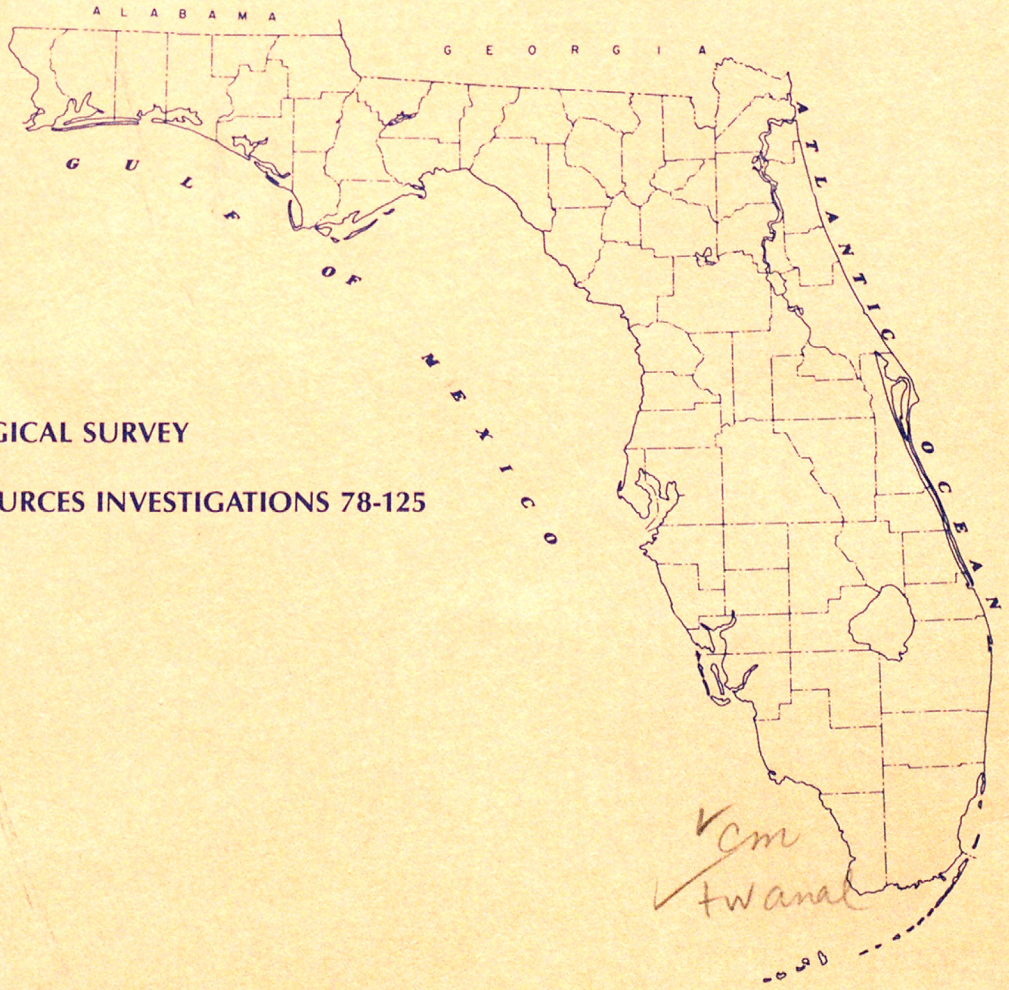
HYDROLOGIC DATA FROM URBAN WATERSHEDS IN THE TAMPA BAY AREA, FLORIDA



U.S. GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS 78-125

Prepared in cooperation with the
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT,
the CITIES OF CLEARWATER, ST. PETERSBURG, and TAMPA,
and HILLSBOROUGH and PINELLAS COUNTIES

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1979

UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, Secretary

GEOLOGICAL SURVEY

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CONVERSION FACTORS

For use of those readers who may prefer to use SI (metric) units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain SI (metric) unit
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
acre	0.4047	hectare (ha)
pound (lb)	0.4536	kilogram (kg)
pound per acre (lb/acre)	1.12	kilogram per hectare (kg/ha)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

HYDROLOGIC DATA FROM URBAN WATERSHEDS IN THE TAMPA BAY AREA, FLORIDA

By M. A. Lopez and D. M. Michaelis

ABSTRACT

Hydrologic data are being collected in 10 urbanized watersheds located in the Tampa Bay area, Florida. The gaged watersheds have impervious areas that range from 19 percent for a residential watershed in north Tampa to nearly 100 percent for a downtown Tampa watershed. Land-use types, including roads, residential, commercial, industrial, institutional, recreational, and open space, have been determined for each watershed. Rainfall and storm runoff data collected since 1971 for one site and since 1975 for six other sites through September 1976, have been processed. These data are recorded at 5-minute intervals and are stored in the U.S. Geological Survey WATSTORE unit values file. Daily rainfall at 12 sites and daily pan evaporation at one site have been stored in the WATSTORE daily values file.

Chemical and biological analyses of storm runoff for six sites, base flow for seven sites, and analyses of bottom material for seven sites are also stored in the WATSTORE water-quality file.

Rainfall and storm runoff for selected storms, daily rainfall, and daily pan-evaporation data are summarized in this report. Water-quality analyses of all water-quality samples are also listed.

INTRODUCTION

Urban growth and related land use have a major impact on the water resources in the Tampa Bay area, Florida. Major problems accompanying rapid urban growth include reduced infiltration and resultant increased flood potential, pollution of streams, and the degradation of water quality of Tampa Bay and the Gulf beaches. Municipal and county governments in the Tampa Bay area are under increasing pressure from Federal and State regulatory agencies to incorporate into storm drainage systems design features that reduce pollutants carried to the receiving water. In those communities where the Federal Insurance Administration has conducted flood insurance studies, flood insurance rates are based on the 100- and 500-year flood elevations. Present Flood Insurance Study guidelines (U.S. Dept. of Housing and Urban Development, 1976) require estimates of flood-peak discharge and resulting flooding in areas designated for detailed study which have drainage areas over one square mile. The present methods of estimating flood-peak discharge or pollutant loads in urban areas are based on data from other geographical areas and have not been verified in the Tampa Bay area.

The investment in capital improvements to Tampa's drainage system has been about $6 million annually since 1972 (Brundage, 1977). At present (1978), the city plans to continue to budget about $6 million for drainage system improvements (Donald Terp, City of Tampa, oral commun., 1978). Pinellas County is planning to invest approximately one-half million dollars during the next several years for a master storm drainage study (Charles Diggs, oral commun., 1978).

Solutions to urban storm water problems will require an extensive data collection and analysis program involving land use, rainfall, runoff, and quality of water information for developing areas. In response to the need for storm-runoff data from urban watersheds in the Tampa Bay area, the U.S. Geological Survey, in cooperation with the Southwest Florida Water Management District, cities of Clearwater, St. Petersburg, and Tampa, and counties of Hillsborough and Pinellas, initiated a comprehensive study in 1974.

PURPOSE AND SCOPE

This report summarizes the progress of the Tampa Bay area urban storm water project during fiscal years 1975 and 1976. The first phase consists of watershed selection, construction of gages, and establishment of a hydrologic data base for urban watersheds. Descriptions of watersheds, instrumentation, and data collection methods are presented. Rainfall, runoff, and evaporation data through September 30, 1976, stored in the U.S. Geological Survey WATSTORE (Water Storage and Retrieval) system are summarized. Water-quality analyses of water samples collected during selected storms in 1975-76 stored in WATSTORE are listed.

The study area, referred to in this report as the Tampa Bay area, includes the counties of Hillsborough and Pinellas in west-central Florida (fig. 1). The objectives of the project are: (1) To assess the quantity and quality of storm water; (2) to relate the storm-water runoff and water quality to land use and intensity of development; and (3) to develop the planning and management information needed for the design and management of storm drainage systems to meet both peak flow and water-quality criteria. To accomplish these objectives, a multi-phase program was designed as follows:

(1) Establish a hydrologic data base for the Tampa Bay area consisting of land use, storm-runoff quantity and quality, and rainfall.

(2) Calibrate and verify digital rainfall-runoff models for use in simulating flood histories of urban areas under varying degrees of development using historical rainfall and evaporation records.

(3) Develop flood-frequency curves using results of rainfall-runoff model simulations.

(4) Relate flood peaks of various recurrence intervals and water-quality concentrations to characteristics of land use, climate, and physiography.

Progress on the project has been on schedule with the construction of 10 streamflow gaging stations and 12 recording rain gages and tabulation of watershed land use completed in 1975. Storm-runoff and rainfall data and samples of water quality have been collected since 1975. Runoff and rainfall data for selected storms from August 1971 to September 1976 at one site which was part of the State-wide small streams project have been stored in WATSTORE. Storm runoff and rainfall from June 1975 to September 1976 at six other sites are stored in WATSTORE. Daily rainfall from June 1975 to September 1976 at 12 rain gages in the project area and daily pan-evaporation data from October 1972 to September 1976 at a nearby evaporation station have been stored in WATSTORE.

URBAN WATERSHED DATA

The data network is a system of data collection sites selected and operated to provide representative and transferable information defining the spatial and temporal variability of flood peaks and water quality of urban watersheds in the Tampa Bay area. Although the objectives of such a network should emphasize the concepts of "representative samples" and "transferability" of collected data to ungaged sites, they must also consider the short-term and long-term uses of these data.

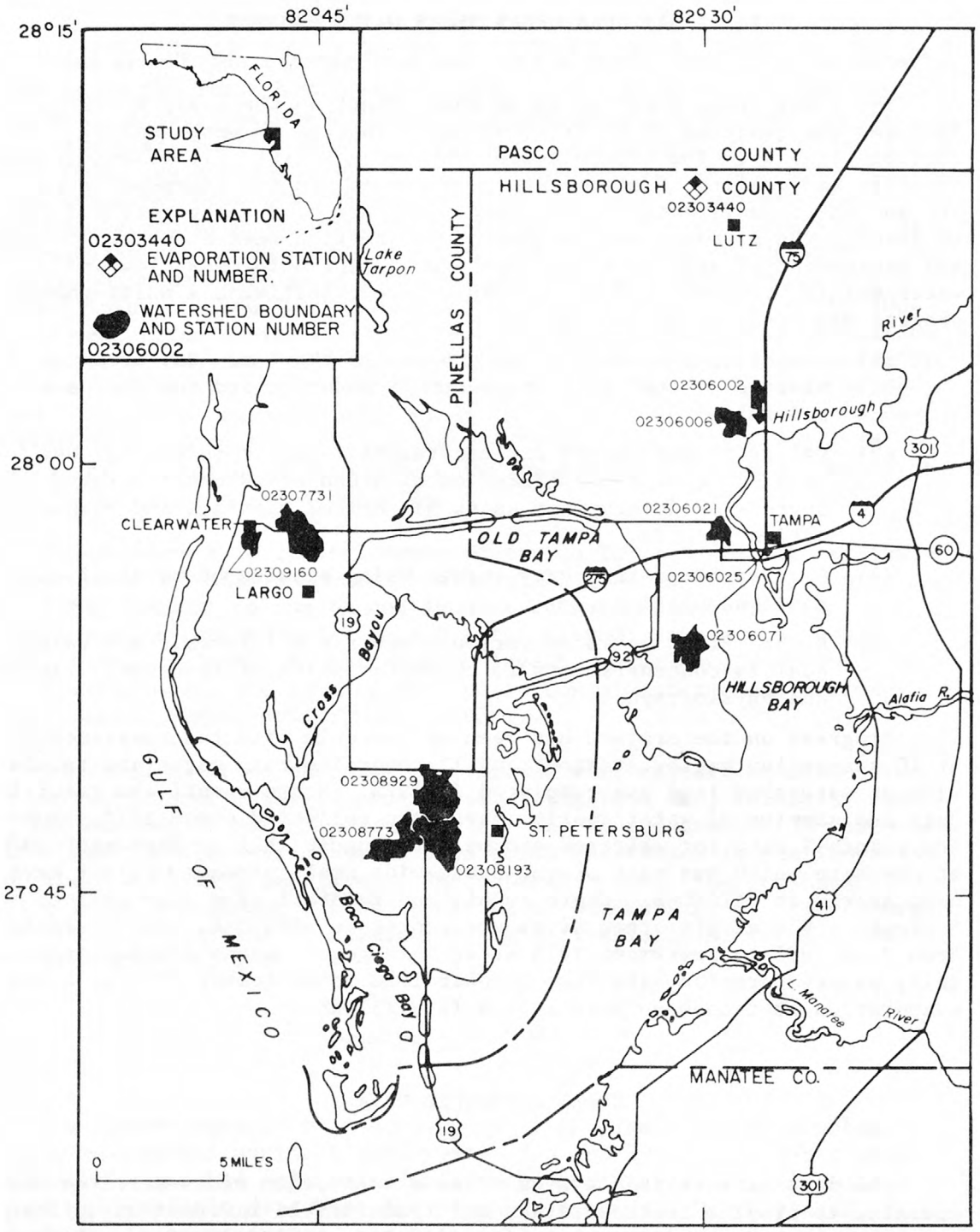

Figure 1.--Tampa Bay area urban watersheds.

Watershed Selection

To meet the objectives of the project, both for short-term modeling of the rainfall-runoff relation and for long-term flood-frequency and water-quality relationships in watersheds with varying degrees of development, the following selection criteria were used:

(1) Watershed drainage area should be within the size range of most drainage system designs.

(2) Land use in the watershed should be typical of the different types of development in the Tampa Bay area.

(3) Land-use type and development should remain stable during the investigation.

(4) Stage-discharge relation at watershed outlet should be defined by current meter measurement.

(5) Samples of storm runoff for water-quality analyses should be collected throughout the range of discharge experienced.

Five of the selected watersheds were in Hillsborough County, all within the Tampa city limits. The others were located in Pinellas County, three in the city of St. Petersburg, one near the town of Largo, and one in the city of Clearwater. Locations of the watersheds are shown in figure 1. The watersheds are identified by station numbers which are used in the following descriptions and figures.

Watershed Descriptions

Artic Street Storm Drain (02306002).--This 0.34 mi^2 watershed is in Sulphur Springs, 5.5 mi north of the Tampa Post Office. The watershed is elongated, about 1.4 mi long and 0.5 mi wide, and drains southward through an underground storm-sewer system with grated street inlets. The drain is tributary to Hillsborough River. Development is about evenly divided between older single-unit residences and commercial businesses with several large shopping centers making up most of the commercial development. Florida Avenue, a heavily traveled four-lane street, runs the length of the watershed and is highly developed commercially including fast-food type outlets and car dealerships. Streamflow, rainfall, and water-quality data are collected at a station installed in a 72-in. diameter storm sewer under Artic Street. Figure 2 shows land use in Artic Street Storm Drain watershed and locations of streamflow and rain gages.

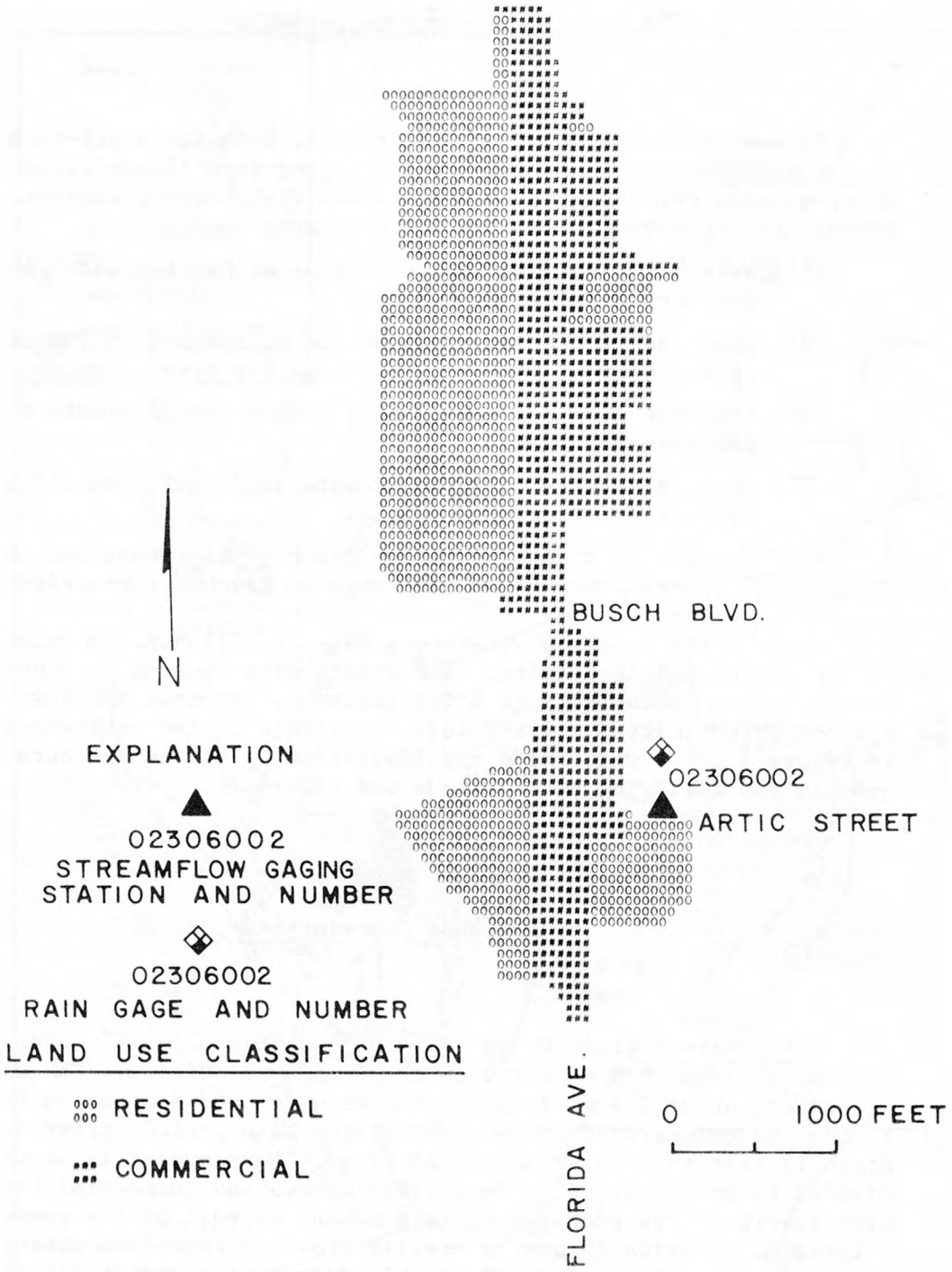

Figure 2.--Land use in Artic Street Storm Drain watershed.

Kirby Street Drainage Ditch (02306006).--This 1.15 mi^2 watershed is located 5.6 mi north of the Tampa Post Office. It is trapezoidal in shape and the longest distance from the gage to boundary is 1.7 mi. A large percentage of land use in the basin is residential with most units on large lots. Open space comprises most of the remaining area which is lightly wooded and naturally vegetated. A small lake (0.04 mi^2) is at the headwater of the watershed. Except for a few short sections of storm sewers at the outer edges of the watershed, drainage is by open ditch. The ditch is tributary to the Hillsborough River. Streamflow, rainfall, and quality of water data are collected at the southeastern boundary of the watershed where a 72-in. diameter culvert outlets under North Boulevard. Figure 3 shows land use in Kirby Street Drainage Ditch watershed and locations of streamflow and rain gages.

St. Louis Street Drainage Ditch (02306021).--The St. Louis Street Drainage Ditch drains 0.51 mi^2 of an older residential section 3 mi northwest of the Tampa Post Office. The basin shape is roughly triangular with extensions around the perimeter where outlying areas are served by individual storm sewers. The longest distance from gage to boundary is 1.2 mi. Land use is predominantly residential with an average impervious area for each house of 1,900 ft^2. The commercial, institutional, recreational, and open space land use is generally balanced. Drainage is eastward through an underground storm-sewer system that outlets under Tampania Avenue into an open ditch which empties into the Hillsborough River. Streamflow, rainfall, and quality of water data are collected in the open ditch section about 300 ft east of Tampania Avenue. Figure 4 shows land use in St. Louis Street Drainage Ditch watershed and locations of streamflow and rain gages.

Cass Street Storm Drain (02306025).--This 0.02 mi^2 watershed is in downtown Tampa with the Post Office inside its southern boundary. The watershed is elongated and drains westward through an underground storm-sewer system with grated street inlets. Land use is commercial with a large percentage of paved streets contributing to its 100 percent impervious area. Streamflow is measured at the storm sewer outlet under the Cass Street-Hillsborough River Bridge. The drain is tributary to the Hillsborough River. Figure 5 shows land use in Cass Street Storm Drain and location of the streamflow gage.

Gandy Boulevard Drainage Ditch (02306071).--This 1.29 mi^2 watershed lies roughly in the center of Interbay Peninsula 5 mi southwest of the Tampa Post Office. The watershed shape is irregular with extensions in several directions draining outlying areas. The longest distance from gage to boundary is 1.8 mi. Drainage is westward through a network of underground storm sewers with grated street inlets. The ditch is tributary to Old Tampa Bay. Land use is predominantly residential, commercial, and open space. The residential areas consist of high density developments of smaller houses. Commercial development consists mainly of retail centers with large parking areas. Open space is evenly divided between heavily vegetated undeveloped land and grassy open fields.

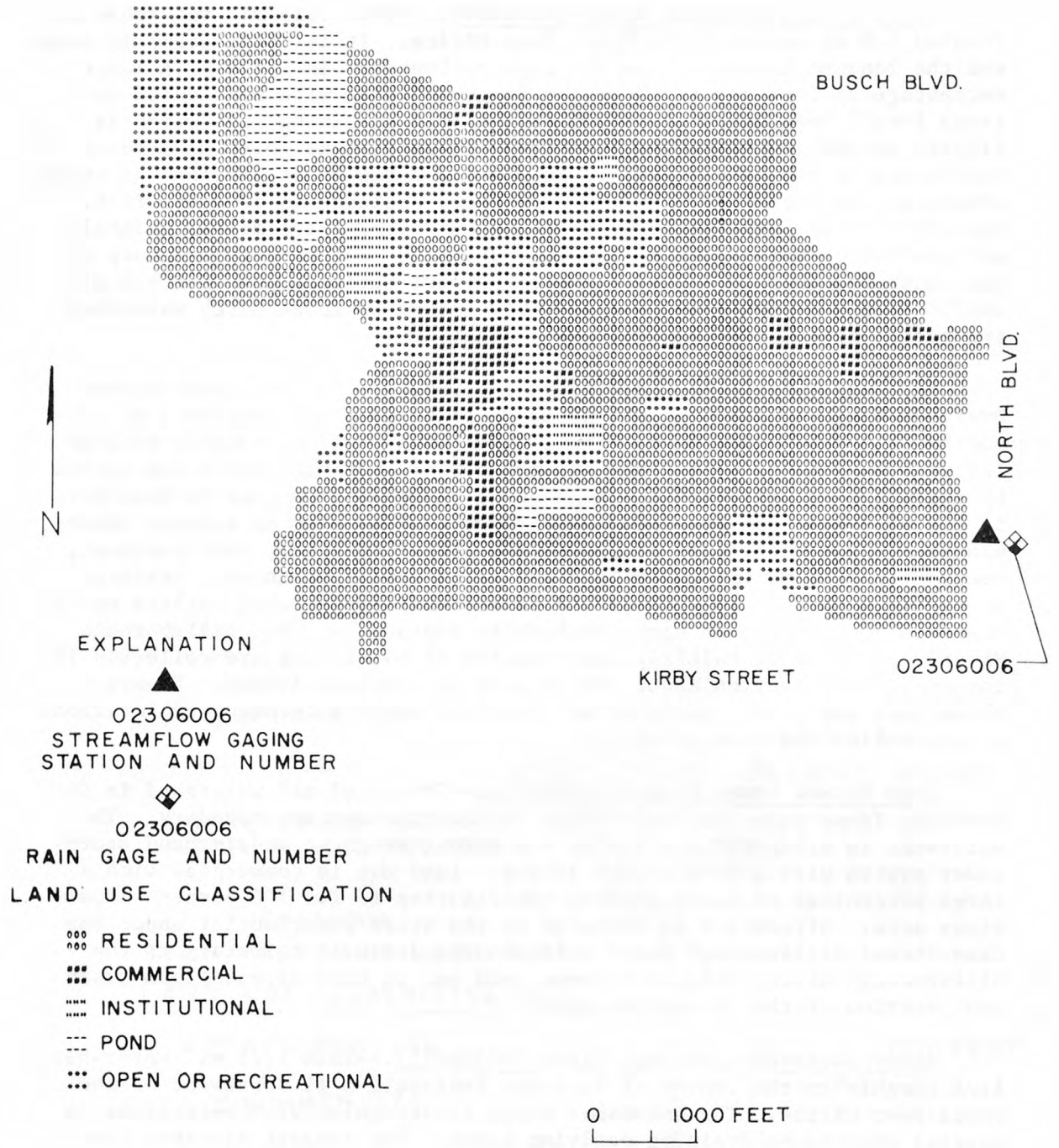

Figure 3.--Land use in Kirby Street Drainage Ditch watershed.

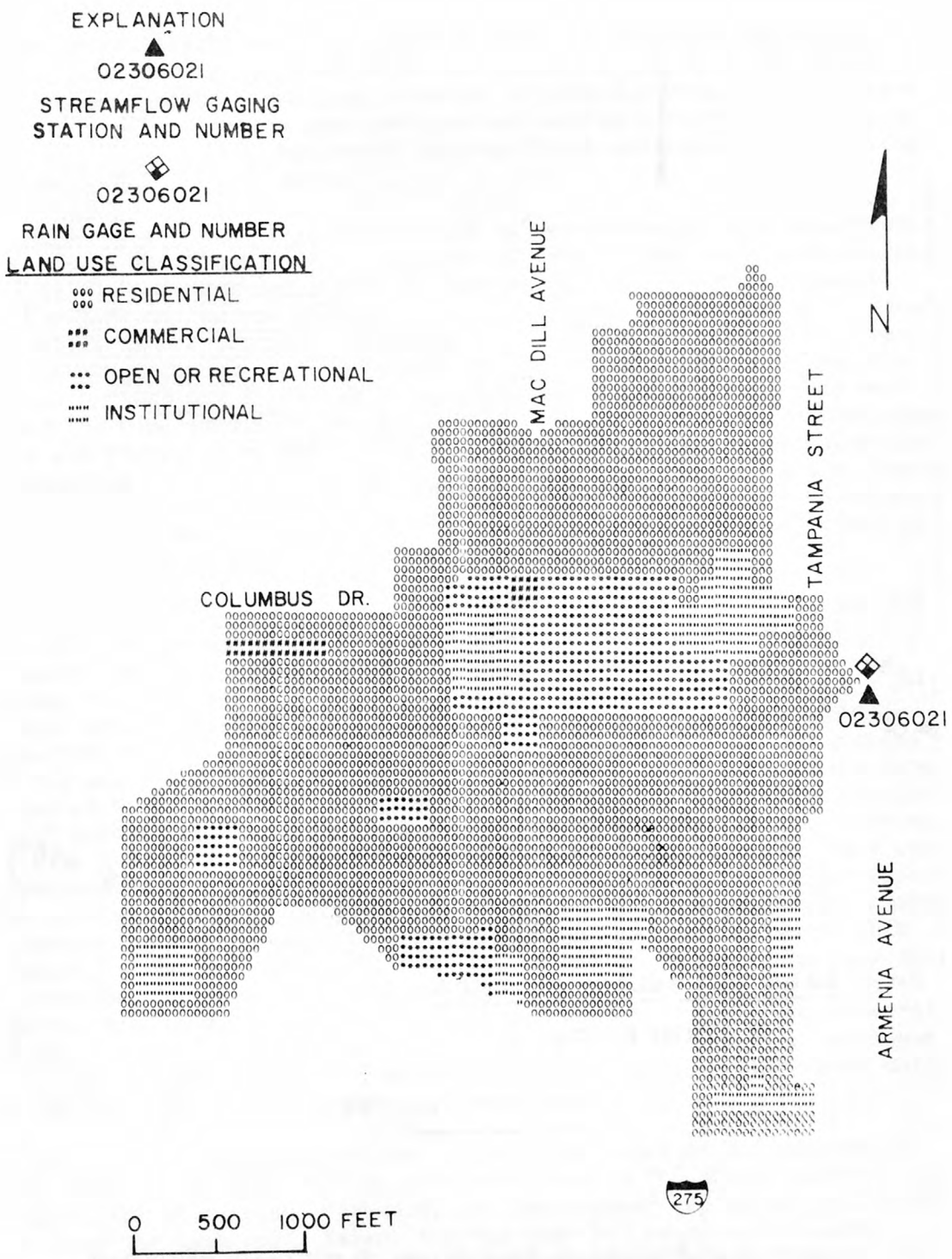

Figure 4.--Land use in St. Louis Street Drainage Ditch watershed.

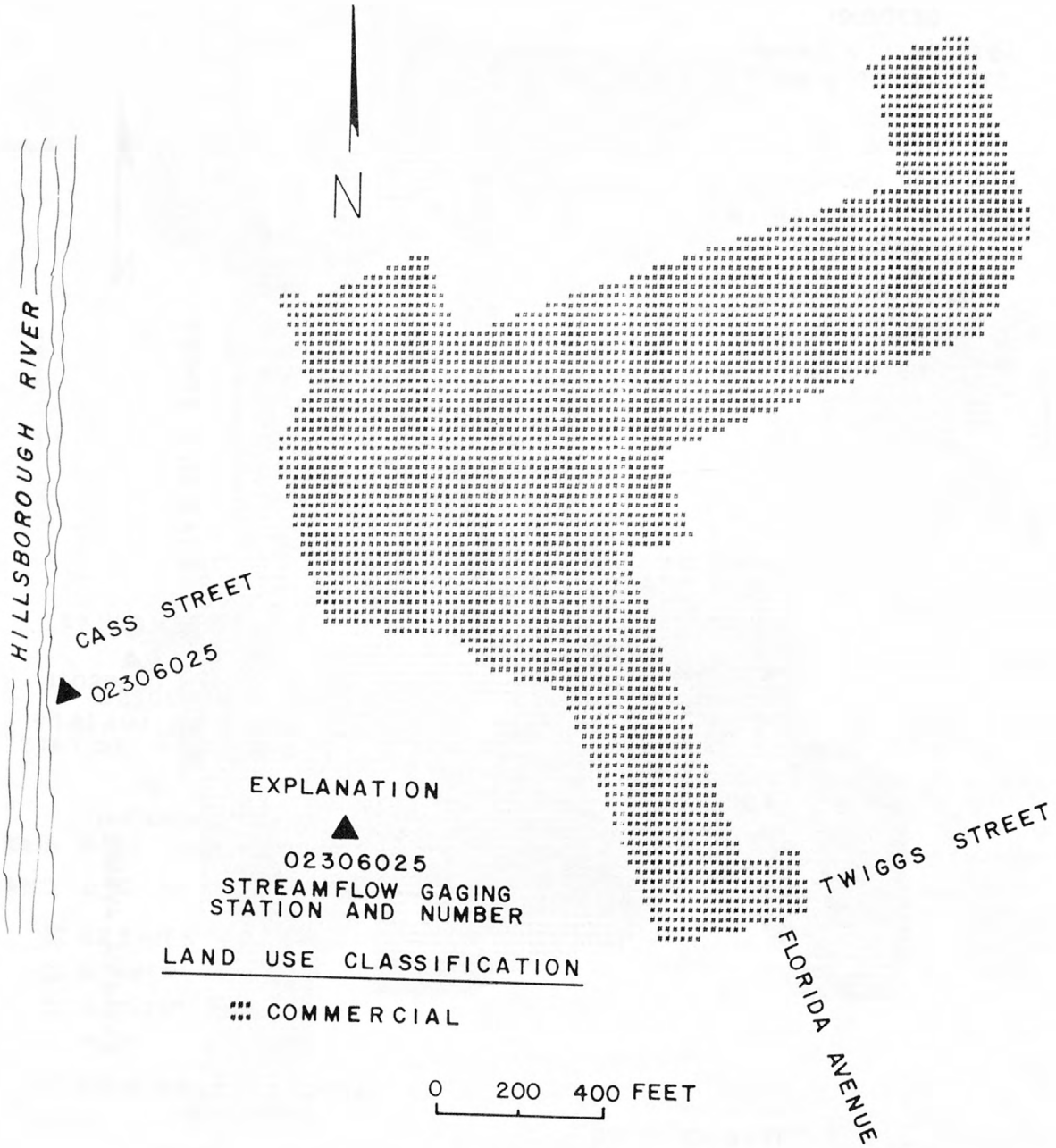

Figure 5.--Land use in Cass Street Storm Drain watershed.

Streamflow, rainfall, and water-quality data are collected where the drain outlets into an open ditch at the western boundary of the watershed. A supplemental rain gage (station 275336082300900) is 1.0 mi east of the streamflow station near the centroid of the watershed. Figure 6 shows land use in Gandy Boulevard Drainage Ditch watershed and locations of streamflow and rain gages.

Allen Creek (02307731).--This 1.88 mi^2 watershed is in a newer residential area 3 mi northeast of the town of Largo. The watershed is elongated in the southerly direction of drainage and the longest distance from the gage to the boundary is 3.3 mi. Land use is predominantly single residential with a few condominium units. The average impervious areas for each single and multiple unit are 2,800 ft^2 and 6,500 ft^2. Heavily traveled Gulf-to-Bay Boulevard (U.S. Highway 60), running east and west, divides the watershed. The northern half is drained by a network of storm sewers and the southern half by open ditch. Allen Creek is tributary to Old Tampa Bay. Streamflow, rainfall, and water-quality data are collected below a control structure at the watershed's southern boundary on Nursery Road. Figure 7 shows land use in Allen Creek watershed and locations of streamflow and rain gages.

Booker Creek (02308193).--The Booker Creek watershed is 1.0 mi west of the St. Petersburg Post Office. The 3.76 mi^2 watershed is roughly triangular with the longest distance from gage to boundary of 3.5 mi. Drainage is southeasterly with networks of storm sewers that connect with the main stem open channel at points along its conveyance to Tampa Bay. During the study, construction of Interstate Highway 275 has progressed from the watershed's northern boundary to a point just south of its intersection with Booker Creek. Changes to the channel have included construction of a retention basin and control structure upstream of the intersection with I-275, and a box culvert through the highway system. Land use is predominantly older residential with an average of 1,670 ft^2 of impervious area per house. Commercial land use includes a considerable amount of warehousing and distributing activity along the railway system that converges in the watershed. Streamflow, rainfall, and water-quality data are collected in an open channel at the culvert under 17th Street North about 0.2 mi downstream from the I-275 box culvert exit. A supplemental rain gage (station 274739082400400) in the watershed is 1.6 mi northwest of the streamflow station. Figure 8 shows land use in Booker Creek watershed and locations of streamflow and rain gages.

Bear Creek (02308773).--This 1.89 mi^2 watershed is 4.5 mi west of the St. Petersburg Post Office. The watershed is "L" shaped with the longer leg of 2.1 mi running east-west, and the shorter leg of 1.5 mi running north from the east end. Except for the last 0.7 mi of open channel, drainage is by underground sewer with grated street inlets. Bear Creek is tributary to Boca Ciega Bay. Development is predominantly residential with an average impervious area of 1,703 ft^2 per unit. Streamflow, rainfall, and water-quality data are collected at the southwestern boundary of the watershed under 1st Avenue North, 1.9 mi upstream from Boca Ciega

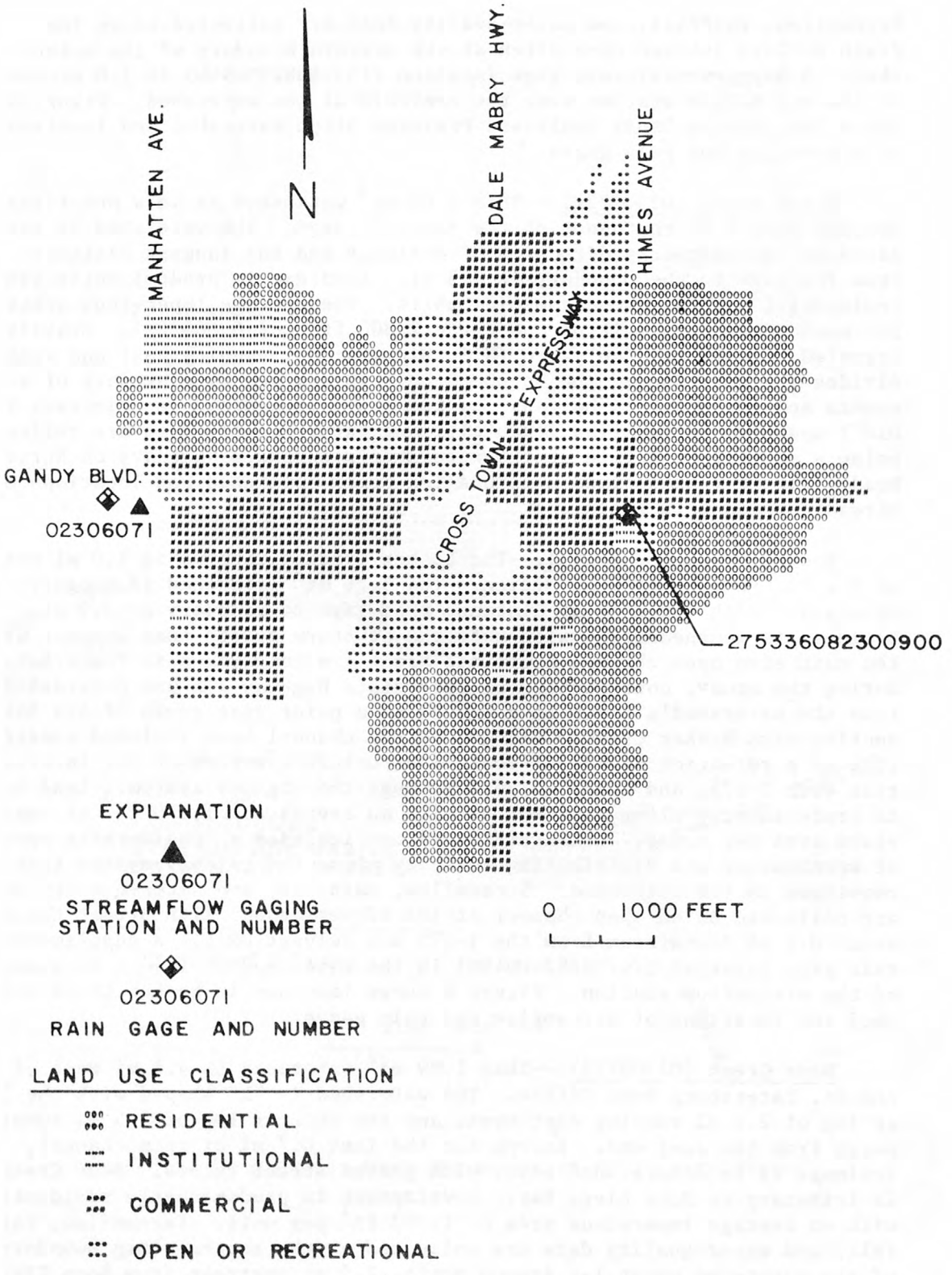

Figure 6.--Land use in Gandy Boulevard Drainage Ditch watershed.

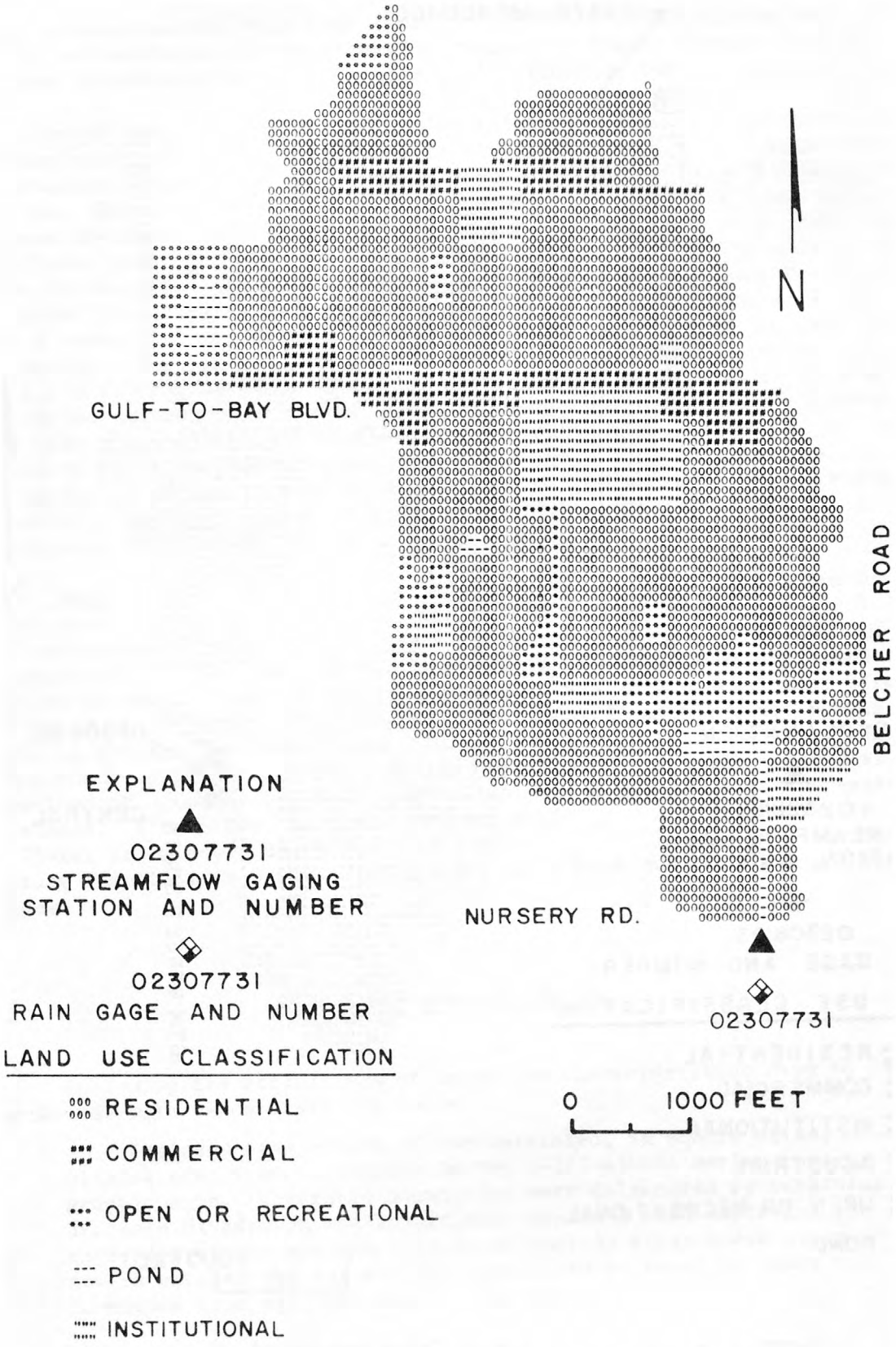

Figure 7.--Land use in Allen Creek watershed.

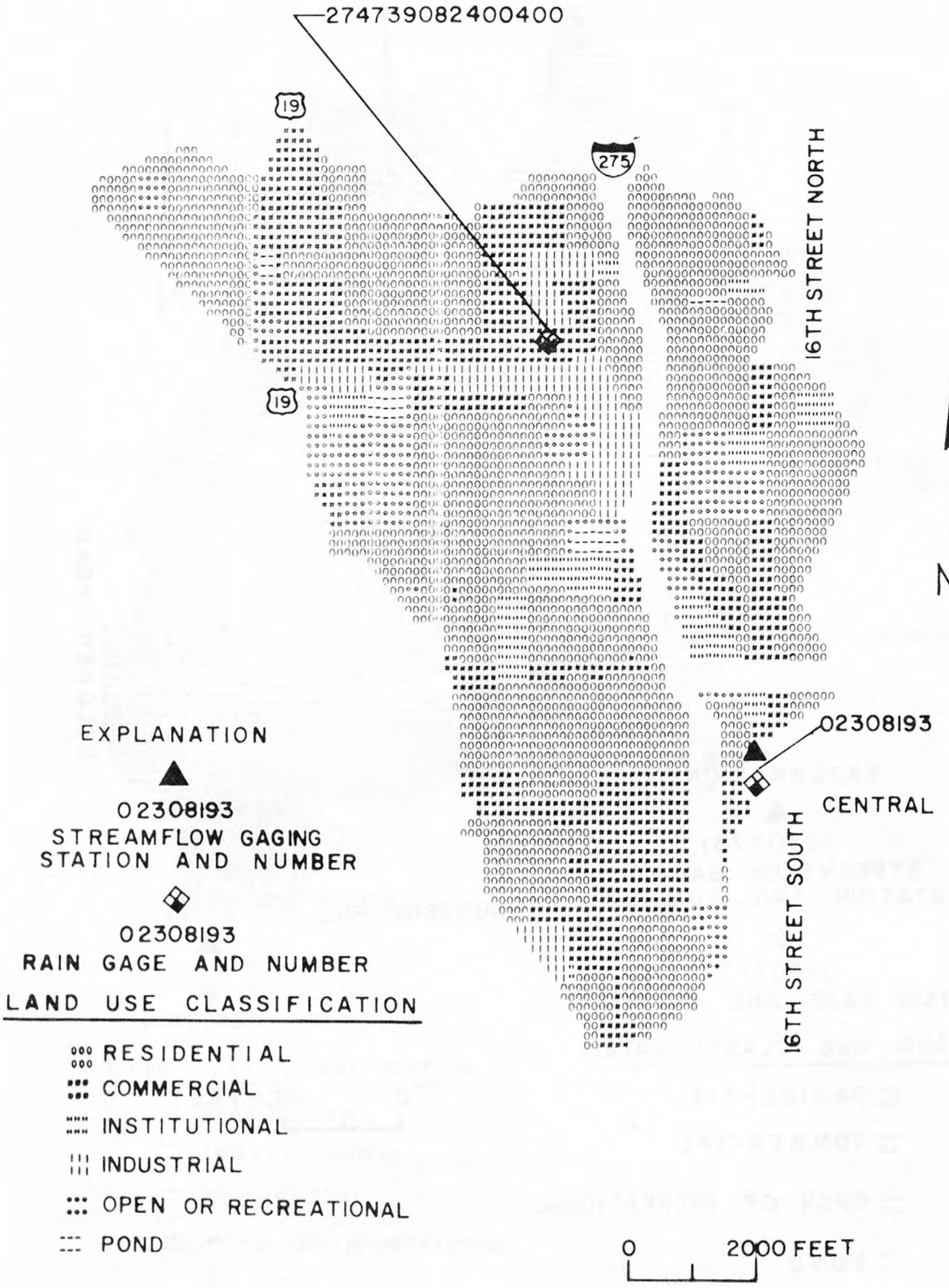

Figure 8.--Land use in Booker Creek watershed.

Bay. A supplemental rain gage (station 274645082410800) in the watershed is 1.7 mi northeast of the streamflow station. Figure 9 shows land use in Bear Creek watershed and locations of streamflow and rain gages.

Saint Joes Creek (02308929).--The Saint Joes Creek watershed is 3.5 mi northwest of the St. Petersburg Post Office. The 1.72 mi^2 watershed is roughly square with the longest distance from the gage to boundary of 1.8 mi. Saint Joes Creek flows east-to-west, is channelized, and receives drainage from the upper third of the basin by open ditch and from the lower two-thirds by underground storm sewers. Interstate Highway 275 runs north-south inside the eastern boundary, and the Seaboard Coastline railroad lies diagonally across the southwest third of the basin servicing a commercial and light industrial development. Residential land use is mainly older houses and mobile homes with an average impervious area of 1,650 ft^2 per unit. Streamflow, rainfall, and water-quality data are collected at the downstream side of a culvert outlet under U.S. Highway 19. The stage-discharge relation is affected by a small lake 0.1 mi downstream. A supplemental rain gage (station 274739082400400) is 1.5 mi southeast of the streamflow station and 0.4 mi south of the watershed boundary. Figure 10 shows land use in Saint Joes Creek watershed and locations of streamflow and rain gages.

Turner Street Storm Drain (02309160).--The Turner Street Storm Drain watershed is 0.8 mi southeast of the Clearwater Post Office. The 0.24 mi^2 watershed is roughly square with the longest distance from gage to boundary of 0.8 mi. Drainage is by underground storm sewer northward to the north boundary at Turner Street and then westward under Turner Street to the Gulf of Mexico. Residential development is mainly older houses with an average impervious area of 2,640 ft^2 per unit. A railroad yard runs north-south through the watershed and serves the light industrial development. Commercial development includes an auto dealership-repair business. Streamflow, rainfall, and water-quality data are collected at a 72-in. storm sewer under Turner Street. Figure 11 shows land use in Turner Street Storm Drain watershed and locations of streamflow and rain gages.

Watershed Characteristics

Following are definitions of watershed characteristics used to describe the watersheds listed in table 1:

Drainage area.--Area of the watershed, in square miles, planimetered from Geological Survey 7-1/2-minute series topographic maps. Watershed boundaries were delineated by outlining drainage divides on the topographic maps and then modifying the natural drainage area to include or exclude areas where storm sewers crossed the natural drainage divides, based on sewer information from city and county agencies.

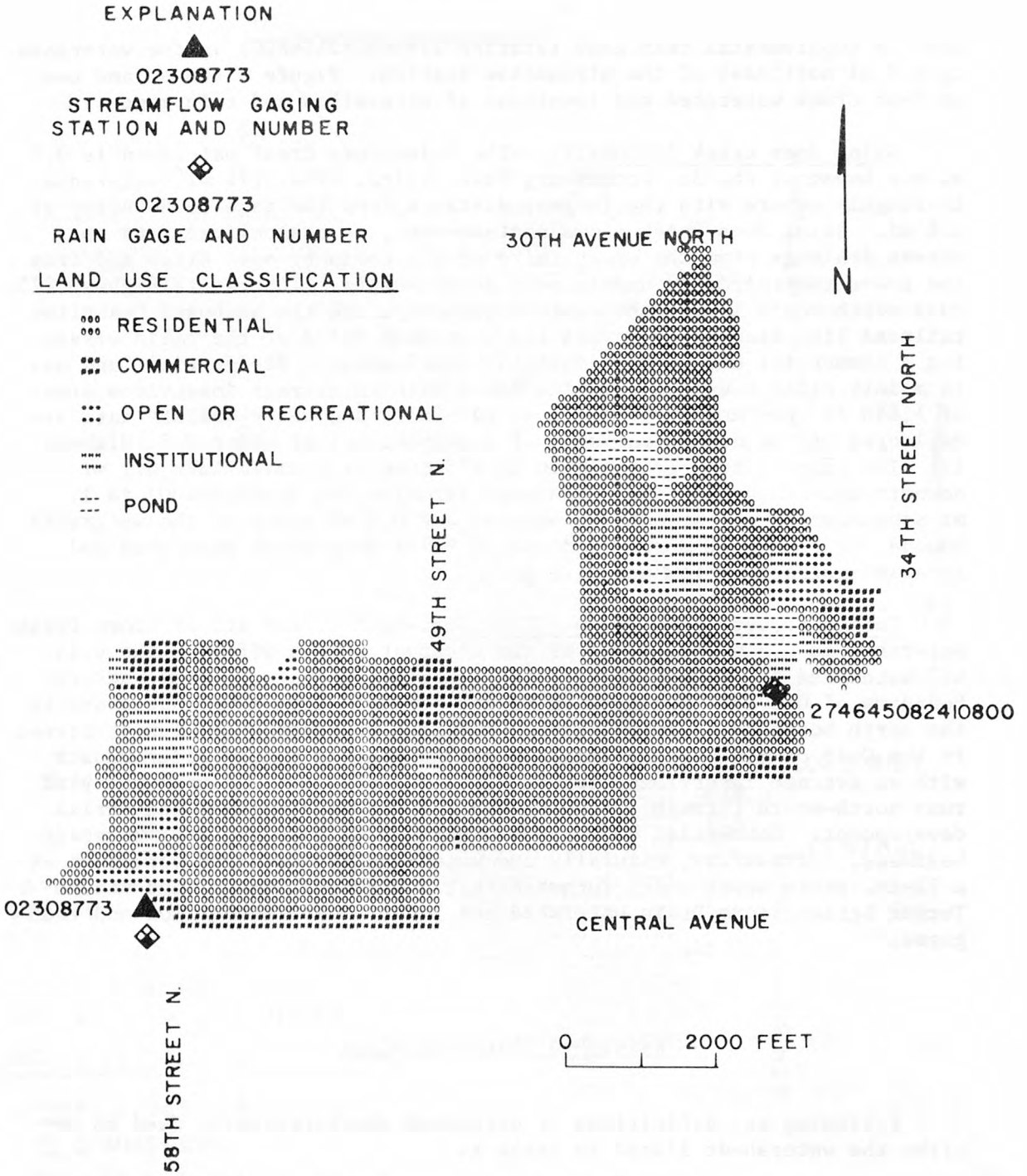

Figure 9.--Land use in Bear Creek watershed.

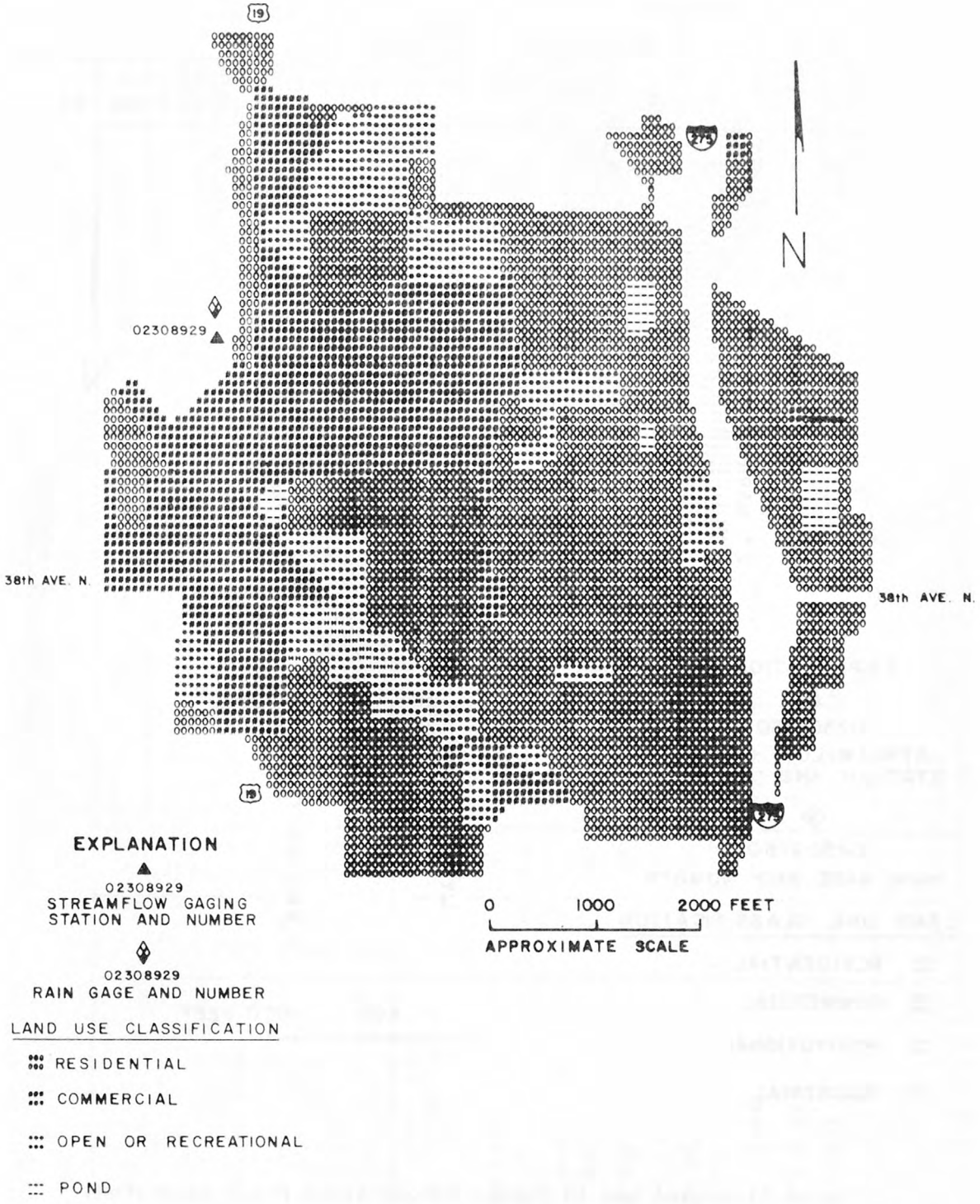

Figure 10.--Land use in Saint Joes Creek watershed.

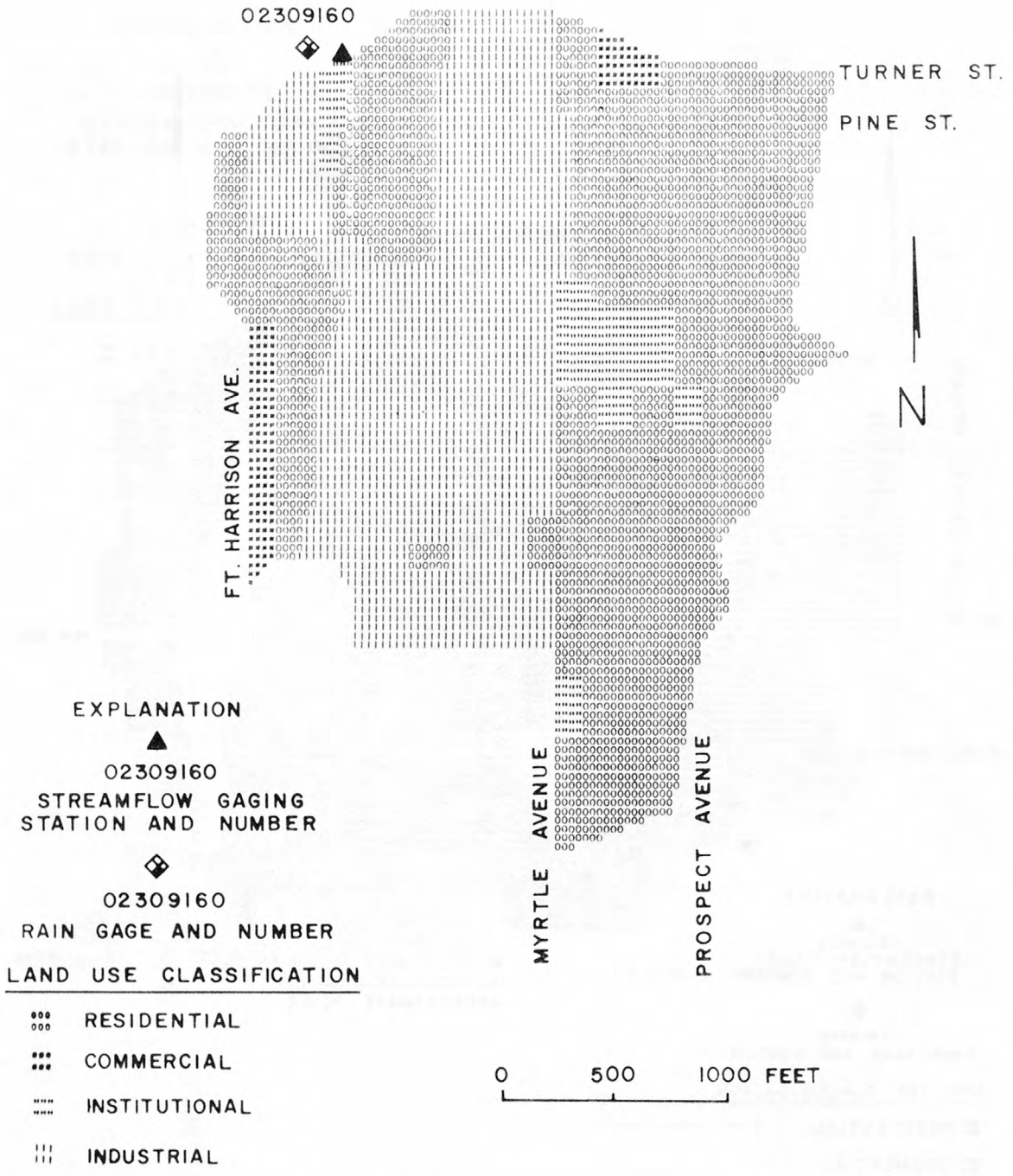

Figure 11.--Land use in Turner Street Storm Drain watershed.

Table 1.--Watershed characteristics

Station no. and name	Drainage area (mi^2)	Population density (persons/acre)	Land use, percent of total area								Impervious area percent of total area
			Roads	Single-family residential	Multi-family residential	Commercial	Industrial	Institutional	Recreational	Open space	
02306002 Artic Street Storm Drain	0.34	6.6	14.7	46.2	0	36.5	0	1.5	0	1.1	61
02306006 Kirby Street Drainage Ditch	1.15	6.8	4.4	69.0	3.3	4.5	0	2.2	1.0	15.6	19
02306021 St. Louis Street Drainage Ditch	.51	8.2	11.8	68.1	0	3.3	0	6.5	2.3	8.0	27
02306025 Cass Street Storm Drain	.02		30.9	0	0	69.1	0	0	0	0	100
02306071 Gandy Blvd. Drainage Ditch	1.29	5.7	8.5	31.6	5.1	21.0	0	3.9	5.6	24.3	38
02307731 Allen Creek	1.88	6.9	10.3	59.0	3.9	7.0	0	7.9	0.5	11.4	36
02308193 Booker Creek	3.76	5.8	12.3	48.8	1.7	18.1	4.4	3.0	2.7	9.0	41
02308773 Bear Creek	1.89	6.9	12.8	66.1	4.3	5.8	0	5.5	1.0	4.5	32
02308929 Saint Joes Creek	1.72	5.3	12.0	47.7	.1	16.2	7.7	1.8	1.9	12.6	38
02309160 Turner Street Storm Drain	.24	6.9	11.8	47.3	1.1	5.9	28.4	5.5	0	0	48

Population density.--The number of persons per acre computed by dividing the population within the watershed boundary by the watershed area, in acres. Population was estimated from the 1970 U.S. Census.

Land Use

Roads.--The area within the watershed covered by paved roads, in percent of the total watershed area.

Single-family residential.--The area within the watershed covered by single-family homes, in percent of the total watershed area.

Multifamily residential.--The area within the watershed covered by multifamily homes or apartments, in percent of the total watershed area.

Commercial.--The area within the watershed covered by commercial buildings and parking lots, in percent of total watershed area.

Industrial.--The area within the watershed covered by industrial buildings, railroad sidings, storage areas and parking lots, in percent of total watershed area.

Institutional.--The area within the watershed covered by public service institutions such as schools, colleges, hospitals, and clinics, in percent of total watershed area.

Recreational.--The area within the watershed covered by recreational facilities, in percent of total watershed area.

Open space.--The area within the watershed covered by unused, undeveloped, or agricultural land, in percent of total watershed area.

Impervious area.--The total of all impervious area within the watershed, in percent of total watershed area.

HYDROLOGIC DATA COLLECTION

The data collection network was designed within the framework of the short-term objective of calibration of a rainfall-runoff model and the long-term objectives of defining the flood-frequency relation for urban areas and the relation between land use and quantity and quality of urban storm runoff.

Criteria for locating rain gages and stage recorders, type of instrumentation, density of gages, and a description of the instrumentation is described in the following section. The section on water quality contains the strategy for sampling storm runoff and the selection of water-quality

parameters to be measured. The equipment used for processing the samples is also described and methods of sample preparation and shipment to the laboratory are given.

Rainfall and Runoff

Because both the peak rate of runoff and the volume of flow are important factors in design, continuous records of rainfall and runoff were collected for each watershed. Density of rain gages was determined on the basis of watershed size and the spatial and temporal variability of rainfall during storm events. Recording rain gages were co-located with the streamflow gages at all sites except one, and three watersheds have multiple rain gage installations. (Refer to figures 2 through 11.) Each streamflow gaging station is identified by an eight-digit, downstream order, station number. Rain gages co-located with the streamflow gages have the same station number, while three others located away from the streamflow stations have 15-digit station numbers based on latitude and longitude. Table 2 lists the streamflow and rain gage locations and gives a brief description of the type of recording instruments.

A typical rainfall and stage recording station is shown in figure 12. The two battery operated digital recorders are regulated by a single electronic timer. Five-minute observations of rainfall depth and stream stage are punched synchronously on 16-channel paper tapes.

Rainfall is collected by means of an 8-in. diameter standard rain gage funnel attached to the top of the gage cover and drains into a 3-in. diameter pipe well. The accumulation of rainfall in the pipe is recorded by a float and tape assembly attached to a recorder drive shaft. Rainfall depth is recorded to the nearest 0.01 in.

Stage at open-channel sites is measured in a stilling well, usually a 12-in. diameter pipe, that is open to the channel through a series of holes in the pipe bottom. A float-tape arrangement is used to record gage-heights to the nearest 0.01 ft.

The bubble gage, a gas-purged servocontrolled-manometer system (Beck and Goodwin, 1970), is used to record water-surface level at two sites where stilling wells were not practical. This instrumentation, housed near the storm sewer, regulates nitrogen gas through a 1/8-in. polyethylene tubing to the bottom of the sewer pipe. The head of water above the tubing orifice establishes a pressure which is sensed and converted by the servocontrolled-manometer to a rotation of the recorder drive shaft.

The recorded stage is used to calculate discharge by means of a stage-discharge relation developed for each streamflow station. The stage-discharge relation is determined by current meter discharge measurements made throughout the range in stage experienced at the station. A typical discharge hydrograph and hyetograph (rainfall depth graph) are shown in figure 13.

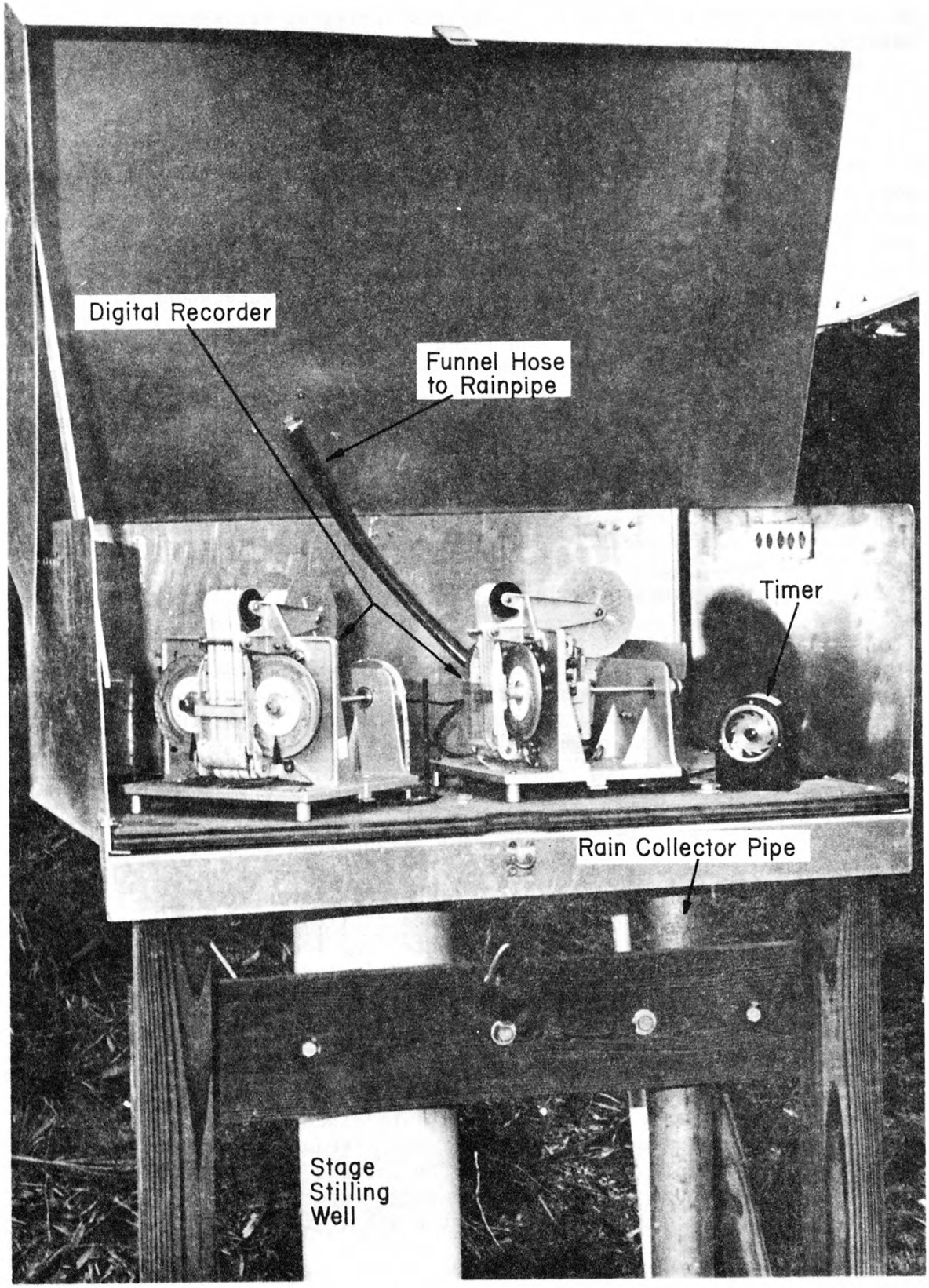

Figure 12.--Digital rainfall and stage recorders.

Table 2.--Descriptions of hydrologic-data collection sites

Station no.	Name and location
02306002	Artic Street Storm Drain at Sulphur Springs, Fla. Lat 28°01'43", long 082°27'22", in SE1/4 sec. 24, T.28S, R.18E, Hillsborough County. Digital water level recorder driven by a gas-purged servo-controlled manometer and digital rain gage in a 6- x 8-ft metal shed on Yukon Street on south side of Northgate Shopping Center parking lot.
02306006	Kirby Street Drainage Ditch at Tampa, Fla. Lat 20°01'07", long 082°28'04", in NE1/4 sec. 26, T.28S, R.18E, Hillsborough County. Digital water level recorder driven by a float-tape and digital rain gage in metal shelter over a stilling well attached to the upstream face of abutment at culvert under North Boulevard, 250 ft north of Kirby Street.
02306021	St. Louis Street Drainage Ditch at Tampa, Fla. Lat 72°57'54", long 082°27'52", in NW1/4 sec. 24, T.29S, R.18E, Hillsborough County. Digital water level recorder driven by a float-tape and digital rain gage in metal shelter over a stilling well attached to braces on south bank of ditch at edge of St. Louis Street, 1,450 ft west of Armenia Avenue.
02306025	Cass Street Storm Drain at Tampa, Fla. Lat 27°56'59", long 082°27'52", in NW1/4 sec. 24, T.29S, R.18E, Hillsborough County. Digital water level recorder driven by a float-tape in metal shelter attached to wall on east bank of Hillsborough River at south side of Cass Street bridge.
02306071	Gandy Boulevard Drainage Ditch at Tampa, Fla. Lat 27°53'37", long 082°31'07", in SE1/4 sec. 5, T.30S, R.17E, Hillsborough County. Digital water level recorder driven by a float-tape and digital rain gage in metal shelter over a stilling well attached to east headwall of box culvert under the Zayres parking lot, 350 ft west of Manhattan Avenue.
02307731	Allen Creek near Largo, Fla. Lat 27°56' 30", long 082°45'00", in SE1/4 sec. 24, T29S, R.15E, Pinellas County. Digital water level recorder driven by float-tape and rain gage in metal shelter over a stilling well on east wingwall on south side of bridge at Nursery Road, 1,000 ft west of Belcher Road.

Table 2.--Descriptions of hydrologic-data collection sites - continued

Station no.	Name and location
02308193	Booker Creek at St. Petersburg, Fla. Lat 27°46'23", long 082°39'42", in NW1/4 sec. 24, T.31S, R.16E, Pinellas County. Digital water level recorder in metal shelter over a stilling well on downstream abutment of triple culvert under 17th Street N., 150 ft north of 2nd Avenue N. in St. Petersburg. Digital rain gage in metal shelter at upstream wingwall at south side of culvert.
02308773	Bear Creek at St. Petersburg, Fla. Lat 27°46'17", long 082°42'51", in NE1/4 sec. 20, T.31S, R.16E, Pinellas County. Digital water level recorder and rain gage in separate metal shelters on south side of bridge on 1st Avenue N., 600 ft west of 58th Street N.
02308929	Saint Joes Creek at St. Petersburg, Fla. Lat 27°48'48", long 082°40'47", in SE1/4 sec. 3, T.31S, R.16E, Pinellas County. Digital water level recorder driven by a float-tape and rain gage in metal shelter over stilling well on north bank, about 100 ft northwest of 34th Street N.
02309160	Turner Street Storm Drain at Clearwater, Fla. Lat 27°57'36", long 082°47'56", in NE1/4 sec. 16, T.29S, R.15E, Pinellas County. Digital water level recorder driven by a gas-purged servomanometer and rain gage recorder in metal walk-in shelter at southwest corner of Turner Street and Indiana Avenue.
274645082410800	Lafayette Street rain gage at St. Petersburg, Fla. Lat 27°46'45", long 082°41'08" in SE1/4 sec. 15, T.31S, R.16E, Pinellas County. Digital rain gage in metal shelter over 3-in. pipe in ground near intersection of Lafayette Street and 7th Avenue N.
274739082400400	Twenty-fifth Street rain gage at St. Petersburg, Fla. Lat 27°47'39", long 082°40'04", in SE1/4 sec. 11, T.31S, R.16E, Pinellas County. Digital rain gage in metal shelter over 3-in. pipe in ground in vacant lot near intersection of 25th Street N. and 25th Avenue N.
275336082300900	Himes Avenue rain gage at Tampa, Fla. Lat 27°53'36", long 082°30'09", in NE1/4 sec. 9, T.30S, R.18E, Hillsborough County. Digital rain gage in metal shelter over 3-in. pipe in ground northwest of the Himes Avenue Fire Station.

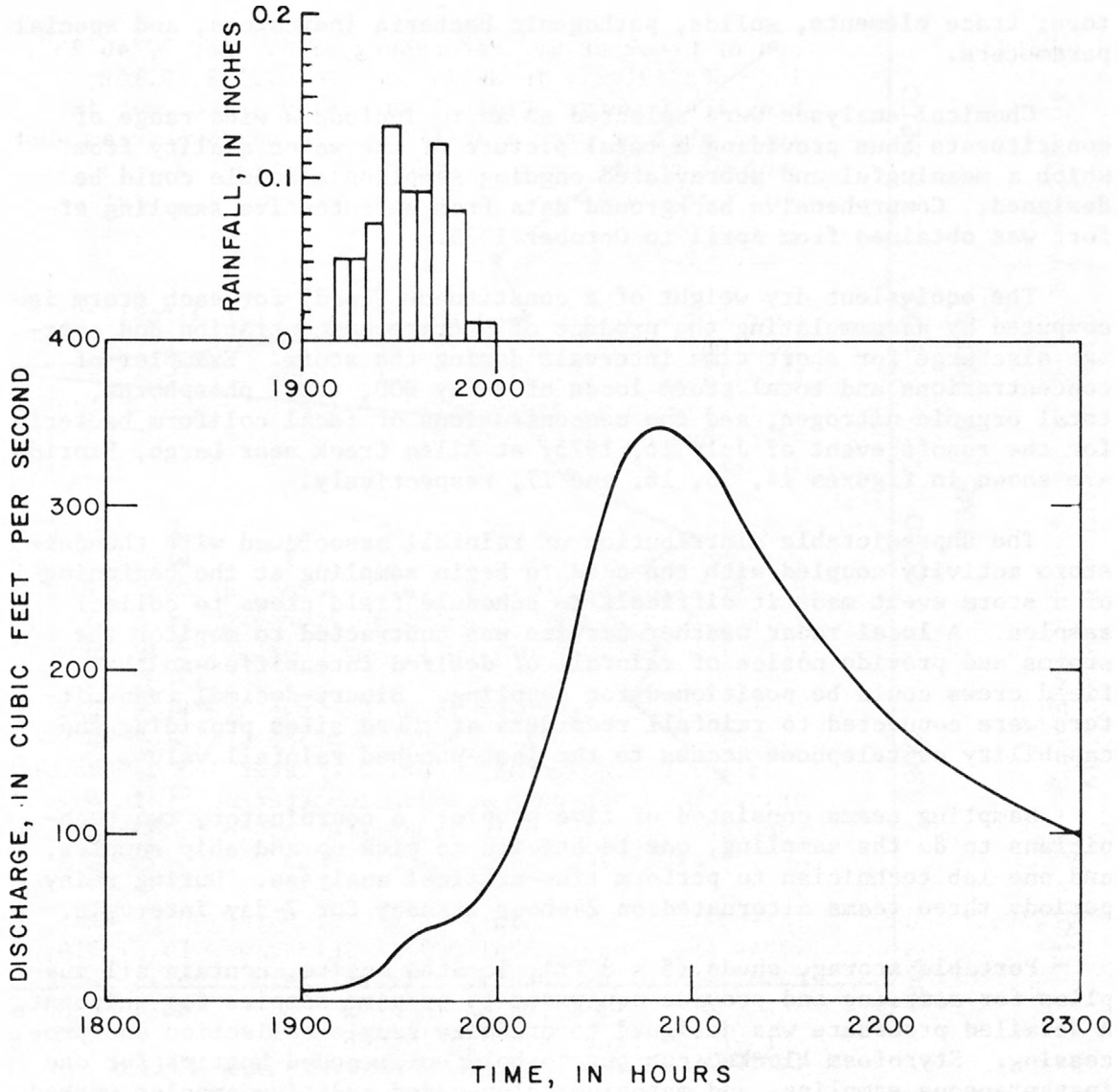

Figure 13.--Storm runoff hydrograph and rainfall hyetograph on July 16, 1975, at Allen Creek near Largo, Florida.

Water Quality

Water-quality data of interest in urban hydrology fall into seven classes: common constituents and indicators, nutrients, organic indicators, trace elements, solids, pathogenic bacteria indicators, and special parameters.

Chemical analyses were selected so as to include a wide range of constituents thus providing a total picture of the water quality from which a meaningful and abbreviated ongoing sampling schedule could be designed. Comprehensive background data from an intensive sampling effort was obtained from April to October 1975.

The equivalent dry weight of a constituent (load) for each storm is computed by accummulating the product of average concentration and average discharge for short time intervals during the storm. Examples of concentrations and total storm loads of 5-day BOD, total phosphorus, total organic nitrogen, and the concentrations of fecal coliform bacteria for the runoff event of July 16, 1975, at Allen Creek near Largo, Florida, are shown in figures 14, 15, 16, and 17, respectively.

The unpredictable distribution of rainfall associated with thunderstorm activity coupled with the need to begin sampling at the beginning of a storm event made it difficult to schedule field crews to collect samples. A local radar weather service was contracted to monitor the storms and provide notice of rainfall of desired intensities so that field crews could be positioned for sampling. Binary-decimal transmitters were connected to rainfall recorders at three sites providing the capability of telephone access to the last-punched rainfall values.

Sampling teams consisted of five people: a coordinator, two technicians to do the sampling, one technician to pick up and ship samples, and one lab technician to perform time-critical analyses. During rainy periods three teams alternated on 24-hour standby for 7-day intervals.

Portable storage sheds (5 x 8 ft), located onsite, contain all supplies for sampling and provide equipment to prepare samples for shipment. A detailed procedure was designed to organize sample collection and processing. Styrofoam blocks, cut out to hold color-coded bottles for one instantaneous sampling, and matching color-coded additive ampules worked very well to reduce the time required to process the samples. In a typical storm event, the maximum time from initial radar alert to shipment of samples was 4 hours.

Samples were analyzed in the U.S. Geological Survey water-quality laboratories using standard analytical techniques described in U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chapter A1 (Brown and others, 1970) and Standard Methods for the Examination of Water and Wastewater (American Public Health Association, 1971).

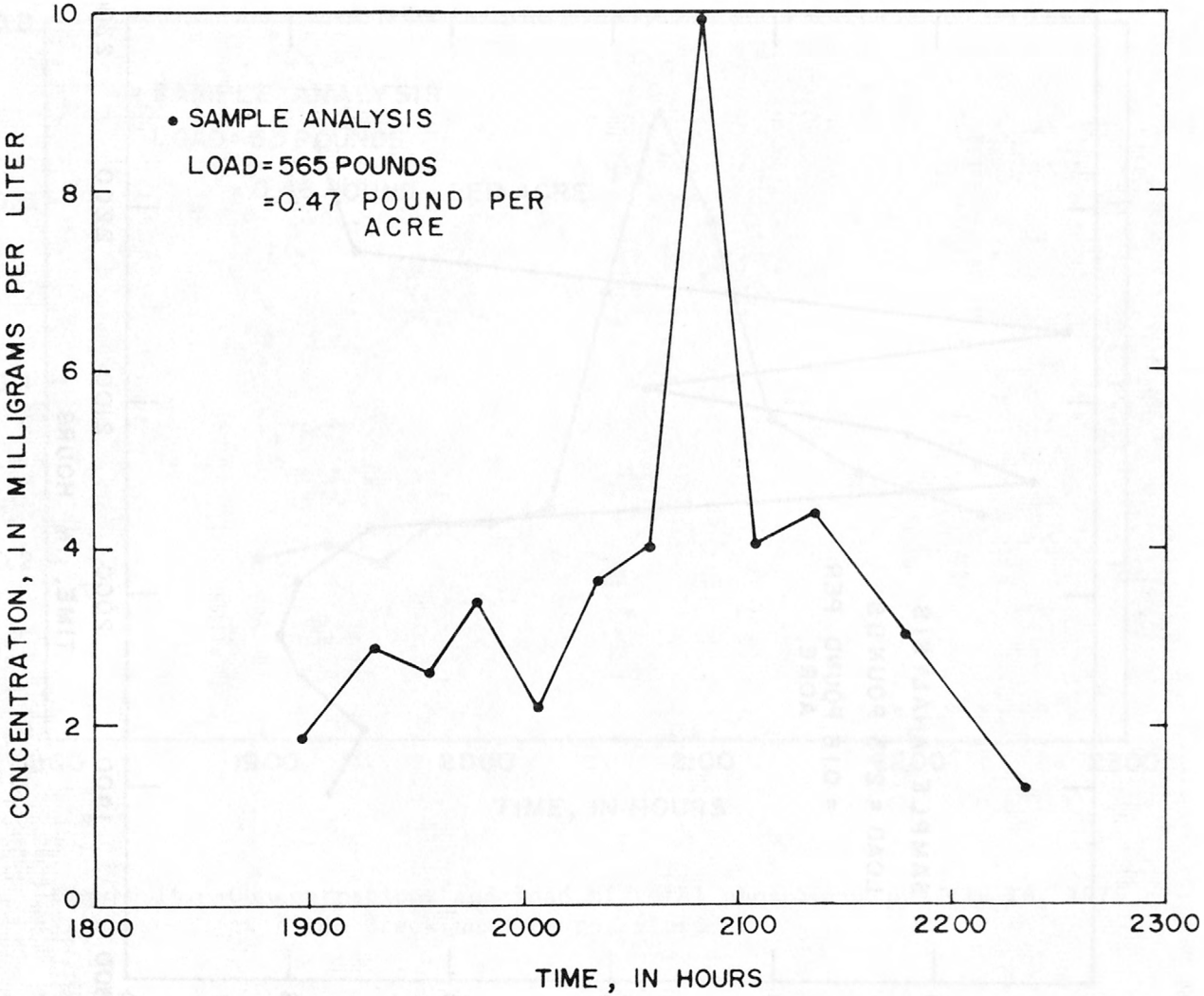

Figure 14.--Concentrations and load of 5-day BOD on July 16, 1975, at Allen Creek near Largo, Florida.

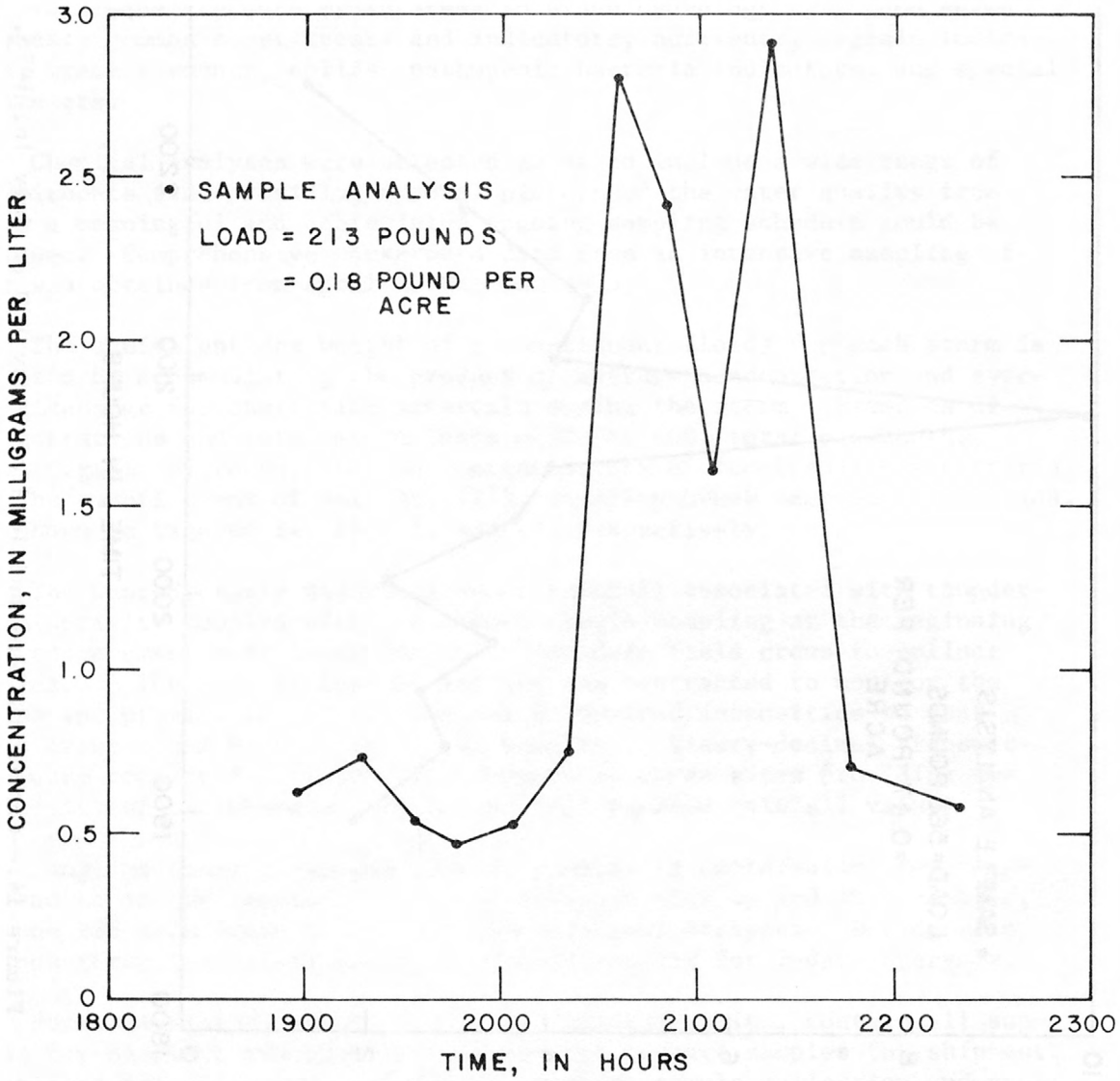

Figure 15.--Concentrations and load of total organic nitrogen on July 16, 1975, at Allen Creek near Largo, Florida.

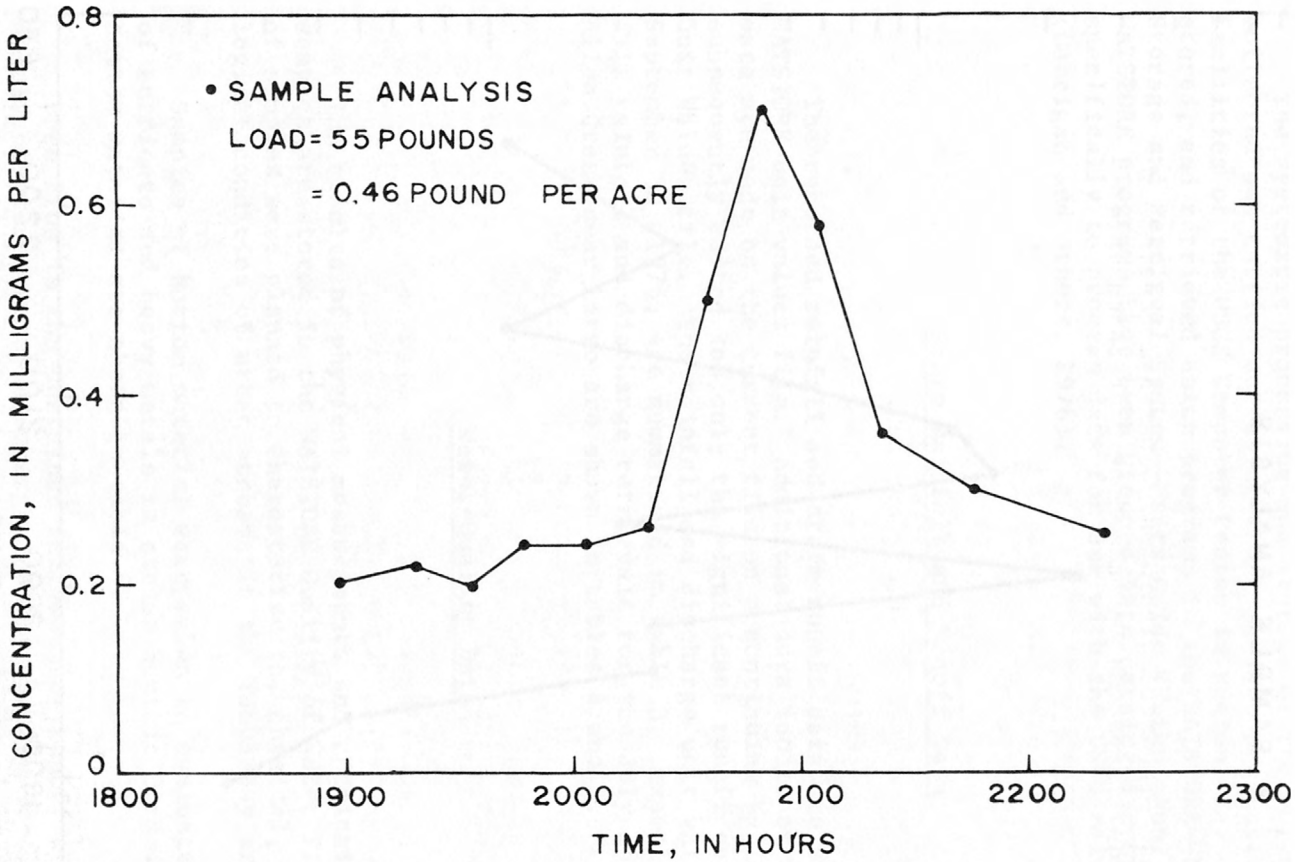

Figure 16.--Concentrations and load of total phosphorus on July 16, 1975, at Allen Creek near Largo, Florida.

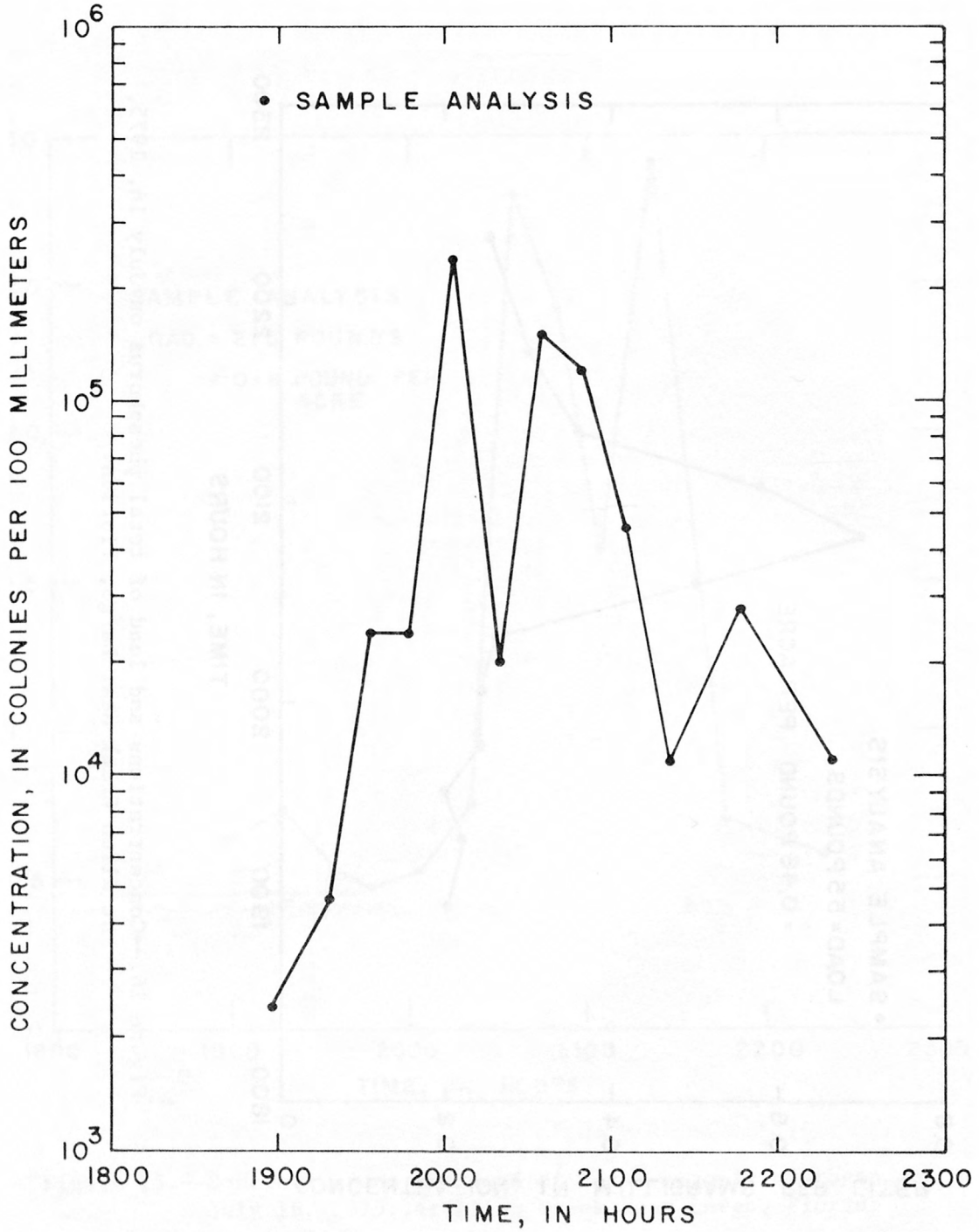

Figure 17.--Concentrations of fecal coliform bacteria on July 16, 1975, at Allen Creek near Largo, Florida.

The systematic processing and storage of the voluminous data being collected was carried out using existing data processing programs and facilities of the USGS Computer Center in Reston, Va. Data are processed, stored, and retrieved using programs in the WATSTORE--National Water Data Storage and Retrieval System--Users Guide (Hutchinson, 1975). Selected WATSTORE programs have been grouped into cataloged procedures prepared specifically to process data for use with the USGS rainfall-runoff models (Carrigan and others, 1976).

Storm Rainfall and Runoff Data

The recorded rainfall and storm runoff data are stored in the WATSTORE unit values file. Additional data inputs or updates to existing data are made on the current file on a continuing basis. The data are subsequently edited and only the significant runoff events are kept in the unit values file. The rainfall and discharge unit value data through September 30, 1976, are summarized in table 3. Examples of unit values file rainfall and discharge retrievals for the July 16, 1975, storm at Allen Creek near Largo are shown in tables 4 and 5.

Water-Quality Data

The results of physical measurements and chemical analyses of water samples are stored in the WATSTORE Quality of Water File. Three series of samples were planned to characterize the physical, chemical, and biological condition of urban streams in the Tampa Bay area.

Samples of bottom material were taken to evaluate the accumulation of nutrients and heavy metals in stream benthic deposits. Analyses of bottom material are shown in table 6.

Base flow is the sustained fair-weather runoff which is composed mainly of ground-water discharge. Analyses of base-flow samples are shown in table 7 for three stations. Analyses of storm-runoff samples taken at St. Louis Street Drainage Ditch, Gandy Boulevard Drainage Ditch, Allen Creek, Bear Creek, and Saint Joes Creek are listed in tables 8, 9, 10, 11, and 12.

Table 3.--Tampa Bay area urban storm runoff and rainfall data in WATSTORE unit values file as of September 30, 1977

Station no. and name	Records in unit values file			
	Date of storm	Discharge		Rainfall total (in.)
		Peak (ft^3/s)	Total (in.)	
02306006 Kirby Street Drainage Ditch at Tampa, Fla.	June 5, 1975	34	0.16	0.57
	June 18, 1975	34	0.17	1.11
	June 30, 1975	32	0.16	0.79
	July 15, 16, 1975	33	0.65	1.11
	July 19, 20, 1975	57	0.58	2.59
	August 30, 31, 1975	95	0.87	3.83
	October 28, 29, 1975	27	0.62	2.29
	May 15, 16, 1976	113	1.24	4.09
	June 2, 3, 1976	33	0.46	1.73
	June 18, 19, 1976	97	0.68	2.58
	June 20, 21, 1976	85	0.73	1.21
	June 23, 24, 1976	61	0.89	0.63
	June 29, 30, 1976	113	1.81	1.73
	August 4, 5, 1976	93	0.98	1.96
	August 17, 1976	83	0.54	2.46
02306021 St. Louis Street Drainage Ditch at Tampa, Fla.	June 8, 1975	85	0.33	2.04
	June 18, 1975	340	0.62	2.57
	July 15, 1975	72	0.18	1.30
	July 31, 1975	74	0.27	1.21
	August 20, 1975	85	0.20	0.86
	August 30, 1975	161	0.38	2.24
	September 3, 1975	341	0.72	2.54
	September 11, 1975	132	0.27	1.76
	September 23, 24, 1975	50	0.40	1.96
	October 4, 1975	80	0.27	0.84
	May 15, 1976	357	0.94	4.09
	June 18, 1976	226	0.40	2.27
	June 20, 1976	51	0.09	0.91
	July 7, 1976	193	0.44	1.94
	August 11, 1976	82	0.15	1.30
	August 17, 1976	106	0.27	2.70

Table 3.--Tampa Bay area urban storm runoff and rainfall data in WATSTORE unit values file as of September 30, 1977 - continued

Station no. and name	Records in unit values file			
	Date of storm	Discharge		Rainfall total (in.)
		Peak (ft^3/s)	Total (in.)	
02306071 Gandy Boulevard Drainage Ditch at Tampa, Fla.	May 28, 1975	226	0.35	1.76
	June 3, 1975	143	0.32	1.54
	June 18, 19, 1975	223	0.65	1.69
	June 24, 25, 1975	209	0.79	1.11
	July 11, 12, 1975	301	1.36	2.22
	July 13, 14, 1975	206	1.19	2.32
	July 30, 1975	112	0.39	0.92
	July 31-August 1, 1975	156	0.75	2.23
	August 7, 8, 1975	207	1.28	1.30
	August 9, 10, 1975	150	0.98	1.33
	October 18, 1975	109	0.37	0.51
	October 28, 29, 1975	281	1.27	1.67
	May 15, 16, 1976	692	2.61	4.29
	May 17, 1976	410	0.90	2.10
	June 27, 28, 29, 1976	294	0.89	1.69
	August 8, 9, 1976	152	0.74	0.91
	September 11, 12, 1976	183	1.06	0.94
02307731 Allen Creek near Largo, Fla.	July 10, 11, 1971	164	0.44	0.64
	September 9, 10, 11, 1971	552	2.57	2.76
	August 27, 28, 1972	567	1.56	2.12
	August 1, 2, 1973	307	1.09	2.74
	September 8, 9, 1973	336	0.98	2.46
	September 24, 1973	277	0.61	1.52
	June 24, 25, 1974	668	2.40	8.17
	June 26, 27, 1974	718	3.11	4.81
	July 30, 31, 1974	243	0.67	1.49
	June 8, 1975	129	0.35	0.89
	June 30-July 1, 1975	133	0.46	0.77
	July 16, 1975	344	0.71	0.71
	September 19, 20, 1975	365	0.94	0.25
	September 28, 29, 1975	442	1.32	2.00
	August 31-September 1, 1976	122	0.44	0.77

Table 3.--Tampa Bay area urban storm runoff and rainfall data in WATSTORE unit values file as of September 30, 1977 - continued

Station no. and name	Records in unit values file			
	Date of storm	Discharge		Rainfall total (in.)
		Peak (ft^3/s)	Total (in.)	
02308193 Booker Creek at St. Petersburg, Fla.	May 15, 1975	183	0.11	1.03
	May 26, 1975	374	0.21	2.28
	May 27, 28, 1975	130	0.76	0.41
	July 13, 14, 1975	504	1.67	4.51
	August 18, 19, 1975	231	0.26	1.99
	August 20, 21, 1975	164	0.36	1.81
	August 29, 30, 1975	160	0.18	1.60
	September 1, 1975	231	0.14	0.94
	September 28, 29, 1975	191	0.42	1.31
	September 30, 1975	250	0.18	0.63
	October 3, 4, 1975	189	0.34	0.70
	October 6, 1975	307	0.29	1.44
	October 7, 8, 1975	279	0.94	1.71
	May 15, 16, 1976	551	1.72	5.65
	June 20, 21, 1976	264	0.21	0.97
	July 17, 18, 1976	360	0.58	2.40
	September 4, 1976	267	0.23	1.16
	September 5, 1976	169	0.19	0.47
02308773 Bear Creek at St. Petersburg, Fla.	May 15, 1975	253	0.35	1.04
	May 26, 1975	599	0.86	2.28
	May 27, 28, 1975	209	0.51	1.02
	June 18, 1975	107	0.12	0.81
	July 21, 1976	316	0.37	1.02
	July 22, 1976	268	0.41	1.10
	July 26, 1976	325	0.50	1.01
	August 17, 18, 1976	355	0.61	1.76
	September 5, 1976	384	0.58	1.84
	September 6, 1976	106	0.36	1.45
	September 18, 1976	245	0.33	1.19

Table 3.--Tampa Bay area urban storm runoff and rainfall data in WATSTORE unit values file as of September 30, 1977 - continued

Station no. and name	Records in unit values file			
	Date of storm	Discharge		Rainfall total (in.)
		Peak (ft^3/s)	Total (in.)	
02309160 Turner Street Storm Drain at Clearwater, Fla.	June 8, 1975	30	0.07	2.13
	August 15, 1975	20	0.12	0.53
	August 21, 1975	46	0.22	1.06
	August 26, 1975	31	0.14	0.55
	September 14, 1975	20	0.14	0.43
	September 19, 1975	54	0.56	2.62
	August 4, 1976	35	0.45	1.87
	August 16, 1976	25	0.35	0.77

Table 4.--Example rainfall data retrieval from WATSTORE unit values file for rain gage at Allen Creek near Largo, Florida

AGENCY CODE	STATION IDENTIFICATION NUMBER	STATION LOCATOR LAT- ITUDE	LONG- ITUDE	SEQ NUM.	STATE CODE	DISTRICT CODE	COUNTY CODE	SITE CODES #1 #2 #3	HYDROLOGIC UNIT CODE	DRAINAGE AREA	CONTRIB. DRAINAGE AREA
USGS	02307731	275630	0824500	00	12	12	103	SW	03100206	1.88	

STATION NAME OR LOCAL WELL NUMBER	GEOLOGIC UNIT CODE	WELL DEPTH	AQUIFER TYPE	DATUM	PASSWORDS UPD	PASSWORDS RTV	INTERNAL USE TDOPUMLER
ALLEN CREEK NR LARGO, FLA.				15.58	NULL	NULL	111111001

STATION ID = 02307731 PARAMETER CODE = 00045 STATISTIC CODE = 00006

DEPTH =999999.00 CREATE DATE OF REC = 790127 STATE CODE = 12 RCD RET DATE =
X-SECTION =999999.00 ACCOUNT NUMBER =********** AGENCY CODE = USGS PROCESS CODE =

DATE: JULY 16, 1975 READINGS PER DAY = 288 NO VALUE INDICATOR=999999.00 RCD DISP =

HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE
15.15.00	0.01	15.20.00	0.00	15.25.00	0.00	15.30.00	0.00	15.35.00	0.00	15.40.00	0.00
15.45.00	0.00	15.50.00	0.00	15.55.00	0.00	16.00.00	0.00	16.05.00	0.00	16.10.00	0.00
16.15.00	0.00	16.20.00	0.00	16.25.00	0.00	16.30.00	0.00	16.35.00	0.00	16.40.00	0.00
16.45.00	0.00	16.50.00	0.00	16.55.00	0.00	17.00.00	0.00	17.05.00	0.00	17.10.00	0.00
17.15.00	0.00	17.20.00	0.00	17.25.00	0.00	17.30.00	0.00	17.35.00	0.00	17.40.00	0.00
17.45.00	0.00	17.50.00	0.00	17.55.00	0.00	18.00.00	0.00	18.05.00	0.00	18.10.00	0.00
18.15.00	0.00	18.20.00	0.00	18.25.00	0.00	18.30.00	0.00	18.35.00	0.00	18.40.00	0.00
18.45.00	0.00	18.50.00	0.00	18.55.00	0.00	19.00.00	0.00	19.05.00	0.00	19.10.00	0.00
19.15.00	0.05	19.20.00	0.05	19.25.00	0.07	19.30.00	0.13	19.35.00	0.09	19.40.00	0.09
19.45.00	0.12	19.50.00	0.08	19.55.00	0.01	20.00.00	0.08				

Table 5.--Example discharge data retrieval from WATSTORE unit values file for streamflow gage at Allen Creek near Largo, Florida

STATION ID = 02307731 PARAMETER CODE = 00060 STATISTIC CODE = 00011

DEPTH =999999.00 CREATE DATE OF REC = 790126 STATE CODE = 12 RCD RET DATE =
X-SECTION =999999.00 ACCOUNT NUMBER =********* AGENCY CODE = USGS PROCESS CODE =

DATE: JULY 16, 1975 READINGS PER DAY = 288 NO VALUE INDICATOR=999999.00 RCD DISP =

HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE	HR.MIN.SEC	VALUE
00.05.00	9.50	00.10.00	9.30	00.15.00	9.10	00.20.00	9.10	00.25.00	9.10	00.30.00	9.00
00.35.00	8.80	00.40.00	8.80	00.45.00	8.80	00.50.00	8.70	00.55.00	8.70	01.00.00	8.50
01.05.00	8.40	01.10.00	8.40	01.15.00	8.20	01.20.00	8.20	01.25.00	8.20	01.30.00	8.10
01.35.00	8.10	01.40.00	8.10	01.45.00	7.90	01.50.00	7.90	01.55.00	7.90	02.00.00	7.80
02.05.00	7.80	02.10.00	7.80	02.15.00	7.80	02.20.00	7.70	02.25.00	7.70	02.30.00	7.50
02.35.00	7.50	02.40.00	7.50	02.45.00	7.50	02.50.00	7.40	02.55.00	7.40	03.00.00	7.40
03.05.00	7.40	03.10.00	7.40	03.15.00	7.40	03.20.00	7.20	03.25.00	7.20	03.30.00	7.20
03.35.00	7.20	03.40.00	7.20	03.45.00	7.20	03.50.00	7.20	03.55.00	7.20	04.00.00	7.10
04.05.00	7.10	04.10.00	7.10	04.15.00	7.10	04.20.00	6.90	04.25.00	6.90	04.30.00	6.90
04.35.00	6.90	04.40.00	6.90	04.45.00	6.90	04.50.00	6.90	04.55.00	6.80	05.00.00	6.80
05.05.00	6.80	05.10.00	6.80	05.15.00	6.80	05.20.00	6.80	05.25.00	6.80	05.30.00	6.80
05.35.00	6.80	05.40.00	6.80	05.45.00	6.80	05.50.00	6.70	05.55.00	6.70	06.00.00	6.70
06.05.00	6.70	06.10.00	6.70	06.15.00	6.70	06.20.00	6.70	06.25.00	6.70	06.30.00	6.70
06.35.00	6.50	06.40.00	6.50	06.45.00	6.50	06.50.00	6.50	06.55.00	6.50	07.00.00	6.50
07.05.00	6.50	07.10.00	6.50	07.15.00	6.50	07.20.00	6.50	07.25.00	6.50	07.30.00	6.50
07.35.00	6.50	07.40.00	6.50	07.45.00	6.50	07.50.00	6.50	07.55.00	6.50	08.00.00	6.50
08.05.00	6.40	08.10.00	6.40	08.15.00	6.40	08.20.00	6.40	08.25.00	6.40	08.30.00	6.40
08.35.00	6.40	08.40.00	6.40	08.45.00	6.40	08.50.00	6.40	08.55.00	6.40	09.00.00	6.40
09.05.00	6.40	09.10.00	6.40	09.15.00	6.40	09.20.00	6.40	09.25.00	6.40	09.30.00	6.40
09.35.00	6.40	09.40.00	6.30	09.45.00	6.30	09.50.00	6.30	09.55.00	6.30	10.00.00	6.30
10.05.00	6.30	10.10.00	6.30	10.15.00	6.30	10.20.00	6.30	10.25.00	6.30	10.30.00	6.30
10.35.00	6.30	10.40.00	6.30	10.45.00	6.30	10.50.00	6.30	10.55.00	6.30	11.00.00	6.30
11.05.00	6.30	11.10.00	6.30	11.15.00	6.30	11.20.00	6.30	11.25.00	6.30	11.30.00	6.30
11.35.00	6.30	11.40.00	6.30	11.45.00	6.30	11.50.00	6.30	11.55.00	6.30	12.00.00	6.30
12.05.00	6.20	12.10.00	6.20	12.15.00	6.20	12.20.00	6.20	12.25.00	6.20	12.30.00	6.20
12.35.00	6.20	12.40.00	6.20	12.45.00	6.20	12.50.00	6.20	12.55.00	6.20	13.00.00	6.00
13.05.00	6.00	13.10.00	6.00	13.15.00	6.00	13.20.00	6.00	13.25.00	6.00	13.30.00	6.00
13.35.00	6.00	13.40.00	6.00	13.45.00	6.00	13.50.00	6.00	13.55.00	6.00	14.00.00	6.00
14.05.00	6.00	14.10.00	6.00	14.15.00	6.00	14.20.00	6.00	14.25.00	6.00	14.30.00	6.00
14.35.00	6.00	14.40.00	6.00	14.45.00	6.00	14.50.00	6.00	14.55.00	5.90	15.00.00	5.90
15.05.00	5.90	15.10.00	5.90	15.15.00	5.90	15.20.00	5.90	15.25.00	5.90	15.30.00	5.90
15.35.00	5.90	15.40.00	5.90	15.45.00	5.90	15.50.00	5.90	15.55.00	5.90	16.00.00	5.90
16.05.00	5.90	16.10.00	5.90	16.15.00	5.90	16.20.00	5.90	16.25.00	5.40	16.30.00	5.90
16.35.00	5.90	16.40.00	5.90	16.45.00	5.90	16.50.00	5.90	16.55.00	5.90	17.00.00	5.40
17.05.00	5.40	17.10.00	5.90	17.15.00	5.90	17.20.00	5.90	17.25.00	5.90	17.30.00	5.90
17.35.00	5.90	17.40.00	5.90	17.45.00	5.40	17.50.00	5.20	17.55.00	5.20	18.00.00	5.20
18.05.00	5.20	18.10.00	5.70	18.15.00	5.90	18.20.00	5.90	18.25.00	5.90	18.30.00	5.90
18.35.00	5.50	18.40.00	5.70	18.45.00	5.80	18.50.00	5.80	18.55.00	5.80	19.00.00	5.80
19.05.00	5.90	19.10.00	5.90	19.15.00	6.40	19.20.00	10.00	19.25.00	20.00	19.30.00	32.00
19.35.00	39.00	19.40.00	42.00	19.45.00	47.00	19.50.00	54.00	19.55.00	64.00	20.00.00	78.00
20.05.00	94.00	20.10.00	117.00	20.15.00	149.00	20.20.00	186.00	20.25.00	228.00	20.30.00	269.00
20.35.00	309.00	20.40.00	329.00	20.45.00	341.00	20.50.00	344.00	20.55.00	342.00	21.00.00	334.00
21.05.00	325.00	21.10.00	309.00	21.15.00	294.00	21.20.00	275.00	21.25.00	259.00	21.30.00	245.00
21.35.00	231.00	21.40.00	219.00	21.45.00	207.00	21.50.00	194.00	21.55.00	184.00	22.00.00	175.00
22.05.00	164.00	22.10.00	156.00	22.15.00	149.00	22.20.00	142.00	22.25.00	135.00	22.30.00	128.00
22.35.00	122.00	22.40.00	116.00	22.45.00	111.00	22.50.00	106.00	22.55.00	102.00	23.00.00	98.00
23.05.00	95.00	23.10.00	91.00	23.15.00	88.00	23.20.00	85.00	23.25.00	83.00	23.30.00	80.00
23.35.00	78.00	23.40.00	76.00	23.45.00	74.00	23.50.00	72.00	23.55.00	71.00	24.00.00	68.00

Table 6.--Analysis of bottom material, Tampa Bay area urban storm runoff hydrologic data sites

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02306006 - KIRBY STREET DRAINAGE DITCH AT TAMPA, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	SOLIDS, VOLATILE IN BOTTOM MATERIAL (MG/KG)	C.O.D. TOTAL IN BOTTOM MATERIAL (MG/KG)	NITROGEN,NH4 + ORG. TOT IN BOT MAT (MG/KG AS N)	NITROGEN, NO2+NO3 TOT. IN BOT MAT (MG/KG AS N)	PHOSPHORUS, TOTAL IN BOT. MAT. (MG/KG AS P)	CARBON, INORGANIC, TOT IN BOT MAT (G/KG AS C)	CARBON, ORGANIC TOT. IN BOTTOM MAT. (G/KG AS C)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO)
SEP , 1975 03...	1150	1770	5500	96	1.5	57	.1	.1	0	<10	<10	<10

DATE	TIME	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/L AS HG)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 03...	1150	<10	150	<10	<10	.0	<10	.0	37	6.9	3.4	3.9

DATE	TIME	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 03...	1150	4.5	.0	.0	1.0	.0	0	.0	0	0	0

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02306021 - ST. LOUIS STREET DRAINAGE DITCH AT TAMPA, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	SOLIDS, VOLATILE IN BOTTOM MATERIAL (MG/KG)	C.O.D. TOTAL IN BOTTOM MATERIAL (MG/KG)	NITROGEN,NH4 + ORG. TOT IN BOT MAT (MG/KG AS N)	NITROGEN, NO2+NO3 TOT. IN BOT MAT (MG/KG AS N)	PHOSPHORUS, TOTAL IN BOT. MAT. (MG/KG AS P)	CARBON, INORGANIC, TOT IN BOT MAT (G/KG AS C)	CARBON, ORGANIC TOT. IN BOTTOM MAT. (G/KG AS C)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO)
SEP , 1975 03...	1100	14000	17000	470	.5	110	.4	.7	0	<10	<10	<10

DATE	TIME	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/L AS HG)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 03...	1100	<10	1300	<10	<10	.1	30	.0	74	16	12	12

DATE	TIME	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 03...	1100	.8	.0	.0	.0	.0	8	.0	0	0	0

Table 6.--Analysis of bottom material, Tampa Bay area urban storm runoff hydrologic data sites - continued

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02306071 - GANDY BOULEVARD DRAINAGE DITCH AT TAMPA, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	SOLIDS, VOLATILE IN BOTTOM MATERIAL (MG/KG)	C.O.D. TOTAL IN BOTTOM MATERIAL (MG/KG)	NITROGEN,NH4 + ORG. TOT IN BOT MAT (MG/KG AS N)	NITROGEN, NO2+NO3 TOT. IN BOT MAT (MG/KG AS N)	PHOSPHORUS, TOTAL IN BOT. MAT. (MG/KG AS P)	CARBON, INORGANIC, TOT IN BOT MAT (G/KG AS C)	CARBON, ORGANIC TOT. IN BOTTOM MAT. (G/KG AS C)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO)
SEP , 1975 04...	1010	23400	26000	790	.0	200	.1	1.1	0	<10	<10	<10

DATE	TIME	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/L AS HG)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 04...	1010	<10	680	<10	<10	.1	20	.0	46	11	3.9	2.8

DATE	TIME	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 04...	1010	2.3	.0	.0	5.2	.0	15	.0	0	0	0

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02307731 - ALLEN CREEK NR LARGO, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	SOLIDS, VOLATILE IN BOTTOM MATERIAL (MG/KG)	C.O.D. TOTAL IN BOTTOM MATERIAL (MG/KG)	NITROGEN,NH4 + ORG. TOT IN BOT MAT (MG/KG AS N)	NITROGEN, NO2+NO3 TOT. IN BOT MAT (MG/KG AS N)	PHOSPHORUS, TOTAL IN BOT. MAT. (MG/KG AS P)	CARBON, INORGANIC, TOT IN BOT MAT (G/KG AS C)	CARBON, ORGANIC TOT. IN BOTTOM MAT. (G/KG AS C)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO)
SEP , 1975 03...	1550	11100	18000	430	1.0	300	.2	.5	0	<10	<10	<10

DATE	TIME	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/L AS HG)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 03...	1550	<10	580	<10	<10	.1	20	.0	29	.0	.3	.6

DATE	TIME	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 03...	1550	2.3	.0	.0	.6	.0	0	.0	0	0	0

Table 6.--Analysis of bottom material, Tampa Bay area urban storm runoff hydrologic data sites - continued

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02308193 - ROOKER CREEK AT ST. PETERSBURG, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	SOLIDS, VOLATILE IN BOTTOM MATERIAL (MG/KG)	C.O.D. TOTAL IN BOTTOM MATERIAL (MG/KG)	NITROGEN,NH4 + ORG. TOT IN BOT MAT (MG/KG AS N)	NITROGEN, NO2+NO3 TOT. IN BOT MAT (MG/KG AS N)	PHOSPHORUS, TOTAL IN BOT. MAT. (MG/KG AS P)	CARBON, INORGANIC, TOT IN BOT MAT (G/KG AS C)	CARBON, ORGANIC TOT. IN BOTTOM MAT. (G/KG AS C)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO)
SEP . 1975 03...	1350	2240	2900	39	1.5	21	.1	.1	0	<10	<10	<10

DATE	TIME	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/L AS HG)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP . 1975 03...	1350	<10	110	<10	<10	.0	<10	.0	9	.8	1.2	1.6

DATE	TIME	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP . 1975 03...	1350	.3	.0	.0	.0	.0	34	.0	0	0	0

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02308773 - REAR CREEK AT ST. PETERSBURG, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	SOLIDS, VOLATILE IN BOTTOM MATERIAL (MG/KG)	C.O.D. TOTAL IN BOTTOM MATERIAL (MG/KG)	NITROGEN,NH4 + ORG. TOT IN BOT MAT (MG/KG AS N)	NITROGEN, NO2+NO3 TOT. IN BOT MAT (MG/KG AS N)	PHOSPHORUS, TOTAL IN BOT. MAT. (MG/KG AS P)	CARBON, INORGANIC, TOT IN BOT MAT (G/KG AS C)	CARBON, ORGANIC TOT. IN BOTTOM MAT. (G/KG AS C)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO)
SEP . 1975 03...	1425	56900	75000	2600	2.0	1000	.8	2.3	1	<10	<10	<10

DATE	TIME	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/L AS HG)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP . 1975 03...	1425	20	1000	<10	20	.2	50	.0	360	47	36	16

DATE	TIME	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP . 1975 03...	1425	21	.0	.0	2.2	.0	13	.0	0	0	0

Table 6.--Analysis of bottom material, Tampa Bay area urban storm runoff hydrologic data sites - continued

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02308929 - SAINT JOES CREEK AT ST.PETERSBURG,FLA DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	SOLIDS, VOLATILE IN BOTTOM MATERIAL (MG/KG)	C.O.D. TOTAL IN BOTTOM MATERIAL (MG/KG)	NITROGEN,NH4 + ORG. TOT IN BOT MAT (MG/KG AS N)	NITROGEN, NO2+NO3 TOT. IN BOT MAT (MG/KG AS N)	PHOSPHORUS, TOTAL IN BOT. MAT. (MG/KG AS P)	CARBON, INORGANIC, TOT IN BOT MAT (G/KG AS C)	CARBON, ORGANIC TOT. IN BOTTOM MAT. (G/KG AS C)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO)
SEP , 1975 03...	1505	9510	15000	150	.5	160	2.2	.3	1	<10	<10	<10

DATE	TIME	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/L AS HG)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 03...	1505	10	2100	1500	30	.1	60	.0	14	1.1	.0	.0

DATE	TIME	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)
SEP , 1975 03...	1505	4.2	.0	.0	.3	.0	37	.0	0	0	0

Table 7.--Analysis of base flow samples, Tampa Bay area urban storm runoff hydrologic data sites

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02307731 - ALLEN CREEK NR LARGO, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L)
SEP , 1974								
30...	1415	4.66	5.9	30.0	--	388	7.8	--
NOV								
26...	1035	4.39	3.1	21.0	--	388	6.5	--
JAN , 1975								
31...	1450	4.49	4.0	23.5	--	405	5.2	--
AUG								
16...	2035	8.83	2.7	--	--	--	--	--
SEP								
03...	1550	--	--	30.2	--	--	--	--

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02308193 - BOOKER CREEK AT ST. PETERSBURG, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)
OCT , 1974					
01...	1230	4.44	4.4	25.0	385
NOV					
25...	1530	4.54	3.1	24.5	300
FEB , 1975					
04...	0830	4.28	--	20.5	258
SEP					
03...	1350	--	--	29.6	--
04...	0830	4.28	2.8	--	--

Table 7.--Analysis of base flow samples, Tampa Bay area urban storm runoff hydrologic data sites - continued

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02308773 - BEAR CREEK AT ST. PETERSBURG, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L)	OXYGEN DEMAND, CHEM-ICAL (LOW LEVEL) (MG/L)	PH (UNITS)
SEP , 1974											
30...	1735	7.28	3.7	29.5	--	380	--	--	--	--	--
NOV											
15...	1230	7.26	7.0	23.0	30	585	6.0	71	3.0	43	6.0
25...	1410	7.32	1.2	25.0	--	294	--	--	--	--	--
FEB , 1975											
03...	1520	7.09	--	24.5	--	354	--	--	--	--	--

DATE	TIME	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	OIL AND GREASE (MG/L)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)
NOV , 1974											
15...	1230	163	94	114	0	1.5	.33	.01	.10	.15	.05

DATE	TIME	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	CARBON, INOR-GANIC, TOTAL (MG/L AS C)	CARBON, TOTAL (MG/L AS C)	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)	SODIUM AD-SORP-TION RATIO
NOV , 1974											
15...	1230	.05	17	27	44	190	99	62	9.0	40	1.3

DATE	TIME	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC TOTAL (UG/L AS AS)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)
NOV , 1974											
15...	1230	31	2.3	100	45	.3	9.9	3	0	2	1500

DATE	TIME	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LEAD, SUS-PENDED RECOV-ERABLE (UG/L AS PB)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MANGA-NESE, SUS-PENDED RECOV. (UG/L AS MN)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, TOTAL RECOV-ERABLE (UG/L AS NI)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	ZINC, DIS-SOLVED (UG/L AS ZN)
NOV , 1974											
15...	1230	110	1	30	31	50	67	17	0	310	20

DATE	TIME	ALUM-INUM, TOTAL RECOV-ERABLE (UG/L AS AL)	COLI-FORM, TOTAL, IMMED. (COLS. PER 100 ML)	COLI-FORM, FECAL, 0.45 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, (COLS. PER 100 ML)	SOLIDS, SUSP. TOTAL, RESIDUE AT 110 DEG. C (MG/L)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS NO3)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS NO2)
NOV , 1974											
15...	1230	110	8600	816	500	28	374	325	.43	.40	.03

Table 8.--Analysis of storm runoff samples, St. Louis Street Drainage Ditch at Tampa, Florida

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02306021 -- ST. LOUIS STREET DRAINAGE DITCH AT TAMPA, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, NITRITE TOTAL (MG/L AS N)	NITROGEN, NITRATE TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	CARBON, INORGANIC, TOTAL (MG/L AS C)	CARBON, TOTAL (MG/L AS C)	COLIFORM, CONFIRMED (MPN)	COLIFORM, FECAL, EC BROTH (MPN)
JUL, 1975												
31...	1605	.90	1.1	.03	.04	.17	.12	37	26	63	24000	930
31...	1625	.71	1.2	.03	.06	.24	.15	13	28	41	46000	15000
31...	1640	.89	1.3	.02	.02	.22	.12	11	40	51	110000	46000
31...	1650	1.8	--	--	--	.57	--	19	23	42	1100000	93000
31...	1700	1.5	--	--	--	.52	--	7.0	10	17	240000	110000
31...	1710	2.2	--	--	--	.30	--	6.0	3.0	9.0	1100000	75000
31...	1720	.98	--	--	--	.39	--	7.0	3.0	10	150000	21000
31...	1735	.63	--	--	--	.32	--	4.0	3.0	7.0	390000	240000
31...	1755	.41	--	--	--	.27	--	7.0	3.0	10	240000	240000
31...	1756	--	--	--	--	.28	--	--	--	--	--	--
31...	1820	.36	--	--	--	.28	--	4.0	3.0	7.0	110000	110000
AUG												
20...	1150	.52	1.5	.01	.00	.12	.10	13	41	54	4600	2400
20...	1210	1.0	--	--	--	.58	--	8.0	39	47	110000	46000
20...	1215	.71	--	--	--	.30	--	9.0	38	47	240000	43000
20...	1220	.59	--	--	--	.28	--	13	47	60	240000	46000
20...	1225	.77	--	--	--	.32	--	9.0	42	51	460000	150000
20...	1230	1.2	--	--	--	.40	--	7.0	17	24	150000	93000
20...	1237	2.6	--	--	--	.39	--	4.0	6.0	10	1100000	460000
20...	1247	8.0	--	--	--	.56	--	5.0	3.0	8.0	2400000	2400000
20...	1300	1.1	--	--	--	.36	--	7.0	3.0	10	150000	150000
20...	1317	.57	.32	.02	.36	.29	.23	6.0	3.0	9.0	240000	240000
20...	1335	.41	--	--	--	.31	--	7.0	4.0	11	460000	75000

DATE	TIME	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	ARSENIC TOTAL (UG/L AS AS)	COPPER, TOTAL RECOVERABLE (UG/L AS CU)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	PHENOLS (UG/L)	ALDRIN, TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)
JUL, 1975												
31...	1605	.30	0	10	38	.2	--	0	.00	<.1	.00	.00
31...	1625	.20	1	13	96	.3	--	0	.00	<.1	.00	.00
31...	1640	--	1	13	100	.4	110	--	--	--	--	--
31...	1650	.20	4	28	360	.6	--	0	.00	.4	.00	.04
31...	1700	--	3	28	460	.3	180	--	--	--	--	--
31...	1710	.10	1	13	240	.6	--	0	.00	.4	.00	.04
31...	1720	--	2	13	210	.4	100	--	--	--	--	--
31...	1735	.10	1	18	140	.2	--	0	.00	.2	.00	.02
31...	1755	--	2	10	120	.2	100	--	--	--	--	--
31...	1820	--	1	10	100	.4	60	--	--	--	--	--
AUG												
20...	1150	.10	1	10	36	.3	--	0	.00	.0	.00	.00
20...	1210	.10	8	20	130	.5	--	0	.00	.1	.01	.03
20...	1215	--	1	11	110	.3	100	--	--	--	--	--
20...	1220	--	1	12	190	.3	120	--	--	--	--	--
20...	1225	.10	2	11	210	.3	--	1	.00	.1	.01	.01
20...	1230	--	2	26	580	.2	200	--	--	--	--	--
20...	1237	--	3	22	500	.1	190	--	--	--	--	--
20...	1247	.70	1	12	190	.2	--	0	.01	.3	.00	.03
20...	1300	--	2	17	220	.2	140	--	--	--	--	--
20...	1317	--	1	11	220	.1	150	--	--	--	--	--
20...	1335	--	1	11	130	.2	110	--	--	--	--	--

DATE	TIME	DDT, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	LINDANE TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	PCB, TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)
JUL, 1975												
31...	1605	.00	.01	.00	.00	0	.00	.00	.0	.00	.00	.00
31...	1625	.00	.01	.00	.00	0	.00	.00	.0	.00	.00	.00
31...	1650	.10	.02	.00	.00	0	.00	.00	.0	.00	.00	.00
31...	1710	.10	.02	.00	.00	0	.00	.00	.0	.00	.00	.00
31...	1735	.06	.00	.00	.00	0	.00	.00	.0	.00	.00	.00
AUG												
20...	1150	.00	.00	.00	.00	0	.00	.00	.0	.00	.00	.00
20...	1210	.09	.00	.00	.00	0	.00	.00	.0	.00	.00	.00
20...	1225	.02	.00	.00	.00	0	.00	.00	.0	.00	.00	.00
20...	1247	.07	.00	.00	.00	0	.00	.00	.0	.00	.00	.00

Table 8.--Analysis of storm runoff samples, St. Louis Street Drainage Ditch at Tampa, Florida - continued

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02306021 - ST. LOUIS STREET DRAINAGE DITCH AT TAMPA, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	OIL AND GREASE (MG/L)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
JUL , 1975												
31...	1605	11.40	.95	--	23	285	1	109	133	0	120	10
31...	1625	11.40	.95	--	20	288	5	109	133	0	120	7
31...	1640	12.52	5.8	--	--	--	--	--	--	--	--	--
31...	1650	14.51	61	--	30	252	1	96	117	0	100	4
31...	1700	14.77	74	--	--	--	--	--	--	--	--	--
31...	1710	14.69	70	--	15	63	6	18	22	0	25	7
31...	1720	14.41	56	--	--	--	--	--	--	--	--	--
31...	1735	13.73	29	--	15	69	5	26	32	0	25	0
31...	1755	13.04	12	--	--	--	--	--	--	--	--	--
31...	1756	13.03	12	--	--	--	--	--	--	--	--	--
31...	1820	12.69	7.4	--	--	--	--	--	--	--	--	--
AUG												
20...	1150	11.30	.75	27.9	42	391	2	138	168	0	170	30
20...	1210	12.79	8.5	27.1	240	400	1	152	185	0	170	17
20...	1215	14.28	50	27.0	--	368	--	--	--	--	--	--
20...	1220	14.98	85	27.5	--	373	--	--	--	--	--	--
20...	1225	14.93	83	27.5	60	382	1	133	162	0	150	20
20...	1230	14.61	66	26.5	--	177	--	--	--	--	--	--
20...	1237	14.17	46	26.5	--	120	--	--	--	--	--	--
20...	1247	13.67	28	26.2	28	81	1	28	34	0	27	0
20...	1300	13.18	15	26.0	--	85	--	--	--	--	--	--
20...	1317	12.75	8.0	26.2	--	78	--	--	--	--	--	--
20...	1335	12.41	4.9	26.5	--	82	--	--	--	--	--	--

DATE	TIME	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	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)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)
JUL , 1975												
31...	1605	43	2.8	7.8	2.7	10	20	.7	6.5	175	4.2	39
31...	1625	42	2.8	7.7	2.7	9.8	19	.5	6.1	170	4.0	56
31...	1640	--	--	--	--	--	--	--	--	--	7.6	58
31...	1650	36	2.5	6.7	2.3	8.5	17	.3	4.8	146	7.5	120
31...	1700	--	--	--	--	--	--	--	--	--	6.6	130
31...	1710	9.7	.3	1.1	1.0	1.6	5.7	.1	1.0	46	4.8	98
31...	1720	--	--	--	--	--	--	--	--	--	4.0	73
31...	1735	9.4	.3	.5	.8	.5	4.0	.2	.8	36	3.1	53
31...	1755	--	--	--	--	--	--	--	--	--	4.2	38
31...	1756	--	--	--	--	--	--	--	--	--	--	46
31...	1820	--	--	--	--	--	--	--	--	--	3.8	--
AUG												
20...	1150	59	5.0	15	3.6	19	28	.6	10	244	2.0	26
20...	1210	60	4.5	14	3.7	18	29	.3	8.9	360	8.4	70
20...	1215	--	--	--	--	--	--	--	--	--	8.4	40
20...	1220	--	--	--	--	--	--	--	--	--	4.4	30
20...	1225	53	5.0	14	3.8	18	28	.4	9.2	332	7.6	44
20...	1230	--	--	--	--	--	--	--	--	--	11	71
20...	1237	--	--	--	--	--	--	--	--	--	6.3	40
20...	1247	9.5	.7	1.0	1.7	1.5	7.3	.2	.9	36	7.2	56
20...	1300	--	--	--	--	--	--	--	--	--	7.2	64
20...	1317	--	--	--	--	--	--	--	--	--	5.7	31
20...	1335	--	--	--	--	--	--	--	--	--	6.9	30

Table 9.--Analysis of storm runoff samples, Gandy Boulevard Drainage Ditch at Tampa, Florida

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02306071 - GANDY BOULEVARD DRAINAGE DITCH AT TAMPA, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	COLOR (PLATI-NUM-COBALT UNITS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	OIL AND GREASE (MG/L)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
AUG . 1975												
08...	1615	11.81	4.4	--	90	352	0	107	130	0	140	38
08...	1645	11.81	4.4	--	--	--	--	--	--	--	--	--
08...	1659	12.04	8.2	--	90	307	0	98	120	0	130	34
08...	1715	12.83	38	--	--	--	--	--	--	--	--	--
08...	1730	13.20	67	29.4	55	169	1	53	64	0	60	7
08...	1745	13.49	96	28.5	--	--	--	--	--	--	--	--
08...	1800	13.48	95	27.5	43	108	1	38	46	0	44	7
08...	1820	13.47	94	28.0	--	--	--	--	--	--	--	--
08...	1840	13.45	92	28.0	--	--	--	--	--	--	--	--
08...	1904	13.38	84	28.0	--	--	--	--	--	--	--	--
08...	1930	13.30	76	28.0	--	--	--	--	--	--	--	--
08...	2005	13.16	63	28.2	160	211	0	73	89	0	91	18

DATE	TIME	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	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)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)
AUG . 1975												
08...	1615	52	3.6	14	2.4	26	26	.6	4.7	224	4.1	25
08...	1645	--	--	--	--	--	--	--	--	--	4.7	35
08...	1659	48	3.0	12	2.2	19	24	.8	4.3	196	7.0	64
08...	1715	--	--	--	--	--	--	--	--	--	5.6	54
08...	1730	22	1.2	4.6	1.2	6.8	14	.8	1.9	89	12	56
08...	1745	--	--	--	--	--	--	--	--	--	5.6	36
08...	1800	16	1.1	2.8	.8	4.0	10	.8	1.7	49	5.2	34
08...	1820	--	--	--	--	--	--	--	--	--	3.7	25
08...	1840	--	--	--	--	--	--	--	--	--	6.9	35
08...	1904	--	--	--	--	--	--	--	--	--	5.6	32
08...	1930	--	--	--	--	--	--	--	--	--	5.2	37
08...	2005	33	2.1	7.0	1.7	11	17	.5	3.4	131	4.8	40

DATE	TIME	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	CARBON, INOR-GANIC, TOTAL (MG/L AS C)	CARBON, TOTAL (MG/L AS C)	COLI-FORM, CON-FIRMED (MPN)	COLI-FORM, FECAL, EC BROTH (MPN)
AUG . 1975												
08...	1615	.86	.33	.03	.21	.32	.19	12	29	41	210000	15000
08...	1645	.62	.37	.03	.22	.29	.19	9.0	30	39	1100000	460000
08...	1659	.61	.52	.03	.27	.31	.18	11	26	37	2400000	110000
08...	1715	.62	.38	.03	.23	.31	.18	10	26	36	460000	150000
08...	1730	.31	.94	.03	.47	.30	.17	8.0	16	24	240000	110000
08...	1745	.65	.67	.02	.38	.20	.13	--	--	--	110000	46000
08...	1800	1.9	.52	.02	.26	.24	.16	5.0	9.0	14	110000	46000
08...	1820	.21	.50	.02	.26	.22	.16	--	--	--	240000	240000
08...	1840	.57	.53	.03	.27	.37	.23	--	--	--	150000	240000
08...	1904	.55	.50	.03	.26	.38	.25	--	--	--	110000	46000
08...	1930	.56	.50	.03	.25	.38	.24	--	--	--	240000	110000
08...	2005	.52	.46	.03	.21	.44	.28	8.0	20	28	1100000	460000

DATE	TIME	METHY-LENE BLUE ACTIVE SUB-STANCE (MG/L)	ARSENIC TOTAL (UG/L AS AS)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	PHENOLS (UG/L)	ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)
AUG . 1975												
08...	1615	.20	2	6	43	.3	90	0	.00	.0	.00	.00
08...	1645	--	2	7	20	.5	90	--	--	--	--	--
08...	1659	.10	2	5	110	.2	90	0	.00	.0	.00	.00
08...	1715	--	2	5	58	.3	90	--	--	--	--	--
08...	1730	.10	1	8	160	.2	100	0	.00	.0	.00	.00
08...	1745	--	1	6	100	.3	100	--	--	--	--	--
08...	1800	.30	1	5	89	.5	100	0	.00	<.1	.00	.00
08...	1820	--	1	7	98	.2	100	--	--	--	--	--
08...	1840	--	2	7	83	.4	90	--	--	--	--	--
08...	1904	--	2	4	100	.4	90	--	--	--	--	--
08...	1930	--	2	8	83	.5	90	--	--	--	--	--
08...	2005	.20	3	2	66	.4	90	0	.00	.0	.00	.00

DATE	TIME	DDT, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	LINDANE TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	PCB, TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)
AUG . 1975												
08...	1615	.00	.00	.00	.00	0	.00	.00	.0	.00	.00	.04
08...	1659	.00	<.01	.00	.00	0	.00	.00	.0	.00	.00	.03
08...	1730	.00	<.01	.00	.00	0	.00	.00	.0	.00	.00	.00
08...	1800	.00	.00	.00	.00	0	.00	.00	.0	.00	.00	.00
08...	2005	.00	<.01	.00	.00	0	.00	.00	.0	.00	.00	.12

Table 10.--Analysis of storm runoff samples, Allen Creek near Largo, Florida

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02307731 - ALLEN CREEK NR LARGO, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	OIL AND GREASE (MG/L)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
JUL 1975												
16...	1220	4.68	6.2	--	--	--	--	--	--	--	--	--
16...	1858	4.65	5.8	--	55	341	0	89	109	0	140	49
16...	1918	4.85	8.6	--	--	--	--	--	--	--	--	--
16...	1933	5.90	36	--	--	--	--	--	--	--	--	--
16...	1947	6.24	51	--	--	--	--	--	--	--	--	--
16...	2003	6.88	88	--	40	241	0	61	74	0	95	34
16...	2020	8.06	186	--	--	--	--	--	--	--	--	--
16...	2035	9.15	309	--	--	--	--	--	--	--	--	--
16...	2050	9.41	344	--	--	--	--	--	--	--	--	--
16...	2105	9.27	325	27.0	50	104	0	35	43	0	42	6
16...	2121	8.86	272	--	--	--	--	--	--	--	--	--
16...	2146	8.24	204	--	--	--	--	--	--	--	--	--
16...	2220	7.57	142	--	50	132	0	38	46	0	51	13

DATE	TIME	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	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)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)
JUL 1975												
16...	1858	49	3.9	15	3.4	28	35	.3	7.4	226	1.9	31
16...	1918	--	--	--	--	--	--	--	--	--	2.9	36
16...	1933	--	--	--	--	--	--	--	--	--	2.6	34
16...	1947	--	--	--	--	--	--	--	--	--	3.4	24
16...	2003	33	3.0	9.9	2.8	18	24	.5	5.0	150	2.2	15
16...	2020	--	--	--	--	--	--	--	--	--	3.6	26
16...	2035	--	--	--	--	--	--	--	--	--	4.0	26
16...	2050	--	--	--	--	--	--	--	--	--	10	48
16...	2105	15	1.0	2.0	1.4	3.0	8.3	.3	1.4	56	4.0	91
16...	2121	--	--	--	--	--	--	--	--	--	4.4	53
16...	2146	--	--	--	--	--	--	--	--	--	3.0	46
16...	2220	18	1.5	4.3	1.6	7.1	12	.4	2.3	81	1.3	17

DATE	TIME	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	CARBON, INOR-GANIC, TOTAL (MG/L AS C)	CARBON, TOTAL (MG/L AS C)	COLI-FORM, CON-FIRMED (MPN)	COLI-FORM, FECAL, EC BROTH (MPN)
JUL 1975												
16...	1220	--	--	--	--	--	--	13	7.0	20	--	--
16...	1858	.62	.44	.06	.18	.20	.15	15	23	38	4600	2400
16...	1918	.73	.42	.07	.19	.22	.16	14	22	36	24000	4600
16...	1933	.54	.45	.07	1.5	.20	.16	15	23	38	24000	24000
16...	1947	.48	.48	.05	.24	.24	.18	16	18	34	1100000	24000
16...	2003	.52	.38	.04	.23	.24	.18	13	16	29	750000	240000
16...	2020	.75	.40	.04	.25	.26	.18	10	17	27	460000	20000
16...	2035	2.8	--	--	--	.50	--	9.0	16	25	460000	150000
16...	2050	2.4	--	--	--	.70	--	11	9.0	20	1500000	120000
16...	2105	1.6	--	--	--	.58	--	9.0	6.0	15	110000	46000
16...	2121	2.9	--	--	--	.36	--	2.0	6.0	8.0	110000	11000
16...	2146	.70	--	--	--	.30	--	10	9.0	19	28000	28000
16...	2220	.58	--	--	--	.25	--	--	--	--	11000	11000

DATE	TIME	METHY-LENE BLUE ACTIVE SUB-STANCE (MG/L)	ARSENIC TOTAL (UG/L AS AS)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	PHENOLS (UG/L)	ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)
JUL 1975												
16...	1858	.10	1	5	30	.1	30	0	.00	.1	.00	.00
16...	1918	--	1	8	40	.0	70	--	--	--	--	--
16...	1933	--	1	10	22	.1	70	--	--	--	--	--
16...	1947	--	1	9	33	.1	60	--	--	--	--	--
16...	2003	.10	0	28	22	.1	40	0	.00	.1	.00	.00
16...	2020	--	0	8	44	.2	50	--	--	--	--	--
16...	2035	--	3	22	260	.1	130	--	--	--	--	--
16...	2050	--	3	23	300	.2	170	--	--	--	--	--
16...	2105	.10	2	15	230	.2	120	0	.00	.8	.00	.00
16...	2121	--	2	20	160	.2	110	--	--	--	--	--
16...	2146	--	1	11	76	.1	70	--	--	--	--	--
16...	2220	.10	1	6	50	.1	40	0	.00	.2	.00	.00

DATE	TIME	DDT, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	LINDANE TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	PCB, TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)
JUL 1975												
16...	1858	.00	.07	.00	.00	0	.00	.00	.0	.00	.30	.00
16...	2003	.00	.02	.00	.00	0	.00	.00	.0	.00	.90	.00
16...	2105	.00	.09	.00	.00	0	.00	.00	.0	.00	.88	.00
16...	2220	.00	.03	.00	.00	0	.00	.00	.0	.00	.69	.00

Table 11.--Analysis of storm runoff samples, Bear Creek at St. Petersburg, Florida

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02308773 - BEAR CREEK AT ST. PETERSBURG, FLA. DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	OIL AND GREASE (MG/L)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
SEP , 1975												
11...	1840	6.69	1.7	31.0	26	399	0	86	105	0	140	54
11...	1850	6.72	1.9	32.0	--	378	--	--	--	--	--	--
11...	1907	10.06	126	30.5	--	423	--	--	--	--	--	--
11...	1914	11.03	203	29.5	19	263	0	61	74	0	84	23
11...	1923	11.44	240	28.2	--	147	--	--	--	--	--	--
11...	1931	11.49	245	28.0	18	108	0	41	50	0	54	13
11...	1943	11.26	223	27.2	--	99	--	--	--	--	--	--
11...	2000	9.62	170	26.5	18	87	0	25	30	0	24	0
11...	2027	9.62	98	27.0	--	101	--	--	--	--	--	--

DATE	TIME	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	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)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)
SEP , 1975												
11...	1840	47	5.6	22	1.9	51	26	.3	7.0	258	--	--
11...	1907	--	--	--	=4	--	--	--	--	--	--	33
11...	1914	29	2.8	13	1.7	30	16	.3	3.9	144	6.2	53
11...	1923	--	--	--	--	--	--	--	--	--	--	210
11...	1931	20	.9	2.8	1.1	5.9	7.6	.2	1.1	54	6.4	93
11...	1943	--	--	--	--	--	--	--	--	--	--	33
11...	2000	8.6	.7	1.2	1.2	2.3	5.2	.2	.8	33	--	29
11...	2027	--	--	--	--	--	--	--	--	--	--	32

DATE	TIME	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	CARBON, INOR-GANIC, TOTAL (MG/L AS C)	CARBON, TOTAL (MG/L AS C)	COLI-FORM, CON-FIRMED (MPN)	COLI-FORM, FECAL, EC BROTH (MPN)
SEP , 1975												
11...	1840	.88	.12	.01	.03	.09	.03	14	26	40	95000	9300
11...	1850	.60	.11	.01	.03	.08	.03	10	24	34	240000	24000
11...	1907	.51	.40	.01	.07	.10	.14	11	24	35	110000	110000
11...	1914	.42	--	--	--	.25	--	8.0	15	23	150000	43000
11...	1923	.70	--	--	--	.20	--	4.0	11	15	460000	460000
11...	1931	.42	--	--	--	.22	--	--	--	--	2400000	2400000
11...	1943	.57	--	--	--	.30	--	3.0	12	15	110000	110000
11...	2000	.39	--	--	--	.28	--	7.0	9.0	16	460000	460000
11...	2027	1.0	--	--	--	.34	--	5.0	10	15	460000	460000

DATE	TIME	METHY-LENE BLUE ACTIVE SUB-STANCE (MG/L)	ARSENIC TOTAL (UG/L AS AS)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	PHENOLS (UG/L)	ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)
SEP , 1975												
11...	1840	.20	2	8	50	.2	60	1	.00	.0	.00	.00
11...	1850	--	3	7	67	.1	40	--	--	--	--	--
11...	1907	--	3	6	75	.1	100	--	--	--	--	--
11...	1914	.20	2	12	190	.4	70	2	.00	.2	.00	.00
11...	1923	--	4	13	220	.1	160	--	--	--	--	--
11...	1931	.10	2	9	140	.1	70	2	.00	.2	.00	.00
11...	1943	--	3	11	120	.3	60	--	--	--	--	--
11...	2000	.10	1	11	120	.3	50	2	.00	.1	.00	.00
11...	2027	--	2	11	98	.5	60	--	--	--	--	--

DATE	TIME	DDT, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	LINDANE TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	PCB, TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)
SEP , 1975												
11...	1840	.00	.00	.00	.00	0	.00	.00	.0	.00	.00	.23
11...	1914	.00	.00	.00	.00	0	.00	.00	.0	.00	10	.12
11...	1931	.00	.00	.00	.00	0	.00	.00	.0	.06	3.5	.06
11...	2000	.00	.00	.00	.00	0	.00	.00	.0	.11	.75	.04

Table 12.--Analysis of storm runoff samples, Saint Joes Creek at St. Petersburg, Florida

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
02308929 - SAINT JOES CREEK AT ST.PETERSBURG,FLA DISTRICT CODE 12

WATER QUALITY DATA

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPER-ATURE (DEG C)	COLOR (PLATINUM-COBALT UNITS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	OIL AND GREASE (MG/L)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
AUG , 1975												
29...	1804	11.07	6.2	31.0	80	285	1	78	95	0	100	24
29...	1819	11.01	6.2	27.5	-4	115	--	--	--	--	--	--
29...	1835	10.94	5.3	27.8	19	105	2	31	38	0	32	0
29...	1850	10.85	3.6	28.8	--	157	--	--	--	--	--	--
29...	1926	10.74	2.5	29.2	-4	276	--	--	--	--	--	--
29...	2002	10.61	1.3	29.0	38	241	0	71	87	0	86	14

DATE	TIME	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	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)	OXYGEN DEMAND, BIO-CHEMICAL, 5 DAY (MG/L)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)
AUG , 1975												
29...	1804	37	2.3	12	2.0	17	31	.7	7.0	206	--	120
29...	1819	--	--	--	--	--	--	--	--	--	--	66
29...	1835	12	.4	1.7	.9	2.1	9.7	.3	1.1	48	7.3	38
29...	1850	--	--	--	--	--	--	--	--	--	--	52
29...	1926	--	--	--	--	--	--	--	--	--	5.2	48
29...	2002	31	2.0	8.5	2.4	12	22	.6	5.6	128	--	49

DATE	TIME	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	CARBON, INOR-GANIC, TOTAL (MG/L AS C)	CARBON, TOTAL (MG/L AS C)	COLI-FORM, CON-FIRMED (MPN)	COLI-FORM, FECAL, EC BROTH (MPN)
AUG , 1975								
29...	1804	1.1	.26	--	--	--	460000	29000
29...	1819	.78	.20	21	3.0	24	75000	39000
29...	1835	.55	.24	14	2.0	16	110000	46000
29...	1850	.69	.26	--	--	--	1100000	110000
29...	1926	.75	.24	11	21	32	2400000	460000
29...	2002	.69	.27	--	--	--	1.10E+07	1.10E+07

DATE	TIME	METHY-LENE BLUE ACTIVE SUB-STANCE (MG/L)	ARSENIC TOTAL (UG/L AS AS)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	PHENOLS (UG/L)	ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)
AUG , 1975												
29...	1804	.90	2	100	800	.2	300	1	.00	.3	.00	.00
29...	1819	--	3	12	280	.2	180	--	--	--	--	--
29...	1835	.20	1	17	370	.2	160	0	.00	.1	.00	.00
29...	1850	--	1	54	270	.2	180	--	--	--	--	--
29...	1926	--	2	78	110	.2	120	--	--	--	--	--
29...	2002	.20	1	45	100	.3	90	0	.00	.3	.00	.00

DATE	TIME	DDT, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	LINDANE TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	PCB, TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)
AUG , 1975												
29...	1804	.00	.01	.00	.00	0	.00	.00	.0	--	--	--
29...	1835	.00	.01	.00	.00	0	.00	.00	.0	.00	8.3	.00
29...	2002	.00	.03	.00	.00	0	.02	.00	.0	.00	3.1	.00

Daily Rainfall and Daily Pan-Evaporation Data

Daily rainfall data are collected at each of the rain gages in the study area and daily pan-evaporation data is collected at Lake Padgett near Lutz, Florida. These data will be used in the next study phase as input to the rainfall-runoff model. The following records have been stored in the WATSTORE daily values file:

Daily Rainfall

I.D. No.	Station Name	Daily Values
02306002	Artic Street Storm Drain	8/21/74-9/30/76
02306006	Kirby Street Drainage Ditch	11/18/74-9/30/76
02306021	St. Louis Street Drainage Ditch	11/15/74-9/30/76
02306071	Gandy Boulevard Drainage Ditch	3/21/75-9/30/76
02307731	Allen Creek	6/19/71-9/30/76
02308193	Booker Creek	8/21/74-9/30/76
02308773	Bear Creek	8/21/74-9/30/76
02308929	Saint Joes Creek	11/15/74-9/30/76
02309160	Turner Street Storm Drain	6/2/75-9/30/76
274645082410800	Lafayette Street Rain Gage	8/21/74-9/30/76
274739082400400	25th Street Rain Gage	8/21/74-9/30/76
275336082300900	Himes Avenue Rain Gage	2/3/75-9/30/76

Daily Pan Evaporation

02303440	Lake Padgett near Lutz, Florida	10/1/72-9/30/76

DATA AVAILABILITY

Data collected during this study will be made available upon request. Access to the 5-minute interval rainfall and discharge data on a timely basis will permit city and county planners and their consultants to use these data as needed. The data are stored in the WATSTORE unit values file, daily values file, and water-quality file which can be accessed by a compatible computer terminal.

Direct Access to WATSTORE

WATSTORE is available to Federal agencies and selected cooperators of the Geological Survey who acquire or use water data. Authorization to use WATSTORE must be obtained from the Chief Hydrologist, U.S. Geological Survey, National Center, Mail Stop 409, Reston, Va. 22092. When the request is approved, a notice of authorization along with an assigned agency (user) code and account numbers are provided to the requester. Retrievals are made using the procedure described in the WATSTORE User's Guide or User's Guide for U.S. Geological Survey Rainfall-Runoff Models, revised 1976. The cost of the retrieval is charged to the user's account.

Request Through U.S. Geological Survey

A request for data stored in WATSTORE can be made through a U.S. Geological Survey field office with a terminal connected to the National Center. The station identification number, type of data, and dates desired will be needed by Survey personnel to process the requester's WATSTORE retrieval. The cost of preparing the requester's control cards and the computer charges may be billed to the requester, depending on the time and effort required.

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