

Hydrologic and Water-Quality Data for U.S. Coast Guard Support Center Kodiak, Alaska, 1987-89

by Roy L. Glass

U.S. GEOLOGICAL SURVEY

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CONVERSION FACTORS, VERTICAL DATUM, AND WATER-QUALITY INFORMATION

	Multiply	by	To obtain
inch (in.)		25.4	millimeter
foot (ft)		0.3048	meter
mile (mi)		1.609	kilometer
square mile (mi ²)		2.590	square kilometer
cubic foot per second (ft ³ /s)		0.02832	cubic meter per second
gallon (gal)		3.785	liter

In this report, air temperature is reported in degrees Fahrenheit (°F), which can be converted to degrees Celsius (°C) by the following equation:

$$^{\circ}\text{F} = 1.8 (^{\circ}\text{C}) + 32$$

Water temperature is reported in degrees Celsius (°C).

Other abbreviations in this report are:

mL, milliliter
mg/kg, milligram per kilogram
μg/kg, microgram per kilogram
mg/L, milligram per liter
μg/L, microgram per liter
μS/cm, microsiemen per centimeter at 25 °Celsius

Elevation datum:

Mean Sea Level: In this report, mean sea level refers to a tidal datum midway between the arithmetic means of the high-water heights and low-water heights for the Kodiak Island tidal station. This is also called mean tide level.

Notes:

Dates are listed in the format YEAR MONTH DAY. For example, 891225 represents December 25, 1989.

A Chemical Abstract Service (CAS) reference number is a unique identifier assigned by the American Chemical Society to chemicals recorded in the Chemical Abstracts Service Registry system. This number can be used to access many chemical databases and to conclusively identify a substance regardless of name. In this report, a Chemical Abstract Service (CAS) number is assigned to each water property or constituent. The format of a CAS number is typically XXX-XX-X, but the dashes are omitted in this report (71-43-2 is reported as 71432). In this report, CAS numbers less than 1000 represent field properties, not chemicals.

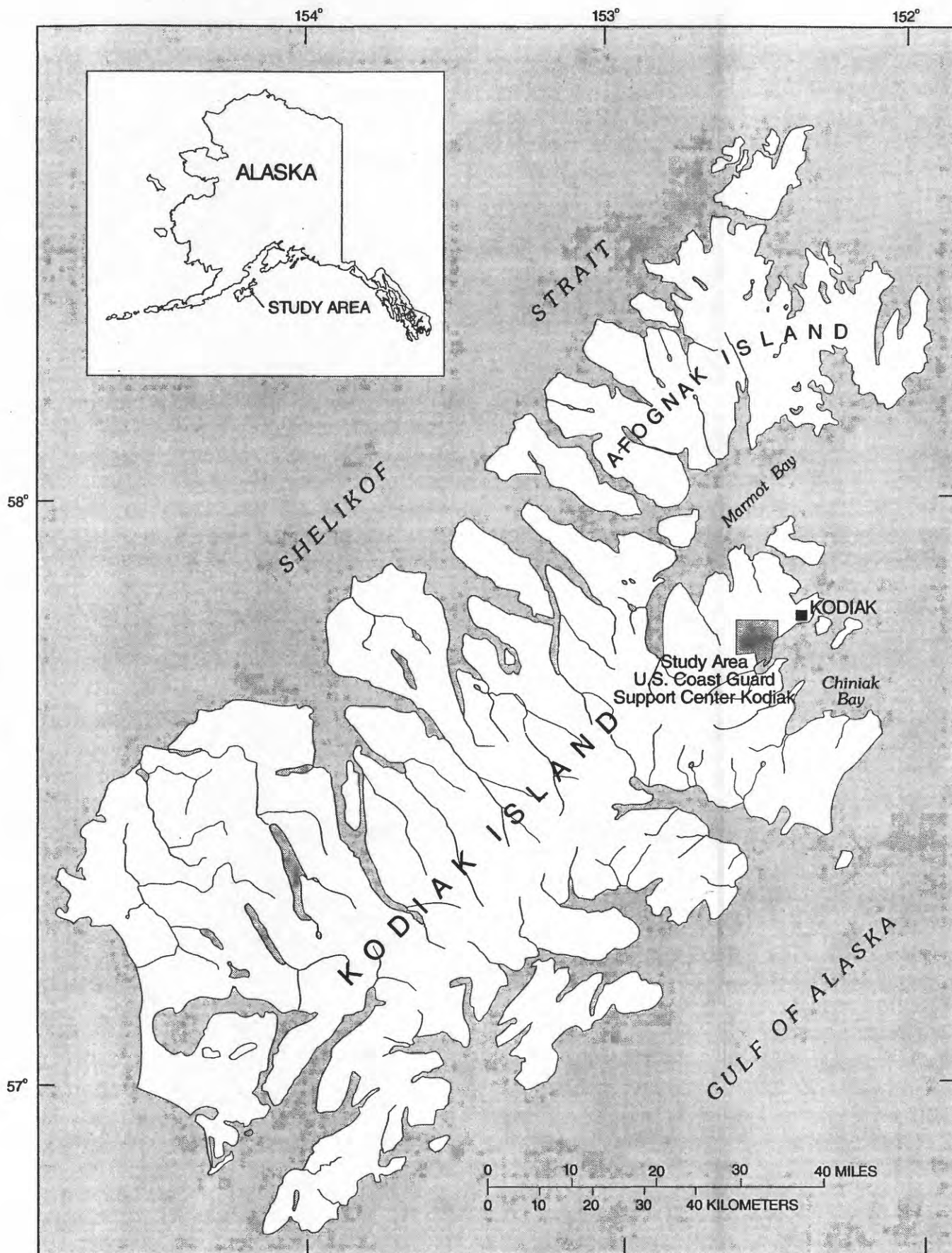


Figure 1. Location of Kodiak Island, Alaska and study area.

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ABSTRACT

Hydrologic and water-quality data were collected at the U.S. Coast Guard Support Center Kodiak on Kodiak Island, Alaska, to determine regional ground-water conditions and if contamination of soils, ground water, or surface water has occurred. Eighteen areas of possible contamination were identified. Ground-water levels, surface-water stages, surface-water discharges, and results of field and laboratory analyses of soil and water samples are presented in tabular form.

Many quality-assurance samples had detectable concentrations of methylene chloride and 1,2-dichloroethane, which may be due to sampling or laboratory contamination. Concentrations were as great as 5.9 micrograms per liter for methylene chloride and 2.6 micrograms per liter for 1,2-dichloroethane. Excluding 1,2-dichloroethane, most soil, ground-water, and surface-water samples contained no detectable concentrations of the organic constituents that were analyzed.

Chemical analyses were performed on two lake-bed-material samples and more than 100 soil samples. The median lead concentration was 9.8 milligrams per kilogram. Concentrations of tetrachloroethene were as great as 1.1 milligram per kilogram in soils near a laundry.

Water samples were collected from 101 wells. The maximum benzene concentration detected in ground water was 78 micrograms per liter from a well at the air station near a site where aviation fuel was spilled. Wells near a laundry yielded water having concentrations of tetrachloroethene as great as 3,000 micrograms per liter, and vinyl chloride as great as 440 micrograms per liter. A well in a former aviation gasoline storage area yielded water with a concentration of trichloroethene as great as 66 micrograms per liter.

Water samples were collected from 59 sites on streams, lakes, or ponds. Surface-water samples had much lower concentrations of organic compounds; the highest concentration of benzene was 2.2 micrograms per liter in a stream near a former aviation-fuel storage area and the maximum vinyl chloride concentration was 15 micrograms per liter in a stream near a former landfill. Tetrachloroethene and trichloroethene were not detected in any surface-water samples.

INTRODUCTION

The U.S. Coast Guard (USCG) Support Center (referred to as "Center" in this report), on the east coast of Kodiak Island in southcentral Alaska (fig. 1), was established during World War II as a U.S. Navy Base. It covers about 55 mi² and it served as a U.S. Navy submarine base, air station, and port during and after the war. In 1972, the Navy transferred the station to the USCG.

Purpose and Scope

The U.S. Geological Survey (USGS), at the request of the USCG, began a study of geologic and hydrologic conditions at the Center and adjacent areas in February 1987. The investigation was prompted by the need to evaluate environmental conditions related to historical waste-disposal practices or spills. Areas where soil and water contamination may have occurred include fuel and

hazardous-material storage areas, landfills, metal-disposal and fire-fighting training areas, and a laundry facility. The general locations of 18 areas of potential contamination are shown in figure 2. Areas thought not to be contaminated and not downgradient of potentially contaminated areas are treated as a single area (Area 19) in this report. The sections of this report describing these areas have maps that show in greater detail the location of surface-water, well, and soil sampling sites. This report lists soil and water data collected on the Center by the USGS during 1987-89 and briefly discusses some of the chemical constituents detected in the areas of potential contamination. Other published reports of this investigation include those by Allely (1989), Brown (1989), Carr (1996), Combellick (1989), Solie and Reifensstuhl (1989), and Solin (1996). Much of the data resulting from this study are in appendixes on the disks included with this report.

Description of Study Area

Steep, rugged, and extensively glaciated terrain characterizes most of Kodiak Island, including areas near and within the Center. Ground elevations range from sea level to 2,482 ft above sea level at Barometer Mountain (fig. 2). Bedrock is exposed throughout much of the Center and is predominantly metamorphosed sedimentary and volcanic rocks. Only limited amounts of unconsolidated materials are present, thus restricting the availability of ground water for use as a water supply. The primary source of water for the Center is Buskin Lake (fig. 2). One well (CG 4) supplies water to the Buskin River Beach House (Building 101), 0.2 mi north of the mouth of the Buskin River.

Kodiak Island is in the maritime climate zone which is characterized by moderate diurnal and annual temperature ranges. Weather data have been collected near the airport's control tower near the center of the airport since 1973. The average temperature was 41 °F during 1973-87 (Leslie, 1987). Mean monthly temperatures for 1987, 1988, and 1989 (National Oceanic and Atmospheric Administration, 1987-89), the period of the investigation, were:

Month	Mean monthly temperature (degrees Fahrenheit)		
	1987	1988	1989
January	34.0	32.2	21.7
February	36.2	34.3	33.0
March	35.4	34.7	33.1
April	38.1	36.8	39.3
May	44.8	45.0	44.9
June	47.7	51.6	50.3
July	55.9	54.1	57.4
August	56.5	55.1	57.2
September	48.4	48.7	52.0
October	41.8	41.2	41.2
November	33.3	32.7	32.2
December	28.0	30.4	34.6
Mean	41.7	41.4	41.4

Mean annual precipitation (as inches of moisture, includes both rain and snow), is about 74 in. Mean annual snowfall is about 66 in. (Leslie, 1989). Total monthly and yearly precipitation for 1987, 1988, and 1989 (National Oceanic and Atmospheric Administration, 1987-89) were:

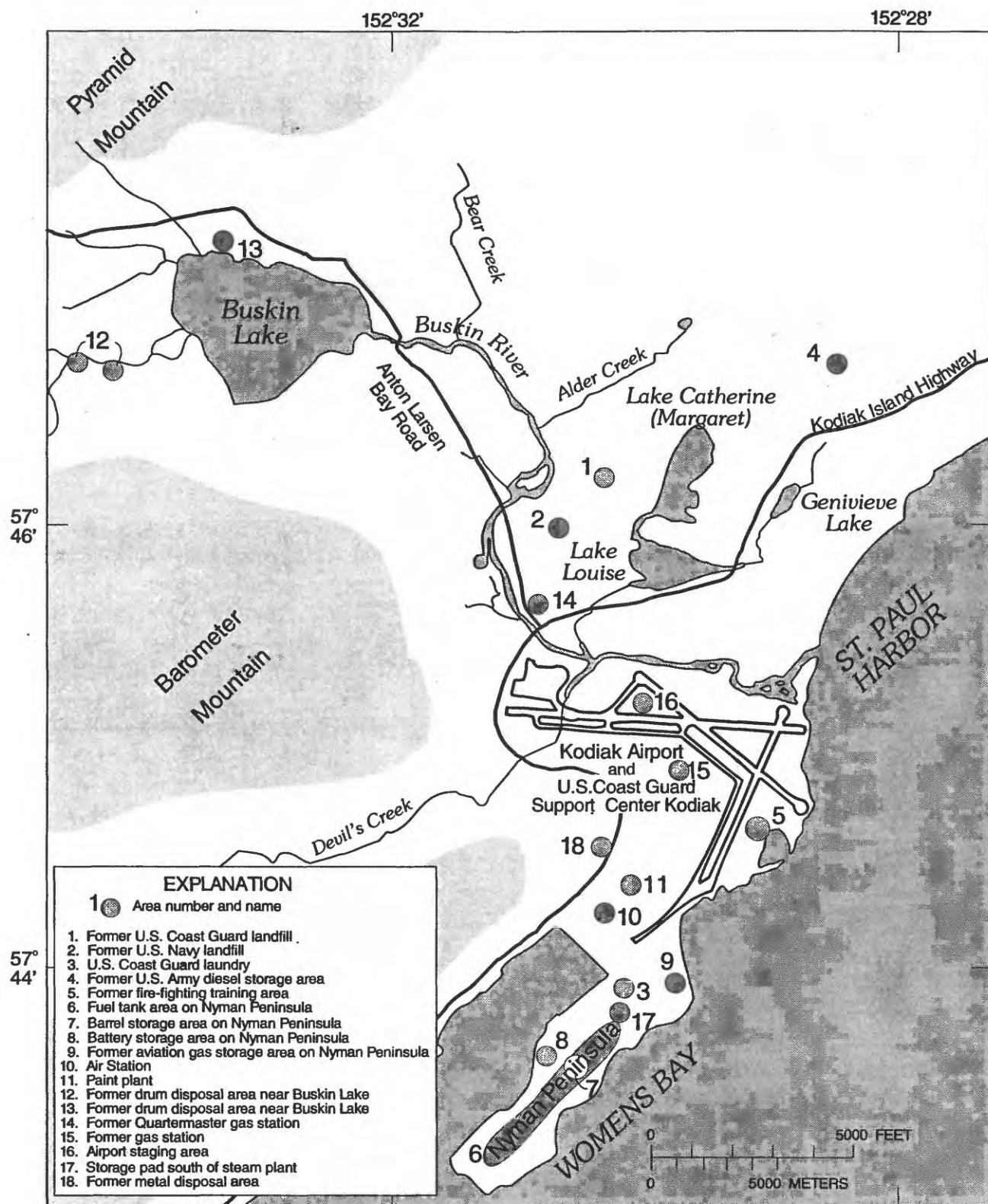


Figure 2. Location of areas of possible contamination at the U.S. Coast Guard Support Center Kodiak.

Month	Monthly precipitation (inches)		
	1987	1988	1989
January	10.21	6.91	2.53
February	4.75	11.50	1.44
March	6.31	8.59	3.61
April	4.93	6.65	4.18
May	3.67	2.42	2.01
June	16.88	1.59	7.22
July	1.25	4.11	3.87
August	0.65	8.28	5.46
September	7.83	6.55	6.37
October	8.08	10.20	7.04
November	4.98	7.93	5.58
December	2.49	11.48	12.48
Total	72.03	86.21	61.79

METHODS OF DATA COLLECTION AND ANALYSIS

In order to investigate contamination at the Center, USGS personnel interviewed persons knowledgeable about the Center's past and present storage and handling procedures for hazardous wastes and fuels. A soil-gas survey was conducted in 1987 using an organic vapor analyzer (J.O. Brunett, U.S. Geological Survey, written commun., 1989). Soil-gas samples were collected over a 200- by 200-foot grid covering most of the Nyman Peninsula and other areas of suspected contamination. In areas where organic vapor concentrations exceeded threshold levels or in areas identified as possibly contaminated, monitoring wells were drilled using a hollow-stem auger or an air-rotary drilling rig so that ground water could be sampled. Where possible, additional wells were placed upgradient and downgradient from these potentially contaminated sites.

Data-collection sites are listed in table 1 (surface water and lake-bed material) and table 2 (soil and ground water). Site types listed as "SW" are streams, ponds or lakes; "SL" sites are where lake-bed or soil samples were collected; "GW" sites are wells where ground-water samples were collected or measurements of ground-water levels were made; and "TW" are sites where water samples from the water-distribution system were collected. Most sites are classified as being upgradient or downgradient from one or more potentially contaminated sites. A stream or well may be upgradient from one potentially contaminated area and downgradient from another.

Upgradient sites were not available at all identified areas of potential contamination for the following reasons: the area was on a hilltop, bedrock was exposed at the land surface, a flowing stream was not present, or places upgradient could not be reached by the drill rigs used. A site was considered downgradient if it was within an area of potential contamination or if it could reasonably be expected to detect changes in water quality from the area of potential contamination. Many areas of potential contamination on Nyman Peninsula and the airport are near or adjacent to the brackish waters of Womens Bay, thus many downgradient surface-water and ground-water sites may be greatly influenced by saltwater or by marine sediments. Surface-water sites possibly influenced by brackish tidewaters include sites 34, 35, 38, 47, 49, 50, and 54. Wells in tidal areas or wells drilled into sediments once inundated by brackish waters may also yield waters that contain high concentrations of minerals. Wells possibly influenced by brackish waters include A018, A034, A037, A042, A044, and A086.

**Table 1. Location and description of surface-water data-collection sites,
U.S. Coast Guard Support Center Kodiak**

[Site type: SL, soil or lake-bed material; SW, surface water; TW, treated water; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS station number	Station name	Site type	Area
1	574658152332600	Buskin Lake Tributary (North-northwest)	SW	13D
2	574654152333600	Buskin Lake Tributary (Northwest)	SW	19U
3	574646152333700	Buskin Lake Tributary (West)	SW	19U
4	574640152324600	Buskin Lake (Station 1)	SW	19U
5	574640152312300	Bear Creek at mouth	SW	19U
6	574638152331000	Buskin Lake (Station 2)	SW	19U
7	574636152314200	Buskin River below lake	SW	19U
8	574635152283400	Unnamed Creek at Building 477 above substation	SW	04D
9	574633152283400	Unnamed Creek above Building 477 Road	SW	04D
10	574633152283800	Unnamed Creek below Transformer Substation	SW	04D
11	574635152300500	Alder Creek at BB Road	SW	19U
12	574638152333000	Buskin Lake Tributary (Southwest 1)	SW	12D
13	574637152332800	Buskin Lake Tributary (Southwest 2)	SW	12D
14	574628152310400	Buskin River 0.9 mile below Buskin Lake	SW	19U
15	574624152303200	Alder Creek at G Road	SW	19U
16	574612152304500	Unnamed Tributary 1 to Buskin River	SW	19U
17	574612152304300	Buskin River 1.3 mile below Buskin Lake	SW	01D
18	574610152311700	Magazine Creek at 0.9 mile Anton Larsen Bay Road	SW	19U
19	574603152303000	Coast Guard Landfill Drain North	SW	01D
20	574558152302200	Coast Guard Landfill Drain East	SW	01D
21	574559152310400	Buskin River at Bridge 6	SW	01D
22	574553152302700	Coast Guard Landfill Drain South	SW	01D
23	574553152305200	Landfill Pond North of Red Lake	SW	02D
24	574546152304200	Red Lake Inlet Ditch Southeast	SW	02D
25	574547152305000	Red Lake	SW	02D
25	574547152305000	Red Lake (Bed material)	SL	02D
26	574548152305400	Red Lake Outlet West	SW	02D
27	574538152301000	Lake Louise Outlet	SW	19U
28	574536152310900	Unnamed Tributary 2 to Buskin River	SW	19U
29	574530152304600	Buskin River at Kodiak Island Highway	SW	02D 14D
30	574522152294000	Buskin River near mouth below Bridge 2	SW	16D 02D 14D
31	574522152303800	Devils Creek below runway near mouth	SW	16D
32	574505152304200	Devils Creek above runway below highway	SW	16U 19U

**Table 1. Location and description of surface-water data-collection sites,
U.S. Coast Guard Support Center Kodiak--Continued**

[Site type: SL, soil or lake-bed material; SW, surface water; TW, treated water; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS station number	Station name	Site type	Area
33	574446152300000	Drury Gulch at Kodiak Island Highway	SW	18D
34	574446152285300	Kodiak Airport Drainage Site 3	SW	05D 16D
35	574436152290800	Kodiak Airport Drainage Site 1	SW	16D
36	574429152292000	Kodiak Airport Drainage Site A	SW	16D
37	574409152293600	Nyman Peninsula Drainage Site 9	SW	09D
38	574408152301000	Nyman Peninsula Drainage Site 1	SW	10D
39	574405152293300	Nyman Peninsula Drainage Site 8	SW	09D
40	574358152302000	Nyman Peninsula Drainage Site 2	SW	06D 17D
41	574355152294500	Nyman Peninsula Drainage Site 6a	SW	09D
42	574351152304100	Nyman Peninsula Drainage Site 2a	SW	06D 08D 07D
43	574345152301200	Nyman Peninsula Drainage Site 6	SW	06D
44	574344152301500	Nyman Peninsula Drainage Site 5a	SW	06D 07D
45	574342152304800	Nyman Peninsula Drainage Site 3	SW	06D
46	574341152302400	Nyman Peninsula Drainage Site 7 Tank	SW	06D
47	574337152305000	Nyman Peninsula Drainage Site 3a	SW	06D
48	574335152305200	Nyman Peninsula Drainage Site 3b	SW	06D
49	574333152302800	Nyman Peninsula Drainage Site 5	SW	06D
50	574323152311500	Nyman Peninsula Drainage Site 3c	SW	06D
51	574322152304600	Peninsula Lake	SW	06D
51	574322152304600	Peninsula Lake (Bed material)	SL	06D
52	574325152305200	Peninsula Lake Inlet Nyman Peninsula	SW	06D
53	574314152311400	Nyman Peninsula Drainage Site 3d	SW	06D
54	574313152311600	Nyman Peninsula Drainage Site 4	SW	06D
55	574700152330000	Unnamed Creek north of Buskin Lake	SW	19U
56	574640152321100	Buskin Lake elevation site	SW*	-
57	574600152295200	Catherine (Margaret) Lake	SW	19U
58	574600152290000	Genevieve Lake	SW	19U
59	574551152300300	Lake Louise elevation site	SW*	-
60	15297440	Buskin River	SW	16D
61	15297439	Devils Creek	SW	19U
TW 1	574633152315001	Treated water 1--water-treatment-plant faucet	TW	-
TW 2	574526152304501	Treated water 2--hotel faucet	TW	-

Table 2. Location and description of soil and ground-water data-collection sites,
U.S. Coast Guard Support Center Kodiak

[Site type: GW, ground water; SL, soil or lake-bed material; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS Station number	Site type	Area	Land-surface altitude (feet)	Well depth (feet)	Well diameter (inches)	Screen top (feet)	Screen bottom (feet)	Construction date
A001	574630152341601	GW	12D	92	17.60	2	7.6	17.6	890520
A001-00.5	574630152341601	SL	12D	-	-	-	-	-	890520
A001-03	574630152341601	SL	12D	-	-	-	-	-	890520
A001-07	574630152341601	SL	12D	-	-	-	-	-	890520
A001A	574630152340101	GW	12D	84	14.5	2	4.5	14.5	890520
A001A-02.5	574630152340101	SL	12D	-	-	-	-	-	890520
A001A-08	574630152340101	SL	12D	-	-	-	-	-	890520
A002A	574626152320801	GW	19U	82.5	7.	2	2.	7.	880419
A002A-05	574626152320801	SL	19U	-	-	-	-	-	880419
A003	574626152313301	GW	19U	68.3	22.	2	0.	22.	880115
A004	574654152312401	GW	19U	82.3	19.	2	9.	19.	880116
A005	574540152313601	GW	19U	134.5	14.5	2	4.5	14.5	880120
A006	574554152310601	GW	02D	36.1	15.5	2	3.5	15.5	880118
A006A	574554152305901	GW	02D	36.2	9.	2	1.	6.	880421
A006A-05	574554152305901	SL	02D	-	-	-	-	-	880421
A007	574605152304101	GW	01D	44.7	18.5	2	3.5	18.5	880118
A008	574522152304801	GW	16D	44.6	37.5	2	17.5	37.5	880419
A009	574536152302301	GW	19U	24.4	12.	2	1.	12.	880121
A010	574553152300901	GW	19U	28.	19.5	2	4.5	19.5	880119
A010A	574602152301701	GW	01D	75.4	13.5	2	3.5	13.5	880419
A010A-05	574602152301701	SL	01D	-	-	-	-	-	880419
A011	574504152304201	GW	16D	66.2	5.5	2	0.5	5.5	880218
A011-05	574504152304201	SL	16D	-	-	-	-	-	880218
A012	574519152293901	GW	16D	16.5	27.	2	17.	27.	880217
A012-10	574519152293901	SL	16D	-	-	-	-	-	880217
A012A	574520152295301	GW	16D	24.	25.	2	15.	25.	880418

Table 2. Location and description of soil and ground-water data-collection sites, U.S. Coast Guard Support Center Kodiak--Continued

[Site type: GW, ground water; SL, soil or lake-bed material; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS Station number	Site type	Area	Land-surface altitude (feet)	Well depth (feet)	Well diameter (inches)	Screen top (feet)	Screen bottom (feet)	Construction date
A012A-15	574520152295301	SL	16D	-	-	-	-	-	880418
A013	574514152291501	GW	16D	17.4	25.	2	15.	25.	880218
A013-10	574514152291501	SL	16D	-	-	-	-	-	880218
A014	574425152302001	GW	10D	35.2	46.	2	41.	46.	880127
A014-15	574425152302001	SL	10D	-	-	-	-	-	880127
A015	574442152295501	GW	19U	53.9	42.5	2	27.5	42.5	880125
A016	574450152295201	GW	15U, 18D	51.5	26.5	2	16.5	26.5	880123
A017	574501152293601	GW	15D	36.	34.5	2	24.5	34.5	880123
A018	574420152301201	GW	10D	13.9	23.	2	18.	23.	880216
A018-09	574420152301201	SL	10D	-	-	-	-	-	880216
A019	574432152295001	GW	19U	28.4	19.	2	14.	19.	880126
A020	574448152292301	GW	19U	60.7	21.5	2	16.5	21.5	880126
A020A	574442152292801	GW	16D	31.2	28.5	2	8.5	28.5	880417
A020A-05	574442152292801	SL	16D	-	-	-	-	-	880417
A021	574414152295701	GW*	10D	12.3	11.	2	6.	11.	880216
A021-09	574414152295701	SL	10D	-	-	-	-	-	880216
A021A	574412152295901	GW	10D	12.4	20.	2	5.	20.	880420
A021A-05	574412152295901	SL	10D	-	-	-	-	-	880420
A022A-05	574427152293401	SL	16D	-	-	-	-	-	880417
A023A	574444152290301	GW	05D, 16D	10.3	23.5	2	8.5	23.5	880417
A023A-05	574444152290301	SL	05D, 16D	-	-	-	-	-	880417
A024	574636152283401	GW	04D	189.4	16.	2	1.	16.	880218
A024-03	574636152283401	SL	04D	-	-	-	-	-	880218
A025	574407152300901	GW	06D, 10D	16.1	7.	2	2.	7.	880217
A025-05	574407152300901	SL	06D, 10D	-	-	-	-	-	880217
A026	574405152300801	GW	06D	20.1	9.	2	4.	9.	880214
A026-05	574405152300801	SL	06D	-	-	-	-	-	880214

Table 2. Location and description of soil and ground-water data-collection sites, U.S. Coast Guard Support Center Kodiak--Continued

[Site type: GW, ground water; SL, soil or lake-bed material; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS Station number	Site type	Area	Land-surface altitude (feet)	Well depth (feet)	Well diameter (inches)	Screen top (feet)	Screen bottom (feet)	Construction date
A027	574404152300301	GW	06D	24.2	4.5	2	-0.5	4.5	880128
A027-03	574404152300301	SL	06D	-	-	-	-	-	880128
A028	574403152295601	GW	06D	22.2	15.5	2	10.5	15.5	880214
A028-05	574403152295601	SL	06D	-	-	-	-	-	880214
A029	574405152294601	GW	09D	32.	23.	2	13.	23.	880131
A029-05	574405152294601	SL	09D	-	-	-	-	-	880131
A030	574402152294401	GW	09D	67.1	18.5	2	13.5	18.5	880130
A030-05	574402152294401	SL	09D	-	-	-	-	-	880130
A032	574358152294101	GW	09D	50.9	3.5	2	-1.5	3.5	880129
A032-03	574358152294101	SL	09D	-	-	-	-	-	880129
A032A	574359152294001	GW	09D	53.	13.5	2	3.5	13.5	880415
A032A-03	574359152294001	SL	09D	-	-	-	-	-	880415
A033	574400152294901	GW	09D	72.9	16.	2	11.	16.	880129
A033-05	574400152294901	SL	09D	-	-	-	-	-	880129
A034	574400152295901	GW	06D, 09D	22.9	9.	2	4.	9.	880215
A034-05	574400152295901	SL	06D, 09D	-	-	-	-	-	880215
A035	574400152300301	GW	03D, 06D	22.7	18.5	2	8.5	18.5	880215
A035-05	574400152300301	SL	03D, 06D	-	-	-	-	-	880215
A036	574401152300801	GW	03D, 06D	21.9	7.5	2	2.5	7.5	880214
A036-05	574401152300801	SL	03D, 06D	-	-	-	-	-	880214
A037	574402152301201	GW	03D, 06D	19.2	25.	2	15.	25.	880213
A037-10	574402152301201	SL	03D, 06D	-	-	-	-	-	880213
A038	574358152301001	GW	06D	18.3	11.	2	1.	11.	880214
A038-05	574358152301001	SL	06D	-	-	-	-	-	880214
A039	574359152300701	GW	03D	22.1	12.	2	2.	12.	880215
A039-04	574359152300701	SL	03D	-	-	-	-	-	880215
A040	574358152300601	GW	03D	21.5	8.	2	3.	8.	880215

Table 2. Location and description of soil and ground-water data-collection sites, U.S. Coast Guard Support Center Kodiak--Continued

[Site type: GW, ground water; SL, soil or lake-bed material; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS Station number	Site type	Area	Land-surface altitude (feet)	Well depth (feet)	Well diameter (inches)	Screen top (feet)	Screen bottom (feet)	Construction date
A040-05	574358152300601	SL	03D	-	-	-	-	-	880215
A041	574357152300301	GW	03U, 06D, 09D	25.6	9.	2	4.	9.	880215
A041-04	574357152300301	SL	03U, 06D, 09D	-	-	-	-	-	880215
A042	574358152302301	GW	06D, 17D	10.8	18.5	2	8.5	18.5	880206
A042-05	574358152302301	SL	06D, 17D	-	-	-	-	-	880206
A043	574355152303001	GW	06D	12.5	18.	2	8.	18.	880205
A043-05	574355152303001	SL	06D	-	-	-	-	-	880205
A044	574348152304001	GW	06D, 08D	6.7	18.5	2	8.5	18.5	880205
A044-05	574348152304001	SL	06D, 08D	-	-	-	-	-	880205
A044-20	574348152304001	SL	06D, 08D	-	-	-	-	-	880205
A045	574342152304301	GW	06D, 07D, 08D	10.2	7.	2	2.	7.	880206
A045-05	574342152304301	SL	06D, 07D, 08D	-	-	-	-	-	880206
A046	574340152304401	GW	06D, 07D, 08D	10.9	13.5	2	3.	13.5	880212
A046-05	574340152304401	SL	06D, 08D	-	-	-	-	-	880212
A047	574339152304401	GW	06D	12.5	15.	2	5.	15.	880207
A047-05	574339152304401	SL	06D	-	-	-	-	-	880207
A048	574335152304801	GW	06D	13.7	6.5	2	1.5	6.5	880206
A049	574332152305101	GW	06D	10.	7.	2	2.	7.	880208
A049-04	574332152305101	SL	06D	-	-	-	-	-	880208
A050	574331152305601	GW	06D	8.2	12.5	2	7.5	12.5	880207
A050-05	574331152305601	SL	06D	-	-	-	-	-	880207
A051	574327152305501	GW	06D	38.1	9.5	2	4.5	9.5	880209
A051-03	574327152305501	SL	06D	-	-	-	-	-	880209
A052	574329152304701	GW	06D	41.9	18.5	2	13.5	18.5	880209

**Table 2. Location and description of soil and ground-water data-collection sites,
U.S. Coast Guard Support Center Kodiak--Continued**

[Site type: GW, ground water; SL, soil or lake-bed material; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS Station number	Site type	Area	Land-surface altitude (feet)	Well depth (feet)	Well diameter (inches)	Screen top (feet)	Screen bottom (feet)	Construction date
A052-04	574329152304701	SL	06D	-	-	-	-	-	880209
A052-09	574329152304701	SL	06D	-	-	-	-	-	880209
A053	574329152304301	GW	06D	29.4	2.5	2	0.5	2.5	880209
A054	574330152304001	GW	06D	30.5	12.	2	7.	12.	880203
A054-SOIL	574330152304001	SL	06D	-	-	-	-	-	880203
A055	574332152303601	GW	06D	25.4	15.	2	10.	15.	880202
A056	574334152303101	GW	06D	27.8	16.5	2	6.5	16.5	880202
A056-05	574334152303101	SL	06D	-	-	-	-	-	880202
A057	574339152303601	GW	06D, 07D	56.7	8.5	2	3.5	8.5	880210
A057-09	574339152303601	SL	06D, 07D	-	-	-	-	-	880210
A058	574340152303801	GW	06D, 07D	52.7	10.	2	3.	8.	880210
A058-05	574340152303801	SL	06D, 07D	-	-	-	-	-	880210
A059	574342152303601	GW	06D, 07D	55.6	13.5	2	3.5	13.5	880210
A059-05	574342152303601	SL	06D, 07D	-	-	-	-	-	880210
A060	574340152303101	GW	06D, 07D	57.1	8.5	2	1.5	6.5	880210
A060-05	574340152303101	SL	06D, 07D	-	-	-	-	-	880210
A061	574344152302601	GW	06D, 07D	66.1	17.	2	12.	17.	880211
A061-05	574344152302601	SL	06D, 07D	-	-	-	-	-	880211
A062	574346152302601	GW	06D	61.5	10.5	2	3.5	8.5	880213
A062-05	574346152302601	SL	06D	-	-	-	-	-	880213
A063	574348152302301	GW	06D	61.2	7.5	2	2.5	7.5	880212
A063-04	574348152302301	SL	06D	-	-	-	-	-	880212
A064	574342152301801	GW	06D, 07D	34.	19.	2	9.	19.	880203
A064-SOIL	574342152301801	SL	06D, 07D	-	-	-	-	-	880203
A065	574344152301501	GW	06D, 07D	30.7	8.	2	3.	8.	880201
A065-05	574344152301501	SL	06D, 07D	-	-	-	-	-	880201
A066A	574347152302102	GW	06D, 07U	70.2	12.5	2	2.5	12.5	880211

Table 2. Location and description of soil and ground-water data-collection sites, U.S. Coast Guard Support Center Kodiak--Continued

[Site type: GW, ground water; SL, soil or lake-bed material; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS Station number	Site type	Area	Land-surface altitude (feet)	Well depth (feet)	Well diameter (inches)	Screen top (feet)	Screen bottom (feet)	Construction date
A066A-04	574347152302102	SL	06D, 07U	-	-	-	-	-	880211
A067	574349152302001	GW	06D	75.	12.	2	4.	9.	880211
A067-04	574349152302001	SL	06D	-	-	-	-	-	880211
A068A	574351152301501	GW	06U	82.6	15.	2	5.	15.	880413
A068A-05	574351152301501	SL	06U	-	-	-	-	-	880413
A069	574345152301901	GW	06D, 07D	60.5	9.	2	2.	7.	880212
A069-05	574345152301901	SL	06D, 07D	-	-	-	-	-	880212
A070	574348152301001	GW	06D	51.2	19.	2	9.	19.	880204
A070-18	574348152301001	SL	06D	-	-	-	-	-	880204
A071	574349152300501	GW	09D	61.5	18.5	2	8.5	18.5	880204
A071-SOIL	574349152300501	SL	09D	-	-	-	-	-	880204
A072	574352152300101	GW	09D	83.6	3.	2	-2.	3.	880205
A073	574348152300101	GW	09D	58.9	28.	2	23.	28.	880201
A073-05	574348152300101	SL	09D	-	-	-	-	-	880201
A074	574319152311501	GW*	06D	27.3	4.5	2	-0.5	4.5	880128
A074-05	574319152311501	SL	06D	-	-	-	-	-	880128
A075	574318152311101	GW	06D	14.3	10.	2	5.	10.	880128
A075-05	574318152311101	SL	06D	-	-	-	-	-	880128
A076	574351152301801	GW*	06D	67.8	6.5	2	1.5	6.5	880212
A076-05	574351152301801	SL	06D	-	-	-	-	-	880212
A077	574531152304901	GW	14D	29.5	23.5	2	8.5	23.5	880419
A077-05	574531152304901	SL	14D	-	-	-	-	-	880419
A078	574552152304701	GW	02U	83.1	8.5	2	3.5	8.5	880419
A078-05	574552152304701	SL	02U	-	-	-	-	-	880419
A079	574513152303101	GW	16D	56.6	19.	2	9.	19.	880418
A079-05	574513152303101	SL	16D	-	-	-	-	-	880418
A081	574443152300301	GW	18D	68.1	18.	2	3.	18.	880421

**Table 2. Location and description of soil and ground-water data-collection sites,
U.S. Coast Guard Support Center Kodiak--Continued**

[Site type: GW, ground water; SL, soil or lake-bed material; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS Station number	Site type	Area	Land-surface altitude (feet)	Well depth (feet)	Well diameter (inches)	Screen top (feet)	Screen bottom (feet)	Construction date
A081-05	574443152300301	SL	18D	-	-	-	-	-	880421
A082	574457152293801	GW	15D	39.4	30.5	2	10.5	30.5	880420
A082-05	574457152293801	SL	15D	-	-	-	-	-	880420
A084	574344152303401	GW	06D, 07D, 08U	45.9	13.5	2	3.5	13.5	880414
A084-05	574344152303401	SL	06D, 07D, 08U	-	-	-	-	-	880414
A085	574347152302801	GW	06D	49.1	19.	2	9.	19.	880413
A085-05	574347152302801	SL	06D	-	-	-	-	-	880413
A086	574358152301701	GW	06D, 17D	7.3	12.	2	2.	12.	880417
A086-05	574358152301701	SL	06D, 17D	-	-	-	-	-	880417
B001	574447152285901	GW	05D, 16D	37.7	40.	2	30.	40.	890516
B001-00	574447152285901	SL	05D, 16D	-	-	-	-	-	890516
B002	574444152290302	GW	05D, 16D	38.4	40.	2	30.	40.	890513
B002-05.5	574444152290302	SL	05D, 16D	-	-	-	-	-	890513
B002-09.5	574444152290302	SL	05D, 16D	-	-	-	-	-	890513
B002-14	574444152290302	SL	05D, 16D	-	-	-	-	-	890513
B002-34	574444152290302	SL	05D, 16D	-	-	-	-	-	890513
B003	574444152290701	GW	05D, 16D	28.4	32.5	2	22.5	32.5	890516
B003-03.5	574444152290701	SL	05D, 16D	-	-	-	-	-	890516
B003-13.5	574444152290701	SL	05D, 16D	-	-	-	-	-	890516
B003-20	574444152290701	SL	05D, 16D	-	-	-	-	-	890516
B004	574401152300601	GW	03D	21.9	22.5	2	12.5	22.5	890514
B004-03	574401152300601	SL	03D	-	-	-	-	-	890514
B005	574359152300501	GW	03D	25.1	20.5	2	10.5	20.5	890515
B005-03.5	574359152300501	SL	03D	-	-	-	-	-	890515
B006	574359152300702	GW	03D	21.5	30.	2	20.	30.	890514
B006-03.5	574359152300702	SL	03D	-	-	-	-	-	890514

Table 2. Location and description of soil and ground-water data-collection sites,
U.S. Coast Guard Support Center Kodiak--Continued

[Site type: GW, ground water; SL, soil or lake-bed material; * indicates water elevation only, no water quality data was obtained at the site. Area: D, downgradient; U, upgradient. -, not applicable]

Site No.	USGS Station number	Site type	Area	Land-surface altitude (feet)	Well depth (feet)	Well diameter (inches)	Screen top (feet)	Screen bottom (feet)	Construction date
B006-06	574359152300702	SL	03D	-	-	-	-	-	890514
B006-22	574359152300702	SL	03D	-	-	-	-	-	890514
B007	574354152301401	GW	06D, 17D	52.6	7.5	2	2.5	7.5	890518
B007-00.5	574354152301401	SL	06D, 17D	-	-	-	-	-	890518
B007-03	574354152301401	SL	06D, 17D	-	-	-	-	-	890518
B008	574344152303402	GW	07D	55.6	9.	2	4.	9.	890519
B008-03	574344152303402	SL	07D	-	-	-	-	-	890519
B008-07	574344152303402	SL	07D	-	-	-	-	-	890519
B009-00.5	574342152303401	SL	07D	-	-	-	-	-	890519
B009-03	574342152303401	SL	07D	-	-	-	-	-	890519
B009-07	574342152303401	SL	07D	-	-	-	-	-	890519
B010	574342152303501	GW	06D, 07D	56.	14.	2	4.	14.	890518
B010-03	574342152303501	SL	06D, 07D	-	-	-	-	-	890518
B010-07	574342152303501	SL	06D, 07D	-	-	-	-	-	890518
B011	574322152310601	GW	06D	39.6	11.5	2	1.5	11.5	890517
B011-04	574322152310601	SL	06D	-	-	-	-	-	890517
B011-07	574322152310601	SL	06D	-	-	-	-	-	890517
B012	574322152310801	GW	06D	27.5	22.	2	12.	22.	890517
B012-02	574322152310801	SL	06D	-	-	-	-	-	890517
B012-07	574322152310801	SL	06D	-	-	-	-	-	890517
B012-12	574322152310801	SL	06D	-	-	-	-	-	890517
B013-00	574446152290101	SL	05D	-	-	-	-	-	-
B014-02	574446152290102	SL	05D	-	-	-	-	-	-
CG 1	574608152303701	GW	01D	45.1	23	6	-	-	860805
CG 2	574557152302601	GW	01D	58.	7	6	-	-	860805
CG 3	574603152301701	GW	01D	77.	6.5	6	-	-	860805
CG 4	574534152284401	GW	19U	36.	115.	6	-	-	41----

Four wells (CG 1 to CG 4) were drilled by the USCG before this study and were constructed using steel casing. The USGS constructed 97 additional wells that yielded sufficient water for water-quality sampling. The lithology penetrated by and the construction of each well are described by Carr (1996). Each well constructed by the USGS used threaded polyvinyl chloride (PVC) casing and screens, a bentonite seal in the wellbore annulus, and a concrete surface pad. Ground-water levels in wells drilled by the USGS were generally measured monthly and before each water-quality sampling. Water samples from selected wells were collected during May, July, and October 1988, and March and May 1989.

Water samples were also collected from 59 sites on streams, lakes, or ponds. Surface-water samples were collected from selected sites during July 1987, May and July 1988, and February 1989. Solin (1996) discusses the flows observed in the Center's streams, and estimates peak-, average-, and low-flow values for Buskin River.

Samples of water from the drinking-water distribution system were also collected from a water-treatment plant near Buskin Lake (TW 1) on July 25, 1988 and from a hotel north of the airport (TW 2) on July 25, 1988 and February 23, 1989. The source of the treated-water samples was Buskin Lake, and the samples were collected after the water had been chlorinated.

Sampling Protocols and Analytical Methods

Four types of chemical analysis schemes or protocols were used as general guides for initial soil- and water-quality monitoring. The methods used to analyze soil and water samples and the most commonly used reporting levels for each analytical method are described in appendix 1 and in the following references: American Public Health Association and others (1980, 1985) for analytical methods prefixed with "A"; U.S. Environmental Protection Agency (USEPA) (1979, 1987) and Federal Register, Vol. 49, No. 209, October 26, 1984 for methods starting with "E"; American Society for Testing and Materials (1964, 1966, 1978) for methods starting with "D"; and USEPA (1986) for methods starting with "SW".

The analyses and methods generally used for sites in Areas 3-10, 12, and 14-16, where fuels may have been spilled, were:

Property or chemical constituent	Analytical method	
	Water	Soil
Temperature (field test)	E170.1	--
Specific conductance (field test)	E120.1	--
pH (field test)	E150.1	--
Total solids	--	D2216
Lead	E239.2	SW7421
Total petroleum hydrocarbons	E418.1	E418.1
Aromatic volatile organics	E602	SW8020
1,2-Dibromoethane	E502.1	--

In addition to the above analyses, surfactants (method E425.1) and halogenated volatile organic compounds (method E601) were measured in Areas 3 and 5, respectively.

In landfill and storage-pad areas (Areas 1, 2, 17, and 18), where a variety of substances may cause contamination, the following protocol was generally used:

<u>Property or chemical constituent</u>	<u>Analytical method</u>	
	<u>Water</u>	<u>Soil</u>
Temperature (field test)	E170.1	--
Specific conductance (field test)	E120.1	--
pH (field test)	E150.1	--
Total solids	--	D2216
Common anions	A429	--
Metals	E200.7	--
Arsenic	E206.2	--
Mercury	E245.1	--
Selenium	E270.2	--
Total dissolved solids	E160.1	--
Total petroleum hydrocarbons	E418.1	E418.1
Purgeable halocarbons	E601	SW8010
Aromatic volatile organics	E602	SW8020
Extractable priority pollutants	E625	--

Dioxins and furans also were analyzed using method SW8280 in Area 18 where polychlorinated biphenyls (PCB's) were suspected.

Bed-material samples from Peninsula Lake (Area 6) and Red Lake (Area 2) were analyzed using the following methods:

<u>Property or chemical constituent</u>	<u>Analytical method for bed material</u>
Total solids	D2216
Metals	E200.7
Lead	SW7421
Purgeable halocarbons	SW8010
Aromatic volatile organics	SW8020
Extractable priority pollutants	E625

In areas not expected to be contaminated (Area 19) soil samples were generally not collected or analyzed. The following protocol was commonly used to characterize water quality:

<u>Property or chemical constituent</u>	<u>Analytical method for water</u>
Temperature (field test)	E170.1
Specific conductance (field test)	E120.1
pH (field test)	E150.1
Alkalinity, carbonate and bicarbonate	A403
Common anions	A429
Total dissolved solids	E160.1
Metals	E200.7
Arsenic	E206.2
Mercury	E245.1
Selenium	E270.2
Purgeable halocarbons	E601

Analytical results were reviewed after each sampling round and future analytical methods were modified as seemed appropriate to meet program objectives. No wells were drilled in Areas 11 and 13 because surveys made using an organic vapor analyzer found that readings in air and in soils were at background levels; thus no ground-water samples were analyzed.

Sample Collection

Before each soil or water sample was collected, all sampling equipment was disassembled and thoroughly cleaned. Each pressure-plate filter apparatus used during the collection of inorganic water samples was washed using non-phosphate detergent, rinsed with 5 percent hydrochloric acid,

and rinsed again with organic-free de-ionized water. Teflon bailers used to collect ground-water samples for both organic and inorganic analyses were washed with non-phosphate detergent and rinsed with tap water, methanol, hexane, and organic-free de-ionized water.

Information about the collection of each soil- and water-quality sample was recorded in field log-books. Chain-of-custody records were made to document sample handling from the time of collection until analysis.

The annotation used to describe each soil sample is based upon the sample's site number and the depth at which sampling started. For example, sample "A006A-05" indicates that the sample was obtained 5 ft below land surface at site A006A. However, where it was not possible to determine precise sampling depth, the sample number does not include a depth value, but includes the suffix "SOIL" instead. Most soil samples were collected between 3 and 10 ft below land surface and were typically less than 3 ft above or below the water table. Soil samples obtained at depths less than 3 ft were collected using a shovel and a stainless steel trowel. Soil samples from depths of 3 ft or more were collected with a split-spoon sampler. Samples of lake-bottom sediments were recovered from Red Lake and Peninsula Lake using an Ekman dredge. Soil samples were examined in the field to determine physical characteristics such as grain size, sorting, color, and saturation. A total of 110 samples underwent laboratory analyses to determine moisture and solid content and to identify and quantify concentrations of selected volatile organic constituents and lead.

A static water-level measurement was made at each well using a steel or electric tape. A transparent teflon bailer was used to allow visual observation of any film of immiscible compounds floating on the water surface within each well. Thin films were detected at wells A021A and A069. Low-yield wells were fully purged at least once before sampling using a peristaltic pump and silicon tubing or a teflon bailer. At least three casing-volumes were evacuated from higher yielding wells before sampling with a teflon bailer equipped with double check valves. Each bailer had a bottom-emptying device to allow the sample containers to be filled with a minimum of sample disturbance. A new nylon monofilament line was used to raise and lower the bailer in each well. Bailers were raised and lowered slowly to prevent degassing of water in the well. Temperature, pH, and specific conductance of the water were measured as the water was bailed or pumped from the well. Field equipment used for measuring pH and specific conductance was calibrated daily and recalibrated periodically throughout each day. Higher yielding wells were considered successfully purged when the discharge water chemically stabilized with regard to temperature, pH, and specific conductance. The reported values of temperature, pH, and specific conductance were the last values recorded before the collection of water samples for laboratory analyses. Ground-water samples were transferred from bailers directly into appropriate containers.

Polyethylene containers with polyethylene-lined caps were used to store water samples for chemical analyses of metals, whereas sample containers for organic chemicals were glass bottles with fluorocarbon resin-lined caps. Samples collected for volatile organics analysis were stored in glass gas-chromatograph vials with septum tops which were filled until no head space remained; concentrated hydrochloric acid was added to each sample to lower its pH to less than 2 pH units. Samples (250 mL) for dissolved metals were filtered using a 0.45-micron filter and preserved with 1 mL of nitric acid to a pH of <2 pH units. All samples were placed in iced coolers and shipped daily for next-day delivery to the laboratory. Water samples collected before February 1988 were analyzed by a USGS laboratory; samples collected after February 1988 were analyzed by Enseco-Rocky Mountain Analytical Laboratory under USGS contract.

Surface-water samples were collected from selected sites during each sampling period. Water temperature, pH, and specific conductance were determined at each site using calibrated instruments. Surface-water-quality samples for volatile organic analysis were collected from streams by dipping gas-chromatograph vials beneath the water surface and then acidifying the sample with concentrated hydrochloric acid. Surface-water samples to be analyzed for inorganic constituents were collected using a peristaltic pump with silicon tubing and were pumped into polyethylene containers. Samples (250 mL) for dissolved metals were filtered using a 0.45-micron filter and preserved with 1 mL of nitric acid to a pH of <2 pH units. However, surface-water samples collected for metal analyses during July, August, and October 1987 were unfiltered. Stream discharge was also measured after the water samples were collected.

Water samples from Buskin Lake (surface-water sites 4 and 6) were collected using a brass van Doren bottle. Water depth at site 4 was 56 ft, and the water sample was collected 30 ft below the water surface. The water depth at site 6 was 42 ft, and the sample was collected 20 ft below the surface.

Quality Assurance

Several methods were used to assure that the reported analytical results accurately express the ambient constituent concentrations in the water being sampled. Accuracy was monitored by the use of spiked samples (samples with known concentrations of a constituent are submitted to the laboratory). Precision was monitored by submitting differently labeled duplicates of some samples so the laboratory would not know the samples were duplicates. Results from duplicate soil, ground-water, and surface-water samples are included in appendixes 2, 3, and 4. Field blanks were submitted and analyzed to monitor potential sample contamination by collection, transport, storage, and analytical procedures. A trip blank and an equipment blank were prepared each sampling day and an ambient-conditions blank was prepared on the first day of each sampling trip and submitted to the lab with the last set of samples from that trip. Preparation of trip blanks and ambient-conditions blanks is done by filling glass gas-chromatograph vials with organic-free de-ionized ("blank") water, transporting them to sites, handling them like samples, and sending them to the laboratory for analysis. An equipment blank is a sample of de-ionized water that has been poured through the sampling-collection devices to check the adequacy of the cleaning procedures used to clean the sampling equipment. The results from 5 ambient-condition blanks, 24 equipment blanks, and 39 trip blanks are not tabulated in this report but are summarized below. A complete listing of the quality-assurance results is available upon request from the District Chief at the address at the front of this report.

Analysis type	Number of constituents analyzed	Number of constituents detected
Anions	66	5
Metals and elements	330	13
Organic constituents	2638	46
Surfactants, MBAS	2	0
Total dissolved solids	7	1
Total petroleum hydrocarbons	17	1
Total	3060	66

Anions detected in these quality-control samples were chloride (1.2 and 1.3 mg/L), nitrate (0.5 mg/L as N), and bicarbonate (14 mg/L total alkalinity and 14 mg/L bicarbonate). Metals and elements detected were sodium (in 9 blanks from 0.06-1.1 mg/L), zinc (in 2 blanks at 0.01 mg/L), lead (0.005 mg/L), and mercury (0.0001 mg/L). Organic constituents detected in these quality-control samples were methylene chloride (2.1 to 5.9 µg/L in 26 blanks); 1,2-dichloroethane (0.33 to 2.6 µg/L in 15 blanks); trichlorofluoromethane (6.8 and 8.1 µg/L); acetone (60 µg/L); 1,1,1-trichloroethane (0.62 µg/L); toluene (1.5 µg/L); and total petroleum hydrocarbons (TPH) (0.9 mg/L). Methylene chloride and 1,2-dichloroethane are contaminants commonly found in blanks from other projects and may be due to sampling or residual laboratory contamination.

The USGS and the contract laboratory also used blanks, spikes, and standards to assure a high level of quality assurance and quality control (Enseco, 1988). The results of the analyses of field and laboratory blanks and spikes were not used to adjust the water-quality data listed and analyzed in this report.

Data Analysis

The soil- and water-quality analytical data compiled as a result of this study are contained in the appendixes which are on the disks included with this report. In this report, a Chemical Abstract Service (CAS) number is assigned to each water property or constituent. A CAS number is a unique identifier assigned by the American Chemical Society to chemicals recorded in the Chemical Abstracts Service Registry system. This number can be used to access many chemical databases and to conclusively identify a substance regardless of name. The format of a CAS number is typically XXX-XX-X, but the dashes are omitted in this report (71-43-2 is reported as 71432).

For this report, water-quality field properties were assigned arbitrary CAS numbers so that the field properties could also be listed in tables in a format similar to that used to list chemical constituents. In this report, CAS numbers less than 1000 represent field properties, not chemicals. Common field properties and their arbitrary CAS numbers assigned for this investigation are:

Field properties	Arbitrary CAS number
Water temperature	10
Instantaneous discharge (streamflow)	61
Specific conductance	95
Ground-water level	237
Dissolved oxygen	300
pH	400

For this report, the analytical reporting level is the lower limit of the range in which a concentration can be accurately quantified by the analytical instrument or method employed. Some constituents have more than one reporting level because analytical methods or sample treatment may have been modified during the course of the program. Concentrations of several organic compounds having distinct gas-chromatograph signatures were also analyzed and are listed as TID (tentatively identified) Compounds 1 through 20.

The reported concentrations of organic chemicals are from the analyses of total (unfiltered) samples. The reported concentrations of inorganic chemicals are from total samples and dissolved (filtered) samples. Results of total and dissolved inorganic analyses are reported separately—concentrations of total inorganic constituents (surface-water samples collected during July, August, and October 1987) are listed in appendix 4 without a CAS number whereas the concentrations of dissolved inorganic constituents are listed with a CAS number.

Before 1989, laboratories reported a single analytical result for each constituent analyzed by each method. In 1989, however, organic analytical results were reported for each gas chromatograph column through which the sample passed. Where two or more concentration values were reported for a chemical constituent, the value noted by the laboratory as the preferred value was used in this report. If the laboratory did not identify a preferred value, the value associated with the lowest reporting level was used in this report. When a constituent was analyzed by more than one method, the value associated with the lowest reporting level was used.

The concentration values for most organic chemical constituents were lower than the levels of analytical detection and these values are reported as being lower than the reporting level for the analytical method used. Methods used to analyze a constituent may not have been the same for each sampling round; thus, reporting level values may be different for each sampling round.

SOIL AND LAKE-BED DATA

Laboratory Analyses

Results of laboratory analyses performed on two lake-bed samples and more than 100 soil samples are listed in appendix 2. Lead is widely dispersed in sedimentary rocks and commonly ranges from 15 to 25 mg/kg in soils. Concentrations of lead from 107 soil and 2 lake-bed samples ranged from 0.3 mg/kg (A001-00.5) to 100 mg/kg (B013-00). The average concentration of lead was 10.6 mg/kg and the median concentration was 9.8 mg/kg. Total Petroleum Hydrocarbons (TPH) were detected in 19 of 107 soil samples; however, some of the soils at these sites may have naturally occurring organic compounds that result in detectable levels of TPH when analytical method E418.1 is used. Organic constituents detected in soils include: vinyl chloride (A040-05), methylene chloride (A057-09), trichloroethene (A073-05), m-xylene (A069-05), toluene (A069-05 and B013-00), tetrachloroethene (A073-05, B005-03.5, B006-03.5, B006-06, B006-22), and o- & p-xylenes (A032A-03, A069-05, B009-00.5).

Comparisons with State Guidelines

Interim contaminated soil cleanup guidelines (Alaska Department of Environmental Conservation (ADEC), 1990) identify soil cleanup target levels for the remediation of gasoline and non-gasoline hydrocarbon releases.

Chemical constituents having soil cleanup target levels are listed below. Also noted are sites having a concentration equal to or greater than the proposed cleanup target levels for a gasoline release.

Proposed cleanup target levels

Constituent	CAS number	Gasoline (mg/kg)	Non-gasoline (mg/kg)	Sites having a concentration equal to or exceeding cleanup target level for a gasoline release
Total petroleum hydrocarbons	5289290400	10	100	The following had concentrations >50mg/kg A001-00.5, A021-09, A029-05, A034-05, A040-05, A042-05, A044-05, A054-SOIL, A069-05, B006-06, B009-00.5, B009-03, B010-03, B012-02, B013-00, B014-02
Benzene	71432	0.5	N/A	All samples had concentrations <0.2 mg/kg
Total BTEX	--	1.0	N/A	A069-05
Benzene	71432			All samples had concentrations <0.2 mg/kg
Toluene	108883			Detected at A069-05 (0.67 mg/kg) and B013-00 (0.28 mg/kg)
Ethylbenzene	100414			All samples had concentrations <0.2 mg/kg
Xylenes	1330207			m-xylene was detected at A069-05 (0.28 mg/kg) and o- & p-xylenes were detected at A032A (0.3 mg/kg), A069-05 (0.34 mg/kg) and B009-00.5 (0.29 mg/kg)

The analytical reporting level for TPH for this study was 50 mg/kg. Therefore, sites listed above have concentrations greater than 50 mg/kg, but it is not known how many or which sites have TPH concentrations between 10 and 50 mg/kg. No soil samples had concentrations of benzene or ethylbenzene greater than analytical reporting levels.

WATER DATA

Results from the measurements of temperature, specific conductance, and pH made in the field and the concentrations of organic and inorganic chemicals determined from laboratory analyses are listed for ground water in appendix 3 and for surface water in appendix 4. Measurements of ground-water levels (appendix 5), streamflow measurements (appendix 6), and surface-water elevations (appendix 7) were made to help determine general hydrologic conditions at the Center during the sampling periods. Data collected by the USGS at surface-water sites before February 1987 (when this study was initiated) are also included in appendixes 4, 6, and 7.

Field Analyses

Temperature

A total of 347 ground-water and 144 surface-water temperature readings were recorded in the study area. The average temperature of ground water (6.3 °C) was cooler and less variable than was that of surface water (8.9 °C). Water in most small streams and several wells froze during winter. However, underground steam pipes on Nyman Peninsula may maintain above-freezing water temperatures in nearby wells throughout the year.

Specific Conductance

Specific conductance is an indirect measure of the total concentration of ions dissolved in water. Specific conductance measures the ability of a cubic centimeter of water at 25 °C to conduct an electric current and is expressed as microsiemens per centimeter (µS/cm). A total of 349 specific conductance observations were recorded from ground-water sites and 155 specific conductance readings were collected at 58 surface-water sites. The mean values of ground-water and surface-water specific conductance values are summarized below.

Comparisons of specific conductance for ground water and surface water
(--, no data)

Area	Ground water		Surface water	
	Number of analyses	Mean specific conductance (μS/cm)	Number of analyses	Mean specific conductance (μS/cm)
<u>Upgradient data</u>				
1-Navy landfill	4	188	--	--
2-USCG landfill	4	108	--	--
6-Nyman fuel storage	8	182	--	--
8-Battery storage	4	182	--	--
15-Gas station	4	134	--	--
16-Airport staging	--	--	4	70
19-Upgradient and background	34	137	66	56
<u>Downgradient data</u>				
1-USCG landfill	11	232	16	90
2-Navy landfill	9	167	15	161
3-Laundry facility	23	a371	--	--
4-Diesel storage	4	307	6	78
5-Fire training area	7	a149	2	a19900
6-Nyman fuel storage	171	a537	23	194
7-Nyman drum storage	47	286	3	92
8-Battery storage	12	a2564	1	55
9-Aviation fuel storage	39	245	5	121
10-Air station	16	a373	2	a1069
12-Buskin drum storage	2	54	2	30
14-Quartermaster gas station	4	48	8	43
15-Gas station	7	79	--	--
16-Airport staging	32	156	17	a1470
17-Storage pad	10	a1354	2	149
18-Metal disposal	8	121	5	151

a, water from one or more sites may be affected by brackish sea water

The mean specific conductance value of ground water from background wells (Area 19) was 137 μS/cm. The mean specific conductance values of ground water from downgradient sites in nine downgradient areas (1, 3, 4, 6-10, 17) were significantly greater than the mean specific conductance value for Area 19. However, because many areas of potential contamination were near Womens Bay, the specific conductance values from many downgradient sites are affected by brackish sea water. Ground water from downgradient sites in Areas 2, 5, 15, 16, and 18 had mean specific conductance values that were not significantly different from the mean specific conductance value of the upgradient area, and in Areas 12 and 14, ground water from downgradient sites had mean specific conductance values that were significantly less than that for Area 19.

pH

The pH of a water is a useful index of the status of equilibrium reactions in an aqueous medium. The activity of hydrogen ions is expressed in logarithmic units and the abbreviation "pH" represents the negative base-10 log of the hydrogen ion activity in moles per liter. Ground water and surface water typically have pH values ranging from 6 to 8 pH units, but lower pH values are commonly found in natural waters and bogs that are rich in dissolved organic matter. Values of pH for ground water ranged from 4.9 (A028) to 9.7 units (A030) and for surface water pH ranged from 5.8 (site 37) to 9.6 units (site 40). The median pH values for ground and surface waters were 6.6 and 7.2 units, respectively. The following wells yielded water having a pH value less than 6 units:

A008, A013, A016, A017, A020A, A028, A032, A035, A041, A043, A051, A053, A059, A060, A062, A066A, A071, A075, A081, A084, B006, and B008. Surface-water sites 37 and 52 on Nyman Peninsula also had pH values less than 6 units. Waters having pH values greater than 8 units were obtained from wells A030, A033, A078, and B001 and surface-water site 40 on the Nyman Peninsula.

The mean values of pH (listed below) were calculated using two methods. When one is interested in proton (H^+) activity and pH acts as an intensity factor, the mean pH value is calculated by the equation:

$$pH_{\text{mean}} = \frac{1}{n} \sum_{i=1}^n pH_i$$

where $pH = -\log [H^+]$ and $[H^+]$ is the proton activity.

When one is interested in the extent to which chemicals in a system can be converted from one form to another, such as the buffering capacity of a water sample, mean pH is calculated by taking the log of the mean hydrogen ion activities:

$$pH_{\text{mean}} = -\log \left[\frac{1}{n} \sum_{i=1}^n [H^+]_i \right]$$

Water collected from upgradient sites had a pH similar to water sampled at downgradient sites. The mean pH values of upgradient and downgradient ground-water and surface-water sites are summarized below.

	Number of sites	Number of samples	Mean(log $[H^+]$)	Log(mean $[H^+]$)
Ground water				
Upgradient	10	34	6.51	6.39
Downgradient	91	304	6.64	6.28
Up- and downgradient	101	338	6.63	6.29
Surface water				
Upgradient	17	29	7.12	7.00
Downgradient	39	69	7.16	6.82
Up- and downgradient	56	98	7.15	6.85

Laboratory Analyses

The results of approximately 350 ground-water samples collected from 101 wells and 110 surface-water samples collected from 59 sites on streams or lakes are shown in appendixes 3 and 4 and are summarized below.

Physical property or type of constituent	Analytical method	Number of constituents analyzed	Number of constituents detected	Detection frequency (percent)
<u>Ground water</u>				
Dissolved ions and metals	E200.7, E245.1, E300, A429, 6010, 7421	4,458	1,554	34.9
Total dissolved solids	E160.1	64	64	100
Petroleum hydrocarbons	E418.1	185	28	15.1
Organic constituents, total	E502.1, E601, E602, E608, E624, E625, SW8280	11,171	254	2.3
Surfactants	E425.1	9	0	0.0
<u>Surface water</u>				
Dissolved ions and metals	E200.7, E245.1, E300, A429, 6010, 7421	948	297	31.3
Total dissolved solids	E160.1	12	12	100
Petroleum hydrocarbons	E418.1	29	0	.0
Organic constituents, total	E502.1, SW8010, SW8020, E608, E624, E625, SW8280	7,346	87	1.2
Surfactants	E425.1	1	1	100

Comparisons with Federal Drinking-Water Regulations

The Maximum Contaminant Level Goals (MCLG), Maximum Contaminant Levels (MCL), and Secondary Maximum Contaminant Levels (SMCL) for drinking water contaminants referenced in this report are those established by the USEPA in compliance with the Safe Drinking Water Act Amendments of 1986. Current drinking-water regulations may be found in U.S. Environmental Protection Agency (1995) and in the Code of Federal Regulations (CFR) Volume 40, Parts 141, 142, and 143. Interim drinking-water regulations and water-quality standards are published in the Federal Register.

The MCLG is a non-enforceable concentration of a drinking-water contaminant that is protective of adverse human health effects and which allows an adequate margin of safety. The MCL is the maximum allowable level of a contaminant in drinking water which is delivered to any user of a public water system. By policy, the USEPA sets MCLG's at zero for known or probable human carcinogens and the MCL is established as close to the MCLG as feasible. The SMCL is a goal for drinking-water quality and provides a general guideline for public-water suppliers. Secondary contaminants mainly affect the aesthetic qualities of drinking water; however, at considerably higher concentrations, health problems might exist.

The chemical constituents or properties listed below are regulated and were analyzed during this study. Sites having at least one concentration of a constituent equal to or exceeding a MCLG or SMCL are noted. Sites that had a concentration greater than or equal to a MCL are listed with an asterisk.

PRIMARY DRINKING WATER REGULATIONS

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
INORGANIC CONSTITUENTS (mg/L)				
Antimony	7440360	0.006	0.006	All concentrations were < MCLG
Arsenic	7440382	0.	0.05	A006A, A007, A010, A018, A021A, A029, A032, A032A, A033, A034, A038, A040, A042, A050, A052, A054, A057, A073, A086, B001, B008, B010, CG 1
Barium	7440393	2.	2.	All concentrations were < MCLG
Beryllium	7440417	0.004	0.004	Not detected in any samples
Cadmium	7440439	0.005	0.005	A012A*, A040*, A068A*, B005*, Surface-water site 33*
Chromium	7440473	0.1	0.1	Not detected in any samples
Fluoride	66300	4.	4.	All concentrations < MCLG
Lead	7439921	0.	0.005	A010A, A013, A018, A021A, A023A, A024*, A025*, A028*, A032A*, A033*, A034*, A035, A037*, A039, A042, A044*, A045, A052, A053, A058, A059*, A062*, A065, A067, A069*, A079*, A081*, A086, B012. Surface-water sites: 7*, 19, 53
Mercury	7439976	0.002	0.002	All concentrations were < MCLG
Nickel	7440020	0.1	0.1	All concentrations were < MCLG
Nitrate as N	25900	10.	10.	All concentrations were < MCLG
Selenium	7782492	0.05	0.05	Not detected in any samples
Sulfate	3035	500	500	All concentrations were < MCLG
Thallium	7440280	0.0005	0.002	Surface-water site 34
VOLATILE ORGANIC CARBONS (µg/L)				
Benzene	71432	0.	5.	A021A*, A032, A032A*, A033, A050, A060*, A069*; Surface-water sites 24, 26, 39
Carbon tetra- chloride	56235	0.	5.	Not detected in any samples
Chloro- benzene	108907	100.	100.	Not detected in any samples
1,4-Dichloro- benzene	106467	75.	75.	All concentrations were < MCLG
1,2-Dichloro- benzene	95501	600.	600.	Not detected in any samples
1,2-Dichloro- ethane	107062	0.	5.	A003, A004, A005, A006, A006A, A007, A008, A009, A010, A010A, A012, A012A, A013, A014, A015, A016, A017, A018, A020, A020A, A023A, A024, A025, A026, A027, A028, A029, A032, A032A, A034, A035, A036, A037, A038, A039, A041, A042, A043, A044, A045, A046, A050, A051, A052, A055, A056, A057, A058, A059, A060, A064, A065, A069, A077, A078, A079, A081, A082, A084, A085, A086, B004, B006, CG1. Surface-water sites: 19, 20, 22, 24, 26, 33, 34, 35, 37, 38, 39, 40, 43, 44, 45, 47, 49, 53, TW 2.
1,1-Dichloro- ethene	75354	7.	7.	All concentrations were < MCLG
trans-1,2- Dichloro- ethene	156605	100.	100.	All concentrations were < MCLG
Methylene chloride	75092	0.	--	A039, A085, surface-water sites 26, 43
Tetrachloro- ethene	127184	0.	5.	A039, A040*, A073*, A084, B004*, B006*
1,1,1-Tri- chloro- ethane	71556	200.	200.	Surface-water sites 26, 43
Trichloro- ethene	79016	0.	5.	A040*, A073*, A084, B004, B006
1,2,4-Tri- chloro- benzene	120821	70.	70.	Not detected in any samples
Vinyl chloride	75014	0.	2.	A006A, A007, A040*, CG 2, Surface-water sites 22, 24*, 26

PRIMARY DRINKING WATER REGULATIONS--Continued

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
SYNTHETIC ORGANIC CHEMICALS AND PESTICIDES (µg/L)				
1,1,2-Trichloro-ethane	79005	3.	5.	All concentrations were < MCLG
1,2-Dichloro-propane	78875	0.	5.	Not detected in any samples
Benzo(a)-pyrene	50328	0.	2.	Not detected in any samples
Chlordane	57749	0.	2.	Not detected in any samples
Endrin	72208	2.	2.	Not detected in any samples
Ethyl benzene	100414	700.	700.	All concentrations were < MCLG
Ethylene dibromide	106934	0.	0.05	Not detected in any samples
Heptachlor	76448	0.	0.4	Not detected in any samples
Heptachlor epoxide	1024573	0.	0.2	Not detected in any samples
Hexachloro-benzene	118741	0.	1.	Not detected in any samples
Lindane	58899	0.2	0.2	Not detected in any samples
PCBs	12767792	0.	0.5	Surface-water site 40
Pentachloro-phenol	87865	0.	1.	Not detected in any samples
Styrene	100425	100.	100.	Surface-water site 40
Toluene	108883	1000.	1000.	All concentrations were < MCLG
Toxaphene	8001352	0.	5.	Not detected in any samples
Trihalomethanes				
Bromoform	75252	0.	100.	Not detected in any samples
Bromodichloro-methane	75274	0.	100.	All concentrations were < 5 µg/L. A067, A068A, A082; TW 1, TW 2
Chloroform	67663	0.	100.	All concentrations were < 50 µg/L. A007, A017, A020, A032, A035, A04, A051, A053, A056, A064, A066A, A67, A068A, A077, A082, A085, Surface-water sites 19, 37, 40, 52; TW 1, TW 2
Xylenes	1330207	10,000	10,000	All concentrations were < MCLG

SECONDARY DRINKING WATER REGULATIONS

Constituent	CAS number	SMCL	Sites having at least one concentration greater than or equal to the SMCL
INORGANIC CONSTITUENTS (mg/L)			
Aluminum	7429905	0.05	A003, A006, A006A, A009, A010, A010A, A012A, A020A, A021A, A026, A028, A032A, A035, A039, A040, A042, A044, A047, A048, A051, A052, A058, A059, A060, A062, A063, A064, A067, A068A, A073, A078, A081, A082, A084, A085, A086, B003, B007, B010; Surface-water site 8
Chloride	1003	250.	A044, A050, A086
Copper	7440508	1.	All concentrations were < SMCL
Dissolved solids	1010	500.	All concentrations were < SMCL (However, specific conductance values indicate that the following sites may have dissolved solids greater than 500 mg/L: A018, A037, A042, A044, A050, A058, A086, B010; Surface-water sites 34, 35, 38)
Fluoride	66300	2.	All concentrations were < SMCL
Iron	7439896	0.3	A003, A006A, A007, A009, A010, A010A, A020A, A021A, A023A, A024, A026, A027, A029, A032, A032A, A033, A034, A035, A038, A039, A040, A050, A052, A054, A055, A057, A060, A063, A064, A065, A067, A073, A078, A086, B008, B010, CG1 CG 2, CG 3, CG 4 Surface-water sites: 20, 22, 24, 26
Manganese	7439965	0.05	A001, A001A, A003, A004, A005, A006A, A007, A008, A009, A010, A010A, A013, A014, A015, A016, A018, A019, A020, A020A, A021A, A024, A027, A029, A032, A032A, A033, A034, A035, A037, A038, A039, A040, A041, A046, A049, A050, A051, A052, A053, A054, A055, A056, A057, A058, A059, A060, A061, A063, A064, A065, A069, A070, A071, A073, A075, A079, A081, A082, A084, A085, A086, B001, B002, B003, B004, B006, B007, B008, B010, B011, B012, CG 1, CG 2, CG 3, CG 4 Surface water sites: 19, 20, 22, 24, 26, 27, 57, 58
Zinc	7440660	5.	All concentrations were < SMCL
PROPERTY			
pH	--	6.5-8.5 units	<u>Sites having pH values < 6.5 units:</u> A003, A004, A005, A006, A007, A008, A009, A010, A013, A014, A015, A016, A017, A019, A020A, A021A, A023A, A027, A028, A032, A032A, A034, A035, A036, A038, A039, A040, A041, A042, A043, A044, A050, A051, A052, A053, A055, A057, A059, A060, A061, A062, A063, A064, A065, A066A, A067, A068, A068A, A069, A070, A071, A072, A075, A077, A079, A081, A082, A084, A085, A086, B002, B006, B008 <u>Sites having pH values > 8.5 units:</u> A030, A078

AREA DESCRIPTIONS

Area 19. Upgradient and Background Sites

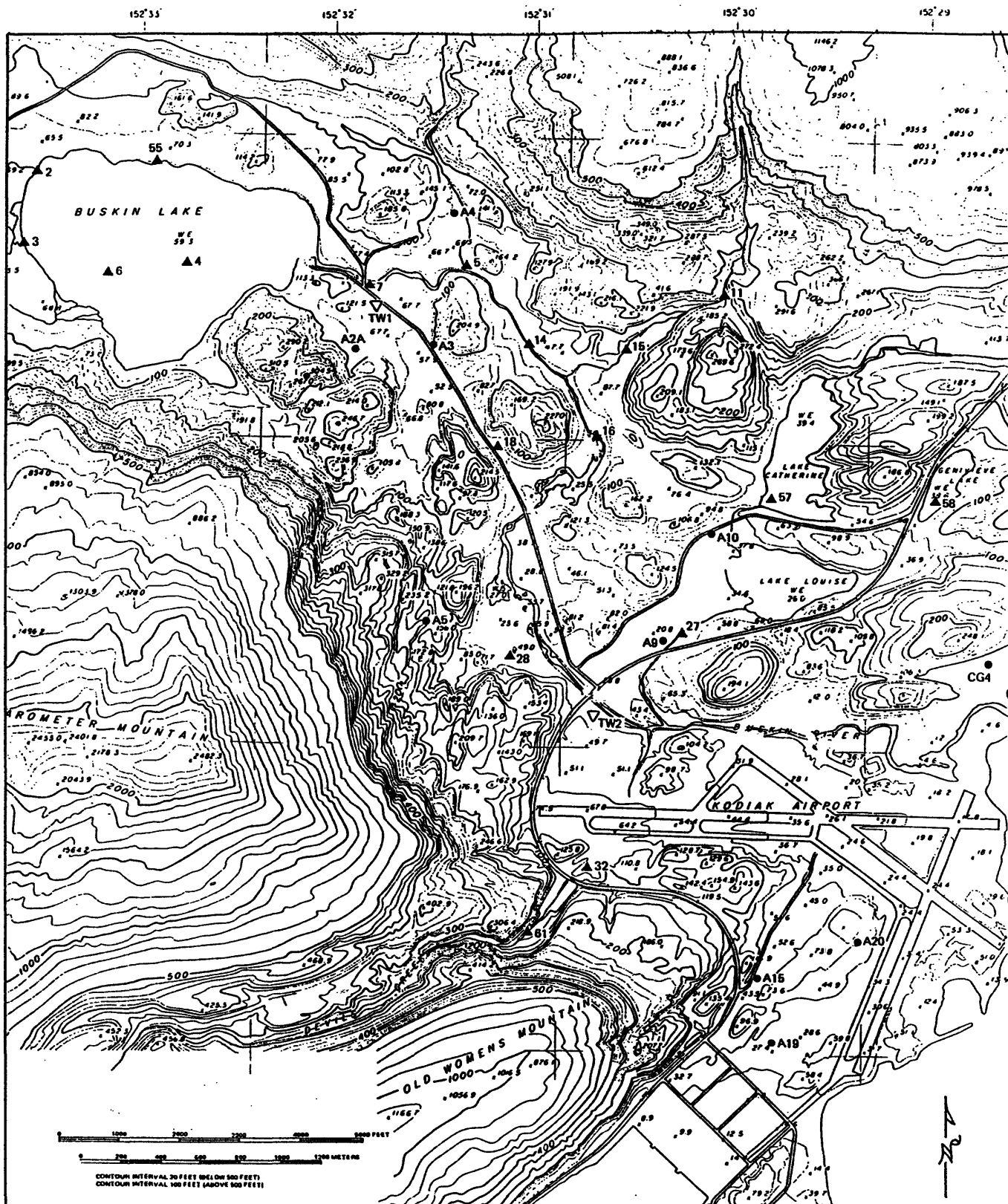
Sampling sites in Area 19 (fig. 3) were selected so that water properties and constituents at the sites would represent upgradient or background conditions. Wells representing upgradient or background conditions are A002A, A003, A004, A005, A009, A010, A015, A019, A020, and CG 4. One soil sample was collected for chemical analysis. At the times when water-quality samples were collected, water levels in completed wells ranged from 0.65 to 25.47 ft below land surface. Surface-water sites include 2, Buskin Lake Tributary (Northwest); 3, Buskin Lake Tributary (West); 4, Buskin Lake (Station 1); 5, Bear Creek at mouth; 6, Buskin Lake (Station 2); 7, Buskin River below lake; 11, Alder Creek at BB Road; 14, Buskin River 0.9 mi below Buskin Lake; 15, Alder Creek at G Road; 16, Unnamed Tributary 1 to Buskin River; 18, Magazine Creek at 0.9 mi Anton Larsen Bay Road; 27, Lake Louise Outlet; 28, Unnamed Tributary 2 to Buskin River; 32, Devils Creek above runway below highway; 55, Unnamed Creek north of Buskin Lake; 57, Catherine (Margaret) Lake; 58, Genivieve Lake; and 61, Devils Creek.

Only one soil sample from background sites was chemically analyzed, from A002A-05 near Buskin Lake. Constituents analyzed were lead, 34 organic chemicals, and TPH. Lead was detected at a concentration of 2 mg/kg. No organic chemicals were present at concentrations higher than reporting levels and the concentration of TPH was less than the 50 mg/kg reporting level.

Thirty-six ground-water samples were collected from 10 wells for measurements of temperature, specific conductance, pH, and analyses for selected chemical constituents. The constituents that were analyzed from each sample varied. Some samples were analyzed only for lead and chloride concentrations, whereas other samples were analyzed for various organic and inorganic constituents because of nearby potential sources of contamination.

Surface-water samples were collected at 18 sites. Thirty-one sets of measurements for temperature, specific conductance, and pH were made; some sets include numerous measurements of field properties across the width or depth of a stream or lake. As with ground water, the constituents that were analyzed varied among the sites.

The following is a list of selected constituents detected in water samples from upgradient and background sites. Sites having a water sample that had one or more concentrations greater than or equal to the MCL for drinking water are marked with an asterisk.



- ▽ TW1 Treated-water sampling site and number
- ▲ 16 Surface-water sampling site and number
- A5 Well or borehole sampling site and number

Figure 3. Area 19, Upgradient and background sites.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Arsenic	7440382	0.	0.05	A010
Lead	7439921	0.	0.005	Surface-water site 7*
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
1,2-Dichloroethane	107062	0.	5.	A003, A004, A005, A009, A010, A015, A020
Chloroform	67663	0.	100.	A020
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A003, A009, A010	
Iron	7439896	0.3	A003, A010, CG 4	
Manganese	7439965	0.05	A003, A004, A005, A009, A010, A015, A019, A020, CG 4	
				Surface-water sites 27, 57, 58

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
bis(2-ethylhexyl)phthalate	117817	Surface-water sites 7, 15 and 32
Total Petroleum Hydrocarbons	5289290400	A004, A020

Concentrations of arsenic from well A010 ranged from 0.006 to 0.16 mg/L. In a sample taken by the USGS on May 1969 from Buskin River below Buskin Lake (site 7), lead had a concentration of 0.02 mg/L. 1,2-dichloroethane was detected in water from numerous background wells in concentrations as great as 1 µg/L, however, this constituent was also detected in numerous quality-control samples at concentrations as great as 2.6 µg/L and may be a laboratory contaminant or a contaminant in the organic-free distilled water that was used to rinse sampling equipment. Chloroform is a suspected human carcinogen that is widely distributed in the environment and is found in minute quantities in many municipal drinking supplies (Lucius and others, 1989, p. 205). It was detected in the chlorinated treated-water samples collected from a water-treatment plant (site TW 1, 6.2 µg/L) and a hotel (site TW 2, 2.6 and 5.4 µg/L). Chlorination of water containing organic carbon (such as plant and animal debris and humic substances) can lead to formation of trihalomethane compounds such as chloroform. Buskin River (site 7) had concentrations of bis(2-ethylhexyl)phthalate of 7, <20, and 270 µg/L. Phthalates are commonly associated with plastics. Among the background wells, A003 yielded water having the highest aluminum concentration, which ranged from 0.07 to 0.52 mg/L. All samples from background streams had aluminum concentrations lower than 0.05 mg/L. Well A010 yielded water having iron concentrations ranging from 6 to 11 mg/L. Concentrations of iron were lower than 0.05 mg/L in all samples from background streams. Dissolved manganese in water from well A020 ranged from 1.0 to 3.3 mg/L, whereas water in Genivieve Lake (site 58) had 0.41 mg/L dissolved manganese. TPH concentrations in waters from well A004 and A020 ranged from <0.5 to 1.0 and <0.5 to 0.5 mg/L. However, naturally occurring organic carbons can make up part or all of the hydrocarbons in the TPH analyses.

Area 1. Former U.S. Coast Guard Landfill

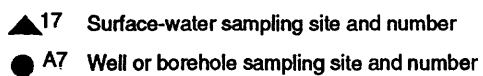
Area 1 (fig. 4) is a landfill in a small elevated glacial valley east of the Buskin River that was used by the USCG from the early 1970's until 1987. Domestic refuse is the predominant component of the landfill's contents; however, several thousand gallons of paint may have been discarded into the landfill and fuel-contaminated soils reportedly were used as cover material. Upon landfill closure the USCG installed three monitoring wells (CG 1, CG 2 and CG 3) at the site. Closure procedures were approved by the Alaska Department of Environmental Conservation. Because of surface-water staining, however, there is concern that contaminants may be seeping into the Buskin River or Lake Louise.

No upgradient wells were drilled and no upgradient samples were collected. A total of 13 downgradient water-quality samples were collected from three USCG monitoring wells and from two wells drilled by the USGS (A007 and A010A). A soil sample from A010A was also chemically analyzed. A total of 13 water samples were also collected from three drains near the landfill that have orange-colored stained channels (surface-water sites 19, 20, and 22) and from two sites on the Buskin River (sites 17 and 21). Streamflows measured in the three drains were less than 0.01 ft³/s. Water levels in wells A007 and A010A ranged from 8.00 to 10.70 and 0.22 to 2.11 ft below land surface. Measurements of water levels in wells CG 1, CG 2 and CG 3 on May 24, 1989 were 10.35, 5.35 and 3.94 ft, respectively, below land surface.

Lead was detected in the soil sample from A010A at 10 mg/kg. All organic chemical constituents in the soil sample were less than analytical reporting levels.

The following is a list of selected constituents detected in water samples in or downgradient from the USCG landfill. Only sites having a water sample that had one or more concentrations that were greater than or equal to a MCLG or a SMCL are listed. Concentrations of all constituents were lower than the MCL's for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Arsenic	7440382	0.	0.05	A007, CG 1
Lead	7439921	0.	0.005	A010A; Surface-water site 19
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
1,2-Dichloroethane	107062	0.	5.	A007, A010A, CG 1; Surface-water sites 19, 20, 22
Vinyl chloride	75014	0.	2.	A007, CG 2; Surface-water site 22
Chloroform	67663	0.	100.	A007; Surface-water site 19
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A010A	
Iron	7439896	0.3	A007, A010A, CG 1, CG 2, CG 3; Surface-water sites 20, 22	
Manganese	7439965	0.05	A007, A010A, CG 1, CG 2, CG 3; Surface-water sites 17, 19, 20, 22	



Area 1. Former U.S. Coast Guard Landfill 31

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples downgradient from the former USCG landfill:

Constituent	CAS number	Sites having constituent detected at least once
Dichlorodifluoromethane	75718	Surface-water site 19
bis (2-Ethylhexyl)phthalate	117817	Surface-water site 22
Total petroleum hydrocarbons	5289290400	CG 1, CG 2, CG 3

Concentrations of dissolved arsenic were as great as 0.011 mg/L in waters from well A007 and CG 1. Lead concentrations ranged from <0.002 to 0.003 mg/L in water from A010A and was 0.003 mg/L in a sample from the Coast Guard Landfill Drain North at site 19. Bis(2-ethylhexyl)phthalate was present at 460 µg/L in a water sample recovered from a drain at the landfill (site 22) on May 11, 1988, but was not detected at a 10 µg/L reporting level in a subsequent sample.

Area 2. Former U.S. Navy Landfill

Area 2 (fig. 5) is an abandoned U.S. Navy landfill in a valley east of the Buskin River. Possibly opened in the 1940's, the landfill was closed before 1972. The type of refuse in the landfill is not known, but the landfill may contain domestic refuse as well as petroleum-based products such as solvents, degreasers, and paints. A thin layer of glacial till overlies bedrock throughout most of the area near the landfill. Water in two ponds west and south of the landfill (surface-water sites 23 and 25) is red and a small lake between the landfill and Anton Larsen Bay Road is called Red Lake. The ponds overflow periodically onto equipment-storage pads near Anton Larsen Bay Road and the overflow commonly reaches the Buskin River.

One upgradient soil and four water-quality samples were collected at well A078. A soil sample from A006A and a lake-bed material sample from the center of Red Lake were also chemically analyzed. Downgradient water-quality samples were collected from wells A006 and A006A, a pond (site 23), Red Lake (site 25), an inlet to and an outlet from Red Lake (sites 24 and 26), and two sites on the Buskin River (sites 29 and 30). Water levels in well A006A near the landfill ranged from 0.72 to 3.03 ft below land surface. Measured flows into and out of Red Lake were 0.05 ft³/s or less.

Lead was detected in soil samples from A006A-05 (15 mg/kg) and A078-05 (13 mg/kg) and from Red Lake bed material (24 mg/kg). All organic constituents from soil and lake-bed material samples were less than reporting levels.

The following is a list of selected constituents detected in ground water and surface water near the former Navy landfill. Sites having a water sample with a concentration higher than the MCL for drinking water are listed with an asterisk.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Arsenic	7440382	0.	0.05	A006A
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
Benzene	71432	0.	5.	Surface-water sites 24, 26
1,2-Dichloroethane	107062	0.	5.	A006, A006A, A078; Surface-water sites 24, 26
Methylene chloride	75092	0.	--	Surface-water site 26
Vinyl chloride	75014	0.	2.	A006A; Surface-water sites 24*, 26
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A006, A006A, A078	
Iron	7439896	0.3	A006A, A078; Surface-water sites 24, 26	
Manganese	7439965	0.05	A006A; Surface-water sites 24, 26	

The following selected constituents do not have MCLG's or SMCL's, but were detected in water samples:



Figure 5. Area 2, the former U.S. Navy landfill.

Constituent	CAS number	Sites having constituent detected at least once
Dichlorodifluoromethane	75718	Surface-water sites 23, 24
Diethyl phthalate	844622	Surface-water site 26

Ground water from well A006A had arsenic concentrations as great as 0.006 mg/L. Water in an inlet ditch to Red Lake (site 24) had benzene concentrations of <0.7 and 0.6 µg/L, while water in the outlet ditch (site 26) had benzene concentrations of <0.7 and 0.2 µg/L. Concentrations of vinyl chloride ranged from 5.4 to 15 µg/L in water from the inlet to Red Lake. Diethyl phthalate was present at 22 µg/L in water flowing out of the lake, but was not detected in a water sample from the inlet.

Area 3. U.S. Coast Guard Laundry

The USCG laundry facility is on the northeastern Nyman Peninsula (fig. 6). The facility has been in operation since about 1940. Before 1987, laundry personnel periodically disposed of dry-cleaning wastes (possibly as much as 5 gal per week) onto the ground near the south exit of the building. The laundry is on compacted fill that consists mostly of sand and pebble-cobble gravel with lenses of volcanic ash, silt, and peat. Depth to bedrock varies widely. Bedrock is exposed southwest of the laundry building and is more than 25 ft below land surface at well A037.

Wells A035, A036, A037, A039, A040 and A041 were drilled by the USGS in 1988 and B004, B005 and B006 were drilled in 1989. Well A041 is upgradient from the laundry facility, whereas the others are downgradient. However, well A041 is downgradient from a fuel storage area (Area 6) and a former aviation gasoline storage area (Area 9). Ten soil samples were analyzed, at least one soil sample from each well drilled. No surface-water sites near the laundry were sampled. Water levels in downgradient wells ranged from 1.11 ft below land surface in well A040 to 16.09 ft below land surface in A037. Water levels in A041, the upgradient well, ranged from 1.25 to 4.60 ft below land surface.

Lead was detected in all soil samples and ranged from 1.2 mg/kg (A040-05) to 17 mg/kg (A039-04). Vinyl chloride was detected in soil from well A040-05 at 0.22 mg/kg. Tetrachloroethene was detected in soil samples from B005-03.5 (1.1 mg/kg), B006-06 (1.0 mg/kg), and B006-22 (0.48 mg/kg). TPH in soils from A040-05 (260 mg/kg) and B006-06 (60 mg/kg) were at concentrations greater than the proposed state cleanup target levels for a gasoline release (ADEC, 1990).

The following is a list of selected constituents detected in 29 water samples from 9 wells near the laundry. Sites listed with an asterisk indicate that a concentration was detected that exceeded the MCL for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Arsenic	7440382	0.	0.05	A040
Cadmium	7440439	0.005	0.005	A040*, B005*
Lead	7439921	0.	0.005	A035, A037, A039
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
1,2-Dichloroethane	107062	0.	5.	A035, A036, A037, A039, A041, B004, B006
Methylene chloride	75092	0.	--	A039
Tetrachloroethene	127184	0.	5.	A039, A040*, B004*, B005*, B006*
Trichloroethene	79016	0.	5.	A040*, B004, B006
Vinyl chloride	75014	0.	2.	A040*
Chloroform	67663	0.	100.	A035
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A035, A039, A040	
Iron	7439896	0.3	A035, A039, A040	
Manganese	7439965	0.05	A035, A036, A037, A039, A040, B004, B006	

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Total petroleum hydrocarbons	5289290400	A041

The only organic constituent detected in water from the upgradient well (A041) was 1,2-dichloroethane, a compound that is commonly a sampling or laboratory contaminant. Methylene chloride was present at 180 µg/L in a water sample collected from well A039 on March 8, 1989, but was not detected at the 2 µg/L level in three other samples collected from the well on other dates. Well B005 on the west side of the laundry building yielded water with a tetrachloroethene concentration of 3,000 µg/L. Wells north (B004), east (B006) and south (A040) of the laundry had tetrachloroethene concentrations as great as 12, 19, and 21 µg/L, respectively. A040, B004 and B006 also yielded waters having high trichloroethene concentrations, as great as 49, 0.74, and 3.9 µg/L. Concentrations of vinyl chloride in water from A040 ranged from 230 to 440 µg/L.

Area 4. Former Diesel Storage Area

Area 4 is in a small valley about 2 mi north of the airport (fig. 7). Used as a diesel fuel storage area since the 1940's by the U.S. Army and the USCG, the site is now the location of an electric substation belonging to the Kodiak Electric Association. Diesel storage tanks were adjacent to Building 477 and others were located about 270 ft southeast of the building. Numerous small leaks occurred in the tanks and the distribution lines, and the odor of diesel fuel is present at the site. Surficial sediments in the area consist of compacted sand and gravel fill above layers of ash, peat, and till.

No upgradient wells were drilled and no upgradient samples were collected. A soil sample and four water samples from well A024 were chemically analyzed. Downgradient water-quality samples were also collected from three unnamed streams, twice from site 8 and once from sites 9 and 10. Streamflows at sites 8, 9, and 10 during late July 1987 were estimated to be <0.01, 0.2, and 0.4 ft³/s, respectively. Water levels in well A024 ranged from 3.77 to 6.39 ft below land surface.

The following is a list of selected constituents detected in water samples downgradient from the former diesel storage site. No concentrations exceeded MCL's for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Lead	7439921	0.	.005	A024
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
1,2-Dichloroethane	107062	0.	5.	A024
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	Surface-water site 8	
Iron	7439896	0.3	A024	
Manganese	7439965	0.05	A024	

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
bis (2-Ethylhexyl)phthalate	117817	Surface-water site 8
Di-n-octyl phthalate	117840	Surface-water site 8
Diethyl phthalate	844622	Surface-water site 9

Lead was detected in the soil samples from A024-03 at 0.6 mg/kg. Lead concentrations in water from A024 was 0.007 mg/L in one sample, but lead was not detected in three other water samples from A024 at the 0.002 mg/L detection level. Toluene and 1,2-dichloroethane were each detected once at low concentrations (<3 µg/L) at well A024, but were not detected during the analyses of three other samples taken from the well on other dates.

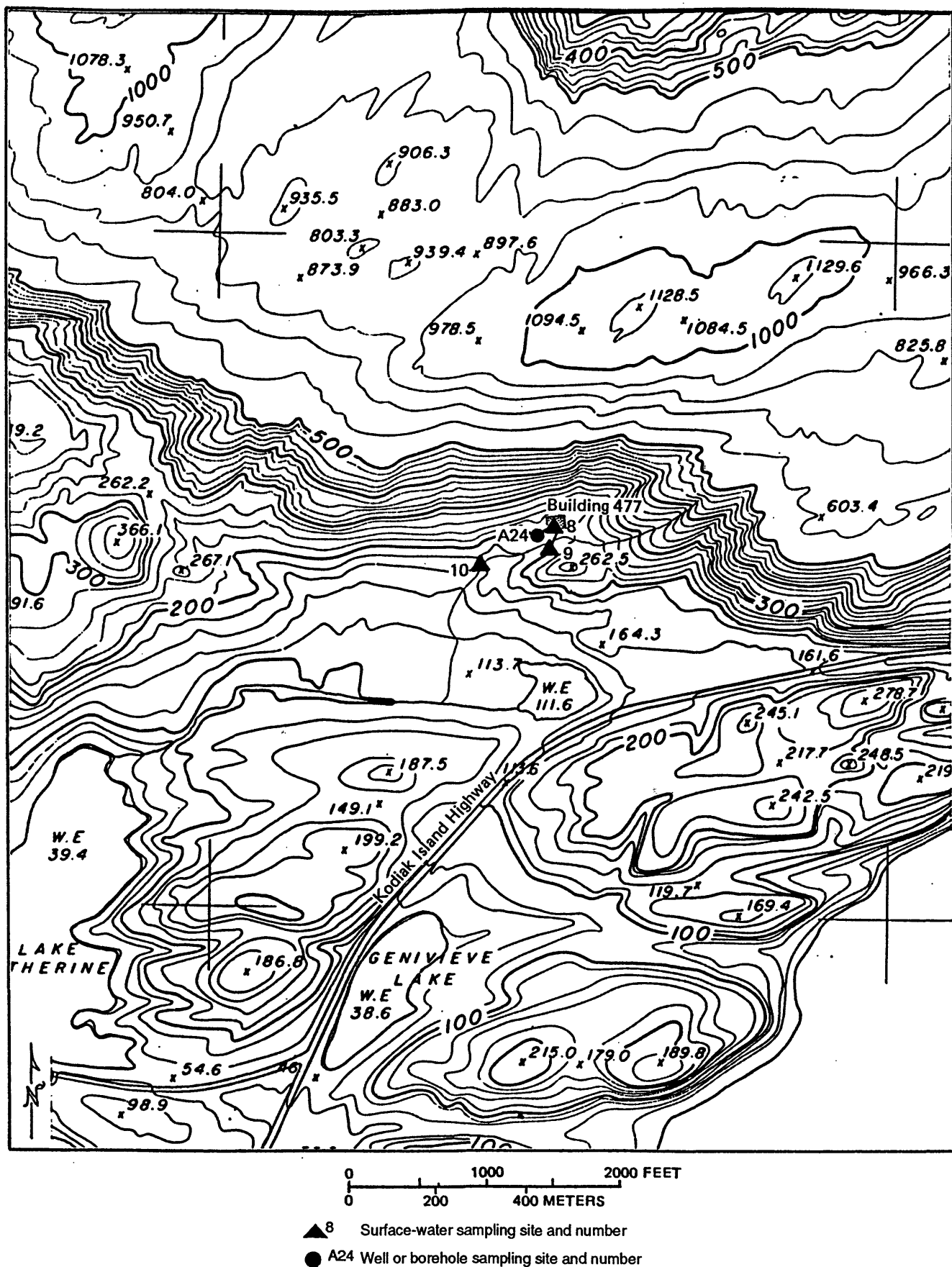


Figure 7. Area 4, a former U.S. Army diesel storage area.

Area 5. Former Fire-Fighting Training Area

A former fire-fighting training area (Area 5) is between the airport's north-south runway and Womens Bay (fig. 8). In this area, fuels and other flammable liquids were burned intermittently in an unlined pit from about 1979 through 1987. Most of the training area is on compacted fill that consists of silt, sand, and gravel. Bedrock with near-vertical bedding is exposed northwest of the abandoned training pit. Bedrock is present 2 ft below land surface in wells A023 and B001, but was not penetrated during the drilling of wells A023A, B002, or B003 (24 to 45 ft deep). Drilling at site A023 was terminated at the bedrock surface (2 ft below land surface) and casing was not installed in the borehole. Drilling at site B001 continued through bedrock to a depth of 71 ft below land surface but the borehole was backfilled to 40 ft with drill cuttings. No upgradient wells were drilled. Soil samples were collected during the drilling of wells A023A, B001, B002, and B003. Near-surface soil samples were also collected in the burn pit (B013) and about 20 ft from the pit (B014). A total of eight downgradient water-quality samples were collected from wells A023A, B001, B002, B003, and two surface-water samples from an airport drainage channel (site 34) near Womens Bay. The quality of water in the drainage channel is influenced by the bay's brackish water; specific conductance of water was 19,900 $\mu\text{S}/\text{cm}$ on February 24, 1989 when discharge was estimated to be 0.03 ft^3/s . Water levels in well B001, completed in bedrock, ranged from 15.1 to 22 ft below land surface. Water levels in wells A023A, B002, and B003 that were completed in unconsolidated sediments were 9.14-11.82, 38.33-38.97, and 28.18-28.99 ft, respectively, below land surface.

The following is a list of selected constituents detected in water from four wells and a stream. No constituents had concentrations that exceeded the MCL's for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Arsenic	7440382	0.	0.05	B001
Lead	7439921	0.	0.005	A023A
Thallium	7440280	0.0005	0.002	Surface-water site 34
<u>ORGANIC CONSTITUENTS ($\mu\text{g}/\text{L}$)</u>				
1,2-Dichloroethane	107062	0.	5.	A023A, Surface-water site 34
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A023A, B003	
Iron	7439896	0.3	A023A	
Manganese	7439965	0.05	B001, B002, B003	

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Chloromethane	74873	B001
Trichlorofluoromethane	75694	B002; Surface-water site 34

Lead was detected in all soil samples and ranged from 8 mg/kg (B003-13.5) to 100 mg/L (B013-00). Concentrations of TPH as high as 38,100 mg/kg were found in soil from the burn pit (B013). Toluene was also detected in the soil sample from B013 at a concentration of 0.28 mg/kg. Organic constituents detected in ground water include chloromethane (3.3 $\mu\text{g}/\text{L}$ from B001), trichlorofluoromethane (27 $\mu\text{g}/\text{L}$ from B002), and toluene (6.5 $\mu\text{g}/\text{L}$ from B001). Trichlorofluoromethane and 1,2-dichloroethane were also detected at concentrations less than 1 $\mu\text{g}/\text{L}$ in water from a stream (site 34).

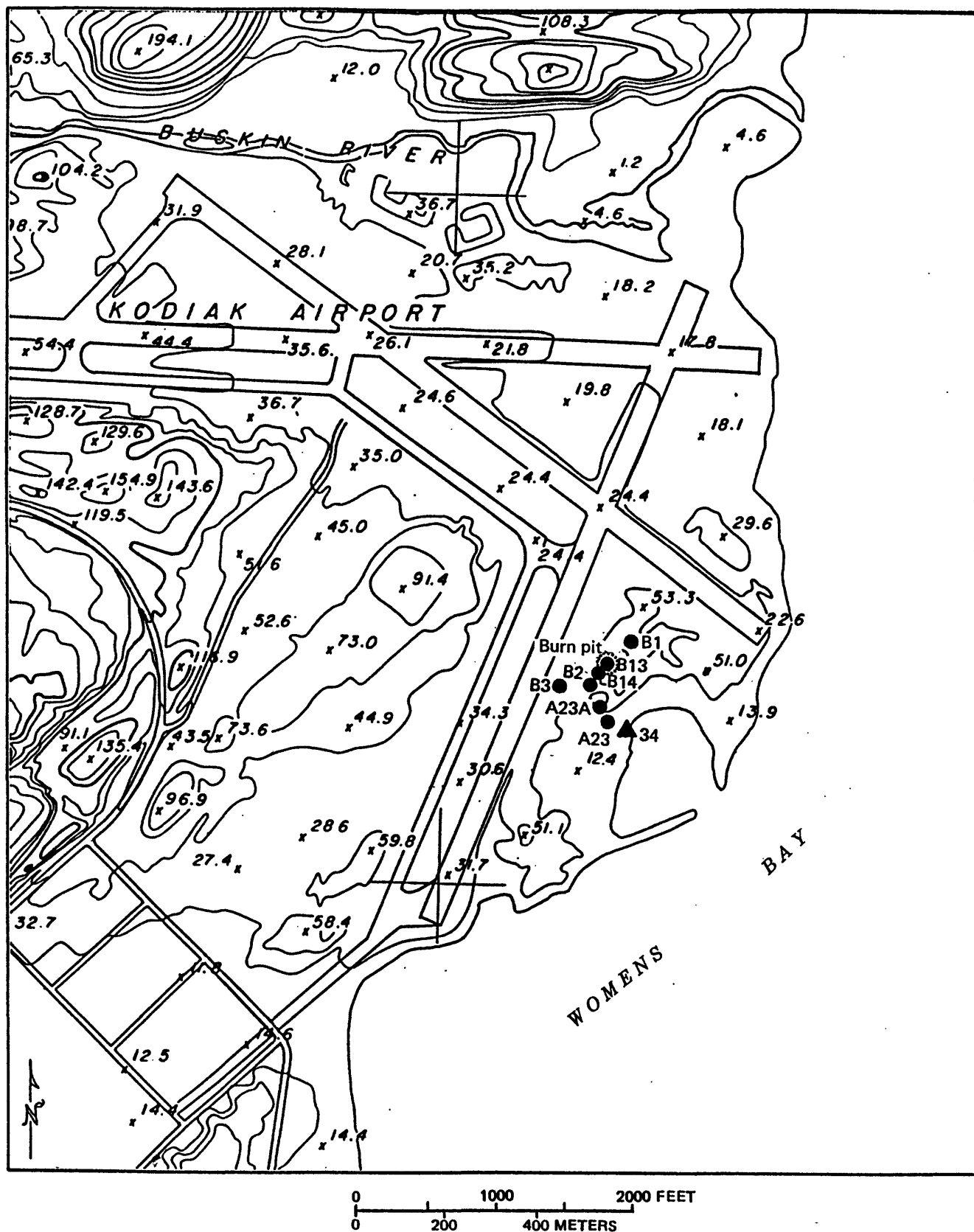


Figure 8. Area 5, a former fire-fighting training area.

Area 6. Fuel Storage Areas on Nyman Peninsula

Area 6 (fig. 9), where fuels and lubricants have been stored since the early 1940's, is in the hills of the central Nyman Peninsula. Distribution lines and numerous large fuel-storage tanks, some with capacities as large as 40,000 gal, are located in the area. Seven of these tanks currently store jet fuels, heavy oils, and waste oil. Two others are empty, except for fuel residues and water. Jet fuel, gasoline, heavy fuel oil, and waste oil may have leaked into the nearby soils because petroleum products have been detected in ditches and excavations along the hillsides and in water in Womens Bay. Area 6 also includes storage sites for aviation gasoline, fuel, and non-fuel chemicals (Areas 7, 9, and 17), batteries (Area 8), gasoline, and waste oils. Storage tanks in an area referred to as "Mogas" (on a hill near the southwestern end of the peninsula) once were used to store gasoline and aviation gasoline. These tanks now are used to store waste oil. Downslope oil seeps are evident south of this site. Bedrock is exposed in the area or is covered by as much as 12 ft of gravel fill, glacial till, or soil. Lenses of sand or gravel are present above and within the till.

One well (A068A) was drilled upgradient of the fuel storage areas. Forty-eight wells were drilled downgradient: A025, A026, A027, A028, A034, A035, A036, A037, A038, A041, A042, A043, A044, A045, A046, A047, A048, A049, A050, A051, A052, A053, A054, A055, A056, A057, A058, A059, A060, A061, A062, A063, A064, A065, A066A, A067, A069, A070, A074, A075, A076, A084, A085, A086, B007, B010, B011, and B012. However, wells A074 and A076 did not yield sufficient quantities of water and water-quality samples were not recovered from these wells. One upgradient and 52 downgradient soil samples were chemically analyzed. Downgradient water-quality samples were also collected from 14 surface-water sites: 40, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, and 54. Several of the ground-water and surface-water sites are near Womens Bay and the water quality at those sites is influenced by the bay's brackish water. Water levels in completed wells ranged from 2.1 ft above land surface (A075) to 16.31 ft below land surface (A061).

The reporting levels for lead in soils ranged from 0.2 to 10 mg/kg. Fifty-two of the 53 soil samples had detectable concentrations of lead ranging from 0.3 to 18 mg/kg. Sample A056-05 had a lead concentration which was lower than the reporting level of <0.9 mg/kg for that sample. A soil sample from well A069 contained toluene and xylenes at <1 mg/kg. TPH's were detected in soil samples from eight locations at 50 mg/kg or greater. The highest concentration of TPH was 2,000 mg/kg from B010-03.

The following is a list of selected constituents detected in 207 ground-water and 23 surface-water samples downgradient from the fuel storage areas. Sites having a water sample that had a concentration greater than or equal to the MCL are listed with an asterisk.

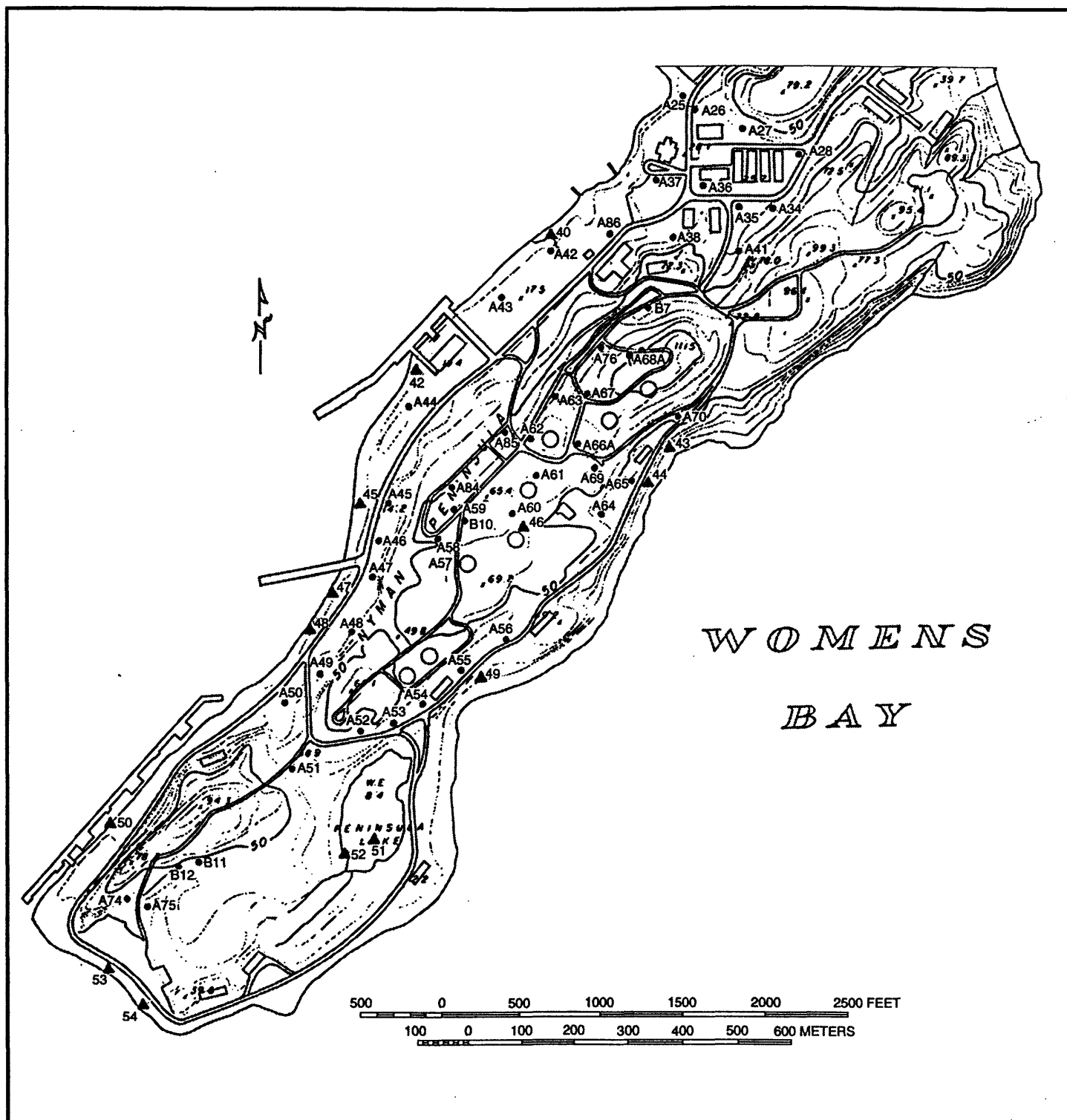


Figure 9. Area 6, the fuel tank area on Nyman Peninsula.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
INORGANIC CONSTITUENTS (mg/L)				
Arsenic	7440382	0.	0.05	A034, A038, A042, A050, A052, A054, A057, A086, B010
Lead	7439921	0.	0.005	A025*, A028*, A034*, A035, A037*, A042, A044*, A045, A052, A053, A058, A062*, A065, A067, A069*, A086, B012, Surface-water sites 7, 53
ORGANIC CONSTITUENTS (µg/L)				
Benzene	71432	0.	5.	A050, A060*, A069*
Chloroform	67663	0.	100.	A035, A044, A051, A053, A056, A064, A066A, A067, A085; Surface-water sites 40, 52
1,2-Dichloro-ethane	107062	0.	5.	A025, A026, A027, A028, A034, A035, A036, A037, A038, A041, A042, A043, A044, A045, A046, A050, A051, A052, A055, A056, A057, A058, A060, A064, A065, A069, A084, A085, A086; Surface-water sites 40, 43, 44, 45, 47, 49, 53
Methylene chloride	750920	0.	--	A085; Surface-water site 43
Tetrachloro-ethene	127184	0.	5.	A084
Trichloro-ethene	79016	0.	5.	A084
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A026, A028, A035, A042, A044, A047, A048, A051, A052, A058, A060, A062, A063, A064, A067, A084, A085, A086, B007, B010	
Chloride	1003	250.	A044, A050, A086	
Iron	7439896	0.3	A026, A027, A034, A035, A038, A050, A052, A054, A055, A057, A060, A063, A064, A065, A086, B010	
Manganese	7439965	0.05	A027, A034, A035, A037, A038, A041, A046, A049, A050, A052, A053, A054, A055, A056, A057, A058, A059, A060, A061, A063, A064, A065, A069, A070, A075, A084, A085, A086, B007, B010, B011, B012	

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Total petroleum hydrocarbons	5289290400	A026, A027, A034, A041, A043, A045, A053, A066A, A067, A069, B007, B010, B011
bis(2-Ethylhexyl)phthalate	117817	Surface-water site 42

Some of the organic constituents detected in ground water include benzene, toluene, ethylbenzene, xylenes, chloroform and 1,2-dichloroethane. The highest concentrations observed were the following: 17 µg/L benzene from A060; 15 µg/L toluene from A069; 33 µg/L ethylbenzene from A069; 33 µg/L m-xylene and 140 µg/L o- & p-xylenes from A060; 31 µg/L chloroform from A067; and 1.9 µg/L 1,2-dichloroethane from A043. Surface-water samples had few organic constituents at concentrations above reporting levels. Benzene, ethylbenzene, and xylenes were not detected in any surface-water samples. The highest concentrations of toluene and chloroform detected in surface water were 0.3 and 5.5 µg/L, respectively, from site 40.

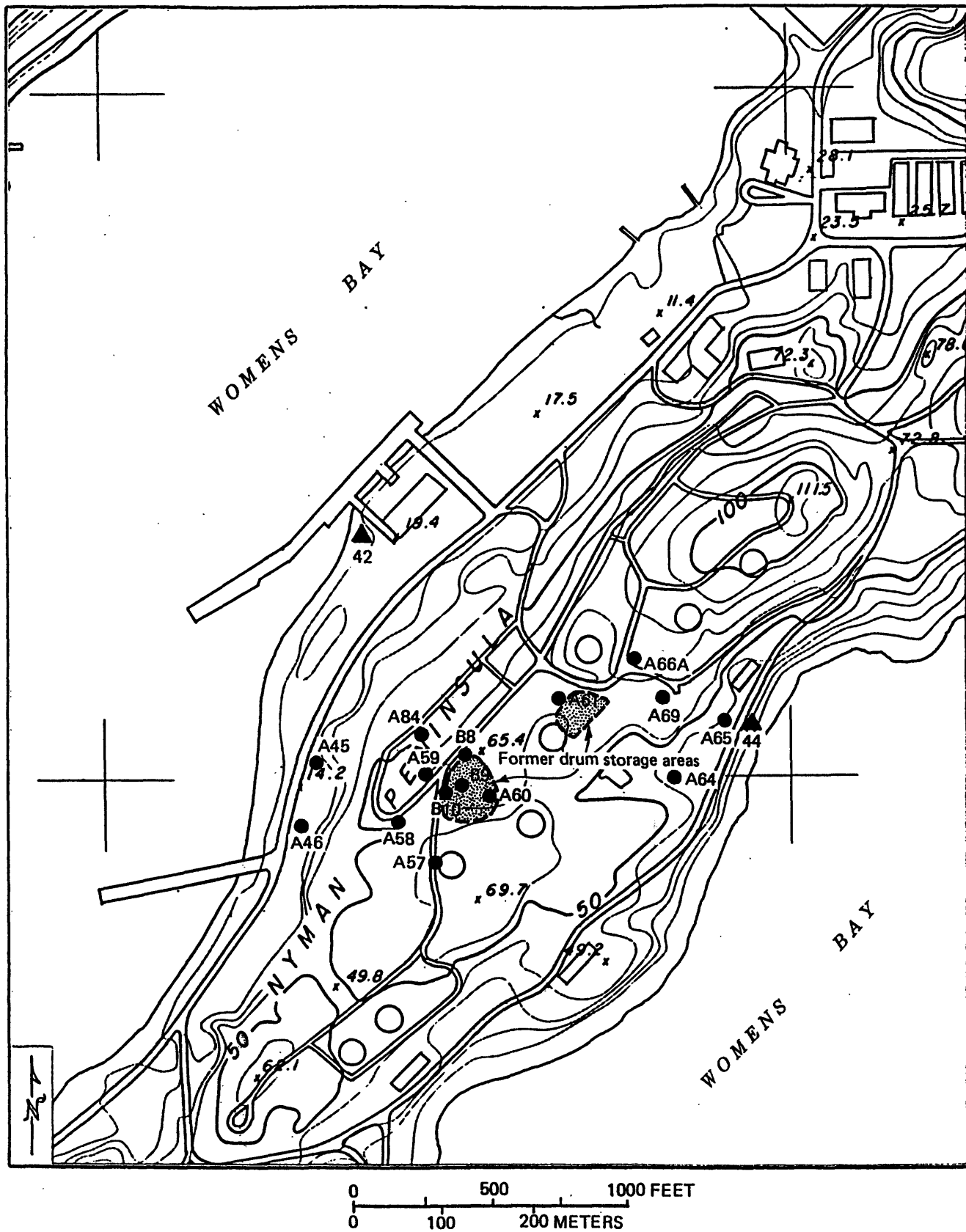
Area 7. Former Drum Storage Areas on Nyman Peninsula

Area 7 (fig. 10) consists of two former drum storage areas on the hills of Nyman Peninsula that may have been used by the Navy and USCG since the early 1940's. A 1986 USCG inventory of barrels and drums in Area 7 revealed the presence of solvents, degreasers, tetrachloroethylene, carbon tetrachloride, methylene chloride, 1,1,1-trichloroethane, trichloroethylene, and bags of absorbent materials that had been used to clean up petroleum-product spills. Much of the ground surface in the storage area is stained, indicating that products may have leaked or spilled. In 1986, the contents of numerous barrels and drums were poured into storage tanks in the Mogas area. Most containers were removed from the site by June 1990. Bedrock at these sites is typically covered with 10 to 15 ft of gravel fill, glacial till, or soil. The till consists of poorly sorted clay, silt, sand, and gravel that becomes more compacted with depth.

Although well A066A is downgradient from the fuel storage tanks in Area 6, it is considered to be upgradient from the drum storage areas in Area 7. Fourteen wells were considered downgradient: A045, A046, A057, A058, A059, A060, A061, A064, A065, A069, A084, B008, B009, and B010; however, B009 yielded no water. Four upgradient and 47 downgradient ground-water samples were analyzed. One upgradient and 17 downgradient soil samples were chemically analyzed. Downgradient water-quality samples were also collected from two surface-water sites. One sample was collected from site 42 and two samples were collected from site 44. Discharges at sites 42 and 44 were less than or equal to 0.01 ft³/s. Water levels in completed wells ranged from 0.11 ft (A084) to 16.31 ft (A061) below land surface.

All soil samples had detectable concentrations of lead ranging from 0.4 mg/kg (A058-05) to 14 mg/kg (A069-05). A069-05 contained toluene and m-xylene (0.67 and 0.28 mg/kg). TPH was detected in near-surface soil samples A069-05 (100 mg/kg), B009-03 (300 mg/kg), and B010-03 (2,000 mg/kg). However, concentrations of TPH were lower than reporting levels (50 mg/kg) at depths of 7 ft at sites B009 and B010.

The following is a list of selected constituents detected in water samples near the former drum storage areas. Sites having a water sample that had one or more concentrations greater than or equal to the MCL's are listed with an asterisk.



- ▲ 44 Surface-water sampling site and number
- A66 Well or borehole sampling site and number

Figure 10. Area 7, former drum storage areas on Nyman Peninsula.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Arsenic	7440382	0.	0.05	A057, B008, B010
Lead	7439921	0.	0.005	A045, A058, A059*, A065, A069*
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
Benzene	71432	0.	5.	A060*, A069*
Chloroform	67663	0.	100.	A064, A066A
1,2-Dichloroethane	107062	0.	5.	A045, A046, A057, A058, A059, A060, A064, A065, A069, A084; Surface-water site 44
Tetrachloroethene	127184	0.	5.	A084
Trichloroethene	79016	0.	5.	A084
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A058, A059, A060, A064, A084, B010	
Iron	7439896	0.3	A057, A060, A064, A065, B008, B010	
Manganese	7439965	0.05	A046, A057, A058, A059, A060, A061, A064, A065, A069, A084, B008, B010	

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Total Petroleum Hydrocarbons	5289290400	A045, A066A, A069, B010
bis(2-Ethylhexyl)phthalate	117817	Surface-water site 42
m-xylene	108383	A060, A069
o- & p-xylenes	816700	A060, A069

Well A069 yielded water having the highest dissolved lead concentration at the Center, 0.019-0.11 mg/L. Water from A069 also contained benzene at concentrations ranging from <0.7 to 8.3 µg/L. Well A060 yielded water having benzene concentrations from <0.7 to 17 µg/L. Organic compounds detected in surface water were 1,2-dichloroethane (0.82 µg/L from site 44) and bis(2-ethylhexyl)phthalate (17 µg/L from site 42).

Area 8. Battery Storage Areas on Nyman Peninsula

Area 8 (fig. 11) consists of two battery storage areas on Nyman Peninsula. Batteries currently are stored only on a concrete pad near well A045. The battery storage area northeast of well A084 is not being used at the present time. Bedrock at these sites is typically mantled by gravel fill, glacial till, sand, or soil. The till consists of poorly sorted clay, silt, sand, and gravel that becomes more compacted with depth.

Well A084 is considered upgradient from the battery storage areas, but this site is downgradient from fuel tanks discussed in Area 6 and from drum-storage sites discussed in Area 7. One soil and four water samples were collected from A084. Water levels in well A084 ranged from 0.96 to 4.60 ft below land surface. Three wells were considered downgradient (A044, A045, and A046), and a total of 3 downgradient soil and 12 downgradient ground-water samples were collected. These wells are near Womens Bay and their water quality is influenced by the bay's brackish water. The specific conductance of water from A044 was as high as 9,910 $\mu\text{S}/\text{cm}$. Water levels in wells ranged from 1.95 to 12.73 ft below land surface in well A044, 0.29 to 3.99 ft in well A045, and 0.62 to 4.25 ft in well A046. One downgradient water-quality sample was also collected from a drainage channel near Womens Bay (surface-water site 42). Discharge at site 42 on October 9, 1988, was estimated to be 0.01 ft^3/s and its specific conductance was 55 $\mu\text{S}/\text{cm}$.

The following is a list of selected constituents detected in water from four wells and a stream near the battery storage areas. Sites listed with an asterisk indicate that a concentration equaled or exceeded the MCL's for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Lead	7439921	0.	0.005	A044*, A045
<u>ORGANIC CONSTITUENTS $\mu\text{g}/\text{L}$</u>				
1,2-Dichloroethane	107062	0.	5.	A044, A045, A046, A084
Chloroform	67663	0.	100.	A044
Tetrachloroethene	127184	0.	5.	A084
Trichloroethene	79016	0.	5.	A084
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Manganese	7439965	0.05	A046, A084	

The following selected constituents do not have MCLGs or SMCLs but were detected in water samples recovered in Area 8:

Constituent	CAS number	Sites having constituent detected at least once
Total petroleum hydrocarbons	5289290400	A045
bis(2-Ethylhexyl)phthalate	117817	Surface-water site 42

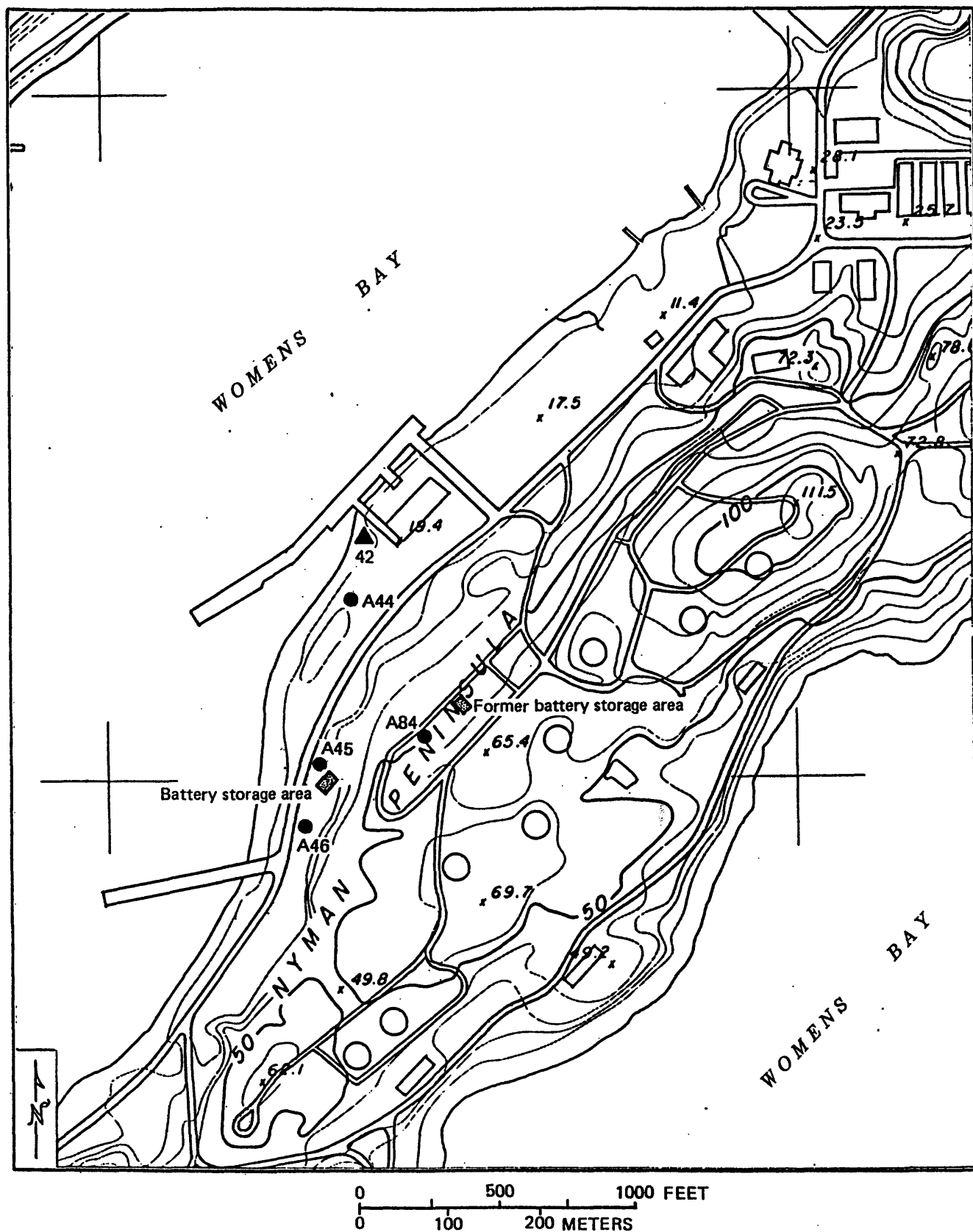


Figure 11. Area 8, the battery storage areas on Nyman Peninsula.

Contaminants from batteries may lead to soils and waters having low pH and high concentrations of lead and mercury. Soils were not analyzed for mercury content, but soil samples had concentrations of lead ranging from 7.2 to 15 mg/kg. Soil sample A044-05 had a detectable concentration of TPH, but TPH's were not detected in sample A044-20.

The lowest pH values were observed in water from the upgradient well, A084, and ranged from 5.8 to 6.4 units. pH values in waters from downgradient wells ranged from 6.0 to 6.4 in A044, 7.2 to 7.6 in A045, and 7.4 to 7.6 in A046. Dissolved lead concentrations in water from A044 ranged from <0.004 to 0.005 mg/L and from A045 ranged from <0.002 to 0.004 mg/L. Mercury concentrations in waters from all wells were less than 0.0001 mg/L.

Area 9. Former Aviation Gasoline Storage Area on Nyman Peninsula

Area 9 consists of four sites near the northeastern end of Nyman Peninsula (fig. 12) where aviation gasoline was stored in drums and in storage tanks as large as 25,000 gal. Each site is on or near the crest of a hill and all tanks and drums have been removed. Bedrock at these sites is typically covered by gravel fill, glacial till, sand, or soil. The till consists of poorly sorted clay, silt, sand, and gravel that becomes more compacted with depth.

No wells were drilled upgradient from the former aviation gasoline storage sites. The following 10 wells were drilled downgradient: A029, A030, A032, A032A, A033, A034, A041, A071, A072, and A073. A well was also drilled at site A031, but the well was dry and no water samples were collected. Water levels in completed wells ranged from 0.54 ft above land surface (A032A) to 17.61 ft below land surface (A071). A total of 34 ground-water samples were analyzed. Nine down-gradient soil samples were chemically analyzed. Downgradient water-quality samples were also collected from surface-water sites 37, 39, and 41. Two samples each were collected from sites 37 and 39 and one sample was collected from site 41. Measured discharges ranged from 0 to 0.04 ft³/s.

All soil samples had detectable concentrations of lead ranging from 0.6 mg/kg (A034-05) to 25 mg/kg (A032A-03). A soil sample from A073-05 had detectable concentrations of trichloroethene (0.15 mg/kg) and tetrachloroethene (0.41 mg/kg). A sample from well A032A-03 contained o- & p-xylenes (0.3 mg/kg) and samples from A029-05 and A034-05 contained TPH (170 and 60 mg/kg respectively).

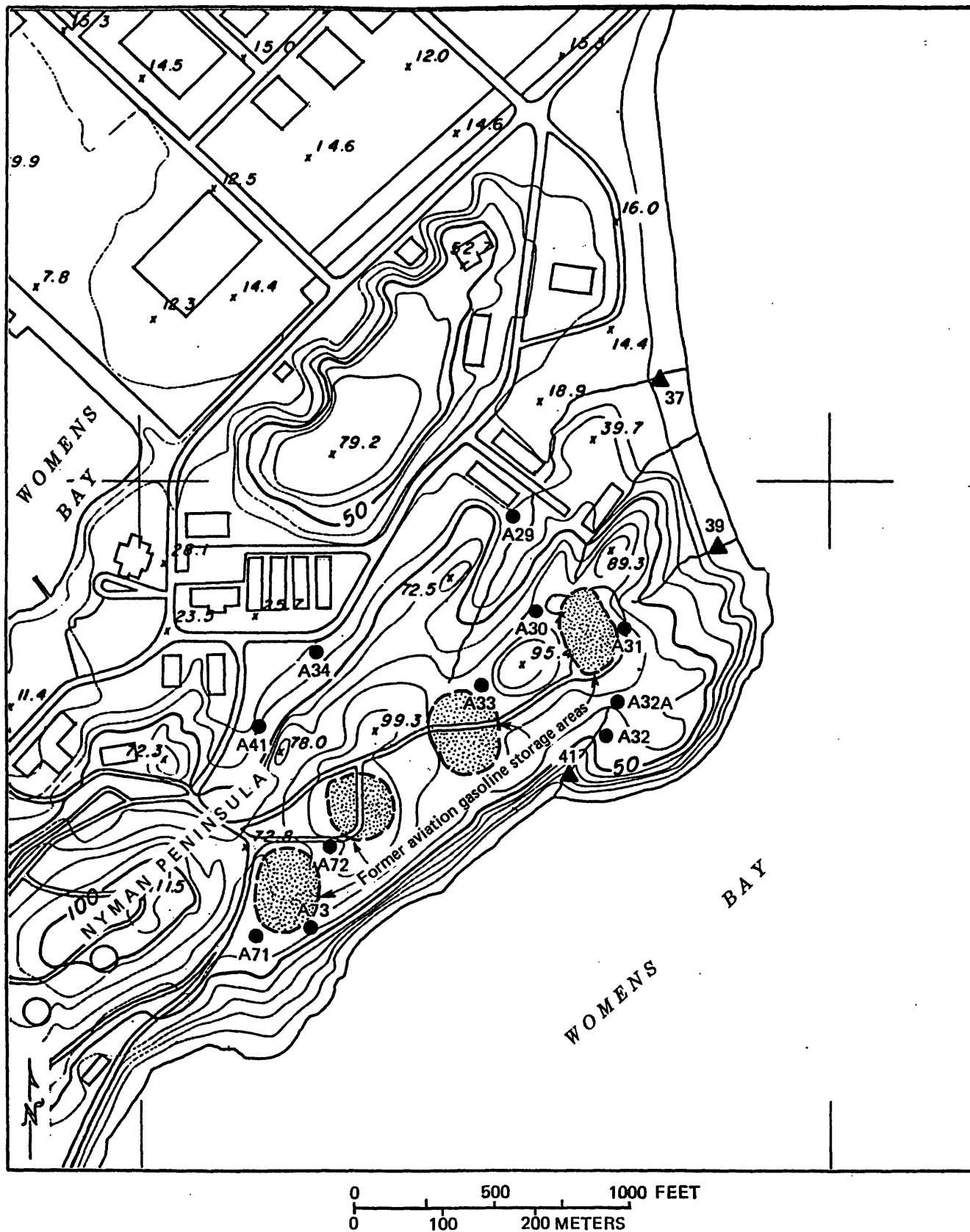
The following is a list of selected constituents detected in water in wells and streams near the aviation gasoline storage areas. Sites listed with an asterisk indicate that a concentration equaled or exceeded the MCL for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
INORGANIC CONSTITUENTS (mg/L)				
Arsenic	7440382	0.	0.05	A029, A032, A032A, A033, A034, A073
Lead	7439921	0.	0.005	A032A*, A033*, A034*
ORGANIC CONSTITUENTS (µg/L)				
Benzene	71432	0.	5.	A032, A032A*, A033; Surface-water site 39
Chloroform	67663	0.	100.	A032, Surface-water site 37
1,2-Dichloroethane	107062	0.	5.	A029, A032, A032A, A034, A041; Surface-water sites 37, 39
Tetrachloroethene	127184	0.	5	A073*
Trichloroethene	79016	0.	5.	A073*
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A032A, A073	
Iron	7439896	0.3	A029, A032, A032A, A033, A034, A073	
Manganese	7439965	0.05	A029, A032, A032A, A033, A034, A041, A071, A073	

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Total petroleum hydrocarbons	5289290400	A030, A032A, A034, A041, A071

Well A032A yielded water containing up to 0.02 mg/L dissolved lead, 15 µg/L benzene, 76 µg/L toluene, 250 µg/L ethylbenzene, 150 µg/L m-xylene, and 150 µg/L o- & p-xylenes. Well A073 yielded water having trichloroethene and tetrachloroethene concentrations as high as 66 and 20 µg/L, respectively. Water from surface-water site 39 contained benzene at <0.2 and 2.2 µg/L and ethylbenzene at <0.2 and 3.1 µg/L.



- ▲ 37 Surface-water sampling site and number
- A32 Well or borehole sampling site and number

Figure 12. Area 9, the former aviation gasoline storage area on Nyman Peninsula.

Area 10. Air Station

Aircraft are maintained, fueled, and parked in Area 10 (fig. 13), and underground fuel-distribution lines have been installed throughout the area. Upgradient areas south of the air station are places where oils, lubricants, and aviation gasoline are or have been stored. Most low-lying areas are covered with asphalt taxiways and parking aprons. Gravel fill, glacial till, and sand underlie the asphalt and are the surficial sediments in upland areas. In 1987, approximately 150,000 gal of jet fuel leaked from an above-ground storage tank on the southeastern side of the area.

No wells were drilled upgradient from the air station. Five wells were drilled downgradient from fuel and aircraft storage areas: A014, A018, A021, A021A, and A025; however, well A021 was destroyed shortly after it was constructed. Sixteen ground-water samples were collected. Water levels in completed wells ranged from 5.27 ft (A025) to 35.73 ft (A014) below land surface. Soil samples from A014, A018, A021, and A021A were chemically analyzed. Two downgradient water-quality samples were also collected from surface-water site 38.

All soil samples had detectable concentrations of lead ranging from 5.2 mg/kg (A018-09) to 12 mg/kg (A025-05). A soil sample from A021-09 contained 360 mg/kg TPH.

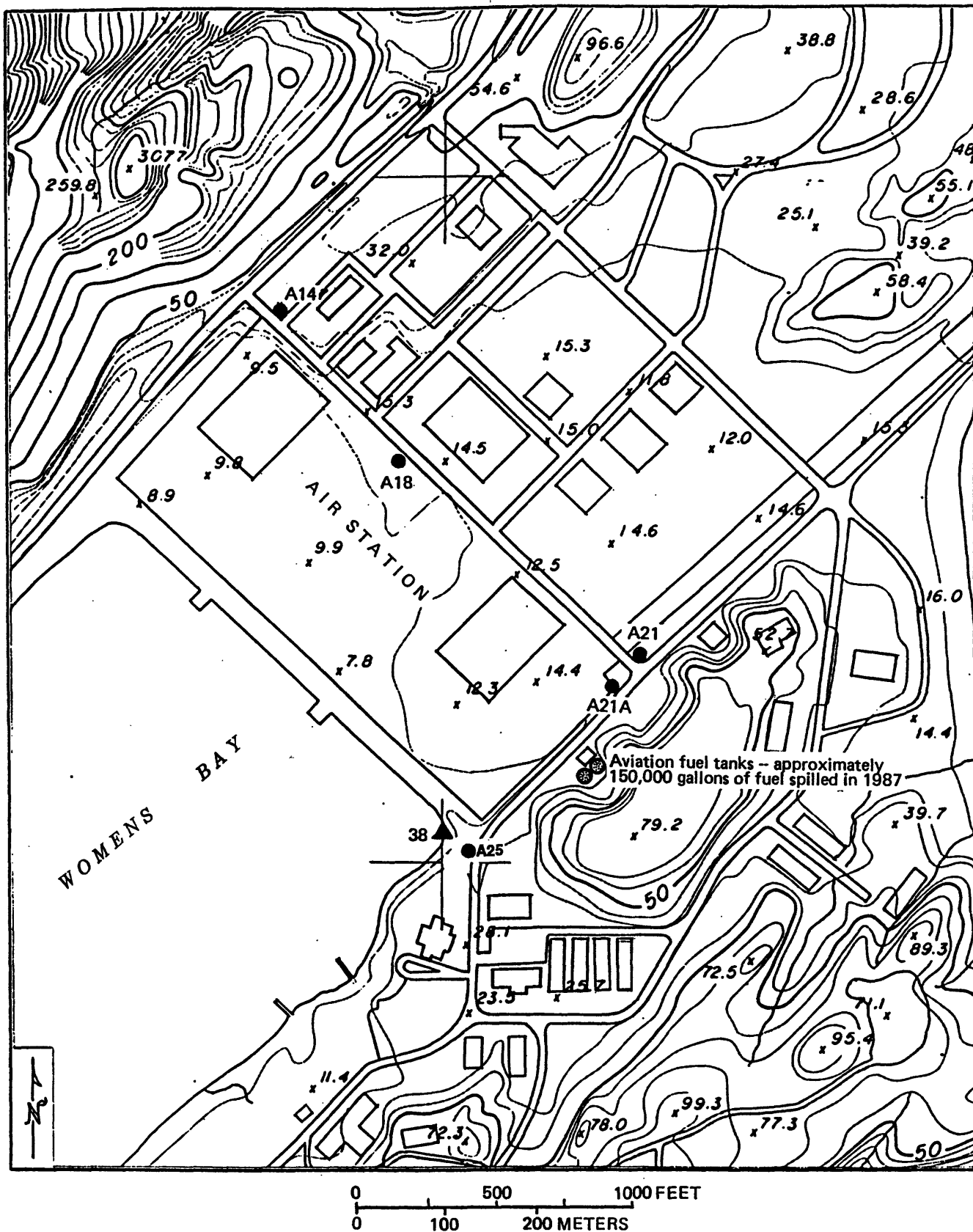
The following is a list of selected constituents detected in water in four wells and a stream near the air station. Sites listed with an asterisk indicate that a concentration equaled or exceeded the MCL for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Arsenic	7440382	0.	0.05	A018, A021A
Lead	7439921	0.	0.005	A018, A021A, A025
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
Benzene	71432	0.	5.	A021A*
1,2-Dichloroethane	107062	0.	5.	A014, A018, A025; Surface-water site 38
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A021A	
Iron	7439896	0.3	A021A	
Manganese	7439965	0.05	A014, A018, A021A	

The following selected constituent does not have MCLG's or SMCL's, but was detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Total petroleum hydrocarbons	5289290400	A021A

A thin film, possibly a fuel product, was present on the water surface in well A021A. The well yielded water having concentrations as high as 78 µg/L benzene, 18 µg/L toluene, 140 µg/L ethylbenzene, 55 µg/L m-xylene, 170 µg/L o- & p-xylenes, and 9.2 mg/L TPH. However, two sets of water samples from a nearby drainage channel (surface-water site 38) had concentrations of these organic compounds that were lower than detection levels.



- ▲ 38 Surface-water sampling site and number
- A21 Well or borehole sampling site and number

Figure 13. Area 10, the air station.

Area 11. Paint Plant

An underground storage tank is in Area 11 (fig. 14). The reconnaissance soil-gas survey with an organic vapor analyzer found that organic vapors in this area did not exceed background levels; thus no test holes or wells were drilled in Area 11 and soils and surface-water were not sampled.

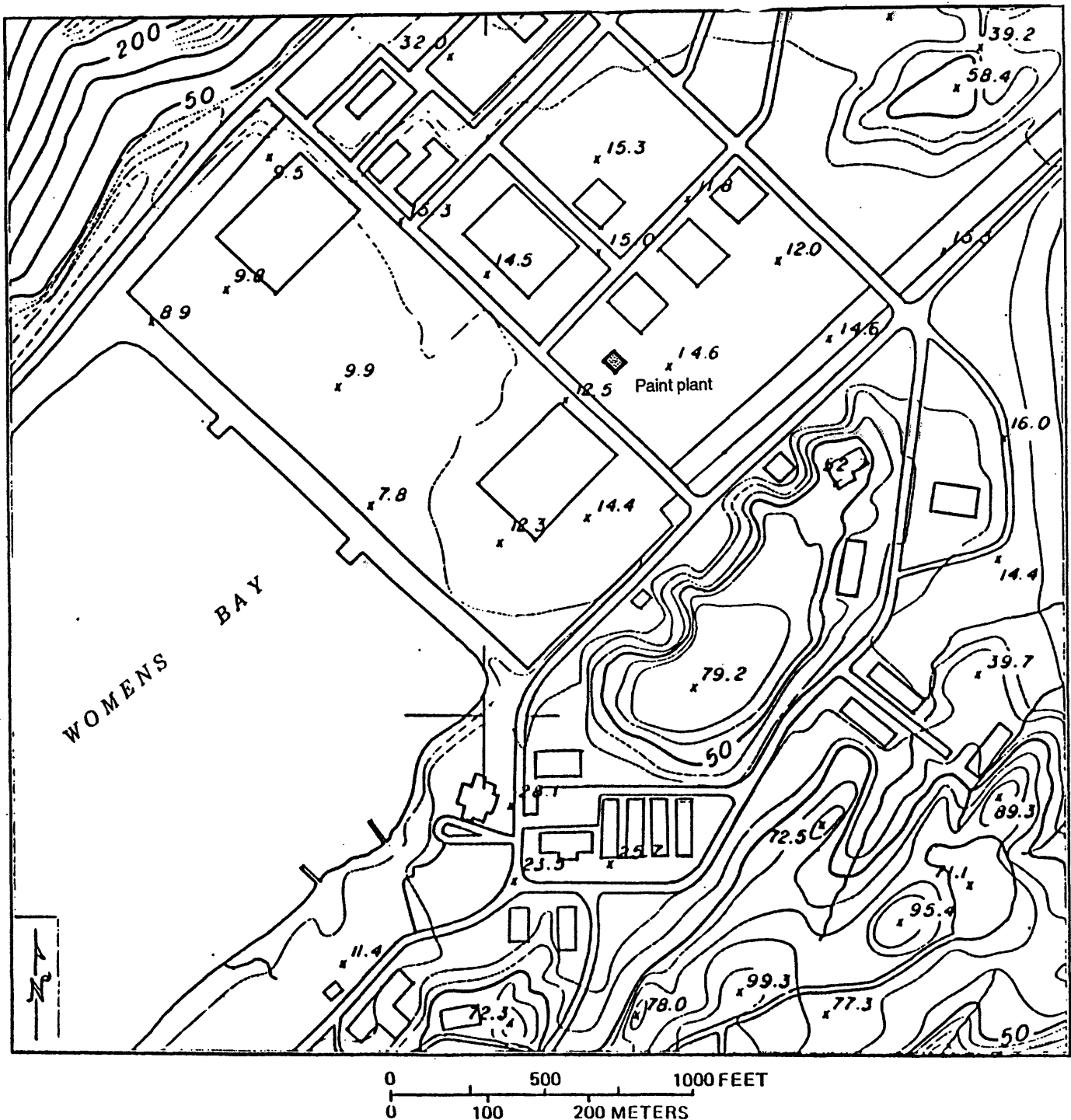


Figure 14. Area 11, the paint plant

Area 12. Drum Disposal Area West of Buskin Lake

Area 12 (fig. 15) is an area west of Buskin Lake where about 3,000 drums were discarded. The former contents of the drums are unknown, but most drums now are rusted and all are empty. The reconnaissance soil-gas survey found that organic vapor readings in the air and soils at the site were at background levels. The area is underlain by alluvium of unknown thickness.

No wells were drilled upgradient. Wells A001 and A001A were drilled downgradient from the drum disposal site. One water sample was collected from each well. On May 23, 1989, water levels in wells A001 and A001A were 8.44 and 5.32 ft below land surface. Three soil samples from well A001 and two from A001A were chemically analyzed. Field water-quality properties were also measured from surface-water sites 12 and 13 near Buskin Lake. Discharges at sites 12 and 13 on July 29, 1987 were 18 and 3 ft³/s, respectively.

The following selected constituent was detected in water in wells and streams near Area 12:

Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL
Manganese	7439965	0.05	A001, A001A

All soil samples had detectable concentrations of lead (0.3 to 8.4 mg/kg). A soil sample from A001-00.5 contained 130 mg/kg TPH, but no organic constituents were detected in the two ground-water samples and no constituents had concentrations exceeding MCL's.

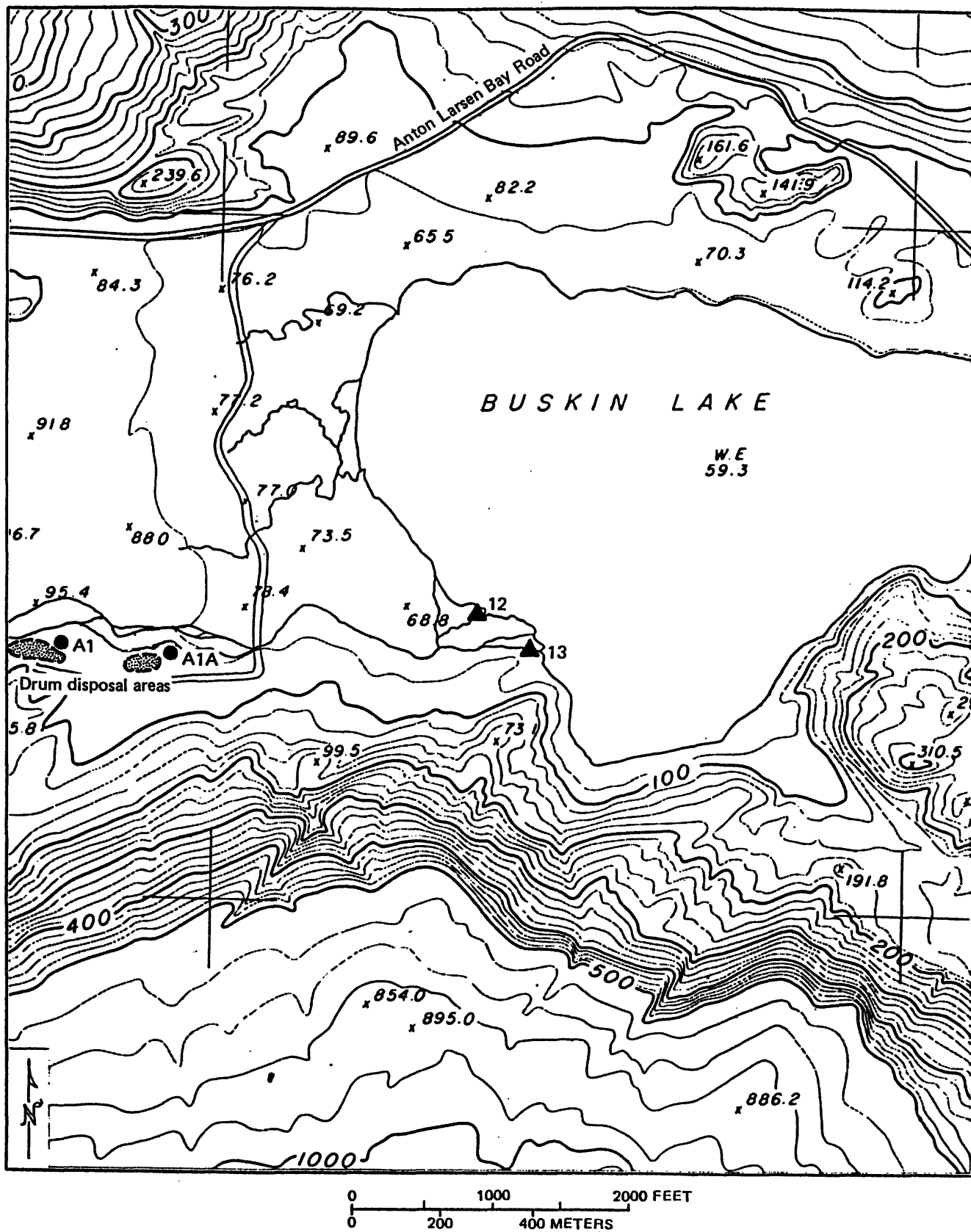


Figure 15. Area 12, a former drum disposal area near Buskin Lake.

Area 13. Drum Disposal Area Northwest of Buskin Lake

Area 13 is a drum disposal area north of Buskin Lake (fig. 16). Little is known about the contents of the hundreds of drums reportedly discarded here and subsequently crushed and buried by the U.S. Army Corps of Engineers. The area is underlain by alluvium of unknown thickness.

No upgradient or downgradient wells were drilled. Field water-quality properties were measured from a tributary to Buskin Lake (surface-water site 1) on July 28, 1987. The results are listed below:

Chemical or property	Value
Water temperature	11.5 °C
Specific conductance	32 μ S/cm
pH	7.0 units
Discharge, instantaneous	0.6 ft ³ /s (estimated)
Organic carbon	0.8 mg/L as C
Barometric pressure	760 mm of Hg

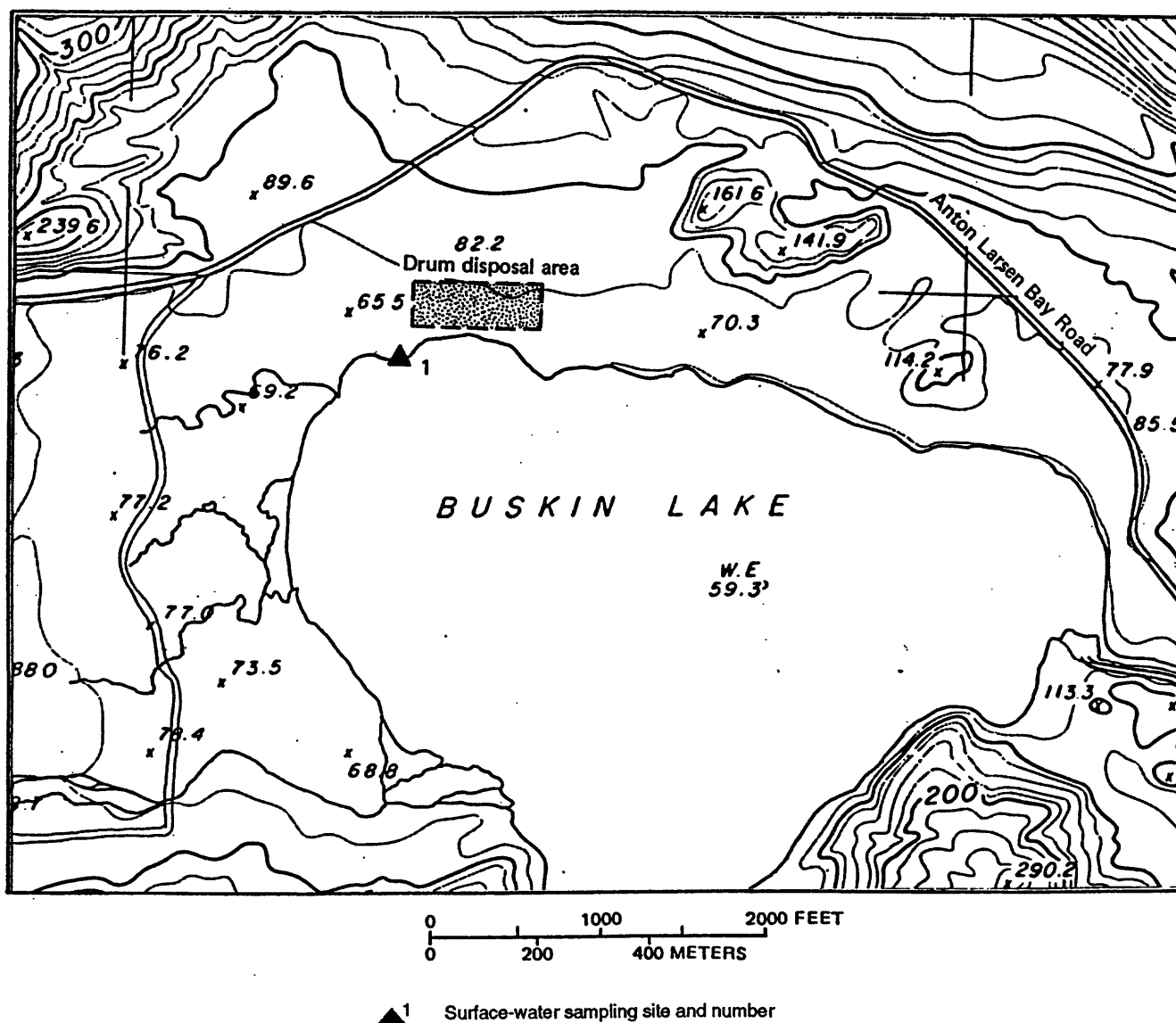


Figure 16. Area 13, a former drum disposal area near Buskin Lake.

Area 14. Former Quartermaster Gasoline Station

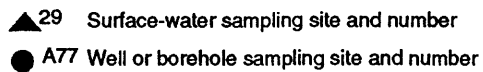
Area 14 is a former quartermaster gas station near the intersection of Anton Larsen Bay Road and Old Tom Stiles Road (fig. 17). Underground fuel storage tanks may still be present in the area, which is underlain by gravel fill and alluvium of unknown thickness.

No wells were drilled upgradient. One soil and four water samples from downgradient well A077 were chemically analyzed. Water levels in A077 ranged from 8.68-10.20 ft below land surface. Field water-quality properties were collected from a sample at surface-water site 29. Three downgradient water-quality samples also were collected from surface-water site 30 on the Buskin River. No organic constituents were detected in the surface-water samples.

The following is a list of selected constituents detected in water from well A077. No constituents were detected at concentrations higher than the MCL's for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>ORGANIC CONSTITUENTS ($\mu\text{g/L}$)</u>				
Chloroform	67663	0.	100.	A077
1,2-Dichloro- ethane	107062	0.	5.	A077

Lead was detected in a soil sample from A077-05 at 5.6 mg/kg. Only two organic constituents were detected in ground-water samples: 1,2-dichloroethane (0.78 $\mu\text{g/L}$) and chloroform (1.5 $\mu\text{g/L}$). The 1,2-dichloroethane, detected in a sample recovered on March 7, 1989, may be a laboratory contaminant. Chloroform, detected in a sample taken on October 5, 1988, may occur in the water naturally. Neither of these constituents were detected in other water samples recovered from well A077 at other times.

**Area 14. Former Quartermaster Gasoline Station 61**

Area 15. Former Gasoline Station

Area 15 is a former gasoline station on G Avenue near Peterson Elementary School (fig. 18). Underground fuel storage tanks have been removed. The area is underlain by gravel fill, alluvium, and glacial till of unknown thicknesses.

Well A016 was drilled upgradient and wells A017 and A082 were drilled downgradient from the gas station. Well A016, however, is downgradient from a metal disposal area (Area 18). Only one soil sample was collected (A082-05); lead was detected in the soil sample at 12 mg/kg. Water levels in the wells, in feet below land surface, were: A016, 14.99-25.04; A017, 23.75-31.48; and A082, 19.84-dry (>30.5 ft). Ground-water samples were collected from three wells, but no surface-water samples were collected near the former gasoline station.

The following is a list of selected constituents detected in 10 water samples from 3 wells near the former gas station. Concentrations of all constituents were lower than the MCL's for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
Chloroform	67663	0.	100.	A017, A082
1,2-Dichloroethane	107062	0.	5.	A016, A017, A082
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A082	
Manganese	7439965	0.05	A016, A082	

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Bromodichloromethane	75274	A082
Total petroleum hydrocarbons	5289290400	A016

Well A082 yielded water having concentrations of bromodichloromethane ranging from <0.5 to 1.5 µg/L and chloroform ranging from 2.5 to 24 µg/L.



● A16 Well or borehole sampling site and number

Figure 18. Area 15, a former gasoline station.

Area 16. Airport Staging Area

Area 16 includes most areas at and near the airport (fig. 19) but excludes the burn pit in the former fire-fighting training area (Area 5). Various fuels, which have been and are currently stored here, reportedly have leaked or have been spilled throughout this area. The locations of all buried fuel tanks are not known. The area is underlain by bedrock, gravel fill, and alluvium.

Wells A008, A011, A012, A012A, A013, A020A, A022, A022A, A023, A023A, A079, B001, B002, and B003 were drilled at or downgradient from the airport. Sixteen soil and 32 ground-water samples were collected. Well A023 was not completed and no soil or water samples were recovered from this site. Wells A022 and A022A were dry, thus no water-quality samples were collected from these wells. Water levels in the remaining wells ranged from 3.63 ft (A011) to 38.97 ft below land surface (B002). Surface-water site 32 is upgradient and sites 30, 31, 34, 35, 36, and 60 are downgradient. Two upgradient and 11 downgradient surface-water samples were collected. Streamflows measured in Devils Creek at site 31 during the study ranged from 2.7 to 58 ft³/s. Measured discharges in three drainage channels (sites 34-36) were less than 0.5 ft³/s.

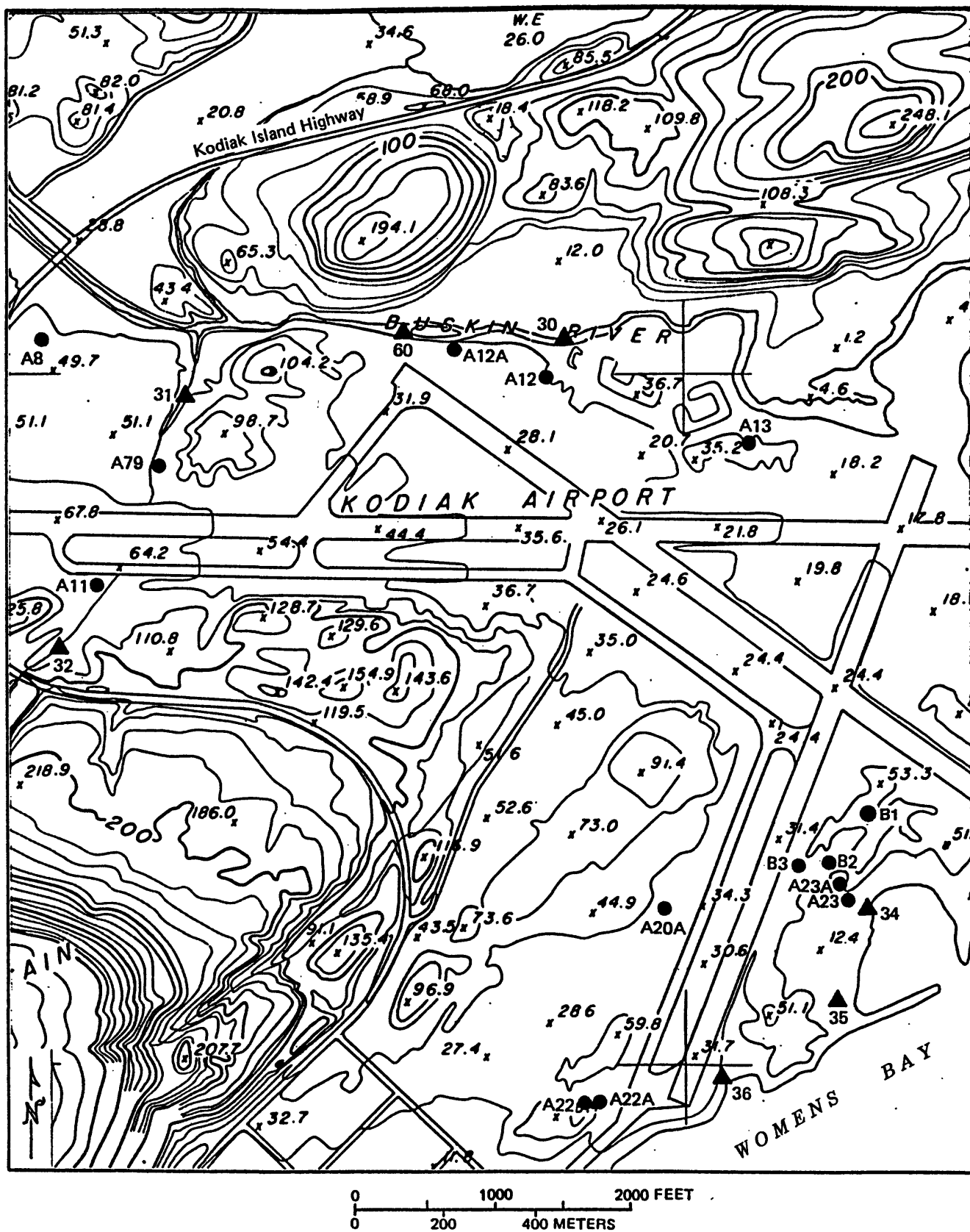
The following is a list of selected constituents detected in water from wells and streams near the airport. Sites listed with an asterisk indicate that the constituent was present at a concentration greater than or equal to the MCL for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Cadmium	7440439	0.005	0.005	A012A*
Lead	7439921	0.	0.005	A013, A023A, A025*, A079*
Thallium	7440280	0.0004	--	Surface-water site 34
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
1,2-Dichloroethane	107062	0.	5.	A008, A012, A012A, A013, A020A, A023A, A079; surface-water sites 34, 35
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A012A, A020A, A023A, B003	
Iron	7439896	0.3	A020A, A023A	
Manganese	7439965	0.05	A008, A013, A020A, A079, B001, B002, B003	

The following selected constituents do not have MCLG's or SMCL's but were detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Trichlorofluoromethane	75694	Surface-water site 34
bis (2-ethylhexyl)phthalate	117817	Surface-water sites 31, 32

Lead was detected in the 16 soil samples recovered from 11 wells and its concentration ranged from 3.8 to 16 mg/kg. Toluene was detected only in water from one well (B001) at a concentration of 6.5 µg/L.



- ▲ 60 Surface-water sampling site and number
- A13 Well or borehole sampling site and number

Figure 19. Area 16, the airport staging area.

Area 17. Storage Pad South of Steam Plant

Area 17 is an outside storage pad (fig. 20) where paints, painting-related chemicals, and other organic products are stored. Underground tanks that contained heavy oil (FS6) were removed from this site. The area is underlain by a thin layer of gravel fill and bedrock.

Well B007 was drilled near the center of the pad, whereas wells A042 and A086 were drilled downgradient northwest of the site. Water levels in well B007 ranged from 2.52 to 3.68 ft below land surface. Soil samples were obtained at A042-05, A086-05, B007-0.5, and B007-03. Ground-water samples were analyzed from wells A042, A086, and B007; four each from A042 and A086 and one from B007. Two downgradient surface-water samples were collected at site 40.

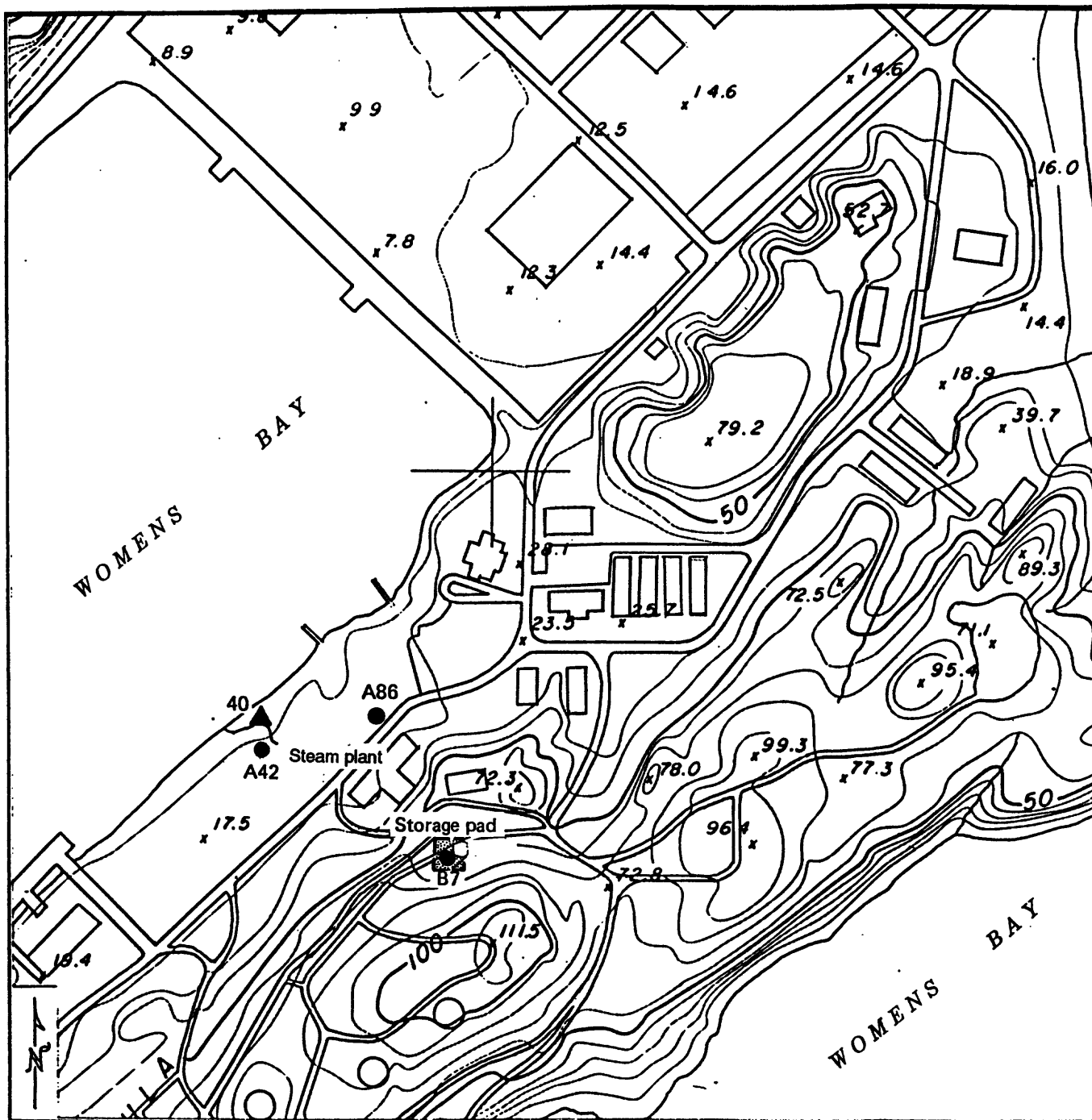
The following is a list of selected constituents detected in water in three wells and a stream near the storage pad:

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Arsenic	7440382	0.	0.05	A042, A086
Lead	7439921	0.	0.005	A042, A086
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
Chloroform	67663	0.	100.	Surface-water site 40
1,2-Dichloro-ethane	107062	0.	5.	A042, A086; surface-water site 40
PCB	12767792	0.	0.5	Surface-water site 40
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Chloride	1003	250.	A086	
Aluminum	7429905	0.05	A042, A086, B007	
Iron	7439896	0.3	A086	
Manganese	7439965	0.05	A086, B007	

The following selected constituent does not have MCLG's or SMCL's but was detected in water samples:

Constituent	CAS number	Sites having constituent detected at least once
Total petroleum hydrocarbons	5289290400	B007

Lead was detected in all soil samples ranging from 10 to 16 mg/kg. TPH's were detected in soils from well A042 at 280 mg/kg. Well B007 yielded water having a TPH concentration of 17 mg/L but no detectable volatile organics or lead. Well A042 may be affected by Womens Bay as specific conductance of water from the well ranged from 356 to 1,780 µS/cm. PCB's were detected in water at surface-water site 40 at 0.1 µg/L.



- ▲ 42 Surface-water sampling site and number
- 86 Well or borehole sampling site and number

Figure 20. Area 17, a storage pad south of the steam plant.

Area 18. Former Metal Disposal Area

Area 18 is in Drury Gulch (fig. 21) where a variety of metallic refuse was discarded. Electric transformers that contained PCB's were stored, emptied, burned, and buried there. Much of the area is underlain by sand, gravel, and cobbles that overlie bedrock.

No wells were drilled upgradient from the metal disposal area. Wells A016 and A081 were drilled downgradient. Water levels in well A016 ranged from 14.99 to 25.04 ft below land surface and water levels in A081 ranged from 1.11 to 10.05 ft below land surface. A soil sample was analyzed from well A081 and three water-quality samples were analyzed from each of wells A016 and A081. Three downgradient surface-water samples were collected at Drury Gulch at Kodiak Island Highway (site 33). Discharges measured at site 33 ranged from <0.01 to 0.05 ft³/s.

The following is a list of selected constituents detected in water in the two wells and Drury Gulch. An asterisk indicates that the site had a concentration of that constituent that was greater than or equal to the MCL for drinking water.

Constituent	CAS number	MCLG	MCL	Sites having at least one concentration greater than or equal to the MCLG
<u>INORGANIC CONSTITUENTS (mg/L)</u>				
Lead	7439921	0.	0.005	A081*
Cadmium	7440439	0.005	0.005	Surface-water site 33*
<u>ORGANIC CONSTITUENTS (µg/L)</u>				
1,2-Dichloro-ethane	107062	0.	5.	A016, A081; Surface water site 33
Constituent	CAS number	SMCL (mg/L)	Sites having at least one concentration greater than or equal to the SMCL	
Aluminum	7429905	0.05	A081	
Manganese	7439965	0.05	A016, A081	

The following selected constituent does not have MCLG's or SMCL's but was detected in water samples:

Constituent	CAS number	Site having constituent detected at least once
Total petroleum hydrocarbons	5289290400	A016

Lead was detected in a soil sample from A081-05 at 8.2 mg/kg. Lead was once detected at a concentration of 0.01 mg/L in water from A081, but in three other samples from the well had concentrations <0.02 mg/L. The concentration of TPH in water from well A016 was 0.9 mg/L. No PCB's, dioxins, or furans were detected in water from well A081 or from surface-water site 33.

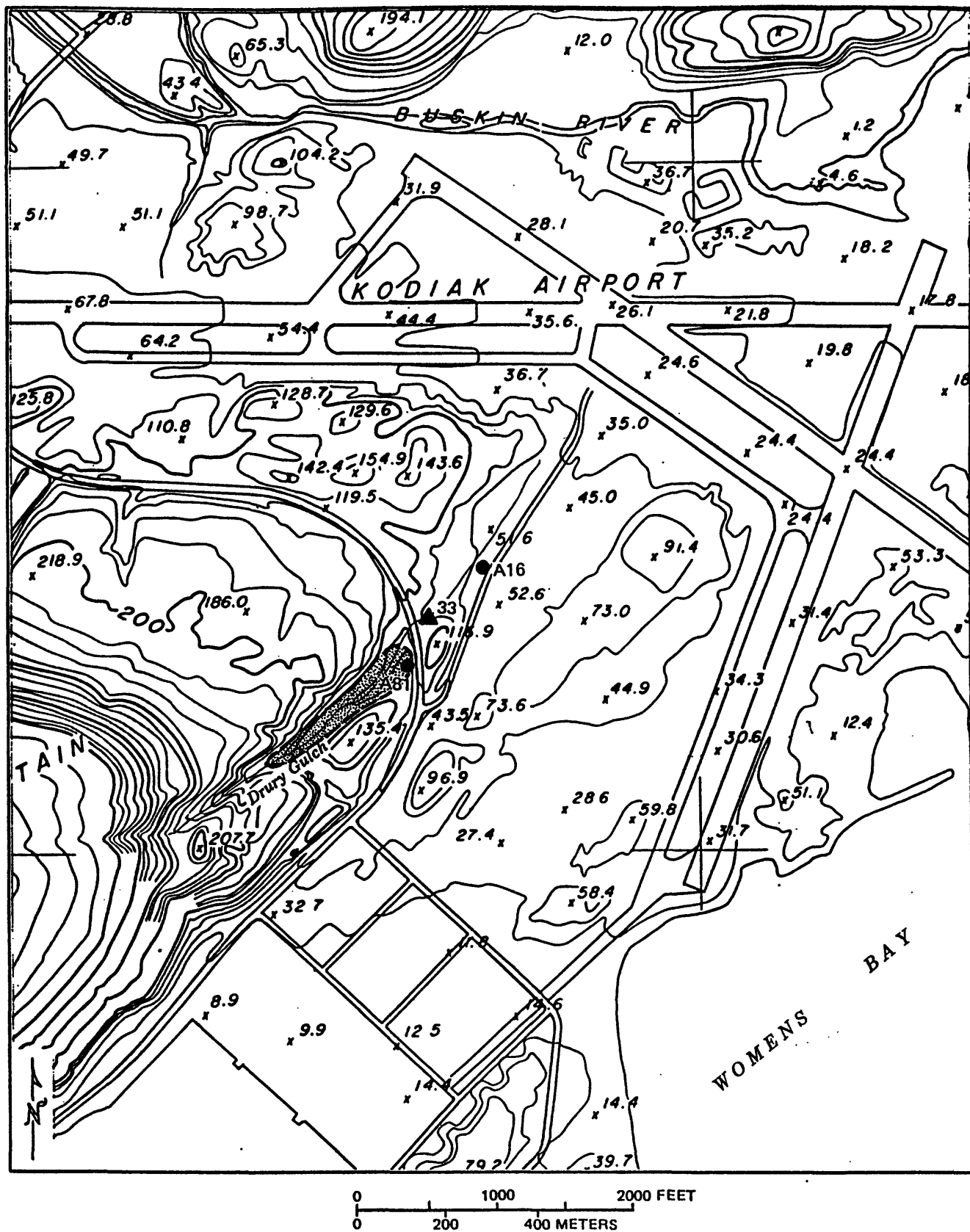


Figure 21. Area 18, a former metal disposal area.

SUMMARY

The USCG Support Center on Kodiak Island was established during World War II as a U.S. Navy base. It served as a naval submarine base, air base, and port during and after the war, and was acquired by the USCG in 1972. The shallow geology of the area is characterized by a thin cover of unconsolidated sediments, but bedrock is commonly exposed. About 100 wells were installed by the USGS to help develop a general understanding of the regional ground-water system and to examine locations and potential sources of suspected contamination. Eighteen areas of potential contamination were identified and studied. Many of these areas are near the ocean, thus surface and ground water within or downgradient from these areas may be affected by brackish sea water.

The water supply for the Center is Buskin Lake. Only one well (CG 4) supplies water to a building outside of the water-distribution system and the well is upgradient from all known sources of contamination. No organic constituents were detected in water from CG 4, but chloroform and bromodichloromethane were detected in samples of chlorine-treated water from the water-distribution system.

Sixty-eight quality-control "blank" water samples were analyzed to monitor potential contamination from the collection, transport, storage, and analysis of water samples. Methylene chloride was detected in 26 blanks at concentrations as great as 5.9 µg/L and 1,2-dichloroethane was detected in 15 blanks at concentrations as great as 2.6 µg/L. The presence of these organic constituents is likely due to sampling or laboratory contamination.

Two lake-bed-material samples and more than 100 soil samples were chemically analyzed. Total Petroleum Hydrocarbons were detected at 16 sites. O- & p-xylenes and tetrachloroethene were detected at three sites; toluene was detected at two sites; and vinyl chloride, methylene chloride, trichloroethene, and m-xylene were each detected once. Lead, which occurs naturally in soils, was detected at all but one site and ranged from 0.3 to 100 mg/kg. The average concentration of lead was 10.6 mg/kg.

Approximately 350 ground-water samples were collected from 101 wells; 110 surface-water samples were collected from 59 sites on streams or lakes. Cadmium, lead, thallium, benzene, tetrachloroethene, trichloroethene, and vinyl chloride were detected at a concentration higher than allowed by primary drinking-water regulations. Arsenic, cadmium, lead, sulfate, thallium, benzene, chloroform, 1,2-dichloroethane, methylene chloride, tetrachloroethene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride, PCB's, and styrene were detected at concentrations higher than Maximum Contaminant Level Goals.

Water samples from 10 wells and 18 surface-water sites were analyzed to obtain background or upgradient conditions. Aluminum, iron, and manganese were present in water at several sites at concentrations higher than the Secondary Maximum Contaminant Levels for drinking water. Low concentrations of arsenic, lead, and chloroform were also found. The constituent 1,2-dichloroethane was found in several ground-water samples, but its presence may be due to a sampling or laboratory contaminant as it was also detected in several quality-control blanks.

Water present downgradient from a landfill (Area 1) that operated from the early 1970's until 1987 contained 1,2-dichloroethane, vinyl chloride, and TPH in low (<3 µg/L) concentrations. Bis(2-ethylhexyl)phthalate was present at 460 µg/L in a water sample from a drain south of the landfill, but was not detected at a 10 µg/L level in a subsequent sample.

Before 1972 another landfill (Area 2) was used. Vinyl chloride, the only constituent found in concentrations exceeding MCL's for drinking water, was detected in surface water recovered from a ditch near the landfill. The maximum vinyl chloride concentration at this site was 15 µg/L. Benzene, 1,2-dichloroethane, methylene chloride, and dichlorodifluoromethane were detected at concentrations less than 5 µg/L.

High concentrations of vinyl chloride, tetrachloroethene, and trichloroethene are present in ground water near a laundry facility (Area 3) where dry-cleaning wastes were discarded onto the ground. The maximum concentrations for vinyl chloride, tetrachloroethene, and trichloroethene were 440, 3,000, and 49 µg/L respectively. Constituents present in ground water at concentrations less than 5 µg/L include chloroform and 1,2-dichloroethane. Methylene chloride was present at 180 µg/L in a water sample from well A039, but was not detected at the 2 µg/L level in three other samples collected at other times from the same well.

Toluene and 1,2-dichloroethane were each detected at low concentrations (<3 µg/L) once, but were not detected three other times in water from a well near a former diesel storage area (Area 4).

Concentrations of TPH as high as 38,100 mg/kg were found in soils in a burn pit at a former fire-fighting training area (Area 5). Organic constituents detected in ground water include chloromethane (3.3 µg/L), trichlorofluoromethane (27 µg/L), and toluene (6.5 µg/L). Trichlorofluoromethane and 1,2-dichloroethane were also detected at concentrations less than 1 µg/L in water from a stream near the fire training area.

Fuels and lubricants have been, and continue to be, stored at several locations on Nyman Peninsula (Area 6). Seven large above-ground storage tanks contain jet fuel, oil, and waste oil and have underground distribution lines. Within Area 6 are other storage areas for fuel and non-fuel chemicals (Areas 7 and 17) and batteries (Area 8). Nine of 52 soil samples had detectable concentrations of TPH, but only one sample had detectable concentrations of toluene and xylenes. Some of the organic constituents detected in ground water include benzene, toluene, ethylbenzene, xylenes, chloroform and 1,2-dichloroethane. The highest concentrations observed were 17 µg/L benzene, 15 µg/L toluene, 33 µg/L ethylbenzene, 33 and 140 µg/L m-xylene and o- & p-xylenes, 31 µg/L chloroform, and 1.9 µg/L 1,2-dichloroethane. Surface-water samples had few organic constituents at concentrations above reporting levels. Benzene, ethylbenzene, and xylenes were not detected in any surface-water samples. The highest concentrations of toluene and chloroform detected in surface water were 0.3 and 5.5 µg/L, respectively.

Two former drum-storage areas made up Area 7, which is within the fuel-storage tank area (Area 6) on Nyman Peninsula. Benzene was detected in two wells at concentrations as great as 8.3 and 17 µg/L, but concentrations in both wells were also below detection levels (0.7 µg/L) at other times. One of these wells yielded water having dissolved lead concentrations of 0.19 and 0.11 mg/L.

Two battery storage areas make up Area 8, which is in the fuel storage tank area (Area 6). The highest lead concentration in ground water was 0.005 mg/L and all observed concentrations of mercury were <0.0001 mg/L. The lowest observed pH was 5.8 units and was from water from an upgradient well.

Aviation gasoline was stored at the eastern end of Nyman Peninsula (Area 9). The highest concentration of TPH found in soils in Area 9 was 170 mg/kg. One well yielded water containing as much as 0.02 mg/L lead, 15 µg/L benzene, 76 µg/L toluene, 250 µg/L ethylbenzene, 150 µg/L

m-xylene, and 150 µg/L o- & p-xylenes. Water from another well had trichloroethene and tetrachloroethene concentrations as high as 66 and 20 µg/L, respectively.

A well at the air station (Area 10) near where jet fuel was spilled in 1987 yielded water having concentrations as high as 78 µg/L benzene, 18 µg/L toluene, 140 µg/L ethylbenzene, 55 µg/L m-xylene, 170 µg/L o- & p-xylenes, and 9.2 mg/L TPH.

No wells were drilled near a paint plant (Area 11) on the air station or a drum disposal site (Area 13) north of Buskin Lake because surveys made using an organic vapor analyzer found that readings in air and in soils were at background levels.

No organic constituents were detected in ground water from two wells at a drum disposal site (Area 12) west of Buskin Lake, but a soil sample contained 130 mg/kg TPH.

A well near a former quartermaster gasoline station (Area 14) yielded water having low concentrations of chloroform (1.5 µg/L).

A well near another former gasoline station (Area 15) yielded water having concentrations of bromodichloromethane as high as 1.5 µg/L and chloroform as high as 24 µg/L.

Thirteen wells were drilled near the airport (Area 16). Toluene was detected only in water from one well at a concentration of 6.5 µg/L.

The concentration of TPH was 17 mg/L in water from a well in an area where paints are stored (Area 17). No volatile organic compounds or lead were detected in water from the well.

The only organic constituent detected in water from wells near a metal-disposal site (Area 18) was 1,2-dichloroethane. No PCB's were detected.

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APPENDIXES 1-7

1. Description of methods used to analyze soil and water
 2. Physical and chemical characteristics of soil and lake-bed material
 3. Physical and chemical characteristics of ground water
 4. Physical and chemical characteristics of surface water
 5. Ground-water levels
 6. Surface-water data-collection sites and miscellaneous streamflow measurements, U.S. Coast Guard Support Center Kodiak
 7. Water-surface elevations of selected streams and lakes, U.S. Coast Guard Support Center Kodiak
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ALL APPENDIXES ARE ON DISKS

Data Disk Information

On disk 1 there is an ASCII file named README.TXT. It says:

This text file contains an overview of the files available on these data disks.

Report title:

Hydrologic and water-quality data for U.S. Coast Guard Support Center Kodiak, Alaska, 1987-89
by R.L. Glass, 1996

U.S. Geological Survey Open File Report 96-498

For additional information write to:

District Chief
US Geological Survey
4230 University Drive, Suite 201
Anchorage, Alaska, 99508-4664

These disks contain the data from the appendixes. They are 3.5-inch, 1.44 megabyte disks formatted with the IBM PC operating system MS-DOS. Data tables are written in ASCII format with semicolons delimiting data columns with .TXT extension. Descriptions of the contents of each data file are included in ASCII files with .HDR extension. For example, the contents of Appendix 1 are described in the file APPEND1.HDR and the data are in APPEND1.TXT

A list of the appendixes is given on the next page and a paper copy of the first page of each appendix is given on the following pages, as samples.

Explanation of the appendixes on the disks:

Appendix No.	Disk No.	File name	File description
1	1	APPEND1.HDR	Describes contents of APPEND1.TXT
1	1	APPEND1.TXT	Analytical methods used to analyze soil and water
2	1	APPEND2.HDR	Describes contents of APPEND2.TXT
2	1	APPEND2.TXT	Physical and chemical characteristics of soil and lake-bed
3	1	APPEND3.HDR	Describes contents of APPEND3.TXT
3A	1	APPEND3A.TXT	Physical and chemical characteristics of ground water
3B	2	APPEND3B.TXT	Physical and chemical characteristics of ground water
3C	2	APPEND3C.TXT	Physical and chemical characteristics of ground water
4	3	APPEND4.HDR	Describes contents of APPEND4.TXT
4A	3	APPEND4A.TXT	Physical and chemical characteristics of surface water
4B	3	APPEND4B.TXT	Physical and chemical characteristics of surface water
5	1	APPEND5.HDR	Describes contents of APPEND5.TXT
5	1	APPEND5.TXT	Ground-water levels
6	1	APPEND6.HDR	Describes contents of APPEND6.TXT
6	1	APPEND6.TXT	Streamflow measurements
7	1	APPEND7.HDR	Describes contents of APPEND7.TXT
7	1	APPEND7.TXT	Water-surface elevations of selected streams and lakes

APPENDIX 1 SAMPLE PAGE

Appendix 1.--Description of methods used to analyze soil and water

The ASCII file APPEND1.TXT is 429 lines and describes the methods used to analyze soil and water.

The first thirty six lines of the file APPEND1.TXT appear after the column-count line

1 2 3 4 5 6 7 8 9
12345678901234567890123456789012345678901234567890123456789012345678901234567890

Appendix 1.--Description of methods used to analyze soil and water

A129 or E300 - Common Anions

A method which utilizes an ion chromatograph to determine the concentrations of anions in water.

Anion	Reporting level (mg/L)
Chloride	0.5
Fluoride	0.5
Nitrate	0.5
Sulfate	0.5

A403 - Alkalinity

The alkalinity of a solution is defined as the capacity for solutes it contains to react with and neutralize acid. The property of alkalinity is determined by titration with strong acid, and the end point of the titration is the pH at which virtually all solutes contributing to alkalinity have reacted. In almost all natural waters the alkalinity is produced mainly by the dissolved carbon dioxide species, bicarbonate, carbonate and hydroxide. The titration end points used were at pH 4.5 and 8.3. The property of alkalinity is reported in terms of an equivalent calcium carbonate.

Property	Reporting level (mg/L)
Alkalinity, Total as CaCO ₃ at pH 4.5	5
Alkalinity, Bicarbonate at pH 4.5	5
Alkalinity, Carbonate at pH 8.3	5
Alkalinity, Hydroxide	5

APPENDIX 2 SAMPLE PAGE

Appendix 2.-Physical and chemical characteristics of soil and lake-bed material samples

The ASCII file APPEND2.TXT is 4,829 lines and contains the following semicolon-delimited data:

Column	Description of data within the column
1	...
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100	...

2-31	Surface-water site number and name used in report	
	DUPLICATE	a quality-assurance sample
34-39	Date. Year, month, day.	
	890223	February 23, 1989
41-51	Chemical Abstract Service (CAS) number without hyphens.	
	71432	71-43-2.
54-85	Physical or chemical characteristic analyzed	
88-94	Concentration or value	
	<	less than
	NR	less than reporting level
95-100	Reporting level	
	--	unknown
103-110	Unit	
	mg/kg	milligram per kilogram
	ug/ka	microgram per kilogram

The first thirty lines of the file APPEND1.TXT appear after the column-count line

[illegible]

APPENDIX 3 SAMPLE PAGE

Appendix 3.-Physical and chemical characteristics of ground water

The original ASCII file APPEND3.TXT was 18,960 lines and has been divided into three files which contain the following semicolon-delimited data:

Column	Description
2-11	Ground-water site number used in report DUPLICATE a quality-assurance duplicate sample
14-19	Date. Year/month/day. 890523 May 23, 1989
21-31	Chemical Abstract Service (CAS) number without hyphens. For example, 71432 represents 71-43-2. Numbers less than 1000 are not CAS numbers but are arbitrary numbers assigned to field-measured properties such as water temperature (10), specific conductance (95), ground-water level (237), and pH (400).
34-61	Physical or chemical characteristic analyzed
63-72	Concentration or value < less than - not specified or unknown
84-93	Unit uS/cm microsiemens per centimeter mg/L milligram per liter ug/L microgram per liter

APPEND3A.TXT contains water-quality results from wells A001 through A021A-DUPLICATE and is 5,383 lines
 APPEND3B.TXT contains water-quality results from wells A023A through A052-DUPLICATE and is 5,899 lines
 APPEND3C.TXT contains water-quality results from wells A053 through CG 4 and is 7,679 lines

The first thirty lines of the file APPEND3A.TXT appear after the column-count line

0	1	2	3	4	5	6	7	8	9	10
12345678901234567890123456789012345678901234567890123456789012345678901234567890										
Site no.	; Date	; CAS number	; Physical or chemical charact	; Concentrat	; Report L	; Unit				
A001	; 890523;	10;	Temperature	; 3	; -	; DEGREE C				
A001	; 890523;	95;	Specific conductance	; 58	; -	; uS/cm				
A001	; 890523;	400;	pH	; 7.3	; -	; STD UNITS				
A001	; 890523;	1003;	Chloride	; 3.5	; 0.7	; mg/L				
A001	; 890523;	1010;	Total Dissolved Solids	; 43.	; 10.	; mg/L				
A001	; 890523;	3035;	Sulfate	; 3.2	; 0.5	; mg/L				
A001	; 890523;	25900;	Nitrate as N	; < 0.5	; 0.5	; mg/L				
A001	; 890523;	56235;	Carbon tetrachloride	; < 0.60	; 0.60	; ug/L				
A001	; 890523;	66300;	Fluoride	; < 0.5	; 0.5	; mg/L				
A001	; 890523;	67663;	Chloroform	; < 0.30	; 0.30	; ug/L				
A001	; 890523;	71432;	Benzene	; < 0.70	; 0.70	; ug/L				
A001	; 890523;	71556;	1,1,1-Trichloroethane	; < 0.20	; 0.20	; ug/L				
A001	; 890523;	74839;	Bromomethane	; < 6.0	; 6.0	; ug/L				
A001	; 890523;	74873;	Chloromethane	; < 1.1	; 1.1	; ug/L				
A001	; 890523;	74953;	Dibromomethane	; < 5.0	; 5.0	; ug/L				
A001	; 890523;	75003;	Chloroethane	; < 3.0	; 3.0	; ug/L				
A001	; 890523;	75014;	Vinyl chloride	; < 0.60	; 0.60	; ug/L				
A001	; 890523;	75092;	Methylene chloride	; < 2.0	; 2.0	; ug/L				
A001	; 890523;	75252;	Bromoform	; < 1.0	; 1.0	; ug/L				
A001	; 890523;	75274;	Bromodichloromethane	; < 0.50	; 0.50	; ug/L				
A001	; 890523;	75343;	1,1-Dichloroethane	; < 0.40	; 0.40	; ug/L				
A001	; 890523;	75354;	1,1-Dichloroethene	; < 0.70	; 0.70	; ug/L				
A001	; 890523;	75694;	Trichlorofluoromethane	; < 5.0	; 5.0	; ug/L				
A001	; 890523;	75718;	Dichlorodifluoromethane	; < 9.0	; 9.0	; ug/L				
A001	; 890523;	78875;	1,2-Dichloropropane	; < 0.50	; 0.50	; ug/L				
A001	; 890523;	79005;	1,1,2-Trichloroethane	; < 0.20	; 0.20	; ug/L				
A001	; 890523;	79016;	Trichloroethene	; < 0.60	; 0.60	; ug/L				
A001	; 890523;	79345;	1,1,2,2-Tetrachloroethane	; < 1.4	; 1.4	; ug/L				
A001	; 890523;	95501;	1,2-Dichlorobenzene	; < 0.50	; 0.50	; ug/L				

APPENDIX 4 SAMPLE PAGE

Appendix 4.-Physical and chemical characteristics of surface water

The original ASCII file APPEND4.TXT was 9,548 lines and has been divided into two files that contains the following semicolon-delimited data:

Column	Description
2-35	Surface-water site number and name used in report
	DUPLICATE A quality-assurance duplicate sample
38-43	Date. Year/month/day
	870728 July 28, 1987
45-55	Chemical Abstract Service (CAS) number without hyphens. For example, 71432 represents 71-43-2. Numbers less than 1000 are not CAS numbers but are arbitrary numbers assigned to field-measured properties such as water temperature (10), stream discharge (61), specific conductance (95), and pH (400).
58-87	Physical or chemical characteristic analyzed
89-98	Concentration or value
	< Less than
	E Estimated
100-107	Reporting level
	-- Unknown
110-120	Unit
	FT3/S cubic feet per second
	uS/cm microsiemens per centimeter
	mg/L milligram per liter
	ug/L microgram per liter

APPEND4A.TXT contains water-quality results from surface-water sites 1 through 30 and is 4,961 lines
APPEND4B.TXT contains water-quality results from surface-water sites 31 through TW 2 and is 4,587 lines

The first thirty lines of the file APPEND4A.TXT appear after the column-count line

[illegible]

APPENDIX 5 SAMPLE PAGE

Appendix 5.-Ground-water levels

The ASCII file APPEND5.TXT is 1,627 lines and contains the following data.

Column	Description
-----	-----
2-6	Well name used in report
10-15	Date of water-level measurement. Year, month, day
	890521 May 21, 1989
17-22	Water level, in feet below land surface. Negative values represent water levels above land surface.
25	Status of well at time of measurement
	D Dry
	O Obstruction (Ice is a common obstruction during winter)
	R Recently pumped or bailed
	W Well destroyed
	- No remarks
28	Method of water-level measurement
	E Estimated
	S Steel tape
	T Electric tape
	- No remarks

Below the column-count line are the first thirty lines of the file APPEND5.TXT

```

-----
      1      2      3
123456789012345678901234567890

Site ; Date ;   GWL ;St;Method
A001 ; 890521;  8.31; -; T
A001 ; 890522;  8.53; -; S
A001 ; 890523;  8.43; -; S
A001A ; 890521;  5.38; -; S
A001A ; 890522;  5.27; -; S
A001A ; 890523;  5.31; -; T
A002 ; 880116;  4.36; -; S
A002 ; 880226;  -   ; D; -
A002 ; 880419;  -   ; W; -
A002A ; 880503;  -   ; D; S
A002A ; 880614;  -   ; D; S
A002A ; 880830;  1.31; -; S
A002A ; 880928;  2.08; -; S
A002A ; 880930;  4.00; -; S
A002A ; 881002;  0.40; -; S
A002A ; 881003;  0.65; R; S
A002A ; 881012;  1.51; -; S
A002A ; 881108;  -   ; D; T
A002A ; 881205;  -   ; D; -
A002A ; 890109;  6.88; -; T
A002A ; 890206;  -   ; D; -
A002A ; 890304;  -   ; D; -
A002A ; 890521;  6.88; -; T
A002A ; 890522;  -   ; D; -
A003 ; 880115;  4.05; -; S
A003 ; 880226;  4.05; -; S
A003 ; 880503;  6.05; -; S
A003 ; 880503;  6.11; R; T
A003 ; 880614;  7.40; -; S

```

APPENDIX 6 SAMPLE PAGE

Appendix 6.-Surface-water data-collection sites and miscellaneous streamflow measurements,
U.S. Coast Guard Support Center Kodiak

The ASCII file APPEND6.TXT is 132 lines and contains the following semicolon-delimited data:

Column	Description
-----	-----
2-3	Map site number used in report
6-20	USGS Station number
24-70	Station name
72-78	Drainage area, square miles
81-88	Date. Year/month/day
	19870728 July 28, 1987
92-99	Discharge, cubic feet per second
E	Estimated
--	No data
<	Less than
a	Variable flow, 0.01-0.5 ft ³ /s
b	Indirect measurement of maximum discharge

The first thirty lines of the file APPEND6.TXT appear after the column-count line

0	1	2	3	4	5	6	7	8	9	0
12345678901234567890123456789012345678901234567890123456789012345678901234567890										
Sit;	Station number		Station name				DArea		Date	Discharge
1	;	574658152332600	;	Buskin Lake Tributary (North-northwest)			;	--	;	19870728 ; E0.60
2	;	574654152333600	;	Buskin Lake Tributary (Northwest)			;	--	;	19870728 ; 7.6
3	;	574646152333700	;	Buskin Lake Tributary (West)			;	--	;	19870728 ; 0.45
4	;	574640152324600	;	Buskin Lake (Station 1)			;	--	;	-- ; --
5	;	574640152312300	;	Bear Creek at mouth			;	3.35	;	19890224 ; 2.4
6	;	574638152331000	;	Buskin Lake (Station 2)			;	--	;	-- ; --
7	;	574636152314200	;	Buskin River below lake			;	12.0	;	19590717 ; 43
7	;	574636152314200	;	Buskin River below lake			;	12.0	;	19870728 ; 48
7	;	574636152314200	;	Buskin River below lake			;	12.0	;	19870819 ; 20
7	;	574636152314200	;	Buskin River below lake			;	12.0	;	19880510 ; 191
7	;	574636152314200	;	Buskin River below lake			;	12.0	;	19880724 ; 87
7	;	574636152314200	;	Buskin River below lake			;	12.0	;	19890224 ; 16
8	;	574635152283400	;	Unnamed Creek at Building 477 above substation			;	--	;	19870731 ; E<0.01
8	;	574635152283400	;	Unnamed Creek at Building 477 above substation			;	--	;	19880719 ; 0.02
9	;	574633152283400	;	Unnamed Creek above Building 477 Road			;	--	;	19870730 ; E0.20
10	;	574633152283800	;	Unnamed Creek below Transformer Substation			;	--	;	19870730 ; E0.40
11	;	574635152300500	;	Alder Creek at BB Road			;	--	;	19890224 ; 1.1
12	;	574638152333000	;	Buskin Lake Tributary (Southwest 1)			;	--	;	19870729 ; 18
13	;	574637152332800	;	Buskin Lake Tributary (Southwest 2)			;	--	;	19870729 ; 3.0
14	;	574628152310400	;	Buskin River 0.9 mile below Buskin Lake			;	--	;	19890224 ; 18
15	;	574624152303200	;	Alder Creek at G Road			;	1.49	;	19880510 ; 21
15	;	574624152303200	;	Alder Creek at G Road			;	1.49	;	19880724 ; 4.4
15	;	574624152303200	;	Alder Creek at G Road			;	1.49	;	19880816 ; 0
15	;	574624152303200	;	Alder Creek at G Road			;	1.49	;	19890224 ; 0
16	;	574612152304500	;	Unnamed Tributary 1 to Buskin River			;	--	;	19870728 ; E0.04
16	;	574612152304500	;	Unnamed Tributary 1 to Buskin River			;	--	;	19870819 ; 0
16	;	574612152304500	;	Unnamed Tributary 1 to Buskin River			;	--	;	19890224 ; 0
17	;	574612152304300	;	Buskin River 1.3 mile below Buskin Lake			;	17.4	;	19870728 ; 49
17	;	574612152304300	;	Buskin River 1.3 mile below Buskin Lake			;	17.4	;	19870819 ; 18

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The file APPEND7.TXT is an ASCII file that contains the following semicolon-delimited data:

2-3	Surface-water site number
6-42	Surface-water site name
45-50	Date. Year/month/day. 890223 represents February 23, 1989
53-56	Time. Hour/minute. 1605 represents 4:05 pm
59-65	Stage, in feet above sea level: a, stage elevation affected by backwater from ice

The file APPEND7.TXT is 185 lines

The thirty lines of the file APPEND7.TXT appear after the column-count line

Sit	Station name	Date	Time	Stage
7	Buskin River below lake	880724;	1605;	65.95
7	Buskin River below lake	880816;	1715;	64.64
7	Buskin River below lake	880817;	1059;	64.69
7	Buskin River below lake	880830;	1420;	65.65
7	Buskin River below lake	880928;	1758;	65.15
7	Buskin River below lake	881108;	1719;	64.88
7	Buskin River below lake	881205;	1140;	a64.70
7	Buskin River below lake	890109;	1620;	a64.63
7	Buskin River below lake	890224;	1040;	64.35
7	Buskin River below lake	890427;	1913;	65.10
21;	Buskin River at Bridge 6	880724;	1627;	26.23
21;	Buskin River at Bridge 6	880816;	1355;	25.83
21;	Buskin River at Bridge 6	880816;	1720;	25.82
21;	Buskin River at Bridge 6	880817;	1020;	26.10
21;	Buskin River at Bridge 6	880824;	1215;	26.12
21;	Buskin River at Bridge 6	880830;	1414;	26.96
21;	Buskin River at Bridge 6	880928;	1804;	26.44
21;	Buskin River at Bridge 6	881108;	1725;	26.59
21;	Buskin River at Bridge 6	881205;	1150;	a25.78
21;	Buskin River at Bridge 6	890109;	1640;	a25.82
21;	Buskin River at Bridge 6	890224;	1340;	25.38
21;	Buskin River at Bridge 6	890427;	1918;	26.77
29;	Buskin River at Kodiak Island Highway;	880510;	1240;	20.25
29;	Buskin River at Kodiak Island Highway;	880512;	1020;	20.68
29;	Buskin River at Kodiak Island Highway;	880512;	1120;	20.74
29;	Buskin River at Kodiak Island Highway;	880614;	1230;	20.12
29;	Buskin River at Kodiak Island Highway;	880630;	0940;	19.81
29;	Buskin River at Kodiak Island Highway;	880630;	2210;	19.78
29;	Buskin River at Kodiak Island Highway;	880701;	1045;	19.74
29;	Buskin River at Kodiak Island Highway;	880715;	1900;	19.74