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UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Federal Center, Lakewood, Colorado 80225

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT,  
AMCHITKA ISLAND, ALASKA, JANUARY 13-APRIL 5, 1972

(Amchitka-35)  
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ABSTRACT

The U.S. Geological Survey collected 110 water samples from Amchitka Island, Alaska, between January 13 and April 5, 1972. Tritium determinations were made on all samples collected and gross alpha and gross beta/gamma determinations were made on 92 samples.

The gross alpha and gross beta determinations when compared with previously determined ranges for fresh waters on Amchitka Island show no trends.

INTRODUCTION

The U.S. Geological Survey established a sampling program on Amchitka Island in 1967 in cooperation with the U.S. Atomic Energy Commission. Water samples are analyzed routinely for tritium, gross alpha, and gross beta/gamma content. Frequency of sampling has been bimonthly since the Cannikin event (November 6, 1971). The sampling frequency will be quarterly for the remainder of the first year (through November 1972). Sampling frequency will be changed to an annual basis approximately 1½ years after the event.

The techniques and procedures used for sample collection, identification, and analysis are described in Beetem, Washington, Janzer, and Schroder (1971) and Schroder (1971). Data obtained from samples

analyzed by the U.S. Geological Survey through November 1970 are reported in Beetem, Washington, Janzer, and Schroder (1971). Data obtained from samples analyzed by the U.S. Geological Survey from September 1971 through December 1971 are reported in Schroder and Ballance (1972). This report presents the radiochemical data from samples collected from January 13, 1972 through April 5, 1972.

## RESULTS

Figures 1, 2, and 3 show the locations of the sampling points. Table 1 correlates the location name and identification numbers with the dates samples were collected and the types of analyses performed. Table 2 presents the data obtained from the water-sampling locations.

The gross alpha activity, as U equivalent, ranged from  $<0.4$  to  $1.7$  pCi/l (picocuries per liter) for the January 1972 sampling and from  $<0.1$  to  $2.3$  pCi/l for the April 1972 sampling. This compares with a range from  $<0.1$  to  $23$  pCi/l in fresh waters on Amchitka as reported by Beetem, Washington, Janzer, and Schroder (1971) and  $<0.2$  to  $2.6$  pCi/l as reported by Schroder and Ballance (1972).

The gross beta activity in water as Cs-137 equivalent ranged from  $3.2$  to  $20$  pCi/l for the January 1972 sampling and from  $2.0$  to  $11$  pCi/l for the April 1972 sampling. This compares with a range from  $<1.0$  to  $36$  pCi/l in fresh waters on Amchitka as reported by Beetem, Washington, Janzer, and Schroder (1971) and  $2.1$  to  $17$  pCi/l as reported by Schroder and Ballance (1972). The only water samples having detectable tritium activity, that is, greater than  $640$  pCi/l (200 tritium units), were those collected at the Long Shot site.

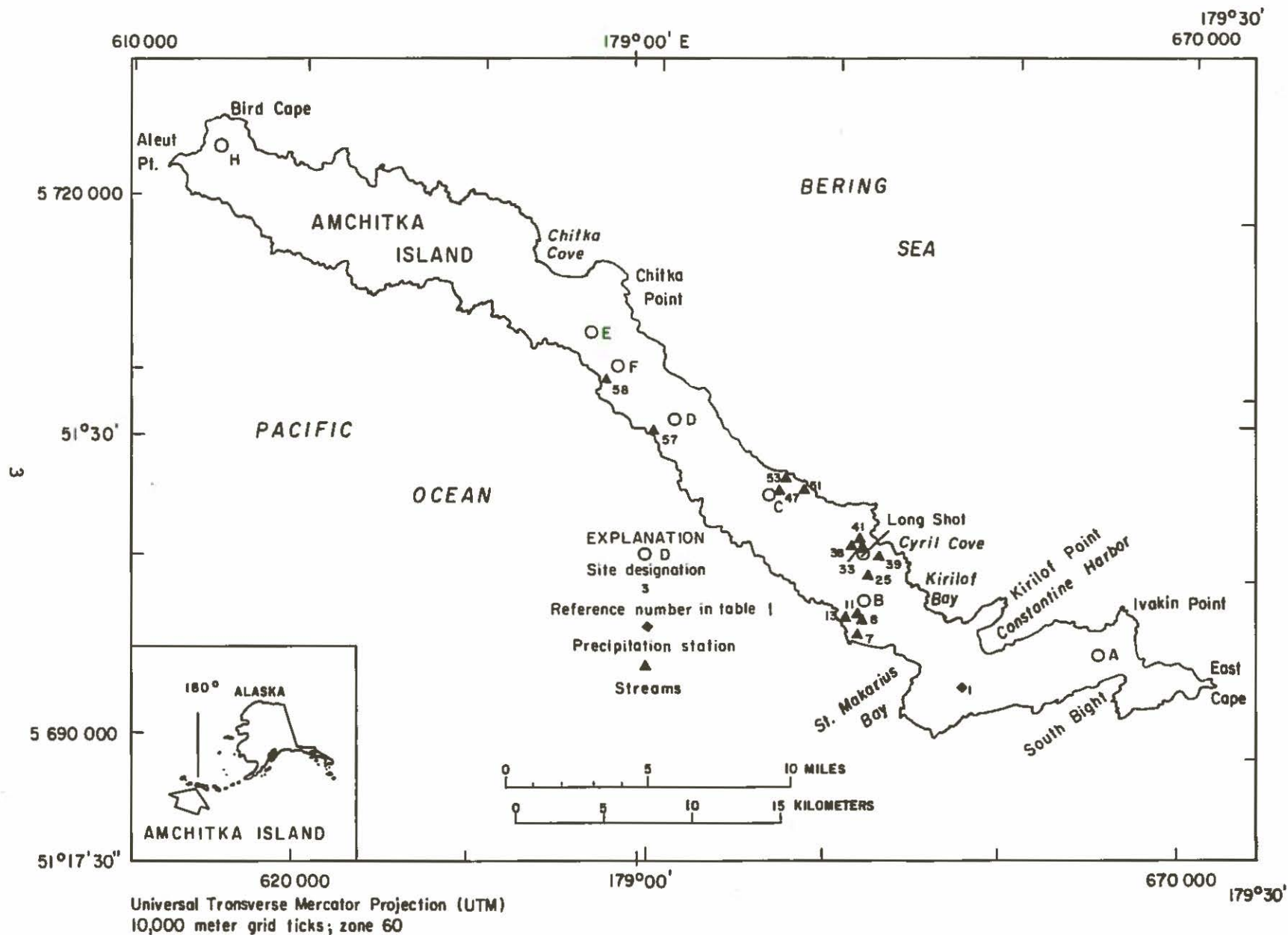


Figure 1.-- Precipitation and stream sampling stations for radiochemical monitoring, Amchitka Island, Alaska.

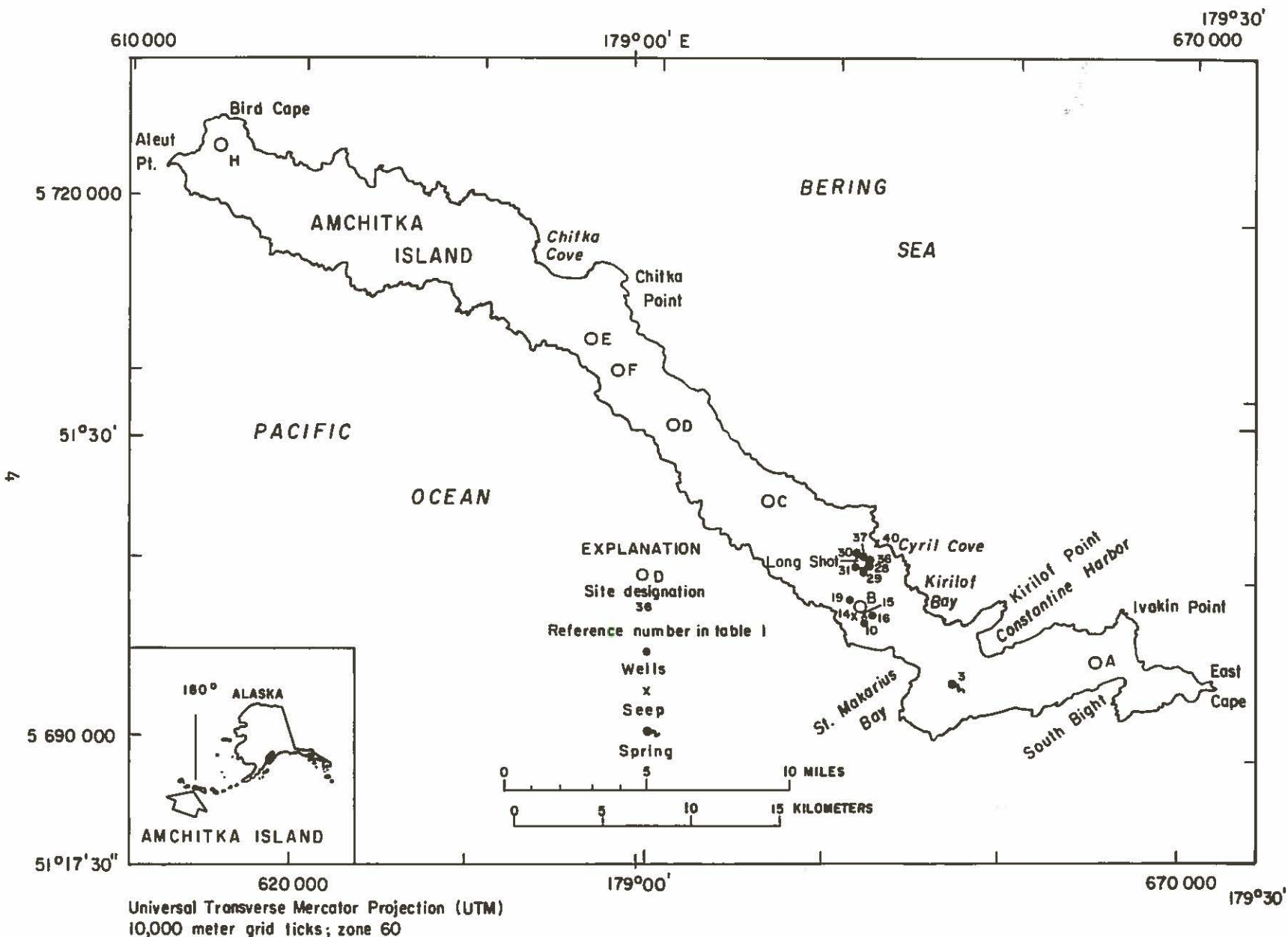


Figure 2.-- Well, spring and seep sampling stations for radiochemical monitoring, Amchitka Island, Alaska.

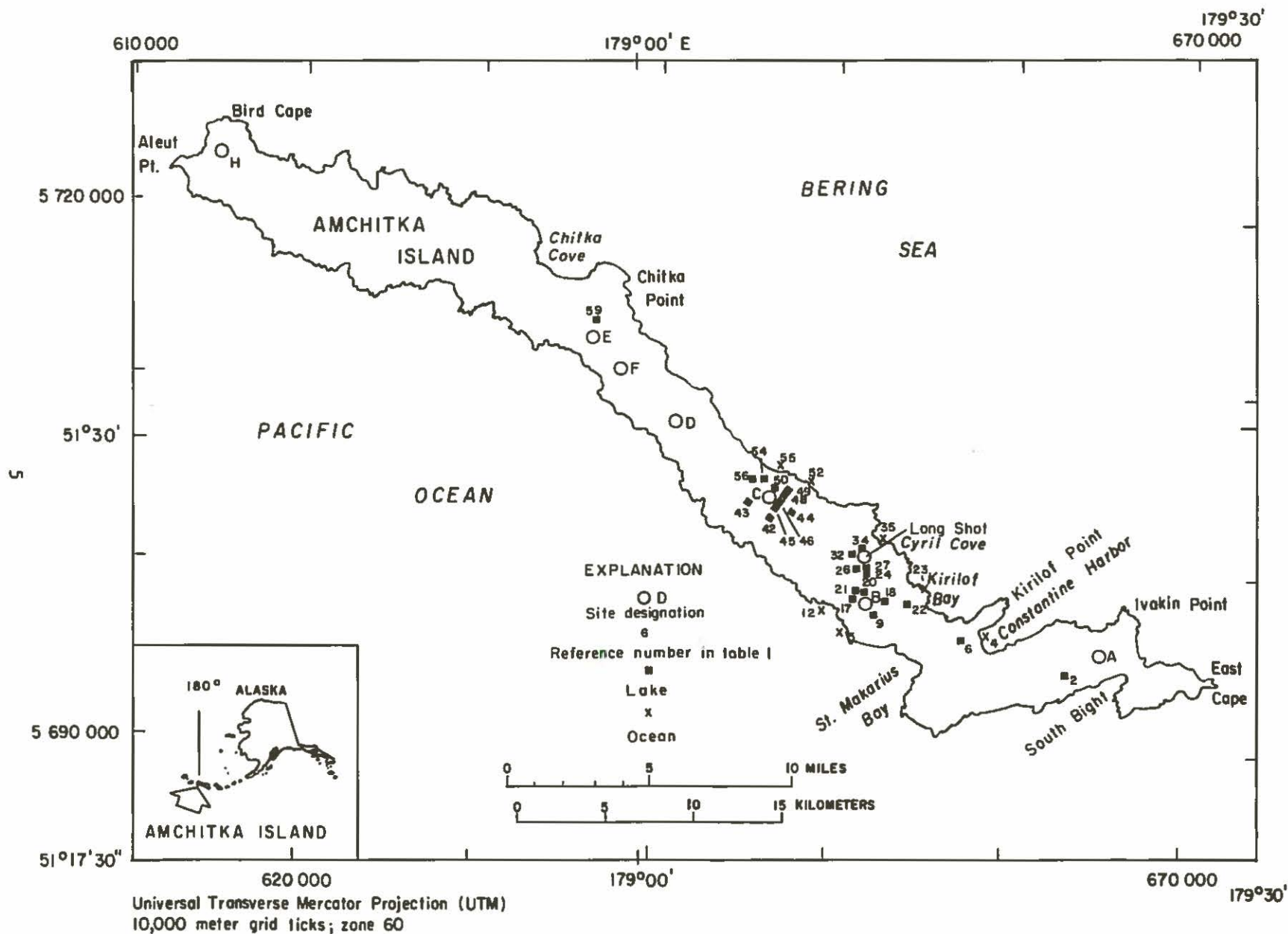


Figure 3.--Lake and ocean sampling stations for radiochemical monitoring, Amchitka Island, Alaska.

Table 1.--Radiochemical sampling stations and timetable for Cannikin event

(A, analyzed for gross alpha, gross beta/gamma, and tritium; T, analyzed for tritium; N, not collected; D, destroyed in shipment)

Ident. no.	Ref. no. 1/	Other identifying name	Collection timetable			
			Nov. (D+15)	Dec. (D+30)	Jan. (D+60)	April (D+120)
PR93-57	1	Precipitation at South Hangar	T	T	T	T
LK94-62	2	Lake 145	A	A	A	A
SP94-56	3	Constantine Spring	A	A	A	A
OB96-58	4	Bering Sea	T	T	T	T
OP96-51	5	Pacific Ocean	T	N	T	T
LK96-57	6	Jones Lake	A	A	A	A
ST96-51	7	Clevenger Creek at road	A	A	A	A
ST97-51	8	Clevenger Creek at gage	A	A	A	A
LK97-52	9	Lake B-1	A	A	A	A
WE97-51	10	Well W-13	A	A	A	A
ST97-51A	11	Stream B-6	A	A	A	A
OP97-50	12	Pacific Ocean	T	T	T	T
ST97-50	13	Midden Creek	A	A	A	A
SE98-51	14	Seep B-13	A	A	A	A
SE98-51A	15	Seep B-18	N	A	N	A
WE98-51C	16	Well W-17	A	A	A	A
LK98-51B	17	Lake B-3	A	A	A	A
LK98-52A	18	Lake B-4	A	A	A	A
WE98-51K	19	Well W-11	A	A	T	A
LK98-51	20	Lake B-2	A	A	A	A
LK98-51A	21	Lake B-2A	A	A	A	A
LK98-53	22	Silver Salmon Lake	A	A	A	A
OB99-54	23	Bering Sea	T	T	T	T
LK00-52	24	Lake 130	N	N	N	N
ST00-51	25	Stream A-7	A	A	A	A
LK00-51B	26	Lake A-6	A	N	D	T
LK00-51A	27	Lake	A	A	T	A
WE00-51E	28	Well No. 10C	N	T	A	A
WE00-51	29	Well WL-2	T	T	A	A
WE00-51H	30	Well WL-1	T	N	A	A

Table 1.--Radiochemical sampling stations and timetable for Cannikin event--  
Continued

(A, analyzed for gross alpha, gross beta/gamma, and tritium; T, analyzed for tritium; N, not collected; D, destroyed in shipment)

Ident. no.	Ref. no. 1/	Other identifying name	Collection timetable			
			Nov. (D+15)	Dec. (D+30)	Jan. (D+60)	April (D+120)
WE00-51F	31	Well No. 8A	N	T	A	A
LK00-51	32	Lake	N	A	T	A
ST00-51B	33	Long Shot drainage ditch	A	A	A	A
LK00-51D	34	Long Shot mudpit	A	A	A	A
OB01-52A	35	Bering Sea (F-11)	T	T	T	T
WE00-51I	36	Well No. 3	N	N	N	N
WE00-51J	37	Well No. 7	N	N	N	N
ST01-51	38	Stream at weir 2	A	A	A	A
ST01-52	39	Stream at weir 1	A	A	A	A
SE01-52	40	Seep 3	A	A	T	A
ST01-51A	41	Bridge Creek at gage	A	A	A	A
LK02-46	42	Lake C-2	A	A	A	A
LK03-45	43	Lake	A	A	A	A
LK03-47	44	Lake	A	A	A	A
LK04-46C	45	Lake	A	A	A	A
LK04-46D	46	Lake	A	A	A	A
ST04-47A	47	White Alice Creek	A	A	N	N
LK04-46B	48	Lake	A	A	A	A
LK04-46F	49	Lake	A	A	A	A
LK04-46E	50	Lake	A	A	A	A
ST04-47	51	White Alice Creek at gage	A	A	A	A
OB05-47	52	Bering Sea at outlet of White Alice Creek	T	T	T	T
ST05-47	53	Stream	A	A	A	A
LK05-46	54	Lake	A	A	A	A
OB05-46	55	Bering Sea north of UA-1-HTH-1	T	T	T	T
LK05-45	56	Lake	A	A	A	A
ST07-40	57	Falls Creek at gage	N	N	A	A
ST09-36	58	Limpet Creek at gage	A	A	A	A
LK14-36	59	Lake E-2	A	A	A	A

1/ Reference numbers used for locations on figures 1, 2, and 3.

Table 2.--Radiochemical analyses of water samples collected on Amchitka Island, Alaska

(Gross beta as cesium-137, gross alpha as U equiv., and tritium, reported in picocuries per liter; &lt;, less than)

Ident. no.	Ref. no. 1/	Latitude N.			Longitude E.			Date			Time	Gross beta	Gross alpha	Tritium
		Deg	Min	Sec	Deg	Min	Sec	Mo	Da	Yr				
PR93-57	1	51	22	25	-179	15	48	1	16	72	1030	--	--	<640
PR93-57	1	51	22	25	-179	15	48	1	18	72	0935	--	--	<640
PR93-57	1	51	22	25	-179	15	48	2	20	72	0930	--	--	<640
PR93-57	1	51	22	25	-179	15	48	2	22	72	1430	--	--	<640
LK94-62	2	51	22	37	-179	20	25	1	13	72	0930	7.5	<0.5	<640
LK94-62	2	51	22	37	-179	20	25	3	29	72	1040	7.2	<.4	<640
SP94-56	3	51	22	43	-179	14	59	1	13	72	1020	5.5	<.5	<640
SP94-56	3	51	22	43	-179	14	59	3	29	72	1120	6.5	<.7	<640
OB96-58	4	51	24	08	-179	16	32	1	13	72	1008	--	--	<640
OB96-58	4	51	24	08	-179	16	32	3	29	72	1105	--	--	<640
OP96-51	5	51	24	09	-179	10	17	1	17	72	--	--	--	<640
OP96-51	5	51	24	09	-179	10	17	3	30	72	1530	--	--	<640
LK96-57	6	51	24	11	-179	16	09	1	13	72	0950	6.2	<.5	<640
LK96-57	6	51	24	11	-179	16	09	3	29	72	1110	5.8	<.7	<640
ST96-51	7	51	24	16	-179	10	19	1	17	72	1530	18	<.6	<640
ST96-51	7	51	24	16	-179	10	19	3	30	72	1530	5.9	1.1	<640
ST97-51	8	51	24	35	-179	11	00	1	16	72	1430	7.9	<1.5	<640
ST97-51	8	51	24	35	-179	11	00	3	30	72	1200	7.0	<.8	<640
LK97-52	9	51	24	43	-179	11	15	1	16	72	1420	8.4	<.6	<640
LK97-52	9	51	24	43	-179	11	15	3	30	72	1225	7.1	<.4	<640
WE97-51	10	51	24	50	-179	10	58	1	10	72	1300	6.8	<1.4	<640
WE97-51	10	51	24	50	-179	10	58	3	30	72	1420	4.5	<.8	<640
ST97-51A	11	51	24	51	-179	10	55	1	16	72	1315	3.9	<.4	<640
ST97-51A	11	51	24	51	-179	10	55	3	30	72	1425	2.9	<.5	<640
OP97-50	12	51	24	52	-179	09	44	1	17	72	1610	--	--	<640

Table 2.--Radiochemical analyses of water samples collected on Amchitka Island, Alaska--Continued

(Gross beta as cesium-137, gross alpha as U equiv., and tritium, reported in picocuries per liter; &lt;, less than)

Ident. no.	Ref. no. 1/	Latitude N.			Longitude E.			Date			Time	Gross beta	Gross alpha	Tritium
		Deg	Min	Sec	Deg	Min	Sec	Mo	Da	Yr				
OP97-50	12	51	24	52	-179	09	44	3	30	72	1515	--	--	<640
ST97-50	13	51	24	53	-179	09	49	1	17	72	1550	17	1.2	<640
ST97-50	13	51	24	53	-179	09	49	3	30	72	1510	6.4	<.5	<640
SE98-51	14	51	24	56	-179	10	58	1	16	72	1325	7.7	.9	<640
SE98-51	14	51	24	56	-179	10	58	3	30	72	1435	3.0	.5	<640
SE98-51A	15	51	24	56	-179	10	56	3	29	72	1430	2.5	<.4	<640
WE98-51C	16	51	24	57	-179	11	03.5	1	16	72	1255	6.5	<.7	<640
WE98-51C	16	51	24	57	-179	11	03.5	3	30	72	1415	2.3	<.4	<640
LK98-51B	17	51	25	01	-179	10	51	1	16	72	1345	11	<.8	<640
LK98-51B	17	51	25	01	-179	10	51	3	30	72	1450	8.6	2.3	<640
LK98-52A	18	51	25	03	-179	11	36	1	14	72	1650	15	1.5	<640
LK98-52A	18	51	25	03	-179	11	36	3	29	72	1645	5.1	<.3	<640
WE98-51K	19	51	25	04.5	-179	10	55	1	16	72	1340	--	--	<640
WE98-51K	19	51	25	04.5	-179	10	55	3	30	72	1440	9.7	1.2	<640
LK98-51	20	51	25	08	-179	10	59	1	16	72	1235	6.7	<.6	<640
LK98-51	20	51	25	08	-179	10	59	3	30	72	1400	3.6	<.3	<640
LK98-51A	21	51	25	12	-179	10	59	1	16	72	1210	10	.6	<640
LK98-51A	21	51	25	12	-179	10	59	3	29	72	1435	6.9	<.4	<640
LK98-53	22	51	25	17	-179	12	48	1	17	72	1320	14	<.7	<640
LK98-53	22	51	25	17	-179	12	48	3	30	72	1245	6.6	<.5	<640
OB99-54	23	51	25	31	-179	13	28	1	17	72	1335	--	--	<640
OB99-54	23	51	25	31	-179	13	28	3	30	72	1300	--	--	<640
ST00-51	25	51	26	11	-179	11	11	1	14	72	1640	5.3	<.5	<640
ST00-51	25	51	26	11	-179	11	11	3	29	72	1535	7.1	<.4	<640
LK00-51B	26	51	26	17	-179	10	45	3	29	72	1415	--	--	<640

Table 2.--Radiochemical analyses of water samples collected on Amchitka Island, Alaska--Continued

(Gross beta as cesium-137, gross alpha as U equiv., and tritium, reported in picocuries per liter; &lt;, less than)

Ident. no.	Ref. no. 1/	Latitude N.			Longitude E.			Date			Time	Gross beta	Gross alpha	Tritium
		Deg	Min	Sec	Deg	Min	Sec	Mo	Da	Yr				
LK00-51A	27	51	26	14	-179	11	00	1	17	72	1055	--	--	<640
LK00-51A	27	51	26	14	-179	11	00	3	29	72	1410	6.9	0.5	<640
WE00-51E	28	51	26	15	-179	10	59	1	17	72	1015	9.6	<1.6	4.3x10 <sup>3</sup>
WE00-51E	28	51	26	15	-179	10	59	3	29	72	1345	11	<1.4	7.4x10 <sup>3</sup>
WE00-51	29	51	26	15	-179	10	56	1	17	72	1015	3.2	<1.2	2.8x10 <sup>3</sup>
WE00-51	29	51	26	15	-179	10	56	3	29	72	1400	2.7	<1.0	2.7x10 <sup>3</sup>
WE00-51H	30	51	26	16	-179	10	54	1	17	72	1030	6.9	<2.0	<640
WE00-51H	30	51	26	16	-179	10	54	3	29	72	1350	4.2	1.2	<640
WE00-51F	31	51	26	17	-179	10	58	1	17	72	1100	13	<1.5	1.4x10 <sup>4</sup>
WE00-51F	31	51	26	17	-179	10	58	3	29	72	1500	6.2	<1.1	1.5x10 <sup>3</sup>
LK00-51	32	51	26	17	-179	10	45	1	17	72	1120	--	--	<640
LK00-51	32	51	26	17	-179	10	45	3	29	72	1415	6.9	<.2	<640
ST00-51B	33	51	26	18	-179	11	04	1	17	72	1000	13	<1.1	<640
ST00-51B	33	51	26	18	-179	11	04	3	29	72	1330	5.0	<.7	<640
LK00-51D	34	51	26	18	-179	11	01	1	17	72	0950	4.6	<1.0	5.5x10 <sup>3</sup>
LK00-51D	34	51	26	18	-179	11	01	3	29	72	1340	2.0	<.5	6.3x10 <sup>3</sup>
OB01-52A	35	51	26	22	-179	11	59	1	17	72	0920	--	--	<640
OB01-52A	35	51	26	22	-179	11	59	3	29	72	1440	--	--	<640
ST01-51	38	51	26	37	-179	10	47	1	14	72	1630	8.1	<.4	<640
ST01-51	38	51	26	37	-179	10	47	3	29	72	1515	5.6	<.5	<640
ST01-52	39	51	26	45	-179	11	32	1	17	72	0905	14	<.6	<640
ST01-52	39	51	26	45	-179	11	32	3	29	72	1430	5.3	<.4	<640
SE01-52	40	51	26	53	-179	11	40	1	17	72	0940	--	--	<640
SE01-52	40	51	26	53	-179	11	40	3	29	72	1450	5.4	<.8	<640
ST01-51A	41	51	26	54	-179	10	57	1	14	72	1625	9.5	.8	<640

Table 2.--Radiochemical analyses of water samples collected on Amchitka Island, Alaska--Continued

(Gross beta as cesium-137, gross alpha as U equiv., and tritium, reported in picocuries per liter; &lt;, less than)

Ident. no.	Ref. no. 1/	Latitude N.			Longitude E.			Date			Time	Gross beta	Gross alpha	Tritium
		Deg	Min	Sec	Deg	Min	Sec	Mo	Da	Yr				
ST01-51A	41	51	26	54	-179	10	57	3	29	72	1530	6.6	<0.3	<640
LK02-46	42	51	27	37	-179	06	32	1	13	72	1625	10	<.4	<640
LK02-46	42	51	27	37	-179	06	32	3	30	72	1635	5.5	<.2	<640
LK03-45	43	51	28	05	-179	05	26	1	13	72	1600	8.3	<.8	<640
LK03-45	43	51	28	05	-179	05	26	3	30	72	1625	3.6	<.1	<640
LK03-47	44	51	28	08	-179	07	12	1	15	72	1615	20	<.8	<640
LK03-47	44	51	28	08	-179	07	12	4	01	72	1410	6.4	<.3	<640
LK04-46C	45	51	28	12	-179	06	42	1	15	72	1340	9.0	<.7	<640
LK04-46C	45	51	28	12	-179	06	42	4	01	72	1250	6.6	<.9	<640
LK04-46D	46	51	28	14	-179	06	46	1	15	72	1330	8.4	<.8	<640
LK04-46D	46	51	28	14	-179	06	46	4	01	72	1255	3.6	.5	<640
LK04-46B	48	51	28	25	-179	06	55	1	15	72	1345	20	1.7	<640
LK04-46B	48	51	28	25	-179	06	55	4	01	72	1315	6.7	.5	<640
LK04-46F	49	51	28	27	-179	06	49	1	15	72	1335	16	<1.0	<640
LK04-46F	49	51	28	27	-179	06	49	4	01	72	1310	7.3	<.3	<640
LK04-46E	50	51	28	36	-179	06	50	1	15	72	1400	12	.5	<640
LK04-46E	50	51	28	36	-179	06	50	4	01	72	1335	6.5	<.2	<640
ST04-47	51	51	28	41	-179	07	34	1	15	72	1420	6.0	<.5	<640
ST04-47	51	51	28	41	-179	07	34	4	02	72	1430	4.7	<.5	<640
OB05-47	52	51	28	47	-179	07	35	1	15	72	1530	--	--	<640
OB05-47	52	51	28	47	-179	07	35	4	02	72	1505	--	--	<640
ST05-47	53	51	28	47	-179	07	16	1	15	72	1345	8.3	<.5	<640
ST05-47	53	51	28	47	-179	07	16	4	01	72	1355	4.8	<.6	<640
LK05-46	54	51	28	57	-179	06	23	1	15	72	1145	9.3	<.6	<640
LK05-46	54	51	28	57	-179	06	23	3	30	72	1615	8.0	1.3	<640

Table 2.--Radiochemical analyses of water samples collected on Amchitka Island, Alaska--Continued

(Gross beta as cesium-137, gross alpha as U equiv., and tritium, reported in picocuries per liter; &lt;, less than)

Ident. no.	Ref. no. <u>1/</u>	Latitude N.			Longitude E.			Date			Time	Gross beta	Gross alpha	Tritium
		Deg	Min	Sec	Deg	Min	Sec	Mo	Da	Yr				
OB05-46	55	51	29	00	-179	06	47	1	15	72	1215	--	--	<640
OB05-46	55	51	29	00	-179	06	47	4	02	72	1015	--	--	<640
LK05-45	56	51	29	01	-179	05	55	1	15	72	1150	8.5	0.9	<640
LK05-45	56	51	29	01	-179	05	55	3	30	72	1620	5.0	.8	<640
ST07-40	57	51	30	04	-179	01	01	1	14	72	1345	6.2	1.0	<640
ST07-40	57	51	30	04	-179	01	01	4	01	72	1305	4.7	1.6	<640
ST09-36	58	51	31	32	-178	58	24	1	14	72	1030	6.2	<.4	<640
ST09-36	58	51	31	32	-178	58	24	3	31	72	1125	6.4	1.1	<640
LK14-36	59	51	33	58	-178	58	23	1	13	72	1420	13	<1.1	<640
LK14-36	59	51	33	58	-178	58	23	3	31	72	1015	4.2	<.3	<640

1/ Reference numbers used for location on figures 1, 2, and 3.

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