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WATER-QUALITY AND GEOHYDROLOGIC DATA AT TWO SANITARY LANDFILL SITES NEAR ANCHORAGE, ALASKA

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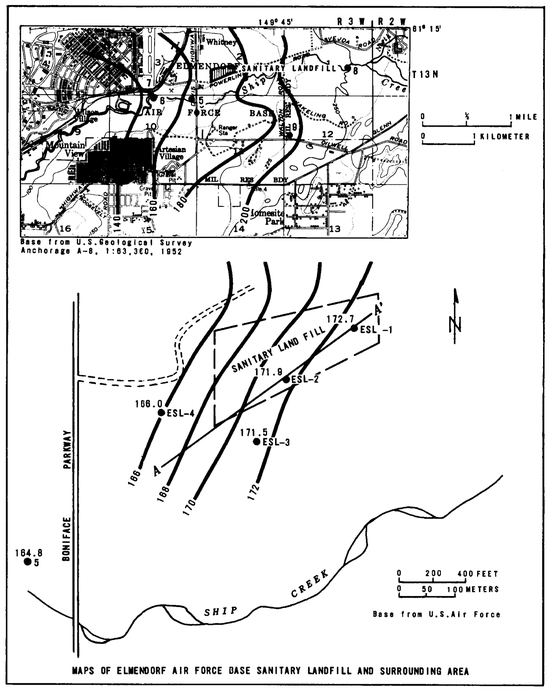
DISCUSSION

Water-quality and geohydrologic data were collected at two sanitary landfill (solid-waste disposal) sites near Anchorage, Alaska. The study was undertaken by the U.S. Geological Survey in cooperation with the Greater Anchorage Area Borough and the U.S. Air Force. The purpose of the study was to evaluate the environmental effects of solid-waste disposal on the ground-water system and establish criteria for selecting future landfill sites. This report is a compilation of the data collected through August 1973.

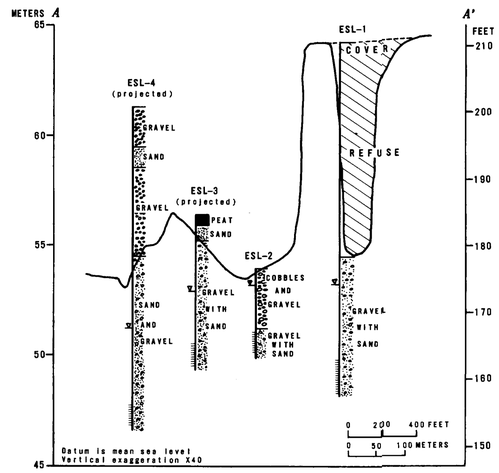
The objectives of the Geological Survey's program are (1) to detect the possible presence of leachate components in ground water and to obtain detailed chemical analyses, (2) to determine the rate of attenuation in concentration of any leachate component with distance from the landfill area, and (3) to determine the direction and rate of movement of ground water containing the leachate.

For this study, 14 wells, designated by the letters BSL (Borough Sanitary Landfill) and ESL (Elmendorf Sanitary Landfill), were drilled within and near the two landfill areas. The initial sampling of ground water did detect presence of leachate in the ground water within and beneath the Anchorage Borough landfill site but not in the ground water beneath the Elmendorf Air Force Base site. Drillers' logs of the wells show the Anchorage Borough site to be a wet area--the refuse is deposited below the water table in some parts of the landfill. The Elmendorf Air Force Base site is in a dry area--the refuse is deposited above the water table. This is reflected by the water-level contours shown on the maps in this report. These contours are based on measurements in the BSL, ESL, and other nearby shallow wells. At the Anchorage Borough landfill site, the contours are terminated at International Airport Road, because the roadway is a barrier to shallow ground-water flow, and there are no reliable water-level data north of the road.

The initial collection of ground-water data at both landfill sites and the detection of leachate constituents in the ground water at the Anchorage Borough site have satisfied the first objective of this study. The other objectives are of long-term nature and are being pursued by a continuing program of water-quality and water-level monitoring.



MAPS OF ELMENDORF AIR FORCE BASE SANITARY LANDFILL AND SURROUNDING AREA

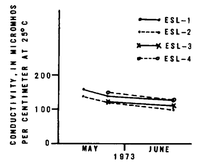


SECTION THROUGH ELMENDORF AIR FORCE BASE SANITARY LANDFILL

Water-quality data at Elmendorf Air Force Base Sanitary Landfill and nearby area, June 22-23, 1973. (Analyses by U.S. Geological Survey, Salt Lake City, Utah)

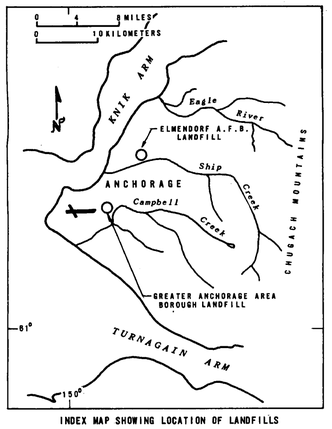
Sample no.	Location description	Depth to water below land surface ft (m)	Water temperature (°C)	Specific conductance (micromhos at 25° C)	pH units	Milligrams per liter																Micrograms per liter											
						Calcium (Ca) dissolved	Magnesium (Mg) dissolved	Sodium (Na) dissolved	Potassium (K) dissolved	Bicarbonate (HCO_3)	Chloride (Cl) dissolved	Sulfate (SO_4) dissolved	Nitrate dissolved (as N)	Fluoride (F) dissolved	Carbon (C), organic dissolved	Silica (SiO_2)	Phosphorus, dissolved (as P)	Phosphorus total (as P)	Nitrogen, dissolved organic (as N)	Nitrogen, ammonia, dissolved (as N)	Aluminum (Al) dissolved	Chromium (Cr) dissolved	Cadmium (Cd) dissolved	Copper (Cu) dissolved	Arsenic (As) dissolved	Selenium (Se) dissolved	Zinc (Zn) dissolved	Iron (Fe) dissolved	Iron (Fe) total	Manganese (Mn) dissolved	Manganese (Mn) total
ESL-1*	Well in landfill	37.6 (11.5)	5.0	149	7.6	20	3.2	3.0	0.3	72	1.3	18	0.29	0.0	0.0	7.8	0.00	0.01	0.08	0.00	0	0	0	24	1	14	10	0	1400	0	30
ESL-2*	Well in landfill	4.6 (1.4)	4.0	129	7.1	17	2.6	3.0	.4	49	1.0	19	.32	.0	.0	7.8	.00	.00	.09	.00	0	0	0	30	3	0	10	50	270	0	20
ESL-3*	Well 200 ft (61 m) south of landfill	13.0 (4.0)	3.5	132	7.1	18	2.9	2.4	.4	52	1.0	18	.32	.0	.5	7.6	.00	.00	.04	.00	0	0	0	25	1	1	10	50	200	0	0
ESL-4*	Well 320 ft (98 m) west of landfill	34.5 (10.5)	3.5	156	7.6	21	3.4	2.8	.4	59	1.4	23	.29	.1	.0	7.6	.00	.02	.08	.00	0	0	0	18	1	0	0	40	610	10	40
5	Well nr Ship C at Boniface Parkway	5.2 (1.6)**	3.5	137	7.0	19	2.9	2.7	.4	58	0.9	18	.25	.1	.0	7.6	.00	.00	.10	.01	0	0	0	27	0	0	220	110	850	10	20
6	Surface water - Ship C downstream from landfill	-- --	6.0	119	7.3	18	2.7	2.1	.4	54	.5	13	.11	.1	1.5	6.1	.00	.01	.10	.01	10	0	0	17	0	0	0	119	210	0	10
7	Gallery well nr Ship C downstream from landfill	9.0 (2.7)	5.0	189	7.0	27	4.9	3.0	.5	88	1.5	18	.25	.3	0.0	9.9	.01	.20	.00	.00	10	0	0	21	5	1	10	0	40	0	0
8	Surface water - Ship C upstream from landfill	-- --	8.0	121	8.0	17	2.6	2.1	.4	55	0.8	13	.15	.0	2.0	6.4	.01	.02	.13	.02	20	0	0	17	1	0	10	9	190	0	0
9	Well nr U.S. Air Force Hospital	26.9 (8.2)**	8.0	246	7.8	39	6.6	3.2	.7	134	1.3	15	.30	.1	0.0	12	.01	.01	.08	.00	10	0	0	21	1	1	10	9	930	0	0

* Elmendorf Sanitary Landfill well.
** Water level measured April 23, 1973.

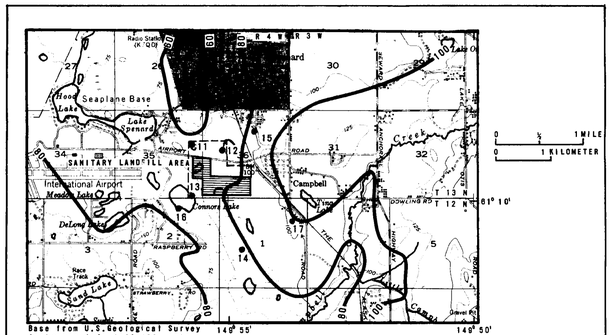


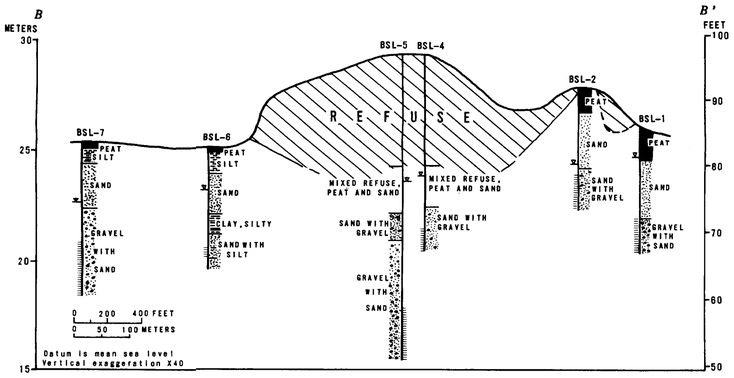
CONDUCTIVITY MEASUREMENTS
ELMENDORF AIR FORCE BASE LANDFILL

Bulldozer spreading and compacting refuse in typical landfill operation. Refuse is covered with at least 8 inches of clean fill (material at lower right) at the end of each day's operation.

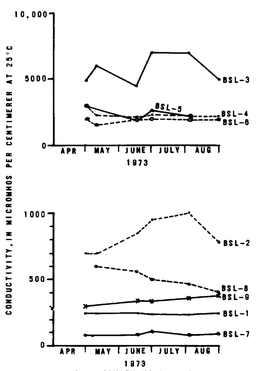


INDEX MAP SHOWING LOCATION OF LANDFILLS





SECTION THROUGH GREATER ANCHORAGE AREA BOROUGH SANITARY LANDFILL



CONDUCTIVITY MEASUREMENTS
GREATER ANCHORAGE AREA BOROUGH LANDFILL

EXPLANATION

MAPS

81.0
● BSL-1 (or ESL-1)

Water-quality sampling and water-level observation wells drilled specifically for this study; upper number is altitude, in feet above mean sea level, of water level in the well.

● 5 (through 17)

Other water-quality sampling and (or) water-level observation points near sanitary landfill sites.

76
● USGS A.H.

Water-level observation auger hole; drilled by U.S.Geological Survey; number is altitude, in feet above mean sea level, of water level in the well.

——78——

Water-level contours showing altitude of the water table (in feet above sea level). Three different contour intervals (1 foot, 2 feet, and 20 feet) are used on the maps in this report.

A———A'

Approximate lines of sections through the landfill areas.

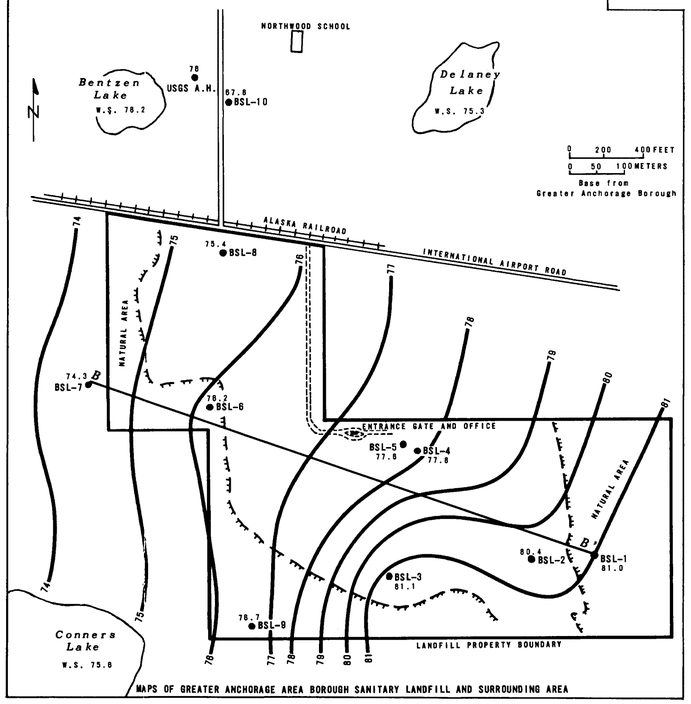
Boundary of active fill area at Anchorage Borough landfill

SECTIONS

Measured water levels in wells

Perforated interval of well casings.

FEET X 0.3048 = METERS
English-Metric conversion factor (for water-level figures on maps)



MAPS OF GREATER ANCHORAGE AREA BOROUGH SANITARY LANDFILL AND SURROUNDING AREA

Water-quality data at Greater Anchorage Area Borough Sanitary Landfill and nearby area, June 8-9, 1973. (Analyses by U.S. Geological Survey, Salt Lake City, Utah)

Sample no.	Location description	Depth to water below land surface ft (m)	Water temperature (°C)	Specific conductance (micromhos at 25° C)	pH units	Milligrams per liter																Micrograms per liter											
						Calcium (Ca) dissolved	Magnesium (Mg) dissolved	Sodium (Na) dissolved	Potassium (K) dissolved	Bicarbonate (HCO_3)	Chloride (Cl) dissolved	Sulfate (SO_4) dissolved	Nitrate dissolved (as N)	Fluoride (F) dissolved	Carbon (C), organic dissolved	Silica (SiO_2)	Phosphorus dissolved (as P)	Phosphorus total (as P)	Nitrogen, dissolved organic (as N)	Nitrogen, ammonia, dissolved (as N)	Aluminum (Al) dissolved	Chromium (Cr) dissolved	Cadmium (Cd) dissolved	Copper (Cu) dissolved	Arsenic (As) dissolved	Selenium (Se) dissolved	Zinc (Zn) dissolved	Iron (Fe) dissolved	Iron (Fe) total	Manganese (Mn) dissolved	Manganese (Mn) total
BSL-1*	In natural area approx. 750 ft (46 m) east of fill	4 (1.2)	1.0	252	7.3	39	6.1	2.6	0.6	139	3.8	13	0.00	0.2	3.0	31	0.06	0.06	0.02	0.01	110	0	0	1	2	0	30	5,600	5,500	490	470
BSL-2*	Within landfill area nr eastern edge	4 (1.2)**	3.0	514	6.3	75	16	27	2.0	270	9.8	4.2	.04	.1	130	41	.04	.04	.28	.04	0	0	0	3	11	3	20	1,900	43,000	2,400	2,100
BSL-3*	Within landfill area	6 (1.8)	--	5,350	6.7	--	--	--	--	3,510	--	--	.00	--	2,480	--	--	--	--	--	--	--	--	--	--	--	--	--	760,000	--	18,000
BSL-4*	Within landfill area	17 (5.2)	3.0	2,640	6.2	440	64	76	6.6	1,380	110	8.4	.00	.3	860	31	.07	.07	.00	5.9	0	10	0	10	7	16	80	76,000	94,000	7,800	6,700
BSL-5*	Within landfill area	18 (5.5)	3.5	2,460	5.7	160	100	140	4.5	1,230	170	9.2	.00	.2	1,030	34	.04	.18	1.4	2.1	0	20	0	10	12	0	260	34,000	--	14,000	--
BSL-6*	In natural area approx. 80 ft (24 m) west of fill	10 (3.0)	8.5	1,790	6.9	270	57	97	5.6	911	210	28	.00	.2	35	22	.02	.15	1.4	0.51	0	0	0	5	5	13	70	59,000	--	4,800	--
BSL-7*	In natural area approx. 800 ft (240 m) west of BSL-6	12 (3.8)	2.5	80	7.1	10	1.7	2.1	0.5	30	1.4	11	.07	.1	1.5	15	.00	.11	2.7	.01	10	0	0	3	0	0	10	220	4,300	10	90
BSL-8*	Within landfill area; nr northern edge At International Airport Road	13 (4.0)	5.0	676	6.3	77	17	36	1.8	314	68	3.4	.00	.1	23	22	.01	.09	0.65	.55	0	0	0	4	2	2	30	2,900	--	2,000	--
BSL-9*	In undisturbed area approx. 440 ft (134 m) south of fill	11 (3.4)	2.0	363	7.1	46	16	4.9	1.1	230	2.7	4.0	.00	.1	6.0	26	.02	.03	.03	.06	10	0	0	1	10	3	20	33,000	--	470	460
BSL-10*	Nr Northwood School 750 ft (229 m) north of fill	11 (3.4)	--	212	7.6	30	7.4	3.9	1.1	125	4.3	3.4	--	.1	5.5	1.5	.00	.08	.19	.19	--	0	0	4	7	0	10	30	--	280	--
11	Bentzen Lake (at surface)	--	11.0	60	7.8	2.4	1.0	1.8	1.2	12	2.8	2.0	.01	.0	6.5	0.2	.02	.03	.56	.05	--	0	0	6	28	2	0	220	--	20	--
12	DeLaney Lake (at surface)	--	12.0	221	7.4	25	7.8	6.9	2.3	97	11	12	.01	.1	12	.6	.00	.04	.65	.06	--	0	1	9	4	3	10	120	--	70	--
13	Conners Lake (at surface)	--	5.0	116	7.5	15	3.8	2.6	0.9	63	2.7	2.0	.01	.1	8.5	.4	.00	.04	.47	.05	--	0	0	13	8	2	10	220	--	30	--
14	Swampy area south of fill (at surface)	--	12.0	79	6.5	8.0	2.4	3.5	1.5	35	3.7	3.2	--	.2	38	.4	.01	.04	1.1	.12	--	0	0	12	5	8	20	450	--	40	--
15	Central Alaska Utility well	unavailable	3.0	244	7.6	31	9.7	4.4	0.8	147	1.9	7.6	.00	.2	3.0	15	.04	.04	0.00	.02	10	0	0	6	0	2	10	170	340	100	100
16	Well at Conners Lake	30 (9.2)	5.0	260	8.0	30	8.6	9.8	3.3	165	1.4	2.9	.00	.2	3.5	29	.29	.29	.09	.31	10	0	0	--	48	0	0	120	220	70	80
17	Central Alaska Utility well	unavailable	3.0	201	7.7	33	7.9	5.8	1.5	158	1.6	2.5	.00	.2	2.5	27	.29	.31	.00	.49	10	0	0	6	1	0	10	260	400	90	100

* Borough Sanitary Landfill well.
** 10 ft (3.05 m) casing added after sampling date.

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