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U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

Water-Supply Paper 555

SURFACE WATER SUPPLY OF HAWAII

JULY 1, 1921, TO JUNE 30, 1922

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Prepared in cooperation with the
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AUTHORITY FOR INVESTIGATIONS

This volume contains results of measurements of the flow of certain streams and ditches in the Territory of Hawaii made during the year ending June 30, 1922. The investigations leading to the report were made by the United States Geological Survey in cooperation with the Territory of Hawaii, under the general sanction of the organic law of the Survey (Stat. L., vol. 20, p. 394), which contains the following paragraph:

> *Provided*, That this officer [the Director] shall have the direction of the Geological Survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

As water is the most abundant and most valuable of the minerals, the investigation of water resources is authorized under the provision for examining mineral resources. The work has been supported since the fiscal year ending June 30, 1895, by appropriations in successive sundry civil bills passed by Congress under the following item:

> For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

The Legislature of the Territory of Hawaii approved on March 22, 1909, "An act to promote the conservation and development of the natural resources of the Territory," which provided in substance as follows: A special tax of 2 per cent shall be levied, assessed, and collected annually on all incomes in excess of $4,000; and all amounts so collected shall constitute a special fund to be expended only for the encouragement of immigration and the conservation of natural resources in the proportion of three-fourths for immigration and one-fourth for conservation. The conservation fund shall be used for the development, conservation, improvement, and utilization of the natural resources, and shall be available for expenditure at such times and in such manner as a board of three persons appointed in accordance with section 80 of the organic act shall, with the approval of the governor, determine.

An act of April 26, 1911, amended the original act so as to extend it until December 31, 1913.

On April 4, 1913, the Governor of the Territory of Hawaii approved the following acts providing (act 56) for the creation and maintenance

of a division of hydrography under the board of agriculture and forestry, and (act 57) appropriating the revenues from water licenses for the use of the board of commissioners of agriculture and forestry toward forest protection and hydrographic surveying.

Section 1 of act 56 reads:

The board of agriculture and forestry is hereby authorized to create and maintain a division of hydrography for the investigation and determination of the water resources of the Territory by the gaging of streams and rainfall and other means, in cooperation with the United States Geological Survey or otherwise, and in furtherance thereof to take over and exercise the functions of the Territory in the conduct of the present hydrographic survey of the Territory.

Section 2 provides that this act shall take effect July 1, 1913.

Section 1 of act 57 reads:

All revenues derived from water licenses issued by the Territory during the period beginning July 1, 1913, and ending June 30, 1915, whether by way of rentals or otherwise, shall constitute and be held as a special fund in the treasury of the Territory to be disbursed on warrants of the auditor issued on approved vouchers of the president of the board of commissioners of agriculture and forestry. Such moneys shall be apportioned and applied from time to time by the board of commissioners of agriculture and forestry, acting with the approval of the governor, equally between the division of forestry and the division of hydrography to the following general purposes, and not otherwise:

1. For the protection of forest reservations, established or set apart according to law, against damage by fire, animals, and otherwise by means of fences and any other means whatsoever, and for the expenditures of the division of forestry.

2. For the developemnt and maintenance of the hydrographic survey throughout the Territory.

Each voucher against said fund shall designate the general purpose for which t is drawn.

Section 2 provides that this act also shall take effect July 1, 1913.

Since June 30, 1915, the funds for the use of the division of hydrography have been supplied by successive appropriations from the general revenues of the Territory.

On March 23, 1917, the following act by the Legislature of the Territory of Hawaii was approved:

ACT 27

SECTION 1. The division of hydrography, authorized by and created pursuant to section 483 of the Revised Laws of Hawaii, 1915, is hereby transferred, together with all the materials, equipment, and supplies now under the control of the division or of the board of commissioners of agriculture and forestry for the division, to the commissioner of public lands.

SEC. 2. The commissioner of public lands shall have and exercise the same powers, duties, and jurisdiction with respect to said division as are now exercised by the board of commissioners of agriculture and forestry.

SEC. 3. All unexpended balances of appropriations heretofore made for said division, the expenditure of which is now by law vested in the board of commissioners of agriculture and forestry, are hereby transferred to the commissioner of public lands and the expenditure thereof vested in said commissioner.

SEC. 4. This act shall take effect upon its approval.

On April 27, 1917, act 156 by the Legislature of the Territory of Hawaii, "relating to the use of water from artesian wells" was approved, defining and prohibiting waste therefrom. Sections 5, 7, and 10 of this act read as follows:

SEC. 5. Any person boring, or causing to be bored, an artesian well shall keep a complete and accurate record of the depth and thickness of the different strata penetrated and within ninety days after the last day of boring, shall file such record in the office of the superintendent of hydrography of the Territory of Hawaii.

SEC. 7. For the more effectual carrying out of this act, the high sheriff and deputy high sheriff of the Territory, the sheriff and deputy sheriff of any county or city and county, all police officers, and any authorized representative of any city, or county, or city and county, or of the superintendent of hydrography of the Territory may at all times enter without warrant the premises where an artesian well is situated or whereon or wherein artesian water is used in order to procure such information or for such other purpose as may be necessary.

SEC. 10. This act shall take effect from and after July 1, 1917, A. D.

A special item in the appropriation for the division of hydrography provided $1,200 for "expenses, water investigation" to be used for obtaining information regarding artesian wells. Since that time no further appropriations for the purpose have been made.

COOPERATION

COOPERATION WITH THE TERRITORY OF HAWAII

Under the authority conferred by the Federal and Territorial legislation, the Director of the United States Geological Survey and the Governor of the Territory of Hawaii entered into a cooperative agreement, dating from July 1, 1910, for "the gaging of streams and the determination of the water supply of the Territory of Hawaii."[1]

The principal features of this agreement are:

1. The United States Geological Survey assumes the responsibility of gathering, analyzing, and publishing the data.

2. During the progress of the work all notes, maps, and data gathered as a result of field studies are at all times open to inspection by the representative of the Territory, and if they are not satisfactory the agreement can be terminated.

3. Accounts for payment of salaries, travel, and subsistence, supplies, or other expenses necessary to the completion of the work shall be rendered in the manner required by the laws and regulations of the contracting parties, and vouchers shall be preferred to either party for payment according as it may be convenient or according to the balance remaining in the respective allotments.

4. The cost of publication is borne entirely by the Geological Survey.

[1] The United States Geological Survey also cooperated with the Territory of Hawaii in mapping several islands. The whole of the islands of Kauai and Oahu and a part of the island of Hawaii have been mapped.

Unless otherwise stated, all data have been collected and are published under this cooperative agreement with the Territory of Hawaii, which has borne from 60 to 80 per cent of the cost thereof.

Until June 30, 1913, the Territory of Hawaii was represented in the cooperation by the Board of Conservation; from July 1, 1913, to March 23, 1917, by the Board of Commissioners of Agriculture and Forestry; and since this date by the Commissioner of Public Lands.

OTHER COOPERATION

Special investigations have been made in cooperation with the Hawaiian Department, United States Army, the city and county of Honolulu, and private persons and corporations, under one of the plans indicated in the following paragraphs:

1. Expense of work, equipment, or installation paid entirely or in part by the cooperating party or by direct reimbursement to the field men.

2. Records collected by employees of a cooperating party but under supervision of and by methods of the Survey.

3. Assistance given in the collection of records, such as furnishing transportation, subsistence, or equipment.

4. Records furnished by a cooperating party, collected by his methods and under his supervision.

Cooperation in the collection of records for whose accuracy responsibility has not rested with the Survey has been acknowledged in the descriptions of the stations. Special acknowledgment is due to the following companies cooperating under plans 1, 2, and 3: Island of Kauai—Waimea Sugar Co., Kekaha Sugar Co., and Princeville plantation; Island of Oahu—Wahiawa Water Co.; Island of Maui—Pioneer Mill Co., and East Maui Irrigation Co.

SCOPE OF WORK

The investigations of the surface waters of the Territory are not complete nor do they include all the streams and ditches that might advantageously be studied. They include, however, as many of the streams and ditches on the five larger islands as the available appropriations would allow. It is essential that records of stream flow should be kept during a period of years long enough to determine within reasonable limits the range of flow from the maximum to the minimum. The length of such a period manifestly varies for different streams. Experience has shown that the records should be kept from 20 to 30 years.

In the performance of this work an effort is made to reach the highest degree of precision possible with a rational expenditure of time and money. In all engineering work there is a point beyond

which refinement is needless and wasteful, and this statement applies with especial force to stream-measurement work in Hawaii. It has been found, however, that it is possible to obtain data which are sufficiently accurate, although many of those presented in this report are for periods too short to yield definite conclusions.

Special intensive investigations of the discharge of certain streams which are of major importance for domestic water supply, power, and irrigation have been made.

Investigations of ditch seepage and other losses, in certain localities, were made in cooperation with private corporations.

Records were kept of the artesian heads on typical wells in the more important artesian areas on Oahu.

DEFINITION OF TERMS

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated more or less definitely with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as "second-feet," "gallons per minute," "gallons per day," "miner's inches," and "run-off in second-feet per square mile," and (2) those which represent the actual quantity of water, as "run-off in inches," "million gallons," and "acre-feet." They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the unit for the rate of discharge of water flowing in a stream 1 square foot in cross section at a rate of 1 foot per second. It is generally adopted as the fundamental unit in the measurement of flowing water and is the "natural" unit, as the foot and the second are the units used in making the physical determinations.

"Gallons per minute" is generally used in connection with pumping and city water supply, the United States gallon of 231 cubic inches being the unit of quantity and 1 minute the unit of time.

The "miner's inch" is the unit for the rate of discharge of water that passes through an orifice 1 inch square under a head which varies locally. It is commonly used by miners and irrigators throughout the West, and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly, both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

In the Territory of Hawaii the unit most commonly used in measuring water is the "million gallons." This is used with two meanings—(1) to indicate a rate of flow and (2) to express an actual quantity of water. In the former sense "millions gallons per day" is inferred, 1,000,000 gallons being taken as the unit of quantity and 24 hours as the unit of time. With this meaning the term is generally used in connection with pumping and irrigation. In the latter sense "million gallons" as an absolute quantity is used in the measurement of storage capacities of reservoirs.

The following convenient approximate relations exist between second-feet, million gallons per day, and acre-feet: 1 second-foot flowing 24 hours equals about 2 acre-feet; 1,000,000 gallons equals about 3 acre-feet; and 1 second-foot equals approximately two-thirds million gallons per day.

"Man's water" is an irrigator's term also in common use in Hawaii. It signifiies the amount of water that one irrigator can properly handle in the field. It varies greatly, being dependent upon the condition of the furrows, the age of the crop, and the skill and individuality of the irrigator.

EXPLANATION OF TABLES

For each current-meter gaging station are given, in general, the folowing data: Description of station, list of discharge measurements, table of daily discharge, table of monthly and yearly discharge and run-off in acre-feet and million gallons.

All rates of flow are expressed as million gallons per day.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as shifting channels and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the utilization of the water, the maximum and minimum stage and discharge, and the accuracy of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, gage height, and discharge in second-feet and million gallons per day.

The table of daily discharge gives the discharge in million gallons per day corresponding to the observed gage height as determined from the rating table, the number of significant figures used varying with the size of the discharge.

In the table of monthly discharge the column headed "Maximum" gives the flow for the day when the total discharge was greatest. This does not correspond to the rate of flow at the crest of the flood which is given under the heading "Extremes of discharge." Likewise in the column of "Minimum "the quantity given is the flow for the day when the total discharge was least. The columns headed "Mean" give the average flow in million gallons per day and in cubic feet per second during the month. The "Total in million gallons" and "Total in acre-feet" given in the columns under these heads are computed from the mean discharge in million gallons per day.

Owing to the volcanic formation of the Hawaiian Islands there is so wide a diversity in the character and porosity of the rocks of the drainage basins that the determination of a general relation between rainfall and run-off is of no value. For this reason information concerning drainage areas has been omitted in the various station descriptions.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS

The accuracy of stream-flow data depends (1) on permanence of the relation between discharge and stage, (2) number, accuracy, and distribution of discharge measurements, and (3) on the accuracy of observations of stage and interpretation of data.

The accuracy recorded in the station description is based on the accuracy of the rating curve, the reliability of the gage-height record, the range of the fluctation in stage, and knowledge of local conditions. The use of "excellent," "good," "fair," or "poor," indicates that the probable errors are within 5, 10, 15, and 25 per cent, respectively.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published.

DIVISION OF WORK

The data were collected and prepared for publication under the direction of James E. Stewart and E. D. Burchard, district engineers, Honolulu, Hawaii, by Max H. Carson, office engineer, B. F. Rush, E. M. Pickop, W. C. Renshaw, S. B. Hall, Karl Jetter, Francis Kanahele, John Kaheaku, Keiji Suzuki, R. Y. Goo, Cheong Wong, Miss Lola F. Pryor, Mrs. C. H. Stevens, Miss Claudia L. Underwood, and Miss Marjory L. Rood. The manuscript has been prepared by B. L. Bigwood and reviewed by Max H. Carson.

PUBLICATIONS

The following table gives, by years, the numbers of the papers on the surface-water supply of Hawaii published from 1903 to 1922.

The data for any particular gaging station will be found in the reports covering the years during which the station was maintained. This table in conjunction with the list of stations following provides a convenient index for finding the data for any station. For example, to find the data for Koolau ditch near Keanae, Maui, refer to the list of stations, which shows that this station was operated from 1910 to 1912 and again from 1917 to date. Then referring to the table below it is found that Water-Supply Papers 318, 336, 485, 515, 516, 535, and 555 contain the data for the years during which the station was operated.

Numbers of papers on surface-water supply of Hawaii, 1903–1922

Year	No.	Year	No.	Year	No.
1903	[a] 77	1913–15	430	1918–19	515
1909–1911 [b]	318	1915–16	445	1919–20	516
1912 [b]	336	1916–17	465	1920–21	535
1913 [b]	373	1917–18	485	1921–22	555

[a] Water resources of Molokai, by Waldemar Lindgren.
[b] Calendar years; subsequent reports cover the year beginning July 1 and ending June 30.

GAGING STATIONS MAINTAINED IN HAWAII

The following list comprises the gaging stations maintained in Hawaii by the United States Geological Survey and cooperative parties. The stations are arranged by stream basins and appear in systematic order for the several islands, tributaries of main streams being indicated by indention. The dates show the years or parts of years for which records are available. A dash following the date indicates that the station was being maintained June 30, 1922.

KAUAI ISLAND

Waimea River below Kekaha ditch intake, near Waimea, 1921—
Waimea River near Waimea, 1910–1919.
Poomau River:
Kawaikoi Stream near Waimea, 1909–1917; 1919—
Waiakoali Stream near Waimea, 1909–1912; 1919—
Kauaikinana Stream near Waimea, 1919—
Mohihi Stream near Waimea, 1909–1912.
Mohihi Stream at elevation 3,500 feet, near Waimea, 1919—
Waiahulu Stream near Waimea, 1916–1920.
Koaie Stream near Waimea, 1916–1918.
Koaie Stream at elevation 3,700 feet, near Waimea, 1919—
Waialae River near Waimea, 1910–1916.
Waialae River at elevation 800 feet, near Waimea, 1916–1921.
Waialae River at elevation 3,700 feet, near Waimea, 1920—
Kekaha ditch at Camp No. 1, near Waimea, 1910–1915, 1917—
Kekaha ditch at flume No. 3, near Waimea, 1910–1912.
Kekaha ditch at flume No. 4, near Waimea, 1916–17.
Kekaha ditch at siphon near Waimea, 1910–1912.

Waimea River near Waimea, 1910–1919.—Continued.
Kekaha ditch at tunnel No. 12, near Waimea, 1910–1914.
Kekaha ditch below tunnel No. 12, near Waimea, 1916–
Waimea ditch near Waimea, 1911–1913, 1916–1921.
Kamenehune ditch near Waimea, 1911–1919.
Makaweli River near Waimea, 1911–1917.
Halekua Stream near Waimea, 1912–13.
Olokele River near Waimea, 1915–1917.
Olokele ditch at tunnel No. 12, near Makaweli, 1904–1917.
Olokele ditch at weir, near Makaweli, 1912–1917.
Poowaiomahaihai ditch near Waimea, 1911–1913.
Hanapepe River above Hanapepe Falls, near Eleele, 1911–12.
Hanapepe River at Koula, near Eleele, 1910–1916, 1917–1921.
Hiloa ditch near Eleele, 1911–1915.
East Branch Hanapepe River below Hanapepe Falls, near Eleele, 1911–12.
Hanapepe ditch at Hanapepe Falls, near Eleele, 1911–1915.
Hanapepe ditch at Koula, near Eleele, 1910–1921.
Hanapepe ditch at weir near Hanapepe, 1910–1917.
Manuahi Stream near Eleele, 1917–1920.
Huleia River near Lihue, 1912–1915.
Hanamaulu River at Kapaia, near Lihue, 1911–1914.
Wailua River:
South Fork of Wailua River at siphon near Lihue, 1910–1911.
South Fork of Wailua River near Lihue, 1911–
Hanamaulu ditch near Lihue, 1910–1919.
Lihue ditch near Lihue, 1910–1919.
North Fork of Wailua River near Lihue, 1910–1914.
North Fork of Wailua River at elevation 650 feet near Lihue, 1914–
Kanaha ditch near Lihue, 1910–
East Branch of North Fork of Wailua River near Lihue, 1912–
Uhau Iole Stream at elevation 750 feet, near Lihue, 1912.
Keahua Stream at elevation 750 feet, near, 1912.
Kawi Stream at elevation 750 feet, near Lihue, 1912.
Konohiki Stream at Makakualele weir (mauka), near Kapaa, 1911–1913.
Kaehulua Stream at Kuhinoa (mule stable) weir, near Kapaa, 1911–1913.
South Fork of Kaehulua Stream at Wainamuamu weir, near Kapaa, 1911–12.
North Fork of Kaehulua Stream at Wainamuamu weir, near Kapaa, 1911–1913.
Kapaa River near Kealia, 1910–1920.
Akulikuli Spring near Kealia, 1911–1913.
Kapahi ditch near Kealia, 1909–
Tunnel ditch at Kapahi, near Kapaa, 1909–1911.
Kapaa ditch at Kapahi, near Kapaa, 1909–1911.
Pipe ditch at Kapahi, near Kapaa, 1909–1911.
Kealia Stream:
Kaneha ditch near Kealia, 1909–1913.
Anahola River at elevation 1,140 feet near Kealia, 1912.
Anahola River near Kealia, 1910, 1912–
Anahola River at Kiokala dam, near Kealia, 1910–1912.
Anahola ditch above Kaneha reservoir, near Kealia, 1914–
Anahola ditch at Kiokala, near Kealia, 1909–1914.
Anahola ditch at makai weir, near Kealia, 1909–1911.
Kalihiwai River near Hanalei, 1914–
Kalihiwai River near Kilauea, 1912–1914.
Hanalei River at elevation 625 feet, near Hanalei, 1914–

Hanalei River near Hanalei, 1911–1919.
China ditch near Hanalei, 1911–1919.
Kuna ditch near Hanalei, 1912–13, 1916–1919.
Waioli Stream near Hanalei, 1914–
Lumahai River near Hanalei, 1914–1917, 1920–
Lumahai River near Wainiha, 1912.
Wainiha River near Hanalei, 1914–1917.
Wainiha River, East Channel, near Wainiha, 1912–1916.
Wainiha River, West Channel, near Wainiha, 1911–1916.
Wainiha canal at intake, near Wainiha, 1910–1916.
Wainiha canal at tunnel No. 18, near Wainiha, 1911.
Wainiha canal at tailrace, near Wainiha, 1911.

OAHU ISLAND

Kalihi Stream near Honolulu, 1913–
Nuuanu Stream at Luakaha weir in upper Nuuanu Valley, near Honolulu, 1903, 1910–1913.
Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, 1913–
Nuuanu Stream at Kuakini Street, near Honolulu, 1911–12.
Lulumaha ditch at upper Nuuanu reservoir, near Honolulu, 1911–1913.
Maole ditch, mauka station, near Honolulu, 1917–1920.
Maole ditch, makai station, near Honolulu, 1917–
Pauoa Stream at upper Pauoa Valley , near Honolulu, 1911–1913.
Kahuawai Spring, near Honolulu, 1912–1914.
Manoa Stream at upper Manoa Valley, near Honolulu, 1910–1913.
Manoa Stream at College of Hawaii, near Honolulu, 1909–1918.
West Branch of Manoa Stream near Honolulu, 1913–1921.
East Branch of Manoa Stream near Honolulu, 1913–1921.
East Manoa ditch near Honolulu, 1915–16, 1918–1921.
Palolo Stream:
Pukele Stream at Mahoe springs, near Honolulu, 1912–13.
Waiomao Stream at upper Palolo Valley, near Honolulu, 1911–1913.
Waiomao Stream above Pukele, near Honolulu, 1911–12.
Waimanalo ditch below main reservoir, near Waimanalo, 1912–13.
Pump ditch near Waimanalo, 1912.
Makawao ditch near Kailua, 1912–1916.
Kailua Stream near Kailua, 1912–1916.
Wong Leong's ditch near Kailua, 1912–1916.
Makawao Stream near Kailua, 1912–1916.
Makawao Spring near Kailua, 1914–1916.
Kaimi Stream near Kailua, 1912–1916.
Main Spring near Kailua, 1914–1916.
Kamakalepo Stream near Kailua, 1912–1916.
Pohakea Stream near Kailua, 1912–1914.
Kahanaiki Stream in Kailua Valley, near Kailua, 1912.
Kahanaiki Stream near Kailua, 1914–1916.
South Branch of Kahanaiki Stream near Kailua, 1913–14.
North Branch of Kahanaiki Stream near Kailua, 1913–14.
Kahanaiki ditch in Kailua Valley, near Kailua, 1912–13.
Kaneohe Stream near Kaneohe, 1914–1916.
Young Mau ditch near Kaneohe, 1914–1916.
Ahlo ditch near Kaneohe, 1914–1916.
Hooleinaiwa Stream near Kaneohe, 1914–1916.

Kaneohe Stream near Kaneohe, 1914–1916—Continued.
Piho Stream near Kaneohe, 1914–1916.
Kuou Stream near Kaneohe, 1914–1916.
Kuou ditch near Kaneohe, 1914–1916.
Luluku Stream near Kaneohe, 1914–1916.
North Luluku ditch near Kaneohe, 1914–1916.
Kawa Stream near Kaneohe, 1914–1916.
Heeia Stream:
Wing Wo Tai ditch near Heeia, 1914–1916.
Hop Tuck ditch near Heeia, 1914–1916.
Lee ditch near Heeia, 1914–1916.
Haiku Stream near Heeia, 1914–1919.
Reservoir ditch near Heeia, 1914–1916.
Waipio ditch near Heeia, 1914–1916.
Iolekaa Stream near Heeia, 1914–1916.
Waiahole Stream below power house near Waiahole, 1915.
Waiahole Stream near Waiahole, 1911–1916.
Waiahole Stream at Waiahole, near Waikane, 1911–12.
Waihi Stream near Waikane, 1911.
Halona Stream near Waikane, 1911.
Waianu Stream near Waikane, 1911.
Waikane Stream near Waikane, 1911–12.
Kahana Stream near Kahana, 1914–1917.
East Branch of Kahana Stream near Kahana, 1914–1917.
Punaluu Stream at elevation 539 feet, near Punaluu, 1915–1918.
Punaluu Stream at elevation 250 feet, near Punaluu, 1914–1918.
Punaluu Stream near Hauula, 1906–7.
Waihoi Stream near Punaluu, 1915–1917.
Kaluanui Stream near Hauula, 1906–7, 1915–1917.
Kaipapau Stream near Hauula, 1906–7.
Koloa Stream near Laie, 1914–1918.
Wailele Stream near Laie, 1914–1918.
East Branch of Kahawainui Stream near Laie, 1914–1918.
East Branch of Malaekahana Stream near Kahuku, 1914–1918.
Middle Branch of Malaekahana Stream near Kahuku, 1914–1918.
Kaukonahua Stream:
North Fork of Kaukonahua Stream near Wahiawa, 1911.
Right Branch of North Fork of Kaukonahua Stream near Wahiawa, 1913–
Left Branch of North Fork of Kaukonahua Stream near Wahiawa, 1913–
South Fork of Kaukonahua Stream above United States Army reservoir, near Wahiawa, 1911, 1913–1917.
United States Army ditch at reservoir, near Wahiawa, 1914–15.
South Fork of Kaukonahua Stream below United States Army reservoir, near Wahiawa, 1914–1917.
Wahiawa reservoir ditch near Wahiawa, 1910–11.

MOLOKAI ISLAND

Halawa Stream near Halawa, 1917–
Papalaua Stream near Wailau, 1919–
Wailau Stream:
Waiakeakua Stream near Wailau, 1919–
Pulena Stream near Wailau, 1919–

Pelekunu Stream near Pelekunu, 1919–
Lanipuni Stream near Pelekunu, 1919–
Waikolu Stream at elevation 650 feet, near Kalaupapa, 1920–
Waikolu Stream at pipe-line crossing, near Kalaupapa, 1919–

MAUI ISLAND

WEST MAUI

Iao Stream near Wailuku, 1910–1915.
Maniania ditch near Wailuku, 1909–1913.
Waiehu Stream:
South Waiehu Stream near Wailuku, 1910–1917.
South Waiehu ditch near Wailuku, 1912–1915.
North Waiehu Stream near Wailuku, 1912–1917.
North Waiehu ditch near Wailuku, 1910–11, 1916–17.
Waihee Stream near Waihee, 1910–1912, 1913–1917.
Waihee canal near Waihee, 1910–1912.
Waihee canal at weir, near Wailuku, 1911–12.
Spreckels ditch near Waihee, 1910–1913.
Spreckels ditch at Waiale weir, near Wailuku, 1910–11.
Kahakuloa Stream at Kahakuloa, near Waihee, 1912–13.
Kahakuloa Stream near Honokahau, 1913–14.
Honokahau Stream near Honokahau, 1913–1920.
Honokahau ditch at intake, near Honokahau, 1907–1913.
Honokahau ditch above Honolua Stream, near Honokahau, 1910–11.
Honokahau ditch at Honokawai weir, near Lahaina, 1910–1912.
Honolua Stream at Honolua ranch, 1911.
Honolua Stream near Honokahau, 1913–1917.
Honolua ditch near Honokahau, 1911–12.
Honokawai Stream near Lahaina, 1911; 1912–1917.
Honokawai Stream at weir No. 1, near Lahaina, 1901.
Honokawai ditch near Lahaina, 1912–1917; 1918–
Kahoma Stream near Lahaina, 1911–12; 1913–1917.
Kahoma Stream at weir No. 1, near Lahaina, 1901.
Kahoma Stream at weir No. 2, near Lahaina, 1901.
Kahoma development tunnel near Lahaina, 1911–1917.
Lahainaluna Stream above pipe-line intake, near Lahaina, 1916–
Lahainaluna Stream near Lahaina, 1911–1916.
Lahainaluna weir No. 1 near Lahaina, 1901.
Lahainaluna weir No. 2 near Lahaina, 1901.
Lahainaluna ditch near Lahaina, 1913–14.
Kauaula Stream near Lahaina, 1912; 1913–1917.
Kauaula Stream at weir No. 3, near Lahaina, 1901.
Kauaula ditch near Lahaina, 1911–1917.
Kauaula Stream, North Fork, at weir No. 1, near Lahaina, 1901.
Kauaula Stream, South Fork, at weir No. 2, near Lahaina, 1901.
Launiupoko Stream near Lahaina, 1911–1917.
Olowalu Stream near Olowalu, 1913–1916.
Olowalu ditch near Olowalu, 1911–
Ukumehame Stream near Olowalu, 1911–12; 1913–1919.
Waikapu Stream near Waikapu, 1910–1917.
Palolo (Everett) ditch near Waikapu, 1910–1917.
South Side Waikapu ditch near Waikapu, 1910–1917.

EAST MAUI

Koolau ditch region:
- Hanawi Stream near Nahiku, 1914–15; 1921–
- Kapaula Stream near Nahiku, 1921–
- Waiohue Stream near Nahiku, 1921–
- West Kopiliula Stream near Keanae, 1914–1917; 1921–
- East Wailuaiki Stream near Keanae, 1913–1917.
- West Wailuaiki Stream near Keanae, 1914–1917; 1921–
- East Wailuanui Stream near Keanae, 1914–1917; 1921–
- West Wailuanui Stream near Keanae, 1913–1917.
- Koolau ditch at Nahiku weir, near Nahiku, 1919–
- Koolau ditch near Keanae, 1910–1912, 1917–
- Koolau ditch at Wahinepe, near Huelo, 1922–
- Koolau ditch at Alo division weir, near Huelo, 1908–1911.
- Puohakamoa intake of Koolou ditch near Huelo, 1922–

Spreckles ditch region:
- Honomanu Stream at Haiku-uka boundary, near Kailiili, 1919–
- Honomanu Stream near Keanae, 1913–
- Haipuaena Stream at Haiku-uka boundary, near Kailiili, 1919–
- Haipuaena Stream near Huelo, 1910–
- Puohakamoa Stream near Huelo, 1910–
  - East Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, 1919–
  - Middle Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, 1919–
  - West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, 1919–
- Waikamoi Stream above Wailoa ditch, near Huelo, 1922–
- Waikamoi Stream near Huelo, 1910–1922.
  - East Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, 1918–
  - West Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, 1918–
- Alo Stream near Huelo, 1910–
- Oopuola Stream near Huelo, 1910–1915.
- Spreckels ditch at station No. 1, near Huelo, 1910–1913.
- Spreckels ditch at station No. 2, near Huelo, 1911–1913.
- Spreckels ditch at station No. 3, near Huelo, 1910–1913.
- Spreckels ditch at station No. 4, near Huelo, 1910–1913.
- Spreckels ditch at station No. 5, near Huelo, 1911–1913.
- Spreckels ditch at station No. 6, near Huelo, 1911–1913.
- Spreckels ditch below Kaaiea Gulch, near Huelo, 1917–
- Spreckels ditch at station No. 7, near Huelo, 1911–1912.
- Spreckels ditch at station No. 8, near Huelo, 1911–1913.

Center ditch region:
- Manuel Luis ditch at Puohakamoa Gulch, near Huelo, 1917–
- Center ditch at Waikamoi, near Huelo, 1918–1922.
- Center ditch below Kolea reservoir, near Huelo, 1922–
- Center ditch near Huelo, 1910–1912.

Hamakua ditch region:
- Nailiilihaele Stream, near Huelo, 1910–1912; 1913–1918; 1919–
- Kailua Stream at Haiku-uka boundary, near Kailiili, 1918–
- Kailua Stream near Huelo, 1910–1912; 1913–1918; 1919–

Hamakua ditch region—Continued.
Oanui Stream near Huelo, 1910–11; 1913–1916.
Hoolawaliilii Stream near Huelo, 1911–
Hoolawanui Stream near Huelo, 1911–
Honopou Stream near Huelo, 1910–
Halehaku Stream at dam near Huelo, 1910–11.
Halehaku Stream weir near Huelo, 1910–1912.
Opana Stream near Huelo, 1910–1912.
Opana ditch near Huelo, 1910–1912.
New Hamakua ditch at Nailiiliheale weir, near Huelo, 1910–1912.
New Hamakua ditch at Honopou, near Huelo, 1918–
New Hamakua ditch at Halehaku weir, near Huelo, 1910–
New Hamakua ditch at station No. 1, near Huelo, 1912.
New Hamakua ditch at station No. 2, near Huelo, 1912.
New Hamakua ditch at station No. 3, near Huelo, 1912.
New Hamakua ditch at station No. 4, near Huelo, 1912.
New Hamakua ditch at station No. 5, near Huelo, 1912.
Old Hamakua ditch at Kailua, near Huelo, 1919–1922.
Old Hamakua ditch at Honopou, near Huelo, 1918–1922.
Old Hamakua (Kauhikoa) ditch at Opana weir, near Huelo, 1910–
Kaluanui ditch at Puuomalei, near Hamakuapoko, 1910–1912.
Lowrie ditch at Opana weir, near Huelo, 1910–
Haiku ditch at Peahi weir, near Huelo, 1910–1914.
Haiku ditch at Manawai Gulch, near Peahi, 1914–

HAWAII ISLAND

Hilo group:
81 stations at elevation 2,700 feet, in forest back of Hilo, 1911–1913.
Olaa flume at Kaumana, near Hilo, 1917–1920.
Wailuku River near Hilo, 1911–1913, 1918–1919.
Hilo Boarding School ditch near Hilo, 1918–1919.
Honolii River at Kaiwiki, near Hilo, 1911–1913.
Honolii ditch at Kaiwiki, near Hilo, 1911.
Kawainui River at Kawainui, near Pepeekeo, 1911–12.
4 stations at Piihonua, near Hilo, 1912.
Hamakua group:
Waipio River below Koiawe, near Waipio, 1911–12.
Waipio River below Waima, near Waipio, 1911–12.
Waipio River at elevation 360 feet, near Waipio, 1901–2.
New Hamakua ditch at Waima Stream, near Waipio, 1912.
Lower Hamakua ditch at main weir, near Kukuihaele, 1910–1920.
Upper Hamakua ditch at Puualala and reservoir No. 3 weirs, near Kukuihaele, 1913–1920.
Kawainui Branch of Waipio River, near Waipio, 1911–12.
Kawainui Stream at elevation 2,120 feet, near Waipio, 1901–2.
Kawainui Stream at elevation 1,435 feet, near Waipio, 1901–2.
Kawainui Stream at elevation 775 feet, near Waipio, 1901–2.
Branch No. 3 of Kawainui Stream at elevation 1,700 feet, near Waipio, 1901–2.
Branch No. 2 of Kawainui Stream at elevation 1,405 feet, near Waipio, 1901–2.
Branch No. 1 of Kawainui Stream at elevation 1,380 feet, near Waipio, 1901–2.
Alakahi Stream at elevation 1,200 feet, near Waipio, 1901–2.
Alakahi Stream at elevation 730 feet, near Waipio, 1901–2.

Hamakua group—Continued.
Waipio River at elevation 360 feet, near Waipio, 1901–2—Continued.
Koiawe Stream at elevation 610 feet, near Waipio, 1901–2.
Waima Stream at elevation 790 feet, near Waipio, 1901–2.
Waima Stream at elevation 385 feet, near Waipio, 1901–2.
Kohala group:
Honokane Stream—
East Branch of Honokane Stream at elevation 1,300 feet, near Honokane, 1901.
East Branch of Honokane Stream at elevation 770 feet, near Honokane, 1901.
West Branch of Honokane Stream at elevation 1,370 feet, near Honokane, 1901.
West Branch of Honokane Stream at elevation 775 feet, near Honokane, 1901.
Kohala ditch above Honokane gulch, near Kohala, 1908–1918.
Kohala ditch at Awini weir, near Kohala, 1907–1917.
Kohala ditch at Niulii weir, near Kohala, 1907–1917.
Kehena ditch at Honokane mauka, near North Kohala, 1912–13.
Kehena ditch near Kohala, 1917–1919.
Kau group:
Waiohinu Springs, mauka station, near Naalehu, 1917–18.
Waiohinu Springs, makai station, near Naalehu, 1917–18.

GAGING-STATION RECORDS

ISLAND OF KAUAI

WAIMEA RIVER BELOW KEKAHA DITCH INTAKE, NEAR WAIMEA, KAUAI

LOCATION.—In Waimea Canyon, 8 miles by trail north of Waimea, at camp No. 1, 500 feet below Kekaha ditch intake.

RECORDS AVAILABLE.—July 24, 1921, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 40 feet below gage.

CHANNEL AND CONTROL.—Bed composed of boulders. Right bank vertical rock wall, 1,100 feet high. Left bank sloping and boulder-strewn; not subject to overflow. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 12.0 feet at 10.30 p. m. January 31 (discharge, from extension of rating curve, 1,800 million gallons per day or 2,790 second-feet); minimum stage recorded, 0.88 foot for several hours June 26–28 (discharge, 0.4 million gallons per day or 0.6 second-foot).

DIVERSIONS.—Entire low-water flow, except leakage through dam, is diverted into Kekaha ditch at intake 500 feet above station.

REGULATION.—By diversion only.

OBJECT OF STATION.—To determine amount of flow not diverted into Kekaha ditch.

UTILIZATION.—Low-water flow used for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation changed several times during year. Three rating curves used, all fairly well defined below 250 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair except those for high stages, for which they are poor.

Discharge measurements of Waimea River below Kekaha ditch intake, near Waimea, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 24	E. M. Pickop	1.35	3.2	2.1	Feb. 10	E. M. Pickop	2.17	56	36.5
Aug. 22	B. F. Rush	1.24	.85	.55	Mar. 30	S. B. Hall	1.14	4.3	2.8
Oct. 10	M. H. Carson	1.21	1.4	.9	May 19	E. M. Pickop	1.01	1.15	.75
Nov. 21	do	1.22	1.6	1.05					

Discharge, in million gallons per day, of Waimea River below Kekaha ditch intake, near Waimea, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		1.4	0.6	235	2.4	1.4	48	908	28	2.9	0.8	0.7
2		26	.6	98	11.2	1.2	31	567	12.0	2.9	.8	.6
3		2.4	.6	27	5.2	1.1	22	387	7.3	3.0	.8	.6
4		1.5	.6	4.2	1.6	7.1	17.5	231	17.1	2.7	.8	.6
5		61	.6	1.2	1.2	1.9	90	168	32	3.3	37	.6
6		4.6	.6	1.6	2.9	1.2	83	98	220	24	47	.6
7		.6	.6	21	1.1	1.2	16.9	104	199	72	3.0	.6
8		.6	.6	2.0	1.0	1.1	8.8	82	249	106	2.6	.6
9		.6	.6	1.1	1.0	1.1	6.4	51	306	16.4	16.3	.8
10		.6	.6	1.0	1.0	1.2	3.0	37	223	3.6	2.6	.8
11		.6	.6	1.0	1.0	23	1.2	49	146	3.0	2.1	.6
12		37	.5	1.0	1.1	201	1.2	125	182	29	.6	.5
13		30	.5	1.0	1.4	115	1.1	48	72	4.1	10.6	.5
14		.7	.5	1.0	1.2	88	1.2	86	30	35	.7	.5
15		.6	.5	1.0	1.1	12.0	1.5	61	12.3	17.0	.7	.5
16		.6	.5	1.0	1.1	258	1.5	24	8.0	3.3	.7	.5
17		.6	.8	1.1	1.0	134	1.5	17.7	12.2	4.9	.7	.5
18		.6	13.4	1.1	1.0	44	1.4	9.2	6.4	3.1	.6	.5
19		.6	1.3	1.1	60	7.1	1.2	5.4	36	9.2	.6	.4
20		.6	.5	1.1	5.0	2.9	39	4.2	4.9	116	.6	.4
21		.6	.5	1.1	1.5	61	385	3.2	3.5	73	.6	2.3
22		.6	39	1.1	51	742	192	12.0	3.0	3.4	.6	5.6
23		.6	16.3	1.1	326	478	60	45	10.4	.7	56	.5
24	2.0	.6	1.2	1.8	72	630	32	4.7	3.4	.7	272	7.5
25	1.4	8.1	.6	5.4	8.1	388	133	3.2	3.2	1.1	77	7.0
26	1.3	1.5	.5	57	16.3	230	213	3.2	3.0	.9	159	1.2
27	1.3	.6	.5	2.3	3.8	115	189	184	2.9	.8	47	.4
28	1.8	34	8.6	1.1	3.7	60	375	126	2.9	.8	3.6	.4
29	23	.7	1.4	1.0	2.4	56	285	-------	2.9	.8	.8	.4
30	3.0	.6	16.7	8.2	1.4	54	386	-------	2.9	.8	.7	.4
31	1.7	.6	-------	4.1	-------	34	698	-------	2.9	-------	.7	-------

Monthly discharge of Waimea River below Kekaha ditch intake, near Waimea, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July 24–31	23	1.3	4.44	6.87	35.5	109
August	61	.6	7.09	11.0	220	675
September	39	.5	3.68	5.69	110	339
October	235	1.0	15.7	24.3	487	1,490
November	326	1.0	19.6	30.3	589	1,800
December	742	1.1	121	187	3,750	11,500
January	698	1.1	107	166	3,330	10,200
February	908	3.2	123	190	3,440	10,600
March	306	2.9	59.5	92.1	1,840	5,660
April	116	.7	18.1	28.0	544	1,670
May	272	.6	24.1	37.3	748	2,290
June	7.5	.4	1.24	1.92	37.1	114
The period					15,100	46,400

KAUAIKINANA STREAM NEAR WAIMEA, KAUAI

LOCATION.—1 mile east of Kokee, 12 miles north of Waimea (20 miles from Waimea by road and trail), and 200 feet above Kokee-Mohihi trail.

RECORDS AVAILABLE.—July 1, 1919, to June 30, 1922. Miscellaneous measurements 1911–1916.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable at gage.

CHANNEL AND CONTROL.—Rocky boulder-strewn bed and high rocky banks. Control composed of large boulders. Subject to shift during high floods.

EXTREMES OF DISCHARGE.—Maximum stage not known; probably occurred January 31; minimum stage recorded, 1.71 feet at 2 p. m. October 23 (discharge, 0.17 million gallons per day or 0.26 second-foot).

1919–1922: Maximum stage recorded, 8.30 feet December 24, 1920 (discharge, 380 million gallons per day, or 588 second-feet); minimum discharge recorded in October, 1921.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high level (3,100 feet) diversion to serve semiarid Territorial lands now idle on account of lack of water.

UTILIZATION.—After it reaches Waimea River low-water flow is used for power and irrigation.

ACCURACY.—Stage-discharge relation changed February 27. Rating curve used June 1 to February 27, fairly well defined below 14 million gallons per day; curve used February 28 to June 30, fairly well defined below 30 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records June 1 to February 27 fair below 14 million gallons per day and poor above that quantity; records February 28 to June 30, fair below 30 million gallons per day and poor above that quantity.

Discharge measurements of Kauaikinana Stream near Waimea, Kauai during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 17	E. M. Pickop	1.82	0.55	0.35	Nov. 20	M. H. Carson	1.93	1.15	0.75
Aug. 23	do	1.77	.3	.2	Feb. 3	E. M. Pickop	2.92	18.3	11.8
Oct. 8	M. H. Carson	1.92	.9	.6					

Discharge, in million gallons per day, of Kauaikinana Stream near Waimea, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.5	0.4	0.2	3.4	1.0	0.3			3.7	1.9	1.1	1.1
2	.4	.4	.2	1.2	1.7	.3		20	3.3	1.9	1.0	1.0
3	.6	.4	.2	.5	1.0	.3			3.0	1.9	1.2	1.0
4	1.5	.4	.2	.3	.7	.6		7.8	2.9	1.9	1.8	1.0
5	1.0	2.1	.2	.3	.4	.4		5.6	2.7	2.3	3.3	1.0
6	.6	.8	.2	3.8	.3	.3		4.6	3.2	2.6	2.4	1.0
7	.5	.5	.2	2.9	.3	.3		4.2	5.6	2.6	2.1	1.0
8	.6	.4	.2	.8	.2	.2		3.6	11.2	4.8	1.6	1.0
9	.8	.4	.2	.4	.2	.2		3.3	18.7	2.5	1.6	1.0
10	.5	.4	.2	.3	.2	.2		3.0	6.9	2.1	1.5	.9
11	.4	.4	.2	.3	.2	.5	1.0	3.3	4.0	1.8	1.3	.9
12	.4	.5	.2	.3	.2	8.3		4.8	3.3	1.8	1.2	.9
13	.4	1.0	.2	.2	.2	3.8		3.1	3.2	1.6	1.2	.8
14	.4	.5	.2	.2	.2	2.2		5.5	2.9	1.6	1.1	.8
15	.4	.4	.2	.2	.2	1.2		3.3	2.7	1.6	1.0	.9
16	.4	.3	.2	.2	.2	18.3		2.8	2.9	5.2	1.0	.8
17	.4	.3	.2	.2	.2	4.2		2.6	3.5	3.2	1.0	.8
18	.4	.3	.2	.2	.2	1.9		2.5	2.7	2.5	1.0	.8
19	.5	.3	.2	.2	5.1	1.4		2.3	2.7	2.3	1.0	.7
20	.5	.3	.2	.2	.9	1.1		2.3	2.5	9.2	1.0	.7
21	2.3	.3	.3	.2	.5	1.0		2.2	2.4	3.0	1.0	1.0
22	.8	.3	.8	.2	1.9			2.6	2.3	2.1	1.0	1.0
23	.5	.3	.8	.2	15.4	20		2.6	4.8	1.8	3.7	.8
24	.5	.3	.4	.2	2.6		6.5	2.1	2.7	1.8	9.2	.7
25	.4	.3	.3	.3	1.2			2.0	2.3	1.7	2.7	.7
26	.4	.3	.2	1.0	1.0			2.0	2.3	1.6	5.4	.7
27	.4	.3	.3	.4	.6			19.8	2.1	1.3	2.4	.7
28	.4	.4	.4	.2	.5			8.1	2.1	1.2	1.7	.7
29	.6	.3	.3	.2	.4	3.8		-------	2.1	1.2	1.4	.6
30	.5	.3	.4	1.0	.4		17	-------	1.9	1.2	1.2	.6
31	.4	.2	-------	.8	-------			-------	1.9	-------	1.2	-------

NOTE.—No gage-height record Dec. 22 to Feb. 3; discharge estimated by comparison with flow of Waiakoali, Kawaikoi, and Mohihi streams. Discharge for December 21 based on gage-height record for part of day. Braced figures show mean discharge for periods indicated.

Monthly discharge of Kauaikinana Stream near Waimea, Kauai, for the the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	2.3	0.4	0.59	0.91	18.4	56
August	2.1	.2	.45	.70	13.8	43
September	.8	.2	.27	.42	8.2	25
October	3.8	.2	.67	1.04	20.8	64
November	15.4	.2	1.27	1.96	38.1	117
December	-------	.2	4.83	7.47	150	460
January	-------	-------	4.31	6.67	134	410
February	-------	2.0	5.93	9.18	166	510
March	18.7	1.9	3.82	5.91	118	363
April	9.2	1.2	2.41	3.73	72.2	222
May	9.2	1.0	1.91	2.96	59.3	182
June	1.1	.6	.85	1.32	25.6	78
The year	-------	.2	2.26	3.50	824	2,530

KAWAIKOI STREAM NEAR WAIMEA, KAUAI

LOCATION.—3 miles northeast of Eric Knudsen's mountain house and 21 miles by road and trail from Waimea.

RECORDS AVAILABLE.—April 13, 1909, to July 11, 1917, and July 1, 1919, to June 30, 1922. No record of value from December 17, 1916, to July 3, 1919.

GAGE.—Stevens continuous water-stage recorder installed August 4, 1919. Staff gage April 13, 1909, to May 26, 1910; Friez water-stage recorder May 26, 1910, to October 11, 1911; Barrett and Lawrence water-stage recorder October 11, 1911, to August 4, 1919.

DISCHARGE MEASUREMENTS.—Made by wading or from cable near trail-crossing 300 feet downstream.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below station. Banks high and wooded. Control composed of rock ledge and boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.06 feet at 10.30 p. m. January 31 (discharge, 1,020 million gallons per day or 1,580 second-feet); minimum stage recorded, 1.28 feet for several hours September 15 (discharge, 1.3 million gallons per day or 2.0 second-feet).

1909–1922: Maximum stage recorded, 15.2 feet December 18, 1916 (discharge not determined); minimum discharge recorded in September, 1921.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of diverting flood water into high level (3,100 feet) ditch to serve Territorial lands now idle on account of lack of irrigation.

UTILIZATION.—After it reaches Waimea River, low water is used for power and irrigation.

ACCURACY.—Records for this station published below for the period July 1, 1919, to June 30, 1921, supersede records previously published. Stage-discharge relation changed frequently. Three rating curves used, all well defined between 2 and 200 million gallons per day; extended above 200 million gallons per day. Operation of water-stage recorder satisfactory except during periods noted in footnote to tables of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for unusually high stages.

Discharge measurements of Kawaikoi Stream near Waimea, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 18	E. M. Pickop	2.36	35	22.6	Nov. 20	M. H. Carson	1.86	12.6	8.1
Aug. 23	do	1.40	3.3	2.1	Feb. 4	E. M. Pickop	2.58	49	31.5
Oct. 8	M. H. Carson	1.84	14.9	9.6					

Discharge, in million gallons per day, of Kawaikoi Stream near Waimea, Kauai, for the years ending June 30, 1920–1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1919–20												
1	4.0	5.0	37	2.8	1.8	1.6	25	8.1	3.6	9.2	3.9	4.0
2			9.0	5.8	1.8	28	13.4	7.6	3.3	8.8	3.7	3.1
3	4.2		4.5	3.9	1.7	147	13.4	7.2	3.2	8.1	3.5	2.7
4	4.4		3.7	2.4	1.6	29	10.5	6.9	3.2	7.7	3.4	2.6
5	4.4	3.9	3.8	9.9	1.6	34	13.2	6.6	3.2	7.4	3.2	9.7
6	4.4	3.8	5.8	23	4.2	19.1	92	6.6	33	8.3	3.2	9.1
7	4.7	3.6	8.5	4.8	13.1	10.3	69	6.9	50	8.8	3.2	4.4
8	6.0	7.9	10.5	4.9	3.4	6.9	16.4	17.6	121	6.8	3.2	4.9
9	51	14.4	60	2.9	16.0	15.2	37	9.7	16.4	6.2	3.1	3.4
10	13.3	6.9	10.9	2.3	7.5	16.6	44	7.4	71	5.7	3.0	13.2
11	11.8	3.4	5.2	3.5	39	7.9	13.2	8.6	143	5.7	3.0	27
12	5.8	2.6	3.7	9.4	12.4	5.7	11.0	10.3	202	5.3	2.9	34
13	25	2.4	3.0	3.2	5.8	4.7	27	6.8	133	5.0	2.9	26
14	29	3.9	2.6	2.2	3.3	5.4	46	5.7	23	6.0	2.8	17.4
15	33	10.4	2.4	2.0	2.5	15.2	162	5.0	15.2	5.2	2.7	10.4
16	12.6	16.3	2.3		2.2	6.8	194	4.7	12.4	4.7	2.7	12.1
17	5.7	5.6	2.3		2.0	7.0	156	4.4	13.0	4.3	2.8	8.3
18	5.3	3.2	2.2	1.8	1.8	6.3	164	4.2	107	23	10.6	6.1
19	32	9.1	2.0		1.8	4.5	36	4.1	201	10.2	7.2	4.4
20		60	2.4		1.8	3.8	25	4.0	84	14.1	3.9	3.7
21		30	2.3	10	7.0	3.3	41	3.9	33	70	3.2	3.2
22		10.1	2.1		15.0	17.5	36	3.8	69	57	2.8	3.0
23		5.7	2.0	12.6	4.0	48	17.7	4.1	94	27	2.8	4.5
24		4.0	1.9	10.5	6.4	8.1	15.2	3.9	76	11.0	3.9	3.7
25	5.0	3.3	1.9	3.9	2.9	5.7	13.2	12.5	111	7.9	4.1	3.1
26		3.0	1.8	2.4	2.2	27	27	30	40	6.3	9.9	2.8
27		2.8	1.8	1.9	1.9	15.2	21	6.8	23	5.2	4.4	2.8
28		2.5	1.8	3.8	1.8	22	12.0	4.7	16.4	4.7	3.2	2.7
29		2.4	1.8	4.4	1.8	55	10.5	4.0	13.2	4.4	19.4	3.6
30		2.3	1.8	2.6	1.7	75	9.2	-------	11.7	4.1	28	3.8
31		10.2	-------	2.1	-------	41	8.6	-------	10.8	-------	6.3	-------
1920–21												
1	13.5	8.5	8.5	7.2	13.7	14.3	12.2	36	79	14.4	5.4	2.9
2	10.6	8.8	10.7	13.9	21		14.0	20	186	11.4	4.8	6.0
3	7.6	16.7	14.6	8.6	40		23	15.7	20	9.9	5.0	4.2
4	5.0	26	13.1	6.0	9.7		148	15.1	24	9.0	6.0	3.9
5	3.3	10.9	10.8	4.9	7.2		397	15.4	19.3	28	6.2	2.6
6	2.8	4.4	26	8.7	11.1	35	248	12.9	16.7	26	8.1	2.2
7	2.7	3.4	37	49	167		54	11.9	10.6	100	6.4	2.3
8	4.3	3.1	16.1	9.6	159		111	11.1	9.0	65	5.0	2.6
9	3.6	3.1	58	6.6	19.3		164	10.6	8.1	31	4.1	2.9
10	9.2	4.2	42	5.3	80		106	10.1	7.7	14.1	3.7	2.5
11	54	6.2	45	7.5	24		106	9.9	7.2	11.1	3.3	2.1
12	56	6.0	49	19.8	15.5	65	66	10.4	7.0	9.9	3.3	32
13	15.6	8.0	18.6	9.7	12.7	175	152	9.2	6.4	12.7	3.4	46
14	5.8	4.9	22	6.6	11.2	112	741	8.5	6.1	10.1	3.5	9.2
15	14.9	2.8	43	99	9.7	32	899	8.3	6.0	8.8	3.1	4.6
16	34	2.5	99	26	8.5	19.3	737	7.9	51	35	2.8	4.2
17	48	15.7	17.7	31	7.6	15.8	267	7.7	16.3	14.4	2.7	2.5
18	9.0	8.6	16.7	17.5	7.2	13.4	74	10.6	9.7	10.6	2.6	2.2
19	6.6	4.7	13.4	10.1	25	12.2	61	8.3	6.8	8.3	2.6	2.4
20	8.1	103	17.4	13.3	22	11.0	162	10.7	6.0	7.2	2.5	3.4
21	5.2	106	22	11.1	14.3	10.1	41	52	19.6	9.0	2.5	2.5
22	4.1	67		7.2	17.6	45	28	15.8	9.8	7.4	2.4	2.2
23	6.2	29		6.6	24	216	24	9.7	193	6.6	2.3	2.8
24	4.1	36		17.4	37	401	21	8.1	44	7.0	2.3	2.3
25	4.5	29	15	10.1	91	76	55	7.4	15.7	8.8	2.3	2.0
26	3.6	37		16.9	30	30	37	7.0	10.6	7.5	2.2	1.9
27	3.1	18.6		41	15.2	21	50	6.4	11.1	6.8	2.2	1.9
28	6.4	14.6	6.8	12.4	12.7	19.3	28	6.1	50	6.2	2.2	8.2
29	7.7	22	6.4	7.7	131	16.7	18.2	-------	73	5.8	4.0	10.4
30	7.6	18.5	12.3	6.4	45	15.5	46	-------	102	5.6	6.0	4.5
31	12.1	10.0	-------	24	-------	13.0	30	-------	22	-------	4.4	-------

Discharge, in million gallons per day, of Kawaikoi Stream near Waimea, Kauai, for the years ending June 30, 1920–1922—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1921–22												
1	2.6	3.1	1.8	77	20	4.9	10.6	366	18.9	5.0	5.2	6.4
2	6.3	2.8	1.8	17	31	4.1	9.4	188	18.5	5.2	5.0	6.0
3	18.5	6.8	1.7	7.1	17.7	5.0	8.8	88	13.8	8.8	8.8	5.5
4	24	12.9	1.7	4.8	11.7	19.2	7.7	32	18.2	7.0	26	5.2
5	8.5	46	1.8	3.7	7.1	6.6	7.4	24	14.1	29	57	5.0
6	4.2	8.0	1.8	14.6	4.9	4.4	7.7	19.3	40	33	21	4.8
7	2.7	5.5	1.7	27	4.1	3.5	6.8	26	93	87	17.9	4.5
8	13.9	4.1	1.6	9.3	3.7	3.0	6.6	19.3	}	84	11.1	4.2
9	6.3	3.0	1.6	5.9	3.3	2.8	6.4	14.1	150	15.4	13.8	4.1
10	3.4	2.8	1.6	4.1	3.2	2.8	5.8	13.8	}	9.7	12.4	4.0
11	2.5	9.4	1.6	3.4	3.1	5.4	6.1	27	}	9.8	8.3	4.0
12	2.2	27	1.6	3.0	10.5	170	6.1	51		13.5	7.5	4.0
13	2.0	14.6	1.4	2.8	7.7	70	5.4	18.9		7.7	6.2	3.7
14	1.9	5.5	1.4	2.6	4.5	27	4.8	50	25	9.3	5.8	3.7
15	1.8	3.4	1.4	2.5	3.4	11.6	4.5	24		8.5	5.2	3.9
16	1.7	2.6	1.4	2.5	3.0	95	4.2	13.2	}	12.2	4.9	3.7
17	3.1	2.4	1.6	2.4	2.9	43	6.2	11.4		12.6	4.8	3.5
18	18.6	2.3	2.0	2.4	11.9	17.8	11.4	10.4		20	4.5	3.4
19	5.8	2.2	2.2	2.3	80	12.9	7.4	9.7		18.2	4.6	3.3
20	18.0	3.2	1.8	2.3	8.9	11.9	11.8	9.2		117	5.2	4.7
21	51	2.4	7.4	2.2	11.4	31	169	8.5		23	5.6	25
22	7.3	2.2	29	2.1	56	170	66	16.7		11.9	5.5	6.6
23	5.6	1.9	11.9	2.1	236	276	24	18.6	8.5	11.4	76	4.5
24	7.4	1.9	4.5	8.3	27	336	22	10.1		13.1	146	3.5
25	3.9	2.0	2.9	23	13.9	215	71	8.3		16.4	32	3.2
26	4.2	2.6	2.1	23	19.1	55	76	7.5	}	8.8	91	3.0
27	3.4	4.9	2.0	6.4	8.3	25	65	207		7.5	22	2.9
28	12.5	9.7	4.8	4.0	6.4	18.9	176	66		6.4	11.1	2.8
29	13.9	3.7	4.0	3.3	5.5	15.7	82	-------	5.6	6.0	8.8	2.7
30	10.1	2.3	16.1	28	4.9	13.8	198	-------	5.5	5.5	7.7	2.6
31	5.2	2.0	-------	11.6	-------	11.6	358	-------	5.2	-------	7.0	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of adjacent streams.

Monthly discharge of Kawaikoi Stream near Waimea, Kauai, for the years ending June 30, 1920–1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1919–20						
July	51		10.3	15.9	321	980
August	60	2.3	8.18	12.7	254	778
September	60	1.8	6.70	10.4	201	617
October	23		5.30	8.20	164	504
November	39	1.6	5.67	8.77	170	522
December	147	1.6	22.3	34.5	693	2,120
January	194	8.6	44.5	68.9	1,380	4,230
February	30	3.8	7.45	11.5	216	663
March	202	3.2	56.1	86.8	1,740	5,340
April	70	4.1	11.9	18.4	358	1,100
May	28	2.7	5.25	8.12	163	499
June	34	2.6	7.99	12.4	240	736
The year	202		16.1	24.9	5,900	18,100
1920–21						
July	56	2.7	12.2	18.9	379	1,160
August	106	2.5	20.6	31.9	639	1,960
September	99	6.4	23.9	37.0	716	2,200
October	99	4.9	16.8	26.0	521	1,600
November	167	7.2	36.3	56.2	1,090	3,340
December	401	10.1	54.3	84.0	1,680	5,170
January	899	12.2	159	246	4,920	15,100
February	52	6.1	13.0	20.1	363	1,120
March	193	6.0	34.0	52.6	1,050	3,230
April	100	5.6	16.9	26.1	508	1,560
May	8.1	2.2	3.78	5.85	117	360
June	46	1.9	5.98	9.25	179	551
The year	899	1.9	33.3	51.5	12,200	37,400
1921–22						
July	51	1.7	8.79	13.6	272	836
August	46	1.9	6.55	10.1	203	623
September	29	1.4	3.94	6.10	118	363
October	77	2.1	10.0	15.5	311	951
November	236	2.9	21.0	32.5	631	1,930
December	336	2.8	54.5	84.3	1,690	5,180
January	358	4.2	46.8	72.4	1,450	4,450
February	366	7.5	48.5	75.0	1,360	4,170
March			30.2	46.7	935	2,870
April	117	5.0	20.8	32.2	623	1,910
May	146	4.5	20.9	32.3	648	1,990
June	25	2.6	4.81	7.44	144	443
The year	366	1.4	23.0	35.6	8,380	25,700

WAIAKOALI STREAM NEAR WAIMEA, KAUAI

LOCATION.—150 feet below Kokee-Mohihi trail, a quarter of a mile below Waiakoali camp, and 12 miles northeast of Waimea (22 miles from Waimea by road and trail).

RECORDS AVAILABLE.—April 13, 1909, to December 4, 1912, and July 1, 1919, to June 30, 1922. Occasional measurements 1913 to 1917 reported as miscellaneous.

GAGE.—Stevens continuous water-stage recorder installed July 30, 1919. Staff gage April 13, 1909, to December 4, 1912.

DISCHARGE MEASUREMENTS.—Made by wading or from cable near trail.

CHANNEL AND CONTROL.—Channel a series of pools with mud and silt bottom divided by rapids of boulders and cobblestones. High sloping banks covered with ferns and underbrush. Control, large boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.80 feet at 10.15 p. m. January 31 (discharge, 190 million gallons per day or 294 second-feet); minimum stage recorded, 1.10 feet for several hours September 15 and 16 (discharge, 0.4 million gallons per day or 0.6 second-foot).

1909-1922: Maximum stage recorded during period of record, 8.60 feet January 16, 1921 (discharge, 304 million gallons per day or 470 second-feet); minimum stage recorded, 1.45 feet (old staff gage) November 29, 1909 (discharge, 0.4 second-foot or 0.3 million gallons per day).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of diverting flood water into high level (3,100 feet) ditch to serve Territorial lands now idle on account of lack of irrigation.

UTILIZATION.—After it reaches Waimea River low water is used for power and irrigation.

ACCURACY.—Stage-discharge relation changed slightly on October 1. Two rating curves used, both fairly well defined between 0.5 million gallons per day and 30 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of Waiakoali Stream near Waimea, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 18	E. M. Pickop...	1.54	3.7	2.4	Nov. 19	M. H. Carson...	2.27	13.5	8.7
Aug. 23	....do.....	1.20	.9	.6	Feb. 4	E. M. Pickop...	2.52	14.7	9.5
Oct. 8	J. E. Stewart....	1.48	2.3	1.5					

Discharge, in million gallons per day, of Waiakoali Stream near Waimea, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.2	1.0	0.6	16.9	1.1	1.0	3.3	64	6.5	2.1	1.5	1.5
2	1.0	.9	.6	6.2	2.8	.8	3.0	37	5.6	2.0	1.5	1.4
3	2.1	1.4	.5	1.8	2.2	.8	2.6	19.8	4.6	2.1	1.5	1.4
4	4.3	1.3	.5	1.1	1.7	2.5	2.4	12.4	4.6	2.1	1.9	1.4
5	2.7	5.2	.5	.8	1.2	1.4	2.4	9.8	4.2	2.1	3.4	1.6
6	1.6	2.4	.5	.8	.8	1.0	2.9	7.9	7.9	3.3	5.5	1.6
7	1.2	1.4	.5	3.5	.7	.8	2.4	7.1	17.8	5.2	3.0	1.4
8	1.6	1.1	.5	1.6	.6	.7	2.1	6.5	25	9.4	2.5	1.2
9	2.0	1.0	.5	1.1	.6	.6	2.0	5.6	32	4.3	3.1	1.2
10		.9	.5	.8	.5	.6	1.8	5.2	15.1	3.1	2.6	1.2
11		.9	.5	.7	.5	.9	1.8	6.4	9.8	2.3	2.1	1.2
12		2.6	.5	.6	.5	14.5	1.7	12.0	9.1	2.4	1.8	1.2
13		4.0	.5	.6	.5	10.4	1.6	6.7	7.1	2.3	1.6	1.1
14	.9	1.8	.4	.6	.6	6.9	1.6	8.7	5.8	2.1	1.5	1.1
15		1.2	.4	.5	.5	2.8	1.5	6.9	4.8	2.4	1.4	1.3
16		.9	.4	.5	.5	19.5	1.4	4.8	4.2	2.0	1.4	1.1
17		.8	.4	.5	.5	10.1	1.5	4.0	4.2	2.1	1.4	1.0
18	3.2	.8	.5	.5	.5	4.2	1.5	3.6	3.8	2.0	1.3	1.0
19	2.0	.7	.5	.5	9.8	2.7	1.6	3.5	3.5	2.1	1.3	1.0
20	1.2	.7	.5	.5	2.4	2.2	1.6	3.2	3.3	12.4	1.3	1.0
21	7.6	.7	.5	.4	1.2	4.7	19.1	3.0	3.1	8.1	1.2	1.2
22	2.4	.6	2.8	.4	7.0	40	15.4	3.7	3.0	3.5	1.2	1.6
23	1.4	.6	3.0	.4	34	36	7.1	4.6	3.2	2.6	4.6	1.2
24	1.2	.6	1.4	.4	8.6	47	4.6	3.3	3.1	2.3	16.0	1.0
25	1.0	.6	.9	.6	3.0	32	12.2	2.8	2.7	2.6	7.2	1.0
26	.9	.7	.7	3.5	3.1	10.1	15.5	2.7	2.6	2.3	10.2	.9
27	.8	.8	.7	1.3	1.8	8.5	14.0	19.0	2.5	2.0	6.0	.9
28	.8	3.3	1.0	.8	1.3	6.3	24	13.1	2.3	1.8	2.8	.8
29	1.0	1.4	1.4	.6	1.1	5.1	16.7	-------	2.3	1.7	2.1	.8
30	1.6	.9	.9	2.0	1.0	4.3	34	-------	2.2	1.6	1.8	.8
31	1.4	.7	-------	1.8	-------	3.7	60	-------	2.1	-------	1.7	-------

NOTE.—Braced figure shows mean discharge estimated, on account of lack of record, by comparison with Mohihi and Kawaikoi streams.

Monthly discharge of Waiakoali Stream near Waimea, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	7.6	----------	1.66	2.57	51.4	158
August	5.2	0.6	1.35	2.09	41.9	128
September	3.0	.4	.77	1.19	23.1	71
October	16.9	.4	1.69	2.61	52.3	161
November	34	.5	3.02	4.67	90.6	278
December	47	.6	9.10	14.1	282	866
January	60	1.4	8.49	13.1	263	808
February	64	2.7	10.3	15.9	287	885
March	32	2.1	6.71	10.4	208	638
April	12.4	1.6	3.21	4.97	96.3	296
May	16.0	1.2	3.11	4.81	96.4	296
June	1.6	.8	1.17	1.81	35.1	108
The year	64	.4	4.19	6.48	1,530	4,690

MOHIHI STREAM AT ELEVATION 3,500 FEET, NEAR WAIMEA, KAUAI

LOCATION.—At upper trail crossing, at elevation 3,500 feet, 4 miles west of Kokee (6 miles by trail), and 24 miles by road and trail from Waimea.

RECORDS AVAILABLE.—August 12, 1919, to June 30, 1922. Fragmentary records at old station 2 miles downstream, from April 13, 1909, to December 31, 1912. Records valueless August 12, 1919, to June 12, 1920.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 260 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 300 feet above and 100 feet below station. Bed composed of mud and silt except at low-water measuring section where it is composed of boulders. Right bank sloping and covered with ferns and brush; subject to overflow for about 30 feet during extremely high stages. Left bank steep and fern-covered; not subject to overflow. Control at boulder rapids 60 feet below gage; subject to shift through collection of débris.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending June 30, 1921, 6.91 feet at 1.35 p. m. January 16 (discharge, about 520 million gallons per day or 805 second-feet); minimum stage recorded, 0.84 foot from 3 to 6 p. m. June 27 (discharge, 0.3 million gallons per day or 0.5 second-foot).

Maximum stage recorded during year ending June 30, 1922, 4.92 feet at 8.50 and 10.30 p. m. January 31 (discharge, 275 million gallons per day or 425 second-feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, from 4 to 6 p. m. July 16, 2 to 5 p. m. September 14, and noon to 3 p. m. September 15.

1919–1922: Maximum stage recorded, 6.91 feet at 1.35 p. m. January 16, 1921 (discharge, about 520 million gallons per day or 805 second-feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, from 4 to 6 p. m. July 16, 2 to 5 p. m. September 14, and noon to 3 p. m. September 15, 1921.

DIVERSIONS.—None.

REGULATION.—No artificial regulation. Stream is a series of long pools and short rapids, and heads in the Alakai swamps.

OBJECT OF STATION.—To determine feasibility of diverting flood water into high level (3,100 feet) ditch to serve Territorial lands now idle on account of lack of irrigation.

UTILIZATION.—After it reaches Waimea River low-water flow is used for power and irrigation.

ACCURACY.—Stage-discharge relation changed frequently during period June 12, 1919, to June 30, 1922. Four rating curves used, all fairly well defined between 0.5 and 100 million gallons per day; extended above 100 million gallons per day. Operation of water-stage recorded satisfactory except during periods noted in footnote to tables of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair except those for high stages which are subject to error.

Discharge measurements of Mohihi Stream at elevation 3,500 feet, near Waimea, Kauai, during the years ending June 30, 1920–1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
1919					1920				
Sept. 29	W. V. Hardy	1.07	0.9	0.6	Sept. 28	B. F. Rush	1.34	3.0	1.95
Oct. 14	S. Takabayashi	1.21	1.35	.9	Nov. 5	do	1.34	2.8	1.85
Dec. 14	do	1.30	1.75	1.15	1921				
1920					Jan. 25	do	1.74	14.4	9.3
Jan. 22	do	1.96	16.2	10.5	Mar. 16	do	1.36	5.2	3.4
Mar. 9	do	1.51	5.3	3.4	May 7	do	1.19	3.7	2.4
May 7	W. V. Hardy	1.06	1.2	.8	July 19	E. M. Pickop	1.25	3.2	2.1
22	S. Takabayashi	1.10	1.05	.7	Aug. 23	do	.84	.6	.4
June 11	M. H. Carson	1.20	1.7	1.1	Oct. 8	J. E. Stewart	1.17	3.4	2.2
13	do	1.68	21.4	13.8	Nov. 20	M. H. Carson	1.30	6.2	4.0
July 28	do	1.14	1.15	.75	1922				
29	do	1.41	4.1	2.7	Feb. 4	E. M. Pickop	1.88	15.0	9.7
Aug. 24	do	1.87	29.5	19.1					

Discharge, in million gallons per day, of Mohihi Stream at elevation 3,500 feet, near Waimea, Kauai, for the years ending June 30, 1920–1922

Day	June	Day	June	Day	June
1919–20		1919–20		1919–20	
1		11		21	0.7
2		12		22	.8
3		13	6.2	23	2.2
4		14	3.5	24	1.2
5		15	2.5	25	.8
6		16	2.7	26	.7
7		17	2.8	27	.7
8		18	1.9	28	.7
9		19	1.1	29	.7
10		20	.9	30	.8
				31	

Discharge, in million gallons per day, of Mohihi Stream at elevation 3,500 feet, near Waimea, Kauai, for the years ending June 30, 1920–1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920–21												
1	1.4	1.5	1.5	2.2	3.1	3.8	3.1	16.3	8.8			1.0
2	2.0	1.4	1.3	7.3	4.5	2.7	3.2	9.0	40			.8
3	1.5	1.5	1.7	3.8	6.6	3.7	5.1	6.4	8.1			1.0
4	1.0	5.4	2.5	2.2	3.5	2.8	25	6.0	7.7		2.2	.9
5	.8	2.9	2.1	1.5	2.2	2.8	49	7.7	6.0			.8
6	.7	1.8	1.8	1.7	1.8	6.7	60	5.2	5.0			.6
7	.6	1.0	10.6	12.3	33	5.3	15.4	4.3	3.5	5.2		.6
8	.6	.8	6.6	4.0	43	19.4	26	3.7	2.6		2.0	.6
9	.6	.7	11.1	2.2	5.3	14.5	28	3.4	2.2			.6
10	.6	.9	10.8	1.5	9.2	14.4	24	3.0	2.0			.6
11	8.2	1.1	11.2	1.5	5.8	5.8	14.5	2.8	1.8			.6
12	11.0	1.2	13.6	5.5	2.4	5.5	15.5	2.5	1.6		1.4	2.4
13	5.8	2.6	5.8	5.3	1.5	54	41	2.4	1.5			11.6
14	2.2	1.8	3.0	3.2	1.3	48	184	2.1	1.4			2.9
15	5.6	1.0	4.9	18.2	1.2	12.8	232	2.2	1.3			1.2
16	7.4	.9	28	9.1	1.1	7.2	246	2.1	4.5			.8
17	10.3	5.6	6.4	14.9	1.0	5.3	86	2.1	4.5			.6
18	3.0	3.7	3.7	6.5	.9	4.1	30	3.9	3.0			.8
19	1.8	2.2	2.8	3.9	1.8	3.5	26	2.5	1.7			.6
20	1.4	12.7	2.3	6.7	3.7	3.0	69	4.6				.5
21	1.0	17.2	2.6	4.2	2.3	2.8	20	30		2.2	.8	.4
22	.8	8.2	2.2	2.6	4.0	4.0	13.6	7.9				.4
23	.8	6.4	2.2	2.0	3.5	60	10.3	4.2				.3
24	.7	10.3	3.9	2.3	6.4	111	8.5	3.0				.3
25	.7	8.3	3.3	2.4	9.8	26	14.0	2.5	9.4			.3
26	.6	12.0	7.1	2.2	7.7	9.7	15.7	2.1				.3
27	.6	4.8	2.8	7.2	4.5	6.5	38	1.9				.3
28	1.0	3.9	2.0	3.9	2.6	5.3	15.1	1.7			.6	.5
29	2.3	3.1	1.8	2.4	11.1	4.5	8.3	-------			.8	1.1
30	1.4	2.3	3.2	1.8	9.6	4.3	22	-------			1.0	1.0
31	1.4	1.8	-------	1.9	-------	3.5	16.9	-------		-------	1.2	-------
1921–22												
1	0.6	1.0	0.4	42	1.9	1.5	3.5	104	4.6	1.0	0.6	1.0
2	.7	2.3	.3	9.8	4.7	1.0	3.2	47	4.0	1.0	.6	.9
3	4.1	3.0	.3		3.9	1.4	2.6	17.2	3.2	1.2	.6	.8
4	6.7	2.0	.3		3.4	5.7	2.3	9.8	3.3	1.0	1.4	.8
5	3.3	9.0	.3	2.8	1.7	2.4	3.8	7.3	4.3	1.1	5.1	1.2
6	1.4	3.0	.3		1.0	1.3	5.7	5.6	12.3	4.0	5.9	1.0
7	.7	1.6	.3		.6	.9	3.3	5.0	22	5.5	3.4	.8
8	1.6	1.1	.3		.5	.7	2.5	4.6	29	7.5	2.8	.7
9	1.8	.8	.3	1.4	.4	.6	2.1	3.7	41	3.7	4.2	.7
10	1.0	.6	.3	.8	.4	.6	1.7	3.4	18.4	2.4	3.1	.8
11	.8	1.0	.3	.5	.4	2.1	1.6	6.9	9.4	1.6	2.2	.7
12	.5	3.8	.2	.4	.4	20	1.4	18.1	11.0	2.2	1.4	.7
13	.4	5.1	.2	.4	1.0	14.8	1.2	5.7	6.7	1.7	1.1	.6
14	.3	2.0	.2	.3	.7	10.2	1.2	9.2	4.9	2.3	.9	.6
15	.3	1.0	.2	.3	.5	4.2	1.1	6.2	3.8	2.9	.8	.8
16	.2	.6	.3	.3	.4	24	1.0	3.6	3.2	1.7	.6	.6
17	.3	.5	.4	.3	.3	11.1	1.0	2.9	3.1	1.4	.6	.6
18	3.5	.4	.8	.3	.3	5.0	1.4	2.5	2.6	1.5	.7	.5
19	2.0	.4	.8	.3	8.9	3.5	2.0	2.5	2.4	1.3	.6	.5
20	.8	.5	.5	.3	3.6	3.3	4.4	2.2	2.2	13.4	.6	.6
21	12.4	.5	.4	.3	5.3	9.8	41	2.0	2.0	6.2	.6	1.7
22	3.0	.4	5.4	.2	12.6	65	15.1	2.7	1.8	2.6	.6	1.6
23	1.4	.4	4.5	.3	55	55	7.2	4.6	1.8	1.8	4.7	.8
24	1.4	.4	2.0	.4	10.2	82	6.1	2.5	1.9	1.4	22	.6
25	1.0	.4	1.2	1.0	4.1	40	16.5	2.1	1.6	2.5	7.6	.5
26	.6	1.1	.7	6.1	5.0	15.4	18.2	1.8	1.5	1.8	13.8	.5
27	.5	1.6	.6	2.0	2.7	7.7	16.8	15.8	1.3	1.2	6.5	.4
28	.6	5.7	2.0	.8	1.9	5.7	34	11.7	1.2	1.0	2.7	
29	3.0	2.0	1.8	.5	1.4	4.8	21	-------	1.2	.8	1.8	.4
30	3.1	.9	3.8	4.3	1.5	4.6	60	-------	1.1	.7	1.4	
31	1.8	.5	-------	3.0	-------	3.7	103	-------	1.0	-------	1.2	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated, because of lack of gage-height record, by comparison with flow of adjacent streams.

Monthly discharge of Mohihi Stream at elevation 3,500 feet, near Waimea, Kauai, for the years ending June 30, 1921 and 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1920–21						
July	11.0	0.6	2.51	3.88	77.8	239
August	17.2	.7	4.16	6.44	129	396
September	28	1.3	5.43	8.40	163	500
October	18.2	1.5	4.72	7.30	146	449
November	43	.9	6.48	10.0	194	597
December	111	2.7	14.9	23.1	463	1,420
January	246	3.1	44.0	68.1	1,370	4,190
February	30	1.7	5.20	8.05	146	447
March			7.10	11.0	220	675
April			3.40	5.26	102	313
May			1.30	2.01	40.4	124
June	11.6	.3	1.15	1.78	34.4	106
The year	246	.3	8.44	13.1	3,080	9,460
1921–22						
July	12.4	.2	1.93	2.99	59.8	184
August	9.0	.4	1.73	2.68	53.6	165
September	5.4	.2	.98	1.52	29.4	90
October	42	.2	3.00	4.64	93.1	285
November	55	.3	4.49	6.95	135	413
December	82	.6	13.2	20.4	408	1,260
January	103	1.0	12.4	19.2	386	1,180
February	104	1.8	11.1	17.2	311	954
March	41	1.0	6.70	10.4	208	637
April	13.4	.7	2.61	4.04	78.4	240
May	22	.6	3.23	5.00	100	307
June	1.7		.74	1.14	22.2	68
The year	104	.2	5.16	7.98	1,880	5,780

KOAIE STREAM AT ELEVATION 3,700 FEET, NEAR WAIMEA, KAUAI

LOCATION.—At elevation 3,700 feet, 4 miles east of Mohihi station, 1 mile below swamps, and 13 miles northeast of Waimea (27 miles by trail from Waimea by way of Kokee).

RECORDS AVAILABLE.—July 1, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder, installed September 5, 1919.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 200 feet above gage.

CHANNEL AND CONTROL.—Channel covered with boulders and cobblestones and flanked by high banks; straight for 100 feet above and 400 feet below gage. Control is bedrock across stream, forming low falls; right end is low and blocked by cobblestones and boulders which may shift. Control too wide to be very sensitive at low stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.78 feet at 10 p. m. January 31 (discharge, 892 million gallons per day, or 1,380 second-feet); minimum stage recorded, 0.40 foot at 5 p. m. June 29 (discharge, 2.0 million gallons per day, or 3.1 second-feet).

1919–1922: Maximum stage recorded, 5.70 feet January 16, 1921 (discharge, about 3,750 million gallons per day[2] or 5,800 second-feet[2]); minimum stage recorded, 0.39 foot September 28, 1919 (discharge, 1.3 million gallons per day or 2.0 second-feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of flood water available for storage for use in irrigating high level lands above Waimea and Kekaha.

[2] A revision of the discharge previously published, based on later high-water discharge measurements.

UTILIZATION.—After it reaches Waimea River low-water flow is used for power and irrigation.

ACCURACY.—Discharge records for this station published below for the years ending June 30, 1920 and 1921, supersede previously published records. During the period July 1, 1919, to June 30, 1922, stage-discharge relation changed occasionally during floods. Two rating curves used, both fairly well defined between 2 and 400 million gallons per day. Indirect method for shifting control used July 1 to November 24, 1921. Operation of water-stage recorder satisfactory except during periods indicated in footnote to tables of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for period for which shifting-control method was used. Records good except those for unusually high stages and those estimated or obtained by shifting-control method.

Discharge measurements of Koaie Stream at elevation 3,700 feet, near Waimea, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 19	E. M. Pickop	0.60	8.8	5.7	Nov. 24	M. H. Carson	0.72	16.2	10.5
Aug. 22	do	.66	12.3	8.0	Feb. 5	E. M. Pickop	1.00	60	38.5
Oct. 9	J. E. Stewart	.56	5.2	3.4	Mar. 29	S. B. Hall	.46	2.9	1.85

Discharge, in million gallons per day, of Koaie Stream at elevation 3,700 feet, near Waimea, Kauai, for the years ending June 30, 1920–1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1919-20												
1				3.3	2.6	1.9	12.8	2.2	1.9	2.8	2.2	2.3
2				2.8	3.0	48	6.6	2.2	1.9	11.8	2.1	2.1
3			8	3.2	3.6	212	5.6	2.1	1.8	27	2.1	2.0
4				2.8	2.6	21	5.6	2.0	1.8	40	2.0	1.9
5				6.1	3.9	9.4	6.6	2.0	1.8	12.8	2.0	22
6			9.4	12.9	120	8.3	45	2.0	5.0	7.8	1.9	7.2
7			13.7	3.0	14.6	3.8	46	2.2	10.3	3.4	1.9	3.2
8			19.0	2.4	4.4		8.8	2.1	50	2.8	1.9	2.3
9			75	2.2	8.3		28	2.0	11.1	2.7	1.9	2.0
10			8.3	2.1	8.4		31	1.9	21	2.4	2.0	8.3
11			4.4	4.2	22	3.3	6.1	63	44	2.2	1.9	15.8
12			3.6	3.9	8.3		3.9	8.3	205	2.2	1.9	23
13			3.2	2.6	5.0		31	3.4	77	2.3	1.9	22
14			2.7	2.1	3.2	2.7	59	2.7	11.1	2.7	1.9	19.0
15			2.3	2.0	2.7	2.7	176	2.4	5.6	3.0	1.8	8.3
16			2.3	1.9	2.4	2.4	165	2.0	3.6	2.7	1.8	33
17			2.3	1.9	2.2	2.6	75	2.1	9.0	2.4	1.8	30
18			2.1	1.9	2.1	2.8	18.0	2.1	75	27	1.9	7.2
19			2.0	2.1	2.0	2.6	9.4	2.0	130	8.8	3.0	3.4
20			3.2	2.7	1.9	2.3	7.2	1.8	21	6.1	2.8	3.0
21			3.2	3.4	2.0	2.1	27	1.8	24	16.3	2.3	2.4
22			2.4	2.6	2.3	2.2	20	1.9	49	26	3.3	2.8
23			2.0	4.2	2.3	2.8	6.1	1.8	84	13.7	3.8	4.4
24			1.6	3.3	5.0	2.6	3.6	1.9	29	6.6	6.6	3.2
25			1.6	3.3	2.8	2.3	3.3	2.1	44	3.8	3.4	2.4
26			1.5	2.4	2.4	2.6	3.2	3.4	24	3.3	5.0	2.4
27			1.4	31	2.7	3.3	3.0	3.0	12.0	2.8	3.9	3.0
28			1.4	39	2.4	8.3	2.7	2.3	7.2	2.7	2.8	8.8
29			2.4	13.4	2.1	28	2.6	2.1	5.0	2.7	2.4	12.8
30			3.3	3.6	2.1	41	2.4		3.4	2.4	3.3	3.9
31				2.8		16.3	2.4		3.2		2.7	

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Discharge, in million gallons per day, of Koaie Stream at elevation 3,700 feet, near Waimea, Kauai, for the years ending June 30, 1920–1922—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920–21												
1	3.9	6.1	8.5	5.0	15.0	7.8	6.1	17.3	30	6.7	8.0	4.4
2	5.0	7.2	19.1	51	22	5.0	19.3	9.3	68	5.0	5.0	3.4
3	3.4	14.8	22	9.4	39	8.8	20	6.0	11.4	4.2	11.8	3.3
4	3.0	21	10.3	6.1	7.8	6.1	66	6.3	10.6	8.0	17.0	3.4
5	2.6	7.8	8.3	3.6	3.9		221	6.7	8.6	16.4	17.0	3.1
6	2.3	3.8	12.1	7.9	5.6		165	5.5	7.3	8.2	14.0	2.8
7	2.2	3.2	75	46	91	35	62	4.7	5.2	25	6.0	2.7
8	2.3	2.7	17.1	11.1	97		149	4.2	4.2	119	5.2	3.0
9	2.2	2.7	39	5.0	9.4		80	3.7	3.7	32	5.5	4.4
10	2.6	3.9	42	3.4	27		44	3.4	3.4	10.0	4.4	3.4
11	28	3.9	39	4.4	14.6		64	3.4	3.3	5.5	3.7	3.0
12	25	12.4	52	35	6.1	45	96	3.3	3.1	5.2	3.4	9.0
13	8.3	30	10.3	21	3.9		174	3.1	3.0	19.5	3.3	42
14	3.8	5.6	8.3	8.3	3.4		492	3.3	3.0	8.6	3.3	13.5
15	32	3.4	23	81	3.2	15.5	590	9.6	2.8	5.7	3.3	6.7
16	29	3.4	71	30	3.0	6.6	1,110	6.1	5.5	15.0	3.1	5.7
17	35	14.6	10.3	61	2.8	3.9	234	4.8	15.8	12.0	3.0	21
18	7.2	16.3	7.2	19.0	2.6	3.4	52	8.0	8.3	9.1	3.0	7.9
19	5.0	5.6	7.2	7.2	10.3	3.2	54	4.7	3.9	6.7	7.8	4.7
20	9.4	35	5.0	31	11.1	2.8	141	6.4	3.7	5.5	5.4	5.2
21	6.6	57	5.6	11.1	19.0	2.6	28	60	14.0	14.2	5.9	3.7
22	5.6	20	9.4	5.0	17.9	21	12.6	10.5	5.5	8.0	8.6	3.1
23	3.6	21	25	3.8	16.3	174	9.3	5.2	42	11.9	4.6	3.1
24	3.3	51	24	5.0	28	268	8.0	4.4	23	36	3.7	3.3
25	3.0	43	30	4.4	37	30	79	3.7	7.6	22	3.3	3.7
26	2.8	57	21	4.4	29	8.3	46	3.4	4.4	15.3	3.1	5.2
27	5.6	14.6	8.8	17.1	20	4.4	98	3.3	4.2	11.6	2.8	4.7
28	19.0	41	6.1	7.8	7.8	3.6	16.5	3.1	19.7	6.0	2.8	8.7
29	14.6	11.1	7.8	3.8	45	3.6	8.0	-------	41	16.4	2.8	10.0
30	6.1	6.1	12.0	3.3	27	3.4	37	-------	56	15.9	3.6	10.6
31	7.8	10.8	-------	3.9	-------	3.3	25	-------	12.6	-------	7.2	-------
1921–22												
1	13.8	5.0	2.3	81	3.8	5.6	17.1	272	7.2	2.0	2.2	3.7
2	25	32	2.2	22	13.9	3.4	6.6	107	8.3	2.1	2.2	4.2
3	33	10.3	2.2	10.7	8.8	4.8	3.6	95	5.0	2.6	2.4	3.9
4	25	7.3	2.1	6.6	6.1	8.3	3.2	41	8.3	2.7	5.6	3.9
5	10.1	23	2.4	3.4	3.6	3.4	49	33	36	7.3	35	5.2
6	5.0	6.1	3.8	3.6	2.8	2.6	28	12.7	88	16.5	18.2	5.0
7	3.4	3.8	3.3	10.8	2.6	2.3	8.3	26	46	15.9	6.6	3.7
8	8.8	3.3	2.8	5.6	2.3	2.1	5.6	14.1	67	17.8	22.0	3.3
9	6.6	3.0	2.7	3.4	2.3	2.0	3.8	5.6	49	7.8	16.2	11.8
10	4.4	2.8	2.7	2.8	2.3	2.0	3.0	5.0	90	3.9	15.4	6.0
11	3.4	7.5	3.0	2.6	2.3	18.2	2.8	16.2	60	13.8	8.3	4.4
12	3.3	31	2.4	2.3	3.3	47	2.6	31	70	18.9	3.6	3.9
13	2.8	14.2	2.2	2.2	3.6	34	2.4	8.3	32	7.2	3.2	3.4
14	2.7	3.9	2.0	2.1	2.8	28	2.3	24	9.4	35	2.7	3.3
15	2.6	3.0	1.9	2.1	2.4	6.5	2.3	10.8	8.3	9.3	2.7	3.7
16	2.3	2.6	2.2	2.1	2.2	48	2.2	4.4	6.1	5.0	2.6	3.3
17	28	2.4	16.6	2.0	2.1	19.4	2.4	3.4	9.2	5.2	6.0	3.0
18	33	2.6	28	1.9	2.3	6.6	2.8	3.0	4.4	6.1	5.6	2.8
19	6.6	6.6	5.2	1.9	17.6	4.4	3.0	2.8	3.4	3.6	3.6	2.8
20	9.0	8.0	3.0	1.8	5.0	3.9	40	2.6	3.0	41	3.6	2.8
21	39	4.4	5.2	1.8	15.9	28	118	2.6	2.8	18.5	6.6	21
22	5.6	8.6	29	1.8	23	184	35	16.6	2.6	5.6	5.0	5.5
23	3.9	3.6	12.8	3.5	94	180	15.4	10.4	2.7	3.6	32	3.7
24	3.9	3.0	7.3	15.5	14.0	241	13.3	3.6	2.6	3.3	120	3.0
25	3.3	29	5.0	26	6.6	90	45	2.8	2.6	9.3	33	2.7
26	3.0	5.5	3.2	24	13.7	26	47	2.7	2.3	3.8	72	2.4
27	2.7	12.6	4.8	3.9	5.0	8.3	42	18.1	2.2	3.2	17.4	2.4
28	17.7	21	25	3.0	14.0	8.3	106	25	2.2	2.7	7.3	2.3
29	20	3.8	11.1	2.6	8.3	19.8	55	-------	2.0	2.4	5.2	2.1
30	12.0	3.0	26	9.0	8.3	15.0	110	-------	2.0	2.3	4.4	2.1
31	4.4	2.4	-------	4.4	-------	8.8	278	-------	2.0	-------	3.9	-------

NOTE.—Water-stage recorder installed Sept. 5, 1919; mean discharge July 1 to Sept. 5, 1919, estimated by comparison with flow of adjacent streams, as follows: July 1–31, 8.39 million gallons per day; Aug. 1–31, 6.45 million gallons per day; Sept. 1–5, 8.0 million gallons per day. Recorder not operating Dec. 8–13, 1919, and Dec. 5–14, 1920, discharge estimated by comparison with flow of adjacent streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Koaie Stream at elevation 3,700 feet near Waimea, Kauai, for the years ending June 30, 1920–1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1919–20						
July	----------	----------	8.39	13.0	* 260	798
August	----------	----------	6.45	9.98	* 200	617
September	75	1.4	7.14	11.0	214	657
October	39	1.9	5.65	8.74	175	538
November	120	1.9	8.31	12.9	249	765
December	212	1.9	14.6	22.6	454	1,390
January	176	2.4	26.5	41.0	823	2,520
February	63	1.8	4.51	6.98	131	401
March	205	1.8	31.4	48.6	973	2,990
April	40	2.2	8.44	13.1	253	777
May	6.6	1.8	2.59	4.01	80.2	246
June	33	1.9	8.80	13.6	264	810
The year	212	1.4	11.1	17.2	4,080	12,500
1920–21						
July	35	2.2	9.36	14.5	290	890
August	57	2.7	17.3	26.8	536	1,650
September	75	5.0	21.2	32.8	636	1,950
October	81	3.3	16.6	25.7	516	1,580
November	97	2.6	20.9	32.3	626	1,920
December	268	2.6	31.5	48.7	975	3,000
January	1,110	6.1	136	210	4,210	12,900
February	60	3.1	7.62	11.8	213	655
March	68	2.8	14.0	21.7	435	1,330
April	119	4.2	16.2	25.1	485	1,490
May	17.0	2.8	5.86	9.07	182	557
June	42	2.7	6.96	10.8	209	641
The year	1,110	2.2	25.5	39.5	9,310	28,600
1921–22						
July	39	2.3	11.1	17.2	344	1,060
August	32	2.4	8.88	13.7	275	845
September	29	1.9	7.41	11.5	222	682
October	81	1.8	8.59	13.3	266	817
November	94	2.1	9.83	15.2	295	905
December	241	2.0	34.2	52.9	1,060	3,250
January	278	2.2	34.1	52.8	1,060	3,240
February	272	2.6	28.6	44.3	800	2,460
March	90	2.0	20.5	31.7	637	1,950
April	41	2.0	9.28	14.4	278	854
May	120	2.2	15.3	23.7	474	1,460
June	21	2.1	4.38	6.78	131	403
The year	278	1.8	16.0	24.8	5,840	17,900

* See footnote to daily-discharge tables.

WAIALAE RIVER AT ELEVATION 3,700 FEET, NEAR WAIMEA, KAUAI

LOCATION.—At elevation 3,700 feet, 2 miles below swamps and 15 miles by trail northeast of Waimea, by way of Gay's mountain house.

RECORDS AVAILABLE.—January 26, 1920, to June 30, 1922, at present site; August 1, 1910, to January 25, 1916, at old site 2 miles downstream.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel rocky boulder-strewn bed with steep high banks; straight for 300 feet above and 100 feet below station. Control solid rock shoulder about 15 feet below well intake.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.40 feet at 9.15 p. m. January 31 (discharge, about 1,320 million gallons per day or 2,040 second-feet); minimum stage recorded, 0.80 foot 4 p. m. to 10 p. m. September 14 (discharge, 1.6 million gallons per day or 2.5 second-feet).

1920–1922: Maximum stage recorded, 8.44 feet January 16, 1921 (discharge, estimated 4,500 million gallons per day or 6,960 second-feet); minimum discharge recorded on September 14, 1921.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of flood water available for storage for use in irrigating high level lands above Waimea and Kekaha.

UTILIZATION.—After it reaches Waimea River low-water flow is used for irrigation.

ACCURACY.—Stage-discharge relation changed November 22 and December 21. Rating curve used November 23 to December 21, fairly well defined between 3.5 and 200 million gallons per day; curve used for remainder of year, well defined between 2 and 200 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for low and medium stages except for period November 23 to December 21, for which they are fair; high-stage records subject to error.

Discharge measurements of Waialae River at elevation 3,700 feet, near Waimea, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 20	E. M. Pickop	0.99	5.4	3.5	Nov. 23	M. H. Carson	2.13	183	118
Aug. 22	do	1.14	9.8	6.3	Feb. 7	E. M. Pickop	1.33	24.8	16.0
Oct. 9	J. E. Stewart	.99	5.3	3.4	Mar. 30	M. H. Carson	.88	3.7	2.4

Discharge, in million gallons per day, of Waialae River at elevation 3,700 feet, near Waimea, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	10.8	3.9	2.2	95	4.1	6.4	17.9	362	4.4	2.2	2.1	3.0
2	17.2	36	2.1	38	5.9	4.8	6.2	115	3.9	2.4	2.0	3.1
3	28	7.4	2.1	19.4	5.9	4.6	4.4	111	3.5	2.8	2.1	3.0
4	15.4	5.3	2.1	10.4	4.8	6.2	3.9	39	4.6	2.4	3.2	2.9
5	6.5	20	2.4	5.1	3.6	4.8	79	24	41	3.0	22	4.3
6	3.8	4.6	3.6	5.1	3.0	4.1	24	9.9	112	8.4	10.0	4.1
7	2.9	3.2	3.0	9.3	2.8	3.8	6.5	17.4	42	6.2	4.6	3.2
8	5.6	2.8	2.5	5.3	2.5	3.5	5.1	9.3	68	4.4	11.2	2.9
9	3.9	2.4	2.2	3.8	2.4	3.5	4.4	5.3	45	3.9	8.5	9.5
10	3.0	2.4	2.2	3.1	2.6	4.5	3.6	4.8	79	3.4	8.2	4.4
11	2.6	6.1	2.2	2.8	2.5	31	3.2	8.4	46	8.2	5.1	3.2
12	2.3	32	2.0	2.5	2.8	36	3.0	14.1	74	11.4	3.4	2.8
13	2.2	11.0	1.9	2.3	3.0	21	2.8	5.9	25	4.6	2.8	2.5
14	2.0	3.6	1.8	2.2	2.8	24	2.6	13.0	7.4	29	2.5	2.3
15	2.0	2.6	1.7	2.2	2.5	8.5	2.6	6.8	5.9	5.6	2.3	2.4
16	2.0	2.3	1.9	2.2	2.3	63	2.6	4.4	5.0	3.6	2.2	2.2
17	44	2.2	10.8	2.2	2.2	12.8	2.6	3.8	7.1	3.5	6.6	2.2
18	35	2.5	25	2.2	2.2	6.9	2.6	3.5	4.3	4.1	4.4	2.0
19	5.1	7.2	4.6	2.2	5.6	5.6	3.4	3.2	3.6	3.1	3.4	2.0
20	12.1	5.0	2.8	2.2	4.3	5.1	38	3.0	3.1	25	3.1	2.1
21	43	3.5	4.8	2.1	9.5	50	123	2.9	3.0	11.0	4.1	7.0
22	5.0	4.6	27	2.2	12.5	298	36	12.6	2.9	4.4	3.8	3.4
23	3.4	3.0	12.8	3.3	65	135	10.9	7.3	2.8	3.4	23	2.5
24	2.9	2.5	6.5	13.0	9.6	217	8.3	3.8	2.6	2.9	119	2.2
25	2.8	20	4.6	23	5.6	83	36	3.2	2.4	4.3	18.9	2.0
26	2.4	4.4	3.0	32	7.7	22	41	2.9	2.3	3.2	43	2.0
27	2.2	20	4.2	5.3	5.4	7.7	47	4.3	2.2	2.6	9.1	1.9
28	9.3	18.8	19.3	3.5	9.4	7.1	98	10.9	2.2	2.3	4.6	1.8
29	9.9	3.9	11.6	3.0	6.4	14.1	42	-------	2.2	2.2	3.6	1.8
30	7.7	2.8	17.4	11.2	6.2	13.9	93	-------	2.2	2.1	3.2	1.8
31	3.8	2.3	-------	5.1	-------	7.4	309	-------	2.2	-------	3.0	-------

Monthly discharge of Waialae River at elevation 3,700 feet, near Waimea, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	44	2.0	9.64	14.9	299	917
August	36	2.2	8.01	12.4	248	762
September	27	1.7	6.34	9.81	190	584
October	95	2.1	10.4	16.1	321	989
November	65	2.2	6.84	10.6	205	630
December	298	3.5	36.0	55.7	1,120	3,420
January	309	2.6	34.3	53.1	1,060	3,260
February	362	2.9	29.0	44.9	812	2,490
March	112	2.2	19.7	30.5	612	1,870
April	29	2.1	5.85	9.05	176	539
May	119	2.0	11.1	17.2	345	1,060
June	9.5	1.8	3.02	4.67	90.5	278
The year	362	1.7	15.0	23.2	5,480	16,800

KEKAHA DITCH AT CAMP NO. 1, NEAR WAIMEA, KAUAI

LOCATION.—Half a mile below intake, 1,000 feet below Kekaha Sugar Co.'s weir, and 8 miles by trail north of Waimea.

RECORDS AVAILABLE.—July 12, 1921, to June 30, 1922. Staff 900 feet upstream October 26, 1917, to July 11, 1921; at flume No. 4 1 mile below intake, March 18, 1916, to August 2, 1917; weir, 1,000 feet above present site, November 8, 1907, to June 30, 1915.

GAGE.—Gurley printing water-stage recorder installed July 12, 1921, replacing vertical staff 900 feet upstream.

DISCHARGE MEASUREMENTS.—Made from upper end of covered section of ditch.

CHANNEL AND CONTROL.—Ditch about 9 feet wide cut in soft lava rock and lined with concrete slab; straight for 1,000 feet above and 300 feet below gage. Control in concrete-lined section of ditch and probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.09 feet at 11 p. m. March 6 (discharge, 67 million gallons per day or 104 second-feet); minimum stage, 0.36 foot 11 a. m. June 25 to 3 a. m. June 26 (discharge, 0.1 million gallons per day or 0.15 second-foot).

1907–1922: Maximum discharge recorded, 67 million gallons per day or 104 second-feet on January 4, 1921, and March 6, 1922. Water occasionally shut off.

DIVERSIONS.—None above station. Numerous diversions near Waimea and Kekaha.

REGULATION.—By head gates.

OBJECT OF STATION.—To measure water diverted from river by ditch. Land and water owned by Territory and leased to Kekaha Sugar Co.

UTILIZATION.—Water used for irrigation of sugar cane and for domestic supply along the coastal plain east of Waimea and Kekaha.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined above 10 million gallons per day. Operation of water-stage recorder satisfactory except during periods indicated in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained by averaging the hourly gage heights printed by the recorder or, for days of considerable fluctuation in stage, by averaging the discharge for hourly intervals of the day. Records good.

Kekaha ditch diverts water from Waimea River at a point 8 miles by trail north of Waimea, 500 feet above gaging station on river and camp No. 1, and at an elevation of about 550 feet. The course of the ditch is roughly parallel to the river for a distance downstream of about 4½ miles where it crosses and then continues roughly parallel to the river for a distance of about 2½ miles to a point about half a mile north of and at an elevation of about 400 feet above Waimea. Here, at the lower end of the river valley, it swings eastward and continues roughly parallel to the coast line for a distance of about 10 miles.

Discharge measurements of Kekaha ditch at camp No. 1, near Waimea, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 25	E. M. Pickop	2.82	53	34.5	Feb. 10	E. M. Pickop	3.21	68	44
Aug. 22	B. F. Rush	2.83	53	34	Mar. 30	M. H. Carson	2.77	54	35
Oct. 9	M. H. Carson	2.86	56	36.5	May 20	E. M. Pickop	2.80	53	34.5
Nov. 21	do	2.79	54	35					

Discharge, in million gallons per day, of Kekaha ditch at camp No. 1, near Waimea, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		35	29	54	45	40	40		57	35	33	36
2		54	28	54	57	36	36		62	34	33	35
3		54	28	57	57	32	33		62	40	33	35
4		45	28	52	50	52	34		59	40	50	35
5		59	28	40	38	42	42		62	42	57	36
6		54	29	38	11.7	33	47	45	64	52	57	38
7	45	40	31	59	30	30	50		62	50	57	36
8		35	30	47	28	29	45		62	52	54	33
9		33	29	40	26	28	45		59	52	57	36
10		32	28	33	26	29	42		59	52	59	42
11		40	29	32	26	47	42	47	62	42	54	34
12		52	28	30	29	57	40	45	62	54	45	32
13	31	59	26	29	34	59	38	54	62	50	13.4	31
14	30	45	26	29	30	57	38	59	59	52	36	30
15	29	35	25	28	28	57	36	59	64	52	34	32
16	28	32	25	28	26	23.4		52	59	47	34	31
17	34	31	30	28	25	16.8		50	59	52	35	30
18	52	30	59	26	25			54	57	54	42	29
19	50	31	40	26	54	40		54	14.0	54	35	29
20	38	42	31	26	50			54	47	52	35	28
21	52	34	31	26	38	42		52	47	57	36	31
22	52	36	54	26	59	17.0		52	47	57	40	31
23	40	33	59	26	59	22		59	52	52	47	30
24	40	30	42	40	59	20	50	59	50	50	54	1.5
25	35	45	40	57	57	25		54	45	52	54	.1
26	34	42	33	59	57	6.6		50	42	50	52	24
27	32	36	31	47	47	5.9		59	40	45	54	26
28	35	59	50	34	47	38		59	38	38	52	26
29	57	42	50	31	45	47		-------	38	35	47	25
30	57	33	45	47	45	45		-------	36	34	42	25
31	45	31	-------	52	-------	40		-------	36	-------	40	-------

NOTE.—Recorder not operating July 1–12, Dec. 18–20, and Jan. 16 to Feb. 10; discharge estimated by comparison with flow of this ditch at station below tunnel No. 12. Braced figures show mean discharge for periods indicated.

Monthly discharge of Kekaha ditch at camp No. 1, near Waimea, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July		28	42.3	65.4	1,310	4,020
August	59	30	40.6	62.8	1,260	3,860
September	59	25	34.7	53.7	1,040	3,190
October	59	26	38.7	59.9	1,200	3,680
November	59	11.7	40.3	62.4	1,210	3,710
December	59	5.9	35.4	54.8	1,100	3,370
January			45.4	70.2	1,410	4,320
February	59		50.8	78.6	1,420	4,370
March	64	14.0	52.4	81.1	1,620	4,990
April	57	34	47.6	73.6	1,430	4,380
May	59	13.4	44.2	68.4	1,370	4,200
June	42	.1	29.6	45.8	888	2,730
The year	64	.1	41.8	64.7	15,300	46,800

KEKAHA DITCH BELOW TUNNEL NO. 12, NEAR WAIMEA, KAUAI[3]

LOCATION.—7 miles below intake, 2½ miles by trail from Waimea, and just above diversion for Waimea domestic supply.

RECORDS AVAILABLE.—July 15, 1921, to June 30, 1922. April 7, 1908 to November 30, 1914, and July 20, 1916, to July 15, 1921, at site half a mile downstream.

GAGE.—Gurley printing water-stage recorder installed July 15, 1921, replacing vertical staff half a mile downstream.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Channel cut in lava rock; fairly straight near gage. Control in section of ditch; not well defined; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.40 feet at 8.30 a. m. December 22 (discharge, 64 million gallons per day or 99 second-feet); minimum stage recorded, 0.55 foot at midnight November 6–7 (discharge, 2.4 million gallons per day or 3.7 second-feet).

1916–1922: Maximum stage recorded in December, 1921. Water shut off occasionally.

DIVERSIONS.—Small amount of water is diverted above station for domestic supply and occasionally for irrigation of rice and taro.

REGULATION.—By head gates.

OBJECT OF STATION.—To determine discharge above first important lateral, also determine ditch losses between intake and station. Territorial land and water.

UTILIZATION.—Water used for irrigation of sugar cane, rice, and taro, and for domestic supply.

[3] Published as "Kekaha ditch at weir below tunnel No. 12, near Waimea, Kauai," in Water-Supply Paper 318 and as "Kekaha ditch at tunnel No. 12, near Waimea, Kauai," in Water-Supply Papers 336 and 430.

ACCURACY.—Stage-discharge relation permanent at old station July 1–15, and at new station for remainder of year. Rating curve used July 1–15, well defined between 10 and 50 million gallons per day; curve used for remainder of year, well defined between 15 and 50 million gallons per day. Staff gage read to hundredths twice daily July 1–15; operation of water-stage recorder satisfactory for remainder of year. Daily discharge ascertained by applying to rating table mean daily gage height obtained from twice-daily staff gage readings or by averaging hourly gage heights from recorder record, except for days of considerable fluctuation in stage, for which it was ascertained by hourly-discharge method. Records good except those for unusually low stages, which are fair.

For description of Kekaha ditch see under "Kekaha ditch at camp No. 1, near Waimea, Kauai."

Discharge measurements of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 26	E. M. Pickop	2.42	39.5	25.5	Feb. 2	E. M. Pickop	3.37	66	42.5
Aug. 23	B. F. Rush	2.36	41.5	27	Apr. 1	S. B. Hall	2.53	46.5	30.0
Oct. 9	M. H. Carson	2.61	46	29.5	May 20	E. M. Pickop	2.60	44.5	29.0
Nov. 18	do	2.00	30.5	19.6					

Discharge, in million gallons per day, of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	31	29	22	44	29	31	28	44	42	28	25	31
2	41	37	20	46	36	29	25	40	42	28	24	29
3	43	40	19.2	44	38	25	23	31	42	29	24	29
4	43	35	19.2	40	35	35	22	20	42	31	31	29
5	43	42	19.2	31	28	35	28	29	46	31	38	31
6	34	40	20	26	10.4	26	31	31	48	38	40	33
7	31	31	23	38	22	24	31	35	48	40	38	31
8	44	28	21	35	20	23	29	36	44	40	36	29
9	37	25	20	29	20	21	29	33	48	38	36	28
10	29	24	20	24	19.2	21	29	35	44	38	36	33
11	27	26	20	22	19.2	31	28	36	42	33	35	28
12	26	36	20	20	19.2	42	28	35	40	36	29	26
13	26	42	19.2	19.2	26	44	28	40	38	36	14.1	25
14	24	36	18.4	18.4	24	42	26	42	38	35	27	24
15	23	28	16.8	18.4	22	40	26	42	38	36	28	26
16	23	24	16.8	18.4	20	23	26	40	36	33	26	25
17	24	23	17.6	17.6	20	10.8	26	36	35	35	26	24
18	42	22	42	17.6	19.2	26	29	38	33	36	33	24
19	40	23	35	17.6	36	36	31	40	14.0	36	29	24
20	33	29	25	17.6	42	36	31	40	34	36	29	23
21	40	26	23	17.6	31	36	38	38	35	42	29	26
22	40	26	38	17.6	44	29	42	40	35	40	33	26
23	33	26	46	17.6	48	19.2	42	44	36	40	35	24
24	31	23	35	26	48	16.8	40	44	38	38	44	9.8
25	28	30	31	40	46	17.6	40	40	35	36	46	3.6
26	26	36	25	44	44	9.9	40	38	33	36	44	15.1
27	24	26	23	36	36	2.5	38	44	33	31	42	22
28	25	42	33	26	33	28	17.9	48	31	29	42	22
29	42	35	38	22	35	33	2.7	-------	31	28	38	21
30	42	26	33	29	33	31	37	-------	29	26	35	21
31	36	23	-------	36	-------	28	42	-------	29	-------	33	-------

Monthly discharge of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	44	23	33.3	51.5	1,030	3,170
August	42	22	30.3	46.9	939	2,880
September	46	16.8	25.3	39.1	759	2,330
October	46	7.6	27.6	42.7	856	2,630
November	48	10.4	30.1	46.6	903	2,770
December	44	2.5	27.5	42.5	852	2,620
January	42	2.7	30.1	46.6	934	2,860
February	48	20	37.8	58.5	1,060	3,250
March	48	14.0	37.4	57.9	1,160	3,560
April	42	26	34.6	53.5	1,040	3,190
May	46	14.1	33.1	51.2	1,030	3,150
June	33	3.6	24.8	38.4	742	2,280
The year	48	2.5	31.0	48.0	11,300	34,700

SOUTH FORK OF WAILUA RIVER NEAR LIHUE, KAUAI

LOCATION.—One-third of a mile above Waiehu Falls and 7 miles northeast of Lihue. Prior to November 18, 1918, station was one-third of a mile farther upstream.

RECORDS AVAILABLE.—December 10, 1911, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder installed November 19, 1918. Friez water-stage recorder December 19, 1911, to November 8, 1918. Staff gage December 10–16, 1911.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 600 feet above and 300 feet below station. Right bank steep and high; left bank slopes gently. Control composed of solid rock ledge; somewhat shifting owing to boulders lodging in water-worn grooves at left end of control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.85 feet at 11.30 a. m. December 24 (discharge, 6,180 million gallons per day or 9,560 second-feet); minimum stage recorded, 0.96 foot from 10 a. m. to 4 p. m. July 16 (discharge, 4.8 million gallons per day or 7.4 second-feet).

1911–1922: Maximum stage recorded, 11.25 feet at 7.25 p. m. January 16, 1920 (discharge, 29,000 million gallons per day, or 44,900 second-feet); minimum stage recorded, 2.06 feet (on old gage) at 6 p. m. October 7, 1918 (discharge, 2.8 million gallons per day, or 4.3 second-feet).

DIVERSIONS.—Several diversions above station for irrigation and power development.

REGULATION.—By diversions above station only.

OBJECT OF STATION.—To determine feasibility of diversion for homesteads after stream enters Territorial lands.

UTILIZATION.—Water going to waste, except a small amount used for irrigation of rice and taro.

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ACCURACY.—Stage-discharge relation changed February 21. Rating curve used July 1 to February 21, well defined between 4 and 15,000 million gallons per day; curve used February 22 to June 30, well defined between 4 and 200 million gallons per day, and fairly well defined between 200 and 15,000 million gallons per day. Operation of water-stage recorder satisfactory except during periods noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good July 1 to February 21; low and medium stage records good, and high-stage records fair, February 22 to June 30.

Discharge measurements of South Fork of Wailua River near Lihue, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 7	E. M. Pickop	1.62	33	21.4	Nov. 17	M. H. Carson	1.00	8.5	5.5
Aug. 26	B. F. Rush	2.00	69	44.5	Feb. 11	E. M. Pickop	2.43	150	97
Oct. 6	J. E. Stewart	2.04	84	54	Mar. 1	M. H. Carson	1.62	41	26.5
11	M. H. Carson	1.56	30	19.3					

Discharge, in million gallons per day, of South Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	21	28	16.0	177	9.2	37	77	571	25	10.6		43
2	36	58	14.3	86	10.2	18.6	60	216	21	13.6		38
3	40	30	13.5	238	9.4	16.3	46	226	18.5	20		42
4	28	19.6	12.7	256	8.1	14.3	35	134	54	11.9	13	299
5	23	23	14.6	69	7.4	10.8	61	231	89			108
6	21	13.5	14.0	52	7.0	9.4	83	124	120	140		65
7	20	28	13.2	42	6.8	8.4	50	156	71			40
8	22	49	15.7	30	6.7	7.4	58	126	102			30
9	15.4	20	23	24	6.5	7.4	32	126	150			45
10	11.8	14.6	22	21	7.2	7.0	26	100	368			25
11	10.2	18.9	13.2	17.6	7.7	46	21	88	488	45	50	28
12	11.0	139	10.6	16.0	15.6	53	17.0	74	468			21
13	7.0	46	8.3	14.3	14.1	26	16.3	60	317			13.9
14	5.7	18.6	7.0	13.0	7.9	64	15.2	60	157			39
15	5.4	13.8	6.7	12.5	6.8	22	14.6	57	124			59
16	5.1	10.6	59	16.0	6.2	114	13.0	48	95			57
17	87	8.6	46	20	5.6	44	11.8	38	82			20
18	69	23	35	15.2	5.4	20	11.3	28	50	90		13.2
19	19.6	20	14.6	11.3	6.0	15.7	12.2	32	44		16	14.4
20	12.2	24	9.8	10.0	6.8	11.3	46	27	41			21
21	44	102	12.6	9.4	5.6	371	144	19.0	45			34
22	16.0	79	18.8	9.6	6.7	1,240	44	132	31			22
23	48	23	13.8	12.5	19.2	665	18.9	51	28			11.6
24	32	24	23	20	15.3	1,800	14.6	31	26			8.3
25	16.0	261	13.8	28	8.8	680	19.2	31	23			7.5
26	11.5	64	10.8	26	23	268	41	25	21	25	200	7.0
27	9.2	196	120	17.5	9.6	126	24	37	18.5			6.6
28	129	97	138	30	28	97	158	53	14.6			7.0
29	108	32	48	14.3	164	86	347	-------	13.5		38	6.8
30	70	24	343	16.0	149	77	282	-------	12.6		98	6.1
31	28	19.2	-------	12.0	-------	77	1,260	-------	11.9	-------	47	-------

NOTE.—Recorder clock stopped July 8 and Oct. 6; discharge ascertained by estimating gage-height graph for the day. No gage-height record Apr. 5 to May 28; discharge estimated by comparison with flow at stations on adjacent streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of South Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	129	5.1	31.7	49.0	982	3,020
August	261	8.6	49.3	76.3	1,530	4,690
September	343	6.7	37.0	57.2	1,110	3,410
October	256	9.4	43.1	66.7	1,340	4,100
November	164	5.4	19.7	30.5	590	1,810
December	1,800	7.0	195	302	6,040	18,600
January	1,260	11.3	98.7	153	3,060	9,390
February	571	19.0	104	161	2,900	8,940
March	488	11.9	101	156	3,130	9,610
April			61.7	95.5	1,850	5,680
May			55.9	86.5	1,730	5,320
June	299	6.1	37.9	58.6	1,140	3,490
The year	1,800	5.1	69.6	108	25,400	78,100

NORTH FORK OF WAILUA RIVER AT ELEVATION 650 FEET, NEAR LIHUE, KAUAI

LOCATION.—1½ miles above intake of Kanaha ditch and 10 miles northwest of Lihue.

RECORDS AVAILABLE.—September 21, 1914, to June 30, 1922. Records available for old station at elevation 500 feet, August 1 to October 28, 1910, and December 28, 1910, to September 25, 1914.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 80 feet above and 50 feet below gage. Right bank steep and high; left bank slopes gently. Control composed of boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.68 feet at 2.45 p. m. February 19 (discharge, 994 million gallons per day or 1,540 second-feet); minimum stage recorded, 0.86 foot at 1 p. m. November 16 (discharge, 19.6 million gallons per day or 30.3 second-feet).

1914–1922: Maximum stage recorded, 9.5 feet at 6.30 p. m. September 26, 1914 (discharge, from extension of rating curve, 2,200 million gallons per day or 3,400 second-feet); minimum discharge, 12.9 million gallons per day or 20.0 second-feet, May 7, 1919.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of diversion above or near this elevation. Territorial land and water. Important in relation to water supply for homesteads.

UTILIZATION.—Most of low-water flow diverted for irrigation of sugar cane.

ACCURACY.—Discharge records for this station published below for the period May 17 to June 30, 1921, supersede previously published records. Stage-discharge relation practically permanent. Rating curve well defined, between 20 and 300 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for unusually high stages.

Discharge measurements of North Fork of Wailua River at elevation 650 feet, near Lihue, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 8	E. M. Pickop	1.20	52	34	Jan. 31	E. M. Pickop	2.72	324	209
Aug. 26	do	1.51	79	51	Feb. 28	M. H. Carson	1.28	61	39.5
Oct. 7	J. E. Stewart	1.16	47	30.5	Apr. 5	do	1.02	36	23.1
Nov. 16	M. H. Carson	.86	28.5	18.5					

Discharge, in million gallons per day, of North Fork of Wailua River at elevation 650 feet, near Lihue, Kauai, for the years ending June 30, 1921 and 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920–21												
1				26	46	30	32	58	55	28	35	28
2			80	61	43	26	39	48	46	28	38	28
3				62	56	30	36	41	26	28	88	38
4				34	48	37	55	38	28	39	38	30
5			35	27	30	33	133	35	26	35	45	26
6				33	34	50	146	32	24	39	35	26
7				49	85	43	168	32	24	60	32	28
8				65	71	71	337	32	24	226	30	26
9				31	36	42	174	30	22	71	28	26
10			100	27	49	58	90	28	22	41	28	24
11				30	34	50	81	38	22	35	26	24
12				48	28	103	137	30	22	35	26	40
13				34	25	359	211	28	22	37	50	76
14				32	23	86	420	28	22	30	34	35
15			60	67	22	67	620	50	22	32	28	31
16				56	21	58	920	28	24	35	26	30
17				77	20	49	620	28	40	32	26	45
18				47	22	40	568	28	22	32	28	30
19				216	85	33	505	26	22	32	45	32
20			30	190	40	26	465	30	31	53	28	28
21				87	109	23	125	59	33	40	34	26
22				56	52	67	77	28	24	41	34	26
23				43	42	288	67	26	39	32	26	26
24			40	44	54	376	66	24	35	117	26	26
25			60	33	46	91	297	24	28	62	24	31
26			60	30	99	50	245	24	24	62	22	35
27			42	46	72	37	490	22	26	62	22	28
28			29	33	36	31	137	22	30	35	37	28
29			30	26	45	32	72		52	103	51	30
30			32	25	40	28	167		77	67	40	30
31				33		26	99		32		30	

Discharge, in million gallons per day, of North Fork of Wailua River at elevation 650 feet, near Lihue, Kauai, for the years ending June 30, 1921 and 1922—Contd.

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1921–22												
1	46	53	30	160	23	42	52	205	30	24	26	37
2	44	67	30	48	26	32	35	119	30	28	24	36
3	48	41	30	59	22	36	32	128	28	26	24	32
4	40	35	28	61	22	30	43	140	50	24	28	41
5	30	38	34	41	22	28	84	157	69	31	39	32
6	32	30	30	36	21	26	70	79	77	26	28	30
7	28	87	28	32	21	24	51	71	48	73	26	33
8	33	41	33	30	21	24	43	54	65	63	52	30
9	28	32	38	28	21	22	32	50	64	35	52	44
10	26	32	34	28	22	22	32	46	158	42	51	30
11	28	36	28	26	21	33	28	46	224	55	43	37
12	26	74	26	26	37	62	28	45	191	48	30	28
13	24	35	24	24	22	46	26	35	150	45	71	26
14	24	30	24	24	21	51	26	40	75	132	32	76
15	24	28	22	26	21	34	26	32	58	50	35	38
16	22	26	56	24	19.6	66	24	30	52	55	36	32
17	66	26	49	24	21	35	24	30	43	52	48	28
18	38	52	35	22	20	32	24	28	38	40	34	26
19	26	42	26	22	31	30	32	70	35	40	30	29
20	34	30	26	22	21	26	53	32	38	101	28	30
21	36	102	29	22	28	124	79	38	35	56	37	41
22	26	52	31	28	27	274	46	71	30	38	32	31
23	56	32	27	34	64	234	31	32	30	32	42	26
24	30	48	47	34	30	371	28	32	30	38	233	24
25	26	162	28	43	40	230	40	30	28	42	63	24
26	24	57	26	32	31	100	52	28	26	30	138	22
27	26	150	97	38	28	62	38	63	26	28	58	22
28	107	61	99	38	62	51	102	48	24	26	41	22
29	59	41	55	26	118	51	112	-------	24	26	35	22
30	54	35	64	28	124	49	158	-------	24	27	56	22
31	33	32	-------	23	-------	53	328	-------	24	-------	35	-------

NOTE.—Recorder clock stopped for about eight hours on July 8; discharge ascertained by estimating missing gage-height record by comparison with record for East Branch of this stream.

Monthly discharge of North Fork of Wailua River at elevation 650 feet, near Lihue, Kauai, for the years ending June 30, 1921 and 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1920–21						
September	-------	-------	57.3	88.7	1,720	5,280
October	216	25	53.8	83.2	1,670	5,120
November	109	20	47.1	72.9	1,410	4,340
December	376	23	75.5	117	2,340	7,180
January	920	32	245	379	7,600	23,300
February	59	22	32.8	50.7	917	2,820
March	77	22	30.5	47.2	946	2,900
April	226	28	52.3	80.9	1,570	4,820
May	88	22	34.2	52.9	1,060	3,250
June	76	24	31.2	48.3	937	2,870
The period	-------	-------	-------	-------	20,200	61,900
1921–22						
July	107	22	36.9	57.1	1,140	3,510
August	162	26	51.8	80.1	1,610	4,930
September	99	22	37.8	58.5	1,130	3,480
October	160	22	35.8	55.4	1,110	3,410
November	124	19.6	33.6	52.0	1,010	3,090
December	371	22	74.2	115	2,300	7,060
January	328	24	57.4	88.8	1,780	5,460
February	205	28	63.5	98.2	1,780	5,460
March	224	24	58.8	91.0	1,820	5,590
April	132	24	44.4	68.7	1,330	4,090
May	233	24	48.6	75.2	1,510	4,620
June	76	22	31.7	49.0	951	2,920
The year	371	19.6	47.9	74.1	17,500	53,600

KANAHA DITCH NEAR LIHUE, KAUAI

LOCATION.—300 feet below point where Kauai Electric Co.'s power line crosses ditch and 9 miles north of Lihue.

RECORDS AVAILABLE.—July 26, 1921, to June 30, 1922. August 6, 1910, to July 25, 1921, at site 800 feet upstream.

GAGE.—Gurley printing water-stage recorder, installed July 25, 1921. Vertical staff gage, 800 feet upstream, prior to that date.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage.

CHANNEL AND CONTROL.—Channel cut in conglomerate and clay; straight for 300 feet above and 10 feet below gage, where a sharp turn is made into a ¾-mile tunnel. Control composed of soft lava rock; shifting probably due to caving in of tunnel roof.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.01 feet at 2.30 a. m. October 1 (discharge, 24 million gallons per day or 37 second-feet); minimum discharge, 1.3 million gallons per day or 2.0 second-feet, January 25–28 and March 29.

1910–1922: Maximum stage recorded on October 1, 1921. Ditch occasionally dry.

DIVERSIONS.—All diversions below station.

REGULATION.—By head gates.

OBJECT OF STATION.—To determine discharge of ditch which diverts water from river and delivers it to fee simple and Territorial lands leased to Lihue plantation. Territorial water. Important station relative to North Wailua homesteads.

UTILIZATION.—Water used for irrigation of sugar cane and for domestic supply.

ACCURACY.—Stage-discharge relation not permanent. Rating curve for staff gage, used July 1–25, fairly well defined between 5 and 20 million gallons per day. Two fairly well defined curves used subsequent to July 25; the first, applicable July 25 to February 3, was used direct July 25 to October 27, and as standard curve for shifting-control method October 28 to February 3; the second was used direct February 4 to June 30. Staff gage read to hundredths once daily July 1–25; operation of water-stage recorder satisfactory subsequent to July 25. Daily discharge ascertained by applying to rating table daily staff gage reading or mean daily gage height obtained by averaging hourly gage heights from recorder record or, for days of considerable fluctuation in stage, by averaging the hourly discharge, except for period for which shifting-control method was used. Records fair.

Kanaha ditch diverts from North Fork of Wailua River at a point about 8½ miles above mouth of river, 9 miles north of Lihue, and at an elevation of about 600 feet. The course of the ditch is due east, about parallel to the river, for a distance of about a third of a mile, and then turns sharp to the south. About 3 miles farther on it crosses South Fork of Wailua River and within a short distance joins Lihue ditch at an elevation of about 550 feet. Through Lihue ditch the water is carried around the base of Kilohana Crater, south for a distance of about 5 miles to the vicinity of Lihue.

Discharge measurements of Kanaha ditch near Lihue, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 24	W. C. Renshaw	3.24	28	18.0	Nov. 16	M. H. Carson	3.08	27	17.4
Aug. 26	B. F. Rush	3.53	31	20.1	Feb. 28	do	2.78	25	16.2
Oct. 7	M. H. Carson	3.19	26.5	17.0					

Discharge, in million gallons per day, of Kanaha ditch near Lihue, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	15.8	19.0	19.0	18.2	20	22	3.2	12.5	16.8	16.8	17.6	19.2
2	15.0	18.2	19.0	15.7	20	21	3.2	18.2	16.8	18.4	17.6	19.2
3	15.0	18.2	19.0	15.7	20	21	3.2	10.3	17.6	17.6	17.6	19.2
4	15.0	18.2	19.0	19.0	19.0	22	3.2	1.4	17.6	17.6	19.2	16.8
5	15.0	17.3	20	17.3	19.0	21	3.0	1.4	17.6	18.4	19.2	9.0
6	15.8	17.3	20	17.3	18.2	21	3.0	1.4	16.8	17.6	18.4	9.0
7	15.0	18.2	19.0	17.3	17.3	21	3.0	1.4	16.0	19.2	17.6	16.0
8	15.8	19.0	20	16.5	18.2	21	3.0	1.4	17.6	20	18.4	17.6
9	15.0	18.2	20	16.5	18.2	21	3.0	1.4	17.6	18.4	18.4	20
10	14.2	18.2	20	15.7	19.0	22	3.0	1.4	16.0	19.2	18.4	18.4
11	15.0	18.2	19.0	17.3	18.2	23	2.8	1.4	14.6	19.2	18.4	19.2
12	14.2	19.0	19.0	18.2	21	22	2.6	1.4	13.8	18.4	17.6	17.6
13	13.4	19.0	18.2	17.3	20	23	2.4	11.1	15.3	18.4	18.4	16.8
14	13.4	18.2	19.0	17.3	18.2	22	2.3	16.8	16.0	19.2	16.8	19.2
15	15.0	18.2	19.0	18.2	18.2	22	2.3	15.3	16.8	18.4	17.6	19.2
16	15.8	18.2	21	17.3	17.3	22	2.1	15.3	16.8	18.4	18.4	18.4
17	18.2	18.2	21	17.3	17.3	22	1.9	15.3	16.0	17.6	19.2	17.6
18	17.4	21	19.0	17.3	20	22	1.8	16.0	16.8	18.4	18.4	16.8
19	17.4	20	17.3	16.5	20	21	1.8	17.6	16.8	18.4	18.4	17.6
20	16.6	19.0	18.2	17.3	18.2	21	1.7	16.8	16.8	18.4	18.4	18.4
21	16.6	20	18.2	17.3	22	22	1.7	16.0	17.6	17.6	19.2	20
22	16.6	19.0	19.0	19.0	21	19.0	1.8	18.4	17.6	17.6	19.2	19.2
23	19.0	19.0	19.0	19.0	23	19.0	1.5	16.0	16.0	17.6	20	16.8
24	16.6	19.0	20	19.0	22	20	1.4	15.3	17.6	18.4	16.8	16.0
25	16.6	21	19.0	20	22	19.0	1.3	15.3	17.6	19.2	16.0	15.3
26	17.3	18.2	18.2	19.0	22	7.6	1.3	14.6	16.8	18.4	16.8	15.3
27	17.3	21	20	20	21	3.4	1.3	16.8	16.8	18.4	17.6	17.6
28	20	19.0	20	21	22	3.2	1.3	16.8	5.4	17.6	17.6	18.4
29	19.0	19.0	18.2	20	23	3.2	1.4	-------	1.3	17.6	18.4	17.6
30	19.0	20	18.2	20	23	3.2	1.4	-------	10.0	18.4	17.6	17.6
31	18.2	18.2	-------	20	-------	3.2	5.4	-------	16.8	-------	18.4	-------

Monthly discharge of Kanaha ditch near Lihue, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	20	13.4	16.3	25.2	504	1,550
August	21	17.3	18.8	29.1	584	1,790
September	21	17.3	19.2	29.7	576	1,770
October	21	15.7	18.0	27.9	558	1,710
November	23	17.3	19.9	30.8	598	1,830
December	23	3.2	17.9	27.7	556	1,700
January	5.4	1.3	2.33	3.61	72.3	222
February	18.4	1.4	11.0	17.0	307	945
March	17.6	1.3	15.6	24.1	484	1,480
April	20	16.8	18.3	28.3	549	1,680
May	20	16.0	18.1	28.0	562	1,720
June	20	9.0	17.3	26.8	519	1,590
The year	23	1.3	16.1	24.9	5,870	18,000

EAST BRANCH OF NORTH FORK OF WAILUA RIVER NEAR LIHUE, KAUAI

LOCATION.—1,200 feet above confluence with North Fork and 8 miles north of Lihue.

RECORDS AVAILABLE.—July 31, 1912, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder, December 31, 1914, to June 30, 1922. Staff gage 800 feet below, July 31, 1912, to September 30, 1914.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 60 feet above and 400 feet below gage. Banks low and wooded. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.65 feet at 3.45 a. m. October 1 (discharge, 1,010 million gallons per day or 1,560 second-feet); minimum discharge, 12.0 million gallons per day or 18.6 second-feet, during a few hours on June 29 and 30.

1912–1922: Maximum discharge, about 3,000 million gallons per day or 4,640 second-feet, at gage height 8.9 feet, at 8 a. m. March 3, 1916; minimum stage recorded, 1.6 feet February and March, 1915 (discharge, 7 million gallons per day or 11 second-feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of diversion above this point. Territorial land and water. Valuable for prospective homesteads of North Wailua.

UTILIZATION.—After joining North Fork of Wailua River, part of water is diverted for irrigation of sugar cane, but most of it is wasted.

ACCURACY.—Stage-discharge relation changed January 30. Rating curve used July 1 to January 30 fairly well defined between 10 and 500 million gallons per day; curve used January 31 to June 30, fairly well defined between 8 and 500 million gallons per day. Operation of recorder satisfactory except during periods noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair except for periods during which recorder did not operate.

Discharge measurements of East Branch of North Fork of Wailua River near Lihue, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 7	B. F. Rush	1.88	29	18.7	Jan. 30	E. M. Pickop	3.39	353	228
Aug. 26	E. M. Pickop	1.97	33.5	21.5	Feb. 28	M. H. Carson	2.15	56	36
Oct. 6	J. E. Stewart	2.13	51	33	Apr. 5	S. B. Hall	1.95	31.5	20.4
Nov. 17	M. H. Carson	1.70	19.0	12.3					

Discharge, in million gallons per day, of East Branch of North Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	22	18.0	18.0	161		24	33	185	23	15.4	17.3	23
2	28	22	17.6	46		21	29	92	22	16.8	16.3	22
3	30	19.3	18.9	82		25	27	81	20	17.8	16.3	21
4	28	18.0	17.2	49		19.8		57	27	15.4	17.8	30
5	21	20	18.9	33	13	17.2		74	34	27	30	21
6	21	16.8	16.8	33		16.4	35	49	47	20	21	19.4
7	18.9	40	16.4	27		15.9		49	39	154	17.8	19.4
8	23	26	17.2	22		15.5		39	53	94	61	17.8
9	18.5	18.5	17.2	20	13.4	14.8		35	56	32	26	19.9
10	17.6	18.0	18.0	18.9	12.5	14.5		36	113	32	26	17.3
11	17.2	18.5	15.9	18.0	12.8	17.2		37	140	35	24	19.9
12	16.4	33	14.8	17.2	18.6	37		36	96	29	20	17.8
13	15.5	22	14.2	16.8				28	103	26	21	15.8
14	14.8	18.0	13.9	16.4			20	29	56	49	18.9	15.4
15	15.5	16.4	13.9	16.8	13			26	50	30	17.8	18.9
16	14.8	15.5	18.5	15.9		25		23	41	28	21	18.9
17	24	15.1	21	19.2	12.2			21	38	37	26	15.8
18	21	17.2	15.9	15.9	14.1				31	31	18.9	14.9
19	15.9	16.4	14.2	14.5	23				28	33	17.8	14.9
20	18.2	15.9	14.2	13.9	13.4				27	58	16.8	15.8
21	30	28	15.9	13.6	13.4	118	34		27	39	19.4	24
22	17.6	27	18.0	13.9	15.9	280		27	23	28	17.3	18.9
23	32	17.2	15.1	14.5	47	278	21		22	24	26	15.8
24	20	18.0	21	14.5	19.8	484	19.3		25	26	177	14.4
25	17.2	54	15.5	20	21	268	26		21	27	56	13.9
26	15.9	23	14.5	16.4	20	112	32		18.9	21	105	13.4
27	15.5	56	41	16.8	15.1	70	24		17.8	19.9	48	13.0
28	32	30	62	15.1	21	54	61	35	17.3	18.9	35	13.0
29	32	22	32		52	46	83	-------	17.3	17.8	30	12.5
30	30	21	32	15	48	43	140	-------	16.3	17.3	32	12.5
31	20	18.5	-------		-------	39	357	-------	15.8	-------	36	-------

NOTE.—Water-stage recorder not operating Oct. 29 to Nov. 8, Nov. 13–16, Dec. 13–20, Jan. 4–22, and Feb. 18–27; discharge estimated by comparison with flow at station on North Fork of Wailua River. Braced figures show mean discharge for periods indicated.

Monthly discharge of East Branch of North Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	32	14.8	21.4	33.1	664	2,040
August	56	15.1	23.2	35.9	719	2,210
September	62	13.9	20.0	30.9	600	1,840
October	161	13.6	26.7	41.3	826	2,540
November	52	----------	18.3	28.3	549	1,680
December	484	14.5	71.9	111	2,230	6,840
January	357	----------	44.0	68.1	1,360	4,190
February	185	----------	42.9	66.4	1,200	3,690
March	140	15.8	40.8	63.1	1,270	3,880
April	154	15.4	34.0	52.6	1,020	3,130
May	177	16.3	33.0	51.1	1,020	3,140
June	30	12.5	17.7	27.4	530	1,630
The year	484	----------	32.9	50.9	12,000	36,800

KAPAHI DITCH NEAR KEALIA, KAUAI

LOCATION.—500 feet below intake and 5 miles west of Kealia.

RECORDS AVAILABLE.—April 15, 1909, to May 2, 1914; May 10, 1915, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder; installed March 4, 1920. Stevens eight-day water-stage recorder used May 10, 1915, to March 3, 1920. Watson recorder used prior to May 10, 1915.

DISCHARGE MEASUREMENTS.—Made by 20-foot sharp-crested weir immediately below gage and from foot plank across box flume 100 feet below gage.

CHANNEL AND CONTROL.—Channel straight for 50 feet above weir.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.65 feet at 5.45 p. m. August 7 (discharge, 90 million gallons per day or 139 second-feet); minimum discharge, no flow, 2 p. m. June 3 to 11 a. m. June 6 (head gates closed while ditch was being cleaned).

1915–1922: Maximum stage recorded, 2.40 feet at 7.10 a. m. January 16, 1921 (discharge, 158 million gallons per day or 244 second-feet); water turned out of ditch November 23–24, 1916, and June 3–6, 1922.

DIVERSIONS.—All diversions below station.

REGULATION.—Flow regulated by head gates.

OBJECT OF STATION.—To determine amount of water diverted by ditch. Water owned by Territory and part is leased to Makee Sugar Co. Homesteads entitled to part of water.

UTILIZATION.—Water used for irrigation of sugar cane and for domestic supply.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except during periods indicated in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those for periods during which recorder did not operate for which they are poor.

Kapahi ditch diverts from Kapaa River at a point about 4 miles east of Kealia and mouth of the river and at an elevation of about 400 feet. The general course of the ditch is eastward toward Kealia. It comprises about 6 miles of main ditch.

No discharge measurements were made at this station during the year.

Discharge, in million gallons per day, of Kapahi ditch near Kealia, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	17.1	12.1	10.4	8.4	9.3	13.4		7.0	9.8	10.0	14.7	8.5
2	26	13.4	10.0	4.1	10.4	10.8		6.7	13.4	11.7	13.0	7.4
3	27	12.5	13.2	3.1	10.0	15.7		8.5	13.4	13.0	13.8	8.0
4	25	12.1	10.0	2.8	10.0	11.7		9.3	16.6	10.8	12.5	0.0
5	18.0	13.4	11.7	5.9	9.3	10.0		12.5	13.6	19.9	19.0	0.0
6	17.1	10.8	10.8	12.1	8.5	9.3		12.5	9.3	14.2	16.1	5.6
7	15.6	30.5	10.0	13.0	8.5	9.3		5.7	10.8	15.0	14.2	11.7
8	20.5	17.7	10.8	13.0	8.5	8.9	12	12.4	8.5	5.4	17.1	11.2
9	14.2	12.5	12.5	11.7	8.5	8.5		13.8	9.4	8.1	17.1	13.8
10	13.0	13.8	13.0	11.2	10.0	8.9		10.4	11.2	7.8	16.6	12.5
11	14.2	13.8	10.0	10.8	9.3	20		8.5	7.8	12.1	15.1	15.6
12	13.0	27	9.3	10.4	31.5	49		8.5	10.0	17.1	15.1	12.5
13	11.7	16.1	8.9	10.0	13.0	41		11.7	13.8	18.0	13.8	11.7
14	11.2	11.7	8.9	10.0	10.4	24		13.4	17.1	17.6	8.9	11.2
15	10.8	10.4	8.5	9.3	9.3	16.1		13.4	17.1	16.1	12.5	13.8
16	10.4	10.0	13.0	8.1	8.9		10.4	11.7	16.6	18.5	14.7	13.8
17	19.8	9.7	18.9	8.5	8.5		11.2	11.2	16.1	18.5	20.5	12.1
18	15.6	13.0	10.8	8.5	10.8		11.7	10.8	13.8	17.4	15.1	11.2
19	11.7	12.9	9.3	8.1	29	30	12	14.9	12.5	10.8	14.2	12.1
20	16.9	11.7	9.3	8.1	9.7			10.8	14.2	10.5	12.5	14.2
21	23.5	31	10.4	8.1	8.9		16.5	8.5	14.2	11.2	14.7	21
22	13.4	18.5	15.1	8.1	11.4		7.0	8.9	12.5	16.6	12.1	18.0
23	33	11.7	9.3	8.1	33		10.4	9.7	12.1	14.7	14.2	13.8
24	15.1	12.5	11.7	8.1	12.5		10.8	11.2	17.0	14.2	6.7	11.2
25	13.0	28	9.3	7.8	11.0		12.5	10.4	13.4	16.7	10.5	10.4
26	11.7	13.8	8.5	7.8	15.9	10	7.4	9.3	11.7	13.8	12.8	10.0
27	11.7	30.5	26.5	7.8	11.2		7.0	8.1	11.2	13.4	8.5	9.7
28	34	15.6	30	7.8	13.0		7.0	5.1	10.8	12.5	10.0	10.0
29	21	11.7	15.5	7.4	28.5		7.0	-------	10.0	12.1	12.5	9.7
30	21.5	11.2	14.7	7.4	33.5		7.8	-------	9.7	13.0	11.2	9.3
31	13.8	10.4	-------	8.1	-------		9.3	-------	10.4	-------	10.8	-------

NOTE.—Water-stage recorder not operating Oct. 1–4, Dec. 10–12, Dec. 16 to Jan. 16, and Jan. 18–21; discharge estimated by comparison with flow at adjacent stations on both ditches and natural streams. Head gates closed June 4 and 5 and for part of day June 3 and 6. Braced figures show mean discharge for periods indicated.

Monthly discharge of Kapahi ditch near Kealia, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	34	10.4	17.4	26.9	540	1,660
August	31	9.7	15.5	24.0	480	1,470
September	30	8.5	12.3	19.0	370	1,130
October	13.0	2.8	8.50	13.2	264	809
November	33.5	8.5	13.7	21.2	412	1,260
December	-------	-------	18.0	27.9	557	1,710
January	-------	-------	11.0	17.0	340	1,050
February	14.9	5.1	10.2	15.8	285	876
March	17.1	7.8	12.5	19.3	388	1,190
April	19.9	5.4	13.7	21.2	411	1,260
May	20.5	6.7	13.6	21.0	420	1,290
June	21	.0	11.0	17.0	330	1,010
The year	-------	.0	13.1	20.3	4,800	14,700

ANAHOLA RIVER NEAR KEALIA, KAUAI

LOCATION.—A quarter of a mile above dam at Kiokala and 6 miles northwest of Kealia.

RECORDS AVAILABLE.—August 22 to November 2, 1910; December 30, 1912, to June 30, 1922. Fragmentary record December 15, 1910, to December 28, 1912, at dam a quarter of a mile below present site.

GAGE.—Stevens continuous water-stage recorder, March 14, 1920, to June 30, 1922. Friez water-stage recorder, August 22 to November 2, 1910, and December 28, 1912, to March 7, 1920.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 75 feet above and below gage. Right bank steep and high and covered with underbrush; left bank low for about 40 feet out from low-water channel then rises abruptly. Control composed of boulders; permanent for low and medium stages; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.30 feet at 9.30 p. m. December 21 (discharge, 675 million gallons per day or 1,040 second-feet); minimum stage recorded, 1.54 feet at 3.45 a. m. September 16 and for several hours September 19, 20, and 24–26 (discharge, 1.4 million gallons per day, or 2.2 second-feet).

1910; 1912–1922: Maximum stage recorded, 12.9 feet at 7.30 p. m. September 26, 1915 (discharge, from extension of rating curve, 1,450 million gallons per day or 2,240 second-feet); minimum stage recorded, 1.3 feet February 27 and 28, 1915 (discharge, 2.0 million gallons per day, or 3.1 second-feet).

DIVERSIONS.—Part of flow diverted 3 miles above station.

REGULATION.—None except by diversions.

OBJECT OF STATION.—To determine feasibility of additional diversions for sugar-cane irrigation. Water owned by Territory and leased to Makee Sugar Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent. Two rating curves used; both fairly well defined below 40 million gallons per day and poorly defined above that quantity. Shifting-control method used February 28 to March 13. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for period for which shifting-control method was used. Records fair except those for high stages, which are poor.

Discharge measurements of Anahola River near Kealia, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 27	E. M. Pickop	1.65	4.3	2.8	Jan. 27	E. M. Pickop	1.81	8.8	5.7
Aug. 27	do	2.45	40	25.5	Mar. 1	M. H. Carson	1.91	14.7	9.5
Oct. 5	J. E. Stewart	2.20	20.7	13.4	Apr. 6	do	1.89	11.6	7.5
Dec. 8	M. H. Carson	1.67	4.6	3.0					

Discharge, in million gallons per day, of Anahola River near Kealia, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.8	3.3	2.3	26	3.0	4.5	12.7	117	9.8	4.7	7.4	8.8
2	7.6	3.4	2.2	42	9.5	3.4	11.2	44	8.6	5.1	7.0	9.1
3	9.6	3.3	2.2	13.6	4.0	4.5	10.1	43	8.6	4.9	7.2	9.8
4	6.1	2.7	2.2	47	3.3	4.4	15.3	25	26	4.7	6.6	7.9
5	4.5	3.3	2.2	18.9	2.8	3.3	8. [illegible]	16.2	18.6	7.7	9.3	7.4
6	3.8	2.6	2.2	32	2.7	3.0	12.2	13.8	22	7.9	8.8	7.0
7	3.4	30	2.0	18.8	2.6	2.8	11.1	13.8	23	87	7.0	7.2
8	9.4	6.7	2.0	9.3	2.6	2.8	13.0	11.5	24	214	11.4	6.8
9	3.6	2.7	2.0	7.6	2.6	2.7	7.9	10.1	27	44	7.4	7.0
10	3.3	2.9	2.3	6.6	3.1	2.7	8.6	14.6	35	25	8.8	6.4
11	3.1	3.3	1.8	5.9	2.8	3.6	7.9	12.7	41	16.2	10.7	8.0
12	2.8	20	1.7	5.3	17.2	50	6.8	13.8	37	13.0	7.2	6.6
13	2.6	5.4	1.6	4.7	4.9	29	6.4	8.6	57	11.0	6.1	5.7
14	2.6	3.3	1.5	4.5	3.1	16.6	6.4	8.4	16.7	17.2	5.5	5.5
15	2.4	2.8	1.5	4.4	2.8	7.0	5.9	7.9	12.7	9.8	5.1	5.5
16	2.3	2.6	1.8	4.2	2.6	67	5.7	7.0	10.7	11.2	5.5	5.3
17	2.8	2.5	2.5	4.4	2.4	102	20	6.8	10.1	73	6.8	5.1
18	2.8	4.2	2.0	4.0	2.4	15.8	6.8	6.6	8.8	114	5.3	4.9
19	2.3	2.7	1.6	3.4	31	11.5	6.6	6.6	8.1	68	4.7	4.9
20	2.1	2.6	1.5	3.3	3.6	9.3	6.6	6.6	9.1	57	4.7	5.1
21	18.8	8.4	1.7	3.3	2.8	65	10.1	6.4	9.1	28	4.7	8.6
22	3.1	4.1	2.0	3.3	2.8	140	7.2	11.3	8.1	19.1	4.4	7.2
23	7.2	2.7	1.7	3.1	16.6	206	5.9	7.4	7.4	15.2	7.9	5.5
24	4.8	2.9	1.5	3.4	4.7	246	5.7	6.4	6.8	13.4	62	4.7
25	3.0	21	1.4	5.3	12.4	142	7.0	5.9	6.4	12.7	15.3	4.2
26	2.7	3.6	1.4	3.8	10.4	58	7.2	5.5	6.1	11.0	48	4.2
27	2.7	23	9.2	3.4	3.8	34	5.5	75	5.7	9.8	14.1	4.0
28	8.0	3.7	21	3.3	3.8	24	24	18.6	5.5	8.8	10.1	3.8
29	5.3	2.8	3.0	3.1	6.9	19.6	30	-------	5.3	8.1	9.1	3.8
30	4.0	2.6	2.8	3.1	15.4	15.5	54	-------	5.1	7.9	29	3.6
31	3.4	2.5	-------	2.8	-------	15.8	238	-------	4.9	-------	10.7	-------

Monthly discharge of Anahola River near Kealia, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	18.8	2.1	4.64	7.18	144	441
August	30	2.5	6.05	9.36	188	576
September	21	1.4	2.83	4.38	84.8	261
October	47	2.8	9.80	15.2	304	932
November	31	2.4	6.29	9.73	189	579
December	246	2.7	42.3	65.4	1,310	4,020
January	238	5.5	18.9	29.2	585	1,800
February	117	5.5	18.9	29.2	530	1,620
March	57	4.9	15.6	24.1	484	1,480
April	214	4.7	31.0	48.0	929	2,850
May	62	4.4	11.5	17.8	358	1,090
June	9.8	3.6	6.12	9.47	184	563
The year	246	1.4	14.5	22.4	5,290	16,200

ANAHOLA DITCH ABOVE KANEHA RESERVOIR, NEAR KEALIA, KAUAI

LOCATION.—At upper end of second tunnel above Kaneha reservoir, 7 miles from Kealia.

RECORDS AVAILABLE.—December 9, 1921, to June 30, 1922. At station 100 feet upstream at lower end of third tunnel above reservoir, May 29, 1915, to December 9, 1921. Flow at the two stations not exactly comparable owing to occasional operation of check gate and spillway between.

GAGE.—Stevens continuous water-stage recorder. At old station 100 feet upstream a Friez recorder was used from May 29 to June 26, 1915, a Stevens eight-day recorder from June 26, 1915, to April 10, 1920, and a Stevens continuous recorder from April 10, 1920, to December 9, 1921.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel at gage is short straight stretch of open ditch cut in firm earth between two tunnels. Control is rock section of ditch in tunnel; probably permanent. Possible back-water effect from reservoir below.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.85 feet at 1.15 a. m. April 8 (discharge, 84 million gallons per day or 130 second-feet); minimum stage, 0.92 foot from 5.30 to 6.30 a. m. April 22 (discharge, 0.4 million gallons per day or 0.6 second-foot).

1915–1922: Maximum stage recorded, 6.25 feet (at old station) at 7.10 a. m. January 16, 1921 (discharge, 130 million gallons per day or 201 second-feet). Water occasionally turned out of ditch; no flow into reservoir.

DIVERSIONS.—None except that occasionally excess water is diverted through spillway 100 feet above station.

REGULATION.—By operation of head gates and spillway gates.

OBJECT OF STATION.—To determine amount of water diverted from Anahola River into Kaneha reservoir. Water owned by Territory and leased to Makee Sugar Co.

UTILIZATION.—Water is stored in Kaneha reservoir for irrigation of sugar cane and for domestic supply in the vicinity of Anahola and Kealia.

ACCURACY.—Stage-discharge relation practically permanent during year at both old and new stations. Rating curve for old station, applicable July 1 to 2 p. m. December 9, well defined below 10 and fairly well defined below 35 million gallons per day. Curve for present station, applicable from 5 p. m. December 9 to June 30, fairly well defined below 10 million gallons per day; extended above that point on basis of form of previous curve. Operation of water-stage recorder satisfactory except during periods indicated in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder-graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Discharge at old station does not include discharge through spillway, as the effect of opening spillway on relation of stage to discharge into reservoir is probably slight. Records good prior to December 9, except for periods during which water was wasted over spillway or recorder did not operate. Records fair subsequent to December 9, except for period during which recorder did not operate.

Anahola ditch diverts water from Anahola River at a point about 3½ miles above gaging station and dam on the river at Kiokala and carries it southeastward, for about 1½ miles, to Kaneha reservoir where it is stored.

Discharge measurements of Anahola ditch above Kaneha reservoir, near Kealia, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 27	W. C. Renshaw	1.24	3.1	2.0	Nov. 15	M. H. Carson	1.22	3.1	2.0
Aug. 27	B. F. Rush	1.94	16.1	10.4	Jan. 27	E. M. Pickop	1.47	5.9	3.8
Oct. 5	J. E. Stewart	1.25	9.4	6.1	Apr. 6	S. B. Hall	1.51	7.4	4.8

Discharge, in million gallons per day, of Anahola ditch above Kaneha reservoir, near Kealia, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	4.5		3.0	14.3	3.6	4.6			4.9	2.5	3.5	4.2
2	5.9		2.8	11.0	8.4	3.6			4.1	2.8	3.3	3.7
3	6.5		3.3	7.6	4.5	6.8		0.8	4.0	2.9	4.5	3.6
4	6.4	2.6	2.9	6.2	3.3	4.6			7.0	2.6	3.3	3.5
5	4.4		4.0	3.6	2.8	3.3	6.5		7.3	5.4	11.4	3.3
6	3.5		3.0	7.6	2.7	3.0			7.3	5.7	6.3	3.0
7	3.2		2.8	8.2	2.6	2.8			7.4	11.1	5.4	3.1
8	6.5		3.7	5.0	2.5	2.5			7.8	12.1	8.5	2.9
9	3.8		3.3	4.2	2.5	2.4		4.5	7.7	1.3	5.1	3.8
10	3.4	6.0	4.4	3.7	3.6	2.4			8.0	2.1	7.3	2.9
11	3.1		2.7	3.4	3.0	3.8			8.4	2.1	6.1	4.0
12	2.9		2.5	3.0	10.1	12.3	4.2		8.0	1.8	4.2	3.0
13	2.8		2.3	2.9	3.3	11.5		4.6	3.7	3.8	3.7	2.7
14	2.7		2.2	2.8		9.1		5.3	.6	7.2	3.4	2.5
15	2.5		2.1	2.8		5.6		4.5	4.5	5.8	3.1	4.1
16	2.4	3.0	5.1	2.6	2.3	6.2		3.8	5.6	6.5	5.4	2.8
17	3.0		7.1	2.8	2.2	.6		3.7	5.3	8.0	6.0	2.5
18	4.5		3.1	2.5	2.8	.6		3.4	4.6	11.8	3.5	2.4
19	2.6		2.5	2.3	9.2	.6		2.2	4.2	5.1	3.3	2.3
20	2.7		2.3	2.2	3.1	2.0		2.3	5.2	.5	3.2	2.8
21	6.6		2.8	2.2	2.7	5.5		3.4	5.0	.4	3.7	5.1
22	3.6		6.1	2.2	2.5	5.5	5.0	5.5	3.9	2.0	3.1	4.6
23			2.8	2.5	9.0	3.8		4.4	4.4	3.5	10.2	3.2
24		5.5	2.4	3.2	4.0	3.8		3.4	4.0	5.4	10.1	2.5
25			2.3	7.0	6.0	3.7		3.9	3.6	6.6	10.1	2.3
26			2.2	4.2	5.7	3.6		3.1	3.1	4.1	6.8	2.1
27	3.9		13.6	5.0	3.6	3.7		5.8	2.8	4.4	5.6	2.1
28		6.1	14.9	3.8	5.2		7.1	4.5	2.8	3.8	5.4	2.1
29		4.1	5.1	4.0	8.0	5.5		-------	2.8	3.6	4.6	2.0
30		3.6	7.6	3.6	9.1		12	-------	2.8	3.7	7.4	1.9
31		3.2	-------	3.0	-------			-------	2.6	-------	4.5	-------

NOTE.—Water-stage recorder did not operate July 23 to Aug. 27, Nov. 13–15, Dec. 28 to Jan. 27, and Jan. 29 to Feb. 12; discharge estimated by comparison with stations on adjacent ditches and natural streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Anahola ditch above Kaneha reservoir, near Kealia, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July			3.95	6.11	123	376
August			4.33	6.70	134	412
September	14.9	2.1	4.16	6.44	125	383
October	14.3	2.2	4.50	6.96	139	428
November	10.1	2.2	4.50	6.96	135	414
December	12.3	.6	4.51	6.98	140	429
January			5.93	9.18	184	564
February			3.55	5.49	99.3	305
March	8.4	.6	4.95	7.66	153	471
April	12.1	.4	4.62	7.15	139	425
May	11.4	3.1	5.55	8.59	172	528
June	5.1	1.9	3.03	4.69	91.0	279
The year		.4	4.48	6.93	1,630	5,010

KALIHIWAI RIVER NEAR HANALEI, KAUAI

LOCATION.—At elevation 700 feet, 1 mile east of Kauai Electric Co.'s power line, and 9 miles southeast of Hanalei.

RECORDS AVAILABLE.—March 13, 1914, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and 50 feet below gage; current sluggish at low stages. Right bank low and wooded; left bank a nigh and nearly vertical cliff. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, about 5.8 feet at midnight April 17 (discharge, about 1,050 million gallons per day or 1,620 second-feet); minimum stage recorded, 0.24 foot at 10 p. m. June 30 (discharge, 11.2 million gallons per day or 17.3 second-feet).

1914–1922: Maximum stage recorded, 14.4 feet at 6.30 a. m. September 25, 1914 (discharge, from extension of rating curve, 4,000 million gallons per day or 6,200 second-feet); minimum discharge, 5.8 million gallons per day or 9.0 second-feet, at 8 a. m. February 22, 1920 (gage height, 0.58 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high-level diversion, in connection with Territorial project relative to Hanalei River.

UTILIZATION.—Part of flow is diverted below station for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation permanent subsequent to July 28. Rating curve used July 29 to June 30, well defined below 80 million gallons per day. Shifting-control method used July 1–28. Operation of water-stage recorder satisfactory except during period noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for period during which recorder did not operate, for which they are fair.

Discharge measurements of Kalihiwai River near Hanalei, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 29	W. C. Renshaw	0.94	57	37	Jan. 28	E. M. Pickop	1.39	103	67
Aug. 24	E. M. Pickop	.70	38	24.4	Feb. 26	M. H. Carson	.40	24.3	15.7
Oct. 5	M. H. Carson	.60	32	20.7	Apr. 1	do	.30	18.5	12.0
Dec. 3	do	.90	52	34					

Discharge, in million gallons per day, of Kalihiwai River near Hanalei, Kauai for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	16.0	17.4	17.4	81	13.1	28	28	112	26	12.9		21
2	23	22	16.1	51	22	23	24	60	26	13.6	20	18.8
3	26	17.8	17.1	29	15.1	29	22	68	21	14.8		18.1
4	21	17.8	15.8	25	13.4	22	29	49	32	13.4		17.1
5	17.0	21	19.2	21	12.6	17.8	32	60	33	27		16.4
6	16.0	15.3	15.8	30	11.8	16.6	34	43	47	22		15.6
7	16.0	63	14.8	21	11.4	15.3	34	45	46	144	40	15.1
8	26	27	16.1	17.4	11.4	15.1	29	34	49			14.8
9	17.0	18.1	19.2	15.8	11.4	14.1	23	32	49	100		20
10	17.0	17.8	17.8	15.1	12.6	13.8	21	34	104			14.8
11	19.0	19.2	14.6	13.8	11.6	17.6	21	32	123			20
12	18.0	46	13.6	13.1	28	116	18.8	34	107			14.8
13	19.0	23	12.4	12.6	14.1	68	17.4	25	90	35		14.3
14	19.0	17.8	12.4	12.4	12.2	58	16.6	27	43			19.5
15	19.0	15.6	12.0	12.2	11.4	29	15.8	22	40			16.9
16	20	14.8	19.8	11.8	11.0	47	16.2	19.9	32		20	15.6
17	34	14.3	26	14.4	11.0	40	19.6	19.9	28			14.3
18	25	18.9	15.3	12.0	31	27	18.8	17.1	25			13.6
19	17.0	17.4	12.9	11.2	53	23	19.9	19.9	22			13.1
20	29	15.1	12.6	11.2	15.6	21	27	16.9	21	70		14.6
21	28	50	13.8	11.0	14.1	53	44	16.9	20			24
22	15.8	27	23	12.6	17.0	100	26	23	18.1			19.2
23	34	17.1	14.3	13.6	59	205	19.6	17.8	18.5		95	15.1
24	18.8	24	15.1	15.8	21	333	19.2	16.4	23			14.3
25	15.6	63	12.9	23	35	183	32	17.8	17.4		52	12.9
26	13.6	28	12.4	16.9	24	64	29	15.3	15.3	25	102	12.6
27	14.3	82	68	19.2	21	43	24	141	14.8		40	12.4
28	46	34	50	15.3	24	34	60	45	14.6		28	12.0
29	34	25	25	13.4	68	34	65	-------	13.8		24	12.0
30	27	21	29	15.1	61	32	82	-------	13.4		29	11.6
31	18.5	18.5	-------	12.9	-------	34	275	-------	13.4	-------	21	-------

NOTE.—Water-stage recorder did not operate Apr. 7 to May 25; discharge estimated by comparison with flow of adjacent streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Kalihiwai River near Hanalei, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	46	13.6	21.9	33.9	680	2,080
August	82	14.3	26.7	41.3	829	2,540
September	68	12.0	19.5	30.2	584	1,800
October	81	11.0	19.3	29.9	600	1,840
November	68	11.0	22.6	35.0	678	2,080
December	333	13.8	56.7	87.7	1,760	5,390
January	275	15.8	36.9	57.1	1,140	3,510
February	141	15.3	38.0	58.8	1,060	3,270
March	123	13.4	37.0	57.2	1,150	3,520
April	----------	----------	43.8	67.8	1,310	4,030
May	----------	----------	33.7	52.1	1,050	3,210
June	24	11.6	15.8	24.4	474	1,450
The year	----------	----------	31.0	48.0	11,300	34,700

HANALEI RIVER AT ELEVATION 625 FEET, NEAR HANALEI, KAUAI

LOCATION.—2 miles west of Kauai Electric Co.'s power line and 10 miles south of Hanalei. Trail to station leaves power line at Pole No. 334.

RECORDS AVAILABLE.—January 26, 1914, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder; moved 300 feet upstream on July 20, 1921. Datum of recorder in use prior to July 20, 1921, raised 6.0 feet January 15, 1915.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages. Bed composed of boulders; rough. Right bank steep and high; left bank slopes gently. Control composed of boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage during year ending June 30, 1919, estimated 4.95 feet November 25 (discharge, from extension of rating curve, 2,000 million gallons per day or 3,100 second-feet); minimum stage recorded, 0.22 foot at 6.30 p. m. March 17 (discharge, 19 million gallons per day or 29 second-feet).

Maximum stage recorded during year ending June 30, 1920, 6.62 feet at 7.45 p. m. January 16 (discharge, from extension of rating curve, 4,540 million gallons per day or 7,020 second-feet); minimum stage recorded, 0.56 foot for several hours February 21 (discharge, 29 million gallons per day or 45 second-feet).

Maximum stage recorded during year ending June 30, 1921, 7.50 feet at 11.20 a. m. January 16 (discharge, from extension of rating curve, 6,500 million gallons per day or 10,100 second-feet); minimum stage recorded, 0.44 foot for several hours February 20 (discharge, 25 million gallons per day or 39 second-feet); stage probably slightly lower February 24-28, when recorder was not operating.

Maximum stage recorded during year ending June 30, 1922, 5.74 feet at 2.30 a. m. October 1 (discharge, from extension of rating curve, 1,800 million gallons per day or 2,790 second-feet); minimum discharge, 31 million gallons per day or 48 second-feet, at 9 a. m. June 30 (gage height, 1.10 feet).

1914–1922: Maximum discharge recorded on January 16, 1921; minimum discharge, 14 million gallons per day or 22 second-feet, January 6 and 10, 1918 (gage height, 0.35 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high-level diversion to Territorial agricultural lands. Territorial water.

UTILIZATION.—Small part of flow diverted for irrigation of rice and taro and for domestic supply.

ACCURACY.—July 1, 1919, to July 19, 1921: Stage-discharge relation not permanent. Standard rating curve fairly well defined below 400 million gallons per day; extended above that point. Operation of water-stage recorder very unsatisfactory during 1919, owing to poor maintenance and inspection; during 1920 and 1921, the recorder operated fairly satisfactorily except that clogging of the intake caused occasional errors at low water and lagging of recorder pencil during high water. Discharge for 1919 based mainly on a comparison with flow of adjacent streams, the gage-height graph being used wherever it appeared to be a true record. Daily discharge for 1920 and 1921, ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records poor for 1919; fair for 1920 and 1921, except those for high stages and periods during which recorder did not operate, which are poor. Some of the discharge measurements indicate possible shifts in control that vary as high as 10 per cent from the standard rating. Owing to this condition and the many other sources of error, the daily-discharge record should be used with caution. Monthly-discharge records are probably fairly accurate.

July 20, 1921, to June 30, 1922: Stage-discharge relation not permanent. Standard rating curve well defined below 200 million gallons per day and extended above that point; was used direct except for periods November 23 to December 24 and May 24 to June 30, for which shifting-control method was used. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for periods for which shifting-control method was used. Records good except for high stages and for periods for which shifting-control method was used, which are fair.

Discharge measurements of Hanalei River at elevation 625 feet, near Hanalei, Kauai, during the years ending June 30, 1919–1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
1918					1920				
Dec. 17	W. V. Hardy	1.18	111	72	Aug. 18	M. H. Carson	1.16	128	83
17	do	.95	82	53	Oct. 9	B. F. Rush	.81	63	41
1919					Nov. 20	do	.93	73	47
Mar. 6	Y. Masato	1.36	158	102	1921				
6	do	1.04	107	69	Jan. 11	do	1.50	186	120
7	do	1.33	146	94	Mar. 7	do	.84	70	45
July 14	S. Takabayashi	.97	100	65	May 19	do	1.16	102	66
Sept. 30	do	.72	50	32.5	July 4	W. C. Renshaw	1.05	95	61
Nov. 13	do	.84	62	40	21	do	1.66	104	67
Dec. 17	do	.70	47	30	Aug. 25	E. M. Pickop	2.60	283	183
1920					Oct. 6	M. H. Carson	1.30	69	44.5
Jan. 13	do	.72	53	34	Dec. 4	do	1.38	81	52
Feb. 18	do	.60	36	23.5	1922				
Mar. 26	do	1.60	213	138	Jan. 29	E. M. Pickop	2.28	201	130
May 18	do	.66	47	30	Feb. 27	M. H. Carson	1.24	64	41.5
June 23	M. H. Carson	.74	65	42	Apr. 2	S. B. Hall	1.27	68	44
July 12	do	.93	80	52					

Discharge, in million gallons per day, of Hanalei River at elevation 625 feet, near Hanalei, Kauai, for the years ending June 30, 1919–1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1918–19												
1	41	52	49	37	92	44		37	49	38		
2	41	47	56	37	67	62			47	40	41	
3	49	43	45	37	57	340			57	40		
4	43	52	41	38	48	78			46	38	44	
5	108	96	39	42	75	96	38		43	37	61	
6	84	80	37	41	48	446			64	37	48	
7	144	67	41	42	39	454			89	37	48	
8	106	71	71	42	36	298			59	37	47	
9	87	60	53		56	131			53	37	87	
10	202	50	48		53	364			55	39	66	
11	277	46	42	42	151	134	36		46	37	134	
12	114	48	37		79	88	42		89	38	73	
13	83	145	40		48	73	67		51	38	62	
14	89	155	41		41	63			33	40	55	
15	86	69	38	67	37	55		39	31	54	51	46
16	73	63	38	56	31	50			26	87	53	
17	60	137	45	35	30	52			22	102	48	
18	59	92	50	30	30	54			25	189	46	
19	63	61	52						22	457	47	
20	55	57	48				47		31	582	54	
21	51	101	42						54	199	51	
22	48	155	40						93	74	52	
23	39	114	38	35	153	46			50	76	51	
24	101	71	35						39	53	52	
25	79	83	31						36	44	51	
26	93	64	31						34	39	53	
27	77	55	32						34	35	52	
28	54	48	34	44		48			36	34	55	
29	59	45	39	57	69	48	51	-------	37	38	59	
30	55	43	39	147	54	53	47	-------	37		53	
31	58	45	-------	359	-------		40	-------	37	-------	51	-------
1919–20												
1		110	54			31		36	30	105	31	31
2		67	41			298		35	31	148	30	31
3		49	76			316		35	31	92	31	35
4		48	67			82		33	32	311	31	37
5		43	62			60		32	31	132	32	82
6		42	53			49		32	40	79	34	37
7	43	41	53		44	43	55	32	38	62	34	33
8		47	62			40		32	66	56	35	32
9		50	138			89		31	45	51	36	31
10		50	73			49		36	46	51	36	40
11		46	57			46		215	155	47	36	51
12		43	50			40		69	344	46	34	46
13		51	46		39	39	65	43	162	46	36	43
14	59	56	44		41	38	143	37	60	43	35	41
15	57	84	43		37	37	362	34	47	44	34	36
16	42	61	43	24	36	35	890	32	43	40	35	54
17	36	48	43		34	37	426	32	93	39	44	66
18	33	41	42		32	37	121	31	403	61	60	41
19	40	42	41		31	35	73	32	481	41	48	42
20	74	61	48		31	34	57	31	146	48	36	36
21	87	83	41		48	33	49	30	178	170	46	36
22	79	57	40		40	39	48	30	228	181	42	42
23	62	48	37		37	34	43	30	260	74	58	37
24	53	41	36		34	32	41	30	129	51	54	34
25	53	38	38		33	32	40	34	272	45	77	32
26	60	36	36		31		40	46	140	39	74	39
27	55	36	34		32		38	31	84	37	40	48
28	106	34	38		31	61	38	31	64	35	34	49
29	71	35	40		30		36	30	66	32	34	48
30	83	36	38		32		35	-------	89	31	34	35
31	98	38	-------		-------		34	-------	62	-------	32	-------

Discharge, in million gallons per day, of Hanalei River at elevation 625 feet, near Hanalei, Kauai, for the years ending June 30, 1919–1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920-21												
1	34	51	167	44	82	49	48	68		80	61	46
2	32	49	106	76	86	46	51	55		66	53	48
3	30	49	89	59	99	48	58	43		60	112	60
4	28	58	67	46	79	52	146	40	57	64	77	49
5	29	56	55	42	60	59	244	37		106	65	44
6	29	46	64	53	61	71	295	34		99	67	43
7	31	43	208	84	144	69	272	32	45	137	68	45
8	29	40	80	74	187	133	834	31	44	358	60	43
9	29	42	111	52	75	73	316	30	42	229	58	43
10	43	41	114	43	99	87	153	29	41	129	55	41
11	96	38	154	47	86	66	129	30	41	99	51	41
12	68	50	123	77	66	188	182	29	39	82	48	65
13	107	76	74	55	55	752	367	28	38	75	46	101
14	53	48	67	48	49	163	1,330	27	38	65	51	52
15	71	42	74	151	45	99	2,250	45	38	61		56
16	88	40	137	102	42	84	2,870	28	49	60	38	47
17	93	48	64	172	40	65	1,160	28	51	58		68
18	52	64	57	80	39	55	750	27	43	55		48
19	49	42	51	271	76	50	803	26	42	52	57	56
20	48	62	50	317	50	47	771	26	45	48	45	46
21	48	104	47	121	122	42	137		55	60	52	43
22	40	57	51	84	60	152	92		47	48	50	42
23	38	80	51	72	55	467	75		186		43	43
24	36	192	57	86	82	1,050	64		162		46	43
25	39	92	73	62	77	166	232	25	75		44	48
26	50	141	63	59	92	77	235		62	78	42	48
27	61	73	55	84	83	60	442		56		41	46
28	139	101	47	71	191	53	125		63		75	48
29	74	57	49	60	92	52	71	-------	114		72	51
30	60	49	49	55	80	49	131	-------	212		60	50
31	55	124	-------	58	-------	45	77	-------	114	-------	51	-------
1921-22												
1	65	63	42	236	38	58	66	267	54	38	42	54
2	66	81	38	66	46	50	54	148	50	42	38	50
3	72	58	42	66	38	75	50	142	46	42	38	46
4	57	56	38	56	34	50	63	178	60	38	50	46
5	50	60	46	50	31	42	133	222	80	59	70	42
6	58	50	42	54	31	42	97	100	123	54	54	42
7	48	91	38	54	31	38	67	84	94	216	46	42
8	64	58	46	46	31	34	62	66	110	162	149	38
9		50	46	42	31	34	54	63	112	66	63	50
10		50	46	38	34	34	50	60	221	60	66	38
11		50	34	38	31	48	46	68	235	74	58	46
12		82	34	34	50	150	42	78	224	66	50	38
13		56	31	34	34	92	42	58	152	60	81	38
14	52	46	31	34	31	73	42	60	84	134	50	82
15		42	31	34	31	54	38	54	74	63	46	59
16		42	59	34	28	84	38	50	66	66	54	46
17		38	60	34	28	71	38	46	60	75	75	38
18		55	50	34	42	58	38	46	56	64	54	38
19		51	34	31	76	54	45	63	54	60	50	38
20	62	46	34	31	38	46	87	46	54	157	46	50
21	67	85	42	31	45	146	128	52	54	87	54	59
22	42	68	49	50	52	224	70	75	46	60	46	46
23	73	50	42	50	146	354	56	54	46	56	67	38
24	50	62	56	54	58	636	50	46	54	57	250	38
25	42	168	42	62	75	348	71	46	42	59	91	34
26	42	58	38	52	60	138	76	42	42	50	225	34
27	42	160	111	49	54	84	60	130	38	46	84	34
28	102	76	110	46	74	70	149	77	38	42	63	34
29	74	56	67	38	122	70	150	-------	34	42	56	34
30	67	50	101	46	101	63	182	-------	34	42	61	31
31	54	46	-------	34	-------	70	478	-------	34	-------	54	-------

NOTE.—Water-stage recorder did not operate satisfactorily Oct. 9–14, 19–27, Nov. 19–28, Dec. 19–27, 30, and 31, 1918; Jan. 1–10, 14–28, Feb. 2 to Mar 1, Apr. 29 to May 3, June 1 to July 13, Sept. 30 to Nov. 13, and Dec. 26–31, 1919; Jan. 1–12, 1920; Feb. 21 to Mar. 6, Apr. 23–30, and Dec. 2–3, 1921; discharge estimated by comparison with flow at stations on adjacent streams. Recorder being installed at new location July 9–19, 1921; discharge estimated by comparison with flow at stations on adjacent streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Hanalei River at elevation 625 feet, near Hanalei, Kauai, for the years ending June 30, 1919–1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1918–19						
July	277	39	83.2	129	2,580	7,920
August	155	43	74.7	116	2,320	7,110
September	71	31	42.4	65.6	1,270	3,900
October	359	----------	54.1	83.7	1,680	5,150
November	----------	----------	89.0	138	2,670	8,190
December	454	----------	113	175	3,500	10,800
January	----------	----------	44.1	68.2	1,370	4,200
February	----------	----------	38.9	60.2	1,090	3,340
March	93	22	46.0	71.2	1,420	4,380
April	582	----------	87.8	136	2,630	8,080
May	134	----------	55.7	86.2	1,730	5,300
June	----------	----------	46.0	71.2	1,380	4,240
The year	582	----------	64.8	100	23,600	72,600
1919–20						
July	106	----------	55.1	85.3	1,710	5,240
August	110	34	50.4	78.0	1,560	4,790
September	138	34	50.5	78.1	1,510	4,650
October	----------	----------	24.0	37.1	744	2,280
November	----------	----------	38.6	59.7	1,160	3,550
December	316	----------	63.6	98.4	1,970	6,050
January	890	----------	104	161	3,240	9,890
February	215	30	40.8	63.1	1,180	3,630
March	481	30	126	195	3,900	12,000
April	311	31	74.6	115	2,240	6,870
May	77	30	40.4	62.5	1,250	3,840
June	82	31	41.5	64.2	1,240	3,820
The year	890	----------	59.3	91.8	21,700	66,600
1920–21						
July	139	28	54.2	83.9	1,680	5,160
August	192	38	66.3	103	2,060	6,310
September	208	47	81.8	127	2,450	7,530
October	317	42	87.2	135	2,700	8,290
November	191	39	81.8	127	2,450	7,530
December	1,050	42	144	223	4,470	13,700
January	2,870	48	475	735	14,700	45,200
February	68	----------	31.9	49.4	893	2,740
March	212	38	67.2	104	2,080	6,390
April	358	----------	90.5	140	2,720	8,330
May	112	----------	54.9	84.9	1,700	5,220
June	101	41	50.1	77.5	1,500	4,610
The year	2,870	----------	108	167	39,400	121,000
1921–22						
July	102	42	57.1	88.3	1,770	5,430
August	168	38	64.6	100	2,000	6,150
September	111	31	49.3	76.3	1,480	4,540
October	236	31	50.3	77.8	1,560	4,790
November	146	28	50.7	78.4	1,520	4,670
December	636	34	109	169	3,390	10,400
January	478	38	84.6	131	2,620	8,050
February	267	42	86.5	134	2,420	7,430
March	235	34	79.7	123	2,470	7,580
April	216	38	71.2	110	2,140	6,560
May	250	38	72.0	111	2,230	6,850
June	82	31	43.4	67.1	1,300	4,000
The year	636	28	68.2	106	24,900	76,400

NOTE.—See footnote to table of daily discharge.

WAIOLI STREAM NEAR HANALEI, KAUAI

LOCATION.—3 miles above mouth of stream and 4 miles from Hanalei.

RECORDS AVAILABLE.—July 1, 1914, to June 30, 1922. Data from December 19, 1916, to June 30, 1918, have been revised in Water-Supply Paper 515.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable at gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 30 feet above and 20 feet below gage. Right bank steep; left bank slopes gently. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.97 feet at 8.30 p. m. April 7 (discharge, 590 million gallons per day, or 913 second-feet); minimum stage recorded, 1.28 feet at 1 p. m. November 18 (discharge, 5.5 million gallons per day, or 8.5 second-feet).

1914–1922: Maximum stage recorded, 6.15 feet at 6.30 a. m. December 19, 1916 (discharge, from extension of rating curve, 955 million gallons per day, or 1,480 second-feet); minimum stage recorded, 0.6 foot July 22, 1914 (discharge, 2.0 million gallons per day, or 3.1 second-feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high level diversions in connection with Territorial Hanalei River project. Territorial land and water.

UTILIZATION.—Small part of flow is diverted for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation not permanent. Rating curve used July 1 to January 31 well defined below 60 million gallons per day; curve used February 1 to April 7 fairly well defined below 30 million gallons per day; curve used April 8 to May 24 well defined below 75 million gallons per day; and curve used May 25 to June 30 well defined below 60 million gallons per day. Operation of water-stage recorder satisfactory except for short periods noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those for high stages and those estimated, which are fair to poor.

Discharge measurements of Waioli Stream near Hanalei, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 6	E. M. Pickop	1.50	14.7	9.5	Jan. 26	E. M. Pickop	1.86	31	20.0
Aug. 24	B. F. Rush	1.53	15.5	10.0	Feb. 25	M. H. Carson	1.52	18.6	12.0
Oct. 4	J. E. Stewart	1.56	16.8	10.9	Apr. 4	S. B. Hall	1.56	20.4	13.2
Dec. 5	M. H. Carson	1.42	11.7	7.6	May 21	E. M. Pickop	1.62	16.0	10.3

Discharge, in million gallons per day, of Waioli Stream near Hanalei, Kauai, for the year ending June 30, 1922

Day	July	Aug.,	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	7.8	14.6	7.8	76	10.7		13.6	136	18.8	9.2	7.9	9.6
2	9.2	22	7.6	17.0	21		9.4	64	15.8	12.4	7.9	7.8
3	14.0	13.6	7.8	12.0	11.7	9.0	8.0	60	16.9	15.1	10.9	7.2
4	13.6	14.1	8.2	11.6	8.8		7.6	42	23	13.0	12.6	7.1
5	11.0	17.5	11.4	10.1	7.1	7.8	25	35	39	37	35	6.8
6	9.6	11.2	9.2	36	6.4	7.4	19.3	24	48	39	16.2	6.4
7	9.0	11.7	8.0	21	6.1	7.2	14.0	25	59	195	12.3	6.4
8	13.0	10.3	8.2	11.7	6.0	6.9	11.2	16.9	61	138	24	6.4
9	9.4	9.0	9.4	9.2	5.8	6.8	10.6	14.1	65	25	14.3	9.4
10	9.2	12.0	8.6	8.2	7.2	6.6	8.2	14.4	112	15.7	13.3	7.2
11	11.2	12.8	7.1	7.8	7.1	21	8.0	16.0	88	22	10.4	8.0
12	8.8	39	6.9	7.4	25	167	7.8	18.7	91	16.0	9.8	7.6
13	7.8	16.2	6.4	7.2	8.8	69	6.8	12.7	59	14.3	9.6	7.4
14	7.8	10.6	6.3	7.1	6.6	34	6.6	19.8	24	20	8.8	9.4
15	7.4	9.2	6.1	7.2	6.0	13.3	6.4	13.0	19.6	15.0	7.5	9.4
16	7.2	8.8	11.9	7.4	5.8	56	6.4	10.5	33	12.9	7.7	7.6
17	13.0	8.2	23	6.9	5.7	45	7.8	9.5	19.2	27	10.4	7.2
18		10.1	16.8	6.6	43	28	17.6	9.2	14.8	64	11.2	7.1
19		15.6	8.8	6.6	44	16.0	12.2	9.2	14.1	32	10.6	7.8
20		10.8	8.0	6.3	10.3	12.0	50	8.8	13.2	90	10.6	10.8
	13											
21		19.0	11.7	6.1	10.3	29	81	12.0	12.1	24	12.3	17.0
22		12.5	18.0	8.4	18.1	53	25	42	11.8	13.6	9.6	12.5
23		9.2	11.0	11.8	68	198	16.9	16.9	17.1	11.2	38	9.2
24		10.1	12.7	20	14.7	244	13.3	13.5	12.4	12.7	104	8.0
25		28	8.0	17.5	26	190	27	13.5	11.2	15.2	27	7.6
	7.5											
26		11.2	7.6	11.7	13.8	38	34	12.5	11.0	9.6	78	7.4
27		22	23	8.0	11.7	17.5	23	193	10.2	8.8	18.1	7.4
28		13.8	24	7.2	11.0	16.0	103	46	9.8	8.1	11.2	7.4
29	20	9.9	11.7	8.6	18.1	16.9	75	-------	9.5	7.7	9.4	7.8
30	16.3	9.0	24	11.2	12.5	14.1	77	-------	9.5	8.1	12.1	7.6
31	10.6	8.0	-------	7.6	-------	14.1	196	-------	9.5	-------	9.4	-------

NOTE.—Water-stage recorder did not operate July 18–29 and Dec. 1–14; discharge estimated by comparison with flow at stations on adjacent streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Waioli Stream near Hanalei, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	----------	----------	11.1	17.2	344	1,060
August	39	8.0	13.9	21.5	430	1,320
September	24	6.1	11.3	17.5	339	1,040
October	76	6.1	12.9	20.0	401	1,230
November	68	5.7	15.2	23.5	457	1,400
December	244	6.6	44.2	68.4	1,370	4,200
January	196	6.4	29.9	46.3	928	2,840
February	193	8.8	32.4	50.1	908	2,780
March	112	9.5	30.9	47.8	958	2,940
April	195	7.7	31.1	48.1	932	2,860
May	104	7.5	18.7	28.9	580	1,780
June	17.0	6.4	8.28	12.8	248	762
The year	244	5.7	21.6	33.4	7,900	24,200

LUMAHAI RIVER NEAR HANALEI, KAUAI

LOCATION.—6 miles above mouth and 10 miles by road and trail from Hanalei.

RECORDS AVAILABLE.—May 23, 1914, to October 11, 1917, and July 1, 1920, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 350 feet above and 150 feet below station. Bed composed of large boulders and cobblestones. Right bank high and vertical; left bank low, wooded, and sloping. Control composed of large boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.20 feet at 3.30 p. m. January 31 (discharge, 1,820 million gallons per day or 2,820 second-feet); minimum discharge, 23 million gallons per day or 36 second-feet, at 7 p. m. June 29 (gage height, 0.64 foot).

1914–1917; 1920–1922: Maximum discharge recorded on January 31, 1922; minimum discharge occurred on June 29, 1922.

Flood of January 16, 1921, probably exceeded all others, but owing to nonoperation of recorder no record of the stage was obtained.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high-level diversions in connection with Territorial Hanalei River project.

UTILIZATION.—Small part of flow used for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation not permanent. Standard rating curve well defined below 100 million gallons per day and fairly well defined between 100 and 400 million gallons per day; was used direct July 1 to April 7; shifting-control method used April 8 to June 30. Operation of water-stage recorder satisfactory except during periods noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for period for which shifting-control method was used. Records good except those estimated and those for period for which shifting-control method was used, which are fair.

Discharge measurements of Lumahai River near Hanalei, Kauai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 29	B. F. Rush	1.20	126	81	Feb. 24	M. H. Carson	0.88	70	45
Oct. 4	M. H. Carson	.79	60	39	Apr. 3	do	.82	62	40.5
Dec. 2	do	.78	55	35.5	May 22	E. M. Pickop	.80	51	32.5
Jan. 24	E. M. Pickop	.93	67	43					

Discharge, in million gallons per day, of Lumahai River near Hanalei, Kauai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	42	41	30	305	44	50		670	68	32	30	32
2	51	66	29	61	89	35		396	55	31	30	29
3	97	50	29	45	50	44		270	55	35	35	28
4	81	55	30	39	38			209	66	35	39	27
5	48	75	33	35	33		50	210	177	99	114	26
6	38	41	30	52	30	30		92	295	119	56	25
7	35	50	29	54	29			78	283	231	46	25
8	57	39	30	38	28			61	363	262	129	25
9	37	33	30	34	28			56	360	66	66	28
10	35	38	30	32	28			49	571	49	53	25
11	35	38	28	30	28			72	320	63	42	26
12	32	118	27	30	66			107	297	56	36	25
13	31	52	26	29	31			55	215	47	52	24
14	30	36	26	28	28	160	30	93	84	116	35	37
15	30	33	26	29	27			62	68	53	32	29
16	30	31	42	28	26			56	78	45	31	25
17	68	30	63	28	26			48	61	65	50	25
18	57	34	46	28	114			39	49	84	36	24
19	36	49	32	27	140			35	45	56	33	25
20	86	35	31	26	39	70	120	34	45	294	33	28
21	115	55	35	26	48			40	41	97	36	48
22	43	41	68	31	99			171	38	53	33	30
23	71	32	41	38	458			59	45	42	160	26
24	43	33	43	63	88	520	61	44	37	46	432	24
25	36	117	33	80	120		138	40	36	59	131	24
26	33	39	30	55	79		158	37	35	38	362	24
27	33	85	95	34	49		135	470	35	35	92	24
28	112	56	122	30			432	183	35	33	47	24
29	73	35	51	33	75	60	353	-------	34	32	37	24
30	58	32	146	40			481	-------	33	31	39	24
31	39	30	-------	31	-------		975	-------	32	-------	32	-------

NOTE.—Water-stage recorder did not operate Nov. 28 to Dec. 1 and Dec. 4 to Jan. 23; discharge estimated by comparison with flow at stations on Waioli and Kalihiwai streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Lumahai River near Hanalei, Kauai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	115	30	52.0	80.5	1,610	4,950
August	118	30	48.4	74.9	1,500	4,600
September	146	26	43.7	67.6	1,310	4,020
October	305	26	46.4	71.8	1,440	4,410
November	458	26	69.6	108	2,090	6,410
December	----------	----------	150	232	4,640	14,300
January	975	----------	134	207	4,160	12,700
February	670	34	133	206	3,740	11,400
March	571	32	128	198	3,960	12,200
April	294	31	76.8	119	2,300	7,070
May	432	30	76.7	119	2,380	7,300
June	48	24	27.0	41.8	810	2,490
The year	975	24	82.0	127	29,900	91,800

MISCELLANEOUS MEASUREMENTS

Measurements of streams and ditches on the Island of Kauai at points other than regular gaging stations are listed below.

Miscellaneous discharge measurements on Kauai during the year ending June 30, 1922

Date	Stream	Tributary to—	Locality	Gage height (feet)	Discharge	
					Second-feet	Million gallons per day
July 19	Left Branch of Koaie	Koaie Stream	On new trail to Waialae near Waimea, Kauai.		0.4	0.25
Oct. 9	do	do	do		.45	.3
Aug. 23	Waimea ditch	Waimea River	Former gaging station at lower portal of tunnel 22, 2½ miles north of Waimea, Kauai.	0.955	5.7	3.7
May 30	Halaulani	Kahiliholo Stream	1½ miles above confluence near Kilauea, Kauai.	1.02	8.9	5.7
July 6	Hanalei River	Pacific Ocean	Elevation 1,210 feet near Hanalei, Kauai.		37	23.9
6	do	do	100 feet above Kaapoko Stream near Hanalei, Kauai.		54	35
20	Kaapoko	Hanalei River	Elevation 1,210 feet near Hanalei, Kauai.		12.8	8.3
20	do	do	150 feet above Hanalei River near Hanalei, Kauai.		22.2	14.3

ISLAND OF OAHU

KALIHI STREAM NEAR HONOLULU, OAHU

LOCATION.—At Kioi Pool, three-eighths of a mile above Catholic Orphanage, 3 miles up Kalihi Road from King Street car line, and 5 miles north of Honolulu post office.

RECORDS AVAILABLE.—September 6, 1913, to June 30, 1922.

GAGE.—Gurley seven-day water-stage recorder installed June 25, 1918. Friez recorder in use September 8 to November 22, 1913, and Gurley printing recorder December 4, 1913, to June 25, 1918.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Water drops over a 10-foot fall into pool at gage. Channel is solid rock, with steep, high banks; two channels above gage height of 6.0 feet. High-water control, solid rock; lower-water control, concrete dam completed January 11, 1919; shifts owing to deposition of gravel in pool above.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.47 feet at 6.30 a. m. October 3 (discharge, about 720 million gallons per day or 1,110 second-feet); minimum stage recorded, 2.83 feet at 8 p. m. July 1 (discharge 0.7 million gallons per day or 1.1 second-feet).

1913–1922: Maximum stage determined from flood marks, 14.00 feet January 16, 1921 (discharge, estimated 1,250 million gallons per day or 1,930 second-feet); minimum stage recorded, 2.80 feet several times between February 27 and March 5, 1920 (discharge, 0.5 million gallons per day or 0.8 second-foot).

DIVERSIONS.—Catholic Orphanage diverts water for domestic use into a 4-inch pipe (which is reduced by several stages to 1-inch at the outlet) at a dam about 300 feet above the station. Dam was installed May, 1920. Prior to this there were no diversions above station.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of using stream to augment water supply of city of Honolulu. Part of water rises on Territorial lands.

UTILIZATION.—Part of water diverted 400 feet below station for power development; remaining low-water flow is diverted farther downstream for irrigation of taro.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined between 1 and 150 million gallons per day; extended to cover high stages. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for extremely high stages.

Discharge measurements of Kalihi Stream near Honolulu, Oahu, during the year ending June 30, 1922

[Made by M. H. Carson]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Jan. 28	4.37	45.5	29.5
Feb. 11	3.17	8.3	5.4
May 13	3.01	2.3	1.5

Discharge, in million gallons per day, of Kalihi Stream near Honolulu, Oahu, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.7	1.6	0.9	50	1.4	2.7	6.2	19.3	5	2.2	1.7	2.0
2	1.0	1.3	.9	3.9	2.7	2.5	5.5	11.1	4.0	2.2	1.6	2.0
3	1.7	1.3	.9	61	2.4	2.7	5.2	8.4	4.6	2.1	1.6	1.9
4	2.8	1.1	.9	15.6	1.6	2.4	7.7	6.5	28	2.0	2.0	2.1
5	1.3	5.2	1.0	6.2	1.4	2.2	7.6	5.5	15.0	10.4	2.9	1.8
6	1.4	1.8	.9	4.0	1.3	2.1	5.0	5.5	6.3	3.8	1.7	1.7
7	1.3	1.6	.9	3.3	1.3	2.0	4.6	4.9	17.3	4.0	1.6	1.6
8	1.2	1.3	.9	2.8	1.2	1.9	4.0	4.3	16.8	2.6	2.8	1.6
9	.9	1.1	2.4	2.6	1.2	1.8	3.9	6.9	15.3	2.3	1.6	1.6
10	.9	1.0	1.3	2.4	1.2	1.8	3.6	4.4	11.8	2.9	2.7	1.5
11	.9	1.4	1.2	2.3	1.1	1.8	3.5	4.2	14.0	2.2	12.9	1.5
12	.9	1.8	1.0	2.1	1.3		3.3	4.0	7.8	2.1	2.8	1.5
13	.9	1.3	1.0	1.9	1.1		3.1	3.6	7.8	2.6	2.1	1.6
14	.7	1.1	.9	1.9	1.0		3.3	3.4	6.2	5.7	1.8	5.8
15	.9	1.0	.9	1.8	1.0	45	2.9	3.1	5.0	2.5	1.7	2.0
16	.9	1.0	1.2	1.9	1.0		4.0	2.9	4.6	2.6	3.0	1.6
17	2.0	1.0	1.0	2.2	1.0		2.7	2.8	4.6	6.6	4.8	1.6
18	3.2	1.0	1.0	2.1	1.7	17.0	2.7	2.8	3.9	7.6	2.0	1.5
19	1.6	1.7	.9	1.8	24	10.5	3.0	2.7	3.6	3.0	1.8	1.4
20	1.5	1.1	.9	1.7	3.6	8.4	35	2.6	3.5	2.4	2.1	1.9
21	1.1	1.0	.9	1.7	28	13.0	5.8	3.0	3.3	2.2	1.8	6.8
22	1.3	1.4	1.0	1.7	8.4	57	4.4	3.8	3.1	2.0	1.7	6.6
23	2.3	1.0	1.0	1.9	4.8	17.9	5.2	2.7	3.1	1.9	2.2	3.0
24	1.5	1.2	.9	2.0	3.5	66	3.8	3.9	3.0	1.9	5.4	2.2
25	1.3	1.1	1.0	1.7	3.9	47	3.6	2.7	2.8	1.9	5.4	1.9
26	1.0	1.4	.9	1.8	3.3	17.0	3.5	2.4	2.6	1.8	6.5	1.7
27	1.5	1.7	3.3	1.6	3.4	11.9	4.2	31	2.5	1.8	3.3	1.6
28	2.1	1.3	3.4	1.5	4.2	9.7	37	15	2.4	1.7	2.7	1.6
29	2.6	1.0	1.5	1.6	3.8	8.6	25	-------	2.3	1.8	2.7	1.6
30	1.7	1.0	4.7	1.4	3.1	7.4	50	-------	2.3	2.0	2.2	1.6
31	1.5	1.0	-------	1.5	-------	6.5	23	-------	2.2	-------	2.2	-------

NOTE.—Water-stage recorder did not operate satisfactorily Oct. 12–15, Dec. 10–11, Jan. 21, Feb. 27, and Mar. 2; discharge obtained by estimating gage-height graph for all or part of day. Recorder did not operate Dec. 12–17, Jan. 20, and Feb. 28 to Mar. 1; discharge estimated by comparison with flow at station on Nuuanu Stream near Honolulu. Braced figures show mean discharge for periods indicated.

Monthly discharge of Kalihi Stream near Honolulu, Oahu, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	3.2	0.7	1.44	2.23	44.6	137
August	5.2	1.0	1.38	2.14	42.8	131
September	4.7	.9	1.32	2.04	39.6	122
October	61	1.4	6.13	9.48	190	583
November	28	1.0	3.96	6.13	119	365
December		1.8	19.1	29.6	592	1,820
January	50	2.7	9.11	14.1	282	867
February	31	2.4	6.19	9.58	173	532
March	28	2.2	6.93	10.7	215	659
April	10.4	1.7	3.03	4.69	90.8	279
May	12.9	1.6	2.95	4.56	91.3	281
June	6.8	1.4	2.23	3.45	66.8	205
The year		.7	5.33	8.25	1,950	5,980

NUUANU STREAM BELOW RESERVOIR NO. 2 WASTEWAY, NEAR HONOLULU, OAHU

LOCATION.—One Pali road in upper Nuuanu Valley, 1 mile above end of car line, and 5 miles from Honolulu post office.

RECORDS AVAILABLE.—October 21, 1913, to January 16, 1921, and September 12, 1921, to June 30, 1922. Station rebuilt September, 1921, after destruction by flood of January 16, 1921.

GAGE.—Gurley weekly water-stage recorder; installed September 12, 1921. Friez weekly water-stage recorder, August 7, 1920, to January 16, 1921. Gurley weekly water-stage recorder, April 12, 1918, to August 7, 1920, at same location as old inclined staff. Datum practically unchanged.

DISCHARGE MEASUREMENTS.—Low-water discharge measured by 2-foot sharp-crested weir with end contractions; flood discharge measured by 12-foot sharp-crested weir with end contractions, which with flow over small weir, gives total flood discharge. Both weirs set in concrete. Crest of small weir is 1 foot lower than that of large weir. The weirs were reconstructed April 10–27, 1914, and September 12, 1921, but original dimensions were maintained.

CHANNEL AND CONTROL.—Channel originally in solid rock; has filled in considerably with gravel and silt; straight for about 75 feet above and below weir. Banks high and covered with vegetation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.22 feet at 6.15 a. m. October 3 (discharge, 486 million gallons per day or 752 second-feet); minimum stage recorded, 0.12 foot for several hours September 19–22 (discharge, 0.10 million gallons per day or 0.16 second-foot).

1913–1922: Maximum stage, determined by leveling to flood marks, 8.74 feet January 16, 1921 (discharge, 1,600 million gallons per day or 2,480 second-feet); minimum discharge recorded September 19–22, 1921.

DIVERSIONS.—Most of low and medium stage flow is diverted above station for domestic supply and for power development.

REGULATION.—Amount diverted above station varies.

OBJECT OF STATION.—To determine amount of water in the stream at this point in connection with investigations of water supply for city of Honolulu. Territorial land and water.

UTILIZATION.—Station measures waste water and seepage from reservoirs Nos. 2, 3, and 4 and the Luakaha Weir. This waste water is used for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation permanent after reconstruction of station on September 13. Rating curve well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records excellent.

Discharge measurements of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Sept. 16	E. M. Pickop	0.14	0.15	0.10	Feb. 11	M. H. Carson	1.30	12.8	8.3
Jan. 28	M. H. Carson	1.86	51.5	33	Apr. 15	do	.66	4.2	2.7

Discharge, in million gallons per day, of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, for the year ending June 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		2.3	0.7	1.5	10.8	15.2	7	2.5	1.0	0.4
2		.55	1.0	1.3	10.2	12.6		2.8	.95	.4
3		43	1.0	1.3	9.6	11.0	7.6	2.7	.9	.35
4		5.5	.8	1.2	10.2	10.5	9.3	2.6	1.2	.35
5		3.3	.7	1.2	9.6	9.9	10.8	4.0	1.3	.35
6		3.0	.6	1.2	10.2	9.3	8.3	3.1	.95	.35
7		1.8	.45	1.1	8.4	9.3	9.9	3.1	.8	.35
8		2.1	.4	1.1	9.1	8.6	8.3	2.8	.85	.35
9		1.4	.35	1.1	8.6	9.8	10.1	3.0	.65	.3
10		1.4	.35	1.0	8.3	8.1	9.9	2.2	.75	.3
11		1.6	.3	1.2	7.9	8.8	13.2	1.6	3.5	.3
12		2.0	.3	52	7.6	7.6	9.9	1.6	.9	.35
13	0.15	3.4	.3	32	7.4	6.7	8.6	2.6	.7	.35
14	.15	3.0	.3	16.0	7.4	7.6	6.9	2.5	.65	.5
15	.15	1.6	.4		6.7	7.4	7.1	2.0	.65	.35
16	.15	1.4	.35	16	6.7	8.1	6.3	1.7	.8	.3
17	.2	1.5	.35		6.9	7.6	6.5	4.5	1.2	.3
18	.15	1.1	.35	13.7	7.1	6.8	6.1	2.2	.85	.3
19	.15	1.0		10.2	9.0	6.4	5.4	2.0	.5	.3
20	.1	1.0		9.9	11.9	6.2	5.5	1.7	.5	.3
21	.1	1.0		12.4	7.2	6.1	5.1	1.3	.4	.4
22	.15	1.0		37	7.6	6.1	4.8	1.2	.35	.35
23	.15	1.3	3.8	15.2	7.9		4.5	1.3	.35	.3
24	.15	1.3		33	6.9		4.4	1.3	1.2	.25
25	.15	1.0		29	6.9	7	4.3	1.3	1.2	.25
26	.15	1.2		16.0	7.9		3.9	1.3	1.6	.2
27	.4	1.1	2.0	13.7	8.1		3.7	1.3	.7	.2
28	1.0	.9	2.6	13.3	29		3.4	1.1	.5	.15
29	.4	.9	2.8	12.6	21	-------	3.4	1.0	.45	.2
30	.65	.8	2.1	12.2	24	-------	3.0	1.1	.4	.15
31	-------	.75	-------	11.3	20	-------	2.7	-------	.4	-------

NOTE.—Water-stage recorder did not operate satisfactorily Nov. 19–26, Dec. 15–17, and Feb. 23 to Mar. 2; discharge estimated by comparison with flow at stations on Kalihi Stream and Maole ditch. Braced figures show mean discharge for periods indicated.

Monthly discharge of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
September 13–30	1.0	0.1	0.250	0.387	4.50	14
October	43	.55	3.01	4.66	93.2	286
November		.3	1.63	2.52	48.9	150
December	52	1.0	12.9	20.0	401	1,230
January	29	6.7	10.3	15.9	320	980
February	15.2		8.28	12.8	232	711
March	13.2	2.7	6.67	10.3	207	635
April	4.5	1.0	2.11	3.26	63.4	194
May	3.5	.35	.876	1.36	27.2	83
June	.5	.15	.310	.480	9.30	28
The period					1,410	4,310

MAOLE DITCH, MAKAI STATION, NEAR HONOLULU, OAHU

LOCATION.—In Nuuanu Valley, 150 feet from Pali road, opposite reservoir No. 4 into which the ditch empties, and 6½ miles from Honolulu post office.

RECORDS AVAILABLE.—October 5, 1917, to January 16, 1921, and September 12, 1921, to June 30, 1922.

GAGE.—Gurley weekly water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Ditch is earth cut with bottom lining of concrete. At the gage a section 50 feet long, 5½ feet wide, and 3 feet deep is constructed of concrete, with concrete control at lower end.

EXTREMES OF DISCHARGE.—1919–1922: Maximum stage recorded, 4.17 feet at 3.30 a. m. January 16, 1921 (discharge, 168 million gallons per day or 260 second-feet); minimum stage recorded, ditch occasionally dry.

DIVERSIONS.—Ditch diverts water from Maole Stream and a few intermittent streams into Nuuanu reservoir No. 4.

REGULATION.—By head gates.

OBJECT OF STATION.—To determine amount of water diverted from Maole Stream in Hillebrand Glen to reservoir No. 4 of city.

UTILIZATION.—City water supply and power development.

ACCURACY.—Stage-discharge relation practically permanent, except as affected by backwater from mud deposited in pool above control. Rating curve well defined below 10 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage by averaging discharge for intervals of the day. Records good for low and medium stages; subject to error for high stages.

The following discharge measurement was made by M. H. Carson:

January 28: Gage height, 0.66 foot; discharge, 2.0 million gallons per day or 3.1 second-feet.

Discharge, in million gallons per day, of Maole ditch, makai station, near Honolulu, Oahu, for the year ending June 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		3.0		0.05	0.2	0.95	0.35			
2		.15	0.55	.05	.15	.45	.2	0.02		
3		3.2	.35	.08	.1	.25	.45			
4		.01	.04	.06	.45	.2	3.4		0.02	
5		.01	.01	.06	.3	.15	.75	.7	.09	
6				.04	.1	.15	.5			
7				.04	.08	.1	.75			
8				.04	.08	.08	.8		.04	
9				.03	.07	.35	.8	.07		
10				.02	.07	.15	.7	.5	.02	
11				.01	.06	.09	.9	.1	1.15	
12			.02	13.7	.05	.25	.4	.05	.08	
13				2.7	.05	.08	.3	.08	.01	
14				.4	.02	.06	.25	.35		1.5
15					.02	.03	.15	.08		.04
16				.35	.07	.02	.15	.09	.35	
17		.04		9.3	.01	.02	.2	.6	.4	
18		.04	.09	.55	.04	.01	.1	.15	.02	
19				.02	.01	.01	.09	.07		
20				.2	1.1		.09	.15	.04	.08
21				.65	.3	.06	.08	.03		.7
22		.01		7.8	.2	.2	.08	.01		.95
23		.08	.9	1.65	.35	.15	.08	.01		.25
24		.15		13.1	.15	.3	.08		1.4	.05
25		.01		7.3	.1	.08	.07		1.35	.01
26				.75	.09	.02	.06		.75	
27	0.1		.25	.4	.2	7.8	.04		.15	
28	.25		.3	.3	2.2	3.0	.03		.05	
29			.25	.25	3.2		.01		.04	
30	.2		.08	.25	6.5		.01	.02	.01	
31				.2	2.3					

NOTE.—No flow during days for which no discharge is given. Water-stage recorder did not operate Nov. 19–26, April 3–8, and May 30 to June 3; discharge estimated by comparison with flow at station on Kalihi Stream near Honolulu. Recorder did not operate for part of day Dec. 10 and April 14 and 15; missing record estimated. Stage-discharge relation affected by mud in pool above control Dec. 26–31 and June 16 and 17; discharge ascertained from estimated gage-height graph. Braced figures show mean discharge for periods indicated.

Monthly discharge of Maole ditch, makai station, near Honolulu, Oahu, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
September 12–30	0.25	0.00	0.029	0.045	0.55	2
October	3.2	.00	.216	.334	6.70	20
November		.00	.305	.472	9.14	28
December	13.7	.00	1.95	3.02	60.4	186
January	6.5	.01	.601	.930	18.6	57
February	7.8	.00	.536	.829	15.0	46
March	3.4	.00	.383	.593	11.9	36
April		.00	.219	.339	6.58	20
May	1.4	.00	.093	.299	5.98	18
June	1.5	.00	.119	.184	3.58	11
The period					138	424

RIGHT BRANCH OF NORTH FORK OF KAUKONAHUA STREAM NEAR WAHIAWA, OAHU

LOCATION.—200 feet upstream from intake of Wahiawa Water Co.'s tunnel, which is at confluence of right and left branches, or two main branches, of North Fork of Kaukonahua Stream, 8 miles northeast of Wahiawa.

RECORDS AVAILABLE.—May 29, 1913, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 20 feet upstream from gage.

CHANNEL AND CONTROL.—Channel is a straight stretch 200 feet long that has been cleared of boulders. Banks steep and flow well distributed and confined. Natural control of large boulders has been improved somewhat for low-water stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.84 feet at 7.15 a. m. December 12 (discharge, about 408 million gallons per day or 631 second-feet); minimum stage recorded, 149 feet at 8 p. m. November 18 (discharge, 0.8 million gallons per day or 1.2 second-feet).

1913–1922: Maximum stage during period of record, as determined by flood marks and comparison with record for Left Branch, 9.0 feet at 3 a. m. March 26, 1920 (discharge, from extension of rating curve, 985 (revised determination) million gallons per day or 1,520 second-feet); minimum mean daily discharge, 0.2 million gallons per day or 0.3 second-foot, March 24 and 28, 1914.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water taken from Territorial lands by Wahiawa Water Co. Water rises on Territorial lands.

UTILIZATION.—Wahiawa Water Co.'s ditch diverts entire low-water flow of both right and left branches of North Fork of Kaukonahua Stream for domestic water supply and irrigation in vicinity of Wahiawa. All water, except the low flow, from North Fork is impounded in Wahiawa reservoir for irrigation of sugar cane on Waialua plantation.

ACCURACY.—Stage-discharge relation changed during flood of March 4. Rating curves well defined between 1 and 200 million gallons per day; used July 1 to March 4, and March 5 to June 30. Operation of water-stage recorder satisfactory except during period December 15 to March 23. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good below 200 million gallons per day; above that quantity they are subject to error; estimated records fair.

Discharge measurements of Right Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 3	M. H. Carson	1.80	4.5	2.9	Dec. 15	J. E. Stewart	1.98	7.8	5.0
Aug. 1	do	2.47	24.2	15.6	Feb. 5	do	2.75	40.5	26
Sept. 5	do	2.10	10.0	6.5	Mar. 23	S. B. Hall	1.78	4.5	2.9
30	do	2.55	27	17.5	May 9	M. H. Carson	1.75	4.4	2.8
Nov. 1	do	1.60	1.65	1.05	June 21	do	2.39	23.9	15.4

Discharge, in million gallons per day, of Right Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	7.7	21	2.8	27	1.2	3.1				1.8	1.9	2.3
2	10.8	7.7	2.5	5.9	2.6	2.2				1.8	1.8	2.4
3	3.4	4.3	2.3	4.2	3.5	2.3			7	1.7	1.6	2.1
4	13.5	3.5	2.5	3.7	1.7	2.0				1.5	8.8	2.3
5	3.6	7.9	9.6	3.1	1.2	1.6		9		43	5.8	2.0
6	4.6	3.3	2.9	2.8	1.1	1.4				5.8	2.4	1.7
7	2.0	11.8	2.6	2.5	1.0	1.3				5.4	1.8	1.5
8	2.8	4.2	3.8	2.3	1.0	1.2				11.4	23	2.3
9	1.6	2.9	10.8	2.1	1.0	1.1	4.2			6.9	2.7	7.0
10	1.4	2.6	5.4	2.0	1.0	1.0			20	26	9.1	2.0
11	3.4	6.9	4.7	1.9	1.0	1.0				8.0	20	1.6
12	1.5	8.7	3.8	1.7	3.4	51				8.7	4.0	1.4
13	1.7	2.9	2.5	1.7	1.4	42				16.8	4.2	1.6
14	1.3	2.5	3.4	1.5	1.0	14.7				38	4.7	26
15	1.4	2.3	2.5	1.5	.9			4.5		7.7	2.9	3.4
16	3.9	2.0	9.3	1.3	.8					9.2	19.8	2.1
17	17.6	2.0	5.6	4.6	.8	14				9.0	9.8	1.7
18	6.8	2.1	4.8	1.6	.8					4.8	3.2	1.5
19	2.4	42	2.5	1.2	7.0					4.5	2.8	1.4
20	4.8	4.6	2.3	1.1	1.8				5	14.9	2.6	2.9
21	3.6	4.8	2.2	4.3	17.3		16			4.5	2.5	14.9
22	2.1	23	2.4	3.6	7.2					3.5	2.1	13.4
23	8.2	4.2	2.2	6.4	2.8					3.0	2.5	3.5
24	2.4	29	2.0	3.8	1.7				2.8	2.8	30	2.4
25	2.0	18.7	2.3	5.1	9.0			5	2.6	2.6	8.6	2.1
26	1.8	15.7	4.0	7.1	3.3	17				2.4	2.4	24	1.8
27	2.2	9.0	36	4.3	3.9					2.3	2.3	5.1	1.6
28	20	4.9	15.2	2.4	6.6					2.2	2.2	3.6	1.5
29	10.9	3.9	5.2	3.7	10.7		30			2.1	2.0	3.0	1.4
30	4.3	5.3	8.6	1.6	6.6					2.0	2.3	2.8	1.4
31	5.5	3.1		1.4						1.9		2.6	

NOTE.—Water-stage recorder did not operate satisfactorily Dec. 15 to Mar. 23; discharge estimated by means of fragmentary gage-height record and comparison with flow at station on Left Branch. Braced figures show mean discharge for periods indicated.

Monthly discharge of Right Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	20	1.3	5.14	7.95	159	489
August	42	2.0	8.61	13.3	267	819
September	36	2.0	5.56	8.60	167	512
October	27	1.1	3.79	5.86	117	361
November	17.3	.8	3.44	5.32	103	317
December		1.0	12.8	19.8	397	1,220
January			12.2	18.9	379	1,160
February			5.93	9.18	166	510
March			10.4	16.1	321	989
April	43	1.5	8.48	13.1	254	781
May	30	1.6	7.09	11.0	220	675
June	26	1.4	3.77	5.83	113	347
The year		0.8	7.30	11.3	2,660	8,180

LEFT BRANCH OF NORTH FORK OF KAUKONAHUA STREAM NEAR WAHIAWA, OAHU

LOCATION.—100 feet above intake of Wahiawa Water Co.'s tunnel which is at confluence of right and left branches, or two main branches, of North Fork of Kaukonahua Stream 8 miles northeast of Wahaiwa.

RECORDS AVAILABLE.—May 25, 1913, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel straight for 100 feet above and below gage; fairly uniform in cross section with high, wooded banks; one channel at all stages. Stream bed composed of boulders and gravel. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.55 feet at 7.20 a. m. December 24 (discharge, 1,690 million gallons per day or 2,610 second-feet); minimum stage recorded, 1.24 feet at 3 p. m. June 19 (discharge, 1.7 million gallons per day or 2.6 second-feet).

1913–1922: Maximum stage recorded, 9.60 feet at 4.30 a. m. January 16, 1921 (discharge, 3,460 million gallons per day or 5,350 second-feet); minimum discharge recorded, 0.1 million gallons per day or 0.16 second-foot, at 4 a. m. February 18 and 11.30 p. m. March 5, 1920.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted from Territorial land by Wahiawa Water Co. Water all rises on Territorial lands.

UTILIZATION.—Wahiawa Water Co.'s tunnel diverts entire low-water flow of both right and left branches of North Fork, for domestic water supply and irrigation in vicinity of Wahiawa. All water, except the low flow, from North Fork of Kaukonahua Stream is impounded in Wahiawa reservoir for irrigation of sugar cane on Waialua plantation.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined between 2 and 75 million gallons per day; fairly well defined above 75 million gallons per day, on basis of logarithmic extension and one slope determination at a stage of 8.82 feet. Operation of water-stage recorder satisfactory except during period September 5 to November 1. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those for period during which recorder did not operate, which are fair.

Discharge measurements of Left Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 3	M. H. Carson	1.54	9.3	6.0	Dec. 15	J. E. Stewart	1.59	11.3	7.3
Aug. 1	do	1.88	23.1	14.9	Feb. 5	do	2.68	84	54
Sept. 5	do	1.78	18.1	11.7	Mar. 23	S. B. Hall	1.47	5.9	3.8
30	do	1.88	24	15.5	May 9	M. H. Carson	1.40	5.8	3.7
Nov. 1	do	1.32	3.8	2.4	June 21	do	2.60	93	60

Discharge, in million gallons per day, of Left Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	10.1	14.9	5.2		2.5	5.2	5.4	42	6.2	3.2	3.2	3.9
2	31	12.7	4.7		6.1	3.3	5.1	20	4.7	3.2	3.0	4.2
3	8.5	8.4	4.4		7.7	3.6	50	15.4	10.0	2.9	3.0	3.4
4	24	6.8	5.6		3.7	2.8	11.0	13.7	7.6	2.5	19.7	4.9
5	7.6	14.2			3.4	2.5	15.6	19.3	54	47	17.7	3.3
6	24	6.4	8		3.3	2.5	9.8	29	45	9.8	5.4	2.7
7	5.6	10.3			3.3	2.4	6.4	17.9	28	8.5	3.9	2.5
8	8.1	6.0			3.3	2.5	5.6	10.1	16.6	14.9	11.6	2.8
9	3.9	5.2		8.5	3.3	2.4	5.4	29	25	7.4	4.4	6.6
10	3.6	4.9			3.6	2.3	5.1	12.4	63	12.2	5.6	2.8
11	8.8	26	9		3.6	2.3	4.0	8.8	74	13.5	37	2.8
12	3.6	25			9.3	80	4.0	7.9	24	11.8	6.4	2.4
13	3.9	6.8			4.7	59	4.0	7.0	19.4	23	5.6	6.0
14	3.2	5.4			3.6	27	3.7	6.6	19.5	39	4.2	19.9
15	5.0	5.2			3.4	7.6	3.4	6.0	10.4	12.4	3.7	4.7
16	10.2	4.4			3.2	8.1	3.3	5.6	9.1	11.3	10.0	3.0
17	50	4.2			2.9	51	3.2	5.4	13.6	11.1	5.4	2.4
18	16.2	4.4			2.8	15.0	4.0	5.1	7.2	8.6	3.6	2.3
19	7.0	56		5	17.8	7.0	11.6	4.7	6.6	7.4	3.3	2.0
20	9.1	8.8	9.5		4.7	5.6	58	4.4	6.0	36	4.9	8.7
21	6.4	8.8			26	8.8	55	5.7	5.4	7.9	3.9	32
22	6.7	50			13.4	40	12.7	9.6	5.2	6.0	2.9	19.6
23	22	8.6			5.1	27	11.5	4.7	4.9	5.2	5.0	6.2
24	5.8	34			3.4	213	6.6	9.9	4.7	4.9	36	4.6
25	4.9	21			28	46	6.8	5.2	4.4	4.6	23	3.7
26	5.1	20		8.5	9.5	15.3	7.6	3.9	4.0	4.0	50	3.3
27	9.1	11	14		11.4	10.4	8.4	18.7	3.7	3.7	8.8	3.0
28	46	7.4			5.4	8.4	55	27	3.6	3.6	6.0	2.8
29	30	7.0			12.2	7.4	38	-------	3.4	3.4	5.2	3.2
30	11.8	8.4			5.6	6.4	68	-------	3.2	3.7	4.9	2.7
31	8.8	5.6	-------		-------	5.6	40	-------	3.2	-------	4.0	-------

NOTE.—Water-stage recorder did not operate Sept. 5 to Nov. 1; discharge estimated by comparison with flow at station on Right Branch. Braced figures show mean discharge for periods indicated.

Monthly discharge of Left Branch of North Fork of Kaukonahua Stream near, Wahiawa, Oahu, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	50	3.2	12.9	20.0	400	1,230
August	56	4.2	13.5	20.9	418	1,280
September	----------	----------	9.66	14.9	290	889
October	----------	----------	8.05	12.5	250	766
November	28	----------	7.21	11.2	216	664
December	213	2.3	21.9	33.9	680	2,080
January	68	3.2	17.0	26.3	528	1,620
February	42	3.9	12.7	19.6	355	1,090
March	74	3.2	16.0	24.8	496	1,520
April	47	2.5	11.1	17.2	333	1,020
May	50	2.9	10.9	15.5	311	951
June	32	2.0	5.75	8.96	172	529
The year	213	----------	12.2	18.9	4,450	13,600

MISCELLANEOUS MEASUREMENTS

Measurements of streams and ditches on the Island of Oahu at points other than regular gaging stations are listed below.

Miscellaneous measurements on Oahu during the year ending June 30, 1922

Date	Stream	Tributary to—	Locality	Gage height (feet)	Discharge	
					Second-feet	Million gallons per day
Oct. 29	Palolo development tunnel.	Honolulu water-supply system.	Head of Palolo Valley, near Honolulu.	-------	0.25	0.15
Apr. 17	Kailua	Pacific Ocean	¼ mile below confluence of two main tributaries and ¾ mile south of Kailua.	0.71	5.5	3.6
May 16	do	do	do	.67	4.8	3.1
16	do	do	First bridge on Kailua road near Kailua.	-------	4.4	2.8
16	do	do	½ mile below first bridge on Kailua road near Kailua.	-------	3.4	2.2
Apr. 24	Wahiawa reservoir ditch.	Wahiawa water-supply system.	Below Wahiawa reservoir near Wahiawa.	[a] 1.36	56	36
24	do	do	do	[a] 1.36	56	36
24	do	do	do	[a] .93	31	20
Mar. 3	Puhawai	Lualualei Valley	30 feet above intake of lowest ditch above ranch headquarters near Waianae.	-------	.15	.09
3	do	do	15 feet below intake of lowest ditch above ranch headquarters near Waianae.	-------	.025	.016
3	Tributary of Puhawai.	Puhawai Stream	120 feet above forest reserve fence near Waianae.	-------	.045	.029
3	do	do	Forest reserve fence near Waianae.	-------	.025	.016
3	do	do	100 feet below forest reserve fence near Waianae.	-------	.081	.052
9	Raymond Grove ditch.	Main irrigation ditch.	Above flow from artesian well No. 199 at Pearl City.	-------	.20	.15
9	do	do	Below flow from artesian well No. 199 at Pearl City.	-------	4.0	2.6

[a] Head on old weir; determined by levels.

ISLAND OF MOLOKAI

HALAWA STREAM NEAR HALAWA, MOLOKAI

LOCATION.—250 feet below confluence of two main branches and 2 miles above mouth of stream and Halawa schoolhouse.

RECORDS AVAILABLE.—August 28, 1917, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 150 feet above and 100 feet below gage; banks high and steep. Control composed of large boulders; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.5 feet at 3.40 a. m. October 2 (discharge, 910 million gallons per day or 1,410 second-feet); minimum stage recorded, 0.12 foot 12 to 2 a. m. June 20 and 11 to 12 p. m. June 30 (discharge, 3.9 million gallons per day or 6.0 second feet).

1917–1922: Maximum stage recorded, 9.75 feet at 8.15 a. m. January 17, 1920 (discharge, 1,360 million gallons per day or 2,100 second-feet); minimum discharge recorded, 0.8 million gallons per day or 1.2 second-feet, at stage 0.35 foot, October 13–15 and 19, 1917.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of water-supply project for Halawa village and amount of water available for irrigation on leeward side of island.

UTILIZATION.—For irrigation of taro and for domestic supply.

ACCURACY.—Stage-discharge relation changed October 2, January 30, and May 25. Three rating curves used, well defined below 150 million gallons per day; extended above that quantity. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge, July 1 to January 30, ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day; daily discharge, January 31 to June 30, ascertained similarly except that for days of considerable fluctuation the discharge integrator was used. Records good except those estimated which are fair.

Discharge measurements of Halawa Stream near Halawa, Molokai, during the yea ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 13	J. E. Stewart	0.36	8.6	5.6	Jan. 25	J. E. Stewart	0.81	19.4	12.5
Aug. 24	do	.72	17.0	11.0	Mar. 12	M. H. Carson	1.16	35.5	23.1
Oct. 13	do	.39	10.5	6.8	May 1	do	.47	13.5	8.7
Nov. 30	do	.71	16.6	10.7	June 14	E. D. Burchard	1.43	44	28.5

Discharge, in million gallons per day, of Halawa Stream near Halawa, Molokai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		12.9	7.2	53	7.0	23	13.4	134	21	6.1	8.6	
2		11.8	5.8	150	29	12.4	22	58	15.1	6.1	8.0	
3	13	10.0	5.3	29	41	24	22	38	19.5	7.0	8.0	6.5
4		8.5	5.3	21	11.6	21	38	22	63	7.0	13.2	
5		28	11.8	13.4	8.0	12.4	95	17.4	58	19.2	14.1	
6		10.9	6.2	10.8	7.0	11.6	19.2	19.6	52	22	10.6	
7		43	5.8	76	6.5	9.2	14.4	19.5	46	14.4	8.0	
8		11.8	18.4	14.4	6.0	8.6	12.4	15.1	53	22	7.5	5
9		8.5	55	10.8	7.5	8.6	11.6	66	45	13.0	7.0	
10	17	7.2	12.9	9.2	9.1	7.5	13.9	24	41	17.0	22	
11		19.0	19.0	8.0	6.0	7.0	10.0	21	45	18.5	62	
12		25	9.2	7.5	19.5	172	8.6	19.8	27	16.6	16.7	8
13		9.2	7.2	7.0	12.1	188	9.2	14.0	19.8	21	14.2	
14	5.3	7.2	20	6.5	6.5	60	28	12.2	16.2	17.7	9.2	
15	6.3	6.7	24	6.0	5.6	24	10.8	11.4	14.0	10.6	8.6	11.4
16	11.9	5.8	20	6.0	5.2	15.6	8.6	11.4	13.1	50	7.5	6.2
17	26	7.8	17.5	8.0	5.2	125	8.3	10.6	18.5	29	8.0	4.9
18	36	6.2	10.9	6.0	4.8	81	14.4	9.9	11.4	54	8.0	4.5
19	32	33	8.5	5.6	174	33	26	9.2	10.6	27	9.2	4.2
20	25	9.2	10.7	5.9	97	18.0	59	8.6	9.2	18.7	26	15.3
21	10.0	15.7	14.0	10.4	250	21	27	77	8.6	12.2	11.4	36
22	24	23	17.2	9.6	99	48	32	37	8.6	9.9	8.0	8.5
23	28	7.8	14.3	15.4	34	126	29	17.4	8.0	8.6	7.0	22
24	10.9	9.2	8.5	39	19.2	206	15	43	7.5	8.0	44	8.5
25	10.9	7.2	8.5	11.6	31	126		25	7.5	9.9	48	6.2
26	13.4	23	6.7	9.2	43	44	41	22	7.0	14.0	50	5.3
27	16.2	17.1	31	7.5	39	24	43	13.0	7.0	8.6	19.0	4.9
28	32	7.8	25	27	19.2	19.2	149	111	6.6	16.7	21	4.5
29	61	6.7	11.8	27	13.4	21	84	-------	7.5	17.6		4.5
30	23	10.0	15.2	10.0	11.6	16.8	131	-------	7.0	14.3	10	4.2
31	11.8	13.5	-------	8.6	-------	16.8	90	-------	6.6	-------		-------

NOTE.—Water-stage recorder did not operate July 1–13, Jan. 24–25, and May 29 to June 14; discharge estimated by comparison with flow at station on Papalaua Stream, except for Jan. 24–25 for which it was ascertained by estimating gage-height graph. Braced figures show mean discharge for periods indicated.

Monthly discharge of Halawa Stream near Halawa, Molokai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	-------	-------	18.9	29.2	585	1,800
August	43	5.8	13.6	21.0	423	1,300
September	55	5.3	14.4	22.3	433	1,330
October	150	5.6	20.3	31.4	629	1,930
November	250	4.8	34.3	53.1	1,030	3,150
December	206	7.0	49.4	76.4	1,530	4,700
January	149	8.3	35.5	54.9	1,100	3,380
February	134	8.6	31.7	49.0	887	2,720
March	63	6.6	21.9	33.9	680	2,090
April	54	6.1	17.2	26.6	517	1,590
May	62	-------	16.6	25.7	515	1,580
June	-------	-------	8.02	12.4	241	738
The year	250	-------	23.5	36.4	8,570	26,300

PAPALAUA STREAM NEAR WAILAU, MOLOKAI

LOCATION.—A quarter of a mile above mouth, 2 miles east of Wailau landing, 5 miles by foot-trail west of Halawa village, and 6½ miles due north of Pukoo village.

RECORDS AVAILABLE.—September 17, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder installed May 22, 1920. Prior to this date Gurley printing water-stage recorder was used.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge near station.

CHANNEL AND CONTROL.—Bed, rocky and boulder-strewn. Banks, high and rocky. Control composed of large boulders and gravel; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.50 feet at 11.45 a. m. November 21 (discharge, 750 million gallons per day or 1,160 second-feet); minimum stage recorded, 0.86 foot at 10 p. m. October 19 (discharge, 1.6 million gallons per day or 2.5 second-feet).

1919–1922: Maximum stage recorded, 8.58 feet at 10.20 a. m. December 24, 1920 (discharge, 1,050 million gallons per day or 1,620 second-feet); minimum discharge, 1.0 million gallons per day or 1.6 second-feet, February 26 and 27, 1920 (gage height, 1.02 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water in stream available for irrigation on leeward side of island.

UTILIZATION.—Entire flow now wastes into sea.

ACCURACY.—Stage-discharge relation not permament. Three rating curves used are fairly well defined below 200 million gallons per day; applicable July 1 to December 22 and May 26 to June 30, December 23 to January 27, and March 1 to May 25; shifting-control method used January 28 to February 28. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good below 200 million gallons per day except those estimated and those for periods for which shifting-control method was used, which are fair.

Discharge measurements of Papalaua Stream near Wailau, Molokai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 13	J. E. Stewart	0.98	3.7	2.4	Jan. 26	J. E. Stewart	2.08	46.5	30
Aug. 24	do	1.28	9.4	6.1	Mar. 13	M. H. Carson	1.46	17.8	11.5
Oct. 13	do	.99	3.5	2.3	June 14	E. D. Burchard	1.48	16.5	10.7
Dec. 1	do	1.54	18.3	11.8					

Discharge, in million gallons per day, of Papalaua Stream near Wailau, Molokai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	2.9	12.7	3.9	118	3.5	15.6		125	10.0		4.8	2.9
2	13.0	9.6	2.8	114	42	9.5		41	7.1		4.2	2.6
3	21	6.2	2.3	15.7	30	25	35	25	19.5	2.5	4.7	4.4
4	16.3	5.6	2.3	10.8	6.4	14.2		9.5	52		11.4	2.9
5	4.5	24	9.7	6.1	4.3	6.8		7.8	47		11.9	2.2
6	44	6.8	3.3	8.5	3.3	6.1		14.0	42		6.7	2.2
7	5.3	35	3.7	81	2.8	4.4		11.2	38		4.4	2.2
8	38	6.6	14.8	7.2	2.4	4.4		8.3	40		4.1	2.2
9	5.0	4.7	46	4.8	4.1	3.9		73	41		3.6	2.2
10	4.2	4.0	7.8	4.2	4.2	3.0		17.2	36	15	28	2.1
11	7.2	22	18.8	3.3	2.4	2.7		19.1	43		58	2.0
12	3.4	17.8	5.8	2.8	24	195	6	13.7	17.0		14.1	2.0
13	2.6	5.4	4.0	2.4	6.6	216		7.8	10.5		8.8	3.2
14	1.9	3.9	18.9	2.2	3.2	43		6.4			5.4	15.2
15	5.1	3.1	18.0	2.2	2.5	10.3		5.6			4.4	5.9
16	7.4	2.6	11.9	2.2	2.1	6.4		5.6	7		4.0	2.4
17	26	4.2	12.0	4.4	2.0	180		4.9		35	5.4	1.9
18	40	3.8	7.0	2.3	1.9	126		4.3			5.2	1.9
19	34	40	4.8	1.8	212	17.1		3.8			5.2	1.8
20	17.5	5.4	8.5	6.7	84	7.6		3.6			23	9.4
21	6.1	16.5	10.5	7.2	268	6.1		70			7.7	23
22	24	17.0	17.0	6.3	94	83	25	23		4.5	4.4	4.0
23	21	4.3	10.2	12.8	19.3	58		10.2	3.5		3.9	13.4
24	5.8	5.6	5.9	39	10.1			29			50	3.4
25	8.2	5.0	5.8	7.6	24	75		13.2			45	2.0
26	8.2	26	4.8	5.8	47			9.4			44	1.9
27	16.2	9.2	40	4.8	22		37	11.5			13.9	1.8
28	35	4.4	28	29	9.8		126	112	3	10	8.6	1.8
29	62	3.8	8.4	16.7	6.1	9	56	-------			5.4	1.8
30	17.0	6.3	12.4	5.4	7.6		112	-------			4.2	1.8
31	6.2	11.7	-------	5.4	-------		54	-------		-------	3.5	-------

NOTE.—Water-stage recorder did not operate, Dec. 24 to Jan. 26, and Mar. 14 to Apr. 30; discharge estimated by comparison with flow at station on Halawa Stream near Halawa. Braced figures show mean discharge for periods indicated.

Monthly discharge of Papalaua Stream near Wailau, Molokai, for the year ending June, 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	62	1.9	16.4	25.4	509	1,560
August	40	2.6	10.7	16.6	333	1,020
September	46	2.3	11.6	17.9	349	1,070
October	118	1.8	17.4	26.9	541	1,660
November	268	1.9	31.7	49.0	952	2,920
December	-------	-------	44.5	68.9	1,380	4,230
January	-------	-------	27.0	41.8	838	2,570
February	125	3.6	24.5	37.9	685	2,110
March	-------	-------	15.7	24.3	488	1,490
April	-------	-------	13.1	20.3	392	1,210
May	58	3.5	13.2	20.4	408	1,260
June	23	1.8	4.22	6.53	126	389
The year	-------	1.8	19.2	29.7	7,000	21,500

WAIAKEAKUA STREAM NEAR WAILAU, MOLOKAI

LOCATION.—Half a mile above confluence with Pulena Stream, 3 miles south of Wailau landing, and 4 miles northwest of Pukoo village.

RECORDS AVAILABLE.—October 30, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at station.

CHANNEL AND CONTROL.—Stream bed, rocky and boulder strewn. Banks, steep, high, and covered with vegetation. Control, formed of boulders, cobblestones, and gravel; shifts during severe floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.65 feet at 4.40 p. m. October 2 (discharge, 267 million gallons per day or 413 second-feet); minimum stage recorded, 1.07 feet at 9 p. m. June 30 (discharge, 2.1 million gallons per day or 3.2 second-feet).

1919–1922: Maximum stage recorded, 5.20 feet on noon December 24, 1920 (discharge, 348 million gallons per day or 538 second-feet); minimum stage recorded, 0.92 foot March 7, 1920 (discharge, 1.3 million gallons per day or 2.0 second-feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for irrigation of west end of Molokai.

UTILIZATION.—Small amount being used for irrigation of taro. Most of flow wastes into sea.

ACCURACY.—Stage-discharge relation changed during flood of January 28. Two rating curves used are well defined below 150 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those for extremely high stages and those estimated, which are fair.

Discharge measurements of Waiakeakua Stream near Wailau, Molokai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 16	J. E. Stewart	1.22	5.7	3.7	Jan. 30	J. E. Stewart	3.59	207	134
Aug. 27	do	1.32	7.3	4.7	Mar. 16	M. H. Carson	1.56	11.4	7.4
Oct. 16	do	1.21	5.3	3.4	May 4	do	1.37	7.4	4.8
Dec. 4	do	1.54	11.2	7.2	June 17	E. D. Burchard	1.18	4.6	3.0
Jan. 27	do	2.90	109	70					

Discharge, in million gallons per day, of Waiakeakua Stream near Wailau, Molokai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.2	6.5	3.4	13.4	4.1	9.0	9.0	52	12.8	3.6	3.9	3.8
2	5.5	5.7	3.2	41	11.1	7.3	11.4	22	10.3	3.6	3.6	3.6
3	10.1	4.8	3.1	12.5	10.2	11.9	8.0	18.2	13.2	3.8	4.0	3.7
4	7.1	4.5	3.5	11.1	5.9	8.3		12.1	12.8	3.6	4.3	3.6
5	4.3	9.9	3.8	7.5	4.6	6.8	19.0	10.3	27	6.4	5.9	3.4
6	11.9	5.4	3.0	6.5	4.2	6.2		10.8	18.6	4.9	4.3	3.3
7	5.5	10.3	3.0	8.0	4.0	5.3		9.5	16.2	4.2	3.9	3.1
8	10.6	5.3	4.2	5.6	3.8	5.1		8.7	21	5.2	3.6	3.2
9	5.1	4.5	10.6	5.1	4.2	4.7		26	17.5	4.3	3.4	2.9
10	5.2	4.2	4.3	4.6	3.9	4.3		12.8	16.2	7.3	6.5	2.7
11	4.8	8.1	5.7	4.4	3.5	4.2		14.6	18.0	7.7	14.3	2.7
12	3.7	7.0	4.0	4.1	3.9	110		12.3	11.9	6.9	6.0	2.7
13	3.5	4.5	3.6	4.0	3.7	114	6.0	9.5	9.5	8.7	5.0	2.7
14	3.3	4.2	6.8	3.8	3.4	24		8.5	8.2	7.2	4.3	3.7
15	4.1	3.8	6.7	3.7	3.3	13.8		7.7	7.2	5.4	3.9	3.8
16	4.1	3.6	6.8	3.6	3.2	10.3		7.2	7.5	12.7	3.7	3.1
17	7.5	3.9	5.6	3.8	3.2	29		6.7	8.5	11.1	3.6	2.9
18	13.7	3.8	4.4	3.5	3.3	16.2		6.1	6.4	13.6	3.4	2.9
19	9.9	11.0	4.1	3.4	18.4	10.5		5.8	5.9	8.2	3.6	2.8
20	7.3	4.7	6.4	3.7	17.0	8.7		5.4	5.4	10.9	9.0	5.7
21	5.2	5.3	6.0	3.7	93	7.8		15.9	5.1	6.7	5.0	8.4
22	8.5	6.2	7.6	4.5	60	38		10.0	4.9	5.8	3.6	4.6
23	8.3	4.1	6.1	4.2	17.5	33	16.0	7.8	4.8	4.8	3.5	8.0
24	5.1	4.0	5.1	15.0	12.1	74		13.0	4.6	4.7	17.2	3.5
25	5.3	4.1	4.6	5.4	13.2	42		7.7	4.3	4.8	8.8	2.9
26	4.7	6.2	4.5	5.0	19.5	17.5		7.0	4.1	4.2	25	2.5
27	6.8	4.4	8.9	4.1	15.7	12.5		16.4	4.0	3.8	9.0	2.5
28	10.6	3.7	10.8	7.9	10.1	11.3	68	45	3.9	5.6	6.6	2.5
29	17.5	3.5	6.7	6.6	8.1	11.7	40	-------	3.8	5.2	5.5	2.4
30	9.2	3.7	6.7	4.8	8.1	9.4	52	-------	3.8	5.1	4.8	2.2
31	6.3	4.8	-------	4.8	-------	8.9	27	-------	3.6	-------	4.2	-------

NOTE.—Water-stage recorder did not operate properly Jan. 4–27; discharge estimated by comparison with flow at stations on Pulena and Pelekunu streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Waiakeakua Stream near Wailau, Molokai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	17.5	3.2	7.03	10.9	218	669
August	11.0	3.5	5.35	8.28	166	509
September	10.8	3.0	5.44	8.42	163	501
October	41	3.4	7.07	10.9	219	673
November	93	3.2	12.5	19.3	376	1,150
December	114	4.2	21.8	33.7	676	2,070
January	68	----------	15.8	24.4	488	1,500
February	52	5.4	13.9	21.5	389	1,190
March	27	3.6	9.71	15.0	301	924
April	13.6	3.6	6.33	9.79	190	583
May	25	3.4	6.24	9.65	193	594
June	8.4	2.2	3.53	5.46	106	325
The year	114	2.2	11.2	17.3	3,490	10,700

PULENA STREAM NEAR WAILAU, MOLOKAI

LOCATION.—Half a mile above confluence with Waiakeakua Stream, 3 miles south of Wailau landing, and 4 miles northwest of Pukoo village.

RECORDS AVAILABLE.—October 30, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge near station.

CHANNEL AND CONTROL.—Channel, rocky and boulder-strewn. Banks, steep, high, and fairly clean. Control of boulders and gravel; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.69 feet at 8.40 p. m. December 21 (discharge, about 645 million gallons per day or 998 second-feet); minimum stage recorded, 1.15 feet at 7 p. m. June 30 (discharge, 5.0 million gallons per day or 7.7 second-feet).

1919–1922: Maximum stage recorded, 11.5 feet about noon December 24, 1920 (discharge, roughly estimated, 1,000 million gallons per day or 1,500 second-feet); minimum stage recorded, 0.89 foot June 28 and July 14, 1920 (discharge, 3.0 million gallons per day or 4.6 second-feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for irrigation on west end of Molokai.

UTILIZATION.—Small amount being used for irrigation of taro. Most of flow wastes into sea.

ACCURACY.—Stage-discharge relation not permanent. Rating curve used July 1 to October 1, poorly defined throughout; curve used October 2 to January 31 and May 26 to June 30, well defined below 150 million gallons per day; curve used February 1 to May 25, well defined below 100 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair July 1 to October 1; good for remainder of year except those for extremely high stages

Discharge measurements of Pulena Stream near Wailau, Molokai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 16	J. E. Stewart	1.52	15.6	10.1	Jan. 27	J. E. Stewart	2.26	72	46.5
Aug. 27	do	1.55	14.8	9.6	Mar. 16	M. H. Carson	1.67	29.5	19.1
Oct. 16	do	1.36	14.2	9.2	May 4	do	1.72	34.5	22.4
Dec. 4	do	2.09	54	34.5	June 17	E. D. Burchard	1.20	9.1	5.9

Discharge, in million gallons per day, of Pulena Stream near Wailau, Molokai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	une
1	6.0	19.6	7.6	27	11.0	24	23	199	34	9.9	10.6	8.5
2	15.3	19.2	6.8	127	19.0	19.1	22	110	24	10.2	9.7	8.1
3	21	14.5	6.5	38	30	42	17.6	78	33	12.1	11.8	7.7
4	16.4	13.0	6.8	40	16.5	28	95	47	38	10.8	18.3	7.5
5	8.8	32	12.9	23	12.3	24	61	38	105	16.5	28	7.1
6	8.2	17.5	7.0	17.6	10.5	21	30	34	78	12.1	15.6	6.8
7	6.8	17.2	6.8	26	9.8	17.6	24	31	107	11.1	12.1	6.5
8	13.4	12.7	9.3	16.2	9.1	16.2	20	26	115	10.8	11.1	6.8
9	7.4	10.2	11.8	13.4	9.3	14.8	19.1	64	93	9.7	10.2	7.7
10	7.2	10.0	9.0	11.7	8.9	13.7	16.2	44	72	17.8	12.1	6.5
11	9.3	22	10.2	10.5	8.3	12.8	14.2	44	68	21	21	6.5
12	6.5	24	8.0	9.5	12.0	214	13.7	54	47	18.6	12.1	7.1
13	5.8	12.4	7.0	8.9	9.3	302	12.8	38	34	23	10.4	7.3
14	5.5	11.0	10.8	8.5	7.7	126	13.1	30	27	23	9.7	7.0
15	10.0	9.3	9.3	7.9	7.1	55	12.3	25	23	15.6	9.5	6.2
16	11.3	8.8	11.0	8.3	7.1	35	11.5	22	21	19.9	9.5	5.7
17	31	8.8	12.1	9.3	6.8	76	11.5	19.9	22	19.1	10.2	5.6
18	60	9.3	9.3	7.5	6.7	62	13.9	18.3	18.0	16.2	9.5	5.4
19	39	35	7.6	7.1	70	38	33	16.9	16.2	12.9	10.8	5.3
20	36	14.9	15.6	7.5	63	28	45	15.9	15.3	15.9	22	14.1
21	17.8	13.2	18.8	7.7	271	24	64	29	14.6	12.6	13.5	16.1
22	17.5	15.5	31	8.8	274	112	41	21	13.7	12.1	10.2	7.7
23	21	10.0	20	11.0	103	103	43	18.0	13.2	10.6	11.3	12.3
24	13.0	9.8	15.5	53	55	221	24	26	12.6	12.0	48	7.0
25	12.1	10.0	13.3	17.6	56	152	24	16.9	11.8	12.9	18.7	6.2
26	11.5	11.9	12.4	14.5	126	82	61	15.3	11.3	10.4	34	5.6
27	18.1	10.5	19.6	12.0	75	48	88	31	10.8	9.7	16.9	5.4
28	32	8.4	26	14.2	41	35	201	105	10.6	23	13.4	5.4
29	53	8.0	18.2	14.2	30	35	118	-------	10.6	14.6	11.0	5.6
30	32	10.2	18.9	13.2	24	28	173	-------	10.6	12.9	9.8	5.3
31	18.6	11.8	-------	17.6	-------	26	124	-------	10.2	-------	8.9	-------

Monthly discharge of Pulena Stream near Wailau, Molokai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	60	5.5	18.4	28.5	572	1,750
August	35	8.0	14.2	22.0	441	1,350
September	31	6.5	12.6	19.5	379	1,160
October	127	7.1	19.6	30.3	609	1,870
November	274	6.7	46.3	71.6	1,390	4,260
December	302	12.8	65.7	102	2,040	6,250
January	201	11.5	47.4	73.3	1,470	4,510
February	199	15.3	43.5	67.3	1,220	3,740
March	115	10.2	36.1	55.9	1,120	3,440
April	23	9.7	14.6	22.6	437	1,340
May	48	8.9	14.8	22.9	460	1,410
June	16.1	5.3	7.33	11.3	220	675
The year	302	5.3	28.4	43.9	10,300	31,800

PELEKUNU STREAM NEAR PELEKUNU, MOLOKAI

LOCATION.—Half a mile above confluence with Lanipuni Stream, 2 miles south of Pelekunu landing, 6 miles north of Kamalo village, and 12 miles by trail northwest of Pukoo village.

RECORDS AVAILABLE.—December 1, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 1,000 feet below station.

CHANNEL AND CONTROL.—Stream bed, rocky with scattered boulders. Banks, steep and rocky. Control, large boulders wedged into cleft in rock ledge; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.85 feet at 11 p. m. November 21 (discharge, 410 million gallons per day or 634 second-feet); minimum stage recorded, 0.78 foot at 8 p. m. July 14 (discharge, 2.2 million gallons per day or 3.4 second-feet).

1919–1922: Maximum stage recorded, 8.35 feet at 10.20 a. m. December 24, 1920 (discharge, 1,020 million gallons per day or 1,580 second-feet); minimum stage recorded, 1.65 feet 5 to 9 p. m. March 7 and July 13, 1920 (discharge, 1.8 million gallons per day or 2.8 second-feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for irrigating West Molokai.

UTILIZATION.—Small amount of water used for irrigation of taro. Most of flow wastes into sea.

ACCURACY.—Stage-discharge relation changed during floods of November 21 and January 30. Rating curve used July 1 to November 21 fairly well defined below 250 million gallons per day; curve used November 22 to January 30, poorly defined throughout; curve used January 31 to June 30, well defined below 50 million gallons per day and poorly defined above that point. Operation of water-stage recorder satisfactory except for a few short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good July 1 to November 21 and for all except high stages January 31 to June 30; records fair November 22 to January 30.

Discharge measurements of Pelekunu Stream near Pelekunu, Molokai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 15	J. E. Stewart	0.84	4.2	2.7	Jan. 30	J. E. Stewart	3.40	71	46
Aug. 26	do	.95	5.5	3.6	Mar. 15	M. H. Carson	2.20	20	12.9
Oct. 15	do	.95	4.7	3.0	May 3	do	1.71	7.0	4.5
Dec. 3	do	1.76	15.0	9.7	June 16	E. D. Burchard	1.57	4.8	3.1

Discharge, in million gallons per day, of Pelekunu Stream near Pelekunu, Molokai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.2	9.4	3.3	7.8	4.5	11.8	18.5	66	21	5.1	4.9	4.5
2	8.7	10.8	3.1	49	12.8	10.0	16.3	39	13.9	5.4	4.5	4.2
3	6.8	8.0	2.9	20	16.3	16.6	15.3	29	13.9	6.4	6.0	4.1
4	7.4	6.5	3.1	33	8.7	14.3	39	19.4	16.5	5.8	10.6	4.1
5	3.8	13.4	7.5	15.0	6.2	13.9	29	16.1	38	8.3	13.2	3.8
6	3.1	7.1	3.3	9.9	5.1	11.6	22	13.9	33	6.8	7.9	3.7
7	2.8	6.5	3.1	17.8	4.5	9.2	18.5	12.8	54	5.6	6.2	3.6
8	4.7	5.4	3.9	8.9	4.0	8.2	16.3	11.4	52	4.9	5.6	3.7
9	2.9	4.5	4.3	7.1	4.3	7.2	16.3	17.2	40	4.7	5.3	4.1
10	2.8	4.4	3.4	6.0	3.9	6.4	14.3	13.9	38	7.4	5.8	3.6
11	3.9	6.8	3.6	5.5	3.6	6.0	13.3	12.8	30	11.6	7.4	3.7
12	2.7	14.1	2.8	5.1	5.8	130	13.3	21	23	10.8	5.1	3.8
13	2.4	5.7	2.7	4.8	4.3	128	12.3	15.0	17.2	12.4	4.7	3.8
14	2.2	4.8	3.4	4.4	3.6	49	12.3	12.4	13.9	14.9	4.5	3.5
15	4.1	4.3	3.2	3.9	3.2	26	11.8	10.6	12.6	9.0	4.5	3.3
16	5.2	3.9	4.2	4.0	3.1	18.5	11.8	9.4	11.4	9.0	4.3	3.3
17	27	3.8	6.5	4.4	3.0	46	11.8	8.4	12.0	8.4	4.4	3.2
18	38	3.8	4.5	3.6	3.2	43	12.3	7.9	10.0	6.6	4.4	3.1
19	23	14.7	3.1	3.3	46	24	30	7.4	9.2	5.8	4.5	3.1
20	24	5.7	5.1	3.3	48	17.4	25	6.8	8.4	6.1	8.3	6.6
21	10.4	4.9	11.1	3.2	244	15.3	37	10.9	7.9	5.5	5.5	6.5
22	8.1	7.6	17.1	3.7	169	58	30	10.5	7.5	5.5	4.2	3.7
23	8.9	4.4	11.7	7.3	56	50	26	7.9	6.8	4.9	5.5	4.1
24	5.8	4.4	7.4	26	32	104	21	9.4	6.6	5.3	18.3	3.5
25	5.2	4.8	5.7	9.0	34	66	22	7.0	6.2	5.6	8.3	3.3
26	4.8	5.0	5.1	7.8	58	41	37	6.6	6.0	4.9	10.6	3.1
27	9.9	5.0	6.7	5.8	34	29	}	15.5	5.8	4.4	8.4	3.0
28	18.6	3.7	8.3	5.5	22	24	} 65	56	5.6	9.5	6.8	2.9
29	30	3.6	6.2	5.4	16.3	24	}	-------	5.4	6.7	5.8	3.0
30	18.6	6.9	7.1	6.4	13.3	22	88	-------	5.4	5.8	5.1	2.9
31	10.1	5.4	-------	7.9	-------	19.8	46	-------	5.3	-------	4.8	-------

NOTE.—Water-stage recorder did not operate satisfactorily Oct. 14, Dec. 2, and Jan. 27–29; discharge estimated or interpolated on basis of comparison with flow at stations on Lanipuni and Pulena streams. Braced figure shows mean discharge for period indicated.

Monthly discharge of Pelekunu Stream near Pelekunu, Molokai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	38	2.2	9.97	15.4	309	948
August	14.7	3.6	6.43	9.95	199	612
September	17.1	2.7	5.45	8.43	163	502
October	49	3.2	9.83	15.2	305	935
November	244	3.0	29.1	45.0	873	2,680
December	130	6.6	33.9	52.5	1,050	3,230
January	-------	11.8	27.8	43.0	861	2,640
February	66	6.6	16.9	26.1	474	1,450
March	54	5.3	17.3	26.8	536	1,650
April	14.9	4.4	7.10	11.0	213	654
May	18.3	4.2	6.63	10.3	205	631
June	6.6	2.9	3.76	5.82	113	346
The year	244	2.2	14.5	22.4	5,300	16,300

LANIPUNI STREAM NEAR PELEKUNU, MOLOKAI

LOCATION.—Half a mile above junction with Pelekunu Stream, 2 miles south of Pelekunu landing, 6 miles north of Kamalo village, and 13 miles by trail northwest of Pukoo village.

RECORDS AVAILABLE.—December 1, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 200 feet below gage.

CHANNEL AND CONTROL.—Channel, rocky and boulder strewn. Banks, high and rocky. Control of boulders and gravel; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.80 feet at 1 p. m. December 12 (discharge, 555 million gallons per day or 859 second-feet); minimum stage recorded, 0.12 foot 10 a. m. to 3 p. m. November 18 (discharge, 1.9 million gallons per day or 2.9 second-feet).

1919–1922: Maximum stage recorded, 5.90 feet at 10 a. m. December 24, 1920 (discharge, about 1,250 million gallons per day or 1,930 second-feet); minimum discharge recorded, 1.9 million gallons per day or 2.9 second-feet at 3.30 p. m. July 13, 1920 (gage height, 0.68 foot) and at 3 p. m. November 18, 1921 (gage height, 0.12 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for irrigating West Molokai.

UTILIZATION.—Small amount of water used for irrigation of taro. Most of flow wastes into sea.

ACCURACY.—Stage-discharge relation changed October 1, December 12, January 31, and April 28. Rating curve used July 1 to October 1, fairly well defined between 2 and 200 million gallons per day; curve used October 2 to December 12 and February 1 to April 28, fairly well defined between 2 and 15 million gallons per day and extended for higher stages on basis of form of other curves; curve used December 13 to January 31 fairly well defined between 1.5 and 30 million gallons per day and extended for higher stages on basis of form of other curves; curve used April 29 to June 30, fairly well defined between 2 and 10 million gallons per day and extended for higher stages on basis of form of other curves. Operation of water-stage recorder satisfactory except for one short period. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good July 1 to October 1; fair for remainder of year.

Discharge measurements of Lanipuni Stream near Pelekunu, Molokai, during the the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 15	J. E. Stewart	0.75	7.0	4.6	Jan. 29	J. E. Stewart	1.34	35	22.6
Aug. 26	do	.72	7.2	4.6	Mar. 15	M. H. Carson	.88	18.2	11.8
Oct. 14	do	.35	5.2	3.4	May 31	do	.68	8.1	5.2
Dec. 2	do	.63	10.1	6.5	June 16	E. D. Burchard	.56	5.5	3.5

Discharge, in million gallons per day, of Lanipuni Stream near Pelekunu, Molokai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	4.9	8.0	4.7	11.0	3.2	7.6	5.4	86	19.4	7.9	5.8	4.8
2	9.4	8.8	4.3	43	12.0	7.0	4.9	46	13.9	8.1	5.4	4.5
3	15.4	6.4	4.0	8.6	14.0	10.2	4.1	29	34	8.7	6.2	4.3
4	11.3	5.8	4.4	10.1	5.6	9.8	34	17.6	25	8.7	14.4	4.3
5	6.0	12.5	8.1	6.2	4.0	10.0	13.4	14.9	54	14.5	18.7	4.0
6	5.0	6.9	4.3	5.3	3.6	7.7	7.2	13.8	57	10.7	8.2	4.0
7	4.6	6.0	4.2	13.6	3.3	6.6	5.0	13.5	69	8.9	6.6	3.9
8	10.3	5.2	4.6	5.8	3.2	6.1	4.5	12.1	56	7.9	6.0	4.2
9	5.0	4.6	5.5	4.9	3.3	5.8	4.5	33	51	7.7	5.6	4.2
10	5.0	4.7	4.4	4.5	3.0	5.6	3.8	18.6	51	8.9	6.4	3.9
11	5.4	10.2	5.7	4.2	2.9	5.3	3.4	21	36	13.8	8.6	3.9
12	4.3	14.3	4.4	4.0	4.7	225	3.3	23	22	11.7	6.0	4.0
13	3.9	6.0	4.2	3.9	3.2	164	3.2	15.6	17.2	14.4	5.3	4.0
14	3.8	5.2	5.8	3.6	3.0	38	3.2	13.1	13.5	18.8	5.1	3.9
15	8.6	4.4	4.7	3.3	2.9	12.2	2.8	11.6	11.9	10.2	5.0	3.7
16	7.9	4.4	5.0	3.6	2.8	7.9	2.8	10.5	11.0	11.2	5.0	3.7
17	36	4.2	5.7	3.6	2.8	76	3.0	10.0	11.3	10.0	5.0	3.7
18	54	4.6	4.7	3.1	6.6	61	4.7	9.5	10.2	8.9	5.1	3.7
19	27	22	4.2	2.6	121	15.7	19.3	9.3	9.7	8.1	5.3	3.7
20	22	6.2	7.5	2.3	53	8.8	12.7	9.1	9.3	8.5	7.6	6.9
21	9.2	6.2	10.3	2.3	248	6.6	20	17.7	9.3	7.9	6.4	7.6
22	9.2	7.1	17.1	2.5	162	31	13.0	11.9	9.1	7.9	5.1	4.8
23	8.5	4.9	11.1	4.2	39	31	12.0	10.2	8.9	7.7	7.6	6.4
24	6.2	5.0	7.8	19.7	22	107	7.4	13.8	8.5	8.8	23	4.5
25	5.7	5.0	6.2	6.6	68	53	7.9	9.5	8.3	9.0	9.9	4.2
26	5.2	5.8	5.7	4.9	102	22		9.1	8.1	7.7	11.1	3.9
27	14.2	5.2	6.9	3.6	31	10.0	45	17.9	8.1	7.4	8.0	3.8
28	29	4.4	7.1	3.8	13.8	8.2		85	8.1	22	6.4	3.8
29	30	4.9	5.7	3.5	9.7	8.8		-------	7.9	9.8	5.6	3.8
30	11.4	6.8	8.0	4.0	8.7	7.2	73	-------	7.9	6.9	5.1	3.6
31	7.3	7.4	-------	4.2	-------	6.2	36	-------	7.9	-------	5.0	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated, on account of nonoperation of water-stage recorder, by comparison with flow at station on Pelekunu Stream.

Monthly discharge of Lanipuni Stream near Pelekunu, Molokai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	54	3.8	12.4	19.2	386	1,180
August	22	4.2	6.87	10.6	213	654
September	17.1	4.0	6.21	9.61	186	572
October	43	2.3	6.66	10.3	206	634
November	248	2.8	32.1	49.7	962	2,960
December	225	5.3	31.7	49.0	981	3,020
January	-------	2.8	16.0	24.8	494	1,520
February	86	9.1	21.2	32.8	592	1,820
March	69	7.9	21.8	33.7	674	2,070
April	22	6.9	10.1	15.6	303	930
May	23	5.0	7.56	11.7	234	719
June	7.6	3.6	4.32	6.68	130	398
The year	248	2.3	14.7	22.7	5,360	16,500

WAIKOLU STREAM AT ELEVATION 650 FEET, NEAR KALAUPAPA, MOLOKAI

LOCATION.—2 miles above mouth of stream and 5 miles southeast of Kalaupapa.

RECORDS AVAILABLE.—July 1, 1920, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Stream bed, of gravel and boulders. Right bank, vertical rock; left bank, sloping and formed of loose material. Control, formed of unstable boulders.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.35 feet at 10 a. m. December 12 (discharge, about 630 million gallons per day or 975 second-feet); comparison with lower gaging station at pipe-line crossing indicates that a higher stage probably occurred December 22 shortly after recorder float wire broke. Minimum stage, 1.63 feet for several hours September 13 and 14 and October 21 and 22 (discharge, 3.1 million gallons per day or 4.8 second-feet).

1920–1922: Maximum stage recorded, about 13.0 feet at 10.20 a. m. December 24, 1920 (data insufficient for determination of discharge); minimum discharge, 2.4 million gallons per day or 3.7 second-feet, at noon October 2, 1920 (gage height, 1.95 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine the amount of water available for proposed power and irrigation project for leper settlement and for irrigation of the west end of Molokai.

UTILIZATION.—Part of water used for water supply of leper settlement and for irrigation of taro. Remainder wastes into sea.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve fairly well defined below 250 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated and those for extremely high stages.

Discharge measurements of Waikolu Stream at elevation 650 feet, near Kalaupapa, Molokai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 14	J. E. Stewart	1.67	5.6	3.6	Feb. 1	J. E. Stewart	4.80	291	188
Aug. 25	do	1.66	5.0	3.3	2	do	2.57	20.7	13.4
Oct. 14	do	1.65	4.3	2.8	Mar. 14	M. H. Carson	2.16	12.3	8.0
Dec. 1	do	1.89	7.0	4.6	May 2	do	2.02	9.7	6.3
Feb. 1	do	4.50	264	171	June 15	do	2.00	7.7	5.0

Discharge, in million gallons per day, of Waikolu Stream at elevation 650 feet, near Kalaupapa, Molokai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.7	3.5	3.5	3.7	3.6	4.8			9.6	6.4	6.4	5.4
2	4.9	4.4	3.3	21	12.1	4.7	10	40	8.0	6.4	5.9	5.4
3	5.9	4.7	3.2	10.1	17.6	14.7		11.6	22	6.9	5.9	5.4
4	6.4	3.8	3.1	44	5.0	11.4		8.0	9.9	6.9	8.6	5.4
5	4.0	6.7	3.8	4.8	3.8	9.5		8.0	33	8.6	9.9	5.4
6	3.6	4.3	3.6	3.8	3.4	7.3	15	7.4	28	15.9	6.9	5.4
7	3.4	3.6	3.3	15.4	3.3	4.9		8.0	44	8.6	6.4	5.4
8	4.7	3.5	3.2	4.6	3.3	4.6		8.0	36	6.9	5.9	5.4
9	4.0	3.4	3.4	3.6	3.3	4.4		11.7	27	6.9	5.9	5.4
10	3.5	3.3	3.5	3.4	3.3	4.4		8.6	28	6.4	5.9	5.9
11	3.6	3.4	3.3	3.3	3.2	4.4		15.4	13.3	9.2	6.4	5.9
12	3.5	6.0	3.2	3.2	3.3	234		17.0	10.6	11.6	6.4	5.9
13	3.4	3.8	3.1	3.2	3.8	168	7	9.2	8.0	12.0	5.9	5.9
14	3.3	3.5	3.1	3.2	3.4	24		9.2	7.4	13.7	5.9	5.9
15	3.4	3.4	3.2	3.1	3.3	8.6		7.4	7.4	7.4	5.9	5.9
16	4.1	3.3	3.3	3.1	3.2	6.9		6.9	7.4	6.9	5.9	5.9
17	10.5	3.3	5.6	3.1	3.1	71		6.9	9.2	7.4	5.9	5.9
18	22	3.2	4.8	3.1	3.3	35		6.9	7.4	6.9	5.9	5.9
19	21	6.1	3.4	3.1	97	9.2		6.4	7.4	6.4	5.9	5.9
20	10.0	4.4	3.3	3.1	33	7.4		6.4	6.9	6.4	6.9	5.9
21	4.3	3.5	5.4	3.1	203	6.9	16	11.6	6.9	6.4	6.9	7.4
22	3.8	3.8	11.0	3.1	158			10.9	6.9	6.4	5.9	6.4
23	4.5	3.4	6.5	3.4	36			6.9	6.9	6.4	8.2	6.4
24	3.8	3.3	3.8	10.4	12.4			8.6	6.9	6.4	17.5	6.4
25	3.6	3.3	3.5	5.2	27	40		6.9	6.9	6.4	7.4	5.9
26	3.4	3.3	3.3	5.7	61			6.4	6.9	6.9	8.0	5.9
27	4.2	3.4	3.3	3.8	15.4			9.8	6.9	6.4	6.9	5.4
28	8.4	3.3	3.8	3.4	7.4		50	86	6.4	6.9	6.4	5.4
29	9.7	3.3	3.6	3.6	5.9			-------	6.4	8.0	5.9	5.4
30	6.2	3.6	3.6	3.5	5.0	10		-------	6.4	6.4	5.9	5.4
31	3.8	4.3	-------	5.8	-------			-------	6.4	-------	5.9	-------

NOTE.—Water-stage recorder did not operate satisfactorily Dec. 22 to Feb. 2; discharge estimated by comparison with flow at lower station on this stream at pipe-line crossing. Braced figures show mean discharge for periods indicated.

Monthly discharge of Waikolu Stream at elevation 650 feet, near Kalaupapa, Molokai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	22	3.3	5.95	9.21	185	566
August	6.7	3.2	3.87	5.99	120	368
September	11.0	3.1	3.93	6.08	118	362
October	44	3.1	6.35	9.82	197	604
November	203	3.1	24.9	38.5	746	2,290
December	234	4.4	30.8	47.7	956	2,930
January	-------	-------	20.3	31.4	630	1,930
February	86	6.4	13.9	21.5	390	1,190
March	44	6.4	13.0	20.1	404	1,240
April	15.9	6.4	7.81	12.1	234	719
May	17.5	5.9	6.89	10.7	214	655
June	7.4	5.4	5.78	8.94	174	532
The year	-------	-------	12.0	18.6	4,370	13,400

WAIKOLU STREAM AT PIPE-LINE CROSSING, NEAR KALAUPAPA, MOLOKAI

LOCATION.—At 300-foot elevation, 1 mile above mouth of stream and 4 miles southeast of Kalaupapa.

RECORDS AVAILABLE.—June 2, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Stream bed, composed of sand, gravel, and boulders Right bank, steep and rocky; left bank is overflowed at high stages. Control is concrete casing of 8-inch water main and is permanent, except for slight changes caused by flood damage and subsequent repairs.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.75 feet at 8.50 p. m. December 22 (discharge, about 820 million gallons per day or 1,270 second-feet); minimum stage recorded, 3.92 feet 6 to 8 a. m. September 26 (discharge, 2.8 million gallons per day or 4.3 second-feet).

1919–1922: Maximum stage recorded, 10.20 feet at 10.30 a. m. December 24, 1920 (discharge, about 1,270 million gallons per day or 1,960 second-feet); minimum discharge for period occurred on September 26, 1921.

DIVERSIONS.—Intake ditch for Kalaupapa water supply diverts about 2.5 million gallons per day at elevation of about 500 feet. Some of this water returns to stream just below station.

REGULATION.—By diversion only.

OBJECT OF STATION.—To determine amount of water available for proposed power and irrigation project for leper settlement.

UTILIZATION.—Part of water used for irrigation of taro. Remainder wastes into sea.

ACCURACY.—Stage-discharge relation changed August 26–30 by rebuilding of control and again by flood of February 28. Rating curve used July 1 to August 26 and March 1 to June 30, well defined between 4 and 50 million gallons per day; curve used August 30 to February 28 fairly well defined, by two discharge measurements, as a parallel curve. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated and those for high stages.

Discharge measurements of Waikolu stream at pipe-line crossing, near Kalaupapa Molokai, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 14	J. E. Stewart	3.96	7.3	4.7	Feb. 3	J. E. Stewart	4.38	34	22.0
Aug. 25	do	3.94	7.2	4.7	Mar. 14	M. H. Carson	4.22	25.5	16.5
Oct. 14	do	3.98	7.2	4.6	May 2	do	4.14	20.6	13.2
Dec. 1	do	4.06	10.4	6.7	June 15	E. D. Burchard	4.08	14.6	9.4

Discharge, in million gallons per day, of Waikolu Stream at pipe-line crossing, near Kalaupapa, Molokai, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	5.7	5.4	4.9	3.3	4.4	7.8	16.3	55	20	15.0	12.4	
2	7.5	6.4	4.6	17.8	9.6	6.7	15.8	32	18.5	15.0	11.9	
3	9.0	7.9	4.4	9.8	19.6	13.8	15.3	21	33	15.5	11.9	
4	9.8	6.1	4.1	39	7.1	15.3	35	17.3	21	15.5	13.2	
5	6.1	9.8	4.9	6.7	5.3	11.9	23	16.8	37	18.0	13.7	
6	5.7	6.7	4.9	4.9	4.6	10.7	17.8	16.3	36	25	12.8	
7	5.4	5.7	4.4	20	4.4	7.1	16.8	16.8	45	18.0	12.4	10
8	7.5	6.1	4.1	6.3	4.6	6.7	15.3	16.3	40	16.5	12.8	
9	6.4	5.4	4.4	4.9	4.9	6.3	15.3	21	33	16.0	11.9	
10	5.7	5.4	4.4	4.9	4.4	6.3	14.8	17.3	33	15.5	11.5	
11	5.7	5.4	4.4	4.6	4.1	6.0	14.8	22		20	10.6	
12	5.7	9.0	4.1		4.9	280	14.3	26	18	21	11.0	
13	5.4	6.4	4.4	4.3	5.6	179	14.3	18.3		22	10.2	
14	5.1	4.8	4.4		4.9	34	14.3	17.8		22	10.2	
15	5.4	4.8	4.1	4.1	4.6	17.8	14.3	15.3	15.5	17.0		10.2
16	6.1	4.8	4.1	4.4	4.4	14.8	13.8	14.3	15.5	16.5		10.2
17	12.7	4.8	6.7	4.4	4.4	72	13.8	13.8	18.5	17.0	11	10.2
18	22	5.1	6.0	4.6	4.6	43		13.8	16.0	15.5		10.2
19	24	9.4	4.4	4.4	92	19.9		13.8	15.0	15.0		10.2
20	16.0	7.9	4.1	4.4	38	15.8		13.3	15.0	15.0		10.2
21	6.7	5.7	5.6	4.4	199	15.3	25	16.5	15.0	13.7		11.9
22	6.4	5.7	10.9	4.4	128	81		18.5	15.0	14.1		10.6
23	7.1	5.4	7.3	4.6	36	41		13.8	15.0	13.7	15	11.0
24	6.1	5.1	3.9	13.9	19.9	109		15.8	15.0	13.7		10.6
25	5.4	5.1	3.3	7.2	30	42		13.8	14.6	14.1		10.2
26	5.4		3.1	7.5	55	26		12.8	14.6	14.1		9.8
27	6.4		3.3	4.6	22	18.8		23	14.6	13.2		9.8
28	12.4	5	3.6	4.1	14.3	17.8	55	91	14.6	16.5		9.8
29	14.6		3.6	4.1	10.2	19.4		-------	14.6	15.5	11	9.8
30	9.8		3.3	4.1	8.9	21		-------	14.6	13.2		9.8
31	6.4	6.0	-------	7.2	-------	17.8		-------	14.6	-------		-------

NOTE.—Water-stage recorder did not operate satisfactorily as follows: Aug. 26–30, control being rebuilt; Oct. 12-14, clock run down; Jan. 18 to Feb. 1 and Mar. 11–14, clock stopped ;May 15 to June 15, intake clogged. Discharge for these periods estimated by comparison with flow at upper station at elevation 650 feet. Braced figures show mean discharge for periods indicated.

Monthly discharge of Waikolu Stream at pipe-line crossing, near Kalaupapa, Molokai, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	24	5.1	8.50	13.2	264	809
August	9.8	----------	5.98	9.25	185	569
September	10.9	3.1	4.66	7.21	140	429
October	39	3.3	7.34	11.4	228	698
November	199	4.1	25.3	39.1	760	2,330
December	280	6.0	38.2	59.1	1,180	3,630
January	----------	----------	27.3	42.2	845	2,600
February	91	12.8	21.6	33.4	603	1,860
March	----------	----------	20.8	32.2	646	1,980
April	25	13.2	16.4	25.4	493	1,510
May	----------	----------	12.0	18.6	374	1,140
June	----------	----------	10.2	15.8	304	939
The year	----------	----------	16.5	25.5	6,030	18,500

MISCELLANEOUS MEASUREMENTS

Measurements of streams and ditches on the Island of Molokai at points other than regular gaging stations are listed below.

Miscellaneous measurements on Molokai during the year ending June 30, 1922

Date	Stream	Tributary to or diverting from—	Locality	Gage height (feet)	Discharge	
					Second-feet	Million gallons per day
July 14	Right Branch of Papalaua.	Papalaua Stream	Near Halawa		0.55	0.35
14	do	do	do		.08	.05
Oct. 13	do	do	do		.70	.45
Dec. 1	do	do	do		1.9	1.2
Oct. 16	Wailau	Pacific Ocean	Above first taro ditch near Wailau.		38	24.5
July 14	Pelekunu	do	Above first taro ditch near Pelekunu.		14.3	9.2
Aug. 25	do	do	do		15.4	10.0
Oct. 14	do	do	do		18.8	12.2
Dec. 2	do	do	do		45	29
July 14	Waikolu	do	Below Big Springs Branch near Kalaupapa.		13.8	8.9
Aug. 25	do	do	do		12.3	8.0
Oct. 14	do	do	do		11.8	7.6
Dec. 2	do	do	do		17.8	11.5
Feb. 3	do	do	do		54	34.5
Dec. 2	Taro ditch	Wakiolu Stream	At measuring section on main Waikolu Stream below Big Springs Branch.		.2	.15
Oct. 18	Waileia	Pacific Ocean	Near Kalaupapa		.03	.02
18	Waihanau	do	do		.19	.12
18	Kapuna	Waianui Gulch	do		.17	.11
18	Waihii	do	do		.06	.04

ISLAND OF MAUI

HONOKAWAI DITCH NEAR LAHAINA, MAUI

LOCATION.—75 feet below intake on Honokawai Stream, 25 feet inside of ditch tunnel, 2¼ miles above Pioneer Mill Co.'s power-house, and 7½ miles northeast of Lahaina.

RECORDS AVAILABLE.—May 28, 1921, to June 30, 1922. At station 1½ miles downstream, November 14, 1918, to May 27, 1921; at station half a mile downstream on old ditch line, July 1, 1912, to December 31, 1917. Records not comparable.

GAGE.—Gurley weekly water-stage recorder; installed April 15, 1919. Stevens continuous recorder November 14, 1918, to April 15, 1919. Staff gage prior to November 14, 1918.

DISCHARGE MEASUREMENTS.—Made from plank across ditch.

CHANNEL AND CONTROL.—Concrete-lined ditch section in tunnel a quarter of a mile long; subject to backwater from collection of gravel at a point where tunnel widens, about 500 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.30 feet at 7.30 p. m. and midnight November 21 (discharge, 41 million gallons per day or 63 second-feet); minimum stage, 0.26 foot for several hours October 4–6, 22, 23, and November 16–19 (discharge, 2.8 million gallons per day or 4.3 second-feet).

1921–22 (present station): Maximum and minimum stages recorded during 1922.

1912–1922: Maximum stage for period recorded at present station on November 21, 1921; minimum stage recorded, 0.22 foot at 9 p. m. November 14, 1918, at station 1½ miles downstream (discharge, 0.32 million gallons per day or 0.5 second-foot).

DIVERSIONS.—Flood-water diversion ditch 1½ miles below station diverts part of flood flow when flood gates are open. Gates 30 feet above station may also be used to divert flood water.

REGULATION.—By head gates and by flood gates noted under "Diversions."

OBJECT OF STATION.—Most of drainage area in Territorial lands. Data valuable in relation to Territorial lease to Pioneer Mill Co.

UTILIZATION.—Water used for power development and irrigation of sugar cane.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined above 2.5 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by means of the discharge integrator. Records excellent.

Honokawai ditch diverts from Honokawai Stream at elevation about 1,570 feet. The water is carried southwest through a tunnel about 1¼ miles long to elevation about 1,550 feet. Here the general course of the ditch changes to north of west and the water is carried down a small gulch to power house No. 1 at elevation about 950 feet and thence nearly due south to the vicinity of Lahaina where the water is used by the Pioneer Mill Co. for irrigation of sugar cane. The system comprises about 5½ miles of main ditch.

Discharge measurements of Honokawai ditch near Lahaina, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 19	Hayashi[a] and Phelps[a]	1.39	30.5	19.8	Mar. 27	Gillin and Maxwell	0.61	8.5	5.5
19	do	2.03	53	34	27	do	.61	7.6	4.9
Oct. 21	J. E. Stewart	.275	4.5	2.9	Apr. 19	S. B. Hall	.67	10.2	6.6
Jan. 16	G. M. Phelps	.32	4.9	3.2	June 26	William Maxwell	.67	10.8	7.0
Feb. 20	S. B. Hall	.41	6.1	3.9					
Mar. 24	Gillin[a] and Maxwell[a]	.62	8.8	5.7					

[a] Engineers for Pioneer Mill Co.

Discharge, in million gallons per day, of Honokawai ditch near Lahaina, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.3	8.7	3.7	3.0	4.1	6.2	3.6	17.2	7.2	5.9	6.8	7.4
2	4.3	11.4	3.7	6.0	4.0	4.0	3.4	11.8	7.2	7.4	6.9	7.4
3	8.4	5.7	3.2	3.2	8.0	15.5	3.3	7.7	12.6	7.9	7.5	7.4
4	6.1	3.8	3.0	3.0	3.9	9.2	10.5	5.3	12.0	7.9	13.3	7.4
5	3.5	5.4	3.2	2.8	3.3	5.6	5.9	5.2	17.3	18.7	12.1	7.4
6	3.3	3.5	3.2	2.9	3.1	4.3	4.8	5.8	15.3	8.2	7.6	7.4
7	3.3	3.9	3.3	3.0	3.0	3.4	3.9	5.8	18.3	6.4	7.0	7.4
8	5.2	3.3	3.8	3.0	3.0	3.3	4.4	6.2	17.2	6.2	11.3	7.6
9	3.4	3.3	4.7	3.0	3.5	3.2	4.5	16.8	15.9	6.0	7.6	7.8
10	3.2	3.1	4.0	3.0	3.6	3.1	4.0	8.8	17.2	7.0	9.4	7.6
11	3.7	12.7	3.6	3.0	3.1	3.0	3.7	7.4	11.5	9.5	8.4	7.0
12	3.1	8.3	3.3	3.0	2.9	14.7	3.7	6.5	11.5	12.9	7.4	7.3
13	3.0	3.5	3.1	3.0	3.3	22	3.7	5.0	11.2	16.0	7.1	7.7
14	3.0	3.2	3.1	3.0	3.0	13.0	3.6	4.5	7.4	15.3	7.1	7.3
15	5.4	3.1	4.0	3.0	3.0	5.0	3.3	4.4	6.8	8.3	7.1	7.0
16	7.8	3.0	4.0	3.7	2.9	4.3	3.4	4.0	6.2	12.2	7.1	7.0
17	14.8	3.0	4.3	3.4	2.9	10.7	3.3	4.0	9.1	9.7	7.1	6.8
18	12.6	3.2	3.7	3.3	2.8	14.3	6.0	3.9	6.4	7.1	7.3	6.8
19	12.3	16.1	3.4	3.1	9.2	5.1	4.5	3.9	6.3	6.8	8.1	6.8
20	4.7	3.7	3.4	3.1	11.8	3.7	4.3	4.0	6.2	8.2	12.7	7.8
21	3.3	6.2	3.7	3.0	31	3.3	11.1	4.3	6.0	8.1	8.7	11.3
22	3.3	6.1	8.2	2.9	28	4.7	11.0	5.6	6.0	7.0	7.8	7.8
23	4.3	3.5	4.8	5.9	7.5	5.9	9.3	8.7	5.9	7.0	8.8	9.2
24	3.3	4.0	3.5	21	12.0	15.9	5.9	12.6	5.9	7.1	11.7	6.8
25	3.4	3.6	3.3	5.5	22	11.3	6.6	5.8	5.9	8.9	11.1	6.8
26	3.4	6.0	6.0	4.1	22	10.0	13.2	5.1	5.9	6.8	14.5	6.5
27	10.1	3.6	10.8	3.4	10.5	5.6	15.6	6.4	5.9	6.8	8.6	6.3
28	7.0	3.2	14.7	4.0	4.8	4.4	12.7	20	5.9	6.6	7.8	6.3
29	22	4.5	4.8	5.5	4.0	5.4	12.3	-------	5.9	9.6	7.6	6.3
30	7.0	11.0	3.1	6.1	3.7	4.0	16.8	-------	5.9	6.9	7.4	6.4
31	3.4	5.4	-------	5.9	-------	3.8	16.1	-------	5.9	-------	7.4	-------

Monthly discharge of Honokawai ditch near Lahaina, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	22	3.0	5.96	9.22	185	567
August	16.1	3.0	5.45	8.43	169	518
September	14.7	3.0	4.49	6.95	135	413
October	21	2.8	4.25	6.58	132	404
November	31	2.8	7.66	11.9	230	705
December	22	3.0	7.35	11.4	228	699
January	16.8	3.3	7.05	10.9	218	671
February	20	3.9	7.38	11.4	207	634
March	18.3	5.9	9.29	14.4	288	884
April	18.7	5.9	8.75	13.5	262	806
May	14.5	6.8	8.72	13.5	270	830
June	11.3	6.3	7.33	11.3	220	675
The year	31	2.8	6.97	10.8	2,540	7,810

LAHAINALUNA STREAM ABOVE PIPE-LINE INTAKE, NEAR LAHAINA, MAUI

LOCATION.—200 feet above intake of pipe line supplying Lahaina and Lahainaluna school and 2½ miles northeast of Lahaina, at elevation 1,057 feet.

RECORDS AVAILABLE.—February 29, 1916, to June 30, 1922. From August 5, 1911, to January 18, 1916, at a station about a mile downstream.

GAGE.—Stevens continuous water-stage recorder installed August 27, 1919, to replace Gurley printing water-stage recorder previously used.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; fairly straight near gage; filled with large boulders; banks steep and high. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.97 feet at 10 p. m. March 7 (discharge about 125 million gallons per day or 193 second-feet); minimum stage recorded, 0.93 foot at 11 p. m. November 14 (discharge, 1.8 million gallons per day or 2.8 second-feet).

1916–1922: Maximum stage recorded, 3.79 feet at 10.30 a. m. November 26, 1918 (discharge, 314 million gallons per day or 486 second-feet); minimum discharge, 1.8 million gallons per day or 2.8 second-feet, November 14, 1921 (gage height, 0.93 foot), and August 9–11 and 17–19, 1920 (gage height, 0.92 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—Data valuable in relation to Territorial agreement with Pioneer Mill Co. pertaining to division of water.

UTILIZATION.—Water used for domestic purposes, development of power, and irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent. Standard rating curve fairly well defined between 1.5 and 60 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, and by correcting quantities thus obtained on basis of the plotting of the discharge measurements with reference to the standard curve. Records fair.

Discharge measurements of Lahainaluna Stream above pipe-line intake, near Lahaina, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 17	J. E. Stewart	2.42	75	48.5	Feb. 20	S. B. Hall	1.06	6.5	4.2
Aug. 15	W. C. Renshaw	.95	2.8	1.85	Apr. 27	do	1.11	7.0	4.5
Sept. 28	do	.96	3.0	1.95					

66289—26†—WSP 555——7

Discharge, in million gallons per day, of Lahainaluna Stream above pipe-line intake, near Lahaina, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	2.0	4.1	2.0	2.1	2.7		4.1	29	5.8	5.0	4.7	4.1
2		7.7	2.0	3.8	2.1		4.0	17.5	4.7	7.9	4.8	4.1
3	5.3	3.7	2.0	2.0	3.1		3.9	8.3	9.4	8.4	5.4	4.1
4	4.1	3.4	2.1	2.0	2.8		8.4	5.1	8.2	8.2	8.6	4.1
5	2.1	7.7	2.3	2.0	2.0		6.3	4.9	23	16.5	9.0	4.1
6	2.0	2.3	2.0	2.0	1.9	6.0	6.9	5.9	41	7.8	5.2	4.1
7	2.0	2.0	2.0	2.0	1.9		4.1	6.0	57	5.4	4.8	4.1
8	2.7	2.0	2.1	1.9	1.9		5.1	4.9	65	5.2	5.3	4.1
9	2.0	2.0	2.6	1.9	2.2		4.3	12.8	29	4.8	4.6	4.3
10	2.2	1.9	2.4	1.9	2.1		4.0	7.4	44	6.7	4.9	4.1
11	2.1	5.7	2.0	1.9	1.9		3.9	5.7	20	11.6	4.9	4.3
12	2.0	9.1	2.0	1.9	2.0		3.9	6.7	11.2	11.1	4.6	5.2
13	2.0	2.1	2.0	1.9	2.0		3.9	4.6	8.3	15.3	4.4	4.6
14	1.9	2.0	2.0	1.9	1.9		3.9	4.5	6.1	8.4	4.4	4.3
15	4.9	1.8	2.7	1.9	1.8	13	3.7	4.3	5.7	5.2	4.4	4.1
16	5.6	1.8	3.0	2.0	1.9		3.9	4.3	5.6	7.0	4.4	4.0
17	20	1.8	5.1	1.9	1.9	6.5	3.7	4.3	7.7	5.0	4.4	4.0
18	9.5	1.9	2.2	1.9	1.9	6.0	5.0	4.3	5.6	4.7	4.4	4.0
19	16.8	8.0	2.1	1.9		4.0	4.1	4.2	5.6	4.5	4.9	3.9
20	7.7	2.0	2.8	1.8		3.9	7.0	4.2	5.6	8.5	7.1	7.6
21	2.2	2.0	3.5	1.8		3.9	14.8	4.2	5.6	6.4	4.7	9.7
22	2.2	2.7	15.2	1.8		4.1	12.5	4.3	5.4	7.1	4.6	4.0
23	2.3	2.0	4.5	19.5	19	10.6	10.2	5.6	5.4	5.0	5.1	4.2
24	2.8	2.0	2.7	23		17.8	8.9	7.0	5.2	4.4	5.5	4.0
25	2.3	2.0	2.1	7.2		28	8.7	5.1	5.2	6.0	4.7	3.9
26	2.5	2.1	2.1	3.6		22	13.6	4.2	5.2	4.5	5 8	3.9
27	8.3	2.1	2.6	2.1		5.6	27	4.2	5.2	4.5	4.6	3.8
28	3.1	2.0	2.3	2.1		4.5	24	11.2	5.0	4.7	4 4	3.8
29	9.8	2.0	2.1	2.9	4.0	6.9	10.2	-------	5.0	5.4	4 4	3.6
30	4.5	9.9	4.0	7.1		4.3	46	-------	5.0	4.7	4 2	3.6
31	2.0	4.7	-------	4.2	-------	4.2	13.1	-------	5.2	-------	4.2	-------

NOTE.—Water-stage recorder did not operate July 1–2 and Nov. 19 to Dec. 16; discharge estimated by comparison with flow at station on Honokawai ditch. Braced figures show mean discharge for periods indicated.

Monthly discharge of Lahainaluna Stream above pipe-line intake, near Lahaina, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	20	----------	4.55	7.04	141	433
August	9.9	1.8	3.44	5.32	106	327
September	15.2	2.0	2.95	4.56	88.5	272
October	23	1.8	3.74	5.79	116	356
November	----------	1.8	6.87	10.6	206	632
December	28	----------	8.49	13.1	263	808
January	46	3.7	9.13	14.1	283	869
February	29	4.2	6.95	10.8	195	597
March	65	4.7	13.7	21.2	426	1,300
April	16.5	4.4	7.00	10.8	210	644
May	9.0	4.2	5.08	7.86	157	483
June	9.7	3.6	4.39	6.79	132	404
The year	65	1.8	6.36	9.84	2,320	7,120

OLOWALU DITCH NEAR OLOWALU, MAUI

LOCATION.—425 feet above intake to penstock of hydroelectric power station, 1 mile above Olowalu, and 7 miles east of Lahaina.

RECORDS AVAILABLE.—July 28, 1916, to June 30, 1922. Replaces old station in tailrace of power house, for which records are available August 12, 1911, to June 30, 1916.

GAGE.—Stevens continuous water-stage recorder; installed June 9, 1919, to replace staff gage installed July 28, 1916.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel, about 3.5 feet wide cut in earth and rock; straight for 50 feet above and below gage. Control, not well defined.

EXTREMES OF DISCHARGE.—1916–1922: Maximum stage recorded, 1.53 feet 3 a. m. December 25, 1920 (discharge, 18 million gallons per day, or 28 second-feet); minimum stage recorded, ditch occasionally dry.

DIVERSIONS.—None.

REGULATION.—By head gates.

OBJECT OF STATION.—Data valuable in relation to Territorial lease to Olowalu Co.

UTILIZATION.—After passing through power house water is used for irrigation of sugar cane. A small amount is sometimes diverted for irrigation at higher levels and does not pass through power house.

ACCURACY.—Stage-discharge relation not permanent. Two rating curves, fairly well defined between 1 and 8 million gallons per day, used as follows: July 1 to February 1 and March 5 to June 30; and February 2 to March 4. Operation of water-stage recorder satisfactory except for a few short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection, or for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair.

Olowalu ditch diverts from Olowalu Stream at elevation about 450 feet. The water is carried about 1 mile southwestward along the side of Olowalu gulch to a point where it drops about 200 feet to a power house; thence it continues southwestward for about 1 mile to near Olowalu, where the water is used for irrigation of sugar cane by the Olowalu Co.

Discharge measurements of Olowalu ditch near Olowalu, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 18	J. E. Stewart	0.69	8.0	5.2	Dec. 17	J. E. Stewart	1.01	12.4	8.0
Aug. 15	W. C. Renshaw	.42	4.4	2.8	Feb. 20	S. B. Hall	.57	7.6	4.9
Sept. 28	do	.29	3.9	2.5	Apr. 28	do	.63	7.0	4.5
Oct. 21	J. E. Stewart	.17	2.6	1.7					

Discharge, in million gallons per day, of Olowalu ditch near Olowalu, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	2.8	4.4	2.6	2.1	2.6	2.5	6.6	7.1	11.6	5.6	4.4	4.1
2	2.8	6.6	2.3	2.6	2.4	2.0	5.6	9.2	8.8	5.6	4.3	4.1
3	5.0	5.2	2.2	2.4	3.8	6.6	5.2	12.2	11.0	5.6	4.3	4.2
4	6.6	4.3	2.1	2.5	3.2	8.5	6.4	12.2	10.5	5.6	4.8	4.3
5	3.6	6.1	2.2	4.2	2.6	7.5	9.0	11.0	10.0	7.9	5.2	4.1
6	3.0	4.4	2.1	4.6	2.3	6.6	6.6	9.4	8.5	8.3	4.8	3.9
7	2.8	4.2	2.1	2.9	2.1	4.8	5.2	8.3	10.0	6.6	4.4	3.8
8	3.5	3.9	2.2	2.5	2.0	4.2	5.2	7.8	9.0	5.6	4.4	3.9
9	2.8	3.5	2.3	2.2	2.2	4.0	5.2	12.2	8.5	5.6	4.3	3.9
10	2.8	3.2	2.3	2.1	2.5	2.7	4.4	12.2	9.5	5.2	4.8	3.8
11	2.8	3.6	2.1	2.0	2.2	3.9	4.0	11.0	8.5	5.2	4.8	3.8
12	2.6	6.1	2.0	2.0	2.2	7.5	3.8	11.6	7.5	5.6	4.4	3.9
13	2.4	4.0	2.0	1.9	2.4	9.0	4.8	9.4	6.6	9.0	4.3	3.9
14	2.3	3.6	2.2	1.8	2.1	3.8	6.1	8.3	5.2	10.0	4.3	3.8
15	2.8	3.0	3.1	1.8	1.9	6.1	5.6	7.3	4.4	9.0	4.3	3.8
16	2.8	2.8	3.6	2.0	1.9	8.5	5.2	6.8	4.1	9.5	4.2	3.7
17	4.3	2.8	2.5	1.9	1.8	8.0		6.1	5.5	9.0	4.0	3.7
18	6.9	2.8	2.2	1.8	1.9	10.0	6.0	5.8	4.3	7.0	4.0	3.6
19	8.0	5.9	2.0	1.7	2.3	7.5		5.5	3.8	6.1	4.1	3.6
20	6.6	3.8	1.9	1.7	3.8	4.8		5.1	6.7	5.6	5.7	3.8
21	4.0	3.6	1.9	1.7	5.2	4.0	5.2	5.3	9.0	5.6	4.3	3.8
22	3.7	4.8	2.6	1.7	7.5	3.4	6.3	5.3	8.5	5.2	4.0	3.6
23	3.8	3.4	2.5	1.9	4.8	6.0	8.5	5.3	8.0	5.2	4.0	4.4
24	3.4	3.2	2.1	4.3	4.3	4.8	7.0	6.8	7.5	4.8	4.1	3.9
25	2.9	2.9	2.0	2.8	5.6	3.4	6.6	5.7	7.0	6.1	4.3	3.6
26	2.9	2.8	1.9	2.1	3.3	2.6	7.5	4.9		5.2	5.6	3.5
27	3.5	2.9	2.3	1.9	5.8	2.6	10.5	4.9	6.6	4.8	4.8	3.4
28	3.4	2.6	2.5	2.0	6.1	2.9	10.5	12.2		4.8	4.4	3.4
29	7.0	2.5	2.4	2.8	3.8	5.3	10.5	-------	6.1	4.8	4.3	3.2
30	7.5	2.8	2.2	2.9	3.5	9.0	10.5	-------	6.1	4.8	4.2	3.2
31	4.4	3.3	-------	3.1	-------	7.5	7.9	-------	5.6	-------	4.1	-------

NOTE.—Water-stage recorder did not operate satisfactorily July 1–2, Jan. 17–20, and Mar. 26–28; discharge based on comparison with flow at station on Lahainaluna Stream. Braced figures show mean discharge for periods indicated.

Monthly discharge of Olowalu ditch near Olowalu, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	8.0	2.3	3.99	6.17	124	380
August	6.6	2.5	3.84	5.94	119	365
September	3.6	1.9	2.28	3.53	68.4	210
October	4.6	1.7	2.38	3.68	73.9	226
November	7.5	1.8	3.27	5.06	98.1	301
December	10.0	2.0	5.48	8.48	170	521
January	10.5	3.8	6.58	10.2	204	626
February	12.2	4.9	8.18	12.7	229	703
March	11.6	3.8	7.47	11.6	232	711
April	10.0	4.8	6.30	9.75	189	580
May	5.7	4.0	4.45	6.89	138	423
June	4.4	3.2	3.79	5.86	114	349
The year	12.2	1.7	4.82	7.46	1,760	5,400

HANAWI STREAM NEAR NAHIKU, MAUI

LOCATION.—200 feet above Koolau ditch intake and trail, 2 miles southwest of Nahiku post office, 6½ miles east of Upper Keanae, and 11½ miles by road and trail west of Hana.

RECORDS AVAILABLE.—January 9, 1914, to January 6, 1916, and November 1, 1921, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder. Datum November 1, 1921, 0.12 foot above old datum.

DISCHARGE MEASUREMENTS.—Made from footbridge 100 feet above gage or by wading.

CHANNEL AND CONTROL.—Channel at gage is a pool with nearly vertical rock walls. Control is rock ledge; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period November 1, 1921, to June 30, 1922, 10.78 feet at 2 a. m. December 13 (discharge, about 1,200 million gallons per day or 1,860 second-feet); minimum stage, 0.26 foot at 8 p. m. June 30 (discharge, 1.8 million gallons per day or 2.8 second-feet).

1914–1916; 1921–22: Maximum stage, about 20 feet during flood of January 18, 1916 (determination of discharge not feasible); minimum discharge, 1.8 million gallons per day or 2.8 second-feet, February 3 to March 12, 1914, August 16 and September 1, 1915, and at 8 p. m. June 30, 1922.

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Normal flow is diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 50 million gallons per day and fairly well defined up to 150 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good.

Discharge measurements of Hanawi Stream near Nahiku, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Nov. 10	J. E. Stewart	0.55	5.2	3.4
Apr. 6	E. M. Pickop	.97	12.0	7.8

Discharge, in million gallons per day, of Hanawi Stream near Nahiku, Maui, for the year ending June 30, 1922

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		28	16.0	216	22	5.3	5.0	3.6
2		27	14.0	138	12.0	5.5	5.1	3.4
3		107	13.0		36	6.6	5.7	3.2
4		58	64		13.6	9.1	10.8	3.1
5		26	48	80	141	23	9.6	3.0
6	7.5	21	24		172	9.6	6.4	2.9
7		16.0	14.0	46	171	6.6	5.6	2.7
8		13.0	13.0	40	182	5.5	6.7	2.8
9		11.2	11.2	50	109	5.0	4.8	2.7
10		9.6	9.6	38	163	6.8	4.7	2.7
11	3.8	8.8	8.3	28	80	10.8	4.3	2.6
12	4.5	112	7.8	26	48	11.7	3.9	3.1
13	4.5	342	8.2	18.4	43	12.0	3.7	3.1
14	3.9	77	7.6	15.0	38	10.3	3.6	2.7
15	3.9	18.4	7.1	12.0	36	7.2	3.5	2.5
16	3.8	13.0	6.8	11.2	42	6.6	3.4	2.4
17	3.7	61	6.7	9.6	54	5.5	3.3	2.3
18	3.6	86	7.1	8.8	26	4.9	3.2	2.3
19	54	26	93	8.1	19.7	4.5	3.2	2.3
20	83	19.7	54	7.5	16.0	4.2	4.4	2.3
21	180	17.2	100	29	14.0	4.0	3.2	2.3
22	231	16.0	42	11.1	12.0	4.1	3.0	2.2
23	126	36	22	8.0	10.3	3.8	3.3	2.2
24	102	193	15.8	7.8	9.6	4.5	3.9	2.1
25	94	110	22	6.4	8.6	4.5	3.5	2.0
26	190	84	74	5.8	8.0	3.6	8.3	2.0
27	48	23	121	28	7.3	3.4	7.2	2.0
28	28	16.0	114	183	6.8	76	14.0	2.0
29	26	18.4	33	-------	6.3	24	5.8	1.9
30	27	16.0	188	-------	5.8	6.1	4.4	1.8
31	-------	17.2	309	-------	5.6	-------	4.0	-------

NOTE.—Water-stage recorder installed Nov. 10; estimate of discharge Nov. 1–10 based on flow at stations on adjacent streams. No record Feb. 3–6; discharge estimated by comparison with flow on adjacent streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Hanawi Stream near Nahiku, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
November	231	----------	43.2	66.8	1,300	3,980
December	342	8.8	52.5	81.2	1,630	4,990
January	309	6.7	47.6	73.6	1,470	4,530
February	----------	5.8	45.4	70.2	1,270	3,900
March	182	5.6	49.0	75.8	1,520	4,660
April	76	3.4	9.82	15.2	295	904
May	14.0	3.0	5.21	8.06	162	496
June	3.6	1.8	2.54	3.93	76.2	234
The period	----------	----------	----------	----------	7,72	23,700

KAPAULA STREAM NEAR NAHIKU, MAUI

LOCATION.—150 feet above Koolau ditch intake, 300 feet above ditch trail, 2½ miles southwest of Nahiku post office, and 6 miles east of Upper Keanae.

RECORDS AVAILABLE.—November 1, 1921, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge at gage.

CHANNEL AND CONTROL.—One channel at all stages; fairly straight for 75 feet above gage and curving to right over a series of falls below. Banks nearly perpendicular for 20 feet with little vegetation. Control is rock ledge; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 8.45 feet at 2.45 a. m. December 13 (discharge, from extension of rating curve, 930 million gallons per day or 1,440 second-feet); minimum stage, 0.48 foot during several hours June 29 and 30 (discharge, 1.1 million gallons per day or 1.7 second-feet).

DIVERSIONS.—None above stations.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 1 and 35 million gallons per day; extended above 35 million gallons per day and subject to considerable error at high stages. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for low stages; high-stage records should be used with caution.

Discharge measurements of Kapaula Stream near Nahiku, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Nov. 3	E. M. Pickop	1.20	21.6	14.0
5	do	.77	6.2	4.0
10	J. E. Stewart	.63	4.0	2.6

Discharge, in million gallons per day, of Kapaula Stream near Nahiku, Maui, for the year ending June 30, 1922

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1			9.9		22	2.9	2.8	2.0
2			8.6		16.2	3.0	3.4	1.8
3	10	40	8.1		43	4.4	4.9	1.8
4			74	70	17.0	10.5	12.9	1.8
5	4.0		35		126	32	9.7	1.7
6	3.5		17.9		150	7.1	4.7	1.7
7	3.2	16	8.9	22	156	3.9	3.8	1.6
8	3.0		9.4	19.9	159	3.2	5.7	1.6
9	2.7		7.9	39	112	2.9	3.2	1.6
10	2.4	6.7	5.9	30	151	5.8	3.0	1.6
11	2.2	5.8	5.1	21	68	11.1	2.6	1.6
12	2.4	116	4.7	26	30	11.2	2.2	1.7
13	3.0	295	6.3	15.2	26	11.9	2.0	2.0
14	2.4	65	4.7	11.7	16.7	8.6	1.9	1.8
15	2.0	11.1	4.0	9.7	16.0	4.3	1.8	1.5
16	1.8	7.7	3.6	8.1	38	4.7	1.8	1.5
17	1.8	67	3.8	6.9	41	3.2	1.8	1.4
18	1.7	94	4.4	5.8	16.0	2.7	1.7	1.4
19	94	13.9	92	5.1	13.0	2.3	1.7	1.4
20	84	9.4	68	4.6	12.0	2.2	2.6	1.5
21	208	8.9	81	31	10.2	2.2	1.8	1.4
22	176	8.9	36	10.6	8.4	2.6	1.8	1.4
23	107	18.2	21	8.0	7.1	2.6	1.7	1.3
24	120	190	25	6.3	5.9	2.7	2.2	1.4
25	126	107	27	4.4	5.1	3.8	2.3	1.2
26	164	83	82	3.8	4.4	2.8	7.6	1.2
27		19.5		28	4.0	2.2	6.3	1.2
28	30	13.0		167	3.8	93	16.1	1.2
29		18.0	130	-------	3.6	26	4.4	1.1
30		11.4		-------	3.2	3.5	2.8	1.1
31	-------	12.7		-------	2.9	-------	2.2	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated by comparison with records for stations on adjacent streams because of lack of gage-height record.

Monthly discharge of Kapaula Stream near Nahiku, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
November	208	1.7	42.5	65.8	1,280	3,910
December	295	5.8	45.9	71.0	1,420	4,370
January	----------	3.6	42.1	65.1	1,300	4,010
February	----------	3.8	32.3	50.0	904	2,780
March	159	2.9	41.5	64.2	1,290	3,950
April	93	2.2	9.31	14.4	279	857
May	16.1	1.7	3.98	6.16	123	379
June	2.0	1.1	1.52	2.35	45.5	140
The period	----------	----------	----------	----------	6,640	20,400

KOOLAU DITCH AT NAHIKU WEIR, NEAR NAHIKU, MAUI

LOCATION.—Between Kapaula and Waiohue streams, three-quarters of a mile southwest of Nahiku post office, 6 miles east of Upper Keanae, and 12 miles by road and trail west of Hana.

RECORDS AVAILABLE.—February 12, 1919, to June 30, 1922. Gage readings made by East Maui Irrigation Co. available January 1, 1912, to February 11, 1919.

GAGE.—Stevens continuous water-stage recorder since April 27, 1922, when the Geological Survey began operating the station. Prior to that date Friez seven-day water-stage recorder was used, but discharge record was determined from twice-daily staff gage readings made by East Maui Irrigation Co.'s ditchman.

DISCHARGE MEASUREMENTS.—Made by weir at gage (see under "Channel and control") or from plank across ditch near gage.

CHANNEL AND CONTROL.—Open concrete-lined ditch below weir. Gage operates in weir basin into which the water discharges from a tunnel. Control formed by sharp-crested rectangular weir, 13.1 feet long, installed February 12, 1919; has complete end contractions and a free fall at all stages; velocity of approach negligible.

EXTREMES OF DISCHARGE.—1919–1922: Maximum stage recorded, 1.48 feet in morning of September 3, 1919 (discharge, 47.8 million gallons per day or 74.0 second-feet); minimum discharge, practically no flow, occurs when intake gates are occasionally closed.

DIVERSIONS.—None in vicinity of station except spillways.

REGULATION.—By gates at intervals.

OBJECT OF STATION.—To determine amount of water diverted through Koolau ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during period of record. Rating curve well defined. Staff gage read to quarter inches or to hundredths twice daily prior to April 28, 1922; thereafter, operation of water-stage recorder fairly satisfactory. Daily discharge prior to April 28, 1922, ascertained by applying mean daily gage height to rating table; subsequent to that date it was ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging dicharge for intervals of the day. Records excellent except those estimated.

COOPERATION.—Gage-height record prior to April 28, 1922, furnished by East Maui Irrigation Co.

Koolau ditch, at elevation about 1,200 feet, diverts the ordinary flow of all streams on the windward side of the crater of Haleakala between Makapipi and Alo streams inclusive. The continuation of the ditch west of Alo Stream, called Wailoa ditch, diverts the ordinary flow of all streams between Waikamoi and Halehaku streams inclusive. The general course of the ditch is northwestward along the side of Haleakala. The water is carried to a point near Paia where it is distributed for the irrigation of sugar cane, the development of power, and for domestic purposes on the plantations of Hawaiian Commercial & Sugar Co. and Maui Agricultural Co. The system comprises about 18 miles of main ditch which has a maximum carrying capacity of 145 million gallons per day; it is the most important of the East Maui Irrigation Co.'s ditches. Koolau ditch proper is about 8 miles long and has a carrying capacity of about 100 million gallons per day.

No discharge measurements were made at this station during the year.

66289—26†—WSP 555——8

Discharge, in million gallons per day, of Koolau ditch at Nahiku weir, near Nahiku, Maui, for the years ending June 30, 1919–1922

Day	Feb.	Mar.	Apr.	May	June	Day	Feb.	Mar.	Apr.	May	June
1918–19						16	3.6	9.3	13.2	11.0	5.9
1	-------	3.6	16.7	28	7.6	17	3.0	9.0	16.0	11.0	5.9
2	-------	3.8	16.0	16.7	7.3	18	3.0	6.3	9.5	23	6.8
3	-------	4.1	15.3	13.9	6.8	19	2.8	6.3	9.8	13.2	5.9
4	-------	3.2	14.2	12.9	6.6	20	18.1	6.3	10.7	11.0	5.9
5	-------	6.8	13.9	28	6.3	21	5.9	4.5	17.4	12.0	5.4
6	-------	11.3	12.9	26	6.3	22	6.3	13.9	28	10.1	5.1
7	-------	11.0	12.3	17.1	6.1	23	6.3	6.6	34	12.3	5.1
8	-------	9.5	11.6	16.4	6.1	24	5.6	4.7	30	11.3	5.1
9	-------	11.0	11.3	32	5.9	25	6.3	6.3	30	10.4	4.9
10	-------	13.2	11.0	21	5.9	26	4.3	5.4	24	9.5	4.7
11	-------	10.1	10.4	17.8	6.1	27	4.1	4.7	24	9.0	5.9
12	7.9	9.8	10.1	15.3	5.6	28	3.4	4.5	18.9	8.7	6.6
13	6.3	9.0	9.5	15.3	5.6	29	-------	4.1	16.0	8.1	6.1
14	5.9	7.1	9.0	12.9	5.1	30	-------	10.4	13.9	7.9	5.4
15	4.3	6.1	8.4	11.6	6.8	31	-------	18.1	-------	7.9	-------

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1919–20												
1	18.9	14.6	32	8.7	6.3	4.1	17.8	3.0	3.2	23	8.7	5.1
2	19.6	13.9	19.6	10.4	6.6	4.1	15.0	2.8	2.5	36	8.1	5.4
3	9.8	13.2	42	10.4	5.9	3.8	12.6	2.6	2.3	34	7.9	6.3
4	7.6	22	30	10.1	5.9	4.7	10.7	2.6	2.2	36	7.9	4.5
5	7.3	36	23	26	5.4	3.8	9.5	2.6	2.0	36	7.6	4.3
6	6.8	34	23	42	5.4	3.8	8.4	2.6	2.0	34	7.3	4.1
7	6.3	36	24	30	5.1	3.8	7.6	2.6	2.0	36	6.8	3.8
8	5.9	34	26	26	5.1	3.6	6.8	2.6	3.2	32	6.6	3.6
9	5.6	28	23	19.2	5.1	3.4	6.3	2.6	3.0	30	6.3	3.4
10	6.1	23	26	16.0	5.1	3.4	5.9	3.0	2.8	28	6.1	3.4
11	5.9	20	22	13.9	23	3.4	6.3	2.8	2.3	26	6.1	4.7
12	14.2	18.9	18.5	12.3	9.0	3.2	5.9	2.6	15.3	24	5.6	3.8
13	11.3	28	17.1	11.6	9.0	3.0	5.4	2.8	8.4	26	5.6	5.9
14	18.1	21	16.0	11.0	9.5	3.0	4.9	2.6	4.5	23	5.6	4.1
15	26	34	14.6	9.8	11.6	3.0	4.7	2.6	3.6	20	5.4	6.8
16	16.4	32	13.9	9.0	8.4	3.0	4.7	2.6	3.0	18.5	5.1	4.9
17	11.3	30	12.9	8.7	7.3	3.0	4.9	2.6	3.0	17.4	5.1	4.7
18	9.5	24	12.3	8.1	6.8	2.8	5.1	2.8	21	16.0	4.9	4.5
19	8.7	24	12.0	7.9	6.3	2.6	4.5	2.6	34	15.3	4.7	4.3
20	8.7	18.9	12.3	7.6	6.1	2.6	4.3	2.6	36	13.9	4.7	3.8
21	13.9	16.4	11.6	9.8	5.9	2.6	4.1	2.6	28	12.9	4.7	3.8
22	13.9	13.9	11.0	6.8	5.6	2.6	4.5	2.6	36	12.3	4.7	3.8
23	11.3	15.0	10.4	6.8	5.4	7.3	4.1	3.8	26	12.6	4.5	3.6
24	9.8	13.9	9.8	7.9	5.1	4.5	3.8	2.8	30	11.6	4.7	3.4
25	16.0	7.3	9.3	6.8	4.7	3.8	3.8	2.5	28	11.0	4.3	3.4
26	13.9	3.4	9.3	6.3	4.7	3.2	3.6	2.3	12.0	10.7	4.3	3.2
27	23	6.8	8.7	6.8	4.7	5.9	3.4	2.3	10.7	10.7	3.6	3.0
28	28	10.7	8.1	6.3	4.3	9.5	3.4	2.3	8.1	10.4	3.8	3.0
29	21	12.6	7.9	6.3	4.3	30	3.4	2.3	7.3	9.8	3.8	3.0
30	17.8	19.9	8.1	5.9	4.3	32	3.4	-------	13.9	9.3	3.8	3.0
31	16.0	38	-------	6.1	-------	36	3.2	-------	10.1	-------	4.1	-------

Discharge, in million gallons per day, of Koolau ditch at Nahiku weir, near Nahiku, Maui, for the years ending June 30, 1919–1922—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920–21												
1	3.2	8.4	10.7	9.8	14.2	40	26	6.8	7.9	21	19.6	7.9
2	3.0	8.7	9.8	9.0	18.1	34	26	6.6	19.6	17.8	22	7.3
3	2.8	10.7	9.3	9.0	24	32	32	17.4	17.4	24	22	6.8
4	2.5	13.2	9.0	8.1	19.9	30	28	6.8	11.6	19.2	21	6.6
5	2.3	9.5	9.0	7.9	16.4	28	32	6.3	9.8	16.4	18.1	6.6
6	2.3	8.7	15.3	9.0	13.9	36	40	6.3	9.3	24	16.7	6.1
7	2.3	7.6	30	10.1	13.2	30	36	5.9	8.7	34	15.6	6.1
8	2.3	6.8	22	8.7	34	34	32	5.4	8.1	30	14.6	5.6
9	2.3	6.6	23	8.1	36	36	30	11.0	7.9	30	13.9	5.6
10	2.3	6.1	19.9	7.9	32	38	26	18.5	7.3	30	12.9	5.6
11	2.3	5.9	32	14.6	32	36	24	17.8	7.3	30	12.6	5.6
12	2.3	6.6	32	18.9	26	32	24	16.4	6.8	32	12.3	5.1
13	2.3	23	32	12.6	23	36	6.0	15.0	6.6	32	11.3	5.1
14	2.2	22	24	10.7	21	38	8.0	13.9	5.9	28	10.7	4.7
15	2.8	12.3	20	30	19.6	34	36	18.9	5.6	24	10.4	4.7
16	2.6	9.5	17.8	36	18.1	32	36	18.5	5.6	34	9.8	4.5
17	5.9	8.7	16.4	32	16.7	30	24	15.6	5.6	28	9.8	4.7
18	4.5	8.1	15.0	36	16.0	28	15.3	14.6	6.3	24	17.4	4.7
19	4.3	7.6	13.2	30	15.6	28	10.1	13.2	6.8	23	17.1	6.1
20	4.3	10.1	12.0	24	24	26	9.0	12.3	5.9	30	20	4.5
21	13.2	16.0	11.0	19.9	34	26	8.4	11.6	8.1	26	15.6	4.3
22	18.1	12.0	10.1	17.1	38	24	7.9	11.0	6.3	28	13.2	4.3
23	22	12.0	9.8	15.3	36	30	7.6	10.1	5.9	34	13.2	4.3
24	13.9	12.0	9.3	13.2	32	34	7.1	9.8	12.0	34	18.1	3.8
25	11.6	13.9	9.0	32	30	30	7.9	9.3	13.9	30	13.9	3.8
26	8.7	15.3	8.7	28	38	15.3	11.6	9.0	12.0	32	11.6	3.8
27	7.9	26	8.1	19.6	30	5.9	9.3	8.7	30	28	10.4	4.3
28	8.4	18.1	7.6	17.4	28	1.2	8.1	8.1	26	24	9.8	16.0
29	8.4	13.2	7.9	15.6	30	.1	7.9	-------	28	22	9.3	13.2
30	9.3	12.0	10.1	14.6	44	7.0	7.3	-------	34	23	8.7	6.8
31	9.0	11.0	-------	14.2	-------	26	7.1	-------	30	-------	8.1	-------
1921–22												
1	5.9	17.1	10.4	12.0	23	-------	9.5			18.1	24	13.9
2	5.6	32	9.3	28	26	-------	9.5			18.9	23	12.6
3	9.5	28	9.0	19.2	34	-------	20			23	23	
4	9.5	20	8.4	15.0	28	-------	34			26	32	
5	6.8	19.6	10.7	12.6	22	-------	30			36	32	
6	5.9	17.4	10.4	11.0	19.2	-------	28			32	26	
7	5.6	18.5	9.8	10.4	16.7	-------	24			24	23	
8	5.6	16.7	9.5	9.8	15.3	-------	23			21	28	
9	5.4	13.9	13.9	9.3	12.0	15.0	22			18.5	21	
10	5.4	12.3	14.6	8.7	12.9	32	21			21	19.6	
11	5.4	16.7	10.7	8.7	12.3	32	24			32	17.4	8.5
12	5.1	32	9.5	8.1	13.2	34	28			28	15.6	
13	5.4	19.9	9.0	7.6	15.0	28	30		1.5	34	14.6	
14	4.9	16.4	9.0	7.3	12.6	11.0	28			36	13.9	
15	12.6	13.9	14.6	6.8	11.6	11.3	26	1.0		30	12.9	
16	15.3	12.3	15.0	7.6	10.7	12.3	24			30	12.3	
17	28	11.6	18.5	6.8	10.4	13.9	23			23	12.0	
18	34	11.0	15.0	6.3	9.8	18.5	23			19.6	11.3	
19	32	28	12.6	6.1	22	10.7	36			17.8	11.0	
20	30	17.8	11.3	5.6	34	10.4	24			16.0	14.2	6.3
21	22	15.0	12.0	5.6	18.1	10.7				15.3	11.3	6.3
22	17.4	15.3	21	5.1	10.0	10.4				15.0	10.4	6.1
23	15.3	12.9	24	7.9	-------	10.4				13.6	10.4	5.6
24	12.9	12.3	22	30	-------	24				13.2	12.0	5.9
25	12.3	11.3	16.7	32	-------	14.6				16.4	11.3	5.4
26	11.6	10.7	14.2	34	-------	12.0	4.0		28	13.2	22	5.1
27	16.0	12.0	16.7	26	-------	10.1			26	12.0	26	5.4
28	14.6	9.8	13.9	26	-------	10.1			24	27	26	4.9
29	30	9.5	12.9	34	-------	9.8		-------	22	36	23	4.5
30	28	10.7	12.9	32	-------	9.5		-------	21	30	16.7	4.7
31	18.5	11.6	-------	30	-------	9.8		-------	19.2	-------	15.0	-------

NOTE.—Intake gates closed for part of day Dec. 29, 30, 1920, Jan. 13, 14, 1921, Nov. 22, 1921, Dec. 9, 1921, and June 2 and 20, 1922; mean daily discharge estimated. Intake gates closed Nov. 23 to Dec. 8, 1921; practically no flow assumed. Water wasting Jan. 21 to Mar. 25, 1922; mean discharge based on record of flow at station near Keanae. No record June 3–19, 1922; discharge estimated by comparison with flow at station near Keanae. Braced figures show mean discharge for periods indicated.

Monthly discharge of Koolau ditch at Nahiku weir, near Nahiku, Maui, for the years ending June 30, 1919-1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1919						
February 12-28	18.1	2.8	5.71	8.83	97.1	298
March	18.1	3.2	7.74	12.0	240	736
April	34	8.4	15.9	24.6	478	1,460
May	32	7.9	14.9	23.1	461	1,420
June	7.6	4.7	5.96	9.22	179	549
The period					1,460	4,460
1919-20						
July	28	5.6	13.2	20.4	409	1,260
August	38	3.4	21.4	33.1	663	2,040
September	42	7.9	17.1	26.5	514	1,570
October	42	5.9	12.1	18.7	374	1,150
November	23	4.3	6.73	10.4	202	620
December	36	2.6	6.63	10.3	206	631
January	17.8	3.2	6.19	9.58	192	589
February	3.8	2.3	2.66	4.12	77.1	237
March	36	2.0	11.8	18.3	366	1,120
April	36	9.3	21.2	32.8	636	1,950
May	8.7	3.6	5.56	8.60	172	529
June	6.8	3.0	4.15	6.42	125	382
The year	42	2.0	10.8	16.7	3,940	12,100
1920-21						
July	22	2.2	6.11	9.45	189	581
August	26	5.9	11.7	18.1	362	1,110
September	32	7.6	15.5	24.0	464	1,430
October	36	7.9	17.4	26.9	539	1,660
November	44	13.2	25.8	39.9	774	2,380
December	40	.1	27.7	42.9	858	2,640
January	40	6.0	19.1	29.6	591	1,820
February	18.9	5.4	11.6	17.9	325	997
March	34	5.6	12.1	18.7	376	1,150
April	34	16.4	27.1	41.9	812	2,500
May	22	8.1	14.2	22.0	440	1,350
June	16.0	3.8	5.95	9.21	178	548
The year	44	.1	16.2	25.1	5,910	18,200
1921-22						
July	34	4.9	14.1	21.8	436	1,340
August	32	9.5	16.3	25.2	506	1,550
September	24	8.4	13.2	20.4	398	1,220
October	34	5.1	15.1	23.4	470	1,440
November	34	.0	13.0	20.1	389	1,200
December	34	.0	11.6	17.9	360	1,100
January	36		17.1	26.5	531	1,630
February			1.00	1.55	28.0	86
March	28		5.73	8.87	178	545
April	36	12.0	23.2	35.9	697	2,140
May	32	10.4	18.4	28.5	571	1,750
June	13.9	4.7	7.71	11.9	231	710
The year	36	.0	13.1	20.3	4,790	14,700

WAIOHUE STREAM NEAR NAHIKU, MAUI

LOCATION.—200 feet above Koolau ditch intake, 300 feet above ditch trail, 4 miles southwest of Nahiku post office, and 5 miles east of Upper Keanae.

RECORDS AVAILABLE.—October 9, 1921, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 150 feet above station and curving to left just below. Banks covered with brush and subject to overflow at high stages. Control for low stages is solid rock ledge; may scour at the ends during high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 6.23 feet at 3 a. m. December 13 (discharge, 630 million gallons per day or 975 second-feet); minimum stage recorded, 0.62 foot from noon to 10 p. m. June 30 (discharge, 2.3 million gallons per day or 3.6 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 2.5 and 30 million gallons per day; extended above 30 million gallons per day and subject to considerable error at high stages. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for low stages; high-stage records should be used with caution.

Discharge measurements of Waiohue Stream near Nahiku, Maui, during the year ending June 30, 1922

[Made by E. M. Pickop]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Oct. 8	0.78	6.1	3.9
10	.76	5.6	3.6
Nov. 3	1.19	16.1	10.8
5	.96	9.5	6.1

Discharge, in million gallons per day, of Waiohue Stream near Nahiku, Maui, for the year ending June 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	-------	6.1	10.6	8.9	87	11.6	4.1	4.5	3.8
2	-------	10.6	8.9	8.2	52	8.9	4.4	4.7	3.7
3	-------	13.0	28	7.6	}	22	4.8	5.0	3.6
4	-------	6.4	16.2	34	}	14.5	5.4	7.2	3.5
5	-------	5.8	10.0	18.5	} 30	77	17.4	7.6	3.3
6	-------	5.6	10.3	12.7	}	61	6.8	5.4	3.2
7	-------	5.4	8.4	8.7	15.8	66	5.3	5.1	3.2
8	-------	5.1	8.0	9.5	13.0	76	4.7	8.4	3.2
9	3.5	5.0	7.4	8.4	19.0	48	4.5	5.3	3.2
10	3.4	4.8	6.8	7.2	15.0	70	6.6	5.3	3.2
11	3.4	4.7	6.4	6.6	12.1	40	9.4	4.8	3.1
12	3.2	5.1	72	6.4	12.7	26	9.5	4.5	3.5
13	3.2	5.3	185	7.6	9.5	21	12.1	4.2	3.7
14	3.1	4.7	29	6.2	8.2	15.0	10.0	4.2	3.3
15	3.0	4.4	10.6	5.8	7.6	12.4	6.1	4.1	3.2
16	3.4	4.1	8.9	5.3	7.2	17.5	7.0	3.9	3.0
17	3.1	4.0	30	5.6	6.6	19.8	5.4	3.8	2.9
18	2.9	3.9	57	5.8	6.4	9.8	5.0	3.7	2.8
19	2.8	45	12.4	59	6.2	8.7	4.7	3.8	2.7
20	2.7	48	9.2	30	5.8	8.0	4.5	4.7	2.7
21	2.7	124	8.2	30	15.2	7.4	4.4	3.8	2.7
22	2.7	72	8.2	15.4	7.4	6.8	4.2	3.7	2.7
23	3.6	34	10.0	11.4	7.0	6.4	4.1	3.6	2.7
24	12.4	41	120	12.4	6.6	5.9	4.6	4.2	2.6
25	6.8	43	44	14.0	5.4	5.6	5.1	3.8	2.6
26	7.0	77	34	31	6.8	5.3	4.2	6.4	2.5
27	5.4	27	14.3	56	12.2	5.1	3.9	6.2	2.5
28	6.8	19.0	11.7	42	77	4.8	37	6.4	2.4
29	9.2	13.7	13.7	20	-------	4.7	11.3	4.7	2.4
30	7.4	11.4	10.6	151	-------	4.5	4.6	4.1	2.4
31	7.6	-------	11.4	140	-------	4.2	-------	3.9	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated, because of lack of gage-height record, by comparison with records of flow for adjacent streams.

Monthly discharge of Waiohue Stream near Nahiku, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
October 9–31	12.4	2.7	4.75	7.35	109	335
November	124	3.9	22.0	34.0	659	2,030
December	185	6.4	26.5	41.0	821	2,520
January	151	5.3	25.3	39.1	785	2,410
February	87	5.4	19.3	29.9	542	1,660
March	77	4.2	22.4	34.7	694	2,130
April	37	3.9	7.37	11.4	221	679
May	8.4	3.6	4.87	7.54	151	463
June	3.8	2.4	3.01	4.66	90.3	277
The period					4,070	12,500

WEST KOPILIULA STREAM NEAR KEANAE, MAUI

LOCATION.—600 feet above Koolau ditch crossing and highway bridge, 4½ miles by trail east of Upper Keanae, and 7 miles east of Keanae post office.

RECORDS AVAILABLE.—January 3, 1914, to September 17, 1917, and October 1, 1921, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder at same datum as Friez recorder used prior to September 17, 1917.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge 200 feet below gage or by wading.

CHANNEL AND CONTROL.—Channel straight for 200 feet below gage; falls above with channel divided. Stream bed composed of loose boulders. Left bank covered with vegetation and subject to overflow; right bank steep. Control composed of medium-sized boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period October 1, 1921, to June 30, 1922, 7.88 feet at 2 a. m. December 13 (discharge, about 1,800 million gallons per day or 2,790 second-feet); minimum stage, 1.11 feet from 8 to 12 p. m. October 21 (discharge, 1.8 million gallons per day or 2.8 second-feet).

1914–1917; 1921–22: Maximum stage recorded, 9.25 feet at 5.30 a. m. January 18, 1916 (discharge, about 2,000 million gallons per day or 3,090 second-feet); minimum stage recorded, 0.6 foot September 15–17, 1917 (discharge, 0.6 million gallons per day or 0.9 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation for low stages changed November 21. Rating curves fairly well defined. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair.

Discharge measurements of West Kopiliula Stream near Keanae, Maui, during the year ending June 30, 1922

[Made by E. M. Pickop]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Oct. 5	1.27	4.6	3.0
14	1.17	3.1	2.0
27	1.66	11.6	7.5
Nov. 5	1.61	12.1	7.8

Discharge, in million gallons per day, of West Kopiliula Stream near Keanae, Maui, for the year ending June 30, 1922

Day	Oct.	Nov.	Dec.	Jan	Feb.	Mar.	Apr.	May	June
1		7.6	11.6	13.1	330	37	4.6	5.8	3.7
2		17.2	10.1	11.2	166	24	4.8	5.9	3.4
3	7.0	30	84	10.4		57	6.4	8.1	3.4
4		10.6	85	61		17.5	11.2	12.7	3.2
5		7.2	30	43	40	197	30	10.9	3.1
6	2.7		25	20		240	9.0	7.3	3.0
7	2.9		14.2	13.9	15.0	243	6.9	6.7	2.9
8	2.7		11.2	14.6	13.5	264	5.6	6.7	2.9
9	2.5		9.6	12.7	27	150	5.4	5.2	3.0
10	2.4		8.5	9.0	21	210	6.9	5.2	3.0
11	2.5	5.5	7.7	8.5	16.5	80	11.6	4.6	2.9
12	2.2		251	8.1	20	38	12.0	4.3	3.5
13	2.2		600	9.6	13.9	27	11.6	4.1	3.5
14	2.1		101	7.7	10.9	17.0	9.0	4.0	3.0
15	2.1		22	7.1	9.3	13.5	6.2	3.9	2.9
16	2.8		13.9	8.1	8.1	22	6.4		2.7
17	2.1	4.3	80	6.9	7.5	39	5.2		2.7
18	2.0	4.2	122	8.7	6.9	13.1	4.8		2.6
19	1.9	151	26	144	6.4	10.7	4.4		2.6
20	1.9	166	14.6	85	6.0	9.6	4.4	3.8	2.7
21	1.9	417	11.6	123	43	8.5	4.4		2.7
22	1.9	478	10.7	81	16.7	7.9	5.8		2.5
23	4.9	234	29	49	9.8	7.5	4.7		2.5
24	56	189	343	54	8.1	7.1	5.2		2.4
25	40	166	149	57	6.4	6.4	5.8	3.8	2.4
26	31	391	116	147	5.9	6.0	4.8	9.5	2.3
27	10.3	71	37	226	66	5.6	4.2	6.5	2.3
28	8.8	26	22	128	325	5.3	119	14.7	2.3
29	13.8	16.0	24	56	-------	5.2	22	5.4	2.2
30	18.4	13.1	17.5	489	-------	4.9	6.5	4.2	2.2
31	18.3	-------	17.0	428	-------	4.7	-------	4.0	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparson with flow at stations on adjacent streams.

Monthly discharge of West Kopiliula Stream near Keanae, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
October	56	1.9	8.88	13.7	275	845
November	478	4.2	82.0	127	2,460	7,550
December	600	7.7	74.3	115	2,300	7,070
January	489	6.9	75.5	117	2,340	7,180
February	330	5.9	47.1	72.9	1,320	4,050
March	264	4.7	57.4	88.8	1,780	5,460
April	119	4.2	11.6	17.9	349	1,070
May	14.7	----------	5.73	8.87	178	545
June	3.7	2.2	2.82	4.36	84.5	260
The period	----------	----------	----------	----------	11,100	34,000

WEST WAILUAIKI STREAM NEAR KEANAE, MAUI

LOCATION.—500 feet above Koolau ditch crossing and trail bridge, 3 miles east of Upper Keanae, and 5½ miles east of Keanae post office.

RECORDS AVAILABLE.—January 1, 1914, to October 22, 1917, and November 1, 1921, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder. Datum unchanged.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge 90 feet below station or by wading.

CHANNEL AND CONTROL.—Gage located on a pool at base of a falls. Control at outlet of pool composed of boulders and rock ledge; probably permanent. Banks are nearly vertical rock walls; not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period November 1, 1921, to June 30, 1922, 12.02 feet at 1.30 a. m. December 13 (discharge, about 3,200 millions gallons per day or 4,950 second-feet); minimum stage, 0.55 foot from 5 p. m. to midnight June 30 (discharge, 1.3 million gallons per day or 2.0 second-feet).

1914–1917; 1921–22: Flood of January 18, 1916, carried away gage shelter and must have reached a stage of about 13 feet (discharge, possibly 4,000 million gallons per day or 6,190 second-feet); minimum discharge recorded, 0.4 million gallons per day or 0.6 second-foot, October 8–12 and 18–22, 1917 (gage height, 0.6 foot).

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow is diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation practically permanent during period. Rating curve well defined below 30 million gallons per day; fairly well defined between 30 and 500 million gallons per day; extended above 500 million gallons per day. Operation of water-stage recorder satisfactory except for periods noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the days. Records good except those for extremely high stages and those estimated.

Discharge measurements of West Wailuaiki Stream near Keanae, Maui, during the year ending June 30, 1922

[Made by E. M. Pickop]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Nov. 4	1.47	26.5	17.1
7	1.08	13.5	8.7
Apr. 6	1.33	19.6	12.7

Discharge, in million gallons per day, of West Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1922

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		12.0	29		57		8.8	4.8
2		10.5	22	360	36	7.5	9.0	4.3
3	30	173	19.0		84		12.0	4.0
4		115	75		26		24	3.9
5	10.9	43	83	130	307		16.0	3.8
6	8.4	34	64		361		10.9	3.5
7	7.2	14.7	51	64	373		9.4	3.4
8	6.2	11.8	45	54	445		9.4	3.5
9	5.7	9.8	38	68	215	20	7.0	3.6
10	5.4	8.4	27	68	327		6.5	3.5
11	5.1	7.5	22	64	102		5.8	3.2
12	5.8	539	18.7	68	49		5.2	4.8
13	6.4	1,070	26	54	35		4.8	4.4
14	5.6	146	19.7	45	22		4.7	3.4
15	4.9	34	15.2	38	15.8		4.3	2.9
16	4.6	20	13.3	29	19.0		4.1	2.7
17	4.3	157	16.9	25	36		4.0	2.6
18	4.0	191	25	22	14.5		4.1	2.5
19	224	32	229	19.7	12.0		4.2	2.6
20	240	18.1	121	17.8	10.9	6.5	5.9	2.8
21	769	13.8	151	80	10.2		4.0	2.8
22	868	12.4	96	26	9.0		3.7	2.3
23	310	24	71	12.2	8.2		5.6	2.2
24	256	606	75	11.8	8.0		5.5	2.0
25	247	263	71	8.4		7.0	4.4	1.9
26	571	174	204	7.3		6.7	14.5	1.8
27	84	71	349	60	7.0	5.5	11.6	1.7
28	29	54	183	567		292	17.6	1.5
29	17.4	51	92	--------		52	9.2	1.4
30	13.8	42	600	--------		11.1	6.1	1.3
31	--------	35		--------		--------	5.5	--------

NOTE.—Recorder did not operate Jan. 30 to Feb. 6; recorder removed during rebuilding of shelter Mar. 25 to Apr. 24; no record Nov. 1–4; discharge for these periods estimated by comparison with flow at stations on adjacent streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of West Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
November	868	4.0	128	198	3,830	11,800
December	1,070	7.5	129	200	3,990	12,300
January	----------	13.3	111	172	3,450	10,600
February	----------	7.3	103	159	2,880	8,850
March	445	----------	84.9	131	2,630	8,080
April	292	----------	23.2	35.9	695	2,140
May	24	3.7	7.99	12.4	248	760
June	4.8	1.3	2.97	4.60	89.1	273
The period	----------	----------	----------	----------	17,800	54,800

EAST WAILUANUI STREAM NEAR KEANAE, MAUI

LOCATION.—125 feet above Koolau ditch intake, 250 feet above trail, 2½ miles east of Upper Keanae, and 5 miles east of Keanae post office.

RECORDS AVAILABLE.—November 23, 1921, to June 30, 1922. For station upstream, January 1, 1914, to October 24, 1917.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading just above ditch intake or from suspension footbridge 500 feet above gage.

CHANNEL AND CONTROL.—One channel at all stages. Control is rock ledge at outlet of pool formed at foot of 12-foot falls; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 5.30 feet at 1.30 a. m. December 13 (discharge, from extension of rating curve, 715 million gallons per day, or 1,110 second-feet); minimum stage recorded, 0.33 foot during several hours June 29 and 30 (discharge, 0.4 million gallons per day, or 0.6 second-foot).

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 15 million gallons per day; extended above that quantity and subject to considerable error at high stages. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for low stages; records for high stages should be used with caution.

The following discharge measurement was made by E. M. Pickop:

April 6: Gage height, 0.55 foot; discharge, 6.5 second-feet, or 4.2 million gallons per day.

Discharge, in million gallons per day, of East Wailuanui Stream near Keanae, Maui, for the year ending June 30, 1922

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		3.5	3.3	48	9.9	1.0	2.3	1.6
2		3.0	2.8	25	7.4	1.2	2.4	1.4
3		39	2.6	}	18.8	2.2	3.0	1.3
4		9.0	22		11.9	3.2	5.8	1.2
5		6.6	12.5	11	83	14.6	6.0	1.1
6		6.9	8.3	}	46	3.8	3.1	1.0
7		3.8	4.3	5.3	50	3.0	3.0	.9
8		2.8	4.8	4.6	62	2.6	4.3	1.0
9		2.6	3.5	12.2	36	2.0	2.6	1.0
10		2.4	2.8	8.5	56	3.3	2.4	1.1
11		2.1	2.6	5.8	38	5.6	2.1	.9
12		93	2.4	7.0	16.3	7.0	1.9	1.7
13		162	3.5	4.6	10.6	9.4	1.8	1.6
14		28	2.4	3.3	5.8	6.6	1.7	1.0
15		6.0	2.1	2.8	4.6	3.5	1.6	.9
16		4.0	2.0	2.3	7.7	3.5	1.3	.8
17		31	2.1	2.1	10.2	2.8	1.3	.8
18		54	3.4	2.1	4.3	2.3	1.3	.8
19		7.0	5	1.9	3.1	2.0	1.4	.8
20		4.3	2	1.9	2.4	1.9	2.4	.8
21		3.0	25	9.1	2.1	1.8	1.2	.8
22		3.0	9.0	2.8	1.9	1.9	1.2	.8
23	14.6	4.2	7.3	3.3	1.8	1.7	1.9	.8
24	27	110	6.0	2.8	1.7	2.6	1.9	.7
25	42	39	7.7	2.0	1.6	2.6	1.4	.7
26	52	30	9.8	1.9	1.4	1.8	6.1	.6
27	15.1	7.3	37	2.4	1.3	1.6	3.6	.5
28	7.7	5.3	31	63	1.2	54	6.7	.5
29	4.8	5.8	11.4	-------	1.2	19.0	2.4	.5
30	4.0	4.3	111	-------	1.0	2.6	1.9	.4
31	-------	4.6	172	-------	.9	-------	1.8	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated, because of lack of gage-height record, by comparison with records of flow of ad acent streams.

Monthly discharge of East Wailuanui Stream near Keanae, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
November 23–30	52	4.0	20.9	32.3	167	513
December	162	2.1	22.2	34.3	688	2,110
January	172	2.0	19.0	29.4	590	1,810
February	63	1.9	9.60	14.9	269	825
March	83	.9	16.1	24.9	500	1,530
April	54	1.0	5.70	8.82	171	525
May	6.7	1.2	2.64	4.08	81.8	251
June	1.7	.4	.93	1.44	28.0	86
The period					2,490	7,650

KOOLAU DITCH NEAR KEANAE, MAUI

LOCATION.—5 feet above portal of tunnel in west side of Keanae Valley, a quarter of a mile above ditch foreman's house, and 3 miles southwest of Keanae post office.

RECORDS AVAILABLE.—January 1, 1910, to December 31, 1912, and November 2, 1917, to June 30, 1922.

GAGE.—Gurley printing water-stage recorder installed June 23, 1922, to replace Friez water-stage recorder installed November 2, 1917. Gage was moved to present location on March 25, 1922. East Maui Irrigation Co. has obtained staff-gage readings at this location since about 1904.

DISCHARGE MEASUREMENTS.—Made from plank 20 feet above gage.

CHANNEL AND CONTROL.—Concrete-lined ditch; straight for 100 feet above gage. Control not well defined but probably fairly permanent as ditch enters long tunnel 5 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.36 feet at 7.15 p. m. January 4 (discharge, 175 million gallons per day or 271 second-feet). Ditch reported dry February 19; probably dry several days during February and March when water was turned out of ditch.

1910–1912; 1917–1922: Maximum stage recorded during periods same as that recorded above for 1922. Ditch occasionally dry when gates are closed.

DIVERSIONS.—None in vicinity of station except spillways.

REGULATION.—By gates at intervals.

OBJECT OF STATION.—To determine amount of water diverted through ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation practically permanent at both old and new stations. Rating curve, for old station, used prior to March 25 well defined between 5 and 125 million gallons per day; curve for new station, well defined between 30 and 100 million gallons per day and fairly well defined for lower stages. Operation of water-stage recorders satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from Friez recorder graph by inspection or from printed record of Gurley recorder by averaging hourly gage heights, except for days of considerable fluctuation in stage, for which it was ascertained by averaging discharge for intervals of the day. Records good except those estimated which are fair to poor.

For description of ditch see under Koolau ditch at Nahiku weir, near Nahiku, Maui.

No discharge measurements were made at this station during the year.

Discharge, in million gallons per day, of Koolau ditch near Keanae, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	15.0	66	32	48	76	42	66	20		45	70	35
2	22	112	27		89	41	86	8.0	3.5	51	70	32
3	52	93	25		109	90	69	5.0		73	76	30
4	36	72	25		93	72	102	6.0		90	110	27
5	23	72	42	62	83	51	79	5.9	14.0		110	26
6	20	60	39		69	60	76		8.0	109	83	24
7	20	72	30		63	69	57		6.0		73	22
8	25	57	30	36	57	63	69		9.0	76	86	
9	20	48	59	30	51	63	57		6.0	70	60	20
10	21	45	50	29	48	86	48		7.0		57	
11	20	69	33	28	45	83	64			102	51	21
12	18.0	119	28	26	54	89	72				45	32
13	19.0	72	26	25	57	92	86			127	39	35
14	17.0	60	26	24	48	69	76			117	38	24
15	58	51	59	23	42	60	72			90	35	21
16	96	45	57	27	36	51	66			93	.2	187
17	116	42	60	22	34	76	72	1.5	1.5	73	31	176
18	119	42	48	21	32	109	86			63	30	176
19	122	93	39	20	76	60	89			57	30	176
20	119	60	36	19.0	126	63	61			57	50	176
21	83	54	42	19.0	112	72	19			57	31	187
22	66	54	92	19.0	79	60	5.0			67	27	164
23	57	45	96	52	54	93	4.0			54	36	164
24	51	42	72	116	63	116	2.0				39	153
25	45	36	54	119	86	72	3.0		15		31	153
26	39	34	48	116	70	69	3.0		63	69	90	153
27	76	33	54	93	79	69	9.0		60		83	142
28	57	30	48	99	63	79	8.5		57		86	142
29	119	29	42	122	69	83	4.5	-------	54	113	63	140
30	99	39	45	112	66	76	21	-------	51	83	45	136
31	66	45	-------	93	-------	76	64	-------	48	-------	39	-------

NOTE.—Water turned out of ditch, and water surface below recorder-well intake for part of day, Jan. 21, 22, 27, 28, 30, Feb. 2–5, and Mar. 5–10, 25; discharge ascertained by estimating incorrect portions of gage-height record. Water surface continually below intake, Jan. 23–26, Feb. 6 to Mar. 4, and Mar. 11–24; discharge estimated by comparison with graph of rainfall at Kopiliula and Keanae. When water is turned out of ditch the entire flow is derived from surface inflow and therefore the rainfall graph in conjunction with fragmentary correct gage-height record forms a safe basis for estimating incorrect record. No gage-height record obtained Oct. 2–7, Apr. 5–7, 10–12, 24–28, and June 8–10; discharge ascertained by comparison with flow at Nahiku weir. Ditch reported dry February 19. Braced figures show mean discharge for periods indicated.

Monthly discharge of Koolau ditch near Keanae, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	122	15.0	55.4	85.7	1,720	5,270
August	119	29	57.8	89.4	1,790	5,500
September	96	25	45.5	70.4	1,360	4,190
October	122	19.0	55.2	85.4	1,710	5,250
November	126	32	67.6	105	2,030	6,220
December	116	41	72.7	112	2,250	6,920
January	102	2.0	51.3	79.4	1,600	4,880
February	20	----------	2.84	4.39	79	244
March	63	----------	14.0	21.7	433	1,330
April	127	----------	81.1	125	2,430	7,470
May	110	27	56.3	87.1	1,750	5,360
June	35	13.6	21.0	32.5	632	1,930
The year	127	----------	48.7	75.4	17,800	54,600

HONOMANU STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At end of Haiku-uka boundary line trail, 8 miles east of Kailiili.

RECORDS AVAILABLE.—October 9, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and below station; narrows into a gorge below station. Control composed of two-man boulders; subject to shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.15 feet at 10 p. m. January 30 (discharge, from extension of rating curve, about 1,150 million gallons per day or 1,780 second-feet); minimum stage recorded, 0.59 foot at 3 p. m. October 20 (discharge, 0.10 million gallons per day or 0.15 second-foot).

1919–1922: Maximum stage recorded, 9.00 feet at 7.20 p. m. January 16, 1921 (discharge, by comparison with Honomanu Stream near Keanae, 1,200 million gallons per day or 1,860 second-feet); minimum stage recorded, 0.28 foot at 10 a. m. April 3 and noon April 5, 1920 (discharge, 0.03 million gallons per day or 0.05 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple land above and Territorial lands below.

UTILIZATION.—Water picked up below by East Maui Irrigation Co.'s ditches for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed during floods of January 31 and March 10. Rating curves fairly well defined between 1 and 80 million gallons per day. Operation of water-stage recorder satisfactory except for two short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair and those for high stages which are subject to error.

Discharge measurements of Honomanu Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Sept. 30	W. C. Renshaw	0.82	1.45	0.95	Feb. 15	S. B. Hall	0.99	4.0	2.6
Dec. 18	J. E. Stewart	2.62	114	74	May 17	do	.74	.75	.5

Discharge, in million gallons per day, of Honomanu Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.4	4.6	1.1	1.4	2.4	5.8	2.3	149	22	0.6	2.0	0.9
2	.8	24	.6	2.7	10.9	3.6	1.7	130	24	.7	2.5	.9
3	4.0	4.6	.4	1.5	22	106	1.3	61	29	2.5	6.8	1.0
4	3.1	3.0	.4	.8	6.2	75	7.2	14.2	6.7	9.7	11.8	.8
5	2.2	2.4	1.4	.6	2.2	24	8.7	8.5	50	16.6	6.2	.7
6	1.5	2.0	1.0	.5	1.6	15.6	2.5	6.1	171	27	4.0	.6
7	1.2	2.9	.6	.6	1.3	5.6	1.4	5.3	209	16.1	2.6	.4
8	2.7	2.2	.6	1.2	1.2	3.9	1.3	4.2	195	6.9	1.9	.4
9	1.0	1.4	3.4	.7	3.7	2.9	1.3	15.8	95	12.1	1.6	.6
10	.7	1.0	2.5	.4	2.2	2.0	1.0	10.4	162	6.7	6.6	.6
11	.6	4.6	.8	.6	1.3	1.3	.8	5.5	38	7.4	5.3	.4
12	.5	17.6	.4	.3	1.2	131	.9		14.5	5.0	2.3	.8
13	.4	2.6	.3	.3	1.7	312	6.0		12.7	3.9	1.2	1.2
14	.6	1.7	.3	.2	1.4	65	3.0		8.4	2.6	.9	.8
15	6.4	1.3	1.5	.2	.9	11.3	1.2	2.4	5.5	3.7	.7	1.0
16	8.7	1.0	2.9	.3	.6	6.4	1.2	1.8	4.2	10.7	.6	.6
17	7.1	.9	1.1	.2	.5	46	1.2	1.4	11.0	5.6	.6	.4
18	28	.8	.8	.2	.4	74	2.4	1.3	4.2	2.9	.6	.3
19	46	3.8	.6	.2	77	19.6	22	1.0	2.9	1.8	.6	.3
20	11.4	1.7	.4	.2	78	5.9	19.4	1.0	2.3	5.9	2.5	.3
21	2.4	1.4	1.2	.4	209	4.2	57	30	2.4	9.7	1.0	1.0
22	1.8	2.2	20	.3	356	3.5	41	10.1	2.2	7.7	.7	.6
23	1.9	1.1	5.2	4.2	165	17.5	22	4.6	2.0	3.6	1.7	.3
24	1.7	.8	1.9	60	138	176	22	4.4	1.5	2.0	2.4	.3
25	1.4	.8	1.6	29	114	98	22	3.1	1.1	4.3	1.6	.3
26	1.2	.7	1.2	17.2	184	70	76	3.2	.9	2.6	6.9	.2
27	6.4	.8	1.0	4.2	38	14.2	113	33	.8	1.4		.2
28	2.3	.6	1.2	5.4	10.6	7.4	127	195	.7	34		.2
29	7.3	.8	1.2	7.3	6.4	6.7	18.2	-------	.7	11.7	2.1	.2
30	5.0	2.2	1.0	16.9	5.0	4.3	242	-------	.7	2.6		.2
31	8.5	2.4	-------	7.9	-------	3.1	247	-------	.6	-------	-------	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of adjacent streams.

Monthly discharge of Honomanu Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	46	0.4	5.39	8.34	167	513
August	24	.6	3.16	4.89	97.9	301
September	20	.3	1.89	2.92	56.6	174
October	60	.2	5.35	8.28	166	509
November	356	.4	48.1	74.4	1,440	4,430
December	312	1.3	42.6	65.9	1,320	4,050
January	247	.8	34.6	53.5	1,070	3,290
February	195	1.0	25.7	39.8	719	2,210
March	209	.6	34.9	54.0	1,080	3,320
April	34	.6	7.60	11.8	228	700
May	11.8	.6	2.78	4.30	86.1	264
June	1.2	.2	.55	.85	16.5	51
The year	356	.2	17.7	27.4	6,460	19,800

HONOMANU STREAM NEAR KEANAE, MAUI

LOCATION.—500 feet above Spreckels ditch intake and trail bridge and 6 miles south of Keanae post office.

RECORDS AVAILABLE.—November 15, 1913, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder. Datum raised 1.345 feet on May 12, 1922.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 200 feet above and below gage; stream bed filled with large boulders and very rough; right bank vertical wall of rock; left bank steep and high. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.00 feet at 10.30 p. m. January 30 (discharge, about 1,070 million gallons per day or or 1,660 second-feet); minimum stage recorded, 2.01 feet (old datum) about October 20 (discharge, 0.45 million gallons per day or 0.7 second-foot).

1913–1922: Maximum stage recorded, 9.9 feet at 9 p. m. May 1, 1916 (discharge, 1,500 million gallons per day or 2,320 second-feet); minimum discharge recorded, 0.17 million gallons per day or 0.26 second-foot, on July 14, 1920.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—Data valuable in relation to Territorial water licenses to ditch company.

UTILIZATION.—Ordinary flow is diverted by Spreckels ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed by flood of January 30 and by change in gage datum May 12. Two rating curves used both fairly well defined between 1 and 500 million gallons per day. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair for periods during which recorder operated.

Discharge measurements of Honomanu Stream near Keanae, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Oct. 8	W. C. Renshaw	2.29	2.3	1.5	Feb. 14	Karl Jetter	2.80	9.0	5.8
Jan. 10	S. B. Hall	2.40	4.5	2.9	June 30	S. B. Hall	.60	.85	.55

Discharge, in million gallons per day, of Honomanu Stream near Keanae, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.0		1.4	3.1		7.9	4.5	280	47	1.7	5.5	2.5
2	1.6		1.1	5.7	25	4.7	3.6	220	48	2.0		2.3
3	7.6		.9	2.4		154	3.0	103	69	6.8		2.3
4	4.2		.9	1.6		101	17.0	33	24	14.5	13	2.1
5	2.6		2.2	1.2		40	17.2	18.3	163	41		2.0
6	2.0	5.5	1.8	1.2		28	6.2	12.0	288	39		1.6
7	1.5		1.2	1.3		7.4	3.7	9.8	314			1.6
8	4.6		1.1	1.7	4.3	4.7	4.9	7.4	327	17		1.6
9	1.8		6.3	1.3		3.3	3.5	39	184		6.5	1.7
10	1.4		3.2	1.1		2.4	2.7	27	295			1.8
11	1.2		1.2	1.0		1.8	2.4	14.4	106	14.4		1.6
12	1.0	30	1.0	.8	2.5	244	2.4	32	44	11.0	3.5	2.8
13	.9	6.5	.8	.8	2.7	500	12.2	10.6	30	9.2	2.9	3.0
14	.9	2.6	.8		2.3	127	5.6	6.6	16.8	5.9	2.6	2.0
15	14.4	2.0	2.8		1.5	23	2.6	5.0	9.6	5.8	2.4	2.0
16		1.7	4.0		1.3	9.4	2.5	4.3	6.6	14.5	2.2	1.6
17		1.5	2.0		1.2	108	2.6	3.8	18.2	9.3	2.0	1.5
18	30	1.6	1.6	.7	1.1	146	5.2	3.7	6.3	4.8	2.2	1.3
19		12.8	1.2		141	24	45	3.4	4.6	3.7	2.2	1.3
20		2.8	1.1		146	9.6	45	2.9	3.9	10.9	4.8	1.3
21		2.5	1.6		377	6.2	101	53	3.7	14.1	2.5	1.6
22		3.5	32		517	4.9	68	17.3	2.8	12.0	2.3	1.5
23		2.0	10.0		230	26	40	7.7	2.8	5.9	3.7	1.2
24		1.7	3.6		206	313	34	7.9	2.8	4.3	4.1	1.0
25		1.4	2.5		222	176	41	5.3	2.4	7.0	3.0	1.0
26	6.0	1.4	1.9	30	346	132	101	5.6	2.0	4.8	24	.9
27		1.3	2.0		68	29	220	49	1.9	3.3	9.6	.8
28		1.2	1.9		19.8	12.6	211	310	1.9		15.3	.8
29		1.2	1.7		9.6	12.6	38	-------	1.8	30	6.0	.7
30		3.3	1.6		6.7	7.4	374	-------	1.8		3.3	.6
31		3.4	-------		-------	5.9	500	-------	1.8	-------	3.0	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparisons with flow of adjacent streams.

Monthly discharge of Honomanu Stream near Keanae, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	----------	0.9	8.47	13.1	263	806
August	30	1.2	4.67	7.23	145	444
September	32	.8	3.18	4.92	95.4	293
October	----------	----------	9.66	14.9	300	919
November	517	1.1	81.1	125	2,430	7,470
December	500	1.8	73.3	113	2,270	6,970
January	500	2.4	61.9	95.8	1,920	5,890
February	310	2.9	46.1	71.3	1,290	3,960
March	327	1.8	65.3	101	2,030	6,210
April	----------	1.7	13.5	20.9	404	1,240
May	24	2.0	6.15	9.52	191	585
June	3.0	.6	1.60	2.48	48.0	147
The year	517	----------	31.2	48.3	11,400	34,900

HAIPUAENA STREAM AT HAIKU-UKA BOUNDARY ,NEAR KAILIILI, MAUI

LOCATION.—50 feet upstream from Haiku-uka boundary-line trai crossing and 7½ miles by trail east of Kailiili.

RECORDS AVAILABLE.—June 3–30, 1922, at present site; May 27, 1919, to June 2, 1922, at site 250 feet upstream. Records comparable.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge or by wading.

CHANNEL AND CONTROL.—Old location: Channel, in pool at base of 60-foot falls. Control, formed by solid rock ledge at lower end of pool; practically permanent and the same for all stages.

New location: One channel at all stages; straight for 50 feet above gage and 100 feet below. Artificial control composed of heavy boulders anchored with concrete; shifts owing to deposition of gravel in pool above.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.50 feet at 4 p. m. March 6 (discharge, 135 million gallons per day or 209 second-feet); minimum discharge, 0.15 million gallons per day or 0.23 second-feet, at gage height 0.74 foot at 8 p. m. June 29 (new station location).

DIVERSIONS.—Entire low-water flow at 4,200-foot elevation (about 1½ miles above station) diverted into Kula pipe line.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple land above and Territorial lands below.

UTILIZATION.—Water diverted below into East Maui Irrigation Co.'s ditches for the irrigation of sugar cane.

ACCURACY.—Old location: Stage-discharge relation changed July 19 and January 30. Three rating curves used; fairly well defined below 25 million gallons per day. Operation of water-stage recorder not satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair for periods during which recorder operated.

New location: Stage-discharge relation permanent during period. Rating curve fairly well defined for stages which occurred. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection. Records fair.

Discharge measurements of Haipuaena Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 30	W. C. Renshaw	0.42	0.7	0.45
Dec. 18	J. E. Stewart	1.54	35	22.5
Feb. 15	S. B. Hall	.52	2.8	1.8
June 7	Karl Jetter	.86	.4	.25

Discharge, in million gallons per day, of Haipuaena Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.5		0.7	0.7					11	1.0	1.9	6.5
2	.6	4.0	.5	1.2					8.9	1.1	2.0	
3	2.7		.4	.8	4.1				14.2	2.2	3.8	.5
4	2.0		.4	.5					2.9	4.6	5.8	.5
5	1.2		.7	.4					18.6	7.9	3.4	.5
6	1.0		.7	.4					50	10.0	2.5	.4
7	.9	1.3	.5	.5					61	6.1	2.0	.3
8	1.8		.6	.6				11	34	2.6	1.8	.3
9	.9		1.7	.5					33	5.2	1.5	.4
10	.8		1.4	.4		14	1.6		40	3.0	3.1	.3
11	.7	2.3	.6	.4	.9				15.4	3.8	1.9	.3
12	.7	7.2	.5	.4					6.1	2.8	1.5	.5
13	.7	1.1	.4	.3					5.7	2.5	1.2	.6
14	.7	.7	.4	.3					3.7	2.1	1.1	.4
15	4.4	.6	1.0	.3				1.9	2.6	2.2	1.0	.4
16	5.5	.6	1.7	.3				1.7	2.5	4.2	1.0	.3
17	7.1	.6	.8	.3	.4			1.5	5.2	2.8	.9	.2
18	13.2	.6	.7	.2	.4			1.4	2.3	1.9	1.0	.2
19	19.1	1.8	.6	.2		4.8		1.4	2.0	1.8	1.6	.2
20	4.9	.8	.6	.2		2.7		1.3	1.7	3.8	1.3	.3
21	1.3	.7	.7	.3		2.1		11.9	1.7	4.6		.5
22	1.1	1.0	9.9	.2	6.0	2.1		4.6	1.6	3.9		.3
23	1.0	.6	2.6	2.2		7.4		2.3	1.6	2.5		.2
24	1.0	.6	1.0	23				2.2	1.5	2.0		.2
25	.9	.5	.9	11.0			20	1.9	1.5	2.5		.2
26	.8	.5	.7	6.8				1.9	1.4	2.1	2.0	.2
27	3.9	.6	.7	1.5		14		14.3	1.1	1.7		.2
28	1.2	.5	.7	2.3	7.5			40	1.1	10.1		.2
29	4.2	.5	.7	2.7				-------	1.0	7.6		.2
30	2.5	1.0	.6	3.7				-------	1.1	2.0		.2
31	4.5	1.1	-------	2.2	-------			-------	1.0	-------		-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow at station on this stream near Huelo and at stations on adjacent streams.

Monthly discharge of Haipuaena Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	19.1	0.5	2.96	4.58	91.8	282
August	-------	.5	1.54	2.38	47.7	147
September	9.9	.4	1.11	1.72	33.4	102
October	23	.2	2.09	3.23	64.8	199
November	-------	.4	18.0	27.9	541	1,660
December	-------	-------	12.4	19.2	383	1,180
January	-------	-------	9.32	14.4	289	887
February	-------	1.3	8.65	13.4	242	743
March	61	1.0	10.8	16.7	335	1,030
April	10.1	1.0	3.69	5.71	111	340
May	-------	.9	2.01	3.11	62.3	191
June	-------	.2	.73	1.13	22.0	67
The year	-------	.2	6.09	9.42	2,220	6,830

HAIPUAENA STREAM NEAR HUELO, MAUI

LOCATION.—200 feet above inflow of Spreckels ditch and 7 miles by trail east of Huelo.

RECORDS AVAILABLE.—October 19, 1913, to June 30, 1922; also records of combined flow of stream and Spreckels ditch at staff-gage station 600 feet below present site December 18, 1910, to September 30, 1913.

GAGE.—Stevens continuous water-stage recorder installed June 16, 1914, to replace original Friez recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages; straight for 200 feet above and below gage; right bank, high with steep slope; left bank, nearly vertical. Control, composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.13 feet at 10.30 a. m. January 31 (discharge, 440 million gallons per day or 681 second-feet); stage may have gone higher but recorder stopped operating. Minimum stage recorded, 0.33 foot for several hours June 29 and 30 (discharge, 0.6 million gallons per day or 0.9 second-foot).

1913–1922: Maximum stage recorded, 5.67 feet at 7.40 p. m. January 16, 1921 (discharge, 530 million gallons per day or 820 second-feet); minimum stage recorded, 0.20 foot frequently during December, 1919 (discharge, 0.3 million gallons per day or 0.5 second-foot).

DIVERSIONS.—Low-water flow at 4,200 feet elevation is diverted into Kula pipe line about 1½ miles above the station on this stream at Haiku-uka boundary.

REGULATION.—None.

OBJECT OF STATION.—Data valuable in relation to appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—Ordinary flow diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined between 1 and 150 million gallons per day. Operation of water-stage recorder satisfactory except as indicated in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for periods during which recorder operated, except for high stages.

Discharge measurements of Haipuaena Stream near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Oct. 6	W. C. Renshaw	0.68	3.3	2.2
Feb. 14	Karl Jetter	.94	9.3	6.0

Discharge, in million gallons per day, of Haipuaena Stream near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.8	8.5	2.9		9.1	6.9	4.9		21	1.7	4.2	2.4
2	2.2	18.0	2.4		21	5.2	4.6	70	15.3	2.1	4.7	2.2
3	7.4	9.8	2.0	4.5	25	56	4.1		38	5.0	8.0	2.1
4	5.4	6.2	2.0		10.2	40	13.7		21	6.9	12.7	2.0
5	3.1	6.1	3.3			13.0	14.1	12	78	23	10.4	1.8
6	2.8	4.9	3.3	2.6		16.6	7.6		105	17.4	6.2	1.7
7	2.3	6.6	2.5	2.7		6.2	5.1		119	11.2	5.2	1.6
8	5.0	5.4	2.5	2.9		5.1	6.1	5.8	119	6.1	6.1	1.6
9	2.9	4.2	5.2	2.5	4.4	4.5	4.9	22	74	7.4	4.0	1.7
10	2.5	3.7		2.3		3.9	4.2	17.3	116	6.7	5.1	1.7
11	2.2	7.4		2.0		3.6	3.8	11.8	50	9.4	4.5	1.5
12	1.9	21		1.9		89	3.6	19.4	23	9.2	3.3	2.9
13	2.0	5.9		1.8	4.6	201	8.1	7.6	16.4	10.5	2.8	2.7
14	1.7	4.8		1.8	3.9	56	5.7	5.5	10.2	6.7	2.5	1.8
15	10.0	3.9		1.8	3.2	12.0	3.6	4.8	7.1	5.2	2.3	1.7
16	14.8	3.4	3.5	2.4	2.8	6.7	3.3	4.1	5.5	7.9	2.1	1.4
17	18.8	3.1		1.8	2.6	50	3.4	3.8	9.7	6.0	1.9	1.2
18	35	3.0		1.5	2.4	76	4.7	3.4	5.1	4.0	1.9	1.1
19	40	14.1		1.4	67	13.5	25	3.0	4.2	3.5	2.0	1.1
20	18.2	4.9		1.4	84	7.5	26	2.7	3.7	5.8	3.9	1.2
21	7.1	4.9		1.3	150	5.6	55	26	3.6	5.7	2.2	1.4
22	5.5	5.4	21	1.4	162	4.9	30	9.8	3.0	6.2	2.0	1.2
23	4.8	3.8	10.2	8.4	77	13.1	22	5.4	2.8	4.2	3.5	1.0
24	4.4	3.4		50	76	138	15.5	6.8	2.6	4.2	3.7	.9
25	4.2	3.1		3.0	88	75	22	4.4	2.5	5.3	3.0	.9
26	3.7	2.7		22	131	64	45	4.4	2.4	3.9	12.5	.9
27	11.2	2.6	4.1	9.3	35	16.4	90	17.8	2.2	3.2	6.1	.9
28	5.8	2.4		9.1	11.9	9.1	92	113	2.1	44	10.5	.8
29	18.5	2.2		13.6	7.6	9.1	19.2	-------	2.0	23	5.0	.7
30	11.8	4.0		17.6	6.4	6.4	142	-------	1.8	5.2	3.3	.7
31	8.0	4.5	-------	14.2	-------	5.9	229	-------	1.6	-------	2.9	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, by comparison with flow at station on this stream at Haiku-uka boundary and at stations on adjacent streams, because of lack of gage-height record. Daily discharge Oct. 24 and 25 estimated in the same manner.

Monthly discharge of Haipuaena Stream near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	40	1.7	8.55	13.2	265	813
August	21	2.2	5.93	9.18	184	564
September	21	----------	4.27	6.61	128	393
October	----------	1.3	6.55	10.1	203	623
November	162	2.4	33.9	52.5	1,020	3,120
December	201	3.6	32.9	50.9	1,020	3,130
January	229	3.3	29.6	45.8	918	2,820
February	113	2.7	19.9	30.8	557	1,710
March	119	1.6	28.0	43.3	868	2,660
April	44	1.7	8.69	13.4	261	800
May	12.7	1.9	4.79	7.41	148	456
June	2.9	.7	1.49	2.31	44.8	137
The year	229	.7	15.4	23.8	5,610	17,200

PUOHAKAMOA STREAM NEAR HUELO, MAUI

LOCATION.—150 feet above Spreckels ditch inflow and trail crossing and 7 miles east of Huelo.

RECORDS AVAILABLE.—June 13, 1913, to June 30, 1922; December 18, 1910, to June 18, 1913, at station 150 feet downstream.

GAGE.—Stevens continuous water-stage recorder installed November 23, 1917, replacing Barrett and Lawrence water-stage recorder installed June 13, 1913. Old staff gage station was 150 feet downstream at trail bridge below inflow from Spreckles ditch.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 200 feet above gage. Inflow of Spreckles ditch must be deducted from measurements made at trail bridge at old station.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage. Banks steep and high. Stream bed very rough and steep. Control composed of large boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.45 feet at 1.45 a. m. February 1 (discharge, about 990 million gallons per day or 1,530 second-feet); minimum stage recorded, 0.65 foot at 6 p. m. October 21 (discharge, 1.4 million gallons per day, or 2.2 second-feet); actual minimum flow probably about 1.1 million gallons per day during latter part of June when intake was plugged.

1910–1922: Maximum stage recorded February 1, 1922; minimum stage recorded, 0.25 foot October 26, 1917 (discharge, 0.4 million gallons per day, or 0.6 second-foot).

DIVERSIONS.—Kula pipe line diverts small amount of water above station at elevation 4,300 feet.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow of stream is diverted by East Maui Irrigation Co.'s ditches for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed by floods of August 19 and January 31. Rating curve used July 1 to August 18 well defined between 3 and 10 million gallons per day; curve used August 19 to January 30 well defined between 1 and 100 million gallons per day; curve used January 31 to June 30 well defined between 0.5 and 125 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair.

Discharge measurements of Puohakamoa Stream near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Oct. 8	W. C. Renshaw	1.30	8.2	5.3
Feb. 15	Karl Jetter	2.22	18.7	12.1
June 29	....do	.96	1.85	1.2

Discharge, in million gallons per day, of Puohakamoa Stream near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	2.2	14.9	6.0	7.6	11.4	15.6	13.6	249	45	4.7	10.5	4.8
2	3.0	35	5.0	10.8	37	10.4	12.0	171	29	5.8	10.5	4.4
3	11.9	15.8	4.7	7.0	40	100	11.4	88	86	12.9	16.8	4.1
4	7.6	9.8	4.4	6.0	15.6	59	31	38	54	16.7	27	3.7
5	4.2	9.2	7.0	5.3	9.9	25	29	23	160	53	23	3.3
6	3.4	7.6	6.7	4.7	8.6	28	16.8	21	230	33	14.3	2.9
7	2.7	10.2	5.3	5.3	7.4	13.6	12.8	19.5	248	24	11.4	2.4
8	6.0	7.6	5.0	5.3	7.4	10.9	14.6	15.4	251	14.3	13.9	2.8
9	3.5	5.9	8.2	4.7	8.8	9.9	12.0	38	161	15.6	8.9	3.1
10	3.0	5.2	8.4	4.0	8.2	9.0	10.4	16.6	260	16.7	8.9	2.7
11	2.7	9.6	5.3	3.6	6.7	8.2	9.9	35	118	21	8.8	2.3
12	2.1	38	4.7	2.9	7.4	181	9.9	44	62	21	7.5	5.3
13	2.2	9.2	4.1	2.4	8.2	388	19.5	19.5	38	23	6.2	5.2
14	1.7	7.6	4.1	2.1	7.0	119	12.2	13.3	27	15.4	5.5	3.0
15	18.0	5.9	7.3	2.1	6.0	30	9.9	12.3	19.5	12.3	5.1	2.4
16	27	5.2	9.0	4.2	5.3	18.0	9.0	11.4	16.6	16.6	4.5	
17	37	4.8	7.4	2.8	5.0	123	9.9	10.5	14.3	13.3	4.4	
18	66	4.8	6.0	2.0	4.7	170	14.3	9.7	14.3	8.9	4.4	
19	74	27	5.0	1.7	142	30	43	8.8	13.3	8.1	4.4	
20	34	9.4	4.7	1.7	158	18.0	53	7.6	16.0	12.9	17.0	2.1
21	11.3	9.0	6.4	1.5	312	15.6	105	50	10.5	13.4	4.6	
22	9.2	9.9	31	1.7	306	13.6	50	18.2	8.9	13.3	4.2	
23	7.6	7.4	14.6	15.8	127	25	42	13.4	8.1	8.9	6.7	
24	6.7	7.0	10.4	99	146	278	36	18.3	7.5	8.6	7.4	
25	6.7	6.4	7.8	56	182	165	36	12.3	7.4	11.4	5.4	
26	5.5	6.0	7.0	40	260	136	79	11.4	6.5	7.8	24	1.5
27	21	5.6	7.4	13.5	64	36	191	37	6.2	6.3	13.3	
28	8.6	5.3	6.7	18.0	28	23	190	220	5.6	86	20	
29	36	5.0	6.0	21	14.6	21	42	-------	5.4	57	10.5	
30	20	8.2	6.0	32	12.8	16.8	286	-------	5.2	12.3	6.4	
31	11.3	8.6	-------	22	-------	18.0	402	-------	4.7	-------	5.5	-------

NOTE.—Intake to stilling well not functioning properly June 16-30; discharge estimated by comparison with flow at stations on the branches of this stream at Haiku-uka boundary and on adjacent streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Puohakamoa Stream near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	74	1.7	14.7	22.7	456	1,400
August	38	4.8	10.4	16.1	321	989
September	31	4.1	7.39	11.4	222	680
October	99	1.5	13.1	20.3	407	1,250
November	312	4.7	65.2	101	1,960	6,000
December	388	8.2	68.2	106	2,110	6,490
January	402	9.0	58.5	90.5	1,810	5,570
February	249	7.6	44.0	68.1	1,230	3,780
March	260	4.7	62.5	96.7	1,940	5,950
April	86	4.7	19.1	29.6	574	1,760
May	27	4.2	10.4	16.1	321	989
June	5.3	----------	2.64	4.08	79.1	243
The year	402	----------	31.3	48.4	11,400	35,100

EAST BRANCH OF PUOHAKAMOA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—On left bank of stream 200 yards downstream from trail crossing and 7 miles by trail southeast of Kailiili.

RECORDS AVAILABLE.—October 9, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder. Datum lowered 3.50 feet on April 16, 1920.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 5 feet below gage.

CHANNEL AND CONTROL.—Bed of stream, boulder-strewn; banks steep and high. Pool at station 20 feet wide by 35 feet long, clear and smooth. Control large boulders; subject to shift during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.36 feet at 12.10 a. m. February 1 (discharge, about 78 million gallons per day or 121 second-feet); minimum stage recorded, 3.91 feet at 9 p. m. June 30 (discharge, 0.10 million gallons per day or 0.15 second-foot).

1919–1922: Maximum stage, estimated by comparison with West and Middle branches of Puohakamoa Stream, 3.27 feet (old datum) March 22, 1920 (discharge, about 102 million gallons per day or 158 second-feet); minimum discharge, no flow, several days in December, 1919, and July 14, 1920.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple land above and Territorial lands below.

UTILIZATION.—Water picked up below by East Maui Irrigation Co.'s ditches for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed slightly July 19. Rating curves fairly well defined between 0.1 and 10 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair.

Discharge measurements of East Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 30	W. C. Renshaw	4.05	0.6	0.4
Dec. 18	J. E. Stewart	4.61	9.7	6.2
Feb. 15	S. B. Hall	4.10	1.1	.7
May 17	do	4.00	.25	.15

Discharge, in million gallons per day, of East Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.1	0.8	0.4	0.6	1.0	1.6	1.2	11.2	1.9	0.3	0.5	0.3
2	.2	2.3	.3	1.0	2.3	1.3	1.1		2.0	.3	.6	.3
3	.8	1.2	.3	.6	2.6	4.8	1.0	4.9	3.9	.7	.9	.3
4	.5	.8	.3	.5	1.4	3.6	1.8		1.2	1.4	1.5	.3
5	.2	.8	.5	.4	1.0	2.4	1.7		6.2	2.0	1.4	.3
6	.1	.7	.4	.4	.8	2.4	1.1		12.3	1.5	.8	.3
7	.2	.6	.4	.4	.8	1.4	1.0		12.3	.9	.6	.2
8	.4	.6	.4	.5	.7	1.2	1.0		12.7	.6	.5	.2
9	.2	.5	.8	.4	.8	1.0	.9		9.0	.6	.4	.2
10	.1	.5	.6	.4	.8	1.0	.8	1.3	14.0	.8	.4	.3
11	.1	1.0	.4	.3	.6	.9	.8		6.2	.8	.4	.2
12	.1	2.6	.4	.3	.6	10.4	.7		2.5	.8	.4	.3
13	.1	.8	.3	.3	.6	19.8	1.2		1.9	.6	.4	.3
14	.1	.7	.3	.3	.6	6.1	.9		1.3	.5	.3	.3
15	1.0	.5	.5	.3	.5	2.3	.8	.6	1.0	.4	.3	.2
16	1.6	.5	.8	.3	.5	1.7	.7	.6	.9	.5	.3	.2
17	2.1	.4	.5	.3	.4	7.9	.7	.6	1.0	.5	.3	.2
18	3.0	.4	.5	.3	.4	8.3	1.0	.5	.8	.4	.3	.2
19	4.3	1.4	.4	.3	6.9	2.6	2.8	.5	.7	.4	.3	.2
20	1.9	.6	.4	.3	8.3	1.9	3.2	.5	.6	1.0	.5	.2
21	1.0	.5	.4	.3	16.8	1.6	6.0	2.4	.6	.6	.3	.2
22	.8	.6	2.4	.2	16.1	1.4	3.3	.8	.6	.6	.3	.2
23	.8	.5	1.3	1.4	7.7	1.9	2.4	.6	.5	.5	.4	.2
24	.8	.5	.8	5.5	8.8	16.1	1.9	.6	.5	.5	.5	.2
25	.8	.4	.6	3.4	10.7	9.2	2.3	.5	.4	.6	.4	.2
26	.7	.4	.5	2.6	14.6	7.9	5.0	.5	.4	.4	1.7	.2
27	1.8	.4	.5	1.3	4.4	2.8	9.8	2.4	.4	.4	.8	.2
28	1.0	.4	.5	1.4	2.4	2.0	7.7	11.0	.4	5.8	.9	.2
29	2.3	.4	.5	1.7	1.8	2.0	2.4	-------	.4	2.4	.6	.2
30	1.4	.6	.4	2.5	1.5	1.6	16.8	-------	.4	.6	.4	.1
31	.8	.6	-------	1.6	-------	1.4	22	-------	.3	-------	.4	-------

NOTE.—Braced figures show mean discharge estimated because of lack of gage-height record.

Monthly discharge of East Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	4.3	0.1	0.95	1.47	29.3	90
August	2.6	.4	.74	1.14	23.0	70
September	2.4	.3	.56	.87	16.8	52
October	5.5	.2	.97	1.50	30.1	92
November	16.8	.4	3.88	6.00	116	357
December	19.8	.9	4.21	6.51	130	401
January	22	.7	3.35	5.18	104	319
February	11.2	-------	2.18	3.37	61.0	187
March	14.0	.3	3.14	4.86	97.3	299
April	5.8	.3	.91	1.41	27.4	84
May	1.7	.3	.57	.88	17.8	54
June	.3	.1	.23	.36	6.9	21
The year	22	.1	1.81	2.80	660	2,030

66289—26†—WSP 555——9

MIDDLE BRANCH OF PUOHAKAMOA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At trail crossing 200 feet above Haiku-uka boundary line and 6¾ miles southeast of Kailiili.

RECORDS AVAILABLE.—March 14, 1919, to June 30, 1922. Records for the period March 14 to June 30, 1919, hitherto unpublished, are given in this report.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension bridge just above gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 25 feet above and below control. Right bank vertical; left bank 1½ on 1 slope. Stream bed composed of gravel and boulders. Control probably shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.81 feet at 5 p. m. December 12 (discharge, 140 million gallons per day or 217 second-feet); minimum stage recorded, 4.18 feet from 9 a. m. to 10 p. m. October 20 (discharge, 0.18 million gallons per day or 0.3 second-foot).

1919–1922: Maximum stage recorded, 8.47 feet at 5 p. m. March 22, 1920 (discharge, 207 million gallons per day or 320 second-feet); minimum stage recorded, 3.91 feet at noon December 22, 1919, and 4.06 feet from 7 to 9 p. m. July 14, 1920 (discharge, 0.06 million gallons per day or 0.09 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple land above and Territorial lands below.

UTILIZATION.—Water picked up below by East Maui Irrigation Co.'s ditches for the irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent. Rating curve used July 1 to November 20, well defined between 0.2 and 16 million gallons per day; two curves used November 21 to June 30, not well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair

Stage-discharge relation practically permanent during period March 14 to June 30, 1919. Rating curve well defined below 15 million gallons per day. Records good except those estimated.

Discharge measurements of Middle Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Sept. 30	W. C. Renshaw	4.30	0.6	0.4	Feb. 14	S. B. Hall	4.50	3.4	2.2
Dec. 18	J. E. Stewart	5.18	23	14.9	May 17	do	4.24	.85	.55

Discharge, in million gallons per day, of Middle Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the years ending June 30, 1919, and 1922

Day	Mar.	Apr.	May	Day	Mar.	Apr.	May	Day	Mar.	Apr.	May
1919				1919				1919			
1		0.8	3.9	11		0.2		21	1.0	2.2	
2		.6	1.2	12		.3		22	14.3	5.6	
3		.5	.8	13		.2		23	5.7	3.2	
4		.5	.8	14	1.5	.1		24	2.8	2.2	
5		.4	5.4	15	1.4	.1		25	1.7	1.6	
6		.4	3.4	16	1.9	1.4		26	1.6	1.7	
7		.3	1.2	17	1.9	2.5		27	1.3	1.4	
8		.3	1.0	18	1.1	1.1		28	1.1	1.0	
9		.3	2.0	19	1.1	1.0		29	1.0	.7	
10		.2	1.1	20	1.1	1.8		30	.8	1.4	
								31	.9		

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1921-22												
1		2.2	0.4	0.5	1.4	2.5	2.0		8.3	0.8	1.5	0.7
2		4.4	.3	1.0	3.9	2.1	1.9	25	7.9	.9	1.6	.7
3	1.4	2.2	.3	.6	6.3	20	1.7		10.9	1.7	3.2	.7
4		1.5	.3	.3	2.6	29	3.8		3.4	3.9	4.7	.7
5	.7	1.2	.6	.3	1.2	8.1	3.8		15.6	6.4	3.4	.7
6	.6	.9	.4	.3	.9	3.7	1.9		37	6.5	2.3	.6
7	.3	1.2	.3	.3	.8	2.2	1.6		41	4.2	1.6	.6
8	.8	.9	.3	.4	.7	1.8	1.6		40	2.1	1.4	.6
9	.4	.6	1.3	.3	1.8	1.6	1.5	4.4	26	4.2	1.2	.7
10	.3	.5	1.3	.3	1.2	1.5	1.4		39	2.6	2.0	.6
11	.3	1.7	.3	.2	.7	1.3	1.2		14.4	3.1	2.3	.6
12	.2	6.6	.3	.2	.6	42	1.2		6.3	2.3	1.3	.8
13	.2	1.3	.3	.2	.8	48	2.8		5.4	2.0	.9	.9
14	.2	.8	.2	.2	.8	14.0	1.9	2.0	4.0	1.6	.9	.7
15	2.8	.6	.8	.2	.5	4.2	1.2	1.7	2.8	1.5	.8	.8
16	4.3	.5	1.6	.2	.4	2.8	1.2	1.5	2.4	2.7	.7	.6
17	5.5	.4	.5	.2	.4	16.1	1.3	1.4	3.7	2.1	.7	.5
18	10.1	.4	.4	.2	.4	23	2.0	1.3	2.2	1.4	.7	.4
19	13.9	1.7	.3	.2	18.0	5.1	6.1	1.2	1.9	1.2	.7	.4
20	4.7	.8	.3	.2	21	3.0	6.9	1.1	1.8	2.8	1.5	.5
21	1.4	.6	.5	.3	43	2.4	16.0	8.8	1.6	3.4	.9	.8
22	.9	1.1	6.9	.2	55	2.2	9.8	3.6	1.5	3.0	.7	.6
23	.9	.5	2.6	2.2	30	4.9	6.5	1.9	1.4	1.9	1.0	.4
24	.9	.4	1.0	16.8	32	37	6.6	2.1	1.3	1.4	1.4	.4
25	.8	.4	.8	8.2	29	22	6.7	1.5	1.2	1.8	1.2	.4
26	.6	.3	.5	5.6	48	19.4	18.5	1.6	1.1	1.4	4.1	.4
27	3.2	.4	.5	2.0	12.1	5.6	31	6.6	1.0	1.1	2.6	.4
28	1.2	.3	.6	2.4	3.9	3.5	22	34	1.0	8.5	2.2	.3
29	3.6	.3	.6	2.8	2.6	3.5	5.0	-------	1.0	5.2	1.8	.3
30	2.6	.9	.4	5.9	2.5	2.6	51	-------	.9	1.7	1.0	.3
31	2.6	.9	-------	3.2	-------	2.2	50	-------	.9	-------	.9	-------

NOTE.—Braced figures show mean discharge estimated by comparison with flow of adjacent streams because of lack of gage-height record. Water-stage recorder did not operate May 11 to June 30, 1919; mean monthly discharge estimated as follows: May, 1.52 million gallons per day; June, 0.40 million gallons per day.

Monthly discharge of Middle Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the years ending June 30, 1919 and 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1919						
March 14–31	14.3	0.8	2.34	3.62	42.2	129
April	5.6	.1	1.13	1.75	34.0	104
May			[a]1.52	2.35	47	145
June			[a].40	.62	12	37
The period					135	415
1921–22						
July	13.9	0.2	2.25	3.48	69.6	214
August	6.6	.3	1.18	1.83	36.5	112
September	6.9	.2	.83	1.28	24.9	76
October	16.8	.2	1.80	2.79	55.9	171
November	55	.4	10.8	16.7	322	994
December	48	1.3	10.9	16.9	337	1,040
January		1.2	8.71	13.5	270	829
February		1.1	6.76	10.5	189	581
March	41	.9	9.25	14.3	287	880
April	8.5	.8	2.78	4.30	83.4	256
May	4.7	.7	1.65	2.55	51.2	157
June	.9	.3	.57	.88	17.1	52
The year	55	.2	4.78	7.40	1,740	5,360

[a] See footnote to table of daily discharge.

WEST BRANCH OF PUOHAKAMOA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At trail crossing 500 feet above Haiku-uka boundary line and 6½ miles by trail southeast of Kailiili.

RECORDS AVAILABLE.—March 15, 1919, to June 30, 1922. Records for the period March 15 to June 30, 1919, hitherto unpublished, are given in this report.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension bridge 200 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 30 feet above and 50 feet below gage. Right bank, vertical; left bank 1 on 1½ slope. Stream bed, rock and gravel. Control, composed of large boulders; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.98 feet at 9.30 p. m. December 12 (discharge, about 190 million gallons per day or 294 second-feet); minimum stage recorded, 3.59 feet June 27–30 (discharge, 0.4 million gallons per day or 0.6 second-foot).

1919–1922: Maximum stage occurred at 5.30 p. m. March 22, 1920. Float stuck at gage height 5.62 feet but from the shape of the graph and comparison with the Middle and East branches of Puohakamoa Stream it is estimated that a stage of 8 feet was reached (discharge, about 250 million gallons per day or 387 second-feet). Minimum stage recorded, 3.48 feet at 8.30 a. m. December 22 and 2 a. m. December 23, 1919 (discharge, 0.08 million gallons per day or 0.12 second-foot).

DIVERSIONS.—Small amount of water diverted by Kula pipe line above station at elevation 4,300 feet.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple lands above and Territorial lands below.

UTILIZATION.—Water diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed slightly November 21 and April 15. Rating curve used July 1 to November 21 and April 16 to June 30, well defined between 0.4 and 25 million gallons per day; curve used November 22 to April 15, fairly well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records for ordinary stages, good.

Stage-discharge relation practically permanent during period March 15 to June 30, 1919. Rating curve well defined below 15 million gallons per day. Records good.

Discharge measurements of West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Sept. 30	W. C. Renshaw	3.72	1.05	0.7	Feb. 14	S. B. Hall	3.88	4.0	2.6
Dec. 18	J. E. Stewart	4.52	28	18.1	May 17	do	3.68	1.15	.75

Discharge, in million gallons per day, of West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the years ending June 30, 1919 and 1922

Day	Mar.	Apr.	May	June	Day	Mar.	Apr.	May	June
1919					1919				
1		0.7	7.1	1.1	16	2.5	2.0	.5	.2
2		.6	1.8	.5	17	2.9	2.9	4.4	.5
3		.5	1.3	.3	18	1.7	1.2	12.1	1.8
4		.5	1.2	.2	19	1.4	1.2	1.5	1.1
5		.4	9.9	.2	20	1.6	1.8	.9	.4
6		.3	4.3	.2	21	1.4	2.8	1.3	.3
7		.3	1.8	.2	22	22	10.6	1.1	.2
8		.2	1.5	.2	23	10.5	5.2	1.3	.2
9		.3	3.2	.2	24	3.6	3.8	1.1	.2
10		.2	1.6	.2	25	2.0	3.0	.7	.2
11		.3	1.3	.2	26	1.7	2.8	.5	.2
12		.6	1.0	.2	27	1.5	2.4	.6	.3
13		.3	.9	.2	28	1.2	1.6	.6	.8
14		.3	.9	.2	29	1.0	1.2	.4	.4
15	1.8	.3	.6	.2	30	.7	3.2	.3	.2
					31	.7		1.7	

Discharge, in million gallons per day, of West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the years ending June 30, 1919 and 1922—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1921–22												
1		3.1	0.9	1.0	2.0	3.6	3.0		10.0	1.2	1.8	0.8
2		5.9	.7	1.8	5.8	2.5	2.7		11.0	1.3	2.0	.8
3	1.4	2.7	.6	1.0	9.5	26	2.6	30	16.1	2.8	4.8	.8
4		2.0	.6	.8	3.8	18.2	6.2		6.1	5.1	6.7	.7
5	.9	1.8	1.2	.7	1.8	8.0	5.1		26	9.3	4.5	.7
6	.8	1.4	.9	.6	1.4	6.5	3.0		57	9.9	2.7	.7
7	.7	1.7	.7	.7	1.2	3.1	2.5		64	7.4	2.0	.6
8	1.6	1.4	.7	9	1.2	2.7	2.7		61	3.4	1.6	.6
9	.8	1.1	2.1	.6	2.2	2.3	2.4	4.0	39	5.9	1.5	.6
10	.6	.9	1.4	.6	1.5	2.1	2.2		60	4.3	1.5	.6
11	.6	2.7	.7	.6	1.1	1.9	2.0		23	5.0	1.6	.6
12	.6	8.5	.6	.5	1.1	41	2.0		9.0	3.8	1.1	.8
13	.5	1.7	.6	.5	1.2	82	4.5		7.3	3.2	.9	.9
14	.5	1.3	.6	.5	1.2	21	2.8	2.7	5.0	2.5	.9	.6
15	4.6	1.1	1.2	.5	.9	19.3	2.1	2.5	3.7	2.3	.9	.6
16	5.9	1.0	1.9	.5	.8	3.4	2.1	2.3	3.2	3.8	.8	.5
17	7.8	.9	1.0	.5	.7	35	2.1	2.1	5.4	2.6	.7	.5
18	14.6	.9	.9	.4	.6	30	3.1	2.0	3.0	1.7	.8	.5
19	19.5	3.5	.7	.4	27	6.4	9.5	1.8	2.5	1.3	.8	.5
20	6.1	1.2	.6	.4	29	4.2	10.8	1.8	2.4	4.2	2.0	.5
21	2.1	1.2	1.0	.4	64	3.5	25	12.5	2.4	4.7	.9	.6
22	1.6	1.4	9.9	.4	83	3.2	14.7	4.4	2.1	4.0	.8	.5
23	1.3	1.0	3.0	3.9	41	7.7	9.2	3.0	2.0	2.2	1.4	.4
24	1.4	.9	1.4	25	42	55	9.4	2.9	1.9	1.7	1.7	.4
25	1.2	.8	1.2	13.3	42	36	9.7	2.6	1.7	2.5	1.1	.4
26	1.1	.7	.9	8.0	62	30	29	2.7	1.5	1.8	5.3	.4
27	4.5	.7	1.0	2.7	12.0	7.8	47	15	1.4	1.3	2.5	.4
28	1.6	.6	1.0	3.6	4.6	5.1	36	51	1.4	12.6	2.7	.4
29	4.8	.6	.9	4.6	3.5	5.2	7.1	------	1.4	8.3	1.6	.4
30	3.2	1.6	.8	8.9	3.0	3.8	75	------	1.3	2.1	1.1	.4
31	3.3	1.5	------	4.8	------	3.4	80	------	1.2	------	.9	------

NOTE.—Braced figures show mean discharge estimated by comparison with records of flow of adjacent streams because of lack of gage-height record.

Monthly discharge of West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the years ending June 30, 1919 and 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1919						
March 15–31	22	0.7	3.42	5.29	58.2	178
April	10.6	.2	1.72	2.66	51.5	158
May	12.1	.3	2.17	3.36	67.4	206
June	1.8	.2	.38	.59	11.3	35
The period	----------	----------	----------	----------	188	577
1921–22						
July	19.5	.5	3.15	4.87	97.8	300
August	8.5	.6	1.80	2.79	55.8	171
September	9.9	.6	1.32	2.04	39.7	122
October	25	.4	2.87	4.44	89.1	273
November	83	.6	15.0	23.2	451	1,380
December	82	1.9	15.5	24.0	480	1,470
January	----------	2.0	13.4	20.7	416	1,270
February	----------	1.8	8.55	13.2	239	735
March	64	1.2	14.0	21.7	433	1,330
April	12.6	1.2	4.07	6.30	122	375
May	6.7	.7	1.92	2.97	59.6	183
June	.9	.4	.57	.88	17.2	52
The year	----------	.4	6.85	10.6	2,500	7,660

PUOHAKAMOA INTAKE OF KOOLAU DITCH NEAR HUELO, MAUI

LOCATION.—20 feet below Puohakamoa Stream intake, a short feeder canal to Koolau ditch, 7 miles southeast of Huelo.

RECORDS AVAILABLE.—March 23 to June 30, 1922. East Maui Irrigation Co. previously obtained records at this location.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made in short channel between Puohakamoa Stream and head gates in Koolau ditch. When all water is being diverted into ditch measurements may be made by wading in stream about 300 feet above intake.

CHANNEL AND CONTROL.—Control formed by 6-foot sharp-crested trapezoidal weir 21 feet below gage; some velocity of approach; permanent. Recorder operates in weir basin 14 feet by 40 feet. Below weir, channel slopes downward at 30° entering Koolau ditch in tunnel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 2.42 feet at 1 a. m. April 29 (discharge, 56 million gallons per day or 87 second-feet); minimum stage, 0.52 foot at noon June 30 (discharge, 4.7 million gallons per day or 7.3 second-feet).

DIVERSIONS.—During high water Spreckels ditch intake 120 feet downstream takes water wasted at this intake above.

REGULATION.—Entire flow of Spreckels ditch empties into Puohakamoa Stream about 400 feet above station. During ordinary stages station measures all water carried by this ditch and the stream.

OBJECT OF STATION.—To determine amount of water diverted into ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 4 and 30 million gallons per day. Operation of water-stage recorder satisfactory except for one short period. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for period March 26–29 during which recorder did not operate and daily discharge was estimated by comparison with flow of Koolau ditch at Wahinepe. Records good.

The following discharge measurement was made by S. B. Hall:

June 28: Gage height, 0.54 foot; discharge, 5.0 million gallons per day or 7.8 second-feet.

Discharge, in million gallons per day, of Puohakamoa intake of Koolau ditch near Huelo, Maui, for the year ending June 30, 1922

Day	Mar.	Apr.	May	June	Day	Mar.	Apr.	May	June
1		12.8	25	15.4	16		30	13.2	9.2
2		15.4	26	14.3	17		28	12.5	8.7
3		25	28	13.6	18		25	12.5	8.1
4		25	36	12.5	19		23	13.0	7.8
5		33	36	11.7	20		26	24	8.3
6		31	31	10.5	21		31	14.3	10.1
7		31	28	9.9	22		32	12.8	8.5
8		28	31	10.5	23	17.8	25	22	7.6
9		28	24	11.2	24	17.8	24	23	6.8
10		28	25	11.7	25	15.4	28	17.8	6.4
11		31	26	10.1	26	14.7	23	34	6.0
12		31	22	19.8	27	13.9	18.9	33	5.7
13		31	17.8	20	28	13.4	33	32	5.4
14		30	16.0	11.4	29	13.6	38	28	5.1
15		28	14.7	10.8	30	12.8	28	22	4.8
					31	11.9		18.9	

Monthly discharge of Puohakamoa intake of Koolau ditch near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
March 23–31	17.8	11.9	14.6	22.6	131	403
April	38	12.8	27.4	42.4	821	2,520
May	36	12.5	23.2	35.9	720	2,210
June	20	4.8	10.1	15.6	302	930
The period					1,970	6,060

MANUEL LUIS DITCH AT PUOHAKAMOA GULCH, NEAR HUELO, MAUI

LOCATION.—In Puohakamoa Gulch at lower portal of tunnel between Haipuaena and Puohakamoa streams, 6 miles east of Huelo.

RECORDS AVAILABLE.—December 15, 1917, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by rectangular sharp-crested weir 4.5 feet long set in concrete, with full contractions.

CHANNEL AND CONTROL.—Weir basin 25 feet long, 8.3 feet wide, and 1.9 feet deep below crest of weir; made by enlarging tunnel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.23 feet at 3.30 a. m. December 13 (discharge, 88 million gallons per day, or 136 second-feet); minimum stage recorded, 0.06 foot from 2 to 4 p. m. June 29 (discharge, 0.14 million gallons per day, or 0.22 second-foot).

1910–1922: Maximum stage recorded, 4.35 feet at 9.50 p. m. January 16, 1921 (discharge, 93 million gallons per day or 144 second-feet); minimum stage recorded, 0.03 foot at 6.30 p. m. March 3, 1920 (discharge, 0.05 million gallons per day or 0.08 second-foot).

DIVERSIONS.—Ditch is an extension of Center ditch and picks up water not diverted by ditches at higher elevations.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—To determine amount of water diverted by ditch from areas involved under Territorial water license.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 1 and 70 million gallons per day. Operation of water-stage recorder satisfactory except for a few short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records excellent.

Manuel Luis ditch, at elevation about 500 feet, diverts the flow of Kolea, Haipuaena, and Puohakamoa streams below Koolau and Spreckels ditches and discharges into Waikamoi Stream. The water is then picked up by Center ditch (see Center ditch at Waikamoi, near Huelo) and carried to Kailua Stream where it is diverted into Lowrie ditch (see Lowrie ditch at Opana weir, near Huelo) and carried to the vicinity of Paia for use in irrigation of sugar cane on the plantations of Hawaiian Commercial & Sugar Co. The system comprises about 20 miles of main ditch. Manuel Luis ditch proper is about 1½ miles long and has a carrying capacity of 30 million gallons per day.

No discharge measurements were made at this station during the year.

Discharge, in million gallons per day, of Manuel Luis ditch at Puohakamoa Gulch, near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.0	6.8	0.8	1.6	10.1	9.3	4.1	47	26	0.6	2.7	0.6
2		20	.7	15.4	12.3	3.7	2.1	41	21	.9	3.5	.6
3		10.8	.6	3.7	27	29	2.5	30	30	5.3	8.1	.5
4	4.9	3.3	.6	1.7	15.2	37	15.8	12.2	21	5.5	20	.5
5	.7	3.8	.9	1.3	6.2	24	17.9	6.3	44		18.5	.5
6	.5	3.0	.9	1.1	3.1	23	10.4	4.0	48	13	8.9	.4
7	.4	5.7	.7	1.1	1.7	8.6	2.6	3.2	48		4.9	.4
8	3.0	2.1	.9	1.1	3.1	4.6	5.7	1.8	51		12.9	.4
9	.6	1.3	4.3	.9		3.0	2.7	18.6	42		2.6	.5
10	.4	1.2	4.3	.9	1.0	3.2	1.5	16.6	51		3.4	.5
11	.4	5.6	.8	.8		2.6	1.8	10.6	39		3.2	.4
12	.4	23	.7	.7		23	2.5	18.2	33		1.6	.9
13	.4	4.2	.6	.7	4.5	63	12.2	4.6	29	6.0	1.1	1.2
14	.4	2.4	.6	.6	1.8	35	6.0	2.0	16.0		.9	.5
15	7.2	1.4	5.6	.6	.9	6.0	2.1	1.4	10.8		.8	.4
16	12.2	1.2	5.6	1.0	.9	2.9	1.8	1.3	8.6		.7	.4
17	17.1	1.1	3.7	.7	.8	20	1.8	1.2	16.4		.6	.3
18	29	1.0	1.4	.6	.7	42	7.3	1.1	7.6	3.0	.6	.3
19	29	15.7	.9	.5	27	18.5	21	1.1	5.0	2.4	.6	.3
20	20	2.5	.8	.5	45	8.1	26	.9	3.6	4.2	2.4	.3
21	4.4	2.0	2.0	.5	54	4.0	37	14.0	3.2	4.6	.7	.3
22	2.0	2.3	15.3	.4	54	2.6	31	11.6	2.1	4.9	.6	.3
23	1.6	1.1	13.7	7.2	42	16.0	23	4.5	1.6	2.1	.8	.3
24	1.2	.9	6.9	33	42	52	16.0	11.5	1.8	2.9	1.1	.3
25	1.1	.9	2.4	29	45	42	23	5.4	1.1	6.0	.9	.2
26	1.0	.9	1.5	27	54	39	31	5.5	1.5	1.7	15.2	.2
27	10.0	.8	2.8	13.0	33	22	40	8.5	1.3	1.1	10.2	.2
28	2.4	.7	2.1	14.3	19.2	14.4	42	48	1.1	22	12.7	.2
29	22	.7	1.1	21	11.5	15.2	25	-------	1.0	24	4.4	.2
30	14.0	1.6	1.1	19.5	10.1	5.6	48	-------	.9	6.2	.9	.2
31	5.3	2.1	-------	21	-------	5.6	60	-------	.7	-------	.7	-------

NOTE.—Braced figures show mean discharge estimated by comparison with records of flow of Haipuaena Stream because of lack of gage-height record.

Monthly discharge of Manuel Luis ditch at Puohakamoa Gulch, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	29	----------	6.47	10.0	201	616
August	23	0.7	4.20	6.50	130	400
September	15.3	.6	2.81	4.35	84.3	259
October	33	.4	7.14	11.0	221	679
November	54	----------	17.6	27.2	529	1,620
December	63	2.6	18.9	29.2	585	1,800
January	60	1.5	16.9	26.1	524	1,610
February	48	.9	11.9	18.4	332	1,020
March	51	.7	18.3	28.3	567	1,740
April	24	.6	6.55	10.1	196	603
May	20	.6	4.72	7.30	146	449
June	1.2	.2	.41	.63	12.3	38
The year	63	.2	9.67	15.0	3,530	10,800

66289—26†—WSP 555——10

KOOLAU DITCH AT WAHINEPE, NEAR HUELO, MAUI

LOCATION.—Between Puohakamoa and Waikamoi streams, half a mile below Puohakamoa intake, and 7 miles southeast of Huelo.

RECORDS AVAILABLE.—March 25 to June 30, 1922. East Maui Irrigation Co. previously obtained records at this location.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank across ditch.

CHANNEL AND CONTROL.—Ditch section in rock tunnel; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 5.51 feet at 2 a. m. April 5 (discharge, 119 million gallons per day or 184 second-feet); minimum stage, 1.44 feet from 7 to 10 p. m. June 30 (discharge, 17.3 million gallons per day or 26.8 second-feet).

DIVERSIONS.—Flood water diverted at gage through a cross-cut channel, and at Puohakamoa intake half a mile upstream. Other flood water waste gates along course of ditch.

REGULATION.—Complete regulation by various intake gates and by flood water waste gates.

OBJECT OF STATION.—To determine amount of water diverted through Koolau ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 25 and 80 million gallons per day. Operation of water-stage recorder satisfactory except during period April 24 to May 14. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated, which are fair.

For description of this ditch see Koolau ditch at Nahiku weir, near Nahiku, Maui.

No discharge measurements were made at this station during the year.

Discharge, in million gallons per day, of Koolau ditch at Wahinepe, near Huelo, Maui, for the year ending June 30, 1922

Day	Mar.	Apr.	May	June	Day	Mar.	Apr.	May	June
1		64		52	16		116	49	29
2		70		47	17		104	47	28
3		99		44	18		91	47	26
4		99		39	19		80	47	26
5		119	95	38	20		85	75	26
6		116		35	21		93	49	28
7		116		32	22		101	42	25
8		107		34	23		83	62	24
9		101		36	24			67	22
10		104		35	25	48		52	21
							80		
11		116	70	32	26	83		99	20
12		116		53	27	77		107	19.4
13		116		56	28	72		99	18.4
14		116		37	29	72	100	91	18.4
15		113	52	32	30	67		67	17.5
					31	64		59	

NOTE.—Braced figures show mean discharge for periods indicated; estimated on account of nonoperation of water-stage recorder, by comparison with flow at Puohakamoa intake.

Monthly discharge of Koolau ditch at Wahinepe, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
March 25-31	83	48	69.0	107	483	1,480
April	119	64	98.2	152	2,940	9,040
May		42	73.9	114	2,290	7,030
June	56	17.5	31.7	49.0	951	2,920
The period					6,670	20,500

WAIKAMOI STREAM ABOVE WAILOA DITCH, NEAR HUELO, MAUI

LOCATION.—250 feet above Wailoa ditch intake, one-quarter mile from Spreckels ditch trail, and 4½ miles southeast of Huelo.

RECORDS AVAILABLE.—January 28 to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge at gage or by wading.

CHANNEL AND CONTROL.—One channel at all stages. Banks, high, steep, and covered with vegetation; not subject to overflow. Control, composed of boulders and solid rock; may shift occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 8.26 feet at 11.45 p. m. January 30 (discharge, 1,020 million gallons per day, or 1,580 second-feet); minimum stage, 0.51 foot at 9 a. m. June 30 (discharge, 0.6 gallons per day, or 0.9 second-foot).

DIVERSIONS.—A small amount of water is diverted by Haleakala ranch pipe line above station at elevation 5,300 feet, and by Kula pipe line at elevation 4,300 feet.

REGULATION.—By diversion only.

OBJECT OF STATION.—To determine feasibility of additional diversions or flood storage; also to assist valuation appraisers in relation to Territorial water license to ditch company.

UTILIZATION.—Low water is all diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation practically permanent during period. Rating curve well defined between 1 and 35 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days during which flow remained above about 3 million gallons per day, by means of the discharge integrator. Records below 35 million gallons per day, excellent; others subject to error.

No discharge measurements were made at this station during the year.

Discharge, in million gallons per day, of Waikamoi Stream above Wailoa ditch, near Huelo, Maui, for the year ending June 30, 1922

Day	Jan.	Feb.	Mar.	Apr.	May	June	Day	Jan.	Feb.	Mar.	Apr.	May	June
1	------	161	39	1.8	4.4	2.5	16	------	5.3	9.3	9.0	2.0	1.4
2	------	131	26	2.2	4.7	2.2	17	------	4.4	14.5	9.8	2.0	1.2
3	------	68	50	5.3	8.6	2.1	18	------	3.9	11.5	5.3	2.0	1.1
4	------	28	24	8.2	22	1.9	19	------	3.6	7.3	4.3	2.2	1.1
5	------	17.4	83	29	14.8	1.7	20	------	3.2	5.5	8.4	4.9	1.2
6	------	12.1	145	20	8.8	1.6	21	------	29	5.1	12.2	2.6	1.5
7	------	11.3	189	20	6.6	1.4	22	------	16.3	4.3	11.5	2.1	1.3
8	------	7.9	182	10.4	7.7	1.6	23	------	8.2	3.7	7.6	3.1	1.1
9	------	27	103	20	4.4	1.8	24	------	12.1	3.5	5.4	4.8	1.9
10	------	23	160	12.1	4.3	1.6	25	------	6.4	3.1	7.0	3.2	1.0
11	------	14.2	69	15.6	8.3	1.5	26	------	6.4	2.8	4.6	13.6	.9
12	------	26	37	12.6	4.9	2.6	27	------	19.0	2.6	3.2	9.6	.8
13	------	11.9	24	12.5	3.4	2.8	28	125	162	2.3	22	10.2	.8
14	------	7.9	19.8	8.3	2.7	1.7	29	31	------	2.1	26	7.0	.8
15	------	6.6	12.9	6.1	2.3	1.5	30	236	------	2.1	5.8	3.7	.7
							31	336	------	2.0	------	2.9	------

Monthly discharge of Waikamoi Stream above Wailoa ditch near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
January 28–31	336	31	182	282	728	2,230
February	162	3.2	29.9	46.3	836	2,570
March	189	2.0	40.2	62.2	1,250	3,820
April	29	1.8	10.9	16.9	326	1,000
May	22	2.0	5.93	9.18	184	564
June	2.8	.7	1.48	2.29	44.4	136
The period					3,360	10,320

WAIKAMOI STREAM NEAR HUELO, MAUI

LOCATION.—500 feet above Spreckels ditch intake and 5 miles by trail east of Huelo post office.

RECORDS AVAILABLE.—December 18, 1910, to February 22, 1922, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder installed April 20, 1920. Friez water-stage recorder, October 14, 1913, to April 20, 1920, prior to which, original staff gage at different datum was read twice daily.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage. Banks, high and covered with vegetation. Water drops over a fall at control which is rock ledge covered with boulders. Shifts due to changes in position and number of boulders.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 6.11 feet at midnight January 30 (discharge, 1,780 million gallons per day, or 2,750 second-feet); minimum stage recorded, 0.08 foot from 4 a. m. to 8 p. m. October 21 (discharge, 0.8 million gallons per day, or 1.2 second-feet).

1910–1922: Maximum stage recorded, 7.57 feet at 5 a. m. January 18, 1916 (discharge, from extension of rating curve, 1,800 million gallons per day, or 2,780 second-feet); minimum stage recorded, — 0.40 foot from 1 to 4 p. m. July 14, 1920 (discharge, 0.2 million gallons per day, or 0.3 second-foot).

DIVERSIONS.—A small amount of water is diverted by Haleakala ranch pipe line above station at elevation 5,300 feet and by Kula pipe line at elevation 4,300 feet.

Regulation.—By diversion only.

Object of station.—To determine feasibility of additional diversions or flood storage; also to assist valuation appraisers in relation to Territorial water license to ditch company.

Utilization.—Low water is all diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

Accuracy.—Stage-discharge relation changed July 19. Rating curves used July 1–19 and July 20 to February 22, fairly well defined below 250 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated. At medium and high stages, and especially while it is raining, water is spilled into the stream above the station from New Hamakua ditch. Except for low flow, therefore, the flow at this station is not the true flow of the stream.

Discharge measurements of Waikamoi Stream near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Oct. 8	W. C. Renshaw	0.38	3.9	2.5	Jan. 14	S. B. Hall	0.74	11.2	7.2
Jan. 5	E. M. Pickop	1.03	24	15.5	16	Karl Jetter	.55	7.9	5.1

Discharge, in million gallons per day, of Waikamoi Stream near Huelo, Maui, for the period July 1, 1921, to February 22, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
1			4.5	2.8	7.3	13.8	8.7	304
2			3.7	7.0	14.4	9.2	7.0	229
3			3.3	3.6	30	130	6.3	91
4			3.3	2.5	10.9	81	18.9	33
5			5.2	2.0	5.9	27	26	22
6		11.5	4.6	1.8	4.1	27	15.4	15.0
7			3.8	1.9	3.3	13.0	9.2	13.4
8	6.5		3.8	2.3	3.0	8.7	9.5	11.2
9			10.4	1.7	3.7		8.1	30
10			10.1	1.4	4.3	5.5	6.3	27
11			4.2	1.4	2.8		5.4	16.6
12		23	3.6	1.2	2.7		5.0	29
13		15.0	3.2	1.1	3.0	280	13.0	13.8
14		8.4	3.1	1.0	2.8		11.4	9.8
15		5.9	11.4	1.0	2.2	24	5.6	8.1
16		5.4	13.4	1.5	1.9		4.6	6.5
17		5.0	10.2	1.1	1.8	170	5.2	5.6
18		4.8	5.9	1.0	1.6		7.5	5.2
19		35	4.3	.9	95	25	30	4.8
20		11.2	4.0	.9	137	13.8	33	4.3
21	25	9.8	5.4	.8	342	9.8	93	31
22		9.8	42	.9	512	8.1	52	27
23		5.4	33	6.9	158	25	38	-------
24		4.8	11.8	72	157	294	26	-------
25		4.3	7.8	39	144	130	39	-------
26		4.1	6.5	28	258	103	72	-------
27		4.0	6.3	10.6	63	34	208	-------
28		3.8	13.6	9.8	25	16.6	225	-------
29	18.5	3.6	2.9	13.4	15.8	16.2	40	-------
30		7.3	2.6	22	12.6	12.0	449	-------
31		7.8	-------	17.6	-------	11.2	629	-------

Note.—Braced figures show mean discharge estimated, because of lack of gage-height record, by comparison with records of flow of adjacent stream.

Monthly discharge of Waikamoi Stream near Huelo, Maui, for the period July 1, 1921, to February 22, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July			15.6	24.1	484	1,480
August			9.84	15.2	305	936
September	42	2.6	8.26	12.8	248	760
October	72	.8	8.36	12.9	259	795
November	512	1.6	67.5	104	2,030	6,210
December			72.7	112	2,250	6,920
January	629	4.6	68.0	105	2,110	6,470
February 1–22	304	4.3	42.6	65.9	937	2,880
The period					8,620	26,500

EAST BRANCH OF WAIKAMOI STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—200 feet above Haiku-uka boundary-line trail crossing, at elevation 3,020 feet, 5½ miles east of Kailiili.

RECORDS AVAILABLE.—May 28, 1918, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge just above control.

CHANNEL AND CONTROL.—Channel has gravel and boulder bed with steep high banks of hardpan. Control is broad-crested concrete weir, completed June 3, 1922; permanent for low stages but drowned out at high stages. Old control, composed of large boulders and gravel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.45 feet at midnight January 31 (discharge, 220 million gallons per day or 340 second-feet); minimum stage recorded, 3.92 feet at 3 p. m. June 29 (discharge, 0.2 million gallons per day or 0.3 second-foot).

1918–1922: Maximum stage recorded, 7.92 feet at 5.20 p. m. March 22, 1920 (discharge, 230 million gallons per day or 356 second-feet); minimum stage recorded, 3.77 feet April 15, 1919 (discharge, 0.07 million gallons per day or 0.11 second-foot).

DIVERSIONS.—A little water is diverted above station by Kula pipe line.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple lands above and Territorial lands below.

UTILIZATION.—Water diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed June 3, 1922, by construction of artificial control. Rating curve used prior to that date, fairly well defined between 0.5 and 5 million gallons per day; curve used subsequent to that date, well defined between 0.3 and 15 million gallons. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good.

Discharge measurements of East Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30,1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 30	W. C. Renshaw	4.19	1.45	0.9
Feb. 14	S. B. Hall	4.39	4.3	2.8
June 7	Karl Jetter	3.96	.5	.3

Discharge, in million gallons per day, of East Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.4	4.6	1.0	1.6	2.2	3.6	1.8	41	7.8	0.9	1.8	0.8
2	1.1	8.2	.6	2.4	7.6	2.2	1.6	32	10.1	1.0	2.2	
3	4.3	3.7	.5	1.3	9.5	21	1.5		13.3	2.9	4.8	.4
4	2.9	2.6	.5	.9	3.7	13.4	5.4		5.4	5.9	1.5	.4
5	1.4	2.5	1.5	.8	1.9	8.2	3.4		21	7.9	5.4	.4
6	1.2	1.9	1.0	.6	1.5	5.8	1.9		47	7.4	3.1	.3
7	.8	2.3	.7	.9	1.4	2.5	1.5		50	4.8	2.3	.3
8	1.9	1.8	.7	1.1	1.3	1.9	1.6	6.5	45	2.9	1.8	.3
9	1.0	1.2	2.6	.7	3.0	1.6	1.4		31	5.1	1.6	.4
10	.7	1.0	1.8	.6	1.8	1.5	1.2		47	4.2	2.8	.4
11	.7	4.3	.8	.5	1.2	1.3	1.0		19.6	4.1		.3
12	.5	10.8	.6	.5	1.2	35	1.1		7.4	3.6	1.4	.4
13	.4	2.5	.5	.4	1.5	54	3.3		6.8	3.1	1.2	.6
14	.5	1.6	.5	.4	1.4	13.6	1.9	3.0	4.9	2.3	1.1	.4
15	6.2	1.3	1.7	.3	1.0	3.4	1.1	2.5	3.8	1.9	1.0	.4
16	7.7	1.1	2.4	.5	.8	2.2	1.2	2.3	3.1	3.5	.9	.3
17	11.0	1.0	1.2	.3	.7	18	1.2	2.0	4.7	2.6	.9	.3
18	16.4	1.0	1.1	.3	.7		2.1	1.9	3.0	2.0	1.0	.3
19	21	4.7	.8	.3	31	4.1	6.0	1.7	2.4	1.7	1.0	.3
20	7.2	1.5	.8	.3	30	2.8	8.2	1.6	2.3	4.7	2.6	.3
21	2.4	1.5	1.3	.3	65	2.0	17.4	10.6	2.0	4.7	1.2	.4
22	1.8	2.0	12.1	.3	67	1.9	9.0	3.8	1.7	4.0	1.0	.3
23	1.8	1.1	3.7	6.7	38	4.4	6.0	2.9	1.6	2.6	1.8	.3
24	1.9	.9	1.9	26	39	41	5.6	3.1	1.5	2.0	2.4	.3
25	1.6	.8	1.7	13.8	42	24	6.2	2.2	1.3	2.8	1.6	.3
26	1.4	.8	1.2	8.9	57	19.2	16.7	2.3	1.2	1.8	5.8	.3
27	7.3	.9	1.3	2.9	11.8	4.6	34	12.1	1.2	1.5	3.1	.3
28	2.4	.7	1.4	4.2	4.6	3.4	24	42	1.1	13.3	3.5	.2
29	7.3	.7	1.3	4.4	3.1	3.7	4.6	-------	1.0	6.6	1.8	.2
30	4.2	2.2	1.0	10.7	2.8	2.5	50	-------	.9	2.0	1.0	.2
31	4.8	1.9	-------	4.5	-------	2.0	57	-------	.9	-------		-------

NOTE.—Discharge estimated Feb. 3–13 by comparison with records of flow of adjacent streams because of lack of gage-height record; discharge estimated May 30 to June 2 on account of changes in stage-discharge relation caused by construction of artificial control. Braced figures show mean discharge for periods indicated.

Monthly discharge of East Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	21	0.4	4.01	6.20	124	381
August	10.8	.7	2.36	3.65	73.1	225
September	12.1	.5	1.61	2.49	48.2	148
October	26	.3	3.14	4.86	97.4	299
November	67	.7	14.3	22.1	429	1,320
December	54	1.3	10.4	16.1	323	989
January	57	1.0	9.00	13.9	279	856
February	42	1.6	8.52	13.2	238	732
March	50	.9	11.3	17.5	350	1,080
April	13.3	.9	3.79	5.86	114	349
May	6.5	----------	2.27	3.51	70.4	216
June	----------	.2	.36	.56	10.9	33
The year	67	.2	5.91	9.14	2,160	6,630

WEST BRANCH OF WAIKAMOI STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At Haiku-uka boundary-line trail crossing, at elevation 3,000 feet, 5 miles east of Kailiili.

RECORDS AVAILABLE.—May 28, 1918, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 35 feet above gage.

CHANNEL AND CONTROL.—Channel is solid rock with steep rock and hardpan banks. Control is solid rock ledge.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.42 feet at 10 p. m. January 30 (discharge, 730 million gallons per day, or 1,130 second-feet); minimum stage recorded, 0.43 foot at 2.30 a. m. June 30 (discharge, 0.40 million gallons per day or 0.60 second-foot).

1918–1922: Maximum stage recorded, 9.85 feet at noon December 6, 1918 (discharge, 2,020 million gallons per day or 3,130 second-feet); minimum stage recorded, 0.33 foot at 8.30 p. m. December 22, 1919 (discharge, 0.06 million gallons per day or 0.09 second-foot).

DIVERSIONS.—A small amount of water is diverted by Haleakala ranch pipe line above station at elevation 5,300 feet and by Kula pipe line at elevation 4,300 feet.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple lands above and Territorial lands below.

UTILIZATION.—Water diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 1 and 150 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated.

Discharge measurements of West Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 29	W. C. Renshaw	0.56	1.45	0.95
Feb. 14	S. B. Hall	.68	5.3	3.4

Discharge, in million gallons per day, of West Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.6	7.5	1.1	1.3	7.0	5.3	3.0	145	22	0.8	1.7	1.1
2	.8		.9	2.1		3.3	2.5	128	20	.9	1.7	1.1
3	3.5		.8	1.5		90	2.1	59	30	1.8	7.3	.9
4	2.8		.7			69	7.5	14.8	7.6	5.0	12.6	.9
5	1.5		1.3			20	9.1	8.2	48	14.0	7.6	.7
6	1.2	2.5	1.1	1.0		15.3	3.2		163	14.8	4.5	.7
7	.9		.8			5.8	2.3		195	15.0	2.8	.7
8	1.4		.8			3.8	2.1		194	5.8	2.0	.8
9	1.0		1.5			2.8	1.8		93	19.7	1.6	.8
10	.8		2.0	.7		2.5	1.7	6.0	162	6.9	2.6	.8
11	.8	7.0	1.0		1.8	2.0	1.5		41	7.9	4.5	.8
12	.7	16.3	.8			111	1.6		16.1	4.8	2.5	1.0
13	.6	3.0	.7			282	4.4		11.8	3.3	1.6	1.1
14	.6	1.7	.7			55	3.0	3.2	8.2	2.3	1.2	.9
15	6.0	1.4	1.0			10.7	1.7	2.8	5.2	2.0	1.0	.9
16	16	1.2	2.3		.9	5.5	1.6	2.3	3.8	4.5	.9	.8
17		1.1	1.4	.4		37	1.7	2.1	8.5	4.5	.8	.8
18		1.1	1.1			57	2.6	2.0	4.5	2.1	.8	.7
19		3.3	.9		60	10.3	15.5	1.8	2.3	1.6	.9	.7
20		1.6	.8		72	5.5	14.0	1.7	2.1	5.5	1.8	.7
21	2.3	1.3	1.2	19	167	4.0	54	26	2.0	8.2	1.1	1.0
22		1.5	18.4		323	3.5	32	11.0	1.7	7.6	1.0	.9
23		1.2	8.1		154	18.6	20	4.0	1.5	4.0	1.3	.7
24		1.1	2.6		133	131	18.5	4.2	1.5	2.5	2.0	.7
25		1.0			107	82	21	3.0	1.3	3.0	1.3	.7
26	6.5	.9	1.5	6.0	229	58	66	3.0	1.2	2.1	6.4	.6
27		.9			32	13.4	137	36	1.1	1.5	5.0	.6
28		.8			11.0	7.6	112	162	1.0	10.3	4.2	.5
29		.8		7.6	6.3	7.6	17.0	-------	1.0	8.5	2.8	.5
30		1.7	1.2	14.4	4.2	4.8	237	-------	1.0	2.3	1.4	.4
31		1.6	-------	6.0	-------	3.8	250	-------	.9	-------	1.2	-------

NOTE.—Braced figures show mean discharge estimated by comparison with flow of adjacent streams because of lack of gage-height record.

Monthly discharge of West Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July		0.6	4.82	7.46	150	459
August		.8	2.92	4.52	90.5	278
September	18.4	.7	2.02	3.13	60.7	186
October			4.27	6.61	132	406
November	323		45.0	69.6	1,350	4,140
December	282	2.0	36.4	56.3	1,130	3,460
January	250	1.5	33.8	52.3	1,050	3,220
February	162	1.7	23.9	37.0	668	2,050
March	195	.9	33.9	52.5	1,050	3,230
April	19.7	.8	5.77	8.93	173	531
May	12.6	.8	2.84	4.39	88.1	270
June	1.1	.4	.78	1.21	23.5	72
The year	323		16.3	25.2	5,970	18,300

ALO STREAM NEAR HUELO, MAUI

LOCATION.—300 feet above inflow of Spreckels ditch and trail crossing and 5 miles east of Huelo.

RECORDS AVAILABLE.—December 18, 1910, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder installed April 5, 1920, to replace Friez water-stage recorder installed June 18, 1914. Prior to June 18, 1914, vertical staff at trail bridge 300 feet downstream from present site. Datum lowered 0.05 foot May 19, 1922.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Channel at gage, in a fairly large pool at foot of rapids. Banks, steep and high. Control, at outlet of pool, composed of rock ledge and large boulders; shifts only in severe floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.60 feet at 8.30 a. m. January 31 (discharge, 380 million gallons per day or 588 second-feet); minimum stage recorded, 0.40 foot at 7 a. m. July 2 (discharge, 0.4 million gallons per day, or 0.6 second-foot).

1910–1922: Maximum stage recorded, 4.35 feet at 7 p. m. December 9, 1916 (discharge, from extension of rating curve, 638 million gallons per day, or 987 second-feet); minimum stage recorded, 1.34 feet (old datum) November 4, 1911 (discharge, 0.06 million gallons per day, or 0.1 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—Ordinary flow diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed by flood of January 31, and by change in gage datum May 19. Rating curve used prior to January 31, well defined between 2 and 60 million gallons per day; curve used subsequent to January 31, well defined between 2 and 10 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good.

Discharge measurements of Alo Stream near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Oct. 8	W. C. Renshaw	0.60	2.1	1.35
Feb. 15	Karl Jetter	.74	3.1	2.0

Discharge, in million gallons per day, of Alo Stream near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.6	5.8	1.6	3.5	3.9	3.8	3.5	55	7.7	0.7	1.4	1.2
2	.7	10.5	1.4	4.8	9.9	3.0	3.0	19.5	5.0	1.0	1.4	1.1
3	4.6	5.4	1.3	2.6	10.3	16.6	2.6	13.5	19.0	1.3	2.7	1.0
4	2.8	3.6	1.2	2.1	3.9	7.7	2.3	8.7	23	1.5	3.2	1.0
5	1.3	3.5	2.0	1.9	3.0	4.3		5.4	65	17.1	4.1	.9
6	1.1	2.8	1.9	1.8	2.5	3.9		4.3	36	4.4	1.9	.8
7	1.0	5.2	1.5	1.8	2.3	3.2	7.5	3.5	34	6.2	2.1	.8
8	2.7	3.0	1.8	1.5	2.0	2.7		2.8	45	2.5	8.7	.9
9	1.2	2.4	2.6	1.4	2.0	2.2		10.9	25	1.8	2.1	.9
10	1.2	2.2	2.0	1.3	1.8	2.0	2.7	9.5	40	4.6	2.1	.8
11	1.2	5.0	1.5	1.2	1.8	1.9	2.4	7.2	29	6.8	1.6	.8
12	.9	9.0	1.4	1.1	2.0	36	2.3	6.0	13.7	8.0	1.5	1.6
13	1.0	3.4	1.4	1.0	2.6	92	6.3	3.5	10.1	13.3	1.4	1.6
14	.9	3.0	1.4	.9	1.9	22	3.0	2.6	5.4	6.0	1.1	.9
15	4.1	2.4	4.3	.9	1.5	5.7	2.1	2.1	4.5	3.6	1.1	.8
16	5.8	2.1	3.1	1.9	1.4	3.6	2.0	1.7	3.2	6.3	1.0	.7
17	9.1	2.0	3.5	1.2	1.4	16.8	1.9	1.5	5.1	3.0	.9	.7
18	16.3	2.0	2.5	.9	1.3	42	4.1	1.4	2.4	2.2	.9	.6
19	11.2	12.5	2.0	.8	55	5.3	17.4	1.2	2.0	1.8	.9	.6
20	5.4	3.0	2.1	.8	46	3.5	15.1	1.1	1.8	1.6	1.3	.6
21	3.4	3.0	2.5	.7	85	3.1	16.2	11.8	1.5	1.4	.8	.7
22	3.3	2.8	8.4	.7	24	2.6	7.2	2.7	1.4	2.1	.8	.6
23	2.7	2.1	6.0	2.4	11.5	5.3	6.7	2.9	1.3	1.3	1.2	.6
24	2.4	2.0	4.7	14.2	14.3	76	5.3	8.5	1.2	2.5	1.4	.6
25	2.4	1.8	3.1	12.1	30	32	6.9	2.4	1.1	2.6	1.2	.6
26	2.0	2.0	2.8	8.0	29	19.6	10.9	1.9	1.0	1.3	4.9	.6
27	4.8	1.6	3.1	4.3	13.7	6.7	31	2.3	.9	1.2	2.6	.5
28	3.1	1.4	2.8	6.7	6.7	4.9	40	41	.8	8.3	4.9	.5
29	15.7	1.4	2.2	5.8	4.5	5.3	10.5	-------	.9	7.9	1.8	.5
30	6.5	2.6	2.3	5.8	3.9	3.9	69	-------	.8	1.6	1.4	.5
31	3.8	2.8	-------	5.4	-------	4.5	116	-------	.8	-------	1.4	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated by comparison with flow of adjacent streams, because of lack of gage-height record.

Monthly discharge of Alo Stream near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	16.3	0.6	3.97	6.14	123	378
August	12.5	1.4	3.62	5.60	112	344
September	8.4	1.2	2.61	4.04	78.4	240
October	14.2	.7	3.21	4.97	99.5	305
November	85	1.3	12.6	19.5	379	1,160
December	92	1.9	14.3	22.1	442	1,360
January	116	1.9	13.8	21.4	428	1,310
February	55	1.1	8.39	13.0	235	721
March	65	.8	12.5	19.3	389	1,190
April	17.1	.7	4.13	6.39	124	380
May	8.7	.8	2.06	3.19	63.8	196
June	1.6	.5	.80	1.24	24.0	74
The year	116	.5	6.84	10.6	2,500	7,660

SPRECKELS DITCH BELOW KAAIEA GULCH, NEAR HUELO, MAUI

LOCATION.—1,000 feet below intake in Kaaiea Stream and 2½ miles by trail southeast of ditch superintendent's house at Huelo.

RECORDS AVAILABLE.—December 15, 1917, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Ditch section below gage. During heavy rains stage-discharge relation is affected by two small streams which enter ditch a short distance below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.55 feet at 10.30 a. m. November 21 (discharge, 96 million gallons per day, or 149 second-feet); minimum stage recorded, 0.24 foot from 3 to 5 p. m. June 29 (discharge, 0.04 million gallons per day, or 0.06 second-foot).

1917–1922: Maximum stage recorded, 5.65 feet at 7.30 p. m. January 16, 1921 (discharge, 110 million gallons per day or 170 second-feet); minimum stage recorded, no flow, when water is occasionally turned out of ditch.

DIVERSIONS.—Ditch diverts water from a dozen or more streams east of Nailiilihaele.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—To determine discharge of ditch at boundary between Territorial lands above and fee simple lands below.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent. Rating curve used July 1 to January 31 well defined between 2 and 30 million gallons per day; standard curve used February 1 to June 30, well defined below 40 million gallons per day; shifting-control method used February 1 to June 30. Operation of water-stage recorder satisfactory, except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for period for which shifting-control method was used for which it was ascertained by applying to the amounts thus obtained a correction based upon the plotting of individual measurements with respect to the standard curve. Records fair.

Spreckels ditch diverts water from all streams on the windward side of the crater of Haleakala between Nuaailua Gulch and Kailua Stream. It diverts above Koolau ditch as far as Puohakamoa Stream. Beyond Puohakamoa Stream to Kailua Stream it diverts below Koolau (Wailoa) and New Hamakua ditches, and above Center ditch. At Kailua Stream the water is diverted into Lowrie ditch and carried to the vicinity of Paia for irrigation of sugar cane. Spreckels ditch proper is about 6 miles long and has a maximum carrying capacity of 45 million gallons per day. It was originally one of the main irrigation ditches on East Maui but with the completion of Koolau and Haiku ditches it was abandoned west of Kailua Stream and became mainly a storm-water ditch east of Kailua Stream.

Discharge measurements of Spreckels ditch below Kaaiea Gulch, near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Oct. 4	W. C. Renshaw	0.90	6.8	4.4
Feb. 16	Karl Jetter	.69	1.4	.9

Discharge, in million gallons per day, of Spreckels ditch below Kaaiea Gulch, near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		30	7.6	4.7	10.0	10.9	2.6	37	3.6	0.6	0.9	0.2
2	12	36	5.9	11.7	10.5	8.6	2.3	28	2.5	.7	.9	.2
3		32	5.2	6.2	20	13.3	2.2	22	7.6	.6	1.1	.2
4	16.5	28	5.4	4.4	13.3	13.3	7.3	14.4	6.6	.6	2.1	.2
5	7.8	28	12.5	3.8	8.5	12.5	4.7	11.0	34	2.4	.8	.2
6	6.6	23	10.9	3.4	6.5	12.5	3.9	8.5	14.4	1.0	.4	.2
7	5.5	26	6.2	3.6	5.7	10.1	2.8	7.2	16.1	4.2	.2	.2
8	11.7	23	6.5	3.9	5.0	8.6	2.7	5.8	19.9	1.6	.7	.2
9	6.8	14.9	14.7	3.2	5.3	6.9	2.6	15.9	9.1	.9	.2	.2
10	6.1	10.9	18.1	2.8	6.9	5.9	2.4	13.6	21	1.1	.2	.2
11	5.5	20	6.6	2.7	4.4	5.1	2.2	11.0	11.7	2.2	.2	.2
12	4.7	32	5.2	2.5	4.3	15.4	2.1	10.6	4.5	2.6	.3	.2
13	5.2	26	4.8	2.3	4.8	32	6.8	6.9	3.7	4.0	.3	.2
14	4.7	22	5.1	2.3	4.4	8.2	3.3	3.5	2.6	2.3	.3	.2
15	16.7	14.1	16.1	2.2	3.3	4.3	2.4	1.1	2.2	1.6	.2	.2
16	28	10.1	22	3.3	2.9	3.7	2.2	.9	1.7	2.3	.2	.1
17	32	8.9	20	2.7	2.8	6.4	2.2	.9	2.2	1.7	.2	.1
18	34	8.9	14.9	2.2	2.6	14.9	3.3	.6	1.7	1.6	.2	.1
19	30	29	8.5	2.1	22	4.5	11.6	.3	1.3	1.7	.3	.1
20	28	19.1	7.5	2.0	38	3.7	13.5	.2	1.3	1.6	.6	.1
21	28	14.9	11.7	2.0	45	2.8	18.3	5.5	1.1	1.6	.4	.1
22	26	19.1	18.5	2.0	11.7	2.4	11.7	.3	1.0	1.5	.2	.1
23	20	10.9	30	6.6	7.1	3.7	10.1	.5	1.0	1.3	.4	.1
24	15.7	9.0	16.1	22	9.5	31	8.6	1.7	.9	1.4	.5	.1
25	14.1	8.0	7.1	22	14.9	13.3	10.9	.2	.8	1.7	.5	.1
26	9.5	7.8	6.1	22	15.7	6.6	13.3	.2	.7	1.2	3.1	.1
27	27	7.2	6.4	13.3	14.9	4.7	20	.2	.7	1.0	.6	.1
28	24	6.5	6.1	13.3	13.3	3.9	27	20	.7	2.6	.4	.05
29	38	6.5	5.2	16.5	11.7	3.7	11.7	-------	.7	2.8	.3	.05
30	34	14.1	5.1	14.7	10.1	3.4	31	-------	.6	.9	.2	.05
31	28	16.5	-------	17.4	-------	3.3	55	-------	.6	-------	1.2	-------

NOTE.—Braced figure shows mean discharge for period indicated, estimated by comparison with flow of adjacent streams because of lack of gage-height record.

Monthly discharge of Spreckels ditch below Kaaiea Gulch, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	38	4.7	17.7	27.4	550	1,680
August	36	6.5	18.1	28.0	562	1,720
September	30	4.8	10.5	16.2	316	967
October	22	2.0	7.22	11.2	224	687
November	45	2.6	11.2	17.3	335	1,030
December	32	2.4	9.02	14.0	280	858
January	55	2.1	9.70	15.0	301	923
February	37	.2	8.14	12.6	228	699
March	34	.6	5.69	8.80	176	541
April	4.2	.6	1.71	2.65	51.3	157
May	3.1	.2	.58	.90	18.1	55
June	.2	.05	.145	.224	4.35	13
The year	55	.05	8.35	12.9	3,050	9,330

CENTER DITCH AT WAIKAMOI, NEAR HUELO, MAUI

LOCATION.—250 feet below intake on Waikamoi Stream and 4 miles by trail east of Huelo. Station moved half a mile downstream on May 9, 1922; records not comparable; see "Center ditch below Kolea reservoir, near Huelo, Maui."

RECORDS AVAILABLE.—March 6, 1918, to April 30, 1922, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Channel composed of rock and hardpan; straight for 30 feet above and 10 feet below gage. Control formed by plank set on edge in bottom of ditch 5 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.11 feet at noon November 21 (discharge, 81 million gallons per day, or 141 second-feet); minimum stage recorded, 0.36 foot from 6 to 12 a. m. February 2 (discharge, 1.0 million gallons per day, or 1.6 second-feet).

1918–1922: Maximum stage recorded, 4.10 feet at 5 a. m. December 25, 1920 (discharge, 94 million gallons per day, or 145 second-feet); minimum stage, ditch dry, December 4, 1918, and January 16, 1919.

DIVERSIONS.—Ditch diverts water that arises in streams below or passes Spreckels ditch.

REGULATION.—Flow regulated by head gates.

OBJECT OF STATION.—The discharge at this station less the discharge at the Manuel Luis ditch station gives amount of water diverted from Territorial lands under water license No. 974.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 15 million gallons per day; extended above on basis of form of previous curve. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection, or for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records excellent.

Center ditch, at elevation about 500 feet, diverts below all other main ditches on the windward side of the crater of Haleakala between Waikamoi and Kailua streams. It picks up the water from Manuel Luis ditch (see Manuel Luis ditch at Puohakamoa Gulch, near Huelo) at Waikamoi Stream. At Kailua Stream the flow of the ditch is diverted into Lowrie ditch and carried to a point near Paia where it is used for irrigation of sugar cane. Center ditch proper is about 3 miles long and has a carrying capacity of 100 million gallons per day.

Discharge measurements of Center ditch at Waikamoi, near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Oct. 6	W. C. Renshaw	0.64	4.4	2.9
Feb. 17	Karl Jetter	.94	9.0	5.8

Discharge, in million gallons per day, of Center ditch at Waikamoi, near Huelo, Maui, for the period July 1, 1921, to April 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1	9.5	18.0	2.4	4.5	13.4	14.5	8.6	1.4	40	2.2
2		55	2.0	21	14.1	8.6	6.4	3.2	37	2.6
3		31	1.9	6.6	31	31	6.8	5.6	46	6.9
4	6.3	9.5	2.0	4.0	18.0	52	23	4.9	34	6.4
5	1.9	9.9	2.9	3.3	9.0	31	24	4.8	58	24
6	1.6	6.2	2.4	3.0	5.8	32	13.4	6.4	52	16.3
7	1.5	16.5	2.2	3.1	4.6	14.5	7.5	7.2	52	16.9
8	4.4	6.1	2.5	2.9	4.0	9.9	9.5	6.8	55	10.4
9	1.7	4.2	6.9	2.5	3.1	8.5	7.2	7.0	58	15.8
10	1.6	4.0	9.6	2.2	4.2	9.9	5.2	6.8	58	9.3
11	1.5	16.4	2.4	2.1	2.7	7.6	5.6	6.4	55	12.0
12	1.3	57	2.0	1.8	4.5	18.0	7.0	6.5	43	12.2
13	1.3	11.8	1.9	1.7	5.8	14.3	15.7	6.1	36	14.2
14	1.2	6.4	1.7	1.6	3.2	22	11.2	5.9	28	11.8
15	22	4.1	9.1	1.5	2.0	22	6.7	6.3	21	9.9
16	42	3.6	10.2	2.2	1.8	13.4	5.9	6.1	18.0	11.4
17	61	3.4	6.2	1.6	1.6	32	5.6	6.4	24	9.5
18	67	3.2	3.4	1.4	1.6	61	11.8	6.2	16.8	7.0
19	67	39	2.5	1.2	31	31	36	4.4	13.0	5.1
20	58	7.0	3.7	1.2	64	18.0	44	4.1	10.6	6.4
21	21	5.0	13.1	1.1	68	12.8	64	23	9.9	8.5
22	6.4	6.1	36	1.1	31	8.6	49	26	7.6	9.3
23	4.7	3.6	38	7.8	50	31	40	11.8	6.7	4.3
24	3.7	3.4	14.2	54	76	55	29	23	6.2	4.6
25	3.6	3.2	5.1	45	73	52	37	12.4	5.4	9.9
26	3.2	3.2	4.0	32	49	49	55	12.0	5.5	3.8
27	7.6	2.8	5.4	16.8	46	31	73	13.5	4.8	2.8
28	6.6	2.4	4.3	16.8	30	20	73	55	4.1	21
29	56	2.4	3.1	23	16.8	20	43	-------	2.8	31
30	38	3.8	3.0	26	15.6	10.3	55	-------	2.4	13.4
31	12.0	4.2	-------	25	-------	9.9	12.4	-------	2.2	-------

NOTE.—Braced figure shows mean discharge for period indicated, estimated because of lack of gage-height record.

Monthly discharge of Center ditch at Waikamoi, near Huelo, Maui, for the period July 1, 1921, to April 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	67	1.2	17.2	26.6	533	1,640
August	57	2.4	11.4	17.6	352	1,080
September	38	1.7	6.80	10.5	204	626
October	54	1.1	10.3	15.9	318	980
November	76	1.6	22.7	35.1	681	2,090
December	61	7.6	24.2	37.4	751	2,300
January	73	5.2	25.5	39.5	792	2,430
February	55	1.4	10.3	15.9	289	885
March	68	2.2	26.2	40.5	813	2,490
April	51	2.2	10.6	16.4	319	976
The period					5,050	15,500

CENTER DITCH BELOW KOLEA RESERVOIR, NEAR HUELO, MAUI

LOCATION.—200 feet below headgates at spillway crossing of Kolea reservoir, half a mile below intake in Waikamoi Stream, and 3½ miles by trail east of Huelo. Prior to May 1, 1922, station was half a mile upstream near intake in Waikamoi Stream; records not comparable; see "Center ditch at Waikamoi, near Huelo, Maui."

RECORDS AVAILABLE.—May 9 to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank just above gage or by wading.

CHANNEL AND CONTROL.—Channel slightly curved in immediate vicinity of gage, developing into somewhat sharper curve below gage. Bed composed of rock and hardpan. Control formed by excavated ditch section; may shift slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 2.58 feet at 7.45 p. m. May 26 (discharge, 32 million gallons per day, or 50 second-feet); minimum stage recorded, 0.79 foot for several hours June 30 (discharge, 1.7 million gallons per day, or 2.6 second-feet).

DIVERSIONS.—Ditch diverts water that arises in streams below or passes Spreckels ditch.

REGULATION.—Flow regulated by head gates and by release of water from Kolea reservoir. The flow at this station is the same as that at the old station at Waikamoi except for the occasional addition of water from Kolea reservoir.

OBJECT OF STATION.—The discharge at this station less the discharge at the Manuel Luis ditch station gives amount of water diverted from Territorial lands under water license No. 974.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 45 million gallons per day; contains a reversal between 3 and 7 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records excellent.

For a description of this ditch see Center ditch at Waikamoi, near Huelo.
No discharge measurements were made at this station during the year.

Discharge, in million gallons per day, of Center ditch below Kolea reservoir, near Huelo, Maui, for the year ending June 30, 1922

Day	May	June	Day	May	June	Day	May	June
1		5.0	11	10.3	3.8	21	5.2	2.7
2	9.5	4.7	12	9.8	5.2	22	5.3	2.4
3		4.5	13	10.3	6.9	23	6.4	2.2
4		4.5	14	6.0	4.3	24	7.4	2.2
5		4.3	15	5.9	3.1	25	5.9	2.1
6	25	4.0	16	5.4	2.7	26	22	2.0
7		3.8	17	5.2	2.6	27	21	1.9
8		4.0	18	5.0	2.5	28	17.2	1.9
9	8.0	4.5	19	4.7	2.4	29	13.0	1.8
10	10.3	4.0	20	8.9	2.5	30	6.6	1.7
						31	5.5	

NOTE.—Braced figures show mean discharge for periods indicated; estimated from record furnished by East Maui Irrigation Co. because of lack of gage-height record.

Monthly discharge of Center ditch below Kolea reservoir, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
May		4.7	11.6	17.9	359	1,100
June	6.9	1.7	3.34	5.17	100	308
The period					459	1,410

NAILILIHAELE STREAM NEAR HUELO, MAUI

LOCATION.—200 feet above Wailoa ditch intake, 700 feet above New Hamakua ditch trail, and 3 miles south of Huelo.

RECORDS AVAILABLE.—October 8, 1913, to June 30, 1918, and August 6, 1919, to June 30, 1922. Also at old staff-gage station below New Hamakua ditch from December 9, 1910, to December 31, 1912.

GAGE.—Stevens continuous water-stage recorder installed December 13, 1917, replacing original Barrett and Lawrence water-stage recorder. Datum lowered 0.50 foot March 20, 1922, to eliminate negative gage heights.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge just above gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage. Stream bed, very rough and steep. Banks, steep and high and covered with dense vegetation. Control, concrete and large boulders; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.23 feet at 2 a. m. February 1 (discharge, 940 million gallons per day, or 1,450 second-feet); minimum stage recorded, −0.29 foot from 3 to 10 p. m. July 14 (discharge, 1.5 million gallons per day, or 2.3 second-feet).

1913–1922: Maximum stage recorded, 6.3 feet at 6.30 p. m. May 1, 1916 (discharge, from extension of rating curve, 1,800 million gallons per day, or 2,780 second-feet); minimum stage recorded, −0.52 foot from 11 a. m. to 7 p. m. July 14, 1920 (discharge, 0.45 million gallons per day, or 0.7 second-foot).

DIVERSIONS.—Low flow of left branch of stream diverted above station by Old Hamakua ditch from about March 1, 1918, to February 28, 1922.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of additional diversions or flood storage. Also to assist valuation appraisers in relation to Territorial water license to ditch company.

UTILIZATION.—Ordinary flow is diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 0.5 and 80 million gallons per day. Operation of water-stage recorder unsatisfactory at times. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection, or for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated.

Discharge measurements of Nailiilihaele Stream near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Oct. 4	W. C. Renshaw	0.06	10.1	6.5	Feb. 18	S. B. Hall	0.18	19.8	12.8
Jan. 6	S. B. Hall	.31	26.5	17.0	June 26	Karl Jetter	[a].38	4.8	3.1

[a] Gage datum lowered 0.5 foot Mar. 20, 1922.

Discharge, in million gallons per day, of Nailiilihaele Stream near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		19.5	4.8		15.6	17.8	17.2	159		8.5	15.6	10.8
2	6	39	4.1	9.5	29	13.0	13.0	88		10.3	15.1	10.3
3		22	3.8		37	52	11.6	70		16.5	19.7	9.4
4	7.9	13.5	3.8	7.3	15.6	40	17.3	41	60	16.2	31	8.2
5	3.3	13.0	6.1	7.0	12.1	22	55	30		68	32	7.6
6	2.5	10.3	5.8	5.8	10.3	23	23	22		31	19.4	7.0
7	2.2	14.1	4.5	6.4	9.0	14.6	14.6	20	149	28	18.3	6.7
8	5.5	9.8	4.1	6.1	8.2	12.6	17.8	17.2	157	21	32	7.0
9	2.6	7.9	7.3	4.8	7.6	11.2	13.5	46	121	19.4	16.2	7.6
10	2.5	7.0	6.1	4.3	7.3	9.4	12.1	42	176	27	17.2	6.7
11	2.4	11.2	4.1	4.0	6.1		9.8	32	127	37	15.6	6.4
12	1.8	33	3.7	3.7	7.0	85		37	74	40	13.5	12.7
13	2.2	11.6	3.4	3.5	9.4			22	54	50	12.1	12.6
14	1.6	9.4	3.4	3.2	7.0			18.9	40	32	13.0	7.0
15	14.7	7.6	7.4	3.0	5.8		16	16.7	32	25	10.3	5.8
16	24	6.7	8.5	5.0	5.3			15.1	26	32	9.8	5.3
17	36	5.8	8.2	3.3	4.8			13.0	31	23	9.4	5.2
18	55	5.3	5.5	2.6	4.5			12.6	22	19.4	9.4	4.8
19	50	38	4.1	2.5	94			12.1	19.4	17.2	9.4	4.6
20	30	9.4	4.3	2.3	108	50		11.2	18.3	16.7	13.5	4.8
21	13.0	9.0	6.1	2.1	207		40	40	17.2	16.7	9.0	5.2
22	10.8	9.8	23	2.0	129			23	15.6	18.9	8.2	4.5
23	8.5	7.3	20	12.8	63			18.3	14.6	15.6	12.1	4.5
24	7.6	6.4	14	62	69			30	13.0	17.2	13.0	4.1
25	7.0	5.5		47	120	100	32		12.1	21	10.8	3.8
26	5.5	5.3		33	120	97		85	11.2	14.6	26	3.5
27	21	4.8		15.6	60	38	97		10.8	13.0	20	3.4
28	11.6	4.0	8	21	31	23	156		9.8	48	30	3.3
29	43	3.8		21	20	24	38	-------	9.4	51	17.2	3.2
30	24	7.3		25	17.8	18.9	144	-------	8.5	17.8	13.5	3.2
31	18.5	9.0	-------	26	-------	17.8	200	-------	7.6	-------	12.1	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated because of lack of gage-height record.

Monthly discharge of Nailiilihaele Stream near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	55		13.8	21.4	428	1,310
August	39	3.8	11.8	18.3	366	1,120
September			7.34	11.4	220	676
October	62	2.0	12.0	18.6	371	1,140
November	207	4.5	41.3	63.9	1,240	3,800
December			44.3	68.5	1,370	4.210
January	260		42.8	66.2	1,330	4,070
February	159	11.2	42.0	65.0	1,180	3,610
March	176	7.6	49.6	76.7	1,540	4,720
April	68	8.5	25.7	39.8	772	2,370
May	32	8.2	16.3	25.2	504	1,550
June	12.7	3.2	6.31	9.76	189	581
The year			26.0	40.2	9,500	29,200

KAILUA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At trail crossing 100 feet above Haiku-uka boundary line and 1½ miles by horse trail southeast of Kailiili.

RECORDS AVAILABLE.—July 11, 1918, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge just below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 25 feet above and 50 feet below gage. Right bank, low; left bank, steep. Control for low stages is concrete slab, 1.5 feet thick, across stream 15 feet below gage; permanent. Control for high stages is crest of falls 100 feet below gage; may shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.53 feet at 1.30 p. m. November 22 (discharge, about 275 million gallons per day or 425 second-feet); minimum stage recorded, 4.18 feet June 27–30 (discharge, 0.02 million gallons per day or 0.03 second-foot).

1918–1922: Maximum stage recorded, 9.6 feet January 16, 1921 (discharge, about 500 million gallons per day or 770 second-feet); minimum discharge, 0.002 million gallons per day or 0.003 second-foot, occurred at 2.20 p. m. July 13, 1920, and 1 a. m. and 1.50 p. m. December 22, 1919.

DIVERSIONS.—None.

REGULATION.—None

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple lands above and Territorial lands below.

UTILIZATION.—Water picked up by East Maui Irrigation Co.'s ditches for irrigation of cane lands.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 80 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good.

Discharge measurements of Kailua Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 29	W. C. Renshaw	4.27	0.3	0.2
Feb. 16	S. B. Hall	4.32	1.1	.7

Discharge, in million gallons per day, of Kailua Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.1	2.0	0.15	0.2	1.4	2.7	1.2	65	14.4	0.15	6.25	0.05
2	.1	4.6	.1	.35	2.9	1.8	1.2	}	10.5	.15	.2	.05
3	.8	1.8	.1	.25	9.1	34	.8	35	18.1	.25	1.6	.05
4	.8	1.0	.1	.2	3.0	35	37	}	4.8	1.4	4.9	.05
5	.35	.8	.15	.15	1.4	11.8	4.2	}	25	5.1	3.1	.05
6	.15	.45	.1	.15	.8	10.0	1.2	4.3	76	4.2	1.4	.05
7	.1	.35	.1	.15	.45	3.0	.8	}	87	5.5	.6	.05
8	.15	.35	.05	.2	.35	1.8	.8	}	80	2.5	.35	.05
9	.1	.25	.1	.15	.45	1.4	.6	}	45	11.1	.45	.05
10	.1	.2	.2	.1	.6	1.4	.6	}	74	3.1	.35	.05
11	.1	1.9	.1	.1	.35	1.2	.45	5.5	26	3.0	1.0	.05
12	.05	7.1	.1	.1	.35	46	.45	}	10.5	1.6	.45	.05
13	.05	1.2	.1	.1	.25	105	1.4	2.2	5.7	1.0	.35	.05
14	.05	.45	.1	.05	.25	30	1.4	1.8	4.3	.6	.25	.05
15	1.2	.25	.1	.05	.25	5.9	.8	1.4	2.5	.6	.2	.05
16	4.6	.2	.2	.05	.2	3.2	.6	1.0	1.8	.8	.15	.05
17	8.7	.2	.15	.05	.15	17.3	.6	1.0	3.9	1.2	.1	.05
18	19.9	.15	.1	.05	.1	33	1.2	.8	1.8	.6	.1	.05
19	23	1.2	.1	.05	28	6.5	6.9	.6	1.2	.35	.1	.05
20	8.2	.35	.1	.05	41	3.0	8.9	.6	1.0	1.4	.2	.05
21	1.4	.25	.1	.05	74	2.2	34	11.6	.8	2.6	.1	.05
22	.8	.25	7.9	.05	126	1.8	22	6.1	.6	2.2	.1	.05
23	.45	.2	3.3	1.1	66	10.4	12.1	2.0	.45	1.2	.1	.05
24	.35	.15	1.0	25	61	58	9.6	1.8	.45	.6	.2	.05
25	.35	.1	.45	16.6	52	39	12.2	1.2	.35	.6	.15	.05
26	.25	.1	.35	10.3	86	31	35	1.4	.25	.45	1.1	.05
27	2.4	.1	.25	2.6	20	8.6	65	16.2	.2	.25	.6	.02
28	1.0	.1	.25	1.6	6.0	4.0	49	71	.2	3.0	.2	.02
29	2.5	.1	.25	2.5	3.7	3.5	8.5	-------	.2	3.0	.15	.02
30	2.0	.2	.25	6.8	2.5	2.0	103	-------	.2	.45	.1	.02
31	1.4	.25	-------	5.2	-------	1.6	94	-------	.15	-------	.65	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated by comparison with flow of adjacent streams, because of lack of gage-height record.

Monthly discharge of Kailua Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	23	0.05	2.63	4.07	81.5	250
August	7.1	.1	.858	1.33	26.6	82
September	7.9	.05	.547	.846	16.4	50
October	25	.05	2.40	3.71	74.4	228
November	126	.1	19.6	30.3	589	1,800
December	105	1.2	16.6	25.7	516	1,580
January	103	.45	16.6	25.7	516	1,580
February	71	.6	11.8	18.3	330	1,010
March	87	.15	16.0	24.8	497	1,520
April	11.1	.15	1.96	3.03	59.0	180
May	4.9	.05	.611	.945	19.0	58
June	.05	.02	.046	.071	1.38	4
The year	126	.02	7.47	11.6	2,730	8,340

KAILUA STREAM NEAR HUELO, MAUI

LOCATION.—About 400 feet above Wailoa ditch intake and 1 mile south of Huelo.

RECORDS AVAILABLE.—December 8, 1910, to June 30, 1918, and July 1, 1919, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder installed March 7, 1918, replacing Barrett and Lawrence water-stage recorder installed October 8, 1913, at same location and datum as original staff gage.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Channel at gage is a large, deep pool with high, sloping banks, at foot of low waterfall. Control at outlet of pool is solid rock ledge and large boulders; seldom shifts.

EXTREMES OF DISCHARGE.—Maximum stage during year, estimated about 10.5 feet at about 2 a. m. February 1 (discharge, about 1,500 million gallons per day or 2,300 second-feet); float washed out of well at gage height about 8.5 feet. Minimum stage recorded, 0.67 foot from 4 to 7 a. m. July 15 (discharge, 0.25 million gallons per day or 0.4 second-foot).

1910–1922: Maximum stage recorded on February 1, 1922; minimum stage recorded, 0.57 foot from 3 to 4 a. m. June 27, 1921 (discharge, 0.07 million gallons per day or 0.11 second-foot).

DIVERSIONS.—Nearly all low-water flow diverted by Old Hamakua ditch above station from Febrary 5, 1918, to February 28, 1922.

REGULATION.—By diversion only.

OBJECT OF STATION.—Data valuable in connection with Territorial water leases to ditch company.

UTILIZATION.—Ordinary flow of stream is diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined below 350 million gallons per day. Operation of water-stage recorder unsatisfactory during most of year. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for periods during which recorder operated.

Discharge measurements of Kailua Stream near Huelo, Maui, during the year ending June 30, 1922.

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Oct. 3	W. C. Renshaw	1.35	5.4	3.5	Feb. 17	S. B. Hall	1.54	5.1	3.3
Dec. 31	Karl Jetter	1.80	21.6	14.0	June 26	do	.93	1.5	.95

Discharge, in million gallons per day, of Kailua Stream near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1			1.4	5.5		7.1	11.1	360	32	1.6	5.0	2.4
2	1.4		.8			4.5	9.2		13.5	1.7	4.8	2.2
3		16	.5	3.8	20	101	7.9	85	64	3.3	7.4	2.1
4	2.0		.4	2.4		90	34	31	34	3.6	18.1	1.9
5	.4		1.3			24	28	13.9	129	26	16.5	1.8
6	.3		1.7		3.7	28	15.3	8.9	225	11.5	8.7	1.6
7	.3		.9			10.8	9.2	7.3	258	11.4	7.3	1.6
8	.3	4.0	.5			7.5	10.0	6.0	237	8.2	9.1	1.6
9	.3		1.1	1.2		6.0	8.2		148	22	5.3	1.7
10	.3					4.7	6.6		247	11.8	4.5	1.6
11	.3				2.8	3.6	5.3	15	119	14.9	5.3	1.6
12	.3	13				131	5.2		46	13.9	4.4	2.0
13	.3					381	10.5		23	15.3	3.6	2.4
14	.3					149	11.1		13.5	9.7	3.6	1.6
15	5.9				1.5	33	5.8		9.7	7.1	3.1	1.5
16	15.8	2.9	3.4		1.2	18.3	4.8	3.8	7.3	7.5	2.6	1.2
17	31				1.0	91	5.2		9.5	7.1	2.4	1.2
18	70			.4	.8	166	9.7		6.8	5.2	2.4	1.2
19	72	28			128	31	29		5.2	4.2	2.3	1.1
20	32	7.3			200	16.4	30		4.7	4.9	3.4	1.1
21	7.1	7.5			318	11.7	132		4.2	7.2	2.4	1.1
22		6.0			366	10.0	71		3.6	7.7	2.2	1.1
23		2.8	23		186	24	53		3.2	5.8	2.8	1.0
24	2.9	2.2	9.5	55	178	218	28	15	2.8	4.7	3.6	1.0
25		1.7	4.7		203	125	54		2.5	6.3	2.9	.9
26		1.6	3.4	47	270	112	70		2.4	4.0	7.4	.9
27		1.1			72	30	183		2.1	3.2	7.5	.9
28		.8	2.0		18.4	15.3	191	213	1.9	21	7.3	.8
29	15	.7		20	9.5	16.0	41	-------	1.9	30	5.1	.8
30		2.1			7.1	12.9	237	-------	1.8	6.4	3.2	.8
31		3.1	-------		-------	14.2	460	-------	1.6	-------	2.7	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated by comparison with flow at station on this stream at Haiku-uka boundary and at stations on adjacent streams.

Monthly discharge of Kailua Stream near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	72	0.3	10.7	16.6	333	1,020
August		.7	7.37	11.4	228	701
September			3.38	5.23	101	311
October			11.1	17.2	344	1,060
November	366	.8	69.1	107	2,070	6,360
December	381	3.6	61.1	94.5	1,890	5,810
January	460	4.8	57.3	88.7	1,780	5,450
February	360		36.3	56.2	1,020	3,120
March	258	1.6	53.6	82.9	1,660	5,100
April	30	1.6	9.57	14.8	287	881
May	18.1	2.2	5.38	8.32	167	512
June	2.4	.8	1.42	2.20	42.7	131
The year	460		27.2	42.1	9,920	30,500

OLD HAMAKUA DITCH AT KAILUA, NEAR HUELO, MAUI

LOCATION.—250 yards above intake of penstock to hydroelectric plant on Old Humakua ditch, 1¼ miles southwest of Kailua on left side of valley, and 83 feet above bed of Kailua Stream.

RECORDS AVAILABLE.—July 22, 1919, to January 31, 1922, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from plank footbridge.

CHANNEL AND CONTROL.—Channel excavated in gravel and hardpan; straight for 10 feet above and 75 feet below station. Control is ditch bottom; fairly permanent.

EXTREMES OF DISCHARGE.—1919–1922:Maximum stage recorded, 3.22 feet at 4 a. m. January 7, 1921 (discharge, 24 million gallons per day or 37 second-feet); minimum discharge, no flow, at gage height 0.43 foot at 11 a. m. December 13, 1921 (probably caused by break in ditch above station).

DIVERSIONS.—None.

REGULATION.—By head gates.

OBJECT OF STATION.—In conjunction with the two stream stations, this station gives the total flow of Kailua and Nailiilihaele streams.

UTILIZATION.—Water used for power, domestic, and other purposes at Wailoa ditch camp.

ACCURACY.—Stage-discharge relation not permanent. Rating curves fairly well defined. Operation of water-stage recorder unsatisfactory. Records generally good when water-stage recorder was operating.

Old Hamakua ditch diverted from all streams on the windward side of the crater of Haleakala, below Wailoa ditch and west of Nailiilihaele Stream. The water was carried to a point near Paia and used for irrigation of sugar cane. Old Hamakua ditch proper was about 16 miles long and had a carrying capacity of 25 million gallons per day. It was abandoned west of Halehaku upon the completion of Kauhikoa ditch (see Kauhikoa ditch at Opana weir, near Huelo, Maui) and the rest was abandoned after Wailoa ditch was put into operation.

Discharge measurements of Old Hamakua ditch at Kailua, near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Aug. 19	J. E. Stewart	1.28	8.7	5.6
Oct. 3	W. C. Renshaw	1.06	7.0	4.5
Jan. 7	Karl Jetter	1.19	7.4	4.8

Discharge, in million gallons per day, of Old Hamakua ditch at Kailua, near Huelo, Maui, for the period July 1, 1921, to Jan. 31, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
1	5.5	7.6	4.7	4.5		6.7	4.9
2	5.5	8.5	4.7	5.0		6.7	4.9
3	8.5	8.5	4.7	4.6		7.2	4.8
4	8.5	8.0	4.5	4.6		7.6	5.0
5	7.6	8.5	4.6	4.6		7.2	5.0
6	6.2	8.5	4.8	4.6		7.2	4.9
7	5.4	8.5	4.5	4.4	5.0	6.7	4.7
8	6.2	8.5	4.6	4.3		6.7	4.7
9	5.6	8.5	4.5	4.3		6.7	4.7
10	5.0	9.5	4.6			6.7	4.2
11	4.8	10.5	4.6			6.7	4.3
12	4.3	7.7	4.5			7.0	4.2
13	4.3	.6	4.4			3.9	4.6
14	3.9	1.5	4.3		4.7	6.7	4.4
15	6.2	2.5	4.5		4.7	5.7	4.3
16	8.5	4.3	4.5	4.0	4.7	5.4	4.3
17	8.5	5.0	4.4		4.7	5.8	4.3
18	9.0	4.9	4.6		4.6	6.7	4.3
19	8.5	5.2	4.5		5.5	5.5	5.0
20	8.0	3.3	4.4		6.7	4.9	5.1
21	7.6	.9	4.8		8.5	4.6	5.8
22	7.6	3.9	5.1		10.5	4.4	5.4
23	7.6	4.9	5.2		7.6	4.9	5.2
24	7.6	4.9	5.0		6.0	6.2	5.0
25	7.6	4.7	4.9		6.7	5.8	5.3
26	7.6	4.7	4.9		8.0	5.8	5.5
27	7.6	4.7	4.9	5.5	7.6	5.2	6.2
28	7.6	4.6	4.8		6.7	4.8	6.7
29	8.0	4.6	4.7		6.7	4.8	5.6
30	8.0	4.6	4.6		6.7	4.4	5.8
31	7.6	4.7				4.4	6.7

NOTE.—Braced figures show mean discharge for periods indicated; estimated by comparison with flow at station on Kailua Stream at Haiku-uka boundary because of lack of gage-height record.

Monthly discharge of Old Hamakua ditch at Kailua, near Huelo, Maui, for the period July 1, 1921, to Jan. 31, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	9.0	3.9	6.92	10.7	214	658
August	10.5	.6	5.72	8.85	177	544
September	5.2	4.3	4.66	7.21	140	429
October			4.55	7.04	141	433
November	10.5		5.85	9.05	176	539
December	7.6	3.9	5.90	9.13	183	561
January	6.7	4.2	5.03	7.78	156	479
The period					1,190	3,640

HOOLAWALIILII STREAM NEAR HUELO, MAUI

LOCATION.—400 feet above New Hamakua ditch crossing and 4 miles by trail west of Huelo.

RECORDS AVAILABLE.—April 6, 1911, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder installed June 19, 1914, at same location and datum as original staff gage. Datum lowered 0.52 foot May 14, 1922.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Channel at gage is a pool about 100 feet long and 20 feet wide formed by concrete control about 20 feet long at brink of falls over which water makes a drop of about 50 feet. Banks slope gently and are covered with dense growth of vegetation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.82 feet at 11 a. m. November 21 (discharge, about 485 million gallons per day, or 750 second-feet); minimum stage recorded, 0.10 foot from 3 p. m. July 14 to 1 a. m. July 15 (discharge, 0.70 million gallons per day, or 1.1 second-feet).

1911–1922: Maximum stage recorded in November, 1921; minimum stage recorded, 0.02 foot at 9 p. m. December 11, 1919 (discharge, 0.5 million gallons per day, or 0.8 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—All water during low and medium stages picked up by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed May 14 owing to change in gage datum, and also a considerable change in high-water rating was assumed to have occurred on that date. The change in high-water rating was probably brought about by encroachment of vegetation during the early summer assumed to become effective shortly after the rise of May 8. Rating curve used prior to May 14, fairly well defined below 20 million gallons per day; curve used subsequent to that date, well defined below 25 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the the day. Records good.

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Discharge measurements of Hoolawaliilii Stream near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 14	W. C. Renshaw	0.27	4.9	3.2	Jan. 5	S. B. Hall	0.36	10.7	6.9
Oct. 13	do	.18	3.1	2.0	Feb. 13	Karl Jetter	.32	9.7	6.2

Discharge, in million gallons per day, of Hoolawaliilii Stream near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.4	7.4	2.7	5.5	7.1	6.1	5.6	90	12.0	1.9	2.4	1.8
2		15.5	2.4		7.6	4.6	5.0	45	9.0	1.9	2.4	1.8
3		8.5	2.2	4.0	12.3	9.7	4.3	33	18.1	1.9	2.4	1.9
4	1.6	6.6	2.1	3.7	7.6	7.1	12.2	18.9	17.2	1.9	3.4	1.8
5	1.2	6.6	2.7	3.4	6.6	5.3	10.0	12.8	74	4.1	3.7	1.8
6	1.0	5.6	2.2	3.0	5.3	5.0	8.0	9.0	47	3.4	3.0	1.7
7	1.0	6.1	2.2	3.7	5.0	4.3	5.6	8.0	50	2.7	2.7	1.7
8	1.4	5.0	2.1	3.4	4.6	4.0	5.6	6.6	54	2.4	6.6	1.7
9	1.2	4.3	2.2	3.0	4.3	3.4	5.0	10.0	33	2.2	3.4	1.7
10	1.0	4.0	2.2	2.7	4.0	3.0	4.3	9.0	54	2.2	3.4	1.6
11	1.0	5.0	2.2	2.4	3.7	2.7	4.0	8.0	46	3.7	3.4	1.6
12	.9	8.5	2.1	2.4	3.7	18.3	4.3	9.5	31	5.0	3.0	1.7
13	.9	5.6	2.1	2.2	4.0	89	7.5	6.6	20	8.5	2.4	1.7
14	.9	4.6	1.9	2.2	3.7	34	5.3	6.1	12.8	5.3	2.1	1.7
15	1.6	4.0	2.1	2.1	3.4	15.8	4.3	5.0	10.0	4.6	1.9	1.6
16	2.1	4.0	2.2	2.7	3.0	9.5	4.0	4.6	7.1	5.0	1.8	1.6
17	5.0	3.7	2.4	2.2	2.7	16.4	3.7	4.3	7.6	4.3	1.8	1.6
18	15.9	3.7	2.2	2.1	2.4	48	4.6	4.0	5.3	3.7	1.8	1.6
19	12.9	14.0	2.1	1.9	48	15.8	8.8	3.4	4.6	3.4	1.8	1.5
20	7.6	5.3	1.9	1.9	55	10.0	12.4	3.0	4.3	3.0	1.9	1.5
21	4.6	4.6	2.2	1.7	120	7.6	23	8.7	4.0	3.0	1.8	1.5
22	4.3	4.6	3.8	1.7	54	6.1	14.3	4.6	3.7	2.7	1.8	1.5
23	4.0	4.0	4.3	2.1	26	7.6	12.0	4.3	3.4	2.4	1.9	1.5
24	3.7	4.0	4.0	9.1	18.9	52	9.0	6.1	2.7	2.4	1.9	1.5
25	3.4	3.7	3.4	11.6	29	40	10.5	5.9	2.7	2.7	1.8	1.4
26	3.0	3.7		9.5	38	31	15.1	5.3	2.4	2.4	2.2	1.4
27	4.3	3.4		6.1	26	15.8	36	4.3	2.2	2.4	2.1	1.5
28	3.7	3.0	3.2	7.1	14.3	11.3	49	30	2.2	2.4	2.2	1.4
29	9.8	2.7		6.6	9.5	10.0	22	-------	1.9	4.0	2.2	1.4
30	8.0	3.7		6.6	7.1	7.1	66	-------	1.7	2.7	2.1	1.4
31	5.3	3.7	-------	7.6	-------	6.6	140	-------	1.9	-------	1.9	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of adjacent streams.

Monthly discharge of Hoolawaliilii Stream near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	15.9	0.9	3.73	5.77	116	355
August	15.5	2.7	5.45	8.43	169	518
September		1.9	2.60	4.02	77.9	239
October	11.6	1.7	4.18	6.47	130	398
November	120	2.4	17.9	27.7	537	1,650
December	89	2.7	16.4	25.4	507	1,560
January	140	3.7	16.8	26.0	521	1,600
February	90	3.0	13.1	20.3	366	1,130
March	74	1.7	17.6	27.2	546	1,670
April	8.5	1.9	3.27	5.06	98.2	301
May	6.6	1.8	2.49	3.85	77.2	237
June	1.9	1.4	1.60	2.48	48.1	147
The year	140	.9	8.75	13.5	3,190	9,800

HOOLAWANUI STREAM NEAR HUELO, MAUI

LOCATION.—200 feet above intake of Wailoa ditch and 5 miles by trail west of Huelo at elevation of 1,240 feet.

RECORDS AVAILABLE.—December 12, 1910, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder, installed June 20, 1914, 200 feet upstream from original staff, which it replaced.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Stream drops over a low waterfall into a large circular pool with gently sloping banks. Control at outlet of pool composed of boulders; shifts during severe floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.40 feet at 3 a. m. February 1 (discharge, about 550 million gallons per day or 851 second-feet); minimum stage recorded, 0.05 foot at midnight June 30, 1922 (discharge, 0.55 million gallons per day, or 0.85 second-foot).

1910–1922: Maximum stage recorded in February, 1922; minimum stage recorded, −0.19 foot at 7 p. m. October 25, 1917 (discharge, 0.15 million gallons per day, or 0.2 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—All water during low and medium stages picked up by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed by flood of January 31, and by construction of an automatic gate pipe-line intake February 9–20. Rating curve used July 1 to January 30, well defined between 0.5 and 40 million gallons per day; curve used January 31 to February 20, poorly defined; curve used February 21 to June 30, fairly well defined for ordinary stages. Shifting-control method used February 9–20. Operation of water-stage recorder satisfactory. Daily discharge ascertained by, applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for period during which shifting-control method was used. Records good except those for February.

Discharge measurements of Hoolawanui Stream near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 14	W. C. Renshaw	0.40	5.9	3.8	Feb. 9	Karl Jetter	1.07	25.5	16.5
Oct. 13	do	.15	2.0	1.3	27	do	.54	6.8	4.4
Nov. 17	J. B. Cox [a]	.275	4.5	2.9	June 28	do	.08	1.0	.65
Jan. 5	S. B. Hall	.72	16.7	10.8	28	do	.08	1.05	.7

[a] Engineer for East Maui Irrigation Co.

Discharge, in million gallons per day, of Hoolawanui Stream near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.9	6.1	2.4	5.5	7.6	10.3	8.6	115	17.5	2.9	3.9	1.8
2		11.7	2.2		9.6	8.1	7.2	66	12.3	3.0	3.5	1.8
3		7.6	2.1		16.2	21	6.4	47	24	3.3	4.1	1.7
4		6.0	2.0	2.9	8.8	17.3	14.1	29	23	3.3	6.1	1.6
5	1.3	5.6	2.4	2.7	6.6	12.2	15.3	22	57	9.2	6.6	1.5
6	1.1	5.0	2.3	2.6	5.8	11.4	10.0	17.3	62	6.0	4.8	1.5
7	1.0	5.2	2.0	2.8	5.6	8.1	7.6	13.7	61	5.0	4.6	1.4
8	1.3	4.5	1.9	2.6	5.2	6.2	7.8	12.0	64	4.1	6.7	1.4
9	1.0	4.0	2.0	2.4	5.0	5.5	6.4	17.3	49	4.9	4.1	1.6
10	1.0	3.7	2.0	2.2	4.6	4.9	5.6	17.3	69	5.7	4.4	1.3
11	1.0	4.2	1.8	2.0	4.1	4.3	5.0	14.8	54	7.2	4.0	1.2
12	.9	8.5	1.8	1.9	4.1	39	5.2	17.3	32	7.9	3.5	1.6
13	.9	5.0	1.6	1.8	4.0	142	6.8	13.7	24	9.5	3.3	1.5
14	.8	4.5	1.6	1.8	3.5	67	6.4	11.8	15.0	7.8	3.2	1.2
15	1.8	3.8	1.7	1.7	3.2	27	4.5	10.4	11.9	7.0	3.0	1.0
16	2.9	3.6	1.8	2.3	3.0	15.7	4.5	9.2	10.2	7.4	2.7	1.0
17	6.2	3.5	2.0	1.9	2.8	32	4.5	8.7	10.0	6.6	2.6	1.0
18	16.0	3.2	1.8	1.8	2.6	74	5.8	8.1	8.5	5.9	2.4	.8
19	14.8	10.5	1.6	1.7	38	25	9.9	7.5	7.3	5.3	2.4	.8
20	11.0	4.6	1.5	1.7	62	15.7	14.2	7.2	6.6	5.0	2.7	.8
21	5.2	4.3	1.8	1.6	146	12.2	30	11.1	6.0	4.6	2.3	1.0
22	4.5	4.1	3.9	1.6	116	9.8	20	7.3	5.4	4.9	2.0	.8
23	3.8	3.6	4.6	2.3	58	11.7	17.9	6.0	5.0	4.5	2.4	.8
24	3.6	3.4	4.0	15.8	49	76	14.4	7.0	4.6	4.5	2.4	.8
25	3.4	3.2	3.0	14.9	71	58	17.9	6.9	4.1	4.8	2.3	.7
26	3.0	3.0	2.8	11.6	90	58	23	5.3	3.8	4.0	2.9	.7
27	5.2	2.8	2.4	6.4	52	29	64	4.9	3.3	3.6	2.8	.7
28	3.8	2.6		5.6	25	18.6	82	44	3.3	5.7	2.9	.7
29	8.7	2.6		6.0	16.3	15.7	31	-------	3.2	9.9	2.5	.6
30	6.8	3.0		8.9	12.2	12.0	93	-------	3.0	4.3	2.2	.6
31	5.0	3.1	-------	10.8	-------	10.3	140	-------	2.9	-------	2.0	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated by comparison with flow of adjacent streams because of lack of gage-height record.

Monthly discharge of Hoolawanui Stream near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	16.0	0.8	3.99	6.17	124	380
August	11.7	2.6	4.73	7.32	146	450
September		1.5	2.27	3.51	68.2	209
October	15.8	1.6	4.48	6.93	139	426
November	146	2.6	27.9	43.2	838	2,570
December	142	4.3	27.7	42.9	858	2,640
January	140	4.5	22.2	34.3	689	2,110
February	115	4.9	19.9	30.8	558	1,710
March	69	2.9	21.4	33.1	663	2,040
April	9.9	2.9	5.59	8.65	168	515
May	6.7	2.0	3.40	5.26	105	323
June	1.8	.6	1.13	1.75	33.9	104
The year	146	.6	12.0	18.6	4,390	13,500

HONOPOU STREAM NEAR HUELO, MAUI

LOCATION.—200 feet above New Hamakua ditch crossing and 6 miles west of Huelo, at elevation 1,250 feet.

RECORDS AVAILABLE.—December 12, 1910, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder, installed June 19, 1914, at same site as original staff gage.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and below gage. Right bank is overflowed during floods; left bank, steep and high. Control, an old iron weir set in concrete; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.50 feet at 3.25 a. m. February 1 (discharge, 658 million gallons per day, or 1,020 second-feet); minimum stage recorded, 0.08 foot from noon to 7 p. m. July 14 (discharge, 0.2 million gallons per day, or 0.3 second-foot).

1910–1922: Maximum stage recorded in February, 1922; minimum stage recorded, 0.05 foot from 2 to 8 p. m. July 14, 1920 (discharge, 0.15 million gallons per day or 0.23 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—Ordinary flow is diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed March 7. Rating curve used prior to March 8, well defined above 1 million gallons per day; curve used subsequent to March 7, well defined below 25 million gallons per day and fairly well defined above that point. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records excellent.

Discharge measurements of Honopou Stream near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Oct. 4	W. C. Renshaw	0.16	1.0	0.65
Feb. 13	Karl Jetter	.52	7.1	4.6
June 27	do	.14	.55	.35

Discharge, in million gallons per day, of Honopou Stream near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.4	2.4	0.9	1.5	2.7	5.4	4.9	82	6.2	1.2	1.2	0.6
2		4.3	.8	2.6	3.0	4.4	4.0	33	5.7	1.2	1.2	.6
3		2.7	.8	1.3	4.7	7.4	3.4	23	9.4	1.2	1.3	.6
4	.5	2.3	.8	1.1	3.1	5.1	7.5	15.2	12.1	1.2	1.6	.6
5	.4	2.4	.9	1.0	2.7	4.0	5.4	10.9	40	2.1	1.9	.5
6	.4	2.0	.8	1.0	2.6	3.7	4.9	8.1	28	1.5	1.4	.5
7	.4	2.3	.7	1.1	2.4	3.4	3.8	6.6	30	1.4	1.3	.5
8	.5	1.9	.7	1.0	2.3	3.2	3.8	5.7	30	1.2	2.9	.5
9	.4	1.7	.7	.9	2.1	2.9	3.4	7.7	18.7	1.1	1.4	.5
10	.3	1.6	.7	.9	2.0	2.6	2.9	5.9	32	1.4	1.4	.5
11	.3	1.9	.7	.9	1.9	2.4	2.6	5.9	27	1.9	1.3	.5
12	.3	3.2	.6	.8	1.8	9.3	2.7	6.2	18.8	2.2	1.2	.5
13	.3	2.0	.5	.8	1.6	64	4.5	4.9	13.0	3.4	1.1	.5
14	.3	1.7	.5	.8	1.5	26	2.9	4.3	8.9	2.2	1.0	.5
15	.4	1.5	.6	.7	1.4	13.2	2.3	3.8	7.2	1.9	.9	.4
16	.8	1.5	.7	1.0	1.1	9.2	2.1	3.6	5.5	2.4	.9	.4
17	1.9	1.3	.7	.8	1.1	11.8	2.0	3.0	5.2	1.9	.9	.4
18	5.0	1.3	.6	.7	1.1	31	2.7	2.7	4.0	1.7	.8	.4
19	4.2	4.7	.5	.7	18.5	12.5	4.6	2.5	3.5	1.6	.8	.4
20	2.6	1.9	.5	.7	26	8.9	5.8	2.3	3.0	1.5	.8	.4
21	1.9	1.7	.6	.6	80	7.0	10.8	5.6	2.6	1.5	.7	.4
22	1.8	1.6	1.6	.6	36	5.7	7.0	2.7	2.3	1.5	.7	.4
23	1.6	1.5	1.6	.8	18.7	6.8	6.6	2.7	2.1	1.4	.7	.4
24	1.4	1.4	1.2	3.9	13.2	29	5.4	3.4	2.0	1.4	.7	.4
25	1.3	1.3	.8	4.4	17.4	22	5.9	3.5	1.9	1.5	.7	.4
26	1.2	1.3	.8	3.6	26	20	7.7	2.6	1.7	1.2	.9	.4
27	1.6	1.2		2.5	17.4	12.7	18.1	2.1	1.6	1.2	.8	.4
28	1.3	1.1	.8	2.5	11.6	9.8	28	13.5	1.5	1.4	.9	.4
29	2.7	1.1		2.3	8.5	7.9	13.7	-------	1.4	1.7	.7	.4
30	2.3	1.3		2.5	6.6	6.2	37	-------	1.3	1.3	.7	.4
31	1.7	1.3	-------	2.9	-------	6.0	113	-------	1.2	-------	.6	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with records of flow of adjacent streams.

Monthly discharge of Honopou Stream near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	5.0	0.3	1.26	1.95	39.0	120
August	4.7	1.1	1.92	2.97	59.4	183
September	1.6	.5	.78	1.21	23.5	72
October	4.4	.6	1.51	2.34	46.9	144
November	80	1.1	10.6	16.4	319	976
December	64	2.4	11.7	18.1	364	1,110
January	113	2.0	10.6	16.4	329	1,010
February	82	2.1	9.76	15.1	273	839
March	40	1.2	10.6	16.4	328	1,010
April	3.4	1.1	1.61	2.49	48.3	148
May	2.9	.6	1.08	1.67	33.4	103
June	.6	.4	.46	.71	13.8	42
The year	113	.3	5.14	7.95	1,880	5,760

NEW HAMAKUA DITCH AT HONOPOU, NEAR HUELO, MAUI

LOCATION.—600 feet below Honopou Stream crossing, 15 feet above tunnel portal, and 7 miles by road and trail west of Huelo.

RECORDS AVAILABLE.—May 14, 1921, to June 30, 1922. January 25, 1918, to May 13, 1921, from station 300 feet upstream. Records comparable.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from lehua logs across ditch just above gage.

CHANNEL AND CONTROL.—Sides and bottom of ditch, composed of hardpan; fairly smooth. Channel, straight for 25 feet above and about 1,000 feet below station. No well-defined control; stage-discharge relation affected by deposition of mud and gravel on ditch bottom and by caving of tunnel roof.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.15 feet at 2.40 a. m. February 1 (discharge, about 124 million gallons per day or 192 second-feet); minimum stage, −0.07 foot from 2 to 6 a. m. June 27 (discharge, 0.5 million gallons per day or 0.77 second-foot).

1918–1922: Maximum and minimum stages for period of record were recorded in 1922.

DIVERSIONS.—Ditch receives small amount of seepage and, during floods, the waste water from Wailoa ditch intakes.

REGULATION.—Flow regulated by gates.

OBJECT OF STATION.—To determine amount of water diverted from Territorial lands above to fee simple lands below.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent. Standard rating curve well defined below 90 million gallons per day. Indirect method for shifting control used October 27 to June 7. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, or by the indirect method for shifting control. Records good except those for period during which shifting-control method was used, which are fair.

New Hamakua ditch, at elevation about 500 feet, diverts from all streams on the windward side of Haleakala, below Wailoa ditch, between Waikamoi and Halehaku streams inclusive. The water is carried to a point near Paia where it is distributed for the irrigation of sugar cane. The system comprises about 14 miles of main ditch and has a carrying capacity of 75 million gallons per day. Upon completion of Wailoa ditch New Hamakua ditch was abandoned west of Halehaku and became a storm-water ditch east of Halehaku.

Discharge measurements of New Hamakua ditch at Honopou, near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 14	W. C. Renshaw	4.04	123	79	Jan. 6	E. M. Pickop	2.16	24.6	15.9
Oct. 14	do	1.08	15.4	10.0	Feb. 27	Karl Jetter	2.08	18.1	11.7
Dec. 6	E. M. Pickop	1.78	9.4	6.1	May 15	do	.82	4.8	3.1

Discharge, in million gallons per day, of New Hamakua ditch at Honopou, near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	36	87	63	18.4	18	7.3	9.6	65	26	9.6	5.6	0.9
2	38	96	57	42	15	11	7.9	30	26	9.6	6.2	.8
3	63	93	52	19.2	46	22	6.8	13	42	9.6	7.3	.8
4	63	87	52	15.2	12	14	19	7.9	36	10	17	.7
5	49	87	66	14.4	6.1	18	20	7.9	55	22	18	.7
6	41	81	66	15	6.8	12	13	7.3	26	15	11	.6
7	36	84	60	16.0	7.9	10	10	7.3	26	18	8.5	1.0
8	54	78	57	15.2	8.5	10	10	7.3	28	14	28	1.7
9	44	78	66	14	6.7	9.6	9.6	9.1	22	12	7.9	1.0
10	38	78	66	13	5.4	7.9	9.1	7.9	26	13	5.9	1.0
11	38	84	60	12	5.0	7.9	9.1	7.3	26	20	3.9	1.0
12	32	96	54	11	5.1	19	9.6	7.3	22	22	3.4	1.0
13	33	84	52	10	5.1	44	15	7.3	19	28	3.1	1.0
14	29	81	52	9.6	4.7	19	13	7.3	17	22	3.0	1.0
15	49	78	57	9.6	4.8	15	9.1	6.8	16	17	2.9	1.0
16	78	75	63	12.9	4.8	13	7.9	6.8	14	22	2.8	1.1
17	87	72	63	10.2	4.4	17	6.0	6.7	16	16	2.8	1.0
18	96	72	63	9.1	3.8	32	9.6	9.1	17	8.5	2.5	.8
19	96	93	60	8.5	14	28	9.6	7.9	15	4.6	2.3	.8
20	93	81	57	7.9	12	26	16	7.9	14	4.4	2.5	.8
21	81	78	60	7.9	32	19	24	16	11	4.5	2.2	.8
22	78	78	78	7.3	20	13	22	13		4.9	2.0	.7
23	75	75	84	12.0	15	18	22	12		2.9	2.2	.6
24	75	72	48	60	19	40	19	18		5.3	2.4	.6
25	72	69	21	63	26	26	18	14		8.5	2.1	.6
26	69	66	20	72	32	24	24	15	10	5.1	6.7	.6
27	81	63	22	22	24	18	38	12		5.5	5.5	.6
28	78	57	21	18	17	22	44	42		9.6	4.9	.6
29	93	57	17.6	26	9.6	19	32	-------		16.0	3.2	.6
30	90	66	16.8	24	7.9	18	50	-------		5.4	1.7	.6
31	96	72	-------	36	-------	13	70	-------	9.6	-------	1.2	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated, because of lack of gage-height record, by comparison with records of flow of adjacent streams.

Monthly discharge of New Hamakua ditch at Honopou, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	96	29	63.9	98.9	1,980	6,080
August	96	57	78.0	121	2,420	7,420
September	84	16.8	52.5	81.2	1,570	4,830
October	72	7.3	20.4	31.6	631	1,940
November	46	3.8	13.3	20.6	399	1,220
December	44	7.3	18.5	28.6	573	1,760
January	70	6.0	18.8	29.1	583	1,790
February	65	6.7	13.5	20.9	379	1,160
March	55	----------	19.3	29.9	600	1,840
April	28	2.9	12.2	18.9	365	1,120
May	28	1.2	5.76	8.91	179	548
June	1.7	.6	.83	1.28	25.0	76
The year	96	.6	26.6	41.2	9,710	29,800

OLD HAMAKUA DITCH AT HONOPOU, NEAR HUELO, MAUI

LOCATION.—250 feet below intake in Honopou Stream and 7 miles by road and trail west of Huelo.

RECORDS AVAILABLE.—January 25, 1918, to June 30, 1922, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Sides and bottom of ditch are hardpan with small amount of rock and gravel; banks high and steep; straight for 250 feet above and 150 feet below gage. Original concrete control has been completely covered by a bed of gravel.

EXTREMES OF DISCHARGE.—1918–1922: Maximum stage recorded, 3.25 feet at 8.10 p. m. January 16, 1921 (discharge, 58 million gallons per day, or 90 second-feet); minimum stage recorded, ditch dry July 1–15, 1920, frequently during April, May, June, and July, 1921, and June 5–30, 1922.

DIVERSIONS.—Ditch heads at Nailiilihaele Stream and picks up water from streams west of that point.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—To determine amount of water diverted from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed February 1. Rating curve used July 1 to February 1 fairly well defined below 20 million gallons per day; curve used February 2 to June 30 not well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair.

For a description of this ditch see Old Hamakua ditch at Kailua, near Huelo.

Discharge measurements of Old Hamakua ditch at Honopou, near Huelo, Maui, during the year ending June 30, 1922

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Nov. 18	J. E. Stewart	0.62	[a] 0.01	[a] 0.005	Jan. 6	S. B. Hall	1.95	28	18.1
Dec. 7	do	.66	[a] .2	[a] .15	Feb. 2	Karl Jetter	1.36	9.0	5.8

[a] Estimated.

Discharge, in million gallons per day, of Old Hamakua ditch at Honopou, near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		4.2	0.2	0.5	0.3	3.2	13.2	4.8	0.7	0.35	0.4	0.3
2	0.05	20	.2	1.0	3.2	1.4	12.2	5.0	.6	.4	.35	.3
3		5.0	.1	.25	9.6	6.9	11.4	3.0	.75	.35	.35	.25
4	.1	.55	.1	.25	11.8	6.7	15.2	.9	.8	.4	.5	.1
5	.01	.55	.2	.2	9.1	.4	15.2	.7	11.2	.65	.75	-------
6	-------	.35	.2	.2	6.0	3.8	18.2	.65	4.7	.55	.6	-------
7	-------	.8	.2	.2	3.4	2.4	15.2	.65	6.0	.55	.5	-------
8	.01	.35	.2	.2	.9	.2	14.2	.6	6.9	.65	1.3	-------
9	-------	.25	.2	.15	.2	.2	14.2	.8	1.5	.5	.65	.01
10	-------	.25	.2	.1	.2	.2	12.8	.6	8.2	.5	.6	-------
11	-------	1.0	.2	.1	.2	.2	10.7	.6	4.8	.7	.6	-------
12	-------	11.0	.15	.1	.2	6.3	10.5	.55	1.4	.95	.55	-------
13	-------	.35	.1	.1	.2	22	13.3	.5	.95	1.2	.45	-------
14	-------	.2	.1	.1	.2	20	9.9	.5	.8	.95	.45	-------
15	-------	.2	.1	.05	.15	17.2	8.8	.5	.75	.8	.4	-------
16	.35	.2	.2	.2	.15	15.2	5.5	.4	.75	.9	.35	-------
17	3.4	.2	.2	.2	.15	16.2	8.4	.4	.8	.8	.3	-------
18	18.6	.2	.2	.1	.1	18.2	13.2	.45	.7	.75	.35	-------
19	14.4	11.9	.1	.1	8.4	14.2	14.5	.35	.7	.65	.35	-------
20	6.3	.4	.1	.1	20	9.9	17.2	.35	.65	.65	.4	-------
21	.2	.2	.15	.1	20	7.7	17.2	6.3	.6	.6	.35	-------
22	.2	.2	2.7	.1	10.1	10.8	16.2	.45	.6	.55	.3	-------
23	.15	.2	.55	.15	8.3	14.2	15.2	.4	.6	.55	.35	-------
24	.1	.2	.3	8.6	6.1	22	13.2	.55	.6	.5	.45	-------
25	.1	.2	.15	8.9	9.1	21	19.2	.5	.55	.55	.4	-------
26	.1	.2	.15	4.2	19.2	20	19.2	.35	.55	.5	.6	-------
27	.6	.15	.2	.35	17.2	18.2	20	.25	.5	.4	.7	-------
28	.2	.1	.2	.9	16.2	16.2	22	2.5	.4	.4	.65	-------
29	12.5	.1	.15	.2	12.2	17.2	20	-------	.4	.75	.6	-------
30	6.1	.2	.1	.7	3.2	13.2	21	-------	.4	.4	.5	-------
31	.2	.3	-------	1.4	-------	17.2	15.3	-------	.35	-------	.4	-------

NOTE.—Braced figure shows mean discharge for period indicated, estimated because of lack of gage-height record. Discharge interpolated Sept. 29 and 30. No flow on days for which no discharge is shown.

Monthly discharge of Old Hamakua ditch at Honopou, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	18.6	0.00	2.06	3.19	63.8	196
August	20	.1	1.94	3.00	60.0	185
September	2.7	.1	.263	.407	7.90	24
October	8.9	.05	.961	1.49	29.8	91
November	20	.1	6.54	10.1	196	602
December	22	.2	11.0	17.0	342	1,050
January	22	5.5	14.6	22.6	452	1,390
February	6.3	.25	1.20	1.86	33.6	103
March	11.2	.35	1.91	2.96	59.2	182
April	1.2	.35	.615	.952	18.4	57
May	1.3	.3	.500	.774	15.5	48
June	.3	.00	.032	.050	.96	3
The year	22	.00	3.51	5.43	1,280	3,930

NEW HAMAKUA DITCH AT HALEHAKU WEIR, NEAR HUELO, MAUI

LOCATION.—Just above crossing of Halehaku Stream, 7 miles by trail west of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1922.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by 25-foot Cipolletti weir.

CHANNEL AND CONTROL.—Large pool at weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—Halehaku weir is one of four weirs which measure water diverted from Territorial lands through Old and New Hamakua, Lowrie, and Haiku ditches, by the East Maui Irrigation Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge records copied from records of East Maui Irrigation Co.

For a description of this ditch see New Hamakua ditch at Honopou, near Huelo.

Discharge, in million gallons per day, of New Hamakua ditch at Halehaku weir, near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	29.3	68.1	49.1	40.3	67.3	61.0	64.0			44.3	58.5	31.8
2	29.4	70.8	43.5	75.2	63.6	66.0	64.8			49.7	63.4	29.6
3	35.0	69.0	28.0	56.8	74.6	76.3	65.2			58.4	59.6	30.4
4	50.2	68.5	26.4	51.4	71.4	70.2	67.8			72.8	54.4	29.2
5	44.0	68.1	29.6	48.5	63.5	59.0	55.7			80.0	56.1	28.1
6	27.7	67.8	39.1	43.6	67.7	74.2	61.0			73.0	47.1	27.4
7	22.1	60.5	33.8	42.1	54.7	79.3	46.8			70.1	46.4	26.2
8	37.6	67.0	33.1	38.1	47.5	47.5	48.0			71.2	63.8	26.9
9	25.9	54.2	38.9	30.6	43.5	70.8	49.8			69.9	41.8	28.3
10	22.7	52.8	54.1	28.1	44.8	78.5	55.6			69.3	52.1	27.6
11	21.9	47.5	40.6	26.8	42.3	68.7	59.2			69.3	50.0	26.8
12	18.9	62.2	34.9	25.6	39.8	72.4	66.1			69.0	43.2	32.0
13	18.9	67.3	28.3	24.1	48.1	58.5	70.7			71.3	38.0	37.9
14	18.2	66.4	26.3	21.3	47.0	35.5	58.2			69.8	33.4	30.5
15	28.7	58.1	29.5	20.1	42.1	50.3	46.6			67.1	35.5	26.5
16	60.4	51.5	44.4	24.1	37.7	59.8	48.2			68.3	30.0	24.9
17	69.4	43.0	55.6	24.4	35.3	63.6	49.8			66.8	28.0	22.1
18	69.4	35.4	50.2	19.6	32.4	61.4	57.9			61.9	27.5	20.3
19	69.2	58.3	42.2	15.1	48.7	60.3	46.6			56.6	27.5	18.6
20	68.3	62.9	32.7	16.6	63.5	69.2	17.5			59.7	35.2	19.2
21	67.8	55.0	36.7	17.2	61.7	68.3			20.5	64.1	30.8	20.6
22	69.2	48.8	48.0	18.4	55.9	60.8			41.8	66.3	28.1	20.2
23	66.9	47.5	58.2	33.3	35.7	75.7			38.2	66.5	30.7	19.2
24	56.1	46.8	62.0	77.6	64.8	79.3			38.5	52.2	41.4	18.1
25	57.8	40.3	58.7	73.4	62.0	57.8			42.6	51.2	41.2	17.4
26	44.5	37.8	55.2	74.0	53.1	50.6			52.4	53.1	55.2	17.1
27	48.2	35.8	68.7	77.7	38.1	56.0			55.4	42.7	64.5	16.3
28	59.6	31.8	65.7	71.4	49.9	72.3			53.5	52.3	58.9	15.9
29	65.9	30.0	47.8	71.4	61.0	73.3			53.2	70.7	48.6	15.8
30	68.2	33.2	39.6	71.0	52.5	41.8			52.8	59.0	37.9	15.7
31	65.7	48.5		72.1		60.0			47.4		35.6	

NOTE.—No flow on days for which no discharge is given.

Monthly discharge of New Hamakua ditch at Halehaku weir, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	69.4	18.2	46.4	71.8	1,440	4,410
August	70.8	30.0	53.4	82.6	1,650	5,080
September	68.7	26.3	43.4	67.1	1,300	4,000
October	77.7	15.1	42.9	66.4	1,330	4,080
November	74.6	32.4	52.3	80.9	1,570	4,820
December	79.3	35.5	63.8	98.7	1,980	6,070
January 1–20	70.7	17.5	55.0	85.1	1,100	3,380
March 21–31	55.4	20.5	45.1	69.8	496	1,520
April	80.0	42.7	63.0	97.5	1,890	5,800
May	64.5	27.5	44.0	68.1	1,360	4,190
June	37.9	15.7	24.0	37.1	721	2,210
The year (306 days)					14,800	45,600

NOTE.—No flow Jan. 21 to Mar. 20.

KAUHIKOA DITCH AT OPANA WEIR, NEAR HUELO, MAUI

LOCATION.—A short distance below crossing of Opana Stream and 8 miles by road west of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1922.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—By 25-foot sharp-crested weir, and by current meter from plank across ditch 100 feet below gage.

CHANNEL AND CONTROL.—Large pool at weir.

EXTREMES OF DISCHARGE.—See monthly discharge table.

DIVERSIONS.—None.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—Opana weir is one of four weirs which measure water diverted from Territorial lands through Old and New Hamakua, Lowrie, and Haiku ditches, by East Maui Irrigation Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Kauhikoa ditch, at elevation about 900 feet, diverts from all streams on the windward side of the crater of Haleakala between Halehaku and Maliko streams inclusive, above Lowrie and Haiku ditches. The water is carried to the vicinity of Paia and distributed for irrigation of sugar cane. The ditch comprises about 6 miles of main channel and has a carrying capacity of 90 million gallons per day. Kauhikoa ditch replaced Old Hamakua ditch west of Halehaku.

Discharge, in million gallons per day, of Kauhikoa ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.6	5.3	2.3	2.9	36.0	26.7	48.3	8.8	49.8	2.2	13.4	8.3
2	1.8	14.2	1.8	15.2	23.9	22.8	44.4	-------	45.3	2.6	4.6	1.8
3	3.2	19.3	1.9	8.4	48.3	43.9	49.1	2.9	68.8	4.3	9.3	1.7
4	3.3	12.9	1.9	6.2	49.1	50.1	59.8	16.3	61.4	16.5	35.2	1.7
5	1.8	11.7	2.2	7.2	34.8	25.7	56.1	26.1	65.1	34.5	34.2	1.5
6	1.2	8.6	2.3	5.6	29.6	25.8	48.3	22.8	60.8	35.5	31.4	1.4
7	1.1	6.6	1.8	5.5	24.2	22.0	37.8	17.8	60.0	36.5	29.3	1.4
8	1.5	8.9	1.6	5.5	20.0	15.5	55.0	21.9	53.5	35.5	35.2	1.4
9	1.4	5.1	1.7	5.5	17.6	17.2	42.7	26.2	65.0	40.6	24.7	1.6
10	1.7	4.4	2.4	4.8	10.8	19.2	40.2	45.1	87.5	41.5	31.4	1.2
11	1.6	4.2	1.7	4.6	7.7	14.6	48.7	56.5	80.1	44.8	31.7	1.3
12	1.6	16.1	1.4	5.6	9.4	32.7	56.3	56.2	49.9	44.9	26.1	1.5
13	1.5	6.1	1.4	3.3	7.2	47.2	38.4	61.8	36.7	46.9	17.5	1.8
14	1.6	5.1	1.8	2.8	5.8	38.7	37.9	60.2	34.8	42.8	9.3	1.5
15	2.2	4.1	2.0	3.9	2.1	39.0	38.7	55.6	56.2	40.5	8.8	1.6
16	4.2	3.6	2.8	4.8	1.8	38.2	38.6	50.8	64.5	42.6	8.4	1.6
17	12.7	3.0	2.8	4.5	1.8	40.0	30.2	46.8	67.7	39.6	7.8	1.4
18	37.4	2.8	2.4	2.3	1.7	39.0	34.2	44.6	57.0	35.7	7.4	1.4
19	37.6	27.1	2.2	8.6	30.5	38.8	33.1	42.6	51.4	29.8	7.0	1.4
20	29.2	20.8	2.0	3.8	74.7	38.6	36.5	39.1	50.7	31.2	8.0	1.4
21	13.7	4.0	2.6	1.8	82.0	36.3	61.1	47.3	26.1	38.1	7.0	1.4
22	9.8	3.6	8.3	1.8	79.5	36.0	44.5	53.0	4.8	42.4	6.4	1.4
23	7.9	3.3	9.8	6.3	73.2	40.9	40.3	54.0	4.2	31.9	6.8	1.4
24	4.5	2.9	13.6	46.6	73.3	40.2	35.2	66.4	3.8	24.7	7.5	1.4
25	4.5	2.7	8.1	59.7	41.1	38.6	46.7	56.4	3.8	31.4	4.6	1.2
26	3.6	2.6	4.8	58.3	40.8	38.6	50.6	44.8	4.5	17.4	15.8	1.2
27	6.2	2.4	5.2	37.8	40.2	38.6	65.5	46.5	4.7	6.4	27.7	1.1
28	5.7	2.0	3.6	29.0	41.4	38.8	67.4	67.8	4.2	6.5	20.0	1.0
29	24.8	1.8	6.0	40.5	38.2	38.9	56.1	-------	4.1	26.0	22.0	1.0
30	19.8	2.5	3.8	39.8	25.5	35.4	61.9	-------	2.4	16.0	9.4	1.0
31	7.0	2.8	-------	41.2	-------	45.8	19.9	-------	2.6	-------	10.7	-------

NOTE.—Ditch dry Feb. 2.

Monthly discharge of Kauhikoa ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	37.6	1.1	8.25	12.8	256	785
August	27.1	1.8	7.11	11.0	220	676
September	13.6	1.4	3.54	5.48	106	326
October	59.7	1.8	15.3	23.7	474	1,460
November	82.0	1.7	32.4	50.1	972	2,980
December	50.1	14.6	34.3	53.1	1,060	3,260
January	67.4	19.9	45.9	71.0	1,420	4,370
February (27 days)	67.8	2.9	42.2	65.3	1,140	3,500
March	87.5	2.4	39.7	61.4	1,230	3,780
April	46.9	2.2	29.6	45.8	889	2,730
May	35.2	4.6	16.7	25.8	519	1,590
June	8.3	1.0	1.63	2.52	49.0	150
The year (364 days)					8,340	25,600

NOTE.—Ditch dry Feb. 2.

LOWRIE DITCH AT OPANA WEIR, NEAR HUELO, MAUI

LOCATION.—A short distance west of Halehaku Gulch and 8 miles by road northwest of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1922.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by sharp-crested weir 16⅓ feet long, with bottom and end contractions, and by current meter from plank across ditch 150 feet below gage.

CHANNEL AND CONTROL.—Large pool back of weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—Opana weir is one of four weirs which measure water diverted from Territorial lands through Old and New Hamakua, Lowrie, and Haiku ditches, by East Maui Irrigation Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Lowrie ditch, at elevation about 500 feet, a continuation of Manuel Luis and Center ditches, diverts from streams on the windward side of the crater of Haleakala between Kailua and Halehaku streams inclusive, below Wailoa ditch and Old and New Hamakua ditches, and above Haiku ditch. At Kailua stream it receives the combined flow of Manuel Luis and Center ditches. The water is carried to the vicinity of Paia and distributed for the irrigation of sugar cane. The ditch comprises about 15 miles of main channel and has a carrying capacity of 65 million gallons per day. With the completion of Wailoa ditch Lowrie ditch became mainly a storm-water ditch or reservoir feeder.

Discharge, in million gallons per day, of Lowrie ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	31.8	53.4	42.1	49.2	54.9	39.4	55.6	38.5	52.3	39.7	52.5	34.6
2	29.2	53.4	35.3	55.2	55.1	49.3	51.7	25.3	53.1	42.8	52.5	37.3
3	36.3	53.2	35.1	54.6	55.4	55.1	44.1	38.2	52.9	46.1	51.0	32.8
4	50.1	52.8	34.7	48.0	55.1	55.8	47.3	24.5	33.3	44.0	51.5	30.1
5	36.1	53.2	50.6	37.8	55.4	56.0	52.6	20.6	53.2	50.7	51.9	28.1
6	25.3	54.3	50.5	35.2	55.0	55.8	48.6	29.0	41.1	47.7	53.4	25.4
7	26.2	54.3	38.1	39.1	55.1	56.0	34.6	41.2	22.2	52.3	52.8	23.8
8	39.8	53.7	39.8	44.8	55.2	50.0	25.5	38.7	26.4	54.2	52.4	25.7
9	29.4	54.3	40.8	48.6	54.6	53.7	23.2	61.7	42.5	52.8	51.7	27.3
10	28.3	54.7	52.3	37.0	53.6	55.7	20.1	52.6	50.1	54.0	45.4	25.6
11	26.3	54.1	44.4	36.0	51.9	55.4	21.4	48.2	45.4	54.2	49.8	24.4
12	22.6	54.8	39.9	32.2	49.5	56.1	21.0	51.9	42.4	54.2	39.6	35.4
13	21.6	54.5	32.5	29.4	54.6	51.9	30.4	45.9	42.9	54.2	41.3	45.5
14	21.2	54.5	34.2	29.3	51.5	43.6	35.0	42.1	45.3	54.4	45.8	26.6
15	36.0	54.1	44.7	28.8	43.2	44.6	35.7	37.2	51.4	54.4	38.6	23.7
16	53.7	52.7	53.5	43.5	39.9	52.5	35.9	31.7	50.5	54.5	37.2	22.6
17	53.8	50.9	52.8	28.1	37.6	54.8	42.0	26.8	52.0	54.5	36.9	22.8
18	54.6	51.8	49.2	24.9	35.6	43.2	55.8	26.9	46.8	49.7	34.5	21.0
19	54.4	55.1	37.2	24.9	45.0	45.1	55.2	24.5	40.0	40.5	35.2	22.1
20	54.4	52.7	38.1	25.3	56.0	55.5	46.4	22.0	38.9	38.6	48.7	22.4
21	54.6	54.6	50.7	25.2	57.0	56.0	53.8	31.7	40.8	48.3	36.9	24.5
22	53.9	54.5	49.4	24.0	52.2	54.5	53.8	44.7	32.1	49.1	30.2	19.6
23	53.8	52.9	53.8	37.3	52.1	54.7	53.6	37.1	29.4	39.8	44.4	19.1
24	54.7	52.4	54.8	53.7	56.0	54.4	53.8	47.5	25.7	34.8	49.0	18.7
25	51.5	49.9	53.4	53.8	56.2	52.4	54.4	37.4	24.4	51.6	30.9	17.6
26	47.2	48.4	52.8	54.9	55.9	55.0	54.3	28.4	49.9	45.2	52.2	17.2
27	53.5	43.8	55.8	53.9	56.0	55.1	54.5	32.9	45.6	43.6	52.7	16.3
28	53.2	40.2	54.8	54.6	54.2	55.3	55.4	52.3	41.2	51.1	51.5	16.0
29	54.0	41.0	46.0	54.4	41.2	55.3	55.3	-------	40.1	51.0	46.1	15.7
30	53.0	54.6	52.9	54.4	31.1	47.6	55.8	-------	37.1	52.4	44.1	15.2
31	53.6	47.8	-------	74.7	-------	46.2	57.8	-------	35.9	-------	37.8	-------

Monthly discharge of Lowrie ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	54.7	21.2	42.4	65.6	1,310	4,030
August	55.1	40.2	52.0	80.5	1,610	4,950
September	55.8	32.5	46.0	71.2	1,380	4,240
October	74.7	24.0	41.4	64.1	1,280	3,940
November	57.0	31.1	50.9	78.8	1,530	4,690
December	56.1	39.4	52.1	80.6	1,620	4,960
January	57.8	20.1	44.7	69.2	1,380	4,250
February	61.7	20.6	37.1	57.4	1,040	3,190
March	53.2	22.2	41.4	64.1	1,280	3,940
April	54.5	34.8	48.7	75.4	1,460	4,480
May	53.4	30.2	45.1	69.8	1,400	4,290
June	45.5	15.2	24.6	38.1	737	2,260
The year	74.7	15.2	43.9	67.9	16,000	49,200

HAIKU DITCH AT MANAWAI GULCH, NEAR PEAHI, MAUI

LOCATION.—In bottom of western branch of Manawai Gulch just west of Keaaula-Opana boundary, a quarter of a mile north of Peahi, and 8 miles by road northwest of Huelo.

RECORDS AVAILABLE.—October 7, 1914, to June 30, 1921, at present site. January 1, 1910, to October 7, 1914, at Peahi weir, on old Haiku ditch.

GAGE.—Friez water-stage recorder, installed about October 21, 1914. Daily staff gage readings prior to that date.

DISCHARGE MEASUREMENTS.—Made from concrete footbridge across ditch.

CHANNEL AND CONTROL.—Control is submerged concrete weir across ditch, installed between October 21, and November 18, 1914; rated by engineers of East Maui Irrigation Co. Shifts slightly on account of gradual accumulation of tunnel débris on upstream side of control.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—NONE.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—To determine amount of water diverted from Territorial lands by East Maui Irrigation Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Haiku ditch, at elevation about 250 feet, diverts from all streams on the windward side of the crater of Haleakala, below all other main ditches, between Kailua Stream and Maliko Gulch. The water is carried to the vicinity of Paia and distributed for irrigation of sugar cane. The ditch comprises about 16 miles of main channel and has a carrying capacity of 87 million gallons per day. Haiku ditch replaced Spreckels ditch west of Kailua Stream.

Discharge, in million gallons per day, of Haiku ditch at Manawai Gulch, near Peahi, Maui, for the year ending June 30, 1922

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	4.6	55.9	2.4	9.9	71.3	68.9	65.6	50.8	84.8	17.4	42.5	16.0
2	1.2	73.9	1.0	59.2	58.7	58.4	48.0	36.9	71.1	17.5	57.6	14.9
3	21.2	61.6	1.2	38.8	102.0	72.4	44.5	34.2	72.5	17.6	41.2	8.2
4	23.2	51.8	1.4	32.4	77.1	88.8	60.1	64.2	68.5	23.2	68.2	8.2
5	7.5	54.5	4.9	29.2	61.8	82.0	61.5	68.7	75.6	82.1	78.8	7.6
6	1.6	32.7	3.8	10.1	46.6	78.9	49.6	65.0	68.3	73.4	64.3	7.4
7	1.3	42.1	1.5	8.8	34.1	69.7	44.1	68.7	65.9	70.2	44.4	7.1
8	1.4	29.1	1.8	7.2	20.8	46.9	42.5	82.4	67.2	61.0	77.3	7.8
9	1.9	15.8	7.2	5.4	11.7	41.4	41.6	86.4	62.8	45.3	39.4	7.6
10	1.7	15.2	20.5	4.0	20.4	54.1	37.4	87.6	65.5	51.9	41.2	7.1
11	1.6	20.4	2.0	3.4	7.8	48.8	35.9	86.3	63.6	83.3	55.6	7.3
12	1.6	22.0	2.0	2.8	11.1	70.2	45.8	88.0	61.8	85.8	44.2	8.3
13	1.6	39.6	2.0	2.8	28.1	80.8	63.6	82.9	60.7	89.8	22.7	12.6
14	1.6	28.3	2.0	3.0	16.5	49.4	74.4	69.6	57.1	88.7	12.2	8.0
15	10.7	20.1	8.3	2.1	8.6	73.2	54.6	58.6	51.8	63.3	11.2	6.8
16	49.6	4.8	35.6	5.1	8.8	75.5	44.6	57.6	44.2	78.3	10.2	6.3
17	72.4	5.3	13.6	2.4	8.2	81.5	40.7	56.9	65.8	61.2	10.2	6.4
18	85.2	2.5	4.7	3.5	7.4	90.0	65.1	50.2	65.9	31.2	9.9	5.2
19	79.6	44.9	14.3	2.1	42.7	83.5	79.8	42.0	58.2	24.6	9.9	4.5
20	68.4	36.1	1.5	1.6	90.0	83.6	84.6	37.6	47.4	33.8	27.8	4.6
21	57.3	14.3	10.0	1.5	90.0	73.2	88.0	51.6	39.4	39.2	10.8	5.2
22	29.3	16.5	28.6	1.2	86.8	63.0	88.3	73.6	32.7	38.8	9.5	4.4
23	19.1	13.8	62.6	7.9	81.7	89.6	82.0	66.8	29.9	28.0	12.0	4.4
24	28.9	6.8	45.8	85.8	86.9	90.0	68.7	82.9	28.6	44.6	16.2	4.4
25	11.7	2.4	23.7	90.8	90.0	90.0	82.4	58.9	26.2	64.0	10.6	4.2
26	3.4	1.8	13.4	93.6	90.0	90.0	86.4	64.9	30.5	36.6	61.1	4.0
27	35.0	1.5	25.9	70.8	74.1	90.0	90.0	33.3	24.0	20.0	65.8	3.8
28	24.6	1.5	25.5	84.6	54.6	89.1	90.0	87.4	24.8	35.5	49.7	3.8
29	60.6	1.5	11.2	89.7	34.6	87.4	90.0	-------	21.3	70.1	39.8	3.8
30	55.3	10.2	10.6	81.7	55.1	64.4	90.0	-------	18.0	50.7	20.0	3.8
31	47.4	15.2	-------	90.8	-------	55.4	70.1	-------	17.8	-------	20.0	-------

Monthly discharge of Haiku ditch at Manawai Gulch, near Peahi, Maui, for the year ending June 30, 1922

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	85.2	1.2	26.1	40.4	810	2,480
August	73.9	1.5	23.9	37.0	742	2,270
September	62.6	1.0	13.0	20.1	389	1,200
October	93.6	1.2	30.1	46.6	932	2,860
November	102.0	7.4	49.2	76.1	1,480	4,530
December	90.0	41.4	73.6	114	2,280	7,000
January	90.0	35.9	64.8	100	2,010	6,160
February	88.0	33.3	64.1	99.2	1,790	5,510
March	84.8	17.8	50.7	78.4	1,570	4,820
April	89.8	17.4	50.9	78.8	1,530	4,690
May	78.8	9.5	35.0	54.2	1,080	3,330
June	16.0	3.8	6.79	10.5	204	625
The year	102.0	1.0	40.6	62.8	14,800	45,500

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MISCELLANEOUS MEASUREMENTS

Measurements of streams and ditches on the Island of Maui at points other than regular gaging stations are listed below.

Miscellaneous measurements on Maui during the year ending June 30, 1922

Date	Stream	Tributary to or diverting from—	Locality	Gage height (feet)	Discharge	
					Second-feet	Million gallons per day
Oct. 20	Honokahau	Pacific Ocean	Old gaging station, 1,000 feet above intake of Honokahau ditch, near Lahaina.		11.3	7.3
20	do	do	do		12.4	8.0
May 2	do	do	do	1.71	29.5	19.1
Aug. 9	Honokahau ditch	Honokahau Stream	Cross-cut No. 2, near Lahaina.	1.23	19.1	12.3
Oct. 20	do	do	do	1.07	17.1	11.1
Aug. 9	do	do	Cross-cut No. 17	1.21	16.6	10.7
9	do	do	Honolua Stream		15.7	10.1
10	do	do	do	.98	14.9	9.6
9	do	do	Mailepai cross-cut		17.8	11.5
10	do	do	Power house		14.5	9.4
10	do	do	Cross-cut No. 26 (?) below Mailepai Stream.		14.4	9.3
9	do	do	Mahinahina weir	.31	14.8	9.6
9	do	do	do	.31	14.6	9.4
10	do	do	do	.27	12.3	8.0
10	do	do	do	.28	12.9	8.3
Oct. 21	do	do	do	.252	11.3	7.3
Aug. 9	do	do	Between fields No. 33 and 34 of Pioneer Mill Co.		16.2	10.5
9	do	do	In field No. 32 of Pioneer Mill Co.		15.9	10.3
9	Taro ditch	Honokahau ditch	Cross-cut No. 15 on main ditch.		1.0	.65
Oct. 20	do	do	do		1.55	1.0
Aug. 9	Honolua	Pacific Ocean	Intake of Honokahau ditch near Lahaina.		1.1	.7
Oct. 21	East Wailuaiki	do	1,000 feet above Wailoa ditch and 6¼ miles east of Keanae post office.	.69	4.2	2.7
27	do	do	do	1.15	14.7	9.5
Nov. 7	do	do	do	1.02	11.1	7.6
Dec. 30	Kaaiea	do	1,000 feet above Wailoa ditch intake and 4 miles southeast of Huelo.	.66	4.3	2.8
June 26	do	do	do	.44	.7	.45
Sept. 20	Wailoa ditch	Being an extension of Koolau ditch this ditch diverts from all streams on windward Haleakala from Makapipi to Halehaku inclusive.	100 feet below intake on Honopou Stream, one-half mile west of Lupi, and 7 miles southwest of Huelo.	.30	2.6	1.65
Oct. 21	do	do	do	1.90	44	28.5
June 27	do	do	do	1.78	49	31.5

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