

SECTION 5

GEOGRAPHY AND ENVIRONMENT

This section relates to area, climatologic, topographic, hydrologic, noise and other geographic and environmental measurements of Hawaii.

The State consists of eight major islands and 124 minor islands with a total land area of 6,425 square miles and a general coastline of 750 miles. Honolulu is 214 miles from Hilo, 1,367 miles from Kure Atoll (the westernmost end of the State), and 2,397 miles from San Francisco. The highest peak in the State is Mauna Kea, 13,796 feet above sea level; the longest stream is Kaukonahua Stream, Oahu, 33 miles in length; the biggest lake is Halalii, on Niihau, 841 acres; and the highest named waterfall is Kahiwa, Molokai, a 1,750-foot cascade. Various measures of air pollution, such as suspended particulate matter, indicate that Honolulu is one of the cleanest cities in the nation. There is also very little water pollution: 29 out of 35 major Oahu beaches were rated "A" in 1975 (coliform not exceeding 50 per 100 ml.), only six were rated "B" (51-500), and none was rated "C" (501 or more). Climatically, Hawaii is marked by remarkably balmy temperatures and wide variations in rainfall. The all-time temperature range in downtown Honolulu, for example, is from 57° to 88° F. Normal precipitation, however, ranges from 5.7 inches near Kawaihae, South Kohala, to 486 inches atop Waialeale. The longest volcanic eruption in Island history lasted 875 days, the worst earthquake attained 7.5 on the Richter scale, and the highest tsunami wave reached 66 feet. Water withdrawn for use in 1970 averaged 2.7 billion gallons per day, compared with 2.0 billion in 1965 and 1.5 billion in 1960. Among thirty neighborhoods on Oahu, median noise levels ranged from 44.7 decibels (in Pearl City) to 61.5 decibels (in Waikiki).

Important sources of data include the U.S. Geological Survey, National Ocean Survey, National Weather Service, U.S. Bureau of the Census Geography Division, the Division of Water and Land Development of the State Department of Land and Natural Resources, the State Department of Health, and the University of Hawaii Institute of Geophysics. Detailed information is given in *Hawai'i, the Natural Environment*, published by the Department of Planning and Economic Development in 1974. National data are reported in *Statistical Abstract of the United States: 1975*, Section 6.

Table 65.—GREAT CIRCLE DISTANCES BETWEEN HONOLULU INTERNATIONAL AIRPORT AND SPECIFIED PLACES

Place	Distance from Honolulu		Place	Distance from Honolulu	
	Statute miles	Kilometers		Statute miles	Kilometers
Hawaiian Islands:			Other Pacific locations, con.:		
Cape Kumukahi, Hawaii ¹	236	380	Johnston Island	820	1,319
Hilo, Hawaii ²	214	344	Kingman Reef	1,073	1,726
Ka Lae (South Cape), Hawaii	221	356	Manila, Philippines	5,293	8,516
Kailua, Kona, Hawaii	168	270	Pago Pago, Amer. Samoa	2,606	4,193
Kahului, Maui	98	158	Palmyra Island	1,101	1,772
Lanai Airport	72	116	Papeete, Tahiti	2,741	4,410
Molokai Airport	54	87	Suva, Fiji	3,159	5,083
Lihue, Kauai	103	166	Sydney (Port Jackson), Australia ...	5,070	8,158
Puuwai, Niihau	152	245	Tokyo, Japan	3,847	6,190
Nihoa	283	455	Wake Island	2,294	3,691
Necker Island	520	837			
French Frigate Shoals	556	895	North and South America:		
Gardner Pinnacles	688	1,107	Anchorage, Alaska	2,781	4,475
Maro Reef	851	1,369	Cape Horn, Chile	7,457	11,998
Laysan Island	936	1,506	Chicago, Illinois	4,179	6,724
Lisianski Island	1,065	1,714	Cristobal, Canal Zone	5,214	8,389
Pearl and Hermes Atoll	1,208	1,944	Los Angeles, California ³	2,557	4,114
Midway Islands	1,309	2,106	Miami, Florida	4,856	7,813
Kure Atoll ¹	1,367	2,200	New York, New York	4,959	7,979
			Portland, Oregon	2,595	4,175
Trust Territory of the Pacific Isl.:			San Diego, California	2,610	4,199
Majuro, Marshall Islands	2,271	3,654	San Francisco, California ²	2,397	3,857
Kwajalein, Marshall Islands	2,443	3,931	Seattle, Washington	2,679	4,311
Kolonia, Ponape, E.C.I.	3,087	4,967	Vancouver, B.C.	2,709	4,359
Saipan, Mariana Islands	3,704	5,960	Victoria, B.C.	2,668	4,293
Koror, Palau, W.C.I.	4,593	7,390	Tijuana, Mexico	2,616	4,209
			Washington, D.C.	4,829	7,770
Other Pacific locations:					
Apra Harbor, Guam	3,806	6,124	London, England	7,226	11,627
Auckland, New Zealand	4,393	7,068	Bombay, India	8,010	12,888
Hong Kong	5,541	8,915	Ghanzi, Botswana ³	12,417	19,979

¹The great circle distance from Cape Kumukahi to Kure Atoll—the points farthest apart in the Hawaiian Archipelago and State of Hawaii—is 1,523 statute miles (2,451 kilometers). The distance from Kure Atoll to other extreme points in the United States is: West Quoddy Head, Maine, 5,788 miles (9,313 kilometers); Log Point, Elliot Key, Florida, 5,852 miles or 9,416 kilometers (Kure and Log Point are the points farthest apart in the fifty States). Kure is 2,486 miles (4,000 kilometers) from Tokyo, Japan.

²Hilo is 2,315 statute miles (3,725 kilometers) from San Francisco and 2,447 miles (3,937 kilometers) from Los Angeles.

³Ghanzi, Botswana, is Honolulu's antipode, that is, the point precisely opposite to it on the globe.

Source: U.S. Department of the Interior, Geological Survey, *Elevations and Distances in the United States* (1970), and distance computations prepared for the Department of Planning and Economic Development.

Table 66.—AREA AND COASTLINE OF COUNTIES, ISLANDS, AND CITIES

County, island, or city	Total area		Land area ¹		Inland water area ²		General coastline ³		Tidal shoreline ⁴	
	Sq. mi.	Sq. km.	Sq. mi.	Sq. km.	Sq. mi.	Sq. km.	Statute miles	Km.	Statute miles	Km.
State total	6,450	16,707	6,425	16,642	25	65	750	1,207	1,052	1,693
Counties:										
Hawaii	4,038.0	10,458	4,037.0	10,456	1.0	3	266	428	313	504
Maui	1,161.1	3,007	1,160.3	3,005	0.8	2	} 210	338	343	552
Kalawao	13.3	34	13.3	34	—	—				
Honolulu	610.9	1,582	595.7	1,543	15.2	39					137	220	234	377
Kauai	627.1	1,624	619.1	1,603	8.0	21	137	220	162	261
Islands:										
Hawaii	4,038.0	10,458	4,037.0	10,456	1.0	3	266	428	313	504
Maui	728.8	1,888	728.2	1,886	0.6	2	120	193	149	240
Kahoolawe	45.0	117	45.0	117	—	—	29	47	36	58
Molokini	(⁵)	(⁵)	(⁵)	(⁵)	—	—	...	...	...	...
Lanai	139.5	361	139.5	361	—	—	47	76	52	84
Molokai	261.1	676	260.9	676	0.2	1	88	142	106	171
Oahu	607.7	1,574	592.7	1,535	15.0	39	112	180	209	336
Kauai	553.3	1,433	548.7	1,421	4.6	12	90	145	110	177
Niihau	73.0	189	69.6	180	3.4	9	45	72	50	80
Lehua	0.4	1	0.4	1	—	—	...	...	...	...
Kaula	0.4	1	0.4	1	—	—	2	3	2	3
Northwestern Haw'n. I. ⁶ ...	3.2	8	3.0	8	0.2	1	25	40	25	40
Cities:										
Hilo ⁷	298.9	774	298.9	774	—	—	...	...	...	...
Honolulu ⁸	88.7	230	86.6	224	2.1	5	...	...	...	...
On Oahu	85.5	221	83.6	217	1.9	5	...	...	...	...

¹Dry land and land temporarily or partially covered by water, as marshland, swamps, etc.; streams and canals under one-eighth statute mile wide; and lakes, reservoirs, and ponds under 40 acres of area.

²Permanent inland water surface, such as lakes, reservoirs, and ponds having 40 acres or more of area; streams, sloughs, estuaries, and canals one-eighth of a statute mile or more in width; deeply indented embayments and sounds, and other coastal waters behind or sheltered by headlands or islands separated by less than 1 nautical mile of water; and islands having less than 40 acres of area.

³Figures are lengths of general outline of seacoast. Measurements were made with a unit measure of 30 minutes of latitude on charts as near the scale of 1:1,200,000 as possible. Coastline of bays is included to a point where they narrow to width of unit measure, and includes the distance across at such point. Figures for the four islands of Maui county are not consistent with the published county total.

⁴Figures obtained in 1939-1940 with a recording instrument on the largest-scale charts and maps then available. Shoreline of outer coast, offshore islands, bays, rivers, and creeks is included to the head of tidewater or to a point where tidal waters narrow to a width of 100 feet.

⁵The area of Molokini is 18.6 acres (0.03 square miles or 7.5 hectares).

⁶The Northwestern Hawaiian Islands, from Nihoa to Kure Atoll, but exclusive of the Midway Islands (which are part of the Hawaiian Archipelago but not legally part of the State of Hawaii).

⁷As defined in Hawaii Revised Statutes, Sec. 70-1. As defined for statistical purposes under provisions of Sec. 26-18, Hilo has a land area of 56.1 square miles or 145 square kilometers.

⁸As defined for statistical purposes under HRS, Sec. 26-18. Includes the Northwestern Hawaiian Islands from Nihoa to Kure Atoll, exclusive of the Midway Islands.

Source: Data from Geography Division, U.S. Bureau of the Census, and U.S. Coast and Geodetic Survey, cited in the Hawaii State Department of Planning and Economic Development, *Hawai'i, the Natural Environment* (1974), pp. 9 and 13.

Table 67.—MAJOR SUMMITS
(Elevation of the highest point on each island and other important peaks.)

Island and mountain	Elevation		Island and mountain	Elevation	
	Feet	Meters		Feet	Meters
Hawaii:			Oahu:		
Mauna Kea ¹	13,796	4,205	Kaala	4,020	1,225
Mauna Loa	13,677	4,169	Konahuanui ²	3,150	960
Hualalai	8,271	2,521	Tantalus	2,013	614
Kohala	5,480	1,670	Olomana	1,643	501
Kilauea (Uwekahuna)	4,090	1,247	Diamond Head	760	232
Kilauea (Halemaumau Rim)	3,646	1,111	Punchbowl	500	152
			Koko Head	642	196
Kahoolawe:			Kauai:		
Lua Makika	1,477	450	Kawaiikini	5,243	1,598
			Waialeale	5,148	1,569
Maui:			Niihau:		
Haleakala (Red Hill)	10,023	3,055	Paniau	1,281	390
Haleakala (Kaupo Gap)	8,201	2,500			
Puu Kukui	5,788	1,764	Kaula	550	168
Iao Needle	2,250	686	Nihoa	910	277
			Necker Island	277	84
Lanai:			La Perouse Pinnacle	135	41
Lanaihale	3,370	1,027	Gardner Pinnacles	190	58
			Maro Reef	Awash	Awash
Molokai:			Laysan Island	35	11
Kamakou	4,970	1,515	Lisianski Island	20	6
Puu Nana	1,381	421	Pearl and Hermes Atoll	—	—
			Midway Islands ³	12±	4±
			Kure Atoll	20	6
			Kingman Reef ³	3	1
			Palmyra Islands ³	6	2

¹Includes 19 cones over 11,000 feet, five of them over 13,000.

²Two distinct peaks. The lower has an elevation of 3,105 feet.

³Not part of the State of Hawaii.

Source: U.S. Geological Survey data cited in the Hawaii State Department of Planning and Economic Development, *Elevations of Major Mountains in Hawaii* (Statistical Report 52, November 7, 1967), as revised.

Table 68.—MAJOR STREAMS, LAKES, AND WATERFALLS

Subject	Name	Island	Magnitude
Streams:			
Longest water feature (miles)	Kaukonahua Stream	Oahu	33.0
Second longest water feature (miles)	Wailuku River	Hawaii	32.0
Greatest average discharge (million gal. per day)	Wailuku River	Hawaii	184.0
Lakes:			
Greatest area (acres)—			
Natural, intermittent	Halalii Lake	Niihau	841
Natural, perennial	Halulu Lake	Niihau	182
Man-made	Waita Reservoir	Kauai	422
Longest shoreline (miles)	Wahiawa Reservoir	Oahu	11
Deepest (feet)	Wahiawa Reservoir	Oahu	85
Highest (feet above sea level)	Lake Waiau	Hawaii	13,020
Named waterfalls:			
Greatest sheer drop (feet)	Akaka Falls	Hawaii	442
Greatest cascade (feet)	Kahiwa Falls	Molokai	1,750

Source: Hawaii State Department of Planning and Economic Development, *Hawai'i, the Natural Environment* (1974), pp. 15, 16 and 18.

Table 69.—VOLCANIC ERUPTIONS: 1959 TO 1975

Volcano and date of outbreak	Repose period since previous eruption (months)	Duration (days)	Location	Altitude (feet)	Area (square miles)	Volume (1,000 cubic yards)
Mauna Loa:						
1975: July 5	300	<1	Summit	13,000 12,100	5.2	39,200
Kilauea:						
1959: Nov. 14	53.5	36	Kilauea Iki	3,500	0.24	51,000
1960: Jan. 12	0.8	36	E. rift	100	4.1	155,000
1961: Feb. 24	12.2	1	Halemaumau	3,150	0.02	30
Mar. 3	0.2	22	Halemaumau	3,150	0.1	350
July 10	3.5	7	Halemaumau	3,150	0.4	17,300
Sept. 22	2.2	3	E. rift	2,600-1,300	0.3	3,000
1962: Dec. 7	14.4	2	E. rift	3,250-3,100	0.02	430
1963: Aug. 21	8.4	2	E. rift	3,150-2,700	0.06	1,100
Oct. 5	1.4	<1	E. rift	2,750-2,300	1.3	9,000
1965: Mar. 5	17.0	10	E. rift	3,000-2,300	3.0	23,000
Dec. 24	9.5	<1	E. rift	3,150-3,000	0.23	1,160
1967: Nov. 5	23.3	251	Halemaumau	3,150	0.25	110,000
1968: Aug. 22	1.3	5	E. rift	2,900-1,900	0.01	176
Oct. 7	1.3	15	E. rift	3,000-2,400	0.8	9,000
1969: Feb. 22	4.0	6	E. rift	3,100-2,900	2.3	22,000
May 24	2.0	867	E. rift	3,150	19.3	242,000
1971: Aug. 14	—	<1	Caldera	3,660-3,600	0.8	12,400
Sept. 24	—	5	Caldera, SW rift	3,740-2,730	1.5	10,500
1972: Feb. 4	4.3	455	E. rift	3,150	13.5	163,800
1973: May 5	—	<1	E. rift	3,340-3,250	0.1	1,600
May 7 ¹	—	187	...	...	0.2	3,200
Nov. 10	—	30	E. rift	3,250-2,900	0.4	3,700
Dec. 12	1.1	203	E. rift	3,150	3.1	39,300
1974: July 19	—	3	Caldera, E. rift	3,600-3,520	1.2	9,000
Sept. 19	2.0	<1	Caldera	3,680	0.4	14,000
Dec. 31	3.4	<1	Caldera	3,600	2.9	19,600
1975: Nov. 29	11.0	<1	Caldera	3,600	0.05	330

¹Listed by Tilling but not by Macdonald and Hubbard (see source).

Source: Gordon A. Macdonald and Douglass H. Hubbard, *Volcanoes of the National Parks in Hawaii*, 7th edition (Hawaii Natural History Association, December 1974), pp. 14 and 29, as corrected by Dr. Macdonald, May 5, 1976, and updated by Robert I. Tilling, Hawaiian Volcano Observatory, April 28, 1976 and May 21, 1976. Correct to December 31, 1975.

**Table 70.—EARTHQUAKES OF MAGNITUDE 5 OR GREATER:
1957 TO 1975**

Date	Location	Magnitude (Richter Scale)
1957: Aug. 18	E. of Hana, Maui	5.6
1961: Sept. 25	Hawaii	5.75-6
1962: June 27	Hawaii	6.1
June 28	Hawaii	5.75
1963: Oct. 23	Hawaii	5.4
1964: Oct. 11	W. of S. Kona	5.3
Dec. 10	Hawaii	5
1969: May 9	Hawaii	5
1971: Aug. 1	S.E. of Hawaii	4.5-5
1972: Dec. 23	W. of Kona	5
1973: Apr. 26	Hawaii	6.2
Oct. 9	Hawaii	4.8-5
1974: Nov. 30	Hawaii	5.5-6
1975: Jan. 1, 2:41 AM	Near Pahala, Hawaii	5.1
Jan. 1, 3:20 AM	Mauna Loa, Hawaii	5.1
Jan. 2	Near Pahala, Hawaii	5.6
Jan. 5	Mauna Loa, Hawaii	5.1
Nov. 29, 3:35 AM	Puna, Hawaii	5.7
Nov. 29, 4:47 AM	Puna, Hawaii	7.2

Source: Augustine S. Furumoto, N. Norby Nielsen, and William R. Phillips, *A Study of Past Earthquakes, Isuseismic Zones of Intensity and Recommended Zones for Structural Design for Hawaii* (University of Hawaii, Center for Engineering Research, June 15, 1972), pp. 16-19; Hawaii Institute of Geophysics, records. Complete to Sept. 30, 1975; preliminary for Oct. 1-Dec. 31, 1975.

**Table 71.—TSUNAMIS WITH RUN-UP OF 2 METERS (6.6 FEET) OR MORE:
1946 TO 1976**
(Correct to May 26, 1976)

Date	Maximum height in Hawaii		Deaths in Hawaii	Damage in Hawaii (dollars)
	Meters	Feet		
1946: April 1	17.0	55.8	159	26,000,000
1952: Nov. 4	6.1	20.0	—	1,000,000
1957: March 9	16.0	52.5	—	5,000,000
1960: May 22	10.5	34.5	61	23,000,000
1964: March 27	4.8	15.7	—	67,590
1975: Nov. 29	7.9	26.0	2	1,500,000

Source: George Pararas-Carayannis, *Catalog of Tsunamis in the Hawaiian Islands* (U.S. Coast and Geodetic Survey, May 1969); Robert C. Schmitt, "Catastrophic Mortality in Hawaii," *The Hawaiian Journal of History*, Vol. III (1969), pp. 66-86; Hawaii Institute of Geophysics, records; Harold G. Loomis, *The Tsunami of November 29, 1975 in Hawaii* (Hawaii Institute of Geophysics, December 1975), pp. 1 and 10.

Table 72.—WATER USE: 1960 TO 1975
(In millions of gallons per day, unless otherwise specified.)

Subject	1960	1965	1970	1975
Water withdrawn ¹	1,500	2,000	2,700	2,540
Ground water	600	820	920	890
Fresh	580	780	910	890
Saline	21	37	13	2
Surface water	860	1,200	1,700	1,650
Fresh	600	670	850	670
Saline	260	500	860	980
Reclaimed sewage	—	—	66	—
Withdrawn for irrigation	920	1,160	1,280	950
Conveyance losses	100	200	220	450
Used for hydroelectric power	(NA)	360	330	260
Fresh water consumed	410	580	810	600
Per capita use (gallons per day)	2,500	2,800	3,500	3,140

NA Not available.

¹Excludes water used for hydroelectric power. Irrigation conveyance losses excluded in 1960 and included thereafter.

Source: U.S. Geological Survey, *Estimated Use of Water in the United States* for 1960 (Circular 456, 1961), 1965 (Circular 556, 1968), and 1970 (Circular 676, 1972), and unpublished 1975 data (1976).

Table 73.—AVERAGE DAILY WATER CONSUMPTION FROM COUNTY WATERWORKS: 1958 TO 1975
(In millions of gallons)

Year	Total	City of Honolulu ¹	Rest of Oahu ²	Hawaii County ³	Kauai County ⁴	Maui County ⁵
1958	(NA)	41.9	11.3	3.17	(NA)	4.63
1959	63.7	39.8	13.0	3.19	2.62	5.11
1960	69.5	41.9	16.0	3.40	2.78	5.49
1961	70.5	41.4	17.4	3.51	2.60	5.61
1962	72.8	41.7	19.4	3.77	2.49	5.45
1963	75.6	43.0	21.4	3.79	2.51	4.90
1964	81.3	44.3	24.0	4.15	2.72	6.15
1965	82.6	45.5	24.0	4.59	2.97	5.57
1966	89.1	48.4	26.1	5.03	3.15	6.42
1967	(NA)	51.0	28.0	(NA)	3.05	6.22
1968	95.3	51.5	29.1	5.38	3.28	6.06
1969	106.2	56.3	33.5	5.94	3.44	7.06
1970	115.5	59.8	37.0	6.67	4.11	7.94
1971	117.9	60.4	37.7	7.16	4.06	8.55
1972	125.1	62.4	40.7	8.02	4.34	9.63
1973	135.7	67.2	44.4	8.99	4.66	10.45
1974	133.6	65.6	43.0	9.32	5.04	10.69
1975	138.3	65.3	45.9	9.63	5.20	12.29

NA Not available.

¹Amount supplied, 1958; consumption, 1959 and later years. Data refer to calendar years through 1960, the six-month period ended June 30, 1961, and years ended June 30, 1962 and thereafter.

²Water sales, 1958; consumption, 1959 and later years. Data refer to calendar years through 1960, the six-month period ended June 30, 1961, and years ended June 30, 1962 and thereafter.

³Total water consumption for all years. Data refer to calendar years through 1966 and years ended June 30 thereafter.

⁴Water sales for all years. Data refer to years ended June 30.

⁵Total consumption for all years. Data refer to calendar years through 1965, the six-month period ended June 30, 1966, and years ended June 30, 1967 and thereafter.

Source: Honolulu Board of Water Supply, *Supplement to the Annual Report* for 1963-1975, and records; Hawaii County Department of Water Supply, records; Kauai County Department of Water, records; Maui County Department of Water Supply, *Annual Report . . . 1975*, p. 36, and records.

Table 74.—WATER QUALITY AT OAHU BEACHES: 1974 AND 1975

Beach	Number of samples		Coliform density (geometric mean, MPN/100 ml)	
	1974	1975	1974	1975
Ala Moana Park (Ewa)	54	38	17	8.2
Ala Moana Park (Center)	54	32	9	3.9
Ala Moana Park (Diamond Head)	54	35	8	11.1
Bellows Air Force Beach	10	9	11	12.0
Elks Club Beach	53	39	8	20.8
Ewa Beach	12	11	15	6.9
Fort DeRussy Beach	54	29	23	36.8
Gray's Beach	53	44	24	28.0
Haleiwa Park Beach	12	8	10	12.1
Hanauma Bay	11	11	6	4.8
Hauula Park Beach	12	10	3	6.4
Kaaawa Park Beach	12	10	10	17.6
Kahala Beach	8	9	39	46.2
Kahala Hilton Beach	8	9	48	22.4
Kahana Park Beach	12	10	194	228.6
Kahanamoku Beach	55	34	13	18.8
Kahanamoku Lagoon (Ewa)	52	24	120	288.7
Kahanamoku Lagoon (Diamond Head)	53	36	200	148.4
Kailua Park Beach	11	8	12.7	26.3
Kalama Beach	10	8	26.2	51.3
Kawela Bay	12	6	27	12.8
Kokokahi Pier	11	14	95	35.1
Kuhio Beach	53	41	45	41.7
Lanikai Beach	10	6	33.8	74.5
Makaha Beach	12	11	2	3.1
Nanakuli Park Beach	12	11	3	2.9
Public Bath Beach	53	43	5	6.9
Punaluu Park Beach	12	10	36	85.3
Sandy Beach (East)	10	11	2	3.8
Sandy Beach (West)	11	9	2	3.2
Tavern Beach	52	40	11	9.8
Waianae Park Beach	12	11	7	5.1
Waikiki Natatorium	34	29	6	4.9
Waimanalo Park Beach	10	10	6	6.0
Waimanalo Surfer's Beach	10	8	7	9.7

Source: Hawaii State Department of Health, Pollution Investigation and Enforcement Branch, records.

Table 75.—DAILY REFUSE, FOR OAHU: 1970
 (Excludes agricultural and military refuse.)

Kind of refuse	Tons
Total refuse	2,236
Combustible:	
Paper	635
Trimmings	362
Rags	23
Wood	494
Food	51
Plastics and miscellaneous	20
Non-combustible:	
Metal	127
Glass	63
Demolition material	461

Source: Metcalf & Eddy, *Solid Waste Management Plan for City and County of Honolulu* (July 1971), p. 61.

**Table 76.—SUSPENDED PARTICULATE MATTER,
FOR HONOLULU: 1957 TO 1975**

(Sampling conducted from roof of Health Department Building. Annual mean levels over 80 ug/m³ may affect human health.)

Year	Mean micrograms per cubic meter
1957	47
1958	59
1959	63
1960	47
1961	43
1962	41
1963	42
1964	44
1965	41
1966	35
1967	38
1968	45
1969	43
1970	37
1971	45
1972	41
1973	34
1974	35
1975	40

Source: Hawaii State Department of Health, *Statistical Report* (annual) and records.

Table 77.—AIR POLLUTANT EMISSIONS, BY SOURCE AND COUNTY: 1970

(In tons per year)

Source or county	Sulphur oxides	Particulates	Carbon monoxide	Hydrocarbons	Nitrogen oxides
Total	58,000	51,000	506,000	119,000	74,000
Source:					
Motor vehicles	1,000	1,420	413,500	67,900	40,700
Aircraft	570	1,390	4,570	3,810	1,250
Vessels	1,490	160	400	100	610
Other transportation	420	240	3,040	3,460	3,220
Fuel combustion in stationary sources	53,000	25,000	1,550	3,200	25,000
Residential, commercial, institutional	12,200	490	83	170	3,470
Industrial	12,000	910	11	160	3,000
Agricultural	2,550	22,800	1,450	2,200	3,900
Steam-electric utilities	26,200	1,150	6	700	14,800
Solid waste disposal	400	5,800	24,600	8,700	1,900
Industrial process losses	1,280	11,800	270	20,200	200
Agricultural field burning	(N)	4,860	57,200	11,440	1,140
County:					
City and County of Honolulu	50,500	23,800	368,000	86,100	57,800
Hawaii County	3,000	15,000	61,000	14,500	7,400
Kauai County	1,200	6,600	30,400	7,200	3,400
Maui County	3,400	5,600	46,600	10,900	5,400

N Negligible.

Source: Hawaii State Department of Health, Environmental Protection and Health Services Division, records (revised May 1973.)

Table 78.—AEROMETRIC SURVEY DATA FOR SPECIFIED LOCATIONS: 1975

Subject	DOH Bldg. ¹	Kalihi Kai	Pearl City	Barbers Point	Waimanalo	Ala Moana	Kahului, Maui ²	Kihei, Maui ²	Hilo, Hawaii	Lihue, Kauai
Minimum:										
Particulate matter ³	12	24	25	13	13	41	15	40	12	16
Sulfur dioxide ³	< 5	< 5	< 5	< 5	—	< 5	< 5	—	< 5	< 5
Nitrogen dioxide ³	< 20	< 20	< 20	< 20	—	< 20	< 20	—	< 20	< 20
Carbon monoxide, 1 hr. ⁴	0.9	—	—	—	—	—	—	—	—	—
Photochemical oxidants ³	6	—	—	—	—	—	—	—	—	—
Maximum:										
Particulate matter ³	96	92	128	137	65	152	127	296	89	96
Sulfur dioxide ³	31	34	10	11	—	9	149	—	32	13
Nitrogen dioxide ³	70	71	43	25	—	64	32	—	29	21
Carbon monoxide, 1 hr. ⁴	27.4	—	—	—	—	—	—	—	—	—
Photochemical oxidants ³	65	—	—	—	—	—	—	—	—	—
Annual average:										
Particulate matter ³	40	51	67	52	29	64	63	112	30	40
Sulfur dioxide ³	9	< 5	< 5	< 5	—	< 5	30	—	< 5	< 5
Nitrogen dioxide ³	33	31	23	11	—	26	17	—	16	< 20

¹South Beretania and Punchbowl Streets, Honolulu. Carbon monoxide sampled for only 11 months.

²Sampled for 11 months.

³Concentration in micrograms per cubic meter.

⁴Concentration in milligrams per cubic meter.

Source: Hawaii State Department of Health. Environmental Protection and Health Services Division, records.

Table 79.—NOISE LEVELS IN VARIOUS NEIGHBORHOODS ON OAHU: 1974

[Noise measurements were taken at 578 stations distributed over the populated areas on Oahu, except Waialua, Haleiwa and small communities along the north shoreline. Noise readings were not taken in these areas because previous noise measurements in these communities were similar to noise levels in Waimanalo and Olomana areas. The noise measurement stations were randomly distributed over the communities.

Since one of the objectives of this noise survey was to establish the existing ambient and residual noise levels of each community, the noise readings at each station were taken as far as possible away from all heavily used roads and freeways. Loud identifiable noise from nearby traffic, airplane passing overhead, dogs barking and noise from other sources were also measured. The noise readings at any location were taken on three or more widely separated days. This was done to avoid any abnormal noise conditions. In densely populated areas, the noise survey was conducted between the hours of 4:00 a.m. to 10:00 a.m., 9:00 a.m. to 5:00 p.m. and 4:00 p.m. to 2:00 a.m. In less populated areas west of Pearl City, Wahiawa and Mililani Town, the noise readings were taken during the daytime only.]

Neighborhood	Noise level (in decibels) exceeded—		
	10 percent of time	50 percent of time	90 percent of time
HONOLULU			
Aina Haina	53.5	45.0	40.0
Aina Koa	61.0	48.4	42.3
Downtown	67.0	58.0	50.5
Hawaii Kai	57.0	46.5	40.5
Kahala	56.7	45.5	42.0
Kaimuki	59.0	50.7	44.0
Kalihi	58.0	50.2	43.7
Kapahulu	55.0	49.7	44.0
Kapalama-Liliha	63.8	56.0	46.0
Kuliouou	53.5	46.3	40.5
Makiki	64.5	55.0	49.5
Manoa	58.7	45.3	40.0
Moiliili	62.0	55.0	50.0
Niu Valley	57.0	46.7	39.5
Nuuanu	63.0	50.1	45.4
Palolo	58.5	49.4	44.0
Pawaa	65.5	60.0	54.0
Waikiki	69.0	61.5	54.0
Waialae-Iki	60.0	50.5	41.5
Ward to Punchbowl	67.5	60.2	57.0
REST OF OAHU			
Aiea-Waimalu	57.5	47.3	40.5
Halawa Heights, Foster Village, Salt Lake, Aliamanu	57.5	54.5	48.7
Kailua	55.5	45.0	37.5
Kaneohe	54.0	45.5	40.5
Mililani Town	57.5	50.0	45.0
Pearl City	53.2	44.7	38.7
Wahiawa	62.5	50.5	46.0
Waianae	56.5	50.0	45.0
Waimanalo	54.5	50.0	44.5
Waipahu	59.0	51.0	45.5

Source: Survey conducted by Dr. Iwao Miyake for the Hawaii State Department of Health, and summarized by the Noise and Radiation Branch, Department of Health.

**Table 80.—NOISE COMPLAINTS RECEIVED BY THE HONOLULU POLICE
DEPARTMENT: 1973 TO 1975**

Type of noise	1973	1974	1975
All noise complaints	9,009	8,741	15,536
Loud party, music, singing, TV, radio, etc.	4,809	4,081	3,255
Loud talking, yelling, crying, etc.	909	1,700	6,508
Loud vehicle	979	604	763
Loud equipment, construction noises	329	231	156
Noisy animals	998	788	623
Unspecified noises	985	1,337	4,231

Source: Honolulu Police Department, records.

Table 81.—CLIMATIC DATA FOR SELECTED PLACES

Island and station	Ground elevation (feet)	Average temperature (°F)		Extreme temperature of record (°F)		Average annual precipitation (inches)	Average annual possible sunshine (percent)
		Coolest month	Warmest month	Lowest	Highest		
Hawaii:							
Hilo Airport	27	71.0	75.9	53	94	133.57	38
Hawaii Volcanoes Nat. Park Hdq.	3,971	57.6	63.2	37	85	102.81	...
Kona (Kailua)	30	72.1	77.3	54	93	25.22	...
Puako ¹	10	73.1	79.8	52	98	9.47	...
Waimea (Kamuela)	2,670	62.3	66.8	34	90	40.05	...
Mauna Kea summit ²	13,796	31.1	42.5	11	66	8.08	...
Maui:							
Hana	120	71.3	76.8	50	90	70.65	...
Haleakala summit	9,960	42.6	50.0	14	73	50.69	...
Kihei ³	90	70.9	78.4	49	98	13.79	...
Kahului Airport	48	71.6	78.8	48	95	18.43	70
Lahaina	45	71.5	78.0	52	93	15.51	...
Molokai:							
Kaunakakai	12	...	...	...	...	14.08	...
Molokai Airport	450	70.2	77.6	48	90	29.21	...
Lanai:							
Lanai City	1,620	65.8	72.8	46	88	38.44	...
Oahu:							
Honolulu International Airport ..	7	72.3	80.7	52	92	22.90	69
Honolulu Federal Building ⁴	12	72.0	78.6	57	88	25.35	65
Waikiki ⁵	10	71.9	80.6	51	93	27.32	...
Manoa (HSPA)	500	69.4	75.2	...	...	158.41	...
Kaneohe MCAS	10	72.9	79.1	58	90	43.88	...
Kahuku	25	71.6	78.8	49	95	41.10	...
Wheeler AFB	826	68.2	75.5	52	89	39.85	...
Waianae	20	72.1	79.7	45	96	20.31	...
Kauai:							
Kilauea	315	68.7	75.6	49	94	68.03	...
Kealia	9	70.2	78.0	44	93	43.28	...
Lihue Airport	103	71.2	79.1	50	90	44.18	55
Poipu (Makahuena Pt.)	52	72.4	79.4	50	93	36.39	...
Kokee (Kanalohuluhulu)	3,600	54.9	65.5	31	80	72.25	...
Waialeale	5,075	...	...	...	...	486.	...
Northwestern Hawaiian Islands:							
Midway	10	65.0	78.6	52	89	43.60	...

¹ Temperature data are for Mahukona.

² Based on incomplete and non-continuous data for 1966-1972.

³ Temperature data refer to Puunene Airport.

⁴ Temperature sensors are 87 feet above the ground.

⁵ Located at Honolulu Zoo. Available only from 1965.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service Pacific Region, data supplied March 17, 1976.

Table 82.—CLIMATIC DATA FOR THE PERIOD OF RECORD

Subject	Date	Place	Magnitude
Long-term averages:			
Lowest monthly average minimum temperature (°F.)	February	Mauna Kea summit	23.3
Lowest monthly average daily temp. (°F.)	February	Mauna Kea summit	31.1
Highest monthly average maximum temperature (°F.)	August	Waiawa, Kauai	89.7
Highest monthly average daily temp. (°F.)	August	Puako, Hawaii	80.7
Lowest average annual rainfall (inches)		N. of Kawaihae	5.7
Highest average annual rainfall (inches)		Waialeale	486
Single events:			
Lowest temperature of record (°F.)	Feb. 11, 1973	Mauna Kea summit	11.
Highest temperature of record (°F.)	April 27, 1931	Pahala, Hawaii	100.
Lowest annual rainfall of record (inches)	1953	Kawaihae, Hawaii	0.2
Highest annual rainfall of record (inches)	1947-1948	Waialeale	624.
Highest wind speed of record (m.p.h.)	Jan. 17-18, 1959	Mauna Loa Obser.	105+

Source: U.S. Department of Commerce, National Weather Service, Pacific Region, data supplied March 14, 1973.

Table 83.—TEMPERATURE AND RAINFALL, FOR SPECIFIED LOCATIONS: 1960 TO 1975

Year	Average temperature (°F.): Honolulu Federal Bldg.			Extreme temps. (°F.): Honolulu Fed. Bldg.		Annual rainfall (inches)				
	Annual	February	August	Lowest	Highest	Honolulu Fed. Bldg.	Hilo Airport	Holualoa Beach	Lahaina	Koloa
1960	75.6	71.9	79.2	60	86	16.23	146.80	18.08	6.62	72.05
1961	76.1	73.7	79.3	61	87	18.40	119.70	31.05	24.00	67.49
1962	75.6	71.7	78.2	58	85	15.47	71.45	20.60	14.90	70.99
1963	75.5	72.6	78.9	61	86	45.51	124.75	35.42	22.56	70.95
1964	75.8	73.5	78.3	62	85	19.96	166.44	28.42	14.57	94.83
1965	75.2	69.3	78.6	60	87	43.85	127.29	39.79	23.85	89.31
1966	75.7	70.9	78.8	58	86	25.54	124.01	23.14	13.01	58.67
1967	76.0	73.5	79.6	60	87	37.63	154.00	31.10	28.48	86.23
1968	77.0	73.0	80.9	63	88	36.24	134.14	48.86	25.87	84.00
1969	74.8	71.9	78.7	59	86	26.71	173.23	32.89	10.09	72.42
1970	75.5	71.7	78.9	59	85	18.35	153.98	20.78	11.95	64.45
1971	75.4	73.5	78.5	59	85	28.61	140.69	37.61	15.93	75.33
1972	75.0	71.2	78.8	61	88	26.72	98.85	33.22	20.21	66.72
1973	74.8	70.8	78.1	62	85	18.66	107.97	14.85	10.13	66.78
1974	75.9	73.8	79.0	63	86	28.24	117.34	40.49	13.01	86.35
1975	74.6	72.1	77.5	61	85	24.63	99.93	25.97	12.19	49.91

Source: U.S. Department of Commerce, National Weather Service, Pacific Region, records.

Table 84.—TREES ALONG STREETS OR IN PARKS UNDER THE JURISDICTION OF THE CITY AND COUNTY OF HONOLULU: 1960 TO 1975

Date	City and County streets and highways ¹		Trees in City and County parks
	Length in miles	Trees	
1960: Apr.-June	784.0	19,472	(NA)
1965: June 30	815.54	22,475	(NA)
1970: June 30	933.58	46,290	63,500
1971: June 30	958.13	54,146	64,500
1972: June 30	974.30	61,023	65,000
1973: June 30	987.00	70,497	65,500
1974: June 30	999.80	82,635	65,800
1975: June 30	1,022.00	88,654	68,300

NA Not available.

¹Excludes Federal, State, and private thoroughfares.

Source: Harland Bartholomew and Associates, *1960 Survey of Oahu Street Trees, City and Co. of Honolulu, State of Hawaii* (Department of Parks and Recreation, 1960), p. 6; Honolulu Department of Parks and Recreation, Conservation and Beautification Division, records.

Table 85.—HAWAII AUDUBON SOCIETY BIRD COUNTS OF THE HONOLULU AREA: 1958 TO 1975

(Counts are made in late December, in a circle, 15 miles in diameter, centered near Nuuanu Pali.)

Year	Species	Individual birds	Species ¹	Individual birds: 1975
1958	34	7,457	Endemic species:	
1959	34	4,076	'Amakihi	103
1960	34	4,656	Black-necked Stilt	97
1961	39	3,954	'Apapane	72
1962	39	2,969		
1963	35	7,963	Indigenous species:	
1964	34	10,139	Red-footed Booby	549
1965	46	11,820+	Great Frigatebird	245
1966	51	12,557		
1967	51	22,641	Introduced species:	
1968	49	11,024	Common Mynah	2,211
1969	53	13,236	Barred Dove	1,557
1970	51	10,454	Japanese White-eye	1,099
1971	50	13,218	Spotted Dove	1,072
1972	52	14,559		
1973	48	9,574	Migratory species:	
1974	44	10,263	Pacific Golden Plover	928
1975	54	12,008	Ruddy Turnstone	109

¹Endemic birds numbering more than 50 individuals, indigenous birds more than 200, introduced birds more than 1,000 and migratory species and stragglers more than 100. Endemic birds are those peculiar to a particular region, in this case Hawaii, and therefore found nowhere else in the world; indigenous birds are those native to a given region, in this case Hawaii, but with a total range of distribution encompassing a much wider area. The classification is that reported in Andrew J. Berger, *Hawaiian Birdlife* (1972).

Source: Hawaii Audubon Society, *The Elepaio* for February 1968–February 1976.

Table 86.—ENDANGERED, THREATENED, AND EXTINCT SPECIES OF NATIVE HIGHER PLANTS: 1974

Status	Species, subspecies, and varieties	Percent
Total native flora	2,200	100.0
Endangered, threatened, or extinct ¹	1,088	49.5
Endangered	639	29.0
Threatened	194	8.8
Extinct	255	11.6
Not endangered, threatened, or extinct ..	1,112	50.5

¹ For the other 49 States, 2,099 (or 10.5 percent) of all 20,000 native higher plants are endangered, threatened, or extinct.

Source: 94th Congress, 1st Session, House Document No. 94-51, *Report on Endangered and Threatened Plant Species of the United States*, presented to the Congress of the United States of America by the Secretary, Smithsonian Institution, 15 December 1974, p. 11 (percentages recalculated by DPED).