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Report of Investigations 93-2

GROUND-WATER QUALITY DATA COLLECTED FROM 30 WELLS IN JULY 1991, WEST NIKISKI, ALASKA

BY
Mary A. Maurer

STATE OF ALASKA
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GROUND-WATER QUALITY DATA COLLECTED FROM 30 WELLS IN JULY 1991, WEST NIKISKI, ALASKA

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INTRODUCTION

The Alaska Department of Natural Resources, Division of Water (DOW) began a ground-water study of the west Nikiski area (fig. 1) on the Kenai Peninsula in 1990. This report summarizes results of onsite and laboratory analyses of ground water collected from 30 wells in July 199 1.

The Kenai Peninsula Ground-Water Task Force developed a four-phase project plan to study the ground water of the Kenai Peninsula (KPGWTF, 1990a). Phase I, completed in 199 1, consisted of mapping and listing existing U.S. Geological Survey (USGS) water-quality data (Bullington, 1991). Phase II will examine the regional ground-water quality and flow systems (KPGWTF, 1990b). Phase III consists of detailed subsurface geologic, water-table, and water-quality mapping at the subregional scale (KPGWTF, undated). Phase IV will include long-term monitoring, ground-water protection, and educational activities.

KPGWTF selected the west Nikiski area as the first phase III project because (1) most residents and businesses rely on ground water as a water supply, and (2) ground-water contamination has been identified there (Harding Lawson Inc., 1989). The water-quality objectives of this phase IIIA pilot project are to:

1. Survey ground-water quality by conducting onsite measurements of key water-quality properties and constituents

2. Collect ground-water samples and analyze them for selected inorganic, organic, and radioactive constituents

3. Show selected water-quality constituent concentrations on maps by using all available field and laboratory data

4. Describe ground-water quality in the west Nikiski area.

This report presents and evaluates the laboratory and onsite water quality results collected for objective 2.

ACKNOWLEDGMENTS

The author thanks the members of the KPGWTF who helped to develop the project, the Kenai Peninsula Borough, Alaska Oil and Gas Association, Unocal Oil and Gas, Unocal Chemical, ARCO Alaska Inc., Marathon Oil Company, Phillips Petroleum Company, and Tesoro Alaska Petroleum Corporation for providing partial project funding.

Roy Glass (USGS), William Petrik, Roger Allely, Richard Noll, Stephen Weems, and Kellie Litzen (DOW), Jim Jurgens (ADNR-Division of Management), and Hans Schweiger (student intern) assisted with data collection. Roy Glass (USGS), James Munter (DOW), and Jean Bodeau, Alaska Department of Environmental Conservation (ADEC), reviewed and edited the report. I also thank the Nikiski area property owners who graciously allowed access to their property for water-quality data collection.

[1]Division of Water, Alaska Hydrologic Survey, P.O. Box 772116, Eagle River, AK 99577.

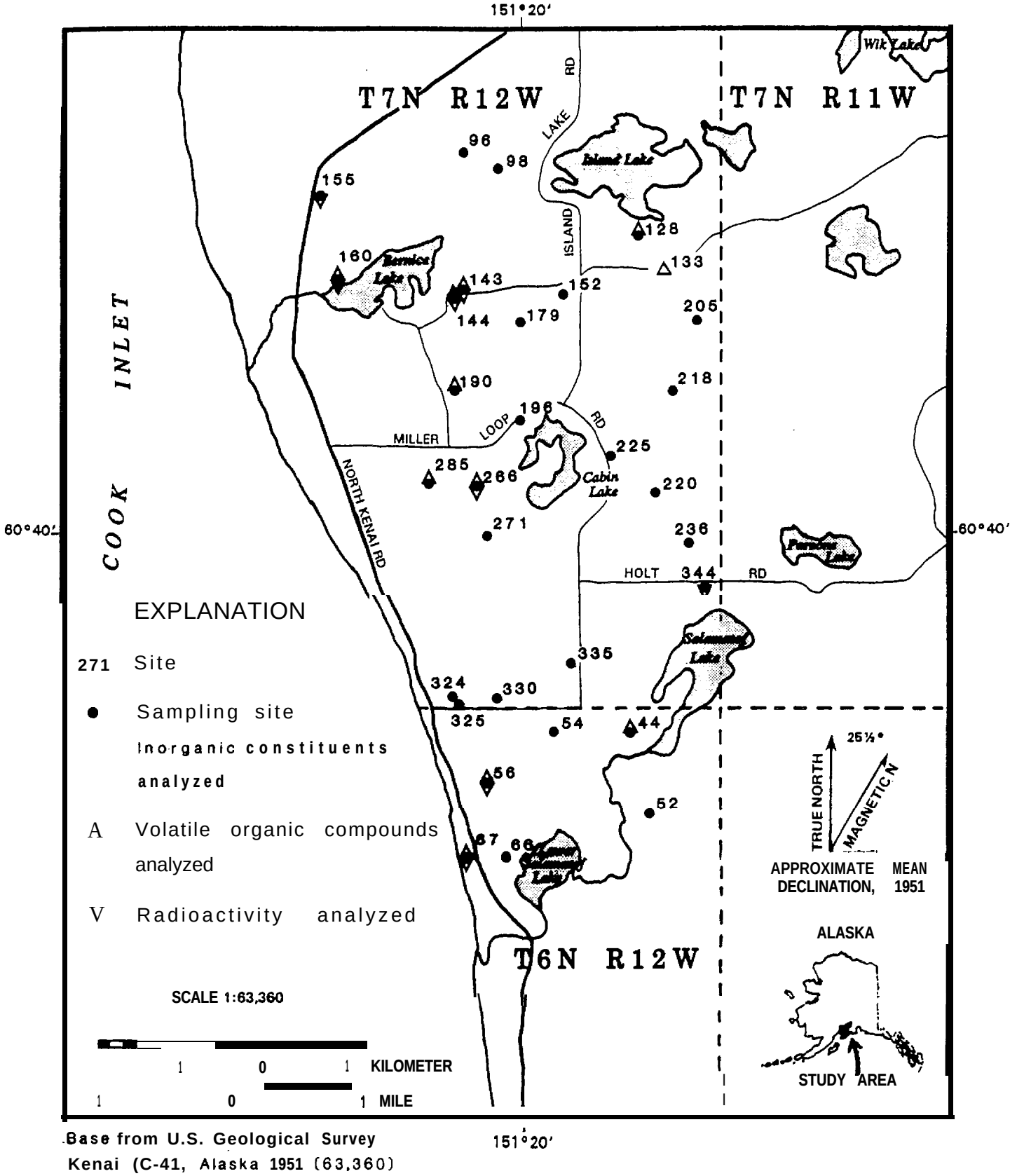


Figure 1. *Location of water-quality sample sites, west* Nikiski *area, Alaska.*

PREVIOUS INVESTIGATIONS

Previous ground-water investigations in the Nikiski area include Anderson and Jones (1972), Howland and Freethey (1978), and Nelson (1981). Three major aquifers were described by Nelson (1981): an unconfined aquifer, an upper confined aquifer, and a lower confined aquifer. The unconfined aquifer is composed of coarse sand and gravel with some silt. It ranges in depth from about 5 to 100 ft below land surface (Anderson and Jones, 1972). Most domestic wells in the Nikiski area tap this aquifer, which is underlain by a silt, clay, and sand unit that is termed the upper confining layer (Nelson, 1981). The upper confined aquifer, composed of sand, gravel, and silty interbeds, ranges in depth from about 100 A to more than 300 A below land surface; several industrial wells tap this aquifer. It is underlain by a silt and clay confining unit which is generally more than 100 ft thick. The lower confined aquifer is poorly defined but may consist of interconnected sand and gravel layers.

Even though the aquifers have been previously studied and identified, ground-water flow directions and the quality of water in the aquifers are poorly understood.

SAMPLING AND ANALYTICAL PROCEDURES

Most water samples were taken from private domestic wells that were in daily use at the time of sampling. When possible, water samples were collected before they passed through water pressure tanks. If the tanks could not be bypassed, the tank volume was added to the total volume of water needed to be purged to obtain a sample representative of the well's aquifer. All water-treatment systems were bypassed.

A detailed description of sampling and analytical equipment and procedures is given in the quality-assurance plan (QAP) for this project (Maurer, 1991). Initially, a water-level measurement was taken in each well before turning on any faucet. An outside spigot was then turned on to purge water from the well casing. A Y-shaped valved adapter was attached to the spigot and split the waterflow into a long hose for purging and a short hose for monitoring and sampling. A model-4041 Hydrolab, fitted with a flow cell, continually monitored the water's temperature, pH, and specific conductance during purging. Water for onsite and laboratory tests was collected only when at least four well casing volumes were purged and when pH and specific conductance fluctuated no more than 5 percent. Onsite total alkalinity was determined by potentiometric titration with Gran's graphical methods (Stumm and Morgan, 1981). Onsite analyses of total iron, total hardness, and nitrate-nitrogen concentrations were made using test kits manufactured by Hach Company, of Loveland, Colorado.

The actual sampling method differed only slightly from that outlined in the QAP. Radiological sample bottles and total trace element (iron and manganese) samples were filled from the outlet of the short hose. Water for dissolved major-ion and trace-element analyses was filtered by using an in-line filtration system. Silicone tubing attached to the outlet of the short hose carried water into a 142-mm Geotech filter assembly containing a 0.45-µm membrane filter. After the filter and assembly were flushed with about 1 liter of filtrate, the sample bottles for dissolved constituents were filled. Two volatile organic compound (VOC) septum vials were filled directly from the spigot. All other preservation and handling procedures were done according to QAP specifications.

Inorganic constituent analyses of 36 water sample sets were conducted at the DOW Water Quality Laboratory in Fairbanks, Alaska; 11 VOC samples were analyzed at Northern Testing Laboratories in Anchorage. Nine gross-alpha and gross-beta radioactivity samples were analyzed at Core Laboratories in Casper, Wyoming. Laboratory quality-control procedures, data-quality objectives, and analytical methods are given in Maurer (1991).

WATER-OUALITY STANDARDS

The State of Alaska Drinking-Water Regulations (ADEC, 1991) specify the maximum concentration or level of a contaminant for public water systems (app. A). A contaminant is defined as any physical, chemical, biological, or radiological substance or material in water which, in sufficient quantity, makes water unfit for human consumption (ADEC, 1991). A primary maximum contaminant concentration level (PMCL) is health

related and is legally enforceable for suppliers of public drinking water. A secondary maximum contaminant concentration level (SMCL) applies to the aesthetic qualities of drinking water and is a recommended guideline for public water suppliers. Concentrations are reported in milligrams per liter (mg/l) or micrograms per liter (µg/l). The conversion is 1,000 µg/l = 1 mg/l; and 1 mg/l is about 1 part per million (ppm).

RESULTS AND DISCUSSION

A listing of sampled wells, site numbers, and well characteristics is shown in table 1. Site numbers were arbitrarily assigned for this study, whereas the 'local well number' is based on the rectangular subdivision of public lands (app. B) and is a unique site identifier used by both the USGS and DOW. Well depths ranged from 3 1 to 303 A.

Table 1. *Sampled wells* in *Township 6 North, Range 12 West, Sections 1, 2, 11 and Township 7 North, Range 12 West, Sections 11, 13-15, 23-27, 35, 36 Seward Meridian*

Site[1]	Local well no.[2]	Altitude of land surface (ft above sea level)	Well depth[3] (ft)	Legal property description
44	SB00601201BACA2 004	102	31	NIKISHKA, L1 B12
52	SB00601201CDAA1 008	104	34	BETTYANN'S ACR., GOGGIA ADD.#2, L1D B3
54	SB00601202AACD1 008	107	46	KISKA, L7
56	SB00601202CABB1 009	103	65	INDUSTRIAL PARK, L5 B2
66	SB00601211BAAC1 012	93	87	MONFOR #1, L1
67	SB00601211BBBD1 011	94	303	REDOUBT VIEW, L1A B1
96	SB00701211CCBD1 008	152	97	ARBOR ESTATES, L4 B2
98	SB00701211CDCC1 037	152	96	TIKCHIK ESTATES, L3
128	SB00701213BDDC1 016	138	59	MILLER'S HIDE-AWAY, L14 B3
133[4]	SB00701213DBCD1 023	151	70	CACHE, L17
143	SB00701214CCBD1 015	132	75	ROSS, ADDITION #1, L11 B3
144	SB00701214CCCB1 002	122	60	ROSS, GIBSON ADDITION, L4A
152	SB00701214DDCA1 018	140	55	ERNST, L2
155	SB00701215BBCB1 011	122	51.2	TACHATNA PARK, L5 B1
160	SB00701215CCAB1 010	78	130	GALEN GRAY #2, TR. A, B4
179	SB00701223ABBC1 017	141	67.5	WELAKA LAKE ACRES, TR. 4
190	SB00701223CBBC1 002	112	36	VAN SKY HOMESTEAD
196	SB00701223DCBC1 010	131	110	CAD ESTATES, TR. D
205	SB00701224AABD1 016	154	58.5	BASTIEN-HOOVER L1C B3
218	SB00701224DBAC1 005	128	45	WHITE, L3
220	SB00701225ACBA1 021	134	59	SUNSHINE ESTATES, L1 B3
225	SB00701225BBAC1 028	123	58	REAL DEVELOPMENT, L1 B1
236	SB00701225DACC1 027	131	39	GARNET, TR. D2
266	SB00701226BCAA1 039	131	55	McCAUGHEY, TR. 1, B2
271	SB00701226CACB1 024	105	128	McCAUGHEY #4, L2E-1
285	SB00701227ADBA1 027	123	63	FORELANDS ACRES, L12 B1
324	SB00701235CCCB1 015	108	84.5	FOREST LANE ESTATES, L6
325	SB00701235CCCC2 004	102	82	McCONNELL, L2
330	SB00701235CDCA3 018	96	40	FIREWEED ESTATES, L17
335	SB00701235DADB1 037	116	56	FOLEY ESTATES, L1 B2
344	SB00701236AAAB1 006	122	155	NORTH STAR ELEMENTARY SCHOOL, HOLT RD.

'Numbers arbitrarily assigned for this project, see fig. 1 for location.

'The local well number is based on the official rectangular subdivision of public lands, see app. B.

[3]Distance from land surface to bottom of hole, in feet.

[4]Site 133 was measured and sampled by U.S. Geological Survey. AK Div. of Water submitted volatile organic compound sample for analysis, see app. C.

ONSITE MEASUREMENTS AND ANALYSES

Results from onsite measurements and analyses are shown in table 2. Water levels ranged from 9.82 to 96.71 ft below land surface. Water temperature ranged from 3.1 to 7.8°C. Specific conductance was typically less than 300 microsiemens per centimeter @S/cm), which is considered acceptable for domestic use. The pH values ranged widely and several sites were outside the SMCL range of pH 6.5-8.5 (ADEC, 1991); six sites had pH values of less than 6.5 and three sites had pH values of greater than 8.5. Total alkalinity ranged from 33 to 270 mg/l as $CaCO_3$, with a mean value of 69 mg/l and a median value of 59.5 mg/l. Total hardness ranged from 9 to 130 mg/l as $CaCO_3$, with a mean value of 49 mg/l and a median value of 44.5 mg/l. Water having a hardness value less than 60 mg/l is considered soft, 61-120 mg/l is considered moderately hard, and 121-180 mg/l is considered hard (Hem, 1985).

Total iron concentrations were highly variable, ranging from 0.1 to 14.4 mg/l. Concentrations of iron less than 0.3 mg/l are desired for domestic uses. Nitrate-nitrogen (NO, as N) concentrations were either undetectable or measured in concentrations less than 2 mg/l. Concentrations of nitrogen less thau 10 mg/l are desired for domestic uses.

LABORATORY ANALYSES

The results of the laboratory analyses for water samples from the 30 wells are shown in tables 3 and 4. Complete analytical reports for each laboratory are given in appendix C and the quality-assurance evaluation report for each laboratory is presented in appendix D.

Most laboratory-analyzed inorganic constituents and trace elements did not exceed the PMCLs promulgated in the Alaska Drinking Water Regulations (ADEC, 1991). For example, the nitrate-nitrogen concentration ranged from <0. 1 to 4.45 mg/l, substantially less than the nitrate PMCL of 10 mg/l as nitrogen. Arsenic has a PMCL of 50 µg/l. An arsenic concentration of 71 µg/l was measured from a sample collected at site 67 (fig. 1); the sampled well is located less than 100 A from the Cook Inlet bluff, and at 303 ft deep is completed in the lower confined aquifer (W.A. Petrik, oral commun., 1992). Arsenic concentrations in water from a few wells more than 200 ft deep in the west Nikiski area have exceeded 50 µg/l, based on USGS historical data (USGS, 1978). Although elevated arsenic concentrations may not be common in water from shallow wells in the Nikiski area, they do occur sporadically in ground water elsewhere on the Kenai Peninsula (USGS, 1992; Munter and Maurer, 1991).

Concentrations of total (unfiltered) and dissolved (filtered) iron and manganese were analyzed. Besides pH, iron and manganese were the only aualyzed inorganic constituents that had concentrations exceeding SMCLs (ADEC, 1991). Total iron concentrations ranged from 0.05 to 16.3 mg/l, and exceeded the SMCL of 0.3 mg/l at 22 sites. Total manganese concentrations ranged from <0.005 to 0.94 mg/l, and exceeded the SMCL of 0.05 mg/l at 20 sites. Dissolved iron and manganese concentrations exceeded their respective SMCLs at 19 sites. Both iron and manganese affect the taste and visual qualities of drinking water.

The absence of detectable VOCs in 10 of 11 ground-water samples suggests that VOC contamination is not an areawide problem in the residential west Nikiski area. The only detected VOC was 1,1 ,1-trichloroethane (table 4). A concentration of 0.7 µg/l was measured in a sample collected at site 143, 0.2 miles east of Bernice Lake (fig. 1). For comparison, the PMCL for l,l,l-trichloroethane is 200 µg/l (ADEC, 1991). The occurrence of 1,1 ,1-trichloroe-thane has been neither confirmed nor disproven with additional sampling.

The origin of 1,1,1-trichloroethane is unknown. No detectable concentrations of selected VOCs were measured at site 144, which is located about 300 ft southwest of and downgrade from site 143, according to water-table contour maps (R.D. Allely, oral commuu., 1992). Nevertheless, it is impossible to determine the origin or areal extent of 1, 1, 1 -trichloroethane in ground water based on the distribution of available analyses.

Water samples were collected from nine wells for radioactivity analysis (table 3). Total gross-alpha and total gross-beta radioactivities of sampled ground waters in the west Nikiski area were low compared to the PMCLs

Table 2. *Results from DOW* on-site *water-quality measurements and analyses, taken at sites for which laboratory results are available*

Site[1]	Date	1991 Water level (ft)[2]	Water temp. (°C)	Specific conductance (µS/cm)	pH	Total iron[3] (mg/l)	Total nitrte[4] (mg/l as N)	Total hardness[5] (mg/l as $CaCO_3$)	Total alkalinity (mg/l as $CaCO_3$)
44	7-09-91	17.47	6.4	116	6.4	7.8	<0.20	35	55
52	7-18-91	16.09	4.3	77	6.7	3.2	<0.02	32	33
						10.0	<0.02	72	
56	7-17-91	39.32	3.7	121	7.0	7.8	co.02	39	50
54	7-19-91	27.07	3.6	179	6.6				80
66	7-22-91	9.82	5.8	121	6.9	8.4	<0.02	36	60
67	7-19-91	96.71	4.5	1473	8.6	0.8	<0.02	35	270
96	7-24-91	58.37	4.9	201	6.5	2.1	0.42	50	80
98	7-23-91	59.87	5.0	138	7.6	0.7	<0.02	55	68
128	7-12-91	46.36	4.8	126	6.4	0.4	0.80	52	46
143	7-20-91	39.08	4.3	90	6.6	2.7	<0.02	37	34
144	7-09-91	34.41	4.0	116	7.0	5.2	0.20	36	55
152	7-21-91	36.13	5.7	186	6.3	0.2	0.70	73	67
155	7-22-91	35.60	4.5	327	6.9	14.4	<0.02	130	150
160	7-20-91	20.02	5.8	195	7.9	4.1	<0.02	9	87
179	7-10-91	40.61	3.1	117	7.1	4.1	<0.02	37	45
190	7-11-91	16.79	5.9	127	6.7	7.1	<0.02	11	41
196	7-10-91	NM[6]	4.8	254	7.8	0.8	<0.02	110	117
205	7-16-91	48.01	5.9	160	6.3	0.3	0.21	70	77
218	7-16-91	24.31	7.8	85	6.5	0.3	0.24	30	34
220	7-15-91	33.63	5.1	105	6.5	1.6	0.04	38	36
225	7-15-91	39.67	3.8	146	5.9	1.2	0.25	44	48[7]
236	7-15-91	23.98	4.8	82	6.5	1.0	<0.20	34	33
266	7-09-91	34.77	4.6	171	7.0	6.2	<0.02	59	72
271	7-13-91	36.37	6.4	126	8.6	0.4	<0.02	52	63
285	7-10-91	NM[6]	4.5	144	7.1	5.0	<0.02	49	59
324	7-12-91	64.79	3.6	123	8.4	0.4	<0.02	56	62
325	7-17-91	59.39	5.4	201	7.4	4.1	<0.02	50	99
330	7-18-91	25.24	6.7	167	6.0	0.1	1.1	56	44
335	7-17-91	26.86	4.2	94	7.0	5.0	0.02	32	40
344	7-23-91	22.92	4.9	143	8.7	1.2	<0.02	45	70
MCL[8]					6.5-8.5	0.3	10		

'Numbers arbitrarily assigned for this project, see fig. 1 for location.
[2]Distance below land surface, in feet.
'Total iron concentrations were determined onsite with Hach iron test kit, model IR-18B.
'Nitrate concentrations were determined onsite with Hach low range nitrate test kit, Model NI-14.
[5]Total hardness concentrations were determined onsite with Hach total hardness test kit, model HA-DT.
[6]NM = not measured.
'Total alkalinity collected and measured on 7-16-91.
[8]MCL = Maximum contaminant level (State of Alaska Drinking Water Regulations, 18 AAC 80).
Shaded area = value or concentration exceeds the MCL.

promulgated in the Alaska Drinking Water Regulations (ADEC, 199 1). Gross-alpha radioactivity has a PMCL of 15 picocuries per liter (pCi/l), and gross-beta radioactivity has a PMCL of 50 pCi/l. All total gross-alpha radioactivity concentrations were less than the lower limit of detection (LLD), which ranged from 1.9 to 15.8 pCi/l. Most total gross-beta radioactivity results are reported as less than the LLD concentrations.

Total gross-alpha and gross-beta particle count, error, and LLD concentrations in pCi/l are shown in appendix C. The 'error, ±' is the analytical and counting error associated with the particle count. The LLD concentration is the result of background alpha and beta particle interferences. The total gross-alpha and total

Table 3. *Results from laboratory analyses for inorganic and radioactivity constituents*

Site	Calcium, dissolved (mg/l)	Magnesium, dissolved (mg/l)	Sodium, dissolved (mg/l)	Potassium, dissolved (mg/l)	Sulfate, dissolved (mg/l)	Chloride, dissolved (mg/l)	Fluoride, dissolved (mg/l)	Nitrate + Nitrite, dissolved (mg/l)	Phosphate, dissolved (mg/l)	Gross Alpha, total (pCi/l)	Gross Beta, total (pCi/l)	Aluminum, dissolved (µg/l)	Arsenic, dissolved (µg/l)
44	9.82	2.83	3.65	0.91	0.09	3.39	0.14	<0.1	<0.1			13	<1.0
52	6.71	2.07	3.88	1.06	4.54	4.27	0.11	<0.1	<0.1			<5	<1.0
54	17.1	3.98	6.62	2.10	1.13	4.94	0.20	<0.1	<0.1			<5	<1.0
56	9.91	2.77	4.19	1.65	<0.01	4.84	0.15	<0.1	<0.1	<2.2	<2.5	33	<1.0
66	8.66	3.15	3.92	1.52	<0.01	4.38	0.13	<0.1	<0.1			59	<1.0
67	3.39	4.35	201	8.90	42.0	93.9	<0.01	<0.1	4.7	<15.8	11.3 ± 6.8	100	71
96	21.6	6.19	7.84	2.88	5.63	9.88	0.22	1.18	<0.1			34	<1.0
98	14.2	3.76	6.24	4.02	1.58	4.34	0.19	<0.1	0.2			46	9.9
128	14.2	3.40	6.13	1.42	2.92	8.02	0.16	1.62	<0.1			8	<1.0
143	8.17	2.55	5.76	1.82	6.42	7.91	0.13	<0.1	<0.1	<1.9	<2.7	12	<1.0
144	8.74	3.43	5.17	1.28	2.95	6.38	0.14	<0.1	<0.1	<2.0	<2.7	6	<1.0
152	21.0	5.04	7.34	2.17	2.45	6.70	0.21	4.45	<0.1			<5	<1.0
155	30.4	11.6	9.50	3.16	3.16	4.85	0.31	<0.1	<0.1	<4.1	<3.0	<5	<1.0
160	24.3	4.77	4.27	1.15	8.15	6.69	0.22	<0.1	<0.1	<2.7	<2.8	<5	<1.0
179	9.86	2.98	4.32	1.44	4.57	5.87	0.14	<0.1	<0.1			39	<1.0
190	3.40	0.99	15.2	0.99	13.6	8.46	0.14	<0.1	<0.1			9	9.0
196	36.6	6.92	6.07	2.53	9.25	5.53	0.27	<0.1	<0.1			6	1.8
205	21.4	4.70	6.82	2.01	2.91	4.87	0.21	0.41	<0.1			44	<1.0
218	9.88	1.87	3.68	1.52	4.75	3.05	0.13	0.46	<0.1			7	<1.0
220	9.41	2.61	4.65	1.66	3.78	9.61	0.13	0.32	<0.1			18	<1.0
225	12.4	2.77	5.94	1.49	2.95	4.47	0.17	0.55	<0.1			58	<1.0
236	8.34	1.74	4.44	1.14	2.73	5.01	0.13	0.30	<0.1			6	<1.0
266	16.0	4.70	5.94	1.67	6.07	6.47	0.19	<0.1	<0.1	<2.6	<2.5	9	<1.0
271	15.6	4.12	4.58	2.91	1.34	4.15	0.18	0.11	0.1			10	1.2
285	11.9	4.32	5.08	1.53	5.01	6.83	0.16	<0.1	<0.1			<5	<1.0
324	16.3	3.24	4.09	1.71	3.75	5.07	0.17	<0.1	<0.1			<5	<1.0
325	24.5	5.71	6.06	2.72	7.06	5.44	0.29	<0.1	<0.1			42	<1.0
330	16.4	3.79	8.21	1.89	5.45	14.0	0.19	2.72	<0.1			40	<1.0
335	7.06	2.55	3.98	1.40	3.02	6.37	0.12	<0.1	<0.1			54	<1.0
344	9.96	5.51	7.72	5.28	1.53	3.47	0.19	<0.1	0.2	<2.0	<2.3	43	10
MCL[1]			250		250	250	4.0	10	0.2	15	50		50

[1]MCL = maximum **contaminant** level **(State** of Alaska Drinking Water Regulations, 18 AAC 80).
Shaded area = **concentration** exceeds the MCL.

Table 3. *Results from laboratory analyses (cont.)*

Site	Barium, dissolved (µg/l)	Cadmium, dissolved (µg/l)	Chromium, dissolved (µg/l)	Copper, dissolved (µg/l)	Iron		Lead, dissolved (µg/l)	Manganese		Mercury, dissolved (µg/l)	Nickel, dissolved (µg/l)	Zinc, dissolved (µg/l)
					total (mg/l)	dissolved (mg/l)		total (mg/l)	dissolved (mg/l)			
44	<5	2.0	<1.0	3.5	8.17	7.86	7.5	0.31	0.31	<1	<10	<20
52	11	<1.0	<1.0	1.4	6.11	2.68	<1.0	0.09	0.08	<1	<10	<20
54	48	<1.0	<1.0	<1.0	10.19	9.61	1.1	0.21	0.21	<1	<10	230
56	28	<1.0	<1.0	<1.0	8.20	7.98	<1.0	0.27	0.27	<1	<10	<20
66	17	<1.0	<1.0	<1.0	8.93	9.07	<1.0	0.31	0.31	<1	<10	127
67	11	1.9	<1.0	4.1	6.66	0.38	10.4	0.11	0.03	<1	<10	28
96	12	<1.0	<1.0	10.0	1.19	1.13	1.5	0.04	0.02	<1	<10	<20
98	8	<1.0	<1.0	<1.0	3.48	co.03	<1.0	0.20	0.06	<1	<10	<20
128	<5	<1.0	<1.0	31.1	0.05	0.04	<1.o	co.005	co.005	<1	<10	<20
143	12	Cl.0	<1.0	<1.0	2.25	2.16	<1.0	0.07.	0.05	<1	<10	<20
144	28	<1.0	a.0	<1.0	5.27	5.11	<1.0	0.22	0.22	<1	<10	35
152	<5	<1.0	<1.0	31.4	0.35	co.03	1.5	co.005	co.005	<1	<10	<20
155	57	<1.0	<1.0	<1.0	16.3	16.2	1.4	0.94	0.94;	<1	<10	77
160	31	<1.0	<1.0	<1.0	4.49	4.48	1.4	0.65	0.64	<1	<10	<20
179	22	<1.0	<1.0	<1.0	4.24	3.99	<1.0	0.22	0.22	<1	<10	<20
190	17	<1.0	<1.0	<1.0	8.11	7.39	1.7	0.12	0.12	<1	<10	<20
196	15	<1.0	<1.0	<1.0	0.54	0.44	1.3	0.56	6.55	<1	<10	317
205	<5	<1.0	<1.0	24.0	0.07	<0.03	<1.0	<0.005	<0.005	<1	<10	<20
218	<5	<1.0	<1.0	29.9	0.07	<0.03	<1.0	<0.005	<0.005	<1	<10	<20
220	22	<1.0	1.3	13.9	1.51	0.97	1.8	0.10	0.10	<1	<10	34
225	<5	<1.0	<1.0	16.9	0.18	0.14	<1.0	<0.005	<0.005	<1	<10	81
236	<5	<1.0	<1.0	30.0	0.19	co.03	<1.0	co.005	co.005	<1	<10	<20
266	37	<1.0	<1.0	<1.0	9.49	9.45	1.8	0.40	0.42.	<1	<10	1260
271	<5	<1.0	<1.0	<1.0	0.06	0.05	1.2	0.07	0.07	<1	<10	<20
285	25	<1.0	<1.0	<1.0	4.74	4.74	1.3	0.26	0.26.	<1	<10	41
324	6	<1.0	<1.0	<1.0	0.14	0.13	<1.0	0.37	0.37.	<1	<10	<20
325	20	<1.0	11.0	<1.0	3.99	3.87	1.4	0.61	0.60	<1	<10	<20
330	7	<1.0	Cl.0	22.1	0.91	0.18	1.1	0.03	0.03	<1	<10	<20
335	23	<1.0	Cl.0	<1.0	6.03	4.44	<1.0	0.19	0.18'	<1	<10	<20
344	<5	<1.0	<1.0	9.4	0.09	<0.03	1.1	0.04	0.02	<1	<10	<20
MCL[1]	1000	10	50	1000	0.3 mg/l		50	0.05 mg/l		2		5000

[1]MCL = maximum contaminant level (State of Alaska Drinking Water Regulations, 18 AAC 80).
Shaded area = concentration exceeds the MCL.

Table 4. *Results from laboratory analyses for volatile organic compounds*

Compound	Site											MCL[1]
	44	56	67	128	133	143	144	160	190	266	285	
Benzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0
Bromobenzene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Bromochloromethane	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Bromodichloromethane	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Bromoform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Bromomethane	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
n-Butylbenzene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
sec-Butylbenzene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
tert-Butylbenzene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Carbon tetrachloride	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0
Chlorobenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Dibromochloromethane	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	
Chloroethane	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Chloroform	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Chloromethane	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
o-Chlorotoluene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
p-Chlorotoluene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,2-Dibromo-3-chloropropane	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Dibromomethane	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	
1,4-Dichorobenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	75.0
m-Dichlorobenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
o-Dichorobenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Dichlorodifluoromethane	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
1,1-Dichloroethane	<0.2	<2.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,2-Dichloroethane	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0
1,1-Dichloroethylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.0
cis-1,2-Dichloroethylene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
trans-1,2-Dichloroethylene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Methylene chloride	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
1,2-Dichloropropane	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,3-Dichloropropane	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
2,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
1,1-Dichloropropene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
1,3-Dichloropropene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,2-Dibromoethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Trichlorofluoromethane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Hexachlorobutadiene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Isopropylbenzene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
p-Isopropyltoluene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Naphthalene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
n-Propylbenzene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Styrene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,1,1,2-Tetrachloroethane	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,1,2,2-Tetrachloroethane	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Tetrachloroethylene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Total Trihalomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	100.0
Toluene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
1,2,3-Dichlorobenzene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
1,2,4-Trichlorobenzene	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
1,1,1-Trichloroethane	<0.2	<0.2	<0.2	<0.2	<0.2	0.7	<0.2	<0.2	<0.2	<0.2	<0.2	200.0
1,1,2-Trichloroethane	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	
Trichloroethylene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5.0
1,2,3-Trichloropropane	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
1,2,4-Trimethylbenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,3,5-Trimethylbenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Vinyl Chloride	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0
m,p-Xylenes	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	
o-Xylene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	

[1]MCL = maximum contaminant level (State of Alaska Drinking Waler Regulations, 18 AAC 80)
Shaded area = concentration exceeds the MCL.

gross-beta LLD concentrations of 15.8 and 10.4 pCi/l, respectively, for the sample collected at site 67 is high compared to other samples. The total dissolved solid (TDS) concentration of a sample is a limiting factor in the sensitivity of the analytical method (USEPA, 1980). Specific conductance is an indirect indicator of TDS, and the comparatively high specific conductance (1473 µS/cm) of the ground water at site 67 probably contributes to the higher LLD concentrations.

COMPARISONS OF ONSITE AND LABORATORY RESULTS

Total iron concentrations determined onsite (table 2) were compared to those determined in the laboratory (table 3). Figure 2 shows the relation between the two data sets, represented by the best-fit' line. A good linear relationship (r = 0.92) exists between onsite and laboratory results. The 'expected line' is how the data would plot if there was a perfect relationship (r = 1 .OO) between the two data sets.

A frequency distribution of iron concentrations show that 11 of 30 sites had concentrations <1 .O mg/l, regardless of the testing method used (fig. 3). The difference between onsite and laboratory data at iron concentrations <1 .O mg/l is attributed to the lower resolution of the onsite method. The onsite method has a detection limit of about 0.2 mg/l, whereas the laboratory method has a detection limit of 0.03 mg/l. Presumably, the laboratory method was better at quantifying iron concentrations <1 .0 mg/l. Onsite screening for iron was considered adequate only when iron concentrations were >1 .O mg/l.

Hardness values determined onsite (table 2) were compared to hardness values computed from laboratory data. A laboratory hardness value for each water sample was calculated by converting calcium and magnesium concentrations in mg/l (table 3) to milliequivalents per liter (meq/l) and then multiplying the sum of calcium and magnesium in meq/l by 50 (Hem, 1985). Figure 4 shows the actual relation (best-fit line) between the two data sets. A fairly good linear relationship (r = 0.80) exists between onsite and laboratory methods. Figure 5 shows the frequency distribution of hardness data for the two data sets. The onsite and laboratory results are in reasonably close agreement throughout the measured concentration range.

Nitrate (NO,) data comparisons are not graphically presented because most samples contained concentrations of nitrogen less than the detection levels of both the test kit and laboratory instruments. Nitrite (NO,) concentrations are usually a very small part of the NO_2+NO_3-N ratio when the water is oxygenated and are not expected to significantly affect the relationship between data sets.

INTERLABORATORY COMPARISONS

The USGS collected and analyzed 27 ground-water samples in the greater Nikiski area during 1991 for the KPGWTF's regional hydrogeologic study of the Kenai Peninsula, referred to as the phase II project. Samples were analyzed at the USGS Laboratory in Denver by using the methods described in Fishman and Friedman (1985). The analytical results are presented in the USGS annual water-resource data report (USGS, 1992).

The Alaska DOW and the USGS concurrently sampled water from two wells, sites 66 and 344, to make interlaboratory comparisons of analytical results (table 5). The general reliability of laboratory analyses was checked by calculating the cation-anion balance for each data set. All four analyses are acceptable because the error in the cation-anion balance is less than 10 percent.

Generally, the two laboratories are in good agreement with respect to major-ion analytical results (table 5). Interlaboratory comparisons for many trace elements is not possible because most concentrations were below detection limits. Comparisons for concentrations of fluoride, aluminum, arsenic, and manganese were poor between laboratories; this is most likely due to the difficulty in quantifying trace elements at concentrations near the detection limit.

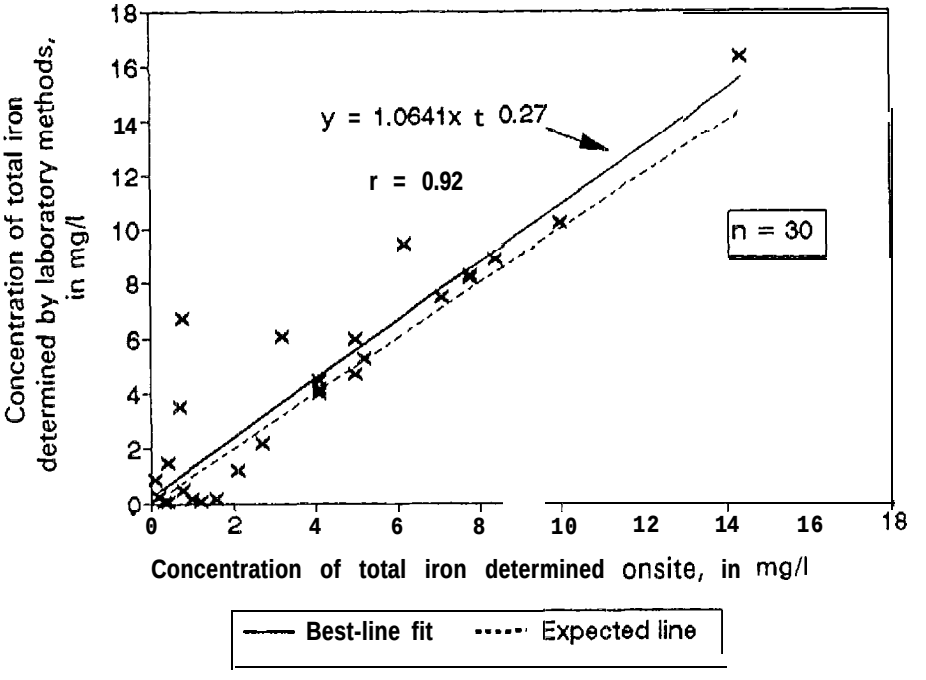


Figure *2. Relation of total iron concentration measured onsite and in the laboratory.*

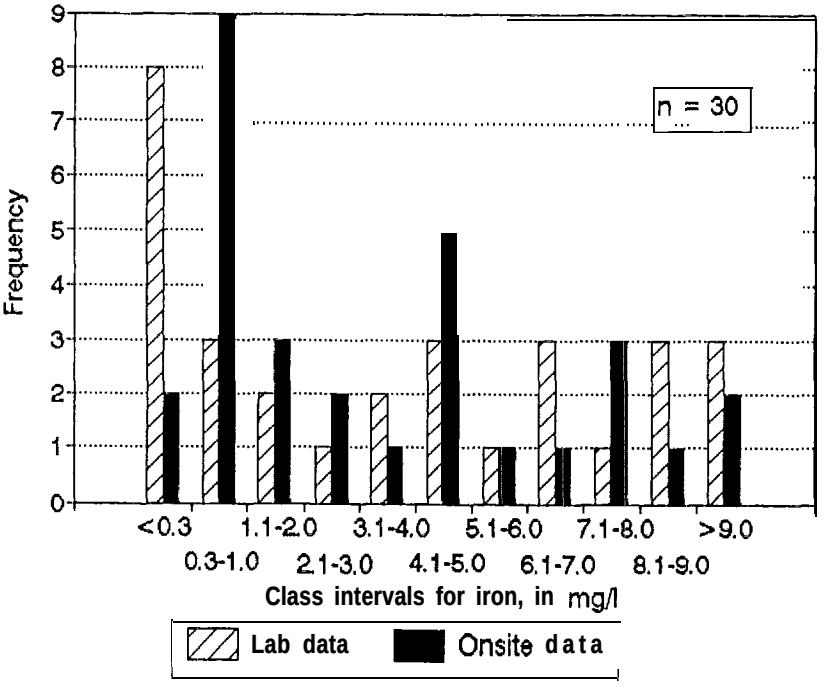


Figure 3. *Histogram showingfrequency distribution of onsite and laboratory iron data,*

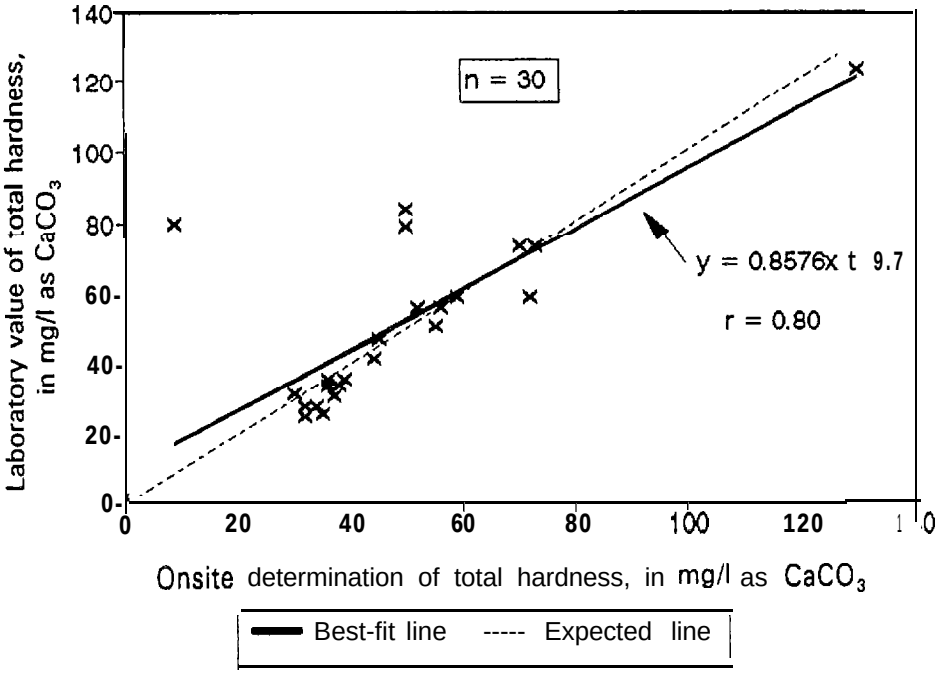


Figure *4. Relation of total hardness determined onsite and in the laboratory.*

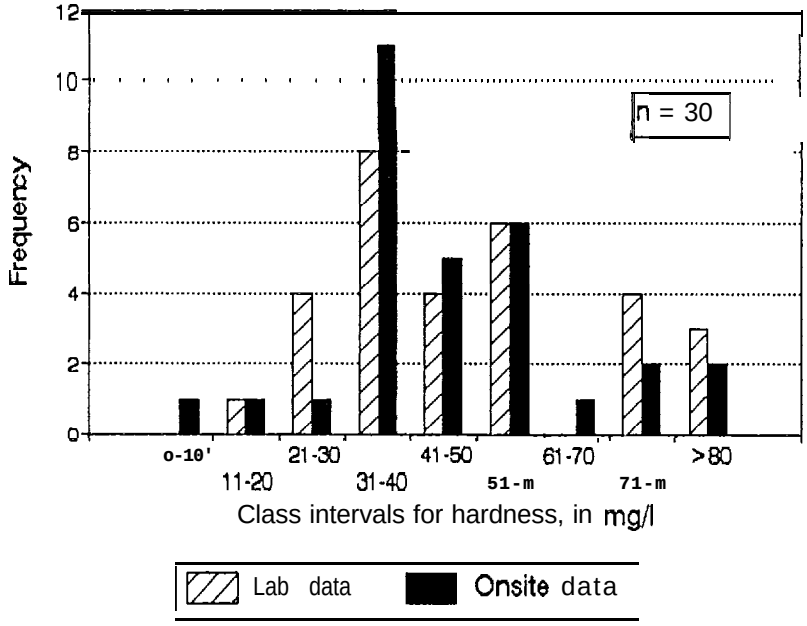


Figure *5. Histogram showing frequency distribution of onsite and laboratory-calculated hardness data.*

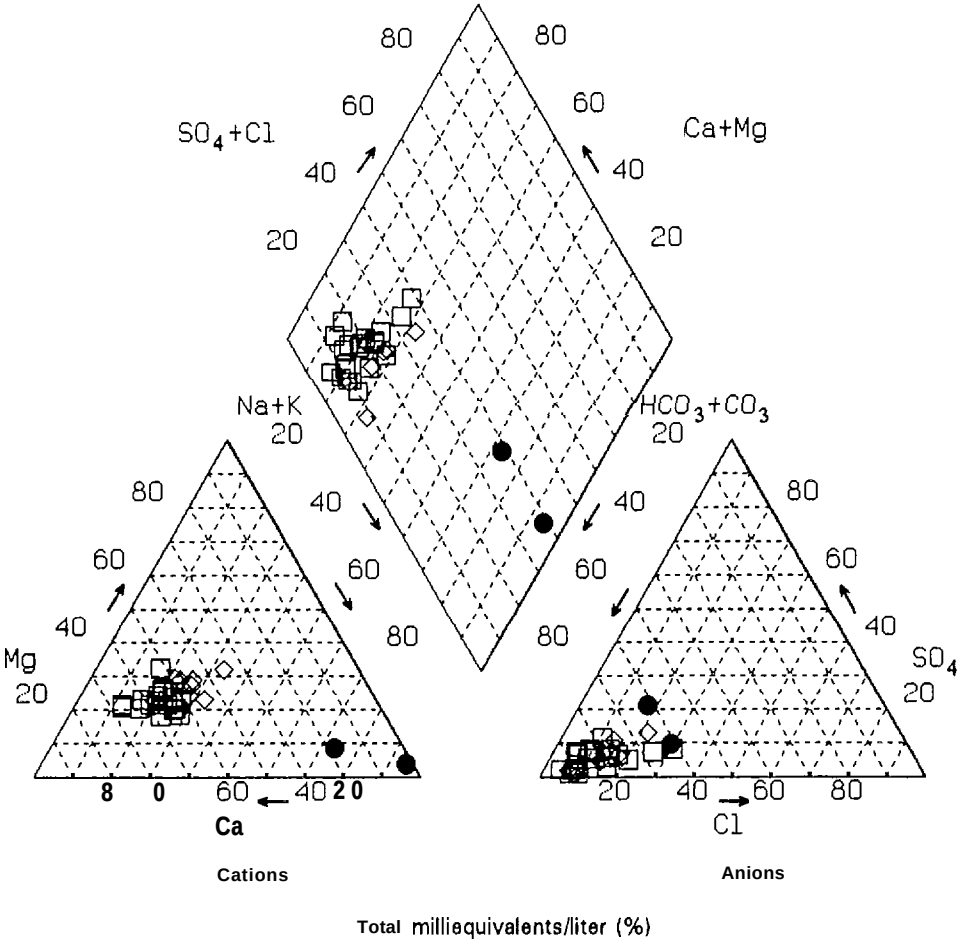
WATER-TYPE CLASSIFICATION

Trilinear diagrams can be used to show the chemical character of a water sample (Piper, 1944). Ratios of selected cations (calcium, magnesium, and sodium plus potassium) and anions (bicarbonate plus carbonate, chloride, and sulfate) for each water analysis are shown in the diagram as percentages of the total cations and anions, in meq/l. A water type can be described on the basis of predominant cations and anions found in the water.

Table 5. *Comparisons of analytical results between the Alaska Division of Water laboratory and U.S. Geological Survey laboratory*

Water properties	Site 66				Site 344			
	DOW	USGS	Mean	Deviation from mean (%)	DOW	USGS	Mean	Deviation from mean (%)
Major Ions, dissolved (mg/l)								
Calcium	8.66	8.9	8.8	1	9.96	11	10.5	5
Magnesium	3.15	3.3	3.2	2	5.51	5.9	5.7	3
Sodium	3.92	4.6	4.3	8	7.72	8.0	7.9	2
Potassium	1.52	1.4	1.46	4	5.28	4.7	5.0	6
Iron	9.07	9	9	<1				
Alkalinity (as HCO_3)	73.2	75.6	74.4	2	85.4	86.6	86.0	1
Chloride	4.38	4.6	4.5	2	3.47	4.7	4.1	15
Sulfate	<0.01	0.20			1.53	1.5	1.51	1
Fluoride	0.13	0.20	0.16	21	0.19	0.20	0.195	3
Sum of ions								
Cations (meq/l)	1.225	1.273			1.421	1.502		
Anions (meq/l)	1.327	1.383			1.540	1.688		
Error	4.0%	4.1%			4%	5.8%		
Trace elements, dissolved (µg/l)								
Aluminum	59	10	34.5	71	43	<10		
Arsenic	<1.0	1			10	24	17	41
Barium	17	20	18.5	8	<5	4		
Cadmium	<1.0	1.0			<1.0	<1.0		
Chromium	<1.0	<5			<1.0	<5		
Copper	<1.0	<10			9.4	10	9.7	3
Iron					<0.03	0.014		
Lead	<1.0	<10			1.1	<10		
Manganese	310	320	315	2	20	44	32	38
Mercury	<1	<0.1			<1	<0.1		
Nickel	<10	<10			<10	<10		
Nitrate + nitrite (as N)	<100	<50			<100	<50		
Phosphorus, ortllo (as P)	<100	<10			200	180	190	5
Zinc	127	100	113.5	12	<20	35		

Twenty-one sites sampled in the Nikiski area have ground water that is of the calcium-bicarbonate type (fig. 6). Seven sites have ground water of the 'mixed-cation'-bicarbonate type because the percentage of no single cation exceeds 50 percent. All 28 sites tap the unconfined or upper-confined aquifer (W.A. Petrik, oral commun., 1992).



EXPLANATION

Symbol	Water type	Site
cl	Calcium bicarbonate	44, 54, 56, 96, 98, 128, 152, 155, 160, 179, 196, 205, 218, 220, 225, 236, 266, 271, 324, 325, 330
0	'Mixed-cation' bicarbonate	52, 66, 143, 144, 285, 335, 344
●	Sodium bicarbonate	67, 190

Figure 6. *Trilinear diagram showing water analyses of ground water collectd from 30 wells in the west Nikiski area during July 1991.*

Two sites have ground water of the sodium-bicarbonate type. Site 67 has a well depth of 303 ft and is the only well sampled that taps the lower-confined aquifer. Site 190 has a well depth of only 36 ft and taps the unconfined aquifer. According to Anderson and Jones (1972), most of the ground waters of the sodium-bicarbonate water type occur in wells ranging from 100 to 450 ft deep.

SUMMARY AND CONCLUSIONS

- Generally, the ground waters sampled from 30 wells in the residential area of west Nikiski during 199 1 by DOW had low concentrations of inorganic and organic constituents; levels of radioactivity were acceptable for domestic use. No areawide contamination by volatile organic compounds was detected.

- Most sampled ground waters had concentrations of naturally occurring iron and manganese that were higher than levels desired for domestic use.

- All wells sampled had low nitrate concentrations.

- One deep well had an arsenic concentration above drinking-water standards, but high concentrations of arsenic occur in scattered locations throughout the Kenai Peninsula in both shallow and deep wells.

- Concentrations of gross-alpha and gross-beta radioactivity were low in water from nine wells.

- Concentrations of 59 volatile organic compounds were analyzed from water samples from 11 wells. Only one volatile organic compound, 1 ,1 ,1-trichloroethane, was detected. It was found in one well and had a concentration of 0.7 µg/l.

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APPENDIX A

State of Alaska Drinking-water Regulations, maximum contaminant concentration levels, 18 AAC 80.070

*Note: **The** following copy of 18 AAC 80.070 was current **at the time of research and data compilation. The code has since been updated.***

18 AAC 80.070. MAXIMUM CONTAMINANT CONCENTRATION LEVELS (MCLs). (a) The primary maximum contaminant concentration levels (MCLs) for a public water system are for a public water system are

(1) Inorganic Chemical Contaminants

Contaminant	Maximum Contaminant Level (ug/l)
Arsenic	50.0
Barium	l,ooo.o
Cadmium..	10.0
chromium	50.0
Fluoride..	.4,000.0
Lead	50.0
Mercury	2.0
Nitrate (as Nitrogen).	10,000.0
Selenium..	10.0
Silver	50.0

(2) Organic Chemical Contaminant

(A) Pesticides

Contaminant	Maximum Contaminant Level (ug/l)
Endrin	0.2
Lindane	4.0
Methoxychlor..	100.0
Toxaphene	5.0
2, 4-D	100.0
2, 4, 5-TP Silvex	10.0

(B) Volatile Organic Chemicals (VOCs)

Contaminant	Maximum Contaminant Level (ug/l)
1, 1-Dichloroethylene	7.0
1, 1, 1-Trichloieothane	.200.0
1, 2-Dichloroethane	5.0
Benzene..	5.0
Carbon tetrachloride	5.0
4-Dichlorobenzene..	75.0
Trichloroethylene	5.0
Vinyl chloride	2.0

VOCs for which an MCL has not yet been set, but which are subject to monitoring under this chapter, are set out in Tables H, I, and J, in 18 AAC 80.400(a).

(C) Total Trihalomethanes (TTHMs)

	Maximum Contaminant Level (ug/l)
Total Trihalomethanes	100.0

The sampling and analysis requirements for total trihalomethanes are set out at 40 C.F.R. 141.30, as amended August 15, 1989, the requirements of which are incorporated by reference in this chapter.

(3) Physical Contaminants

Contaminant	**Maximum Contaminant Level (nephelometric turbidity unit, NTU)**
Turbidity	1.49 NTTJ as a monthly average of samples required, or 5.0 NTU as an average for two consecutive days. Exceeding either measure is a violation of this paragraph.

(4) Radioactive Contaminants

(A) Natural radioactivity

Contaminant	**Maximum Contaminant Level (pCi/l)**
Gross Alpha	15.0
Combined Radium-226 and 228..	5.0

(B) Manmade radioactivity

Contaminant	**Maximum Contaminant Level (pCi/l)**
Gross Beta	50.0
Strontium-90	8.0
Tritium	20,000.0

(5) Total Coliform Bacteria

Contaminant	Maximum Contaminant Level
(A) Membrane Filter Technique	No coliform may be present in any of the 100 milliliter routine samples.
(B) Fermentation Tube Method	No gas production may be present in any of the five 10 milliliter portions in any routine sample.
(C) Minimal Media ONPGMUG (MMO-MUG) Test	No coliform may be present in any of the routine samples any of the routine samples.

(b) The secondary maximum contaminant concentration levels (MCLs) for a public water system are

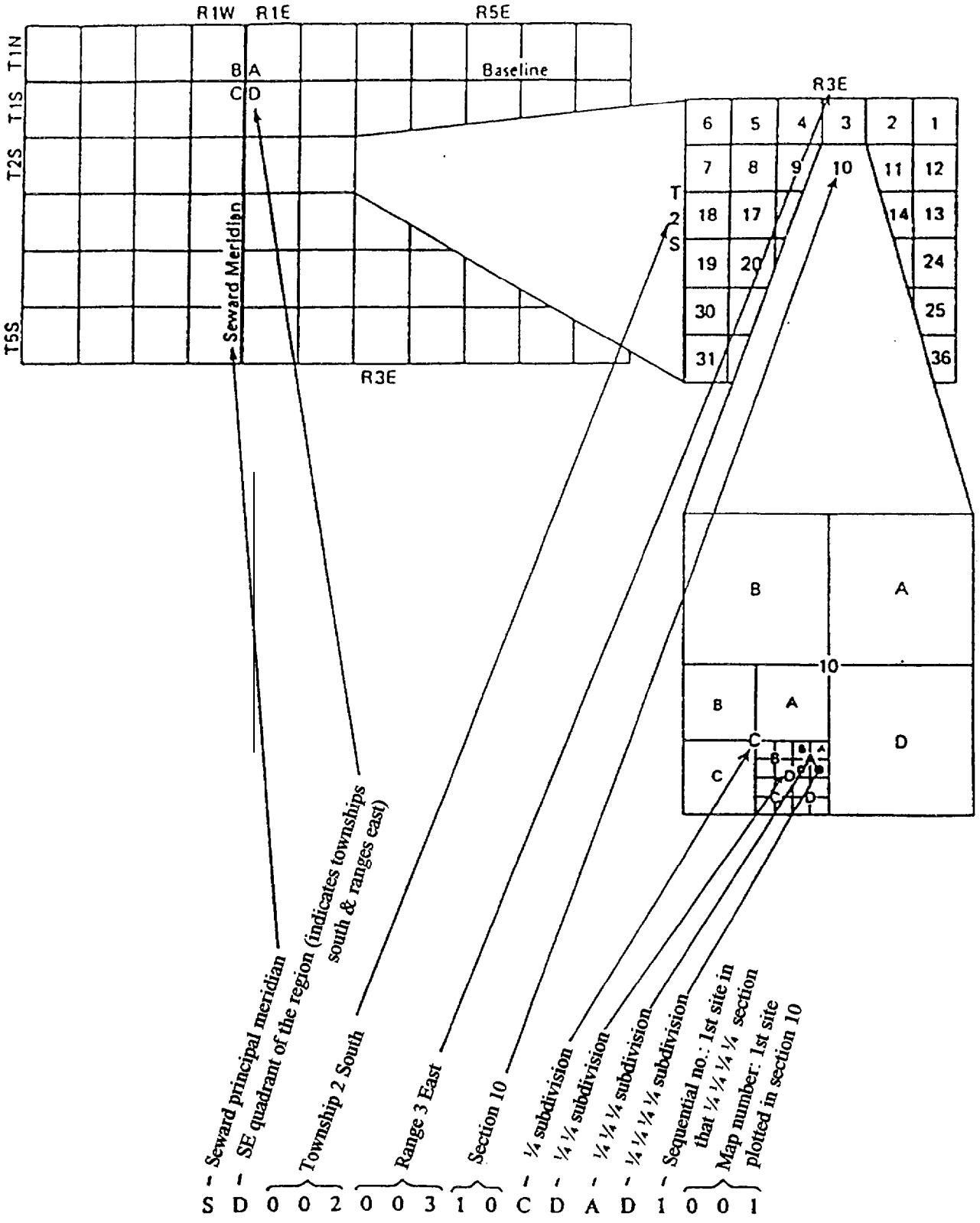
Contaminant	Maximum Contaminant Level
Chloride	250 mg/l
Color	15 units
Copper	1 mg/l
Corrosivity	Noncorrosive
Fluoride	2,000 mg/l
Foaming Agents	0.5 mg/l
Iron	00.3 mg/l
Manganese	0.05 mg/l
Odor	3 threshold odor no.
pH	6.5-8.5
Sodium	250 mg/l
Sulfate	250 mg/l
Total Dissolved Solids	500 mg/l
Zinc	5 mg/l

(c) The secondary levels set by (b) of this section represent reasonable goals far drinking water quality and, in general, provide a guideline for public water suppliers, 'These secondary contaminants mainly affect the aesthetic qualities of drinking water, but, at considerably higher concentrations, health problems might exist. The department will, in its discretion, require a public water system to meet the secondary MCLs if public health is threatened or if there is a strong consumer objection to exceeding a listed MCL. (Eff. 6/14/91, Register 188)

Authority: AS 46.03.020 AS 46.03.050 AS 46.03.070 AS 46.03.7 10 AS 46.03.720

APPENDIX B

Diagram showing derivation of local well number, based on the official subdivision of public lands, used by the U.S. Geological Survey.



APPENDIX C

Laboratory water-quality analytical reports

INORGANIC CONSTITUENTS

Analyzed by Alaska Division of Water, Water Quality Laboratory, Fairbanks, Alaska
All inorganic constituents are dissolved, unless otherwise noted.
DL = detection limit
RPD = relative percent difference
SEE FOLLOWING PAGE FOR SAMPLE BOTTLE KEY

VOLATILE ORGANIC COMPOUNDS

Analyzed by Northern Testing Laboratory, Inc., Anchorage, Alaska
Key to laboratory numbers for volatile organic compounds analyzed by Northern Testing Laboratories, Inc.:

Site No.	Lab No.
44	A112159
56	A112161
67	A112305
128	A112158
133	A112160
143	A112307
144	A111977
160	A112306
190	A111980
266	A111978
285	A111979
	A111981 (Travel Blank)

RADIOLOGICAL PARAMETERS

Analyzed by Core Laboratories, Casper, Wyoming
LLD = lower limit of detection
Key to laboratory numbers for radioactivity samples analyzed by Core Laboratories:

Site No.	Sample No.
56	3; 4
67	5
143	7
144	1
155	8
160	6
266	2
344	9

Key to sample bottle numbers for inorganic constituent samples analyzed by Alaska Division of Water Laboratory.

	Constituent Group				
	Dissolved Anions[1]	Dissolved Nitrate + Nitrite	Dissolved Cations & Trace Elements[2]	Total Iron & Manganese	Dissolved Mercury
44	K577	K696	K491	K638	K762
52	K604	K718	K514	K660	K796
54	K605	K719	K515	K661	K750
56	K598	K713	K508	K654	K790
56	K599[3]	K714[3]	K509[3]	K655[3]	K791[3]
56	K600[4]	K715[4]	K510[4]	K656[4]	K792[4]
66	K613	K727	K524	K669	K752
67	K606	K720	K516	K662	K751
96	K616	K730	K527	K673	K760
98	K615	K729	K526	K671	K759
128	K590	K704	K499	K646	K770
143	K608	K722	K519	K664	K755
144	K576	K695	K490	K637	K761
152	K609	K723	K520	K665	K753
152	K610[3]	K724[3]	K521[3]	K666[3]	K754[3]
152	K611[4]	K725[4]	K522[4]	K667[4]	K756[4]
155	K612	K726	K523	K668	K757
160	K607	K721	K518	K663	K693
179	K586	K700	K495	K642	K766
190	K587	K701	K496	K643	K767
190	K588[3]	K702[3]	K497[3]	K644[3]	K768[3]
190	K589[4]	K703[4]	K498[4]	K645[4]	K769[4]
196	K579	K698	K493	K640	K764
205	K597	K711	K507	K653	K789
218	K596	K710	K506	K652	K788
220	K593	K708	K502	K651	K786
225	K595	K709	K503	K648	K787
236	K592	K706	K501	K649	K785
266	K578	K697	K492	K639	K763
271	K594	K707	K504	K650	K772
285	K580	K699	K494	K641	K765
324	K591	K705	K500	K647	K771
325	K601	K715	K511	K657	K793
330	K603	K717	K513	K659	K795
335	K602	K716	K512	K658	K794
344	K614	K728	K525	K670	K758

'Anions include fluoride, chloride, phosphate, and sulfate

[2]Cations include calcium, magnesium, sodium, and potassium; trace elements include aluminum, arsenic, barium, cadmium, chromium, copper, nickel, lead, zinc, iron, and manganese

[3]Field duplicate sample

[4]Field equipment-blank sample

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Client: DNR/DOW -- Eagle River

Submitted By: Mary Maurer

Date Submitted: Summer 1991

Sample	Calcium	Magnesium	Sodium	Potassium
K490	a74	143	5.17	1.28
K491	9.82	2.83	3.65	0.91
K492	16.0	4.70	5.94	1.67
K493	36.6	6.92	6.07	2.53
K494	11.9	432	5.08	1.53
K49.5	9.86	2.98	4.32	1.44
K496	3.44	0.99	15.3	0.99
K497	3.37	0.98	15.1	0.99
K498	<DL	<DL	CDL	<DL
K499	142	3.40	6.13	1.42
K500	16.3	3.24	4.09	1.71
K501	8.34	1.74	4.44	1.14
K502	9.41	2.61	4.6s	1.66
K503	124	2.77	5.94	1.49
K504	15.6	4.12	458	291
K506	9.88	1.87	3.68	1.52
K507	21.4	4.m	6.82	201
K508	10.0	2.78	4.17	1.67
K509	9.83	276	4x2	1.64
K510	<DL	<DL	<DL	<DL
K511	245	5.71	6.06	272
K512	7.06	2.55	3.98	1.40
K513	16.4	3.79	8.21	1.89
K514	6.71	2.07	3.88	1.06
K515	17.1	3.98	462	2.10
K516	3.39	4.35	201	8.90
K518	243	4.77	4.27	1.15
K519	8.17	2.55	5.76	1.82
K520	21.0	5.04	734	2.20
K521	21.0	5.05	7.34	214
K522	<DL	<DL	<DL	<DL
K523	30.4	11.6	9.50	3.16
K524	8.66	3.15	3.92	1.52
K525	9.96	5.51	7.72	5.28
K526	14.2	3.76	6.24	4.02
K527	21.6	6.19	7.84	288
Units	mg/L	mg/L	mg/L	mg/L
EPA Method	AES 0029	AES 0029	273.1	258.1
Detection Limit	0.01	0.01	0.1	0.01
Analysis Date	29 Oct 91	29 Oct 91	30 Oct 91	30 Oct 91
RPD	1.4	05	0.8	1.9
% Recovery	102	100	100	104

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Sample	Fluoride	Chloride	Phosphate	Sulfate
K576	0.14	6.38	<DL	2 %
K577	0.14	3.39	<DL	0.09
K578	0.19	447	<DL	6.07
K579	0.27	5.53	<DL	92s
K580	0.16	6.83	<DL	5.01
K586	0.14	5.87	<DL	4.57
K587	0.14	8.31	<DL	13.6
K588	0.13	8.42	<DL	13.6
K589	<DL	<DL	<DL	<DL
K590	0.16	8.02	<DL	2.92
K591	0.17	5.07	<DL	3.7s
K592	0.13	5.01	<DL	273
K593	0.13	9.61	<DL	3.78
K594	0.18	4.15	0.1	1.34
K595	0.17	4.47	<DL	2%
KS%	0.13	3.05	<DL	4.75
K597	0.21	4.87	<DL	2.91
K598	0.15	4.85	<DL	<DL
K599	0.15	4.83	<DL	<DL
K600	<DL	<DL	<DL	<DL
K601	0.29	5.44	<DL	7.06
K m	0.12	637	<DL	3.02
K603	0.19	14.0	<DL	5.4s
K m	0.11	4.27	<DL	4.54
K605	0.20	4.94	<DL	1.13
K606	<DL	93.9	4.7	420
K607	0.22	469	<DL	8.15
K608	0.13	7.91	<DL	442
K609	0.21	473	<DL	2.45
K610	021	6.68	<DL	246
K611	<DL	<DL	<DL	<DL
K612	031	4.85	<DL	3.16
K613	0.13	4.38	<DL	<DL
K614	0.19	3.47	0.2	1.53
K615	0.19	4.34	0.2	1.58
K616	0.22	9.88	<DL	5.63
Units	mg/L	mg/L	mg PO4*P/L	mg/L
EPA Mctbod	300.0	300.0	300.0	300.0
Detection Limit	0.01	0.01	0.1	0.01
Analysis Date	2 Aug 91	2 Aug 91	2 Aug 91	2 Aug 91
RPD	1.6	75	8.3	1.8
% Recovery	99	90	91	90

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Sample	Nitrate + Nitrite
K695	CDL
K696	<DL
K m	<DL
K698	<DL
K699	<DL
K m	<DL
K701	<DL
K702	<DL
K m	<DL
Km4	1.62
K705	<DL
K706	030
K707	0.11
K708	0.32
K m	0.55
K710	0.46
K711	0.41
K712	<DL
K713	CDL
K714	<DL
K715	<DL
K716	<DL
K717	2.72
K718	CDL
K719	CDL
K720	<DL
K721	CDL
K722	<DL
K723	4.41
K724	450
K725	<DL
K726	CDL
K727	CDL
K728	<DL
K729	CDL
K730	1.18
Units	$mg(NO_3 + NO_2)^*N/L$
EPA Method	353.2
Detection Limit	0.1
Analysis Date	2 Aug 91
RPD	1.1
% Recovery	92

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Sample	Aluminum	Arsenic	Barium	cadmium	Chromium
K490	6	<DL	28	<DL	<DL
K491	13	<DL	<DL	20	<DL
K492	9	<DL	37	<DL	<DL
K493	6	1.8	15	<DL	<DL
K494	<DL	<DL	2s	<DL	<DL
K495	39	<DL	22	<DL	<DL
K496	10	a9	17	<DL	<DL
K497	8	9.0	16	<DL	<DL
K498	<DL	<DL	<DL	<DL	<DL
K499	8	<DL	<DL	<DL	<DL
Ksm	<DL	<DL	6	<DL	<DL
K501	6	<DL	<DL	<DL	<DL
K502	18	<DL	22	<DL	1.3
K503	58	<DL	<DL	<DL	<DL
K504	10	13	<DL	<DL	<DL
K506	7	<DL	<DL	<DL	<DL
K507	44	<DL	<DL	<DL	<DL
K508	3s	<DL	28	<DL	<DL
K509	30	<DL	28	<DL	<DL
K510	<DL	<DL	<DL	<DL	<DL
K511	42	<DL	20	<DL	<DL
K512	54	<DL	23	<DL	<DL
K513	40	<DL	7	<DL	<DL
K514	<DL	<DL	11	<DL	<DL
Ksls	<DL	<DL	48	<DL	<DL
KS16	100	n	11	1.9	<DL
KS18	<DL	<DL	31	<DL	<DL
K519	12	<DL	12	<DL	<DL
K520	<DL	<DL	<DL	<DL	<DL
K521	<DL	<DL	<DL	<DL	<DL
K522	<DL	<DL	<DL	<DL	<DL
K523	<DL	<DL	57	<DL	<DL
K524	59	<DL	17	<DL	<DL
K525	43	10	<DL	<DL	<DL
K526	46	9.9	8	<DL	<DL
K527	34	<DL	12	<DL	<DL
Units	ug/L	ug/L	ug/L	ug/L	ug/L
EPA Method	AES 0029	206.2	AES 0029	213.2	218.2
Detection Limit	5	1.0	S	1.0	1.0
Analysis Date	15 Nov 91	6 Dec 91	15 Nov 91	5 Dec 91	4 Dec 91
RPD	8.7	1.1	1.6	1.1	23
% Recovery	104	94	102	93	104

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Sample	Copper	Nickel	Lead	Zinc
K490	4DL	<DL	4DL	35
K491	35	4DL	7.5	4DL
K492	4DL	<DL	1.8	1260
K493	4DL	<DL	13	317
K494	4DL	<DL	1.3	41
K495	4DL	4DL	4DL	4DL
K496	<DL	<DL	1.7	4DL
K497	<DL	<DL	1.6	<DL
K498	<DL	<DL	<DL	<DL
K499	31.1	<DL	<DL	<DL
KS00	4DL	<DL	<DL	4DL
KS01	30.0	4DL	<DL	<DL
KS02	13.9	4DL	1.8	34
KS03	16.9	<DL	<DL	81
K m	4DL	<DL	1.2	<DL
KS06	29.9	<DL	4DL	<DL
KS07	24.0	<DL	<DL	4DL
KS08	<DL	<DL	<DL	<DL
KS09	<DL	<DL	<DL	4DL
KS10	<DL	<DL	<DL	<DL
KS11	<DL	<DL	1.4	<DL
KS12	<DL	<DL	<DL	<DL
KS13	221	<DL	1.1	4DL
KS14	1.4	<DL	4DL	<DL
KS15	<DL	4DL	1.1	230
KS16	4.1	4DL	10.4	28
KS18	4DL	<DL	1.4	4DL
KS19	4DL	4DL	4DL	4DL
KS20	31.6	<DL	1.3	4DL
KS21	312	<DL	1.7	4DL
KS22	4DL	<DL	<DL	<DL
KS23	<DL	4DL	1.4	77
KS24	<DL	4DL	4DL	127
KS25	9.4	4DL	1.1	4DL
KS26	4DL	4DL	<DL	4DL
KS27	10.0	4DL	1.5	4DL
Units	ug/L	ug/L	ug/L	ug/L
EPA Method	220.2	AES 0029	239.2	AES 0029
Detection Limit	1.0	10	1.0	20
Analysis Date	2 Dec 91	21 N w 91	3 Dec 91	15 Nov 91
RPD	2.2	25	1.4	35
% Recovery	94	109	107	99

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Sample	Iron	Manganese	Sample	Iron (total)	Manganese (total)
K490	5.11	022	K637	5.27	0.22
K491	7.86	031	K638	8.17	031
K492	9.45	0.42	K639	9.49	0.40
K493	0.44	0.55	K640	0.54	0.56
K494	4.74	0.26	K641	4.74	0.26
K495	3.99	022	K642	424	022
K496	7.37	0.12	Km3	7.54	0.12
K497	7.40	al2	K644	8.69	al2
K498	<DL	<DL	K645	<DL	<DL
K499	0.04	<DL	K646	0.05	<DL
K500	0.13	037	K647	0.14	037
K501	<DL	<DL	K648	0.18	<DL
K502	0.97	0.10	K649	0.19	<DL
K503	0.14	<DL	K650	0.06	0.07
K504	0.05	0.07	K651	151	0.10
K506	<DL	<DL	K652	0.07	<DL
K507	<DL	<DL	K653	0.07	<DL
K508	7.98	0.27	K654	8.33	027
K509	7.97	026	K655	8.08	026
K510	<DL	<DL	K656	<DL	<DL
K512	4.44	0.18	K658	6.03	0.19
K513	0.18	0.03	K659	0.91	0.03
K514	2.68	0.08	K660	6.11	0.09
K515	9.61	021	K661	10.19	021
KS16	0.38	0.03	K662	6.66'	0.11
K518	4.48	0.64	K663	4.49	0.65
K519	2.16	0.05	K664	225	0.07
K520	<DL	<DL	K665	034	<DL
K521	<DL	<DL	K666	0.36	<DL
K522	<DL	<DL	K667	<DL	<DL
K523	162	0.94	K668	163	0.94
K524	9.07	031	K669	a93	031
K525	<DL	0.02	K670	0.09	0.04
K526	<DL	0.06	K671	3.48	020
K527	1.13	0.02	K673	1.19	0.04
K511	3.87	0'60	K657	3.99	061
Units	mg/L	mg/L		mg/L	mg/L
EPA Method	AES 0029	AES 0029		AES 0029	AES 0029
Detection Limit	0.03	0.005		0.03	0.005
Analysis Date	21 Nov 91	21 Nov 91		21 Nov 91	21 Nov 91
RPD	3.2	3.3		2.9	0.6
% Recovery	97	100		98	99

Approved By _____ Date 19 DEC 91

Jim Vohden, Chemist

State of Alaska
Department of Natural Resources – Division of Water
Water Quality Laboratory
209 O'Neill – University of Alaska Fairbanks – Fairbanks, Alaska 99775
(907)474-7713

Client: DNR/DOW – Eagle River

Submitted By: Mary Maurer

Date Submitted: Summer 1991

Sample	Mercury
K761	<DL
K762	<DL
K763	<DL
K764	<DL
K765	<DL
K766	<DL
K767	<DL
K768	<DL
K769	<DL
K770	<DL
K771	<DL
K772	<DL
K787	<DL
K788	<DL
K789	<DL
K785	<DL
K786	<DL
K790	<DL
K791	<DL
K792	<DL
K m	<DL
K795	<DL
K796	<DL
K750	<DL
K751	<DL
K693	<DL
K755	<DL
K753	<DL
K754	<DL
K756	<DL
K757	<DL
K752	<DL
K758	<DL
K759	<DL
K760	<DL
K793	<DL
Units	ug/L
EPA Method	hydride
Detection Limit	1
Analysis Date	28 July 91
RPD	–
% Recovery	91

Approved By _____ Date 19 DEC 91

Jim Vohden, Chemist

NORTHERN TESTING LABORATORIES, INC.

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Alaska Department of Natural Resources
DNR-DGGS
P.O. Box 772116
Eagle River AK 99577

Attn: Mary Maurer

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Div. of Geological Survey
Eagle River

Report Date: 08/05/91

Date Arrived: 07/12/91
Date Sampled: 07/09/91
Time Sampled: 1330
Collected By: MAM

Flag Definitions
U = Below Detection Limit DL Stated in Result
B = Below Regulatory Min.
H = Above Regulatory Max.
E = Below Detection Limit Estimated Value

Our Lab #: A111977
Location/Project: Nikiski Ground Water IIIA
Your Sample ID: Carroll Well
Sample Matrix: Water
Comments:

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A111977	EPA 502.2	Benzene	ug/l	0.2	U	07/19/91
		Bromobenzene	ug/l	0.3	u	
		Bromochloromethane	ug/l	0.3	U	
		Bromodichloromethane	ug/l	0.2	U	
		Bromoform	ug/l	1.0	U	
		Bromomethane	ug/l	2.0	u	
		n-Butylbenzene	ug/l	0.3	u	
		sec-Butylbenzene	ug/l	0.3	u	
		tert-Butylbenzene	ug/l	0.5	u	
		Carbon Tetrachloride	ug/l	0.2	u	
		Chlorobenzene	ug/l	0.2	u	
		Dibromochloromethane	ug/l	0.4	u	
		Chloroethane	ug/l	2.0	u	
		Chloroform	ug/l	0.2	u	
		Chloromethane	ug/l	2.0	u	
		o-Chlorotoluene	ug/l	0.3	u	
		p-Chlorotoluene	ug/l	0.2	U	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	u	
		Dibromomethane	ug/l	0.4	u	
		1,4-Dichlorobenzene	ug/l	0.2	u	
		m-Dichlorobenzene	ug/l	0.2	u	
		o-Dichlorobenzene	ug/l	0.2	u	
		Dichlorodifluoromethane	ug/l	2.0	u	
		1,1-Dichloroethane	ug/l	0.2	u	
		1,2-Dichloroethane	ug/l	0.2	u	
		1,1-Dichloroethylene	ug/l	1.0	u	
		cis-1,2-Dichloroethylene	ug/l	0.2	u	
		trans-1,2-Dichloroethylene	ug/l	0.2	U	
		Methylene Chloride	ug/l	1.0	u	
		1,2-Dichloropropane	ug/l	0.2	u	
		1,3-Dichloropropane	ug/l	0.2	u	

William E. Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Div. of Geological Survey
Eagle River

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A111977	EPA 502.2	**2,2-Dichloropropane**	**ug/l**	1.0	u	**07/19/91**
		l,l-Dichloropropene	**ug/l**	0.5	u	
		1,3-Dichloropropene	**ug/l**	0.2	u	
		Ethylbenzene	**ug/l**	0.2	u	
		1,2-Dibromoethane	**ug/l**	1.0	u	
		Trichlorofluoromethane	**ug/l**	0.5	u	
		Xexachlorobutadiene	**ug/l**	0.3	u	
		Iropropylbenzene	**ug/l**	0.3	u	
		p-Ieopropyltoluene	**ug/l**	0.3	u	
		Naphthalene	**ug/l**	0.3	u	
		n-Propylbenzene	**ug/l**	0.3	u	
		Styrene	**ug/l**	0.2	u	
		1,1,1,2-Tetrachloroethane	**ug/l**	0.2	u	
		1,1,2,2-Tetrachloroethane	**ug/l**	0.3	u	
		Tetrachloroethylene	**ug/l**	0.2	u	
		Total Trihalcmethane	**ug/l**	2	u	
		Toluene	**ug/l**	0.3	u	
		1,2,3-Trichlorobenzene	**ug/l**	0.3	u	
		1,2,4-Trichlorobenzene	**ug/l**	0.3	u	
		1,1,1-Trichloroethane	**ug/l**	0.2	u	
		1,1,2-Trichloroethane	**ug/l**	0.4	u	
		Triehloroethylene	**ug/l**	0.2	u	
		1,2,3-Trichloropropane	**ug/l**	0.3	u	
		1,2,4-Trimethylbenzene	**ug/l**	0.2	u	
		1,3,5-Trimethylbenzene	**ug/l**	0.2	u	
		Vinyl Chloride	**ug/l**	2.0	u	
		m,p-Xylenes	**ug/l**	0.4	u	
		o-Xylene	**ug/l**	0.2	**U**	
		1-Chloro-2-fluorobenzene (Recovery)	**%**	82.0		

William E. Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Alaska Department of Natural Resources
DNR-DGGS
P.O. Box 772116
Eagle River AX 99577

Attnr Mary Maurer

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AUG 07 1991
Div. of Geological Survey
Eagle River

Report Date: 08/05/91

Date Arrived: 07/12/91
Date Sampled: 07/09/91
Time Sampled: 1845
Collected By: MAM

Flag Definitions
U = Below Detection Limit DL Stated in Result
B = Below Regulatory Min.
H = Above Regulatory Max.
E = Below Detection Limit Estimated Value

Our Lab #: Al11978
Location/Project: Nikiski Ground Water IIIA
Your Sample ID: Gordon Well
Sample Matrix: Water
Comments:

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A111978	EPA 502.2	Benzene	ug/l	0.2	u	07/19/91
		Bromobenzene	ug/l	0.3	u	
		Bromochloromethane	ug/l	0.3	U	
		Bromodichloromethane	ug/l	0.2	u	
		Bromoform	ug/l	1.0	u	
		Bromomethane	ug/l	2.0	U	
		n-Butylbenzene	ug/l	0.3	u	
		sec-Butylbenzene	ug/l	0.3	u	
		tort-Butylbencene	ug/l	0.5	u	
		Carbon Tetrachloride	ug/l	0.2	u	
		Chlorobenzene	ug/l	0.2	u	
		Dibromochloromethane	ug/l	0.4	u	
		Chloroethane	ug/l	2.0	u	
		Chloroform	ug/l	0.2	u	
		Chloromethane	ug/l	2.0	u	
		o-Chlorotoluene	ug/l	0.3	u	
		p-Chlorotoluene	ug/l	0.2	u	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	u	
		Dibromomethane	ug/l	0.4	u	
		1,4-Dichlorobenzene	ug/l	0.2	u	
		m-Dichlorobenzene	ug/l	0.2	U	
		o-Dichlorobenzene	ug/l	0.2	u	
		Dichlorodifluoromethane	ug/l	2.0	u	
		l,l-Dichloroethane	ug/l	0.2	u	
		1,2-Dichloroethane	ug/l	0.2	u	
		1,1-Dichloroethylene	ug/l	1.0	u	
		cir-1,2-Dichloroethylene	ug/l	0.2	u	
		trane-1,2-Dichloroethylene	ug/l	0.2	u	
		Methylene Chloride	ug/l	1.0	u	
		1,2-Dichloropropane	ug/l	0.2	u	
		1,3-Dichloropropane	ug/l	0.2	u	

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Div. of Geological Survey
Eagle River

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyze
A111978	EPA 502.2	2,2-Dichloropropane	ug/l	1.0	U	07/19/9
		1,1-Dichloropropene	ug/l	0.5	U	
		1,3-Dichloropropene	ug/l	0.2	U	
		Ethylbenzene	ug/l	0.2	U	
		1, 2-Dibromoethane	ug/l	1.0	U	
		Trfchlorofluoromethane	ug/l	0.5	U	
		Hexachlorobutadiene	ug/l	0.3	u	
		Isopropylbenzene	ug/l	0.3	U	
		p-fmopropyltoluene	ug/l	0.3	U	
		Naphthalene	ug/l	0.3	U	
		n-Propylbenzene	ug/l	0.3	U	
		Styrene	ug/l	0.2	U	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	U	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	U	
		Tetrachloroethylene	ug/l	0.2	U	
		Total Trihalomethane	ug/l	2	u	
		Toluene	ug/l	0.3	U	
		1,2,3-Trichlorobenzene	ug/l	0.3	U	
		1,2,4-Trichlorobenzene	ug/l	0.3	U	
		1,1,1-Trichloroethane	ug/l	0.2	U	
		1,1,2-Trichloroethane	ug/l	0.4	U	
		Trichloroethylene	ug/l	0.2	U	
		1,2,3-Trichloropropane	ug/l	0.3	U	
		1,2,4-Trimethylbenzene	ug/l	0.2	U	
		1,3,5-Trimethylbenzene	ug/l	0.2	U	
		Vinyl Chloride	ug/l	2.0	U	
		m,p-Xylenes	ug/l	0.4	U	
		o-Xylene	ug/l	0.2	U	
		1-Chloro-2-fluorobenzene (Recovery)	%	82.0		

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Alaska Department of **Natural Resources**
DNR-DGGS
P.O. Box 972116
Eagle River AK 99577

Attn: Mary **Maurer**

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Div. of Geological Survey

Report Date: **08/05/91**

Date **Arrived:** 07/12/91
Date **Sampled:** 07/10/91
Time Sampled: 1525
Collected By: **MAM**

Flag Definitions
U = Below Detection **Limit**
DL Stated in **Result**
B = Below Regulatory **Min.**
H = Above Regulatory **Max.**
E = Below Detection Limit
Estimated Value

Our Lab **#:** A111979 Eagle River
Location/Project: **Nikiski** Ground Water IIIA
Your Sample **ID:** Leuenhagen Well
Sample Matrix: Water
Comments:

Laboratory **Number**	Method	Parameter	Unit8	Result	**Flag**	Date Analyzed
A111979	EPA 502.2	Benzene	**ug/l**	0.2	u	**07/19/91**
		Bromobenzene	**ug/l**	0.3	u	
		Bromochloromethane	**ug/l**	0.3	**U**	
		Bromodichloromethane	**ug/l**	0.2	**U**	
		Bromoform	**ug/l**	1.0	**U**	
		Bromomethane	**ug/l**	2.0	u	
		n-Butylbanzene	**ug/l**	**0.3**	u	
		sec-Butylbenzene	**ug/l**	0.3	u	
		tart-Butylbentene	**ug/l**	0.5	**U**	
		Carbon Tetrachloride	**ug/l**	0.2	**U**	
		Chlorobenzene	**ug/l**	0.2	u	
		Dibromochloromethane	**ug/l**	0.4	**U**	
		Chloroethane	**ug/l**	2.0	u	
		Chloroform	**ug/l**	0.2	u	
		Chloromethane	**ug/l**	2.0	u	
		o-Chlorotoluene	**ug/l**	0.3	u	
		p-Chlorotoluene	**ug/l**	0.2	**U**	
		1,2-Dibromo-3-Chloropropane	**ug/l**	2.0	**U**	
		Dibromomethane	**ug/l**	0.4	**U**	
		1,4-Dichlorobenzene	**ug/l**	0.2	**U**	
		m-Dichlorobenzene	**ug/l**	0.2	u	
		o-Dichlorobenzene	**ug/l**	0.2	**U**	
		Dichlorodifluoromethane	**ug/l**	2.0	**U**	
		1,1-Dichloroethane	**ug/l**	0.2	**U**	
		1,2-Dichloroethane	**ug/l**	0.2	**U**	
		1,1-Dichloroethylene	**ug/l**	1.0	**U**	
		cis-1,2-Dichloroethylene	**ug/l**	0.2	u	
		trans-1,2-Dichloroethylene	**ug/l**	0.2	u	
		Methylene Chloride	**ug/l**	1.0	u	
		1,2-Dichloropropane	**ug/l**	0.2	**U**	
		1,3-Dichloropropane	**ug/l**	0.2	u	

Reported By: **William E.** Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Laboratory Number	Method	Parameter	Unite	Result	Flag	Date Analyzed
All1979	EPA 502.2	2,2-Dichloropropane	ug/l	1.0	U	07/19/91
		1,1-Dichloropropene	ug/l	0.5	u	
		1,3-Dichloropropene	ug/l	0.2	U	
		Ethylbenzene	ug/l	0.2	v	
		1,2-Dibromoethane	ug/l	1.0	U	
		Trichlorofluoromethane	ug/l	0.5	U	
		Hexachlorobutadiene	ug/l	0.3	U	
		Isopropylbenzene	ug/l	0.3	U	
		p-Isopropyltoluene	ug/l	0.3	U	
		Naphthalena	ug/l	0.3	U	
		n-Propylbenzene	ug/l	0.3	U	
		Styrene	ug/l	0.2	v	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	U	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	u	
		Tetrachloroethylene	ug/l	0.2	u	
		Total Trihalomethane	ug/l	2	v	
		Toluene	ug/l	0.3	v	
		1,2,3-Trichlorobenzene	ug/l	0.3	v	
		1,2,4-Trichlorobenzene	ug/l	0.3	v	
		1,1,1-Trichloroethane	ug/l	0.2	v	
		1,1,2-Trichloroethane	ug/l	0.4	v	
		Trichloroethylene	ug/l	0.2	v	
		1,2,3-Trichloropropane	ug/l	0.3	U	
		1,2,4-Trimethylbenzene	ug/l	0.2	U	
		1,3,5-Trimethylbenzene	ug/l	0.2	U	
		Vinyl Chloride	ug/l	2.0	U	
		m,p-Xylenes	ug/l	0.4	U	
		o-Xylene	ug/l	0.2	v	
		1-Chloro-2-fluorobenzene (Recovery)	%	69.0		

William E. Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Alaska Department of **Natural Resources**
DNR-DGGS
P.O. Box 992116
Eagle River **AK** 99599

Attn: Mary **Maurer**

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Div. of Geological Survey
Eagle River

Report Date: **08/05/91**

Date Arrived: **07/12/91**
Date Sampled: **07/11/91**
Time Sampled: 1335
Collected By: **MAM**

Flag **Definitions**
U = Below Detection **Limit** DL Stated in **Result**
B = Below Regulatory Min.
H = **Above** Regulatory **Max.**
E = Below Detection **Limit** **Estimated** Value

Our Lab **#:** A111980
Location/Project: **Nikiski** Ground Water IIIA
Your **Sample** ID: Van Sky Well
Sample **Matrix:** Water
Comments:

Laboratory Number	Method	Parameter	Units	Result	tlag	Date Analyzed
A111980	EPA 502.2	Benzene	ug/l	0.2	u	07/19/91
		Bromobenzene	ug/l	0.3	U	
		Bromochloromethane	ug/l	0.3	U	
		Bromodichloromethane	ug/l	0.2	U	
		Bromoform	ug/l	1.0	U	
		Bromomethane	ug/l	2.0	U	
		n-Butylbenzene	ug/l	0.3	U	
		sec-Butylbenzene	ug/l	0.3	U	
		tert-Butylbenzene	ug/l	0.5	U	
		Carbon Tetrachloride	ug/l	0.2	U	
		Chlorobenzene	ug/l	0.2	U	
		Dibromochloromethane	ug/l	0.4	u	
		Chloroethane	ug/l	2.0	U	
		Chloroform	ug/l	0.2	U	
		Chloromethane	ug/l	2.0	U	
		o-Chlorotoluene	ug/l	0.3	U	
		p-Chlorotoluene	ug/l	0.2	U	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	U	
		Dibromomethane	ug/l	0.4	U	
		1,4-Dichlorobenzene	ug/l	0.2	U	
		m-Dichlorobenzene	ug/l	0.2	U	
		o-Dichlorobenzene	ug/l	0.2	U	
		Dichlorodifluoromethan8	ug/l	2.0	U	
		1,1-Dichloroethane	ug/l	0.2	U	
		1,2-Dichloroethane	ug/l	0.2	U	
		1,1-Dichloroethylene	ug/l	1.0	u	
		cis-1,2-Dichloroethylene	ug/l	0.2	U	
		trans-1,2-Dichloroethylene	ug/l	0.2	u	
		Methylene Chloride	ug/l	1.0	U	
		1,2-Dichloropropane	ug/l	0.2	u	
		1,3-Dichloropropane	ug/l	0.2	U	

William E. Buchan

Reported By: William **E.** Buchan
Anchorage Operations Manager

NORTHERN **TESTING LABORATORIES, INC.**

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(907) 456-3116 • [illegible] 456.3125
(907) 277.8378 • FAX 274.9645

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A111980	EPA 502.2	**2,2-Dichloropropane**	**ug/l**	1.0	u	**07/19/91**
		l,l-Dichloropropene	**ug/l**	0.5	u	
		1,3-Dichloropropene	**ug/l**	0.2	u	
		Ethylbenzene	**ug/l**	0.2	u	
		1,2-Dibromoethane	**ug/l**	1.0	u	
		Trichlorofluoromethane	**ug/l**	0.5	u	
		Bexachlorobutadiene	**ug/l**	0.3	u	
		Imopropylbenzene	**ug/l**	0.3	u	
		p-Isopropyltoluene	**ug/l**	0.3	u	
		Naphthalene	**ug/l**	0.3	u	
		n-Propylbenzene	**ug/l**	0.3	u	
		Styrene	**ug/l**	0.2	u	
		1,1,1,2-Tetrachloroethane	**ug/l**	0.2	u	
		1,1,2,2-Tetrachloroethane	**ug/l**	0.3	u	
		Tetrachloroethylene	**ug/l**	0.2	u	
		Total Trihalomethane	**ug/l**	2	u	
		Toluene	**ug/l**	0.3	u	
		1,2,3-Trichlorobenzene	**ug/l**	0.3	u	
		1,2,4-Trichlorobenzene	**ug/l**	0.3	u	
		l,l,l-Trichloroethane	**ug/l**	0.2	u	
		1,1,2-Trichloroethane	**ug/l**	0.4	u	
		Trichloroethylene	**ug/l**	0.2	u	
		1,2,3-Trichloropropane	**ug/l**	0.3	u	
		1,2,4-Trimethylbenzene	**ug/l**	0.2	u	
		1,3,5-Trimethylbenzene	**ug/l**	0.2	u	
		Vinyl Chloride	**ug/l**	2.0	u	
		m,p-Xylenee	**ug/l**	0.4	u	
		o-Xylene	**ug/l**	0.2	u	
		1-Chloro-2-fluorobenzene (Recovery)	**%**	74.0		

Willi E. Buch

Reported By: William E. Buchan
Anchorage **Operations** Manager

NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL AVENUE
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ANCHORAGE. ALASKA 99503
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(907) 277-8378 • FAX 274-9645

Alaska Department of Natural **Resources**
DNR-DGGS
P.O. Box 772116
Eagle **River** AK 99577

Attn: Mary Maurer

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Div. of Geological Survey
Eagle River

Report Date: **08/05/91**

Date **Arrived: 07/12/91**
Date Sampled: **07/09/91**
Time Sampled: -
Collected By: **MAM**

Our Lab **#:** A111981
Location/Project: **Nikiski** Ground Water **IIIA**
Your Sample ID: **Travel** Blank
sample Hatrix: **Water**
Comments:

Plag Definitions
U = Below **Detection Limit**
DL Stated in **Result**
B = Below Regulatory Win.
H = Above **Regulatory** Max.
E = Below Detection Limit
Estimated Value

Laboratory Number	Method	Parameter	Unit8	Result	?lag	Date Analyzed
A111981	EPA 502.2	Benzene	ug/l	0.2	U	07/19/91
		Bromobenzene	ug/l	0.3	U	
		Bromochloromethane	ug/l	0.3	U	
		Bromodichloromethane	ug/l	0.2	U	
		Bromoform	ug/l	1.0	U	
		Bromomethane	ug/l	2.0	U	
		n-Butylbencene	ug/l	0.3	U	
		sec-Butylbenzene	ug/l	0.3	U	
		tert-Butylbenzene	ug/l	0.5	U	
		Carbon Tetrachloride	ug/l	0.2	U	
		Chlorobenzene	ug/l	0.2	U	
		Dibromochloromethane	ug/l	0.4	u	
		Chloroethane	ug/l	2.0	U	
		chloroform	ug/l	0.2	U	
		Chloromethane	ug/l	2.0	U	
		o-Chlorotoluene	ug/l	0.3	U	
		p-Chlorotoluene	ug/l	0.2	U	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	U	
		Dibromomethane	ug/l	0.4	U	
		1,4-Dichlorobenzene	ug/l	0.2	U	
		m-Dichlorobenzene	ug/l	0.2	U	
		o-Dichlorobenzene	ug/l	0.2	U	
		Dichlorodifluoromethane	ug/l	2.0	U	
		1,1-Dichloroethane	ug/l	0.2	U	
		1,2-Dichloroethane	ug/l	0.2	U	
		1,1-Dichloroethylene	ug/l	1.0	U	
		cis-1,2-Dichloroethylene	ug/l	0.2	U	
		trans-1,2-Dichloroethylene	ug/l	0.2	U	
		Methylene Chloride	ug/l	1.0	U	
		1,2-Dichloropropane	ug/l	0.2	U	
		1,3-Dichloropropane	ug/l	0.2	u	

Reported By: William **E. Buchan**
Anchorage **Operations** Manager

NORTHERN TESTING LABORATORIES, INC.

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Eagle River

Laboratory Number	Method	Parameter	Units	Result	Flag O	Flag U	Date Analyzed
AI11981	EPA 502.2	**2,2-Dichloropropane**	**ug/l**	1.0	u		**07/19/91**
		1,1-Dichloropropene	**ug/l**	0.5	u		
		1,3-Dichloropropene	**ug/l**	0.2	u		
		Ethylbenzene	**ug/l**	0.2		**U**	
		1,2-Dibromoethane	**ug/l**	1.0		**U**	
		Trichlorofluoromethane	**ug/l**	0.5		**U**	
		Hexachlorobutadiene	**ug/l**	0.3		**U**	
		Isopropylbenzene	**ug/l**	0.3		**U**	
		p-Isopropyltoluene	**ug/l**	0.3	u		
		Naphthalene	**ug/l**	0.3		**U**	
		n-Propylbenzene	**ug/l**	0.3		**U**	
		Styrene	**ug/l**	0.2		**U**	
		1,1,1,2-Tetrachloroethane	**ug/l**	0.2		**U**	
		1,1,2,2-Tetrachloroethane	**ug/l**	0.3		**U**	
		Tetrachloroethylene	**ug/l**	0.2		**U**	
		Total Trihalomethane	**ug/l**	**2**		**U**	
		Toluene	**ug/l**	0.3		**U**	
		1,2,3-Trichlorobenzene	**ug/l**	0.3		**U**	
		1,2,4-Trichlorobenzene	**ug/l**	0.3		**U**	
		l,l,l-Trichloroethane	**ug/l**	0.2		**U**	
		1,1,2-Trichloroethane	**ug/l**	0.4		**U**	
		Trichloroethylene	**ug/l**	0.2		**U**	
		1,2,3-Trichloropropane	**ug/l**	0.3		**U**	
		1,2,4-Trimethylbenzene	**ug/l**	0.2		**U**	
		1,3,5-Trimethylbenzene	**ug/l**	0.2		**U**	
		Vinyl Chloride	**ug/l**	2.0		**U**	
		m,p-Xylenee	**ug/l**	0.4		**U**	
		o-Xylene	**ug/l**	0.2		**U**	
		l-Chloro-2-fluorobenzene (Recovery)	**%**	92.0			

William E. Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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2505 FAIRBANKS STREET
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Alaska Division of Water
P.O. Box 772116
Eagle River AK 99577

Attn: Mary A. Maurer

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Div. of Geological Survey
Eagle River

Report Date: 08/13/91

Date Arrived: 07/19/91
Date Sampled: 07/12/91
Time Sampled: 1330
Collected By: MAM

Flag Definitions
U = Below Detection Limit DL Stated in Result
B = Below Regulatory Min.
H = Above Regulatory Max.
E = Below Detection Limit Estimated Value

Our Lab #: A112158
Location/Project: 239055
Your Sample ID: Bowlin Well
Sample Matrix: Water
Comments:

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112158	EPA 502.2	Benzene	ug/l	0.2	U	08/04/91
		Bromobenzene	ug/l	0.3	u	
		Bromochloromethane	ug/l	0.3	u	
		Bromodichloromethane	ug/l	0.2	U	
		Bromoform	ug/l	1.0	u	
		Bromomethane	ug/l	2.0	u	
		n-Butylbenzene	ug/l	0.3	u	
		eec-Butylbenzene	ug/l	0.3	u	
		tert-Butylbenzene	ug/l	0.5	u	
		Carbon Tetrachloride	ug/l	0.2	U	
		Chlorobenzene	ug/l	0.2	u	
		Dibromochlorcxnethane	ug/l	0.4	U	
		Chloroethane	ug/l	2.0	U	
		Chloroform	ug/l	0.2	u	
		Chloromethane	ug/l	2.0	U	
		o-Chlorotoluene	ug/l	0.3	u	
		p-Chlorotoluene	ug/l	0.2	u	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	u	
		Dibromomethane	ug/l	0.4	U	
		1,4-Dichlorobenzene	ug/l	0.2	u	
		m-Dichlorobenzene	ug/l	0.2	u	
		o-Dichlorobenzene	ug/l	0.2	U	
		Dichlorodifluoromethane	ug/l	2.0	U	
		1,1-Dichloroethane	ug/l	0.2	u	
		1,2-Dichloroethane	ug/l	0.2	U	
		1,1-Dichloroethylene	ug/l	1.0	u	
		cio-1,2-Dichloroethylene	ug/l	0.2	u	
		trane-1,2-Dichloroethylene	ug/l	0.2	U	
		Hethylene Chloride	ug/l	1.0	u	
		1,2-Dichloropropane	ug/l	0.2	U	
		1,3-Dichloropropane	ug/l	0.2	U	

William E. Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112158	EPA 582.2	**2,2-Dichloropropane**	ug/l	1.0	u	08/04/91
		l,l-Dichloropropene	ug/l	0.5	u	
		1,3-Dichloropropene	ug/l	0.2	u	
		Ethylbenzene	ug/l	0.2	u	
		1,2-Dibromoethane	ug/l	1.0	u	
		Trichlorofluoromethane	ug/l	0.5	u	
		Hexachlorobutadiene	ug/l	0.3	u	
		Isopropylbenzene	ug/l	0.3	u	
		p-Isopropyltoluene	ug/l	0.3	u	
		Naphthalene	ug/l	0.3	U	
		a-Propylbenzene	ug/l	0.3	u	
		Styrene	ug/l	0.2	u	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	u	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	u	
		Tetrachloroethylene	ug/l	0.2	U	
		Total **Trihalomethane**	ug/l	2	u	
		Toluene	ug/l	0.3	u	
		1,2,3-Trichlorobenzene	ug/l	0.3	u	
		1,2,4-Trichlorobenzene	ug/l	0.3	u	
		1,1,1-Trichloroethane	ug/l	0.2	u	
		1,1,2-Trichloroethane	ug/l	0.4	u	
		Trichloroethylene	ug/l	0.2	u	
		1,2,3-Trichloropropane	ug/l	0.3	u	
		1,2,4-Trimethylbenzene	ug/l	0.2	u	
		1,3,5-Trimethylbenzene	ug/l	0.2	u	
		Vinyl Chloride	ug/l	2.0	U	
		m,p-Xylenea	ug/l	0.4	U	
		o-Xylene	ug/l	0.2	u	
		1-Chloro-2-fluorobenzene (Recovery)	%	82.0		

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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ANCHORAGE, ALASKA 99503
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Alamka Division of Water
P.O. Box 772116
Eagle River AK 99577

Attn: Mary A. Maurer

Report Date: 08/13/91

Date Arrived: 07/19/91
Date Sampled: 07/12/91
Time Sampled: 1545
Collected By: MAM

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Div. of Geological Survey
Eagle River

Flag Definitions
U = Below Detection Limit
DL Stated in Result
B = Below Regulatory Min.
H = Above Regulatory Max.
E = Below Detection Limit
Estimated Value

Our Lab #: A112159
Location/Project: 239055
Your Sample ID: Hunt Well
Sample Matrix: Water
Comments:

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112159	EPA 502.2	Benzene	ug/l	0.2	U	08/04/91
		Bromobenzene	ug/l	0.3	U	
		Bromochloromethane	ug/l	0.3	u	
		Bromodichloromethane	ug/l	0.2	U	
		Bromoform	ug/l	1.0	U	
		Bromomethane	ug/l	2.0	U	
		n-Butylbenzene	ug/l	0.3	U	
		sec-Butylbenzene	ug/l	0.3	U	
		tert-Butylbenzene	ug/l	0.5	u	
		Carbon Tetrachloride	ug/l	0.2	u	
		Chlorobenzene	ug/l	0.2	U	
		Dibromochloromethane	ug/l	0.4	u	
		Chloroethane	ug/l	2.0	u	
		Chloroform	ug/l	0.2	u	
		Chloromethane	ug/l	2.0	u	
		o-Chlorotoluene	ug/l	0.3	u	
		p-Chlorotoluene	ug/l	0.2	u	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	U	
		Dibromomethane	ug/l	0.4	u	
		1,4-Dichlorobenzene	ug/l	0.2	U	
		m-Dichlorobenzene	ug/l	0.2	u	
		o-Dichlorobenzene	ug/l	0.2	u	
		Dichlorodifluoromethane	ug/l	2.0	u	
		1,1-Dichloroethane	ug/l	0.2	U	
		1,2-Dichloroethane	ug/l	0.2	U	
		1,1-Dichloroethylene	ug/l	1.0	U	
		cis-1,2-Dichloroethylene	ug/l	0.2	u	
		trans-1,2-Dichloroethylene	ug/l	0.2	U	
		Methylene Chloride	ug/l	1.0	U	
		1,2-Dichloropropane	ug/l	0.2	U	
		1,3-Dichloropropane	ug/l	0.2	u	

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112159	EPA 502.2	**2,2-Dichloropropane**	ug/l	1.0	u	08/04/91
		l,l-Dichloropropene	ug/l	0.5	u	
		1,3-Dichloropropene	ug/l	0.2	u	
		Ethylbenzene	ug/l	0.2	u	
		1,2-Dibromoethane	ug/l	1.0	u	
		Trichlorofluoromethane	ug/l	0.5	u	
		Hexachlorobutadiene	ug/l	0.3	u	
		Isopropylbenzsne	ug/l	0.3	u	
		p-Isopropyltoluene	ug/l	0.3	u	
		Naphthalene	ug/l	0.3	u	
		n-Propylbenzene	ug/l	0.3	u	
		Styrene	ug/l	0.2	u	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	u	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	u	
		Tetrachloroethylene	ug/l	0.2	u	
		Total **Trihalomethane**	ug/l	2	u	
		Toluene	ug/l	0.3	u	
		1,2,3-Trichlorobenzene	ug/l	0.3	u	
		1,2,4-Trichlorobenzene	ug/l	0.3	u	
		l,l,l-Trichloroethane	ug/l	0.2	u	
		1,1,2-Trichloroethane	ug/l	0.4	u	
		Trichloroethylene	ug/l	0.2	u	
		1,2,3-Trichloropropane	ug/l	0.3	u	
		1,2,4-Trimethylbenzene	ug/l	0.2	u	
		1,3,5-Trimethylbenzene	ug/l	0.2	u	
		Vinyl Chloride	ug/l	2.0	u	
		m,p-Xylenes	ug/l	0.4	u	
		o-Xylene	ug/l	0.2	u	
		1-Chloro-2-fluorobenzene (Recovery)	%	93.0		

William E. Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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(907) 456-3116 • FM 456-3125
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Alaska Division of Water
P.O. Box 772116
Eagle River AK 99577

Report Date: **08/13/91**

Date Arrived: **07/19/91**
Date Sampled: **07/12/91**
Time sampled: 1200
Collected By: **MAM**

Attn: **Mary** A. Haurer

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Flag Definition8
V = Below Detection Limit
DL Stated in **Result**
B = Below Regulatory **Min.**
H = Above Regulatory **Max.**
E = Below Detection **Limit**
Estimated Value

Our Lab #: A112160
Location/Project: 239055
Your Sample ID: Valentine Well Eagle River
Sample Matrix: Water
comment s :

Laboratory Number	Method	Parameter	Unite	Result	Flag	Date Analyzed
A112160	EPA 502.2	Benzene	ug/l	0.2	v	08/04/91
		Bromobenzene	ug/l	0.3	v	
		Brcxnochloromethane	ug/l	0.3	v	
		Bromodichloromethane	ug/l	0.2	U	
		Bromoform	ug/l	1.0	v	
		Bromomethane	ug/l	2.0	v	
		n-Butylbenzene	ug/l	0.3	v	
		sec-Butylbenzene	ug/l	0.3	v	
		tart-Butylbenzene	ug/l	**0.5**	V	
		Carbon Tetrachloride	ug/l	0.2	v	
		Chlorobenzene	ug/l	0.2	v	
		Dibromochloromethane	ug/l	0.4	v	
		Chloroethane	ug/l	2.0	v	
		Chloroform	ug/l	0.2	v	
		Chloromethane	ug/l	2.0	v	
		o-Chlorotoluene	ug/l	0.3	v	
		p-Chlorotoluene	ug/l	0.2	v	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	v	
		Dibromomethane	ug/l	0.4	v	
		1,4-Dichlorobenzene	ug/l	0.2	v	
		m-Dichlorobenzene	ug/l	0.2	v	
		o-Dichlorobenzene	ug/l	0.2	v	
		Dichlorodifluoromethane	ug/l	2.0	v	
		1,1-Dichloroethane	ug/l	0.2	v	
		1,2-Dichloroethane	ug/l	0.2	v	
		1,1-Dichloroethylene	ug/l	1.0	v	
		cis-1,2-Dichloroethylene	ug/l	0.2	v	
		trans-1,2-Dichloroethylene	ug/l	0.2	v	
		Methylene Chloride	ug/l	1.0	v	
		1,2-Dichloropropane	ug/l	0.2	v	
		1,3-Dichloropropane	ug/l	0.2	v	

William E. Buchan

Reported By: **William E. Buchan**
Anchorage Operation8 Manager

NORTHER N TESTING LABORATORIES, INC.

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Eagle River

Laboratory Number	Method	Parameter	Unite	Result	Flag	Date Analyzed
Al12160	EPA 502.2	2,2-Dichloropropane	ug/l	1.0	U	08/04/91
		1,1-Dichloropropene	ug/l	0.5	U	
		1,3-Dichloropropene	ug/l	0.2	U	
		Ethylbenzene	ug/l	0.2	U	
		1,2-Dibromoethane	ug/l	1.0	U	
		Trfchlorofluoromethane	ug/l	0.5	U	
		Hexachlorobutadiene	ug/l	D.3	U	
		Isopropylbenzene	ug/l	0.3	U	
		p-Isopropyltoluene	ug/l	0.3	U	
		Naphthalens	ug/l	0.3	u	
		n-Propylbentene	ug/l	0.3	U	
		Styrene	ug/l	0.2	u	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	U	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	U	
		Tetrachloroethylene	ug/l	0.2	u	
		Total Trihalomethane	ug/l	2	U	
		Toluene	ug/l	0.3	U	
		1,2,3-Trichlorobenzene	ug/l	0.3	U	
		1,2,4-Trichlorobenzene	ug/l	0.3	U	
		1,1,1-Trichloroethane	ug/l	0.2	U	
		1,1,2-Trichloroethane	ug/l	0.4	U	
		Trichloroethylene	ug/l	0.2	U	
		1,2,3-Trichloropropane	ug/l	0.3	U	
		1,2,4-Trimethylbenzene	ug/l	0.2	U	
		1,3,5-Trimethylbenzene	ug/l	0.2	u	
		Vinyl Chloride	ug/l	2.0	U	
		m,p-Xylenes	ug/l	0.4	u	
		o-Xylene	ug/l	0.2	u	
		1-Chloro-2-fluorobenzene (Recovery)	%	95.0		

William E. Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL AVENUE, FAIRBANKS, ALASKA 99701, (907) 456.3116 • FAX 456-3125
2505 FAIRBANKS STREET, ANCHORAGE, ALASKA 99503, (907) 277-8378 • FAX 274-9645

Alaska Division **of Water**
P.O. Box 772116
Eagle River AK 99577

Attn: Mary A. **Maurer**

Report **Date:** 08/13/91

Date Arrived: 07/19/91
Date Sampled: 07/12/91
Time Sampled: 1235
Collected By: MAM

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Flag Definitions
U = Below Detection **Limit**
DL Stated in **Result**
B = **Below** Regulatory **Min.**
H = Above Regulatory **Max.**
E = Below Detection Limit
Estimated Value

our Lab #: A112161
Location/Project: 239055
Your Sample ID: Big 3 Lincoln Well Eagle River
Sample Matrix: Water
Comments:

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112161	**EPA** 502.2	Benzene	ug/l	0.2	u	08/04/91
		Bromobenzene	ug/l	0.3	**U**	
		Bromochlorornethane	ug/l	0.3	u	
		Bromodichloromethane	ug/l	0.2	u	
		Bromoform	ug/l	1.0	U	
		Bromomethane	ug/l	2.0	**U**	
		n-Butylbenzene	ug/l	0.3	u	
		see-Butylbenzene	ug/l	0.3	u	
		tert-Butylbenzene	ug/l	0.5	u	
		Carbon Tetrachloride	ug/l	0.2	u	
		Chlorobenzene	ug/l	0.2	**U**	
		Dibromochloromethane	ug/l	0.4	u	
		Chloroethane	ug/l	2.0	u	
		Chloroform	ug/l	0.2	u	
		Chloromethane	ug/l	2.0	u	
		a-Chlorotoluene	ug/l	0.3	u	
		p-Chlorotoluene	ug/l	0.2	u	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	u	
		Dibromomethane	ug/l	0.4	u	
		1,4-Dichlorobenzene	ug/l	0.2	u	
		m-Dichlorobenzene	ug/l	0.2	u	
		o-Dichlorobenzene	ug/l	0.2	u	
		Dichlorodifluoromethane	ug/l	2.0	u	
		1,1-Dichloroethane	ug/l	0.2	u	
		1,2-Dichloroethane	ug/l	0.2	u	
		1,1-Dichloroethylene	ug/l	1.0	u	
		cis-1,2-Dichloroethylene	ug/l	0.2	u	
		trans-1,2-Dichloroethylene	ug/l	0.2	u	
		Methylene Chloride	ug/l	1.0	u	
		1,2-Dichloropropane	ug/l	0.2	u	
		1,3-Dichloropropane	ug/l	0.2	u	

William E. Buchan

Reported By: William E. Buchan
Anchorage **Operations** Manager

NORTHERN TESTING LABORATORIES, INC.

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Eagle River

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112161	EPA 502.2	2,2-Dichloropropane	ug/l	1.0	u	08/04/91
		1,1-Dichloropropene	ug/l	0.5	u	
		1,3-Dichloropropene	ug/l	0.2	U	
		Ethylbenzene	ug/l	0.2	u	
		1,2-Dibromoethane	ug/l	1.0	u	
		Trichlorofluoromethane	ug/l	0.5	u	
		Hexachlorobutadiene	ug/l	0.3	u	
		Ieopropylbenzene	ug/l	0.3	u	
		p-Isopropyltoluene	ug/l	0.3	U	
		Naphthalene	ug/l	0.3	u	
		n-Propylbenzene	ug/l	0.3	u	
		Styrene	ug/l	0.2	u	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	u	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	u	
		Tetrachloroethylene	ug/l	0.2	u	
		Total Trihalomethane	ug/l	2	u	
		Toluene	ug/l	0.3	u	
		1,2,3-Trichlorobenzene	ug/l	0.3	u	
		1,2,4-Trichlorobenzene	ug/l	0.3	u	
		1,1,1-Trichloroethane	ug/l	0.2	u	
		1,1,2-Trichloroethane	ug/l	0.4	u	
		Trichloroethylene	ug/l	0.2	u	
		1,2,3-Trichloropropane	ug/l	0.3	u	
		1,2,4-Trimethylbenzene	ug/l	0.2	u	
		1,3,5-Trimethylbenzene	ug/l	0.2	u	
		Vinyl Chloride	ug/l	2.0	u	
		m,p-Xylenee	ug/l	0.4	u	
		o-Xylene	ug/l	0.2	u	

William E. Buchan

&ported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Alaska Division of Water
P.O. Box 772116
Eagle **River** AX 99577

Attn: Mary Maurer

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Div. of Geological Survey
Eagle River

Report Date: **08/13/91**

Date Arrived: **07/23/91**
Date Sampled: **07/19/91**
Time Sampled: 1512
Collected By: **MM**

Flag Definitions
U = Below Detection Limit
DL Stated in Result
B = Below Regulatory Min.
H = Above Regulatory **Max.**
E = Below Detection Limit
Eetimated Value

Our Lab **#:** **AI12305**
Location/Project: **Nikiski** Groundwater
Your Sample ID: **Newberry** Well
Sample Matrix: Water
Comments:

Laboratory Number	**Method**	Parameter	Unite	Result	Flag	Date Analyzed
A112305	EPA 502.2	Benzene	**ug/l**	0.2	**U**	**08/07/91**
		Bromobenzene	**ug/l**	0.3	**U**	
		Bromochloromethane	**ug/l**	0.3	**U**	
		Bromodichloromethane	**ug/l**	0.2	u	
		Branoform	**ug/l**	1.0	u	
		Bromomethane	**ug/l**	2.0	**U**	
		n-Butylbenzene	**ug/l**	0.3	u	
		eec-Butylbenzene	**ug/l**	0.3	**U**	
		tert-Butylbenzene	**ug/l**	0.5	u	
		Carbon Tetrachloride	**ug/l**	0.2	**U**	
		Chlorobenzene	**ug/l**	0.2	**U**	
		Dibromochloromethane	**ug/l**	0.4	**U**	
		Chloroethane	**ug/l**	2.0	u	
		Chloroform	**ug/l**	0.2	**U**	
		Chloromethane	**ug/l**	2.0	**U**	
		o-Chlorotoluene	**ug/l**	0.3	**U**	
		p-Chlorotoluene	**ug/l**	0.2	u	
		1,2-Dibromo-3-Chloropropane	**ug/l**	2.0	**U**	
		Dibromomethane	**ug/l**	0.4	**U**	
		1,4-Dichlorobenzene	**ug/l**	0.2	**U**	
		m-Dichlorobenzene	**ug/l**	0.2	u	
		o-Dichlorobenzene	**ug/l**	0.2	**U**	
		Dichlorodifluoromethane	**ug/l**	2.0	**U**	
		1,1-Dichloroethane	**ug/l**	0.2	**U**	
		1,2-Dichloroethane	**ug/l**	Q.2	**U**	
		1,1-Dichloroethylene	**ug/l**	1.0	**U**	
		cis-1,2-Dichloroethylene	**ug/l**	0.2	**U**	
		trans-1,2-Dichloroethylene	**ug/l**	0.2	u	
		Methylene Chloride	**ug/l**	1.0	**U**	
		1,2-Dichloropropane	**ug/l**	0.2	u	
		1,3-Dichloropropane	**ug/l**	0.2	u	

William E Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112305	EPA 502.2	2,2-Dichloropropane	ug/l	1.0	u	08/07/91
		1,1-Dichloropropene	ug/l	0.5	u	
		1,3-Dichloropropane	ug/l	0.2	u	
		Ethylbenzene	ug/l	0.2	u	
		1,2-Dibromoethane	ug/l	1.0	u	
		Trichlorofluoromethane	ug/l	0.5	u	
		Hexachlorobutadiene	ug/l	0.3	u	
		Ieopropylbenzene	ug/l	0.3	u	
		p-Iaoprepyltoluene	ug/l	0.3	u	
		Naphthalene	ug/l	0.3	u	
		n-Propylbenzene	ug/l	0.3	u	
		Styrene	ug/l	0.2	u	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	u	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	u	
		Tetrachloroethylene	ug/l	0.2	u	
		Total Trihalomethane	ug/l	2	u	
		Toluene	ug/l	0.3	u	
		1,2,3-Trichlorobenzene	ug/l	0.3	u	
		1,2,4-Trichlorobenzene	ug/l	0.3	u	
		1,1,1-Trichloroethane	ug/l	0.2	u	
		1,1,2-Trichloroethane	ug/l	0.4	u	
		Trichloroethylene	ug/l	6.2	u	
		1,2,3-Trichloropropane	ug/l	0.3	u	
		1,2,4-Trimethylbenzene	ug/l	0.2	u	
		1,3,5-Trimethylbenzene	ug/l	0.2	u	
		Vinyl Chloride	ug/l	2.0	u	
		m,p-Xylenes	ug/l	0.4	u	
		o-Xylene	ug/l	0.2	u	
		1-Chloro-2-fluorobenzene (Recovery)	%			

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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FAIRBANKS. ALASKA 99701
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Alaska Division of Water
P.O. Box 772116
Eagle River **AK** 99577

Attn: **Mary Maurer**

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Div. of Geological Survey
Eagle River

Report Date: **08/13/91**

Date Arrived: **07/23/91**
Date Sampled: **07/20/91**
Time Sampled: 1233
Collected By: **MM**

Flag Definitions
U = Below Detection Limit DL Stated in **Result**
B = Below **Regulatory** Min.
H = Above Regulatory Max.
E = Below Detection Limit Estimated Value

Our Lab **#:** **A112306**
Location/Project: **Nikiski** Groundwater
Your Sample ID: Harris Well
Sample Matrix: Water
Comments:

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112306	EPA 502.2	Benzene	ug/l	0.2	**U**	08/07/91
		Bromobenzene	ug/l	0.3	**U**	
		Bromochloromethane	ug/l	0.3	u	
		Bromodichloromethane	ug/l	0.2	u	
		Bromoform	ug/l	1.0	u	
		Bromometkane	ug/l	**2.0**	u	
		n-Butylbenzene	ug/l	0.3	**U**	
		sec-Butylbenzene	ug/l	0.3	**U**	
		tert-Butylbenzene	ug/l	0.5	**U**	
		Carbon Tetrachloride	ug/l	0.2	**U**	
		Chlorobenzene	ug/l	0.2	**U**	
		Dibromochloromethane	ug/l	0.4	u	
		Chloroethane	ug/l	2.0	u	
		chloroform	ug/l	0.2	**U**	
		Chloromethane	ug/l	2.0	**U**	
		a-Chlorotoluene	ug/l	0.3	**U**	
		p-Chlorotoluene	ug/l	0.2	**U**	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	u	
		Dibromomethane	ug/l	0.4	u	
		1,4-Dichlorobenzene	ug/l	0.2	**U**	
		m-Dichlorobenzene	ug/l	0.2	**U**	
		o-Dichlorobenzene	ug/l	0.2	**U**	
		Dichlorodifluoromethane	ug/l	2.0	u	
		1,1-Dichloroethane	ug/l	0.2	**U**	
		1,2-Dichloroethane	ug/l	0.2	**U**	
		1,1-Dichloroethylene	ug/l	1.0	u	
		cis-1,2-Dichloroethylene	ug/l	0.2	**U**	
		trans-1,2-Dichloroethylene	ug/l	0.2	**U**	
		Hethylene Chloride	ug/l	1.0	**U**	
		1,2-Dichloropropane	ug/l	0.2	**U**	
		1,3-Dichloropropane	ug/l	0.2	**U**	

William E. Buchan

Reported By: William E. Buchan
Anchorage Operations Manager

NORTHERN TESTING LABORATORIES, INC.

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2505 FAIRBANKS STREET ANCHORAGE. ALASKA 99503 (907) 277-8378 . FAX 274-9645

Div. of Geological Survey
Eagle River

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A112306	EPA 502.2	**2,2-Dichloropropane**	ug/l	1.0	U	08/07/91
		1,1-Dichloropropene	ug/l	0.5	U	
		1,3-Dichloropropene	ug/l	0.2	U	
		Ethylbenzene	ug/l	0.2	u	
		1,2-Dibromoethane	ug/l	1.0	U	
		Trichlorofluoromethane	ug/l	0.5	u	
		Hexachlorobutadiene	ug/l	0.3	U	
		Isopropylbenzene	ug/l	0.3	U	
		p-Ioopropyltoluene	ug/l	0.3	u	
		Naphthalene	ug/l	0.3	U	
		n-Propylbenzene	ug/l	0.3	u	
		Styrene	ug/l	0.2	U	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	U	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	u	
		Tetrachloroethylene	ug/l	0.2	u	
		Total Trihalomethane	ug/l	2	u	
		Toluene	ug/l	0.3	u	
		1,2,3-Trichlorobenzene	ug/l	0.3	U	
		1,2,4-Trichlorobenzene	ug/l	0.3	u	
		1,1,1-Trichloroethane	ug/l	0.2	u	
		1,1,2-Trichloroethane	ug/l	0.4	U	
		Trichloroethylene	ug/l	0.2	U	
		1,2,3-Trichloropropane	ug/l	0.3	U	
		1,2,4-Trimethylbenzene	ug/l	0.2	U	
		1,3,5-Trimethylbenzene	ug/l	0.2	U	
		Vinyl Chloride	ug/l	2.0	u	
		m,p-Xylenee	ug/l	0.4	U	
		o-Xylene	ug/l	0.2	U	
		l-Chloro-2-fluorobenzene (Recovery)	%	88.0		

William E. Buchan

Reported By: William E. Buchan
Anchorage Qperations Manager

NORTHERN TESTING LABORATORIES, INC.

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Alaska Division of Water
P.O. Box 772116
Eagle River AK 99577

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Attn: Mary Maurer

Div. of Geological Survey
Eagle River

Report Date: 08/13/91

Date Arrived: 07/23/91
Date Sampled: 07/20/91
Time Sampled: 1803
collected By: MM

Flag Definition8
U = Below Detection Limit
DL Stated in Result
B = Below Regulatory Min.
H = Above Regulatory Max.
E = Below Detection Limit
Estimated Value

Our Lab #: A112309
Location/Project: Nikiski Groundwater
Your Sample ID: Grimm Well
Sample Matrix: Water
Comments:

Laboratory Number	Method	Parameter	Units	Result	Flag	Date Analyzed
A312309	EPA 502.2	Benzene	w/ l	0.2	u	08/07/91
		Bromobenzene	ug/l	0.3	U	
		Bromochloromethane	ug/l	0.3	u	
		Browdichloromethane	ug/l	0.2	u	
		Bromoform	ug/l	1.0	u	
		Bromomethane	ug/l	2.0	u	
		n-Butylbenzene	ug/l	0.3	u	
		see-Butylbenzene	ug/l	0.3	u	
		tort-Butylbenzene	ug/l	0.5	u	
		Carbon Tetrachloride	ug/l	0.2	u	
		Chlorobenzene	ug/l	0.2	u	
		Dibromochloromethane	ug/l	0.4	u	
		Chloroethane	ug/l	2.0	u	
		Chloroform	ug/l	0.2	u	
		Chloromethane	ug/l	2.0	u	
		o-Chlorotoluene	ug/l	0.3	u	
		p-Chlorotoluene	ug/l	0.2	u	
		1,2-Dibromo-3-Chloropropane	ug/l	2.0	u	
		Dibromomethane	ug/l	0.4	u	
		1,4-Dichlorobenzene	ug/l	0.2	u	
		m-Dichlorobenzene	ug/l	0.2	u	
		o-Dichlorobenzene	ug/l	0.2	u	
		Dichlorodifluoromethane	ug/l	2.0	u	
		1,1-Dichloroethane	ug/l	0.2	u	
		1,2-Dichloroethane	ug/l	0.2	u	
		1,1-Dichloroethylene	ug/l	1.0	u	
		cis-1,2-Dichloroethylene	ug/l	0.2	u	
		trans-1,2-Dichloroethylene	ug/l	0.2	u	
		Methylene Chloride	ug/l	1.0	u	
		1,2-Dichloropropane	ug/l	0.2	u	
		1,3-Dichloropropane	ug/l	0.2	u	

William E. Buchan

Reported By: William E. Buchan
Anchorage Operatione Manager

NORTHERN TESTING LABORATORIES, INC.

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FAIRBANKS, ALASKA 99701
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Div. of Geological Survey
Eagle River

Laboratory Number	Method	Parameter	Unite	Result	Flag	Date Analyzed
All2307	EPA 502.2	**2,2-Dichloropropane**	ug/l	1.0	u	08/07/91
		1,1-Dichloropropene	ug/l	0.5	u	
		1,3-Dichloropropene	ug/l	0.2	u	
		Ethylbenzene	ug/l	0.2	u	
		1,2-Dibromoethane	ug/l	1.0	u	
		Trichlorofluoromethane	ug/l	0.5	u	
		Hexechlorobutadiene	ug/l	0.3	u	
		Ieopropylbenzene	ug/l	0.3	U	
		p-Isopropyltoluene	ug/l	0.3	u	
		Naphthalene	ug/l	0.3	u	
		n-Propylbenzene	ug/l	0.3	u	
		Styrene	ug/l	0.2	u	
		1,1,1,2-Tetrachloroethane	ug/l	0.2	u	
		1,1,2,2-Tetrachloroethane	ug/l	0.3	u	
		Tetrachloroethylene	ug/l	0.2	u	
		Total Trihalomethane	ug/l	2	U	
		Toluene	ug/l	0.3	u	
		1,2,3-Trichlorobenzene	ug/l	0.3	u	
		1,2,4-Trichlorobenzene	ug/l	0.3	u	
		1,1,1-Trichloroethane	ug/l	0.7		
		1,1,2-Trichloroethane	ug/l	0.4	U	
		Trichloroethylene	ug/l	0.2	u	
		1,2,3-Trichloropropane	ug/l	0.3	u	
		1,2,4-Trimethylbenzene	ug/l	0.2	U	
		1,3,5-Trimethylbenzene	ug/l	0.2	u	
		Vinyl Chloride	ug/l	2.0	U	
		m,p-Xylenes	ug/l	0.4	u	
		o-Xylene	ug/l	0.2	U	
		1-Chloro-2-fluorobenzene (Recovery)	%	94.0		

William E Buch

Reported By: William E. Buchan
Anchorage Operationa Manager

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Div. of Geological Survey
Eagle River

LABORATORY TESTS RESULTS
08/29/91

JOB NUMBER: 911850 CUSTOMER: STATE OF ALASKA ATTN: MARY MAURER

SAMPLE NUMBER: 1 DATE RECEIVED: 08/02/91 TIME RECEIVED: 10:30 SAMPLE DATE: 07/09/91 SAMPLE TIME: 13:12
PROJECT: CARROL/AB DUE 09/02/91 SAMPLE: CARROL WELL REM: WATER

SAMPLE NUMBER: 2 DATE RECEIVED: 08/02/91 TIME RECEIVED: 10:30 SAMPLE DATE: 07/09/91 SAMPLE TIME: 20:35
PROJECT: GORDON/AB DUE 09/02/91 SAMPLE: GORDON WELL REM: WATER

SAMPLE NUMBER: 3 DATE RECEIVED: 08/02/91 TIME RECEIVED: 10:30 SAMPLE DATE: 07/17/91 SAMPLE TIME: 12:35
PROJECT: BIG 3 LINCOLN/AB DUE 09/02/91 SAMPLE: BIG 3 LINCOLN WELL REM: WATER

SAMPLE NUMBER: 4 DATE RECEIVED: 08/02/91 TINE RECEIVED: 10:30 SAMPLE DATE: 07/17/91 SAMPLE TIME: 15:10
PROJECT: WELDING SHOP/AB DUE 09/02/91 SAMPLE: WELDING SHOP WELL REM: WATER

SAMPLE NWBER: 5 DATE RECEIVED: 08/02/91 TIME RECEIVED: 10:30 SAMPLE DATE: 07/18/91 SAMPLE TIME: 15:00
PROJECT: NEWBERRY/AB DUE 09/02/91 SAMPLE: NEWBERRY WELL REM: WATER

SAMPLE NWBER: 6 DATE RECEIVED: 08/02/91 TIME RECEIVED: 10:30 SAMPLE DATE: 07/20/91 SAMPLE TIME: 12:M
PROJECT: HARRIS/AB DUE 09/02/91 SAMPLE: HARRIS WELL REM: WATER

TEST DESCRIPTION	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5	SAMPLE 6	UNITS OF MEASURE
Gross Alpha, total	0.0	0.6	0.0	0.2	0.0	0.0	pCi/l
Gross Alpha, total, error, +/-	1.2	1.7	1.2	1.2	9.2	1.6	pCi/l
Gross Alpha, total, LLD	2.0	2.6	2.2	2.0	15.8	2.7	pCi/l
Gross Beta, total	1.6	1.3	1.5	1.9	11.3	1.6	pCi/l
Gross Beta, total, error, +/-	1.7	1.6	1.6	1.7	6.8	1.8	pCi/l
Gross Beta, total, LLD	2.7	2.5	2.5	2.7	10.4	2.8	pCi/l

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Div. of Geological Survey
Eagle River

LABORATORY TESTS RESULTS
08/29/91

JOB NUMBER: 911850 CUSTOMER: STATE OF ALASKA ATTN: MARY MAURER

SAMPLE NUMBER: 7 DATE RECEIVED: 08/02/91 TIME RECEIVED: 10:30 SAMPLE DATE: 07/20/91 SAMPLE TIME: 18:03
PROJECT: GRIMM/AB DUE 09/02/91 SAMPLE: GRIMM WELL REM: WATER

SAMPLE NUMBER: 8 DATE RECEIVED: 08/02/91 TIME RECEIVED: 10:30 SAMPLE DATE: 07/22/91 SAMPLE TIME: 10:55
PROJECT: ADAMS/AB DUE 09/02/91 SAMPLE: ADAMS WELL REM: WATER

SAMPLE NUMBER: 9 DATE RECEIVED: 08/02/91 TIME RECEIVED: 10:30 SAMPLE DATE: 07/22/91 SAMPLE TIME: 10:55
PROJECT: NORTH STAR/AB DUE 09/02/91 SAMPLE: NORTH STAR ELEMENTARY SCHOOL REM: WATER

TEST DESCRIPTION	SAMPLE 7	SAMPLE 8	SAMPLE 9	UNITS OF MEASURE
Gross Alpha, total	0.9	1.6	0.0	pCi/l
Gross Alpha, total, error, +/-	1.3	2.7	1.2	pCi/l
Gross Alpha, total, LLO	1.9	4.1	2.0	pCi/l
Gross Beta, total	2.1	4.2	3.2	pCi/l
Gross Beta, total, error, +/-	1.7	2.0	1.5	pCi/l
Gross Beta, total, LLD	2.7	3.0	2.3	pCi/l

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Eagle River

QUALITY ASSURANCE REPORT

08/29/91

JOB NUMBER: 911850 CUSTOMER: STATE OF ALASKA ATTN: MARY MAURER

ANALYSIS				DUPLICATES		REFERERCE STANDARDS		MATRIX SPIKES		
ANALYSIS TYPE	ANALYSIS SUB-TYPE	ANALYSIS I.D.	ANALYZED VALUE (A)	DUPLICATE VALUE (B)	RPD or (|A-B|)	TRUE VALUE	PERCENT RECOVERY	ORIGINAL VALUE	SPIKE ADDED	PERCENT RECOVERY
PARAMETER:Gross Alpha, total DETECTION LIMIT: UNITS:pCi/l				DATE/TIME ANALYZED:08/29/91 10:13 METHOD REFERENCE :EPA 900.0				QC BATCH NUMBER:115522 TECHNICIAN:DF		
DUPLICATE	prep	911850-4	0.2	0.5	86					
DUPLICATE	prep	911899-1	0.0	0.0	0					
DUPLICATE	prep	911753-3	0.0	2.7	3					
PARAMETER:Gross Alpha, total, error, +/- DETECTION LIMIT: UNITS:pCi/l				DATE/TIME ANALYZED:08/29/91 10:24 METHOD REFERERCE :				QC BATCH NUMBER:115523 TECHNICIAN:DF		
PARAMETER:Gross Alpha, total, LLD DETECTION LIMIT: UNITS:pCi/l				DATE/TIME ANALYZED:08/29/91 10:44 METHOD REFERENCE :				QC BATCH NUMBER:115524 TECHNICIAN:DF		
PARAMETER:Gross Beta, total DETECTION LIMIT: UNITS:pCi/l				DATE/TIME ANALYZED:08/29/91 10:49 METHOD REFERENCE :EPA 900.0				QC BATCH NUMBER:115526 TECHNICIAN:DF		
DUPLICATE	prep	911850-4	1.8	1.5	18					
DUPLICATE	prep	911899-1	5.6	12.8	78					
DUPL ICATE	prep	911753-3	31.5	36.1	14					
PARAMETER:Gross Beta, total, error, +/- DETECTION LIMIT: UNITS:pCi/l				DATE/TIME ANALYZED:08/29/91 10:58 METHOD REFERENCE :				QC BATCH NUMBER:115527 TECHNICIAN:DF		
PARAMETER:Gross Beta, total, LLD DETECTION LIMIT: UNITS:pCi/l				DATE/TIME ANALYZED:08/29/91 11:01 METHOD REFERENCE :				QC BATCH NUMBER:115528 TECHNICIAN:DF		

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NC = Not Calculable due to values lower thm the detection limit
ND = Not detected at level in limits column
Quality Control Acceptance Criteria:
- Blanks.............: Analyzed Value less thn or equal to tht Detection Limit
- Reference Standards: 100 +/- 10 Percent Recovery
- Duplicates.........: 20% Relative Percent Difference, or +/- the Detection Limit
- spikes.............: 100 +/- 25 Percent Recovery

(1) EPA 600/4-79-020, Methods for Chemical Analysis of Water and Wastes, March 1983
(2) EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition, November 1986
(3) Standards Methods for tht Examination of Water and Wastewater, 16th, 1985
(4) EPA/6004-80-032, Prescribed Procedures for Measurement of Radioactivity in Drinking Water, August 1930
(5) Federal Register, Friday, October 26, 1984 (40 CFR Part 136)
(6) EPA 600/8-78-017, Microbiological Methods for Monitoring the Environment, December 1978

NOTE - Data reported in QA report my differ from values on data page due to dilution of sample into analytical ranges.

APPENDIX D

Laboratory quality-assurance evaluation on water samples collected for the phase IIIA project, west Nikiski, Alaska

This quality assurance (QA) evaluation covers water samples and associated field and laboratory check samples collected from west Nikiski area ground waters during July 1991.

One-hundred eighty common dissolved ion and trace metal sample bottles were analyzed by the Alaska Division of Water Laboratory, Fairbanks, Alaska. Thirteen samples were analyzed for volatile organic compounds listed in U.S. Environmental Protection Agency (EPA) Method 502.2, by Northern Testing Laboratories, Inc., Anchorage, Alaska. Nine gross alpha and gross beta radioactivity samples were analyzed by Core Laboratories, Casper, Wyoming. Each analytical laboratory is discussed separately. Sample handling, holding times, analytical methods, and data quality objectives are listed in the QA plan (Maurer, 1991).

Alaska Division of Water Laboratory

Samnle Handling: All samples were received intact by the laboratory according to chain-of-custody records.

Field Quality Control Checks: Three blind duplicate sample sets, (a sample set consists of five numbered bottles per site) were collected: sample set 599,714, 509, 655, 791 is a blind duplicate at site 56; sample set 610,724, 521,666, 754 is a blind duplicate at site 152; and sample set 588, 702,497, 644, 768 is a blind duplicate at site 190.

Three blind equipment-blank sample sets were collected: sample set 600,712, 510, 656,792 at site 56; sample set 611, 725, 522, 667, 756 at site 152; and sample set 589, 703, 498, 645, 769 at site 190.

Laboratory Quality Control Checks: All method-required quality control (QC) checks including reagent blanks, laboratory duplicate samples, matrix spike samples, matrix spike duplicate samples, and standard reference samples were performed by the laboratory.

Timeliness: All samples were analyzed within holding time limits. The analysis of orthophosphate (PO_4), which was not scheduled for analysis but inadvertently included on the analytical report, exceeded the holding time limit of 48 hours.

Initial and Continuing Calibration: Instrument calibrations were within acceptable limits.

Blanks: Blind equipment-blank samples and laboratory blank samples are free of contamination.

Detection Limits: The detection limit stated on the analytical report is the same as that stated in the QA plan (Maurer, 1991) for all constituents except nickel, 0.001 mg/l in the QA plan and 0.01 mg/l on the analytical report.

Matrix Spikes (Accuracy): The accuracy data quality (DC) objective for common anions (F, Cl, NO, + NO_2, SO_4) is 90 to 110 percent recovery. The accuracy actually obtained for the common ions is 90 to 99 percent recovery.

The accuracy DQ objective for common cations (Ca, Mg, Na, K, Fe, Mn) and trace metals (Al, As, Ba, Cd, Cu, Cr, Pb, Hg, Ni, Zn) is 80 to 120 percent recovery. The accuracy actually obtained for common and trace metals is 91 to 109 percent recovery.

Laboratory Duplicates (Lab Precision): Precision is expressed as relative percent difference (RPD). The DQ objective for common anions is 10% RPD. The actual lab precision obtained ranges from 1.1 to 7.5% RPD.

The DQ objective for common cations and trace metals is 20% RPD. The actual lab precision obtained ranges from 0.5 to 8.7% RPD.

Lab precision can not be calculated for mercury because all reported values are less than the detection limit. Lab precision is calculated for nickel because samples from other sources, which had detectable concentrations, were analyzed during the same determination. The resultant RPD values for nickel are a measure of the analytical precision of the instrument at that time.

Field Duplicates (Overall Precision): Overall precision, which is a measure of both field and lab precision, is calculable for the sample sets associated with blind duplicate samples (see 'Field Quality Control Checks' above).

The RPD is less than 10% for all common anions in all three sample/blind-duplicate sample comparisons. The RPD is less than 20% for all common cations and trace metals except aluminum (22%) in the 496/497 comparison and lead (27%) in the 520/521 comparison. Overall precision can not be calculated for trace metals with reported values below the detection limit of the analytical method used.

Conclusion: All constituents meet DQ objectives for laboratory accuracy and precision. Overall precision meets or closely approaches 20 percent. The overall precision for aluminum and lead is acceptable because sample concentrations are close to the detection limit of the analytical method used. Therefore, all data are deemed acceptable for use.

Northern Testing Laboratories

Sample Handling: All samples were received intact by the laboratory according to the analytical reports.

Field Quality Control Checks: One travel blank sample was provided by the laboratory and was analyzed with the initial sample set. The travel blank sample, Lab No. Al 11981, is free of contamination.

Laboratory Quality Control Checks: All method-required QC checks, as specified in the QA plan, were performed by the laboratory.

Timeliness: Three separate samples sets were delivered to the laboratory. Five samples, Lab Nos. Al 11977-Al 11981, in the initial sample set were analyzed 10 days after sampling, within the 14day holding time limit. Four samples, Lab Nos. Al 12158 - Al 12162, in the second sample set were analyzed 18 or 23 days after sampling. Three samples, Lab Nos. Al 12305 - Al 12309, in the third sample set were analyzed 18 or 19 days after sampling.

Detection Limits: Acceptable.

Matrix Spikes (Accuracy): No accuracy data is shown on the analytical reports.

Surrogate Spikes: Percent recovery ranges from 69 to 95 percent which is acceptable.

Laboratow Duplicates (Lab Precision): No precision data is shown on the analytical reports.

Conclusion: Although holding times were exceeded for the second and third sample sets, data are deemed useable because volatile organic compounds are undetected in a11 samples, except one. The compound 1,1 ,l-trichloroethane was detected in Lab No. Al 12307 at 0.7 µg/L which is slightly above the LLD of 0.2 µg/L. Although this value is considered valid, it is not confirmed by a duplicate or replicate sample. In conclusion, all data are deemed acceptable for use.

Core Laboratories

Sampling Handling: All samples were received intact by the laboratory according to chain-of-custody records.

Field Quality Control Checks: Sample No. 4 is a blind duplicate of Sample No. 3

Laboratory Quality Control Checks: All method-required QC checks, as specified in EPA Method 900.0, were performed by the laboratory.

Timeliness: All samples were analyzed approximately 5 to 7 weeks after collection, well within the six month holding time limit.

Detection Limits: The actual lower limit of detection (LLD), as stated in the analytical report, ranges from 1.9 to 15.8 pCi/L for gross alpha activity and 2.3 to 10.4 pCi/L for gross beta activity. The LLDs are acceptable except for sample No. 5, which has a LLD of 15.8 pCi/L for gross alpha.

Matrix Spikes (Accuracy): The accuracy DQ objective is 100 ± 10 percent recovery. The QC acceptance criteria listed on the lab's QA report is 100 ± 25 percent recovery, No accuracy calculations are shown on the QA report,

Laboratory Duplicates (Lab Precision): Four of the six samples that were analyzed as duplicates have a RPD of less than 20%. Analysis LB. 911850-4, the only duplicate run on the nine Nikiski samples submitted, has a RPD of 86% for gross alpha and 18% for gross beta.

Field Duplicates (Overall Precision): Overall precision is not calculable for sample No. 3 and its field duplicate, sample No. 4, because the actual values obtained for gross alpha and gross beta radioactivity are below the LLD of the analytical method used.

Conclusion: The majority of gross alpha and gross beta values are below the LLD for the analytical method used. Values which arc reported as 0.0 pCi/L should be reported as less than '<' LLD values. For example, gross alpha for sample No. 1 is <2.0 pCi/L, not 0.0 pCi/L.

The gross alpha value for sample No. 5 is not acceptable because the detection limit is too high. The LLD of 15.8 pCi/L exceeds the drinking water maximum contaminant level of 15 pCi/L (Alaska Department of Environmental Conservation (ADEC], 1991).

The extremely low values warrant higher laboratory accuracy and precision acceptance limits. Therefore, with the exception of the gross alpha value for sample No. 5, these data are deemed acceptable for use.

Overall Comments

Completeness: The stated DQ objective for completeness, that is the percentage of useable data, is 95 percent. The total possible data collected as part of this investigation are 202 samples. The useable data total 201 samples. The completeness is 99 percent.

References Cited

Alaska Department of Environmental Conservation, 1991, State of Alaska Drinking Water Regulations 18 AAC 80: ADEC, Juneau, 87 p.

Maurer, M.A., 1991, Quality assurance plan for the Kenai Peninsula ground-water study phase IIIA, pilot project, west Nikiski, Alaska: Alaska Division of Geological and Geophysical Surveys Public-Data File 91-27, 107 p.