QUALITY OF STORM-WATER RUNOFF,

MILILANI TOWN, OAHU, HAWAII, 1980-84

By Cheryl M. Yamane and Marty G. Lum

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 85-4265

Prepared in cooperation with the

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

Honolulu, Hawaii

December 1985

UNITED STATES DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information write to:

District Chief
U.S. Geological Survey, WRD
Rm. 6110, 300 Ala Moana Blvd.
Honolulu, Hawaii 96850

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CONVERSION TABLE

The following table may be used to convert measurements in the inch-pound system to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI units
Length		
inch (in.)	25.40	millimeter (mm)
foot (ft)	0.3048	meter (m)
Area		
acre	4,047	square meter (m^2)
Volume		
acre-foot (acre-ft)	1,233	cubic meter (m^3)
quart (qt)	0.9464	liter (L)
Flow		
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
Mass		
ton, short	0.9072	megagram (Mg)
ounce, avoirdupois (oz)	28.35	gram (g)
Specific conductance		
micromho per centimeter at 25° Celsius (µmho/cm at 25°C)	1.000	microsiemens per centimeter at 25° Celsius (µS/cm at 25°C)
Temperature		
degree Fahrenheit (°F)	°C=5/9 (°F-32)	degree Celsius (°C)
Slope		
feet per mile (ft/mi)	0.1894	meters/kilometer (m/km)

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ABSTRACT

Storm-water runoff and rainfall data were collected at two urban sites in Mililani Town, Oahu, Hawaii between September 1980 and August 1984. The data included results from analyses of 300 samples of storm-water runoff. Turbidity, suspended solids, Kjeldahl nitrogen, and phosphorus concentrations exceeded the State of Hawaii Department of Health's streamwater standards in more than 50 percent of the samples. Mercury, lead, and fecal coliform bacteria levels exceeded the U.S. Environmental Protection Agency's recommended criteria for either freshwater aquatic life or shellfish harvesting waters in more than half the samples. Other constituents exceeding State or Federal standards in at least one sample included pH, cadmium, nitrate plus nitrite, iron, alkalinity, manganese, chromium, copper, zinc, and the pesticides heptachlor, lindane, and malathion.

Runoff correlated well with rainfall in both basins. Antecedent rainfall conditions and rainfall intensity had little effect on the quantity of runoff.

No statistically significant relationships were found between quantity of runoff and concentration of water-quality constituents. A "first flush" effect was observed for chemical oxygen demand, suspended solids, lead, nitrate plus nitrite, fecal coliform bacteria, dissolved solids, and mercury. There were significant ($\alpha = 0.05$) differences between the two basins for values of discharge, turbidity, specific conductance, chemical oxygen demand, suspended solids, nitrate plus nitrite, phosphorus, lead, dissolved solids, and mercury. The larger basin had higher median and maximum values, and wider ranges of values.

INTRODUCTION

Urbanization can lead to an increase in stormwater discharge, which contains a number of substances that may contaminate receiving waters. The replacement of once permeable areas by impervious materials, along with drainage improvements, establishes a conduit for carrying away storm runoff and its possible contaminant load. Rain falling on impervious surfaces such as streets, sidewalks, and parking lots initially fills the tiny depressions on the surface. Additional rainfall results in surface runoff which can carry away litter, dirt, and other substances that have accumulated. These substances may include organic material, such as leaves, pesticides, animal droppings and the bacteria they carry. Oils, heavy metals, and other toxic pollutants like mercury may also be transported in the process.

It is desirable, however, to keep receiving waters unpolluted for domestic, recreational, agricultural, industrial, and aesthetic purposes. It is also often necessary to control the greater volume of runoff which may lead to flooding problems. To formulate a management plan which can effectively deal with these problems of increased runoff and pollution requires knowledge of the quality and quantity of the storm-water runoff.

Purpose and Scope

The purpose of this report is to present and evaluate the quality of storm-water data collected by the U.S. Geological Survey at two sites in Mililani Town on the island of Oahu, Hawaii. The City and County of Honolulu plans to use these data to help develop alternate storm-water management programs for the Waikele Stream Basin which may then be used as a model for other similar projects throughout the County.

The data collection period was from September 3, 1980 to August 31, 1984. Data are presented in tables and graphs and are compared with Hawaii Department of Health (DOH) water-quality standards and U.S. Environmental Protection Agency (EPA) criteria. Statistical analyses of the data were done to determine relationships between rainfall, runoff, and water quality.

Background Information and Station Description

Mililani Town is located on the central plain between the Koolau and Waianae Mountain Ranges on the island of Oahu, Hawaii (fig. 1). It is a relatively new (built within the last 20 years) and growing community. Mililani Town receives an average of about 40 inches of rainfall a year, although 1981, 1983, and 1984 were up to 75 percent drier than usual, with the wettest six months normally occurring from November to April. Winds are predominantly tradewinds from the east to northeast. Wind speeds from all directions range from one to 18 miles per hour. The average daily temperature is 72°F (Nakama, T., Department of Water and Land Development, oral commun., 1983, 1985).

In 1980, Mililani Town had a population of 21,365, up from 2,035 in 1970, and an average density of 9.1 persons per acre (Department of Planning and Economic Development, 1983, p. 22).

The study area is in the southwestern portion of Mililani Town (fig. 1). The two sampling sites are called Drain A and Drain B. The Drain A basin covers 291 acres and slopes from an elevation of about 650 feet above sea level along the northern boundary to 550 feet at the southernmost point. The gradient is approximately 100 ft/mi. The Drain B basin, covering 139 acres, slopes from an elevation of about 625 feet to 490 feet in the same direction. Its gradient is about 110 ft/mi. Runoff flows south past Drains A and B into Kipapa Stream which joins Waikele Stream and empties into the West Loch of Pearl Harbor.

The soils in the Drain A area are classified as Wahiawa series (Oxisol order) soil and fill land. Wahiawa soil has surface and subsoil layers of silty clay that are fine-textured and well-drained. It has a moderately permeable substratum of soft weathered rock. The Drain B area is covered with soils of the Wahiawa Series, Lahaina series (Oxisol order), and fill land. The Lahaina soil is similar to the Wahiawa soil in composition and characteristics (See Soil Conservation Service, 1972).

Land uses of the study area are shown in table 1.

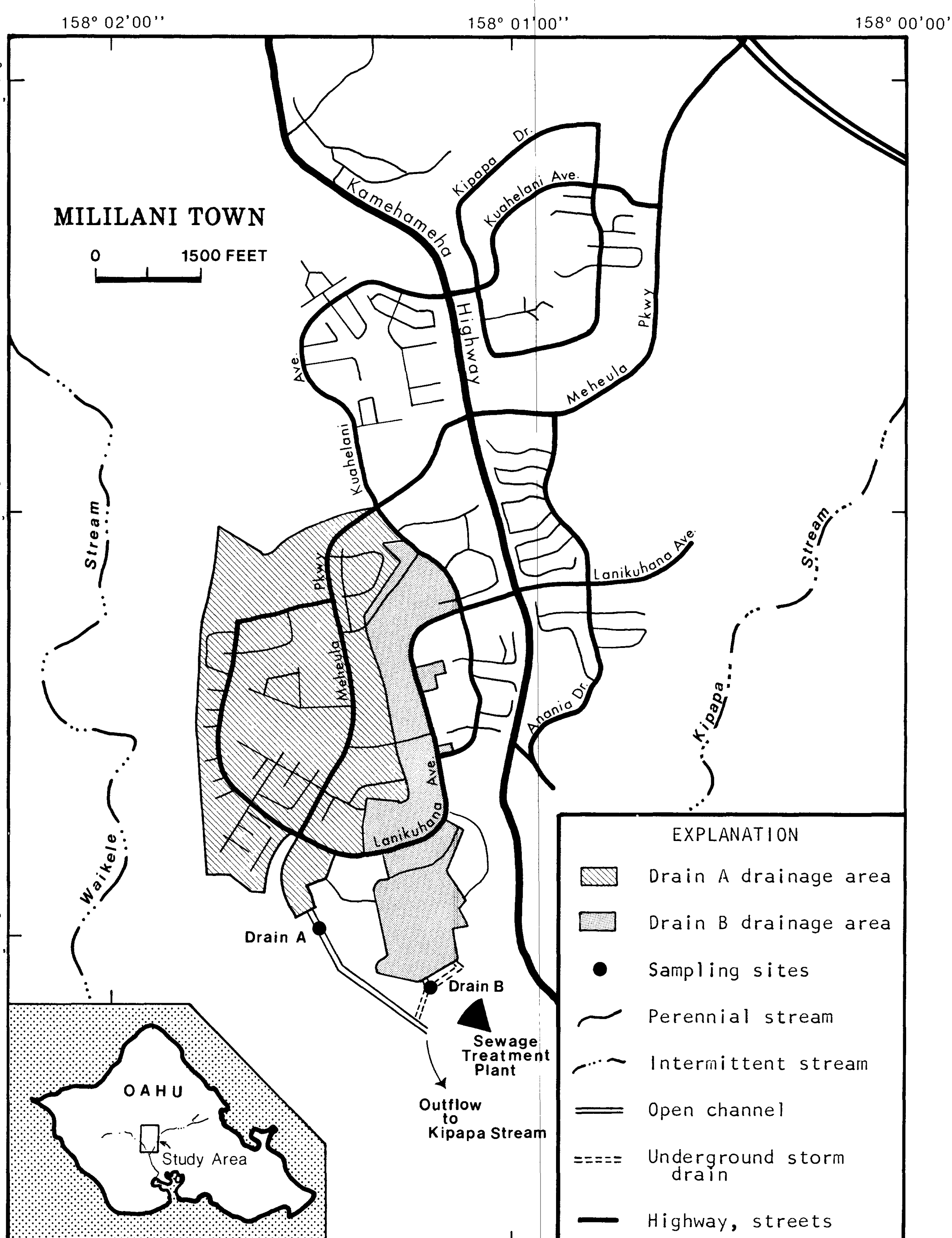


Figure 1. Location of project area and sampling sites in Mililani Town.

Table 1. Land use for study area

Land use	Acres	Percent of total area
	Drain A basin	
Medium density residential (3 to 8 dwellings/acre)	232	80
High density residential (9 or more dwellings/acre)	15	5
Park, school, church	17	6
Commercial*	7	2
Vacant	20	7
Total	291	100
	Drain B basin	
Medium density residential (3 to 8 dwellings/acre)	109	78
Park, school, church	30	22
Vacant	<1	<1
Total	139	100

Roadways and sidewalks adjacent to the areas above have been included in the figures given.

* For approximately the first three years of this project, this land was vacant; it then underwent development and is now a shopping center.

The storm sewer system in the study area is separate from the sanitary sewer system. Both are closed-conduit with the storm sewer system leading into an offsite open channel. Runoff from streets and adjoining areas flows along concrete curbs and gutters and enters the storm drainage system through curb inlets and catch basins. Runoff from large landscaped grassy areas and parking lots enters the system through property drains.

Drain A was located at a 9 x 9-foot, concrete-lined, open channel (fig. 2). Gage-height, rainfall records, and storm runoff samples were collected here. Drain B was situated over an 8-foot-diameter underground storm sewer system. Access to this closed culvert system was through a 23-foot-deep storm drain manhole. Gage-height record and storm runoff samples were collected at this site.

Figure 2. Mililani Drain A station.

Acknowledgment

Mr. Ernest Watanabe allowed U.S. Geological Survey personnel to install and to have access to the Drain B site on his property. Mr. Chew Lun Lau of the City and County Public Works Department initially coordinated this project and provided maps of Mililani Town. Mr. Eugene Ferguson of Mililani Town Inc. also supplied work maps of the study area.

DATA COLLECTION

Procedure

Samples of storm runoff were collected at each site by a Manning Portable Discrete Sampler[1/] preset to operate during times of high flow. The sampler held 24 1-liter plastic bottles, and two bottles were filled for each sample taken. At the beginning of this project, one sample was automatically collected every 7-1/2 minutes after the flow reached a minimum height but, after 3 months the time interval was lengthened to 15 minutes. Hand samples, taken when field personnel were present during high flows, provided large sample volumes for analysis of additional constituents which the limited automatic sampler volumes did not allow.

Drain A was equipped with a rain gage and continuous recorder which recorded accumulated rainfall every five minutes. At each station, gage height (water level in the lined channel or storm drain) was continuously recorded on a circular chart using a Manning Portable Ultrasonic Recorder[1/].

Specific conductance was measured for all automatic and hand samples. Temperature and pH readings, and fecal coliform bacteria counts (membrane filtration method) were also taken for some of the samples. All of the above determinations were made in the U.S. Geological Survey's Hawaii District laboratory except for temperature, which was measured in the field. The gage-height at which each sample was collected was determined from the gage-height recorder chart. Time of collection was determined from the same chart or a sample marker made on the rainfall record or on a specially installed digital tape. Discharge was read from a rating curve theoretically derived for each culvert.

Samples were then sent to the U.S. Geological Survey's Central Laboratory in Arvada, Colorado for analysis of one or more of the following: turbidity, chemical oxygen demand, total and dissolved nutrients, major ions, oil and grease, pesticides, dissolved and suspended solids, total and dissolved metals, and suspended and dissolved organic carbon.

[1/] Use of brand or trade names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

A total of 222 samples from Drain A and 78 samples from Drain B were analyzed. The large difference in the number of samples occurred because Drain A covers a larger runoff area than Drain B and the greater runoff volume resulted in more samples being collected.

All the field and laboratory data were entered into the U.S. Geological Survey's National Water Data Storage and Retrieval System (WATSTORE) for permanent storage and easy retrieval. The data were then analyzed using the SAS (SAS Institute Inc., 1982) and PSTAT (Buhler and others, 1983) statistical packages. Data were checked for normality and log transformations were made to distribute some of the data more normally. Pearson or Spearman and Kendall's tau-b correlations were made depending on the distribution of a given data set. Instantaneous constituent concentrations and corresponding discharges were used in some correlations. Other correlations used data that had been divided into two groups: those samples taken during the initial rise or peak of a storm runoff, and those taken after the peak. Total constituent loads and total runoff volumes were calculated for storms for which sufficient data were available. Differences between Drain A and Drain B data were determined with the Wilcoxon rank-sum test.

Problems

It was not possible to get samples and detailed data for every storm that occurred during the project period. Equipment failure caused some storms to be unsampled or to be only partially sampled. At other times, the sampler would fill all of its 24 bottles; therefore, the remaining part of a storm or any subsequent storm could not be sampled. This resulted in a lack of sufficient data for correlations using total storm loads.

There were also instances when the timing of the sample collections was irregular and the sample collection marks were missing. This meant that the sample collection times had to be estimated from the gage-height charts and that the gage-heights and their corresponding discharges were approximations. If reliable estimates could not be made, then the samples were discarded.

QUALITY OF STORM-WATER RUNOFF

Data for the following graphs and all other Central Laboratory and Hawaii District laboratory data collected during the study period are listed in tables 6 and 7 of the Supplemental Data section (pages 31 to 64).

Figures 3 to 9 are graphs showing relationships of selected constituents and properties for seven storm events, an event being a peak or series of peaks in runoff that occur relatively close together. Elapsed time, shown on the x-axis, is the same for all graphs at any given date. Baseflow is negligible at both stations and is, therefore, not included in the graphs.

Four rainfall-runoff circumstances were observed: (1) runoff followed rainfall by 5 to 20 minutes, the most common situation (figs. 3-9), (2) the rainfall and runoff peaks occurred at about the same time (fig. 5), (3) a rainfall resulted in no apparent runoff, and (4) the runoff was delayed for more than 20 minutes after a rainfall. The first rainfall in figure 6 could be an example of (3) or (4).

Situations (2) to (4) may have been caused by the variable distribution of rainfall within the basin. The area around the rain gage could have received localized rainfall, or a moving storm front could have passed over that area first, before moving to the rest of the basin. It is also possible that rainfall could have been more intense in one area of the basin than another.

In figure 7, there are breaks in some of the graphs because no samples were taken at these times of low flow. Dissolved solids and specific conductance are plotted together because of the close relationship between them. Specific conductance is a measure of the ability of water to conduct an electrical current, which in turn is dependent on the type and concentration of ions in the water. Charged ions make up much of the inorganic dissolved solids in water.

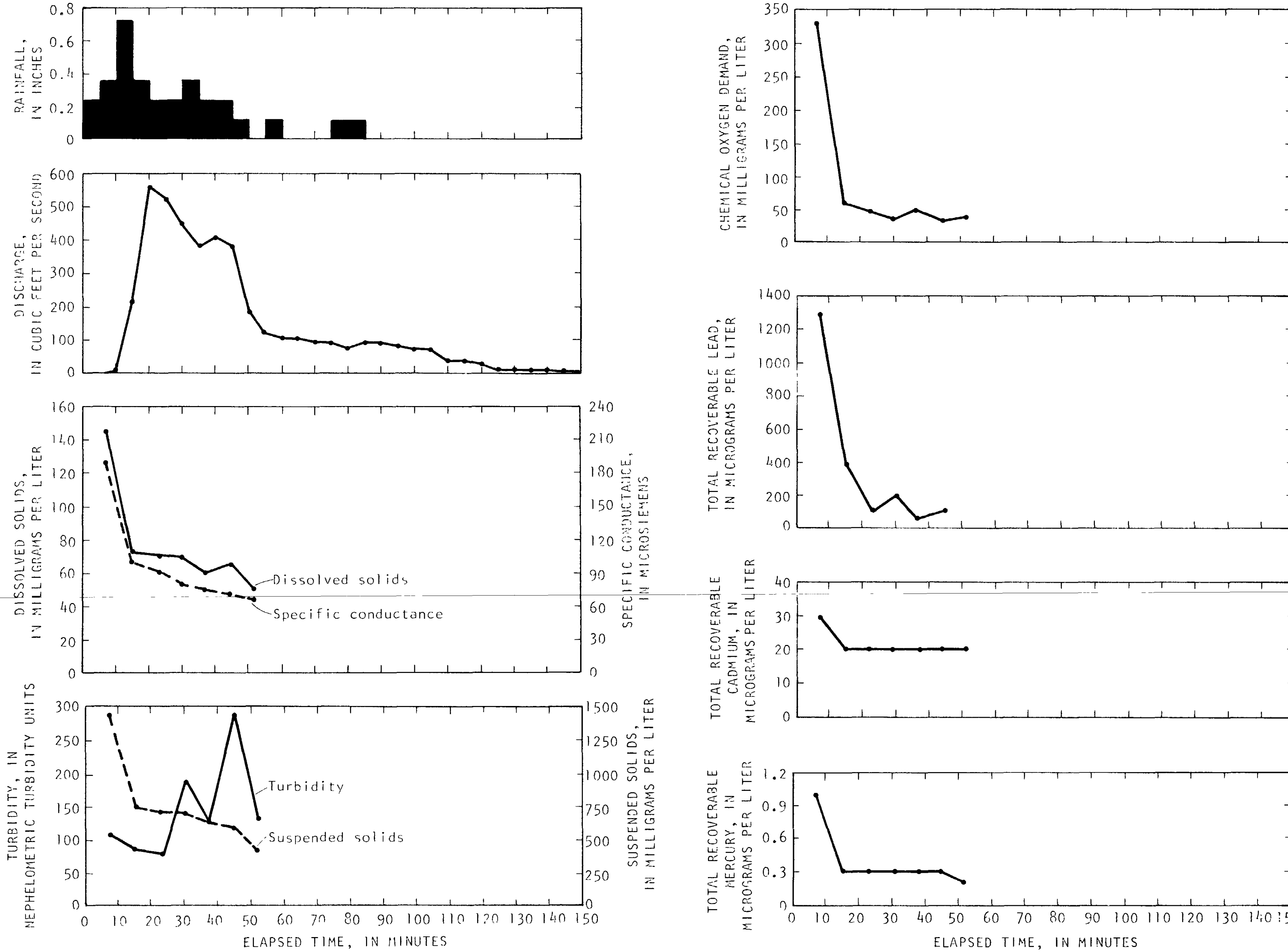


Figure 3.--Relationship of selected constituents and characteristics for storm on September 17, 1980 at Mililani Drain A.

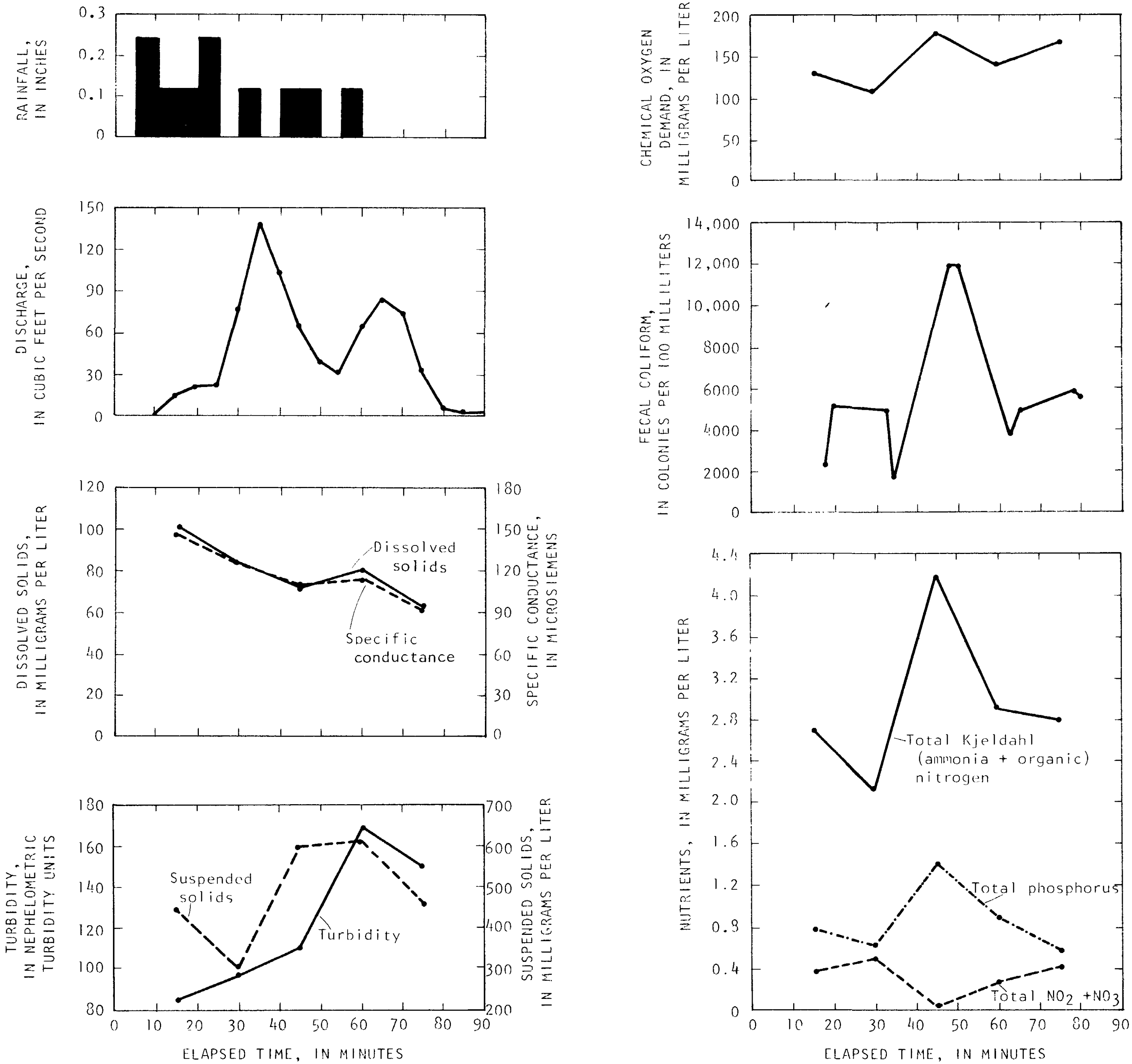


Figure 4.--Relationship of selected constituents and characteristics for storm on December 5, 1980 at Mililani Drain A.

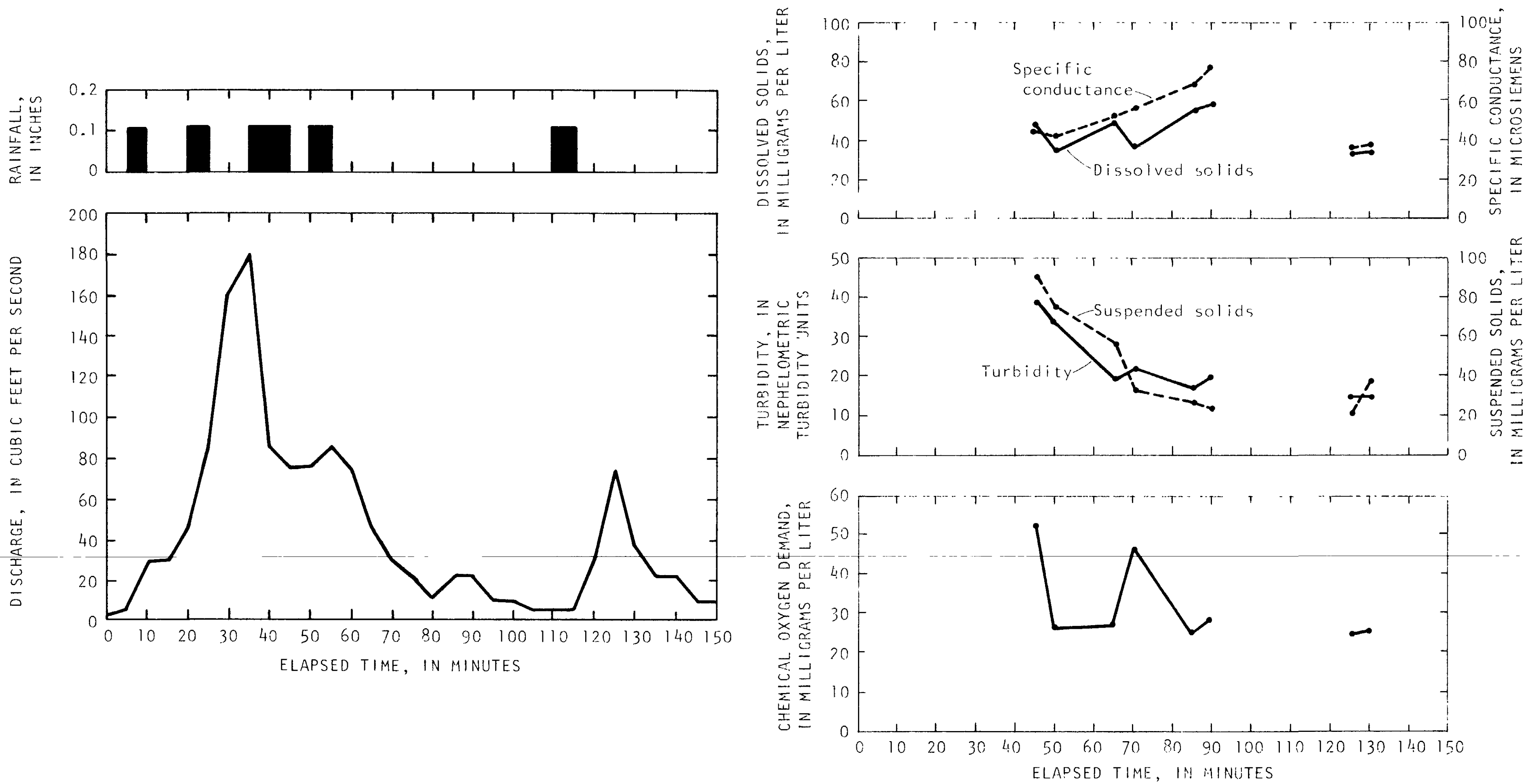


Figure 5.--Relationship of selected constituents and characteristics for storm on August 25, 1982 at Mililani Drain A.

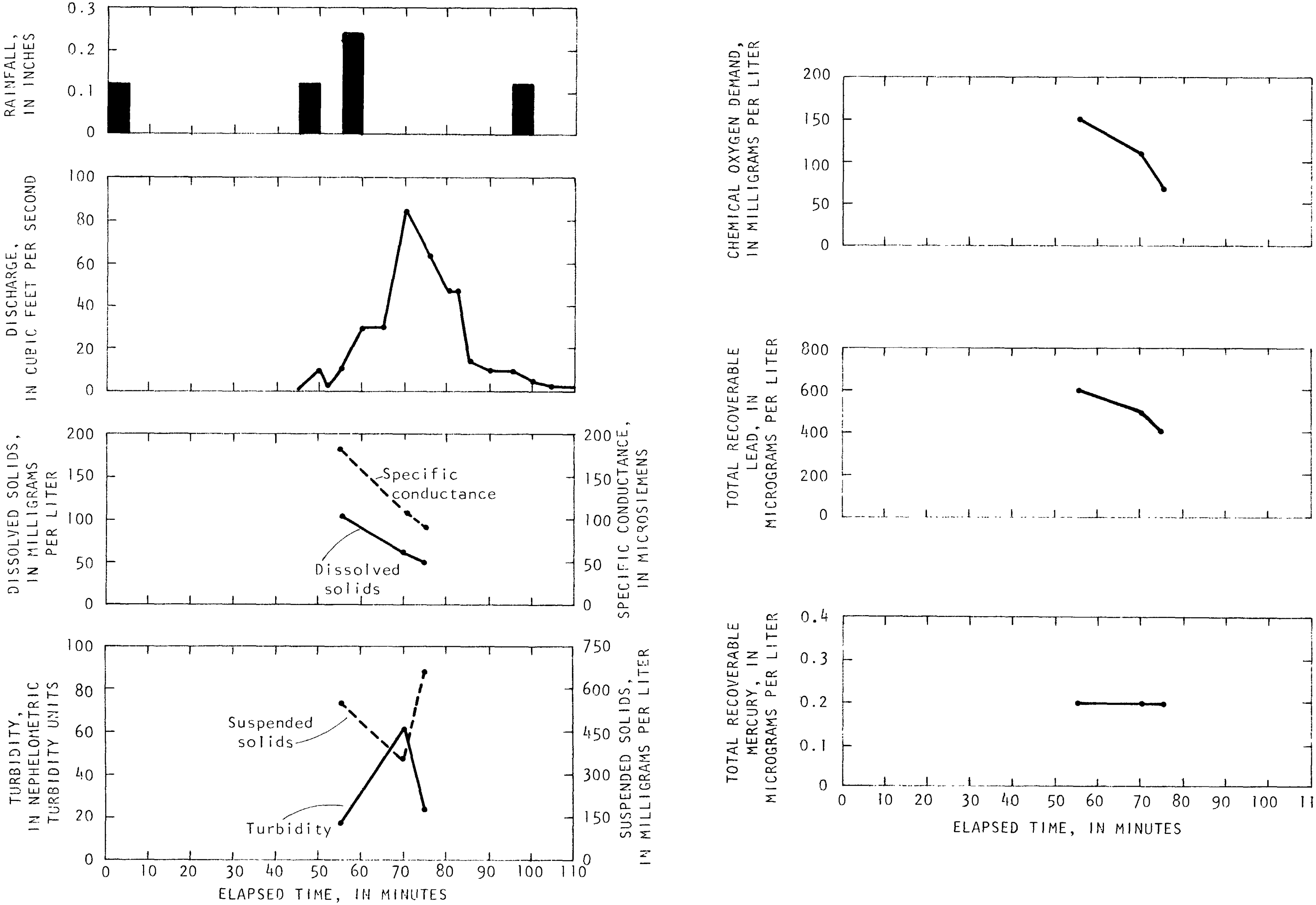


Figure 6.--Relationship of selected constituents and characteristics for storm on September 17, 1983 at Mililani Drain A.

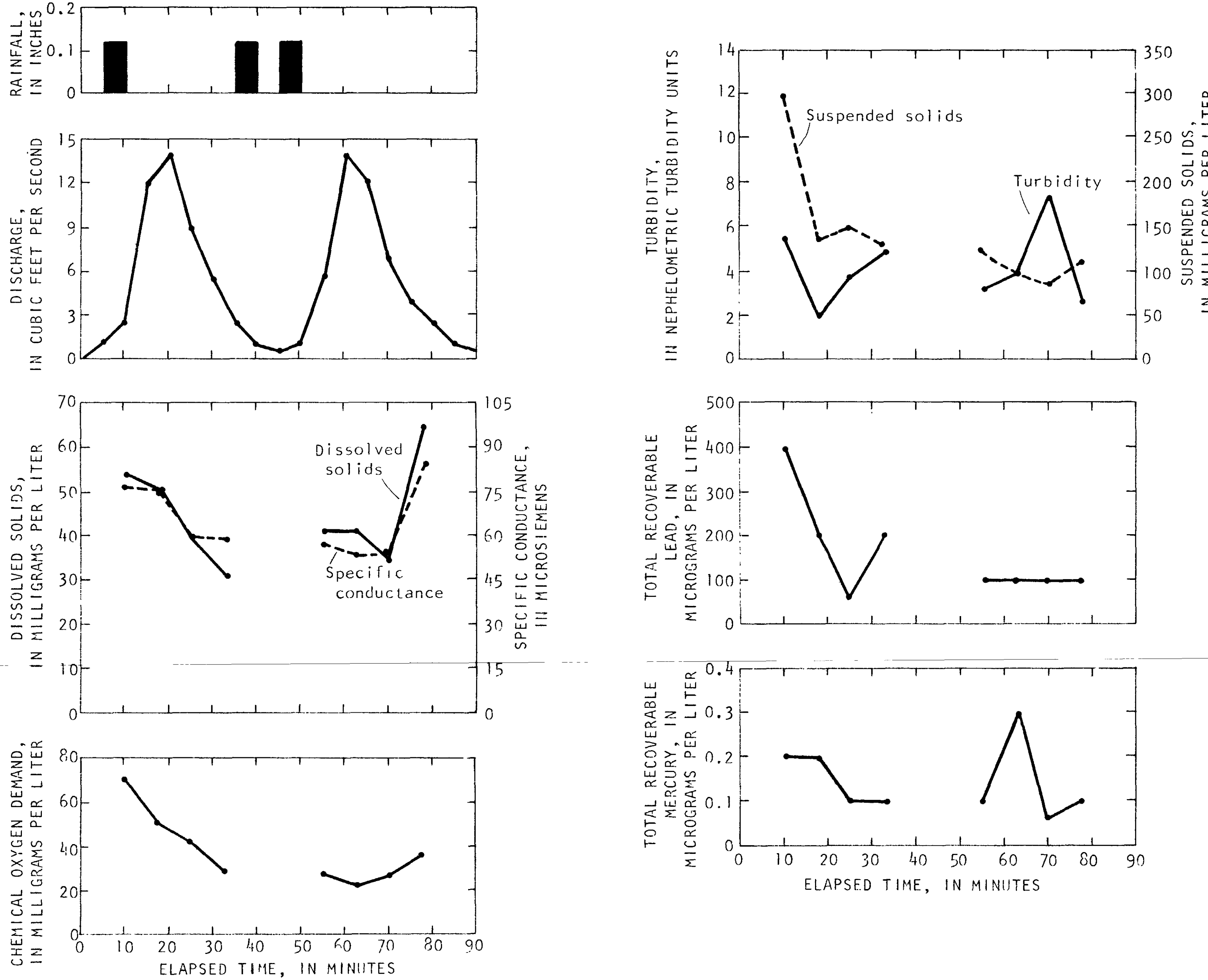


Figure 7.--Relationship of selected constituents and characteristics for storm on October 5, 1980 at Mililani Drain B.

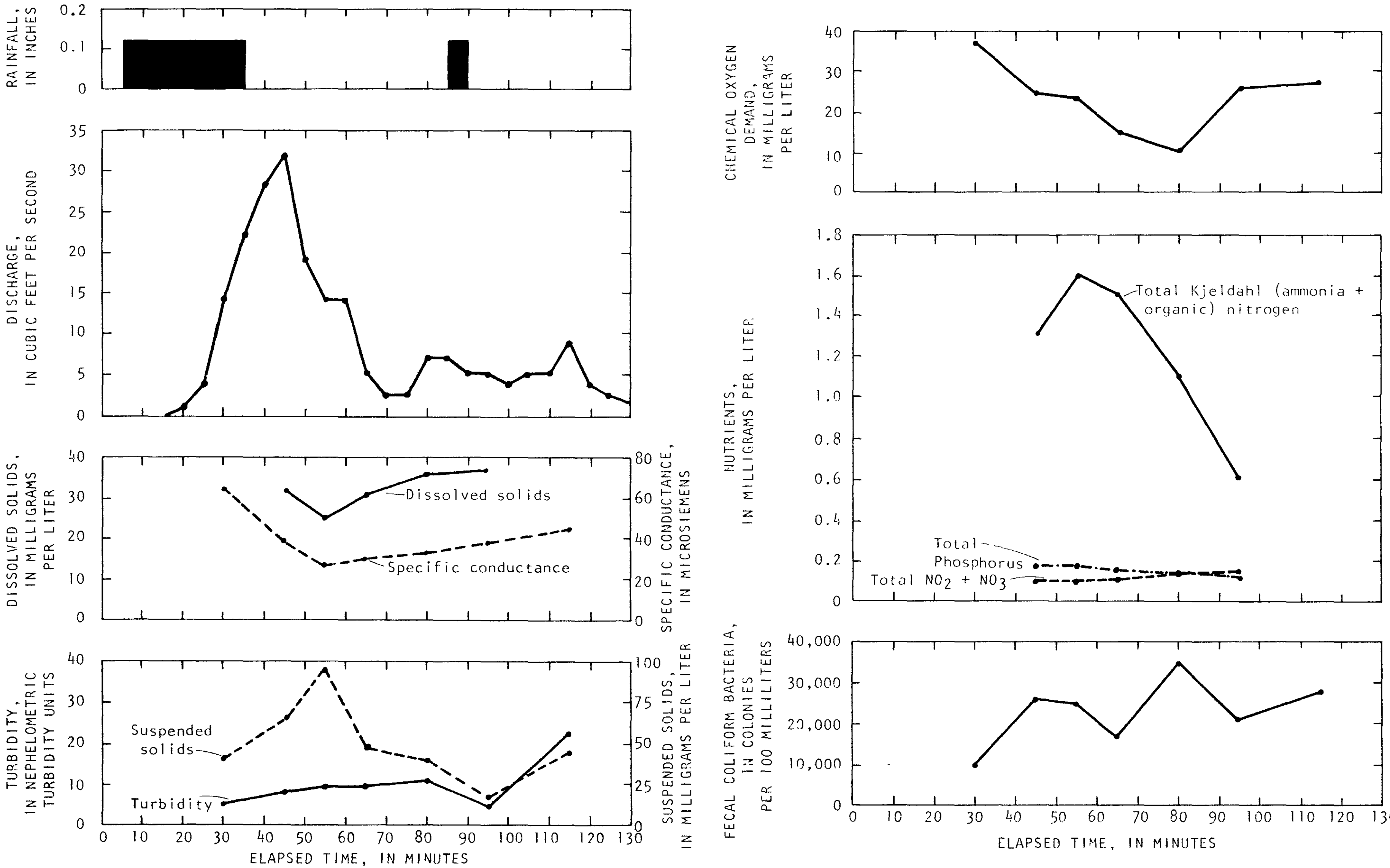


Figure 8.--Relationship of selected constituents and characteristics for storm on August 16, 1982 at Mililani Drain B.

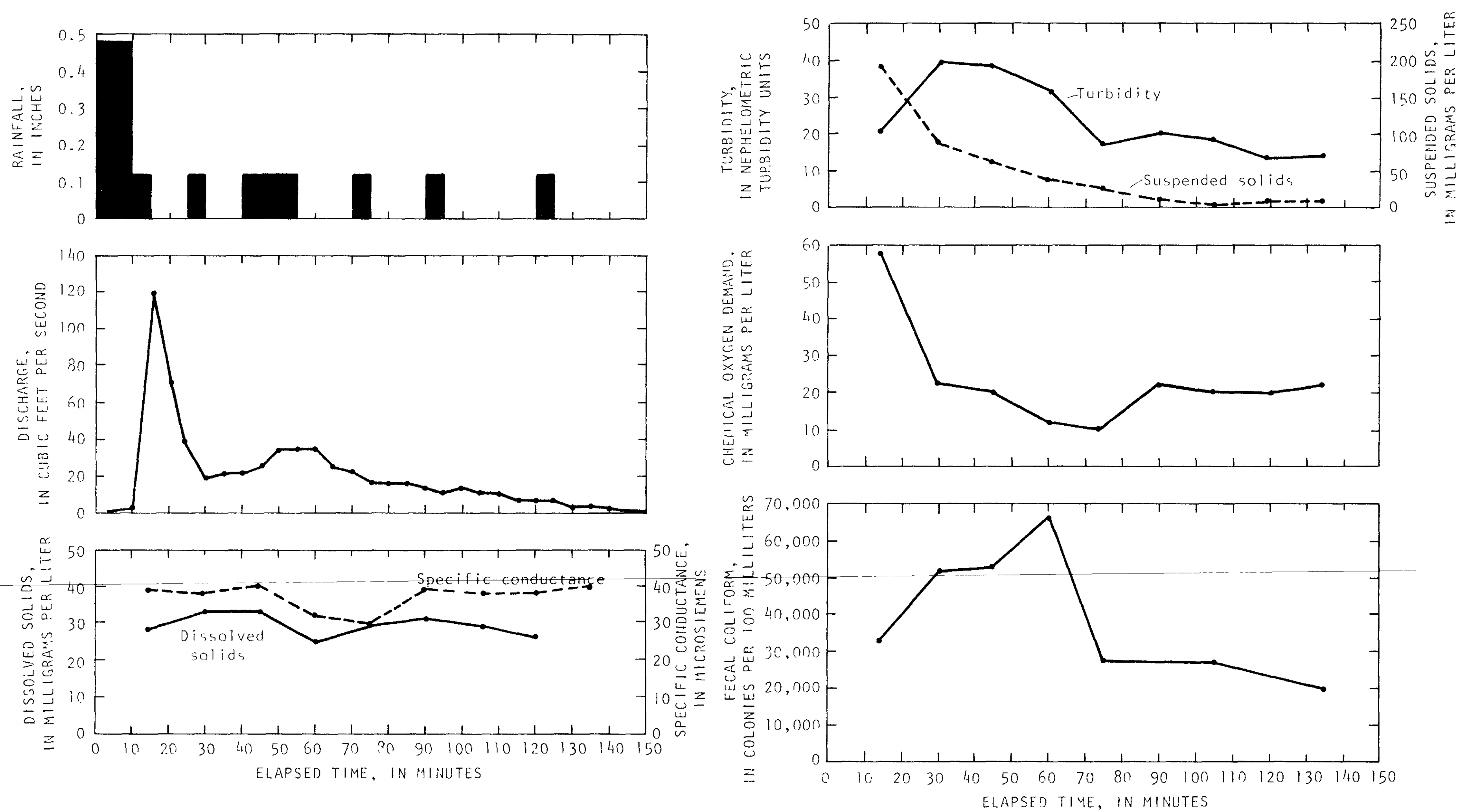


Figure 9.--Relationship of selected constituents and characteristics for storm on December 23, 1982 at Mililani Drain B.

Suspended solids may be organic or inorganic materials and can give the water a turbid appearance. High suspended solids concentrations can lead to clogged storm drains or, when washed into streams, can reduce light penetration. Photosynthesis and primary production may be diminished. The settling of suspended solids, over many years, can cause the level of the streambed to rise, reducing channel capacity and creating a potential for flooding. It can also smother benthic aquatic life and destroy their habitats (See Wilber, 1983, p. 26-28). Suspended solids in urban runoff consist mostly of sediment from soil erosion and particles from the wear of automobile parts (Whipple, 1983, p. 62).

Turbidity may be indicative of the amount of suspended solids in the water; therefore, the two are plotted together. However, in most of the graphs (figs. 3, 4, 6, 7, 8 and 9) turbidity and suspended solids do not correlate well. Precipitation of dissolved solids or subsampling error could explain the cases where there are relatively high turbidity values with relatively low suspended solids concentrations. Colored solutes, large particles that settle rapidly, or subsampling error could explain low turbidity values with high suspended solids concentrations (See Skougstad and others, 1979, p. 549).

Chemical oxygen demand is a measure of the amount of oxygen needed to oxidize organic and inorganic material. It gives an approximate indication of the amount of organic and reduced material in the water.

For the heavy metals, analyses were done most frequently for cadmium, lead, and mercury. Lead is present in paints, varnishes, gasoline, batteries, and insecticides, as well as in the soil. It accumulates in the tissues of living organisms and has no beneficial effects. The major source of lead in Mililani Town runoff is probably from motor vehicle exhaust systems. Cadmium is found in batteries, paints, plastics, photo processing materials, and plated iron products such as nuts and bolts. It is a nonessential and nonbeneficial metal to living organisms (See U.S. Environmental Protection Agency, 1976 and 1980).

Mercury can accumulate in the tissues of living organisms at a far greater rate than it can be eliminated. Therefore, going through the food chain from algae to fish to man, mercury concentrations in tissue can be thousands of times greater than the initial exposure rate. In fish, mercury can affect reproduction, growth, and mortality. In man, mercury or its derivations can affect many different parts of the body including the kidneys, blood, and nervous system. Mercury is used in chlorine and caustic soda preparation. It is found in batteries, insecticides, and paints. It may be a product of fossil fuel burning, and it occurs naturally in rocks and soils (See U.S. Environmental Protection Agency, 1976 and 1980).

High concentrations of nitrogen and phosphorus provide nutrients for algae and other aquatic plants to flourish, sometimes excessively. Dissolved oxygen depletion then occurs and causes problems for oxygen-consuming organisms. Possible sources of nitrogen and phosphorus include fertilizers washed or blown off lawns, soil erosion, auto exhaust, and animal and plant wastes.

Fecal coliform bacteria provide an indication of fecal contamination from warm-blooded animals. High counts can pose a threat to recreational water use and to shellfish which tend to accumulate the bacteria in their tissue. Feces from domestic pets are probably the major source of fecal coliform bacteria in Mililani storm runoff.

Comparison with Water-Quality Standards

Tables 2 and 3 list selected water-quality standards and recommended water-quality criteria as set by the Hawaii State Department of Health and U.S. Environmental Protection Agency, respectively. Most of the DOH standards have two values, one for the wet season and one for the dry, while the EPA criteria have only one set of values. The DOH values are legal standards, whereas the EPA values are guidelines for use by other governmental agencies. Some of the metals in the EPA list have criteria based on hardness of the water. It has been found for these constituents that toxicity decreases as hardness increases, and the equations used to calculate the recommended criteria reflect this. Since the storm runoff from Mililani is routed into Waikele Stream, the EPA criteria applicable to freshwater streams were used. Where freshwater aquatic life criteria were not available, other criteria (domestic water supply or shellfish harvesting water) were used.

Table 2. Selected water-quality standards for Hawaii's streams established by the State Department of Health, 1984[1/]

Constituent or Property	Value not to be exceeded: During dry season (May 1-Oct. 31)	Value not to be exceeded: During wet season (Nov. 1-Apr. 30)
Total nonfilterable residue (mg/L) ---	55	80
Turbidity (NTU) ---------------------	10.0	25.0
Total Kjeldahl nitrogen as N (mg/L) --	0.60	0.80
Total nitrate + nitrite as N (mg/L) --	0.17	0.30
Total phosphorus as P (mg/L) ---------	0.08	0.15
Specific conductance (µS/cm) ---------	300 for both seasons	
pH (units) --------------------------	Not lower than 5.5 nor higher than 8.0 for both seasons	

[1/] Department of Health, 1984, p. 8-9.

Table 3. Selected water-quality criteria recommended by the Environmental Protection Agency[2/]

Constituent	Concentration	Target of criterion
Total cadmium (µg/L)	$e^{(1.05\ [\ln(\text{hardness})]\ -\ 3.73)}$	Freshwater aquatic life.
Total chromium (µg/L)	21	Do.
Fecal coliform bacteria (colonies per 100 ml)	Median of 14 and not more than 10% of samples > 43	Shellfish harvesting water.
Total iron (mg/L)	1.0	Freshwater aquatic life.
Total lead (µg/L)	$e^{(1.22\ [\ln(\text{hardness})]\ -\ 0.47)}$	Do.
Total mercury (µg/L)	0.0017	Do.
Total oil and grease	0.01 of the lowest continuous flow 96-hr LC_{50} of highly susceptible species; surface waters virtually free of floating oil and grease; sediment levels low enough to not cause deleterious effects to biota	Do.
Alkalinity (mg/L as $CaCO_3$)	20	Do.
Total arsenic (µg/L)	440	Do.
Total barium (µg/L)	1000	Domestic water supply.
Total copper (µg/L)	$e^{(0.94\ [\ln(\text{hardness})]\ -\ 1.23)}$	Freshwater aquatic life.
Total cyanide (µg/L)	52	Do.
Total iron (µg/L)	1000	Do.
Total manganese (µg/L)	100	Shellfish harvesting water.
Total selenium (µg/L)	260	Freshwater aquatic life.
Total silver (µg/L)	$e^{(1.72\ [\ln(\text{hardness})]\ -\ 6.52)}$	Do.
Total zinc (µg/L)	$e^{(0.83\ [\ln(\text{hardness})]\ +\ 1.95)}$	Do.
Total aldrin (µg/L)	3.0	Do.
Total chlordane (µg/L)	2.4	Do.
Total 2,4-D (µg/L)	100	Domestic water supply.
Total DDT (µg/L)	1.1	Freshwater aquatic life.
Total dieldrin (µg/L)	2.5	Do.
Total endosulfan (µg/L)	0.22	Do.
Total endrin (µg/L)	0.18	Do.
Total heptachlor (µg/L)	0.52	Do.
Total lindane (µg/L)	0.01	Do.
Total malathion (µg/L)	0.1	Do.
Total methoxychlor (µg/L)	0.03	Do.
Total mirex (µg/L)	0.001	Do.
Total parathion (µg/L)	0.04	Do.
Total silvex (µg/L)	10	Domestic water supply.
Total toxaphene (µg/L)	1.6	Freshwater aquatic life.

2/ See references under U.S. Environmental Protection Agency, 1976 and 1980.

Table 4 lists the percent of samples that exceed the DOH or EPA established limits. For metals for which water hardness is used as a basis for calculating recommended criteria, average hardness values were used if the sample did not have a corresponding individual hardness value. In some instances, the limiting value is less than the laboratory detection limit, therefore, it is not possible to tell whether the limiting values are exceeded or not. These samples are counted in the right-hand column.

Specific conductance is the only frequently-sampled property or constituent that never exceeded established standards at either station. Virtually all of the pH values were also within the acceptable range. For nitrate plus nitrite, the majority of Drain A values and all of the Drain B values were less than the DOH standard. On the other hand, most of the values for turbidity for Drain A and suspended solids, mercury, lead, fecal coliform bacteria, ammonia plus organic nitrogen (referred to as Kjeldahl nitrogen), and phosphorus (as P) for both stations exceeded the standards.

No actual numerical criteria have been set for oil and grease because of the thousands of organic compounds included in this category, therefore, no direct comparison can be made with the Mililani data. Harmful effects, which can occur at concentrations as low as 0.1 µg/L, include tainting of edible aquatic species and interference in the feeding, respiratory, and reproductive processes of aquatic life (U.S. Environmental Protection Agency, 1976). The oil and grease found in samples from Mililani Drains A and B probably originate from motor vehicles.

Iron, manganese, and copper were analyzed in only a few samples and concentrations exceeded the recommended limits in all of them. Selenium, arsenic, barium, and cyanide levels did not exceed the recommended criteria. Chromium and zinc concentrations were greater than EPA criteria in some of the samples.

The rest of the constituents in table 4 are insecticides and herbicides. Heptachlor, lindane, and malathion concentrations were greater than recommended limits in a few samples. Most of the limits are low due to the toxicity to sensitive aquatic organisms. Aldrin, dieldrin, chlordane, DDT, and heptachlor have been banned for production and use by the EPA because of their long persistence, ability to accumulate in the tissues of organisms, and their potential carcinogenicity to humans. Nevertheless, these chemicals are still found in the environment because of continued use of supplies bought before banning took place and/or persistence from earlier applications.

Table 4. Comparison of samples at Mililani Drains A and B with Department of Health standards and Environmental Protection Agency recommended criteria

Property or constituent	Total number of samples		Percent of samples greater than DOH or EPA limit		Percent of samples less than detection level	
	Drain A	Drain B	Drain A	Drain B	Drain A	Drain B
Suspended solids	203	73	80	59		
Turbidity	203	75	84	44		
Total Kjeldahl nitrogen	40	9	100	78		
Total nitrite + nitrate	40	9	38	0		
Total phosphorus	40	9	88	89		
Specific conductance	208	78	0	0		
pH	59	13	7	0		
Total cadmium	168	66	14	5	86	95
Total chromium	2	3	100	33		
Fecal coliform bacteria	49	28	100	100		
Total iron	2	3	100	100		
Total lead	168	66	75	62	25	36
Total mercury	154	66	92	79	8	21
Alkalinity	9	3	100	67		
Total arsenic	3	3	0	0		
Total barium	2	3	0	0		
Total copper	2	3	100	100		
Total cyanide	2	3	0	0		
Total manganese	2	3	100	100		
Total selenium	2	3	0	0		
Total silver	2	3			100	100
Total zinc	2	3	50	33		
Total aldrin	6	2	0	0		
Total chlordane	6	2	0	0		
Total 2,4-D	2	2	0	0		
Total DDT	6	2	0	0		
Total dieldrin	6	2	0	0		
Total endosulfan	6	2	0	0		
Total endrin	6	2	0	0		
Total heptachlor	6	2	17	0		
Total lindane	6	2	17	0		
Total malathion	6	2	100	50		
Total methoxychlor	6	2	0	0		
Total mirex	6	2			100	100
Total parathion	6	2	0	0		
Total silvex	2	2	0	0		
Total toxaphene	6	2	0	0		

Comparison with Similar Studies

Fujiwara's (1973) study of urban runoff in Kalihi, Oahu, another residential area, found that most suspended solids and pH values were within acceptable DOH limits, while all fecal coliform bacteria concentrations were higher than recommended. In his study, Fujiwara also took a composite sample for each of the three residential area storms he sampled. Of the three, one Kjeldahl nitrogen sample and all phosphorus samples had concentrations higher than DOH standards. All three chromium and iron concentrations were less than EPA criteria, but all lead, zinc, and copper values were higher. The oil and grease concentrations Fujiwara obtained were 2.1, 3.2, and 3.2 mg/L compared to <1, <1, 1, and 3 mg/L for the Mililani stations.

Ching (1972), in a study on increasing the effects of urbanization on a receiving water body (Manoa Stream on Oahu), found that concentrations of fecal coliform bacteria, suspended solids, turbidity, total nitrogen, total phosphorus (as PO_4), and nitrates increased greatly in the stream due to urban storm-water runoff.

Relationships of Rainfall, Runoff, and Water Quality

Rainfall and total runoff quantities were calculated for individual storm events and were statistically analyzed to determine the relationship between them. Rainfall and runoff were found to be highly correlated (for Drain A: $r = 0.77$, $p = 0.0001$, $n = 186$; for Drain B: $r = 0.79$, $p = 0.0001$, $n = 71$). In other words, the greater the rainfall, the greater the quantity of runoff that was produced.

The number of preceding dry days and the quantity of rainfall that preceded those dry days had insignificant effects on the quantity of runoff. Storms with equal quantities of rainfall had varying volumes of runoff. At first it was thought that this may be due to the intensity of the rainfalls, but further investigation showed that increased rainfall intensity did not result in increased runoff. A possible explanation may be that the distribution of rainfall varied within the basin.

Figure 10 shows total monthly rainfall compared to total monthly runoff for Drains A and B. Months showing zero runoff may have had discharge that was too low to be detected.

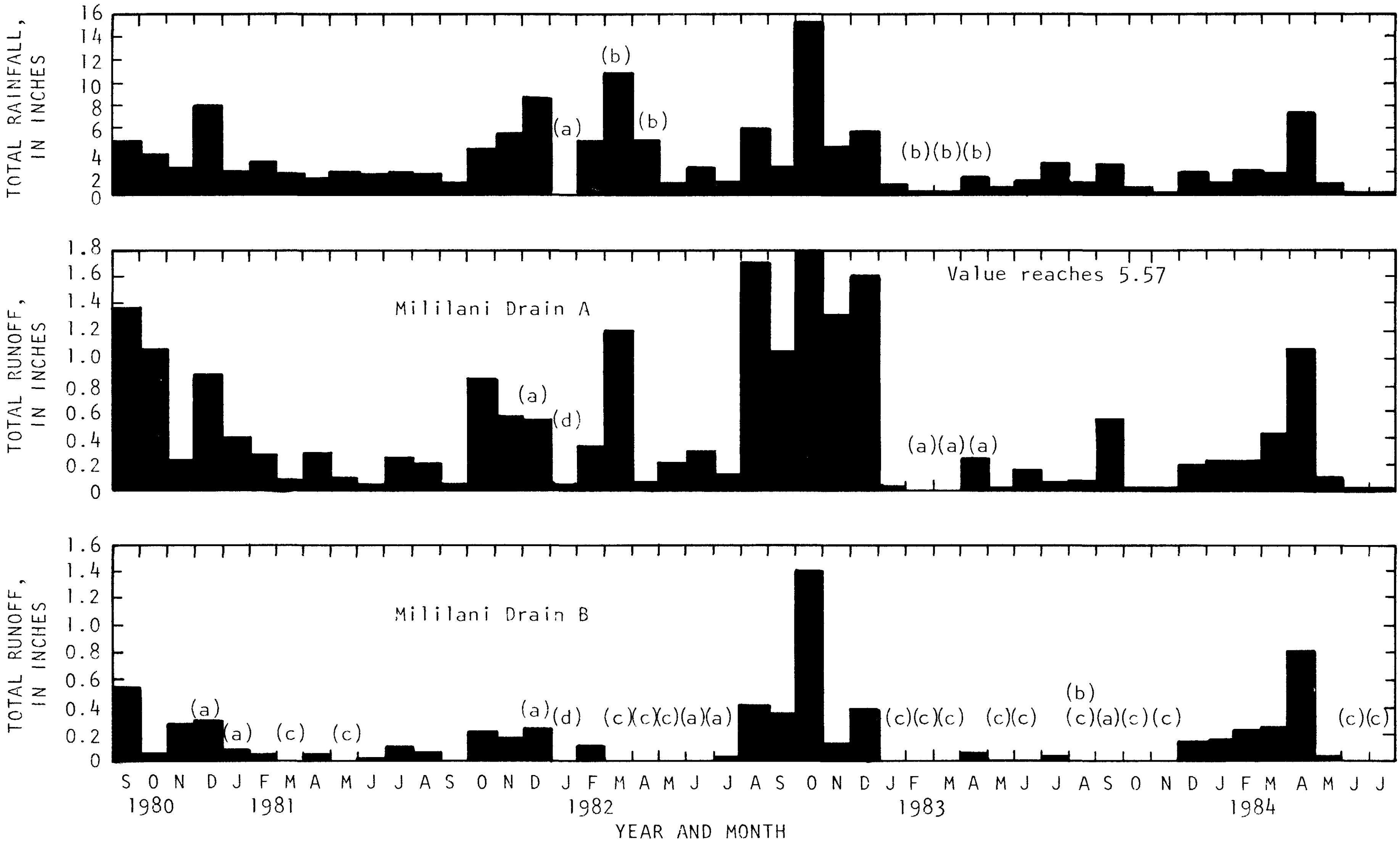
Statistical analyses were done to determine if concentrations of chemical constituents were related to discharge. Instantaneous concentrations and discharges were compared when the water quality data were considered both as a single set and when they were divided into two sets: those samples taken on or before the peak of a storm, and those taken after the peak. No positive or negative correlations of $|r| \geq 0.50$ between constituent concentrations and discharge were found when either the single or double set of data were used. Total constituent loads and total runoff volumes were also analyzed and, although the number of completely-sampled storms was too small to provide statistically significant results, there were indications that larger runoff volumes produce higher constituent loads.

Some constituents showed much higher concentrations during the rising and peak stages than during the falling stages. This is evidence of the "first flush" effect where much of the constituent load was transported during the early part of the runoff. The constituents showing "first flush" effects were chemical oxygen demand, suspended solids, total nitrate plus nitrite, lead, fecal coliform bacteria, dissolved solids, and mercury for Drain A and chemical oxygen demand, suspended solids, lead, and mercury at Drain B.

Attempts were made to find out if antecedent dry days and initial rainfall intensity affected the concentration of constituents in the first runoff sample taken from a storm. Only chemical oxygen demand, suspended solids, lead, and dissolved solids from Drain A had enough range in the data and sufficient numbers of analyses to test for this. Neither variable was significant.

Comparison of Drain A and Drain B Water-Quality

Table 5 shows that large differences exist between some of the Drain A and Drain B data. All of the water-quality characteristics except for fecal coliform bacteria, pH, and total Kjeldahl nitrogen show significant differences at the α = 0.05 level. Factors that may contribute to these differences are Drain A's larger basin size, less open space, and greater number of samples analyzed. Other factors that may have had an effect on the values of the water-quality characteristics include basin slope, percent impervious area, and amount of vehicular traffic.



(a)--Some data are missing, therefore, actual monthly total may be higher
(b)--Estimated
(c)--Total runoff is zero
(d)--Gage-height chart unreadable, total cannot by calculated

Figure 10.--Monthly rainfall and runoff totals for Mililani Drains A and B from September 1980 to July 1984.

Table 5. Median and range values for selected water-quality characteristics at Mililani Drains A and B

Water-quality characteristic	Station	Median value	Range of values
Discharge (ft^3/s)	A	30	2-535
	B	12	1-68
Turbidity (NTU)	A	35	2.4-360
	B	20	1.9-160
Specific conductance (µS/cm)	A	79	22-267
	B	52	23-145
Chemical oxygen demand (mg/L)	A	60	<10-370
	B	34	<10-300
Suspended solids (mg/L)	A	204	11-3000
	B	96	3-759
Dissolved solids (mg/L)	A	47	19-176
	B	35	9-80
Lead (µg/L)	A	200	76-1600
	B	100	22-1200
Mercury (µg/L)	A	0.2	<.1-2.0
	B	0.1	<.1-0.4
Fecal coliform bacteria (colonies per 100/ml)	A	26,000	1,500-300,000
	B	26,000	4,300-100,000
pH (units)	A	7.2	6.9-8.3
	B	7.0	6.8-7.8
Total Kjeldahl nitrogen as N (mg/L)	A	1.2	0.84-4.2
	B	1.4	0.49-1.7
Total NO_2 + NO_3 as N (mg/L)	A	0.21	0.04-0.70
	B	0.10	<0.10-0.30
Total phosphorus as P (mg/L)	A	0.34	0.08-1.4
	B	0.17	0.12-0.27

SUMMARY

Rainfall, runoff, and water quality data were collected for four years in an urban residential area in Mililani Town, Oahu, Hawaii. More than three-fourths of the rainfalls occurring in the study area were less than half an inch, probably because the islands had experienced a relatively dry spell during the study period. However, a few large storms with more than an inch of rainfall were sampled. The runoff samples were analyzed by U.S. Geological Survey laboratories.

Concentrations of many constituents in the storm runoff samples exceeded the Hawaii State Department of Health's water-quality standards for streams or the U.S. Environmental Protection Agency's recommended water-quality criteria for freshwater aquatic life or shellfish harvesting waters. These include the majority of suspended solids, mercury, lead, Kjeldahl nitrogen and phosphorus samples for both stations plus turbidity for Drain A. All concentrations of fecal coliform bacteria for both stations were also greater than the EPA criterion.

Specific conductance values at both stations were all below DOH standards. Most of the nitrate plus nitrite and pH values for Drains A and B and the turbidity values for Drain B were also below the established State limits.

Cadmium and lead were undetectable in many samples, but because the EPA criteria are less than the laboratory detection limits it is erroneous to assume that these concentrations are within recommended levels. Other constituents found in the urban runoff samples that exceeded EPA criteria were iron, manganese, chromium, copper, zinc, and the pesticides heptachlor, lindane, and malathion.

In Mililani Town, quantity of rainfall is the main determinant of quantity of runoff. Variables which proved to be of little importance in determining runoff quantity were rainfall intensity, antecedent dry days and antecedent rainfall.

No relationships ($|r| \geq 0.50$) were found between individual concentrations of water-quality constituents in the runoff samples and instantaneous discharge, however, there may be a positive correlation between total storm volume and total constituent load.

The "first flush" effect was seen for chemical oxygen demand, suspended solids, lead, nitrate plus nitrite, fecal coliform bacteria, dissolved solids, and mercury concentrations. Antecedent dry days and initial rainfall intensity were not important in determining the concentration of chemical oxygen demand, lead, and suspended and dissolved solids in the first runoff samples from storms in Drain A.

There were significant ($\alpha = 0.05$) differences in water-quality data between Drain A and Drain B for discharge, turbidity, specific conductance, chemical oxygen demand, suspended solids, total nitrate plus nitrite, total phosphorus, lead, dissolved solids, and mercury. Drain A data for the above characteristics had higher median and maximum values, and wider ranges of values than Drain B.

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SUPPLEMENTAL DATA

Note: In analyses where the dissolved concentration of a constituent is greater than the total concentration of the same constituent (as it is for some nutrient data), the difference is due to different analytical procedures and their accuracies and is not a reporting or typographical error.

Table 6a.--Water-quality data for storm-water runoff from Mililani Drain A on September 11 and 17, 1980

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
SEPT										
11...	0430	15	183	80	100	54	3	18	2.1	14
11...	0630	9.5	211	95	180	72	6	24	2.9	14
17...	1307	2.5	190	110	330	79	0	27	2.8	11
17...	1315	220	100	90	59	45	2	16	1.2	3.9
17...	1323	535	93	80	46	40	1	14	1.2	3.6
17...	1330	440	80	190	36	32	0	11	1.1	4.1
17...	1337	390	76	130	50	29	0	9.8	1.0	3.4
17...	1345	380	72	290	32	25	0	8.5	1.0	4.0
17...	1352	145	67	130	39	24	0	8.0	0.9	3.5

DATE	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY FIELD (MG/L AS CACO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
SEPT									
11...	35	0.9	2.3	51	8.2	14	0.10	16	137
11...	29	0.8	2.8	66	10	15	0.20	21	164
17...	23	0.6	2.3	79	11	8.3	0.30	15	147
17...	15	0.3	1.2	43	3.2	2.8	0.20	7.4	73
17...	16	0.3	1.4	39	3.3	2.8	0.20	6.6	72
17...	21	0.3	1.5	37	3.3	2.8	0.20	5.9	70
17...	19	0.3	1.7	30	3.0	2.6	0.20	4.8	61
17...	24	0.4	1.6	26	1.1	2.6	0.20	--	67
17...	23	0.3	1.6	25	4.0	2.7	0.20	3.7	51

DATE	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
SEPT									
11...	105	0.19	309	1.5	20	10	400	<1	0.8
11...	130	0.22	512	0.64	20	30	860	<1	1.7
17...	125	0.20	1450	0.30	30	30	1300	10	1.0
17...	62	0.09	750	0.50	20	40	400	<1	0.3
17...	57	0.09	720	0.37	20	50	100	<1	0.3
17...	52	0.09	704	0.48	20	70	200	10	0.3
17...	45	0.08	636	0.52	20	50	<100	<1	0.3
17...	--	0.09	590	0.78	20	50	100	<1	0.3
17...	40	0.06	412	0.79	20	50	<100	<1	0.2

< Actual value is known to be less than the value shown.

Table 6b.--Water-quality data for storm-water runoff from Mililani Drain A on December 5, 1980

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	NITRO-GEN DIS-SOLVED (MG/L AS N)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)
1055	15	145	7.0	85	0.80	130	--	101	0.14
1058	19	--	--	--	--	--	2300	--	--
1100	22	--	--	--	--	--	5100	--	--
1110	75	125	7.0	95	0.91	110	--	84	0.11
1113	115	--	--	--	--	--	5000	--	--
1115	140	--	--	--	--	--	1500	--	--
1125	65	110	7.0	110	0.79	180	--	72	0.09
1128	50	--	--	--	--	--	>12,000	--	--
1130	40	--	--	--	--	--	>12,000	--	--
1140	65	115	7.4	170	0.82	140	--	81	0.11
1143	75	--	--	--	--	--	3900	--	--
1145	85	--	--	--	--	--	4900	--	--
1155	30	92	7.5	150	1.1	170	--	63	0.08
1158	16	--	--	--	--	--	6000	--	--
1200	5.0	--	--	--	--	--	5700	--	--

TIME	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS NH4)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)
1055	4.1	446	0.37	0.33	0.020	<.010	0.02	0.00	2.7	0.47	2.70
1058	--	--	--	--	--	--	--	--	--	--	--
1100	--	--	--	--	--	--	--	--	--	--	--
1110	17	300	0.50	0.47	<.010	0.010	0.00	0.01	2.1	0.43	2.10
1113	--	--	--	--	--	--	--	--	--	--	--
1115	--	--	--	--	--	--	--	--	--	--	--
1125	13	600	0.04	0.02	0.310	0.310	0.38	0.40	3.9	0.46	4.20
1128	--	--	--	--	--	--	--	--	--	--	--
1130	--	--	--	--	--	--	--	--	--	--	--
1140	14.2	614	0.28	0.26	0.010	0.020	0.01	0.03	2.9	0.54	2.90
1143	--	--	--	--	--	--	--	--	--	--	--
1145	--	--	--	--	--	--	--	--	--	--	--
1155	5.1	458	0.43	0.43	0.030	0.020	0.04	0.03	2.8	0.62	2.80
1158	--	--	--	--	--	--	--	--	--	--	--
1200	--	--	--	--	--	--	--	--	--	--	--

TIME	NITRO-GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)
1055	2.2	0.47	3.1	14	0.790	2.4	0.170	10	200	9.9	1.8
1058	--	--	--	--	--	--	--	--	--	--	--
1100	--	--	--	--	--	--	--	--	--	--	--
1110	1.7	0.44	2.6	12	0.620	1.9	0.170	<10	<100	7.9	3.8
1113	--	--	--	--	--	--	--	--	--	--	--
1115	--	--	--	--	--	--	--	--	--	--	--
1125	3.4	0.77	4.2	19	1.40	4.3	0.080	10	800	5.5	1.4
1128	--	--	--	--	--	--	--	--	--	--	--
1130	--	--	--	--	--	--	--	--	--	--	--
1140	2.3	0.56	3.2	14	0.890	2.7	0.150	10	200	12	--
1143	--	--	--	--	--	--	--	--	--	--	--
1145	--	--	--	--	--	--	--	--	--	--	--
1155	2.2	0.64	3.2	14	0.590	1.8	0.120	10	200	4.5	1.0
1158	--	--	--	--	--	--	--	--	--	--	--
1200	--	--	--	--	--	--	--	--	--	--	--

\> Actual value is known to be greater than the value shown.
< Actual value is known to be less than the value shown.

Table 6b.--Water-quality data for storm-water runoff from Mililani Drain A on December 5, 1980--Continued

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	NITRO-GEN DIS-SOLVED (MG/L AS N)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
1315	5.0	71	8.3	22.0	110	1.7	23	>12,000	19	0

CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
6.1	0.9	5.8	38	0.6	1.4	7.6	3.1	0.20	4.8	46

SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS NH4)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)
42	0.06	0.62	62	0.70	0.69	0.390	0.380	0.47	0.49	0.91	0.58

NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	IRON, DIS-SOLVED (UG/L AS FE)
1.30	0.34	0.96	2.0	8.9	0.300	0.92	0.220	3	10	10

LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	OIL AND GREASE, TOTAL RECOV. GRAVI-METRIC (MG/L)	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)
<100	<1	0.1	5.4	<1	<.1	<.01	0.10	<.01	<.01	<.01

DI-AZINON, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METH-OXY-CHLOR, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)
2.3	<.01	<.01	<.01	<.01	0.01	<.01	0.01	1.1	<.01	<.01

METHYL TRI-THION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	NAPHTHA-LENES, POLY-CHLOR. TOTAL (UG/L)	PARA-THION, TOTAL (UG/L)	PER-THANE TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
<.01	<.01	<.1	<.01	<.1	<1	<.01	0.25	<.01	<.01	0.03

> Actual value is known to be greater than the value shown.
< Actual value is known to be less than the value shown.

Table 6c.--Water-quality data for storm-water runoff from Mililani Drain A on December 14, 1980

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	NITRO-GEN DIS-SOLVED (MG/L AS N)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
0415	15	120	40	0.99	47	73	0.09	3.0
0435	18	100	35	1.1	49	62	0.08	3.0
0845	30	80	60	0.59	49	50	0.06	4.1
0905	20	70	70	0.81	59	43	0.05	2.3
0940	15	65	70	0.75	48	35	0.04	1.4
1000	10	60	100	1.0	37	35	0.04	0.95
1015	30	60	90	0.70	30	28	0.03	2.3
1030	10	60	95	1.2	21	31	0.04	0.84
1355	22	55	75	0.74	19	28	0.03	1.7
1410	75	50	70	1.1	21	21	0.02	4.3
1425	15	50	60	0.80	19	19	0.02	0.77
1440	8.0	50	60	1.1	22	24	0.03	0.52

SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS NH4)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)
115	0.34	0.35	0.230	0.220	0.28	0.28	0.87	0.42	1.10
160	0.27	0.29	>.260	0.260	0.28	0.33	0.97	0.50	1.20
169	0.22	0.21	0.210	0.190	0.25	0.24	0.99	0.19	1.20
193	0.20	0.22	>.240	0.240	0.24	0.31	1.6	0.35	1.80
183	0.21	0.21	0.230	0.220	0.28	0.28	0.97	0.32	1.20
167	0.21	0.21	0.250	0.240	0.30	0.31	1.3	0.56	1.50
180	0.20	0.21	0.180	0.180	0.22	0.23	0.92	0.31	1.10
140	0.21	0.23	0.210	0.200	0.25	0.26	0.79	0.80	1.00
115	0.22	0.23	0.170	0.180	0.21	0.23	0.70	0.33	0.87
92	0.21	0.21	0.190	0.180	0.23	0.23	1.0	0.66	1.20
77	0.21	0.21	0.180	0.180	0.22	0.23	0.79	0.41	0.97
75	0.25	0.22	0.190	0.210	0.23	0.27	1.0	0.70	1.20

NITRO-GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
0.46	0.64	1.4	6.4	0.190	0.58	0.120	<10	100
0.44	0.76	1.5	6.5	0.200	0.61	0.110	<10	100
0.82	0.38	1.4	6.3	0.080	0.25	0.090	<10	100
1.2	0.59	2.0	8.9	0.300	0.92	0.090	<10	100
0.66	0.54	1.4	6.2	0.260	0.80	0.110	<10	100
0.70	0.80	1.7	7.6	0.300	0.92	0.120	<10	100
0.61	0.49	1.3	5.8	0.200	0.61	0.080	<10	100
0.00	1.0	1.2	5.4	0.220	0.67	0.080	<10	100
0.36	0.51	1.1	4.8	0.170	0.52	0.080	<10	<100
0.36	0.84	1.4	6.2	0.120	0.37	0.090	<10	<100
0.38	0.59	1.2	5.2	0.120	0.37	0.070	<10	100
0.29	0.91	1.5	6.4	0.130	0.40	0.080	<10	100

> Actual value is known to be greater than the value shown.
< Actual value is known to be less than the value shown.

Table 6d.--Water-quality data for storm-water runoff from Mililani Drain A on January 31, 1981

TIME	STREAM-FLOW, INSTANTANEOUS (FT3/S)	SPECIFIC CONDUCTANCE (US/CM)	TURBIDITY (NTU)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L)
1426	11	130	28	415
1440	55	115	120	616
1441	65	130	120	688
1455	85	155	110	696
1456	85	118	95	525
1510	95	106	75	571
1511	90	102	37	532
1525	75	84	85	349
1526	80	78	110	339
1555	10	79	110	395
1556	9.0	81	100	323
1655	15	80	110	335
1656	15	81	100	399
1855	15	80	100	260
1856	15	72	95	335

TIME	STREAM-FLOW, INSTANTANEOUS (FT3/S)	SPECIFIC CONDUCTANCE (US/CM)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR)	COPPER, TOTAL RECOVERABLE (UG/L AS CU)
1425	10	150	2	200	3	50	90
1540	47	78	2	100	1	60	50

IRON, TOTAL RECOVERABLE (UG/L AS FE)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CYANIDE TOTAL (MG/L AS CN)
15,000	450	1400	0.3	<1	<1	310	<.01
23,000	80	830	0.2	<1	<1	90	<.01

< Actual value is known to be less than the value shown.

Table 6e.--Water-quality data for storm-water runoff from Mililani Drain A on March 6, 30, and 31, 1981

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)
MAR					
06...	1600	15	202	34	468
06...	1601	15	171	110	385
06...	1615	15	143	110	279
06...	1616	15	142	90	271
30...	0035	15	142	35	89
30...	0036	15	115	37	188
31...	0140	30	117	34	185
31...	0141	30	116	39	205
31...	2000	22	164	34	117
31...	2001	22	150	36	111
31...	2025	30	180	75	308
31...	2026	30	163	34	409
31...	2040	22	125	37	579
31...	2041	22	120	34	629
31...	2110	15	118	38	673
31...	2125	15	94	65	204
31...	2126	15	83	65	143
31...	2230	15	87	60	182
31...	2231	15	80	60	135
31...	2345	15	77	60	118
31...	2346	15	118	29	53

Table 6f.--Water-quality data for storm-water runoff from Mililani Drain A on October 27, 28, 31, and November 1, 1981

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)
OCT										
27...	1235	15	128	7.0	27	61	--	--	--	27
27...	1305	10	125	6.9	12	99	--	--	--	89
27...	1330	95	114	6.9	15	110	--	--	--	72
27...	1345	30	117	6.9	15	99	--	--	--	90
27...	2230	55	130	6.9	18	99	--	--	--	120
27...	2245	230	122	6.9	20	120	--	--	--	133
27...	2300	10	121	7.0	29	110	--	--	--	132
27...	2330	40	114	7.0	20	69	--	--	--	77
27...	2345	400	102	7.0	15	54	--	--	--	55
27...	2400	140	92	7.0	14	67	--	--	--	52
28...	0015	25	88	7.1	20	110	--	--	--	38
28...	0030	30	85	7.2	25	84	--	--	--	43
28...	0033	30	157	7.4	35	240	--	--	--	583
31...	1420	15	58	7.2	25	120	36	0.04	1.5	292
NOV										
01...	1720	22	57	7.5	35	69	38	0.05	2.3	292
01...	1735	56	54	7.6	40	140	40	0.05	6.0	242
01...	1750	107	38	7.6	40	100	33	0.04	9.5	184
01...	1805	22	31	7.8	64	87	34	0.04	2.0	138

DATE	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
OCT											
27...	<.09	0.120	0.88	1.00	--	--	0.580	1.8	<30	100	0.2
27...	0.20	0.110	1.4	1.50	1.7	7.5	0.600	1.8	<30	100	0.2
27...	0.13	0.100	1.7	1.80	1.9	8.5	0.470	1.4	<30	100	0.2
27...	0.20	0.110	1.2	1.30	1.5	6.6	0.490	1.5	<30	100	0.2
27...	0.23	0.120	1.4	1.50	1.7	7.7	0.530	1.6	<30	100	0.2
27...	0.22	0.100	1.2	1.30	1.5	6.7	0.530	1.6	<30	100	0.3
27...	0.11	0.110	0.99	1.10	1.2	5.4	0.590	1.8	<30	200	0.2
27...	0.14	0.090	0.75	0.84	0.98	4.3	0.470	1.4	<30	100	0.2
27...	0.21	0.100	0.90	1.00	1.2	5.4	0.370	1.1	<30	100	0.1
27...	0.22	0.090	0.78	0.87	1.1	4.8	0.350	1.1	<30	100	0.2
28...	0.18	0.090	0.77	0.86	1.0	4.6	0.390	1.2	<30	100	0.1
28...	0.16	0.140	0.96	1.10	1.3	5.6	0.340	1.0	<30	100	0.2
28...	0.17	0.240	2.6	2.80	3.0	13	1.10	3.4	<30	300	--
31...	0.59	0.270	1.6	1.90	2.5	11	0.420	1.3	<30	200	0.2
NOV											
01...	0.55	0.210	0.89	1.10	1.7	7.3	0.200	0.61	<30	200	0.2
01...	0.38	0.180	1.3	1.50	1.9	8.3	0.110	0.34	<30	200	0.2
01...	0.17	0.180	0.92	1.10	1.3	5.6	0.240	0.74	<30	200	0.2
01...	0.16	0.200	0.80	1.00	1.2	5.1	0.160	0.49	<30	100	0.2

< Actual value is known to be less than the value shown.

Table 6g.--Water-quality data for storm-water runoff from Mililani Drain A on February 2, 9, 10, and 11, 1982

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
FEB						
02...	0710	22	82	20	72	--
09...	0110	38	99	27	--	62
10...	1845	75	60	22	62	--
10...	1900	95	50	23	27	--
11...	1525	15	48	20	54	38
11...	1610	30	47	26	36	44
11...	1625	38	60	17	17	41
11...	1640	30	72	16	16	50

DATE	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
FEB						
02...	--	--	301	130	200	0.1
09...	0.08	6.4	282	100	200	0.1
10...	--	--	322	130	200	0.1
10...	--	--	230	130	200	0.1
11...	0.05	1.5	258	<2	200	0.1
11...	0.06	3.6	179	1	100	0.1
11...	0.05	4.2	58	50	<100	0.1
11...	0.06	4.1	77	50	<100	0.1

< Actual value is known to be less than the value shown.

Table 6h.--Water-quality data for storm-water runoff from Mililani Drain A on March 11, 12, 14, 15, 18,, and 21, 1982

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
MAR						
11...	2335	30	74	27	69	45
11...	2350	22	78	30	68	65
12...	1605	22	69	32	54	46
12...	1620	22	78	35	61	60
12...	1640	22	66	18	36	49
14...	1325	30	106	30	100	80
14...	1340	38	76	31	31	60
14...	1635	30	76	33	66	59
14...	1755	30	60	29	26	51
14...	1810	22	58	35	27	43
15...	0030	38	58	29	<10	--
15...	0033	76	151	24	150	--
15...	0045	85	155	32	120	111
18...	1310	85	80	31	71	59
18...	1325	47	53	31	30	40
21...	1255	85	49	39	21	--
21...	1257	107	95	31	61	--
21...	1310	107	94	80	66	90
21...	1355	95	62	65	--	--
21...	1410	128	63	100	24	58
21...	1425	38	64	95	17	--
21...	1427	22	81	--	40	--

DATE	SOLIDS, DIS-SOLVED (TONS PER (ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
MAR						
11...	0.06	3.6	278	<30	200	0.4
11...	0.08	3.9	436	<30	300	0.3
12...	0.06	2.7	344	<30	300	0.3
12...	0.08	3.6	262	<30	200	0.2
12...	0.06	2.9	112	<30	100	0.1
14...	0.11	6.5	338	<30	200	0.3
14...	0.08	6.2	277	<30	300	0.2
14...	0.08	4.8	228	<30	300	0.2
14...	0.06	4.1	231	<30	<100	0.2
14...	0.05	2.6	173	<10	200	0.2
15...	--	--	167	<30	200	0.1
15...	--	--	564	<30	600	0.6
15...	0.15	26	367	<30	400	0.6
18...	0.08	14	315	<10	500	0.2
18...	0.05	5.1	213	<10	200	0.1
21...	--	--	112	--	--	0.2
21...	--	--	263	--	--	0.1
21...	0.12	26	361	<10	400	0.2
21...	--	--	349	<10	300	0.2
21...	0.07	20	155	<10	<100	0.3
21...	--	--	151	<10	100	0.1
21...	--	--	140	<10	100	0.2

< Actual value is known to be less than the value shown.

Table 6i.--Water-quality data for storm-water runoff from Mililani Drain A on June 4, 1982

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	NITRO-GEN DIS-SOLVED (MG/L AS N)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
1645	38	49	--	--	21	0.56	85	--	--	--
1646	38	45	7.2	25.0	--	--	--	15	0	5.0
1647	38	46	7.3	25.0	--	--	--	15	0	5.2
1648	38	46	7.2	25.0	--	--	--	16	0	5.6

MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA DIS-SOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)
--	--	--	--	--	--	--	--	--	--	--
0.5	3.0	30	0.4	0.7	<5.0	2.1	0.10	3.1	--	--
0.5	3.1	30	0.4	0.7	<5.0	1.9	0.20	2.3	--	--
0.5	3.7	32	0.4	0.7	5.0	2.3	<.10	3.3	31	0.04

SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N)
--	261	>.16	0.16	0.100	0.080	0.10	1.6	0.32	1.70	1.3	0.40
--	--	--	0.27	--	--	--	--	--	--	--	--
--	--	--	0.14	--	--	--	--	--	--	--	--
3.2	--	--	0.11	--	--	--	--	--	--	--	--

NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)
1.9	8.0	0.500	1.5	0.070	<30	--	400	--	--	--	--
--	--	--	--	--	--	60	--	4	0.1	<.1	0.11
--	--	--	--	--	--	70	--	2	0.2	<.1	0.09
--	--	--	--	--	--	60	--	3	0.2	--	--

CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)
--	--	--	--	--	--	--	--	--	--	--
0.60	<.01	0.01	<.01	1.2	0.01	<.01	<.01	<.01	0.02	<.01
0.70	<.01	0.01	<.01	1.1	0.02	<.01	<.01	<.01	0.03	<.01
--	--	--	--	--	--	--	--	--	--	--

LINDANE TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METH-OXY-CHLOR, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	NAPHTHA-LENES, POLY-CHLOR. TOTAL (UG/L)	PARA-THION, TOTAL (UG/L)	PER-THANE TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	TOTAL TRI-THION (UG/L)
--	--	--	--	--	--	--	--	--	--	--
<.01	0.13	<.01	<.01	<.01	<.01	<.1	<.01	<.1	<1	<.01
<.01	0.13	<.01	<.01	<.01	<.01	<.1	<.01	<.1	<1	<.01
--	--	--	--	--	--	--	--	--	--	--

> Actual value is known to be greater than the value shown.
< Actual value is known to be less than the value shown.

Table 6j.--Water-quality data for storm-water runoff from Mililani Drain A on August 16, 1982

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)
1030	56	--	7.6	25.5	11	27	10,000	35	0.04
1031	56	43	--	--	7.9	--	8400	23	0.03

SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)
5.3	41	<.10	<.10	>.160	0.160	0.21	0.77	0.64	0.90
3.5	21	--	--	--	--	--	--	--	--

NITRO-GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)
0.10	0.80	0.170	0.52	0.060	<10	<100	<.1	4.2	1.1
--	--	--	--	--	<10	<100	<.1	--	--

< Actual value is known to be less than the value shown.
> Actual value is known to be greater than the value shown.

Table 6k.--Water-quality data for storm-water runoff from Mililani Drain A on August 25, 1982

TIME	STREAM-FLOW, INSTANTANEOUS (FT3/S)	SPECIFIC CONDUCTANCE (US/CM)	TURBIDITY (NTU)	OXYGEN DEMAND, CHEMICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)
1725	75	44	39	53	46
1730	75	42	33	26	34
1745	47	52	19	27	49
1750	30	55	22	47	35
1805	22	68	17	25	56
1810	22	78	20	29	58
1845	75	36	15	25	33
1850	38	38	15	26	35

SOLIDS, DISSOLVED (TONS PER ACRE-FT)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)
0.06	9.3	91	<10	<100	0.1
0.04	6.9	76	<10	<100	0.1
0.06	6.2	57	<10	<100	0.1
0.04	2.8	33	<10	<100	<.1
0.07	3.3	27	10	<100	<.1
0.07	3.4	24	<10	<100	<.1
0.04	6.7	21	<10	<100	0.1
0.04	3.6	38	<10	<100	<.1

< Actual value is known to be less than the value shown.

Table 61.--Water-quality data for storm-water runoff from Mililani Drain A on September 1 and 2, 1982

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
SEPT						
01...	1103	47	74	14	99	>23,000
01...	1112	160	36	40	21	20,000
01...	1125	107	46	40	42	>26,000
01...	1137	56	48	40	18	K18,000
01...	1150	250	50	40	30	>24,000
01...	1202	140	53	37	31	>11,000
01...	1215	140	56	40	36	>9400
01...	1227	85	57	38	29	>15,000
01...	1240	38	58	33	18	>26,000
01...	1252	47	59	28	18	26,000
01...	1305	30	60	31	25	>11,000
01...	1317	30	54	32	21	25,000
01...	1325	30	54	6.0	38	--
01...	1350	22	54	31	36	--
01..	1400	22	57	11	35	--
02...	0015	22	55	13	30	--

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
SEPT							
01...	44	0.06	5.6	212	<10	300	0.2
01...	28	0.03	12	73	<10	200	0.1
01...	32	0.04	9.2	66	<10	<100	0.1
01...	36	0.04	5.4	57	<10	<100	0.1
01...	40	0.05	27	50	<10	<100	0.1
01...	51	0.06	19	41	<10	<100	0.1
01...	47	0.06	18	52	<10	<100	0.1
01...	44	0.06	10	33	<10	<100	0.1
01...	40	0.05	4.1	47	10	<100	0.1
01...	52	0.07	6.6	44	<10	<100	0.1
01...	43	0.05	3.5	38	<10	<100	0.1
01...	33	0.04	2.7	44	<10	<100	0.1
01...	25	0.03	2.0	77	<10	100	1.1
01...	31	0.04	1.8	59	<10	100	0.2
01...	47	0.06	2.8	45	<10	100	0.5
02...	--	--	--	60	<10	<100	1.5

> Actual value is known to be greater than the value shown.
< Actual value is known to be less than the value shown.
K Results based on colony count outside the acceptable range(non-ideal colony count).

Table 6m.--Water-quality data for storm-water runoff from Mililani Drain A on November 23, 1982

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)
0855	22	112	8.0	50	71	K54,000
0910	95	39	8.0	50	53	K290,000
0955	--	--	--	--	--	K36,000
1550	75	78	6.9	35	73	--
1605	66	48	7.2	50	50	--
1825	140	82	7.6	55	72	--
1840	117	99	7.2	55	34	--

SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
68	0.09	4.0	52	<10	200	0.1
22	0.03	5.6	160	<10	200	0.2
--	--	--	--	--	--	--
40	0.05	8.1	107	<10	200	0.1
25	0.03	4.5	81	<10	100	0.1
44	0.06	17	142	<10	300	0.2
60	0.08	19	67	<10	100	0.1

K Results based on colony counts outside the acceptable range (non-ideal colony counts).
< Actual value is known to be less than the value shown.

Table 6m.--Water-quality data for storm-water runoff from Mililani Drain A on November 23, 1982--Continued

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	HARD-NESS (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)
0950	30	78	7.9	12	18	K120,000	17	5.3	1.0

SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CADMIUM DIS-SOLVED (UG/L AS CD)
8.1	0.9	2.8	45	0.06	3.7	14	1	<10	<1

COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)
<3	10	92	100	<10	4	3	<.1	<10	42

VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	PCB, TOTAL (UG/L)	NAPHTHA-LENES, POLY-CHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)
<6.0	14	<.1	<.1	0.02	0.10	<.01	<.01	<.01	0.36

DI-ELDRIN TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METH-OXY-CHLOR, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)
<.01	<.01	<.01	<.01	.01	<.01	0.01	1.7	<.01	<.01

METHYL TRI-THION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	PER-THANE TOTAL (UG/L)	PARA-THION, TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
<.01	<.01	<.1	<.01	<1	<.01	0.15	<.01	<.01	.01

K Results based on colony counts outside the acceptable range(non-ideal colony counts).
< Actual value is known to be less than the value shown.

Table 6n.--Water-quality data for storm-water runoff from Mililani Drain A on December 6, 1982

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
0850	128	22	7.2	22	33	50,000
0905	56	32	7.4	22	26	52,000
0930	56	37	7.5	14	22	27,000
0950	22	49	7.6	12	25	38,000

SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
26	0.04	9.0	136	<10	<100	0.4
26	0.04	3.9	77	<10	<100	0.4
26	0.04	3.9	38	<10	<100	0.1
33	0.04	2.0	27	<10	<100	0.1

< Actual value is known to be less than the value shown.

Table 6n.--Water-quality data for storm-water runoff from Mililani Drain A on December 6, 1982--Continued

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	NITRO-GEN DIS-SOLVED (MG/L AS N)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT	SOLIDS, DIS-SOLVED (TONS PER DAY)
0855	95	27	22.0	20	1.4	36	48,000	21	0.03	5.4

SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N)
100	0.10	0.12	0.100	0.090	0.12	1.1	1.2	1.20	0.00	1.3

NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	OIL AND GREASE, TOTAL RECOV. GRAVI-METRIC (MG/L)	PCB, TOTAL (UG/L)	NAPH-THA-LENES, POLY-CHLOR. TOTAL (UG/L)
1.3	5.8	0.250	0.77	0.140	<10	<100	0.1	1	<.1	<.1

ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)
0.13	2.2	<.01	<.01	<.01	1.1	0.03	<.01	<.01	<.01	0.58

HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METH-OXY-CHLOR, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	PER-THANE TOTAL (UG/L)	PARA-THION, TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	TOTAL TRI-THION (UG/L)
<.01	0.02	0.24	<.01	<.01	<.01	<.01	<.1	<.01	<1	<.01

< Actual value is known to be less than the value shown.

Table 6o.--Water-quality data for storm-water runoff from Mililani Drain A on December 23 and 27, 1982

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
DEC							
23...	1040	30	163	--	33	130	--
23...	1042	30	182	--	33	170	--
23...	1045	30	161	--	30	170	--
23...	1300	22	87	7.2	40	54	48,000
23...	1305	22	88	7.2	25	51	27,000
23...	1310	47	72	7.1	25	62	K65,000
23...	1315	500	42	7.2	25	50	K65,000
23...	1400	75	34	7.1	30	<10	28,000
23...	1410	95	40	7.1	50	<10	28,000
23...	1500	22	48	7.2	18	<10	23,000
27...	1145	15	90	--	17	100	K240,000
27...	1150	38	74	--	20	98	K150,000
27...	1155	22	75	--	18	84	K120,000
27...	1205	15	72	--	19	74	66,000

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
DEC							
23...	--	--	--	145	<10	200	0.1
23...	--	--	--	412	<10	300	0.2
23...	--	--	--	78	<10	300	0.2
23...	69	0.09	4.1	28	<10	200	0.1
23...	52	0.07	3.1	28	<10	200	0.2
23...	41	0.06	5.2	83	<10	200	0.1
23...	27	0.04	36	354	<10	500	0.2
23...	31	0.04	6.3	81	<10	<100	0.1
23...	28	0.04	7.2	20	<10	<100	0.1
23...	35	0.05	2.1	17	<10	<100	0.1
27...	66	0.09	2.7	332	<10	400	0.2
27...	52	0.07	5.3	121	<10	300	0.2
27...	50	0.07	3.0	193	<10	200	0.2
27...	50	0.07	2.0	124	<10	100	0.2

K Results based on colony counts outside the acceptable range (non-ideal colony counts).
< Actual value known to be less than the value shown.

Table 6o.--Water-quality data for storm-water runoff from Mililani Drain A on December 27, 1982--Continued

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	NITRO-GEN DIS-SOLVED (MG/L AS N)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
1147	30	76	18	1.7	120	K300,000	51	0.07	4.1

SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N)
236	>.14	0.14	0.140	0.160	0.21	3.2	1.4	3.30	1.7	1.6

NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	OIL AND GREASE, TOTAL RECOV. GRAVI-METRIC (MG/L)	PCB, TOTAL (UG/L)	NAPH-THA-LENES, POLY-CHLOR. TOTAL (UG/L)
3.4	15	0.640	2.0	0.160	<10	300	0.1	3	<.1	<.1

ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)
<.01	0.40	<.01	0.01	<.01	3.6	0.01	<.01	<.01	<.01	.01

HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METH-OXY-CHLOR, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)	METHYL TRI-THION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	PER-THANE TOTAL (UG/L)	PARA-THION, TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	TOTAL TRI-THION (UG/L)
0.01	<.01	0.22	<.01	<.01	<.01	<.01	<.1	<.01	<1	<.01

K Results based on colony counts outside the acceptable range(non-ideal colony counts).
< Actual value is known to be less than the value shown.
> Actual value is known to be greater than the value shown.

Table 6p.--Water-quality data for storm-water runoff from Mililani Drain A on April 2 and 4, July 18, and September 17, 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)
APR						
02...	1140	30	122	7.3	75	150
02...	1147	30	124	7.4	65	170
02...	1155	15	119	7.3	17	180
04...	1435	38	136	7.3	100	270
04...	1440	117	94	7.4	120	260
04...	1455	107	46	7.5	39	36
JUL						
18...	1555	22	86	--	25	140
18...	1600	15	73	--	26	170
18...	1640	30	55	--	25	97
SEPT						
17...	0250	15	267	--	360	370
17...	0550	15	182	--	17	150
17...	0605	85	110	--	60	110
17...	0610	47	91	--	23	68

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
APR					
02...	84	392	<10	600	0.9
02...	75	518	<10	1100	0.7
02...	--	482	<10	800	2.0
04...	--	482	<10	1100	0.3
04...	--	626	<10	1600	0.9
04...	23	140	<10	100	0.3
JUL					
18...	55	331	<10	600	0.1
18...	50	1170	<10	600	0.2
18...	36	517	<10	500	0.1
SEPT					
17...	--	2420	<10	1400	0.6
17...	105	554	<10	600	0.2
17...	61	348	<10	500	0.2
17...	50	665	<10	400	0.2

< Actual value is known to be less than the value shown.

Table 6q.--Water-quality data for storm-water runoff from Mililani Drain A on January 14, February 1 and 14, 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
JAN						
14...	1415	30	194	110	260	156
14...	1420	38	129	35	220	98
14...	1426	66	85	80	130	--
FEB						
01...	1835	30	102	45	160	62
14...	0820	38	219	2.4	<10	176
14...	0835	15	72	23	50	47

DATE	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
JAN						
14...	0.21	13	466	<10	800	1.0
14...	0.13	10	486	<10	700	0.4
14...	--	--	518	<10	800	0.6
FEB						
01...	0.08	5.0	430	<10	400	<.1
14...	0.24	18	11	<10	<100	0.1
14...	0.06	1.9	128	<10	200	<.1

< Actual value is known to be less than the actual value shown.

Table 6r.--Water-quality data for storm-water runoff from Mililani Drain A on March 2, 4, and 11, 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
MAR							
02...	0040	10	94	7.7	85	140	60
02...	0050	22	88	7.7	150	180	56
02...	0155	30	88	9.0	50	130	--
02...	0200	22	61	7.9	40	92	--
02...	0315	22	57	8.5	100	130	40
02...	0320	22	55	8.3	100	100	39
02...	0400	15	36	7.4	9.3	13	23
04...	0735	30	54	--	25	44	39
11...	1410	15	179	--	160	--	--
11...	1415	22	147	--	130	--	114
11...	1425	15	113	--	75	120	85
11...	1455	22	71	--	120	110	62

DATE	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
MAR						
02...	0.08	1.6	467	<10	500	0.2
02...	0.08	3.3	1400	<10	800	0.4
02...	--	--	606	<10	300	0.5
02...	--	--	383	<10	400	0.1
02...	0.05	2.4	617	<10	900	0.3
02...	0.05	2.3	580	<10	600	0.2
02...	0.03	0.93	24	<10	<100	<.1
04...	0.05	3.2	105	<10	100	<.1
11...	--	--	3000	<10	1200	0.8
11...	0.16	6.8	1600	<10	600	0.4
11...	0.12	3.4	651	<10	300	0.4
11...	0.08	3.7	715	<10	200	0.2

< Actual value is known to be less than the value shown.

Table 6s.--Water-quality data for storm-water runoff from Mililani Drain A on April 9, 10, 25, 26, and May 23, 1984

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (FT3/S)	SPECIFIC CONDUCTANCE (US/CM)	TURBIDITY (NTU)	OXYGEN DEMAND, CHEMICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)
APR						
09...	0850	5.0	134	50	160	86
10...	0315	2.0	108	21	170	63
25...	1140	38	73	38	130	55
25...	1205	10	55	21	46	41
26...	1345	30	89	29	80	59
26...	1353	56	64	28	73	47
26...	1600	22	49	18	17	37
MAY						
23...	0555	22	93	55	130	50

DATE	SOLIDS, DISSOLVED (TONS PER ACRE-FT)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)
APR						
09...	0.12	1.2	614	<10	600	<.1
10...	0.09	0.34	514	<10	700	0.1
25...	0.07	5.6	521	<10	400	0.1
25...	0.06	1.1	145	<10	200	0.1
26...	0.08	4.8	362	<10	300	0.2
26...	0.06	7.1	340	<10	500	0.1
26...	0.05	2.2	21	<10	<100	0.1
MAY						
23...	0.07	3.0	381	<10	400	<.1

< Actual value is known to be less than the value shown.

Table 7a.--Water-quality data for storm-water runoff from Mililani Drain B on September 17, 1980

TIME	STREAM- FLOW, INSTAN- TANEOUS (FT3/S)	SPE- CIFIC CON- DUCT- ANCE (US/CM)	TUR- BID- ITY (NTU)	OXYGEN DEMAND, CHEM- ICAL (HIGH LEVEL) (MG/L)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
1422	26	110	65	130	40	0	14	1.3	4.8
1430	14	78	65	33	27	2	9.4	0.9	3.6
1438	13	65	160	29	18	3	5.4	1.2	2.9

PERCENT SODIUM	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LINITY FIELD (MG/L AS CACO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)
20	0.3	1.0	41	1.6	3.1	0.10	7.4	74
22	0.3	1.1	25	--	2.4	0.10	4.2	48
23	0.3	1.7	15	4.7	3.4	0.10	3.8	43

SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER ACRE-FT)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDED (MG/L)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
58	0.10	759	0.53	<10	30	1000	<1	0.4
--	0.06	238	0.62	<10	50	200	<1	0.2
32	0.05	432	0.64	20	60	100	10	0.1

< Actual value is known to be less than the value shown.

Table 7b.--Water-quality data for storm-water runoff from Mililani Drain B on October 5, 1980

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
1515	2.5	77	5.5	71	54
1523	13	76	1.9	51	51
1530	9.0	60	3.7	43	40
1538	3.6	59	4.9	29	31
1600	5.5	58	3.2	28	41
1608	13	54	4.0	23	41
1615	7.0	54	7.5	27	35
1623	3.2	86	2.6	37	65

SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
0.07	0.36	298	<10	400	0.2
0.06	1.8	134	<10	200	0.2
0.05	0.97	147	<10	<100	0.1
0.04	0.30	126	<10	200	0.1
0.05	0.61	121	<10	100	0.1
0.05	1.4	96	<10	100	0.3
0.04	0.66	86	<10	100	<.1
0.08	0.56	111	<10	100	0.1

< Actual value is known to be less than the value shown.

Table 7c.--Water-quality data for storm-water runoff from Mililani Drain B on December 5, 1980

TIME	STREAM-FLOW, INSTANTANEOUS (FT3/S)	SPECIFIC CONDUCTANCE (US/CM)	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	TURBIDITY (NTU)	NITROGEN DISSOLVED (MG/L AS N)	OXYGEN DEMAND, CHEMICAL (HIGH LEVEL) (MG/L)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)
1400	1.0	60	7.8	23.0	17	0.67	31	8800	17	0

CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM ADSORPTION RATIO	POTASSIUM, DISSOLVED (MG/L AS K)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)
5.5	0.7	3.9	32	0.4	1.1	3.7	2.4	0.10	3.9	45

SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER ACRE-FT)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS NH4)	NITROGEN, AMMONIA DISSOLVED (MG/L AS NH4)	NITROGEN, ORGANIC TOTAL (MG/L AS N)
33	0.06	0.12	23	0.30	0.27	0.020	0.010	0.02	0.01	0.47

NITROGEN, ORGANIC DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS TOTAL (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD)	IRON, DISSOLVED (UG/L AS FE)
0.39	0.49	0.09	0.40	0.79	3.5	0.150	0.46	0.130	<10	<3

LEAD, TOTAL RECOVERABLE (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	CARBON, ORGANIC DISSOLVED (MG/L AS C)	OIL AND GREASE, TOTAL RECOV. GRAVIMETRIC (MG/L)	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)
100	<1	<.1	5.3	<1	<.1	<.01	0.30	<.01	<.01	<.01

DIAZINON, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALATHION, TOTAL (UG/L)	METHOXYCHLOR, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)
0.68	0.01	<.01	<.01	<.01	0.02	0.01	0.01	0.33	<.01	<.01

METHYL TRITHION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	PERTHANE TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOTAL TRITHION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
<.01	<.01	<.1	<.01	<.1	<1	<.01	0.15	<.01	0.01	0.03

< Actual value is known to be less than the value shown.

Table 7d.--Water-quality data for storm-water runoff from Mililani Drain B on January 31 and February 1, 1981

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)
JAN					
31...	1353	7.0	87	33	270
31...	1445	7.0	95	27	337
31...	1446	7.0	89	31	420
31...	1500	7.0	76	33	351
31...	1501	7.0	64	26	239
31...	1510	7.0	58	28	150
31...	1511	7.0	54	25	149
31...	1541	5.5	56	31	104
FEB					
01...	0612	19	57	39	137
01...	0613	19	48	140	201
01...	0625	14	47	150	177
01...	0626	14	50	110	127

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)
JAN								
31...	1354	7.0	145	3	100	2	50	80
31...	1525	7.0	56	2	100	1	20	37
FEB								
01...	0630	9.0	52	2	100	1	20	16

DATE	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	CYANIDE TOTAL (MG/L AS CN)
JAN								
31...	15,000	330	1000	0.2	<1	<1	310	<.01
31...	6600	110	400	0.1	<1	<1	90	<.01
FEB								
01...	5900	22	170	0.1	<1	<1	40	<.01

< Actual value is known to be less than the value shown.

Table 7e.--Water-quality data for storm-water runoff from Mililani Drain B on August 15 and 16, 1982

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	NITRO-GEN DIS-SOLVED (MG/L AS N)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)
AUG										
15...	1715	5.2	81	5.3	--	35	4300	--	--	--
16...	0710	14	64	5.5	--	37	9300	--	--	--
16...	0725	32	38	8.3	--	34	26,000	32	0.04	2.8
16...	0735	14	26	9.4	--	33	25,000	25	0.03	0.91
16...	0745	5.2	30	9.4	0.92	25	17,000	31	0.04	0.44
16...	0800	7.0	33	11	1.1	<10	K35,000	36	0.04	0.68
16...	0815	5.2	38	4.5	0.96	26	21,000	37	0.05	0.52
16...	0835	9.0	45	23	--	27	28,000	--	--	--
16...	1030	7.0	39	10	--	17	K17,000	26	0.03	0.18

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N)
AUG											
15...	32	--	--	--	--	--	--	--	--	--	--
16...	41	--	--	--	--	--	--	--	--	--	--
16...	64	<.10	<.10	0.110	0.110	0.14	1.2	1.1	1.30	0.10	1.2
16...	96	<.10	<.10	0.140	0.160	0.21	1.5	0.74	1.60	0.70	0.90
16...	48	0.11	0.12	>.170	0.170	0.22	1.4	0.63	1.50	0.70	0.80
16...	41	0.14	0.13	0.110	0.120	0.15	0.99	0.88	1.10	0.10	1.0
16...	17	0.15	0.16	0.120	0.140	0.18	0.48	0.36	0.60	0.00	0.50
16...	45	--	--	--	--	--	--	--	--	--	--
16...	22	<.10	<.10	0.160	0.140	0.18	1.0	0.56	1.20	0.60	0.60

DATE	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)
AUG										
15...	--	--	--	--	--	<10	<100	<.1	--	--
16...	--	--	--	--	--	10	100	<.1	--	--
16...	--	--	0.180	0.55	0.070	<10	100	<.1	--	--
16...	--	--	0.180	0.55	0.060	<10	100	<.1	--	--
16...	1.6	7.1	0.170	0.52	0.090	<10	100	<.1	--	--
16...	1.2	5.5	0.150	0.46	0.090	<10	<100	<.1	--	--
16...	0.75	3.3	0.120	0.37	0.080	<10	<100	<.1	--	--
16...	--	--	--	--	--	<10	<100	<.1	--	--
16...	--	--	0.140	0.43	0.060	<10	100	<.1	4.2	0.4

< Actual value is known to be less than the value shown.
> Actual value is known to be greater than the value shown.
K Results based on colony count outside the acceptable range(non-ideal colony count).

Table 7f.--Water-quality data for storm-water runoff from Mililani Drain B on September 1, 1982

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
1115	22	36	22	49	11,000
1150	28	30	12	41	K31,000
1152	--	--	--	--	22,000
1210	46	29	14	36	16,000
1225	28	43	18	29	--

SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
37	0.05	2.2	91	<10	200	0.1
16	0.02	1.2	47	<10	<100	0.1
--	--	--	--	--	--	--
15	0.02	1.9	43	<10	<100	<.1
28	0.03	2.1	22	<10	<100	<.1

< Actual value is known to be less than the value shown.
K Results based on colony count outside the acceptable range(non-ideal colony count).

Table 7g.--Water-quality data for storm-water runoff from Mililani Drain B on November 23, 1982

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)
0915	14	47	50	60	K66,000
0920	5.4	68	50	61	--
0935	--	--	--	--	K51,000
0940	--	--	--	--	K100,000
1550	5.4	64	4.5	35	--
1600	9.2	74	3.0	40	--
1610	11	60	3.5	33	--
1840	22	104	7.2	45	--
1850	19	63	6.0	37	--
1905	7.0	92	17	24	--
1945	3.8	100	16	21	--

SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
27	0.04	1.0	67	<10	100	0.2
--	--	--	68	<10	300	0.1
--	--	--	--	--	--	--
--	--	--	--	--	--	--
42	0.06	0.61	--	<10	100	0.1
44	0.06	1.1	37	<10	200	0.1
39	0.05	1.2	--	<10	100	0.1
64	0.09	3.8	150	<10	100	0.1
43	0.06	2.2	70	<10	<100	0.1
59	0.08	1.1	342	<10	100	0.1
57	0.08	0.58	19	<10	<100	0.1

K Results based on colony counts outside the acceptable range(non-ideal colony counts).
< Actual value is known to be less than the value shown.

Table 7g.--Water-quality data for storm-water runoff from Mililani Drain B on November 23, 1982--Continued

TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	HARD-NESS (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
0930	7.0	42	27	38	K37,000	26	8.2	1.3	3.8
1625	5.4	53	5.6	29	--	--	--	--	--
1925	11	98	26	26	--	21	6.1	1.3	9.3

TIME	SODIUM AD-SORP-TION RATIO	SILICA, DIS-SOLVED (MG/L AS SIO2)	RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)
0930	0.3	8.2	29	0.04	0.55	30	<.10	<.10	0.080	<.060	0.08
1625	--	--	31	0.04	0.45	29	<.10	<.10	0.110	0.100	0.13
1925	0.9	4.0	62	0.08	1.8	50	--	--	--	--	--

TIME	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	BARIUM, DIS-SOLVED (UG/L AS BA)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)
0930	1.5	--	1.60	0.90	0.70	0.270	0.83	0.070	29	<.5	<10
1625	1.6	0.80	1.70	0.80	0.90	0.170	0.52	0.060	--	--	<10
1925	--	--	--	--	--	--	--	--	17	<.5	<10

TIME	CADMIUM DIS-SOLVED (UG/L AS CD)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)
0930	<1	15	30	1900	110	110	5	360	0.1	<10	57
1625	--	--	--	--	<100	--	--	--	0.1	--	--
1925	<1	<3	<10	140	<100	<10	14	3	0.1	<10	46

TIME	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	PCB, TOTAL (UG/L)	NAPHTHA-LENES, POLY-CHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DI-AZINON, TOTAL (UG/L)
0930	11	110	<.1	<.1	0.03	0.40	<.01	.01	<.01	0.15
1625	--	--	--	--	--	--	--	--	--	--
1925	<6.0	40	--	--	--	--	--	--	--	--

TIME	DI-ELDRIN TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALA-THION, TOTAL (UG/L)	METH-OXY-CHLOR, TOTAL (UG/L)	METHYL PARA-THION, TOTAL (UG/L)
0930	0.01	<.01	<.01	<.01	0.02	<.01	0.01	0.08	0.03	<.01
1625	--	--	--	--	--	--	--	--	--	--
1925	--	--	--	--	--	--	--	--	--	--

TIME	METHYL TRI-THION, TOTAL (UG/L)	MIREX, TOTAL (UG/L)	PER-THANE TOTAL (UG/L)	PARA-THION, TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	TOTAL TRI-THION (UG/L)	2,4-D, TOTAL (UG/L)	2, 4-DP TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
0930	<.01	<.01	<.1	<.01	<1	<.01	0.21	<.01	0.04	0.01
1625	--	--	--	--	--	--	--	--	--	--
1925	--	--	--	--	--	--	--	--	--	--

K Results based on colony count outside the acceptable range(non-ideal colony count).
< Actual value is known to be less than the value shown.

Table 7h.--Water-quality data for storm-water runoff from Mililani Drain B on December 6 and 23, 1982, and April 4, 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)
DEC							
06...	0840	9.0	23	7.4	3.5	45	10,000
06...	0850	19	25	7.5	10	34	17,000
06...	0900	9.0	23	7.4	12	45	25,000
23...	1320	46	39	7.2	20	58	32,000
23...	1335	19	38	7.1	39	22	54,000
23...	1350	25	40	7.0	38	20	56,000
23...	1405	35	32	6.8	32	14	K67,000
23...	1420	16	30	6.8	17	10	27,000
23...	1435	14	39	6.9	20	24	--
23...	1450	11	38	7.0	18	20	27,000
23...	1505	7.0	38	7.0	13	20	--
23...	1520	3.8	40	7.0	14	24	K20,000
APR							
04...	1445	16	82	--	18	160	--
04...	1500	22	34	--	18	62	--

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
DEC							
06...	9	0.01	0.22	96	<10	100	0.1
06...	17	0.02	0.87	78	<10	<100	0.1
06...	9	0.02	0.19	96	<10	<100	0.1
23...	28	0.04	3.5	191	<10	500	0.2
23...	33	0.04	1.7	84	<10	<100	0.2
23...	33	0.04	2.2	58	<10	<100	0.1
23...	25	0.03	2.4	37	<10	<100	0.1
23...	29	0.04	1.3	25	<10	<100	0.3
23...	31	0.04	1.2	10	<10	<100	0.1
23...	29	0.04	0.86	3	<10	<100	0.2
23...	26	0.04	0.49	7	<10	<100	0.1
23...	--	--	--	8	<10	<100	0.1
APR							
04...	51	--	--	330	<10	500	0.2
04...	--	--	--	129	<10	300	0.1

< Actual value is known to be less than the value shown.
K Results based on colony counts outside the acceptable range (non-ideal colony counts).

Table 7i.--Water-quality data for storm-water runoff from Mililani Drain B on December 24, 1983, January 14, April 25 and 26, 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	TUR-BID-ITY (NTU)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
DEC						
24...	1855	39	86	34	300	80
24...	1910	22	51	22	46	38
JAN						
14...	1435	39	52	32	110	33
14...	1450	28	41	25	37	30
14...	1505	11	43	25	28	48
APR						
25...	1150	25	50	24	74	--
26...	1400	25	49	22	84	--
26...	1415	51	40	21	38	--
26...	1430	68	44	35	41	--
26...	1445	63	43	31	15	--
26...	1500	46	47	31	60	30
26...	1515	22	52	30	29	--

DATE	SOLIDS, DIS-SOLVED (TONS PER ACRE-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)
DEC						
24...	0.11	8.4	722	<10	1200	0.2
24...	0.05	2.3	155	<10	200	0.1
JAN						
14...	0.04	3.5	238	<10	400	0.2
14...	0.04	2.3	114	<10	200	0.1
14...	0.07	1.4	64	<10	100	0.1
APR						
25...	--	--	232	<10	200	0.2
26...	--	--	213	<10	300	0.1
26...	--	--	283	<10	800	0.1
26...	--	--	161	<10	100	0.1
26...	--	--	100	<10	100	0.1
26...	0.04	3.7	76	<10	<100	0.1
26...	--	--	46	<10	<100	<.1

< Actual value is known to be less than the value shown.