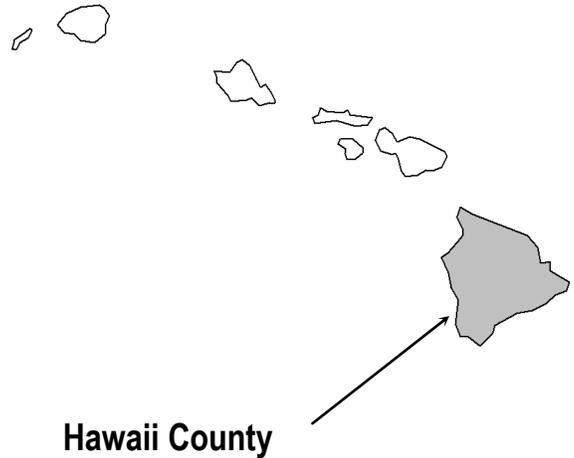


# FLOOD INSURANCE STUDY



VOLUME 2 OF 11

## HAWAII COUNTY, HAWAII



REVISED:  
Month XX, XXXX



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER  
155166V002B

**NOTICE TO  
FLOOD INSURANCE STUDY USERS**

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial FIS Effective Date:	May 3, 1982
First Revised FIS Date:	September 16, 1988
Second Revised FIS Date:	July 16, 1990
Third Revised FIS Date:	May 16, 1994
Fourth Revised FIS Date:	June 2, 1995
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Sixth Revised FIS Date:	Month XX, XXXX

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#### 4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 1-percent annual chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent annual chance flood elevations; delineations of the 1- and 0.2-percent annual chance floodplains; and 1-percent annual chance floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

##### 4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the county. For the streams studied in detail, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using the topographic elevation data.

LiDAR data can be retrieved from the NOAA Coastal LiDAR website. Information used in delineating flood boundaries for each stream studied by detailed methods is given below:

##### SOUTH KOHALA AREA

Flood boundaries for detailed study streams in the South Kohala area were delineated based on topographic maps furnished by the USACE (USACE, 1977). Information on historic flooding was obtained from previous reports covering the study area (U.S. Department of Agriculture, 1961; USACE, 1970; U.S. Department of Agriculture, 1970).

##### SOUTH HILO, KAU, AND HAMAKUA AREAS

Flood boundaries for streams studied in detail within these areas were delineated using USACE topographic maps (USACE, 1977; USACE, January 1977; USACE, 1977; USACE, 1984, et cetera). At the request of the county and with approval from FEMA, detailed mapping for Palai Stream and Palai Stream A have been incorporated as a part of this revision. Although BFEs are shown on the maps for these streams, supporting profile data is not available and therefore not included in this FIS Report. The source of this data is the URS Waiakea-Palai study in 2002.

##### NORTH KONA AND SOUTH KONA AREAS

Flood boundaries for detailed streams in the South Kona areas were delineated from LiDAR data provided by the USACE (USACE, 2007). Flood boundaries for detailed streams in the North Kona area was delineated by LiDAR prepared by Terrapoint USA, Inc. in 2009.

## HAWAII COUNTY COASTLINE

Approximate 1-percent annual chance floodplain boundaries in portions of the North and South Kona areas were taken from the 1977 and 1984 SCS reports (U.S. Department of Agriculture, 1984; U.S. Department of Agriculture, 1977).

The detailed 1-percent annual chance flood boundaries for Waikoloa Stream and Kamuela Stream No. 1 were delineated using topographic maps at a scale of 1:1,200 and a contour interval of 5 feet (USACE, 1984, et cetera).

Detailed study of areas along the northeastern coast of the island, including the city of Hilo and several sections of the east and west coasts of the island re-delineated the 1-percent annual chance tsunami runup elevations and special flood hazard areas using topographic and bathymetric LiDAR data from the USACE (USACE, 2007).

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 3). On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, VE, AH, and AO), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

The 1-percent annual chance floodplain boundaries for the remaining approximate flooding sources in the study area were taken directly from the 1982 FIS for Hawaii County (FEMA, 1982).

### 4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood - carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent annual chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain.

Encroachment onto areas subject to inundation by floodwater having hazardous velocities aggravates the risk of flood damage and heightens potential flood hazards by further increasing

velocities. To provide guidance for encroachment into these areas, a floodway is delineated for that part of the 1-percent annual chance floodplain that conveys flow. Floodways were not computed for the following streams, as a result of their hazardous stream velocities:

- Auwaiakeakua Gulch
- Four Mile Creek Tributary No. 1
- Gulch 2 – Hapuna
- Gulch 3 – Hapuna
- Gulch 4 – Puako
- Kamakoa Gulch
- Ninole Gulch
- Waiakea Stream (downstream reach)

For these streams, floodway boundaries are shown as the portion of the 1-percent annual chance floodplain that conveys flow, and no cross-section data are tabulated in the Floodway Data Table (Table 8).

Floodways are shown for Lanimaumau Stream and Alenaio Stream. At stream segments where hazardous velocities exist, the floodway boundaries shown are the 1-percent annual chance flood boundaries, and no cross-section data are tabulated in the Floodway Data Table (Table 8).

No floodways have been computed for the following sources:

- Four Mile Creek (the upstream shallow flooding reach)
- Four Mile Creek Tributaries 2 and 3
- Honokaa Drainages A through D
- Honokaa Drainages 1, 2, and 3
- Palai Stream (above Haihai Street)
- Palai Streams A through F
- Waiakea Tributaries 1, 2, and 3
- Waikoloa Stream
- Waikoloa Stream Tributary

Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 8). The computed floodways are shown on the FIRM (Exhibit 3). In cases where the floodway and 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 8, "Floodway Data." In order to reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water surface elevation of the 1-percent annual

chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 5.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Alenaio Stream								
A	5,530	66	442	13.3	73.6	73.6	73.6	0.0
B	5,900	92	519	11.3	84.5	84.5	84.5	0.0
C	6,600	170	608	9.7	98.6	98.6	98.6	0.0
D	7,000	117	463	12.7	110.1	110.1	110.1	0.0
E	7,400	134	562	10.5	121.1	121.1	121.1	0.0
F	8,000	161	605	9.7	130.8	130.8	130.8	0.0
G	8,700	148	564	10.7	164.5	164.5	164.5	0.0
H	9,500	187	705	8.2	233.1	233.1	233.1	0.0
I-P*								

<sup>1</sup>Feet above Waiola River

\*Floodway not determined

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

**FLOODWAY DATA**

**ALENAIO STREAM**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Captain Cook Watercourse No.1								
A	40	55	35	8.8	1,152.2	1,152.2	1,152.2	0.0
B	558	40	30	10.3	1,221.9	1,221.9	1,221.9	0.0
C	1,041	60	56	5.5	1,285.9	1,285.9	1,285.9	0.0
D	1,542	5	3	21.0	1,343.6	1,343.6	1,343.6	0.0
E	1,943	10	17	19.1	1,370.6	1,370.6	1,370.6	0.0
F	2,408	58	54	9.3	1,404.1	1,404.1	1,404.1	0.0
G	2,903	76	60	8.4	1,459.1	1,459.1	1,459.1	0.0
H	3,453	32	36	14.0	1,508.5	1,508.5	1,508.7	0.2
I	3,764	38	44	11.4	1,554.4	1,554.4	1,554.4	0.0
J	4,278	119	74	6.8	1,605.9	1,605.9	1,605.9	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

CAPTAIN COOK WATERCOURSE NO.1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Captain Cook Watercourse No.1 Overflow								
A	54	17	17	11.2	1,146.9	1,146.9	1,146.9	0.0
B	541	56	27	7.1	1,206.7	1,206.7	1,206.7	0.0
C	1,084	17	8	15.1	1,291.9	1,291.9	1,291.9	0.0
D	1,536	40	20	5.6	1,351.5	1,351.5	1,351.6	0.1
E	1,707	10	0	2.4	1,370.2	1,370.2	1,370.2	0.0

<sup>1</sup>Feet above confluence with Captain Cook Watercourse No. 1

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

CAPTAIN COOK WATERCOURSE NO.1 OVERFLOW

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Four Mile Creek								
A	1,415	150	2,334	3.1	203.1	203.1	203.6	0.5
B	2,610	140	815	2.3	203.2	203.2	204.2	1.0
C	3,910	135	4,427	4.3	246.1	246.1	247.1	1.0
D	5,010	70	331	5.4	273.2	273.2	274.1	0.9
E	5,870	350	363	5.0	276.9	276.9	277.0	0.1

<sup>1</sup>Feet from Kanoelehua Avenue

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

FOUR MILE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Holualoa Drainageway								
A	487	305	602	4.2	22.3	22.3	22.3	0.0
B	1,200	35	184	13.0	38.0	38.0	38.0	0.0
C	1,700	38	179	13.4	67.0	67.0	67.0	0.0
D	2,400	33	183	13.2	132.6	132.6	132.6	0.0
E	2,853	32	248	9.7	165.9	165.9	166.0	0.1
F	3,313	183	250	6.2	196.9	196.9	196.9	0.0
G	3,899	159	242	6.4	245.2	245.2	245.2	0.0
H	4,337	50	375	4.1	292.7	292.7	292.7	0.0
I	4,593	66	519	3.0	329.2	329.2	329.2	0.0
J	5,201	91	194	8.0	392.1	392.1	392.1	0.0
K	5,794	157	268	5.8	434.1	434.1	434.1	0.0
L	6,314	100	216	7.1	469.8	469.8	469.8	0.0
M	6,800	94	206	7.5	542.1	542.1	542.1	0.0
N	7,197	50	167	9.2	626.1	626.1	626.2	0.1
O	7,700	51	156	9.9	716.9	716.9	716.9	0.0
P	8,521	70	199	7.8	838.6	838.6	838.7	0.1
Q	9,200	38	142	10.8	951.4	951.4	951.5	0.1
R	9,896	34	131	10.7	1,092.5	1,092.5	1,092.6	0.1
S	10,500	45	142	9.9	1,162.7	1,162.7	1,162.8	0.1
T	10,900	21	61	9.8	1,228.2	1,228.2	1,228.2	0.0
U	11,604	22	64	9.3	1,348.2	1,348.2	1,348.2	0.0
V	11,730	16	76	7.8	1,356.7	1,356.7	1,356.7	0.0

<sup>1</sup>Feet above the Pacific Ocean

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

HOLUALOA DRAINAGEWAY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Holualoa Drainageway								
W	12,360 <sup>1</sup>	24	65	9.2	1,428.8	1,428.8	1,428.8	0.0
X	12,900 <sup>1</sup>	24	110	12.1	1,485.2	1,485.2	1,485.2	0.0
Y	13,700 <sup>1</sup>	145	245	5.4	1,607.3	1,607.3	1,607.4	0.1
Z	14,500 <sup>1</sup>	135	222	6.0	1,697.1	1,697.1	1,697.1	0.0
AA	15,400 <sup>1</sup>	121	194	6.8	1,841.1	1,841.1	1,841.1	0.0
Holualoa Drainageway Tributary								
A	353 <sup>2</sup>	29	86	9.6	1,251.1	1,251.1	1,251.1	0.0
B	1,011 <sup>2</sup>	46	96	7.3	1,336.3	1,336.3	1,336.3	0.0
C	1,525 <sup>2</sup>	68	103	7.7	1,380.0	1,380.0	1,380.0	0.0
D	2,017 <sup>2</sup>	14	12	5.2	1,421.7	1,421.7	1,421.7	0.0
E	2,417 <sup>2</sup>	22	14	4.6	1,468.2	1,468.2	1,468.2	0.0
Holualoa Drainageway Tributary Splitflow								
A	43 <sup>3</sup>	39	25	4.6	1,300.9	1,300.9	1,300.9	0.0
B	402 <sup>3</sup>	17	19	6.0	1,353.4	1,353.4	1,353.4	0.0

<sup>1</sup>Feet above the Pacific Ocean

<sup>2</sup>Feet above confluence with Holualoa Drianageway

<sup>3</sup>Feet above confluence with Holualoa Drainageway Tributary

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

HOLUALOA DRAINAGEWAY – HOLUALOA DRAINAGEWAY  
TRIBUTARY – HOLUALOA DRAINAGEWAY TRIBUTARY SPLITFLOW

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Kaluiiki Branch								
A	500 <sup>1</sup>	72	257	10.7	785.0	785.0	785.0	0.0
B	1,500 <sup>1</sup>	57	236	11.6	842.1	842.1	842.1	0.0
Kamuela Stream								
A	65 <sup>2</sup>	47	206	3.7	2,703.1	2,702.0 <sup>3</sup>	2,702.2 <sup>3</sup>	0.2
B	1,438 <sup>2</sup>	67	205	3.8	2,706.1	2,706.1	2,706.2	0.1
C	1,448 <sup>2</sup>	62	89	8.6	2,709.4	2,709.4	2,709.4	0.0
D	1,585 <sup>2</sup>	56	89	8.7	2,711.3	2,711.3	2,711.3	0.0
E	1,595 <sup>2</sup>	56	118	6.5	2,712.1	2,712.1	2,712.1	0.0
F	1,970 <sup>2</sup>	67	111	6.9	2,719.3	2,719.3	2,719.4	0.1
G	2,087 <sup>2</sup>	43	92	8.3	2,726.7	2,726.7	2,726.7	0.0
H	2,373 <sup>2</sup>	43	153	5.0	2,728.6	2,728.6	2,728.8	0.2
I	2,670 <sup>2</sup>	26	78	9.0	2,733.1	2,733.1	2,733.2	0.1

<sup>1</sup>Feet above confluence with Waipahoehoe Stream

<sup>2</sup>Feet above confluence with Lower Lanimaumau Stream

<sup>3</sup>Elevation computed without consideration of backwater effects from Lower Lanimaumau Stream

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

KALUIIKI BRANCH - KAMUELA STREAM

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Kamuela Stream (continued)								
J	2,748 <sup>1</sup>	46	194	3.6	2,738.8	2,738.8	2,739.0	0.2
K	2,863 <sup>1</sup>	50	155	4.6	2,739.6	2,739.6	2,739.8	0.2
L	3,211 <sup>1</sup>	175	247	2.9	2,745.1	2,745.1	2,745.3	0.2
M	3,539 <sup>1</sup>	66	143	5.0	2,751.3	2,751.3	2,752.0	0.7
N	4,170 <sup>1</sup>	90	62	4.5	2,755.9	2,755.9	2,755.9	0.0
O	5,022 <sup>1</sup>	79	67	3.0	2,769.9	2,769.9	2,770.0	0.1
Kaumalumu Drainageway								
A	647 <sup>2</sup>	235	557	7.3	27.0	27.0	27.5	0.5
B	1,357 <sup>2</sup>	160	431	9.4	56.7	56.7	57.5	0.8
C	2,028 <sup>2</sup>	352	737	5.5	74.7	74.7	75.7	1.0
D	2,541 <sup>2</sup>	117	309	13.1	112.4	112.4	113.2	0.8
E-Z*								

<sup>1</sup>Feet above confluence with Lower Lanimaumau Stream

<sup>2</sup>Feet above Pacific Ocean

\*Data not available

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

KAMUELA STREAM -- KAUMALUMALU DRAINAGEWAY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Keopu Drainageway								
A	140 <sup>1</sup>	250	271	2.7	11.4	11.4	11.8	0.4
B	545 <sup>1</sup>	205	300	5.4	19.9	19.9	19.9	0.0
C	810 <sup>2</sup>	134	219	7.4	36.2	36.2	36.3	0.1
D	1,370 <sup>1</sup>	80	551	2.9	53.1	53.1	53.9	0.0
E	2,020 <sup>1</sup>	57	94	17.2	105.8	105.8	105.8	0.0
F	2,495 <sup>1</sup>	77	110	14.7	134.8	134.8	134.8	0.0
G	3,195 <sup>1</sup>	65	173	9.3	23.0	203.2	203.3	0.3
Keopu Drainageway Overflow								
A	347 <sup>3</sup>	333	282	5.3	12.8	12.8	12.8	0.0
B	1,257 <sup>3</sup>	138	121	12.5	65.1	65.1	65.1	0.0
C	2,001 <sup>3</sup>	87	111	11.5	112.8	112.8	112.8	0.0
D	3,022 <sup>3</sup>	32	130	11.6	154.0	154.0	154.0	0.0
Keopu Drainageway Overflow Tributary								
A	100 <sup>4</sup>	52	61	15.3	137.4	137.4	137.4	0.0
B	360 <sup>4</sup>	46	65	4.3	147.3	147.3	147.3	0.0

<sup>1</sup>Feet above Pacific Ocean

<sup>2</sup>Station 810 equals effective station 870

<sup>3</sup>Feet above mouth

<sup>4</sup>Feet above confluence with Keopu Drainageway Overflow

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

KEOPU DRAINAGEWAY – KEOPU DRAINAGEWAY OVERFLOW -  
KEOPU DRAINAGEWAY OVERFLOW TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Lower Lanimaumau Stream								
A	862	168	225	3.6	2,619.1	2,619.1	2,619.4	0.3
B	2,630	99	125	6.4	2,634.9	2,634.9	2,634.6	0.0
C	3,577	813	1,962	0.4	2,635.6	2,635.6	2,635.6	0.0
D	3,835	81	117	6.8	2,640.5	2,640.5	2,640.5	0.0
E	4,853	294	575	2.0	2,641.4	2,641.4	2,641.4	0.0
F	5,045	116	204	7.5	2,649.5	2,649.5	2,649.8	0.3
G	5,926	183	322	4.8	2,662.3	2,662.3	2,662.6	0.3
H	6,414	209	345	4.4	2,677.0	2,677.0	2,677.7	0.7
I	7,130	64	681	2.2	2,687.6	2,687.6	2,687.7	0.1
J	7,548	163	900	1.7	2,688.8	2,688.8	2,688.8	0.0
K	7,590	123	187	10.0	2,692.2	2,692.2	2,692.2	0.0
L	11,165	40	260	3.0	2,703.4	2,703.4	2,703.9	0.5
M	11,205	24	76	10.1	2,711.2	2,711.2	2,711.2	0.0
N	11,517	25	122	6.3	2,713.5	2,713.5	2,713.7	0.2
O	11,562	24	76	10.1	2,723.5	2,723.5	2,723.5	0.0
P	11,902	33	125	6.1	2,728.5	2,728.5	2,729.0	0.5
Q	11,971	36	136	5.7	2,730.3	2,730.3	2,730.7	0.4
R	13,303	38	116	6.6	2,749.2	2,749.2	2,749.6	0.4
S	14,012	20	41	2.1	2,752.1	2,752.1	2,752.6	0.5
T	14,101	7	12	7.2	2,756.3	2,756.3	2,756.3	0.0

<sup>1</sup>Feet above downstream Limit of Study

\*Limit of Study approximately 1,000 feet upstream of Mamalahoa Highway

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

LOWER LANIMAUMAU STREAM

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Lower Lanimaumau Stream (continued)								
U	15,693	13	29	5.0	2,772.4	2,772.4	2,772.5	0.0
V	15,819	7	23	6.3	2,778.3	2,778.3	2,778.4	0.0
W	16,280	13	12	4.9	2,783.3	2,783.3	2,783.6	0.3
X	16,741	7	9	6.3	2,792.1	2,792.1	2,792.1	0.0
Y	17,374	12	19	3.1	2,798.4	2,798.4	2,798.5	0.1
Z	17,607	48	25	2.3	2,805.9	2,805.9	2,805.9	0.0
AA	17,980	9	10	6.1	2,807.2	2,807.2	2,807.2	0.0
AB	18,030	17	52	1.1	2,809.7	2,809.7	2,809.7	0.0
AC	18,108	25	53	1.1	2,809.7	2,809.7	2,809.7	0.0
AD	18,339	8	9	6.2	2,821.4	2,821.4	2,821.4	0.0
AE	18,627	38	59	7.2	2,822.7	2,822.7	2,822.7	0.0
AF	18,862	9	25	5.8	2,831.8	2,831.8	2,831.8	0.0
AG	19,186	14	137	1.1	2,832.4	2,832.4	2,832.5	0.1
AH	19,287	14	28	5.1	2,834.2	2,834.2	2,834.5	0.3
AI	19,459	18	31	4.6	2,838.1	2,838.1	2,838.1	0.0
AJ	19,770	27	34	4.2	2,843.4	2,843.4	2,843.5	0.1
AK	19,989	36	105	0.3	2,844.2	2,844.2	2,844.5	0.3
AL	20,049	9	7	5.0	2,845.1	2,845.1	2,845.1	0.0
AM	20,330	19	18	1.8	2,850.4	2,850.4	2,850.5	0.1

<sup>1</sup>Feet above downstream Limit of Study

\*Limit of Study approximately 1,000 feet upstream of Mamalahoa Highway

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

LOWER LANIMAUMAU STREAM

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Lower Lanimaumau Stream (continued)								
AN	20,426	13	8	4.4	2,854.2	2,854.2	2,854.2	0.0
AO	20,665	18	31	1.1	2,856.2	2,856.2	2,856.3	0.1
AP	20,796	28	18	1.9	2,863.3	2,863.3	2,863.4	0.1
AQ	20,913	45	149	0.2	2,863.4	2,863.4	2,863.5	0.1
AR	20,969	13	8	4.4	2,865.8	2,865.8	2,865.8	0.0

<sup>1</sup>Feet above downstream Limit of Detailed study

\*Limit of Study approximately 1,000 feet upstream of Mamalahoa Highway

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

LOWER LANIMAUMAU STREAM

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Palai Stream								
A	1,095	133	840	2.7	21.7	21.7	22.7	1.0
B	2,460	127	397	5.7	29.4	29.4	29.9	0.5
C	4,027	176	303	7.5	37.3	37.3	37.6	0.3
D	5,085	101	634	3.6	43.7	43.7	44.6	0.9
E	6,873	73	227	10.0	57.6	57.6	57.6	0.0
F	8,200	78	667	3.4	63.9	63.9	64.8	0.9
G	9,508	64	406	5.6	78.3	78.3	78.5	0.2
H	10,852	137	1,104	2.1	91.3	91.3	92.3	1.0
I	11,885	51	380	6.0	91.7	91.7	92.6	0.9
J	12,972	92	245	9.2	103.7	103.7	103.8	0.1
K	14,207	170	420	5.4	136.9	136.9	137.6	0.7
L	16,323	53	299	6.2	186.8	186.8	187.0	0.2
M	17,727	104	246	7.6	222.9	222.9	222.9	0.0
N	18,454	71	291	6.1	241.6	241.6	242.0	0.4
O	19,429	69	250	7.1	265.6	265.6	266.6	1.0
P	20,342	138	425	8.0	293.6	293.6	294.6	1.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

PALAI STREAM

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Queen Kaahumanu Highway Splitflow								
A	64	37	38	5.2	201.1	201.1	201.1	0.0
B	534	69	50	3.9	260.1	260.1	260.1	0.0
C	1,178	108	53	3.7	302.9	302.9	302.9	0.0
D	1,843	51	32	4.0	339.2	339.2	339.2	0.0
Queen Kaahumanu Highway Tributary								
A	360	141	188	6.0	294.0	294.0	294.0	0.0
B	554	116	172	6.5	304.8	304.8	304.8	0.0
C	728	360	1,596	0.7	324.8	324.8	324.8	0.0

<sup>1</sup>Feet above confluence Waiaha Drainageway Splitflow No. 2

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

QUEEN KAAHUMANU HIGHWAY SPLITFLOW – QUEEN KAAHUMANU HIGHWAY TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.1								
A	76	83	316	11.1	*	36.2 <sup>2</sup>	36.2	0.0
B	571	132	399	10.7	115.4	115.4	115.4	0.0
C	859	138	379	9.8	143.1	143.1	143.1	0.0
D	1,430	121	370	10.4	200.4	200.4	200.4	0.0
E	2,093	73	310	12.5	264.1	264.1	264.1	0.0
F	2,670	188	429	8.7	327.0	327.0	327.0	0.0
G	3,075	99	339	9.7	381.0	381.0	381.0	0.0
H	3,241	87	900	3.9	388.6	388.6	388.6	0.0
I	3,968	131	370	9.7	446.3	446.3	446.3	0.0
J	4,289	75	824	4.2	478.9	478.9	479.1	0.2
K	4,876	150	379	9.1	550.6	550.6	550.7	0.1
L	5,258	149	405	9.9	577.7	577.7	578.6	0.9
M	5,774	230	434	7.7	640.6	640.6	640.6	0.0
N	5,930	237	448	7.9	647.5	647.5	647.5	0.0
O	6,578	253	454	7.7	714.3	714.3	715.0	0.7
P	6,992	210	420	8.6	743.9	743.9	744.0	0.1
Q	7,618	148	377	9.4	810.4	810.4	810.4	0.0
R	8,131	96	787	4.3	854.4	854.4	854.5	0.1
S	8,493	113	324	11.3	893.1	893.1	893.1	0.0
T	8,921	107	356	12.1	987.9	987.9	987.9	0.0

<sup>1</sup>Feet above mouth

\*Elevation computed by coastal flooding – See Flood Insurance Rate Map for regulatory base flood elevation

<sup>2</sup>Computed without consideration of backwater effects from Pacific Ocean

TABLE 8	<b>FEDERAL EMERGENCY MANAGEMENT AGENCY</b>  <b>HAWAII COUNTY, HI</b>	<b>FLOODWAY DATA</b>
		<b>SOUTH KONA WATERCOURSE NO. 1</b>

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.1 (continued)								
U	9,311	174	395	8.7	1,037.5	1,037.5	1,037.5	0.0
V	9,737	122	355	10.9	1,097.2	1,097.2	1,097.2	0.0
W	10,309	192	437	9.3	1,171.9	1,171.9	1,172.2	0.3
X	10,922	131	359	10.9	1,252.2	1,252.2	1,252.6	0.4
Y	11,029	83	308	10.3	1,264.5	1,264.5	1,264.9	0.4
Z	11,822	119	285	8.8	1,347.4	1,347.4	1,347.4	0.0
AA	12,389	98	328	11.6	1,411.0	1,411.0	1,412.0	1.0
AB	12,687	91	345	12.0	1,427.2	1,427.2	1,427.7	0.5
AC	13,400	122	396	10.6	1,503.5	1,503.5	1,504.1	0.6
AD	14,399	187	434	9.4	1,609.6	1,609.6	1,609.6	0.0
AE	14,636	82	300	11.1	1,626.5	1,626.5	1,626.5	0.0
AF	15,149	106	333	10.0	1,677.2	1,677.2	1,677.2	0.0
AG	15,648	147	367	9.7	1,722.3	1,722.3	1,722.3	0.0
AH	16,147	234	438	9.2	1,765.3	1,765.3	1,765.3	0.0
AI	16,667	84	290	12.6	1,819.9	1,819.9	1,819.9	0.0
AJ	17,069	20	20	5.6	1,859.1	1,859.1	1,859.1	0.0
AK	17,591	37	24	4.7	1,902.9	1,902.9	1,902.9	0.0
AL	18,131	26	21	5.2	1,937.2	1,937.2	1,937.2	0.0
AM	18,668	26	21	5.2	2,007.2	2,007.2	2,007.4	0.2

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 1 (continued)								
AN	19,168	32	23	4.9	2,069.8	2,069.8	2,069.8	0.0
AO	19,651	30	23	5.0	2,133.8	2,133.8	2,134.0	0.2
AP	20,088	17	19	6.0	2,179.8	2,179.8	2,179.8	0.0
AQ	20,557	29	22	5.1	2,229.2	2,229.2	2,229.2	0.0
AR	20,722	40	25	4.5	2,251.0	2,251.0	2,251.0	0.0

<sup>1</sup>Feet above mouth

TABLE 8	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	HAWAII COUNTY, HI	
		SOUTH KONA WATERCOURSE NO. 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 2								
A	452	98	105	5.9	244.4	244.4	244.4	0.0
B	960	45	82	7.7	305.3	305.3	305.3	0.0
C	1,504	57	88	7.1	363.2	363.2	363.3	0.1
D	2,022	31	71	8.8	415.8	415.8	415.8	0.0
E	2,529	20	63	9.9	499.5	499.5	500.3	0.8
F	2,864	55	87	7.1	544.8	544.8	544.8	0.0
G	3,388	37	76	8.3	605.0	605.0	604.9	0.0
H	3,754	18	91	5.4	657.2	657.2	657.2	0.0
I	4,314	52	73	6.8	717.6	717.6	717.6	0.0
J	4,940	52	74	6.9	778.1	778.1	778.0	0.0
K	5,560	65	78	6.2	849.0	849.0	849.1	0.0
L	5,978	100	165	3.0	906.8	906.8	907.1	0.2
M	6,549	87	86	5.7	971.3	971.3	971.4	0.1
N	6,887	100	90	5.5	1,014.2	1,014.2	1,014.4	0.2
O	7,293	70	80	6.1	1,073.4	1,073.4	1,073.4	0.0
P	7,513	116	94	5.4	1,103.7	1,103.7	1,103.7	0.0
Q	8,181	130	98	5.0	1,180.8	1,180.8	1,180.8	0.0
R	8,358	59	70	7.1	1,200.3	1,200.3	1,200.3	0.0
S	8,967	58	75	6.5	1,285.6	1,285.6	1,285.7	0.1
T	9,390	35	64	7.7	1,337.8	1,337.8	1,337.8	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.3

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 2 (continued)								
U	9,760	55	83	7.8	1,381.1	1,381.1	1,381.5	0.4
V	10,169	38	71	8.0	1,430.0	1,430.0	1,430.6	0.6
W	10,701	84	74	5.4	1,480.1	1,480.1	1,480.1	0.0
X	11,121	197	130	2.4	1,517.6	1,517.6	1,517.6	0.0
Y	11,675	380	172	1.2	1,567.3	1,567.3	1,567.3	0.0
Z	12,110	255	325	1.2	1,589.9	1,589.9	1,589.9	0.0
AA	12,574	56	58	7.0	1,637.8	1,637.8	1,637.8	0.0
AB	13,096	20	46	8.7	1,696.6	1,696.6	1,696.9	0.2
AC	13,586	74	64	6.8	1,748.2	1,748.2	1,748.2	0.0
AD	14,052	36	56	7.1	1,791.8	1,791.8	1,791.8	0.0
AE	14,275	60	70	6.5	1,817.0	1,817.0	1,817.0	0.0
AF	14,776	40	90	4.5	1,858.6	1,858.6	1,858.6	0.0
AG	15,272	70	100	4.1	1,892.1	1,892.1	1,892.2	0.1
AH	15,806	36	55	7.5	1,958.9	1,958.9	1,959.0	0.0
AI	16,367	75	70	5.7	2,027.6	2,027.6	2,027.7	0.1
AJ	16,752	53	64	6.3	2,066.2	2,066.2	2,066.4	0.2
AK	17,344	234	96	4.2	2,139.9	2,139.9	2,139.9	0.0
AL	17,836	77	72	5.6	2,205.7	2,205.7	2,206.0	0.2
AM	18,288	77	74	6.2	2,257.7	2,257.7	2,257.7	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.3

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 2 (continued)								
AN	18,678	39	60	7.4	2,309.8	2,309.8	2,309.8	0.0
AO	19,171	56	65	6.3	2,362.3	2,362.3	2,362.3	0.0
AP	19,608	43	61	6.9	2,384.8	2,384.8	2,384.8	0.0
AQ	19,963	106	82	5.2	2,434.2	2,434.2	2,434.2	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.3

TABLE 8	FEDERAL EMERGENCY MANAGEMENT AGENCY  HAWAII COUNTY, HI	FLOODWAY DATA
		SOUTH KONA WATERCOURSE NO. 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.3								
A	83	105	128	6.2	48.2	48.2	48.2	0.0
B	516	119	113	5.8	100.3	100.3	100.3	0.0
C	1,019	92	110	6.2	162.6	162.6	162.6	0.0
D	1,451	76	126	7.3	197.2	197.2	197.2	0.0
E	1,966	56	97	7.7	252.0	252.0	252.0	0.0
F	2,488	93	139	7.1	304.6	304.6	304.6	0.0
G	2,945	42	105	9.0	354.3	354.3	354.3	0.0
H	3,537	58	118	8.3	418.4	418.4	418.4	0.0
I	4,042	57	118	8.6	466.8	466.8	466.8	0.0
J	4,538	63	121	8.0	520.3	520.3	520.3	0.0
K	4,904	82	130	7.3	578.6	578.6	579.3	0.7
L	5,436	52	116	8.6	648.3	648.3	649.0	0.7
M	5,972	45	109	8.9	698.1	698.1	698.1	0.0
N	6,481	65	126	8.1	776.8	776.8	776.9	0.1
O	6,981	140	158	6.0	816.9	816.9	816.9	0.0
P	7,457	60	123	8.8	887.4	887.4	887.5	0.1
Q	7,979	58	179	5.7	931.8	931.8	932.8	1.0
R	8,472	45	108	8.8	984.5	984.5	984.6	0.1
S	8,991	66	125	8.0	1,035.9	1,035.9	1,035.9	0.0
T	9,411	90	136	6.9	1,082.5	1,082.5	1,082.5	0.0
U	9,737	63	121	8.0	1,126.9	1,126.9	1,126.9	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 3

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.3 (continued)								
V	10,322	66	124	7.9	1,202.2	1,202.2	1,202.2	0.0
W	10,911	83	133	7.6	1,256.8	1,256.8	1,256.8	0.0
X	11,517	110	125	6.9	1,330.7	1,330.7	1,330.7	0.0
Y	12,036	32	108	11.4	1,378.9	1,378.9	1,379.6	0.7
Z	12,614	73	114	7.2	1,445.1	1,445.1	1,445.1	0.0
AA	13,042	68	111	7.4	1,498.0	1,498.0	1,498.0	0.0
AB	13,380	103	127	6.8	1,524.1	1,524.1	1,524.1	0.0
AC	13,778	75	119	7.5	1,575.2	1,575.2	1,575.2	0.0
AD	14,246	95	124	6.6	1,636.7	1,636.7	1,636.7	0.0
AE	14,668	72	114	7.1	1,682.4	1,682.4	1,682.4	0.0
AF	15,336	50	106	8.7	1,753.6	1,753.6	1,753.6	0.0
AG	15,849	71	114	7.1	1,822.2	1,822.2	1,822.2	0.0
AH	16,266	178	159	7.1	1,857.4	1,857.4	1,857.7	0.3
AI	16,785	80	134	8.0	1,914.4	1,914.4	1,915.3	0.9
AJ	17,303	90	123	6.6	1,964.2	1,964.2	1,964.2	0.0
AK	17,697	130	135	6.0	2,017.6	2,017.6	2,017.6	0.0
AL	18,321	106	128	6.3	2,082.3	2,082.3	2,082.3	0.0
AM	19,010	96	126	6.6	2,152.4	2,152.4	2,152.4	0.0
AN	19,533	107	128	6.3	2,218.6	2,218.6	2,218.6	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 3

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 4								
A	106	181	846	1.0	1,378.3	1,378.3	1,379.2	0.9
B	606	130	41	3.8	1,433.1	1,433.1	1,433.1	0.0
C	1,162	37	30	5.2	1,476.1	1,476.1	1,476.1	0.0
D	1,614	31	28	5.6	1,521.8	1,521.8	1,521.8	0.0
E	2,133	38	30	5.1	1,592.2	1,592.2	1,592.3	0.1
F	2,626	30	28	5.6	1,643.8	1,643.8	1,643.8	0.0
G	3,224	25	27	5.9	1,700.7	1,700.7	1,700.7	0.0
H	3,732	37	30	5.2	1,749.8	1,749.8	1,749.8	0.0
I	4,252	61	35	4.4	1,799.4	1,799.4	1,799.4	0.0
J	4,766	46	33	4.9	1,843.4	1,843.4	1,843.4	0.0
K	5,296	27	27	5.8	1,880.1	1,880.1	1,880.1	0.0
L	5,799	20	25	6.3	1,948.6	1,948.6	1,948.6	0.0
M	6,263	14	22	7.0	1,994.1	1,994.1	1,994.2	0.1
N	6,781	27	27	5.9	2,066.0	2,066.0	2,066.0	0.0
O	7,331	27	27	5.8	2,147.4	2,147.4	2,147.6	0.2
P	7,864	36	31	5.5	2,203.5	2,203.5	2,203.5	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.3

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 4

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 5								
A	338	147	143.0	6.0	*	10.4 <sup>2</sup>	10.4	0.0
B	697	136	218.0	3.9	33.8	33.8	33.9	0.0
C	1,379	74	117.0	7.3	62.8	62.8	63.1	0.3
D	1,891	48	92.0	7.8	97.2	97.2	97.5	0.3
E	2,226	58	92.0	7.2	137.1	137.1	137.4	0.3
F	2,671	64	95.0	7.0	205.9	205.9	205.9	0.0
G	3,164	53	127.0	5.2	323.4	323.4	324.2	0.7
H	3,673	76	102.0	6.9	453.1	453.1	453.3	0.2
I	4,015	59	72.0	6.3	534.3	534.3	534.3	0.0
J	4,559	58	71.0	6.4	704.3	704.3	704.2	0.0
K	5,084	51	89.0	7.6	816.7	816.7	816.6	0.0
L	5,494	91	103.0	6.5	944.3	944.3	944.5	0.2
M	5,762	90	104.0	6.3	999.1	999.1	999.1	0.0
N	6,213	63	95.0	7.0	1,093.7	1,093.7	1,093.7	0.0
O	6,816	41	83.0	8.1	1,196.1	1,196.1	1,196.1	0.0
P	7,322	50	88.0	7.5	1,320.2	1,320.2	1,320.2	0.0
Q	7,728	44	84	7.9	1,468.2	1,468.2	1,468.2	0.0
R	8,333	105	89	5.7	1,572.8	1,572.8	1,572.8	0.0
S	8,898	61	78	6.5	1,638.0	1,638.0	1,638.0	0.0
T	9,234	32	64	8.5	1,694.0	1,694.0	1,694.0	0.0
U	9,611	72	82	6.5	1,752.0	1,752.0	1,752.0	0.0

<sup>1</sup>Stream distance in feet above mouth    <sup>\*</sup>Elevation computed by coastal flooding – See Flood Insurance Rate Map for regulatory base flood elevation

<sup>2</sup>Computed without consideration of backwater effects from Pacific Ocean

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 5 (continued)								
V	10,108	39	65	7.5	1,823.3	1,823.3	1,823.3	0.0
W	10,564	39	59	7.1	1,872.2	1,872.2	1,872.1	0.0
X	11,094	35	57	7.3	1,938.2	1,938.2	1,938.2	0.0
Y	11,554	40	59	7.0	2,014.5	2,014.5	2,014.5	0.0
Z	12,020	71	42	4.5	2,072.0	2,072.0	2,072.0	0.0
AA	12,691	51	48	5.6	2,141.4	2,141.4	2,141.4	0.0
AB	13,148	23	37	7.3	2,208.2	2,208.2	2,208.2	0.0
AC	13,632	34	42	6.4	2,272.5	2,272.5	2,272.5	0.0
AD	14,187	23	50	8.3	2,338.9	2,338.9	2,338.9	0.0
AE	14,618	51	64	6.5	2,398.8	2,398.8	2,398.9	0.1
AF	15,065	82	73	5.8	2,465.9	2,465.9	2,465.9	0.0
AG	15,541	37	58	7.2	2,502.0	2,502.0	2,502.3	0.3
AH	15,936	43	139	3.0	2,530.3	2,530.3	2,530.4	0.1
AI	16,592	24	32	6.4	2,608.7	2,608.7	2,608.7	0.0
AJ	16,897	22	31	6.8	2,634.5	2,634.5	2,634.5	0.0

<sup>1</sup>Stream distance in feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 5A								
A	224	71	392	0.9	2,063.9	2,063.9	2,064.0	0.1
B	747	88	52	4.8	2,137.2	2,137.2	2,137.2	0.0
C	1,238	37	41	6.1	2,196.9	2,196.9	2,196.9	0.0
D	1,773	25	36	6.9	2,261.3	2,261.3	2,261.3	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.5

TABLE 8	FEDERAL EMERGENCY MANAGEMENT AGENCY  HAWAII COUNTY, HI	<b>FLOODWAY DATA</b>
		SOUTH KONA WATERCOURSE NO. 5A

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 6								
A	931	53	65	6.7	31.3	31.3	31.3	0.0
B	1,528	105	66	4.8	91.0	91.0	91.0	0.0
C	1,891	108	67	4.7	120.7	120.7	121.0	0.3
D	2,201	32	46	6.9	145.7	145.7	145.7	0.0
E	2,625	36	45	6.4	172.1	172.1	172.2	0.1
F	3,095	26	41	7.0	215.7	215.7	215.7	0.0
G	3,410	73	84	6.1	257.8	257.8	257.8	0.0
H	4,180	77	85	6.0	314.7	314.7	314.7	0.0
I	4,482	56	77	6.7	340.4	340.4	340.4	0.0
J	4,929	132	103	5.1	380.0	380.0	380.0	0.0
K	5,259	139	68	3.9	404.0	404.0	404.1	0.1
L	5,638	126	65	4.7	420.1	420.1	420.2	0.1
M	6,100	95	57	4.8	457.1	457.1	457.3	0.2
N	6,579	31	39	6.4	522.6	522.6	522.6	0.0
O	7,163	32	39	6.3	668.0	668.0	668.0	0.0
P	7,690	72	51	4.9	800.6	800.6	800.6	0.0
Q	8,116	26	37	7.0	875.7	875.7	875.7	0.0
R	8,673	22	35	7.2	977.8	977.8	977.8	0.0
S	9,267	45	44	5.7	1,145.4	1,145.4	1,145.4	0.0
T	9,626	48	43	5.9	1,216.5	1,216.5	1,216.5	0.0
U	10,143	61	47	5.3	1,288.1	1,288.1	1,288.1	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY  
HAWAII COUNTY, HI

**FLOODWAY DATA**

**SOUTH KONA WATERCOURSE NO. 6**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.6 (continued)								
V	10,571	34	40	6.2	1,344.8	1,344.8	1,345.1	0.3
W	11,089	29	37	4.7	1,483.0	1,483.0	1,483.0	0.0
X	11,590	18	26	6.9	1,678.2	1,678.2	1,678.2	0.0
Y	12,099	13	23	7.8	1,817.7	1,817.7	1,817.7	0.0
Z	12,654	40	34	5.3	1,946.5	1,946.5	1,946.5	0.0
AA	13,134	30	30	5.7	2,011.3	2,011.3	2,011.3	0.0
AB	13,593	47	35	4.9	2,096.5	2,096.5	2,096.5	0.0
AC	14,030	42	33	5.1	2,156.2	2,156.2	2,156.2	0.0
AD	14,539	86	42	4.1	2,238.7	2,238.7	2,238.7	0.0
AE	15,155	34	31	5.5	2,369.1	2,369.1	2,369.1	0.0
AF	15,672	52	36	4.8	2,465.4	2,465.4	2,465.4	0.0
AG	16,252	69	39	4.3	2,542.3	2,542.3	2,542.3	0.0
AH	16,617	44	33	5.9	2,570.9	2,570.9	2,571.0	0.1
AI	17,232	21	26	6.5	2,632.6	2,632.6	2,632.6	0.0
AJ	17,752	28	29	5.9	2,697.0	2,697.0	2,697.4	0.4
AK	17,936	23	31	5.6	2,728.4	2,728.4	2,728.5	0.1

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 7								
A	110	55	116	8.4	444.0	444.0	444.0	0.0
B	559	63	121	8.0	482.2	482.2	482.3	0.1
C	1,077	32	98	10.3	564.3	564.3	564.3	0.0
D	1,694	29	95	10.6	685.7	685.7	685.7	0.0
E	2,133	27	91	10.6	781.6	781.6	781.6	0.0
F	2,626	36	100	9.8	872.8	872.8	872.8	0.0
G	3,153	52	120	9.1	968.7	968.7	968.7	0.0
H	3,667	57	118	8.4	1,089.4	1,089.4	1,089.4	0.0
I	4,169	34	99	10.2	1,191.9	1,191.9	1,191.9	0.0
J	4,748	39	102	9.3	1,289.9	1,289.9	1,289.9	0.0
K	5,227	47	115	9.4	1,402.7	1,402.7	1,402.7	0.0
L	5,749	42	103	9.0	1,577.5	1,577.5	1,577.5	0.0
M	6,253	20	81	12.2	1,730.6	1,730.6	1,730.6	0.0
N	6,793	33	97	10.1	1,889.6	1,889.6	1,889.6	0.0
O	7,213	31	93	10.2	1,981.1	1,981.1	1,981.1	0.0
P	7,727	70	148	9.1	2,066.2	2,066.2	2,066.2	0.0
Q	8,223	35	97	9.7	2,147.5	2,147.5	2,147.6	0.1
R	8,757	48	109	9.0	2,260.6	2,260.6	2,260.6	0.0
S	9,284	32	95	9.9	2,364.7	2,364.7	2,364.7	0.0
T	9,635	74	127	7.6	2,423.8	2,423.8	2,423.8	0.0
U	10,164	81	137	8.1	2,501.6	2,501.6	2,501.6	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.8

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 7

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 7 (continued)								
V	10,423	73	126	9.0	2,539.0	2,539.0	2,539.8	0.8
W	10,954	92	125	6.9	2,596.1	2,596.1	2,596.1	0.0
X	11,497	118	142	6.2	2,011.1	2,011.1	2,011.3	0.1
Y	12,112	62	113	7.6	2,726.7	2,726.7	2,727.0	0.3
Z	12,534	71	137	6.3	2,746.3	2,746.3	2,746.3	0.0
AA	13,065	39	101	9.8	2,806.6	2,806.6	2,806.6	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.8

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 7

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 8								
A	961	428	818	1.9	30.6	30.6	30.6	0.0
B	1,549	105	199	7.9	62.6	62.6	63.0	0.4
C	2,008	115	206	7.6	92.5	92.5	92.9	0.4
D	2,562	89	272	5.8	122.2	122.2	122.4	0.2
E	2,901	167	233	6.7	141.6	141.6	141.6	0.0
F	3,354	95	200	8.6	160.7	160.7	160.7	0.0
G	3,814	117	178	8.8	208.9	208.9	208.9	0.0
H	4,409	119	207	7.6	274.1	274.1	274.1	0.0
I	5,115	138	220	7.1	325.0	325.0	325.0	0.0
J	5,522	61	202	10.3	345.4	345.4	345.7	0.3
K	6,026	79	222	9.7	370.7	370.7	370.7	0.0
L	6,433	67	208	10.2	405.2	405.2	405.2	0.0
M	7,007	50	269	7.7	434.0	434.0	434.0	0.0
N	7,543	25	100	11.7	475.6	475.6	475.6	0.0
O	8,032	34	108	10.7	532.6	532.6	532.6	0.0
P	8,428	32	104	10.9	593.5	593.5	593.5	0.0
Q	8,877	28	102	11.4	658.2	658.2	658.2	0.0
R	9,270	56	134	10.5	717.1	717.1	717.1	0.0
S	9,682	46	119	9.4	765.3	765.3	765.3	0.0
T	10,032	63	146	9.4	809.5	809.5	809.5	0.0
U	10,614	45	120	9.6	918.5	918.5	918.5	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY  
HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 8

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.8 (continued)								
V	11,082	47	120	9.7	1,014.1	1,014.1	1,014.1	0.0
W	11,536	105	160	9.0	1,083.7	1,083.7	1,083.7	0.0
X	12,038	38	111	10.0	1,170.4	1,170.4	1,170.4	0.0
Y	12,583	45	118	9.7	1,366.2	1,366.2	1,366.2	0.0
Z	13,051	26	93	11.2	1,489.3	1,489.3	1,489.3	0.0
AA	13,557	38	47	6.3	1,638.3	1,638.3	1,638.3	0.0
AB	14,063	18	37	8.7	1,772.8	1,772.8	1,772.8	0.0
AC	14,559	13	19	7.0	1,910.7	1,910.7	1,910.7	0.0
AD	15,064	46	28	4.6	2,047.4	2,047.4	2,047.4	0.0
AE	15,582	26	24	5.5	2,137.6	2,137.6	2,137.6	0.0
AF	15,997	46	27	5.5	2,241.5	2,241.5	2,241.5	0.0
AG	16,431	20	22	6.0	2,326.8	2,326.8	2,326.8	0.0
AH	16,981	16	20	6.4	2,425.2	2,425.2	2,425.2	0.0
AI	17,475	21	23	5.8	2,534.1	2,534.1	2,534.1	0.0
AJ	18,049	42	28	4.7	2,624.5	2,624.5	2,624.5	0.0
AK	18,517	25	37	3.5	2,684.7	2,684.7	2,684.7	0.0
AL	19,005	21	22	5.9	2,752.6	2,752.6	2,752.6	0.0
AM	19,297	29	25	5.3	2,791.9	2,791.9	2,791.9	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 8

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 8A								
A	243	123	66	5.9	16.4	16.4	16.4	0.0
B	656	38	109	3.6	25.4	25.4	25.5	0.1

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 8A

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.9								
A	222	80	65	5.2	597.0	597.0	597.3	0.3
B	772	47	55	6.4	651.0	651.0	651.0	0.0
C	1,286	30	33	6.0	704.1	704.1	704.1	0.0
D	1,730	103	63	5.5	766.6	766.6	766.6	0.0
E	2,185	120	63	4.5	808.9	808.9	808.9	0.0
F	2,625	38	45	6.4	841.8	841.8	841.9	0.1
G	3,131	108	68	4.8	880.9	880.9	880.9	0.0
H	3,666	77	62	5.3	937.9	937.9	937.9	0.0
I	4,141	53	51	5.6	994.6	994.6	994.6	0.0
J	4,574	40	47	6.4	1,070.2	1,070.2	1,070.5	0.3
K	5,047	29	42	7.0	1,147.0	1,147.0	1,147.0	0.0
L	5,512	77	61	5.2	1,210.5	1,210.5	1,210.5	0.0
M	6,004	46	49	6.0	1,275.3	1,275.3	1,275.3	0.0
N	6,500	17	30	7.5	1,344.8	1,344.8	1,345.0	0.2
O	7,061	27	36	7.3	1,475.7	1,475.7	1,476.1	0.4
P	7,588	32	37	6.3	1,626.8	1,626.8	1,626.8	0.0
Q	7,997	29	36	6.3	1,794.4	1,794.4	1,794.4	0.0
R	8,426	22	33	7.2	1,957.1	1,957.1	1,957.1	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No. 11

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 9

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 10								
A	234	77	71	5.6	889.4	889.4	889.5	0.1
B	746	26	51	8.3	941.8	941.8	942.8	1.0
C	1,201	20	33	7.3	981.6	981.6	981.8	0.2
D	1,736	14	10	4.7	1,084.0	1,084.0	1,084.0	0.0
E	2,215	44	61	9.1	1,142.7	1,142.7	1,143.6	0.9
F	2,751	45	65	7.2	1,215.5	1,215.5	1,215.6	0.1
G	3,272	16	26	7.6	1,264.8	1,264.8	1,264.8	0.0
H	3,797	24	30	6.9	1,375.1	1,375.1	1,375.1	0.0
I	4,254	52	39	5.0	1,472.5	1,472.5	1,472.5	0.0
J	4,749	17	27	7.5	1,614.0	1,614.0	1,614.0	0.0
K	5,248	37	35	5.6	1,778.2	1,778.2	1,778.2	0.0
L	5,417	15	26	7.8	1,878.5	1,878.5	1,878.5	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No. 11

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 10

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.11								
A	382	140	200	6.9	52.6	52.6	52.6	0.0
B	831	127	196	7.2	114.3	114.3	114.3	0.0
C	1,505	191	221	6.2	154.6	154.6	154.7	0.1
D	2,004	160	208	6.6	187.2	187.2	187.2	0.0
E	2,336	121	191	7.2	223.1	223.1	223.1	0.0
F	2,605	177	213	6.7	267.4	267.4	267.4	0.0
G	3,273	137	200	6.9	321.1	321.1	321.7	0.6
H	3,679	161	222	6.9	336.6	336.6	336.6	0.0
I	3,906	180	213	6.5	354.5	354.5	354.5	0.0
J	4,324	105	147	6.8	356.7	356.7	356.7	0.0
K	4,778	79	135	7.4	407.4	407.4	407.5	0.1
L	5,381	150	269	4.9	430.8	430.8	431.1	0.3
M	5,706	89	168	7.8	456.0	456.0	456.2	0.2
N	6,107	124	186	7.0	472.6	472.6	473.0	0.5
O	6,778	116	186	7.5	504.6	504.6	504.6	0.0
P	7,236	67	155	8.8	538.0	538.0	538.0	0.0
Q	7,749	62	143	8.5	575.3	575.3	575.3	0.0
R	8,140	74	155	5.7	596.9	596.9	597.1	0.2
S	8,614	85	109	6.6	622.2	622.2	622.2	0.0
T	9,090	55	109	8.1	662.7	662.7	663.1	0.4
U	9,557	98	139	7.0	734.9	734.9	734.9	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.12

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 11

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 11 (continued)								
V	10,074	120	144	6.5	798.2	798.2	798.2	0.0
W	10,470	102	134	6.8	848.5	848.5	848.5	0.0
X	11,014	94	195	4.6	867.3	867.3	867.3	0.0
Y	11,568	74	144	2.9	886.3	886.3	886.3	0.0
Z	12,118	36	56	7.2	930.6	930.6	931.1	0.5
AA	12,686	17	44	9.4	976.2	976.2	976.2	0.0
AB	13,142	71	70	5.8	1,056.8	1,056.8	1,056.8	0.0
AC	13,680	56	72	7.1	1,152.2	1,152.2	1,152.5	0.3
AD	14,163	19	38	8.2	1,213.9	1,213.9	1,213.9	0.0
AE	14,664	12	32	9.7	1,291.3	1,291.3	1,291.3	0.0
AF	15,191	16	36	8.9	1,383.3	1,383.3	1,383.3	0.0
AG	15,679	23	43	8.1	1,463.7	1,463.7	1,463.7	0.0
AH	16,154	16	36	9.0	1,517.5	1,517.5	1,517.5	0.0
AI	16,651	20	39	8.2	1,622.1	1,622.1	1,622.1	0.0
AJ	16,963	13	33	9.4	1,755.2	1,755.2	1,755.2	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.12

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 11

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.12								
A	2,145	257	1728	2.7	23.4	23.4	23.6	0.2
B	3,026	295	1188	4.8	35.8	35.8	36.1	0.3
C	3,664	326	1809	2.9	37.0	37.0	37.3	0.3
D	4,531	540	2130	2.4	39.3	39.3	39.6	0.3
E	4,769	186	454	9.0	40.4	40.4	40.4	0.0
F	5,334	254	753	6.7	49.7	49.7	49.8	0.1
G	6,171	173	807	5.0	59.7	59.7	60.0	0.3
H	6,578	307	509	7.7	71.2	71.2	71.8	0.6
I	6,960	114	380	10.9	81.3	81.3	81.3	0.0
J	7,700	199	482	10.8	96.4	96.4	96.4	0.0
K	8,145	160	562	7.6	108.3	108.3	108.3	0.0
L	8,495	264	962	4.4	114.2	114.2	114.2	0.0
M	9,013	327	480	8.7	116.2	116.2	116.5	0.3
N	9,662	172	448	10.2	164.5	164.5	165.5	1.0
O	10,441	260	555	9.2	223.9	223.9	224.2	0.3
P	11,044	230	601	6.7	245.9	245.9	246.4	0.5
Q	11,669	279	1050	3.6	254.1	254.1	254.4	0.3
R	12,293	252	480	8.6	266.6	266.6	266.6	0.0
S	12,980	215	454	8.4	295.2	295.2	295.2	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 12

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.12 (continued)								
T	13,454	197	432	8.5	316.6	316.6	316.6	0.0
U	14,266	85	325	11.1	409.8	409.8	410.3	0.5
V	14,938	94	213	8.5	448.7	448.7	448.9	0.2
W	15,419	143	240	7.5	489.4	489.4	489.4	0.0
X	15,863	102	210	8.2	534.5	534.5	535.0	0.5
Y	16,155	58	175	9.9	551.0	551.0	551.0	0.0
Z	16,619	122	218	8.3	566.0	566.0	566.0	0.0
AA	17,026	70	187	9.2	618.5	618.5	618.5	0.0
AB	17,485	148	244	7.5	708.9	708.9	708.9	0.0
AC	17,970	164	269	7.1	730.6	730.6	730.6	0.0
AD	18,480	138	355	10.7	797.1	797.1	797.4	0.3
AE	18,715	147	363	8.9	814.9	814.9	814.9	0.0
AF	19,335	155	370	8.7	851.3	851.3	851.4	0.1
AG	19,822	137	351	9.1	869.4	869.4	870.0	0.6
AH	20,032	159	401	9.8	884.7	884.7	885.4	0.7
AI	20,647	105	329	9.8	919.2	919.2	919.2	0.1
AJ	21,019	66	283	12.6	948.5	948.5	949.3	0.8
AK	21,403	122	344	11.3	1,027.5	1,027.5	1,028.4	0.9
AL	21,881	122	345	11.3	1,071.9	1,071.9	1,072.4	0.5

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 12

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 12 (continued)								
AM	22,442	205	428	9.0	1,141.9	1,141.9	1,142.9	1.0
AN	22,836	92	294	10.3	1,176.1	1,176.1	1,176.9	0.8
AO	23,615	206	391	9.0	1,231.3	1,231.3	1,231.5	0.2
AP	24,032	80	284	10.6	1,270.7	1,270.7	1,271.0	0.3
AQ	24,410	73	283	11.8	1,321.9	1,321.9	1,321.9	0.0
AR	24,931	71	272	11.1	1,426.5	1,426.5	1,426.6	0.1
AS	25,360	100	321	10.6	1,521.6	1,521.6	1,521.7	0.1

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY  
HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 12

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 13								
A	60	292	465	7.9	14.4	14.4	14.4	0.0
B	1,006	172	384	9.8	79.7	79.7	79.7	0.0
C	2,023	184	226	6.3	128.1	128.1	128.1	0.0
D	3,118	104	184	7.8	155.5	155.5	155.5	0.0
E	4,026	83	171	8.4	192.6	192.6	192.7	0.1
F	5,023	183	260	3.9	253.8	253.8	253.8	0.0
G	6,017	246	267	6.5	296.9	296.9	296.9	0.0
H	7,041	186	247	7.7	333.4	333.4	333.5	0.1
I	8,015	102	181	8.1	427.9	427.9	427.9	0.0
J	9,077	137	205	7.2	551.0	551.0	551.0	0.0
K	10,067	71	161	8.9	648.4	648.4	648.4	0.0
L	11,032	73	168	9.2	781.6	781.6	781.6	0.0
M	12,020	121	192	7.5	915.6	915.6	915.6	0.0
N	13,070	192	248	7.0	985.6	985.6	985.6	0.0
O	14,065	122	197	7.3	1,038.8	1,038.8	1,038.8	0.0
P	15,023	95	183	8.3	1,127.2	1,127.2	1,127.2	0.0
Q	16,066	123	213	8.1	1,296.2	1,296.2	1,296.2	0.0
R	17,058	101	183	8.2	1,488.9	1,488.9	1,489.0	0.1
S	17,431	88	182	8.9	1,560.9	1,560.9	1,561.0	0.1

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

**FLOODWAY DATA**

**SOUTH KONA WATERCOURSE NO. 13**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 14								
A	45	48	25	4.4	350.4	350.4	350.4	0.0
B	1,261	29	22	5.0	483.6	483.6	483.6	0.0
C	2,034	36	23	4.6	558.9	558.9	558.9	0.0
D	3,050	22	19	5.6	681.7	681.7	681.7	0.0
E	4,035	27	21	5.4	799.8	799.8	799.8	0.0
F	5,030	47	26	4.2	904.6	904.6	904.6	0.0
G	6,050	12	16	7.1	1,030.5	1,030.5	1,030.5	0.0
H	7,063	86	32	3.6	1,204.3	1,204.3	1,204.3	0.0
I	8,036	9	15	7.4	1,310.8	1,310.8	1,310.8	0.0
J	9,026	10	15	7.0	1,482.6	1,482.6	1,482.6	0.0
K	9,587	14	17	6.6	1,580.3	1,580.3	1,580.3	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.13

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 14

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 15								
A	76 <sup>1</sup>	75	126	7.5	513.7	513.7	513.7	0.0
B	1,044 <sup>1</sup>	59	116	8.1	599.4	599.4	599.4	0.0
C	2,042 <sup>1</sup>	104	141	6.7	694.6	694.6	694.6	0.0
D	3,053 <sup>1</sup>	85	131	7.3	817.9	817.9	817.9	0.0
E	4,016 <sup>1</sup>	102	138	6.9	965.6	965.6	965.6	0.0
F	5,032 <sup>1</sup>	85	131	7.3	1,128.5	1,128.5	1,128.5	0.0
G	6,059 <sup>1</sup>	74	126	7.6	1,301.1	1,301.1	1,301.1	0.0
H	7,029 <sup>1</sup>	45	103	9.4	1,437.9	1,437.9	1,437.9	0.0
I	7,761 <sup>1</sup>	52	113	8.8	1,565.3	1,565.3	1,565.3	0.0
South Kona Watercourse No.16								
A	102 <sup>2</sup>	120	273	3.7	535.5	535.5	535.5	0.0
B	1,119 <sup>2</sup>	81	132	7.4	662.3	662.3	662.3	0.0
C	2,127 <sup>2</sup>	89	136	7.3	803.3	803.3	803.3	0.0
D	3,116 <sup>2</sup>	58	117	8.4	948.5	948.5	948.5	0.0
E	4,140 <sup>2</sup>	68	124	8.0	1,111.0	1,111.0	1,111.0	0.0
F	5,151 <sup>2</sup>	43	106	9.2	1,256.4	1,256.4	1,256.4	0.0
G	6,157 <sup>2</sup>	40	104	9.4	1,416.6	1,416.6	1,416.6	0.0
H	7,073 <sup>2</sup>	69	124	8.4	1,577.0	1,577.0	1,577.1	0.1

<sup>1</sup>Feet above confluence with South Kona Watercourse No.17

<sup>2</sup>Feet above confluence with South Kona Watercourse No.15

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 15 – SOUTH KONA WATERCOURSE NO. 16

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 17								
A	78 <sup>1</sup>	130	206	7.3	115.8	111.9 <sup>2</sup>	111.9	0.0
B	2,017 <sup>1</sup>	157	278	5.6	169.6	169.6	169.6	0.0
C	4,062 <sup>1</sup>	180	232	6.5	308.9	308.9	308.9	0.0
D	6,129 <sup>1</sup>	98	190	7.9	489.2	489.2	489.2	0.0
E	8,030 <sup>1</sup>	183	233	6.5	653.6	653.6	653.6	0.0
F	10,020 <sup>1</sup>	112	198	7.6	873.1	873.1	873.1	0.0
G	12,045 <sup>1</sup>	63	163	9.3	1,156.0	1,156.0	1,156.0	0.0
H	14,596 <sup>1</sup>	142	214	7.2	1,541.8	1,541.8	1,541.8	0.0
South Kona Watercourse No.18								
A	134 <sup>3</sup>	60	72	6.5	829.1	829.1	829.1	0.0
B	1,549 <sup>3</sup>	68	75	6.2	1,031.7	1,031.7	1,031.7	0.0
C	3,093 <sup>3</sup>	84	81	5.6	1,273.9	1,273.9	1,273.9	0.0
D	4,621 <sup>3</sup>	80	80	5.8	1,470.9	1,470.9	1,470.9	0.0
South Kona Watercourse No. 19								
A	223 <sup>4</sup>	145	246	8.1	731.7	731.7	731.7	0.0
B	1,561 <sup>4</sup>	92	206	8.8	919.1	919.1	919.1	0.0
C	3,127 <sup>4</sup>	145	241	7.4	1,165.2	1,165.2	1,165.2	0.0
D	4,855 <sup>4</sup>	62	181	10.1	1,387.4	1,387.4	1,387.4	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No.13

<sup>2</sup>Elevations affected by backwater effects from South Kona Watercourse No. 13

<sup>3</sup>Feet above confluence with South Kona Watercourse No. 17

<sup>4</sup>Feet above confluence with South Kona Watercourse no. 20

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

**FLOODWAY DATA**

**SOUTH KONA WATERCOURSE NO. 17 – SOUTH KONA WATERCOURSE NO. 18 – SOUTH KONA WATERCOURSE NO. 19**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 20								
A	60	43	276	14.8	20.7	20.7	20.7	0.0
B	1,268	201	479	10.1	143.8	143.8	143.8	0.0
C	2,480	230	487	8.3	241.4	241.4	241.4	0.0
D	3,618	161	498	11.8	315.2	315.2	315.3	0.1
E	4,972	400	584	10.9	432.3	432.3	432.3	0.0
F	6,177	197	501	9.9	538.6	538.6	538.6	0.0
G	7,532	129	412	12.5	647.6	647.6	647.7	0.1
H	8,852	182	317	8.4	768.9	768.9	768.9	0.0
I	10,057	158	279	7.6	917.8	917.8	917.8	0.0
J	11,367	79	214	10.5	1,078.7	1,078.7	1,078.7	0.0
K	12,558	85	228	9.8	1,270.3	1,270.3	1,270.3	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 20

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 21								
A	17	195	496	6.4	*	4.3 <sup>2</sup>	4.9	0.6
B	721	263	632	5.5	24.8	24.8	25.2	0.4
C	1,286	171	403	9.2	66.6	66.6	67.6	1.0
D	1,543	125	328	9.2	98.5	98.5	98.9	0.4
E	1,974	123	331	9.5	128.6	128.6	128.8	0.2
F	2,335	175	359	8.2	138.8	138.8	138.9	0.1
G	2,797	131	306	9.3	155.2	155.2	156.1	0.9
H	3,264	104	282	9.3	190.0	190.0	190.0	0.0
I	3,646	123	261	11.2	235.1	235.1	236.1	1.0
J	4,028	186	347	8.9	280.7	280.7	280.7	0.0
K	4,514	84	260	10.1	338.2	338.2	338.7	0.5
L	4,823	122	287	8.9	375.8	375.8	375.8	0.0
M	5,750	54	97	8.0	460.2	460.2	460.8	0.6
N	6,261	49	94	8.1	504.2	504.2	504.2	0.0
O	6,612	57	99	7.4	537.7	537.7	538.2	0.5
P	6,849	46	94	8.5	566.9	566.9	567.9	1.0
Q	7,205	49	94	8.1	588.9	588.9	588.9	0.0
R	7,753	46	77	7.4	625.2	625.2	625.6	0.4
S	8,113	46	77	7.4	663.9	663.9	664.1	0.2

<sup>1</sup>Feet above mouth

\*Elevation computed by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation

<sup>2</sup>Elevation computed without consideration of backwater effects from Pacific Ocean

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 21

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 21 (continued)								
T	8,335	58	84	6.8	673.9	673.9	674.0	0.1
U	8,896	80	96	6.6	718.7	718.7	718.7	0.0
V	9,366	46	78	7.5	764.2	764.2	764.2	0.0
W	9,869	71	90	6.4	834.4	834.4	834.4	0.0
X	10,262	63	87	6.7	888.0	888.0	888.1	0.1
Y	10,703	24	68	6.9	917.0	917.0	917.2	0.2
Z	11,371	37	64	7.7	1,005.0	1,005.0	1,005.7	0.7
AA	11,716	57	74	6.6	1,036.5	1,036.5	1,036.5	0.0
AB	12,224	143	96	5.3	1,084.3	1,084.3	1,084.3	0.0
AC	12,631	73	79	6.0	1,138.0	1,138.0	1,138.2	0.2
AD	12,979	73	88	6.6	1,161.1	1,161.1	1,161.5	0.4
AE	13,460	89	85	5.8	1,201.0	1,201.0	1,201.0	0.0
AF	14,017	51	71	6.9	1,256.9	1,256.9	1,256.9	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 21

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 22								
A	113	49	31	4.8	615.7	615.7	615.8	0.1
B	629	16	22	7.0	659.0	659.0	659.0	0.0
C	1,103	30	27	5.5	707.9	707.9	708.0	0.1
D	1,630	20	24	6.5	796.9	796.9	796.9	0.0
E	2,120	38	30	5.2	853.6	853.6	853.6	0.0
F	2,631	43	31	4.9	913.7	913.7	913.7	0.0
G	3,171	13	16	6.7	975.5	975.5	975.5	0.0
H	3,683	59	25	3.9	1,003.5	1,003.5	1,003.5	0.0
I	4,040	30	21	4.9	1,063.6	1,063.6	1,063.6	0.0
J	4,384	38	23	4.4	1,075.7	1,075.7	1,075.7	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No. 21

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 22

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 23								
A	289	100	232	8.6	389.3	389.3	389.9	0.6
B	408	100	236	9.0	396.1	396.1	396.1	0.0
C	958	86	219	9.2	434.3	434.3	434.6	0.3
D	1,521	105	235	9.4	485.8	485.8	485.8	0.0
E	2,188	113	240	8.2	544.2	544.2	544.4	0.2
F	2,770	114	234	8.2	599.0	599.0	599.0	0.0
G	3,253	112	234	8.3	630.3	630.3	630.3	0.0
H	3,787	118	231	8.4	674.4	674.4	674.4	0.0
I	4,379	82	208	9.1	798.7	798.7	798.9	0.2
J	4,862	131	245	7.8	839.6	839.6	839.9	0.3
K	5,374	135	249	7.8	904.1	904.1	904.1	0.0
L	5,816	114	228	8.2	968.5	968.5	968.5	0.0
M	6,131	225	281	6.5	988.4	988.4	988.4	0.0
N	6,868	117	154	6.6	1,024.1	1,024.1	1,024.1	0.0
O	7,283	60	124	8.2	1,073.2	1,073.2	1,073.3	0.1
P	7,702	57	124	8.7	1,129.3	1,129.3	1,130.2	0.9
Q	8,233	57	121	8.4	1,187.6	1,187.6	1,187.8	0.2

<sup>1</sup>Feet above confluence with South Kona Watercourse No. 21

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 23

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No.24								
A	736	75	110	7.1	718.5	718.5	718.5	0.0
B	1,258	32	86	9.7	764.2	764.2	764.2	0.0
C	1,773	41	92	8.7	831.6	831.6	831.6	0.0
D	2,187	68	106	7.1	881.0	881.0	881.0	0.0
E	2,711	50	98	8.3	966.8	966.8	966.8	0.0
F	3,193	54	97	7.7	1,034.4	1,034.4	1,034.4	0.0
G	3,669	24	46	8.0	1,100.1	1,100.1	1,100.1	0.0
H	3,936	32	51	7.3	1,118.1	1,118.1	1,118.1	0.0

<sup>1</sup>Feet above confluence with South Kona Watercourse No. 25

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 24

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 25								
A	439	220	340	3.8	17.4	17.4	17.5	0.1
B	799	103	182	7.7	28.6	28.6	28.8	0.2
C	1,337	112	197	8.0	53.6	53.6	53.6	0.0
D	1,761	53	139	9.2	147.5	147.5	147.5	0.1
E	2,057	113	178	7.2	201.1	201.1	201.1	0.0
F	2,545	89	164	7.8	275.2	275.2	275.2	0.0
G	2,933	67	162	9.9	330.7	330.7	330.7	0.0
H	3,527	87	250	6.0	403.8	403.8	404.4	0.6
I	3,700	23	104	12.0	430.4	430.4	430.4	0.0
J	4,350	101	181	8.6	499.2	499.2	499.2	0.0
K	4,787	66	156	9.2	553.6	553.6	554.0	0.4
L	5,209	98	133	6.6	591.7	591.7	591.7	0.0
M	5,681	26	84	11.1	640.6	640.6	640.6	0.0
N	6,111	91	123	7.0	669.6	669.6	669.6	0.0
O	6,650	20	29	7.1	702.7	702.7	702.7	0.0
P	7,166	20	33	6.0	757.1	757.1	757.2	0.0
Q	7,690	40	41	6.1	824.4	824.4	824.4	0.0
R	8,064	16	9	4.2	869.8	869.8	869.8	0.0
S	8,551	18	9	4.0	957.0	957.0	957.0	0.0

<sup>1</sup>Feet above mouth

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

SOUTH KONA WATERCOURSE NO. 25

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Kona Watercourse No. 25 (continued)								
T	9,017	9	11	3.4	1,028.4	1,028.4	1,028.4	0.0
U	9,433	22	10	3.8	1,092.9	1,092.9	1,092.9	0.0
V	9,704	12	8	4.7	1,132.1	1,132.1	1,132.1	0.0

<sup>1</sup>Feet above mouth

TABLE 8	FEDERAL EMERGENCY MANAGEMENT AGENCY <b>HAWAII COUNTY, HI</b>	<b>FLOODWAY DATA</b>
		<b>SOUTH KONA WATERCOURSE NO. 25</b>

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Unnamed Stream No.1								
A	75 <sup>2</sup>	114	67	2.3	2,799.5	2,799.5	2,799.5	0.0
B	1,147 <sup>2</sup>	61	35	4.4	2,809.5	2,809.5	2,809.5	0.0
C	1,970 <sup>2</sup>	58	44	3.6	2,830.0	2,830.0	2,830.0	0.0
D	2,829 <sup>2</sup>	13	7	4.0	2,833.5	2,833.5	2,833.5	0.0
E	6,009 <sup>2</sup>	828	730	5.3	2,835.6	2,835.6	2,835.6	0.0
F	7,229 <sup>2</sup>	1,112	1,467	0.7	2,839.2	2,839.2	2,839.2	0.0
G	9,651 <sup>2</sup>	22	68	7.6	2,878.5	2,878.5	2,878.8	0.3
H	10,573 <sup>2</sup>	26	89	5.5	2,907.1	2,907.1	2,907.1	0.0
I	10,810 <sup>2</sup>	30	74	6.7	2,912.7	2,912.7	2,912.9	0.2
Unnamed Stream No. 3								
A-D <sup>1</sup>								
E	4,591 <sup>3</sup>	96	76	5.2	2,904.4	2,904.4	2,904.8	0.4
F	5,111 <sup>3</sup>	56	72	5.6	2,912.3	2,912.3	2,912.7	0.4
G	6,070 <sup>3</sup>	23	60	6.6	2,930.8	2,930.8	2,931.7	0.9
H	6,443 <sup>3</sup>	20	38	5.0	2,937.6	2,937.6	2,937.6	0.0
I	6,962 <sup>3</sup>	39	44	4.3	2,947.2	2,947.2	2,947.2	0.0

<sup>1</sup>Floodway not determined

\*Limit of Study approximately 500 feet upstream of 'Ainahua Alanui Road

<sup>2</sup>Feet above Limit of Study

<sup>3</sup>Feet above the confluence with Unnamed Stream No. 1

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

UNNAMED STREAM NO. 1 – UNNAMED STREAM NO. 3

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Upper Lanimaumau Stream								
A-C*								
D	3,025	41	152	11.1	2,876.7	2,876.7	2,876.7	0.0
E	3,530	32	140	12.1	2,890.9	2,890.9	2,890.9	0.0
F	3,757	31	139	12.1	2,914.3	2,914.3	2,914.4	0.1
G	4,317	54	241	7.0	2,941.8	2,941.8	2,941.9	0.1
H	4,448	25	126	12.9	2,963.1	2,963.1	2,963.1	0.0
I	4,931	16	28	7.5	2,992.3	2,992.3	2,992.3	0.0
J	5,580	13	26	8.1	3,064.7	3,064.7	3,064.7	0.0
K	6,568	17	30	7.1	3,139.0	3,139.0	3,139.0	0.0
L	6,875	11	25	8.4	3,180.0	3,180.0	3,180.0	0.0
M	7,308	12	26	7.9	3,216.8	3,216.8	3,216.8	0.0
N	7,409	14	27	7.8	3,234.2	3,234.2	3,234.2	0.0
O	7,573	31	34	6.1	3,248.2	3,248.2	3,248.2	0.0

<sup>1</sup>Feet above the confluence with Unnamed Stream No.1

\*Floodway not determined

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

UPPER LANIMAUMAU STREAM

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Waiaha Drainageway								
A	48	411	909	8.5	17.2	17.2	17.2	0.0
B	421	227	832	9.2	25.5	25.5	25.5	0.0
C	843	241	694	9.7	38.0	38.0	38.0	0.0
D	1,030	318	832	8.1	55.9	55.9	55.9	0.0
E	1,534	368	936	7.2	100.9	100.9	100.9	0.0
F	2,033	311	757	8.9	140.4	140.4	140.4	0.0
G	2,511	211	794	9.7	171.2	171.2	171.3	0.1
H	4,276	247	781	9.8	329.3	329.3	329.3	0.0
I	4,756	60	477	16.0	360.5	360.5	360.4	(0.1)
J	5,091	231	739	9.2	381.7	381.7	381.7	0.0
K	5,672	204	665	10.2	431.1	431.1	431.1	0.0
L	6,593	130	453	11.2	490.6	490.6	490.6	0.0
M	7,425	372	934	9.0	567.3	567.3	567.3	0.0
N	7,900	310	890	9.4	582.6	582.6	582.6	0.0
O	8,289	157	795	11.8	607.3	607.3	607.3	0.0
P	9,000	236	835	10.0	668.2	668.2	668.2	0.0
Q	9,667	846	5,353	1.6	705.9	705.9	705.9	0.0
R	10,007	136	692	12.0	726.2	726.2	726.3	0.1
S	10,541	252	949	8.7	848.5	848.5	848.6	0.1
T	11,075	177	708	11.7	925.5	925.5	925.5	0.0
U	11,935	101	631	13.1	1,067.9	1,067.9	1,068.0	0.1

<sup>1</sup>Feet above confluence with Pacific Ocean

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

WAIAHA DRAINAGEWAY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Waiaha Drainageway (continued)								
V	12,601	176	801	10.3	1,181.7	1,181.7	1,181.8	0.1
W	13,099	114	683	12.1	1,257.6	1,257.6	1,257.8	0.2
X	13,775	178	780	10.6	1,359.8	1,359.8	1,359.9	0.1
Y	14,431	260	839	9.9	1,452.1	1,452.1	1,452.1	0.0
Z	14,854	216	735	9.3	1,501.5	1,501.5	1,501.6	0.1
AA	15,014	148	652	10.5	1,530.1	1,530.1	1,530.2	0.1
AB	15,640	383	1,136	6.0	1,642.4	1,642.4	1,642.4	0.0
AC	16,412	209	708	9.7	1,764.6	1,764.6	1,764.6	0.0
AD	16,972	218	766	8.9	1,836.3	1,836.3	1,836.3	0.1
AE	17,515	239	855	7.3	1,937.4	1,937.4	1,937.4	0.0
AF	18,306	323	751	8.8	1,998.3	1,998.3	1,998.3	0.0

<sup>1</sup>Feet above confluence with Pacific Ocean

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

WAIAHA DRAINAGEWAY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Waiaha Drainageway Splitflow No. 1								
A	778 <sup>1</sup>	79	119	6.6	390.7	390.7	390.7	0.0
B	955 <sup>1</sup>	84	119	6.7	424.2	424.2	424.2	0.0
C	1,007 <sup>1</sup>	107	413	1.9	431.8	431.8	431.8	0.0
D	2,064 <sup>1</sup>	175	167	5.5	479.1	479.1	479.1	0.0
E	2,331 <sup>1</sup>	121	150	6.1	496.5	496.5	496.5	0.0
Waiaha Drainageway Splitflow No. 2								
A	576 <sup>2</sup>	398	806	2.1	43.9	43.9	43.9	0.0
B	929 <sup>2</sup>	384	378	4.5	57.3	57.3	57.3	0.0
C	1,822 <sup>2</sup>	168	249	6.8	91.6	91.6	91.6	0.0
D	3,016 <sup>2</sup>	185	264	6.4	146.2	146.2	146.2	0.0
E	3,808 <sup>2</sup>	82	220	7.7	189.8	189.8	191.1	0.3
F	3,900 <sup>2</sup>	231	1,252	1.4	200.1	200.1	200.1	0.0
G	4,070 <sup>2</sup>	123	208	7.1	206.5	206.5	206.5	0.0
H	4,728 <sup>2</sup>	126	235	6.3	255.9	255.9	255.9	0.0
I	5,436 <sup>2</sup>	218	416	3.6	275.8	275.8	275.8	0.0
J	5,881 <sup>2</sup>	101	106	5.8	311.4	311.4	311.4	0.0
K	6,665 <sup>2</sup>	98	122	6.1	347.7	347.7	347.7	0.0
L	7,314 <sup>2</sup>	172	152	5.3	377.0	377.0	377.0	0.0
M	8,224 <sup>2</sup>	70	124	6.5	444.3	444.3	444.3	0.0

<sup>1</sup>Feet above confluence with Waiaha Drainageway

<sup>2</sup>Feet above mouth at confluence with Pacific Ocean

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

WAIAHA DRAINAGEWAY SPLITFLOW NO. 1 – WAIAHA DRAINAGEWAY SPLITFLOW NO. 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Waiaha Drainageway Splitflow No. 2 (continued)								
N	8,775 <sup>1</sup>	81	257	9.3	476.7	476.7	476.7	0.0
O	8,917 <sup>1</sup>	166	327	7.3	492.2	492.2	492.2	0.0
P	9,111 <sup>1</sup>	246	390	6.1	506.8	506.8	506.8	0.0
Waiaha Drainageway Splitflow No. 3								
A	453 <sup>2</sup>	51	112	8.4	52.2	52.2	52.2	0.0
B	969 <sup>2</sup>	67	125	7.5	115.1	115.1	115.1	0.0
C	1,021 <sup>2</sup>	31	96	9.8	125.3	125.3	125.3	0.0

<sup>1</sup>Feet above mouth at confluence with Pacific Ocean

<sup>2</sup>Feet above confluence with Waiaha Drainageway

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

**FLOODWAY DATA**

**WAIAHA DRAINAGEWAY SPLITFLOW NO. 2- WAIAHA  
DRAINAGEWAY SPLITFLOW NO. 3**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Waiaha Drainageway Splitflow No. 6								
A	62	56	92	6.7	1,837.8	1,837.8	1,837.8	0.0
B	383	47	82	7.5	1,899.0	1,899.0	1,899.0	0.0
C	512	68	632	6.7	1,930.4	1,930.4	1,930.4	0.0
Waiaha Draiangeway Tributary								
A	101	99	349	10.4	1,480.3	1,480.3	1,480.3	0.0
B	284	143	401	9.0	1,507.4	1,507.4	1,507.4	0.0
C	803	138	295	8.0	1,584.1	1,584.1	1,584.1	0.0
D	1,606	169	307	7.7	1,715.2	1,715.2	1,715.2	0.0
E	2,340	160	319	7.4	1,807.4	1,807.4	1,807.4	0.0

<sup>1</sup>Feet above confluence with Waiaha Drainageway

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

**FLOODWAY DATA**

**WAlAHA DRAINAGEWAY SPLITFLOW NO. 6 – WAlAHA DRAINAGEWAY TRIBUTARY**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET LOCAL MEAN SEA LEVEL)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Waiakea Stream								
A	7,650	240	534	10.1	184.5	184.5	184.5	0.0
B	8,700	180	636	9.8	241.3	241.3	241.3	0.0
C	13,124	48	335	18.6	375.1	375.1	375.1	0.0
D	13,573	46	259	24.1	389.5	389.5	389.5	0.0
E	15,426	54	498	12.5	441.5	441.5	441.5	0.0
F	16,045	77	631	9.9	458.0	458.0	458.0	0.0
G	16,317	68	291	21.4	458.0	458.0	458.0	0.0
H	16,807	48	218	28.6	463.4	463.4	463.4	0.0
I	17,600	241	677	9.2	505.3	505.3	505.3	0.0
J	18,700	150	625	10.0	543.0	543.0	543.2	0.2
K	20,900	94	386	16.1	603.7	603.7	603.7	0.0
L	21,500	245	925	6.7	621.2	621.2	622.1	0.9
M	21,900	360	874	7.1	625.8	625.8	626.7	0.9

<sup>1</sup>Feet above confluence with Waiakea Pond

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWAII COUNTY, HI

FLOODWAY DATA

WAIAKEA STREAM

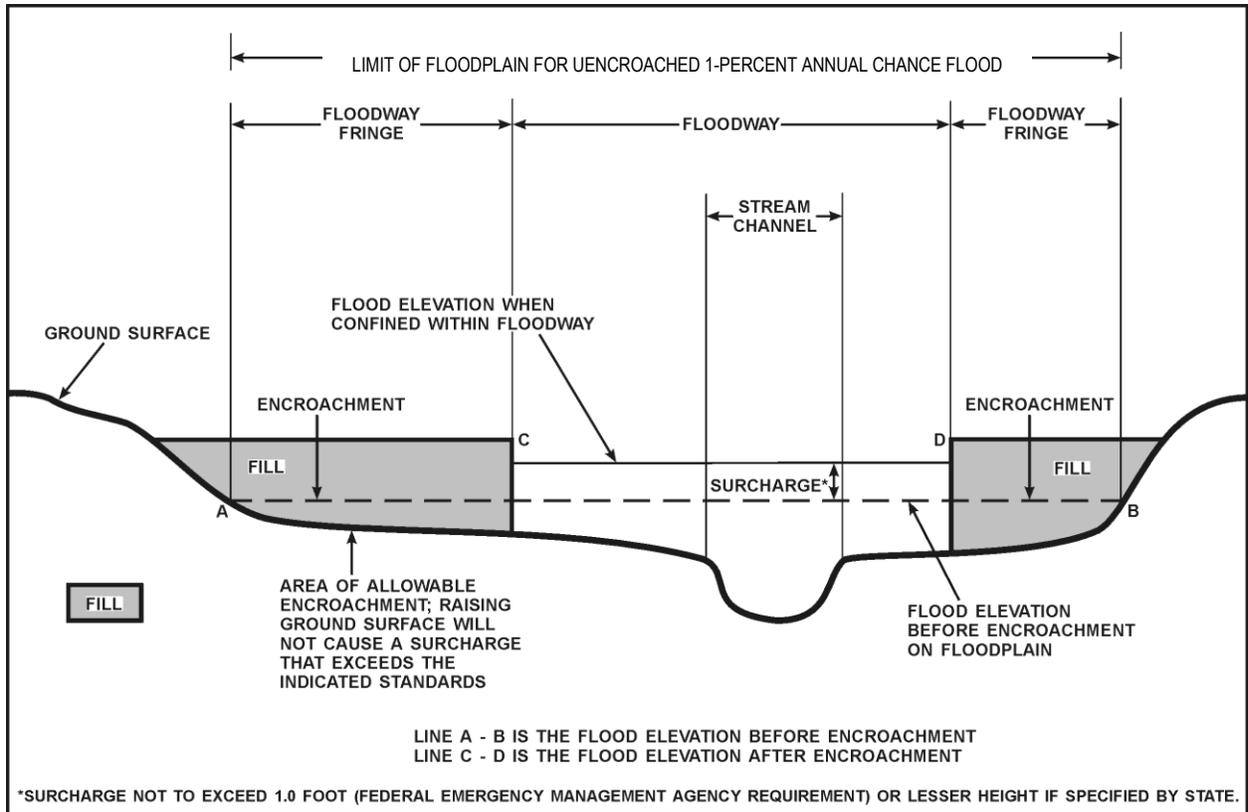


Figure 5: Floodway Schematic

Coastal tsunami floodplain boundaries were taken from the 1982 FIS for Hawaii County (FEMA, 1982). The portion of the coast inundated by the 1-percent annual chance tsunami wave was determined by utilizing tsunami wave elevations, runup elevations, and known topographic characteristics, and is also based on a depth of flooding by the incoming tsunami wave of 4.0 feet. The 1-percent annual chance tsunami inundation boundaries were delineated using methods outlined in Tsunami Inundation Prediction (C. L. Bretschneider, 1976).

Revisions to coastal tsunami floodplain boundaries that were completed as a part of this 2015 FIS revision including areas of Kapoho and Hilo are discussed in detail in Section 4.1 Floodplain Boundaries.

The Coastal High Hazard Area consists of all areas identified by Zone VE. Special performance standards for construction in these Coastal High Hazard Areas are required by FEMA.

The inundation limits for the 1-percent annual chance tsunami are based on existing conditions. Any modification or alteration to existing conditions may have a significant effect on the tsunami inundation limits. For example, any regarding or reduction of surface roughness in onshore areas, such as the removal of native vegetation, could increase the extent of inundation. Similarly, offshore dredge and fill operations could increase the extent of inundation because of the effects of coastal bathymetry on tsunami wave setup. However, existing or planned coastal features such as natural reefs, seawalls, groins, jetties, or beach stabilization projects may have a mitigating effect on tsunami inundation.

Previous and revised mapping of the tsunami hazard was merged with the detailed hurricane coastal hazard study in this revision. This was accomplished by comparing the zone type, base flood elevation, and inland flooding extent of coincident tsunami and hurricane storm surge hazards. The higher of the two elevations was retained and presented on the Flood Insurance Rate Map. If in a tsunami hazard-dominated area, the inland limit of the hurricane storm surge flooding extends further landward than the tsunami hazard, the tsunami base flood elevation is shown and the flooding extent is extended to where the hurricane hazard is mapped. This is to reflect the increased hazard generated by the use of updated topographic data. The VE Zone was extended and mapped to the inland limit of the Primary Frontal Dune for both tsunami and hurricane hazards. In cases where elevations were similar, engineering judgment was applied to facilitate the most appropriate representation of the higher hazard.

Users of the FIRM should also be aware that coastal flood elevations are provided in Table 5, “Summary of Coastal Hurricane Stillwater Elevations”, in this report. If the elevation on the FIRM is higher than the elevation shown in this table, a wave height, wave runup, and/or wave setup component, or tsunami hazard likely exist, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

As defined in the July 1989 *Guidelines and Specifications for Wave Elevation Determination and V Zone Mapping*, the coastal high hazard area (Zone VE) is the area where wave action and/or high velocity water can cause structural damage (*Guidelines and Specifications for Wave Elevation Determination and V-Zone Mapping*, FEMA, 1989). It is designated on the FIRM as the most landward of the following three points:

- 1) The point where the 3.0 ft or greater wave height or 4.0 ft tsunami flood depth could occur;
- 2) The point where the eroded ground profile is 3.0 ft or more below the maximum runup elevation; and
- 3) The primary frontal dune as defined in the NFIP regulations.

These three points are used to locate the inland limit of the coastal high hazard area to ensure that adequate insurance rates apply and appropriate construction standards are imposed, should local agencies permit building in this area.

#### 4.3 Tsunami Inundation Boundaries

Inundation limits from the 1-percent annual chance tsunami were computed for most of the coastline of Hawaii County. The methodology employed in this computation is described in Section 4.1. The 1-percent annual chance tsunami inundation zone is divided into two districts. Where the depth of water from the 1-percent annual chance tsunami exceeds 4 feet, the area is identified as Zone VE. The remainder of the area lying within the inundation limits of the 1-percent annual chance tsunami has a depth of flooding of less than 4 feet and is identified as Zone AE. All AE and VE Zones are identified on the FIRM, except where cliff conditions exist or where the zones are too narrow to show because of map scale limitations. In cases where the AE and VE Zones are too small to be shown separately, only Zone VE was shown.

The Coastal High Hazard Zone consists of all areas that are identified by Zone VE. Special performance standards for construction in Coastal High Hazard Zones have been set by FEMA. The Coastal High Hazard Zones and areas of known bore formations are delineated on the FIRM.

The inundation limits for the 1-percent annual chance tsunami are based on existing conditions. Any modification or alteration to existing conditions may have a significant effect on the tsunami inundation limits. For example, any regarding or reduction of surface roughness in onshore areas, such as that caused by the removal of native vegetation, could increase the extent of inundation. Similarly, dredge and fill operations offshore could increase the extent of inundation, due to the effects of coastal bathymetry on tsunami wave setup. On the other hand, existing or planned coastal features such as natural reefs, seawalls, groins, jetties, or beach-stabilization projects may have a mitigating effect on tsunami inundation.

## 5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

### Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

### Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the FIS by detailed methods. In most instances, whole - foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

### Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole - foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

### Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole - foot depths derived from the detailed hydraulic analyses are shown within this zone.

### Zone V

Zone V is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

## Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

## Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent annual chance floodplain, areas within the 0.2-percent annual chance floodplain, and to areas of 1-percent annual chance flooding where average depths are less than 1 foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent annual chance flood by levees. No base flood elevations or depths are shown within this zone.

## Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

## 6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole - foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

## 7.0 OTHER STUDIES

A USACE report on the Palai Stream and Four-Mile Creek drainage basins was completed in 1981 (USACE, 1981). Hydrology and hydraulic data from the report was incorporated into the April 2, 2004 study's computations.

The SCS published the North Kona Flood Plain Management Study in December 1984 (U.S. Department of Agriculture, 1984) and the South Kona Flood Hazard Analyses report in July 1977 (U.S. Department of Agriculture, 1977).

Information pertaining to revised and unrevised flood hazards within Hawaii County has been compiled into this FIS. Therefore, this FIS supersedes the previously printed FIS Report and FIRM for Hawaii County (FEMA, 2004).

## 8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see <http://www.fema.gov>.

Table 9, “Additional Information”, contains useful contact information regarding the FIS Report, the FIRM, and other relevant flood hazard and GIS data. In addition, information about the State NFIP Coordinator and GIS Coordinator is shown in this table. At the request of FEMA, each Governor has designated an agency of State or territorial government to coordinate that State's or territory's NFIP activities. These agencies often assist communities in developing and adopting necessary floodplain management measures. State GIS Coordinators are knowledgeable about the availability and location of State and local GIS data in their state.

Table 9: Additional Information

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	<a href="http://www.fema.gov">http://www.fema.gov</a>
NFIP website	<a href="http://www.fema.gov/national-flood-insurance-program">http://www.fema.gov/national-flood-insurance-program</a>
NFHL Dataset	<a href="http://msc.fema.gov">http://msc.fema.gov</a>
FEMA Region IX	Federal Regional Center, 1111 Broadway, Suite 1200, Oakland, CA 94607-4052 (510) 627-7181
Other Federal Agencies	
USGS website	<a href="http://www.usgs.gov">http://www.usgs.gov</a>
Hydraulic Engineering Center website	<a href="http://www.hec.usace.army.mil">http://www.hec.usace.army.mil</a>
National Oceanic and Atmospheric Administration	<a href="http://www.noaa.gov/">http://www.noaa.gov/</a>
National Geodetic Survey	<a href="http://www.ngs.noaa.gov/">http://www.ngs.noaa.gov/</a>
State Agencies and Organizations	
State NFIP Coordinator	Carol Tyau-Beam, CFM Hawaii Dept. of Land & Natural Resources P.O Box 373 Honolulu, Hawaii 96809 (808) 587-0267 carol.l.tyau@hawaii.gov
State GIS Coordinator	Arthur Buto GIS Program Manager 235 South Beretania Street, 6 <sup>th</sup> Floor Honolulu, Hawaii 96813 Phone: (800) 587-2894 arthur.j.buto@dbedt.hawaii.gov

## 9.0 BIBLIOGRAPHY AND REFERENCES

Cardone, V.J., Greenwood, C.V., and Greenwood, J.A.. (1992). Unified Program for the Specification of Hurricane Boundary Layer Winds over Surfaces of Specific Roughness. Contract Report CERC-92-1, U.S. Army Engineering Waterways Experiment Station, Vicksburg, Mississippi.

C. L. Bretschneider and P. G. Wybro. (July 1976). Tsunami Inundation Prediction, presented at 15<sup>th</sup> International Conference on Coastal Engineering. Honolulu, Hawaii.

County of Hawaii, Department of Public Works, Bureau of Plans and Surveys. (August 1983). Hilo Storm Drainage, Waiakea Stream Improvements Between Golden Shower Tree Estates, and Kawaihine Street Bridge, Job No. P-2565.

County of Hawaii, Department of Public Works, Bureau of Plans and Surveys. (June 1983). Widening of Palai Street Bridges. Waiakea, Hilo, Hawaii.

County of Hawaii, Department of Public Works, Bureau of Plans and Surveys. (August 1976). Hilo Storm Drainage, Waiakea Stream Improvements Between Golden Shower Tree Estates, and Kawaihine Street Bridge, Job P-2085.

County of Hawaii, Department of Public Works, Bureau of Plans and Surveys. (August 1976). Hilo Storm Drainage, Waiakea Stream Improvements at Kupulau Road, Job P-2085.

County of Hawaii, Department of Public Works (July 1974). Honokaa Park Development P-1929, Sheets C-2 and C-18.

County of Hawaii, Department of Public Works. (June 1969). Waimea Road Improvements. Waimea, South Kohala, Hawaii. Job No. P-1596.

D. C. Cox. (January 1980). Japanese Tsunamis in Hawaii – A Preliminary Report. Environmental Center, University of Hawaii.

Federal Emergency Management Agency. (May 3, 1982). Flood Insurance Study, Hawaii County, Hawaii.

Federal Emergency Management Agency. (February 2007). Atlantic Ocean and Gulf of Mexico coastal guidelines update, Final Draft. Federal Emergency Management Agency, Washington, D.C.

Federal Emergency Management Agency. (April, 2003). Appendix D: Guidance for Coastal Flooding Analyses and Mapping. Washington, D.C.

Federal Emergency Management Agency. (August 1, 2005). Procedure Memorandum No. 37 – Protocol for Atlantic and Gulf Coast Coastal Flood Insurance Studies in FY05. Washington, D.C.

Federal Emergency Management Agency, Federal Insurance Administration. (July 1989). Guidelines and Specifications for Wave Elevation Determination and V Zone Mapping, Third Draft. Washington, D.C.

Gourlay, M. R. (1996). Wave Set-Up on Coral Reefs. 2. Set-Up on Reefs with Various Profiles. Coastal Engineering, Vol.28, 17-55.

Hawaii County, Department of Public Works. (1967). Lanilaula Street Extension, Waiakea, South Hilo, Hawaii. Hilo, Hawaii.

Imata and Associates, Inc. Lehua Heights Subdivision, Unit 1 and 2. Hilo, Hawaii.

Imata and Associates, Inc. (December 1982). Golden Shower Tree Estates Subdivision, Units 1 and 2. Hilo, Hawaii.

Interagency Advisory Committee on Water Data, (March 1982) "Guidelines for Determining Flood Flow Frequency", Bulletin 17B, U.S. Department of the Interior, Geological Survey, Reston, Virginia.

Kuhio Village Roads Construction Plans. Hawaiian Homes Commission.

Le Provost, C., Lyndard, F., Molines, J.M., Genco, M.L., and Rabilloud, F. (1998). A Hydrodynamic Ocean Tide Model Improved by Assimilating a Satellite Altimeter-Derived Data Set. Journal of Geophysical Research v.103, p. 5513-5529.

Luetlich, R. A., Westerink, J. J., and Scheffner, N. W. (1992). ADCIRC: An Advanced Three-Dimensional Circulation Model for Shelves, Coasts, and Estuaries, Report 1: Theory and Methodology of ADCIRC-2DDI and ADCIRC-3DL. Technical Report DRP-92-6, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

National Weather Service (1959) The 1959 Central Pacific Tropical Cyclone Season, National Oceanographic and Atmospheric Administration, National Weather Service Annual Archives, accessed at: <http://www.prh.noaa.gov/hphc/summaries/1959.php>

National Weather Service (1982) The 1982 Central Pacific Tropical Cyclone Season, National Oceanographic and Atmospheric Administration, National Weather Service Annual Archives, accessed at: <http://www.prh.noaa.gov/hphc/summaries/1982.php>

National Weather Service (1992) The 1992 Central Pacific Tropical Cyclone Season, National Oceanographic and Atmospheric Administration, National Weather Service Annual Archives, accessed at: <http://www.prh.noaa.gov/hphc/summaries/1992.php>

National Weather Service (1993) Natural Disaster Survey Report, Hurricane Iniki, September 6-13, 1992. National Oceanographic and Atmospheric Administration, National Weather Service. 54 pages and appendices.

Neighbor Island Consultants. (Undated). Alenaio Stream Flood-Control Improvements, Plan and Profiles. Hilo, Hawaii.

- R. M. Towill Corporation. (North Kona Area, 1977). Topographic Maps, Scale 1:4,800, Contour Interval 5 and 10 feet.
- R. M. Towill Corporation. (September 1977). Kuhio Village, Increment II, Proposed Offsite Drainage Improvements, Exhibit B, Puukapu, Waimea, South Kohola. Hawaii.
- Scheffner, N.W. et al. (1999). Use and Application of the Empirical Simulation Technique: User's Guide. Technical Report CHL-99-21. U.S. Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory, Vicksburg, MS, 194 pages.
- State of Hawaii, Department of Transportation. (1952). Honokaa-Paauhau Road, Project No. S 238(1), Sheet Nos. 5,589.4, 5,589.5, and 5,589.6.
- State of Hawaii, Department of Transportation. (1952). Hawaii Belt Road, Project No. SDS 3(7), Sheet Nos. 5,590.4 and 5,590.5.
- U.S. Army Corps of Engineers, Honolulu District. (March 1990). General Design Memorandum and Environmental Assessment.
- U.S. Army Corps of Engineers. (Honokaa, Hawaii, April 1984; Kamuela, Hawaii, April 1984, February 1977; Hilo Mauka, Hawaii, June 1982; Palai, Four-Mile Creek Area, August 1980). Aerial Photogrammetric Maps, Scale 1:1,200, Contour Interval 5 feet.
- U.S. Army Corps of Engineers, Honolulu District. (September 1981). Flood Plain Management Planning Assistance Report for Palai Stream and Four-Mile Creek, Hilo, Hawaii.
- U.S. Army Corps of Engineers. (August 1977). Technical Report H-77-16, Tsunami Wave Elevation Frequency of Occurrence for the Hawaiian Islands. J. R. Houston, R. D. Carver, and D. G. Markle (authors). Vicksburg, Mississippi, Waterways Experiment Station.
- U.S. Army Corps of Engineers. (Honolulu, Hawaii, January 1977). Aerial Photogrammetric Maps, Scale 1:4,800, Contour Interval 10 feet.
- U.S. Army Corps of Engineers. (Honolulu, Hawaii, January 1977). Aerial Photogrammetric Maps, Scale 1:2,400, Contour Interval 5 feet.
- U.S. Army Corps of Engineers. (Honolulu, Hawaii, January 1977). Aerial Photogrammetric Maps, Scale 1:1,200, Contour Interval 5 feet.
- U.S. Army Corps of Engineers, Hydrologic Engineering Center. (October 1973). HEC-2 Water-Surface Profiles, Users Manual. Davis, California.
- U.S. Army Corps of Engineers, Honolulu District, in cooperation with the State of Hawaii, Department of Land and Natural Resources. (September 1970). Report No. 37, Flood Hazard Information, Island of Hawaii. Honolulu, Hawaii.
- U.S. Army Corps of Engineers, Honolulu District. (1965). Waiola Stream and Tributaries Flood-Control Project, Hilo, Hawaii (As-Built Drawings 30/30). Hilo, Hawaii.

U.S. Army Corps of Engineers, Hydrologic Engineering Center. (November 2002). HECRAS, River Analysis System, Version 3.1. Davis, California.

U.S. Army Corps of Engineers, Coastal Engineering Research Center. (1984). Shore Protection Manual, Volumes I and II, 4th Edition. Washington D.C.

U.S. Army Corps of Engineers, Galveston District. (1975). Guidelines for Identifying Coastal High Hazard Zones. Galveston, Texas.

U.S. Army Corps of Engineers, JALBTCX (2007). 2007 USACE NCMP Topobathy Lidar: Hawaiian Islands. Charleston, South Carolina

U.S. Census Bureau, (2014). Hawaii County, Hawaii

U.S. Department of Agriculture, Soil Conservation Service. (1972). National Engineering Handbook, Section 5, Hydraulics.

U.S. Department of Agriculture, Soil Conservation Service. (December 1984). North Kona Flood Plain Management Study.

U.S. Department of Agriculture, Soil Conservation Service. (July 1977). South Kona Flood Hazard Analyses.

U.S. Department of Agriculture, Soil Conservation Service. (South Kona Area, October 1976). Topographic Maps, Scale 1:4,800, Contour Interval 10 feet.

U.S. Department of Agriculture, Soil Conservation Service. (May 1976). WSP2 Computer Program, Technical Release No. 61.

U.S. Department of Agriculture, Soil Conservation Service. (December 1973). Soil Survey of Island of Hawaii, State of Hawaii.

U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the U.S. Army Corps of Engineers, Honolulu District, and the State of Hawaii. (March 1970). Hawaii Map FP-2, Hilo Flood Hazard Area. Hilo, Hawaii.

U.S. Department of Agriculture, Soil Conservation Service. (May 1965). Computer Program for Project Formulation – Hydrology, Technical Release No. 20.

U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the State of Hawaii, Mauna Kea Soil Conservation District. (November 1961). Watershed Work Plan, Puukapu Watershed.

U.S. Department of Commerce. (1962). Rainfall-Frequency Atlas of the Hawaiian Islands, Weather Bureau Technical Paper No. 43.

U.S. Department of the Interior, Geological Survey. (1967). Water-Supply Paper 1849, Roughness Characteristics of Natural Channels. Harry H. Barnes, Jr. (author). Washington, D.C.

U.S. Department of the Interior, Geological Survey. (Anaehoomalu, Hawaii, 1959; Hawi, Hawaii, 1957; Hila, Hawaii, 1963; Honauna, Hawaii, 1959; Honokaa, Hawaii, 1957; Honokane, Hawaii, 1957; Ka Lai, Hawaii, 1965; Kau Desert, Hawaii, 1963; Kauluo Point, Hawaii, 1962; Kawaihe, Hawaii, 1956; Keaau Ranch, Hawaii, 1963; Keahole Point, Hawaii, 1959; Kealakekua, Hawaii, 1960; Keawanui Bay, Hawaii, 1957; Mahukona, Hawaii, 1957; Makalawena, Hawaii, 1959; Makaopuhi Crater, Hawaii, 1963; Manuka Bay, Hawaii, 1962; Milolii, Hawaii, 1962; Naalehu, Hawaii, 1962; Naliikakani Point, Hawaii, 1963; Pahala, Hawaii, 1966; Papaikou, Hawaii, 1966; Pohue Bay, Hawaii, 1962; Punaluu, Hawaii, 1966; Puu Hinai, Hawaii, 1956; Puu Hou, Hawaii, 1962). 7.5-Minute Series Topographic Maps, Scale 1:2,400, Contour Interval 20 feet.

van der Meer, J.W. (2002). Wave Run-up and Overtopping at Dikes. Technical Report, Technical Advisory Committee for Water Retaining Structures (TAW), Delft, Netherlands.

Water Resources Council. (March 1976). Bulletin 17, "Guidelines for Determining Floodflow Frequency." Washington, D.C.

Wilsho, Okamota and Associates, Inc. (January 1967). Hilo Drainage and Flood-Control. Hilo, Hawaii.