

SECTION 6

GEOGRAPHY AND ENVIRONMENT

This section relates to area, climatologic, topographic, hydrologic, 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 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, 33 miles in length; the biggest lake is Halalii, 841 acres; and the highest named waterfall is Kahiwa, a 1,750-foot cascade. Various measures of air pollution, such as suspended particulate matter and radioactivity, indicate that Honolulu is one of the cleanest cities in the nation. There is also very little water pollution: 32 out of 35 major Oahu beaches were rated "A" in 1972 (coliform not exceeding 50 per 100 ml.), only three 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 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 Water withdrawn for use in 1970 averaged 2.7 billion gallons per day, compared with 1.5 billion in 1960 and 1.3 billion in 1950.

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: 1973*, Section 6.

Table 67.—GREAT CIRCLE DISTANCES BETWEEN HONOLULU INTERNATIONAL AIRPORT AND SPECIFIED PLACES

Place	Statute miles from Honolulu	Place	Statute miles from Honolulu
Hawaiian Islands:		Other Pacific locations, con.:	
Cape Kumukahi, Hawaii ¹	236	Johnston Island	820
Hilo, Hawaii ²	214	Kingman Reef	1,073
Ka Lae (South Cape), Hawaii	221	Manila, Philippines	5,293
Kailua, Kona, Hawaii	168	Pago Pago, Amer. Samoa	2,606
Kahului, Maui	98	Palmyra Island	1,101
Lanai Airport	72	Papeete, Tahiti	2,741
Molokai Airport	54	Suva, Fiji	3,159
Lihue, Kauai	103	Sydney (Port Jackson), Australia	5,070
Puuwai, Niihau	152	Tokyo, Japan	3,847
Nihoa	283	Wake Island	2,294
Necker Island	520	North and South America:	
French Frigate Shoals	556	Anchorage, Alaska	2,781
Gardner Pinnacles	688	Cape Horn, Chile	7,457
Maro Reef	851	Chicago, Illinois	4,179
Laysan Island	936	Cristobal, Canal Zone	5,214
Lisianski Island	1,065	Los Angeles, California ²	2,557
Pearl and Hermes Atoll	1,208	Miami, Florida	4,856
Midway Islands	1,309	New York, New York	4,959
Kure Atoll ¹	1,367	Portland, Oregon	2,595
Trust Territory of the Pacific Isl.:		San Diego, California	2,610
Majuro, Marshall Islands	2,271	San Francisco, California ²	2,397
Kwajalein, Marshall Islands	2,443	Seattle, Washington	2,679
Kolonia, Ponape, E.C.I.	3,087	Vancouver, B.C.	2,709
Saipan, Mariana Islands	3,704	Victoria, B.C.	2,668
Koror, Palau, W.C.I.	4,593	Tijuana, Mexico	2,616
Other Pacific locations:		Washington, D.C.	4,829
Apra Harbor, Guam	3,806	London, England	7,226
Auckland, New Zealand	4,393	Bombay, India	8,010
Hong Kong	5,541	Ghanzi, Botswana ³	12,417

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. The distance from Kure Atoll to other extreme points in the United States is: West Quoddy Head, Maine, 5,788 miles; Log Point, Elliot Key, Florida, 5,852 (Kure and Log Point are the points farthest apart in the fifty States). Kure is 2,486 miles from Tokyo, Japan.

²Hilo is 2,315 statute miles from San Francisco and 2,447 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 68.—AREA AND COASTLINE OF COUNTIES, ISLANDS, AND CITIES

County, Island or city	Area in square statute miles			Coastline in statute miles	
	Total	Land	Inland water	General coastline ¹	Tidal shoreline
The State	6,450	6,425	25	750	1,052
Counties:					
Hawaii	4,038.0	4,037.0	1.0	266	313
Maui	1,161.1	1,160.3	0.8	} 210	343
Kalawao	13.3	13.3	—		
Honolulu	610.9	595.7	15.2		
Kauai	627.1	619.1	8.0	137	162
Islands:					
Hawaii	4,038.0	4,037.0	1.0	266	313
Maui	728.8	728.2	0.6	120	149
Kahoolawe	45.0	45.0	—	29	36
Molokini	<0.01	<0.01	—	—	—
Lanai	139.5	139.5	—	47	52
Molokai	261.1	260.9	0.2	88	106
Oahu	607.7	592.7	15.0	112	209
Kauai	553.3	548.7	4.6	90	110
Niihau	73.0	69.6	3.4	45	50
Lehua	0.4	0.4	—	—	—
Kaula	0.4	0.4	—	2	2
Northwestern Hawaiian Islands	3.2	3.0	0.2	25	25
Cities:					
Hilo ²	298.9	298.9	—	—	—
Honolulu ³	88.7	86.6	2.1	—	—
On Oahu	85.5	83.6	1.9	—	—
On Northwestern Hawaiian Islands	3.2	3.0	0.2	25	25

¹Figures for the four islands of Maui County are not consistent with the published county total.

²As defined in Sec. 70-1, Hawaii Revised Statutes. As defined for census purposes, under provisions of Sec. 26-18, HRS, Hilo has a land area of 56.1 square miles (see DPED Report SB-2a).

³As defined for statistical purposes (see DPED Report SB-1).

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.

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Table 69.—MAJOR SUMMITS
 (Elevation of the highest point on each Island and other important peaks.)

Island and mountain	Elevation(feet)	Island and mountain	Elevation(feet)
Hawaii:		Oahu:	
Mauna Kea ¹	13,796	Kaala	4,020
Mauna Loa	13,677	Konahuanui ²	3,150
Hualalai	8,271	Tantalus	2,013
Kohala	5,480	Olomana	1,643
Kilauea (Uwekahuna)	4,090	Diamond Head	760
Kilauea (Halemaumau Rim)	3,646	Punchbowl	500
		Koko Head	642
Kahoolawe:		Kauai:	
Lua Makika	1,477	Kawaikini	5,243
		Waialeale	5,148
Maui:		Niihau:	
Haleakala (Red Hill)	10,023	Paniau	1,281
Haleakala (Kaupo Gap)	8,201		
Puu Kukui	5,788	Kaula	550
Iao Needle	2,250	Nihoa	910
		Necker Island	277
Lanai:		La Perouse Pinnacle	135
Lanaihale	3,370	Gardner Pinnacles	190
		Maro Reef	Awash
Molokai:		Laysan Island	35
Kamakou	4,970	Lisianski Island	20
Puu Nana	1,381	Pearl and Hermes Atoll	—
		Midway Islands ³	12±
		Kure Atoll	20
		Kingman Reef ³	3
		Palmyra Islands ³	6

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 Department of Planning and Economic Development, *Elevations of Major Mountains in Hawaii* (Statistical Report 52, November 7, 1967), as revised.

Table 70.—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 71.—VOLCANIC ERUPTIONS: 1790 TO 1974

(Includes eruptions over 200 days in duration, 15 square miles in area, or 200,000,000 cubic yards in volume; the most recent eruption of record for each volcano; and all eruptions since 1968.)

Volcano and date of outbreak	Duration (days)	Area (square miles)	Volume (cubic yards)
Haleakala:			
c. 1790	(NA)	2.2	35,000,000
Hualalai:			
1800-1801	(NA)	17.7	410,000,000
Mauna Loa:			
1843: Jan. 9	90	20.2	250,000,000
1855: Aug. 11	450	12.2	150,000,000
1859: Jan. 23	300	32.7	600,000,000
1873: Apr. 20	547	(NA)	(NA)
1880: Nov. 1	280	24.0	300,000,000
1887: Jan. 16	10	11.3	300,000,000
1899: July 4	19	16.2	200,000,000
1919: Sept. 29	Short	9.2	350,000,000
1950: June 1	23	35.0	600,000,000
Kilauea:			
1840: May 30	26	6.6	281,000,000
1919: Feb. 7	294	1.6	34,500,000
Dec. 21	221	5.0	62,000,000
1967: Nov. 5	251	0.25	110,000,000
1968: Aug. 22	5	0.01	50,000
Oct. 7	15	0.8	9,000,000
1969: Feb. 22	6	2.3	22,000,000
May 24	875	19.0	240,000,000
1971: Aug. 14	< 1	0.8	12,000,000
Sept. 24	5	1.5	10,000,000
1972: Feb. 4	645	13.8	178,000,000
1973: May 5	< 1	0.07	1,200,000
Nov. 10	30	0.42	4,000,000
Dec. 10 ¹	In progress	0.60	15,000,000

NA Not available.

¹Still in progress, March 1974; area and volume are as of that time.

Source: Gordon A. Macdonald and Agatin T. Abbott, *Volcanoes in the Sea* (University of Hawaii Press, 1970), pp. 50, 53, 56-57, and 74-75; unpublished data from the U.S. Geological Survey, Hawaiian Volcano Observatory.

✓ **Table 72.—EARTHQUAKES OF MAGNITUDE 5 OR GREATER: 1838 TO 1973** ✓
 (Except for the earthquake of April 2, 1868, magnitudes of earthquakes prior to 1929
 are conjectural.)

Date	Location	Estimated Richter magnitude
1838: December 12	Hawaii	6
1841: April 7	Hawaii	6
1852: March 31	Hawaii	6
1868: March 28	Hawaii	6.5
April 2	Hawaii	7.5
1871: February 18	South of Oahu	6.5
1875: November 23	Hawaii	6
1887: January 24	Hawaii	6
1913: October 25	Hawaii	6.5
1918: November 1	Hawaii	6.5
1919: September 14	Hawaii	6.5
1929: October 6	Hawaii	6.5
1938: January 23	N. of Pauwela Pt., Maui	6.75
1940: June 17	Hawaii	6
1941: September 25	Hawaii	6
1948: June 28	Oahu (?)	Unknown
1950: May 30	Hawaii	6.25
1951: April 23	Hawaii	6.5
August 21	Hawaii	6.9
1952: May 23	Hawaii	6
1953: January 15	Hawaii	5.25
1954: March 30	Hawaii	6
March 30	Hawaii	6.5
1961: September 25	Hawaii	5.75-6
1962: June 28	Hawaii	6.1
1963: October 23	Hawaii	5
1964: October 11	W. of Kona Coast	5
1972: December 23	W. of Kona Coast	5
1973: April 26	Honolulu, Hawaii	6.2
October 9	Kilauea, Hawaii	4.8-5

Source: Information supplied by Wm. Mansfield Adams and Augustine S. Furumoto, Hawaii Institute of Geophysics, University of Hawaii. Correct to December 31, 1973.

Table 73.—TSUNAMIS WITH RUN-UP OF 2 METERS (6.6 FEET) OR MORE: 1819 TO 1974

Date ¹	Maximum height in Hawaii (feet)	Deaths in Hawaii	Damage in Hawaii
1819: April 12	6.6	—	Unknown
1837: Nov. 7	19.7	16	174 houses
1841: May 17	15.1	—	Unknown
1868: April 2	65.6	46	Great locally
August 14	15.1	—	Severe
1869: July 25	29.9	—	Some
1877: May 10	16.1	5	Extensive
1878: Jan. 20	9.8	—	Some houses
1896: June 15	29.9	—	Unknown
1906: Jan. 31	11.8	—	Minor
August 16	11.8	—	Some
1919: April 9	14.1	—	Minor
April 30	13.8	—	Unknown
1922: November 11	6.9	—	Minor
1923: February 3	20.0	1	\$1,500,000
1924: May 30	16.4	—	Great locally
1933: March 2	9.5	—	Unknown
1946: April 1	55.8	159	\$26,000,000
1952: November 4	20.0	—	\$ 1,000,000
1957: March 9	52.5	—	\$ 5,000,000
1960: May 23	34.4	61	\$23,000,000
1964: March 27	15.7	—	\$ 67,590

¹Limited to tsunamis with a maximum run-up of 2.0 meters or more.

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. Correct to July 22, 1974.

Table 74.—WATER PRODUCTION: 1920 TO 1972
(In billions of gallons)

Year and nature of occurrence or distributor	State total	Kauai	Oahu	Molokai	Maui	Lanai	Hawaii
1920, total	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Wells	130.0	8.0	87.7	—	33.6	—	0.5
Other sources	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
1937, total	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Wells	152.0	5.1	101.0	—	43.7	—	1.9
Ground water from tunnels	28.0	0.3	14.3	—	7.5	0.1	5.8
Other sources	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
1953, total ¹	654.4	170.0	200.0	1.0	191.1	0.5	91.8
Surface	348.9	152.2	26.2	0.4	86.4	—	83.7
Ground: basal	287.1	17.0	158.2	0.6	103.5	—	7.8
Ground: all others	18.3	0.7	15.6	—	1.1	0.5	0.3
Unidentified	0.2	0.2	—	—	—	—	—
1957, total ¹	701.1	183.9	195.8	1.1	225.9	0.7	93.9
Surface	410.6	168.5	28.6	0.4	129.3	—	83.7
Ground: basal	268.9	14.5	149.1	0.6	96.1	—	8.5
Ground: all others	21.5	0.7	18.1	—	0.5	0.7	1.6
Unidentified	0.1	0.1	—	—	—	—	—
City and County	22.9	1.0	19.0	0.1	1.6	—	1.2
Federal	9.1	—	9.0	—	—	—	—
Territory of Hawaii	1.3	—	1.1	0.2	—	—	—
Private	667.9	182.9	166.6	0.7	224.3	0.7	92.7
1972, total ²	(NA)	2.3	170.0	(NA)	(NA)	(NA)	(NA)
City and County	52.6	1.6	44.1	3.6	—	—	3.3
Military systems	(NA)	0.1	12.3	(NA)	(NA)	(NA)	(NA)
Plantations	(NA)	0.5	100.4	(NA)	(NA)	(NA)	(NA)
Industrial	(NA)	—	7.1	(NA)	(NA)	(NA)	(NA)
All others	(NA)	0.1	6.1	(NA)	(NA)	(NA)	(NA)

NA Not available.

¹Water consumption.

²Water production for Oahu and water consumption for other islands. The Oahu total includes 148.0 billion gallons of ground water, 12.2 billion in surface water, and 9.8 billion from shallow wells.

Source: Territorial Planning Board, *First Progress Report. An Historic Inventory of the Physical, Social and Economic and Industrial Resources of the Territory of Hawaii* (2nd ed., 1939), pp. 145 and 147; Hawaii Water Authority, *Water Resources in Hawaii* (1959), pp. 132-134; Honolulu Board of Water Supply, estimates supplied December 26, 1973; Hawaii County Department of Water Supply, records; Maui County Department of Water Supply, records; Kauai County Department of Water, estimates supplied December 14, 1973.

Table 75.—WATER USE: 1950 TO 1970
(In millions of gallons per day, unless otherwise specified.)

Subject	1950	1960	1965	1970
Water withdrawn ¹	1,270	1,500	2,000	2,700
Ground water	610	600	820	920
Fresh	(NA)	580	780	910
Saline	(NA)	21	37	13
Surface water	660	860	1,200	1,700
Fresh	(NA)	600	670	850
Saline	(NA)	260	500	860
Reclaimed sewage	(NA)	—	—	66
Withdrawn for irrigation	1,120	920	1,160	1,280
Conveyance losses	(NA)	100	200	220
Used for hydroelectric power	580	(NA)	360	330
Fresh water consumed	(NA)	410	580	810
Per capita use (gallons per day)	2,500	2,500	2,800	3,500

NA Not available.

¹Excludes water used for hydroelectric power. Irrigation conveyance losses included in 1965 and 1970, excluded in 1960, and not specified in 1950.

Source: U.S. Geological Survey, *Estimated Use of Water in the United States* for 1950 (Circular 115, May 1951), 1960 (Circular 456, 1961), 1965 (Circular 556, 1968), and 1970 (Circular 676, 1972).

✓ **Table 76.—AVERAGE DAILY WATER CONSUMPTION FROM COUNTY WATERWORKS: 1905 TO 1973**
(In millions of gallons)

Year	Total	City of Honolulu ¹	Rest of Oahu ²	Hawaii County ³	Kauai County ⁴	Maui County ⁵
1905	...	10.25	...	...	...	...
1910	...	11.82	...	...	...	...
1915	...	16.25	...	...	...	...
1920	...	22.10	...	...	...	...
1925	...	25.2	...	...	...	...
1930	...	22.1	0.62	...	...	...
1935	...	19.0	0.99	...	...	...
1940	...	23.4	1.53	...	...	...
1945	...	39.4	6.14	...	...	...
1950	...	34.8	4.40	...	...	...
1955	...	37.0	8.52	3.41	...	4.65
1960	69.5	41.9	15.97	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	...	51.0	28.0	...	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	135.6	67.2	44.4	8.99	4.66	10.45

¹Average daily delivery, 1905-1920; amount supplied, 1925-1955; consumption, 1960 and later years. Data refer to years ended June 30, 1905 and 1910, calendar years 1915 to 1960, the six-month period ended June 30, 1961, and years ended June 30, 1962 and thereafter.

²Water consumption, 1930 to 1945; water sales, 1940 to 1955; consumption, 1960 and later years. Data refer to calendar years 1930 to 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 Department of Public Works, *Annual Report* for 1927 and 1941-1954 and *2nd Special Report on the Growth of SWS* (1957); Honolulu Board of Water Supply, *Report on the Rural Water Works* (1937 and 1939), *Biennial Report* for 1945-1946 and 1955-1956, *Supplement to the Annual Report* for 1963-1972, and records; Hawaii County Department of Water Supply, records; Kauai County Department of Water, records; Maui County Department of Water Supply, records.

Table 77.—WATER QUALITY DATA FOR OAHU BEACHES: 1950 TO 1972

Beach	Coliform per 100 milliliters (logarithmic average)					
	1950	1960	1969	1970	1971	1972
Ala Moana Park	177.0	11	5	3	7	6
Fort De Russy	19.2	7	13	11	15	17
Kuhio Beach	4.0	6	15	25	43	14
Hanauma Bay	3.9	2	13	16	7	3
Kailua Beach	6.4	6	13	15	14	6
Punaluu Park	6.3	157	7	8	74	19
Haleiwa Park	12.6	81	7	7	11	12
Waianae Park	1.7	3	9	13	32	9
Ewa Beach	2.4	9	6	4	6	13

Source: *Annual Report, Department of Health, State of Hawaii, Statistical Supplement, 1950-1972.*

Table 78.—DAILY REFUSE, FOR OAHU: 1970
(Excludes agricultural and military refuse.)

Kind of refuse	Tons
Total refuse	2,236
Combustible:	
Paper	635
Trimming	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 79.—AEROMETRIC SURVEY DATA, FOR HONOLULU: 1957 TO 1973

Year	Suspended particulate matter (mean micrograms per cubic meter)	Benzene-soluble organic matter (mean micrograms per cubic meter)	Beta radioactivity (mean micromicrocuries per cubic meter)
1957	47	3.5	0.6
1958	59	7.5	3.3
1959	63	5.4	1.3
1960	47	4.1	0.0
1961	43	3.0	0.8
1962	41	3.1	4.0
1963	42	4.3	3.7
1964	44	2.3	0.9
1965	41	2.5	0.3
1966	35	2.8	0.2
1967	38	2.5	0.3
1968	45	2.8	(NA)
1969	43	2.3	(NA)
1970	37	1.5	(NA)
1971	45	(NA)	(NA)
1972	41	(NA)	(NA)
1973	34	(NA)	(NA)

NA Not available.

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

Table 80.—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 81.—AEROMETRIC SURVEY DATA FOR SPECIFIED LOCATIONS: 1973

Subject	DOH Bldg. ¹	Kalihi Kai	Pearl City	Barbers Point	Waimanalo	Ala Moana	Kahului, Maui	Kihei, Maui	Hilo, Hawaii ²	Lihue, Kauai
Minimum:										
Particulate matter ³	18	26	16	14	10	33	23	13	15	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	1.2	...	...	...	...	...	...	...	...	...
Carbon monoxide, 8 hrs. ⁴	0.1	...	...	...	...	...	...	...	...	...
Photochemical oxidants ³	11	...	...	...	...	...	...	...	...	...
Maximum:										
Particulate matter ³	120	225	104	129	67	98	329	168	51	173
Sulfur dioxide ³	22	< 5	< 5	< 5	...	< 5	49	...	< 5	8
Nitrogen dioxide ³	95	77	41	33	...	105	59	...	87	49
Carbon monoxide, 1 hr. ⁴	41.2	...	...	...	...	...	...	...	...	...
Carbon monoxide, 8 hrs. ⁴	13.4	...	...	...	...	...	...	...	...	...
Photochemical oxidants ³	59	...	...	...	...	...	...	...	...	...
Annual average:										
Particulate matter ³	34	61	47	50	34	60	90	77	30	39
Sulfur dioxide ³	7	< 5	< 5	< 5	...	< 5	7	...	< 5	< 5
Nitrogen dioxide ³	46	30	22	<20	...	55	23	...	29	<20

¹South Beretania and Punchbowl Streets, Honolulu. Carbon monoxide sampled for only 8 months.

²Sampled for periods ranging from 4 to 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.

*81A. NOISE LEVELS in VARIOUS NEIGHBORHOODS
on OAHU: 1974*

*81b NOISE COMPLAINTS RECEIVED by the
Honolulu Police Department: 1973 & 1974*

Table 82.—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	70.6	75.8	53	94	136.62	38
Haw'n Volcanoes Nat. Park Hdq.	3,971	57.9	63.5	37	85	100.69	—
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	13.25	—
Kahului Airport	48	71.7	79.0	48	95	16.33	70
Lahaina	45	71.2	77.7	52	93	14.53	—
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	72.4	79.4	52	92	21.89	69
Honolulu Federal Building ⁴	12	71.9	78.4	57	88	23.96	65
Waikiki ⁵	10	71.9	80.6	51	93	28.90	—
Manoa (HSPA)	500	69.4	75.2	—	—	158.41	—
Kaneohe MCAS	10	72.9	79.1	58	90	43.88	—
Kahuku	25	70.6	77.8	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	70.7	78.4	50	90	43.00	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	—

¹Temperature data are for Mahukona.

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

³Temperature data refer to Puunene Airport.

⁴Temperature sensors are 87 feet above the ground.

⁵Located at Honolulu Zoo. Available only from 1965. The rainfall average shown is thought to be above the long-term average.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service Pacific Region, data supplied March 13, 1973.

Table 83.—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 84.—TEMPERATURE AND RAINFALL, FOR SPECIFIED LOCATIONS: 1960 TO 1973

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

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

Table 85.—TREES ALONG STREETS OR IN PARKS UNDER THE JURISDICTION OF THE CITY AND COUNTY OF HONOLULU: 1960 TO 1974

Date	City and County streets and highways ¹		Trees in City and County parks
	Length in miles	Trees	
1960: Apr.-June	784.00	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

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 Recreation, Conservation and Beautification Division, records.

Table 86.—HAWAII AUDUBON SOCIETY BIRD COUNT OF THE HONOLULU AREA: 1945 TO 1973
(Counts made in late December, in a circle, 15 miles in diameter, centered near Nuuanu Pali.)

Years	Annual average		Species	Birds, 1973
	Species	Individual birds		
1945-49	30	3,190	Common Mynah	2,295
1950-54	26	3,561	Red-footed Booby	1,475
1955-59	35	5,383	Barred Dove	1,438
1960-64	36	5,936	Cattle Egret	868
1965-69	50	14,256	House Sparrow	778
			Spotted Dove	578
1970	51	10,454	Japanese White-eye	419
1971	50	13,218	Pacific Golden Plover	407
1972	52	14,559	Great Frigate bird	297
1973	48	9,574	House Finch	184

Source: Hawaii Audubon Society, *The Elepaio*, for Feb. 1949, Feb. 1958, Feb. 1962, Feb. 1972, Feb. 1973, and Feb. 1974.