

**HOURLY RAINFALL AND REPORTED DEBRIS FLOWS FOR SELECTED STORM
PERIODS, 1935-91, IN AND NEAR THE HONOLULU DISTRICT, HAWAII**

U.S. GEOLOGICAL SURVEY

Open-File Report 92-486

Prepared in cooperation with the
CITY AND COUNTY OF HONOLULU,
DEPARTMENT OF PUBLIC WORKS



U.S. DEPARTMENT OF THE INTERIOR

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CONVERSION FACTORS

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
inch (in)	25.4	millimeter
inch per year (in/yr)	25.4	millimeter per year
foot (ft)	0.3048	meter

HOURLY RAINFALL AND REPORTED DEBRIS FLOWS FOR SELECTED STORM PERIODS, 1935-91, IN AND NEAR THE HONOLULU DISTRICT, HAWAII

by Jill D. Torikai and Raymond C. Wilson

ABSTRACT

Selected data are presented that were compiled for a study on debris-flow initiation. The data include hourly rainfall intensities and reported debris flows in and near the Honolulu District for selected storm periods from 1935 through 1991.

Rainfall data were compiled from 12 recording gages located in the watershed areas of or near headwaters in the Koolau Range. An examination of rainfall data indicated 23 rainfall periods with relatively high intensity, long duration, or high total rainfall.

Reports of possible debris flows in and near the Honolulu District were collected for the 23 storm periods. Characteristics of possible debris flows were described in the original report sources as rockslides, mudslides, floods, displaced rocks and boulders, and other debris deposits.

INTRODUCTION

The hillslopes on the island of Oahu are susceptible to debris flows that occur in association with heavy rainfall. Historically, debris flows are a common occurrence on Oahu. Especially notable is the 1987 New Year's Eve storm during which about 400 debris flows were triggered, causing extensive property damage in southeast Oahu, from Aina Haina to Kalama Valley (Ellen and others, 1991) (fig. 1).

Debris flows are defined by Ellen (1988) as the rapid downslope movement of debris and mud that are commonly triggered during periods of heavy rainfall. Debris flows commonly start on hillslopes as shallow landslides, and with the addition of rainwater become slurries that flow down hillsides and channels. The composition of debris flows typically includes uprooted vegetation, soil, surface runoff, and other debris on the ground surface. The term "landslide" refers to all mass-movement processes, including debris flows, and use of the term in non-technical reports has been liberal.

Because of concern for the effects of debris flows, and in order to understand more about the mechanics of debris flows, the U.S. Geological Survey, in cooperation with the City and County of Honolulu, Department of Public Works, conducted a study of debris flows in the Honolulu District.

A major part of the investigation focused on determining the combinations of rainfall intensity and duration that trigger debris flows in susceptible areas. These critical combinations, called rainfall thresholds, could then be used as the basis for a real-time warning system for debris flows, similar to that developed recently for the San Francisco Bay region of California (Keefer and others, 1987).

Rainfall thresholds are affected by a number of factors, including the geometry of the hillslope, and the geotechnical and hydrologic properties of the hillslope medium (Campbell, 1975; Wilson, 1989). However, collecting these types of field data for large areas in complex terrain is difficult. When detailed hillslope data are not collected, historical records of rainfall and possible debris flows become the principal sources of information in developing rainfall thresholds for the area under consideration.

157°39'

157°46'30"

157°54'

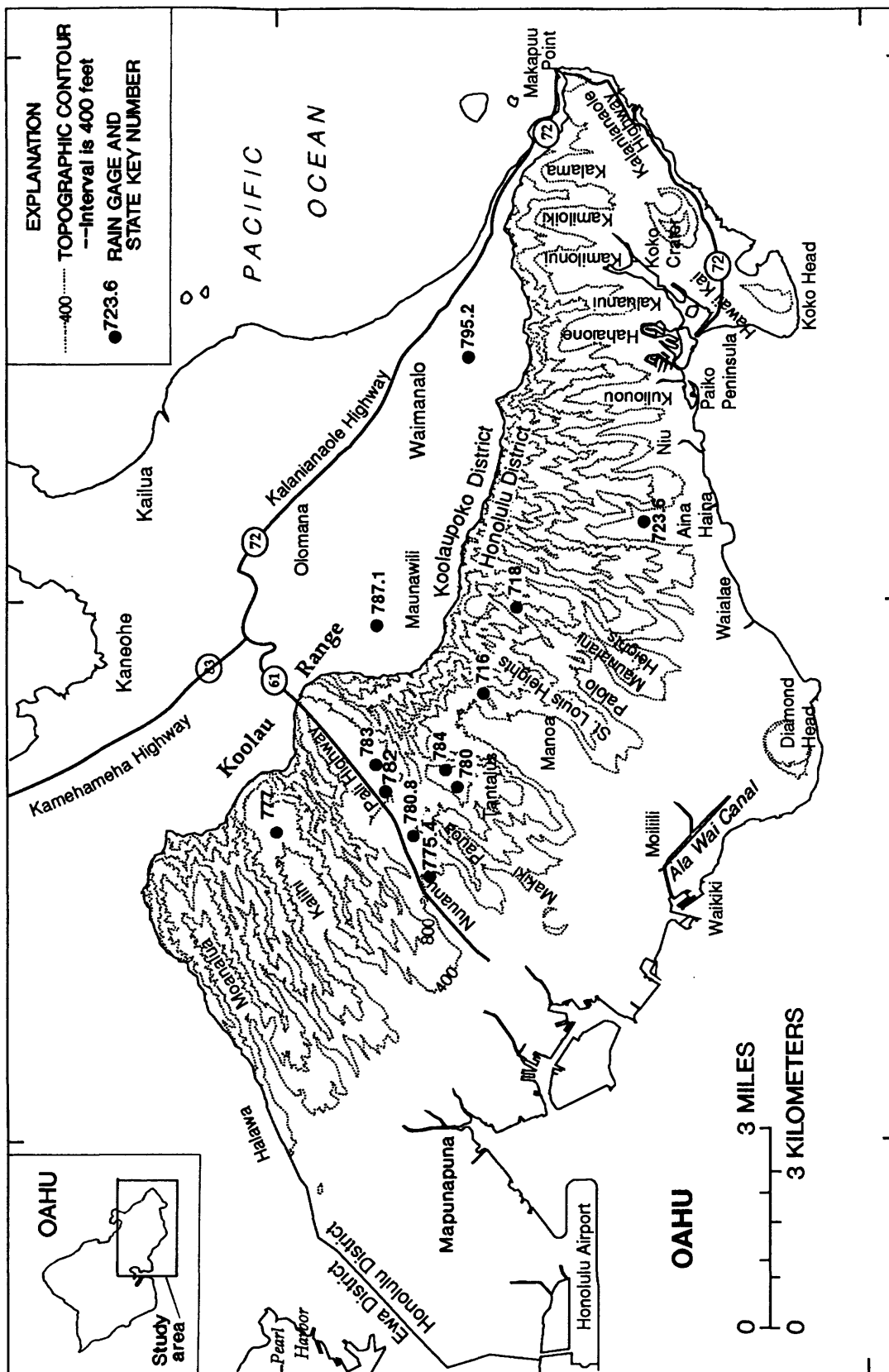


Figure 1. Location of study area and selected rain-gage stations.

Purpose and Scope

This report presents hourly rainfall data and reports of debris flows compiled for a study that investigated the causes of debris flows. The data represent hourly rainfall and reported characteristics of debris flows for selected storm periods in and near the Honolulu District from 1935 through 1991. Rainfall data were obtained from the Honolulu Board of Water Supply and from climatologic data published by the National Oceanic and Atmospheric Administration. Debris-flow data were compiled from the Oahu Civil Defense Agency, storm reports by local agencies, and local newspapers.

Description of Study Area

The Honolulu District study area in southeastern Oahu extends from Moanalua Valley to Makapuu Point on the leeward side of the Koolau Range (fig. 1). The Koolau Range was built by volcanic activity originating from fissures in a northwest-trending rift zone of the Koolau shield volcano (Macdonald and others, 1983). The area consists of a series of steeply sloping valleys that extend from the crest of the Koolau Range at more than 3,000 ft, down to sea level at the ocean's edge.

For comparison, areas outside of the Honolulu District on the windward side of the Koolau Range are included in the lists of selected rain-gage locations and of possible debris flows. The windward slopes of the Koolau Range typically receive more rain annually than the leeward slopes because of the orographic effect of northeasterly tradewinds and moisture-laden air rising against the mountain slopes.

The Koolau Range has a median annual total of greater than 280 in of rain, whereas the open ocean surrounding Oahu receives about 39 in/yr (Giambelluca and others, 1984). The winter months, from October through April, generally receive more rainfall than the summer months.

Most valleys and some ridge crests below an altitude of about 1,000 ft are urbanized. Residential development covers about 50 percent of the Honolulu District. The remainder of the district is undeveloped and is mostly designated as watershed or conservation land by the State.

Acknowledgments

The assistance and cooperation of the Oahu Civil Defense Agency and the Honolulu Board of Water Supply during data collection is greatly appreciated. Mr. Paul Haraguchi, of the Hawaii State Department of Land and Natural Resources, provided assistance with locating historical rainfall data.

HOURLY RAINFALL

Hourly rainfall data were obtained for periods of relatively heavy rainfall in and near the Honolulu District. The selection of rain-gage stations was based on their location in valleys, and on the availability of hourly data. Sources of rainfall data include the National Weather Service (NWS) and the Honolulu Board of Water Supply (BWS). Storm periods were identified from the time that non-zero hourly rainfall data were first recorded.

Rain-Gage Selection

Selected rain-gage stations were located in and near the Honolulu District. The selected gages either recorded rainfall hourly, or had continuous records from which readings at hourly intervals could be computed. The locations of the gages were in watershed areas or near the heads of valleys because debris flows occur more frequently on steep hillslopes (Ellen and others, 1991). The steep hillslopes at higher altitudes of the Koolau Range generally receive more rainfall than those at lower altitudes near the coast.

Of the 15 hourly rain-gage stations located in and near the Honolulu District, data from only 12 stations were used for this study. The other three gages were located too close to the coast. Data were obtained from six stations operated by the NWS and six from the BWS (table 1).

Table 1.--Selected rain-gage stations with hourly data

[NWS, National Weather Service; BWS, Honolulu Board of Water Supply]

Rain gage	State key number	Operator
Dowsett	775.4	NWS
Dowsett Highlands	780.8	NWS
Maunawili	787.1	NWS
Tantalus Peak	780	NWS
Wailupe Valley School	723.6	NWS
Waimanalo-Nonokio	795.2	NWS
Kalihi Reservoir 5	777	BWS
Lower Luakaha	782	BWS
Manoa Tunnel 2	716	BWS
Nuuanu Reservoir 4	783	BWS
Palolo Valley	718	BWS
Pauoa Flats	784	BWS

Hourly gages belonging to the NWS, most installed in the mid-1960's, have a relatively short record of data. The Dowsett Highlands gage (780.8), for example, was discontinued in October 1985, and the Tantalus gage was discontinued in January 1977. The Dowsett gage (775.4) was not installed until September 1983.

The BWS gages have been operating since the 1920's and 1930's, and thus provide a lengthy record of data. Additional information concerning the rain gages are found in Hawaii State Department of Land and Natural Resources (1973).

Storm-Period Selection

A storm period, as defined for this report, has a relatively high intensity, long duration, or high total rainfall relative to average conditions for each rain gage. There were no absolute numerical criteria assigned to these factors during the selection of storm periods. Generally, however, there was one rain gage in a storm period that recorded more than an inch per hour for at least one reading. Rainfall data were accumulated for periods with relatively heavy rainfall in any part of the study area, whether or not any debris flows were reported for those periods. Data on debris flows were collected separately, as described below.

The selection of storm periods was determined by the relative amounts of rainfall at a specific gage station. Examination of monthly rainfall totals for gages within the study area identified 23 storm periods from 1935 through 1991 (table 2). These storm periods are a representative sampling and do not constitute a complete list.

Data Collection

Hourly rainfall data collected at the NWS rain gages are reported in inches to tenths or hundredths of inches. The data are published monthly by the U.S. National Oceanic and Atmospheric Administration (NOAA). The reporting format for some gages changed with time, and are given in table 3 (at end of report) as they appear in the NOAA publications. No well-defined reasons were cited in the monthly tabulations for periods when no rainfall data were recorded (U.S. National Oceanic and Atmospheric Administration, 1965-1991).

Hourly rainfall intensities from the BWS gages have not been published, and had to be hand-calculated at hourly intervals from cumulative recorder charts (table 3). The values were estimated in inches to the nearest tenth or five-hundredth, depending on the scale of the recorder

sheet. Rainfall data were sometimes not available for periods of heavy rainfall when the gage would stop recording once the water level in the rainfall collection can had reached its maximum limit.

Table 2.--Selected storm periods, 1935–91

Date	Year
February 27–March 1	1935
January 16–20	1949
December 2–6	1950
March 10–13	1951
March 24–28	1951
March 5–6	1958
March 6	1963
May 14–15	1963
February 3–4	1965
November 10–14	1965
December 17–18	1967
January 31–February 2	1969
February 13–16	1969
February 5–8	1976
May 11–14	1977
October 30–31	1978
January 7–11	1980
May 6–7	1981
January 20–21	1982
February 12–14	1985
December 30–January 1	1987–1988
March 31–April 2	1989
March 17–24	1991

REPORTED DEBRIS FLOWS

Reports of possible debris flows were reviewed and summarized for the 23 selected storms. A report does not necessarily confirm the existence of a debris flow, but could indicate the occurrence of an event with characteristics of a debris flow.

Data Collection

Information sources for the historical accounts were the Oahu Civil Defense Agency (OCDA), local government storm publications, and Honolulu's two daily newspapers. Debris-flow reports include observations of rockslides, mudslides, floods, displaced rocks and boulders, and other debris deposits.

OCDA debris-flow reports were compiled from communication logs written during civil defense emergencies such as heavy rainfall and flooding. Reports were available for the time period 1959–91. The logs contain the written transcriptions of telephone calls to OCDA from residents, and from civil defense officials at the emergency sites. The OCDA logs also include the dispatches by the Honolulu Police Department, Honolulu Fire Department, and National Weather Service.

The debris-flow reports from all sources were classified as either landslides or floods. Landslides refer to flows predominantly consisting of solid material such as rocks and boulders, and floods refer to flows predominantly consisting of water. Either of these two types of reports could have been debris flows as defined for this report, but without further information, the exact nature of the occurrence cannot be deduced. The term "landslide" is applied loosely in the

historical accounts, and does not necessarily follow the definitions of this report.

A summary of the reports of possible debris flows and the sources of the reports are found in table 4 (at end of report). Descriptions of possible debris flows in table 4 retain the terminology from the original sources. The geographic areas have been designated by valleys and ridges, as indicated in figure 1. Details of Oahu's streets and neighborhoods are given in Clere (1989).

Limitations of the Data

The information listed in table 4 needs to be reviewed cautiously because of the historical nature of the data. Exact locations and terminology used in the original reports are uncertain. The information was compiled from sources that have few explanatory notes.

The debris-flow reports listed in table 4 include events occurring both on natural and unnatural hillslopes. Examples of occurrences on unnatural hillslopes are roadfill failures and rockfalls on road cuts. Distinctions between natural and unnatural hillslopes were not made because of the uncertainty in the exact locations.

Some roadways in the Honolulu District have changed since the beginning of the study period. The current Pali Highway, for example, was constructed in 1952 to replace the old Pali Highway. The changes in direction and path of the Pali Highway have been noted in table 4. Locations of other roadways are assumed to be unchanged, unless otherwise noted in the data table.

The dates and times listed in table 4 represent when the debris flow was first observed or recorded and do not necessarily represent the date and time that the debris flow was initiated. If the time was not given in a report, then a relative time was assigned if it could be deduced from the available information.

Most of the debris-flow reports listed in table 4 represent occurrences that encroached on residential development or farm lots. Some debris flows may have gone unnoticed, or were not severe enough to warrant recording. Some reports may be duplicates, but uncertainty in the descriptions from different sources prevented such an identification. Therefore, all possible debris flows were included in this report.

SUMMARY

The hourly rainfall data and reports of debris flows given in this report were compiled for a study on debris-flow initiation. Rainfall data were compiled from 12 recording rain gages in watershed areas or near heads of valleys in and near the Honolulu District (fig. 1). The 23 selected storm periods are a sampling of heavy rainfall periods identified from the rainfall record from 1935 through 1991. Data were supplied by the Honolulu Board of Water Supply and from climatologic data published by the National Oceanic and Atmospheric Administration.

Data for debris flows were collected for storm periods selected for this report and were summarized with the original phrasing from their respective sources. Debris flows included in this report were originally reported as rockslides, mudslides, floods, displaced rocks and boulders, and other debris deposits. Tables 3 and 4 list the rainfall data and reports of possible debris flows, respectively.

The information in this report can be used to estimate the rainfall thresholds for debris flows in areas for which data are available. Further applications of these historical data include identifying the distribution of debris-flow source and impact areas, and estimating the frequency of their occurrence.

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- 1951d, Flooded streams peril homes: Honolulu, Hawaii, 3/27/51, p. 1.
- 1951e, Armed guards in Kailua flood area: Honolulu, Hawaii, 3/28/51, p. 1.
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- 1958b, Hour after hour, storm reports keep flooding in: Honolulu, Hawaii, 3/6/58, p. 7.
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- 1963b, Violent storms cause mud slides, floods, 1 death: Honolulu, Hawaii, 5/15/63, p. 17.
- 1965a, Traffic snarled on all highways: Honolulu, Hawaii, 2/4/65, p. A-1B.
- 1965b, Car crashes delay thousands; 2 landslides block Pali road: Honolulu, Hawaii, 11/15/65, p. A-1.
- 1965c, Another landslide blocks Pali: Honolulu, Hawaii, 11/16/65, p. A-1.
- 1965d, Officials tour storm-hit areas: Honolulu, Hawaii, 11/16/65, p. A1-A.
- 1965e, Makiki Stream (figure caption): Honolulu, Hawaii, 11/15/65, p. A-1.
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Table 3.--Hourly rainfall for selected storm periods, 1935-91

[values are in inches; dot (.), data not available from source; dash (--), data not obtained from source; asterisk (*), amount included in a following measurement; Vly., Valley; Sch., School; Waima., Waimanalo; Res., Reservoir. Dowsett is Dowsett Highlands (780.8) through storm period of January 20-21, 1982 and Dowsett Highlands (775.4) from storm period of February 12-14, 1985. Hour is the sequential hour after midnight.]

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for February 27 - March 1, 1935

2/27/35

1	.	.	.	.	.	--	--	0	0	0	0
2	.	.	.	.	.	--	--	0	0	0	0
3	.	.	.	.	.	--	--	0.1	0	0.1	0
4	.	.	.	.	.	--	--	0	0	0.1	0.1
5	.	.	.	.	.	--	--	0.1	0.1	0	0.1
6	.	.	.	.	.	--	--	0	0.1	0.1	0.1
7	.	.	.	.	.	--	--	0.2	0.1	0.2	0
8	.	.	.	.	.	--	--	0	0	0	0.1
9	.	.	.	.	.	--	--	0.1	0.1	0	0.2
10	.	.	.	.	.	--	--	0	0	0	0
11	.	.	.	.	.	--	--	0	0	0	0
12	.	.	.	.	.	--	--	0	0	0	0.1
13	.	.	.	.	.	--	--	0.3	0.1	0	0.1
14	.	.	.	.	.	--	--	0.3	0.1	0.1	0.2
15	.	.	.	.	.	--	--	0	0.4	0	0.2
16	.	.	.	.	.	--	--	0.7	0.3	0.4	0.2
17	.	.	.	.	.	--	--	0.1	1.6	0	1.8
18	.	.	.	.	.	--	--	0.4	3.0	0.2	1.8
19	.	.	.	.	.	--	--	1.0	0.7	0.9	0.4
20	.	.	.	.	.	--	--	2.2	1.3	1.6	1.8
21	.	.	.	.	.	--	--	0.4	0.6	0.4	0.6
22	.	.	.	.	.	--	--	0.4	0.4	0.4	0.3
23	.	.	.	.	.	--	--	0.1	0.2	0.1	0.2
24	.	.	.	.	.	--	--	0.2	0.1	0.2	0.1

2/28/35

1	.	.	.	.	.	--	--	0.5	0.3	0.7	0.4
2	.	.	.	.	.	--	--	0.3	0.4	0.1	0.4
3	.	.	.	.	.	--	--	0	0	0	0
4	.	.	.	.	.	--	--	0	0	0	0
5	.	.	.	.	.	--	--	0.7	0	0.3	0
6	.	.	.	.	.	--	--	0.1	0.1	0	0.3

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for February 27 - March 1, 1935--Continued

7	.	.	.	.	.	--	--	0	0	0	0
8	.	.	.	.	.	--	--	0	0	0	0
9	.	.	.	.	.	--	--	0	0	0	0
10	.	.	.	.	.	--	--	0	0	0	0
11	.	.	.	.	.	--	--	0.2	0	0.2	0.1
12	.	.	.	.	.	--	--	0	0.1	0.5	0
13	.	.	.	.	.	--	--	1.0	0	0.7	1.0
14	.	.	.	.	.	--	--	0	1.4	0	0
15	.	.	.	.	.	--	--	0	0.1	0	0
16	.	.	.	.	.	--	--	0.4	0	1.4	0.4
17	.	.	.	.	.	--	--	0.5	0.4	0	0.4
18	.	.	.	.	.	--	--	0.2	1.3	0.4	0.4
19	.	.	.	.	.	--	--	0	0.1	0.1	0.2
20	.	.	.	.	.	--	--	0.3	0	0.1	0
21	.	.	.	.	.	--	--	0.2	0.1	0.1	0.1
22	.	.	.	.	.	--	--	0.8	0	0.9	0.3
23	.	.	.	.	.	--	--	0.3	0.2	0	0.2
24	.	.	.	.	.	--	--	0.3	0	0.3	0.2

3/1/35

1	.	.	.	.	.	--	--	0.1	0	0.4	0.3
2	.	.	.	.	.	--	--	0.1	0.2	0	0.4
3	.	.	.	.	.	--	--	0	0.1	0.3	0.4
4	.	.	.	.	.	--	--	0.8	0.1	0.8	1.0
5	.	.	.	.	.	--	--	0.8	0.4	0.3	0.2
6	.	.	.	.	.	--	--	0.2	0.5	0.3	0
7	.	.	.	.	.	--	--	0.4	0	0.4	0.1
8	.	.	.	.	.	--	--	0.1	0.1	0.1	0.2
9	.	.	.	.	.	--	--	0.2	0.1	0	0.1
10	.	.	.	.	.	--	--	0	0.1	0	0
11	.	.	.	.	.	--	--	0	0	0	0
12	.	.	.	.	.	--	--	0	0	0	0

Rainfall for January 16 - 20, 1949

1/16/49

1	.	.	.	.	.	.	.	0	0	.	.
2	.	.	.	.	.	.	.	0	0.02	.	.
3	.	.	.	.	.	.	.	0	0	.	.

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for January 16 - 20, 1949--Continued

4	.	.	.	.	.	.	.	0	0	.	.
5	.	.	.	.	.	.	.	0	0.04	.	.
6	.	.	.	.	.	.	.	0	0.52	.	.
7	.	.	.	.	.	.	.	0.46	0.02	.	.
8	.	.	.	.	.	.	.	0	0	.	.
9	.	.	.	.	.	.	.	0	0	.	.
10	.	.	.	.	.	.	.	0.10	0.28	.	.
11	.	.	.	.	.	.	.	0.16	0.44	.	.
12	.	.	.	.	.	.	.	0.84	0.42	.	.
13	.	.	.	.	.	.	.	0.56	1.26	.	.
14	.	.	.	.	.	.	.	0.70	0.44	.	.
15	.	.	.	.	.	.	.	0.16	0.36	.	.
16	.	.	.	.	.	.	.	0.68	0.22	.	.
17	.	.	.	.	.	.	.	0.30	0.28	.	.
18	.	.	.	.	.	.	.	0.36	0.54	.	.
19	.	.	.	.	.	.	.	0.44	0.30	.	.
20	.	.	.	.	.	.	.	0.86	2.10	.	.
21	.	.	.	.	.	.	.	2.00	2.14	.	.
22	.	.	.	.	.	.	.	1.20	0.76	.	.
23	.	.	.	.	.	.	.	0.46	0.34	.	.
24	.	.	.	.	.	.	.	0.64	0.68	.	.

1/17/49

1	.	.	.	.	.	.	.	0	0.1	.	.
2	.	.	.	.	.	.	.	0.1	0.2	.	.
3	.	.	.	.	.	.	.	0.4	0.5	.	.
4	.	.	.	.	.	.	.	0.5	0.1	.	.
5	.	.	.	.	.	.	.	0.1	0	.	.
6	.	.	.	.	.	.	.	0	0	.	.
7	.	.	.	.	.	.	.	0	0	.	.
8	.	.	.	.	.	.	.	0	0	.	.
9	.	.	.	.	.	.	.	0	0	.	.
10	.	.	.	.	.	.	.	0	0	.	.
11	.	.	.	.	.	.	.	0	0	.	.
12	.	.	.	.	.	.	.	0	0	.	.
13	.	.	.	.	.	.	.	0	0	.	.
14	.	.	.	.	.	.	.	0	0	.	.
15	.	.	.	.	.	.	.	0	0	.	.
16	.	.	.	.	.	.	.	0	0	.	.
17	.	.	.	.	.	.	.	0	0	.	.

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for January 16 - 20, 1949--Continued											
18	0	0	.	.
19	0	0	.	.
20	0	0	.	.
21	0	0	.	.
22	0	0	.	.
23	0	0	.	.
24	0	0.1	.	.
1/18/49											
1	0.1	0.1	0	.	.
2	0.1	0.1	0.4	.	.
3	0.3	0.2	0.1	.	.
4	0	0.1	0	.	.
5	0	0	0	.	.
6	0	0	0	.	.
7	0.1	0.1	0	.	.
8	0	0	0	.	.
9	0	0	0	.	.
10	0	0	0	.	.
11	0.1	0	0	.	.
12	0	0.1	0.1	.	.
13	0	0.1	0	.	.
14	0	0	0	.	.
15	0	0	0	.	.
16	0	0	0	.	.
17	0	0	0	.	.
18	0	0	0	.	.
19	0	0	0.1	.	.
20	0.1	0.1	0	.	.
21	0	0	0	.	.
22	0	0	0	.	.
23	0	0	0	.	.
24	0	0	0	.	.
1/19/49											
1	0	0	0	0	.	.
2	0.2	0	0	0	.	.
3	0	0	0	0	.	.
4	0	0.1	0.1	0	.	.
5	0.1	0	0	0	.	.

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for January 16 - 20, 1949--Continued

6	.	.	.	.	.	0	0	0	0.1	.	.
7	.	.	.	.	.	0	0.1	0.1	0.1	.	.
8	.	.	.	.	.	0.1	0	0	0.1	.	.
9	.	.	.	.	.	0	0	0	0.1	.	.
10	.	.	.	.	.	0	0.1	0.1	0	.	.
11	.	.	.	.	.	0.1	0.1	0	0.1	.	.
12	.	.	.	.	.	0	0	0	0	.	.
13	.	.	.	.	.	0	0	0	0	.	.
14	.	.	.	.	.	0	0	0	0	.	.
15	.	.	.	.	.	0	0	0	0	.	.
16	.	.	.	.	.	0.1	0	0.1	0	.	.
17	.	.	.	.	.	0	0	0	0	.	.
18	.	.	.	.	.	0	0	0.1	0	.	.
19	.	.	.	.	.	0	0	0	0	.	.
20	.	.	.	.	.	0	0	0	0	.	.
21	.	.	.	.	.	0	0	0	0	.	.
22	.	.	.	.	.	0.1	0	0	0	.	.
23	.	.	.	.	.	0	0	0	0.1	.	.
24	.	.	.	.	.	0	0	0	0	.	.

1/20/49

1	.	.	.	.	.	0	0.1	0	0	.	.
2	.	.	.	.	.	0	0	0	0	.	.
3	.	.	.	.	.	0	0	0	0	.	.
4	.	.	.	.	.	0	0	0	0.1	.	.
5	.	.	.	.	.	0.1	0	0	0.1	.	.
6	.	.	.	.	.	0	0	0	0	.	.
7	.	.	.	.	.	0	0.1	0.2	0	.	.
8	.	.	.	.	.	0	0	0	0	.	.
9	.	.	.	.	.	0.1	0	0	0	.	.
10	.	.	.	.	.	0.2	0	0	0	.	.
11	.	.	.	.	.	0	0	0	0	.	.
12	.	.	.	.	.	0	0	0	0	.	.
13	.	.	.	.	.	0	0	0.1	0.1	.	.
14	.	.	.	.	.	0	0	0.1	0	.	.
15	.	.	.	.	.	0	0	0	0	.	.
16	.	.	.	.	.	0	0	0.1	0	.	.
17	.	.	.	.	.	0	0	0	0	.	.
18	.	.	.	.	.	0	0	0	0	.	.
19	.	.	.	.	.	0	0	0.1	0	.	.

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for January 16 - 20, 1949--Continued

20	.	.	.	.	.	0.1	0	0	0	.	.
21	.	.	.	.	.	0.1	0	0	0	.	.
22	.	.	.	.	.	0.2	0	0	0.2	.	.
23	.	.	.	.	.	0	0.2	0.1	0	.	.
24	.	.	.	.	.	0	0	0.1	0.1	.	.

Rainfall for December 2 - 6, 1950

12/2/50

1	.	.	.	.	.	0.1	0	0	0	.	0
2	.	.	.	.	.	0	0	0	0	.	0
3	.	.	.	.	.	0	0	0	0	.	0
4	.	.	.	.	.	0	0	0	0	.	0
5	.	.	.	.	.	0	0	0.1	0	.	0
6	.	.	.	.	.	0	0	0	0	.	0
7	.	.	.	.	.	0	0	0	0	.	0
8	.	.	.	.	.	0	0	0	0.1	.	0
9	.	.	.	.	.	0.1	0	0	0	.	0.1
10	.	.	.	.	.	0.1	0	0	0.1	.	0
11	.	.	.	.	.	0	0	0	0	.	0
12	.	.	.	.	.	0	0	0	0	.	0
13	.	.	.	.	.	0	0	0	0	.	0
14	.	.	.	.	.	0	0	0	0	.	0
15	.	.	.	.	.	0.1	0.1	0	0	.	0.1
16	.	.	.	.	.	0	0.1	0.1	0	.	0
17	.	.	.	.	.	0.1	0	0	0.1	.	0
18	.	.	.	.	.	0	0.1	0.1	0	.	0.1
19	.	.	.	.	.	0.1	0	0	0.1	.	0
20	.	.	.	.	.	0.1	0	0	0	.	0.1
21	.	.	.	.	.	0	0	0	0.1	.	0
22	.	.	.	.	.	0	0	0	0	.	0
23	.	.	.	.	.	0	0	0	0	.	0
24	.	.	.	.	.	0	0	0	0	.	0

12/3/50

1	.	.	.	.	.	0	0	0	0	0.05	0
2	.	.	.	.	.	0	0	0	0	0	0
3	.	.	.	.	.	0	0	0	0	0	0
4	.	.	.	.	.	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for December 2 - 6, 1950--Continued											
5	0	0	0	0	0.05	0
6	0	0	0	0	0	0
7	0.1	0	0	0	0	0.1
8	0	0.1	0.1	0.1	0	0
9	0	0	0	0	0.05	0
10	0	0	0	0	0.15	0
11	0	0	0	0	0.05	0
12	0	0	0	0	0.05	0.1
13	0.1	0.1	0.1	0.1	0.05	0.6
14	1.2	0.6	0.6	0.5	0.10	0.8
15	0.9	0.7	0.6	1.3	0.15	0.1
16	0.6	0.1	0.1	0.1	1.70	0.4
17	3.7	0.6	0.4	0.4	1.10	1.7
18	1.9	2.0	3.8	2.3	1.25	0.2
19	0.1	0.1	0.4	0.1	0.15	0
20	0	0	0	0	0.05	0
21	0	0	0	0	0.05	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0.05	0.1
12/4/50											
1	0	0	0	0	0.05	0
2	0	0	0	0	0.05	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0.05	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for December 2 - 6, 1950--Continued											
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0.05	0
24	0.1	0	0	0	0	0
12/5/50											
1	0.1	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0.1	0.05	0.1
4	0	0	0	0	0.10	0
5	0	0	0	0	0.15	0
6	0	0	0	0.1	0.05	0
7	0.1	0	0.1	0	0.10	0
8	0	0	0	0	0.05	0
9	0	0.1	0	0	0.10	0.1
10	0	0	0	0	0.15	0
11	0	0	0.1	0	0.05	0
12	0	0	0	0	0.05	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	0.1	0	0	0.05	0.1
17	0.1	0	0.1	0.1	0.10	0.1
18	0	0	0.1	0.1	0.15	0.1
19	0.1	0.1	0.2	0.1	0.20	0
20	0	0.1	0.1	0	0.10	0
21	0	0.1	0.1	0.2	0.05	0.1
22	0	0.1	0.1	0	0.10	0.1
23	0	0	0.1	0.1	0.10	0.1
24	0.9	0.1	0.1	0	0	0.1
12/6/50											
1	--	--	--	0.1	0.05	0
2	--	--	--	0.1	0	0.1
3	--	--	--	0.2	0	0.2
4	--	--	--	0.1	0	0.1
5	--	--	--	0.1	0	0.1
6	--	--	--	0.1	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for December 2 - 6, 1950--Continued											
7	--	--	--	0	0	0.1
8	--	--	--	0	0	0
9	--	--	--	0	0	0
10	--	--	--	0	0	0.1
11	--	--	--	0	0	0
12	--	--	--	0	0	0
13	--	--	--	0	0	0
14	--	--	--	0	0	0
15	--	--	--	0.1	0	0.1
16	--	--	--	0	0	0
17	--	--	--	0	0	0
18	--	--	--	0	0	0.1
19	--	--	--	0	0	0
20	--	--	--	0	0	0
21	--	--	--	0	0	0
22	--	--	--	0	0	0
23	--	--	--	0	0	0
24	--	--	--	0	0	0

Rainfall for March 10 - 13, 1951

3/10/51

1	.	.	.	.	.	0	0	0	0	0	0.2
2	.	.	.	.	.	0	0.2	0	0.3	0.15	0
3	.	.	.	.	.	0.20	0	0.2	0	0	0
4	.	.	.	.	.	0	0	0.1	0	0	0
5	.	.	.	.	.	0	0	0	0	0	0
6	.	.	.	.	.	0	0.1	0.1	0	0.10	0.1
7	.	.	.	.	.	0	0	0.1	0.1	0	0
8	.	.	.	.	.	0	0	0	0	0	0
9	.	.	.	.	.	0.05	0	0	0	0	0
10	.	.	.	.	.	0	0	0	0	0	0
11	.	.	.	.	.	0.05	0	0	0	0	0
12	.	.	.	.	.	0	0	0	0	0	0
13	.	.	.	.	.	0	0	0	0	0.20	0.1
14	.	.	.	.	.	0.15	0.1	0	0.1	0.05	0
15	.	.	.	.	.	0	0	0.2	0	0	0
16	.	.	.	.	.	0	0	0	0	0	0
17	.	.	.	.	.	0	0	0	0	0.	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 10 - 13, 1951--Continued											
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	1.45	0	0	0	0.30	0.1
22	0.20	0	0	0	0.10	0
23	0.20	0	0.3	0	0.05	0.1
24	0	0.1	0.2	0.1	0.05	0
3/11/51											
1	0.25	0	0.1	0	0	0
2	0	0	0	0	0	0
3	0.15	0	0	0	0	0
4	0	0	0	0	0	0
5	0.05	0.1	0	0	0	0.7
6	0.15	1.0	0	0.6	1.00	0.9
7	2.25	2.3	0.2	1.7	1.35	1.2
8	0.6	1.2	1.5	0.05	0.2
9	0.1	1.3	0.2	0.05	0
10	0	0.1	0	0	0
11	0	0	0	0	0
12	0.1	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0.1
19	0	0	0.1	0.30	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0.1
23	0.1	0	0.1	0.05	0
24	0	0	0	0	0
3/12/51											
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0-	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 10 - 13, 1951--Continued											
6	0	0	0	0.05	0
7	0	0	0	0.05	0.1
8	0.1	0.1	0.1	0.05	0
9	0	0	0	0.05	0
10	0	0.1	0	0.05	0.1
11	0	0	0	0.10	0
12	0	0	0	0.10	0.1
13	0	0.1	0.1	0.05	0
14	0.1	0.1	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0.1
20	0	0	0	0	0
21	0.1	0	0.1	0	0
22	0	0.1	0.1	0	0
23	0	0	0	0.05	1.3
24	0.8	0	1.4	1.70	0.7
3/13/51											
1	0.8	0.9	0.7	0.8	0.2
2	0.3	1.0	0.2	0.3	0.2
3	0.3	0.4	0.2	0.2	0.3
4	0.2	0.2	0.3	0.2	0.2
5	0.2	0.2	0.2	0.1	0.1
6	0.2	0.3	0.2	0.2	0.2
7	0.1	0.1	0.2	0.2	0.4
8	0.3	0.2	0.4	0.7	0.3
9	0.4	0.2	0.3	0.2	0.5
10	0.4	0.5	0.5	0.3	0.4
11	0.2	0.5	0.3	.	0.1
12	0.3	0.3	0.2	.	0.1
13	0	0.2	0.1	.	0.1
14	0.1	0.1	0	.	0
15	0	0.1	0	.	0
16	0	0	0	.	0
17	0	0	0	.	0
18	0	0	0	.	0
19	0	0	0	..	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 10 - 13, 1951--Continued											
20	0	0	0	.	0
21	0	0	0	.	0.1
22	0	0	0.1	.	0.1
23	0.2	0.1	0.1	.	0
24	0	0.1	0	.	0.1
Rainfall for March 24 - 28, 1951											
3/24/51											
1	0	0	0	0	0	0
2	0	0	0	0.1	0.10	0
3	0	0	0.1	0	0.15	0.1
4	0	0.1	0.1	0	0.15	0
5	0	0	0	0.1	0.10	0.1
6	0.21	0.1	0.1	0	0.15	0
7	0.05	0	0	0.1	0.05	0
8	0.01	0	0	0	0	0
9	0	0	0	0	0	0
10	0.04	0	0	0	0	0.1
11	0.01	0	0	0.2	0.10	0.1
12	0.01	0.1	0.2	0	0.05	0
13	0.02	0	0	0	0	0
14	0.01	0	0	0	0	0
15	0.01	0	0	0	0.05	0
16	0.01	0.1	0	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0.05	0
20	0	0	0	0	0.10	0
21	0	0	0	0	0	0.1
22	0.01	0	0	0.2	0.15	0
23	0.01	0.1	0	0	0.15	0.1
24	0.01	0	0.1	0.1	0	0
3/25/51											
1	0	0.1	0	0.05	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for March 24 - 28, 1951--Continued

5	.	.	.	.	.	.	0	0	0	0	0
6	.	.	.	.	.	.	0	0	0	0	0
7	.	.	.	.	.	.	0	0	0	0	0
8	.	.	.	.	.	.	0	0	0	0	0
9	.	.	.	.	.	.	0	0	0	0	0
10	.	.	.	.	.	.	0	0	0	0	0
11	.	.	.	.	.	.	0	0	0	0	0.1
12	.	.	.	.	.	.	0.1	0	0.1	0.05	0
13	.	.	.	.	.	.	0	0.1	0	0.05	0.1
14	.	.	.	.	.	.	0.1	0	0	0.05	0.1
15	.	.	.	.	.	.	0.1	0.1	0.1	0.35	0
16	.	.	.	.	.	.	0	0.3	0.1	0	0.1
17	.	.	.	.	.	.	0	0	0.1	0	0
18	.	.	.	.	.	.	0.5	0	0.1	0.25	0.7
19	.	.	.	.	.	.	0.2	0.3	0.4	0	0
20	.	.	.	.	.	.	0	0	0	0	0
21	.	.	.	.	.	.	0	0	0	0	0
22	.	.	.	.	.	.	0	0	0	0	0
23	.	.	.	.	.	.	0	0	0	0.05	0
24	.	.	.	.	.	.	0	0	0	0.15	0.3
3/26/51											
1	.	.	.	.	.	.	0.2	0.1	0.4	0.55	0.2
2	.	.	.	.	.	.	0.3	0.4	0.9	0.50	0.8
3	.	.	.	.	.	.	0.8	0.6	1.2	0.90	1.2
4	.	.	.	.	.	.	0.7	1.0	1.0	1.80	0
5	.	.	.	.	.	.	0	1.1	0.1	0	0.1
6	.	.	.	.	.	.	0.3	0	0.4	0.55	0.3
7	.	.	.	.	.	.	0.5	0.3	0.5	.	1.2
8	.	.	.	.	.	.	1.5	0.5	2.3	.	1.8
9	.	.	.	.	.	.	1.7	2.5	1.4	.	0.4
10	.	.	.	.	.	.	0.5	0.5	0.3	.	0.2
11	.	.	.	.	.	.	0.2	0.3	0.1	.	0.2
12	.	.	.	.	.	.	0.2	0.2	0.2	.	0.1
13	.	.	.	.	.	.	0	0.2	0	.	0
14	.	.	.	.	.	.	0	0.1	0	.	0
15	.	.	.	.	.	.	0.1	0	0.1	.	0
16	.	.	.	.	.	.	0	0	0.1	.	0.1
17	.	.	.	.	.	.	0.2	0.1	0.1	.	0.1
18	.	.	.	.	.	.	0	0.1	0	.	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 24 - 28, 1951--Continued											
19	0	0	0	.	0
20	0.1	0	0.1	.	0.1
21	0.1	0	0.1	.	0.1
22	0.1	0.1	0	.	0.2
23	0.2	0	0.2	.	0.3
24	0.3	0.2	0.4	.	0.4
3/27/51											
1	0.5	.	.	0.4
2	0.6	.	.	1.2
3	0.9	.	.	2.0
4	1.8	.	.	0.8
5	0.7	.	.	0
6	0.6	.	.	0.2
7	0	.	.	0.4
8	0.2	.	.	0.1
9	0	.	.	0.1
10	0.1	.	.	0
11	0	.	.	0
12	0	.	.	0.1
13	0	.	.	0.1
14	0	.	.	0
15	0	.	.	0
16	0	.	.	0
17	0.1	.	.	0
18	0	.	.	0
19	0	.	.	0
20	0.1	.	.	0
21	0	.	.	0
22	0	.	.	0
23	0	.	.	0
24	0	.	.	0
3/28/51											
1	0	0	0	.	0
2	0	0	0	.	0
3	0	0	0	.	0
4	0	0	0	.	0
5	0	0	0	.	0
6	0	0	0	.	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 24 - 28, 1951--Continued											
7	0	0	0	.	0
8	0	0	0	.	0
9	0	0	0	.	0
10	0	0	0	.	0
11	0	0	0	.	0
12	0	0	0	.	0
13	0	0	0	.	0
14	0	0	0.2	.	0
15	0.2	0	0	.	0.1
16	0	0	0	.	0
17	0	0	0	.	0
18	0	0	0	.	0
19	0	0	0	.	0
20	0	0	0	.	0
21	0	0	0	.	0
22	0	0	0	.	0
23	0	0	0	.	0
24	0	0	0	.	0

Rainfall for March 5 - 6, 1958

3/5/58

1	.	.	.	.	.	.	0	0	0	0	0
2	.	.	.	.	.	.	0.1	0	0.2	0.1	0.1
3	.	.	.	.	.	.	0.3	0.1	0.4	0.2	0.2
4	.	.	.	.	.	.	0.2	0.4	0.6	0.7	0.4
5	.	.	.	.	.	.	0.6	0.6	0.6	0.5	0.6
6	.	.	.	.	.	.	0.6	0.6	1.2	0.2	0.6
7	.	.	.	.	.	.	1.6	1.2	1.8	1.5	1.2
8	.	.	.	.	.	.	1.6	2.2	0.8	1.0	2.0
9	.	.	.	.	.	.	1.0	1.4	0.8	2.4	1.0
10	.	.	.	.	.	.	1.0	0.8	0.6	1.0	1.0
11	.	.	.	.	.	.	0.6	0.8	0.1	0.3	0.6
12	.	.	.	.	.	.	0	0	0	0.4	0
13	.	.	.	.	.	.	0	0	0.1	0	0.1
14	.	.	.	.	.	.	0	0	0.2	0	0
15	.	.	.	.	.	.	0.5	0.1	0.1	0	0.2
16	.	.	.	.	.	.	0.3	0.1	1.3	0.3	0.1
17	.	.	.	.	.	.	1.2	0.8	1.4	0.2	0.8

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for March 5 - 6, 1958--Continued

18	.	.	.	.	.	.	1.0	1.8	0.4	1.4	1.8
19	.	.	.	.	.	.	0.9	0.6	0.6	0.5	0.6
20	.	.	.	.	.	.	0.5	0.6	0.2	0.5	0.5
21	.	.	.	.	.	.	0.2	0.2	0.4	1.5	0.3
22	.	.	.	.	.	.	0.3	0.5	0.4	0.2	0.2
23	.	.	.	.	.	.	1.5	0.5	1.0	0.4	0.6
24	.	.	.	.	.	.	0.8	.	.	1.4	1.6

3/6/58

1	.	.	.	.	.	.	0.8	0.4	.	0.2	0.2
2	.	.	.	.	.	.	0.5	0.8	.	0.8	1.0
3	.	.	.	.	.	.	0.5	0.6	.	0.5	0.4
4	.	.	.	.	.	.	0.2	0.6	.	0.2	0.4
5	.	.	.	.	.	.	0.1	0	.	0.2	0.2
6	.	.	.	.	.	.	0.2	0.4	.	0.2	0.2
7	.	.	.	.	.	.	0.1	0.2	.	0.3	0.1
8	.	.	.	.	.	.	0	0	.	0	0
9	.	.	.	.	.	.	0	0	.	0	0
10	.	.	.	.	.	.	0	0	.	0	0
11	.	.	.	.	.	.	.	0	.	0	0.1
12	.	.	.	.	.	.	.	0	.	0	0
13	.	.	.	.	.	.	0	0	.	0.1	0
14	.	.	.	.	.	.	0	0	.	0	0
15	.	.	.	.	.	.	0	0	.	0	0
16	.	.	.	.	.	.	0	0	.	0	0
17	.	.	.	.	.	.	0	0	.	0	0
18	.	.	.	.	.	.	0	0	.	0	0
19	.	.	.	.	.	.	0	0	.	0	0
20	.	.	.	.	.	.	0	0	.	0	0
21	.	.	.	.	.	.	0	0	.	0	0
22	.	.	.	.	.	.	0	0	.	0	0
23	.	.	.	.	.	.	0	0	.	0	0
24	.	.	.	.	.	.	0	0	.	0	0

Rainfall for March 6, 1963

3/6/63

1	.	.	.	.	.	--	--	0.2	0	0	0.2
2	.	.	.	.	.	--	--	0	0	0	0.2

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for March 6, 1963--Continued

3	.	.	.	.	.	--	--	0	0	0	0
4	.	.	.	.	.	--	--	0	0.1	0	0
5	.	.	.	.	.	--	--	0	0	0.1	0.1
6	.	.	.	.	.	--	--	0	0	0	0
7	.	.	.	.	.	--	--	0	0	0	0
8	.	.	.	.	.	--	--	1.0	0	0.2	0
9	.	.	.	.	.	--	--	0.2	0.3	1.3	0.2
10	.	.	.	.	.	--	--	0	0.1	0	0
11	.	.	.	.	.	--	--	0.1	0	0.2	0
12	.	.	.	.	.	--	--	0.2	0.1	0.2	0.2
13	.	.	.	.	.	--	--	0	0	0	0
14	.	.	.	.	.	--	--	0	0	0	0
15	.	.	.	.	.	--	--	0	0	0	0
16	.	.	.	.	.	--	--	0	0	0	0
17	.	.	.	.	.	--	--	0	0	0	0
18	.	.	.	.	.	--	--	0	0	0	0
19	.	.	.	.	.	--	--	0	0	0	0
20	.	.	.	.	.	--	--	0	0	0	0
21	.	.	.	.	.	--	--	0	0	0	0
22	.	.	.	.	.	--	--	0	0	0	0
23	.	.	.	.	.	--	--	0	0	0	0
24	.	.	.	.	.	--	--	0	0	0	0

Rainfall for May 14 - 15, 1963

5/14/63

1	.	.	.	.	.	--	--	0	0	0	0
2	.	.	.	.	.	--	--	0.3	0	0	0
3	.	.	.	.	.	--	--	0	0	0	0
4	.	.	.	.	.	--	--	0.2	0	0	0.1
5	.	.	.	.	.	--	--	0.1	0	0.2	0
6	.	.	.	.	.	--	--	0.1	0	0.1	0.1
7	.	.	.	.	.	--	--	0.1	0.1	0.1	0.2
8	.	.	.	.	.	--	--	0.1	0.1	0.1	0.2
9	.	.	.	.	.	--	--	0	0.2	0.2	0.3
10	.	.	.	.	.	--	--	0.4	0	0.1	0.1
11	.	.	.	.	.	--	--	0.4	0.4	0	0.4
12	.	.	.	.	.	--	--	2.2	0.1	0.2	0.3
13	.	.	.	.	.	--	--	2.4	0.8	0.6	0.8

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for May 14 - 15, 1963--Continued

14	.	.	.	.	.	--	--	0.4	1.8	1.6	2.5
15	.	.	.	.	.	--	--	0.4	2.0	1.6	1.3
16	.	.	.	.	.	--	--	0.1	0.6	0.3	0
17	.	.	.	.	.	--	--	0	0.6	0.5	0
18	.	.	.	.	.	--	--	0	0.2	0.3	2.2
19	.	.	.	.	.	--	--	0.1	0	0.1	0
20	.	.	.	.	.	--	--	0	0.1	0	0.1
21	.	.	.	.	.	--	--	0	0	0	0
22	.	.	.	.	.	--	--	0	0	0.1	0
23	.	.	.	.	.	--	--	0	0	0	0
24	.	.	.	.	.	--	--	0	0	0	0

5/15/63

1	.	.	.	.	.	--	--	0	0	0	0
2	.	.	.	.	.	--	--	0	0	0	0
3	.	.	.	.	.	--	--	0	0	0	0
4	.	.	.	.	.	--	--	0	0	0	0
5	.	.	.	.	.	--	--	0	0	0	0
6	.	.	.	.	.	--	--	0.1	0	0	0
7	.	.	.	.	.	--	--	0	0	0	0
8	.	.	.	.	.	--	--	0.1	0	0	0
9	.	.	.	.	.	--	--	0	0	0	0
10	.	.	.	.	.	--	--	0	0.1	0.2	0.3
11	.	.	.	.	.	--	--	0	0	0	0
12	.	.	.	.	.	--	--	0.3	0	0	0

Rainfall for February 3 - 4, 1965

13	.	.	.	.	.	--	--	0	.	0	0
14	.	.	.	.	.	--	--	0	.	0	0
15	.	.	.	.	.	--	--	0	.	0	0.1
16	.	.	.	.	.	--	--	0.1	.	0.2	0.2
17	.	.	.	.	.	--	--	0.1	.	0.1	0.1
18	.	.	.	.	.	--	--	0.1	.	0.2	0.2
19	.	.	.	.	.	--	--	0	.	0	0.1
20	.	.	.	.	.	--	--	0.1	.	0.1	0
21	.	.	.	.	.	--	--	0	.	0	0
22	.	.	.	.	.	--	--	0.1	.	0	0.1

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for February 3 - 4, 1965--Continued

23	.	.	.	.	.	--	--	0.2	.	0.1	0
24	.	.	.	.	.	--	--	0	.	0.2	0.1
2/4/65											
1	.	.	.	.	.	--	--	0	.	0	0
2	.	.	.	.	.	--	--	0.1	.	0.1	0.2
3	.	.	.	.	.	--	--	0.2	.	0.3	0.2
4	.	.	.	.	.	--	--	0.2	.	0.1	0.1
5	.	.	.	.	.	--	--	0.8	.	0.1	0.5
6	.	.	.	.	.	--	--	2.7	.	3.2	2.5
7	.	.	.	.	.	--	--	0.8	.	0.8	0.8
8	.	.	.	.	.	--	--	0.5	.	0.4	0.5
9	.	.	.	.	.	--	--	0.1	.	0.1	0.2
10	.	.	.	.	.	--	--	0.9	.	0.4	0.6
11	.	.	.	.	.	--	--	0.1	.	0.2	0.2
12	.	.	.	.	.	--	--	0	.	0	0
13	.	.	.	.	.	--	--	0.2	.	0.1	0
14	.	.	.	.	.	--	--	0.2	.	0	0.2
15	.	.	.	.	.	--	--	0.1	.	0	0.3
16	.	.	.	.	.	--	--	0.3	.	0.1	0.2
17	.	.	.	.	.	--	--	0	.	0	0
18	.	.	.	.	.	--	--	0	.	0	0
19	.	.	.	.	.	--	--	0.1	.	0.4	0.1
20	.	.	.	.	.	--	--	0.1	.	0.1	0.2
21	.	.	.	.	.	--	--	0	.	0.1	0.6
22	.	.	.	.	.	--	--	0.1	.	0.1	0
23	.	.	.	.	.	--	--	0.2	.	0	0
24	.	.	.	.	.	--	--	0.2	.	0.1	0.9

Rainfall for November 10 - 14, 1965

11/10/65

16	0	0.07	0.1	.	.	0	0	0	0	0	0.1
17	0.1	0.03	0	.	.	0	0.1	0	0	0.1	0
18	0	1.00	0	.	.	0	0.1	0.1	0	0	0
19	0.1	1.38	0.2	.	.	0	0	0.2	0.1	0.1	0.2
20	1.8	0.33	1.4	.	.	1.6	1.0	1.3	0.7	1.0	1.3
21	0.4	0.28	0.2	.	.	0.2	0.7	0.1	0.8	0.6	0.1
22	0.2	0.06	0.2	.	.	0.2	0.2	0.3	0.2	0.2	0.2

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for November 10 - 14, 1965--Continued											
23	0.3	0.04	0.2	.	.	0.1	0.3	0.2	0.2	0.2	0.2
24	0.1	0.06	0.1	.	.	0	0	0	0.1	0.2	0
11/11/65											
1	0	0.01	0	.	.	.	0.1	0	0	0	0
2	0	0.11	0	.	.	.	0	0	0	0	0
3	0.1	0.23	0.1	.	.	.	0	0.1	0	0	0.1
4	0.1	0.39	0.2	.	.	.	0.2	0.2	0.1	0.1	0.1
5	0.3	0.07	0.6	.	.	.	0.2	0.3	0.2	0.1	0.4
6	0.5	0.04	0.1	.	.	.	0.4	0.2	0.4	0.2	0.1
7	0	*	0.1	.	.	.	0.1	0	0	0.1	0
8	0	0.18	0	.	.	.	0	0	0	0.1	0
9	0.1	0.01	0	.	.	.	0	0	0	0	0
10	0	0.01	0.1	.	.	.	0	0.1	0	0.1	0.1
11	0	0.01	0	.	.	.	0.1	0	0.1	0.1	0
12	0.1	0.01	0	.	.	.	0	0	0	0	0
13	0.02	0.02	0	.	.	.	0	0.1	0	0	0
14	0.01	0.01	0.1	.	.	.	0.1	0	0.1	0	0
15	0	0	0	.	.	.	0	0	0	0.1	0
16	0	0	0	.	.	.	0	0	0	0	0
17	0	0	0	.	.	.	0	0	0	0	0
18	0.01	0	0	.	.	.	0	0	0	0	0
19	0	0	0	.	.	.	0	0	0	0	0
20	0.01	0.21	0	.	.	.	0	0.1	0	0	0.1
21	0.06	0.17	0.1	.	.	.	0.1	0.1	0.1	0.2	0.1
22	0.11	0.30	0	.	.	.	0.1	0.1	0.1	0.2	0.1
23	0.15	0.25	0.1	.	.	.	0.1	0.2	0.1	0.2	0.2
24	0.14	0.16	0.1	.	.	.	0.1	0.2	0.2	0.2	0.1
11/12/65											
1	0.2	0.24	0.1	.	.	0.1	0.2	0.1	0.1	0.2	0.1
2	0.4	0.25	0.2	.	.	0.3	0.3	0.4	0.2	0.2	0.3
3	0.3	0.50	0.2	.	.	0.2	0.3	0.4	0.3	0.4	0.3
4	0.4	0.40	0.1	.	.	0.3	0.4	0.3	0.4	0.3	0.2
5	0.2	0.38	0.2	.	.	0.4	0.4	0.4	0.2	0.4	0.3
6	0.1	0.10	0	.	.	0.1	0.2	0.1	0.2	0.4	0.1
7	0.2	0.17	0.1	.	.	0.1	0.1	0.1	0.1	0.2	0
8	0	0.25	0.1	.	.	0.1	0.2	0.2	0.1	0.1	0.2
9	0.1	0.15	0	.	.	0.1	0.1	0.1	0.1	0.2	0.1
10	0.2	0.26	0.1	.	.	0.1	0.1	0.3	0.1	0.2	0.1

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for November 10 - 14, 1965--Continued

11	0.1	0.39	0.1	.	.	0.1	0.2	0.3	0.2	0.2	0.2
12	0.1	0.18	0.1	.	.	0.2	0.2	0.2	0.2	0.3	0
13	0.1	0.04	0	.	.	0.2	0.1	0.1	0.1	0.3	0
14	0	0.23	0.1	.	.	0	0	0.1	0	0.1	0.1
15	0.1	0.02	0	.	.	0.3	0.2	0.4	0.1	0.1	0.2
16	0.1	0.22	0.1	.	.	0.2	0.2	0.4	0.2	0.3	0.3
17	0.2	0.28	0.2	.	.	0.1	0.4	0.3	0.2	0.3	0.4
18	0.4	0.38	0.6	.	.	0.5	0.4	0.7	0.4	0.2	0.6
19	0.3	0.77	0.3	.	.	0.4	0.4	0.4	0.6	0.2	0.4
20	0.9	1.50	0.7	.	.	0.5	0.6	1.4	0.6	0.6	1.2
21	0.6	1.15	0.7	.	.	1.5	1.2	1.1	1.1	0.3	0.8
22	0.6	1.60	0.5	.	.	1.0	0.8	0.9	0.9	0.9	0.7
23	0.4	0.75	0.4	.	.	0.9	0.7	0.4	0.8	0.8	0.3
24	0.1	0.05	0.1	.	.	0.3	0.5	0.1	0.4	0.5	0.2
11/13/65											
1	0.4	0	0.5	.	.	0.1	0	0.7	0	1.2	0.6
2	0.8	0	0.4	.	.	0.3	0.6	0.2	0.8	0	0.2
3	0.4	0	0.6	.	.	0.5	1.0	1.0	0.9	0	0.6
4	0.1	0	0.1	.	.	0	0.3	0	0	0	0
5	0	0	0	.	.	0	0	0	0	0	0
6	0	0	0	.	.	0	0	0	0	0	0
7	0	0	0	.	.	0	0	0	0	0	0
8	0	.	0	.	.	0	0	0	0	0	0
9	0	.	0	.	.	0	0	0	0	0	0
10	0	.	0	.	.	0	0	0	0	0	0
11	0	.	0	.	.	0	0	0	0	0	0
12	0	.	0	.	.	0	0	0	0	0.1	0
13	0	.	0	.	.	0	0	0	0	0	0
14	0	.	0	.	.	0	0	0	0	0	0
15	0	.	0	.	.	0	0	0	0	0	0
16	0	.	0	.	.	0	0	0	0	0	0
17	0	.	0	.	.	0	0	0	0	0	0
18	0	.	0	.	.	0	0	0	0	0	0
19	0	.	0	.	.	0	0	0.1	0	0	0
20	0	.	0	.	.	0	0	0	0	0	0
21	0	.	0	.	.	0	0	0	0	0	0
22	0	.	0	.	.	0	0	0	0	0	0.1
23	0	.	0	.	.	0	0	0	0	0	0
24	0	.	0	.	.	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for November 10 - 14, 1965--Continued

11/14/65

1	0	.	0	.	.	0	0	0	0	0	0
2	0	.	0	.	.	0.1	0	0	0	0	0.5
3	0.1	.	0	.	.	1.4	0.9	0.2	0	0.1	0.1
4	0.1	.	0.3	.	.	0.2	0.1	0.9	1.5	0.3	0.3
5	0.2	.	0	.	.	0.2	0.3	0	0.2	0	0.2
6	0.2	.	0.2	.	.	0	0.3	0.1	0.2	0.1	0.2
7	0	.	0.1	.	.	0	0	0.1	0	0.1	0.1
8	0.2	.	0	.	.	0.1	0	0	0	0.1	0.1
9	0.3	.	0.5	.	.	0.1	0.1	0.2	0.3	0.1	0.3
10	1.1	.	*	.	.	0.4	0.4	0.6	0.8	0.5	0.9
11	0.2	.	0.9	.	.	0.1	0.8	0.2	0.3	0.1	0.4
12	0.5	.	0.3	.	.	0	0.7	0.2	1.0	0.1	0.6
13	0	.	*	.	.	0	0.7	0	0.4	0.5	0.8
14	0	.	1.6	.	.	0	.	0	0.7	0.4	1.2
15	0.1	.	2.0	.	.	0	.	.	1.1	0.4	1.8
16	0	.	0.4	.	.	0	.	.	0.1	0	1.2
17	.	.	0	.	.	0	.	.	0	0	.
18	.	.	0	.	.	0	.	.	0	0	.
19	0	.	0	.	.	0	.	.	0.3	0	.
20	0.5	.	0	.	.	0	.	.	0.4	0	.
21	0.1	.	0	.	.	0	.	.	0	0	.
22	0.2	.	0	.	.	0	.	.	0	0	1.2
23	0	.	0	.	.	0	.	.	0	0	0
24	0.1	.	0	.	.	0	.	.	0	0	0

Rainfall for December 17 - 18, 1967

12/17/67

20	0	0	0	0	.	0	0	0	0	0	0
21	0	0	0	.	.	0	0	0	0	0	0
22	0	0.07	0	.	.	0	0	0	0	0	0
23	0.1	0.23	0.1	.	.	0.1	0.2	0.2	0	0.1	0.2
24	0.7	1.67	0.6	.	.	0.2	1.4	0.3	0.1	0.2	1.3

12/18/67

1	2.0	1.80	2.3	.	.	1.9	1.9	2.0	0.9	1.6	2.1
2	1.3	1.37	1.3	.	.	1.2	1.1	2.2	1.8	2.0	1.3
3	1.0	1.55	1.0	.	.	0.8	1.0	1.4	1.0	1.6	1.3

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for December 17 - 18, 1967--Continued

4	1.2	1.85	1.2	.	.	1.0	1.6	1.6	0.8	1.6	1.8
5	1.3	1.00	1.2	.	.	0.8	0.4	2.0	1.2	2.5	0.9
6	0.2	0.90	0.2	.	.	1.2	0.3	0.4	0.7	0.5	0.5
7	0.1	0.18	0.2	.	.	0.3	0.1	0.2	0.3	0.6	0.1
8	0	0	0	.	.	0.1	0	0.2	0.1	0.2	0.1
9	0	0	0	.	.	0	0	0	0.1	0	0

Rainfall for January 31 - February 2, 1969

1/31/69

13	0	0	.	0	.	--	--	0	0	0	0
14	0.2	0	.	0	.	--	--	0	0	0	0.2
15	0.4	0	.	0	.	--	--	0.2	0	0	0.1
16	0.3	0	.	0	.	--	--	0.2	0	0.2	0.2
17	0	0	.	0	.	--	--	0	0.1	0	0
18	0.1	0	.	0	.	--	--	0	0	0	0.1
19	0	0	.	0	.	--	--	0	0	0	0
20	0	0	.	0	.	--	--	0	0	0	0
21	0	0	.	0.01	.	--	--	0.1	0	0.1	0.2
22	0.3	0	.	0	.	--	--	0	0	0.1	0.1
23	0.1	0	.	0	.	--	--	0.2	0.1	0.2	0.3
24	0.1	0.06	.	0.02	.	--	--	0.5	0.1	0.2	0.2

2/1/69

1	0.1	0.12	.	0	.	--	--	0.4	0.2	0.4	0.4
2	0.2	0.06	.	0	.	--	--	0	0.4	0	0.2
3	0.1	0	.	0	.	--	--	0	0.3	0	0
4	0	0.02	.	0.02	.	--	--	0	0	0	0
5	0	0.13	.	0.02	.	--	--	0.1	0	0.1	0.1
6	0	0.09	.	0	.	--	--	0.1	0	0	0
7	0	0.06	.	0	.	--	--	0	0.1	0	0
8	0	0.06	.	0.01	.	--	--	0	0	0	0.2
9	0	0.31	.	0	.	--	--	0	0	0	0
10	0	0.50	.	0	.	--	--	0.1	0	0.1	0
11	0.1	0.13	.	0	.	--	--	0	0	0	0.3
12	0	0.13	.	0	.	--	--	0	0.6	0	0
13	0	0.01	.	0	.	--	--	0	0	0	0
14	0	0.58	.	0.03	.	--	--	0	0	0.5	0
15	0	2.50	.	0	.	--	--	0	0.5	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for January 31 - February 2, 1969--Continued

16	0	0.90	.	0	.	--	--	0	0.5	0	0.8
17	0.6	0.65	0	0	.	--	--	0.1	1.8	0.2	0.7
18	0.3	0.05	0	0	.	--	--	0.1	0.7	0	0.4
19	0.3	0	0	0	.	--	--	0	0.3	0	0.4
20	0.2	0	0.4	0	.	--	--	0.1	0.3	0.1	0.5
21	0.2	0	0	0	.	--	--	0	0.2	0	0.1
22	0.2	0	0	0	.	--	--	0.2	0.1	0	0
23	0.6	0	0.4	0	.	--	--	0.2	0	0	0.1
24	0.3	0	0.2	0	.	--	--	0.2	0	0.2	0.2

2/2/69

1	0.2	0	0	0	.	--	--	0.1	0.2	0.1	0.2
2	0.3	0	0	0	.	--	--	0.2	0	0.1	0.3
3	0.1	0	0	0	.	--	--	0.2	0	0	0.3
4	0.3	0	1.1	0	.	--	--	0	0.1	0	0.3
5	0.2	0	0.2	0	.	--	--	0.4	0.3	0.2	0.2
6	0.1	0	0.3	0	.	--	--	0	0	0	0.1
7	0.1	0	0.2	0	.	--	--	0	0	0.1	0
8	0.3	0	0.4	0	.	--	--	0.2	0.1	0	0.2
9	0.1	0	0.2	0.08	.	--	--	0.2	0	0.7	0.3
10	0.1	0	0.1	0.15	.	--	--	0.1	0.2	0	0
11	0.1	0	0.2	0.01	.	--	--	0	0	0.1	0.1
12	0	0	0	0.01	.	--	--	0	0	0	0

Rainfall for February 13 - 16, 1969

2/13/69

13	0	0.06	0	0	.	--	--	0	0	0	0
14	0	0.17	0	0	.	--	--	0.2	0	0.2	0.1
15	0	0.31	0.1	0	.	--	--	0.2	0.1	0.2	0.3
16	0	0.22	0	0.04	.	--	--	0.2	0	0.3	0.2
17	0	0.13	0	0.02	.	--	--	0.1	0	0.2	0.1
18	0.1	0.06	0	0.02	.	--	--	0.3	0.1	0.2	0.1
19	0	0	0	0.03	.	--	--	0.2	0	0.2	0.1
20	0.1	0.01	0	0.06	.	--	--	0.2	0	0.2	0.1
21	0	0	0.1	0.02	.	--	--	0.1	0	0.1	0
22	0.1	0	0.1	0.02	.	--	--	0.1	0	0.1	0.1
23	0	0	0	0	.	--	--	0	0	0	0
24	0.1	0.08	0	0.06	.	--	--	0.4	0	0.2	0.2

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for February 13 - 16, 1969--Continued											
2/14/69											
1	0.1	0.14	0	0.05	.	--	--	0.1	0.1	0.1	0.2
2	0.1	0.62	0.1	0.02	.	--	--	0.2	0	0.1	0.1
3	0	0.36	0	0.10	.	--	--	0.4	0	0.4	0.3
4	0	0.06	0	0.05	.	--	--	0.3	0.1	0.6	0.2
5	0.1	0.22	0	0.07	.	--	--	0.3	0	0.4	0.2
6	0.1	0.12	0	0.09	.	--	--	0.3	0.1	0.4	0.2
7	0	0.20	0	0.05	.	--	--	0.2	0	0.4	0.1
8	0.1	0.25	0	0.04	.	--	--	0.2	0.1	0.2	0.1
9	0.1	0.43	0	0.07	.	--	--	0.2	0	0.2	0.1
10	0	0.35	0	0.10	.	--	--	0.3	0.1	0.4	0.2
11	0.1	0.18	0.1	0.05	.	--	--	0.3	0.2	0.4	0.3
12	0.1	0.11	0	0.01	.	--	--	0.4	0	0.4	0.2
13	0	0.09	0	0.09	.	--	--	0.3	0	0.4	0.2
14	0	0.05	0.1	0.02	.	--	--	0.2	0.2	0.2	0.1
15	0	0.17	0.2	0.07	.	--	--	0.2	0	0.2	0.1
16	0	0.18	.	0.03	.	--	--	0.1	0	0.2	0.2
17	0.1	0.24	.	0.05	.	--	--	0.2	0	0.2	0.1
18	0.1	0.08	.	0.06	.	--	--	0.1	0	0.2	0.1
19	0	0.04	.	0.01	.	--	--	0.1	0	0.1	0.2
20	0.1	0.02	.	0	.	--	--	0.2	0.1	0.1	0.1
21	0	0	.	0.02	.	--	--	0	0	0	0
22	0.1	0	.	0	.	--	--	0.1	0	0	0.1
23	0	0	.	0.02	.	--	--	0	0	0	0
24	0	0	.	0	.	--	--	0	0	0	0
2/15/69											
1	0	0	.	0	.	--	--	0	0	0	0
2	0	0	.	0	.	--	--	0	0	0	0
3	0	0.01	.	0	.	--	--	0.1	0	0	0.1
4	0.2	0.26	.	0.02	.	--	--	0.4	0	0.1	0.4
5	0.3	0.20	.	0.07	.	--	--	0.4	0.1	0.6	0.4
6	0.2	0.43	.	0.12	.	--	--	1.1	0.1	0.5	0.4
7	0.2	0.22	.	0.18	.	--	--	0.4	0.2	0.7	0.2
8	0	0.65	.	0.13	.	--	--	0.3	0.2	0.5	0.2
9	0.1	0.43	.	0.05	.	--	--	0.3	0.1	0.5	0.1
10	0	0.13	.	0	.	--	--	0.1	0	0.1	0.1
11	0.1	0.09	.	0.03	.	--	--	0.1	0	0.1	0
12	0	0.02	.	0.02	.	--	--	0	0	0.1	0.1
13	0	0.01	.	0	.	--	--	0	0	0	0.1

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for February 13 - 16, 1969--Continued

14	0.1	0.01	.	0.02	.	--	--	0.1	0	0.1	0
15	0	0.03	.	0.02	.	--	--	0.2	0	0.1	0.1
16	0	0.01	.	0.01	.	--	--	0	0	0	0
17	0	0.02	.	0.05	.	--	--	0.1	0	0	0.1
18	0.1	0.02	.	0.05	.	--	--	0	0	0.1	0.2
19	0.1	0.07	.	0.15	.	--	--	0.1	0	0.2	0.2
20	0.2	0.03	.	0.06	.	--	--	0.2	0.1	0.1	0.1
21	0	0	.	0.04	.	--	--	0	0	0	0.1
22	0.2	0	.	0.05	.	--	--	0.2	0	0.1	0.2
23	0	0.08	.	0.05	.	--	--	0.2	0	0.2	0
24	0.1	0	.	0.01	.	--	--	0	0.2	0.1	0.2

2/16/69

1	0.2	0.14	.	0.02	.	--	--	0.4	0	0.2	0.2
2	0.2	0.06	.	0.10	.	--	--	0.4	0.1	0.2	0.2
3	0.2	0.02	.	0.10	.	--	--	0.2	0	0.2	0.3
4	0.2	0.03	.	0.03	.	--	--	0.3	0.1	0.2	0.2
5	0.1	0.14	.	0.02	.	--	--	0.3	0.1	0.2	0.1
6	0	0	.	0	.	--	--	0	0.1	0	0
7	0.2	0.21	.	0.11	.	--	--	0.2	0	0	0.2
8	0.1	0.19	.	0.11	.	--	--	0.4	0	0.5	0.3
9	0	0.01	.	0	.	--	--	0	0.2	0.3	0
10	0	0	.	0	.	--	--	0	0	.	0
11	0	0	.	0.01	.	--	--	0	0	.	0
12	0	0	.	0.01	.	--	--	0	0	.	0

Rainfall for February 5 - 8, 1976

2/5/76

13	0	0	.	0	0	0	0	0	0	0	0
14	0	0	.	0.04	0.1	0	0	0	0	0	0
15	0	0.14	.	0	0	0	0	0	0	0	0
16	0	0.03	.	0	0	0.2	0	0	0.2	0	0.1
17	0	0.07	.	0.01	0.2	0.3	0.2	0	0.2	0	0.1
18	0	0.32	.	0.15	0.1	0.4	0.5	0.1	0.7	0.1	0.4
19	0	0.23	.	0.05	0.2	0.2	0.2	0	0.2	0.1	0.1
20	0	0	.	0	0	0	0	0	0	0	0
21	0	0	.	0	0	0	0	0	0	0	0
22	0	0	.	0	0	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for February 5 - 8, 1976--Continued

23	0	0	.	0	0	0	0	0	0	0	0
24	0	0	.	0	0	0	0	0	0	0	0

2/6/76

1	.	0	.	0	0	0	0	0	0	0	0
2	.	0	.	0	0	0	0	0	0	0	0
3	.	0	.	0	0	0	0	0	0	0	0
4	.	0.02	.	0.09	0.2	0	0	0	0	0	0
5	.	0.20	.	0.06	0	0.5	0.5	0.1	0.4	0.2	0.3
6	.	0.25	.	0.67	0.6	0.2	0.2	0	0.1	0	0
7	.	0.45	.	0.20	0.2	1.0	0.7	0.5	0.8	0.8	0.9
8	.	0.05	.	0.58	0.8	0.2	0.3	0	0.3	0.2	0.1
9	.	0.95	.	0.35	0.3	0.3	0.3	0.2	0.4	0.5	0.5
10	.	0.25	.	0.28	0.2	0.3	0.2	0.1	0.2	0.4	0.4
11	.	0.20	.	0.22	0.2	0.3	0.3	0	0.3	0.2	0.2
12	.	0.30	.	0.23	0.3	0.2	0.2	0	0.3	0.2	0.3
13	.	0.20	.	0.21	0.2	0.3	0.2	0.1	0.2	0.3	0.2
14	.	0.27	.	0.21	0.3	0.2	0.3	0	0.2	0.3	0.3
15	.	0.20	.	0.12	0.1	0.1	0.1	0	0.2	0.2	0.2
16	.	0.08	.	0.09	0	0.1	0.1	0	0.1	0.1	0.1
17	.	0.06	.	0.05	0.1	0.1	0	0	0.1	0.1	0
18	.	0.02	.	0	0	0	0	0	0	0	0
19	.	0.01	.	0	0	0	0	0	0	0	0
20	.	0	.	0	0	0	0	0	0	0	0
21	.	0	.	0	0	0	0	0	0	0	0
22	.	0	.	0	0	0	0	0	0	0	0
23	.	0	.	0	0	0	0	0	0	0	0
24	.	0	.	0	0	0	0	0	0	0	0

2/7/76

1	.	0	.	0	0	0	0	0	0	0	0
2	.	0	.	0	0	0	0	0	0	0	0
3	.	0	.	0	0	0	0	0	0	0	0
4	.	0	.	0	0	0	0	0	0	0	0
5	.	0.07	.	0	0	0.5	0.3	0.1	0.3	0.1	0.3
6	.	0.05	.	0	0	0	0.1	0	0	0	0
7	.	0	.	0	0	0.1	0	0	0	0	0
8	.	0	.	0	0	0	0	0	0	0	0
9	.	0	.	0	0	0	0	0	0	0	0
10	.	0	.	0	0	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for February 5 - 8, 1976--Continued

11	.	0	.	0	0	0	0	0	0	0	0
12	.	0	.	0	0	0	0	0	0	0	0
13	.	0	.	0	0	0	0	0	0	0	0
14	.	0	.	0	0	0	0	0	0	0	0
15	.	0	.	0	0	0	0	0	0	0	0
16	.	0	.	0	0	0	0	0	0	0	0
17	.	0	.	0	0	0	0	0	0	0	0
18	.	0	.	0	0	0	0	0	0	0	0
19	.	0	.	0	0	0	0	0	0	0	0
20	.	0	.	0	0	0	0	0	0	0	0
21	.	0	.	0	0	0	0	0	0	0	0
22	.	0.01	.	0.20	0.1	0	0	0	0	0	0
23	.	0.07	.	0.15	0.2	0.2	0.2	0	0.2	0.2	0.1
24	.	0.07	.	0.03	0	0.1	0.1	0.1	0.2	0.2	0.2

2/8/76

1	.	0.15	.	0.17	0.2	0	0	0	0	0	0
2	.	0.25	.	0.24	0.2	0.4	0.3	0	0.4	0.2	0.1
3	.	0.20	.	0.16	0.1	0.3	0.3	0	0.3	0.3	0.4
4	.	0.06	.	0.03	0	0.1	0.2	0.1	0.1	0.2	0.3
5	.	0.07	.	0.05	0.1	0	0	0	0	0	0
6	.	0.06	.	0.02	0	0.1	0.1	0	0.1	0.1	0.1
7	.	0.01	.	0.05	0.2	0	0	0	0	0	0
8	.	0.15	.	0.08	0	0.1	0	0	0.1	0	0
9	.	0.06	.	0.04	0.1	0.1	0.1	0	0	0.1	0.1
10	.	0.04	.	0.03	0	0	0	0	0	0.1	0
11	.	0.01	.	0.03	0	0	0.1	0	0	0	0
12	.	0.01	.	0.01	0	0	0	0	0.1	0.1	0

Rainfall for May 11 - 14, 1977

5/11/77

1	0	0.02	.	0.12	0	--	--	0	0	0.1	0
2	0	0.08	.	0.25	0.1	--	--	0	0.1	0	0
3	0	0.07	.	0	0.1	--	--	0	0	0.1	0.1
4	0.1	0.04	.	0.05	0	--	--	0.1	0	0.2	0
5	0	0.11	.	0.04	0.1	--	--	0.1	0.1	0	0.1
6	0	0.08	.	0.06	0.1	--	--	0.1	0.1	0	0.2
7	0.2	0.02	.	0.10	0	--	--	0.1	0.1	0.1	0.1

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly.	Waima.- Sch. Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for May 11 - 14, 1977--Continued

8	0	0	.	0.02	0.1	--	--	0	0	0	0
9	0.1	0.01	.	0.03	0	--	--	0	0	0	0
10	0	0	.	0	0	--	--	0	0	0	0
11	0	0	.	0	0	--	--	0	0	0	0
12	0	0	.	0	0	--	--	0	0	0	0
13	0	0.12	.	0.03	0	--	--	0.1	0.1	0	0
14	0	0.01	.	0.02	0	--	--	0	0	0	0.1
15	0	0.01	.	0	0.1	--	--	0	0	0	0
16	0	0	.	0	0	--	--	0	0	0	0
17	0	0	.	0	0	--	--	0	0	0	0
18	0	0	.	0	0	--	--	0	0	0	0
19	0	0.16	.	0	0	--	--	0.1	0	0.1	0
20	0	0.40	.	0.03	0.1	--	--	0.2	0.2	0.2	0.1
21	0.1	0	.	0	0	--	--	0	0.4	0	0.5
22	0.4	0.04	.	0	0	--	--	0	0.1	0	0
23	0	0	.	0	0	--	--	0	0	0	0.1
24	0.1	0.10	.	0	0	--	--	0	0	0	0

5/12/77

1	0	0	.	0	0	--	--	0	0	0	0
2	0	0	.	0	0	--	--	0	0	0	0
3	0	0	.	0	0	--	--	0	0	0	0
4	0	0	.	0	0	--	--	0	0	0	0
5	0	0	.	0	0	--	--	0	0	0	0
6	0	0	.	0	0	--	--	0	0	0	0
7	0	0	.	0	0	--	--	0	0	0	0
8	0	0	.	0	0	--	--	0	0	0	0
9	0	0	.	0	0	--	--	0	0	0	0
10	0	0	.	0	0	--	--	0	0	0	0
11	0	0	.	0	0	--	--	0	0	0	0
12	0	0	.	0	0	--	--	0	0	0	0
13	0	0	.	0	0	--	--	0	0	0	0
14	0	0	.	0	0	--	--	0	0	0	0
15	0	0	.	0	0	--	--	0	0	0	0
16	0	0	.	0	0	--	--	0	0	0.1	0
17	0.1	1.91	.	0.04	0	--	--	0.6	0.6	0.4	1.0
18	0	3.75	.	0.25	0.4	--	--	2.2	1.5	1.8	2.1
19	0.6	1.55	.	1.00	2.0	--	--	1.5	1.4	1.0	1.3
20	1.4	1.10	.	0.35	1.1	--	--	1.6	1.3	0.8	1.5
21	1.4	0.11	.	0.06	0.2	--	--	0.1	0.2	0.2	0.2

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for May 11 - 14, 1977--Continued											
22	0.6	0.03	.	0.07	0	--	--	0	0	0	0
23	0.1	0.01	.	0.10	0.1	--	--	0	0	0.1	0.1
24	0	0.01	.	0	0	--	--	0	0.1	0	0
5/13/77											
1	0	0	.	0.01	0	--	--	0	0	0	0
2	0	0.01	.	0.01	0.2	--	--	0	0	0	0
3	0	0.07	.	0.05	0	--	--	0.1	0	0.1	0.1
4	0	0.12	.	0	0.1	--	--	0.1	0.1	0	0
5	0.2	0	.	0	0	--	--	0	0	0	0
6	0	0	.	0	0	--	--	0	0	0	0
7	0	0	.	0	0	--	--	0	0	0	0
8	0	0	.	0	0	--	--	0	0	0	0
9	0	0	.	0	0	--	--	0	0	0	0
10	0	0.04	.	0	0	--	--	0	0	0	0.1
11	0	0.05	.	0	0	--	--	0.1	0.1	0	0
12	0.1	0	.	0	0.1	--	--	0	0	0	0
13	0	0	.	0	0	--	--	0	0	0	0
14	0	0	.	0	0	--	--	0	0	0	0
15	0	0.37	.	0	0.1	--	--	0.3	0	0	0
16	0	0.02	.	0	0.1	--	--	0	0	0.1	0
17	0	0.45	.	0.97	0.1	--	--	0.2	0	0.4	0
18	0	0.03	.	2.50	0.1	--	--	0.1	0	0	0
19	0	0	.	0	0	--	--	0	0	0.2	0
20	0	0.13	.	0	0.2	--	--	0.3	0	0	0
21	0	0.04	.	0	0	--	--	0	0	0	0
22	0	0	.	0	0	--	--	0	0	0	0
23	0	0	.	0	0	--	--	0	0	0	0
24	0	0	.	0	0	--	--	0	0	0	0
5/14/77											
1	0	0	.	0	0	--	--	0	0	0	0
2	0	0	.	0	0	--	--	0	0	0	0
3	0	0.06	.	0.03	0	--	--	0.3	0.2	0.1	0.2
4	0	0	.	0.01	0	--	--	0	0	0	0
5	0.2	0.17	.	0.01	0.2	--	--	0.1	0.7	0.1	0.9
6	0	0.08	.	0	0	--	--	0.1	0.3	0	0.2
7	1.2	0	.	0	0	--	--	0	0	0	0
8	0.4	0.01	.	0	0	--	--	0	0	0	0
9	0	0.14	.	0	0	--	--	0	0	0	0.1

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for May 11 - 14, 1977--Continued

10	0	0.06	.	0.04	0.1	--	--	0	0	0	0
11	0	0	.	0.01	0	--	--	0	0	0	0
12	0	0	.	0	0	--	--	0	0	0	0
13	0	0	.	0.03	0	--	--	0	0	0	0

Rainfall for October 30 - 31, 1978

10/30/78

1	0	0	.	0	0	--	--	0	0	0	0
2	0	0	.	0	0	--	--	0	0	0	0
3	0	0	.	0	0	--	--	0	0	0	0
4	0	0	.	0	0	--	--	0	0	0	0
5	0	0	.	0	0	--	--	0	0	0	0
6	0	0	.	0	0	--	--	0	0	0	0
7	0.1	0.1	.	0	0	--	--	0.1	0	0	0
8	0.2	0.3	.	0	0.1	--	--	0.2	0.2	0.1	0.2
9	0.3	0.3	.	0.2	0.3	--	--	0.2	0.2	0.2	0.3
10	0.4	0.3	.	0.2	0.3	--	--	0.3	0.3	0.2	0.3
11	0.6	0.8	.	0.5	0.5	--	--	0.9	1.0	0.3	0.9
12	0.7	0.7	.	0.9	0.7	--	--	0.6	0.5	0.9	0.5
13	0.7	1.1	.	0.7	1.6	--	--	0.9	1.0	1.0	0.8
14	0.5	0.6	.	0.5	0.7	--	--	0.6	0.5	0.8	0.4
15	0.4	0.6	.	0.3	0.7	--	--	0.7	0.5	0.7	0.5
16	0.2	0.3	.	0.2	0.3	--	--	0.3	0.3	0.4	0.2
17	0.5	0.5	.	0.3	0.4	--	--	0.7	0.4	0.4	0.4
18	0.4	0.4	.	0.4	0.5	--	--	0.4	0.6	0.6	0.5
19	0.3	0.5	.	0.4	0.3	--	--	0.4	0.5	0.7	0.4
20	0.4	0.5	.	0.2	0.5	--	--	0.3	0.4	0.3	0.4
21	0.4	0.4	.	0.2	0.1	--	--	0.5	0.5	0.5	0.4
22	0.2	0.3	.	0.3	0.3	--	--	0.3	0.3	0.4	0.3
23	0.3	0.2	.	0.2	0.3	--	--	0.1	0.2	0.2	0.2
24	0.1	0.2	.	0.2	0.1	--	--	0.1	0.1	0.1	0.2

10/31/78

1	0	0.1	.	0.2	0.2	--	--	0.1	0.1	0.1	0
2	0.1	0	.	0	0	--	--	0	0	0	0
3	0	0	.	0	0.1	--	--	0.1	0	0	0.1
4	0	0	.	0.1	0	--	--	0	0	0	0
5	0	0.1	.	0	0	--	--	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for October 30 - 31, 1978--Continued

6	0	0	.	0	0	--	--	0	0	0	0
7	0.1	0	.	0	0.1	--	--	0	0	0.1	0.1
8	0	0.1	.	0	0	--	--	0.1	0.1	0.1	0
9	0.1	0	.	0.1	0.1	--	--	0.1	0.1	0.1	0.1
10	0.1	0.1	.	0.1	0	--	--	0.1	0.1	0.1	0.1
11	0.2	0.1	.	0.1	0.1	--	--	0.1	0	0.1	0.1
12	0	0	.	0.1	0.1	--	--	0	0.1	0.1	0.1
13	0.1	0.2	.	0	0.1	--	--	0.1	0	0.1	0.1
14	0.1	0.1	.	0.1	0.1	--	--	0.1	0.1	0.1	0.1
15	0.1	0.1	.	0.1	0.2	--	--	0	0.1	0.1	0.1
16	0	0.1	.	0.1	0	--	--	0.1	0.1	0.1	0.1
17	0.1	0.1	.	0	0.1	--	--	0.2	0.1	0.1	0.1
18	0.3	0.8	.	0.6	0.6	--	--	0.9	0.4	0.5	0.3
19	1.0	1.2	.	1.3	1.0	--	--	0.8	0.8	1.2	0.6
20	0.2	0.3	.	0.3	0.4	--	--	0.1	0.4	0.2	0.7
21	0	0	.	0.1	0.1	--	--	0	0	0	0
22	0	0.1	.	0.1	0.2	--	--	0.1	0	0	0
23	0.1	0.2	.	0.1	0.2	--	--	0.1	0.2	0.2	0.1
24	0.1	0.1	.	0.1	0.1	--	--	0.2	0.2	0.2	0.1

Rainfall for January 7 - 11, 1980

1/7/80

1	0	0	.	0	0	--	--	0	0	0	0
2	0	0	.	0	0.1	--	--	0	0	0	0
3	0.3	0.6	.	0.2	0	--	--	0.5	0	0	0
4	0.1	0.1	.	0	0.3	--	--	0	0.4	0.4	0.4
5	0	0.2	.	0	0	--	--	0.1	0	0	0
6	0	0	.	0	0	--	--	0	0	0	0
7	0	0.2	.	0	0	--	--	0.2	0	0.1	0
8	0.2	0.2	.	0.4	0.3	--	--	0	0	0.1	0.1
9	0	0	.	0.1	0.1	--	--	0	0.1	0.1	0
10	0	0.4	.	0.1	0.5	--	--	0.4	0	0	0
11	0.1	0	.	0	0	--	--	0	0.1	0.5	0.2
12	0	0	.	0	0	--	--	0	0	0	0
13	0	0	.	0	0	--	--	0	0	0	0
14	0	0.3	.	0.1	0.1	--	--	0.5	0	0	0
15	0.1	0	.	0	0	--	--	0	0	0.2	0.1
16	0	0	.	0	0	--	--	0	0.1	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for January 7 - 11, 1980--Continued											
17	0	0	.	0	0	--	--	0.1	0.1	0	0
18	0	0	.	0	0.1	--	--	0	0	0	0
19	0	0	.	0	0	--	--	0	0	0	0
20	0	0	.	0	0	--	--	0	0	0	0
21	0	0	.	0	0	--	--	0	0	0	0
22	0	0	.	0	0	--	--	0	0	0	0
23	0	0	.	0	0	--	--	0	0	0	0
24	0	0	.	0	0	--	--	0	0	0	0
1/8/80											
1	0	0	.	0	0	--	--	0.2	0	0	0
2	0.2	0.3	.	0.4	0.3	--	--	0.1	0.2	0.1	0.2
3	0	0.2	.	0	0.2	--	--	0.3	0.2	0.3	0.2
4	0.3	0.3	.	0.1	0.1	--	--	0.1	0.2	0	0.2
5	0.3	0.4	.	0.2	0.4	--	--	0.3	0.3	0.3	0.3
6	0	0.3	.	0.1	0.2	--	--	0.2	0.1	0.1	0
7	0.2	0.5	.	0.2	0.4	--	--	0.2	0.2	0.4	0.2
8	0.1	0.3	.	0	0.1	--	--	0.2	0.2	0.1	0.1
9	0.1	0.3	.	0.3	0.6	--	--	0.1	0.2	0.3	0.1
10	0	0	.	0	0	--	--	0	0	0	0
11	0	0	.	0	0.1	--	--	0	0	0	0
12	0	0	.	0	0	--	--	0	0	0	0
13	0	0.1	.	0	0.1	--	--	0.1	0	0	0
14	0.2	0.3	.	0.1	0.1	--	--	0.1	0.3	0.1	0.2
15	0	0.2	.	0	0.1	--	--	0.2	0	0.1	0
16	0.1	0.3	.	0.2	0.3	--	--	0.3	0.3	0.2	0.2
17	0.4	1.3	.	0.3	0.8	--	--	1.7	0.6	1.0	0.6
18	1.8	1.5	.	1.3	1.1	--	--	0.3	2.3	1.0	2.0
19	0.1	0.3	.	0.2	0.5	--	--	0.2	0.1	0.2	0.2
20	0.2	0.5	.	0.5	0.8	--	--	0.1	0.2	0.4	0.2
21	0	0.1	.	0.1	0.3	--	--	0.1	0.2	0	0
22	0.1	0.2	.	0.1	0.4	--	--	0	0.1	0.3	0.2
23	0	0	.	0	0.1	--	--	0	0	0	0
24	0	0.1	.	0	0	--	--	0	0.1	0	0
1/9/80											
1	0	0	.	0	0.1	--	--	0	0	0	0
2	0	0	.	0	0	--	--	0	0	0	0
3	0	0	.	0	0	--	--	0	0	0	0
4	0	0	.	0	0	--	--	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for January 7 - 11, 1980--Continued											
5	0	0	.	0	0	--	--	0	0	0	0
6	0	0	.	0	0	--	--	0	0	0	0
7	0	0	.	0	0	--	--	0	0	0	0
8	0	0	.	0	0	--	--	0	0	0	0
9	0	0	.	0	0	--	--	0	0	0	0
10	0	0	.	0	0	--	--	0	0	0	0
11	0	0	.	0	0	--	--	0	0	0	0
12	0	0	.	0	0	--	--	0	0	0	0
13	0	0	.	0	0	--	--	0	0	0	0
14	0	0	.	0	0	--	--	0	0	0	0
15	0	0	.	0	0	--	--	0	0	0	0
16	0	0	.	0	0	--	--	0	0	0	0
17	0	0	.	0	0	--	--	0	0	0	0
18	0	0	.	0	0	--	--	0	0	0	0
19	0	0	.	0	0	--	--	0	0	0	0
20	0	0	.	0	0	--	--	0	0	0	0
21	0	0	.	0	0	--	--	0	0	0	0
22	0.1	0.1	.	0.1	0.1	--	--	0	0	0	0
23	0	0.1	.	0.1	0.2	--	--	0.2	0.1	0	0.2
24	0.6	0.6	.	0.4	0.4	--	--	0.3	0.5	0.3	0.6
1/10/80											
1	0.2	0.2	.	0.2	0.1	--	--	0.3	0.3	0	0.3
2	0.4	0.4	.	0.4	0.6	--	--	0.2	0.6	0.6	0.4
3	0.4	1.0	.	0.6	0.7	--	--	1.0	0	0.6	0.9
4	0.5	0.8	.	0.5	0.7	--	--	0.3	1.2	0.8	0.6
5	0.3	0.2	.	0.1	0.2	--	--	0.1	0.3	0.2	0.2
6	0	0.1	.	0	0	--	--	0	0.1	0	0
7	0	0.1	.	0	0.1	--	--	0.4	0	0	0
8	0.5	1.2	.	0.5	0.7	--	--	0.7	0.3	0.9	0.9
9	0.2	0.2	.	0.2	0.3	--	--	0.1	0.5	0.2	0.2
10	0	0	.	0	0.1	--	--	0	0.1	0	0
11	0	0	.	0	0	--	--	0	0	0	0
12	0.2	0.5	.	0.2	0.3	--	--	0.3	0	0.3	0.3
13	0	0	.	0	0	--	--	0	0.2	0	0
14	0	0.1	.	0	0.1	--	--	0	0	0	0
15	0	0	.	0	0	--	--	0	0	0	0
16	0	0	.	0	0	--	--	0	0	0	0
17	0	0	.	0	0	--	--	0	0	0	0
18	0	0	.	0	0	--	--	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for January 7 - 11, 1980--Continued

19	0.9	1.0	.	0.6	0.3	--	--	1.0	0	0	1.4
20	0.4	0.5	.	0.5	1.1	--	--	0.3	1.6	1.4	0.3
21	0.1	0.3	.	0.2	0.3	--	--	0.3	0.2	0.3	0.2
22	0.1	0.4	.	0.3	0.3	--	--	0.2	0.1	0.4	0.1
23	0.1	0.1	.	0.2	0.3	--	--	0.2	0.1	0.1	0.2
24	0.1	0.1	.	0	0.1	--	--	0	0.1	0.1	0

1/11/80

1	0	0.3	.	0.2	0.2	--	--	0.2	0	0	0
2	0	0	.	0.1	0.2	--	--	0	0.1	0.3	0
3	0	0	.	0	0	--	--	0	0	0	0
4	0	0	.	0	0	--	--	0	0	0	0
5	0	0	.	0	0	--	--	0	0	0	0
6	0	0	.	0	0	--	--	0	0	0	0

Rainfall for May 6 - 7, 1981

5/6/81

19	0	0.1	.	0	0	--	--	0	0	0	0
20	0.2	0.4	.	0	0	--	--	0.3	0.4	0	0
21	0.5	0.5	.	0	0	--	--	0.7	0.3	0.8	0
22	0	1.0	.	0	0	--	--	0.7	0.2	1.3	0.8
23	0.1	0.3	.	0	0	--	--	0.5	0.1	0.6	0.2
24	0.1	0.4	.	0	0	--	--	0.4	0.1	0.5	0.2

5/7/81

1	0.4	0.4	.	0	0	--	--	1.2	0.9	1.5	0.2
2	0.7	0.9	.	0	0	--	--	1.0	1.0	1.3	0.6
3	0.3	1.3	.	0	0	--	--	0	0.8	0	2.2
4	0	0.7	.	0	0	--	--	0.2	0.6	0.6	0.6
5	0.1	2.0	.	0	0	--	--	0.8	1.0	0.6	0.2
6	0.8	1.2	.	0	0	--	--	0.7	1.6	1.6	0.4
7	0.5	0.9	.	0	0	--	--	0.5	1.0	0.4	1.2
8	0.3	1.2	.	0	0	--	--	0.2	0.4	0.6	1.2
9	0.3	1.6	.	0	0	--	--	1.4	0.8	1.0	0.6
10	0.8	1.8	.	0	0	--	--	0.7	1.3	0.6	0.4
11	0.2	0.6	.	0	0	--	--	1.1	0.9	1.8	1.4
12	0.7	0.3	.	0	0	--	--	.	0.6	1.0	0.3
13	0.2	0	.	0	0	--	--	.	0.2	0.6	0.4

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for May 6 - 7, 1981--Continued

14	0.1	0	.	0	0	--	--	.	0	0.6	0
15	0.1	0	.	0	0	--	--	.	0.4	0.5	0.4
16	0.1	0	.	0	0	--	--	.	0	0.2	0.2
17	0.3	0	.	0	0	--	--	.	0.4	0.2	0.8
18	0.2	0	.	0	0	--	--	.	0	0	0.4
19	0	0.1	.	0	0	--	--	.	0	0.3	0
20	0.1	0	.	0	0	--	--	.	0.1	0	0.1
21	0	0.1	.	0	0	--	--	.	0	0.1	0.2
22	0	0	.	0	0	--	--	.	0	0	0
23	0	0	.	0	0	--	--	.	0	0	0
24	0	0	.	0	0	--	--	.	0	0	0

Rainfall for January 20 - 21, 1982

1/20/82

1	0	0	.	0	0.1	--	--	0	0	0	0
2	0.4	0.3	.	0.5	0	--	--	0.2	0.7	0	0
3	0.8	0.8	.	0.4	0.4	--	--	0.8	0.7	1.0	0.7
4	0.6	0.7	.	0.6	0.6	--	--	0.4	0.6	0.5	0.8
5	0.3	0.4	.	0.4	0.4	--	--	0.5	0.3	0.5	0.6
6	0.1	0.4	.	0.5	0.2	--	--	0.4	0.2	0.3	0.3
7	0.4	1.1	.	0.4	0.3	--	--	0.7	0.5	0.9	0.2
8	0.1	0.2	.	0.3	0.3	--	--	0.3	0.1	0.3	0.5
9	0.3	0.2	.	0.3	0.4	--	--	0.1	0.2	0.3	0.1
10	0.1	0.2	.	0.1	0	--	--	0.2	0.2	0.2	0.1
11	0.1	0.1	.	0.1	0.3	--	--	0.1	0	0.1	0.2
12	0	0	.	0	0	--	--	0	0	0	0.1
13	0	0	.	0	0	--	--	0	0	0	0
14	0	0.1	.	0	0	--	--	0.1	0.1	0.1	0.1
15	0	0	.	0	0	--	--	0	0	0	0
16	0	0	.	0	0	--	--	0	0	0	0
17	0	0	.	0	0	--	--	0	0	0	0
18	0	0	.	0	0	--	--	0	0	0	0
19	0	0	.	0	0	--	--	0	0	0	0
20	0	0	.	0	0	--	--	0	0	0	0
21	0	0.1	.	0	0.1	--	--	0.1	0.3	0.1	0
22	0.3	0.4	.	0.2	0.1	--	--	0.1	0.3	0.2	0.2
23	0.9	1.0	.	1.2	0.9	--	--	0.2	1.0	0.4	0.4
24	0.3	0.8	.	0.4	1.3	--	--	1.0	0.4	0.8	0.9

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for January 20 - 21, 1982--Continued

1/21/82

1	0.4	0.6	.	0.5	0.4	--	--	0.5	0.6	0.5	0.4
2	0.5	0.6	.	0.3	0.4	--	--	0.6	0.4	0.5	0.5
3	0.1	0.3	.	1.0	0.3	--	--	0.1	0.4	0.3	0.4
4	0.1	0.4	.	0.1	1.1	--	--	0.5	0	0.5	0.2
5	0.1	0.1	.	0.1	0	--	--	0	0.2	0.1	0.1
6	0.2	0.7	.	0.4	0.5	--	--	0	0.2	0.1	0.1
7	0	0	.	0	0	--	--	0.6	0	0.4	0.2
8	0	0	.	0	0.1	--	--	0	0	0	0
9	0	0	.	0	0	--	--	0	0	0	0
10	0	0	.	0	0	--	--	0	0	0.1	0
11	0.1	0	.	0	0	--	--	0	0	0	0
12	0	0	.	0	0	--	--	0	0.2	0	0.1
13	0.6	0.4	.	0.1	0.4	--	--	0.5	0.5	0	0
14	0.6	0.1	.	0.2	0	--	--	1.0	1.0	0.2	0
15	0.9	0.9	.	0.7	0.5	--	--	0.2	0.4	0.7	0
16	0	0.4	.	0.1	0.4	--	--	0	0.2	0.4	0
17	0.3	0.3	.	0.3	0.4	--	--	0	0.2	0.1	0
18	0.1	0.3	.	0.3	0.4	--	--	0	0.2	0.3	0
19	0.2	0.1	.	0.3	0.2	--	--	0	0.3	0.1	0
20	0.4	0.5	.	0.3	0.4	--	--	0	0.3	0.4	0
21	0.1	0.2	.	0.2	0.3	--	--	0	0	0.3	0
22	0	0.1	.	0.1	0.2	--	--	0	0	0.1	0
23	0.2	0.1	.	0.1	0.1	--	--	0	0.3	0.1	0
24	0.1	0.1	.	0.2	0.1	--	--	0	0.1	0.2	0

Rainfall for February 12 - 14, 1985

2/12/85

1	0	0	.	.	0.1	--	--	0	0	0	0
2	0	0.7	.	.	0.1	--	--	0.2	0	0	0.3
3	0.3	0.3	.	.	0.1	--	--	0.4	0	0	0
4	0.1	0.1	.	.	0	--	--	0.1	0.4	0	0.2
5	0	0	.	.	0	--	--	0	0.1	0	0
6	0	0	.	.	0	--	--	0	0	0	0
7	0	0	.	.	0.3	--	--	0	0	0	0.1
8	0.1	0.5	.	.	0	--	--	0.3	0	0	0
9	0	0	.	.	0	--	--	0	0.2	0	0
10	0	0	.	.	0.2	--	--	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for February 12 - 14, 1985--Continued

11	0	0	.	.	0	--	--	0	0	0	0
12	0	0	.	.	0	--	--	0	0	0	0
13	0	0	.	.	0	--	--	0	0	0	0
14	0	0	.	.	0	--	--	0	0	0	0
15	0	0	.	.	0	--	--	0	0	0	0
16	0	0	.	.	0	--	--	0	0	0	0
17	0	0	.	.	0.1	--	--	0	0	0	0
18	0	0.1	.	.	0	--	--	0	0	0	0
19	0	0	.	.	0	--	--	0	0.1	0	0
20	0	0	.	.	0.1	--	--	0	0	0	0.1
21	0	0	.	.	0	--	--	0.1	0	0	0.2
22	0.1	0.5	.	.	0.4	--	--	0.5	0	0	0
23	0.1	0.1	.	.	0	--	--	0	0.1	0.2	0
24	0	0	.	.	0	--	--	0	0.1	0	0

2/13/85

1	0	0	.	.	0	--	--	0	0	0	0
2	0	0	.	.	0	--	--	0	0	0	0
3	0	0	.	.	0	--	--	0	0	0	0
4	0	0	.	.	0	--	--	0	0	0	0
5	0	0	.	.	0	--	--	0	0	0	0
6	0	0.1	.	.	0.1	--	--	0	0	0	0
7	0	0	.	.	0	--	--	0	0	0	0
8	0	0	.	.	0.1	--	--	0.1	0	0.1	0.1
9	0	0.1	.	.	0.2	--	--	0.1	0	0.2	0.1
10	0	0.2	.	.	0	--	--	0	0	0.2	0
11	0	0.1	.	.	0	--	--	0.1	0.1	0.1	0.1
12	0	0.1	.	0	0	--	--	0	0	0	0
13	0	0	.	0	0.1	--	--	0	0	0	0
14	0	0.1	.	0	0	--	--	0	0	0	0
15	0	0	.	0	0	--	--	0	0	0	0
16	0	0	.	0	0	--	--	0	0	0	0
17	0	0	.	0	0	--	--	0	0	0	0
18	0	0	.	0	0	--	--	0	0	0	0
19	0	0	.	0	0	--	--	0	0	0	0
20	0	0	.	0	0	--	--	0	0	0	0
21	0	0	.	0	0	--	--	0	0	0	0
22	0	0	.	0	0	--	--	0	0	0	0
23	0	0.1	.	0	0	--	--	0	0	0	0
24	0	0	.	0	0	--	--	0	0	0.1	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for February 12 - 14, 1985--Continued

2/14/85

1	0	0	.	0	0	--	--	0	0	0	0
2	0	0	.	0	0	--	--	0	0	0	0
3	0	0	.	0	0	--	--	0	0	0	0
4	0	0.1	.	0	0.1	--	--	0	0	0	0
5	0	0.9	.	0	0	--	--	0.1	0	0.3	0.2
6	0	6.0	.	0	4.5	--	--	0.8	0	1.4	1.7
7	0.6	2.1	.	0	0.2	--	--	0.9	0.1	0.3	0
8	0	0	.	0	0.1	--	--	0	2.2	0	0
9	0	0	.	0	0	--	--	0	0.3	0	0
10	0	0	.	0	0	--	--	0	0	0.1	0
11	0	0	.	0	0	--	--	0.1	0	0	0
12	0	0	.	0	0	--	--	0.2	0	0	0.2
13	0	0	.	0	0	--	--	0.4	0	0.1	0.4
14	0.1	0	.	0	0	--	--	1.2	0.2	1.1	0.9
15	0.1	0	.	0	0	--	--	0.4	0.3	0.2	1.4
16	0	0	.	0	0	--	--	0	0.8	0	0.1
17	0	0	.	0	0.2	--	--	0.2	0.7	0	0
18	0.4	0	.	0.2	0.1	--	--	0.2	0	0.2	0.6
19	0.3	0	.	0	0	--	--	0.1	0.2	0.3	0.2
20	0	0	.	0	0.1	--	--	0	0.3	0.1	0.1
21	0	0	.	0	0	--	--	0	0.3	0	0
22	0	0	.	0.1	0	--	--	0	0.1	0	0
23	0	0	.	0	0	--	--	0	0	0	0
24	0	0	.	0	0	--	--	0	0	0	0

Rainfall for December 30, 1987 - January 1, 1988

12/30/87

9	0	0	.	0	.	0	0	0.1	0	0	0
10	0	0	.	0	.	0	0	0.2	0	0	0
11	0	0.1	.	0	.	0.1	0.1	0.8	0	0	0
12	0	0	.	0	.	0	0.3	0.4	0	0	0
13	0	0	.	0	.	0.9	0	0.4	0	0	0.9
14	0	0	.	0	.	0.1	0.3	0.1	0	0	0
15	0.2	0	.	0	.	0	0	0.1	0	0	0
16	0.4	0	.	0	.	0.8	0.8	0.4	0.5	0	0.2
17	0.8	0	.	0	.	0	0.3	0.3	0	0	0.8
18	0.5	0	.	0	.	0.4	0.1	0.1	0.6	0.3	0.7

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for December 30, 1987 - January 1, 1988--Continued											
19	0.4	0	.	0	.	0	0.3	0.6	0.3	0.1	0.5
20	0.5	0.1	.	0	.	0.3	0.2	0.2	0	0.1	0.2
21	0.3	0	.	0	.	0.9	0.6	0.1	0.3	0.5	0.7
22	0.2	0.5	.	0.2	.	0	0.2	0.3	0.1	0.3	0.3
23	0.2	0	.	0	.	0.1	0.1	0.4	0.8	0.5	0.2
24	0.1	0	.	0.1	.	0	0.1	0.5	0	0.4	0.2
12/31/87											
1	0.1	0	.	0.1	.	0.2	0.1	0.2	0.1	0.1	0.2
2	0	0	.	0	.	0.1	0.2	0.3	0.1	0.1	0.2
3	0.1	0.2	.	0.1	.	0.2	0.1	0.4	0.1	0.1	0.2
4	0	0	.	0	.	0.4	0.2	0.6	0.1	0.3	0.1
5	0.2	0.4	.	0	.	0.2	0.1	0.3	0.1	0.3	0.3
6	0.2	0.2	.	0.2	.	0.3	0.4	0.5	0.2	0.6	0.3
7	0.1	0.5	.	0.2	.	0.1	0.3	0.4	0.2	0.5	0.4
8	0	0.1	.	0	.	0.1	0.1	1.2	0.4	0.5	0.2
9	0.1	0	.	0.2	.	0.3	0.2	0.6	0.2	0.3	0.3
10	0.1	0.2	.	0.2	.	0.2	0.4	0.4	0.1	0.3	0.4
11	0	0.1	.	0.1	.	0.5	0.3	0.2	0.1	0.3	0.2
12	0.3	0.2	.	0.1	.	0.1	0.3	0.3	0.3	0.8	0.6
13	0.4	0.1	.	0.1	.	0.1	0.2	0.6	0.3	0.5	0.3
14	0.2	0.1	.	0.2	.	0.1	0.4	0.3	0.3	0.3	0
15	0.3	0	.	0.5	.	0.6	0.5	0	0.3	0.2	0
16	0.2	0	.	0	.	1.4	0.7	0.4	0.3	0.5	0
17	0	0.9	.	0.2	.	1.1	0.2	1.4	0.3	1.3	0
18	0	1.8	.	0	.	0.8	0.4	1.0	0.8	1.0	0
19	0.6	3.0	.	0	.	.	1.2	0.2	0.7	0.4	0
20	0.1	3.4	.	0	.	.	1.6	0.8	1.0	1.1	0
21	0.1	4.0	.	0.1	.	.	0.3	0.8	1.0	2.2	0
22	0.2	2.6	.	0.5	.	.	0.2	0.5	.	0.6	0
23	0.3	0	.	0.4	.	.	0.4	0.4	.	0.8	0
24	0.3	0	.	0.8	.	.	0.6	0.4	.	0.6	0
1/1/88											
1	0.1	0	.	.	.	.	0.5	0.4	.	0.6	0
2	0	0	.	.	.	.	0.3	0.3	.	0.3	0
3	0.1	0	.	.	.	.	0.2	.	.	.	0
4	0	0	.	.	.	.	0.2	.	.	.	0
5	0.1	0	.	.	.	.	0.5	.	.	.	0.5
6	0.2	0	.	.	.	.	0.6	.	.	.	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuuanu Res. 4	Palolo Valley	Pauoa Flats

Rainfall for December 30, 1987 - January 1, 1988--Continued

7	0.1	0	.	.	.	.	0.3	.	.	.	0
8	0	0	.	.	.	.	0.1	.	.	.	0.3
9	0	0	.	.	.	.	0.1	.	.	.	0
10	0	0	.	.	.	.	0.1	.	.	.	0
11	0	0	.	.	.	.	0.1	.	.	.	0
12	0	0	.	.	.	.	0.1	.	.	.	0
13	0.1	0	.	.	.	.	0.1	.	.	.	0
14	0	0	.	.	.	.	0.1	.	.	.	0
15	0.1	0	.	.	.	.	.	.	.	.	0
16	0	0	.	.	.	.	.	.	.	.	0
17	0.1	0	.	.	.	.	.	.	.	.	0
18	0.1	0	.	.	.	.	.	.	.	.	0
19	0	0	.	.	.	.	.	.	.	.	0
20	0	0	.	.	.	.	.	.	.	.	0
21	0	0	.	.	.	.	.	.	.	.	0
22	0	0	.	.	.	.	.	.	.	.	0
23	0.1	0	.	.	.	.	.	.	.	.	0
24	0	0	.	.	.	.	.	.	.	.	0

Rainfall for March 31 - April 2, 1989

3/31/89

1	.	0	.	0	.	0	0	0	0	0	0
2	.	0	.	0	.	0	0	0	0	0	0
3	.	0	.	0	.	0	0	0	0	0	0.1
4	.	0	.	0	.	0	0	0	0	0	0
5	.	0	.	0	.	0	0	0	0	0	0
6	.	0	.	0	.	0	0	0	0	0	0
7	.	0	.	0	.	0	0	0	0	0	0
8	.	0	.	0	.	0	0	0	0	0	0
9	.	0	.	0	.	0	0	0	0	0	0
10	.	0	.	0	.	0	0	0	0	0	0
11	.	0	.	0	.	0	0	0	0	0	0
12	.	0	.	0	.	0	0	0	0	0	0
13	.	0	.	0	.	0	0	0	0	0	0
14	.	0	.	0	.	0	0	0	0	0	0
15	.	0	.	0	.	0	0	0	0	0	0
16	.	0	.	0	.	0	0	0	0	0.1	0.1
17	.	0	.	0	.	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 31 - April 2, 1989--Continued											
18	.	0	.	0	.	0	0	0	0	0	0
19	.	0	.	0	.	0	0	0	0	0	0
20	.	0	.	0	.	0	0	0	0	0	0
21	.	0	.	0	.	0	0	0	0	0	0
22	.	0	.	0	.	0	0	0	0	0	0
23	.	0	.	0	.	0	0	0	0	0.1	0
24	.	0	.	0	.	0	0	0.1	0	0	0
4/1/89											
1	.	0	.	0	.	0	0	0	0	0	0
2	.	0	.	0	.	0.1	0.1	0	0	0.2	0
3	.	0.1	.	0	.	0	0	0.1	0.1	0.1	0.2
4	.	0.1	.	0	.	0.1	0	0.1	0	0.2	0
5	.	0.1	.	0	.	0.1	0.1	0.3	0.1	0	0.1
6	.	0	.	0.1	.	0	0.1	0	0	0	0.1
7	.	0	.	0	.	0	0	0	0	0	0
8	.	0	.	0	.	0	0	0	0	0	0
9	.	0	.	0	.	0	0	0	0	0	0
10	.	0	.	0	.	0	0	0	0	0	0
11	0	0	.	0	.	0	0	0	0	0	0
12	0	0	.	0	.	0	0	0	0	0	0
13	0	0	.	0	.	0	0	0	0	0	0
14	0	0	.	0	.	0	0	0	0	0	0
15	0	0	.	0	.	0	0	0	0	0	0
16	0	0	.	0	.	0	0	0	0	0	0
17	0	0	.	0	.	0	0	0	0	0	0
18	0	0	.	0	.	0	0	0	0	0	0
19	0	0	.	0	.	0	0	0	0	0	0
20	0	0	.	0	.	0	0	0	0	0	0
21	0.1	0	.	0	.	0	0	0	0	0	0
22	0	0	.	0	.	0	0	0	0	0	0
23	0	0	.	0	.	0	0	0	0	0	0
24	0	0	.	0	.	0	0	0	0	0	0
4/2/89											
1	0	0	.	0	.	0	0	0	0	0	0
2	0	0	.	0	.	0.1	0.2	0	0.1	0	0
3	0.1	0	.	0	.	0.1	0.1	0	0	0	0.2
4	0.2	0	.	0	.	0	0.1	0.1	0.2	0.1	0.2
5	0.2	0.1	.	0.2	.	0	0.2	0.2	0.1	0.2	0.1

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 31 - April 2, 1989--Continued											
6	0.1	0	.	0.1	.	0.3	0.2	0.2	0.2	0	0.1
7	0.1	0.1	.	0	.	0	0.5	0	0.5	0	0.2
8	0.4	0.1	.	0	.	0	0	0.1	0	0	0.3
9	.	0	.	0	.	0	0.1	0	0.1	0.1	0
10	.	0	.	0	.	0	0.2	0.2	0.3	0	0.1
11	.	0	.	0	0	0	0	0	0	0	0
12	.	0	.	0	0	0.1	0	0	0	0	0
13	.	0	.	0	0	0	0	0.1	0	0	0
14	.	0	.	0	0	0	0	0	0	0	0
15	.	0	.	0	0	0	0	0.1	0	0	0
16	.	0	.	0	0	0	0	0	0	0	0
17	.	0	.	0	0	0	0	0	0	0	0
18	.	0	.	0	0	0	0	0	0	0.1	0
19	.	0	.	0	0	0	0	0.1	0	0.1	0.1
20	.	0	.	0	0	0	0	0	0	0	0
21	.	0	.	0	0	0	0	0	0	0	0
22	.	0	.	0	0	0	0.1	0	0	0	0
23	.	0.1	.	0	0	0	0	0	0	0	0
24	.	0	.	0	0	0	0	0	0	0	0

Rainfall for March 17 - 24, 1991

3/17/91

1	0	0	.	0	.	0.03	0.05	0.20	0.05	0.10	0.10
2	0.1	0.1	.	0.1	.	0.03	0.15	0.03	0.10	0.10	0.10
3	0.1	0	.	0	.	0	0.15	0.18	0.10	0.10	0.20
4	0	0	.	0.1	.	0.01	0.05	0.02	0.02	0.10	0.07
5	0.1	0	.	0	.	0.02	0.01	0.15	0.01	0	0.03
6	0	0	.	0	.	0.01	0	0.10	0.01	0.10	0.10
7	0	0	.	0	.	0	0	0	0	0	0.02
8	0	0	.	0	.	0	0	0.02	0	0	0
9	0	0	.	0	.	0.01	0.01	0.04	0	0	0.05
10	0	0	.	0	.	0	0.08	0.01	0.05	0.05	0.04
11	0	0	.	0	.	0	0.01	0	0	0	0.01
12	0	0	.	0	.	0	0.01	0	0.02	0	0.02
13	0	0	.	0	.	0	0	0	0	0	0.05
14	0	0	.	0	.	0	0	0	0	0	0.01
15	0	0	.	0	.	0	0	0	0	0	0
16	0	0	.	0	.	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 17 - 24, 1991--Continued											
17	0	0	.	0	.	0	0	0	0	0	0
18	0	0	.	0	.	0	0	0	0	0	0
19	0	0	.	0	.	0	0	0	0	0	0
20	0	0	.	0	.	0	0	0	0	0	0
21	0	0	.	0	.	0	0	0	0	0	0
22	0	0	.	0	.	0	0	0	0	0	0
23	0	0	.	0	.	0	0	0	0	0	0
24	0	0	.	0	.	0.20	0	0	0	0.05	0
3/18/91											
1	0.1	0.1	.	0	.	0	0.10	0	0.02	0	0.18
2	0.1	0	.	0	.	0	0	0.15	0	0.20	0
3	0.1	0.1	.	0	.	0	0.10	0	0.10	0	0.30
4	0	0	.	0	.	0	0	0	0	0	0
5	0	0	.	0	.	0	0	0	0	0	0
6	0	0	.	0	.	0	0	0	0	0	0
7	0	0	.	0	.	0	0.02	0	0	0	0
8	0	0	.	0	.	0.44	0.01	0.20	0	0.10	0.05
9	0.4	0.2	.	0	.	0.20	0.25	0.15	0.20	0.10	0.50
10	0.2	0	.	0	.	0.01	0.40	0.04	0.25	0.10	0.30
11	0	0	.	0	.	0.02	0.02	0.05	0	0	0
12	0.1	0	.	0	.	0.09	0.04	0.10	0.02	0	0.10
13	0.1	0.1	.	0	.	0.30	0.10	0.30	0.10	0	0.20
14	0.2	0	.	0	.	0.14	0.17	0.04	0.10	0.20	0.30
15	0.1	0	.	0	.	0.10	0.20	0.10	0.05	0.05	0.15
16	0.1	0	.	0	.	0	0.10	0	0.10	0.05	0.20
17	0	0	.	0	.	0	0.01	0	0	0	0
18	0	0	.	0	.	0	0	0	0	0	0
19	0	0	.	0	.	0.02	0.02	0.05	0	0.05	0
20	0	0	.	0	.	0.02	0.02	0.10	0.03	0.05	0.05
21	0	0.1	.	0.1	.	0.08	0.10	0.07	0.03	0.05	0.15
22	0.1	0.1	.	0	.	0.35	0.15	0.23	0.15	0.15	0.18
23	0.2	0.2	.	0	.	0.25	0.40	0.40	0.42	0.20	0.40
24	0.1	0.1	.	0.1	.	0.20	0.10	0.40	0.20	0.30	0.30
3/19/91											
1	0.1	0.2	.	0.1	.	0.20	0.20	0.15	0.15	0.20	0.20
2	0.1	0.1	.	0.1	.	0.20	0.10	0.30	0.10	0.10	0.20
3	0.1	0.1	.	0.1	.	0.10	0.15	0.10	0.15	0.20	0.20
4	0	0.1	.	0	.	0.10	0.10	0.10	0.10	0.05	0.20

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 17 - 24, 1991--Continued											
5	0.2	0	.	0	.	0.10	0.15	0.30	0.10	0.15	0.10
6	0.2	0.1	.	0	.	0.30	0.30	0.40	0.30	0.25	0.40
7	0.2	0.1	.	0	.	0.25	0.30	0.20	0.30	0.20	0.60
8	0.2	0.2	.	0.1	.	0.40	0.30	0.40	0.20	0.20	0.20
9	0.2	0.2	.	0	.	0.25	0.30	0.30	0.30	0.30	0.60
10	0.2	0	.	0.1	.	0.47	0.40	0.30	0.20	0.10	0.80
11	0.1	0.2	.	0	.	0.40	0.30	0.20	0.30	0.10	0.40
12	0.2	0.2	.	0.1	.	0.70	0.50	0.30	0.40	0.30	0.60
13	0.4	0.7	.	0.5	.	1.65	1.00	0.80	0.90	0.50	0.80
14	0.7	1.4	.	1.3	.	1.20	1.10	0.90	1.60	1.20	1.70
15	0.3	1.4	.	0.5	.	0.45	0.40	0.20	0.90	0.70	0.70
16	0.1	2.1	.	0.5	.	0.60	0.20	0.40	0.30	0.90	0.30
17	0	0.1	.	0.1	.	0.01	0.05	0.05	0.30	0.10	0.35
18	0.1	0.5	.	0.6	.	0.20	0.10	0.55	0	0.40	0.05
19	0.2	2.1	.	1.6	.	0.25	0.42	0.70	0.70	1.65	0.40
20	0	0.3	.	0.2	.	0.10	0.02	0.05	0.10	0.15	0.45
21	0	0	.	0	.	0.53	0.02	0.02	0.10	0.02	0.05
22	0	0.1	.	0	.	0.37	0.02	0.03	0.10	0.03	0.05
23	0	0.1	.	0	.	0.02	0	0	0.20	0	0.05
24	0	0	.	0	.	0.20	0.01	0	0	0	0
3/20/91											
1	0	0	.	0	.	0.01	0	0	0.05	0	0.02
2	0	0	.	0	.	0.01	0	0	0	0	0.02
3	0	0	.	0	.	0.02	0	0	0	0	0
4	0.1	0	.	0	.	0.05	0.10	0.10	0.05	0.05	0
5	0.1	0.1	.	0.1	.	0.01	0.08	0.05	0.10	0.10	0.05
6	0	0.1	.	0	.	0.09	0.02	0.01	0.02	0	0.10
7	0.2	0	.	0	.	0.03	0.03	0.05	0.02	0.02	0
8	0	0.1	.	0.1	.	0.20	0.03	0.05	0.02	0.08	0.05
9	0.5	0.1	.	0	.	0.30	0.30	0.20	0.15	0.10	0.05
10	0.4	0.5	.	0.4	.	0.60	0.80	0.60	0.20	0.40	0.20
11	0.3	0.4	.	0.2	.	0.08	0.20	0.20	0.90	0.10	0.80
12	0	0.1	.	0	.	0	0.02	0	0.10	0	0.20
13	0	0	.	0	.	0	0	0	0	0	0
14	0	0	.	0	.	0	0	0	0	0	0
15	0	0	.	0	.	0	0	0	0	0	0
16	0	0	.	0	.	0	0	0	0	0	0
17	0	0	.	0	.	0	0	0	0	0	0
18	0	0	.	0	.	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 17 - 24, 1991--Continued											
19	0	0	.	0	.	0	0	0	0	0	0
20	0	0	.	0	.	0	0	0	0	0	0
21	0	0	.	0	.	0	0	0	0	0	0
22	0	0	.	0	.	0.03	0	0	0	0	0
23	0.1	0.1	.	0	.	0.20	0	0.20	0	0	0
24	0.3	0.1	.	0.4	.	0.20	0	0.10	0.04	0.40	0.10
3/21/91											
1	0	0.1	.	0.8	.	0.30	0	0.10	0.50	0.17	0.20
2	0.1	0.2	.	0	.	0.01	0	0.02	0.40	0.03	0.25
3	0	0	.	0	.	0.10	0.40	0.08	0	0	0.15
4	0.1	0.1	.	0	.	0.15	0.20	0	0.10	0.05	0
5	0	0	.	0	.	0.01	0	0	0.03	0	0.06
6	0	0	.	0	.	0	0.10	0	0	0	0
7	0	0	.	0	.	0	0.02	0	0	0	0
8	0	0	.	0	.	0	0	0	0	0	0
9	0	0	.	0	.	0.02	0	0	0	0	0
10	0	0.1	.	0	.	0	0	0	0	0	0.01
11	0	0	.	0	.	0	0.01	0	0	0	0
12	0	0	.	0	.	0	0	0	0	0	0
13	0	0	.	0	.	0	0	0	0	0	0
14	0	0	.	0	.	0	0	0	0	0	0
15	0	0	.	0	.	0	0	0	0	0	0
16	0	0	.	0	.	0	0	0	0	0	0
17	0	0	.	0	.	0	0	0	0	0	0
18	0	0	.	0	.	0	0	0	0	0	0
19	0	0	.	0	.	0	0	0	0	0	0
20	0	0	.	0	.	0	0	0	0	0	0
21	0	0	.	0	.	0	0	0	0	0	0
22	0	0	.	0	.	0	0	0	0	0	0
23	0	0	.	0	.	0	0	0	0	0	0
24	0	0	.	0	.	0	0	0	0	0	0
3/22/91											
1	0	0	.	0	.	0	0	0	0	0	0
2	0	0	.	0	.	0	0	0	0	0	0
3	0	0	.	0	.	0	0	0	0	0	0
4	0	0	.	0	.	0	0	0	0	0	0
5	0	0	.	0	.	0	0	0	0	0	0
6	0	0	.	0	.	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 17 - 24, 1991--Continued											
7	0	0	.	0	.	0	0	0	0	0	0
8	0	0	.	0	.	0	0	0.02	0	0	0
9	0	0	.	0	.	0	0	0	0	0.01	0
10	0	0	.	0	.	0	0	0	0	0	0
11	0	0	.	0	.	0	0	0	0	0	0
12	0	0	.	0	.	0	0	0	0	0	0
13	0	0	.	0	.	0	0	0	0	0	0
14	0	0	.	0	.	0	0	0	0	0	0
15	0	0	.	0	.	0	0	0	0	0	0
16	0	0	.	0	.	0	0	0.01	0	0	0
17	0	0	.	0	.	0	0	0	0	0	0
18	0	0	.	0	.	0	0	0	0	0	0
19	0	0	.	0	.	0	0	0	0	0	0
20	0	0	.	0	.	0	0	0	0	0	0
21	0	0	.	0	.	0	0	0	0	0	0
22	0	0	.	0	.	0	0	0	0.10	0	0
23	0	0	.	0	.	0	0	0	0.10	0	0.04
24	0	0	.	0	.	0	0.10	0	0	0	0
3/23/91											
1	0	0	.	0	.	0	0	0	0	0	0
2	0	0	.	0	.	0	0	0	0	0	0
3	0	0	.	0	.	0	0	0	0	0.02	0
4	0	0.1	.	0	.	0.09	0	0	0	0	0
5	0	0	.	0	.	0	0	0	0	0	0
6	0	0	.	0	.	0.10	0	0.02	0	0	0
7	0	0	.	0	.	0.10	0	0	0	0.02	0.05
8	0	0	.	0	.	0	0	0	0.10	0	0.15
9	0	0	.	0	.	0	0.17	0.03	0	0	0
10	0	0	.	0	.	0	0	0.10	0	0	0.02
11	0.5	0.3	.	0.3	.	0.60	0	0.50	0	0.25	0
12	0.1	0.6	.	1.2	.	0.50	0.03	0.70	0.50	0.65	0.40
13	0.3	0.9	.	0.9	.	0.70	0.17	0.50	0.40	0.80	0.40
14	0.3	0.2	.	1.3	.	0.20	0.40	0.60	0.50	0.70	0.50
15	0.1	0	.	1.0	.	0.25	0.40	0.10	0.30	0.65	0.60
16	0	0	.	0	.	0.05	0.40	0.02	0.20	0.02	0.20
17	0	0	.	0.1	.	0	0.30	0.01	0	0.01	0
18	0	0	.	0	.	0	0.02	0.01	0.20	0	0.03
19	0	0	.	0	.	0	0.01	0	0	0	0
20	0	0	.	0	.	0	0	0	0	0	0

Table 3.--Hourly rainfall for selected storm periods, 1935-91--Continued

Date and hour	Rain-gage stations										
	Dowsett	Mauna- wili	Tantalus Peak	Wailupe Vly. Sch.	Waima.- Nonokio	Kalihi Res. 5	Lower Luakaha	Manoa Tunnel 2	Nuuanu Res. 4	Palolo Valley	Pauoa Flats
Rainfall for March 17 - 24, 1991--Continued											
21	0	0	.	0	.	0	0	0	0	0	0
22	0	0	.	0	.	0	0	0	0	0	0
23	0	0	.	0	.	0	0	0	0	0	0
24	0	0	.	0	.	0	0	0	0	0	0
3/24/91											
1	0	0	.	0	.	0	0	0	0	0	0
2	0	0	.	0	.	0	0	0	0	0	0
3	0	0	.	0	.	0	0	0	0	0	0
4	0	0	.	0	.	0	0	0	0	0	0
5	0	0	.	0	.	0	0	0	0	0	0
6	0	0	.	0	.	0	0	0	0	0	0
7	0	0	.	0	.	0	0	0	0	0	0
8	0	0	.	0	.	0	0	0	0	0	0
9	0	0	.	0	.	0	0	0	0	0	0
10	0	0	.	0	.	0	0	0	0	0	0
11	0	0	.	0	.	0	0	0	0	0	0
12	0	0	.	0	.	0	0	0	0	0	0
13	0	0	.	0	.	0	0	0	0	0	0
14	0	0	.	0	.	0	0	0	0	0	0
15	0	0	.	0	.	0	0	0	0	0	0
16	0	0	.	0	.	0	0	0	0	0	0
17	0	0	.	0	.	0	0	0	0	0	0
18	0	0	.	0	.	0	0	0	0	0	0
19	0	0	.	0	.	0	0	0	0	0	0
20	0	0	.	0	.	0	0	0	0	0	0
21	0	0	.	0	.	0	0	0	0	0	0
22	0	0	.	0	.	0	0	0	0	0	0
23	0	0	.	0	.	0	0	0	0	0	0
24	0	0	.	0	.	0	0	0	0	0	0

Table 4.--Reported debris flows for selected storm periods, 1935-91

[----- (dashes), data unknown; OCDA, Oahu Civil Defense Agency. Time of report is time when debris flow was first observed or recorded.]

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
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Reports associated with storm period February 27 - March 1, 1935

2/27/35 6:00 p.m.	flood	Nuuanu	Nuuanu Stream was swollen and tore away bridges at Kukui Street and Vineyard Street.	MacDonald, A., 1935
2/27/35 -----	flood	Pauoa	Area between Pacific Heights and Punchbowl Crater was badly damaged by floods.	Honolulu Advertiser, 1935

Reports associated with storm period January 16 - 20, 1949

1/16/49 night	flood	Manoa	Several homes on Paty Drive reported near collapse from pressure of flood waters and undermined foundations.	Honolulu Advertiser, 1949a
1/16/49 -----	flood	Palolo	House in 3400 block of Paalea Street partially washed-out.	Honolulu Star-Bulletin, 1949
1/16/49- 1/17/49 -----	flood	Palolo	Two deep channels cut in Waiomao Road by storm waters.	Honolulu Advertiser, 1949b
1/17/49 11:00 a.m.	flood	Pauoa	Pauoa Valley on evacuation alert due to possible increase in flood waters from mountain area.	Honolulu Star-Bulletin, 1949
1/17/49 night	landslide	Nuuanu	Landslide on the Old Pali Highway at the halfway house. (Note: halfway house was located about 3/4 mile southwest of the present Kalaniana'ole/Kamehameha/Pali Highways junction.	Honolulu Advertiser, 1949c

Reports associated with storm period December 2 - 6, 1950

12/3/50 2:30 p.m.	landslide	Aina Haina	Landslide of rocks, tree stumps, and mud came down a mountainside on Manauwea Street. Roadway section ripped off.	Honolulu Star-Bulletin, 1950a
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Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued.

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
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Reports associated with storm period December 2 - 6, 1950--Continued

12/3/50 6:30 p.m.	flood	Koko Head	Serious flood conditions in Wawamalu District near Koko Head. House in the 1000 block of Wawamalu Road flooded from waters streaming off of Koko Head. (Note: Wawamalu Road was off of Lunalilo Home Road. No such street exists presently.)	Honolulu Star-Bulletin, 1950b
12/3/50 -----	landslide	Makapuu Point	Landslide of boulders and mud reported near Makapuu Point.	Honolulu Star-Bulletin, 1950b
12/3/50 -----	landslide	Tantalus	Landslide of boulders and mud reported on Forest Ridge Way.	Honolulu Star-Bulletin, 1950b
12/3/50 -----	landslide	St. Louis Heights	Mudslide from atop St. Louis Heights hits Felix Street. Hardest hit was the 3000 block of Felix Street where a retaining wall was washed away, and mud and debris was 4 feet thick in one lot.	Honolulu Star-Bulletin, 1950c

Reports associated with storm period March 10 - 13, 1951

3/13/51 1:27 a.m.	landslide	Makiki	Landslide on Auwaiolimu Street, west of Nehoa Street.	Honolulu Star-Bulletin, 1951a
3/13/51 1:46 a.m.	landslide	Diamond Head	Minor landslide on Diamond Head Road.	Honolulu Star-Bulletin, 1951a
3/13/51 1:47 a.m.	landslide	Maunalani Heights	Boulders on Sierra Drive.	Honolulu Star-Bulletin, 1951a
3/13/51 3:39 a.m.	landslide	Pauoa	Landslide on Auwaiolimu Street, below the Papakolea bridge.	Honolulu Star-Bulletin, 1951a
3/13/51 -----	landslide	Palolo	Landslide in new residential section of Carlos Long tract.	Honolulu Advertiser, 1951a
3/13/51 -----	flood	Palolo	Floodwaters pour down 10th Avenue and Waio Mao Road. Mud levees built on Waio Mao Road.	Honolulu Advertiser, 1951a

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period March 10 - 13, 1951--Continued				
3/13/51 -----	landslide	Moiliili	Minor slide between the Coyne Street extension and Metcalf Street.	Honolulu Advertiser, 1951b
Reports associated with storm period March 24 - 28, 1951				
3/26/51 12:30 p.m.	landslide	Pali Highway	Large boulder at foot of windward side of the Pali about to fall on road.	Honolulu Advertiser, 1951c
3/26/51 night	landslide	Pali Highway	Three landslides on Old Pali Highway; largest about 450 yards of dirt and rocks, located 100 yards from the top of Pali Road, second slide located at the hairpin turn, and third slide located midway between the others. (Notes: The 450 yards stated in the source was not described further in terms of either volume or depth. The new Pali Highway construction was started in March 1952. The hairpin turn on the Old Pali Highway was located at the southwest start of the current hairpin turn of the highway.)	Honolulu Star-Bulletin, 1951b
3/26/51 -----	flood	Kuliouou	Serious flooding in Kuliouou.	Honolulu Star-Bulletin, 1951c
3/26/51 -----	flood	Waimanalo	Serious flooding in Waimanalo.	Honolulu Star-Bulletin, 1951c
3/26/51 -----	flood	Palolo	Floodwaters wash away land on banks opposite Paalea Street bridge at Palolo Avenue and 9th Avenue.	Honolulu Advertiser, 1951d
3/27/51 -----	landslide	Makapuu Point	Slide on Kalaniana'ole Highway at Makapuu Point.	Hollingsworth, L., 1951
3/27/51 -----	landslide	Olomana	Slide near Koolau Boys Home.	Hollingsworth, L., 1951

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued.

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period March 24 - 28, 1951--Continued				
3/27/51 -----	flood	Ala Wai Canal	Trees and debris dredged from the Ala Wai Canal near McCully Street bridge. Stream reported as brown and swollen, with silt from hills behind the city.	Honolulu Advertiser, 1951e
Reports associated with storm period March 5 - 6, 1958				
3/5/58 7:21 a.m.	landslide	Kalihi	Landslide in the 1600 block of Laulani Street.	Honolulu Star-Bulletin, 1958a
3/5/58 7:30 a.m.	flood	Aina Haina	Debris jammed a hillside ditch above Ahuwale Street. Floodwater, mud, and rocks rushed into homes below.	McMurray, T., 1958
3/5/58 9:30 a.m.	landslide	Nuuanu	Landslide on Niolopua Drive.	Honolulu Star-Bulletin, 1958a
3/5/58 11:35 a.m.	landslide	Manoa	Landslide in the 3300 block of Melemele Place.	Honolulu Star-Bulletin, 1958b
3/5/58 11:50 a.m.	landslide	Kalihi	Landslide in the 2900 block of Kalihi Street.	Honolulu Star-Bulletin, 1958b
3/5/58 1:15 p.m.	landslide	Diamond Head	Landslide on Diamond Head Road at Kulamanu Street.	Honolulu Star-Bulletin, 1958b
3/5/58 3:50 p.m.	landslide	Diamond Head	Rocks on Diamond Head Road at Kahala Avenue.	Honolulu Star-Bulletin, 1958b
3/5/58 5:10 p.m.	landslide	Manoa	Eighteen inches of mud on Manoa Road near Gore Way.	Honolulu Star-Bulletin, 1958b
3/5/58 5:22 p.m.	flood	Waialae	Drainage ditch plugged and overflowed at Keanu and Ekaha Streets.	Honolulu Star-Bulletin, 1958b
3/5/58 5:22 p.m.	landslide	Aina Haina	Mud and debris covering section of Ahuwale Street.	Honolulu Star-Bulletin, 1958b
3/5/58 5:22 p.m.	landslide	Aina Haina	Large boulder on Hao Street.	Honolulu Star-Bulletin, 1958b

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period March 5 - 6, 1958--Continued				
3/5/58 6:00 p.m.	flood	Aina Haina	Hillside ditches giving way and inundating homes.	Honolulu Star-Bulletin, 1958b
3/5/58 6:15 p.m.	landslide	Moiliili	Large boulder on Dole Street between Kanewai Field and University of Hawaii Girls' Dormitory.	Honolulu Star-Bulletin, 1958b
3/5/58 6:16 p.m.	landslide	Pali Highway	Small landslide on Old Pali Highway at Morgan's Corner. (Note: this section of Old Pali Highway is currently called Old Kalaniana'ole Highway.)	Honolulu Star-Bulletin, 1958b
3/5/58 8:17 p.m.	landslide	Kalihi	Landslide covering 3000 block of Kalihi Street.	Honolulu Star-Bulletin, 1958b
3/5/58 9:16 p.m.	landslide	Maunalani Heights	Large boulder on Sierra Drive blocking road.	Honolulu Star-Bulletin, 1958b
3/5/58 11:13 p.m.	landslide	Kalihi	Mudslide on Kula Kolea Drive.	Honolulu Star-Bulletin, 1958b
3/5/58 11:28 p.m.	landslide	St. Louis Heights	Boulder on St. Louis Drive.	Honolulu Star-Bulletin, 1958b
3/5/58 night	landslide	Aina Haina	Ahuwale Street closed due to mud.	Goodfader, A., 1958
3/5/58 night	landslide	Moiliili	Koali Road closed due to mud.	Goodfader, A., 1958
3/5/58 night	landslide	Manoa	Aleo Place closed due to mud.	Goodfader, A., 1958
3/5/58 -----	landslide	Palolo	Rain-driven rubble rolled down from surrounding mountains.	Abood, H., 1958
3/5/58 -----	landslides, floods	Aina Haina, Kuliouou, Niu, Manoa, Nuuanu	Landslides and floods blocked roads in these areas.	Goodfader, A., 1958

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period March 5 - 6, 1958--Continued				
3/5/58 -----	flood	Ala Wai Canal	Ala Wai Canal full of debris.	Honolulu Advertiser, 1958a
3/5/58 -----	flood	Palolo	Water cascades from hills behind Waiomao Tract, knocking over retaining walls and undermining foundations.	Honolulu Advertiser, 1958b
3/5/58 -----	landslide	Diamond Head	Landslide in the 3100 block of Diamond Head Road, blocking the storm drain and causing flooding.	Schreibman, J., 1958
3/5/58 -----	landslide	Diamond Head	Landslides marred shoulders of Diamond Head Road. Homes in the lee of Diamond Head were disheveled; lawns were covered with water and rocks.	Schreibman, J., 1958
3/5/58 -----	flood	Aina Haina	Burst storm drain in the 800 block of Hind Iuka Drive washed tons of rock onto sidewalk.	Schreibman, J., 1958
3/5/58 -----	landslide	Aina Haina	Tons of rock in the 1000 block of Hind Iuka Drive, knocking down a retaining wall.	Schreibman, J., 1958
3/6/58 1:14 a.m.	landslide	Moanalua	Landslides half mile west of Tripler Army Medical Center/Hospital gate.	Honolulu Star-Bulletin, 1958b
3/6/58 2:40 a.m.	landslide	Maunalani Heights	Large boulder in the 4000 block of Lurline Drive.	Honolulu Star-Bulletin, 1958b
3/6/58 4:55 a.m.	landslide	Pali Highway	Rock slide at entrance to Kailua-side tunnel of the Pali Highway, Honolulu-bound. Six inches of mud at exit of Kailua-side tunnel, Honolulu-bound.	Honolulu Star-Bulletin, 1958b
3/6/58 6:59 a.m.	landslide	Kalihi	Landslide in the 2900 block of Kalihi Street. Debris on road.	Honolulu Star-Bulletin, 1958b

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period May 14 - 15, 1963				
5/14/63 2:44 p.m.	landslide	Nuuanu	Minor slides on Kaohinani Drive.	Honolulu Star-Bulletin, 1963a
5/14/63 -----	landslide	Manoa	400 foot mudslide rolls down hill near junction of Woodlawn Drive and Woodlawn Terrace Place.	Honolulu Star-Bulletin, 1963b
5/14/63 -----	landslide	Nuuanu	Mud blocked Waokanaka Place.	Honolulu Star-Bulletin, 1963b
Reports associated with storm period February 3 - 4, 1965				
2/4/65 -----	landslide	Moanalua	Major rock and mudslide on Moanalua Highway near Tripler Army Medical Center/Hospital.	Honolulu Star-Bulletin, 1965a
2/4/65 -----	landslide	Aina Haina	Rains washed rocks onto Kalaniana'ole Highway in Aina Haina and Koko Head.	Honolulu Star-Bulletin, 1965a
Reports associated with storm period November 10 - 14, 1965				
11/12/65 9:00 p.m.	landslide	Palolo	Mud, rocks, and boulders slid onto the 2600 block of Myrtle Street.	Cavaliero, E., and McMurray, T., 1965
11/12/65 night	-----	Niu	Retaining wall in the 200 block of Kawaikui Place collapsed.	Cavaliero, E., and Hunter, G., 1965
11/12/65 midnight	landslide	Kalihi	Landslide on Numana Road in which the backyard of a home on Uaawa Place broke off and slid down. The house is situated 30 feet above the ground.	Cavaliero, E., and Hunter, G., 1965
11/12/65 midnight	landslide	Palolo	Tons of mud and stone slid, even knocking homes off foundations.	Cavaliero, E., and McMurray, T., 1965
11/13/65 5:00 a.m.	landslide	Palolo	Slide brings down boulders.	OCD A

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period November 10 - 14, 1965--Continued				
11/13/65 1:15 p.m.	landslide	Moanalua	Slide on south side of Moanalua Highway, opposite Tripler Army Medical Center/Hospital gate.	Cavaliero, E., and McMurray, T., 1965
11/13/65 4:15 p.m.	landslide	Pali Highway	Large landslide on the Kailua-side of the Pali tunnels, just above the hairpin turn; 15 feet of mud and boulders, covering three lanes, 60 feet wide. Debris slid down 90 feet over a 120 foot high terraced embankment.	Cavaliero, E., and McMurray, T., 1965
11/14/65 2:00 p.m.	landslide	Moanalua	Slide on Moanalua between Halawa and Red Hill.	OCDA
11/14/65 3:52 p.m.	landslide	Pali Highway	Second, larger slide on Pali Highway; covered 4 lanes up to 15 feet above road surface. Occurred as crews were clearing area of earlier slide.	Honolulu Star-Bulletin, 1965b
			Second slide brought down 2000 cubic feet of debris.	Honolulu Star-Bulletin, 1965c
11/14/65 -----	landslide	Nuuanu	Landslides near Meleana Place and Kaohinani Drive in Dowsett Highlands.	Honolulu Star-Bulletin, 1965b
11/14/65 -----	landslide	Mapunapuna	Landslide on Puuloa Road.	Honolulu Star-Bulletin, 1965b
11/14/65 -----	landslide	Tantalus	Landslide on Round Top Drive.	Honolulu Star-Bulletin, 1965b
11/14/65 -----	landslide	Diamond Head	Landslide on Diamond Head Road near lighthouse.	Honolulu Star-Bulletin, 1965b
11/14/65 -----	landslide	Palolo	Landslide on La-I Road and Magnolia Place.	Honolulu Star-Bulletin, 1965b
11/14/65 -----	landslide	Manoa	Slide on Woodlawn Terrace Place.	Cavaliero, E., 1965
11/14/65 -----	landslide	Aina Haina	Slide on Hao Street.	OCDA

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period November 10 - 14, 1965--Continued				
11/14/65 -----	landslide	Palolo	Slide on Carlos Long Street.	Honolulu Star-Bulletin, 1965d
11/14/65 -----	flood	Makiki	Makiki Stream partially blocked by debris at King Street and Kalakaua Avenue.	Honolulu Star-Bulletin, 1965e
11/14/65 -----	landslide	Halawa	Rockslide in Aumakiki Loop.	Honolulu Star-Bulletin, 1965f
11/15/65 9:00 p.m.	landslide	Manoa	Landslide on Woodlawn Drive.	Honolulu Star-Bulletin, 1965c
11/16/65 9:20 a.m.	landslide	Pali Highway	Third and largest slide of this storm on Pali Highway, near the hairpin turn on Kailua-side dumps 8000 cubic yards of mud and jagged rock on top of two earlier slides. Occurred as helicopter hovered over the slide area.	Honolulu Star-Bulletin, 1965c
Reports associated with storm period December 17 - 18, 1967				
12/17/67 -----	-----	Aina Haina	4 retaining walls below 900 block of Kului Place torn out by the storm.	Honolulu Star-Bulletin, 1967a
12/18/67 2:08 a.m.	flood	Niu	Niu Stream flooded homes after becoming dammed at bridge with rocks and other debris.	Hostetler, H., 1967
12/18/67 2:08 a.m.	flood	Kuliouou	Kuliouou Stream dammed up and overflowing.	Honolulu Advertiser, 1967
12/18/67 2:53 a.m.	landslide	Makapuu Point	Landslide blocking Kalaniana'ole Highway near Sea Life Park.	Honolulu Advertiser, 1967
12/18/67 4:06 a.m.	landslide	Manoa	Landslide in the 3100 block of Beaumont Woods Place.	Honolulu Advertiser, 1967
12/18/67 5:06 a.m.	landslide	Aina Haina	Landslide on Leighton Street.	Honolulu Advertiser, 1967

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period December 17 - 18, 1967--Continued				
12/18/67 7:26 a.m.	landslide	Manoa	Manoa Road blocked near Paradise Park.	Honolulu Advertiser, 1967
12/18/67 7:26 a.m.	landslide	Waialae	Landslide on Laukahi Street.	Honolulu Advertiser, 1967
12/18/67 8:00 a.m.	landslide	Diamond Head	Landslide on Diamond Head Road lookout section.	Honolulu Advertiser, 1967
12/18/67 -----	landslide	Palolo	Landslides, road damage, and erosion. La-I Road asphalt washed out by hillside runoff.	U.S. Army Corps of Engineers, 1968
12/18/67 -----	landslide	Palolo	In uppermost portion of valley, landslide covered road, dumping large trees into stream.	U.S. Army Corps of Engineers, 1968
12/18/67 -----	-----	Palolo	In lower Palolo, erosion toppled retaining walls and moved several homes from their foundations.	U.S. Army Corps of Engineers, 1968
12/18/67 -----	flood	Niu	Rock and debris piled up at Halemaumau Place bridge.	Hostetler, H., 1967
12/18/67 -----	flood	Niu	Niu Stream was choked full with boulders, many piling up at Kalaniana'ole Highway bridge.	Honolulu Star-Bulletin, 1967b
12/18/67 -----	flood	Niu	West branch of Niu Stream overflowed; east branch blocked by boulders and debris.	U.S. Army Corps of Engineers, 1968
12/18/67 -----	flood	Hahaione	Channel damage in Hahaione Stream.	U.S. Army Corps of Engineers, 1968
Reports associated with storm period January 31 - February 2, 1969				
2/1/69 6:15 p.m.	landslide	Pali Highway	Rocks on Pali Highway near upper truck ramp.	OCDA

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period February 5 - 8, 1976				
2/8/76 9:37 a.m.	landslide	Pauoa	Landslide in the 2400 block of Pacific Heights Road.	OCDA
2/8/76 10:25 a.m.	landslide	Kalihi	Partial landslide in the 2900 block of Kalihi Street.	OCDA
Reports associated with storm period May 11 - 14, 1977				
5/12/77 7:10 p.m.	landslide	Pali Highway	Landslide blocking one Honolulu-bound lane, one block east of Pali Highway and Kamehameha Highway.	OCDA
Reports associated with storm period October 30 - 31, 1978				
10/30/78 10:49 a.m.	landslide	Diamond Head	Diamond Head Road flooded with rocks.	OCDA
10/31/78 8:00 p.m.	landslide	Pali Highway	Boulders on road at Pali Highway and Kamehameha Highway.	OCDA
Reports associated with storm period January 7 - 11, 1980				
1/8/80 9:13 p.m.	landslide	Kailua	Landslide at Kalaniana'ole/Kamehameha/Pali Highways junction blocking one lane.	OCDA
1/8/80 9:17 p.m.	landslide	Diamond Head	Landslide in the 3200 block of Diamond Head Road.	OCDA
1/8/80 11:07 p.m.	landslide	Diamond Head	Large boulder in the 3200 block of Diamond Head Road.	OCDA
1/10/80 morning	landslide	Kaneohe	Man killed by landslide behind his home.	Haraguchi, P., 1980
1/10/80 8:45 p.m.	landslide	Kailua	Large boulder on road at Kalaniana'ole and Kamehameha Highways.	OCDA
1/10/80 10:49 p.m.	landslide	Kailua	Landslide at Kalaniana'ole and Kamehameha Highways.	OCDA

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period May 6 - 7, 1981				
5/7/81 9:30 a.m.	landslide	Hahaione	Boulders on Hahaione Street and Pepeekeo Street.	OCDA
5/7/81 10:55 a.m.	landslide	Hahaione	Water with rocks and boulders on Hahaione Street.	OCDA
5/7/81 11:10 a.m.	landslide	Hahaione	Flooding on Hahaione Street above Ainapo Street. Water, rocks, and boulders on road.	OCDA
Reports associated with storm period January 20 - 21, 1982				
1/20/82 4:46 a.m.	landslide	Diamond Head	Small landslide on Diamond Head Road near middle lookout.	OCDA
1/21/82 0:23 a.m.	landslide	Maunawili	Landslide at junction of Auloa Road and Pali Highway.	OCDA
1/21/82 2:27 p.m.	landslide	Pali Highway	Mudslide on Pali Highway at same site, Honolulu bound, fronting Kailua Drive-In. (Note: Kailua Drive-In currently does not exist.)	OCDA
1/21/82 2:30 p.m.	landslide	Pali Highway	Rockslide on Pali Highway, Honolulu-bound lanes, near Kailua Drive-In.	Scott, N.W., 1982
1/22/82 0:20 a.m.	landslide	Manoa	Boulder rolled into house in the 3400 block of Paty Drive. Mudslide with boulders.	OCDA
1/22/82 3:08 a.m.	landslide	Kailua	Mudslide on Kalaniana'ole Highway near Castle Junction, town-bound lanes.	Hartwell, J., 1982
1/19/82- 1/21/82 -----	landslide	Kamilonui	Rains caused washouts in the valley east of Hahaione Valley.	U.S. Department of Agriculture, written commun., 1982.

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period February 12 - 14, 1985				
2/14/85 6:20 a.m.	landslide	Pali Highway	Mudslides blocking one lane on Kalaniana'ole Highway at Kailua Drive-In.	OCDA
2/14/85 7:25 a.m.	landslide	Maunawili	Small landslide between Pali Highway and Aulua Road.	OCDA
Reports associated with storm period December 30, 1987 - January 1, 1988				
12/31/87 6:30 p.m.	landslide	Hahaione	Water and boulders start rolling down Hahaione Street.	S.D. Ellen, written commun., 1988
12/31/87 7:25 p.m.	landslide	Pali Highway	Mudslide at Kalaniana'ole and Kamehameha Highways.	OCDA
12/31/87 7:58 p.m.	landslide	Hahaione	Rocks and debris coming down from mountain onto Ainapo Street and Hawaii Kai Drive.	OCDA
12/31/87 9:00- 10:00 p.m.	flood	Kuliouou	Catch basin filled with debris and water, then flows down Kuliouou Road.	S.D. Ellen, written commun., 1988
12/31/87 9:15- 9:45 p.m.	landslide	Hahaione	Rapids with boulders going down Kahena Street.	Dooley, J., 1988
12/31/87 10:23 p.m.	landslide	Kuliouou	Mudslide in area of Kalaau Place and Kuliouou Road.	OCDA
12/31/87 11:00 p.m.	landslide	Niu	Huge mass of debris (rocks, mud, trees) passes 400 block of Halemaumau Street.	Dooley, J., 1988
12/31/87 11:39 p.m.	landslide	Niu	Debris on Halemaumau Street.	OCDA
12/31/87 11:46 p.m.	landslide	Hawaii Kai	Boulders on road.	OCDA
12/31/87 -----	flood	Aina Haina, Niu	Two foot thick layer of mud, rocks, and debris with 2 feet of flowing water crossing Kalaniana'ole Highway near Aina Haina and Niu.	Mayer, P. and Altonn, H., 1988

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period December 30, 1987 - January 1, 1988--Continued				
1/1/88 0:43 a.m.	landslide	Kuliouou	Large boulders, some the size of vehicle tires at Kalaau Place and Kuliouou Road.	OCDA
1/1/88 0:45 a.m.	flood	Kuliouou	Street drain flooded at Makaniolu Place and Maunalua Avenue.	OCDA
1/1/88 1:09 a.m.	flood	Hahaione	Storm culvert blocked at Ainapo and Hahaione Streets. Ainapo Street washed out, 10 feet deep. Culvert dammed by trees with water 20 feet deep behind it.	OCDA
1/1/88 2:27 a.m.	flood	Hahaione	Stream blocked with debris at Hahaione Street and Hawaii Kai Drive.	OCDA
1/1/88 6:40 a.m.	landslide	Niu	Mudslides, 4-5 feet deep, 10 poles long. Vehicles buried in mud.	OCDA
1/1/88 6:50 a.m.	flood	Niu	Water on Halemaumau Street: 2 feet deep with rapids and 2 feet deep of mud. Water crossing Kalaniana'ole Highway and entering homes.	OCDA
1/1/88 7:00 a.m.	flood	Hahaione	No road below the 900 block of Kahena Street. Drainage ditch blocked above this block.	OCDA
1/1/88 7:00 a.m.	landslide	Maunawili	Landslide on Kalaniana'ole Highway, 0.3 miles from Kamehameha Highway. One lane blocked.	OCDA
1/1/88 7:34 a.m.	flood	Niu	Drain clogged in Niu.	OCDA
1/1/88 8:10 a.m.	landslide	Hahaione	Large boulders on hill behind house in the 800 block of Puuomao Street.	OCDA
1/1/88 8:33 a.m.	landslide	Hahaione	Mud and boulders at Hawaii Kai Drive and Hahaione Street, Makapuu side.	OCDA
1/1/88 10:00 a.m.	-----	Manoa	Woolsey Place has roadway warping.	OCDA

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period December 30, 1987 - January 1, 1988--Continued				
1/1/88 10:20 a.m.	flood	Niu	Log jams on bridges in Niu.	OCDA
1/1/88 morning	landslide	Maunawili	Mudslides on Pali and Kalaniana'ole Highways.	Mayer, P. and Altonn, H., 1988
1/1/88 noon	landslide	Hahaione	Canal, tree, and 3 feet of mud on Hahaione Street.	OCDA
1/1/88 8:00 p.m.	landslide	Kuliouou	Debris on Kalaniana'ole Highway between Hawaii Kai Drive and Kawaihae Street bridge. Debris up against pilings.	OCDA
1/2/88 8:25 a.m.	landslide	Kaluanui	Hill behind the 1100 block of Kaluanui Road slid down.	OCDA
1/2/88 8:30 a.m.	flood	Niu	Boulder basin at top of Halaki Street filling up.	OCDA
1/2/88 11:08 a.m.	-----	Manoa	Walls leaning on Lanikaula Street. Roads warped and breaking on Woolsey and Hulu Places.	OCDA
1/2/88 1:00 p.m.	flood	Manoa	Tree in stream causing water back-up in the 3300 block of East Manoa Road.	OCDA
1/2/88 1:05 p.m.	landslide	Niu	Mud slid down on Anonia Street at Anolike Street.	OCDA
1/2/88 2:55 p.m.	landslide	Manoa	Large tree in stream behind the 2900 block of Poelua Street.	OCDA
1/2/88 3:00 p.m.	flood	Niu	Storm drains becoming clogged with mud runoff.	OCDA
1/2/88 3:10 p.m.	flood	Palolo	Bending, loose tree in the 3500 block of Pakui Street. Canal filled with concrete slabs.	OCDA
1/2/88 4:05 p.m.	landslide	Hahaione	2 boulders on hill above the 800 block of Puuomao Street.	OCDA

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period December 30, 1987 - January 1, 1988--Continued				
1/2/88 4:45 p.m.	flood	Kalama	Clogged storm drain in the 1000 block of Oilipuu Place.	OCDA
1/2/88 5:10 p.m.	flood	Palolo	Water running down into house from drain above 2500 block of Waiomao Road.	OCDA
1/2/88 6:00 p.m.	landslide	Hahaione	4 large boulders above 800 block of Waika Place.	OCDA
1/2/88 6:45 p.m.	landslide	Hahaione	Rocks and boulders in cul-de-sac of Waika Place.	OCDA
1/3/88 7:35 a.m.	landslide	Hahaione	Mud at top of Ainapo Street in the 900 block.	OCDA
1/3/88 8:10 a.m.	-----	Manoa	Retaining wall fell in the 3000 block of Woolsey Place.	OCDA
1/3/88 11:20 a.m.	flood	Hahaione	Drainage behind 900 block of Puuomao Street blocked by 15-20 feet of debris.	OCDA
1/3/88 12:55 p.m.	landslide	Kuliouou	Big boulders behind the 700 block of Kalaau Place.	OCDA
1/3/88 6:15 p.m.	landslide	Manoa	Yard slipping where retaining wall was lost in the 3000 block of Woolsey Place.	OCDA
1/4/88 10:45 a.m.	landslide	Moanalua	Boulder rolled down mountain in the 1500 block of Ala Lani Street.	OCDA
1/5/88 10:30 a.m.	flood	Aina Haina	Drainage above the 600 block of Hao Street doesn't drain properly.	OCDA
1/5/88 3:15 p.m.	landslide	Pauoa	Landslide in the 2500 block of Booth Road.	OCDA
1/5/88 3:45 p.m.	flood	Niu	Drains in Niuiki Circle clogged with mud.	OCDA
1/6/88 11:47 a.m.	landslide	Palolo	Stream banks and slopes gone behind 2400 block of Holomua Place.	OCDA

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period March 31 - April 2, 1989				
4/1/89 8:00 p.m. and 4/2/89 3:00 a.m.	landslide	Niu	Landslide in the 300 block of Anonia Street; about 70 cubic yards, head scarp 6-9 feet high, 70 feet wide.	S.R. Spengler, written commun., 1989
4/1/89 -----	landslide	Niu	Slide behind house in 300 block of Anonia Street; scar 6 feet high, 40 feet wide, 45 degree slope.	S.R. Spengler, written commun., 1989
Reports associated with storm period March 17 - 24, 1991				
3/19/91 1:09 p.m.	landslide	Diamond Head	Mudslides on Diamond Head Road.	OCDA
3/19/91 2:19 p.m.	flood	Kamiloiki	Flooding in the 1000 block of Lunalilo Home Road, water over curbs.	OCDA
3/19/91 2:25 p.m.	flood	Kamiloiki	Water from mountain close to homes in the 1200 block Lunalilo Home Road.	OCDA
3/19/91 2:30 p.m.	landslide	Koko Crater	Rock slide on Kalaniana'ole Highway near Blowhole; large rocks on road.	OCDA
3/19/91 2:40 p.m.	landslide	Kamiloiki	Small landslide on Kolokolo Street at top of Kamiloiki Valley.	OCDA
3/19/91 2:49 p.m.	landslide	Koko Crater	Rocks on Kalaniana'ole Highway between Blowhole and Lanai Lookout.	OCDA
3/19/91 3:45 p.m.	landslide	Tantalus	Mudslide and 2 trees on road in the 3800 block of Tantalus Drive.	OCDA
3/19/91 6:20 p.m.	landslide	Niu	Wood and rocks, some the size of basketballs, at Hawaii Loa Street and Kanau Street.	OCDA
3/19/91 6:27 p.m.	landslide	Kalaniana'ole Highway	Kalaniana'ole Highway 2 feet deep with rocks, Kokohead-bound lanes.	OCDA

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period March 17 - 24, 1991--Continued				
3/19/91 6:33 p.m.	landslide	Pali Highway	Landslide on Kalaniana'ole Highway, past Kailua Drive-In.	OCDA
3/19/91 -----	landslide	Paiko Peninsula	Landslide from rubble of a washed-out private road washed down the ridge above the 5900 block of Kalaniana'ole Highway. Washed out asphalt and walls, 4 feet deep hole. Storm runoff surged down private lane in the 5900 block of Kalaniana'ole Highway and ended up in Holy Trinity Church parking lot.	Kaser, T., 1991 Sale, R., 1991
3/20/91 0:40 a.m.	landslide; flood	Paiko Peninsula	Debris, 5900 block of Kalaniana'ole Highway fronting Holy Trinity Church, near Paiko Peninsula between Niu and Kulio'uou.	OCDA
3/20/91 11:40 a.m.	flood	Niu	Drainage along Anolani Street plugged with big rocks.	OCDA
3/20/91 6:12 p.m.	flood	Aina Haina	Boulders may be moving; stream rose 3 feet since caller got home in the 1000 block of Hind Iuka Drive.	OCDA
3/20/91 6:12 p.m.	flood	Kulio'uou	Drainage flooded at corner of Makaniolu and Maunaloa Avenues.	OCDA
3/20/91 6:23 p.m.	flood	Aina Haina	Water coming from all sides of the street in the 5300 block of Manu'wea Street below Hawai'iloa Ridge.	OCDA
3/20/91 -----	landslides, floods	Kulio'uou	Kulio'uou: mud in 400 block of Lani Street; debris in 400 block of Kahinu Street; mud and debris at Kahinu and A'imoku Streets; few branches in boulder basin at end of Kulio'uou Road. (Note: observed on 3/20/91.)	OCDA (initial damage report prepared by Department of Public Works)

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period March 17 - 24, 1991--Continued				
3/20/91 -----	landslides, Niu floods	Niu	Niu: silt in boulder basin at end of Halaki Street; debris and mud at end of Kupaua Place; debris on center culvert support and bridge in 200 block of Halemaumau Place; silt and debris on boulder basin at end of Haleole Street; mudslide in 300 block of Anonia Street; debris on Anolani, Anolike, and Anonia Streets; branches in catch basin in 300 block of Anolani Street; basin plugged in 300 block of Anolani Street; mud and debris in 100 block of Hawaii Loa Street. (Note: observed on 3/20/91.)	OCDA (initial damage report prepared by Department of Public Works)
3/20/91 -----	landslides, Aina Haina floods	Aina Haina	Aina Haina: debris in 800 block of Leighton Street; mud and debris in 5300 block of Manauwea Street; mud and debris in 5300 block of Olapa Street and Olapa Street at Lawelawe Street. (Note: observed on 3/20/91.)	OCDA (initial damage report prepared by Department of Public Works)
3/23/91 11:28 a.m.	flood	Hahaione	Gushing water in drainage building up; no blockage seen at this time in the 900 block of Kahena Street.	OCDA
3/23/91 11:34 a.m.	flood	Kamiloiki	Drainage ditch draining into homes in the 1100 block of Kamiloiki Place at the top of Kamiloiki Valley.	OCDA
3/23/91 11:37 a.m.	flood	Kamiloiki	Flooding in the 1000 and 1200 blocks of Lunalilo Home Road.	OCDA
3/23/91 11:38 a.m.	flood	Kamiloiki	Lots of rocks and water flowing like a river about 1 foot deep at corner of Lunalilo Home Road and Kalapaki Street.	OCDA
3/23/91 11:38 a.m.	landslide	Kamiloiki	Rock and debris from mountain runoff blocking street at Lunalilo Home Road and Wainiha Street.	OCDA
3/23/91 11:46 a.m.	landslide	Makapuu Point	Minor rock slides at Makapuu Point. Small rocks coming down.	OCDA

Table 4.--Reported debris flows for selected storm periods, 1935-91--Continued

Date/time of report	Type of report	Geographic area	Debris-flow report from original source	Source of information
Reports associated with storm period March 17 - 24, 1991--Continued				
3/23/91 11:48 a.m.	landslide	Hahaione	Debris from mountain starting to come down Hahaione Street.	OCDA
3/23/91 noon	flood	Kaluanui	Water rushing/flood on Kaluanui Road and Kaoopulu Place at top of Mariner's Ridge.	OCDA
3/23/91 12:31 p.m.	landslide	Kamiloiki	Rocks and mud in the 1000-1200 blocks of Lunalilo Home Road.	OCDA
3/23/91 2:07 p.m.	flood	Aina Haina	Blocked storm drain at Papai Street and East Hind Drive; water rising.	OCDA
3/23/91 2:15 p.m.	flood	Diamond Head	4 inches of gravel and water at Diamond Head Road and 18th Avenue.	OCDA
3/23/91 2:28 p.m.	landslide	Waialae	Rocks washing down 19th Avenue from Maunaloa storm drain.	OCDA
3/23/91 3:57 p.m.	flood	Aina Haina	Heavy flooding at Wailupe Place; 8 houses threatened to be swept away.	OCDA
3/23/91 4:07 p.m.	landslide	Pali Highway	Mudslide, Kailua side of the Pali between the Kailua Drive-In and Maunawili Junction, Honolulu-bound.	OCDA
3/23/91 -----	landslide	Kamiloiki	Portion of Lunalilo Home Road blocked by debris washed down from a construction site.	Matsunaga, M. and others, 1991