of the State's largest commercial fisheries; commonly, between 3 million and 10 million salmon are harvested annually from Cook Inlet or streams within its basin. Schneider (1997, p. 20) reported that more than 15 million barrels of oil and about 5.1 billion cubic meters (6.6 billion yd^3) of dry natural gas were extracted from the basin in 1995. Most oil and gas are produced from offshore platforms in the northern part of Cook Inlet and from wells in the northern part of Kenai Peninsula (fig. 2) within the Kenai National Wildlife Refuge. Although current coal, gold, and sand and gravel mining activities are on local scales, there is potential for large-area coal mining near the western and eastern shores of Cook Inlet and in the Matanuska Valley (Schneider, 1997) (fig. 2).

Five species of Pacific salmon that require high-quality spawning and rearing habitat are found within the Cook Inlet Basin. Some features that help rivers within the study unit produce large numbers of salmon include sustained high streamflows for extended periods of time; large lakes that regulate streamflow variations, reduce sediment movement, and provide salmon with rearing and over-wintering habitat; stable channels; sparse development; and few sources of pollution (Dorava and Liepitz, 1996). The Kenai River (fig. 4) provided about 30 percent of the commercial chinook salmon harvested in Cook Inlet during 1985-95 (Dorava and Scott, 1996) and about 40 percent of the commercial sockeye salmon harvest. The Kenai River is also the State's most popular sport fishery, accounting for more than 400,000 angler days per year (Litchfield and Kyle, 1991). Except for Ship and Chester Creeks in Anchorage (fig. 5B) and Cooper Creek on the Kenai Peninsula (fig. 4), the study unit contains few man-made barriers that inhibit large-scale salmon migration. A hydroelectric dam on Bradley River (fig. 4) about 25 mi northeast of Homer is upstream from natural barriers to salmon migration.

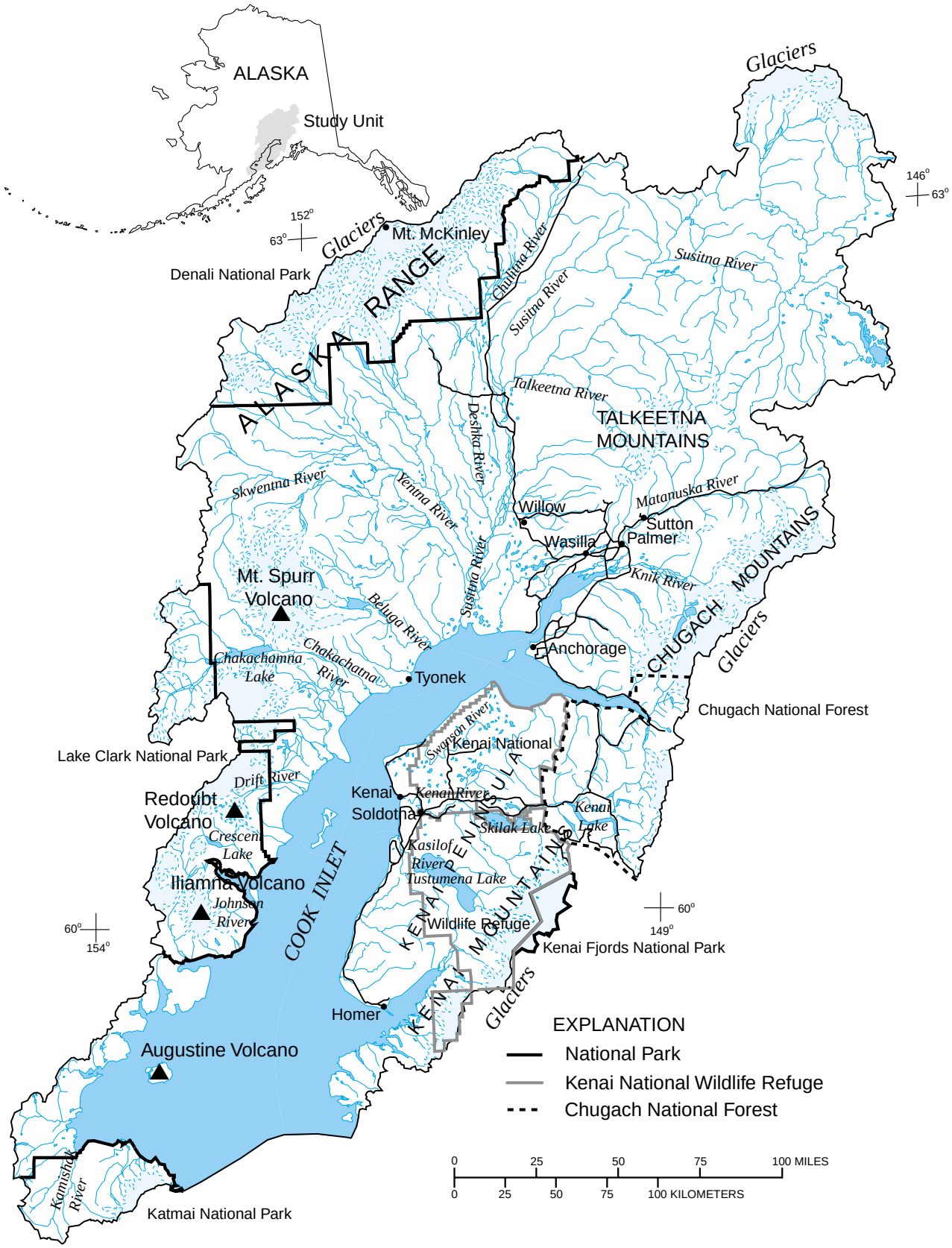

Figure 1. Location and major features of the Cook Inlet Basin, Alaska.

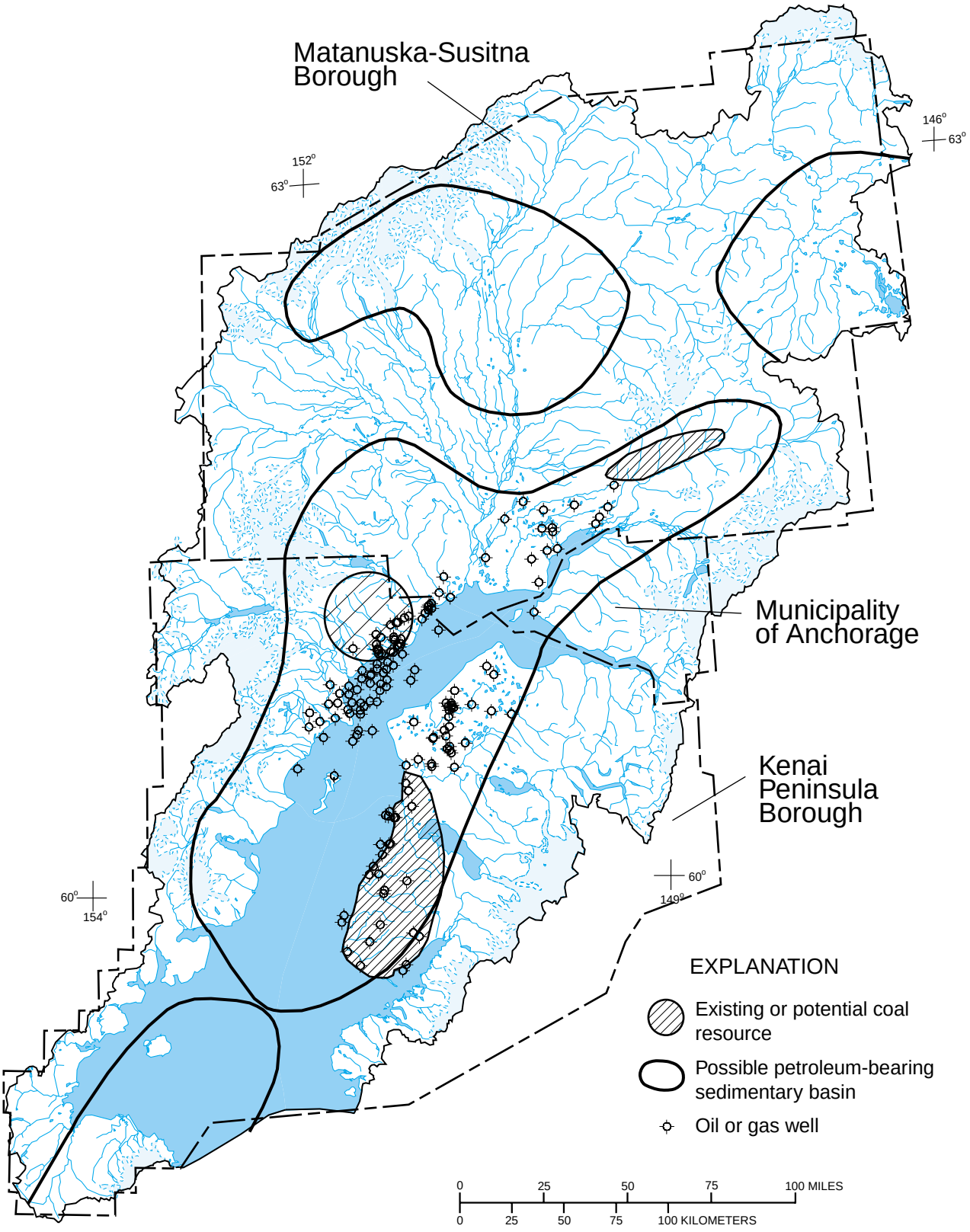

Figure 2. Political boundaries and mineral resource areas in the Cook Inlet Basin, Alaska (adapted from Schneider,1997, figures 7 and 11).

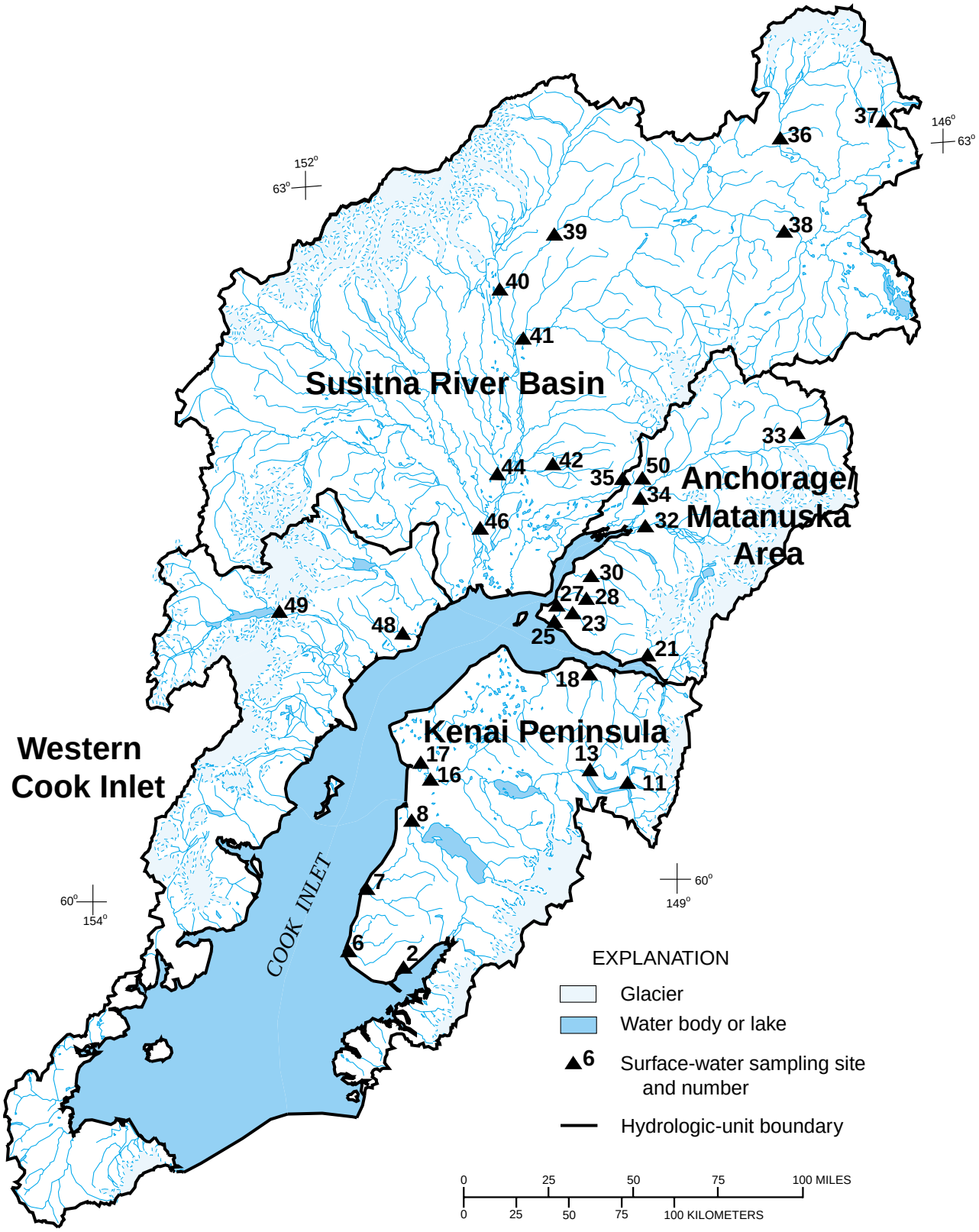

Figure 3. Hydrologic units and selected surface-water quality sampling sites in the Cook Inlet Basin, Alaska.

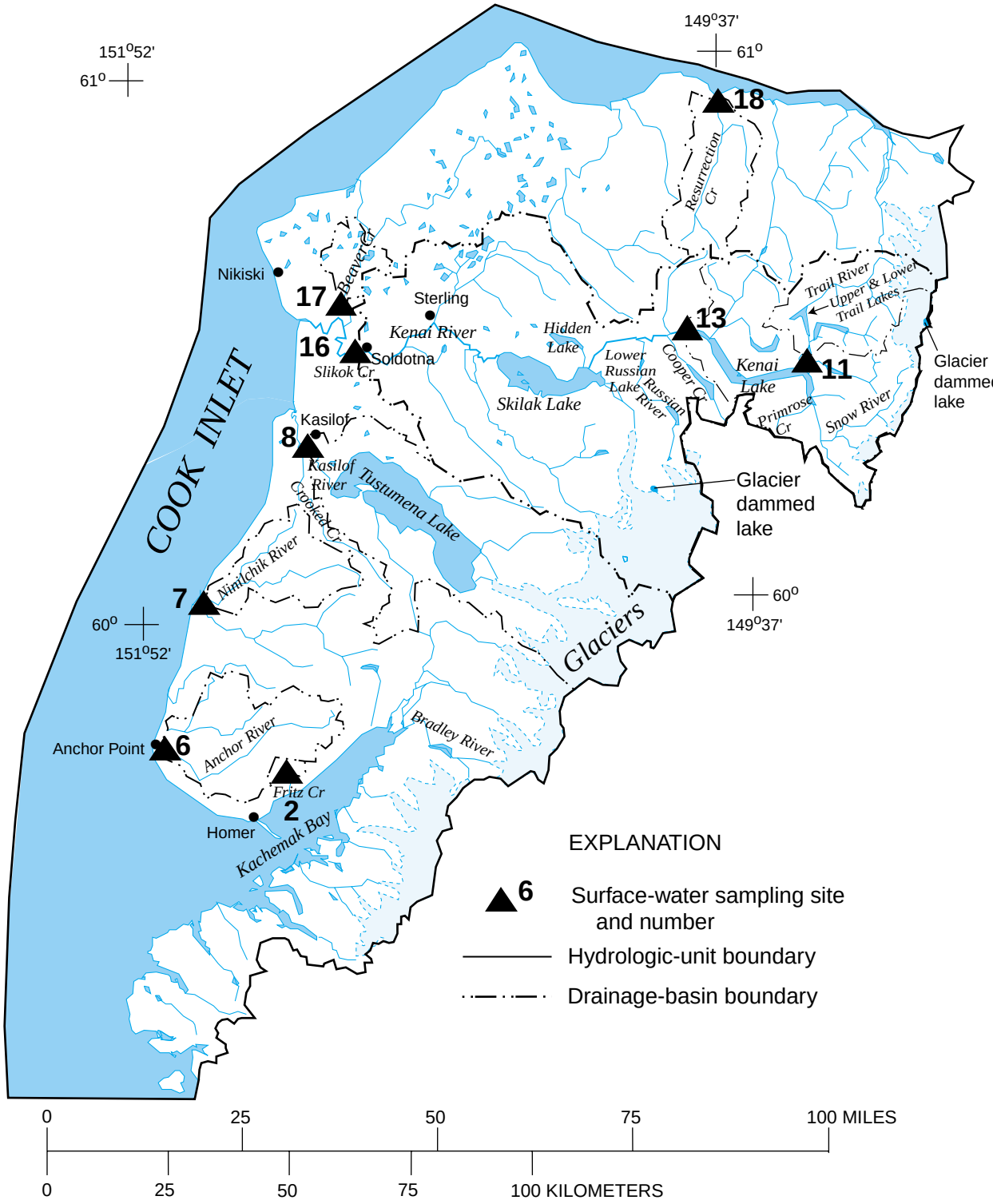

Figure 4. Selected surface-water quality sampling sites on the Kenai Peninsula, Cook Inlet Basin, Alaska.

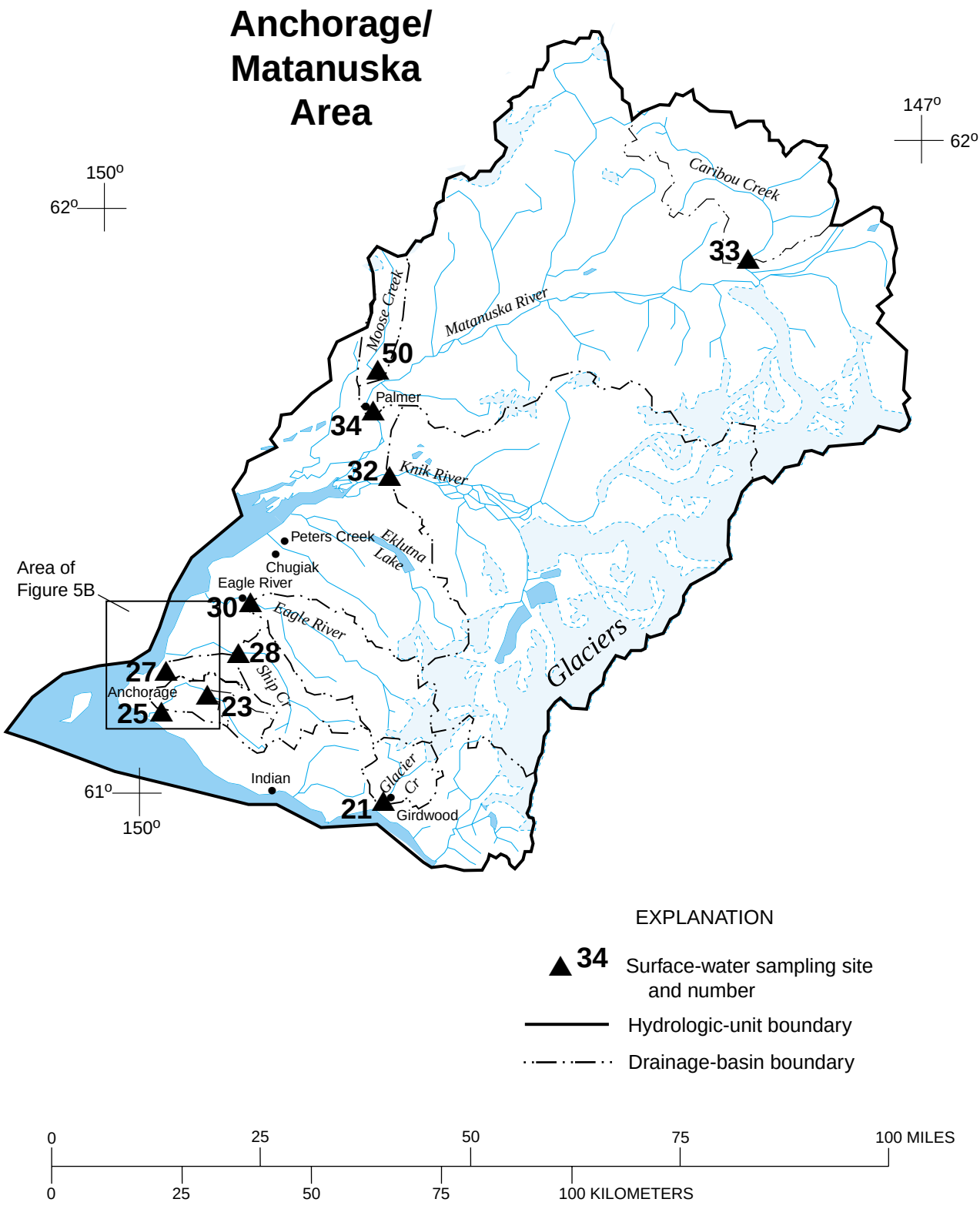

Figure 5A. Selected surface-water quality sampling sites in the Anchorage/Matanuska area of the Cook Inlet Basin, Alaska.

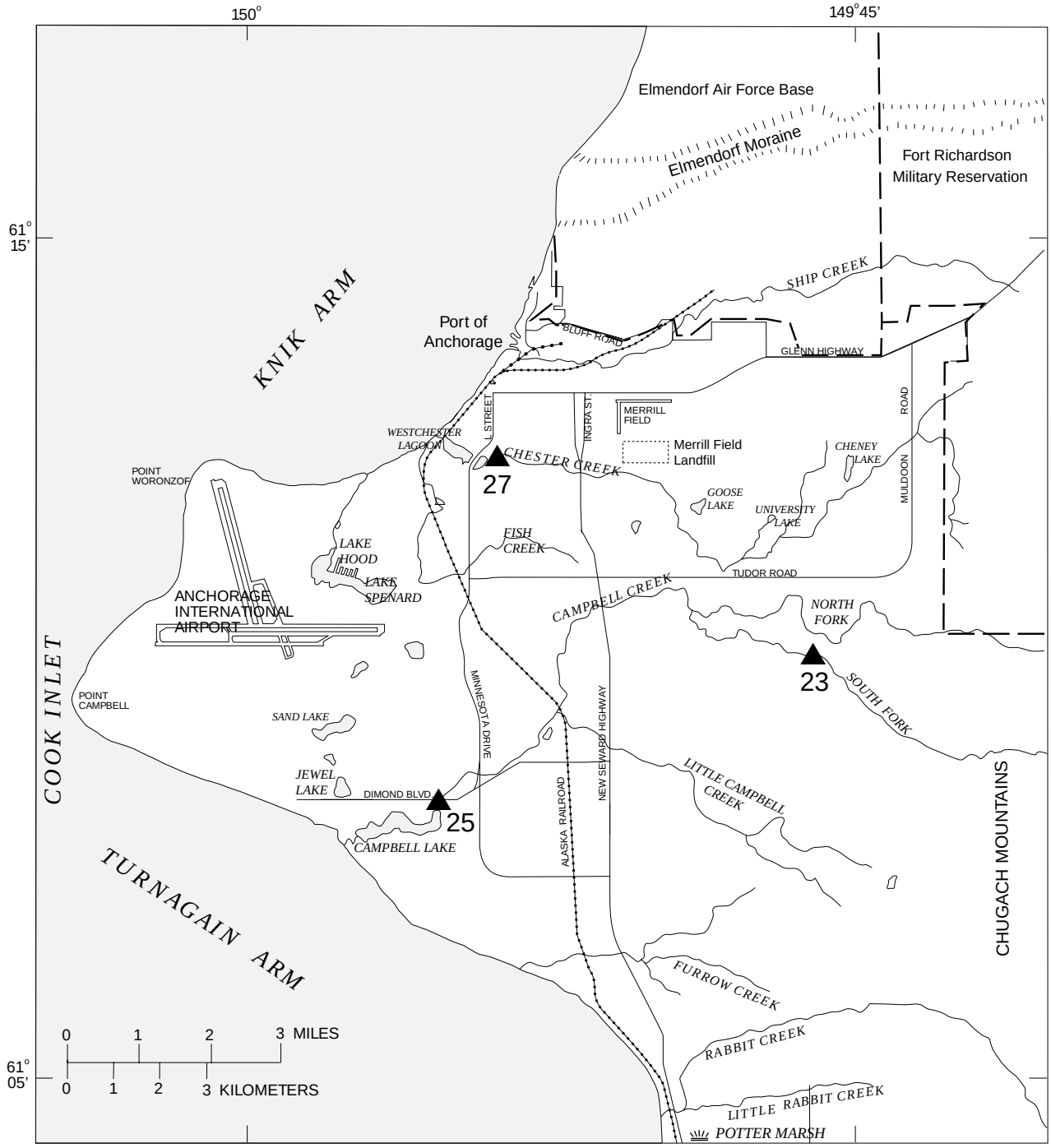

Figure 5B. Major streams and land features of the Municipality of Anchorage (see figure 5A for location).

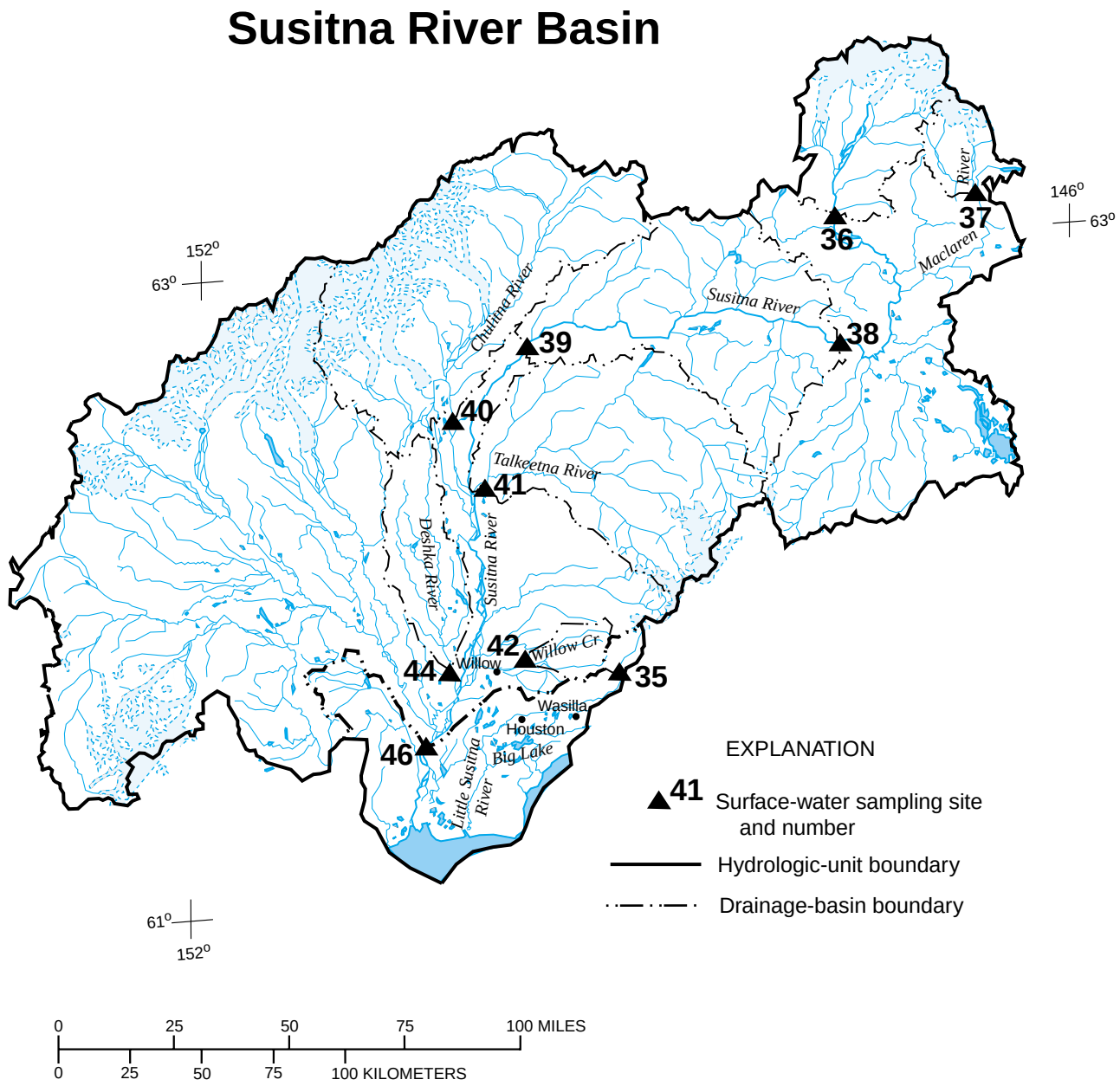

Figure 6. Selected surface-water quality sampling sites in the Susitna River Basin, Cook Inlet Basin, Alaska.

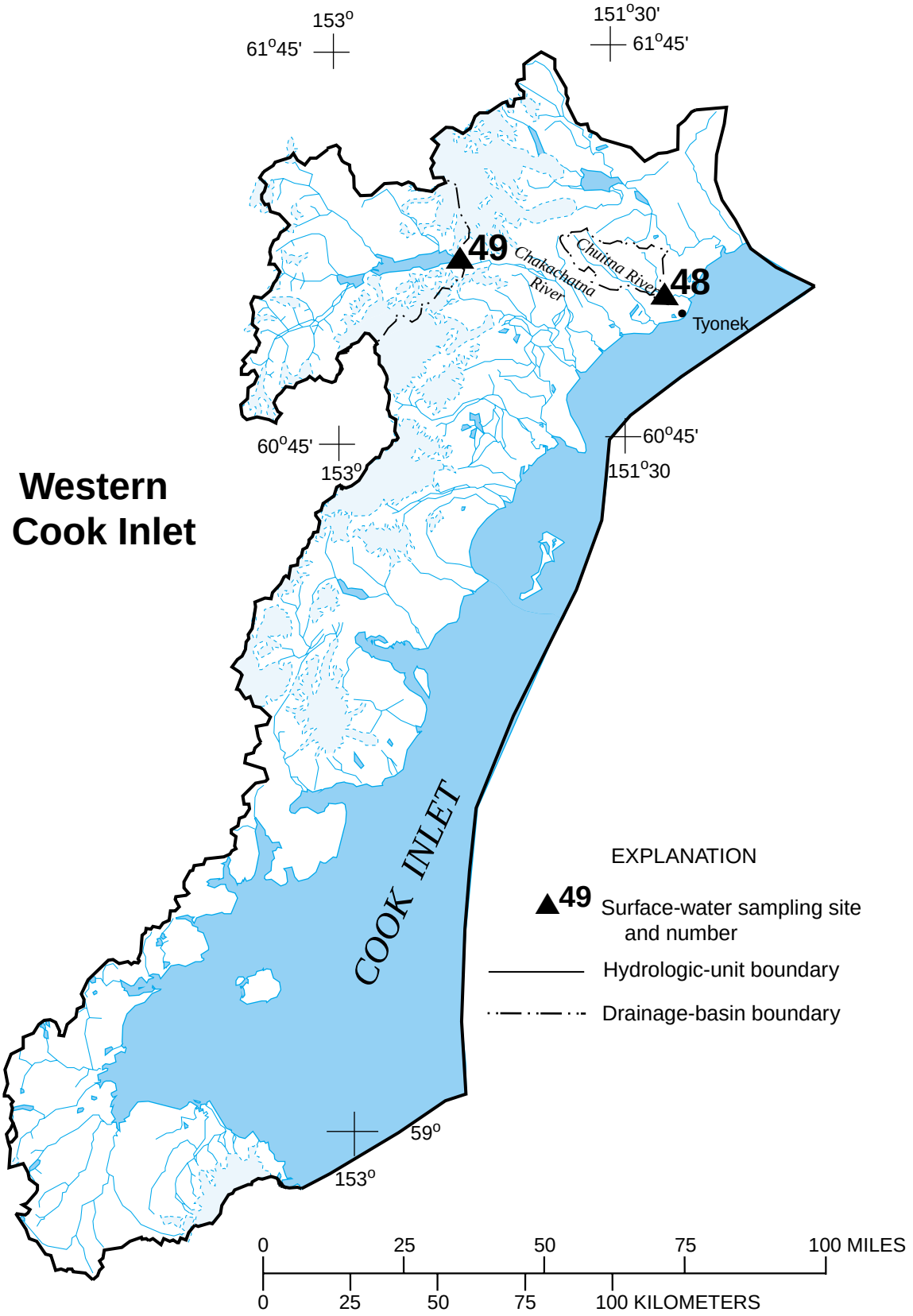

Figure 7. Selected surface-water quality sampling sites in western Cook Inlet Basin, Alaska.

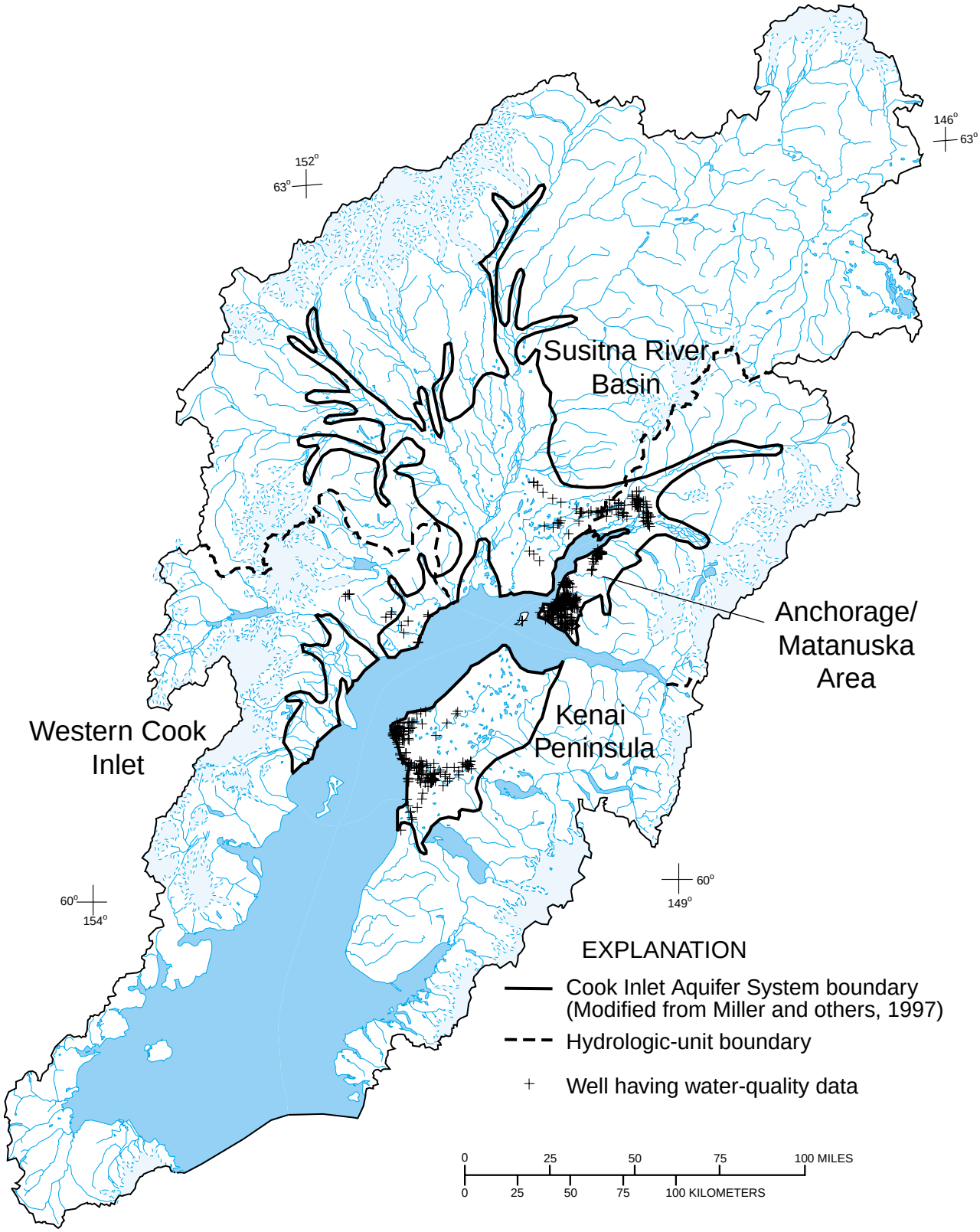

Figure 8. Cook Inlet aquifer system and location of sampled wells in the Cook Inlet Basin, Alaska.

EFFECTS OF GLACIERS ON STREAMFLOW

The annual discharge cycles of streams whose basins contain as little as 5 percent glacier ice are much different from those of stream basins having no glaciers. The 192-square-mile Eagle River Basin (fig. 5A) is about 13 percent glacier covered, whereas the 134-square-mile Ninilchik River Basin (fig. 4) has no glaciers. The differences in streamflow in the Eagle and Ninilchik Rivers can be seen from their daily mean discharges shown on figure 9. Both glacier-fed and nonglacial streams in the Cook Inlet Basin begin to freeze in November, and stream discharges decline throughout the winter unless recharge occurs. Rapid spring warming results in snowmelt and ice breakup during April or May. The Ninilchik River Basin, about 120 mi southwest of the Eagle River Basin, warms earlier in the year and its snowmelt peak is about one month prior to that in the Eagle River. In nonglacial streams, such as the Ninilchik River, streamflows decline rapidly and steadily during warm and dry summer periods whereas streamflows in glacier-fed streams remain at high levels through summer due to melting of snow and ice. In both types of streams, intense rainfall can result in brief high flows during spring, summer, or autumn. Large peaks commonly occur in glacial basins during autumn when warm rains rapidly melt glacier ice and new-fallen snow.

Flows in some glacier-fed streams can also be greatly affected by the sudden draining of water from lakes that form on or along a glacier (Post and Mayo, 1971). The Kenai River is affected by intermittent outbursts from two glacier-dammed lakes: one in the headwaters of the Snow River east of Kenai Lake and the other in the headwaters of the Skilak River southeast of Skilak Lake (fig. 4). The glacial-lake outburst in the Snow River watershed typically occurs every 2 to 3 years. Flooding caused by glacial-lake outbursts can be devastating, especially if it occurs during winter when the stream channel is frozen and contains much ice, or during open-water periods when streamflows are already high from snowmelt or rainfall runoff.

FACTORS AFFECTING WATER QUALITY

Water is continually subject to chemical and biological changes as it progresses through the hydrologic cycle. The quantity and kinds of minerals and compounds dissolved in water depend on the natural and man-affected environments through which the water has passed. Rain and snow are usually quite pure. As water from rain and snowmelt passes over and through vegetation, soils, and rocks, the water picks up soluble compounds and organic materials. The water carried in streams is made up of runoff from precipitation and ground water that infiltrates into the stream channel. During winter low-flow periods, much of the streamflow is contributed by ground water and therefore has higher concentrations of dissolved minerals than the very high streamflows resulting from runoff of rainfall and melting snow and ice. In the Talkeetna River (fig. 6), which has about 7 percent of its basin covered by glaciers, concentrations of dissolved solids are commonly less than 100 mg/L during summer and slightly greater than 100 mg/L during winter (fig. 10). This glacier-fed stream transports high concentrations of suspended sediment (greater than 500 mg/L) during heavy meltwater runoff, usually in mid- or late summer. During winter, suspended-sediment concentrations are commonly 20 mg/L or less.

Water composition is affected by many factors including mixing of ground-water discharge and surface runoff; reactions of the water with organic matter and with mineral solids in the soil, aquifer, streambed, or in suspension; reactions among solutes; plants growing in and near the stream; water-dwelling biota; and human activity. Many of these factors are beneficial, but some can result in conditions that are detrimental to aquatic organisms and make water unfit for human consumption.

The Alaska Department of Environmental Conservation (ADEC) (1996, p.12) states that petroleum products constitute the primary contaminant of water in Alaska: approximately 90 percent of about 2,700 contaminated sites in Alaska are polluted with petroleum. Other water

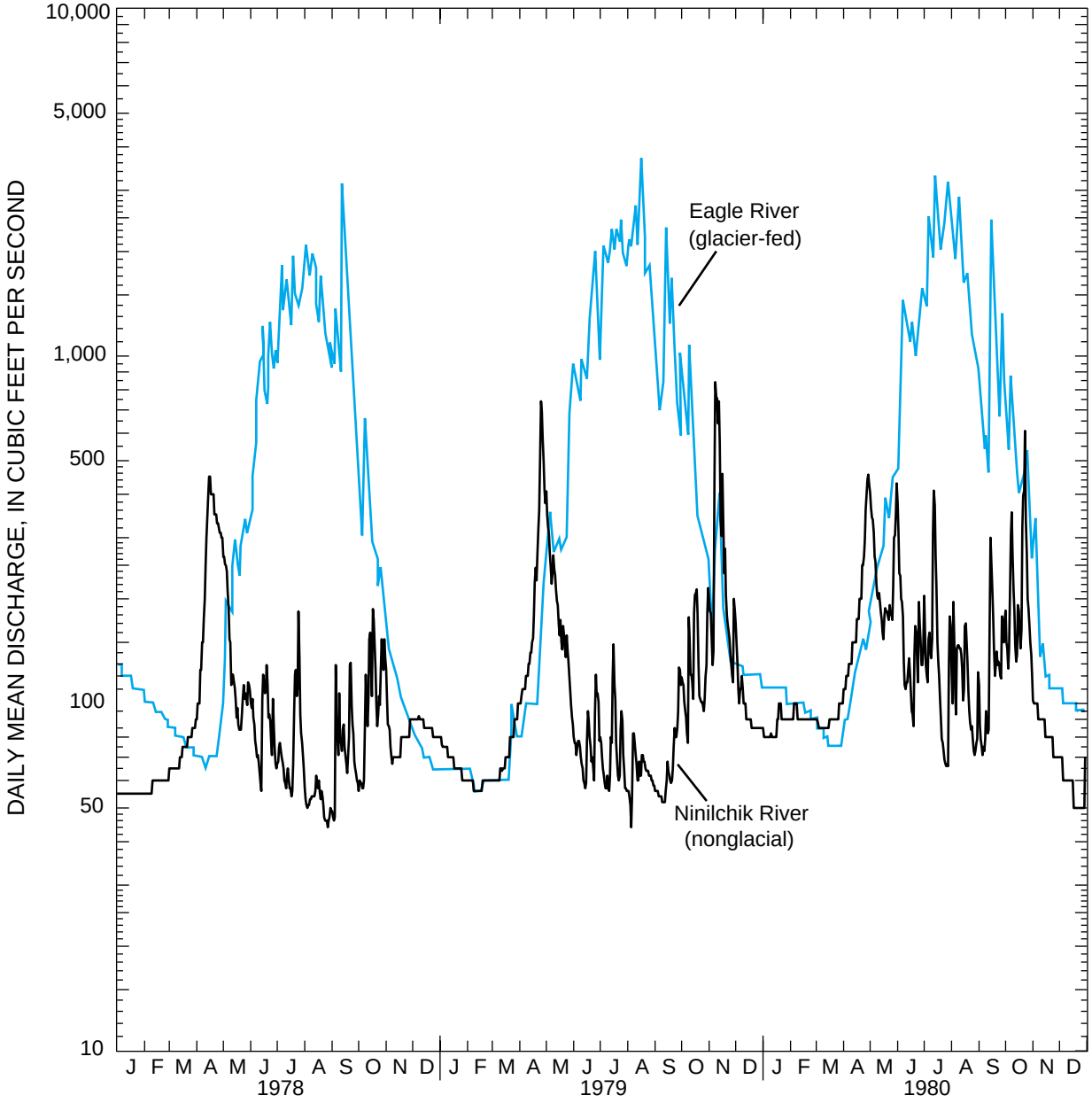

Figure 9. Daily mean discharges of the Ninilchik River (site 7) and the Eagle River (site 30), 1978-80 (see figure 3 for locations).

contaminants include chlorinated solvents, nitrate, and fecal coliform bacteria. Nitrate occurs naturally in water in association with nitrogen-fixing organisms, but on-site septic systems, fertilizers, and animal wastes also add nitrate to water. Arsenic and iron compounds are present naturally in many rocks within Alaska and high concentrations of arsenic and iron in water also occur in some areas.

Runoff from residential, commercial, industrial, and agricultural areas delivers trace elements, organic compounds, and bacteria to streams and shallow aquifers. Several streams in Anchorage have nearly pristine water in the upper parts of their watersheds. However, the water becomes impaired as each stream flows

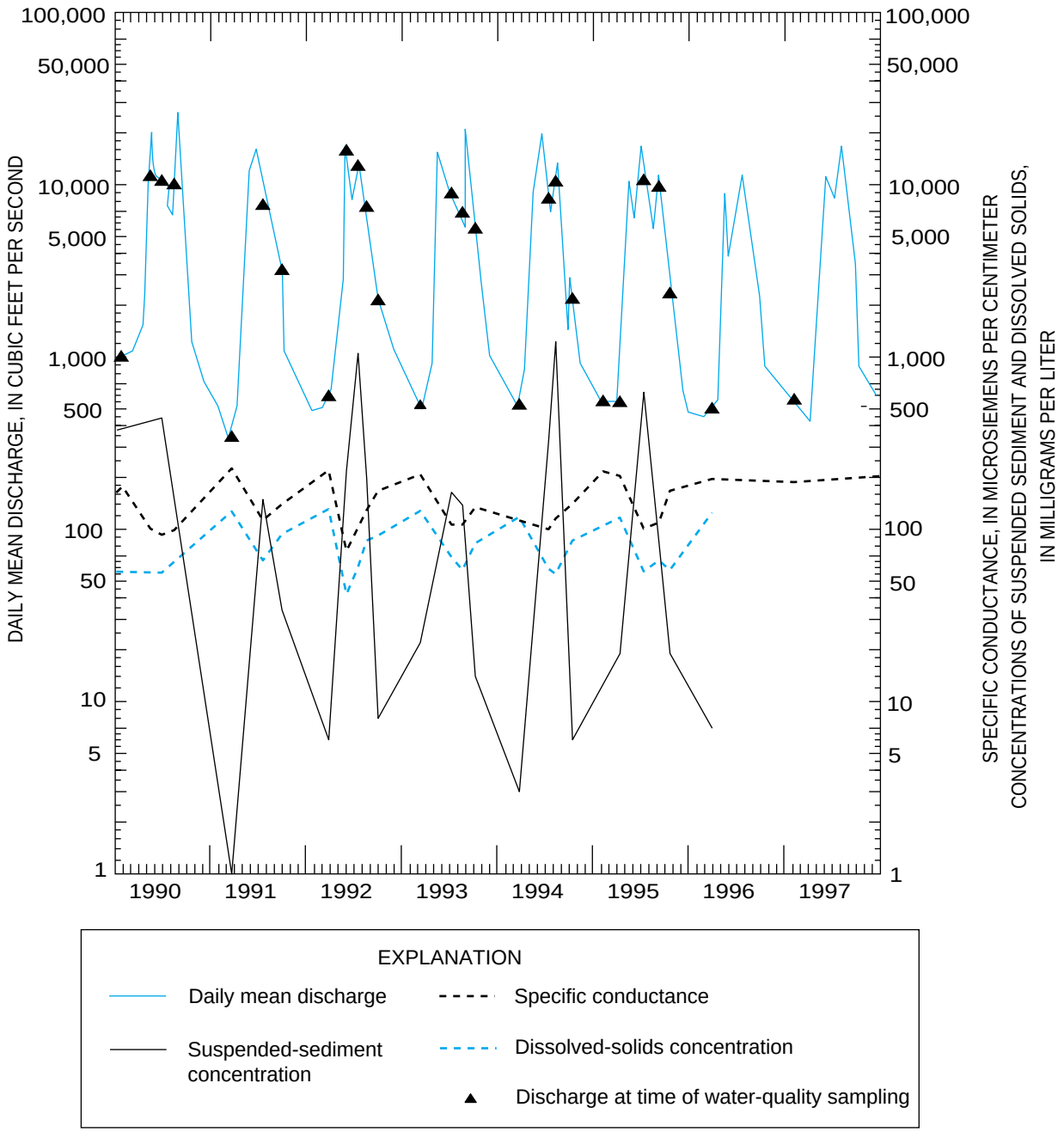

Figure 10. Stream discharge, specific conductance, and concentrations of selected constituents in the Talkeetna River (site 41), 1990-97 (see figure 3 for location).

through residential, commercial, and industrial areas in their lower reaches. Large numbers of waterfowl and domestic animals also contribute bacteria and nutrients to Anchorage's streams and lakes. Within the study unit, ADEC (1996) lists parts of several Anchorage streams and lakes as being water-quality impaired. Surface-water bodies included in this list are Ship, Furrow, Little Rabbit, Little Campbell, Chester, and Fish Creeks; Hood, Spenard, University, Campbell, Jewel, and Cheney Lakes; and Westchester Lagoon (fig. 5B).

The development, refining, transportation, and storage of oil and gas can affect water quality by spilling or leaking of petroleum products or filling of wetlands. Timber harvesting and road building can increase erosion, resulting in sedimentation of streams and deterioration of fish spawning habitat. Loss of streamside vegetation can also degrade fish-rearing habitats by increasing water temperatures and reducing protective cover. Mining can also add sediments to stream water and alter its chemistry. Waters affected by mine drainage may have increased acidity and trace-element concentrations. Seafood processing can add large amounts of organic materials to water bodies. These organic materials decay and reduce the oxygen concentration of water.

Recreation activities may also affect water quality. Fishing and boating can degrade water quality and fish habitat by eroding streambanks, widening streams, increasing water turbidity, and reducing vegetative canopy cover, which can also increase water temperature. Fuel spills, underwater outboard engine exhaust, bilge and deck wash water, and human and fish wastes also degrade water quality.

WATER- QUALITY CRITERIA

Water-quality conditions needed for public health, aquatic life, and recreation have been established by the Federal and State governments. Some of the current Federal and State drinking-water criteria (U.S. Environmental Protection Agency, 1986a, 1986b, 1986c, 1996; Alaska Department of Environmental Conservation, 1994 and 1997a, 1997b) are listed in tables 1 and 2. Concentrations of major metals and trace elements that apply to Federal drinking-water and freshwater-aquatic criteria are for total-recoverable concentrations. A maximum contaminant level goal (MCLG) is a non-enforceable health goal that is set by the Federal government at a level at which no known or anticipated adverse effects on the health of humans occur and at a level that allows an adequate margin of safety. A maximum contaminant level (MCL) is an enforceable standard that must be set as close to the MCLG as is feasible. In this context, "feasible" is defined in the Safe Drinking Water Act as meaning the use of the best technology, treatment techniques, and other means that the Administrator of the U.S. Environmental Protection Agency finds generally available (taking costs into consideration). A secondary maximum contaminant level (SMCL) represents a reasonable goal for drinking water that is intended as a guideline for the States and is not a federally enforceable standard. When a constituent exists at a level greater than the SMCL, health implications as well as aesthetic degradation may exist. In general, State drink-

Table 1. Selected Federal drinking-water standards

[From U.S. Environmental Protection Agency (1986a, b, c and 1996); µg/L, microgram per liter; mg/L, milligram per liter; --, no constituent criteria]

Constituent or property and unit	Maximum contaminant level	Maximum contaminant level goal	Secondary maximum contaminant level
pH, in standard units	--	--	Minimum 6.5 Maximum 8.5
Sulfate, in mg/L as SO_4	500	500	250
Chloride, in mg/L as Cl	--	--	250
Fluoride, in mg/L as F[a]	4	4	2
Dissolved solids, in mg/L	--	--	500
Nitrate, in mg/L as N	10	10	--
Nitrite, in mg/L as N	1	1	--
Arsenic, in µg/L as As[a]	50	--	--
Barium, in µg/L as Ba	2,000	2,000	--
Cadmium, in µg/L as Cd	5	5	--
Chromium, in µg/L as Cr	100	100	--
Copper, in µg/L as Cu (at tap)	[b]1,300	1,300	1,000
Iron, in µg/L as Fe	--	--	300
Lead, in µg/L as Pb (at tap)	[c]15	0	--
Manganese, in µg/L as Mn	--	--	50
Mercury, inorg., in µg/L as Hg	2	2	--
Selenium, in µg/L as Se	50	50	--
Silver, in µg/L as Ag	--	--	100
Zinc, in µg/L as Zn	--	--	5,000

[a]Under review
[b]Copper, treatment technology action level is 1,300 µg/L
[c]Lead, treatment technology action level is 15 µg/L

ing-water standards for public water systems (ADEC, 1994) closely follow Federal maximum contaminant levels and secondary maximum contaminant levels. Criteria for water-contact recreation (ADEC, 1997a, 1997b) (table 2) are set to minimize hazards to human contact and minimize interference with the water's use.

The Federal water-quality criteria for freshwater aquatic life (table 3) are divided into two categories based on toxicity. Acute toxicity refers to short-term effects on the biotic system that often result in the death of organisms, whereas chronic toxicity refers to long-term effects on aquatic organisms (U.S. Environmental Protection Agency, 1986a)

Table 2. Selected Alaska water-quality standards for fresh surface water

[From Alaska Department of Environmental Conservation (1994, 1997a, b); col/100 mL, fecal coliform bacteria colonies per 100 milliliters; mg/L, milligram per liter; -- no constituent criterion]

Constituent or property and unit	Drinking-water supply	Water-contact recreation	Growth and propagation of fish, shellfish, other aquatic life, and wildlife
Range of allowable values			
pH, in standard units	6.0 - 8.5	6.0 - 8.5	6.5 - 9.0
Minimum allowable concentration			
Dissolved oxygen, in mg/L	≥ 4	≥ 4	>7[a]
Maximum allowable temperature or concentration			
Water temperature, in degrees Celsius	15	30	At any time: 20 Migration routes: 15 Spawning areas: 13 Rearing areas: 15 Egg/fry incubation: 13
Fecal coliform bacteria, in col/100 mL[b]	20	100	--
Sulfate, dissolved, in mg/L as SO_4	200	--	--
Chloride, dissolved, in mg/L as Cl	200	--	--
Dissolved solids, in mg/L	500	--	1,500
Sediment	No measurable increase in concentration of settleable solids above natural conditions	No measurable increase in concentration of settleable solids above natural conditions	The percent accumulation of fine sediment in the range of 0.1-4.0 mm in the gravel bed may not be increased more than 5% by weight above natural conditions[a]

a.In water used by anadromous and resident fish
b.Based on the mean value of a minimum of 5 samples taken in a 30-day period

Table 3. Selected Federal water-quality criteria for freshwater aquatic life

[From U.S. Environmental Protection Agency (1986a); µg/L, microgram per liter; mg/L, milligram per liter; --, no constituent criterion]

Constituent or property and unit	Criteria for freshwater aquatic life	
	Acute toxicity[a]	Chronic toxicity[b]
Range of allowable values		
pH, in standard units	--	6.5-9.0
Minimum concentration		
Alkalinity, in mg/L as $CaCO_3$	--	20
Dissolved oxygen, in mg/L	3.0	5.5
Maximum concentration		
Temperature, in degrees Celsius	Species dependent	Species dependent
Ammonia, in mg/L	pH and temperature dependent	pH and temperature dependent
Arsenic, total trivalent, in µg/L as As	360	190
Cadmium, in µg/L as Cd	[c]3.9	[c]1.1
Chromium, in µg/L as Cr		
Chromium, hexavalent	16	11
Chromium, trivalent	[c]1,700	[c]210
Copper, in µg/L as Cu	[c]18	[c]12
Cyanide, in mg/L as Cn	0.022	0.0052
Iron, in µg/L as Fe	--	1,000
Lead, in µg/L as Pb	[c]82	[c]3.2
Mercury, in µg/L as Hg	2.4	0.012
Nickel, in µg/L as Ni	[c]1,800	[c]96
Selenium, in µg/L as Se	260	35
Silver, in µg/L as Ag	[c]4.1	0.12
Zinc, in µg/L as Zn	[c]320	47

a.Highest 1-hour average concentration that should not cause unacceptable toxicity to aquatic organisms during short-term exposure.
b.Highest 4-day average concentration that should not cause unacceptable toxicity to aquatic organisms during long-term exposure.
c.Hardness level of 100 mg/L used to calculate criterion

SOURCES OF WATER-QUALITY AND ANCILLARY DATA

Many government agencies, industries, and citizen groups have collected water or biological samples from streams and wells in the Cook Inlet study unit for a host of purposes. These purposes include determining if water is safe for drinking or swimming; has been degraded by human activities; or meets an industry's manufacturing needs or its permit requirements. Water and biological samples are also collected to determine natural ranges or trends in physical properties, chemical concentrations, or biological diversity. The needs, uses, and types of water-quality data vary widely, and data collected for one purpose are not necessarily suitable for other purposes.

Ground-Water Data

Programs for monitoring ground-water-quality throughout Alaska are described by Maynard (1988a, 1988b). She states that procedures for collecting and analyzing water samples are commonly undocumented, the quality of the data can be uncertain, and data that have not been entered into computer data bases are generally inaccessible. Fortunately, since 1988, more water-quality programs are documenting their procedures and more data are being entered into computer data bases.

Most ground-water-quality monitoring data in Alaska are generated by various programs administered by ADEC. These programs require, among other things, monitoring of public water-supply systems, waste-disposal sites (landfills, wastewater lagoons, hazardous-waste sites, sewage-sludge land-application sites, and injection wells), or contaminated sites. Most data collected by these programs are filed manually along with other facility information at ADEC's region or district offices. Studies of ambient conditions are usually one-time sampling events or are studies lasting for a year or two. Most ground-water studies are in or near areas having known water-quality degradation or in areas of suspected water-quality problems. Except indirectly for public water-supply monitoring, no Federal, State, or local agencies routinely collect ground-water samples to determine ambient conditions in aquifers in the Cook Inlet study.

Monitoring of public-water supplies usually involves treated water, which is water that has passed through filters or chemical chambers to remove sediment, hardness, nitrate, iron, arsenic, or other undesirable constituents. Treated water also commonly has had chemicals such as chlorine and fluoride added to it to reduce the concentrations of bacteria and viruses or to improve the dental health of children. The actual source of water sampled from a public supply is not always known. The water may be a mixture of water from several wells whose locations and depths are unknown.

Most ground-water development in the study unit has been in unconsolidated aquifers in communities on the road system. Few ground-water quality data have been collected outside of major communities or from bedrock aquifers.

Surface-Water Data

Programs to monitor surface-water quality in the study unit have included long-term studies on the Talkeetna and Susitna Rivers; studies on urban runoff, fisheries, and local-area hydrology; and government-required monitoring of public-water supplies, waste-disposal sites, and contaminated sites. Water from the Talkeetna River has been sampled up to four times each year by USGS from 1966-96 as part of the federally funded Hydrologic Benchmark Program. This program is a network of about 50 sites in small drainage basins around the U.S. whose purpose is to provide consistent data on hydrology, water quality, and related factors in representative undeveloped watersheds nationwide (Alexander and others,

1996). The Benchmark Program provides analyses on a continuing basis that can be used to compare and contrast conditions in basins more obviously affected by human activities. Susitna River at Susitna Station (site 46, fig. 3) was sampled about four times each year by USGS from 1975-86 as part of the federally funded National Stream Quality Accounting Network (NASQAN) program. This program's objective was to describe long-term water-quality trends of the Nation's largest rivers by measuring concentrations and mass transport of dissolved and suspended constituents, including nutrients, major ions, dissolved and sediment-bound heavy metals, common pesticides, and inorganic and organic forms of carbon. The Kenai River and its major tributaries have been sampled intermittently by the Alaska Department of Fish and Game since 1990 to determine concentrations of nutrients, major ions, and heavy metals and how they influence aquatic life. Similar sampling of Hidden Lake (fig. 4) in the Kenai River watershed has been conducted by Cook Inlet Aquaculture Association since 1980.

Agencies and Organizations

Federal Agencies

The U.S. Geological Survey has collected water-quality samples and measured streamflows and ground-water levels during numerous hydrologic studies that were done in cooperation with other Federal, State, and local agencies. Stream and lake sites throughout Alaska at which data have been collected are available from the internet at *http://ak.water.usgs.gov.* Rickman (1993a) describes the water quality of six Alaskan streams, including the Talkeetna River. Madison and others (1988) describe the quality of ground water in Alaska. Within the study unit, USGS has measured daily streamflows at about 90 sites, collected more than 7,000 water samples from streams at about 380 sites, and collected ground-water samples from about 700 wells. Maurer and Woods (1987) indexed limnological data for southcentral Alaska lakes. Water-resources data such as daily streamflows, water-quality analyses, and groundwater levels collected by USGS, are published in annual reports and in computerized data bases. Much of these data are available at *http:// ak.water.usgs.gov.*

Several USGS reports describe geologic, hydrologic, and water-quality conditions in the study unit, some of which are listed below. The water resources of Cook Inlet Basin are described by Balding (1976, p. 182-195), Freethey and Scully (1980), and Brabets and others (1999). Jones and Fahl (1994) describe the magnitude and frequency of floods, and Parks and Madison (1985) describe flow and water-quality characteristics of Alaskan streams.

Some of the USGS reports describing ground-water conditions on the Kenai Peninsula include Cederstrom and others (1950), Waller and others (1968), Anderson (1971), Anderson and Jones (1971, 1972), Nelson and Danskin (1980), Nelson and Johnson (1981), Nelson (1981), and Glass (1996). Surface-water conditions on the peninsula are described by Anderson and Jones (1972), Scott (1982), Savard and Scully (1984), Bailey and McIntire (1993), Rickman (1993b, 1995, 1996, 1998a, 1998b), Dorava (1995), Hall (1995), Dorava and Liepitz (1996), and Dorava and Moore (1997).

Selected USGS Anchorage area reports include studies of ground-water conditions by Cederstrom and others (1964), Zenone and others (1974), Zenone (1976), Johnson (1979), Emanuel and Cowing (1982), Brunett and Lee (1983), and Patrick and others (1989). Streams and surface-water quality in Anchorage are described by Barnwell and others (1972), Dearborn and Barnwell (1975), Donaldson and Still (1975), Donaldson (1976), Brabets and Wittenberg (1983), Brabets (1987, 1993), Glass and Brabets (1988), and Lipscomb (1991). Conditions near landfills are described by Nelson (1982) and Brunett (1990).

USGS studies in the Matanuska and Susitna River Basins include those by Trainer (1960), Feulner (1971), Woods (1985), Knott and Lipscomb (1983, 1985), Knott and others (1986, 1987), and Glass (1983). Western Cook Inlet Basin reports include those by Scully and others (1980, 1981), Nelson (1985), Dorava and Waythomas (1994), and Waythomas and Dorava (1997).

The National Park Service manages approximately 6,300 mi^2 within the study unit, which includes parts of four parks: Denali National Park and Preserve, Lake Clark National Park and Preserve, Katmai National Park and Preserve, and Kenai Fjords National Park (fig. 1). Summaries of surface-water-quality data are reported for Denali (National Park Service, 1995), Lake Clark (National Park Service, 1997), and Katmai Parks (LaPerriere, 1996).

The National Resources Conservation Service (NRCS), formerly the Soil Conservation Service, primarily conducts soil and snow surveys. The NRCS also helps support the Homer Soil and Water Conservation District collect basic physical, chemical, bacteriological, and macroinvertebrate information from several Kenai Peninsula streams whose basins are currently being logged.

The U.S. Air Force samples water from Ship Creek and from approximately 130 shallow wells near sites of contamination at Elmendorf Air Force Base (fig. 5B) in Anchorage. Typically, water samples for metals and volatile organic compounds are collected twice annually. Drinking water is also checked for fecal coliform bacteria at about 40 sites on the base.

The U.S. Army periodically samples water from about 30 wells near sites of contamination on Fort Richardson (fig. 5B) in Anchorage for volatile organic compounds. Drinking water is also checked for fecal coliform bacteria at several sites on the reservation. Water quality and biology (benthic macroinvertebrates and diatoms) were studied in Ship Creek to determine the effects of discharging warm water from a power plant and fish hatchery (U.S. Army, 1975). Water use and water rights on Ship Creek are summarized by Quirk (1997).

The U.S. Army Corps of Engineers performs environmental assessments of military reservations, delineates flood plains of rivers, builds flood-control structures, and helps local agencies improve fish habitat and reduce streambank erosion by modifying stream channels and culverts. Their efforts in the study unit include assessing the Kenai River watershed and rehabilitating stream channels on the Kenai River near Soldotna (fig. 4).

U.S. Fish and Wildlife Service (USFWS) manages the 3,000-square-mile Kenai National Wildlife Refuge (fig. 1). In 1998, water-quality monitoring started in the Kenai and Russian Rivers and in Kenai, Skilak, and Lower Russian Lakes (fig. 4). Monitoring includes determining physical properties and chemical concentrations in water, riverbed sediments, and fish tissues, and determining the types of algae and benthic macroinvertebrates present. USFWS also coordinates water-related educational activities with schools and citizens groups, including monitoring of water and macroinvertebrates in Slikok Creek in Soldotna and Crooked Creek in Kasilof (fig. 4).

The U.S. Forest Service (USFS) manages Chugach National Forest (fig. 1), of which about 1,800 mi^2 are within the study unit. The USFS has conducted studies on the Russian River (fig. 4), a popular fishing area and tributary to the Kenai River (Blanchet, 1994); the effects of placer mining on water quality in streams in the northeastern part of the Kenai Peninsula (Blanchet, 1981; Huber and Blanchet, 1992); and arsenic concentrations in Primrose Creek, a gold mining area and tributary to Kenai Lake (Dave Blanchet, U.S. Forest Service, written commun., 1984). From 1988 through 1990, turbidity and suspended-sediment concentrations downstream from placer

mining operations in the Resurrection Creek (fig. 4) watershed were generally within State water-quality standards; observed concentrations were generally less than the maximum allowed concentrations.

State Agencies

The ADNR, the ADEC, and other agencies have collaborated to form the Cook Inlet Information Management and Monitoring System, which can be found on the internet at *http://www.dnr.state.ak.us/ssd/ciimms/index.html*. This information system will eventually have links to water-quality and biology data for the Cook Inlet Basin.

The ADEC administers several programs that collect water-quality information and works with local governments, industry, and citizen groups to assess, monitor, protect, and restore water quality. ADEC is developing water-quality-protection programs using a watershed-management approach. Suppliers of public drinking water are required to periodically analyze water samples and submit the results to ADEC's Drinking Water Section. Water-quality analyses from more than 1,740 public water-supply systems in the Cook Inlet study unit are entered into a computerized ADEC data base. Operators of some waste-disposal facilities, such as municipal landfills, are also required to submit results of water-quality analyses to ADEC. Paper copies of results are stored in manual files. The Contaminated Sites Remediation Section maintains a computerized data base that contains information on contaminated sites. Approximately 1,300 contaminated sites are in the study unit; however, most results submitted are stored in manual files at ADEC. ADEC has collected and analyzed water from streams such as the Kasilof River (fig. 4) in 1990 (ADEC, 1991) and Ship Creek (fig. 5B) in 1997 (Kevin Boden, Alaska Department of Environmental Conservation, written commun., 1997). ADEC (1988) has also described areas of ground-water contamination, such as petroleum contamination in Anchor Point (fig. 4). As required by sections 305(b) and 303(d) of the Clean Water Act, lakes and streams for which water-quality conditions do not meet criteria because of point and nonpoint sources of pollution are summarized biannually by ADEC for the U.S. Environmental Protection Agency. More than a dozen lakes or streams within Anchorage were identified as being water-quality impaired in the 1996 assessment (ADEC, 1996); almost all had high concentrations of fecal coliform bacteria.

The Alaska Department of Fish and Game (ADFG) has collected water-quality information from several lakes and a few streams in the Cook Inlet Basin, mostly on the Kenai Peninsula. Data from lakes include biological measurements, such as phytoplankton and zooplankton counts; physical properties, such as water-column temperatures, conductivity, secchi-disk depths, light penetration, and dissolved-oxygen concentrations; and chemical concentrations, especially nutrients such as nitrogen and phosphorus. Lakes on the Kenai Peninsula having the most data are Hidden, Upper Trail, Lower Trail, Tustumena, Skilak, and Kenai Lakes (fig. 4). Biological, physical, and chemical properties have also been collected from the Kenai River (fig. 4) and its tributaries (Litchfield and Kyle, 1991, 1992). More than 100 reports on chinook, sockeye, and coho salmon production in the Kenai River watershed are listed by Boggs and others (1997a).

Personnel from the ADNR have collected water-quality samples from streams, lakes, and wells within the Cook Inlet Basin. They have also measured streamflows and ground-water levels during numerous short-term hydrologic studies. Water samples were collected to determine ambient conditions or whether the water had been degraded by human activities. Water-quality data are published in reports; in addition, analytical results from many ADNR, ADEC, and consultant reports have been entered into ADNR computerized data bases. Much of the ancillary data such as well logs,

stream-basin characteristics, stream discharges, water use, lake information, published reports, and Geographic Information System data are also stored in computerized data bases. Some areas studied by ADNR and their reports are described in the following paragraphs.

For the State of Alaska, Munter (1987) describes the availability of ground-water data and Maynard (1988a, 1988b) describes ground-water-quality monitoring networks. A guide to what types of geologic and geology-related data are available for Alaska and how they can be accessed was compiled by Daley (1998) and is available on the internet at *http://wwwdggs.dnr.state.ak.us*.

The salinity of ground water within sedimentary rocks in Cook Inlet Basin is reported by McGee (1977). All the commercial oil accumulations in the Cook Inlet area are associated with salt water, but fresh water is needed for domestic, commercial, and industrial uses. Thick fresh-water zones occur near the basin edges where porous and permeable rocks are exposed to streams and other sources of fresh water and in areas where sediments were originally deposited in fresh water. Thinnest or non-existent fresh-water zones occur beneath Cook Inlet, where the sedimentary section has not been exposed to fresh water. The Homer/Anchor Point (fig. 4) area has a relatively thin fresh-water zone.

Limnological and streamflow data for the Kenai Peninsula are reported by Maurer (1988) and by Inghram and Ireland (1990). Kenai River erosion is described by Inghram (1985). Ground-water conditions have been studied for several areas on the Kenai Peninsula where contamination has occurred or is suspected, including Anchor Point (Munter and Maurer, 1992; Petrik, 1993), Nikiski (Maurer, 1993), and Sterling (Maurer and Ireland, 1994; Munter and Maurer, 1994) (fig. 4). Part of an aquifer supplying water to Anchor Point was contaminated by petroleum. Soils and ground water beneath several chemical- and petroleum-related industrial sites in Nikiski are contaminated, and a chemical-waste-disposal site and petroleum-contaminated site are in Sterling.

In the Municipality of Anchorage, several ground- or surface water studies have been performed by ADNR in the following areas (fig. 5A): Girdwood (Carrick and Maurer, 1994), Potter Marsh (Maurer, 1997), and the communities of Eagle River (Munter and Allely, 1992) and Peters Creek (Munter, 1986). In Peters Creek, a leak or spill of petroleum contaminated an aquifer and caused about 15 domestic wells to yield waters that have concentrations of benzene greater than drinking-water standards. Surface-water conditions in the Matanuska River watershed are described by Maurer (1998) and in the Houston area by Collazzi and others (1988). Ground-water conditions are reported for the Palmer (Jokela and others, 1990; LaSage, 1992), Houston (Maynard, 1987), and Big Lake areas (Dearborn and Allely, 1983). Chemical and biological conditions in streams in a coal-bearing area in western Cook Inlet (fig. 7) are described by Maurer (1987).

The University of Alaska also collects information relating to water quality. The university's Alaska Natural Heritage Program has inventoried over 460 computerized and manual data sets that may be useful for watershed management within Alaska (Boggs and others, 1997b). The Natural Heritage Program has also described the aquatic resources of the Kenai River watershed and compiled a bibliography of reports that describe the Kenai River watershed's aquatic, wetland, and terrestrial resources (Boggs and others, 1997a). The university's Environmental and Natural Resources Institute and its Institute of Arctic Biology have studied the abundance and diversity of benthic macroinvertebrates in many streams within the Kenai Peninsula and Anchorage (Milner and Oswood, 1990 and 1996). The university's Cooperative Extension Service helps educate people about water quality. Selkregg (1976)

describes the environmental characteristics of the southcentral Alaska region.

Local Agencies

The Municipality of Anchorage (MOA) has conducted several short-term studies of the water quality of streams, lakes, and shallow ground water within municipal boundaries (James M. Montgomery, Consulting Engineers, Inc., 1990). High concentrations of fecal coliform bacteria occur in numerous lakes and streams. Analytical results from area-wide monitoring by consulting firms are in reports available at the Department of Health and Human Services and at the Department of Public Works. MOA requires homeowners who use private wells to analyze their well water for nitrate and bacteria concentrations when homes are sold. Several small areas on the Anchorage hillside and in the communities of Chugiak and Eagle River (fig. 5A) have wells that yield ground water containing nitrate concentrations greater than the Federal drinking-water standard of 10 mg/L as N (Bristol Environmental Services Corporation, 1997). The MOA Solid Waste Services examines ground-water conditions near its landfills (Montgomery Watson, 1997), and analytical results and ground-water levels from landfill monitoring are in computerized data bases at Solid Waste Services. Concentrations of contaminants are high within the landfills, but concentrations are generally low at short distances from the landfills. Anchorage Water and Wastewater Utility monitors the public drinking-water supply from Ship Creek (fig. 5B), Eklutna Lake (fig. 5A), and several public-supply wells; drinking-water results are submitted to ADEC and entered into ADEC's computerized Drinking Water data base. Sampling of storm water for compliance with National Pollutant Discharge Elimination System (NPDES) permit requirements will be administered by the Department of Public Works. Results from numerous storm-water runoff studies are summarized by Municipality of Anchorage (1997) and are available from the Department of Public Works. Water levels in about 30 wells in Anchorage are measured twice yearly for MOA by USGS and are published in USGS annual water-resources data reports.

The Kenai Peninsula and Matanuska-Susitna Boroughs also monitor their waste-disposal sites and suppliers of public water submit monitoring results to ADEC. No area-wide water-quality or ground-water-level monitoring is performed in these boroughs.

Organizations

Several citizen groups have recently begun monitoring programs to identify pollution, assess trends, characterize local waterways, and educate area residents about local environmental conditions. These groups commonly make physical and chemical measurements such as temperature, pH, dissolved oxygen, nutrients, and turbidity. They also assess living resources such as bacteria, benthic macroinvertebrates, fish, shellfish, birds, and plants. Cook Inlet Keeper is an organization based in Homer that sponsors environmental-education programs and collects environmental data (basic physical, chemical, and bacteriological information) from Kachemak Bay (fig. 4) and several Kenai Peninsula streams. The Cook Inlet Regional Citizens Advisory Council monitors environmental impacts of oil-related activities in Cook Inlet, mostly looking for pollutants in sediments and in tissues of mussels and clams on the shores of Cook Inlet. The Nature Conservancy is developing a water-quality-assessment plan for the Kenai River. The Kenai Watershed Forum monitors pH, specific conductance, water temperature, and dissolved-oxygen content at several sites on the Kenai River. Multi-agency, industrial, and private support have also helped study the water quality of Kenai Peninsula lakes (Eilers and others, 1993), streams, ground water (Swan, 1991), and the Cook Inlet marine environment.

SELECTION OF CONSTITUENTS AND SITES TO BE SUMMARIZED

The NAWQA Program design includes identification of a set of water-quality constituents and properties that will constitute the target variables that help direct the activities of each study unit (Hirsch and others, 1988). The list of target variables (table 4) is compiled on the basis of national and local water-quality issues of interest. Many of the target variables are the subject of Federal regulations, such as those developed under the Safe Drinking Water Act of 1987.

Stream sites described in this report were selected to give a wide geographic distribution. Generally, at least 10 water-quality samples were collected, handled, preserved, and analyzed using known and accepted techniques for each of these streams. Most sites have more than 10 years of daily streamflow records and are in the lower reach of a watershed. Thirty-one stream sites were selected to represent an overview of ambient chemical and physical water-quality conditions. The map numbers of stream water-quality sites on the tables and figures in this report generally follow the map numbering system for stream-gaging stations in the NAWQA environmental setting report (Brabets and others, 1999). Because water-quality conditions are not discussed for each of the stream-gaging stations numbered in the environmental setting report, this water-quality summary contains gaps in the map numbers and the numbers are not sequential. A current list of map numbers is given in appendix 1.

Basin and hydrologic characteristics of the 31 sites, such as locations, drainage areas, and land coverages, are given in table 5. Periods when daily streamflow measurements are available and the average, minimum, and maximum discharges for each site are listed on table 6. The dates when chemical, temperature, sediment, and biological data were collected at each site by USGS are given on table 7. A year is listed in table 7 if one or more samples were collected during that year for a type of water-quality data. For chemical data (table 7), samples from each site were analyzed for one or more of the following constituents at least once during the listed year: major cations and anions, specific conductance, pH, dissolved oxygen, color, trace metals, nutrients, radiochemicals, or pesticides. For water temperature data, continuous or once-daily temperature records were collected. For sediment data, one or more samples per year were analyzed for suspended-sediment concentration and particle-size distribution. For biological data, one or more samples for indicator bacteria, phytoplankton, periphyton, or benthic invertebrates were collected.

Additional information about the 31 sites and references to reports describing water-quality conditions in basins of many of the sites are given on table 8. Almost all water analyzed from these sites were collected and analyzed by USGS; thus only USGS water-quality data were used in the statistical summary (appendixes 2 and 3) and graphic summaries shown later in this report. However, relevant data collected by other agencies and organizations are also discussed later in the text or referenced in table 8.

Ground-water analyses described in this report include the three regions of greatest ground-water usage (Kenai Peninsula, Anchorage/Matanuska area, and Susitna River Basin) as well as western Cook Inlet where ground water is mostly undeveloped (fig. 8). Analyses were limited to water from domestic, commercial, industrial, and public-supply wells, except for those in western Cook Inlet, where all types of wells were used. Analyses were also limited to wells that overlie and most likely yielded water from unconsolidated glacial and alluvial deposits, except for wells in western Cook Inlet, where some test wells yielded water from coal or weakly consolidated sandstone or conglomerate. Water-quality analyses from a total of 564 wells were used to describe general water-quality conditions within the four regions. Additional information about the four ground-water regions and references to reports describing water-quality conditions in them are given on table 9.

Table 4. Inorganic constituents and physical measurements selected as target variables in the National Water-Quality Assessment Program

[Modified from Hirsch and others (1988)]

Constituent	Principal effects			Water-quality issues					Target variables	
	Human health	Eco-systems	Agri-culture	Toxic contami-nation	Nutrient enrich-ment	Acidifi-cation	Salinity	General suitability	Surface water[a]	Ground water
Field measurements										
Specific conductance							X		X	X
pH		X				X			X	X
Temperature		X						X	X	X
Dissolved oxygen		X						X	X	X
Alkalinity		X				X	X	X	X	X
Major constituents and dissolved solids										
Calcium		X	X			X	X	X	X	X
Magnesium		X	X			X	X	X	X	X
Sodium	X	X	X			X	X	X	X	X
Potassium									X	X
Sulfate	X	X				X	X	X	X	X
Chloride		X	X			X	X	X	X	X
Total dissolved solids		X	X				X	X	X	X
Nutrients										
Ammonium		X		X	X				X	X
Nitrate	X	X	X	X	X	X			X	X
Nitrite	X	X	X	X	X				X	X
Total nitrogen		X			X				X	X
Orthophosphate		X			X				X	
Total phosphorus		X			X				X	
Major metals and trace elements										
Aluminum		X	X	X		X			X	
Antimony	X	X		X					X	X
Arsenic	X	X	X	X			X		X	X
Barium	X			X					X	X
Beryllium	X			X					X	
Boron			X				X		X	X
Cadmium	X	X		X		X			X	X
Chromium	X	X		X		X			X	X
Copper		X	X	X		X			X	X
Fluoride	X			X					X	X
Iron								X	X	X
Lead	X	X		X		X			X	X
Manganese								X	X	X
Mercury	X	X	X	X		X			X	X
Molybdenum	X		X	X			X		X	X
Nickel	X			X		X			X	X
Selenium	X	X	X	X			X		X	X
Silver		X		X					X	
Vanadium	X			X					X	X
Zinc		X		X		X			X	

[a]Includes national target variables and candidate study-unit variables measured initially in all surface-water study units

Table 5. Basin and hydrologic characteristics of selected water-quality sites in Cook Inlet Basin, Alaska
[mi^2, square mile; ft/mi, foot per mile; mi, mile; ft, foot; in., inch; °F, degree Fahrenheit]

Map No. (fig. 3)	Station name	USGS station No.	Latitude	Longitude	Drainage area (mi^2)	Main channel slope (ft/mi)	Main channel length (mi)	Mean basin altitude (ft)	Area of lakes and ponds (%)	Area of forests (%)	Area of glaciers (%)	Mean annual precipitation (in.)	Annual snowfall (in.)	Mean minimum January temp. (°F)
Hydrologic Unit 190203 (Drainages on the Kenai Peninsula)														
2	Fritz Creek near Homer	15239500	59°42'30"	151°20'35"	10.4	150	9.8	880	0	68	0	25	70	16
6	Anchor River at Anchor Point	15240000	59°46'21"	151°50'05"	224	51.0	28.0	970	0	53	0	25	80	14
7	Ninilchik River at Ninilchik	15241600	60°02'56"	151°39'48"	[a]134	12.7	21.0	670	1	95	0	20	70	11
8	Kasilof River near Kasilof	15242000	60°19'05"	151°15'35"	738	68.3	55.0	1,810	15	39	28	50	170	10
11	Trail River near Lawing	15248000	60°26'01"	149°22'19"	181	89.0	28.0	2,470	2	9	11	90	90	10
13	Kenai River at Cooper Landing	15258000	60°29'34"	149°48'28"	634	26.8	60.0	2,650	5	13	10	70	140	10
16	Kenai River at Soldotna	15266300	60°28'39"	151°04'46"	[a]1,860	10.7	118	1,750	5	29	11	50	120	8
17	Beaver Creek near Kenai	15266500	60°33'50"	151°07'03"	51.0	4.8	13.5	140	15	67	0	30	60	6
18	Resurrection Creek near Hope	15267900	60°53'40"	149°38'13"	149	126	19.8	2,750	0	24	0	30	65	6
Hydrologic Unit 190204 (Drainages in the Anchorage/Matanuska Area)														
21	Glacier Creek at Girdwood	15272550	60°56'29"	149°09'44"	58.2	455	11.0	2,610	0	28	11	70	160	10
23	South Fork Campbell Creek near Anchorage	15274000	61°09'57"	149°46'15"	[a]26.8	246	11.5	2,530	1	26	0	22	80	6
25	Campbell Creek near Spenard	15274600	61°08'22"	149°55'24"	69.7	162	19.2	1,680	1	46	0	20	70	6
27	Chester Creek at Arctic Boulevard at Anchorage	15275100	61°12'19"	149°53'43"	[a]25.8	169	12.8	780	1	59	0	20	70	6
28	Ship Creek near Anchorage	15276000	61°13'32"	149°38'06"	90.5	119	19.0	3,100	1	13	0	30	80	6
30	Eagle River at Eagle River	15277100	61°18'28"	149°33'32"	192	112	33.5	3,120	1	15	13	40	90	6
32	Knik River near Palmer	15281000	61°30'18"	149°01'50"	1,180	183	43.0	4,000	4	11	54	100	140	9
33	Caribou Creek near Sutton	15282000	61°48'12"	147°40'57"	289	91.1	30.0	4,190	0	10	0	25	80	2
50	Moose Creek near Palmer	15283700	61°41'00"	149°02'36"	[a]54.6	205	15.6	2,849	1	36	2	30	--	5
34	Matanuska River at Palmer	15284000	61°36'34"	149°04'16"	2,070	79.7	77.0	4,000	0	14	12	35	80	4
Hydrologic Unit 190205 (Susitna River Basin)														
35	Little Susitna River near Palmer	15290000	61°42'32"	149°13'36"	61.9	187	14.9	3,700	0	16	5	50	50	4
36	Susitna River near Denali	15291000	63°06'14"	147°30'57"	950	56.6	51.0	4,510	1	1	25	50	400	-6
37	Maclaren River near Paxson	15291200	63°07'10"	146°31'45"	280	133	23.0	4,520	1	0	19	50	400	-6
38	Susitna River near Cantwell	15291500	62°41'55"	147°32'42"	4,140	10.0	107	3,560	2	5	7	30	200	-6
39	Susitna River at Gold Creek	15292000	62°46'04"	149°41'28"	6,160	10.2	189	3,420	1	7	5	30	200	-5
40	Chulitna River near Talkeetna	15292400	62°33'31"	150°14'02"	2,570	23.0	87.0	3,760	1	22	27	55	250	-5
41	Talkeetna River near Talkeetna	15292700	62°20'49"	150°01'01"	[a]1,902	35.0	90.3	3,630	0	25	7	35	150	-2
42	Willow Creek near Willow	15294005	61°46'51"	149°53'04"	166	100	28.0	2,890	1	24	0	30	50	2
44	Deshka River near Willow	15294100	61°46'05"	150°20'13"	[a]564	10.6	86.6	492	5	56	0	25	100	-2
46	Susitna River at Susitna Station	15294350	61°32'41"	150°30'45"	19,400	11.0	289	3,200	2	21	11	35	190	0
Hydrologic Unit 190206 (Drainages in Western Cook Inlet)														
48	Chuitna River near Tyonek	15294450	61°06'31"	151°15'07"	131	53.7	31.5	1,120	2	44	0	45	80	2
49	Chakachatna River near Tyonek	15294500	61°12'30"	152°13'36"	1,120	48.8	54.5	3,900	4	17	30	80	400	0

[a]Drainage area revised from previously published values

Table 6. Streamflow characteristics of selected water-quality sites in Cook Inlet Basin, Alaska

[ft^3/s, cubic foot per second; in/yr, inch per year; --, not determined]

Map No. (fig. 3)	Station name	Period of daily streamflow record (calendar year)	Average[a]		Discharge			
			Discharge (ft^3/s)	Runoff (in/yr)	Minimum (ft^3/s)	Date	Instantaneous maximum (ft^3/s)	Date
Hydrologic Unit 190203 (Drainages on the Kenai Peninsula)								
2	Fritz Creek near Homer	1985-92	12	16.2	2	8-15-90[b]	380	11-29-83
6	Anchor River at Anchor Point	1953-66	298	--	28	7-28-53	11,000	11-30-83
7	Ninilchik River at Ninilchik	1963-85	107	11.3	30	7-20-66	1,240	4-24-74
8	Kasilof River near Kasilof	1949-70	2,293	43.9	19	4-2-64	13,000	8-24-77
11	Trail River near Lawing	1947-74	780	58.5	48	2-9-49[b]	7,480	9-18-67
13	Kenai River at Cooper Landing	1947-present	2,824	60.5	100	3-28-64	23,100	9-21-74
16	Kenai River at Soldotna	1965-present	5,919	37.0	770	4-1-66	42,200	9-24-95
17	Beaver Creek near Kenai	1967-78	26	6.9	8.2	10-23-69	700	10-11-86
18	Resurrection Creek near Hope	1967-86	275	25.1	38	4-1-85[b]	3,380	7-12-80
Hydrologic Unit 190204 (Drainages in the Anchorage/Matanuska Area)								
21	Glacier Creek at Girdwood	1965-78	265	--	10	3-24-77	7,710	9-18-67
23	South Fork Campbell Creek near Anchorage	1947-71	38	15.1	0	10-12-58	891	6-21-49
25	Campbell Creek near Spenard	1966-93	68	13.2	2.2	2-5-69	1,510	8-26-89
27	Chester Creek at Arctic Boulevard at Anchorage	1966-93	20	9.5	1.6	2-12-75[b]	421	8-26-89
28	Ship Creek near Anchorage	1946-present	144	24.5	0	1-2-56[b]	2,100	8-27-89
30	Eagle River at Eagle River	1965-81	528	37.4	24	1-29-74[b]	14,00	9-21-95
32	Knik River near Palmer	1959-88, 91-92	6,918	79.6	260	3-1-62[b]	359,000	7-18-58
33	Caribou Creek near Sutton	1955-78	297	14.0	0	3-16-66[b]	8,720	6-15-73
50	Moose Creek near Palmer	None	--	--	--	--	--	--
34	Matanuska River at Palmer	1949-73, 85-86, 92	3,813	25.0	234	4-25-56	82,100	8-10-71
Hydrologic Unit 190205 (Susitna River Basin)								
35	Little Susitna River near Palmer	1948-present	205	44.9	8	4-1-56[b]	7,840	8-10-71
36	Susitna River near Denali	1957-66, 1968-86	2,775	39.7	34	3-16-59[b]	38,200	8-10-71
37	Maclaren River near Paxson	1958-86	981	47.6	40	3-1-65[b]	9,260	8-11-71
38	Susitna River near Cantwell	1961-72, 1980-86	6,390	21.0	400	3-16-64[b]	55,000	8-10-71
39	Susitna River at Gold Creek	1949-96	9,724	21.4	600	2-16-50[b]	90,700	6-7-64
40	Chulitna River near Talkeetna	1958-72, 1980-86	8,762	46.3	650	4-1-63[b]	75,900	7-20-67
41	Talkeetna River near Talkeetna	1964-present	4,051	26.0	260	2-27-82[b]	67,400	10-11-86
42	Willow Creek near Willow	1978-93	401	32.8	33	3-9-82	12,000	10-11-86
44	Deshka River near Willow	1978-86	892	19.5	160	2-24-86[b]	9,920	11-13-79
46	Susitna River at Susitna Station	1974-93	50,360	35.3	5,000	3-18-82[b]	312,000	10-12-86
Hydrologic Unit 190206 (Drainages in Western Cook Inlet)								
48	Chuitna River near Tyonek	1975-86	359	37.2	30	12-9-79	10,000	10-10-86
49	Chakachatna River near Tyonek	1959-72	3,646	44.2	--	--	470,000	8-11-71

[a]Average values were determined using data through September 30, 1997

[b]Minimum discharge also occurred on other dates

Table 7. Index of water-quality records for selected sites in Cook Inlet Basin, Alaska

[D, some records are available daily; S, seasonal or fragmentary records]

Map No. (fig. 3)	Station name	Period of water-quality collection			
		Chemical	Water temperature	Sediment	Biological
Hydrologic Unit 190203 (Drainages on the Kenai Peninsula)					
2	Fritz Creek near Homer	1951; 62; 67-68;70-71;78-80;86-87, 89, 90, 95		1986-87	1986-87
6	Anchor River at Anchor Point	1951-52; 53-54 D; 55-58; 59-66 D; 78-79, 89	1954; 59-66	1953-54	
7	Ninilchik River at Ninilchik	1952-53; 55-58; 67-68; 70; 75; 78-80	1963; 65	1963-65 D; 75	
8	Kasilof River near Kasilof	1949-58;67-68		1953-54; 56; 67-68	
11	Trail River near Lawing	1949-53; 55-58; 59-67 D; 68-69	1959-67	1967; 74	
13	Kenai River at Cooper Landing	1949; 50 D; 52-53;55-58;66-71;76	1950	1956; 59-60; 67-71; 74; 94	
16	Kenai River at Soldotna	1952-53; 55-58; 66-71		1967-71; 74; 77; 79 D; 80-81	
17	Beaver Creek near Kenai	1952; 56; 67-70; 78-79, 89	1970-75	1970	
18	Resurrection Creek near Hope	1968-71		1968-71	
Hydrologic Unit 190204 (Drainages in the Anchorage/ Matanuska Area)					
21	Glacier Creek at Girdwood	1956; 66-72;76-78; 85-86		1966-74	1985
23	South Fork Campbell Creek near Anchorage	1948-49; 51; 58-61;65-70			
25	Campbell Creek near Spenard	1960-61; 66-73; 75-77; 79-81; 86		1967-73; 80-81; 86 D; 87; 88 D	1980-81; 86
27	Chester Creek at Arctic Boulevard at Anchorage	1966-73; 75-77; 80-86	1981-86	1967-69 D; 81-84; 88 D; 89-91 DS	1980; 82-83
28	Ship Creek near Anchorage	1948; 49-51 D; 53; 57-61; 65-71; 76; 81	1949-50	1967-68	
30	Eagle River at Eagle River	1948-49; 51-52; 56-58; 66-74; 81	1968-69; 71	1966; 67-69 D; 70; 71 D; 72-73	
32	Knik River near Palmer	1948; 49-52 D; 53-58; 64 D; 67; 70-71; 74-75	1963; 65	1953-56; 61; 62-66 D; 67-72; 74	
33	Caribou Creek near Sutton	1949; 51-59; 67-68; 72; 76		1959-69; 76	
50	Moose Creek near Palmer	1948-49; 51-52; 56		1971	
34	Matanuska River at Palmer	1948; 49-53 D; 54; 57-58; 59-66 D; 67-68	1952-53; 59-66	1953-54 D; 59-66 D; 67-68; 72; 85-86	
Hydrologic Unit 190205 (Susitna River Basin)					
35	Little Susitna River near Palmer	1948-52; 67-68; 71-72		1959; 67-73	
36	Susitna River near Denali	1957-61; 68; 76	1974-82	1958-66; 68; 74-86	
37	Maclaren River near Paxson	1958-61; 67-68; 75		1958-68; 74-75	
38	Susitna River near Cantwell	1967-70	1980; 82-86 S	1962-72; 82-83;85-86	
39	Susitna River at Gold Creek	1949; 50-53 D; 54; 55-57 D; 58; 67-68; 75; 77; 80-86	1957; 74-80; 82-86 S	1952 D; 53-56; 57 D; 62; 67; 74-86	
40	Chulitna River near Talkeetna	1958-59; 67-68; 70	1982-86 S	1967-72; 80-83; 85-86	
41	Talkeetna River near Talkeetna	1954 D; 67-	1954	1966-96	1972-
42	Willow Creek near Willow	1978; 81-83	1978-90 S	1978; 81-83	1978; 81-82
44	Deshka River near Willow	1981-84		1981-82	1981-82
46	Susitna River at Susitna Station	1955; 70; 75-86	1975-80; 83-86 S	1975-86	1975-86
Hydrologic Unit 190206 (Drainages in Western Cook Inlet)					
48	Chuitna River near Tyonek	1975-77; 82-84	1976-78	1975-78	
49	Chakachatna River near Tyonek	1955; 59-60; 67; 70-72		1960-61; 70-71	

Table 8. Information about selected surface-water sites in Cook Inlet basin, Alaska

Map No. (fig. 3)	Station name	Remarks	Selected sources of additional information
		Hydrologic Unit 190203 (Drainages on the Kenai Peninsula)	
2	Fritz Creek near Homer	Flows northward in its headwaters but then curves to the east and flows south into Kachemak Bay about 9 miles northeast of Homer. Extensive areas of dead spruce trees associated with an infestation of spruce bark beetles. Logging occurs within the basin.	Waller and others, 1968; Savard and Scully, 1984; Hall, 1995
6	Anchor River at Anchor Point	Important salmon and steelhead fishing river. Lower river has recurrent ice-jam floods. Has two main forks that come together about 1 mile above its mouth near Anchor Point. Extensive areas of dead spruce trees associated with an infestation of spruce bark beetles. Logging occurs within the basin.	Savard and Scully, 1984
7	Ninilchik River at Ninilchik	Important salmon and steelhead fishing river. Flows southward for most of its length before it turns west about 2 miles from its mouth near Ninilchik. Extensive areas of dead spruce trees associated with an infestation of spruce bark beetles. Logging occurs within the basin.	Savard and Scully, 1984
8	Kasilof River near Kasilof	Most of the basin is undeveloped and is in the Kenai National Wildlife Refuge. The river flows through Tustumena Lake, which is 24 miles long and 117 square miles in area.	Alaska Department of Environmental Conservation, 1991; Anderson and Jones, 1971, 1972
11	Trail River near Lawing	Heads at a glacier and flows southwestward to Kenai Lake. The basin has 3 large lakes: Upper and Lower Trail Lakes and Grant Lake. The basin is within Chugach National Forest.	
13	Kenai River at Cooper Landing	Heads at Kenai Lake (19 square miles) and flows through the 12-mile long, 38-square-mile Skilak Lake. The lower section of the river, from Skilak Lake to the mouth, is Alaska's most popular fishing ground, more than 400,000 angler-days per year. The drainage basin area of the Kenai River is 6% of the entire Cook Inlet basin, but 40% of the sockeye salmon produced in the Cook Inlet basin are from the Kenai River watershed. Periodically floods from glacial-lake outbursts.	Anderson and Jones, 1971, 1972; Post and Mayo, 1971; Boggs and others, 1997a; Litchfield and Kyle, 1991, 1992
16	Kenai River at Soldotna		
17	Beaver Creek near Kenai	Heads at a 2.5-mile-long lake and drains a lowland near Kenai. Tidally influenced at its confluence with the Kenai River. A popular fishing area.	Anderson and Jones, 1971, 1972
18	Resurrection Creek near Hope	Mining for placer gold has occurred in this basin since the late 1800's. The basin is within Chugach National Forest.	Blanchet, 1981; Huber and Blanchet, 1992
		Hydrologic Unit 190204 (Drainages in the Anchorage/Matanuska Area)	
21	Glacier Creek at Girdwood	Flows southward to Turnagain Arm of Cook Inlet. Basin contains rugged mountains within Chugach State Park and Chugach National Forest.	Glass and Brabets, 1988; James M. Montgomery, Consulting Engineers, Inc., 1990; Carrick and Maurer, 1994
23	South Fork Campbell Creek near Anchorage	Most of the basin above this site is undeveloped.	Brabets and Wittenberg, 1983; Lipscomb, 1991; James M. Montgomery, Consulting Engineers, Inc., 1990; Milner and Oswood, 1990, 1996, Municipality of Anchorage, 1997
25	Campbell Creek near Spenard	Upper reaches of this basin are undeveloped, lower reaches contain residential development.	

Table 8. Information about selected surface-water sites in Cook Inlet basin, Alaska--Continued

Map No. (fig. 3)	Station name	Remarks	Selected sources of additional information
27	Chester Creek at Arctic Boulevard at Anchorage	Upper reaches of this basin are undeveloped, lower reaches contain residential and commercial development.	Brabets, 1987; James M. Montgomery, Consulting Engineers, Inc., 1990; Milner and Oswood, 1990, 1996
28	Ship Creek near Anchorage	Water-quality site is below a water-supply dam about 10 miles upstream from the stream's mouth. Most of the basin above this site is undeveloped. The lower 8 miles of this stream in downtown Anchorage is one of the State's most popular fishing locations. The stream's water is also used by two fish hatcheries and for cooling at two electric-generating power plants.	James M. Montgomery, Consulting Engineers, Inc., 1990; Milner and Oswood, 1990, 1996; U.S. Army, 1975; Quirk, 1997
30	Eagle River at Eagle River	Heads in rugged glacier-covered mountains within Chugach State Park and Chugach National Forest.	
32	Knik River near Palmer	Heads in rugged glacier-covered mountains within Chugach State Park and Chugach National Forest. Floods resulting from the rapid release of a glacier-dammed lake occurred annually until 1966 (except 1963), after which the ice dam ceased to form.	Lipscomb, 1989
33	Caribou Creek near Sutton	Flows southward into Matanuska River. Basin contains coal deposits.	Maurer, 1998
50	Moose Creek near Palmer	Flows southward into Matanuska River. Basin contains coal deposits.	Maurer, 1998
34	Matanuska River at Palmer	Heads at Matanuska Glacier and flows westerly through the glacially widened Matanuska Valley. Popular recreation (rafting) stream.	Lipscomb, 1989
		Hydrologic Unit 190205 (Susitna River Basin)	
35	Little Susitna River near Palmer	Flows southward from the Talkeetna Mountains. Popular salmon fishing area. Gold mining occurs within this basin.	U.S. Department of Agriculture, 1981
36	Susitna River near Denali	Heads at glaciers in the Alaska Range. Headwater area of the Susitna River.	
37	Maclaren River near Paxson	Heads at glaciers in the Alaska Range and flows southwestward to the Susitna River. Copper and gold deposits occur in this basin.	
38	Susitna River near Cantwell		Knott and Lipscomb, 1983, 85; Knott and others, 1986, 87
39	Susitna River at Gold Creek		Knott and Lipscomb, 1983, 85; Knott and others, 1986, 87
40	Chulitna River near Talkeetna	Heads at glaciers on Mt. McKinley in the Alaska Range. Flows southward to the Susitna River.	Knott and Lipscomb, 1983, 85; Knott and others, 1986, 87
41	Talkeetna River near Talkeetna	Heads in the Talkeetna Mountains and flows mostly westward to Susitna River. Water quality was monitored from 1966-96 as part of the Hydrologic Benchmark program.	Knott and Lipscomb, 1983, 85; Knott and others, 1986, 87
42	Willow Creek near Willow	Heads on Bald Mountain Ridge and flows westward about 34 miles to the Susitna River.	U.S. Department of Agriculture, 1981
44	Deshka River near Willow	Drains lowlands west of the main stem of Susitna River. Deshka River is the local name for the stream reach between the Susitna River and the confluence of Kroto and Trapper Creeks. Important chinook salmon stream.	

Table 8. Information about selected surface-water sites in Cook Inlet basin, Alaska--Continued

Map No. (fig. 3)	Station name	Remarks	Selected sources of additional information
46	Susitna River at Susitna Station	Water-quality was monitored from 1975-86 as part of the National Stream Quality Accounting Network.	Knott and Lipscomb, 1983, 85; Knott and others, 1986, 87
		Hydrologic Unit 190206 (Drainages in western Cook Inlet)	
48	Chuitna River near Tyonek	Coal deposits occur in this basin.	Scully and others, 1980, 1981; Maurer, 1987
49	Chakachatna River near Tyonek	Water-quality site is at the outlet of Chakachamna Lake and across from Barrier Glacier on the southern flank of Mount Spurr, an active volcano. The basin contains over 300 square miles of glaciers and thick deposits of loose, unconsolidated volcanic sediments on steep slopes. Large, fast-moving flows of water, sediment, and rock debris periodically block stream channels and the release of water associated with the failures of these natural dams pose significant hydrologic hazards.	Dorava and Waythomas, 1994; Waythomas and Dorava, 1997

Table 9. Information about ground-water regions in Cook Inlet basin, Alaska

Hydrologic unit (fig. 8)	Region name	Remarks	Selected sources of additional information
190203	Kenai Peninsula	Water-quality analyses available from 174 domestic, commercial, or public-supply wells; 7 in hydrologic unit 19020301 and 167 in unit 19020302	Anderson and Jones, 1971 and 1972; Nelson, 1981; Maurer, 1993; Maurer and Ireland, 1994; Munter and Maurer, 1994; Glass, 1996
190204	Anchorage/ Matanuska Area	Water-quality analyses available from 319 domestic, commercial, or public-supply wells; 260 in hydrologic unit 19020401 and 59 in unit 19020402	Trainer, 1960; Feulner, 1971; Cederstrom and others, 1964; Zenone and others, 1974; Zenone, 1976; Johnson, 1979; Emanuel and Cowing, 1982; Nelson, 1982; Brunett and Lee, 1983; Brunett, 1990; James M. Montgomery, Consulting Engineers, Inc., 1990, Jokela and others, 1990; LaSage, 1992; Munter and Allely, 1992; Munter, 1996; Bristol Environmental Services Corporation, 1997
190205	Susitna River Basin	Water-quality analyses available from 54 domestic, commercial, or public-supply wells in hydrologic unit 19020505	Feulner, 1971; Glass, 1983; Maynard, 1987; Jokela and others, 1990
190206	Western Cook Inlet	Water-quality analyses available from 17 wells in hydrologic unit 190206	Nelson, 1985

EVALUATION OF WATER-QUALITY AND ANCILLARY DATA

Hydrologic data adequate to define seasonal or annual variations in streamflow and water-quality characteristics are available for only a few streams and for only a few constituents in the Cook Inlet Basin. The Talkeetna River (site 41) has the longest period of water-quality record, from 1966-96. Rickman (1993a) analyzed chemical concentrations in the Talkeetna River from 1980-89 and found no trends in the concentrations of alkalinity, dissolved nitrite plus nitrate, dissolved solids, or suspended sediment. Brabets and Wittenberg (1983) found no significant changes in concentrations of dissolved constituents with time in South Fork and North Fork Campbell Creeks and Campbell Creek (site 25) in Anchorage.

Most of the selected streams have several measurements of water temperature, pH, alkalinity, and major ions, but few have extensive analyses for dissolved oxygen, nutrients, major metals, trace elements, radionuclides, organic compounds, or bacteria. Of the nutrients, trace elements, and organic compounds analyzed, most have low concentrations and many concentrations are reported as being less than the analytical detection limit.

Many surface-water sites have numerous values for specific conductance, pH, and water temperature for a single date, indicating that data were recorded in a section across a stream on that day or that data were collected at various times during that day. In this report, median daily values for specific conductance, pH, and water temperature were computed for each surface-water site, and these median daily values were used for subsequent analysis. For ground-water data, when a well had more than one analysis for a given constituent, the most recent value was used.

Determining a true mean value or true range of a constituent's concentration is not possible when one or more of its concentration values is reported as being less than the laboratory detection limit for the constituent. In this report, summary statistics (mean, median, and other percentiles; appendixes 2 and 3) for data that include observations below one or more detection limits were calculated using a method described by Helsel and Cohn (1988). This method uses a probability plot of the logarithms of the data. In general, this method estimates summary statistics by combining observed above-detection-limit values with extrapolated below-detection-limit values. Only surface-water sites or ground-water regions that have two or more observations are included in appendixes 2 and 3.

Few streams have water-quality data for all flow conditions because from late fall to early spring, dangerous ice conditions and extreme weather make it impossible to collect water-quality and streamflow data safely from most large rivers. Thus seasonal or flow-dependent analyses (such as the quantity of a constituent carried by the water over a given time) at many sites would yield uncertain results. The temporal distribution of streamflow, specific conductance, and concentrations of dissolved solids and suspended sediment in the Talkeetna River (site 41) from 1990-97 are shown on figure 10 (page 15). High-flow conditions are representative of surface runoff and contribute a large percentage of the annual sediment and chemical constituent loads. Low-flow conditions are generally indicative of baseflow, which is dominated by ground-water inflow. Baseflow usually contains the highest concentrations of dissolved constituents but contributes only a small percentage of the annual sediment and chemical loads. Most water-quality samplings on streams in the study unit take place during open-water conditions and thus are biased to higher flow conditions than if sampling were performed uniformly throughout the year. The cumulative probability distributions of observed daily mean discharge and discharge at the time when water-quality samples were collected from the Talkeetna River

for 1990-97 are shown on figure 11. The median (50th percentile or 0.5 probability) daily-mean discharge value for 1990-97 was 1,300 ft^3/s, whereas the median discharge at the time of sampling was 5,500 ft^3/s.

Also, the objective for collecting water-quality samples may bias the results. For example, a few studies have been conducted in urban areas to determine chemical and bacteria concentrations during periods of poor water quality, such as during high streamflows. Thus, reported concentrations are larger than values that would have been obtained if sampling were performed uniformly throughout the year.

Because fewer people use bedrock aquifers for their water supply than use unconsolidated aquifers, fewer water-quality samples are available for bedrock aquifers and less is known about their water quality. The chemical quality may be more variable in bedrock aquifers than in unconsolidated aquifers. Water from sedimentary rocks that were deposited in a saltwater environment may have high concentrations of dissolved solids, whereas water from shallow fractured bedrock aquifers may have low concentrations of dissolved solids, but may be quite vulnerable to contamination.

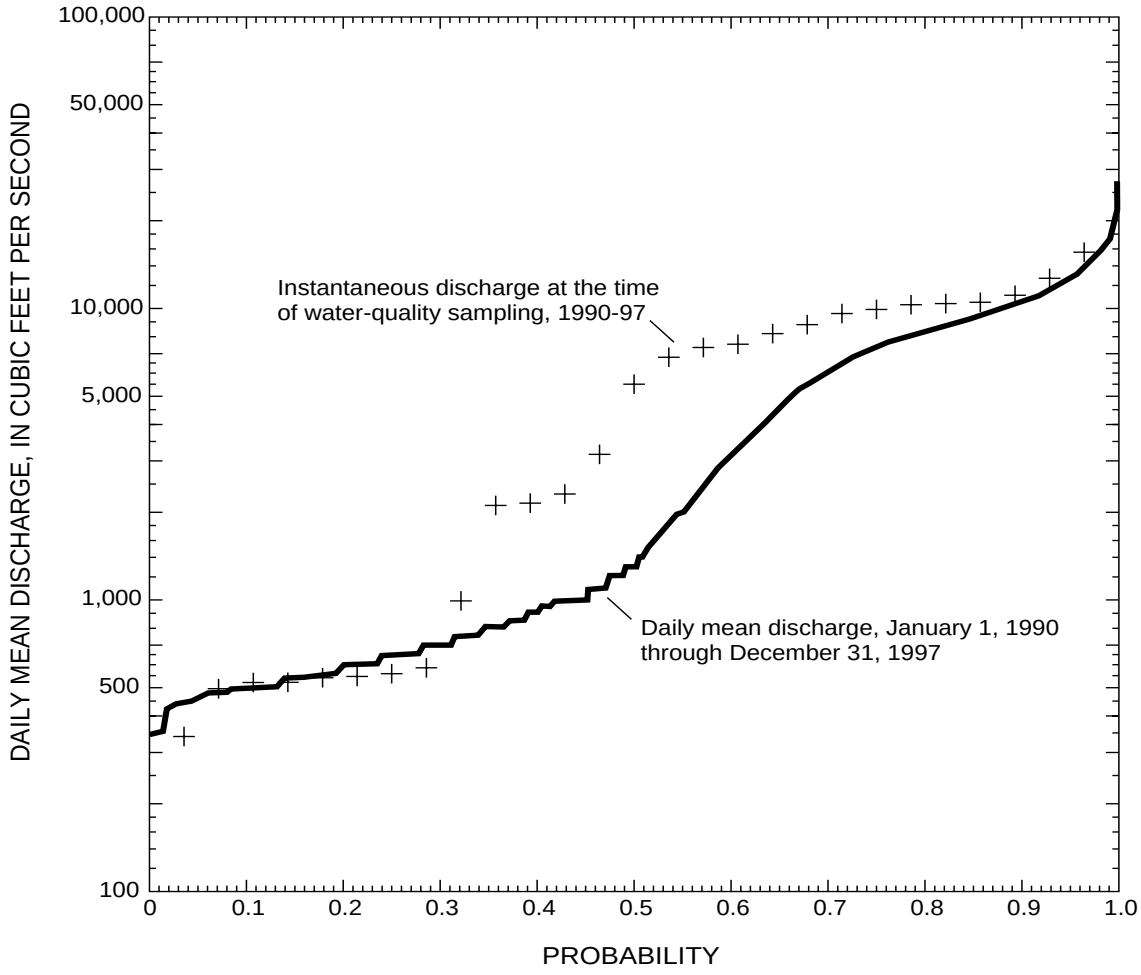

Figure 11. Cumulative probability distributions of daily mean discharge and discharge at the time of water-quality sampling of the Talkeetna River (site 41), 1990-97 (see figure 3 for location).

SUMMARY OF SURFACE- AND GROUND-WATER QUALITY CONDITIONS

Concentrations of selected constituents are summarized later in this report in appendixes 2 and 3, and on boxplots for the 31 surface-water sites and 4 ground-water regions. Analyses from each of the four ground-water regions are grouped by their hydrologic unit numbers: 190203, 190204, 190205, and 190206 (fig. 8). Region 190203 represents the northern Kenai Peninsula; region 190204 includes wells tapping unconsolidated sediments in the Anchorage/Matanuska area; region 190205 includes wells in the Susitna River Basin; and region 190206 includes wells in western Cook Inlet.

Boxplots are used to graphically compare the distribution of concentrations of several constituents among sites. In the boxplots, the 25^{th} and 75^{th} percentiles of the data form the bottom and top of each box. The horizontal line within the box is the median, or 50^{th} percentile. Half of the observed concentrations at a site were greater than the median value and half of the concentrations were less than the median value. Lines called "whiskers" extend vertically from the bottom and top of each box to the 10^{th} and 90^{th} percentiles of the data. The highest and lowest 10 percent of the data are not shown so that most of the data can be plotted without compressing the scale of the box to show extreme values. No plots are drawn for the sites having fewer than four observations. The number above each boxplot is the number of observations on which the boxplot is based. For each surface-water site, if more than one analysis of specific conductance, temperature, and pH was available for a day, a median value for the day was computed and used as the observed value. For each ground-water region, each observation represents the most recent constituent concentration value for a well.

Physical Properties and Field Measurements

Specific conductance is a measure of the capacity of a sample of water to conduct electricity. Because specific conductance and the dissolved-solids concentration are roughly proportional in most natural water, the specific conductance value can be used to estimate the dissolved-solids concentration. Using regression techniques, Parks and Madison (1985) developed equations for estimating concentrations of dissolved solids and other water-quality constituents in Alaskan streams from field measurements of specific conductance. Using data from streams in southcentral Alaska, they observed good correlations between specific conductance (SC), in microsiemens per centimeter at 25°C (µS/cm), and concentrations of dissolved solids, calcium, and the water's hardness during winter (November to April) and during open water (May to October).

Dissolved solids, in milligrams per liter:

Winter:

Dissolved solids = 3.48 + 0.593 (SC)

Open water:

Dissolved solids = 6.15 + 0.572 (SC)

Hardness, in milligrams per liter as $CaCO_3$:

Winter:

Hardness = 0.22 + 0.432 (SC)

Open water:

Hardness = -1.04 + 0.451 (SC)

Calcium, in milligrams per liter:

Winter:

Calcium = 0.67 + 0.130 (SC)

Open water:

Calcium = -0.35 + 0.141 (SC)

Median specific-conductance values at all but three of the selected surface-water stations were less than 200 µS/cm (fig. 12 and appendix 2). The Kasilof River (site 8), which has 28 percent of its basin covered by glaciers, and the Deshka and Chuitna Rivers (sites 44 and 48), which have no glaciers, had the lowest

specific-conductance values with median values less than 50 µS/cm. Caribou Creek (site 33), which drains an upland area containing coal, has the highest median value of specific conductance, 330 µS/cm. Chester Creek (site 27) and Matanuska River (site 34) also had relatively high values. Ground water was generally more mineralized than water in streams: the specific conductance of water from most wells was greater than 200 µS/cm (fig. 12, appendix 3). However, brackish ground water remnant from inundation by a more extensive ancestral Cook Inlet may occur locally, such as in the lower Susitna River valley near Willow where water at depths less than 100 ft below land surface has been reported to be brackish.

The pH of a sample of water is a measure of its hydrogen-ion activity (effective concentration) and can range from 0 (very acidic) to 14 (very alkaline). Natural processes and human activities both can affect pH. Rainwater and melted snow in nonurban, nonindustrial areas typically have pH values normally between 5 and 6 units and the pH of river water in most areas not affected by pollution is typically between 6.5 and 8.0 units. Alaska water-quality standards for growth and propagation of fish require waters within the pH range 6.5 to 9.0 units (table 2). Surface and ground water in the study unit generally ranged from 6.5 to 8.0 units (fig. 13). Several deep (greater than 100 ft) wells north of Kenai yielded water having high pH values (more than 9 units) and had low values of hardness (less than 15 mg/L as $CaCO_3$). Six wells in a coal field in western Cook Inlet yield water having pH values ranging from 5.3 to 6.8 units (Nelson, 1985). The Deshka River (site 44) had the most acidic water (median pH value was 6.6 units), whereas Resurrection Creek (site 18) had the most alkaline water (median pH value was 7.8 units).

The temperature of water determines the amount of oxygen the water can contain when at equilibrium with the atmosphere and it also controls the metabolic rates of fish and their rates of growth when food supply is not limited. State water-quality standards (ADEC, 1997a, 1997b) require temperatures in streams used by salmon and trout to be less than 20°C all the time and less than 13°C during the spawning and egg and fry incubation periods (table 2). Water temperatures in streams in the study unit generally remain near 0°C from October to April and increase rapidly as a result of spring snowmelt. The daily mean water temperature for Willow Creek (site 42) during open-water periods during 1985-90 is shown on figure 14. No winter water temperatures are plotted because the temperature-measuring probes were removed before freeze-up and reinstalled after breakup. Water temperatures reach about 13 to 16°C in July, fluctuate near this maximum, then decline during August and September as solar insolation decreases. Of the selected streams, the Deshka River (site 44) had the highest water temperatures at the time of water-quality sampling, as great as 20.5°C. The high median water temperature for the Deshka River, 10.8°C, (fig. 15) suggests that most data at this site were collected during the summer.

Water acquires dissolved oxygen from the atmosphere and from aquatic plants. The dissolved-oxygen concentration in a stream is controlled by several factors, including water temperature, air temperature and pressure, hydraulic characteristics of the stream, photosynthetic or respiratory activity of stream biota, and the quantity of organic material present. Salmon and trout require well-oxygenated water at every stage in their life history, but young fish are more prone to oxygen shortages than adult fish. State water-quality standards require dissolved-oxygen concentrations to be greater than 7 mg/L in waters used by anadromous and resident fish (table 2) (ADEC, 1997a, 1997b). Except for streams in the USGS

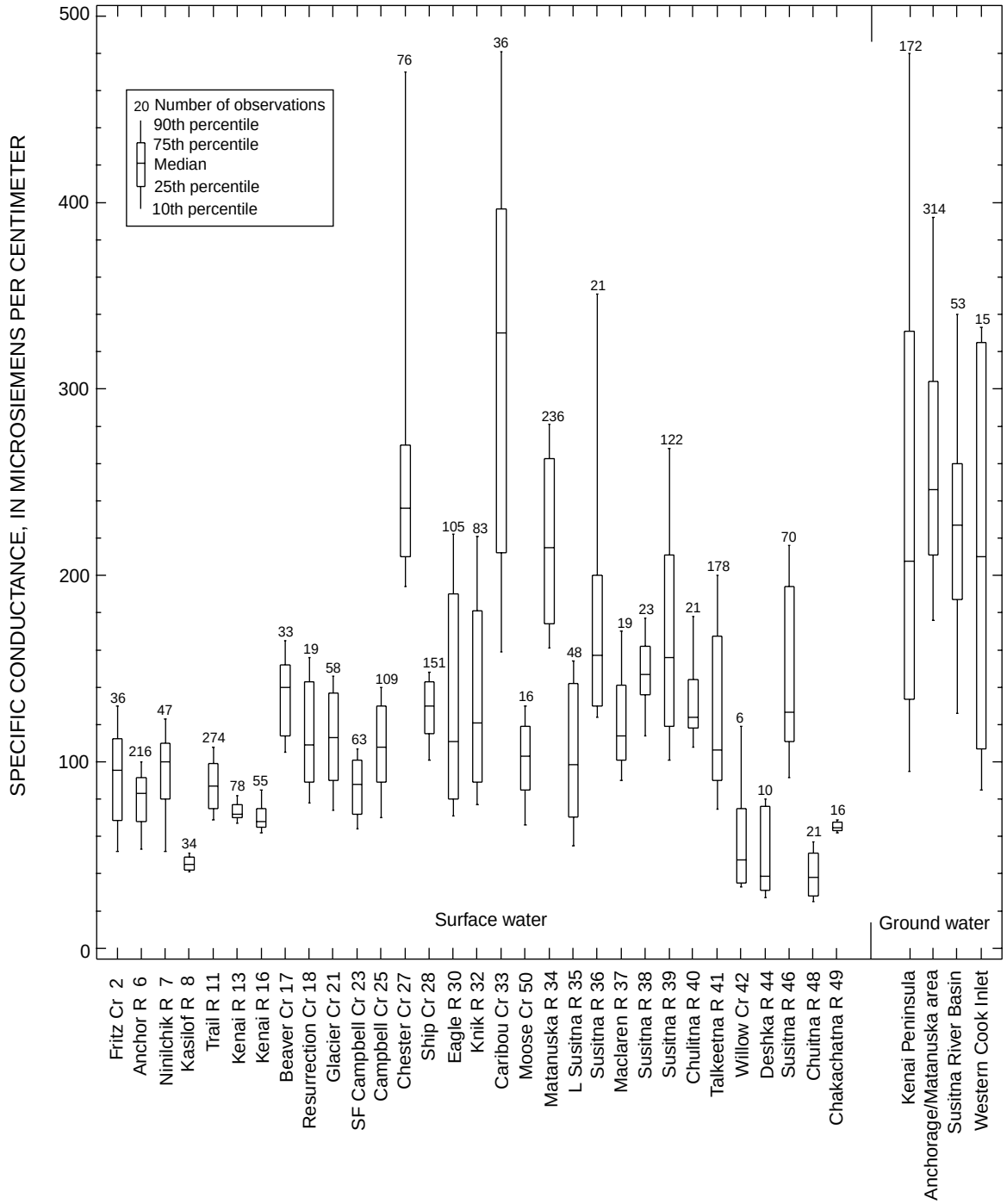

Figure 12. Specific conductance of water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

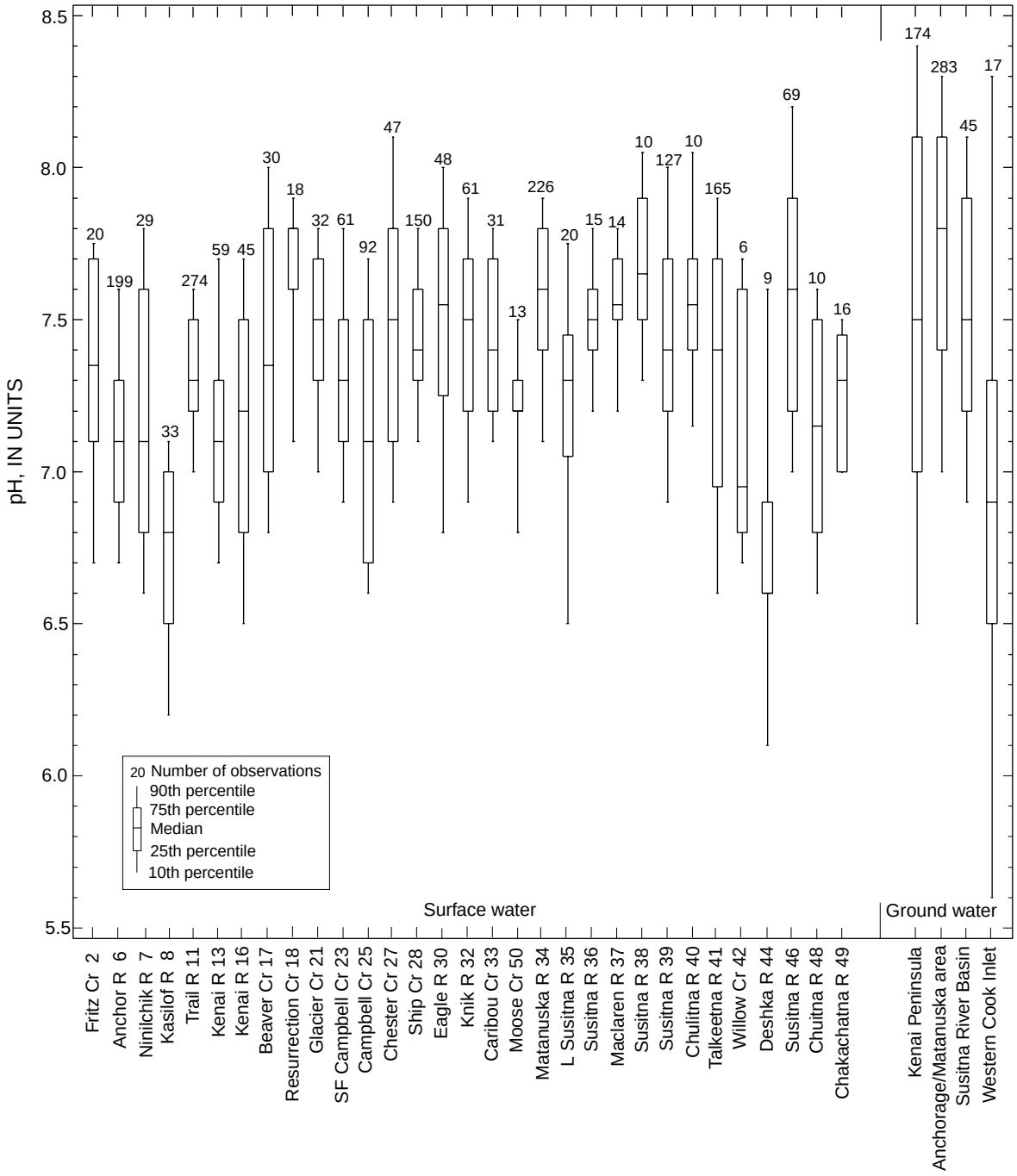

Figure 13. pH of water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

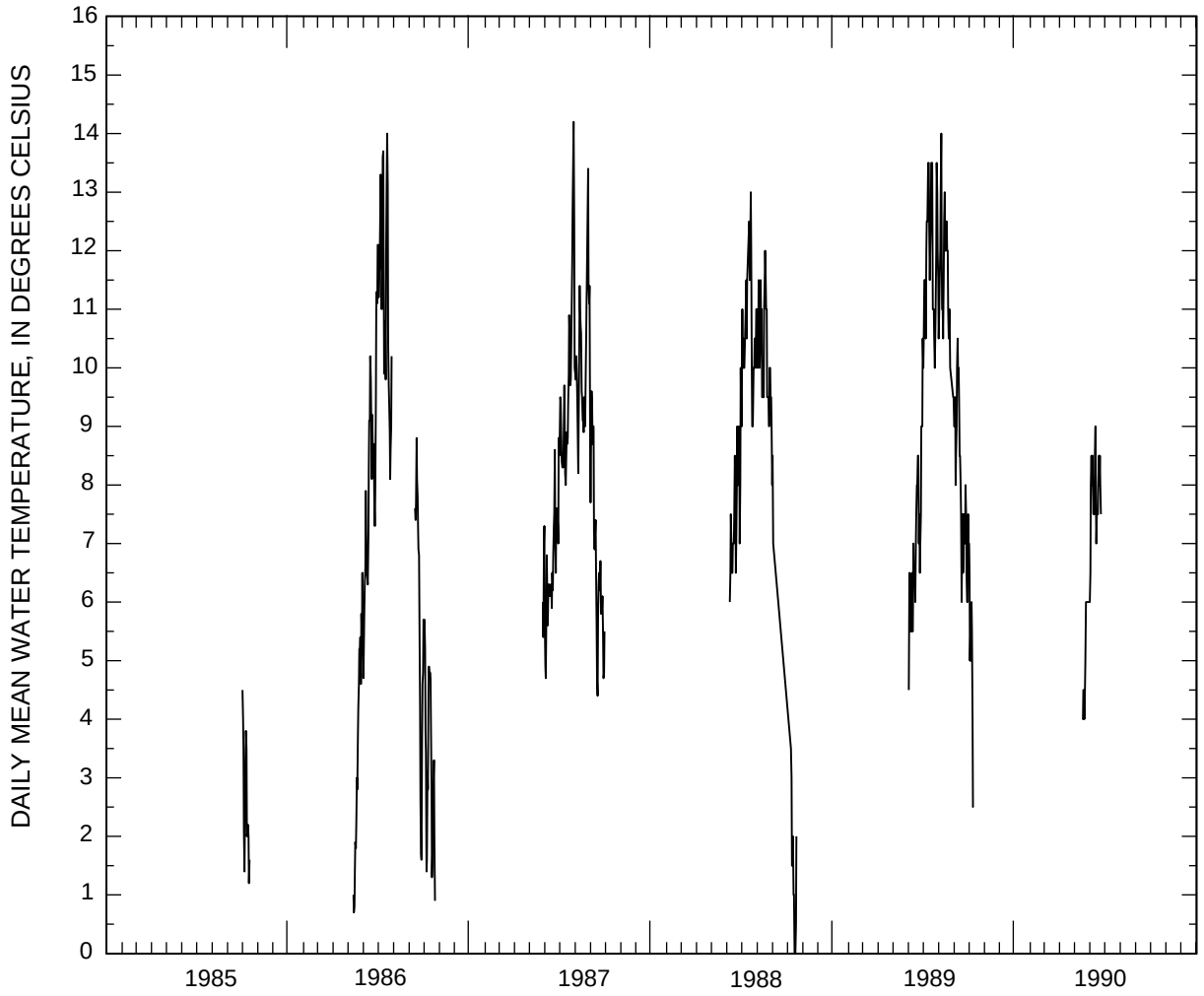

Figure 14. Daily mean water temperatures of Willow Creek (site 42), 1985-90 (see figure 3 for location).

Benchmark and NASQAN Programs and two urban streams in Anchorage, few dissolved-oxygen concentration values are available in the USGS data base for the selected streams (fig. 16). Dissolved-oxygen concentrations were near saturation in most streams and all reported values were greater than 7 mg/L. Dissolved-oxygen concentrations reported by Litchfield and Kyle (1992) ranged from 9.0 to 13.3 mg/L in the main stem of the Kenai River and from 7.3 to 11.4 mg/L in seven of its tributaries, indicating that the amount of oxygen dissolved in these waters were also near saturation at these times.

Water that enters ground-water systems can be expected to contain oxygen at concentrations similar to those of surface water in contact with the atmosphere. As ground water comes into contact with organic matter or oxidizable minerals, the oxygen dissolved in the water can be depleted. Unlike surface water, ground water is usually isolated from the Earth's atmosphere and the consumed oxygen is not replenished, except by surface-water recharge.

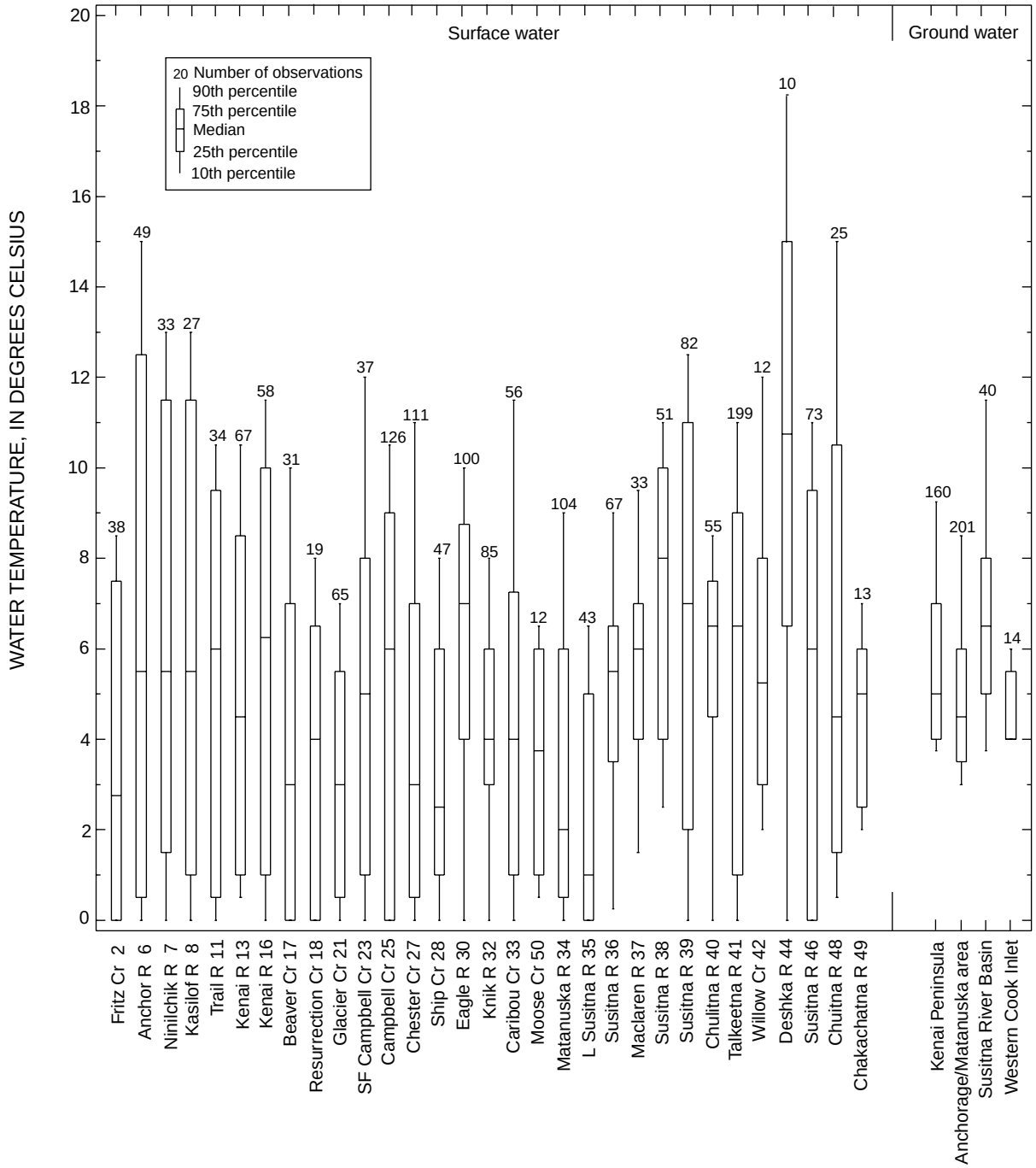

Figure 15. Water temperature from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

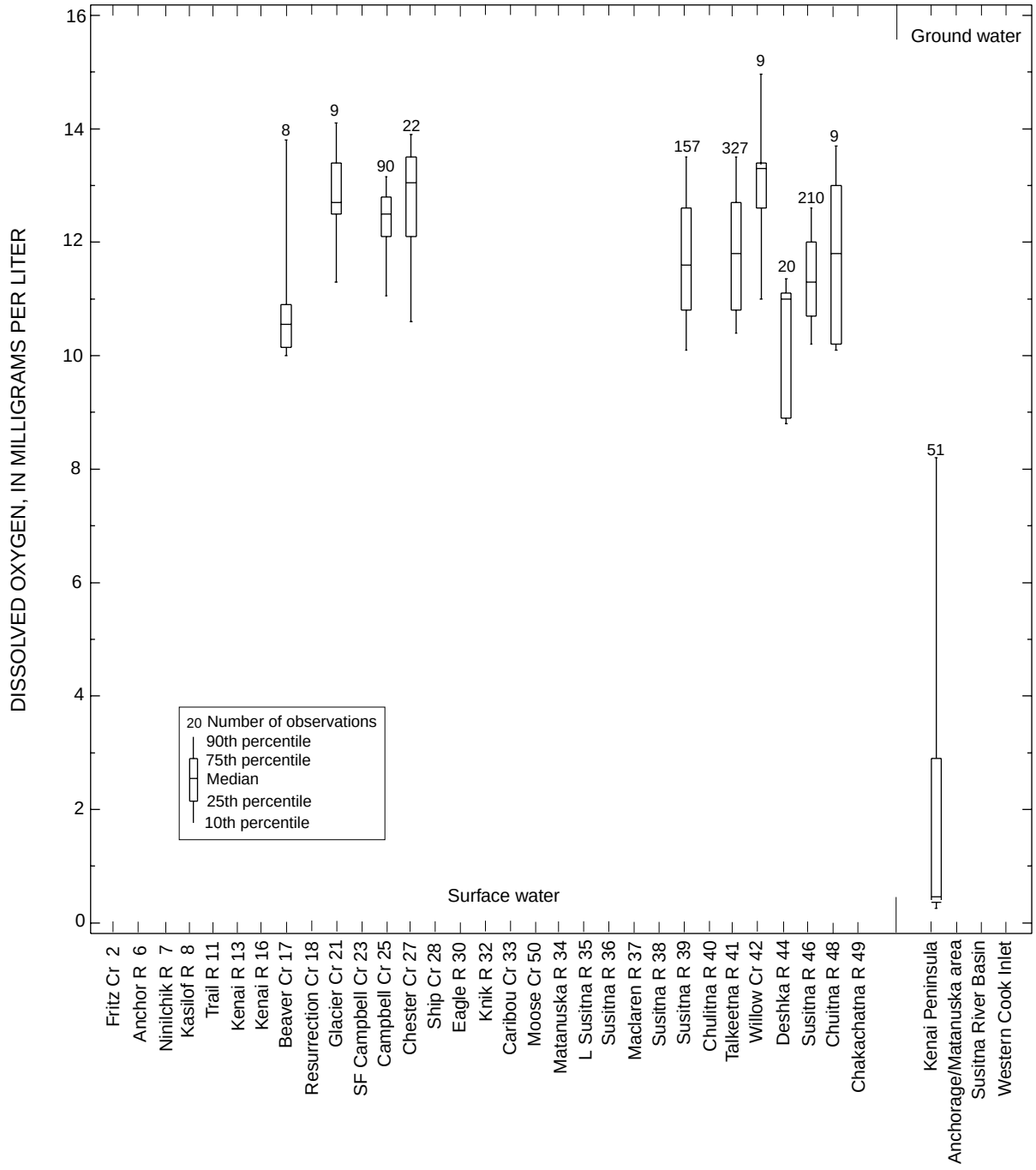

Figure 16. Dissolved oxygen in water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

Measurements of dissolved oxygen were not commonly made when sampling ground water for various reasons. Oxygen can easily be drawn into a water sample during well pumping and sampling; concentrations of dissolved oxygen are not indicators of organic pollution, nor are they significant in evaluating the usability of the water for ordinary purposes. However, the oxygen content within an aquifer greatly affects the transfer of electrons between dissolved, gaseous, or solid constituents. The presence of even small quantities (greater than about 0.2 mg /L) of dissolved oxygen implies an oxidizing chemical environment where organic materials in that part of the aquifer are not being converted to methane; sulfur is present as sulfate instead of sulfides; nitrogen is present principally as nitrate instead of ammonia; and dissolved iron and manganese are present at low levels. The median dissolved-oxygen content measured from ground-water samples from the Kenai Peninsula was 0.5 mg/L (fig. 16).

Hardness describes the amount of mineral scale that will form when water evaporates and the amount of soap needed to produce cleanliness. Hardness is primarily due to the presence of calcium and magnesium and is expressed as milligrams per liter as calcium carbonate ($CaCO_3$). In general, water of hardness as much as 60 mg/L is considered soft; 61–120 mg/L, moderately hard; 121–180 mg/L, hard; and greater than 180 mg/L, very hard (Hem, 1985, p. 159). Most selected streams have low concentrations of calcium (less than 20 mg/L) and magnesium (less than 5 mg/L), and are considered soft waters. Caribou Creek (site 33) had the highest hardness values (median value was 140 mg/L as $CaCO_3$). Most wells yield soft or moderately hard water.

Alkalinity is a measure of the capacity of the substances dissolved in the water to neutralize acid. In most natural waters, alkalinity is produced mainly by bicarbonate and carbonate (Hem, 1985, p. 106), which are ions formed when carbon dioxide or carbonate rocks dissolve in water. Alkalinity values are reported as equivalent concentrations of calcium carbonate ($CaCO_3$). For all selected streams, median alkalinity values are low—less than 100 mg/L as $CaCO_3$ (fig. 17)—indicating low buffering capacity and limited availability of inorganic carbon. The alkalinity of ground water ranged from 15 to 546 mg/L as $CaCO_3$ with median values for the four regions ranging from 100 to 123 mg/L (fig. 17).

Fecal Coliform Bacteria

Fecal coliform bacteria are used as indicators of fecal contamination from humans and other warm-blooded animals. Such contamination can introduce disease-causing viruses and bacteria into a stream. The USGS has collected multiple fecal coliform bacteria samples from only five of the selected streams (appendix 2). Bacteria counts in these five streams have at times exceeded both the 20 col/100 mL water-quality standard for drinking water and the 100 col/100 mL standard for water-contact recreation. Concentrations have been greater than 1,000 col/100 mL in Chester and Campbell Creeks and several other streams in Anchorage (Brabets and Wittenberg, 1983; Brabets, 1987; James M. Montgomery Consulting Engineers, 1990). ADEC (1996) lists parts of several streams and lakes in Anchorage as being impaired by high concentrations of fecal coliform bacteria. The highest counts generally were measured during snowmelt periods and storm periods, possibly indicating a buildup of fecal contaminants on land and subsequent runoff of the contaminants during these periods (Brabets and Wittenberg, 1983). Wastes from domestic animals, waterfowl, or other wildlife, or from on-site septic systems may be the sources of bacterial contamination.

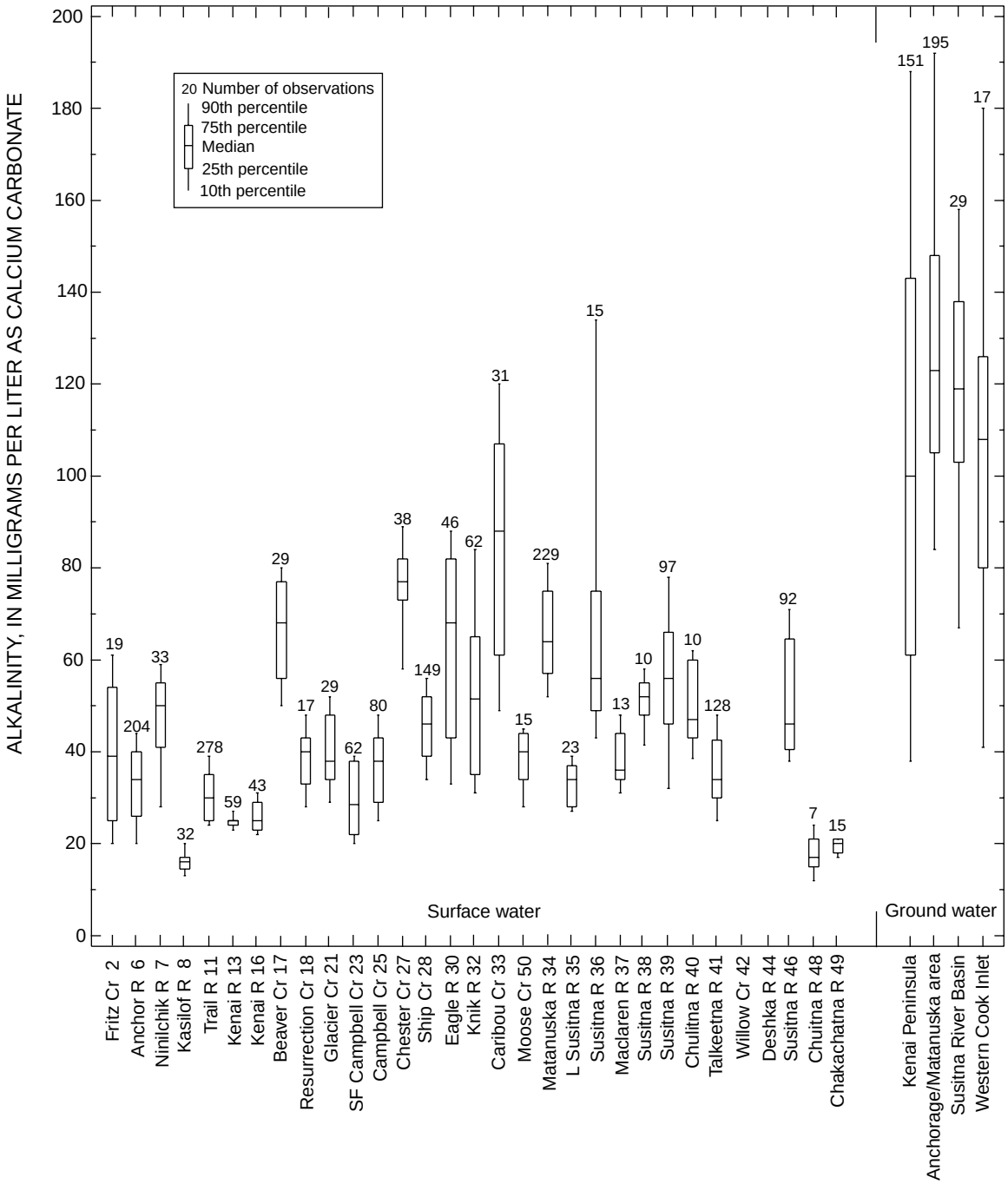

Figure 17. Alkalinity of water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

Major Inorganic Constituents

Calcium and magnesium are both essential elements for plants and animals. Calcium is usually the dominant positively charged ion in most natural water, followed by magnesium (Hem, 1985). Median concentrations of these constituents in the selected streams ranged from 4.7 to 43 mg/L for dissolved calcium (fig. 18) and 0.9 to 7.2 mg/L for dissolved magnesium.

Sodium and chloride are present in all natural waters but usually in low concentrations in streams. Median chloride concentrations in all selected streams were generally less than 10 mg/L (fig. 19), but a few wells in coastal areas near Kenai yielded water having concentrations greater than 250 mg/L, possibly from ground water that is remnant from the time when a larger ancestral Cook Inlet covered the area. Some ground water near Willow in the Susitna River Basin that is less than 100 ft below land surface may also be brackish or salty (Brabets and others, 1999). Concentrations of dissolved chloride as great as 250 mg/L (appendix 2) and concentrations of dissolved sodium as great as 140 mg/L have been observed in snowmelt runoff in Chester Creek (site 27) in Anchorage. De-icing salts and domestic sewage are sources of sodium and chloride that can increase the measured concentrations in streams.

Potassium, an essential element for both plants and animals, is abundant in nature but seldom occurs in high concentrations in natural water (Hem, 1985). All selected sites had median concentrations of dissolved potassium that were less than 3 mg/L.

Sulfate in streams is mostly from the weathering of sedimentary and igneous rocks and biochemical processes. Human activities such as mining, waste discharge, and fossil-fuel combustion also can be important sources. Most selected streams and wells had sulfate concentrations less than 20 mg/L as SO_4 (fig. 20). The largest dissolved sulfate concentrations were in Caribou Creek (site 33) where coal is present in the watershed at the surface. Concentrations decrease downstream at the Matanuska River (site 34) because of dilution.

Fluoride has beneficial human health effects by reducing the incidence of tooth decay when water is consumed during enamel calcification. However, excessive fluoride concentrations in drinking water produce objectionable staining of teeth. The Federal MCL for fluoride is 4 mg/L and the secondary or recommended maximum concentration is 2 mg/L. The median concentration values for dissolved fluoride for all selected streams and ground-water regions were 0.2 mg/L or less.

Silica is dissolved from rocks and soils, and concentrations most commonly observed in natural water are between 1 and 30 mg/L as SiO_2. Median concentrations in four streams on the Kenai Peninsula—Fritz Creek (site 2), Anchor River (site 6), Ninilchik River (site 7), and Beaver Creek (site 17)—ranged from 26 to 32 mg/L, whereas concentrations in other selected streams were between 3.7 and 13 mg/L (fig. 21).

Dissolved solids in stream water consist of inorganic salts and small amounts of organic matter. Dissolved solids are primarily from soil and rock weathering, but can be introduced as a by-product of human activities. Concentrations generally are greatest in streams draining basins underlain by rocks and soils that contain easily dissolved minerals, such as coal and other sedimentary rocks. All selected streams had median concentrations of dissolved solids (the calculated sum of all constituents) that were less than 220 mg/L (fig. 22). High dissolved-solids contents were observed in stream basins containing coal (Caribou Creek, site 33) or having urban land uses (Chester Creek, site 27). Most wells yielded waters having concentrations between 100 and 250 mg/L (fig. 22), but some ground-water samples had concentrations greater than 500 mg/L, the secondary

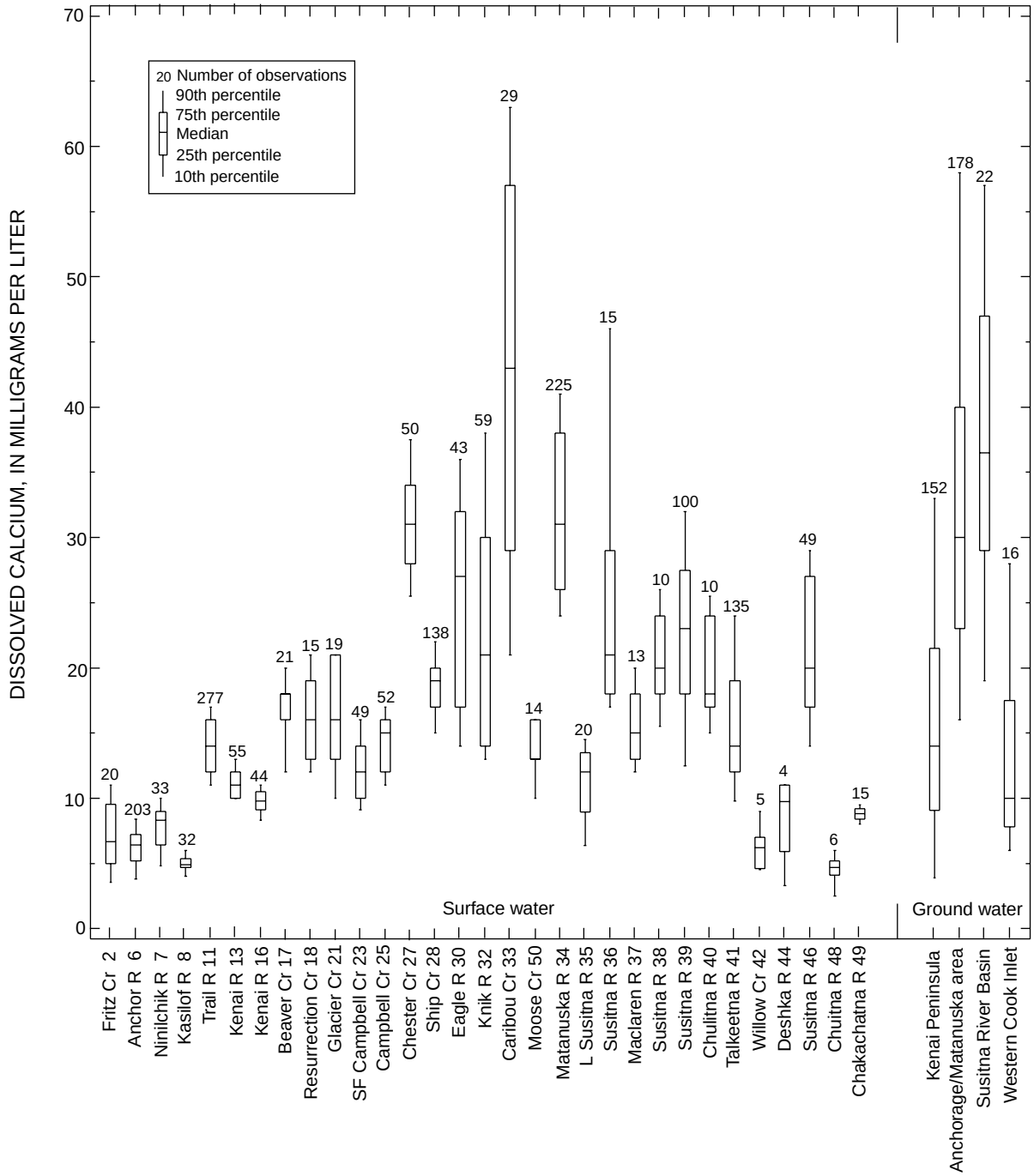

Figure 18. Dissolved-calcium concentrations in water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

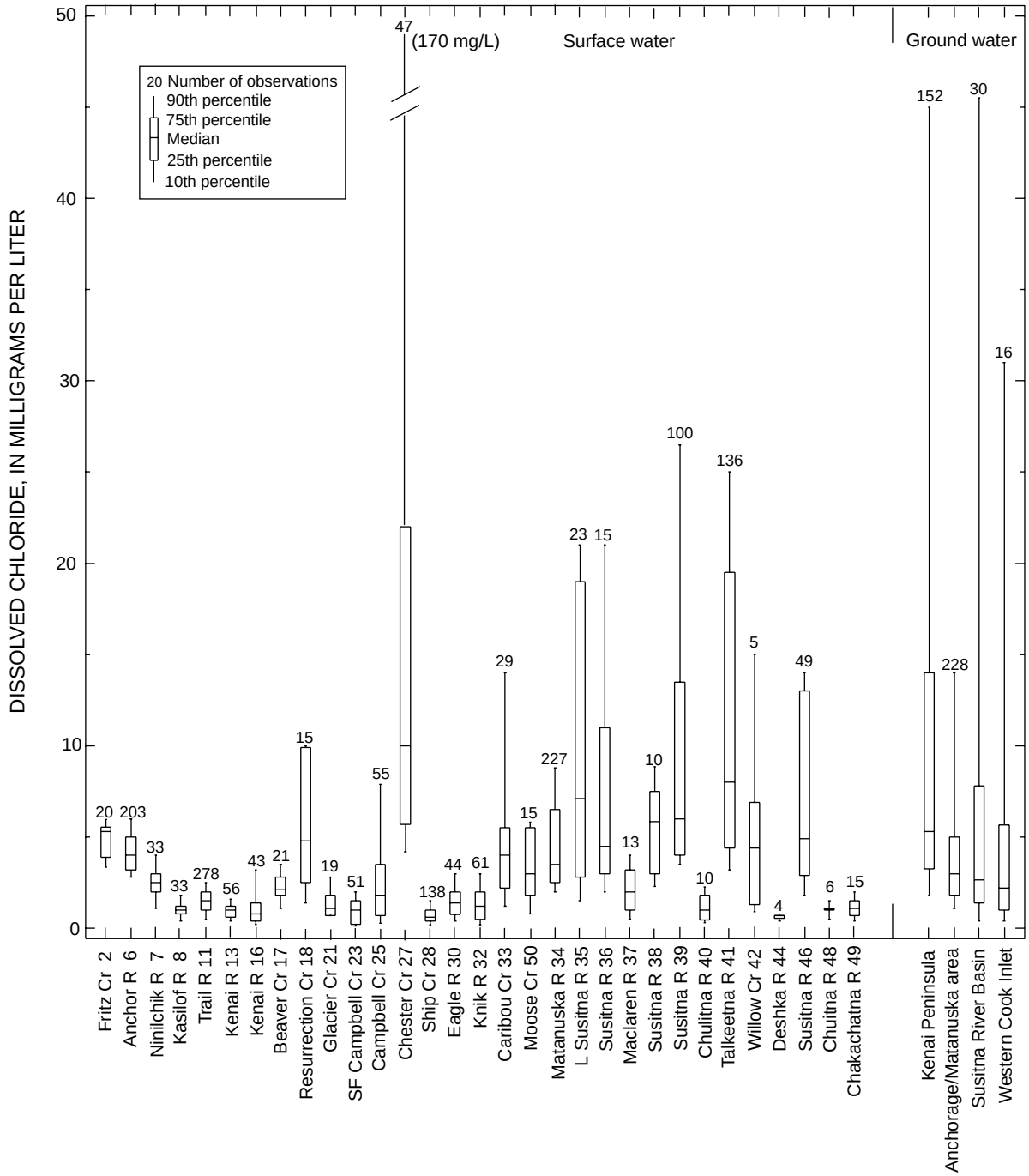

Figure 19. Dissolved-chloride concentrations in water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

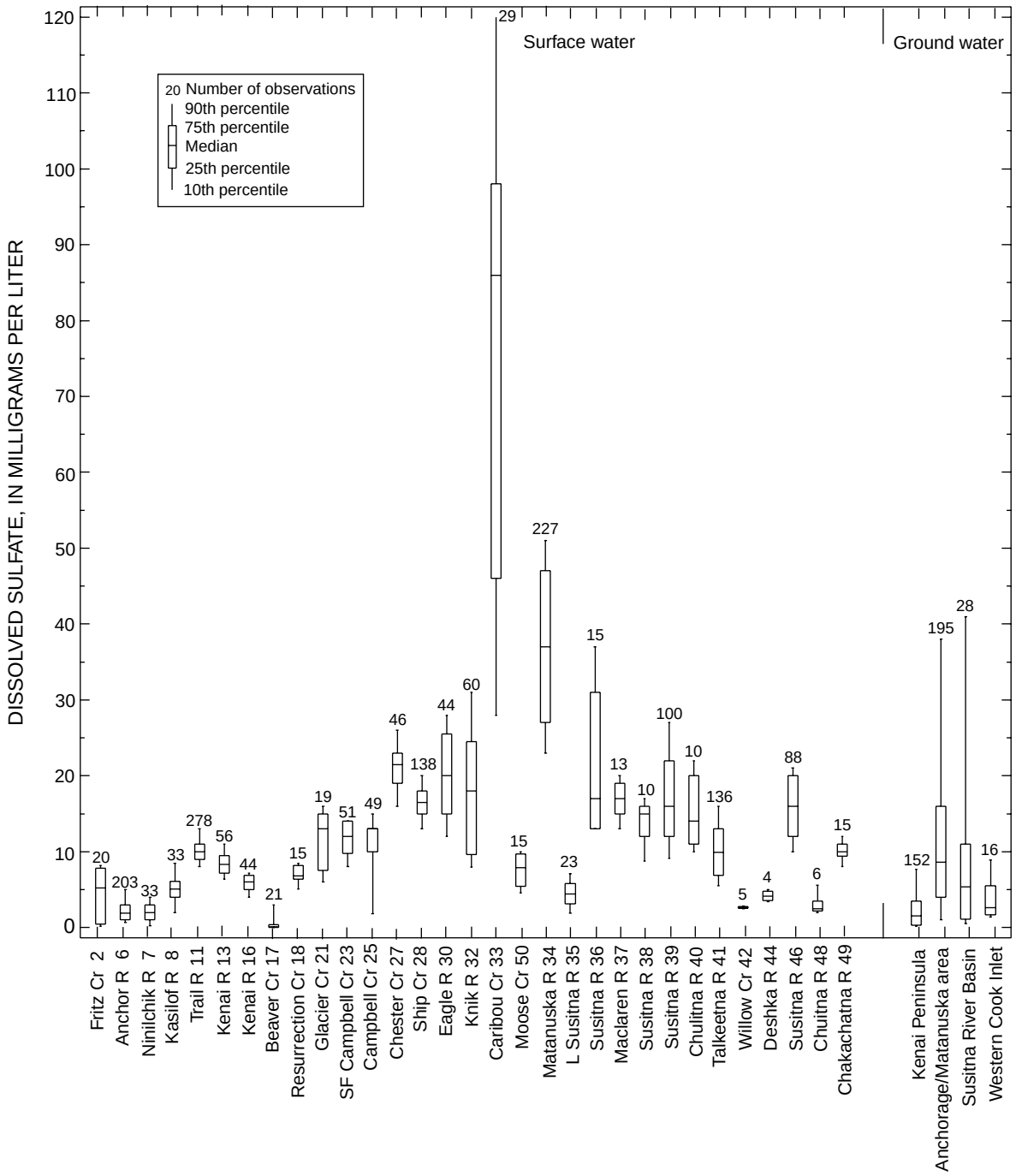

Figure 20. Dissolved-sulfate concentrations in water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

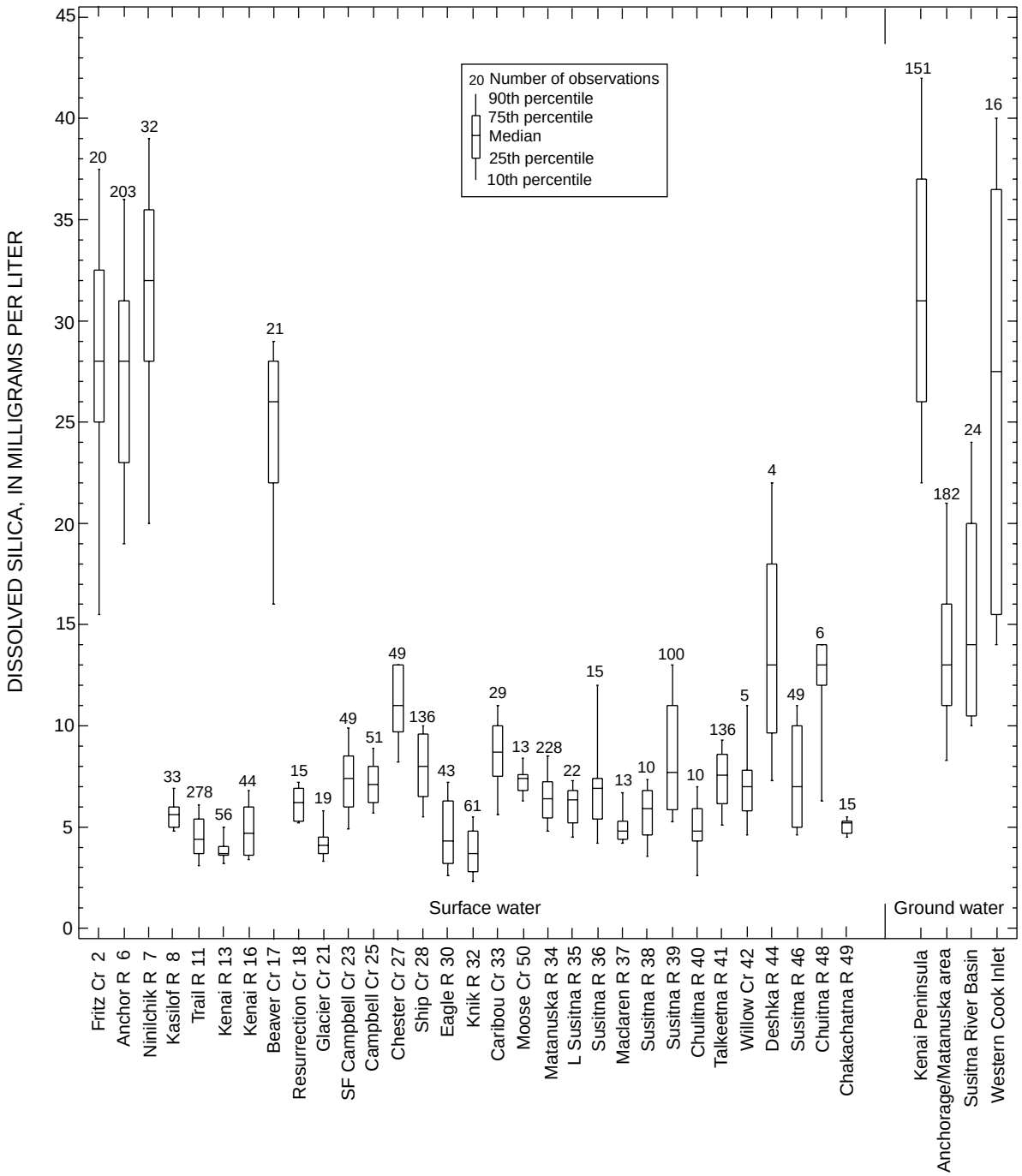

Figure 21. Dissolved-silica concentrations in water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

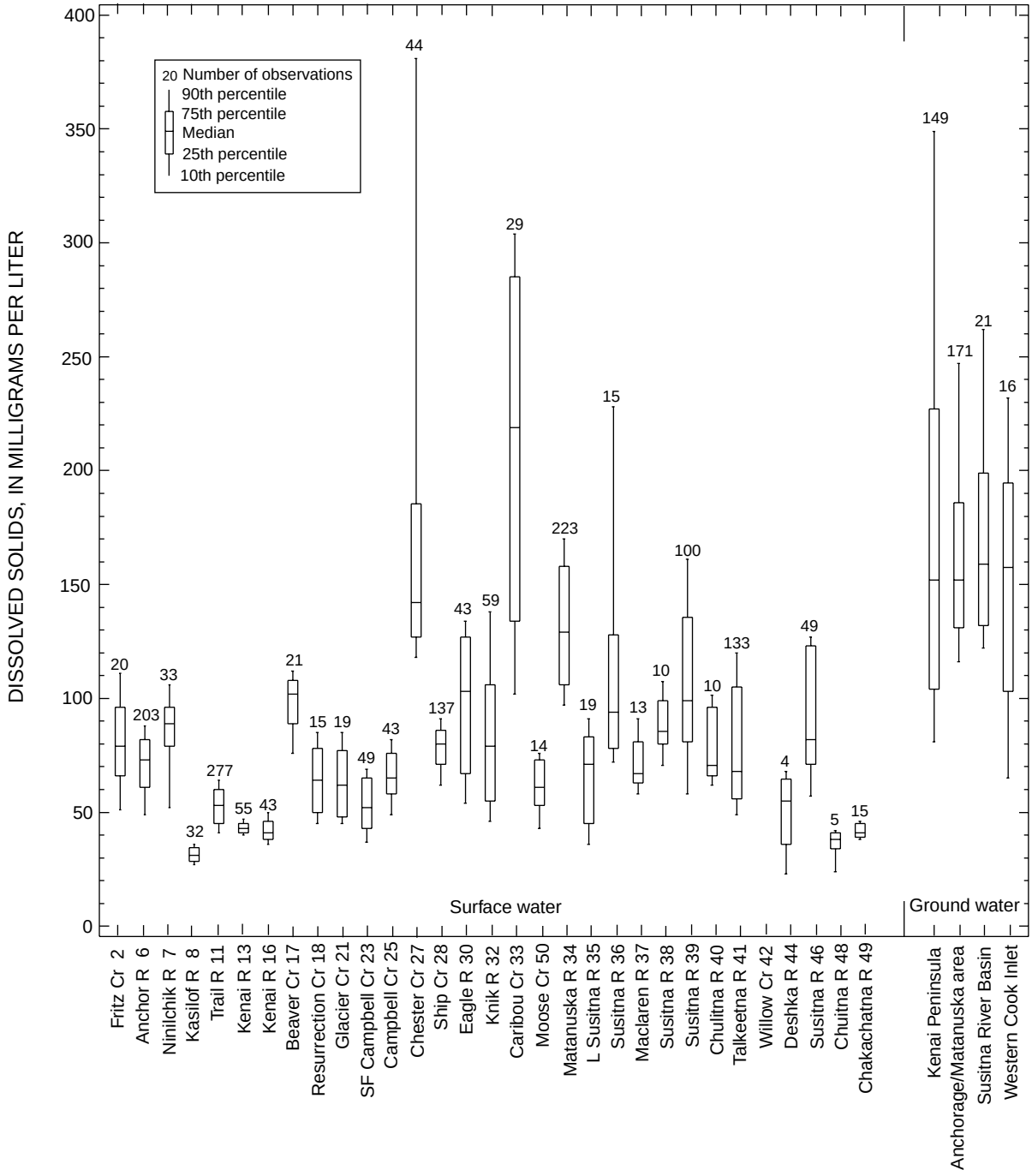

Figure 22. Dissolved-solids concentrations in water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

MCL drinking-water standard. High dissolved-solids content in ground water in low-lying areas may possibly be remnant from a more extensive ancestral Cook Inlet. Brackish-water aquifers could be above the present sea level because the land surface rose after the glaciers that used to overlie the basin melted or because of tectonic uplift.

Leachates from landfills contain high concentrations of dissolved solids. Madison and others (1988) report that leachates from two Anchorage landfills contain large concentrations of iron, manganese, and organic carbon. The leachates have concentrations of dissolved solids ranging from 2 to 20 times greater than adjacent, unaffected ground water. Ground-water contamination by landfills in the study unit appears to be limited to areas immediately adjacent to the landfills. The Merrill Field landfill in Anchorage was used from the 1940's through 1987. Minor amounts of contaminants have reached distances about 2,200 ft from the site, but concentrations are generally less than MCLs except for those within the landfill itself (Brunett, 1990).

Nutrients

Nitrite and nitrate are oxidized forms of inorganic nitrogen that together make up most of the dissolved nitrogen in well-aerated streams. Nitrite readily oxidizes to nitrate in natural water; therefore, nitrate generally is more abundant than nitrite. The MCL for nitrate is 10 mg/L as nitrogen (N). Litchfield and Kyle (1991, 1992) report low mean concentrations of inorganic nitrogen (less than 0.25 mg/L nitrite plus nitrate as N) at 10 sites along the Kenai River, but a mean concentration of 0.5 mg/L as N in an upland tributary, the Russian River. Of the streams in this report, Chester Creek (site 27) had the highest median concentration, 0.6 mg/L as N (fig. 23). Nitrate concentrations from most sampled wells were less than 0.5 mg/L as N. However, in parts of several subdivisions in the hillside area of Anchorage and in the communities of Eagle River and Chugiak, nitrate concentrations in water from domestic wells are greater than 10 mg/L as N (Bristol Environmental Services Corporation, 1997).

Phosphorus is an essential element in the growth of plants and animals. It occurs as organically bound phosphorus or as phosphate. Concentrations of phosphorus in water are not reported to be toxic to human or aquatic life; however, the element can stimulate the growth of algae in lakes and streams. Few streams in the study unit have been sampled for phosphorus, but median concentrations of orthophosphate in the selected streams were low, less than 0.1 mg/L as phosphorus.

Major Metals and Trace Elements

Relatively few samples for metals and trace elements have been collected from surface and ground water in the Cook Inlet study unit. Except for iron and manganese, most metals and trace elements are present in low concentrations and many are present at concentrations lower than the analytic detection limits used. Several constituents have results with multiple detection limits, such as dissolved lead, for which different analyses have reported detection limits of 1, 2, 5, 10, and 20 µg/L. Also, dissolved trace-element concentrations values reported as being greater than analytical detection limits may actually be less than the reported value, because of contamination introduced during sampling, processing, or analysis. New sampling and analysis techniques were initiated during 1994 to reduce the potential for contamination.

Arsenic compounds are present naturally in some rocks within the study unit and arsenic in water can be acutely or chronically toxic to humans and fish. As a result, the MCL for dissolved arsenic is 50 µg/L. Seventeen of 20 samples from the Talkeetna River (site 41) and 6 of

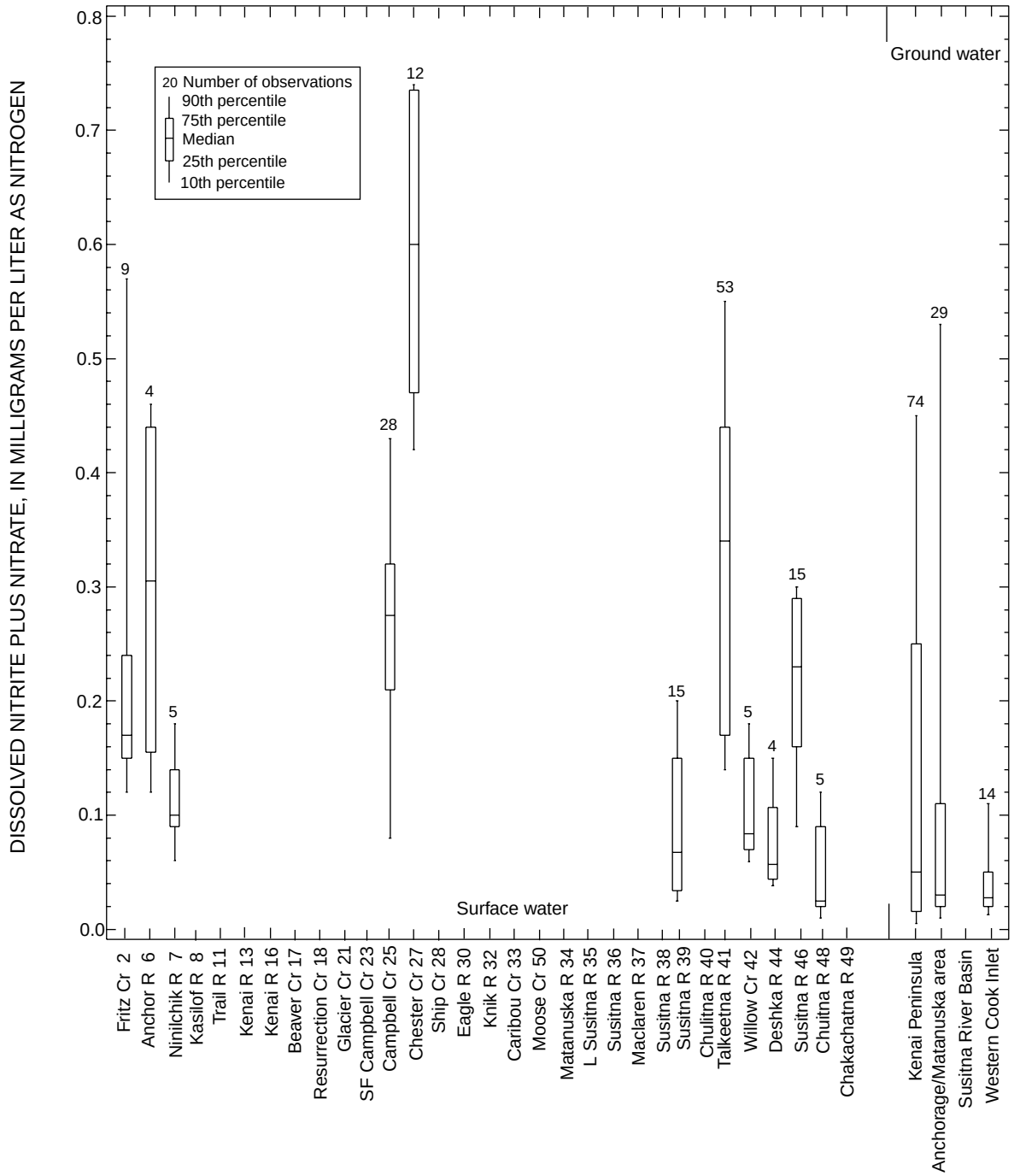

Figure 23. Dissolved nitrite plus nitrate concentrations in water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

27 samples from the Susitna River at Susitna Station (site 46) had concentrations of dissolved arsenic that were less than the 1 µg/L detection limit. The highest concentrations measured in these streams were 2 and 3 µg/L, respectively. Water samples collected by ADFG in 1990 from 10 sites along the Kenai River had mean dissolved-arsenic concentrations ranging from 0.3 to 0.8 µg/L, whereas concentrations in seven Kenai River tributary streams ranged from 0.4 to 4.7µµg/L (Litchfield and Kyle, 1991). Arsenic concentrations as great as 13 µg/L were measured by USFS in May 1984 in streams in the Primrose Creek watershed, a gold mining area and tributary to Kenai Lake (Dave Blanchet, U.S. Forest Service, written commun., 1984). Ground water from 113 wells in the northern part of the Kenai Peninsula sampled by USGS typically had higher concentrations of dissolved arsenic than surface water. The median concentration of dissolved arsenic was 3 µg/L; but nine of 113 wells yielded water having at least 50 µg/L dissolved arsenic (Glass, 1996).

Iron is dissolved from many rocks and soils and is an essential element in the metabolism of animals and plants. On exposure to air, iron in water oxidizes to become a reddish-brown sediment. If present in excess quantities in water used for domestic purposes, it forms a red precipitate that stains laundry and plumbing fixtures, causes discoloration and unpleasant taste in beverages, and may promote growth of iron bacteria in pipes. Iron concentrations less than 300 µg/L are preferred for public supply without treatment. The chronic aquatic toxicity level for total iron is 1,000 µg/L. Iron is present in concentrations that exceed these criteria in both surface and ground water of the study unit. Litchfield and Kyle (1991) report that total (unfiltered) iron concentrations in the Kenai River at Soldotna (site 16) ranged from 279 to 1,120 µg/L. Dissolved iron concentrations vary widely in ground water and concentrations greater than 1,000 µg/L are common (fig. 24).

Suspended Sediment

Suspended sediment is a product of erosion and is also induced by disturbances of land cover caused by glaciers, fires, floods, and human activities such as mining, logging, construction, and recreation. Within the study unit, glaciers are the major agents of erosion. A very high concentration of suspended sediments is needed to kill post-larval fish, but when fine-grained sediments occur in water passing over incubating eggs, the fine sediment may settle on the surface of the egg membranes and physically impair the exchange of gases. A coating of fine sediment over the streambed above gravel redds (nests) will prevent the flow of oxygen-rich water from reaching the buried eggs, which consequently suffer severe mortalities. High suspended-sediment concentrations also reduce the transparency of water making it more difficult for fish to see their food and for light to promote primary productivity. State standards limit the percent accumulation of fine sediment (0.1 to 4.0 mm) in the gravel beds of waters used by anadromous or resident fish (table 2).

Even though many streams on the Kenai Peninsula are glacier fed, large natural lakes such as Kenai, Skilak, and Tustumena allow sediment to settle and reduce the quantity of sediment the streams transport in suspension. The median value of all suspended-sediment concentrations in the Kenai River at Soldotna (site 16), which is downstream from Kenai and Skilak Lakes, was 22 mg/L; the median concentration in the Kasilof River (site 8) below Tustumena Lake was 26 mg/L (fig. 25). In contrast, several glacier-fed rivers that do not contain lakes to retain suspended sediments have the following median values: Matanuska River (site 34), 165 mg/L; Susitna River near Denali (site 36), 942 mg/L; Maclaren River (site 37), 489 mg/L; and Chulitna River (site 40), 763 mg/L (fig. 25).

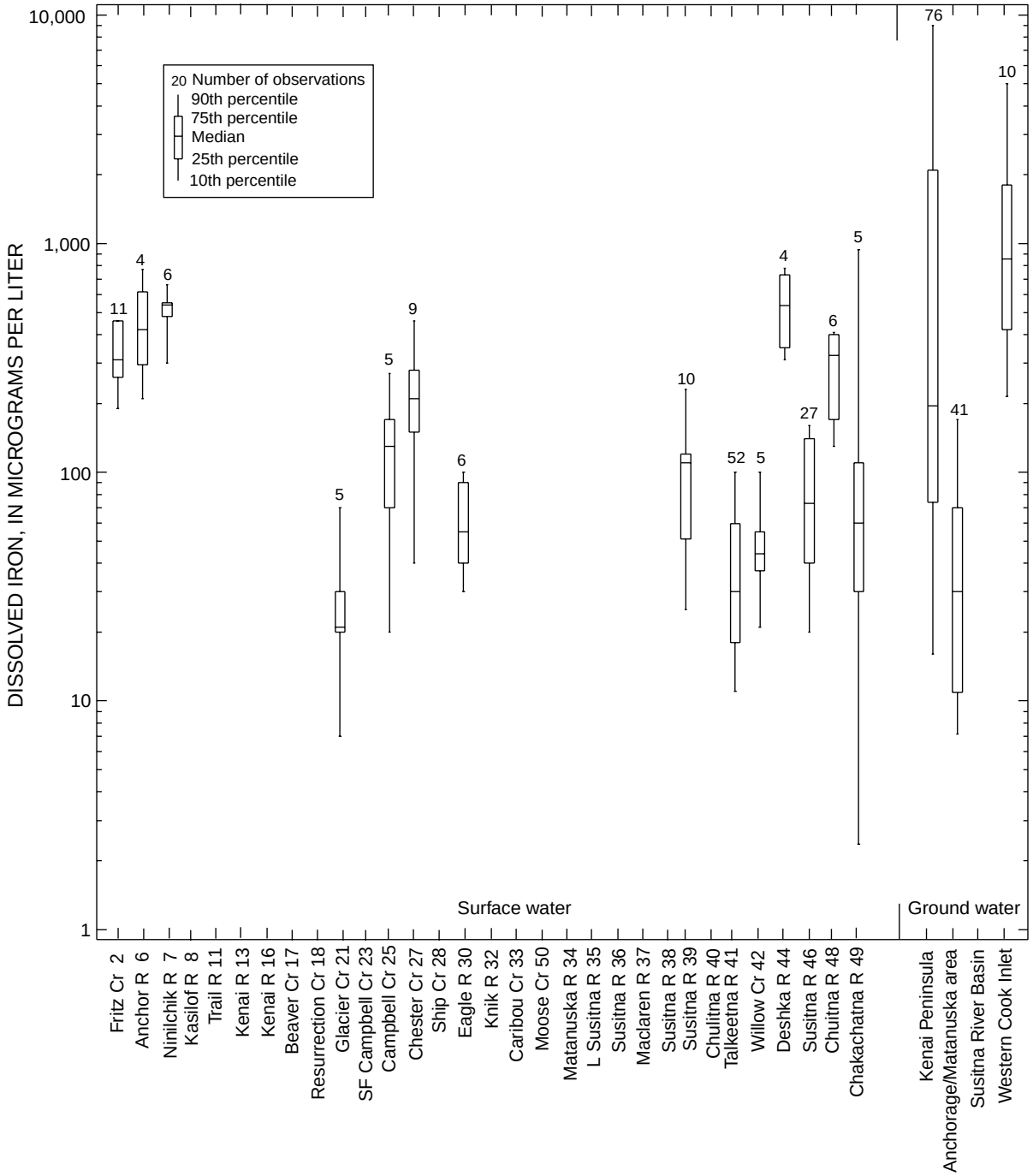

Figure 24. Dissolved-iron concentrations in water from selected surface-water-quality monitoring sites and four ground-water regions in the Cook Inlet Basin.

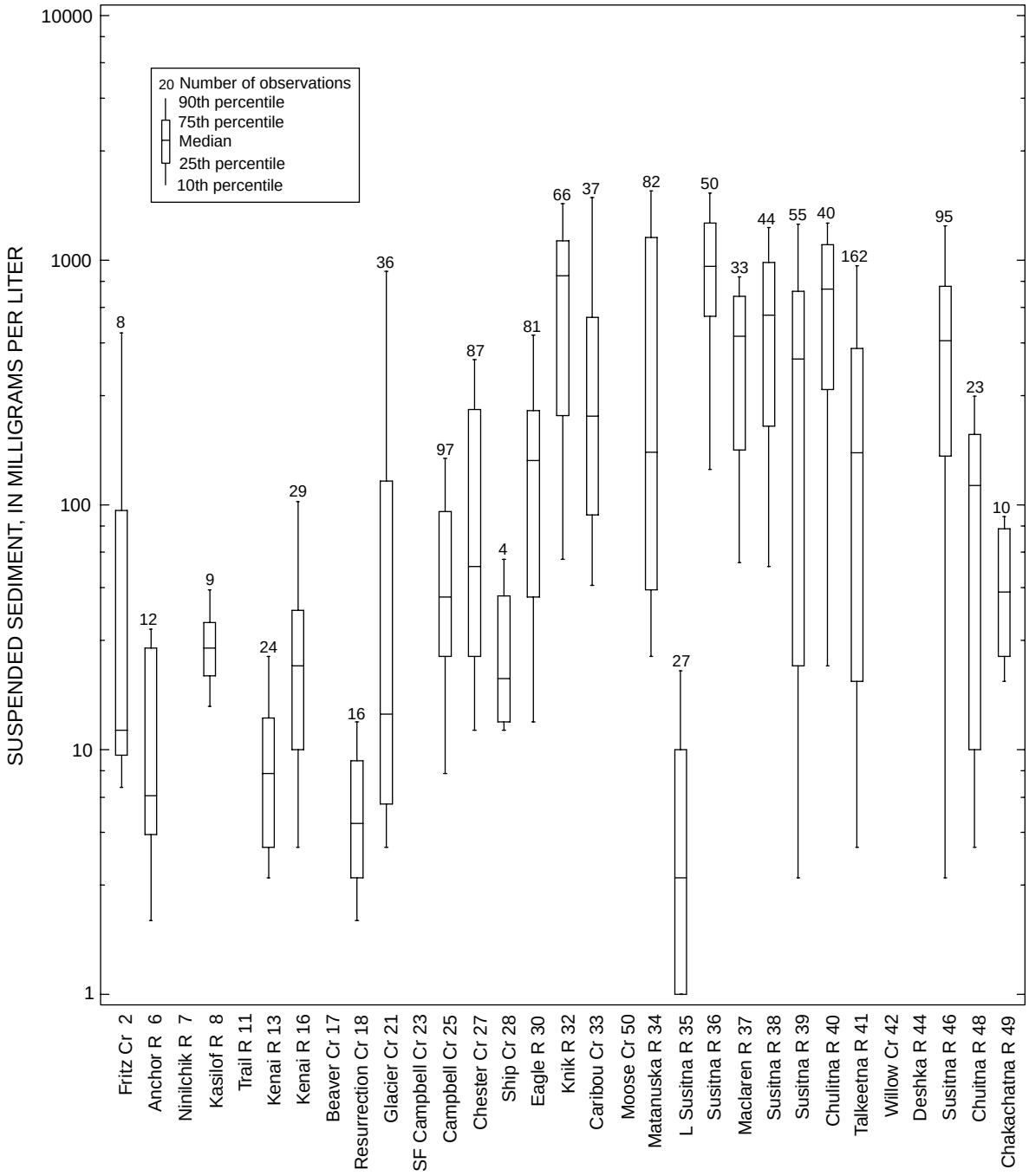

Figure 25. Suspended-sediment concentrations in water from selected surface-water-quality monitoring sites in the Cook Inlet Basin.

Organic Compounds

All natural waters contain some compounds that contain carbon, but concentrations of organic compounds are usually much lower than concentrations of inorganic constituents. Naturally occurring organic solutes may come from decomposing wood, leaves, grasses, peat, and coal in soils or from living plants and animals and their waste products. Water can also contain man-made organic compounds such as oil and gasoline products, herbicides, insecticides, cleaners, disinfectants, and paints. Some organic compounds are toxic to humans, animals, and plant life, even at small concentrations.

The most common type of ground-water contamination in Alaska is caused by spilling or leaking of fuel products (49 of 72 known contamination cases) (Munter and Maynard, 1987). Petroleum-derived fuels are complex mixtures of organic compounds, predominantly hydrocarbons, with varying compositions depending on the source of the crude oil and the refining process. Benzene, toluene, ethylbenzene, and xylenes are commonly associated with gasoline, kerosene, and diesel fuels and have MCLs of 5 µg/L, 1,000 µg/L, 700 µg/L and 10,000 µg/L, respectively (U.S. Environmental Protection Agency, 1996).

Ground-water samples collected outside of contaminated areas generally have concentrations of benzene, toluene, ethylbenzene, or xylenes below analytical detection limits commonly used (0.2 or 0.3 µg/L). However, ADNR's water-quality data base contains results from many wells near leaking fuel-storage tanks, fuel-storage facilities, and petroleum refineries that have benzene concentrations exceeding the MCL. Communities within the study unit having known sites of organic-compound contamination include Anchor Point, Kenai, Nikiski, Soldotna, Anchorage, Indian, Peters Creek, Wasilla, and Elmendorf Air Force Base.

Water samples to be analyzed for concentrations of more than 100 volatile organic compounds were collected in April, June, and September 1986 by USGS from Campbell Creek (site 25). Concentrations of all constituents were less than detection limits. The detection limit for benzene, toluene, ethylbenzene, and xylenes was 0.2 µg/L. Concentrations of volatile organic compounds in water samples collected by ADFG from the Kenai River and its tributaries were highest in the lower part of Kenai River during June and July, and possibly reflect the increased boat traffic at this time of the year (Litchfield and Kyle, 1991). The highest concentration of benzene in samples collected by ADFG on the Kenai River during 1990 was 1.7 µg/L near Eagle Rock, about 9 mi downstream from site 16.

REPORT SUMMARY

Thirty-one streams and four ground-water regions were selected to help describe water-quality conditions within the 39,325-square-mile Cook Inlet Basin study unit. Many streams have several measurements of water temperature, pH, alkalinity, and major ions. However, few sites have long-term water-quality records and very few data are available for dissolved oxygen, nutrients, metals, trace elements, organic compounds, radionuclides, or bacteria. Concentrations of specific organic compounds, such as a specific pesticide, are generally not available because only a few samples have been collected within the study unit.

Generally, the water quality of streams within the Cook Inlet study unit is very good and most streams contain water that is of suitable quality for domestic and industrial uses, propagation of fish and wildlife, and water-contact recreation. However, glacier-fed streams can require treatment to remove suspended sediment. Most streams have low mineral content, have pH values ranging from slightly acid to slightly basic, and have low to moderate acid-neutralizing capacity. Water

temperatures in most streams during summer are sufficiently cool and oxygenated for salmon and trout. Dissolved trace-element concentrations are generally low, but iron concentrations are locally higher than those preferred for drinking. Several streams and lakes in urban areas within Anchorage contain concentrations of fecal coliform bacteria much higher than that allowed for drinking or water-contact recreation.

Most ground water is withdrawn from unconsolidated aquifers and is generally of good quality. However, ground water in most areas can naturally contain objectionable arsenic, iron, and hardness concentrations. Ground water typically contains larger concentrations of dissolved solids than does surface water. Most wells yield water containing less than 500 mg/L dissolved solids. Concentrations of dissolved arsenic exceeding drinking-water standards (50 µg/L) occur, but fewer than 10 percent of wells sampled yielded water containing greater than 50 µg/L. The maximum concentration of dissolved arsenic in ground water from an unconsolidated aquifer was 94 µg/L.

Local water-quality degradation caused by human activity can make ground water in aquifers unsuitable for many uses. The most common type of contamination results from spilling or leaking of petroleum products. Ground water in Anchor Point, Kenai, Soldotna, Sterling, Nikiski, Anchorage, Peters Creek, Indian, and Wasilla has been polluted with petroleum, chlorinated solvents, nitrate, or fecal coliform bacteria.

Human activities, including increasing residential, commercial, and industrial development, spilling or leaking of petroleum and chemical products, developing and transporting of oil and gas, mining, and timber harvesting, are the most likely future threats to water quality.

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APPENDIX 1

Cook Inlet NAWQA Map Numbering System

The map numbers of stream water-quality sites on the tables and figures in this report generally follow the map numbering system for stream-gaging stations in the NAWQA environmental setting report (Brabets and others, 1999). Because water-quality conditions are not discussed for each of the stream-gaging stations numbered in the environmental setting report, this water-quality summary contains gaps in the map numbers and the numbers are not sequential. The following list contains all the map numbers assigned to stream water-quality sites in the NAWQA Program as of summer 1999. Additional sites may be added in the future.

Shaded sites are those that are included in this water-quality summary.

Cook Inlet NAWQA Map Numbering System

Map No.	USGS station No.	Name
1	15238820	Barabara Creek near Seldovia
2	15239500	**Fritz Creek near Homer**
3	15239000	Bradley River near Homer
4	15239050	Middle Fork Bradley River near Homer
5	15239900	Anchor River near Anchor Point
6	15240000	**Anchor River at Anchor Point**
7	15241600	**Ninilchik River at Ninilchik**
8	15242000	**Kasilof River near Kasilof**
9	15244000	Ptarmigan Creek at Lawing
10	15246000	Grant Creek near Moose Pass
11	15248000	**Trail River near Lawing**
12	15254000	Crescent Creek near Cooper Landing
13	15258000	**Kenai River at Cooper Landing**
14	15260000	Cooper Creek near Cooper Landing
15	15264000	Russian River near Cooper Landing
16	15266300	**Kenai River at Soldotna**
17	15266500	**Beaver Creek near Kenai**
18	15267900	**Resurrection Creek near Hope**
19	15271000	Sixmile Creek near Hope
20	15272280	Portage River at Lake Outlet near Whittier
21	15272550	**Glacier Creek at Girdwood**
22	15273900	South Fork Campbell Creek at Canyon Mouth near Anchorage
23	15274000	**South Fork Campbell Creek near Anchorage**
24	15274300	North Fork Campbell Creek near Anchorage
25	15274600	**Campbell Creek near Spenard**
26	15275000	Chester Creek at Anchorage

Cook Inlet NAWQA Map Numbering System (Continued)

Map No.	USGS station No.	Name
27	15275100	**Chester Creek at Arctic Boulevard at Anchorage**
28	15276000	**Ship Creek near Anchorage**
29	15276570	Ship Creek below Power Plant at Elmendorf Air Force Base
30	15277100	**Eagle River at Eagle River**
31	15277410	Peters Creek near Birchwood
32	15281000	**Knik River near Palmer**
33	15282000	**Caribou Creek near Sutton**
34	15284000	**Matanuska River at Palmer**
35	15290000	**Little Susitna River near Palmer**
36	15291000	**Susitna River near Denali**
37	15291200	**Maclaren River near Paxson**
38	15291500	**Susitna River near Cantwell**
39	15292000	**Susitna River at Gold Creek**
40	15292400	**Chulitna River near Talkeetna**
41	15292700	**Talkeetna River near Talkeetna**
42	15294005	**Willow Creek near Willow**
43	15274010	Deception Creek near Willow
44	15294100	**Deshka River near Willow**
45	15294300	Skwentna River near Skwentna
46	15294350	**Susitna River at Susitna Station**
47	15294410	Capps Creek below North Capps Creek near Tyonek
48	15294450	**Chuitna River near Tyonek**
49	15294500	**Chakachatna River near Tyonek**
50	15283700	**Moose Creek near Palmer**
51	5857501541011	Kamishak River near Kamishak
52	1594700	Johnson River above Lateral Glacier near Tuxedni Bay
53	15266010	Kenai River below Russian River near Cooper Landing
54	15266020	Kenai River at Jim’s Landing near Cooper Landing
55	15216110	Kenai River below Skilak Lake Outlet
56	15267160	Swanson River near Kenai
57	6316291493520	Colorado Creek near Colorado
58	6310181493237	Costello Creek near Colorado

APPENDIX 2

Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska

[Note: “Parameter Code” is a 5-digit number used by the U.S. Environmental Protection Agency and the U.S. Geological Survey in their computerized data systems to uniquely identify a specific constituent]

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(00095) Specific conductance (microsiemens per centimeter at 25 degrees Celsius)												
00095	15239500	Fritz Creek near Homer	36	0	43	52	69	96	113	130	155	92
00095	15240000	Anchor River at Anchor Point	216	0	40	53	68	83	92	100	128	80
00095	15241600	Ninilchik River at Ninilchik	47	0	30	52	80	100	110	123	141	95
00095	15242000	Kasilof River near Kasilof	34	0	40	41	42	45	49	51	55	46
00095	15248000	Trail River near Lawing	274	0	57	69	75	87	99	108	124	88
00095	15258000	Kenai River at Cooper Landing	78	0	61	67	70	72	77	82	110	74
00095	15266300	Kenai River at Soldotna	55	0	57	62	65	68	75	85	98	71
00095	15266500	Beaver Creek near Kenai	33	0	43	105	114	140	152	165	180	134
00095	15267900	Resurrection Creek near Hope	19	0	73	78	89	109	143	156	164	114
00095	15272550	Glacier Creek at Girdwood	58	0	68	74	90	113	137	146	156	113
00095	15274000	SF Campbell Creek near Anchorage	63	0	49	64	72	88	101	107	112	86
00095	15274600	Campbell Creek near Spenard	109	0	52	70	89	108	130	140	184	109
00095	15275100	Chester Creek at Arctic Boulevard	76	0	115	194	210	236	270	470	780	275
00095	15276000	Ship Creek near Anchorage	151	0	75	101	115	130	143	148	216	128
00095	15277100	Eagle River at Eagle River	105	0	64	71	80	111	190	222	286	133
00095	15281000	Knik River near Palmer	83	0	69	77	89	121	181	221	266	138
00095	15282000	Caribou Creek near Sutton	36	0	105	159	212	330	397	481	911	326
00095	15283700	Moose Creek near Palmer	16	0	54	66	85	103	119	130	139	101
00095	15284000	Matanuska River at Palmer	236	0	143	161	174	215	263	281	309	218
00095	15290000	Little Susitna River near Palmer	48	0	42	55	71	99	142	154	220	106
00095	15291000	Susitna River near Denali	21	0	121	124	130	157	200	351	467	192
00095	15291200	Maclaren River near Paxson	19	0	84	90	101	114	141	170	182	120
00095	15291500	Susitna River near Cantwell	23	0	91	114	136	147	162	177	250	149
00095	15292000	Susitna River at Gold Creek	122	0	70	101	119	156	211	268	300	169
00095	15292400	Chulitna River near Talkeetna	21	0	101	108	118	124	144	178	190	135

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00095	15292700	Talkeetna River near Talkeetna	178	0	50	75	90	106	168	200	242	126
00095	15294005	Willow Creek near Willow	6	0	33	--	--	48	--	--	119	60
00095	15294100	Deshka River near Willow	10	0	26	27	31	39	76	80	81	49
00095	15294350	Susitna River at Susitna Station	70	0	61	92	111	127	194	216	225	148
00095	15294450	Chuitna River near Tyonek	21	0	25	25	28	38	51	57	79	42
00095	15294500	Chakachatna River near Tyonek	16	0	60	62	63	65	68	69	77	65
		(00400) pH (units)										
00400	15239500	Fritz Creek near Homer	20	0	6.6	6.7	7.1	7.4	7.7	7.8	7.9	7.3
00400	15240000	Anchor River at Anchor Point	199	0	5.9	6.7	6.9	7.1	7.3	7.6	8.2	7.1
00400	15241600	Ninilchik River at Ninilchik	29	0	6.4	6.6	6.8	7.1	7.6	7.8	8.2	7.2
00400	15242000	Kasilof River near Kasilof	33	0	5.9	6.2	6.5	6.8	7.0	7.1	7.5	6.7
00400	15248000	Trail River near Lawing	274	0	5.9	7.0	7.2	7.3	7.5	7.6	8.0	7.3
00400	15258000	Kenai River at Cooper Landing	59	0	6.3	6.7	6.9	7.1	7.3	7.7	8.0	7.1
00400	15266300	Kenai River at Soldotna	45	0	6.1	6.5	6.8	7.2	7.5	7.7	8.6	7.2
00400	15266500	Beaver Creek near Kenai	30	0	6.3	6.8	7.0	7.4	7.8	8.0	8.1	7.4
00400	15267900	Resurrection Creek near Hope	18	0	7.0	7.1	7.6	7.8	7.8	7.9	8.2	7.7
00400	15272550	Glacier Creek at Girdwood	32	0	6.7	7.0	7.3	7.5	7.7	7.8	8.0	7.5
00400	15274000	SF Campbell Creek near Anchorage	61	0	6.6	6.9	7.1	7.3	7.5	7.8	8.1	7.3
00400	15274600	Campbell Creek near Spenard	92	0	6.1	6.6	6.7	7.1	7.5	7.7	8.3	7.1
00400	15275100	Chester Creek at Arctic Boulevard	47	0	6.4	6.9	7.1	7.5	7.8	8.1	8.1	7.5
00400	15276000	Ship Creek near Anchorage	150	0	6.5	7.1	7.3	7.4	7.6	7.8	8.1	7.4
00400	15277100	Eagle River at Eagle River	48	0	6.4	6.8	7.3	7.6	7.8	8.0	8.1	7.5
00400	15281000	Knik River near Palmer	61	0	6.6	6.9	7.2	7.5	7.7	7.9	8.1	7.4
00400	15282000	Caribou Creek near Sutton	31	0	6.9	7.1	7.2	7.4	7.7	7.8	8.2	7.5
00400	15283700	Moose Creek near Palmer	13	0	6.5	6.8	7.2	7.2	7.3	7.5	7.9	7.2
00400	15284000	Matanuska River at Palmer	226	0	6.4	7.1	7.4	7.6	7.8	7.9	8.3	7.5

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00400	15290000	Little Susitna River near Palmer	20	0	6.2	6.5	7.1	7.3	7.5	7.8	8.1	7.2
00400	15291000	Susitna River near Denali	15	0	7.1	7.2	7.4	7.5	7.6	7.8	7.9	7.5
00400	15291200	Maclaren River near Paxson	14	0	6.8	7.2	7.5	7.6	7.7	7.8	7.8	7.5
00400	15291500	Susitna River near Cantwell	10	0	7.2	7.3	7.5	7.7	7.9	8.1	8.1	7.7
00400	15292000	Susitna River at Gold Creek	127	0	6.5	6.9	7.2	7.4	7.7	8.0	8.5	7.4
00400	15292400	Chulitna River near Talkeetna	10	0	7.1	7.2	7.4	7.6	7.7	8.1	8.1	7.6
00400	15292700	Talkeetna River near Talkeetna	165	0	6.2	6.6	7.0	7.4	7.7	7.9	8.6	7.3
00400	15294005	Willow Creek near Willow	6	0	6.7	--	--	7.0	--	--	7.7	7.1
00400	15294100	Deshka River near Willow	9	0	6.1	--	--	6.6	--	--	7.6	6.8
00400	15294350	Susitna River at Susitna Station	69	0	6.5	7.0	7.2	7.6	7.9	8.2	8.3	7.6
00400	15294450	Chuitna River near Tyonek	10	0	6.5	6.6	6.8	7.2	7.5	7.6	7.6	7.1
00400	15294500	Chakachatna River near Tyonek	16	0	6.6	7.0	7.0	7.3	7.5	7.5	7.5	7.2
(00010) Temperature (degrees Celsius)												
00010	15239500	Fritz Creek near Homer	38	0	0.0	0.0	0.0	2.8	7.5	8.5	9.5	3.8
00010	15240000	Anchor River at Anchor Point	49	0	0.0	0.0	0.5	5.5	12.5	15.0	28.0	7.1
00010	15241600	Ninilchik River at Ninilchik	33	0	0.0	0.0	1.5	5.5	11.5	13.0	15.0	6.1
00010	15242000	Kasilof River near Kasilof	27	0	0.0	0.0	1.0	5.5	11.5	13.0	13.5	6.4
00010	15248000	Trail River near Lawing	34	0	0.0	0.0	0.5	6.0	9.5	10.5	12.0	5.7
00010	15258000	Kenai River at Cooper Landing	67	0	0.0	0.5	1.0	4.5	8.5	10.5	12.0	4.9
00010	15266300	Kenai River at Soldotna	58	0	0.0	0.0	1.0	6.3	10.0	11.5	13.0	5.9
00010	15266500	Beaver Creek near Kenai	31	0	0.0	0.0	0.0	3.0	7.0	10.0	11.5	3.7
10000	15267900	Resurrection Creek near Hope	19	0	0.0	0.0	0.0	4.0	6.5	8.0	10.5	3.4
00010	15272550	Glacier Creek at Girdwood	65	0	0.0	0.0	0.5	3.0	5.5	7.0	11.0	3.4
00010	15274000	SF Campbell Creek near Anchorage	37	0	0.0	0.0	1.0	5.0	8.0	12.0	14.0	4.8
00010	15274600	Campbell Creek near Spenard	126	0	0.0	0.0	0.0	6.0	9.0	10.5	15.0	5.0
00010	15275100	Chester Creek at Arctic Boulevard	111	0	0.0	0.0	0.5	3.0	7.0	11.0	14.0	4.2

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00010	15276000	Ship Creek near Anchorage	47	0	0.0	0.0	1.0	2.5	6.0	8.0	11.0	3.5
00010	15277100	Eagle River at Eagle River	100	0	0.0	0.0	4.0	7.0	8.8	10.0	15.0	6.3
00010	15281000	Knik River near Palmer	85	0	0.0	0.0	3.0	4.0	6.0	8.0	12.0	4.2
00010	15282000	Caribou Creek near Sutton	56	0	0.0	0.0	1.0	4.0	7.3	11.5	14.5	4.7
00010	15283700	Moose Creek near Palmer	12	0	0.0	0.5	1.0	3.8	6.0	6.5	7.0	3.5
00010	15284000	Matanuska River at Palmer	104	0	0.0	0.0	0.5	2.0	6.0	9.0	11.5	3.5
00010	15290000	Little Susitna River near Palmer	43	0	0.0	0.0	0.0	1.0	5.0	6.5	9.5	2.4
00010	15291000	Susitna River near Denali	67	0	0.0	0.3	3.5	5.5	6.5	9.0	10.5	5.0
00010	15291200	Maclaren River near Paxson	33	0	0.0	1.5	4.0	6.0	7.0	9.5	11.0	5.7
00010	15291500	Susitna River near Cantwell	51	0	0.0	2.5	4.0	8.0	10.0	11.0	13.0	7.3
00010	15292000	Susitna River at Gold Creek	82	0	0.0	0.0	2.0	7.0	11.0	12.5	14.0	6.6
00010	15292400	Chulitna River near Talkeetna	55	0	0.0	0.0	4.5	6.5	7.5	8.5	9.5	5.7
00010	15292700	Talkeetna River near Talkeetna	199	0	0.0	0.0	1.0	6.5	9.0	11.0	13.0	5.7
00010	15294005	Willow Creek near Willow	12	0	0.0	2.0	3.0	5.3	8.0	12.0	13.0	5.8
00010	15294100	Deshka River near Willow	10	0	0.0	0.0	6.5	10.8	15.0	18.3	20.5	10.1
00010	15294350	Susitna River at Susitna Station	73	0	0.0	0.0	0.0	6.0	9.5	11.0	14.0	5.4
00010	15294450	Chuitna River near Tyonek	25	0	0.0	0.5	1.5	4.5	10.5	15.0	19.0	6.1
00010	15294500	Chakachatna River near Tyonek	13	0	0.5	2.0	2.5	5.0	6.0	7.0	7.0	4.3
(00076) Turbidity (nepthelometric turbidity units)												
00076	15274600	Campbell Creek near Spenard	6	0	3.2	--	--	14.5	--	--	57.0	24.4
00076	15292000	Susitna River at Gold Creek	12	0	0.1	0.5	4.5	40.5	115.0	220.0	290.0	75.3
00076	15292700	Talkeetna River near Talkeetna	34	0	0.4	0.5	1.0	7.8	47.0	96.0	340.0	37.2
00076	15294350	Susitna River at Susitna Station	30	0	0.7	1.0	1.2	27.5	170	335	790	112

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(00300) Oxygen, dissolved (milligrams per liter)												
00300	15239500	Fritz Creek near Homer	3	0	13.6	--	--	13.8	--	--	13.8	13.7
00300	15266500	Beaver Creek near Kenai	8	0	10.0	10.0	10.2	10.6	10.9	13.8	13.8	10.9
00300	15272550	Glacier Creek at Girdwood	9	0	11.3	11.3	12.5	12.7	13.4	14.1	14.1	12.7
00300	15274600	Campbell Creek near Spenard	90	0	9.7	11.1	12.1	12.5	12.8	13.2	14.4	12.4
00300	15275100	Chester Creek at Arctic Boulevard	22	0	9.2	10.6	12.1	13.1	13.5	13.9	14.2	12.6
00300	15276000	Ship Creek near Anchorage	3	0	11.9	--	--	12.0	--	--	13.7	12.5
00300	15277100	Eagle River at Eagle River	2	0	11.8	-	--	12.4	--	--	12.9	12.4
00300	15292000	Susitna River at Gold Creek	157	0	8.5	10.1	10.8	11.6	12.6	13.5	16.2	11.7
00300	15292700	Talkeetna River near Talkeetna	327	0	7.1	10.4	10.8	11.8	12.7	13.5	15.3	11.8
00300	15294005	Willow Creek near Willow	9	0	11.0	11.0	12.6	13.3	13.4	15.0	15.0	13.1
00300	15294100	Deshka River near Willow	20	0	8.8	8.8	8.9	11.0	11.1	11.4	12.4	10.4
00300	15294350	Susitna River at Susitna Station	210	0	9.0	10.2	10.7	11.3	12.0	12.6	13.9	11.4
00300	15294450	Chuitna River near Tyonek	9	0	10.1	10.1	10.2	11.8	13.0	13.7	13.7	11.7
(00301) Oxygen, dissolved, percent saturated												
00301	15266500	Beaver Creek near Kenai	8	0	70	70	76.5	85.5	93.5	99	99	85
00301	15272550	Glacier Creek at Girdwood	9	0	81	81	94	96	98	100	100	95
00301	15274600	Campbell Creek near Spenard	78	0	82	86	87	90	98	103	110	92
00301	15275100	Chester Creek at Arctic Boulevard	15	0	84	92	94	98	100	109	113	98
00301	15276000	Ship Creek near Anchorage	3	0	95	--	--	96	--	--	101	97
00301	15292000	Susitna River at Gold Creek	143	0	77	89	94	99	104	108	119	99
00301	15292700	Talkeetna River near Talkeetna	284	0	47	87	92	98	101	104	110	96
00301	15294005	Willow Creek near Willow	8	0	86	86	98	98	101	109	109	99
00301	15294100	Deshka River near Willow	20	0	84	84	87	91	96	102	107	92
00301	15294350	Susitna River at Susitna Station	164	0	67	78	87	94	98	99	108	92

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(31501) Coliform, membrane filtered, M-ENDO medium, immediate (colonies per 100 milliliters)												
31501	15292700	Talkeetna River near Talkeetna	42	4	0.20	1.00	3.00	6.00	27.00	80.00	190	23.0
31501	15294350	Susitna River at Susitna Station	3	0	2.00	--	--	7.00	--	-	17.00	8.67
(31616) Coliform, membrane filter (colonies per 100 milliliters)												
31616	15292700	Talkeetna River near Talkeetna	19	6	0.07	0.14	0.38	1.00	4.00	11.00	20.00	3.77
31616	15294350	Susitna River at Susitna Station	18	1	0.25	1.00	2.00	4.50	13.00	45.00	50.00	10.29
(31625) Coliform, fecal, 0.7 μm membrane filter M-FC media (colonies per 100 milliliters)												
31625	15239500	Fritz Creek near Homer	9	0	2.00	2.00	3.00	9.00	20.00	290	290	41.2
31625	15274600	Campbell Creek near Spenard	50	0	6.00	10.50	24.00	75.00	190	330	1300	155
31625	15275100	Chester Creek at Arctic Boulevard	12	0	120	150	165	190	385	540	1700	373
31625	15292700	Talkeetna River near Talkeetna	47	10	0.16	0.52	1.00	5.00	12.00	24.00	40.00	8.40
31625	15294350	Susitna River at Susitna Station	29	2	0.95	1.36	5.00	11.00	20.00	41.00	91.00	16.84
(31679) Streptococci, fecal, membrane filter, M-F agar (colonies per 100 milliliters)												
31679	15292700	Talkeetna River near Talkeetna	20	7	0.00	0.02	0.10	1.00	7.50	69.00	130.00	16.2
31679	15294350	Susitna River at Susitna Station	17	3	0.42	0.71	2.00	5.00	14.00	28.00	42.00	10.5
(31673) Streptococci, fecal, membrane filter, KF agar (colonies per 100 milliliters)												
31673	15274600	Campbell Creek near Spenard	20	0	9.00	27.00	102	220	810	1700	2800	561
31673	15292700	Talkeetna River near Talkeetna	44	15	0.06	0.26	0.64	2.50	9.00	18.00	44.00	7.27
31673	15294350	Susitna River at Susitna Station	30	14	0.03	0.14	0.48	1.75	8.00	40.50	69.00	10.8
(00900) Hardness, total (milligrams per liter as $CaCO_3$)												
00900	15239500	Fritz Creek near Homer	20	0	13.0	16.5	24.0	31.5	47.0	54.0	57.0	34.0
00900	15240000	Anchor River at Anchor Point	204	0	11.0	19.0	24.0	30.0	34.5	38.0	46.0	29.2
00900	15241600	Ninilchik River at Ninilchik	33	0	10.0	22.0	32.0	36.0	42.0	45.0	52.0	35.3
00900	15242000	Kasilof River near Kasilof	33	0	10.0	15.0	16.0	18.0	20.0	20.0	22.0	17.6
00900	15248000	Trail River near Lawing	278	0	25.0	31.0	34.0	40.0	46.0	50.0	55.0	40.3
00900	15258000	Kenai River at Cooper Landing	58	0	28.0	29.0	29.0	31.0	34.0	37.0	49.0	32.3

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00900	15266300	Kenai River at Soldotna	45	0	21.0	26.0	27.0	29.0	33.0	36.0	39.0	29.9
00900	15266500	Beaver Creek near Kenai	21	0	38.0	43.0	57.0	61.0	63.0	68.0	110	60.6
00900	15267900	Resurrection Creek near Hope	18	0	33.0	34.0	39.0	47.0	55.0	63.0	73.0	47.7
00900	15272550	Glacier Creek at Girdwood	23	0	30.0	36.0	42.0	50.0	61.0	63.0	68.0	50.7
00900	15274000	SF Campbell Creek near Anchorage	62	0	18.0	28.0	34.0	41.5	48.0	51.0	56.0	40.2
00900	15274600	Campbell Creek near Spenard	63	0	27.0	35.0	42.0	50.0	56.0	60.0	71.0	48.8
00900	15275100	Chester Creek at Arctic Boulevard	52	0	74.0	88.0	95.5	110	120	120	130	105
00900	15276000	Ship Creek near Anchorage	149	0	36.0	47.0	53.0	61.0	66.0	71.0	100	59.9
00900	15277100	Eagle River at Eagle River	46	0	34.0	44.0	53.0	87.0	110	110	130	80.6
00900	15281000	Knik River near Palmer	62	0	34.0	38.0	43.0	64.5	90.0	120	130	69.0
00900	15282000	Caribou Creek near Sutton	31	0	43.0	71.0	90.0	140	180	200	400	142
00900	15283700	Moose Creek near Palmer	14	0	27.0	30.0	37.0	42.0	50.0	51.0	52.0	42.1
00900	15284000	Matanuska River at Palmer	229	0	56.0	73.0	80.0	95.0	120.0	130	140	98.6
00900	15290000	Little Susitna River near Palmer	21	0	18.0	24.0	30.0	39.0	46.0	49.0	100	40.0
00900	15291000	Susitna River near Denali	15	0	50.0	52.0	55.0	68.0	87.0	160	180	84.5
00900	15291200	Maclaren River near Paxson	13	0	37.0	44.0	45.0	51.0	61.0	67.0	83.0	53.7
00900	15291500	Susitna River near Cantwell	10	0	42.0	47.0	58.0	63.0	72.0	74.0	76.0	62.6
00900	15292000	Susitna River at Gold Creek	100	0	30.0	37.5	55.5	71.0	93.0	100	120	71.9
00900	15292400	Chulitna River near Talkeetna	10	0	46.0	49.5	55.0	57.0	78.0	82.5	84.0	62.5
00900	15292700	Talkeetna River near Talkeetna	136	0	22.0	30.0	35.0	42.0	57.0	71.0	79.0	46.4
00900	15294005	Willow Creek near Willow	5	0	15.0	--	--	21.0	--	--	30.0	20.8
00900	15294100	Deshka River near Willow	4	0	11.0	--	--	33.0	--	--	38.0	28.8
00900	15294350	Susitna River at Susitna Station	49	0	36.0	44.0	52.0	60.0	84.0	93.0	96.0	66.6
00900	15294450	Chuitna River near Tyonek	8	0	10.0	10.0	13.0	15.5	17.5	20.0	20.0	15.3
00900	15294500	Chakachatna River near Tyonek	16	0	24.0	24.0	25.0	26.5	28.0	31.0	42.0	27.4

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(00915) Calcium, dissolved (milligrams per liter)												
00915	15239500	Fritz Creek near Homer	20	0	2.8	3.6	5.0	6.7	9.6	11.0	12.0	7.2
00915	15240000	Anchor River at Anchor Point	203	0	1.6	3.8	5.2	6.4	7.2	8.4	12.0	6.3
00915	15241600	Ninilchik River at Ninilchik	33	0	2.4	4.8	6.4	8.3	9.0	10.0	14.0	7.9
00915	15242000	Kasilof River near Kasilof	32	0	1.6	4.0	4.7	4.9	5.4	6.0	6.4	4.9
00915	15248000	Trail River near Lawing	277	0	8.4	11.0	12.0	14.0	16.0	17.0	20.0	13.8
00915	15258000	Kenai River at Cooper Landing	55	0	9.4	10.0	10.0	11.0	12.0	13.0	17.0	11.2
00915	15266300	Kenai River at Soldotna	44	0	6.6	8.3	9.1	9.8	10.5	11.0	13.0	9.8
00915	15266500	Beaver Creek near Kenai	21	0	11.0	12.0	16.0	18.0	18.0	20.0	44.0	17.9
00915	15267900	Resurrection Creek near Hope	15	0	11.0	12.0	13.0	16.0	19.0	21.0	25.0	16.1
00915	15272550	Glacier Creek at Girdwood	19	0	9.9	10.0	13.0	16.0	21.0	21.0	23.0	16.6
00915	15274000	SF Campbell Creek near Anchorage	49	0	5.4	9.1	10.0	12.0	14.0	16.0	17.0	12.1
00915	15274600	Campbell Creek near Spenard	52	0	9.3	11.0	12.0	15.0	16.0	17.0	19.0	14.6
00915	15275100	Chester Creek at Arctic Boulevard	50	0	21.0	25.5	28.0	31.0	34.0	37.5	40.0	31.0
00915	15276000	Ship Creek near Anchorage	138	0	12.0	15.0	17.0	19.0	20.0	22.0	30.0	18.6
00915	15277100	Eagle River at Eagle River	43	0	9.9	14.0	17.0	27.0	32.0	36.0	45.0	25.0
00915	15281000	Knik River near Palmer	59	0	11.0	13.0	14.0	21.0	30.0	38.0	42.0	22.7
00915	15282000	Caribou Creek near Sutton	29	0	14.0	21.0	29.0	43.0	57.0	63.0	130	44.4
00915	15283700	Moose Creek near Palmer	14	0	8.4	10.0	13.0	13.0	16.0	16.0	16.0	13.4
00915	15284000	Matanuska River at Palmer	225	0	18.0	24.0	26.0	31.0	38.0	41.0	47.0	31.7
00915	15290000	Little Susitna River near Palmer	20	0	4.7	6.4	9.0	12.0	13.5	14.5	33.0	11.9
00915	15291000	Susitna River near Denali	15	0	17.0	17.0	18.0	21.0	29.0	46.0	51.0	25.9
00915	15291200	Maclaren River near Paxson	13	0	11.0	12.0	13.0	15.0	18.0	20.0	27.0	15.9
00915	15291500	Susitna River near Cantwell	10	0	14.0	15.5	18.0	20.0	24.0	26.0	27.0	20.7
00915	15292000	Susitna River at Gold Creek	100	0	10.0	12.5	18.0	23.0	27.5	32.0	39.0	22.7
00915	15292400	Chulitna River near Talkeetna	10	0	14.0	15.0	17.0	18.0	24.0	25.5	26.0	19.4

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00915	15292700	Talkeetna River near Talkeetna	135	0	6.8	9.8	12.0	14.0	19.0	24.0	26.0	15.5
00915	15294005	Willow Creek near Willow	5	0	4.5	--	--	6.2	--	--	9.0	6.3
00915	15294100	Deshka River near Willow	4	0	3.3	--	--	9.8	--	--	11.0	8.5
00915	15294350	Susitna River at Susitna Station	49	0	11.0	14.0	17.0	20.0	27.0	29.0	31.0	21.2
00915	15294450	Chuitna River near Tyonek	6	0	2.5	--	--	4.7	--	-	6.0	4.5
00915	15294500	Chakachatna River near Tyonek	15	0	7.8	8.0	8.4	8.8	9.2	9.5	14.0	9.1
(00925) Magnesium, dissolved (milligrams per liter)												
00925	15239500	Fritz Creek near Homer	20	0	1.5	1.8	2.7	3.6	5.5	6.2	7.2	3.9
00925	15240000	Anchor River at Anchor Point	202	0	0.5	1.7	2.4	3.4	4.0	4.9	6.7	3.3
00925	15241600	Ninilchik River at Ninilchik	33	0	0.4	2.0	3.1	3.9	4.5	5.5	6.2	3.8
00925	15242000	Kasilof River near Kasilof	32	0	0.5	0.7	0.9	1.2	1.6	1.9	2.3	1.3
00925	15248000	Trail River near Lawing	277	0	0.4	0.7	1.0	1.2	1.7	2.4	3.8	1.4
00925	15258000	Kenai River at Cooper Landing	55	0	0.3	0.5	0.8	0.9	1.1	1.5	3.5	1.0
00925	15266300	Kenai River at Soldotna	44	0	0.2	0.7	0.9	1.2	1.5	2.0	2.4	1.2
00925	15266500	Beaver Creek near Kenai	21	0	0.9	2.9	3.6	4.3	4.5	4.6	5.0	3.9
00925	15267900	Resurrection Creek near Hope	15	0	1.0	1.1	1.3	2.0	2.5	2.5	2.6	1.9
00925	15272550	Glacier Creek at Girdwood	19	0	1.0	1.2	1.6	1.9	2.3	2.4	2.6	1.9
00925	15274000	SF Campbell Creek near Anchorage	49	1	0.7	1.1	1.4	2.2	2.8	3.1	5.2	2.2
00925	15274600	Campbell Creek near Spenard	52	0	1.1	1.8	2.2	2.9	3.5	4.0	6.4	2.9
00925	15275100	Chester Creek at Arctic Boulevard	50	0	2.7	5.9	6.6	7.1	7.6	8.0	9.6	7.0
00925	15276000	Ship Creek near Anchorage	138	0	1.9	2.4	2.6	3.1	3.6	4.1	7.1	3.2
00925	15277100	Eagle River at Eagle River	43	0	1.5	2.4	2.9	4.4	5.2	5.7	8.4	4.2
00925	15281000	Knik River near Palmer	59	0	1.0	1.4	1.8	2.8	3.4	4.9	7.4	2.9
00925	15282000	Caribou Creek near Sutton	29	0	1.9	3.6	4.9	7.2	9.2	13.0	21.0	7.6
00925	15283700	Moose Creek near Palmer	14	0	1.2	1.3	1.8	2.3	2.5	2.7	3.0	2.1
00925	15284000	Matanuska River at Palmer	225	0	1.2	2.6	3.5	4.5	5.6	6.8	12.0	4.7

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00925	15290000	Little Susitna River near Palmer	19	0	1.3	1.4	1.8	2.8	3.1	3.8	4.6	2.6
00925	15291000	Susitna River near Denali	15	0	1.7	1.9	2.4	3.1	6.4	8.0	16.0	4.7
00925	15291200	Maclaren River near Paxson	13	0	2.2	2.3	2.4	3.5	4.0	4.3	5.4	3.4
00925	15291500	Susitna River near Cantwell	10	0	1.1	1.5	2.2	2.6	3.2	3.9	4.4	2.7
00925	15292000	Susitna River at Gold Creek	100	0	0.3	1.5	2.2	3.5	5.0	6.3	8.3	3.7
00925	15292400	Chulitna River near Talkeetna	10	0	1.9	2.2	2.6	3.2	4.4	4.6	4.6	3.4
00925	15292700	Talkeetna River near Talkeetna	135	0	0.4	1.1	1.3	1.7	2.4	2.7	5.6	1.9
00925	15294005	Willow Creek near Willow	5	0	0.8	--	--	1.2	--	--	1.9	1.2
00925	15294100	Deshka River near Willow	4	0	0.7	--	--	2.2	--	--	2.6	1.9
00925	15294350	Susitna River at Susitna Station	49	0	1.6	2.1	2.4	3.1	4.3	4.6	5.0	3.3
00925	15294450	Chuitna River near Tyonek	6	0	0.8	--	--	1.2	--	--	1.3	1.1
00925	15294500	Chakachatna River near Tyonek	15	0	0.7	0.7	0.9	1.1	1.2	1.8	2.1	1.1
(00930) Sodium, dissolved (milligrams per liter)												
00930	15239500	Fritz Creek near Homer	19	0	2.9	3.1	5.0	5.8	6.2	6.9	7.6	5.5
00930	15240000	Anchor River at Anchor Point	202	0	2.3	3.6	4.6	5.5	6.1	6.7	9.1	5.4
00930	15241600	Ninilchik River at Ninilchik	32	0	1.9	5.4	6.8	7.9	8.9	9.3	12.0	7.5
00930	15242000	Kasilof River near Kasilof	25	0	0.8	0.9	1.2	1.3	1.6	1.9	2.4	1.4
00930	15248000	Trail River near Lawing	269	0	0.3	0.7	0.9	1.3	1.6	1.9	3.3	1.3
00930	15258000	Kenai River at Cooper Landing	41	0	0.7	0.8	0.9	1.1	1.3	1.5	2.0	1.1
00930	15266300	Kenai River at Soldotna	40	0	0.8	1.1	1.3	1.5	1.9	2.5	3.9	1.7
00930	15266500	Beaver Creek near Kenai	20	0	2.0	3.7	4.8	5.3	6.0	6.2	6.6	5.1
00930	15267900	Resurrection Creek near Hope	15	0	1.7	1.9	2.2	3.1	5.1	5.9	6.6	3.8
00930	15272550	Glacier Creek at Girdwood	19	0	1.1	1.3	1.4	2.2	2.5	2.8	3.7	2.1
00930	15274000	SF Campbell Creek near Anchorage	45	1	0.5	0.7	0.9	1.2	1.3	1.6	2.4	1.1
00930	15274600	Campbell Creek near Spenard	50	0	0.7	1.2	1.4	1.9	2.9	4.4	8.4	2.3
00930	15275100	Chester Creek at Arctic Boulevard	47	0	4.3	4.6	5.0	6.6	11.0	88.0	140	22.3

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00930	15276000	Ship Creek near Anchorage	85	0	1.2	1.5	1.8	2.0	2.3	2.5	4.6	2.1
00930	15277100	Eagle River at Eagle River	32	0	0.8	1.2	1.8	2.9	3.5	3.6	3.8	2.6
00930	15281000	Knik River near Palmer	40	0	0.6	0.6	0.9	1.7	2.4	4.1	5.4	1.9
00930	15282000	Caribou Creek near Sutton	22	0	5.2	8.5	12.0	19.5	24.0	25.0	50.0	19.1
00930	15283700	Moose Creek near Palmer	3	0	1.8	--	--	2.0	--	--	4.5	2.8
00930	15284000	Matanuska River at Palmer	189	0	2.1	3.2	3.9	6.0	7.3	8.0	12.0	5.8
00930	15290000	Little Susitna River near Palmer	7	0	1.7	1.7	3.7	9.3	12.0	12.0	12.0	7.7
00930	15291000	Susitna River near Denali	15	0	2.1	2.2	2.9	3.8	10.0	18.0	23.0	7.1
00930	15291200	Maclaren River near Paxson	13	0	0.8	1.1	1.4	1.7	2.0	2.8	3.5	1.8
00930	15291500	Susitna River near Cantwell	10	0	2.1	2.1	2.2	4.0	4.8	6.0	6.3	3.9
00930	15292000	Susitna River at Gold Creek	83	0	2.4	3.0	3.5	4.3	8.4	13.0	17.0	6.1
00930	15292400	Chulitna River near Talkeetna	10	0	0.5	0.9	1.3	1.6	2.3	2.7	2.7	1.7
00930	15292700	Talkeetna River near Talkeetna	135	0	2.4	3.1	3.8	5.6	11.0	14.0	15.0	7.1
00930	15294005	Willow Creek near Willow	5	0	1.6	--	--	3.4	--	--	9.7	4.1
00930	15294100	Deshka River near Willow	4	0	1.2	--	--	2.3	-	--	2.7	2.1
00930	15294350	Susitna River at Susitna Station	49	0	1.8	2.0	2.6	3.8	7.7	8.4	9.0	5.0
00930	15294450	Chuitna River near Tyonek	6	0	1.0	-	--	2.6	--	--	3.0	2.3
00930	15294500	Chakachatna River near Tyonek	15	0	0.7	1.0	1.3	1.4	1.5	1.5	1.5	1.3
(00935) Potassium, dissolved (milligrams per liter)												
00935	15239500	Fritz Creek near Homer	19	0	1.0	1.2	1.7	2.0	2.6	2.8	3.0	2.0
00935	15240000	Anchor River at Anchor Point	200	0	0.1	0.7	1.3	1.6	1.9	2.1	5.9	1.5
00935	15241600	Ninilchik River at Ninilchik	32	0	0.8	1.2	1.6	2.0	2.2	2.4	3.1	1.9
00935	15242000	Kasilof River near Kasilof	25	0	1.0	1.3	1.4	1.4	1.6	1.8	1.9	1.5
00935	15248000	Trail River near Lawing	269	16	0.1	0.3	0.4	0.6	0.7	0.8	1.7	0.6
00935	15258000	Kenai River at Cooper Landing	41	0	0.2	0.5	0.6	0.8	0.9	1.1	1.7	0.8
00935	15266300	Kenai River at Soldotna	40	0	0.3	0.7	0.9	1.0	1.3	1.3	2.3	1.1

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00935	15266500	Beaver Creek near Kenai	20	0	0.3	1.4	2.0	2.3	2.9	3.7	5.8	2.4
00935	15267900	Resurrection Creek near Hope	15	2	0.0	0.1	0.1	0.2	0.3	0.6	1.3	0.3
00935	15272550	Glacier Creek at Girdwood	19	1	0.1	0.1	0.2	0.3	0.3	0.7	1.0	0.3
00935	15274000	SF Campbell Creek near Anchorage	45	5	0.1	0.1	0.2	0.3	0.4	0.4	0.7	0.3
00935	15274600	Campbell Creek near Spenard	50	2	0.1	0.2	0.3	0.5	0.9	1.4	2.0	0.6
00935	15275100	Chester Creek at Arctic Boulevard	46	0	0.2	0.8	0.9	1.0	1.7	2.6	3.7	1.3
00935	15276000	Ship Creek near Anchorage	85	4	0.1	0.2	0.4	0.6	0.8	1.1	1.9	0.6
00935	15277100	Eagle River at Eagle River	32	0	0.2	0.3	0.4	0.5	0.7	1.4	2.2	0.6
00935	15281000	Knik River near Palmer	40	1	0.1	0.1	0.5	0.7	0.9	1.0	1.4	0.7
00935	15282000	Caribou Creek near Sutton	22	1	0.2	0.4	0.6	0.7	1.1	1.6	2.8	0.9
00935	15283700	Moose Creek near Palmer	3	0	0.6	--	--	0.8	--	--	0.9	0.8
00935	15284000	Matanuska River at Palmer	189	1	0.1	0.5	0.6	0.7	0.9	1.3	2.4	0.8
00935	15290000	Little Susitna River near Palmer	7	0	0.5	0.5	0.7	0.9	1.0	1.7	1.7	0.9
00935	15291000	Susitna River near Denali	15	0	1.3	1.8	2.1	2.8	3.6	6.5	6.6	3.4
00935	15291200	Maclaren River near Paxson	13	0	1.4	1.6	1.8	2.1	2.2	2.5	2.6	2.0
00935	15291500	Susitna River near Cantwell	10	0	1.4	1.6	2.2	2.8	4.9	6.3	7.3	3.4
00935	15292000	Susitna River at Gold Creek	83	0	1.0	1.3	1.5	2.1	3.0	3.6	5.0	2.3
00935	15292400	Chulitna River near Talkeetna	10	0	0.4	0.6	1.3	1.8	1.8	2.0	2.2	1.5
00935	15292700	Talkeetna River near Talkeetna	135	0	0.5	0.7	0.8	1.0	1.4	1.6	2.9	1.1
00935	15294005	Willow Creek near Willow	5	0	0.4	--	--	0.7	--	--	1.0	0.7
00935	15294100	Deshka River near Willow	4	0	0.4	--	--	1.0	--	--	1.2	0.9
00935	15294350	Susitna River at Susitna Station	49	0	0.8	1.0	1.3	1.5	1.7	1.9	2.5	1.5
00935	15294450	Chuitna River near Tyonek	6	0	0.4	--	--	0.5	--	--	2.5	0.9
00935	15294500	Chakachatna River near Tyonek	15	0	1.3	1.3	1.4	1.6	1.6	1.7	1.8	1.5

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(00410) Alkalinity, onsite total (milligrams per liter as Ca CO_3)												
00410	15239500	Fritz Creek near Homer	19	0	15.0	20.0	25.0	39.0	54.0	61.0	66.0	38.9
00410	15240000	Anchor River at Anchor Point	204	0	13.0	20.0	26.0	34.0	40.0	44.0	52.0	33.3
00410	15241600	Ninilchik River at Ninilchik	33	0	15.0	28.0	41.0	50.0	55.0	59.0	67.0	46.7
00410	15242000	Kasilof River near Kasilof	32	0	9.0	13.0	14.5	16.0	17.0	20.0	21.0	16.0
00410	15248000	Trail River near Lawing	278	0	21.0	24.0	25.0	30.0	35.0	39.0	44.0	30.7
00410	15258000	Kenai River at Cooper Landing	59	0	22.0	23.0	24.0	25.0	25.0	27.0	37.0	25.0
00410	15266300	Kenai River at Soldotna	43	0	18.0	22.0	23.0	25.0	29.0	31.0	35.0	26.2
00410	15266500	Beaver Creek near Kenai	29	0	18.0	50.0	56.0	68.0	77.0	80.0	93.0	65.3
00410	15267900	Resurrection Creek near Hope	17	0	26.0	28.0	33.0	40.0	43.0	48.0	49.0	38.6
00410	15272550	Glacier Creek at Girdwood	29	0	23.0	29.0	34.0	38.0	48.0	52.0	54.0	40.0
00410	15274000	SF Campbell Creek near Anchorage	62	0	9.0	20.0	22.0	28.5	38.0	39.0	72.0	29.2
00410	15274600	Campbell Creek near Spenard	80	0	21.0	25.0	29.0	38.0	43.0	48.0	52.0	36.7
00410	15275100	Chester Creek at Arctic Boulevard	38	0	49.0	58.0	73.0	77.0	82.0	89.0	99.0	76.2
00410	15276000	Ship Creek near Anchorage	149	0	28.0	34.0	39.0	46.0	52.0	56.0	102	46.0
00410	15277100	Eagle River at Eagle River	46	0	25.0	33.0	43.0	68.0	82.0	88.0	94.0	63.7
00410	15281000	Knik River near Palmer	62	0	30.0	31.0	35.0	51.5	65.0	84.0	95.0	53.6
00410	15282000	Caribou Creek near Sutton	31	0	46.0	49.0	61.0	88.0	107	120	218	88.4
00410	15283700	Moose Creek near Palmer	15	0	23.0	28.0	34.0	40.0	44.0	45.0	53.0	38.5
00410	15284000	Matanuska River at Palmer	229	0	--	52.0	57.0	64.0	75.0	81.0	90.0	65.7
00410	15290000	Little Susitna River near Palmer	23	0	20.0	27.0	28.0	34.0	37.0	39.0	84.0	34.4
00410	15291000	Susitna River near Denali	15	0	42.0	43.0	49.0	56.0	75.0	134	161	70.7
00410	15291200	Maclaren River near Paxson	13	0	28.0	31.0	34.0	36.0	44.0	48.0	64.0	39.5
00410	15291500	Susitna River near Cantwell	10	0	39.0	41.5	48.0	52.0	55.0	58.0	59.0	51.3
00410	15292000	Susitna River at Gold Creek	97	0	23.0	32.0	46.0	56.0	66.0	78.0	88.0	56.2
00410	15292400	Chulitna River near Talkeetna	10	0	38.0	38.5	43.0	47.0	60.0	62.0	64.0	49.0

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00410	15292700	Talkeetna River near Talkeetna	128	0	20.0	25.0	30.0	34.0	42.5	48.0	57.0	35.8
00410	15294005	Willow Creek near Willow	2	0	13.0	--	--	17.0	--	--	21.0	17.0
00410	15294350	Susitna River at Susitna Station	92	0	30.0	38.0	40.5	46.0	64.5	71.0	80.0	51.4
00410	15294450	Chuitna River near Tyonek	7	0	12.0	12.0	15.0	17.0	21.0	24.0	24.0	17.7
00410	15294500	Chakachatna River near Tyonek	15	0	17.0	17.0	18.0	20.0	21.0	21.0	21.0	19.5
(00945) Sulfate, dissolved (milligrams per liter)												
00945	15239500	Fritz Creek near Homer	20	2	0.1	0.2	0.5	5.3	7.9	8.2	12.0	4.3
00945	15240000	Anchor River at Anchor Point	203	13	0.2	0.7	1.0	1.9	3.0	5.0	9.6	2.3
00945	15241600	Ninilchik River at Ninilchik	33	5	0.2	0.2	1.0	2.0	3.0	4.0	6.0	2.0
00945	15242000	Kasilof River near Kasilof	33	0	1.0	2.0	4.0	5.1	6.1	8.5	11.0	5.3
00945	15248000	Trail River near Lawing	278	0	5.0	8.0	9.0	10.0	11.0	13.0	19.0	10.2
00945	15258000	Kenai River at Cooper Landing	56	0	5.9	6.4	7.2	8.4	9.5	11.0	14.0	8.5
00945	15266300	Kenai River at Soldotna	44	0	1.5	4.0	5.0	6.0	6.9	7.2	8.7	5.8
00945	15266500	Beaver Creek near Kenai	21	11	0.0	0.0	0.0	0.1	0.4	3.0	7.1	0.9
00945	15267900	Resurrection Creek near Hope	15	0	4.8	5.1	6.4	6.8	8.2	8.5	28.0	8.4
00945	15272550	Glacier Creek at Girdwood	19	0	5.3	6.0	7.5	13.0	15.0	16.0	17.0	11.4
00945	15274000	SF Campbell Creek near Anchorage	51	0	6.7	8.0	9.8	12.0	14.0	14.0	19.0	11.6
00945	15274600	Campbell Creek near Spenard	49	0	1.0	1.8	10.0	13.0	13.0	15.0	18.0	11.3
00945	15275100	Chester Creek at Arctic Boulevard	46	0	14.0	16.0	19.0	21.5	23.0	26.0	29.0	21.3
00945	15276000	Ship Creek near Anchorage	138	0	7.0	13.0	15.0	16.5	18.0	20.0	27.0	16.5
00945	15277100	Eagle River at Eagle River	44	0	7.5	12.0	15.0	20.0	25.5	28.0	36.0	20.2
00945	15281000	Knik River near Palmer	60	0	6.5	8.0	9.6	18.0	24.5	31.0	43.0	18.4
00945	15282000	Caribou Creek near Sutton	29	0	13.0	28.0	46.0	86.0	98.0	120	250	80.8
00945	15283700	Moose Creek near Palmer	15	0	2.5	4.6	5.4	7.9	9.7	10.0	11.0	7.3
00945	15284000	Matanuska River at Palmer	227	0	18.0	23.0	27.0	37.0	47.0	51.0	58.0	37.2
00945	15290000	Little Susitna River near Palmer	23	1	1.3	1.9	3.1	4.4	5.8	7.1	20.0	5.0

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00945	15291000	Susitna River near Denali	15	0	9.2	13.0	13.0	17.0	31.0	37.0	39.0	20.8
00945	15291200	Maclaren River near Paxson	13	0	13.0	13.0	15.0	17.0	19.0	20.0	22.0	16.9
00945	15291500	Susitna River near Cantwell	10	0	7.5	8.8	12.0	15.0	16.0	17.0	18.0	13.9
00945	15292000	Susitna River at Gold Creek	100	0	4.7	9.1	12.0	16.0	22.0	27.0	38.0	17.1
00945	15292400	Chulitna River near Talkeetna	10	0	10.0	10.0	11.0	14.0	20.0	22.0	22.0	14.8
00945	15292700	Talkeetna River near Talkeetna	136	0	2.8	5.5	6.9	9.9	13.0	16.0	21.0	10.2
00945	15294005	Willow Creek near Willow	5	2	2.5	--	--	2.6	--	--	2.8	2.6
00945	15294100	Deshka River near Willow	4	0	3.4	--	--	4.1	--	--	5.0	4.2
00945	15294350	Susitna River at Susitna Station	88	0	3.7	10.0	12.0	16.0	20.0	21.0	22.0	15.5
00945	15294450	Chuitna River near Tyonek	6	1	2.0	--	--	2.5	--	--	5.6	3.0
00945	15294500	Chakachatna River near Tyonek	15	0	7.0	8.0	9.4	10.0	11.0	12.0	12.0	10.1
(00940) Chloride, dissolved (milligrams per liter)												
00940	15239500	Fritz Creek near Homer	20	0	3.2	3.4	3.9	5.3	5.6	6.0	6.1	4.9
00940	15240000	Anchor River at Anchor Point	203	0	1.0	2.8	3.2	4.0	5.0	6.0	8.0	4.3
00940	15241600	Ninilchik River at Ninilchik	33	0	0.2	1.1	2.0	2.5	3.0	4.0	4.5	2.5
00940	15242000	Kasilof River near Kasilof	33	2	0.2	0.4	0.8	1.0	1.2	1.8	2.5	1.0
00940	15248000	Trail River near Lawing	278	11	0.1	0.5	1.0	1.5	2.0	2.5	4.0	1.4
00940	15258000	Kenai River at Cooper Landing	56	4	0.2	0.4	0.6	1.0	1.2	1.6	3.0	1.0
00940	15266300	Kenai River at Soldotna	43	8	0.1	0.2	0.4	0.8	1.4	3.2	3.9	1.2
00940	15266500	Beaver Creek near Kenai	21	0	0.4	1.1	1.8	2.1	2.8	3.5	5.7	2.2
00940	15267900	Resurrection Creek near Hope	15	0	1.1	1.4	2.5	4.8	9.9	10.0	12.0	5.6
00940	15272550	Glacier Creek at Girdwood	19	0	0.4	0.7	0.7	1.1	1.8	2.8	3.1	1.3
00940	15274000	SF Campbell Creek near Anchorage	51	10	0.1	0.1	0.2	1.0	1.5	2.0	4.0	1.0
00940	15274600	Campbell Creek near Spenard	55	8	0.1	0.3	0.7	1.8	3.5	7.9	14.0	2.9
00940	15275100	Chester Creek at Arctic Boulevard	47	0	1.8	4.2	5.7	10.0	22.0	170	250	39.1
00940	15276000	Ship Creek near Anchorage	138	6	0.1	0.2	0.4	0.6	1.0	1.5	7.0	0.9

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00940	15277100	Eagle River at Eagle River	44	0	0.3	0.4	0.8	1.4	2.0	3.0	17.0	1.9
00940	15281000	Knik River near Palmer	61	3	0.1	0.2	0.5	1.2	2.0	3.0	7.1	1.5
00940	15282000	Caribou Creek near Sutton	29	0	1.0	1.2	2.2	4.0	5.5	14.0	29.0	5.9
00940	15283700	Moose Creek near Palmer	15	0	0.5	0.8	1.8	3.0	5.5	5.8	7.0	3.4
00940	15284000	Matanuska River at Palmer	227	0	0.5	2.0	2.5	3.5	6.5	8.8	14.0	4.5
00940	15290000	Little Susitna River near Palmer	23	0	0.5	1.5	2.8	7.1	19.0	21.0	23.0	10.7
00940	15291000	Susitna River near Denali	15	0	1.5	2.0	3.0	4.5	11.0	21.0	30.0	8.4
00940	15291200	Maclaren River near Paxson	13	0	0.4	0.5	1.0	2.0	3.2	4.0	4.3	2.1
00940	15291500	Susitna River near Cantwell	10	0	2.1	2.3	3.0	5.9	7.5	8.9	9.2	5.5
00940	15292000	Susitna River at Gold Creek	100	0	1.4	3.5	4.0	6.0	13.5	26.5	35.0	10.2
00940	15292400	Chulitna River near Talkeetna	10	3	0.2	0.3	0.4	1.0	1.8	2.3	2.5	1.1
00940	15292700	Talkeetna River near Talkeetna	136	0	1.4	3.2	4.4	8.0	19.5	25.0	33.0	11.0
00940	15294005	Willow Creek near Willow	5	0	0.9	--	--	4.4	--	--	15.0	5.7
00940	15294100	Deshka River near Willow	4	0	0.4	--	--	0.7	--	--	0.7	0.6
00940	15294350	Susitna River at Susitna Station	49	0	1.2	1.8	2.9	4.9	13.0	14.0	18.0	7.4
00940	15294450	Chuitna River near Tyonek	6	0	0.5	--	--	1.1	--	--	1.5	1.0
00940	15294500	Chakachatna River near Tyonek	15	0	0.4	0.4	0.7	1.1	1.5	2.0	2.0	1.2
(00950) Fluoride, dissolved (milligrams per liter)												
00950	15239500	Fritz Creek near Homer	19	8	0.02	0.03	0.05	0.10	0.10	0.30	0.30	0.11
00950	15240000	Anchor River at Anchor Point	197	63	0.03	0.05	0.07	0.10	0.10	0.20	0.60	0.11
00950	15241600	Ninilchik River at Ninilchik	32	8	0.05	0.07	0.09	0.10	0.20	0.20	0.20	0.12
00950	15242000	Kasilof River near Kasilof	28	15	0.03	0.04	0.05	0.07	0.10	0.10	0.30	0.09
00950	15248000	Trail River near Lawing	274	170	0.02	0.04	0.05	0.07	0.10	0.10	0.40	0.08
00950	15258000	Kenai River at Cooper Landing	50	22	0.01	0.03	0.04	0.10	0.20	0.35	0.60	0.13
00950	15266300	Kenai River at Soldotna	44	24	0.01	0.02	0.03	0.06	0.10	0.30	0.40	0.10
00950	15266500	Beaver Creek near Kenai	21	6	0.04	0.05	0.07	0.10	0.20	0.20	0.30	0.12

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00950	15267900	Resurrection Creek near Hope	15	3	0.04	0.06	0.10	0.10	0.20	0.30	0.40	0.16
00950	15272550	Glacier Creek at Girdwood	19	8	0.01	0.01	0.03	0.10	0.20	0.40	1.00	0.15
00950	15274000	SF Campbell Creek near Anchorage	46	21	0.01	0.03	0.04	0.10	0.10	0.20	0.60	0.11
00950	15274600	Campbell Creek near Spenard	49	21	0.02	0.03	0.05	0.10	0.10	0.20	0.60	0.11
00950	15275100	Chester Creek at Arctic Boulevard	43	19	0.02	0.04	0.05	0.10	0.10	0.20	0.50	0.10
00950	15276000	Ship Creek near Anchorage	123	41	0.03	0.05	0.07	0.10	0.10	0.20	0.40	0.11
00950	15277100	Eagle River at Eagle River	39	19	0.02	0.03	0.04	0.10	0.10	0.30	0.40	0.10
00950	15281000	Knik River near Palmer	49	22	0.08	0.08	0.09	0.10	0.10	0.10	0.20	0.10
00950	15282000	Caribou Creek near Sutton	26	4	0.04	0.06	0.10	0.10	0.20	0.30	0.30	0.14
00950	15283700	Moose Creek near Palmer	11	4	0.03	0.04	0.05	0.10	0.10	0.20	0.30	0.11
00950	15284000	Matanuska River at Palmer	202	118	0.03	0.05	0.06	0.08	0.10	0.10	0.30	0.08
00950	15290000	Little Susitna River near Palmer	15	7	0.04	0.04	0.06	0.10	0.10	0.20	0.20	0.09
00950	15291000	Susitna River near Denali	15	5	0.04	0.04	0.06	0.10	0.10	0.20	0.30	0.11
00950	15291200	Maclaren River near Paxson	13	7	0.03	0.04	0.05	0.08	0.10	0.20	0.20	0.10
00950	15291500	Susitna River near Cantwell	10	1	0.06	0.08	0.10	0.20	0.20	0.30	0.30	0.18
00950	15292000	Susitna River at Gold Creek	80	29	0.03	0.05	0.07	0.10	0.10	0.20	0.30	0.10
00950	15292400	Chulitna River near Talkeetna	10	1	0.10	0.10	0.20	0.20	0.30	0.30	0.30	0.21
00950	15292700	Talkeetna River near Talkeetna	133	54	0.01	0.03	0.05	0.10	0.10	0.20	0.60	0.12
00950	15294005	Willow Creek near Willow	5	5	--	--	--	--	--	--	--	--
00950	15294100	Deshka River near Willow	4	2	0.10	--	--	0.10	--	--	0.10	0.10
00950	15294350	Susitna River at Susitna Station	49	2	0.05	0.10	0.10	0.10	0.20	0.20	0.40	0.15
00950	15294450	Chuitna River near Tyonek	6	2	0.10	--	--	0.10	--	--	0.10	0.10
00950	15294500	Chakachatna River near Tyonek	14	3	0.04	0.06	0.10	0.10	0.20	0.20	0.30	0.13

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(00955) Silica, dissolved (milligrams per liter as SiO_2)												
00955	15239500	Fritz Creek near Homer	20	0	13.0	15.5	25.0	28.0	32.5	37.5	40.0	27.7
00955	15240000	Anchor River at Anchor Point	203	0	10.0	19.0	23.0	28.0	31.0	36.0	44.0	27.3
00955	15241600	Ninilchik River at Ninilchik	32	0	9.8	20.0	28.0	32.0	35.5	39.0	50.0	30.8
00955	15242000	Kasilof River near Kasilof	33	0	4.5	4.8	5.0	5.6	6.0	6.9	20.0	6.1
00955	15248000	Trail River near Lawing	278	0	2.0	3.1	3.7	4.4	5.4	6.1	17.0	4.6
00955	15258000	Kenai River at Cooper Landing	56	0	2.3	3.2	3.6	3.7	4.1	5.0	9.1	4.0
00955	15266300	Kenai River at Soldotna	44	0	3.2	3.4	3.6	4.7	6.0	6.8	8.6	4.9
00955	15266500	Beaver Creek near Kenai	21	0	7.3	16.0	22.0	26.0	28.0	29.0	33.0	24.3
00955	15267900	Resurrection Creek near Hope	15	0	2.8	5.2	5.3	6.2	6.9	7.2	7.3	6.0
00955	15272550	Glacier Creek at Girdwood	19	0	2.2	3.3	3.7	4.1	4.5	5.8	6.5	4.2
00955	15274000	SF Campbell Creek near Anchorage	49	0	4.5	4.9	6.0	7.4	8.5	9.9	11.0	7.3
00955	15274600	Campbell Creek near Spenard	51	0	3.5	5.7	6.2	7.1	8.0	8.9	11.0	7.3
00955	15275100	Chester Creek at Arctic Boulevard	49	0	5.4	8.2	9.7	11.0	13.0	13.0	17.0	11.0
00955	15276000	Ship Creek near Anchorage	136	0	3.1	5.5	6.5	8.0	9.6	10.0	12.0	8.0
00955	15277100	Eagle River at Eagle River	43	0	1.8	2.6	3.2	4.3	6.3	7.2	9.0	4.7
00955	15281000	Knik River near Palmer	61	0	1.9	2.3	2.8	3.7	4.8	5.5	11.0	3.9
00955	15282000	Caribou Creek near Sutton	29	0	3.5	5.6	7.5	8.7	10.0	11.0	16.0	8.7
00955	15283700	Moose Creek near Palmer	13	0	5.1	6.3	6.8	7.4	7.6	8.4	9.6	7.3
00955	15284000	Matanuska River at Palmer	228	0	2.2	4.8	5.5	6.4	7.3	8.5	16.0	6.7
00955	15290000	Little Susitna River near Palmer	22	0	3.6	4.5	5.2	6.4	6.8	7.3	7.7	6.0
00955	15291000	Susitna River near Denali	15	0	3.2	4.2	5.4	6.9	7.4	12.0	13.0	7.1
00955	15291200	Maclaren River near Paxson	13	0	4.1	4.2	4.4	4.8	5.3	6.7	8.5	5.3
00955	15291500	Susitna River near Cantwell	10	0	2.7	3.6	4.6	5.9	6.8	7.4	7.6	5.7
00955	15292000	Susitna River at Gold Creek	100	0	4.5	5.3	5.9	7.7	11.0	13.0	20.0	8.6
00955	15292400	Chulitna River near Talkeetna	10	0	2.2	2.6	4.3	4.8	5.9	7.0	7.0	4.9

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00955	15292700	Talkeetna River near Talkeetna	136	0	2.9	5.1	6.2	7.6	8.6	9.3	12.0	7.4
00955	15294005	Willow Creek near Willow	5	0	4.6	--	--	7.0	--	--	11.0	7.2
00955	15294100	Deshka River near Willow	4	0	7.3	--	--	13.0	--	--	22.0	13.8
00955	15294350	Susitna River at Susitna Station	49	0	3.4	4.6	5.0	7.0	10.0	11.0	12.0	7.5
00955	15294450	Chuitna River near Tyonek	6	0	6.3	--	--	13.0	--	--	14.0	12.1
00955	15294500	Chakachatna River near Tyonek	15	0	4.2	4.5	4.7	5.2	5.3	5.5	6.5	5.1
(70300) Dissolved solids, residue at 180° Celsius (milligrams per liter)												
70300	15240000	Anchor River at Anchor Point	33	0	44	50	65	78	85	92	112	75
70300	15241600	Ninilchik River at Ninilchik	9	0	43	43	63	91	94	104	104	80
70300	15248000	Trail River near Lawing	2	0	53	--	--	59	--	--	64	59
70300	15274600	Campbell Creek near Spenard	33	1	45	49	57	84	91	101	116	77
70300	15275100	Chester Creek at Arctic Boulevard	21	0	105	134	158	200	395	425	530	257
70300	15276000	Ship Creek near Anchorage	68	0	58	64	71	80	87	90	94	79
70300	15277100	Eagle River at Eagle River	3	0	118	--	--	129	--	--	130	126
70300	15281000	Knik River near Palmer	8	0	55	55	61	107	127	144	144	98
70300	15282000	Caribou Creek near Sutton	4	0	61	--	--	175	--	--	301	178
70300	15283700	Moose Creek near Palmer	4	0	70	--	--	72	--	--	76	73
70300	15284000	Matanuska River at Palmer	33	0	100	109	114	154	170	175	178	144
70300	15290000	Little Susitna River near Palmer	2	0	76	--	--	79	--	--	81	79
70300	15292000	Susitna River at Gold Creek	69	0	53	62	77	99	140	158	174	107
70300	15292700	Talkeetna River near Talkeetna	97	0	37	52	60	74	106	125	135	81
70300	15294005	Willow Creek near Willow	4	0	19	--	--	41	--	--	66	42
70300	15294100	Deshka River near Willow	4	0	41	--	--	55	--	--	63	54
70300	15294350	Susitna River at Susitna Station	45	0	56	64	70	80	119	129	139	92
70300	15294450	Chuitna River near Tyonek	5	0	29	--	--	40	--	--	41	38

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(70301) Dissolved solids, sum of constituents (milligrams per liter)												
70301	15239500	Fritz Creek near Homer	20	0	37	51	66	79	96	111	120	80
70301	15240000	Anchor River at Anchor Point	203	0	33	49	61	73	82	88	105	71
70301	15241600	Ninilchik River at Ninilchik	33	0	30	52	79	89	96	106	116	84
70301	15242000	Kasilof River near Kasilof	32	0	22	27	29	31	35	36	50	32
70301	15248000	Trail River near Lawing	277	0	36	41	45	53	60	64	73	53
70301	15258000	Kenai River at Cooper Landing	55	0	38	40	41	43	45	47	70	44
70301	15266300	Kenai River at Soldotna	43	0	30	36	38	41	46	50	54	42
70301	15266500	Beaver Creek near Kenai	21	0	71	76	89	102	108	112	112	97
70301	15267900	Resurrection Creek near Hope	15	0	44	45	50	64	78	85	109	66
70301	15272550	Glacier Creek at Girdwood	19	0	39	45	48	62	77	85	85	63
70301	15274000	SF Campbell Creek near Anchorage	49	0	29	37	43	52	65	69	79	54
70301	15274600	Campbell Creek near Spenard	43	0	42	49	58	65	76	82	89	67
70301	15275100	Chester Creek at Arctic Boulevard	44	0	101	118	127	142	186	381	516	187
70301	15276000	Ship Creek near Anchorage	137	0	53	62	71	80	86	91	120	78
70301	15277100	Eagle River at Eagle River	43	0	39	54	67	103	127	134	166	98
70301	15281000	Knik River near Palmer	59	0	44	46	55	79	106	138	162	84
70301	15282000	Caribou Creek near Sutton	29	0	67	102	134	219	285	304	623	220
70301	15283700	Moose Creek near Palmer	14	0	41	43	53	61	73	76	77	61
70301	15284000	Matanuska River at Palmer	223	0	87	97	106	129	158	170	185	132
70301	15290000	Little Susitna River near Palmer	19	0	31	36	45	71	83	91	127	67
70301	15291000	Susitna River near Denali	15	0	71	72	78	94	128	228	270	120
70301	15291200	Maclaren River near Paxson	13	0	52	58	63	67	81	91	108	72
70301	15291500	Susitna River near Cantwell	10	0	65	71	80	86	99	108	110	88
70301	15292000	Susitna River at Gold Creek	100	0	49	58	81	99	136	161	182	105
70301	15292400	Chulitna River near Talkeetna	10	0	60	62	66	71	96	102	104	77

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
70301	15292700	Talkeetna River near Talkeetna	133	0	36	49	56	68	105	120	134	77
70301	15294005	Willow Creek near Willow	3	0	24	--	--	44	--	--	69	46
70301	15294100	Deshka River near Willow	4	0	23	--	--	55	--	--	68	50
70301	15294350	Susitna River at Susitna Station	49	0	52	57	71	82	123	127	139	93
70301	15294450	Chuitna River near Tyonek	5	0	24	--	--	38	--	--	42	36
70301	15294500	Chakachatna River near Tyonek	15	0	35	38	39	41	45	46	51	42
(00630) Nitrite plus nitrate, total (milligrams per liter as N)												
00630	15274600	Campbell Creek near Spenard	6	2	0.166	--	--	0.250	--	--	0.300	0.243
00630	15275100	Chester Creek at Arctic Boulevard	11	0	0.400	0.400	0.400	0.500	0.700	0.700	0.800	0.555
00630	15292000	Susitna River at Gold Creek	13	6	0.096	0.106	0.120	0.140	0.160	0.190	0.200	0.144
00630	15292700	Talkeetna River near Talkeetna	46	0	0.060	0.110	0.200	0.365	0.440	0.550	1.000	0.362
00630	15294005	Willow Creek near Willow	4	0	0.030	--	--	0.051	--	--	0.188	0.080
00630	15294100	Deshka River near Willow	3	2	0.149	--	--	0.149	--	--	0.149	0.149
00630	15294350	Susitna River at Susitna Station	39	0	0.030	0.080	0.100	0.230	0.290	0.480	0.670	0.244
00630	15294450	Chuitna River near Tyonek	5	0	0.010	--	--	0.080	--	--	0.230	0.100
(00631) Nitrite plus nitrate, dissolved (milligrams per liter as N)												
00631	15239500	Fritz Creek near Homer	9	0	0.120	0.120	0.150	0.170	0.240	0.570	0.570	0.229
00631	15240000	Anchor River at Anchor Point	4	0	0.120	--	--	0.305	--	--	0.460	0.298
00631	15241600	Ninilchik River at Ninilchik	5	0	0.060	--	--	0.100	--	--	0.180	0.114
00631	15274600	Campbell Creek near Spenard	28	0	0.050	0.080	0.210	0.275	0.320	0.430	0.820	0.278
00631	15275100	Chester Creek at Arctic Boulevard	12	0	0.290	0.420	0.470	0.600	0.735	0.740	2.900	0.763
00631	15277100	Eagle River at Eagle River	2	0	0.020	--	--	0.100	--	--	0.180	0.100
00631	15282000	Caribou Creek near Sutton	2	0	0.060	--	--	0.070	--	--	0.080	0.070
00631	15292000	Susitna River at Gold Creek	15	6	0.016	0.025	0.034	0.067	0.150	0.200	0.700	0.125
00631	15292700	Talkeetna River near Talkeetna	53	0	0.100	0.140	0.170	0.340	0.440	0.550	1.000	0.344
00631	15294005	Willow Creek near Willow	5	2	0.059	--	--	0.084	--	--	0.180	0.109
00631	15294100	Deshka River near Willow	4	2	0.038	--	--	0.057	--	--	0.150	0.075

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00631	15294350	Susitna River at Susitna Station	15	1	0.060	0.090	0.160	0.230	0.290	0.300	0.350	0.215
00631	15294450	Chuitna River near Tyonek	5	1	0.010	--	--	0.025	--	--	0.120	0.053
00631	15294500	Chakachatna River near Tyonek	3	0	0.030	--	--	0.030	--	--	0.080	0.047
(00608) Nitrogen ammonia, dissolved (milligrams per liter as N)												
00608	15274600	Campbell Creek near Spenard	28	2	0.010	0.025	0.055	0.105	0.175	0.340	0.500	0.140
00608	15275100	Chester Creek at Arctic Boulevard	11	1	0.048	0.080	0.090	0.100	0.210	0.220	0.220	0.125
00608	15292000	Susitna River at Gold Creek	13	4	0.012	0.020	0.020	0.040	0.060	0.090	0.110	0.047
00608	15292700	Talkeetna River near Talkeetna	40	11	0.005	0.008	0.010	0.020	0.035	0.040	0.100	0.027
00608	15294350	Susitna River at Susitna Station	14	4	0.010	0.010	0.020	0.034	0.040	0.070	0.070	0.034
(00625) Nitrogen, total kjeldahl (milligrams per liter as N)												
00625	15274600	Campbell Creek near Spenard	26	0	0.280	0.400	0.620	0.865	1.300	1.600	2.800	0.998
00625	15275100	Chester Creek at Arctic Boulevard	11	0	0.500	0.500	0.600	0.700	0.800	0.800	1.100	0.718
00625	15292000	Susitna River at Gold Creek	16	2	0.106	0.139	0.270	0.400	0.600	1.200	1.500	0.498
00625	15292700	Talkeetna River near Talkeetna	39	25	0.015	0.031	0.061	0.128	0.300	0.640	1.100	0.218
00625	15294005	Willow Creek near Willow	5	0	0.200	--	--	0.290	--	--	0.430	0.304
00625	15294100	Deshka River near Willow	4	0	0.300	--	--	0.750	--	--	1.400	0.800
00625	15294350	Susitna River at Susitna Station	43	2	0.020	0.150	0.270	0.400	0.510	0.600	1.500	0.419
00625	15294450	Chuitna River near Tyonek	5	0	0.090	--	--	0.230	--	--	0.330	0.216
(00665) Phosphorus, total (milligrams per liter as P)												
00665	15274600	Campbell Creek near Spenard	29	1	0.005	0.007	0.011	0.040	0.129	0.259	0.290	0.084
00665	15275100	Chester Creek at Arctic Boulevard	14	1	0.010	0.011	0.030	0.040	0.050	0.110	0.110	0.047
00665	15292000	Susitna River at Gold Creek	16	1	0.003	0.010	0.020	0.045	0.230	0.310	0.390	0.116
00665	15292700	Talkeetna River near Talkeetna	75	25	0.000	0.002	0.006	0.020	0.050	0.120	0.430	0.050
00665	15294005	Willow Creek near Willow	4	2	0.004	--	--	0.005	--	--	0.006	0.005
00665	15294100	Deshka River near Willow	3	0	0.008	--	--	0.018	--	--	0.020	0.015
00665	15294350	Susitna River at Susitna Station	45	6	0.001	0.005	0.010	0.100	0.300	0.570	1.100	0.206

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00665	15294450	Chuitna River near Tyonek	5	1	0.003	--	--	0.020	--	--	0.070	0.025
(00666) Phosphorus, dissolved (milligrams per liter as P)												
00666	15239500	Fritz Creek near Homer	9	0	0.010	0.010	0.040	0.040	0.050	0.060	0.060	0.041
00666	15240000	Anchor River at Anchor Point	3	0	0.020	--	--	0.020	--	--	0.070	0.037
00666	15241600	Ninilchik River at Ninilchik	3	0	0.040	--	--	0.040	--	--	0.060	0.047
00666	15274600	Campbell Creek near Spenard	27	2	0.002	0.003	0.003	0.011	0.028	0.037	0.051	0.017
00666	15275100	Chester Creek at Arctic Boulevard	11	1	0.006	0.010	0.010	0.020	0.030	0.030	0.060	0.023
00666	15292000	Susitna River at Gold Creek	17	3	0.004	0.005	0.010	0.010	0.020	0.030	0.040	0.017
00666	15292700	Talkeetna River near Talkeetna	40	17	0.003	0.005	0.007	0.010	0.020	0.030	0.040	0.014
00666	15294005	Willow Creek near Willow	5	4	0.021	--	--	0.021	--	--	0.021	0.021
00666	15294100	Deshka River near Willow	4	0	0.010	--	--	0.020	--	--	0.100	0.038
00666	15294350	Susitna River at Susitna Station	24	8	0.001	0.002	0.004	0.010	0.010	0.020	0.360	0.025
(00671) Phosphorus, dissolved ortho (milligrams per liter as P)												
00671	15241600	Ninilchik River at Ninilchik	2	0	0.060	--	--	0.065	--	--	0.070	0.065
00671	15274600	Campbell Creek near Spenard	3	3	--	--	--	--	--	--	--	--
00671	15275100	Chester Creek at Arctic Boulevard	7	6	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
00671	15277100	Eagle River at Eagle River	2	1	0.050	--	--	0.050	--	--	0.050	0.050
00671	15282000	Caribou Creek near Sutton	2	2	--	--	--	--	--	--	--	--
00671	15292000	Susitna River at Gold Creek	20	10	0.002	0.003	0.005	0.009	0.020	0.030	0.040	0.013
00671	15292700	Talkeetna River near Talkeetna	48	36	0.001	0.002	0.003	0.004	0.009	0.010	0.030	0.006
00671	15294350	Susitna River at Susitna Station	6	4	0.000	--	--	0.001	--	--	0.030	0.007
00671	15294450	Chuitna River near Tyonek	4	3	0.010	--	--	0.010	--	--	0.010	0.010
00671	15294500	Chakachatna River near Tyonek	3	0	0.060	--	--	0.060	--	--	0.080	0.067

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(01105) Aluminum, total (micrograms per liter)												
01105	15274600	Campbell Creek near Spenard	17	0	70.0	140	510	700	1300	3300	4000	1132
01105	15275100	Chester Creek at Arctic Boulevard	27	0	210	290	400	1000	6900	12000	19000	4317
01105	15292000	Susitna River at Gold Creek	3	0	500	--	--	13000	--	--	14000	9166
01105	15294450	Chuitna River near Tyonek	4	0	60.0	--	--	240.0	--	--	680	305
(01106) Aluminum, dissolved (micrograms per liter)												
01106	15292700	Talkeetna River near Talkeetna	30	4	3.7	7.9	20.0	35.0	100	190	380	74.8
01106	15294005	Willow Creek near Willow	3	0	20.0	--	--	20.0	--	--	30.0	23.3
01106	15294100	Deshka River near Willow	3	0	20.0	--	--	30.0	--	--	60.0	36.7
01106	15294350	Susitna River at Susitna Station	5	1	4.3	--	--	50.0	--	--	80.0	44.9
(01002) Arsenic, total (micrograms per liter)												
01002	15239500	Fritz Creek near Homer	8	0	1.0	1.0	1.5	2.0	2.5	6.0	6.0	2.4
01002	15274600	Campbell Creek near Spenard	24	2	0.6	1.0	1.0	2.0	3.0	3.0	4.0	1.9
01002	15292000	Susitna River at Gold Creek	9	0	1.0	1.0	2.0	5.0	6.0	12.0	12.0	4.8
01002	15292700	Talkeetna River near Talkeetna	19	6	0.3	0.4	0.6	1.0	1.0	2.0	4.0	1.2
01002	15294350	Susitna River at Susitna Station	22	0	1.0	1.0	2.0	5.5	9.0	11.0	40.0	7.4
01002	15294450	Chuitna River near Tyonek	4	2	1.0	--	--	1.0	--	--	1.0	1.0
(01000) Arsenic, dissolved (micrograms per liter)												
01000	15275100	Chester Creek at Arctic Boulevard	3	2	1.0	--	--	1.0	--	--	1.0	1.0
01000	15292000	Susitna River at Gold Creek	7	4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01000	15292700	Talkeetna River near Talkeetna	20	17	0.02	0.04	0.1	0.2	0.4	1.0	2.0	0.4
01000	15294350	Susitna River at Susitna Station	27	6	0.4	0.5	1.0	1.0	2.0	3.0	3.0	1.4
(01007) Barium, total (micrograms per liter)												
01007	15239500	Fritz Creek near Homer	9	7	100	100	100	100	100	100	100	100
01007	15292000	Susitna River at Gold Creek	10	4	17.3	23.3	42.4	100	300	450	500	174
01007	15292700	Talkeetna River near Talkeetna	19	14	40.0	48.3	66.0	93.4	121	200	200	106

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
01007	15294350	Susitna River at Susitna Station	11	4	23.4	34.9	46.2	100	200	300	400	142
01007	15294450	Chuitna River near Tyonek	4	4	--	--	--	--	--	--	--	--
(01005) Barium, dissolved (micrograms per liter)												
01005	15292000	Susitna River at Gold Creek	7	1	22.0	22.0	28.0	31.0	37.0	38.0	38.0	31.4
01005	15292700	Talkeetna River near Talkeetna	40	5	7.0	7.5	10.0	13.1	17.0	20.0	32.0	14.1
01005	15294005	Willow Creek near Willow	3	0	14.0	--	--	14.0	--	--	22.0	16.7
01005	15294100	Deshka River near Willow	3	0	18.0	--	--	24.0	--	--	26.0	22.7
01005	15294350	Susitna River at Susitna Station	16	5	19.2	20.0	25.4	30.0	40.0	53.1	200	42.4
(01027) Cadmium, total (micrograms per liter)												
01027	15239500	Fritz Creek near Homer	9	7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01027	15274600	Campbell Creek near Spenard	7	5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01027	15275100	Chester Creek at Arctic Boulevard	28	24	0.01	0.02	0.1	0.2	0.6	1.1	10.0	0.7
01027	15292000	Susitna River at Gold Creek	10	5	0.1	0.1	0.2	1.0	1.9	16.0	30.0	3.8
01027	15292700	Talkeetna River near Talkeetna	18	17	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01027	15294350	Susitna River at Susitna Station	22	20	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
01027	15294450	Chuitna River near Tyonek	4	4	--	--	--	--	--	--	--	--
(01025) Cadmium, dissolved (micrograms per liter)												
01025	15275100	Chester Creek at Arctic Boulevard	2	2	--	--	--	--	--	--	--	--
01025	15292000	Susitna River at Gold Creek	7	6	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
01025	15292700	Talkeetna River near Talkeetna	22	19	0.01	0.02	0.04	0.1	0.3	1.0	5.0	0.5
01025	15294005	Willow Creek near Willow	3	3	--	--	--	--	--	--	--	--
01025	15294100	Deshka River near Willow	3	3	--	--	--	--	--	--	--	--
01025	15294350	Susitna River at Susitna Station	27	26	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(01034) Chromium, total (micrograms per liter)												
01034	15239500	Fritz Creek near Homer	8	1	1.3	1.3	4.0	5.5	9.0	32.0	32.0	8.8
01034	15274600	Campbell Creek near Spenard	6	0	4.0	--	--	6.0	--	--	26.0	9.0
01034	15275100	Chester Creek at Arctic Boulevard	11	3	0.4	0.7	1.1	5.0	7.0	9.0	55.0	8.7
01034	15292000	Susitna River at Gold Creek	10	2	9.3	9.7	11.7	30.0	30.0	40.0	40.0	25.1
01034	15292700	Talkeetna River near Talkeetna	21	17	1.9	2.7	3.8	5.1	8.2	10.0	20.0	6.8
01034	15294350	Susitna River at Susitna Station	22	9	6.0	8.9	11.3	20.0	30.0	40.0	60.0	22.5
01034	15294450	Chuitna River near Tyonek	4	4	--	--	--	--	--	--	--	--
(01030) Chromium, dissolved (micrograms per liter)												
01030	15275100	Chester Creek at Arctic Boulevard	2	2	--	--	--	--	--	--	--	--
01030	15292000	Susitna River at Gold Creek	7	6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
01030	15292700	Talkeetna River near Talkeetna	19	15	0.1	0.1	0.2	0.5	1.9	2.0	10.0	1.2
01030	15294350	Susitna River at Susitna Station	27	22	0.3	0.5	0.9	2.0	5.0	10.0	30.0	4.0
(01037) Cobalt, total (micrograms per liter)												
01037	15275100	Chester Creek at Arctic Boulevard	6	2	0.3	--	--	1.0	--	--	3.0	1.3
01037	15292000	Susitna River at Gold Creek	7	1	1.9	1.9	3.0	5.0	10.0	10.0	10.0	5.7
01037	15294350	Susitna River at Susitna Station	22	14	1.5	2.0	2.2	4.8	7.0	9.0	11.5	5.1
(01035) Cobalt, dissolved (micrograms per liter)												
01035	15292000	Susitna River at Gold Creek	7	5	0.0	0.0	0.0	0.0	1.0	13.0	13.0	2.0
01035	15292700	Talkeetna River near Talkeetna	35	34	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
01035	15294005	Willow Creek near Willow	3	3	--	--	--	--	--	--	--	--
01035	15294100	Deshka River near Willow	3	3	--	--	--	--	--	--	--	--
01035	15294350	Susitna River at Susitna Station	27	22	0.6	0.8	1.1	1.8	2.2	3.2	7.0	2.0

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(01045) Iron, total (micrograms per liter)												
01045	15239500	Fritz Creek near Homer	2	0	3600	--	--	3700	--	--	3800	3700
01045	15240000	Anchor River at Anchor Point	4	0	980	--	--	1050	--	--	2700	1450
01045	15241600	Ninilchik River at Ninilchik	5	0	900	--	--	1200	--	--	2100	1340
01045	15258000	Kenai River at Cooper Landing	2	0	150	--	--	165	-	--	180	165
01045	15274600	Campbell Creek near Spenard	24	0	370	540	1100	2100	4200	8000	9400	3000
01045	15275100	Chester Creek at Arctic Boulevard	29	0	490	1000	1400	2800	12000	27000	61000	9530
01045	15277100	Eagle River at Eagle River	2	0	1100	--	--	1350	--	--	1600	1350.0
01045	15290000	Little Susitna River near Palmer	3	1	21.7	--	--	50.0	--	--	80.0	51
01045	15291200	Maclaren River near Paxson	2	0	370	--	--	10185	--	--	20000	10200
01045	15292000	Susitna River at Gold Creek	10	0	120	485	4700	14000	18000	22000	24000	12100
01045	15292700	Talkeetna River near Talkeetna	21	1	10.0	70.0	150	640	3200	5000	17000	2430
01045	15294350	Susitna River at Susitna Station	66	0	230	360	560	11000	18000	20000	42000	11400
01045	15294450	Chuitna River near Tyonek	4	0	620	--	--	780	--	--	2400	1145
(01046) Iron, dissolved (micrograms per liter)												
01046	15239500	Fritz Creek near Homer	11	0	170	190	260	310	460	460	540	329
01046	15240000	Anchor River at Anchor Point	4	0	210	--	--	420	--	--	770	455
01046	15241600	Ninilchik River at Ninilchik	6	0	300	--	--	540	--	--	660	512
01046	15272550	Glacier Creek at Girdwood	5	1	7.0	--	--	21.0	--	--	70.0	29.6
01046	15274600	Campbell Creek near Spenard	5	0	20.0	--	--	130	--	--	270	132
01046	15275100	Chester Creek at Arctic Boulevard	9	0	40.0	40.0	150	210	280	460	460	234
01046	15276000	Ship Creek near Anchorage	2	0	30.0	--	--	35.0	--	--	40.0	35.0
01046	15277100	Eagle River at Eagle River	6	0	30.0	--	--	55.0	--	--	100	61.7
01046	15282000	Caribou Creek near Sutton	2	0	10.0	--	--	45.0	--	--	80.0	45.0
01046	15292000	Susitna River at Gold Creek	10	0	10.0	25.0	51.0	110	120	230	320	108
01046	15292700	Talkeetna River near Talkeetna	52	2	4.6	11.0	18.0	30.0	59.5	100.0	410	48.7

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
01046	15294005	Willow Creek near Willow	5	0	21.0	--	--	44.0	--	--	100	51.4
01046	15294100	Deshka River near Willow	4	0	310	--	--	535	--	--	780	540
01046	15294350	Susitna River at Susitna Station	27	1	10.7	20.0	40.0	73.0	140	160	460	99.0
01046	15294450	Chuitna River near Tyonek	6	1	130	--	--	325	--	--	410	293
01046	15294500	Chakachatna River near Tyonek	5	1	2.4	--	--	60.0	--	--	940	228
(01051) Lead, total (micrograms per liter)												
01051	15239500	Fritz Creek near Homer	8	6	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
01051	15274600	Campbell Creek near Spenard	24	5	1.0	1.9	3.2	5.0	12.0	36.0	49.0	11.3
01051	15275100	Chester Creek at Arctic Boulevard	28	1	0.3	3.0	4.5	15.0	115	260	400	74.4
01051	15292000	Susitna River at Gold Creek	10	5	0.7	1.0	1.7	5.1	10.5	14.5	15.0	6.5
01051	15292700	Talkeetna River near Talkeetna	17	11	0.7	1.0	1.8	3.0	6.8	18.0	23.0	5.8
01051	15294350	Susitna River at Susitna Station	22	10	1.0	2.0	3.7	9.9	16.0	28.8	60.0	14.4
01051	15294450	Chuitna River near Tyonek	4	4	--	--	--	--	--	--	--	--
(01049) Lead, dissolved (micrograms per liter)												
01049	15275100	Chester Creek at Arctic Boulevard	2	2	--	--	--	--	--	--	--	--
01049	15292000	Susitna River at Gold Creek	7	4	0.03	0.03	0.1	0.3	2.0	5.0	5.0	1.2
01049	15292700	Talkeetna River near Talkeetna	22	14	0.3	0.5	0.9	1.8	4.0	10.0	15.0	3.4
01049	15294005	Willow Creek near Willow	3	3	--	--	--	--	--	--	--	--
01049	15294100	Deshka River near Willow	3	2	10.0	--	--	10.0	--	--	10.0	10.0
01049	15294350	Susitna River at Susitna Station	27	12	0.3	0.5	0.8	2.0	3.0	5.0	11.0	2.4
(01055) Manganese, total (micrograms per liter)												
01055	15274600	Campbell Creek near Spenard	18	0	20.0	30.0	60.0	140	240	330	440	155
01055	15275100	Chester Creek at Arctic Boulevard	8	0	140	140	160	180	220	280	280	193
01055	15290000	Little Susitna River near Palmer	3	2	160	--	--	160	--	--	160	160
01055	15292000	Susitna River at Gold Creek	10	1	20.0	22.7	80.0	260	320	380	390	220
01055	15292700	Talkeetna River near Talkeetna	21	5	1.0	3.2	6.2	30.0	90.0	140	520	76.2

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
01055	15294350	Susitna River at Susitna Station	22	1	5.8	20.0	30.0	125	320	580	870	231
01055	15294450	Chuitna River near Tyonek	4	0	30.0	--	--	30.0	--	--	130-	55.0
01055	15294500	Chakachatna River near Tyonek	2	2	--	--	--	--	--	--	--	--
(01056) Manganese, dissolved (micrograms per liter)												
01056	15239500	Fritz Creek near Homer	11	0	20.0	21.0	26.0	53.0	60.0	61.0	350	69.8
01056	15240000	Anchor River at Anchor Point	4	0	20.0	--	--	35.0	--	--	80.0	42.5
01056	15241600	Ninilchik River at Ninilchik	6	0	50.0	--	--	75.0	--	--	150-	86.7
01056	15272550	Glacier Creek at Girdwood	5	0	4.0	--	--	30.0	--	--	70.0	30.8
01056	15274600	Campbell Creek near Spenard	5	0	30.0	--	--	40.0	--	--	90.0	48.0
01056	15275100	Chester Creek at Arctic Boulevard	9	0	20.0	20.0	100	120	190	220	220	122
01056	15276000	Ship Creek near Anchorage	2	1	10.0	--	--	10.0	--	--	10.0	10.0
01056	15277100	Eagle River at Eagle River	6	0	10.0	--	--	50.0	--	--	110	58.3
01056	15282000	Caribou Creek near Sutton	2	1	20.0	--	--	20.0	--	--	20.0	20.0
01056	15292000	Susitna River at Gold Creek	11	4	0.7	1.9	5.0	5.0	11.3	40.0	180--0	24.4
01056	15292700	Talkeetna River near Talkeetna	51	6	1.0	3.0	4.0	6.0	10.0	13.0	30.0	7.3
01056	15294005	Willow Creek near Willow	5	1	2.0	--	--	3.5	--	--	5.0	3.7
01056	15294100	Deshka River near Willow	4	0	19.0	--	--	27.5	--	--	76.0	37.5
01056	15294350	Susitna River at Susitna Station	27	10	3.0	4.0	6.0	9.4	20.0	30.0	30.0	12.9
01056	15294450	Chuitna River near Tyonek	6	1	17.0	--	--	26.5	--	--	30.0	25.0
01056	15294500	Chakachatna River near Tyonek	5	4	50.0	--	--	50.0	--	--	50.0	50.0
(01062) Molybdenum, total (micrograms per liter)												
01062	15292000	Susitna River at Gold Creek	3	1	0.03	--	--	1.0	--	--	7.0	2.7
01062	15294450	Chuitna River near Tyonek	4	4	--	--	--	--	--	--	--	--
(01060) Molybdenum, dissolved (micrograms per liter)												
01060	15292700	Talkeetna River near Talkeetna	35	33	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
01060	15294005	Willow Creek near Willow	3	3	--	--	--	--	--	--	--	--
01060	15294100	Deshka River near Willow	3	3	--	--	--	--	--	--	--	--

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
01060	15294350	Susitna River at Susitna Station	5	5	--	--	--	--	--	--	--	--
(01067) Nickel, total (micrograms per liter)												
01067	15274600	Campbell Creek near Spenard	6	0	1.0	--	-	4.5	--	--	48.0	13.8
01067	15275100	Chester Creek at Arctic Boulevard	6	1	3.5	--	-	9.5	--	--	11.0	7.9
01067	15292000	Susitna River at Gold Creek	10	2	6.0	8.5	11.9	19.0	24.0	43.0	50.0	21.1
01067	15294350	Susitna River at Susitna Station	4	0	4.0	-	-	12.5	-	--	40.0	17.3
01067	15294450	Chuitna River near Tyonek	4	4	--	--	--	--	--	--	--	--
(01065) Nickel, dissolved (micrograms per liter)												
01065	15292000	Susitna River at Gold Creek	7	4	0.6	0.6	1.0	1.9	6.0	7.0	7.0	3.0
01065	15292700	Talkeetna River near Talkeetna	31	23	0.04	0.1	0.2	0.4	1.0	2.0	5.0	0.9
01065	15294350	Susitna River at Susitna Station	9	2	0.4	0.4	1.0	1.0	3.0	4.0	4.0	1.8
(01147) Selenium, total (micrograms per liter)												
01147	15239500	Fritz Creek near Homer	8	8	--	--	--	--	--	--	--	--
01147	15274600	Campbell Creek near Spenard	6	6	--	--	--	--	--	--	--	--
01147	15292000	Susitna River at Gold Creek	9	5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01147	15292700	Talkeetna River near Talkeetna	18	16	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01147	15294350	Susitna River at Susitna Station	22	10	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01147	15294450	Chuitna River near Tyonek	4	3	1.0	--	--	1.0	-	-	1.0	1.0
(01145) Selenium, dissolved (micrograms per liter)												
01145	15292000	Susitna River at Gold Creek	7	4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01145	15292700	Talkeetna River near Talkeetna	41	37	0.02	0.06	0.1	0.2	0.4	0.8	2.0	0.4
01145	15294350	Susitna River at Susitna Station	27	19	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(01080) Strontium, dissolved (micrograms per liter)												
01080	15292700	Talkeetna River near Talkeetna	36	0	8.0	48.0	67.0	80.0	135	150	160	91.9
01080	15294005	Willow Creek near Willow	3	0	38.0	--	--	62.0	--	--	120	73.3
01080	15294100	Deshka River near Willow	3	0	50.0	--	--	61.0	--	--	66.0	59.0

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
01080	15294350	Susitna River at Susitna Station	5	0	88.0	--	--	100	--	--	170	115
(01085) Vanadium, dissolved (micrograms per liter)												
01085	15292700	Talkeetna River near Talkeetna	35	35	--	--	--	--	--	--	--	--
01085	15294005	Willow Creek near Willow	3	3	--	--	--	--	--	--	--	--
01085	15294100	Deshka River near Willow	3	3	--	--	--	--	--	--	--	--
01085	15294350	Susitna River at Susitna Station	5	5	--	--	--	--	--	--	--	--
(01092) Zinc, total (micrograms per liter)												
01092	15274600	Campbell Creek near Spenard	7	1	8.6	8.6	30.0	60.0	180	250	250	104
01092	15275100	Chester Creek at Arctic Boulevard	27	0	40.0	50.0	80.0	120	320	420	800	204
01092	15292000	Susitna River at Gold Creek	10	0	10.0	15.0	30.0	60.0	80.0	95.0	100.0	57.0
01092	15292700	Talkeetna River near Talkeetna	19	3	6.3	9.1	11.7	30.0	40.0	90.0	230.0	40.4
01092	15294350	Susitna River at Susitna Station	22	2	8.7	20.0	20.0	50.0	80.0	100	180	55.9
01092	15294450	Chuitna River near Tyonek	4	3	20.0	--	--	20.0	--	--	20.0	20.0
(01090) Zinc, dissolved (micrograms per liter)												
01090	15275100	Chester Creek at Arctic Boulevard	3	0	10.0	--	--	10.0	--	--	40.0	20.0
01090	15292000	Susitna River at Gold Creek	7	1	5.0	5.0	6.4	13.0	15.0	19.0	19.0	11.3
01090	15292700	Talkeetna River near Talkeetna	21	3	2.6	6.0	7.6	9.0	10.0	14.0	90.0	13.0
01090	15294005	Willow Creek near Willow	3	0	4.0	--	--	4.0	--	--	19.0	9.0
01090	15294100	Deshka River near Willow	3	0	9.0	--	--	12.0	--	--	15.0	12.0
01090	15294350	Susitna River at Susitna Station	27	18	0.5	0.9	1.6	4.0	13.2	20.0	55.0	9.0
(01515) Alpha, gross, dissolved (picocuries per liter as U-nat)												
01515	15292700	Talkeetna River near Talkeetna	4	3	0.50	--	--	0.50	--	--	0.50	0.50
(01516) Alpha, gross, suspended (picocuries per liter as U-nat)												
01516	15292700	Talkeetna River near Talkeetna	5	3	0.11	--	--	0.27	--	--	1.00	0.43
(03515) Beta, gross dissolved (picocuries per liter as Cs-137)												
03515	15292700	Talkeetna River near Talkeetna	21	1	0.40	0.70	0.90	1.50	1.80	2.20	3.00	1.48
(03516) Beta, gross suspended (picocuries per liter as Cs-137)												
03516	15292700	Talkeetna River near Talkeetna	21	10	0.09	0.15	0.28	0.60	2.30	2.40	7.10	1.37

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(09511) Radium-226, dissolved, radon method (picocuries per liter)												
09511	15292700	Talkeetna River near Talkeetna	26	4	0.01	0.01	0.02	0.03	0.04	0.08	0.08	0.03
(22703) Uranium, natural dissolved (micrograms per liter)												
22703	15292700	Talkeetna River near Talkeetna	14	0	0.02	0.07	0.11	0.14	0.17	0.19	0.19	0.13
(00680) Total organic carbon (milligrams per liter)												
00680	15274600	Campbell Creek near Spenard	7	0	2.0	2.0	2.6	3.8	9.2	13.0	13.0	5.7
00680	15275100	Chester Creek at Arctic Boulevard	7	0	2.1	2.1	2.2	5.1	6.8	9.0	9.0	4.9
00680	15292000	Susitna River at Gold Creek	4	0	1.1	1.1	1.2	1.5	3.7	5.5	5.5	2.4
00680	15292700	Talkeetna River near Talkeetna	3	0	0.7	--	--	1.6	--	--	1.8	1.4
00680	15294350	Susitna River at Susitna Station	18	0	0.4	0.7	1.3	2.8	5.1	9.1	11.0	3.5
(00681) Suspended organic carbon (milligrams per liter)												
00681	15274600	Campbell Creek near Spenard	22	0	1.7	2.4	4.3	5.9	8.5	9.3	11.0	6.0
00681	15292000	Susitna River at Gold Creek	6	0	1.9	--	--	3.8	--	--	6.0	3.8
00681	15292700	Talkeetna River near Talkeetna	2	0	1.2	--	--	2.3	--	--	3.4	2.3
00681	15294005	Willow Creek near Willow	4	0	1.4	--	--	1.8	--	--	3.5	2.1
00681	15294100	Deshka River near Willow	3	0	3.4	--	--	5.6	--	--	12.0	7.0
00681	15294350	Susitna River at Susitna Station	10	0	0.1	0.4	0.7	2.0	3.7	6.4	6.8	2.5
00681	15294450	Chuitna River near Tyonek	3	0	2.2	--	--	4.0	--	--	4.2	3.5
(80154) Suspended sediment (milligrams per liter)												
80154	15239500	Fritz Creek near Homer	8	0	7.0	7.0	9.5	12.0	95.0	504.0	504.0	93.0
80154	15240000	Anchor River at Anchor Point	12	0	1.0	2.0	4.5	6.5	26.0	31.0	32.0	13.1
80154	15242000	Kasilof River near Kasilof	9	0	15.0	15.0	20.0	26.0	33.0	45.0	45.0	27.3
80154	15248000	Trail River near Lawing	3	0	16.0	--	--	30.0	--	--	40.0	28.7
80154	15258000	Kenai River at Cooper Landing	24	0	2.0	3.0	4.0	8.0	13.5	24.0	72.0	11.6
80154	15266300	Kenai River at Soldotna	29	0	1.0	4.0	10.0	22.0	37.0	103.0	151.0	32.0
80154	15267900	Resurrection Creek near Hope	16	0	1.0	2.0	3.0	5.0	9.0	13.0	97.0	11.4

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Station number	Station name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
80154	15272550	Glacier Creek at Girdwood	36	0	1.0	4.0	6.0	14.0	125	900	3760	290
80154	15274600	Campbell Creek near Spenard	97	0	1.0	8.0	24.0	42.0	94.0	155	495	70.7
80154	15275100	Chester Creek at Arctic Boulevard	87	0	4.0	12.0	24.0	56.0	246	392	683	141
80154	15276000	Ship Creek near Anchorage	4	0	12.0	--	--	19.5	--	--	60.0	27.8
80154	15277100	Eagle River at Eagle River	81	0	4.0	13.0	42.0	152	243	494	1440	216
80154	15281000	Knik River near Palmer	66	0	4.0	60.0	232	861	1200	1700	4500	867
80154	15282000	Caribou Creek near Sutton	37	0	13.0	47.0	91.0	230.0	583.0	1800.0	13200.0	940
80154	15284000	Matanuska River at Palmer	82	0	10.0	24.0	45.0	164	1240	1920	9350	793
80154	15290000	Little Susitna River near Palmer	27	2	0.2	1.0	1.0	3.0	10.0	21.0	100	9.6
80154	15291000	Susitna River near Denali	50	0	5.0	139	590	942	1420	1880	5690	1100
80154	15291200	Maclaren River near Paxson	33	0	6.0	58.0	168	489	710	856	1630	488
80154	15291500	Susitna River near Cantwell	44	0	4.0	56.0	209	597	981	1360	2790	703
80154	15292000	Susitna River at Gold Creek	55	1	0.7	3.0	22.0	394	747	1400	2400	534
80154	15292400	Chulitna River near Talkeetna	40	0	3.0	22.0	296	763	1155	1415	2200	744
80154	15292700	Talkeetna River near Talkeetna	162	0	1.0	4.0	19.0	163	436	947	3530	326
80154	15294005	Willow Creek near Willow	3	0	2.0	--	--	14.0	--	--	23.0	13.0
80154	15294350	Susitna River at Susitna Station	95	1	2.0	3.0	158	469	780	1380	2980	600
80154	15294450	Chuitna River near Tyonek	23	0	1.0	4.0	10.0	120	194	278	1570	203
80154	15294500	Chakachatna River near Tyonek	10	0	18.0	19.0	24.0	44.0	80.0	89.5	92.0	49.2

APPENDIX 3

Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska

[Note: “Parameter Code” is a 5-digit number used by the U.S. Environmental Protection Agency and the U.S. Geological Survey in their computerized data systems to uniquely identify a specific constituent]

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska
[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(72008) Water level (feet below land surface)												
72008	190203	Kenai Peninsula	173	0	14	40	67	100	160	219	371	119
72008	190204	Anchorage/Matanuska area	309	0	10	33	63	116	204	311	850	148
72008	190205	Susitna River Basin	54	0	10	22	31	48	72	114	360	68
72008	190206	Western Cook Inlet	17	0	58	61	100	155	191	383	515	174
(00095) Specific conductance (microsiemens per centimeter at 25 degrees Celsius)												
00095	190203	Kenai Peninsula	172	0	60	95	134	208	331	480	2310	283
00095	190204	Anchorage/Matanuska area	314	0	86	176	211	246	304	392	4090	300
00095	190205	Susitna River Basin	53	0	44	126	187	227	260	340	3640	308
00095	190206	Western Cook Inlet	15	0	53	85	107	210	325	333	575	228
(00400) pH (units)												
00400	190203	Kenai Peninsula	174	0	5.8	6.5	7	7.5	8.1	8.4	9.5	7.5
00400	190204	Anchorage/Matanuska area	283	0	6.3	7	7.4	7.8	8.1	8.3	9.5	7.8
00400	190205	Susitna River Basin	45	0	6	6.9	7.2	7.5	7.9	8.1	8.2	7.5
00400	190206	Western Cook Inlet	17	0	5.3	5.6	6.5	6.9	7.3	8.3	8.4	6.9
(00010) Temperature (degrees Celsius)												
00010	190203	Kenai Peninsula	160	0	3.0	3.8	4.0	5.0	7.0	9.3	20.5	6.0
00010	190204	Anchorage/Matanuska area	201	0	1.5	3.0	3.5	4.5	6.0	8.5	21.5	5.3
00010	190205	Susitna River Basin	40	0	1.0	3.8	5.0	6.5	8.0	11.5	14.5	6.8
00010	190206	Western Cook Inlet	14	0	3.5	4.0	4.0	4.0	5.5	6.0	6.5	4.6
(00076) Turbidity (nepthelometric turbidity units)												
00076	190204	Anchorage/Matanuska area	2	0	0.3	--	--	12.2	-	--	24.0	12.2
(00300) Oxygen, dissolved (milligrams per liter)												
00300	190203	Kenai Peninsula	51	0	0.2	0.3	0.4	0.5	2.9	8.2	10.5	2.2
(00301) Oxygen, dissolved, percent saturated												
00301	190203	Kenai Peninsula	46	0	2.0	2.0	3.0	4.5	22.0	68.0	81.0	18.0

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(00900) Hardness, total (milligrams per liter as $CaCO_3$)												
00900	190203	Kenai Peninsula	152	0	4	21	36	55	89	120	170	63
00900	190204	Anchorage/Matanuska area	204	0	2	72	94	120	160	240	1300	144
00900	190205	Susitna River Basin	29	0	45	57	100	120	150	220	360	133
00900	190206	Western Cook Inlet	16	0	6	27	34	41	75	93	290	64
(00915) Calcium, dissolved (milligrams per liter)												
00915	190203	Kenai Peninsula	152	2	0.5	3.9	9.1	14.0	21.5	33.0	48.0	16.6
00915	190204	Anchorage/Matanuska area	178	0	0.3	16.0	23.0	30.0	40.0	58.0	180	35.2
00915	190205	Susitna River Basin	22	0	13.0	19.0	29.0	36.5	47.0	57.0	110	39.9
00915	190206	Western Cook Inlet	16	0	1.8	6.0	7.8	10.0	17.5	28.0	89.0	16.5
(00925) Magnesium, dissolved (milligrams per liter)												
00925	190203	Kenai Peninsula	152	0	0.3	1.8	2.9	4.5	6.6	9.8	21.0	5.2
00925	190204	Anchorage/Matanuska area	177	0	0.1	4.4	6.6	8.7	11.0	16.0	30.0	9.5
00925	190205	Susitna River Basin	23	0	2.8	3.5	5.0	6.8	12.0	19.0	28.0	9.3
00925	190206	Western Cook Inlet	16	0	0.3	1.1	1.9	4.4	7.2	13.0	16.0	5.4
(00930) Sodium, dissolved (milligrams per liter)												
00930	190203	Kenai Peninsula	152	0	1.1	4.2	5.1	7.9	44.0	98.0	460	38.3
00930	190204	Anchorage/Matanuska area	158	0	1.2	2.8	4.1	6.0	13.0	32.0	157	14.5
00930	190205	Susitna River Basin	18	0	2.3	2.4	2.8	3.4	5.4	130	560	42.3
00930	190206	Western Cook Inlet	16	0	3.4	4.4	7.2	20.0	38.0	55.0	67.0	25.5
(00935) Potassium, dissolved (milligrams per liter)												
00935	190203	Kenai Peninsula	152	0	0.6	1.3	1.7	3.0	4.9	7.0	14.0	3.7
00935	190204	Anchorage/Matanuska area	155	4	0.1	0.5	0.8	1.3	1.8	2.2	20.0	1.5
00935	190205	Susitna River Basin	18	1	0.1	0.3	0.6	0.9	1.3	5.2	6.3	1.6
00935	190206	Western Cook Inlet	16	0	0.3	0.4	0.7	2.2	3.1	7.0	7.6	2.6

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(00410) Alkalinity, onsite total (milligrams per liter as Ca CO_3)												
00410	190203	Kenai Peninsula	151	0	15	38	61	100	143	188	450	114
00410	190204	Anchorage/Matanuska area	195	0	38	84	105	123	148	192	546	134
00410	190205	Susitna River Basin	29	0	45	67	103	119	138	158	230	118
00410	190206	Western Cook Inlet	17	0	34	41	80	108	126	180	320	113
(00945) Sulfate, dissolved (milligrams per liter)												
00945	190203	Kenai Peninsula	152	31	0.02	0.1	0.3	1.6	3.5	7.7	49.0	3.8
00945	190204	Anchorage/Matanuska area	195	13	0.2	1.0	4.0	8.6	16.0	38.0	160	15.3
00945	190205	Susitna River Basin	28	2	0.2	0.5	1.1	5.4	11.0	41.0	72.0	10.9
00945	190206	Western Cook Inlet	16	1	0.6	1.4	1.7	2.7	5.5	8.9	11.0	3.8
(00940) Chloride, dissolved (milligrams per liter)												
00940	190203	Kenai Peninsula	152	2	0.2	1.8	3.3	5.3	14.0	45.0	470	25.1
00940	190204	Anchorage/Matanuska area	228	5	0.1	1.1	1.8	3.0	5.0	14.0	1000	18.0
00940	190205	Susitna River Basin	30	2	0.1	0.4	1.4	2.7	7.8	45.5	1100	48.5
00940	190206	Western Cook Inlet	16	0	0.3	0.4	1.0	2.2	5.7	31.0	42.0	7.0
(00950) Fluoride, dissolved (milligrams per liter)												
00950	190203	Kenai Peninsula	151	32	0.009	0.034	0.100	0.100	0.200	0.600	2.400	0.264
00950	190204	Anchorage/Matanuska area	173	47	0.015	0.042	0.067	0.100	0.200	0.300	1.000	0.157
00950	190205	Susitna River Basin	26	11	0.019	0.030	0.047	0.100	0.100	0.200	0.500	0.106
00950	190206	Western Cook Inlet	16	5	0.027	0.037	0.059	0.100	0.200	0.300	0.500	0.145
(00955) Silica, dissolved (milligrams per liter as SiO_2)												
00955	190203	Kenai Peninsula	151	0	13	22	26	31	37	42	55	32
00955	190204	Anchorage/Matanuska area	182	0	1	8	11	13	16	21	41	14
00955	190205	Susitna River Basin	24	0	10	10	11	14	20	24	29	16
00955	190206	Western Cook Inlet	16	0	13	14	16	28	37	40	54	28

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(70300) Dissolved solids, residue at 180° Celsius (milligrams per liter)												
70300	190203	Kenai Peninsula	13	0	58	65	72	82	113	148	167	97
70300	190204	Anchorage/Matanuska area	10	0	99	109	123	129	199	437	649	194
70300	190205	Susitna River Basin	2	0	169	--	--	211	--	--	253	211
70300	190206	Western Cook Inlet	7	0	53	53	76	98	161	354	354	139
(70301) Dissolved solids, sum of constituents (milligrams per liter)												
70301	190203	Kenai Peninsula	149	0	58	81	104	152	227	349	1280	195
70301	190204	Anchorage/Matanuska area	171	0	69	116	131	152	186	247	652	176
70301	190205	Susitna River Basin	21	0	69	122	132	159	199	262	1910	258
70301	190206	Western Cook Inlet	16	0	51	65	103	158	195	232	369	158
(00630) Nitrite plus nitrate, total (milligrams per liter as N)												
00630	190203	Kenai Peninsula	6	3	0.002	--	--	0.071	--	--	1.100	0.262
00630	190204	Anchorage/Matanuska area	21	4	0.010	0.012	0.040	0.560	1.200	1.400	5.800	0.846
(00631) Nitrite plus nitrate, dissolved (milligrams per liter as N)												
00631	190203	Kenai Peninsula	74	37	0.001	0.005	0.015	0.050	0.250	0.450	6.000	0.302
00631	190204	Anchorage/Matanuska area	29	6	0.007	0.010	0.020	0.030	0.110	0.530	4.600	0.260
00631	190205	Susitna River Basin	3	1	0.110	--	--	0.200	--	--	0.280	0.197
00631	190206	Western Cook Inlet	14	4	0.010	0.013	0.020	0.027	0.050	0.110	0.280	0.052
(00608) Nitrogen ammonia, dissolved (milligrams per liter as N)												
00608	190203	Kenai Peninsula	61	13	0.002	0.009	0.020	0.070	0.190	0.420	0.610	0.136
00608	190204	Anchorage/Matanuska area	5	0	0.020	--	--	0.040	--	--	0.490	0.176
(00625) Nitrogen, total kjeldahl (milligrams per liter as N)												
00625	190203	Kenai Peninsula	6	4	0.400	--	--	0.400	--	--	0.400	0.400
00625	190204	Anchorage/Matanuska area	10	2	0.020	0.028	0.066	0.350	0.460	0.805	0.900	0.357
(00665) Phosphorus, total (milligrams per liter as P)												
00665	190203	Kenai Peninsula	6	2	0.031	--	--	0.230	--	--	0.470	0.241

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
00665	190204	Anchorage/Matanuska area	17	5	0.000	0.001	0.003	0.030	0.070	0.310	16.000	0.999
(00666) Phosphorus, dissolved (milligrams per liter as P)												
00666	190203	Kenai Peninsula	61	7	0.001	0.007	0.020	0.070	0.330	0.590	2.900	0.282
00666	190204	Anchorage/Matanuska area	4	1	0.004	--	--	0.015	--	--	0.030	0.016
00666	190206	Western Cook Inlet	3	1	0.046	--	--	0.060	--	-	0.070	0.059
(00671) Phosphorus, dissolved ortho (milligrams per liter as P)												
00671	190203	Kenai Peninsula	74	14	0.000	0.003	0.010	0.050	0.260	0.600	2.600	0.248
00671	190204	Anchorage/Matanuska area	27	4	0.001	0.004	0.010	0.030	0.060	0.290	1.000	0.096
00671	190205	Susitna River Basin	2	0	0.010	--	-	0.045	-	-	0.080	0.045
00671	190206	Western Cook Inlet	7	0	0.020	--	-	0.160	-	-	0.780	0.267
(01106) Aluminum, dissolved (micrograms per liter)												
01106	190203	Kenai Peninsula	62	43	1.2	2.4	3.7	6.1	10.0	20.0	30.0	7.9
01106	190204	Anchorage/Matanuska area	5	1	5.5	--	--	10.0	--	--	20.0	11.1
(01002) Arsenic, total (micrograms per liter)												
01002	190203	Kenai Peninsula	7	4	0.0	0.0	0.1	0.5	6.0	70.0	70.0	11.7
01002	190204	Anchorage/Matanuska area	9	5	0.3	0.3	0.4	0.6	1.0	2.0	2.0	0.8
01002	190205	Susitna River Basin	3	1	3.0	--	--	3.0	--	--	30.0	12.0
01002	190206	Western Cook Inlet	4	3	--	--	--	--	--	-	--	--
(01000) Arsenic, dissolved (micrograms per liter)												
01000	190203	Kenai Peninsula	69	10	0.2	0.7	2.0	7.0	24.0	48.0	94.0	16.0
01000	190204	Anchorage/Matanuska area	25	6	0.1	0.2	1.0	2.0	4.0	17.0	48.0	5.5
01000	190205	Susitna River Basin	4	1	1.0	--	--	2.4	--	--	19.0	6.2
01000	190206	Western Cook Inlet	15	3	0.1	0.2	1.0	2.0	4.0	20.0	150	13.6
(01007) Barium, total (micrograms per liter)												
01007	190203	Kenai Peninsula	3	3	--	--	--	--	--	--	--	--
01007	190204	Anchorage/Matanuska area	8	8	--	--	--	--	--	--	--	--

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(01005) Barium, dissolved (micrograms per liter)												
01005	190203	Kenai Peninsula	69	5	1.1	4.0	9.0	17.0	29.0	48.0	300	29.2
01005	190204	Anchorage/Matanuska area	19	17	2.4	4.0	9.5	19.6	40.6	96.7	160.	33.5
01005	190206	Western Cook Inlet	5	3	3.2	--	--	10.0	--	--	200	50.0
(01027) Cadmium, total (micrograms per liter)												
01027	190203	Kenai Peninsula	3	3	--	--	--	--	--	--	--	--
01027	190204	Anchorage/Matanuska area	8	8	--	--	--	--	--	--	--	--
(01025) Cadmium, dissolved (micrograms per liter)												
01025	190203	Kenai Peninsula	69	55	0.1	0.1	0.2	0.5	0.9	2.0	3.0	0.7
01025	190204	Anchorage/Matanuska area	23	23	--	--	--	--	--	--	--	--
01025	190206	Western Cook Inlet	13	13	--	--	--	--	--	--	--	--
(01034) Chromium, total (micrograms per liter)												
01034	190203	Kenai Peninsula	2	2	--	--	--	--	--	--	--	--
(01030) Chromium, dissolved (micrograms per liter)												
01030	190203	Kenai Peninsula	69	66	0.2	0.4	0.6	1.0	1.7	2.5	7.0	1.3
01030	190204	Anchorage/Matanuska area	23	23	--	--	--	--	--	--	--	--
01030	190206	Western Cook Inlet	13	11	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
(01035) Cobalt, dissolved (micrograms per liter)												
01035	190203	Kenai Peninsula	62	58	0.1	0.2	0.4	0.8	1.7	3.1	9.0	1.4
01035	190204	Anchorage/Matanuska area	2	2	--	--	--	--	--	--	--	--
(01045) Iron, total (micrograms per liter)												
01045	190203	Kenai Peninsula	4	0	100	100	185	1235	3200	4200	4200	1690
01045	190204	Anchorage/Matanuska area	34	8	1	4	10	75	290	410	2300	218
01045	190205	Susitna River Basin	2	0	220	--	--	710	--	--	1200	710
01045	190206	Western Cook Inlet	3	0	180	-	--	9100	-	-	18000	9090

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(01046) Iron, dissolved (micrograms per liter)												
01046	190203	Kenai Peninsula	76	0	3	16	74	195	2100	9000	21000	2380
01046	190204	Anchorage/Matanuska area	41	12	2	7	11	30	70	170	280	58
01046	190205	Susitna River Basin	5	0	8	--	--	170	-	--	880	306
01046	190206	Western Cook Inlet	10	0	150	215	420	855	1800	5000	6200	1640
(01051) Lead, total (micrograms per liter)												
01051	190203	Kenai Peninsula	4	2	0.1	--	--	2.8	--	--	20.0	6.4
01051	190204	Anchorage/Matanuska area	9	1	2.0	2.0	3.0	4.0	4.0	8.0	8.0	4.3
01051	190205	Susitna River Basin	3	1	2.0	--	--	3.2	--	--	5.0	3.4
01051	190206	Western Cook Inlet	2	2	--	--	--	--	--	--	--	--
(01049) Lead, dissolved (micrograms per liter)												
01049	190203	Kenai Peninsula	69	63	0.1	0.2	0.4	0.8	2.0	4.3	20.0	1.8
01049	190204	Anchorage/Matanuska area	25	15	0.5	0.6	1.0	2.0	2.9	3.8	12.0	2.3
01049	190205	Susitna River Basin	3	3	--	--	--	--	--	--	--	--
01049	190206	Western Cook Inlet	15	6	0.4	0.8	1.0	1.1	2.0	3.0	4.0	1.6
(01055) Manganese, total (micrograms per liter)												
01055	190203	Kenai Peninsula	4	0	80.0	--	--	380	--	--	870	428
01055	190204	Anchorage/Matanuska area	33	5	1.8	4.7	10.0	30.0	90.0	140	460	61
(01056) Manganese, dissolved (micrograms per liter)												
01056	190203	Kenai Peninsula	75	6	1.0	3.0	20.0	87.0	300	630	1400	213
01056	190204	Anchorage/Matanuska area	41	11	3.0	6.9	13.4	31.0	90.0	150	210	57.1
01056	190205	Susitna River Basin	5	0	2.0	--	--	190.0	--	-	460	200
01056	190206	Western Cook Inlet	9	0	40.0	40.0	60.0	100	230	1100	1100	272
(01060) Molybdenum, dissolved (micrograms per liter)												
01060	190203	Kenai Peninsula	62	60	0.0	0.0	0.0	0.1	0.3	1.3	20.0	0.8
01060	190204	Anchorage/Matanuska area	2	1	10.0	--	--	10.0	--	--	10.0	10.0

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska--Continued

[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(01067) Nickel, total (micrograms per liter)												
01067	190204	Anchorage/Matanuska area	8	8	--	--	--	--	--	--	--	--
(01065) Nickel, dissolved (micrograms per liter)												
01065	190203	Kenai Peninsula	62	61	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
01065	190204	Anchorage/Matanuska area	2	2	--	--	--	--	--	--	--	--
(01147) Selenium, total (micrograms per liter)												
01147	190203	Kenai Peninsula	4	1	0.3	--	--	3.5	--	--	6.0	3.3
01147	190204	Anchorage/Matanuska area	8	6	0.0	0.0	0.1	0.2	0.7	2.0	2.0	0.5
(01145) Selenium, dissolved (micrograms per liter)												
01145	190203	Kenai Peninsula	13	12	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01145	190204	Anchorage/Matanuska area	23	22	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
01145	190206	Western Cook Inlet	12	11	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(01080) Strontium, dissolved (micrograms per liter)												
01080	190203	Kenai Peninsula	62	0	18	41	55	81	100	150	200	84
01080	190204	Anchorage/Matanuska area	2	0	170	--	--	280	--	--	390	280
(01085) Vanadium, dissolved (micrograms per liter)												
01085	190203	Kenai Peninsula	62	61	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
01085	190204	Anchorage/Matanuska area	2	2	--	--	--	--	--	--	--	--
(01092) Zinc, total (micrograms per liter)												
01092	190203	Kenai Peninsula	4	1	8.3	--	--	40.0	--	--	660	187
01092	190204	Anchorage/Matanuska area	9	8	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
(01090) Zinc, dissolved (micrograms per liter)												
01090	190203	Kenai Peninsula	69	8	1.1	3.0	7.0	20.0	44.0	100	160	34.0
01090	190204	Anchorage/Matanuska area	23	14	0.5	1.1	2.0	4.0	10.4	20.0	110	11.6
01090	190206	Western Cook Inlet	13	1	3.6	10.0	10.0	20.0	50.0	70.0	110	34.4

Appendix 3. Statistical summary of water-quality characteristics for selected ground-water regions in the Cook Inlet Basin, Alaska--Continued
[--, not determined]

Parameter code	Hydrologic unit	Region name	No. of analyses		Minimum	Percentile					Maximum	Mean
			Total	Less than detection limit		10th	25th	50th Median	75th	90th		
(00680) Total organic carbon (milligrams per liter)												
00680	190203	Kenai Peninsula	3	0	0.9	--	--	1.0	--	--	15.0	5.6
00680	190204	Anchorage/Matanuska area	4	1	0.1	-	-	1.7	--	--	12.0	3.8
(00681) Suspended organic carbon (milligrams per liter)												
00681	190203	Kenai Peninsula	39	0	0.7	0.7	0.8	0.9	1.9	3.1	7.1	1.6
00681	190204	Anchorage/Matanuska area	4	0	0.8	--	--	2.8	--	--	3.5	2.5