EFFECTS OF STORM RUNOFF ON WATER QUALITY IN THE MILL CREEK DRAINAGE BASIN, WILLINGBORO, NEW JERSEY

U. S. GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS 80-98

PREPARED IN COOPERATION WITH THE

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16. Abstract (Limit: 200 words) The effect of storm runoff on the quality of water in streams receiving drainage from the 23.7-square-kilometer Mill Creek basin in Willingboro, New Jersey, was studied from October 1975 to September 1976. Stream discharge and 86 water-quality constituents were measured during base flow and storm runoff. Only 38 of the 86 constituents were detected in significant amounts under any streamflow condition.

Constituent loads and concentrations in the runoff from the nonresidential part of the study area in the upstream part of the drainage basin had a greater effect on stream quality than runoff from the residential area. The nonresidential area contributed more of the nutrient load (nitrate, ammonia, organic nitrogen, and phosphorus), the common inorganics (sodium, potassium, magnesium, chloride, and sulfate), sediment, and organic carbon. The residential area contributed more calcium, nitrite, lead, iron, biochemical oxygen demand, and the pesticides 2,4-D and silvex.

With the exception of suspended iron, fecal coliform bacteria, suspended lead, and suspended phosphorus, all measured constituents met the recommended criteria set by the U.S. Environmental Protection Agency and the New Jersey Department of Environmental Protection even during storms.

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Data published within this report are listed in International System units. The following factors enable the reader to convert to the commonly used inch-pound units.

Multiply SI Units	By	To Obtain Inch-Pound Units
	Length	
millimeters (mm)	0.039	inches (in)
centimeters (cm)	0.394	inches (in)
meters (m)	3.281	feet (ft)
kilometers (km)	0.621	miles (mi)
	Area	
square meters (m^2)	10.76	square feet (ft^2)
square kilometers (km^2)	0.386	square miles (mi^2)
	Flow	
cubic meters per second (m^3/s)	35.31	cubic feet per second (ft^3/s)
	Load	
kilograms per day (kg/d)	2.20	pounds per day (lbs/d)
	Volume	
liters (L)	0.264	gallon (gal)
	Mass	
grams (g)	0.0022	pounds (lb)
kilograms (kg)	2.20	pounds (lb)
kilograms (kg)	0.0011	short tons (2000 lb/ton)
	Specific Conductance	
microsiemens (μS)	1.000	micromhos (μmhos)

ABSTRACT

The effect of storm runoff on the quality of water in the the Mill Creek drainage basin in west-central New Jersey is described in this report. The study area (23.7 square kilometers) consists of agricultural and undeveloped land and the residential community of Willingboro. From October 1975 to September 1976, stream discharge and 86 water-quality constituents were measured during five base flows and five storms at nine sites within the basin. Only 38 of the measured consitituents were detected in significant amounts.

Insignificant amounts of pesticides, except 2,4-D and silvex, and the metals cadmium, chromium, cobalt, copper, mercury, selenium, and carbonate were measured even during heavy runoff. All other constituents showed an increase in concentration with increasing streamflow and the corresponding loads usually correlated with streamflow.

Runoff from the nonresidential part of the study area in the upstream part of the drainage basin had a more significant impact on the stream quality than did the runoff from the residential area. The nonresidential area contributed more nutrients, common inorganics, sediment, and organic carbon than the residential area. The residential area contributed more calcium, nitrite, lead, iron, BOD, 2,4-D, and silvex.

With the exception of suspended iron, fecal coliform bacteria, suspended lead, and suspended phosphorus, all recorded concentrations under all streamflow conditions met the recommended limits set by the U.S. Environmental Protection Agency and the New Jersey Department of Environmental Protection for domestic water supplies or streams not discharging directly into a lake or reservoir. Very short-term exceptions were recorded during peak storm runoff.

Iron concentrations exceeded recommended limits of the U.S. Environmental Protection Agency. Occasional releases of suspended iron from the water-treatment plant in the lower part of the drainage basin contributed to this high concentration. However, Mill Creek and its tributaries will still have naturally occurring high suspended iron concentrations even after the water-treatment plant eliminates its sludge-holding pond.

Fecal coliform bacteria affected the quality of water in the Mill Creek basin more than any other constituent measured. It exceeded recommended limits by as much as two orders of magnitude and was found in equal amounts throughout the streams in the basin. The source of the bacteria could not be identified.

Runoff from the Willingboro residential area produced mean suspended lead concentrations up to three times greater than the 50 micrograms per liter criteria set for domestic water supplies. Mean concentrations of suspended phosphorus throughout the basin

were 2.5 times greater than the recommended limit of 0.1 milligrams per liter. Sediment concentrations and loads increased with increasing streamflow. However, the amounts are not considered unusual for a developed area. The only sediment deposition occurred at the downstream end of the study area, which is slightly affected by tide. A significant part of the deposited material was composed of sludge material from the water-treatment plant in the lower end of the study area.

INTRODUCTION

Efforts to curb water pollution in the United States, under guidelines set forth in Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, initially concentrated on point sources of pollution, such as sewage-treatment plant and industrial-plant effluents. However, a large part of the contaminants in a stream can originate from nonpoint sources, such as runoff from suburban and urban communities, highways, agricultural lands, and mine drainage.

Methods for assessing the effect of storm runoff on the water quality of a stream range from simple desk-top procedures to complex mathematical models. Unfortunately, application of these methods is many times hampered by a data base consisting of too few samples, inadequate streamflow data, a nonrepresentative group of parameters, inappropriate land-use coefficients, or sampling sites that are not representive of homogeneous land uses.

The U.S. Geological Survey, in cooperation with the New Jersey Department of Environmental Protection (NJDEP) and the U.S. Environmental Protection Agency (EPA), collected chemical, streamflow, and land-use data for an investigation on the effect of storm runoff on the water quality of Mill Creek, a small stream flowing through the residential community of Willingboro, N.J. The purpose of the study was to identify and quantify those water-quality constituents affecting the water quality of Mill Creek and its tributaries under various streamflow conditions including storm runoff.

ACKNOWLEDGMENTS

The authors express their appreciation to the following persons and organizations: Mr. John D. Tegley, Willingboro Township Manager, for his cooperation during the planning of the sampling operations; the Public Service Electric and Gas Company for providing rain-gage data from their Burlington facility; Ms. Gayle Huguet from the Delaware Valley Regional Planning Commision for providing basic data for land-use determinations; Mr. Andrew Semeister, also of the Delaware Valley Regional Planning Commission, for advice on the processing of nonpoint source data.

DESCRIPTION OF STUDY AREA

The Mill Creek drainage basin (fig. 1) is in Burlington County in the west-central part of New Jersey and is part of the Delaware River drainage basin. The study area is in the Mill Creek drainage basin upstream from the Levitt Parkway, 4.0 km upstream from the confluence with Rancocas Creek.

The residential community of Willingboro occupies about 45 percent of the study area (fig. 1). Approximately 10,000 homes were built in Willingboro between 1958 and 1970. Census figures for 1970 indicate that about 26,400 people reside in the

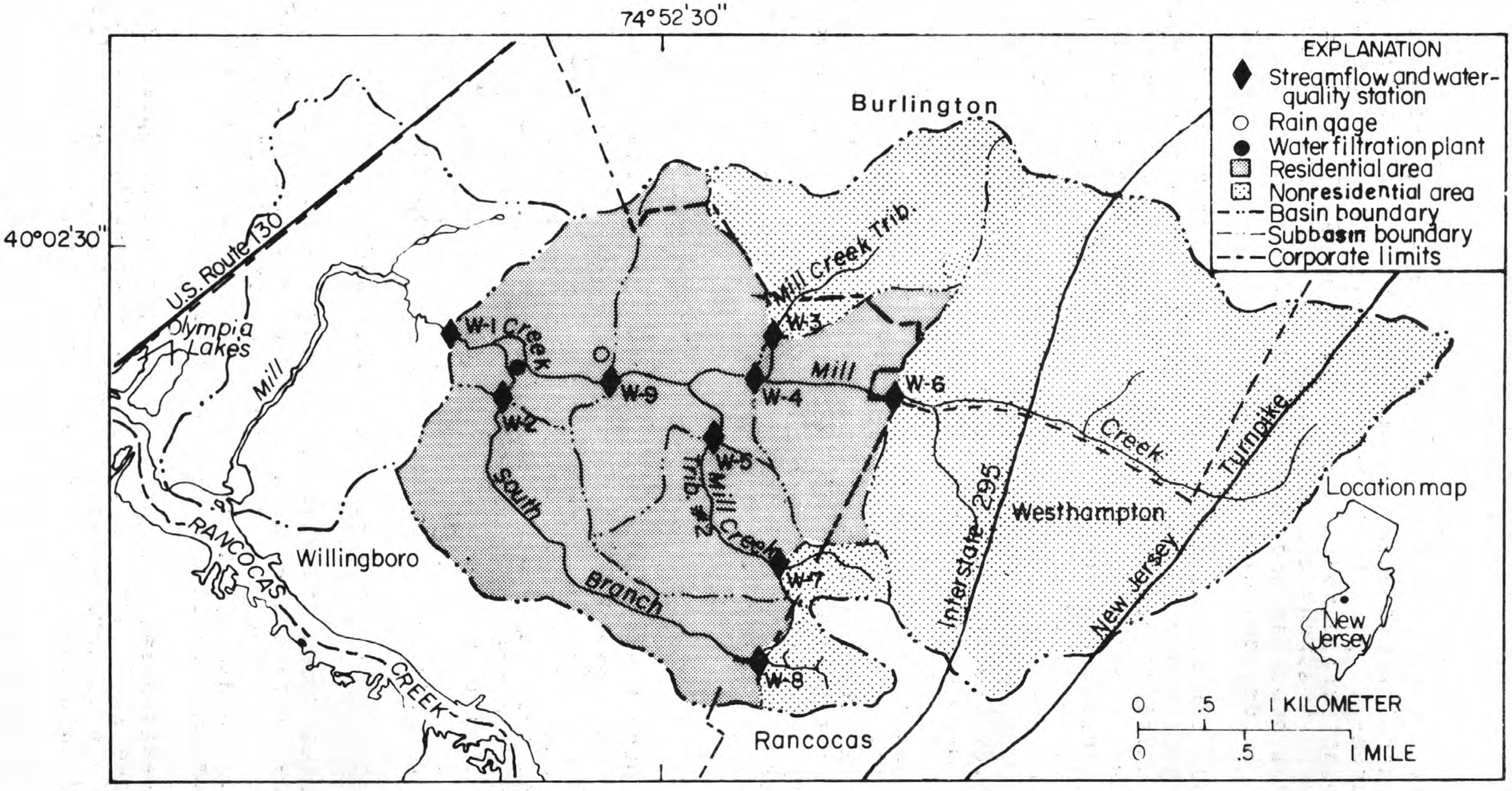

Figure 1.--Map showing major and minor subbasin drainage divisions, residential and nonresidential land-use divisions, and streamflow and water-quality stations.

downstream part of the basin. Buildings in the study area, other than single-family homes, include schools, small shopping centers, gasoline service stations, and one small apartment complex. Since 1970 no major construction has taken place and the area is considered to be relatively stable in development.

The two major subbasins in the study area are the nonresidential subbasin located in the upstream part of the basin and the residential subbasin located in the downstream part. For this study each major subbasin was divided into minor subbasins, each with a corresponding sampling site. (See table 1.) Land-use and population data for each of the major and minor subbasins are listed in table 2.

The major nonresidential subbasin contains minor subbasins W-6, W-3, W-7, and W-8 shown in figure 1 and encompasses 13.78 km^2 or 58 percent of the total study area. Only 3 percent of the total study area population and 16 percent of the total area for housing, commerce, industry, and public lands is in this subbasin.

Subbasin W-6, the largest minor subbasin, has a drainage area of 10.67 km^2 and is in the most upstream part of the study area. Drainage to the sampling site is through cropland, used primarily for corn production, and forests. Subbasin W-6 is crossed by the New Jersey Turnpike and Interstate Route 295.

Minor subbasin W-3 has a drainage area of 2.23 km^2 and has the highest population of the four nonresidential minor subbasins. Drainage from this subbasin is mainly from conservational, recreational, and open-land areas.

Minor subbasin W-7 drains 0.34 km^2, mostly cropland and pasture, and is the least populated subbasin in the study area.

Minor subbasin W-8 has a drainage area of 0.54 km^2, with drainage mostly from cropland through a series of drainage ditches. The streambed for the sampling site for this subbasin was dry during the storms of August 27 and September 10, 1976.

The major residential subbasin of the study area consists of minor subbasins W-4, W-5, W-9, W-2, and W-1. These subbasins occupy 42 percent of the total study area but contain 97 percent of the population. The impervious cover index, as used by Stankowski (1974) for the residential area, is 24.7 percent compared to 5.2 percent in the nonresidential area. Most of the storm-sewer outlets in the study area are located along streams in the residential subbasin.

Minor subbasin W-4 (1.73 km^2) is the most upstream subbasin within the residential area. Most of the drainage in this subbasin comes from land used for single-family residential homes, agriculture, and street and highway right-of-ways. A few

Table 1.--Geographic data for Mill Creek drainage basin in downstream order

Subbasin sampling site designation and USGS No.	Station description	Latitude and longitude	Drainage area (km²)	Distance from mouth of Mill Creek (km)	Distance from confluence with Mill Creek (km)	Elevation difference from W-1 (m)
W-6 1467019	Mill Creek at bridge on Springfield Road near Willingboro, N.J.	40°01'53" 74°51'14"	10.67	8.0	--	5.73
W-3 4002070745153	Mill Creek tributary at bridge on Northampton Drive at Willingboro, N.J.	40°02'07" 74°51'53"	2.23	7.2	0.3	5.39
W-4 4001580745159	Mill Creek at bridge on Willingboro Parkway at Willingboro, N.J.	40°01'58" 74°51'59"	14.6	6.8	--	4.20
W-7 4001110745148	Mill Creek tributary No. 2 at foot of Eaton Lane at Rancocas, N.J.	40°01'11" 74°51'48"	.34	8.4	2.1	8.34
W-5 4001410745212	Mill Creek tributary No. 2 at bridge on Woodlane Road at Willingboro, N.J.	40°01'41" 74°52'12"	1.68	6.9	.6	4.10
W-9 01467020	Mill Creek at bridge on J.F. Kennedy Way at Willingboro, N.J.	40°01'58" 74°52'46"	18.8	5.6	--	2.27
W-8 4000460745159	South Branch Mill Creek at end of Ember Lane at Rancocas, N.J.	40°00'46" 74°51'59"	.54	8.4	4.0	13.20
W-2 4001530745322	South Branch Mill Creek at bridge on Levitt Parkway at Willingboro, N.J.	40°01'53" 74°53'22"	3.26	5.0	.6	2.70
W-1 01467021	Mill Creek at bridge on Levitt Parkway at Willingboro, N.J.	40°02'09" 74°53'38"	23.7	4.0	--	0

Table 2.--Land-use and population data for Mill Creek drainage basin

	Total study area	Residential area W1, W2 W4, W5, W9	Non-residential area W6, W3, W7, W8	Minor subbasins in downstream order W-6	W-3	W-4	W-7	W-5	W-9	W-8	W-2	W-1
Area (km²)--------------	23.70	9.92	13.78	10.67	2.23	1.73	0.34	1.34	2.52	0.54	2.72	1.61
Population (1970)-------	26393	25569	824	180	555	2311	11	4212	7696	78	8338	3012
Population density (persons/km²)----------	11114.00	2578.00	59.80	16.90	249.00	1336.00	32.40	3143.00	3054.00	144.00	3065.00	1871.00
Impervious cover:												
Area (km²)------------	3.17	2.45	.72	.20	.22	.42	.01	.50	.92	.04	1.00	.46
Percentage of area----	13.40	24.70	5.22	1.84	9.67	24.14	2.80	37.07	36.55	7.03	36.61	25.00
Single-family residential:												
Area (km²)------------	6.12	5.58	.55	.21	.29	.52	.02	.95	1.54	.03	1.80	.77
Percentage of area----	25.82	56.25	3.99	2.00	13.00	30.00	7.00	71.00	61.00	5.00	66.00	48.00
Multifamily residential:												
Area (km²)------------	0	0	0	0	0	0	0	0	0	0	0	0
Percentage of area----	0	0	0	0	0	0	0	0	0	0	0	0
Commercial:												
Area (km²)------------	.26	.05	.21	.21	0	.02	0	0	.03	0	0	0
Percentage of area----	1.10	0.50	1.51	2.00	0	1.00	0	0	1.00	0	0	0
Industrial:												
Area (km²)------------	1.67	1.20	.47	.43	.05	.09	0	.17	.30	0	.38	.26
Percentage of area----	7.05	12.10	3.41	4.00	2.00	5.00	0	13.00	12.00	0	14.00	16.00
Public and quasi-public:												
Area (km²)------------	.40	.29	.11	.11	0	.07	0	.07	.02	0	.08	.05
Percentage of area----	1.69	2.92	.79	1.00	0	4.00	0	5.00	1.00	0	3.00	3.00
Conservational and recreational												
Area (km²)------------	15.25	2.80	12.44	9.72	1.90	1.03	.32	.15	.63	.51	.46	.53
Percentage of area----	64.34	28.23	90.30	91.00	85.00	60.00	93.00	11.00	25.00	95.00	17.00	33.00

multiple-family apartment units are located just west of Springside Road. Vegetative growth is prominent in the stream channel during the summer.

Minor subbasin W-5 has a drainage area of 1.35 km^2 and is dominated by single-family residential homes and two schools. Debris and shopping carts had to be removed from the culvert pipes under the bridge at the sampling site to assure accurate stage-discharge relationship during the summer.

Minor subbasin W-9 drains 2.52 km^2, 36.6 percent of which is impervious cover. Drainage comes mostly from land used for single-family residential housing, several schools, and retail stores.

Subbasin W-2 occupies 2.72 km^2 and drainage is mainly from land occupied by single-family homes, schools, and retail food stores. The stream channel is usually clear of vegetative growth at the sampling site where the bed is sand and gravel. Further upstream, however, considerable vegetative growth occurs during the summer. The bridge culverts frequently filled with debris and had to be cleared to assure accurate stage-discharge relationship.

The most downstream minor subbasin is W-1. It has a drainage area of 1.61 km^2. Drainage from this subbasin is mainly from land that is heavily populated and has single-family residential homes. Other drainage is from the holding pond at the water-treatment plant and from street and highway runoff. The stream channel, usually clear of vegetation at the sampling point, has a reddish brown tinge during low flow because of hydrated iron and manganese oxides from the water-treatment plant. The sampling site for this subbasin served as a source of composite samples for the entire study area.

Ground water from wells in Willingboro tapping the Potomac-Raritan-Magothy aquifer system is used for all domestic water supplies within the Mill Creek drainage basin. The water is treated to remove high concentrations of naturally occurring iron and manganese. The water-treatment plant is on the South Branch of Mill Creek just upstream from the confluence with Mill Creek in the downstream part of the study area.

The only significant point source of contaminants entering the stream in the study area is from the water-treatment plant settling pond. These discharges, consisting of precipitated oxides of iron and manganese, are unintentionally released to the stream by overflowing during storms, vandalism, or accidentally when the sludge is periodically removed from the pond. These reddish brown oxides coat the bottom of the stream into the tidally affected section of Mill Creek.

No municipal wastewater enters the streams within the study area because the effluent from the sewage treatment plant is discharged into the tidally affected section of Mill Creek downstream from the study area. The storm-water sewer system is independent of the sanitary sewer system and storm water is discharged through pipes directly into Mill Creek and its tributaries. These storm-water discharge pipes range in size from 20 cm to 91 cm. The relatively uniform distribution of these pipes throughout the study area justified the use of bridge locations as representative sampling sites.

The study area lies in the inner lowlands of the coastal plain as described by Owens and Minard (1960). Elevations in the study area range from 3 to 30 m above sea level.

Four geologic formations crop out in the study area. They are in ascending order: the Merchantville Formation, Woodbury Clay, Englishtown Formation, and Marshalltown Formation of Cretaceous age shown in figure 2 (Owens and Minard, 1964). The formations trend northeast to southwest and dip to the southeast at a rate of about 7.5 m/km (Barksdale and others, 1958). The Englishtown Formation consists predominantly of fine-grained sand. The other three formations are generally clayey in character.

The Raritan and Magothy Formations crop out near the mouth of Mill Creek just downstream from the study area. Most water supply wells in the study area tap the Potomac-Raritan-Magothy aquifer system and have depths ranging from 80 to 150 m. The quality of water in the Englishtown Formation and the Potomac-Raritan-Magothy aquifer system is generally good except for hardness and high iron concentrations (table 3).

DATA COLLECTION AND METHODOLOGY

Land Use

Land use for the Mill Creek basin (table 1) was compiled and tabulated using block statistics from the Delaware Valley Regional Planning Commission. The six major uses of land in the Mill Creek basin are:

1. Single-family residences
2. Multiple-family residences
3. Commercial (retail and wholesale trade, personal business, and professional services)
4. Industry (manufacturing, transportation, automobile parking, communications, and utilities)
5. Public and quasipublic (community services for health, education, religious, and military facilities)
6. Conservation, recreation, and open (agriculture, parks, playgrounds, water areas, and undeveloped land)

Impervious Cover

Impervious cover is the amount of land surface covered by structures, such as houses, parking lots, roads, and sidewalks, that prevent rainfall from penetrating the soil. Impervious cover

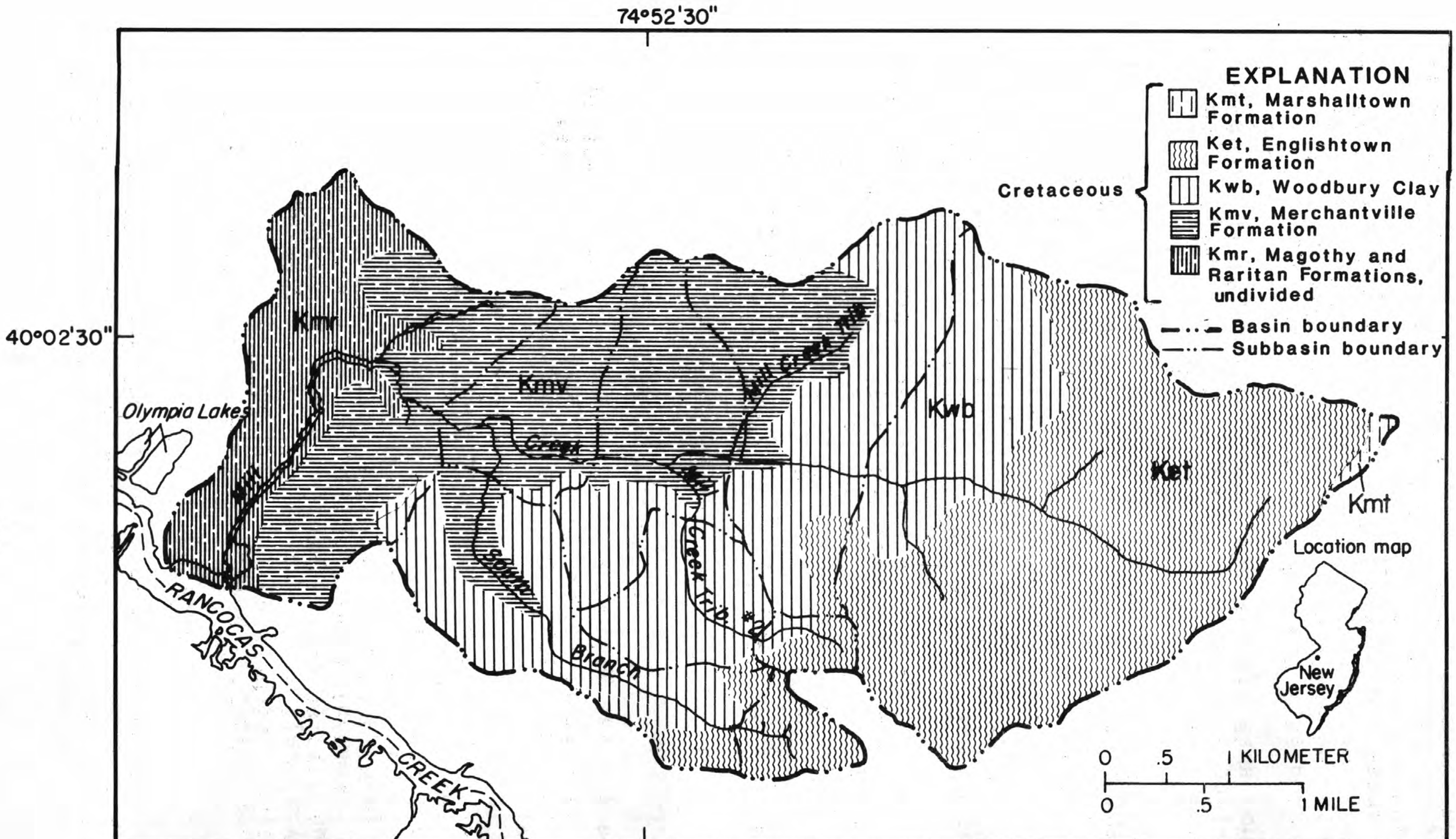

Figure 2.--Pre-Quaternary geologic map of Mill Creek drainage basin. Map modified from Owens and Minard, 1964.

Table 3.--Geologic formations, their lithologic, hydrologic, and water-quality characteristics in Mill Creek drainage basin

Geologic formation	Lithology	Thickness (m)	Geohydrologic properties	Water quality
Marshalltown Formation	Dark gray to black, micaceous glauconitic, quartz sandy clay to very clayey sand.	0 - 7.5	This formation acts as a confining bed between Englishtown aquifer and the overlying Wenonah-Mount Laurel aquifer.	
Englishtown Formation	Light gray to white, micaceous lignitic, fine-grained quartz sand.	0 - 27	The aquifer within the formation is commonly tapped for minor water uses, primarily domestic.	The water quality is fairly good except for hardness and high iron concentrations requiring treatment for removal. Iron exceeds 10 mg/L; dissolved solids are between 110 and 160 mg/L and chloride is <5 mg/L.
Woodbury Clay	Black lignitic, micaceous clay with small amounts of glauconite near its base.			
Merchantville Formation	Dark gray to black micaceous clay to clayey silt beds and lenses of glauconite sand near top of the formation.	0 - 38	The Woodbury Clay and Merchantville Formation function as a confining bed separating the underlying Potomac-Raritan-Magothy aquifer system from the overlying Englishtown aquifer.	
Magothy and Raritan Formations and Potomac Group, undivided	Alternating clay, silt, sand and gravel. Light gray to white cross-stratified medium coarse grained quartz sand, arkosic in part and interbedded with white to red and white variegated clays. More sand near the top than clay, dark and lignite bearing. Mica and pyrite are other accessory minerals.	17 - 70	This is the major aquifer system used by Willingboro Township and nearby municipalities for water supply.	This aquifer system generally contains good chemical quality except for local hardness and high iron concentrations which range from 0.5 to 15 mg/L. Dissolved solids range from 40 to 203 mg/L.

index was determined for each subbasin by using the intermediate values of the percentage of manmade impervious area as weighting factors (Stankowski, 1974). The impervious area is the sum of the weighted proportions of land area in each land-use category.

Population

The population density (table 2) was computed using the 1970 Block Statistics published by the U.S. Department of Commerce (1970). Census figures are not provided for the upstream nonresidential area where the population was sparse and impervious cover was minimal. Estimates for these areas were made by assigning census values according to the number of inhabitable buildings.

Precipitation

Precipitation from December 1975 to September 1976 was recorded with a weighing rain gage at 5-minute intervals to the nearest 0.25 cm at a point 200 m north of sampling site W-9. The Public Service Electric and Gas Company in Burlington, N.J., 5.3 km northeast of the study area, provided additional precipitation data. Precipitation data from the Burlington gage, which has been operated since 1930, are recorded once daily to the nearest 0.025 cm. This gage is a good source of long-term precipitation data for the northern Burlington County area.

Streamflow

Streamflow data were collected from October 1975 to September 1976 at each of the nine sites where water-quality samples were collected. Two sites on the main stem of Mill Creek were equipped with analog to digital stage recorders, while other sites were equipped and operated as partial-record stations. Streamflow measurements were made at all sites at representative stream stages during base flow and storm conditions using Price current meters, pygmy meters, or Parshall flumes. Discharge-stage relationships computed from these data were used to convert gage heights obtained during the collection of water-quality samples to instantaneous discharge values. Chemical constituent loads were computed from the measured concentration and instantaneous discharge values.

Data from the stage recorders at sampling sites W-1 and W-6 were used to compute streamflow-duration curves which give the percentage of time that a particular discharge value would be equaled or exceeded at that site (Searcy, 1959). Flow-duration tables for sampling sites W-3, W-7 and W-8 were estimated by using the results of the regression analyses correlating discharge measurements at site W-1 against simultaneous discharge measurements at these sites.

Mean discharges were computed as the average of the 5 percent increments of the flow-duration table.

Water Quality

The water-quality parameters include field measurements of temperature, pH, and dissolved oxygen, and laboratory analyses of nutrients, five-day biochemical oxygen demand, chemical oxygen demand, specific conductance, fecal coliform bacteria, common inorganics, organic carbon, metals, insecticides, herbicides, and suspended sediment. Sixty-five chemical constituent measurements were made for each sample. Because many of the chemical constituents were analyzed on whole water and filtered (dissolved) samples, 86 different chemical measurements resulted.

Samples to be analyzed for dissolved constituents were filtered in the field using a 0.45-micrometer membrane filter in a nitrogen pressurized barrel-type Plexiglass filtration unit. Samples for dissolved organic carbon were filtered through a 0.45-micrometer silver filter in a stainless steel pressure filtration unit. Fecal coliform bacteria were analyzed using the membrane filtration technique with a 0.45 micrometer filter and mFC agar (nutrient medium for bacterial growth). Samples requiring refrigeration were kept on ice at 4°C.

The collection of water-quality samples occurred from November 1975 to September 1976. They were collected five times during base flow and five times during storms. In order that representative samples would be taken, low-flow and storm samples were collected during each season and under a wide range of flow conditions. Storm samples were taken at different times during the rising and falling stage of the hydrograph.

Conductivity measurements, which were made using the equal-width-increments sampling procedure (Guy and Norman 1970), indicate that a single vertical depth integrated sample from the middle of the stream provides a representative sample and allows a sample volume of 14 L to be collected quickly when stream stages rise rapidly.

The effect of storm runoff on the water quality of a stream can be measured in terms of concentrations and constituent loadings. Constituent concentrations can be used to assess the water quality in terms of established standards, which may vary depending on the intended use of a stream or reach of stream. Constituent loadings can be used to assess the relationship between land-use and stream-water quality.

Constituent loading rates were computed using the following equation:

$$L = C\ Q\ f$$

where L = instantaneous constituent load in grams per hour (g/h) or kilograms per hour (kg/h),
C = measured concentration in milligrams per liter,
Q = instantaneous discharge in cubic meters per second, and
f = a conversion factor equal to 3.6 if instantaneous load is calculated in kilograms per hour or 3,600 if load is calculated in grams per hour.

Linear, semilog (exponential), and log-log (geometric) regression analyses were performed to determine the best relationship between constituent load and discharge. The discharge value was used as the independent variable and the constituent load value as the dependent variable. Base flow and storm samples collected at a given sampling site throughout the study period were considered a representative sample of one population. Results of the regression analyses are summarized in tables 11 to 15 in the appendix.

The frequency of occurrence of a particular constituent loading or discharge value is useful in evaluating its effect on water quality. Consequently, the regression equations developed above were combined with the discharge values from the streamflow duration curves to produce constituent-load duration curves for each of the water-quality parameters (Johnson, 1971). An estimated mean load and mean concentration for each constituent were computed similar to the computation of mean streamflow. Mean loads were computed in units of kilograms per day or grams per day and instantaneous loads in kilograms per hour or grams per hour.

RESULTS

Precipitation

Precipitation data were compared to data from the Public Service Electric and Gas Company in Burlington, N.J. (table 4). The precipitation at the two sites was similar except for lower daily values at the U.S. Geological Survey rain gage on January 1 and 28, 1976, and July 4 and 31, 1976. Climatological data published by the National Oceanic and Atmospheric Administration for nearby precipitation stations at Pemberton, Moorestown, and Cherry Hill also indicate lower amounts of total precipitation for those days than was reported at the Burlington gage. The Burlington gage indicated an accumulated precipitation of 84.21 cm from December 1975 to September 1976, which was 5 percent drier than the long term normal of 89.11 cm for December through September (1940-70). The U.S. Geological Survey gage recorded a total precipitation of 67.56 cm for the 10-month period of study. Despite the lower total precipitation, no droughts, floods, or

Table 4.--Precipitation data for Mill Creek drainage basin, December 1975 to September 1976

		Monthly rainfall at U.S. Geological Survey rain gage in Willingboro, N.J.	Monthly rainfall at Public Service rain gage in Burlington, N.J.		Number of rain storms occurring in each of six rainfall accumulation ranges at U.S. Geological Survey rain gage in Willingboro, N.J.					
		Period of study (cm)	Period of study (cm)	Monthly norm (cm)	0-1 cm	1-2 cm	2-3 cm	3-4 cm	4-5 cm	5-6 cm
1975	December	7.87	6.38	8.97	2	1	1	1	0	0
1976	January	9.14	16.79	7.77	4	1	0	0	0	1
1976	February	4.83	5.23*	7.09	4	2	0	0	0	0
1976	March	5.59	5.11	10.19	3	3	0	0	0	0
1976	April	6.10	6.63	8.23	11	1	1	0	0	0
1976	May	12.70	13.49	8.97	6	4	0	1	0	0
1976	June	3.30	3.56	7.57	4	0	1	0	0	0
1976	July	6.10	13.28	11.96	6	1	1	0	0	0
1976	August	7.11	9.73	10.46	3	1	0	0	1	0
1976	September	4.57	4.01**	7.90	2	3	0	0	0	0
	Total	67.56	84.21	89.11	45	17	4	2	1	1

* One day of missing data
** Two days of missing data

Table 5.--Storm magnitude and duration in Mill Creek drainage basin, December 1975 to September 1976

Storm date	Number dry days before storm	Accumulation during sampling (cm)	Water-quality samples collected (h)	Precipitation during storm (cm)	Storm duration (h)
12/25-26/75	16	-	-	3.56	13
12/30/75	4	-	-	1.52	8
12/31/75	0	-	-	2.03	8
1/26-28/76	13	1.27	8	5.59	31
2/1-2/76	3	-	-	1.52	19
3/13/76	0	-	-	1.78	14
3/31-4/1/76	4	.76	8	2.29	12
5/1/76	5	3.30	11	4.06	14
5/18-19/76	0	-	-	2.29	21
6/1-2/76	0	-	-	2.03	7
7/3/76	2	-	-	2.03	5
8/9/76	1	3.81	5	4.83	8
8/27/76	13	.51	6	.51	6
9/10/76	14	1.02	4	1.02	4
9/30-10/1/76	2	-	-	2.29	12

long durations of rain or snow occurred during the period of study and the Mill Creek drainage basin was assumed to have had a near normal amount of precipitation.

Seventy rainfalls were recorded at the Geological Survey rain gage from December 1975 to September 1976; 45 rainfalls had accumulations of less than 1 cm and 17 had accumulations of between 1 and 2 cm. (See table 4.) Storm magnitude and duration (table 5) varied for each rainfall, making it difficult to determine when and how long sampling should be performed. Table 5 also indicates the number of dry days before the storm.

Streamflow

The analog digital stream-stage recorders installed at sampling sites W-1 and W-6 were in operation from October 1975 to September 1976. Because no previous streamflow data were available for these sites, the calculated flow-duration curves can be considered valid for only the period during which the recorders were operating. Analysis of 35 years of streamflow data for the gaging station at Crosswicks Creek near Extonville, N.J., (USGS 01464500), which is located approximately 32 km northeast of the study area, indicated that in this area of the state no unusual streamflow, such as floods or droughts, occurred during the period of study. The mean discharge at the Crosswicks Creek gaging station was only 4 percent higher than the mean for the 35-year period of record. Analysis of the streamflow data, indicate that streamflow within the study area was normal.

All regression analyses of discharge measurements at site W-1 and sites W-3, W-6, W-7, and W-8 resulted in correlation coefficients greater than 0.92. These results, as indicated in table 6, were expected because of the proximity of the sampling sites, and because the streamflow is not regulated or augmented within the drainage basin. Stage-discharge rating curves at sites W-2, W-4, W-5 and W-9 were difficult to obtain because of debris in the culverts and vegetative growth in the channels during late summer. Flow-duration curves for sites W-1, W-3, W-6, W-7, and W-8 are presented in figure 3 and tabulated in table 25 in the appendix.

Table 6.--Geometric regression analyses of streamflow at site W-1 versus concurrent streamflow at sites W-6, W-3, W-7, and W-8

Sites	Intercept	Slope	Correlation coefficient
W-6	0.472	1.062	0.995
W-3	.083	1.252	.951
W-7	.011	.797	.964
W-8	.016	.914	.921

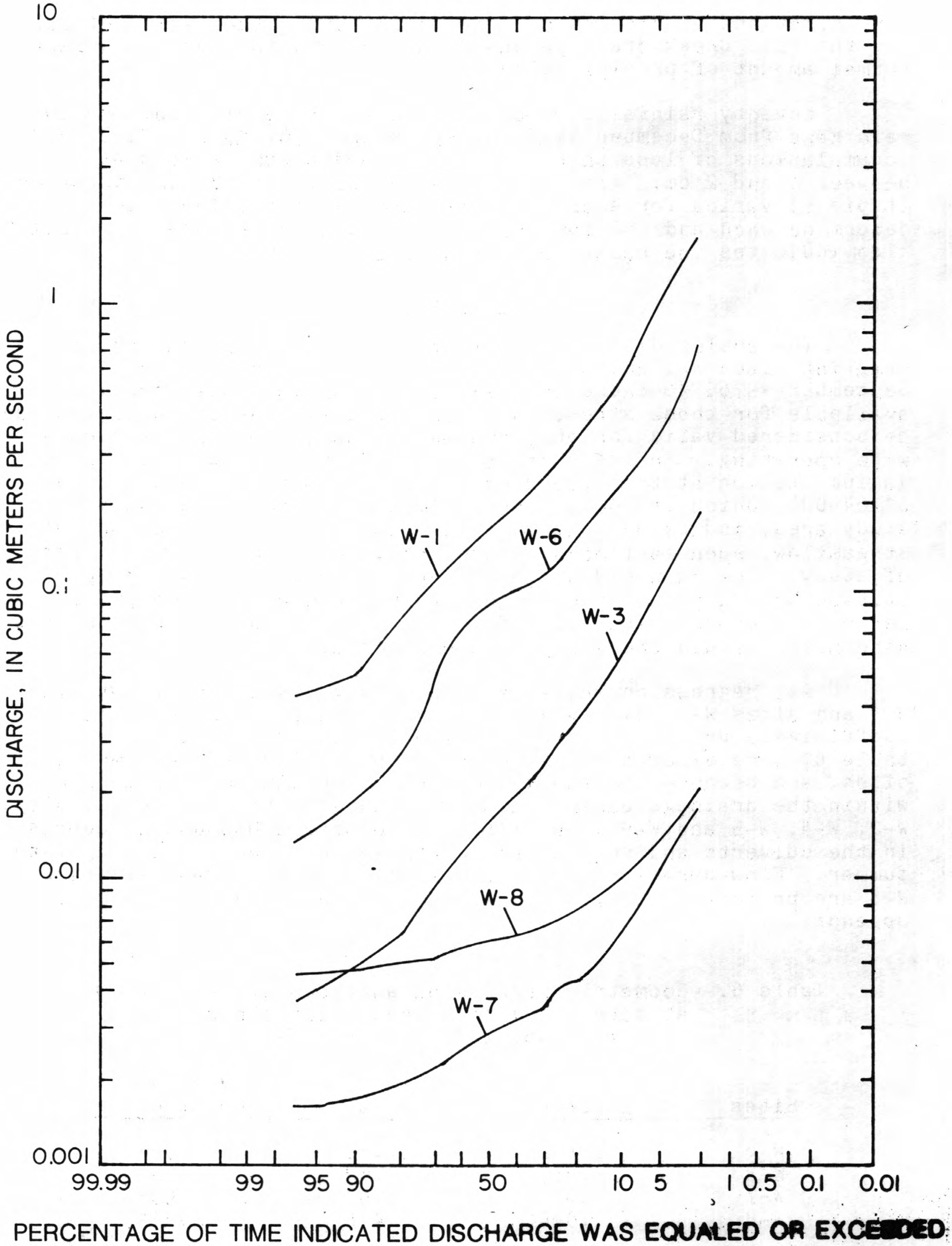

Figure 3.--Flow duration curves for sampling sites in Mill Creek drainage basin.

Streamflow and water-quality data collected at site W-1 were representative of the entire study area as well as the W-1 subbasin. The term "composite" will refer to all W-1 data to emphasize that this site is indicative of the whole study area. The measured extremes of discharge at the nine sampling sites are summarized in tables 16 through 24 in the appendix. The minimum recorded discharge value from October 1975 to September 1976 at W-1 was 0.048 m^3/s, and the maximum value was 17.8 m^3/s. The computed mean discharge for this site was 0.326 m^3/s, which was equaled or exceeded 22 percent of the time (table 7). At site W-6, 75 percent of the flow within the nonresidential subbasin was measured. The measured extremes were a minimum of 0.006 m^3/s and a maximum of 4.45 m^3/s. The mean discharge for W-6 for October 1975 to September 1976 was 0.137 m^3/s and was equaled or exceeded 27 percent of the time.

The response of Mill Creek to storm runoff is illustrated by the hydrographs for the storms sampled (fig. 4). The shapes of these curves illustrate the response of the stream to changing intensity and duration of rainfall. Baseflow, stage extremes, and the number of storms were greatest during the winter.

The computed mean discharges for the total study area, and for the residential area and nonresidential area are shown in table 8. The nonresidential area contributed 56 percent of the total flow in the Mill Creek study area, however, on a per unit area basis, the contributions of the two major subbasins were approximately equal. The contributions from the total study area, residential area, and nonresidential area were 0.01, 0.015, and 0.013 $(m^3/s)/km^2$, respectively.

Water Temperature

Water temperatures in Mill Creek and its tributaries showed no definite trends during storm runoff as indicated by the temperature plots in figures 5, 6, and 7. However, fluctuations of a few degrees do occur from one storm to another because of seasonal changes. During the storm of May 1, 1976, a significant increase in water temperature occurred at site W-1; however, the source could not be determined.

Dissolved Oxygen

Dissolved-oxygen content fluctuated according to the time of year of the measurement. Values greater than 10 mg/L were found during the winter months, but they fell to approximately 7 mg/L during the summer months. Figures 5, 6, and 7 indicate no definite trends in dissolved oxygen during storms, and the range of concentration was generally 1 mg/L or less. A significant decrease in dissolved oxygen occurred at site W-1 during the storm of May 1, 1976; however, the cause was not determined. The maximum value recorded from November 1975 to September 1976 was

Table 7.--Mean discharge, constituent loadings, and concentrations for sites W-1, W-6, W-3, W-7, and, W-8, October 1975 to September 1976

	Site W-1		Site W-6		Site W-3		Site W-7		Site W-8	
Mean discharge (m^3/s)----------	0.326		0.137		0.032		0.004		0.008	
	Mean load (kg/d)	Mean concen-tration (*mg/L) (**μg/L)	Mean load (kg/d)	Mean concen-tration (*mg/L) (**μg/L)	Mean load (kg/d)	Mean concen-tration (*mg/L) (**μg/L)	Mean load (kg/d)	Mean concen-tration (*mg/L) (**μg/L)	Mean load (kg/d)	Mean concen-tration (*mg/L) (**μg/L)
Suspended sediment	2580.00	91.60*	935.00	79.00*	149.00	53.90*	136.00	393.00*	173.00	250.00*
Dissolved solids	4400.00	156.00*	1920.00	162.00*	236.00	85.30*	50.30	145.00*	74.10	107.00*
Total sodium	513.00	18.20*	306.00	25.80*	14.30	5.17*	1.99	5.76*	6.32	9.14*
Dissolved sodium	511.00	18.10*	304.00	25.70*	14.00	5.06*	1.96	5.67*	6.23	9.01*
Total potassium	106.00	3.76*	51.90	4.38*	7.53	2.72*	2.34	6.77*	1.97	2.85*
Dissolved potassium	96.80	3.44*	50.00	4.22*	7.18	2.60*	2.20	6.36*	1.85	2.68*
Total calcium	425.00	15.10*	147.00	12.40*	24.00	8.68*	6.35	18.40*	7.77	11.20*
Dissolved calcium	402.00	14.30*	136.00	11.50*	23.30	8.42*	5.13	14.80*	5.94	8.59*
Total magnesium	157.00	5.57*	73.80	6.23*	9.83	3.55*	3.01	8.71*	4.14	5.99*
Dissolved magnesium	141.00	5.00*	64.00	5.40*	7.94	2.87*	2.72	7.87*	3.88	5.61*
Dissolved chloride	804.00	28.50*	477.00	40.30*	24.10	8.71*	5.65	16.30*	12.10	17.50*
Dissolved sulfate	751.00	26.70*	348.00	29.40*	59.70	21.60*	15.40	44.50*	13.70	19.80*
Total phosphorus as P	6.90	.24*	2.77	.23*	.66	.24*	.10	.29*	.22	.32*
Dissolved phosphorus as P	1.40	.05*	.78	.07*	.23	.08*	.02	.05*	.03	.05*
Total nitrate as N	34.50	1.22*	18.10	1.53*	.01	0 *	1.17	3.38*	2.15	3.11*
Dissolved nitrate as N	32.20	1.14*	16.80	1.42*	0	0 *	1.10	3.18*	1.96	2.83*
Total nitrite as N	1.87	.07*	.77	.07*	.07	.02*	.03	.10*	.02	.03*
Dissolved nitrite as N	1.18	.04*	.42	.04*	.04	.01*	.01	.01*	.01	.02*
Total nitrogen as N	71.70	2.54*	46.70	3.94*	4.10	1.48*	1.78	5.15*	3.06	4.43*
Total organic nitrogen as N	24.80	.88*	15.10	1.28*	2.14	.77*	.27	.79*	.54	.78*
Dissolved organic nitrogen as N	17.70	.63*	9.16	.77*	1.75	.63*	.27	.77*	.37	.54*
Total ammonia (NH_4 + NH_3) as N	8.75	.31*	5.65	.48*	.45	.16*	.09	.27*	.11	.16*
Dissolved ammonia (NH_4 + NH_3) as N	7.38	.26*	5.40	.46*	.46	.17*	.09	.26*	.08	.11*
Biochemical oxygen demand (5 day)	253.00	8.98*	78.50	6.63*	16.80	6.07*	2.02	5.84*	3.68	5.32*
Chemical oxygen demand	933.00	33.10*	401.00	33.90*	111.00	40.10*	15.90	46.00*	18.60	26.90*
Total organic carbon	323.00	11.50*	155.00	13.10*	33.70	12.20*	5.48	15.90*	7.36	10.60*
Dissolved organic carbon	225.00	7990.00**	106.00	8950.00**	24.30	8790.00**	2.82	8160.00**	5.90	8530.00**
Total arsenic	.11	3.90**	.04	3.38**	.02	7.59**	0	11.60**	0	13.00**
Total iron	204.00	7240.00**	29.60	2500.00**	4.95	1790.00**	.50	1440.00**	1.43	2070.00**
Dissolved iron	7.93	281.00**	4.29	362.00**	.56	203.00**	.08	231.00**	.14	201.00**
Total lead	2.05	72.80**	.37	31.20**	.13	46.60**	0	5.79**	0	18.80**
Dissolved lead	.22	7.81**	.05	4.22**	.02	7.95**	0	2.89**	0	2.89**
Total manganese	5.03	179.00**	2.49	210.00**	.36	128.00**	.05	145.00**	.09	133.00**
Dissolved manganese	2.25	79.90**	1.61	136.00**	.29	104.00**	.04	110.00**	.04	57.90**
Total zinc	1.63	57.90**	.66	55.70**	.19	68.70**	.01	34.70**	.02	27.50**
Dissolved zinc	.45	16.00**	.32	27.00**	.16	56.00**	.01	28.90**	.02	27.50**
Total 2,4-D	.08	2.84**	0	0 **	.03	11.60**	0	0 **	0	0 **
Total silvex	.01	.35**	0	0 **	0	1.08**	0	0 **	0	0 **

	Total study area			Residential area				Nonresidential area			
	Drainage area - 23.70 km^2 Mean discharge - 0.355 m^3/s Discharge/km^2 - 0.015 m^3/s			Drainage area - 9.92 km^2 Mean discharge - 0.142 m^3/s Discharge/km^2 - 0.014 m^3/s				Drainage area - 13.78 km^2 Mean discharge - 0.213 m^3/s Discharge/km^2 - 0.015 m^3/s			
	Mean load (kg/d)	Mean load per square kilometer	Mean concentration (*mg/L) (**μg/L)	Mean load (kg/d)	Mean load per square kilometer	Percentage of total study area load	Mean concentration (*mg/L) (**μg/L)	Mean load (kg/d)	Mean load per square kilometer	Percentage of total study area load	Mean concentration (*mg/L) (**μg/L)
Suspended sediment	2580.00	109.00	91.60*	1190.00	120.00	46	95.00*	1390.00	101.00	54	88.90*
Dissolved solids	4400.00	186.00	156.00*	2120.00	214.00	48	169.00*	2280.00	165.00	52	146.00*
Total sodium	513.00	21.60	18.20*	185.00	18.60	36	14.80*	328.00	23.80	64	21.00*
Dissolved sodium	511.00	21.60	18.10*	185.00	18.60	36	14.80*	326.00	23.70	64	20.80*
Total potassium	106.00	4.47	3.76*	42.30	4.26	40	3.38*	63.70	4.62	60	4.07*
Dissolved potassium	96.80	4.08	3.44*	35.60	3.59	37	2.84*	61.20	4.44	63	3.91*
Total calcium	425.00	17.90	15.10*	240.00	24.20	56	19.20*	185.00	13.40	44	11.80*
Dissolved calcium	402.00	17.00	14.30*	232.00	23.40	58	18.50*	170.00	12.30	42	10.90*
Total magnesium	157.00	6.62	5.57*	66.00	6.65	42	5.27*	91.00	6.60	58	5.82*
Dissolved magnesium	141.00	5.95	5.00*	62.00	6.25	44	4.95*	79.00	5.73	56	5.05*
Dissolved chloride	804.00	33.90	28.50*	285.00	28.70	35	22.70*	519.00	37.70	65	33.20*
Dissolved sulfate	751.00	31.70	26.70*	314.00	31.70	42	25.10*	437.00	31.70	58	27.90*
Total phosphorus as P	6.90	.29	.24*	3.15	.32	46	.25*	3.75	.27	54	.24*
Dissolved phosphorus as P	1.40	.06	.05*	.34	.03	24	.03*	1.06	.08	76	.07*
Total nitrate as N	34.50	1.46	1.22*	13.00	1.31	38	1.04*	21.50	1.56	62	1.37*
Dissolved nitrate as N	32.20	1.36	1.14*	12.40	1.25	39	.99*	19.80	1.44	61	1.27*
Total nitrite as N	1.87	.08	.07*	.98	.10	52	.08*	.89	.06	48	.06*
Dissolved nitrite as N	1.18	.05	.04*	.70	.07	59	.06*	.48	.03	41	.03*
Total nitrogen as N	71.70	3.03	2.54*	16.10	1.62	22	1.28*	55.60	4.03	78	3.55*
Total organic nitrogen as N	24.80	1.05	.88*	6.70	.68	27	.53*	18.10	1.31	73	1.16*
Dissolved organic nitrogen as N	17.70	.75	.63*	6.10	.61	34	.49*	11.60	.84	66	.74*
Total ammonia (NH_4+NH_3) as N	8.75	.37	.31*	2.45	.25	28	.20*	6.30	.46	72	.40*
Dissolved ammonia (NH_4+NH_3) as N	7.38	.31	.26*	1.35	.14	18	.11*	6.03	.44	82	.39*
Biochemical oxygen demand(5 day)	253.00	10.70	8.98*	152.00	15.30	60	12.10*	101.00	7.33	40	6.46*
Chemical oxygen demand	933.00	39.40	33.10*	387.00	39.00	41	30.90*	546.00	39.60	59	34.90*
Total organic carbon	323.00	13.60	11.50*	121.00	12.20	37	9.65*	202.00	14.70	63	12.90*
Dissolved organic carbon	225.00	9.49	7.99*	86.00	8.67	38	6.86*	139.00	10.10	62	8.89*
Total arsenic	.11	0	3.90**	.04	0	36	3.19**	0	0	64	4.47**
Total iron	204.00	8.61	7240.00**	168.00	16.90	82	13400.00**	36.50	2.65	18	2330.00**
Dissolved iron	7.93	.33	281.00**	2.86	.29	36	228.00**	5.07	.37	64	324.00**
Total lead	2.05	.09	72.80**	1.54	.16	75	123.00**	.51	.04	25	32.60**
Dissolved lead	.22	.01	7.81**	.14	.01	68	11.20**	.07	.01	32	4.47**
Total manganese	5.03	.21	179.00**	2.04	.21	41	163.00**	2.99	.22	59	191.00**
Dissolved manganese	2.25	.09	79.90**	.27	.03	12	21.50**	1.98	.14	88	127.00**
Total zinc	1.63	.07	57.90**	.75	.08	46	59.80**	.88	.06	54	56.30**
Dissolved zinc	.45	.02	16.00**	0	0	0	0 **	.45	.03	100	28.80**
Total 2,4-D	.08	0	2.84**	.05	.01	63	3.99**	.03	0	38	1.92**
Total silvex	.01	0	.35**	.01	0	100	.80**	0	0	0	0 **

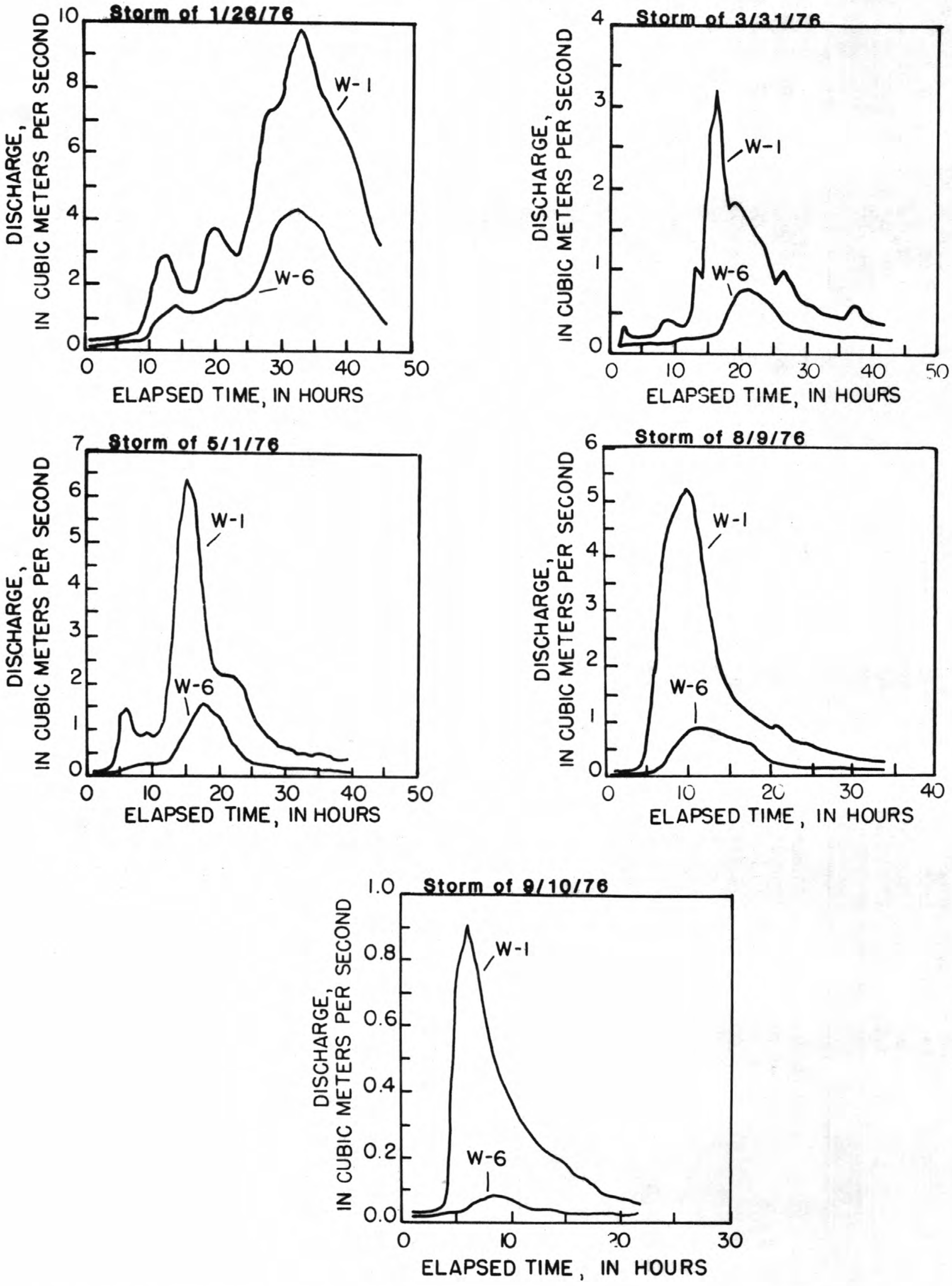

Figure 4.--Storm discharge hydrographs for water-quality sampling sites Mill Creek at Levitt Parkway at Willingboro, N.J. (W-1) and Mill Creek at Springfield Road near Willingboro, N.J. (W-6).

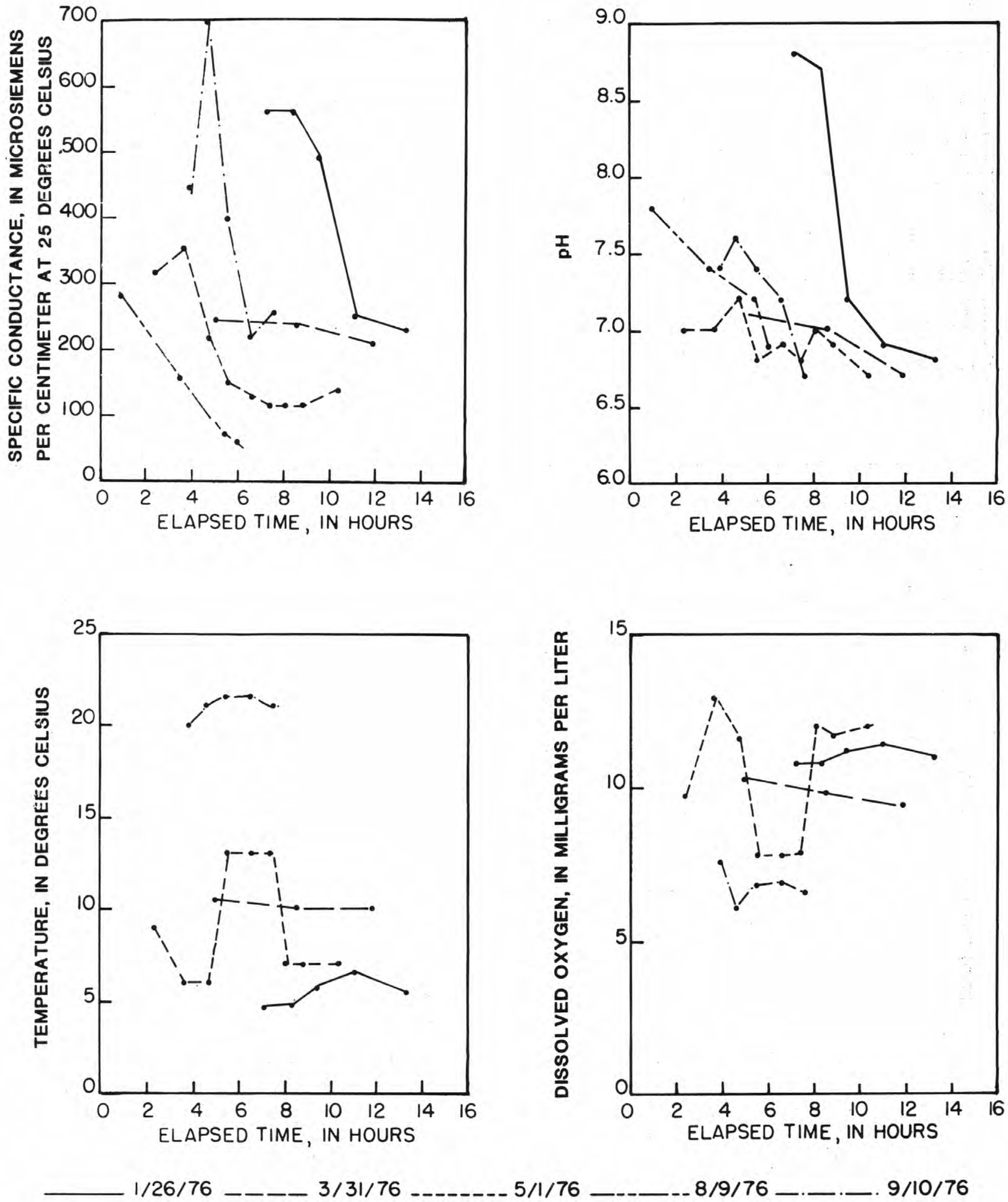

Figure 5.--Specific conductance, pH, temperature, and dissolved oxygen hydrographs for storms at Mill Creek at bridge on Levitt Parkway at Willingboro, N.J. (site W-1). (See fig.4 for discharge hydrograph.)

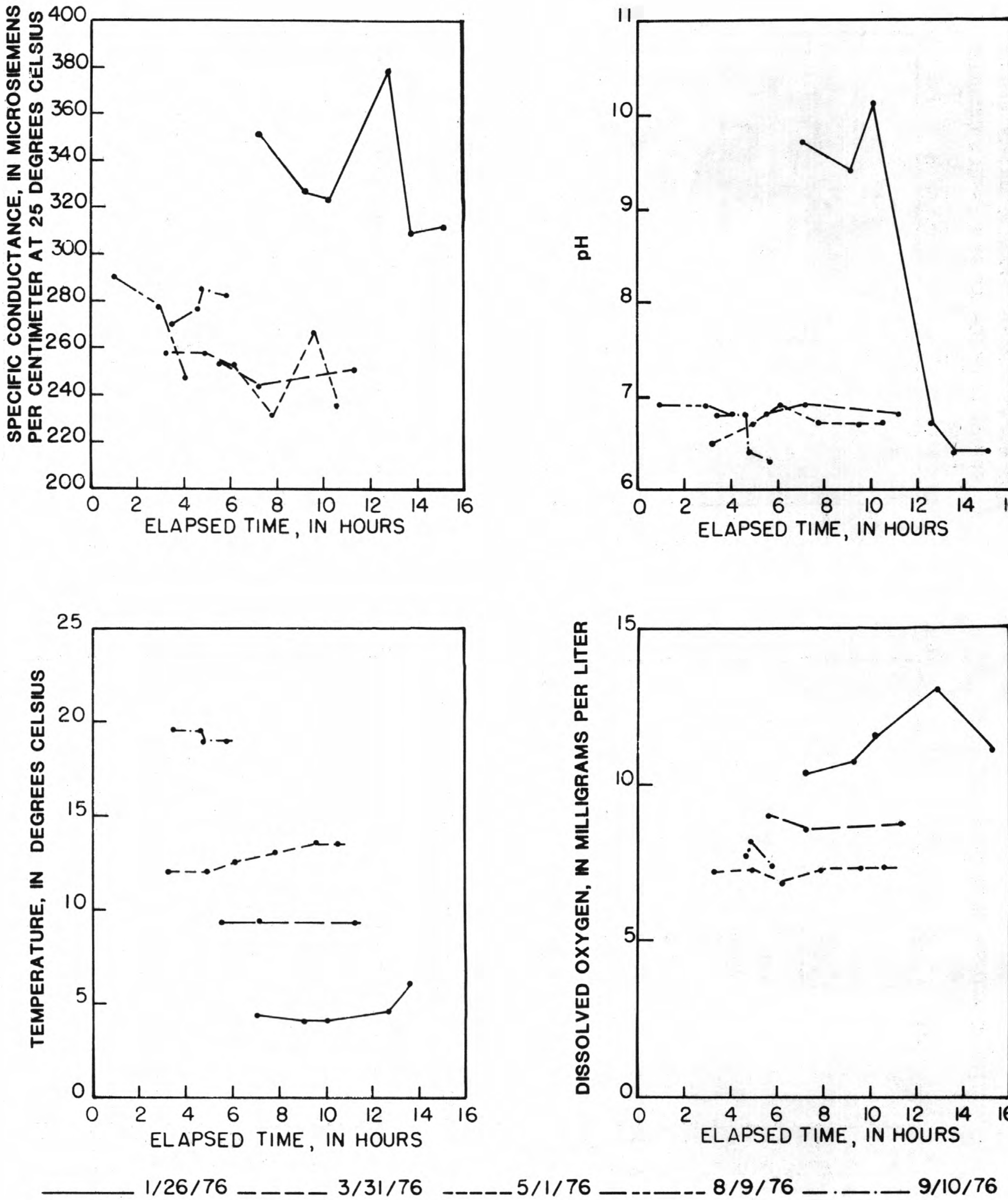

Figure 6.--Specific conductance, pH, temperature, and dissolved-oxygen hydrographs for storms at Mill Creek at bridge on Springfield Road near Willingboro, N.J., (site W-6). (See fig. 4 for discharge hydrograph.)

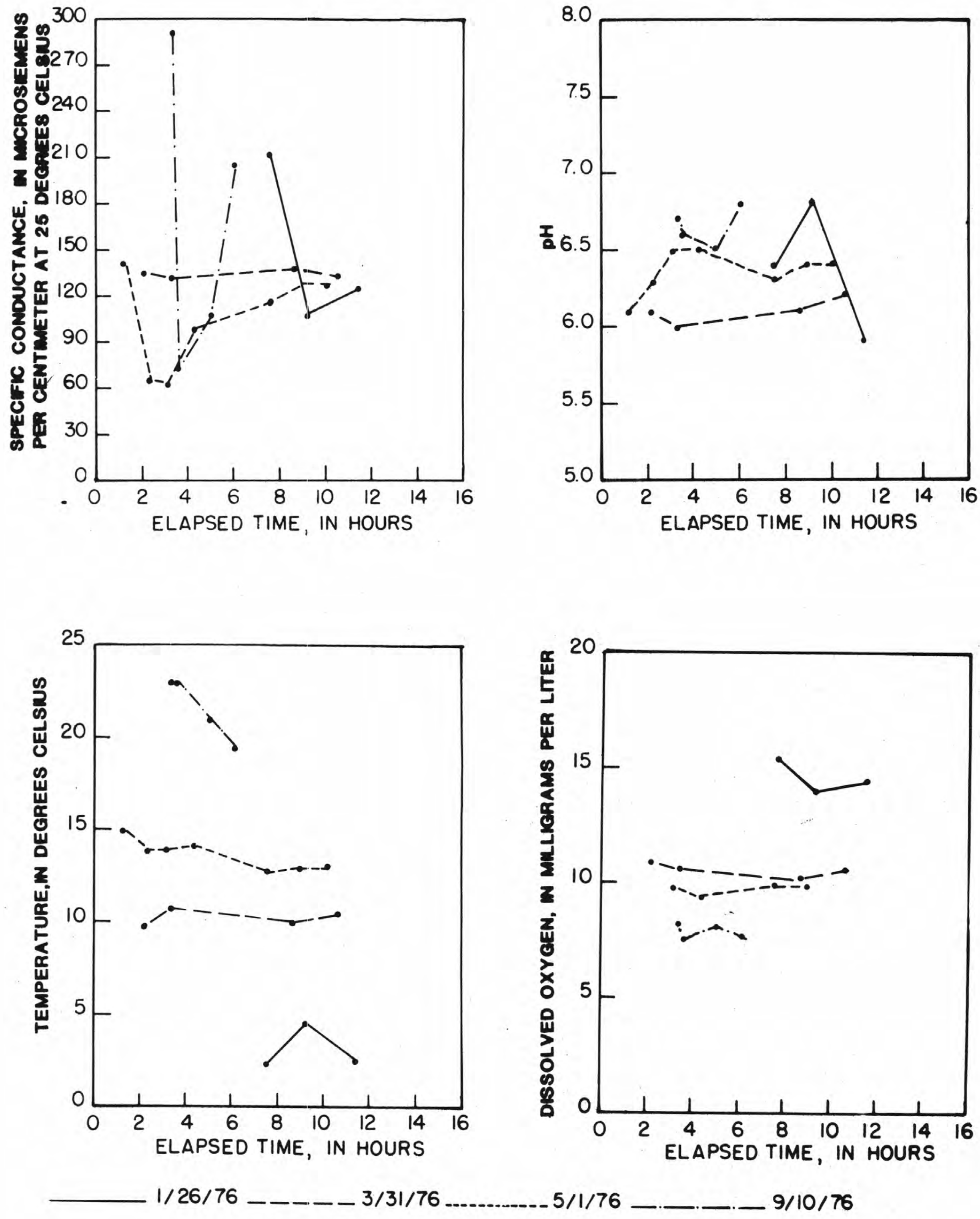

Figure 7.--Specific conductance, pH, temperature, and dissolved oxygen hydrographs for storms at Mill Creek tributary at bridge on Northampton Drive at Willingboro, N.J. (site W-3).

15.4 mg/L at site W-3 during the January, 1976, storm. A minimum value of 4.5 mg/L was recorded at site W-6 during the November low-flow sampling.

pH

The pH values maintained fairly narrow ranges of between 6.0 and 7.5 (figures 5, 6, and 7) at all sites during all storms with the exception of the first few hours of the January 26, 1976, storm. In this instance the pH values started at 10.1 at site W-6, 9.9 at site W-4, 9.7 at site W-9, and 8.8 at site W-1. Within an hour the pH at all these sites, which are located on the main stem of Mill Creek, had dropped to between 6.5 and 7.0 and remained fairly stable throughout the remainder of the storm. The pH at all sites on the tributaries to the main stem was less than 7 during this storm. The pH at each of the main stem sites was smaller at each subsequent site downstream. Therefore, the higher pH values probably originated in the water from the predominantly agricultural area upstream of site W-6, but the specific cause of the higher pH values could not be determined.

All other pH values measured during the period of study remained stable, ranging from 5.5 to 7.7.

Specific Conductance

Specific conductance is a measure of the total ionic concentration in a solution. Most of the ionic concentration consists of sodium, potassium, calcium, magnesium, chloride, and sulfate. Specific conductance, therefore, is a useful indicator for this group of elements sometimes called the "common inorganics."

Specific conductance values at site W-1 dropped significantly during each storm. Decreases in conductivity as storms progressed at sites W-3 and W-6 were less than at site W-1 (from 50 to 600 µS/cm per storm at site W-1, 60 to 280 µS/cm per storm at site W-3, and 230 to 360 µS/cm per storm at site W-6). Plots of conductivity during storms at sites W-1, W-6, and W-3 are presented in figures 5, 6, and 7, respectively.

Measured extremes of specific conductance ranged from 32 umhos at site W-9, as a low-flow background sample prior to the storm sampling of August 9, 1976, to 1,164 µs/cm at site W-5, also a background sample prior to the September 10, 1976, storm. The maximum values, recorded at sites W-2 (1,034 µS/cm), and W-5 (1,164 µS/cm), were considerably higher than the maximum values at the other sites. These high values occurred at the onset of the September 10, 1976, storm. Their origins were within the W-2 and W-5 drainage basins because the two respective upstream sites, W-8 and W-7, had maximum conductivity values of 235 and 300 µS/cm. No explanation for the source of these high values was evident. Measured extremes of conductance are presented in tables 16 through 24 in the appendix.

Sediment.

Suspended sediment is often the most visible component of storm runoff entering a stream and is commonly the dominant constituent carried by the stream. Suspended sediment consists mostly of fragmental material originating from weathering of rocks, but chemical precipitates, metals, and nutrients may be adsorbed onto the sediment particles from the water. The volume and chemical composition of the sediment load can be greatly influenced by the amount of industrialization and urbanization in the drainage basin.

Suspended sediment in the streams within the Mill Creek basin originates from an area where land use has stabilized. Much of the initial stabilization of the residential area of Willingboro was hastened by the use of indigenous topsoil for landscaping shortly after construction in the area was completed.

Suspended-sediment concentrations increased greatly during storm runoff. Minimum concentrations measured at the nine sampling sites during base flow ranged from 0 mg/L at site W-6 in late September to 8 mg/L at site W-1 (tables 18 through 26). This latter value appeared to be caused partially by the contribution of suspended material from the water-treatment plant just upstream. The large amount of fine-grained reddish material coating the streambed downstream from the filtration plant and the chemical data collected on November 11, 1976 (table 9) supports this observation.

Table 9.--Chemical analyses, in micrograms per gram, of bottom material at site W-1 and the water-treatment plant on November 11, 1976

Constituents	Bottom material from site W-1		Water-filtration plant settling pond	Streambed downstream from filtration plant
	Sample 1	Sample 2		
Arsenic	1	1	3	1
Iron	7,200	4,400	56,000	41,000
Manganese	3,000	1,500	12,000	6,300
Lead	<10	<10	<10	<10
Zinc	30	30	60	10

Iron and manganese concentrations in the bottom material from the settling pond at the water-treatment plant were 56,000 µg/g (micrograms per gram) and 12,000 µg/g, respectively. In the small waterway leading from the holding pond to Mill Creek the iron and manganese concentrations in the bottom material were 41,000 and 6,300 µg/g, respectively. Two samples (samples 1 and 2) of bottom material at sampling site W-1 had iron concentrations of 7,200 and 4,400 µg/g and manganese concentrations of 3,000 and 1,500 µg/g. Thus, part of the suspended load downstream from the filtration plant consisted of hydrated oxides of iron and manganese and possibly other material precipitated during the water-treatment process.

The amount of suspended matter from the treatment plant did not increase significantly during the storms. However, the turbulent action of the stream during storms did stir up some of the fine-grained material in the streambed, which resulted in higher suspended-sediment concentrations at sampling site W-1. This did not occur at the other sites because the streambeds consisted of mostly coarse sands, pebbles, and boulders.

Maximum suspended-sediment concentrations measured during storms ranged from 369 mg/L at site W-3 to 2,390 mg/L at site W-5. Maximum loads ranged from 44.2 kg/h at site W-7 to 6,580 kg/h at site W-5.

During the period of study the mean suspended-sediment concentration for the study area was 92 mg/L. The residential area had a mean concentration of 95 mg/L, and the nonresidential area had a mean concentration of 89 mg/L. The corresponding mean suspended-sediment loads for these areas were 2,580, 1,190, and 1,390 kg/d, respectively. The mean load for the study area was equaled or exceeded about 13 percent of the time (table 25). The relationship and expected frequency of occurrence of suspended sediment load to discharge for the study area is shown in figure 8.

The nonresidential area contributed 54 percent of the suspended sediment load of the study area. The unit area load of 101 $(kg/d)/km^2$ for the nonresidential area was less than the 120 $(kg/d)/km^2$ for the residential area. Subbasin W-6 supplied 67 percent of the nonresidential basin sediment load or 36 percent of the total study area sediment load.

Inorganic Constituents

The computed mean loads of the common inorganic constituents, chloride, sulfate, sodium, calcium, magnesium, and potassium indicate that these six constituents composed most of the chemical load in Mill Creek. The results of analyses on both filtered and unfiltered samples are recorded in the tables; however, the discussion of each of these constituents, with the understanding that each constituent was practically all dissolved, is based on the whole sample concentration. The common inorganics

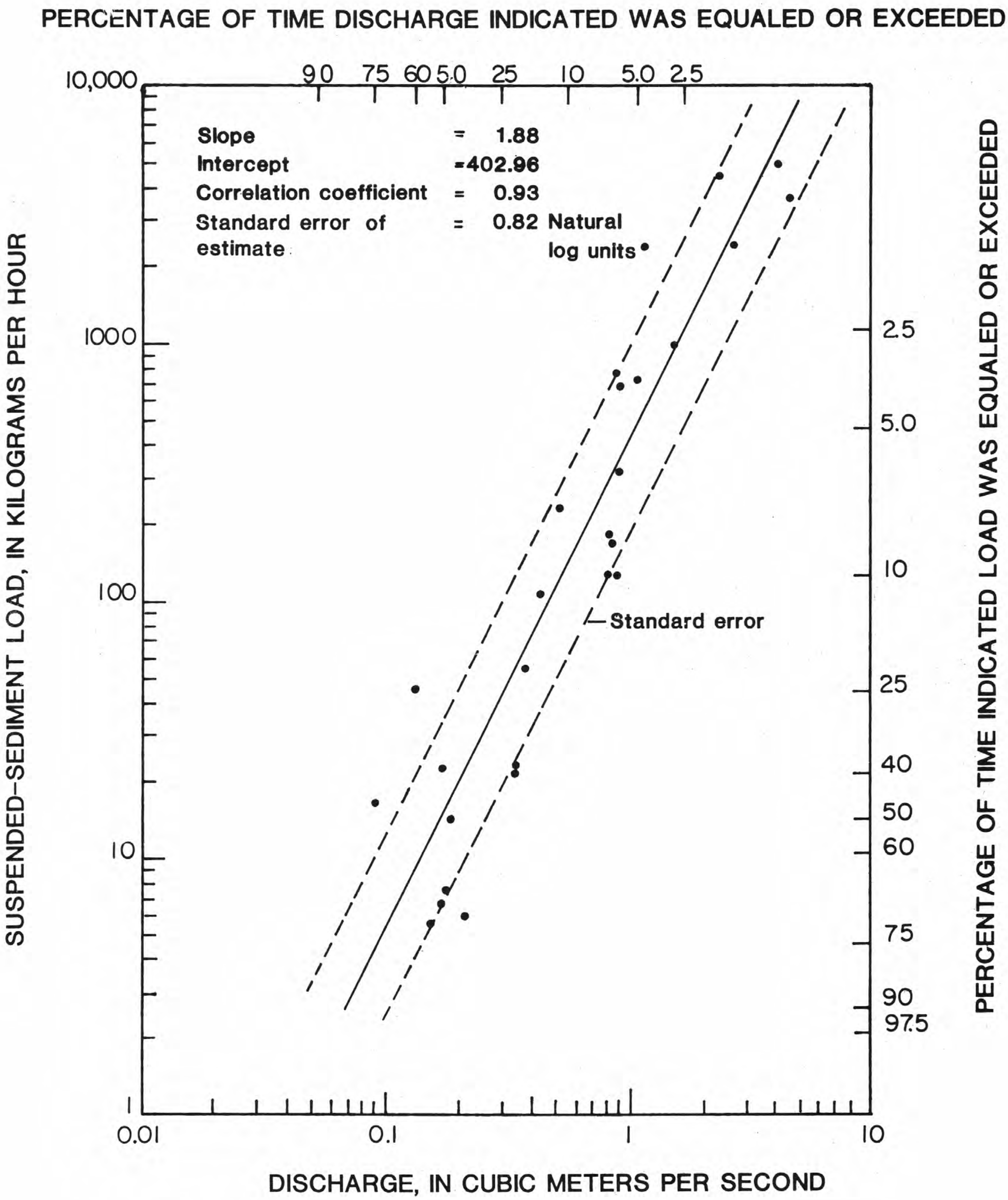

Figure 8.--Regression graph of suspended sediment load versus discharge for Mill Creek at bridge on Levitt Parkway at Willingboro, N.J. (site W-1).

comprised about 61 percent of the dissolved-solids load. The measured extremes of concentration and load for the common inorganics and the other chemical constituents are summarized in tables 16 to 24 in the appendix. The computed mean concentrations and loads are presented in tables 7 and 8 and constituent-load durations are summarized in tables 25 to 62 in the appendix.

Chloride

The composite chloride concentration for the Mill Creek basin, as measured at site W-1, ranged from 8.7 to 140 mg/L. The corresponding loads were 11.6 to 431 kg/h. Within the study area concentrations ranged from 2.6 mg/L at site W-3 to 290 mg/L at site W-5, and loads ranged from 0.012 kg/h at site W-7 to 431 kg/h at W-1.

The mean load and concentration for chloride were 804 kg/d and 28.5 mg/L for the total study area, 285 kg/d and 22.7 mg/L for the residential area, and 519 kg/d and 33.2 mg/L for the nonresidential area. The nonresidential area contributed dissolved chloride at a rate of 37.7 $(kg/d)/km^2$; whereas the residential area contributed at a rate of 28.7 $(kg/d)/km^2$. Fifty-nine percent of the chloride load was from the W-6 subbasin.

The runoff from the residential area during the January 1976 storm produced substantially higher concentrations of sodium and chloride in the stream than any other storm during the study. These high concentrations, however, decreased rapidly as the storm progressed. The most likely source of this excess sodium and chloride is road salt applied during snow and freezing rain on January 24 and 25 prior to the storm sampling on January 26 and 27.

In New Jersey, the salt applied to highways is a five to one mixture of sodium chloride and calcium chloride. The high ratio of sodium to calcium in the mixture may explain why there was no unusual concentration of calcium in the stream during the winter.

Sulfate

Composite sulfate concentrations at site W-1 ranged from 15.0 to 42 mg/L. The minimum concentration was 4.6 mg/L at site W-5, and the maximum concentration was 59 mg/L at site W-7. The calculated mean concentration for the study area was 26.7 mg/L; the residential area mean was 25.1 mg/L; and the nonresidential mean was 27.9 mg/L.

The composite loads at W-1 ranged from 3.64 to 245 kg/h. The study area minimum sulfate load was 0.0047 kg/h at site W-7, and the maximum load was 245 kg/h at site W-1. The mean sulfate loads were 751 kg/d for the study area, 314 kg/d for the residential area and 437 kg/d for the nonresidential area. The study area mean load was equaled or exceded 25 percent of the time. Both the residential and nonresidential areas contributed sulfate at the rate of 31.7 $(kg/d)/km^2$. Forty-six percent of the sulfate load originated in the W-6 subbasin.

Sodium

Sodium was the most prevalent cation in Mill Creek and had a composite range at site W-1 of 5.0 to 79 mg/L. The minimum concentration was 1.0 mg/L at site W-5, and the maximum was 180 mg/L, also at site W-5.

The composite sodium load at site W-1 ranged from 7.34 to 261 kg/h. Within the study area, loads ranged from 0.004 kg/h at site W-7 to 391 kg/h at site W-9.

The computed mean sodium load was 513 kg/d and the mean concentration was 18.2 mg/L. The mean load and concentration for the major residential subbasin were 185 kg/d and 14.8 mg/L, respectively, and for the nonresidential area they were 328 kg/d and 21.0 mg/L, respectively. The nonresidential area contributed sodium at a rate of 23.8 $(kg/d)/km^2$ and the residential area at a rate of 18.6 $(kg/d)/km^2$. Sixty percent of the total sodium load came from the primarily agricultural subbasin W-6.

Calcium

Calcium was the second most prominent cation in the study area and ranged in concentration at site W-1 from 9.0 to 34 mg/L. Within the study area calcium concentrations ranged from 2.7 to 37.0 mg/L. Both of these values were recorded at site W-5.

The composite calcium loads at site W-1 ranged from 3.81 to 127 kg/h. The minimum calcium load was 0.017 kg/h at site W-7, and the maximum load was 137 kg/h at site W-9.

The mean calcium load for the study area was 425 kg/d, a value that was exceeded 25 percent of the time. The residential area contributed calcium approxiately twice the rate [24.2 $(kg/d)/km^2$] of the nonresidential area [13.4 $(kg/d)/km^2$].

Magnesium

The composite concentrations of magnesium at site W-1 ranged from 3.0 to 10.0 mg/L. The minimum concentration was 0.8 mg/L, and the maximum concentration was 11.0 mg/L, both recorded at site W-7.

The minimum magnesium load (0.042 kg/h) was recorded at site W-3. The maximum load for the residential area (44.0 kg/h) was at site W-9.

The mean magnesium load was 157 kg/d and was exceeded 27 percent of the time.

The residential area had a mean load of 66 kg/d and the nonresidential area contributed a mean load of 91 kg/d or 58 percent of the study area load.

Potassium

The minimum composite potassium concentration at site W-1 was 2.2 mg/L. The maximum concentration was 5.6 mg/L. The minimum potassium concentration within the study area was 1.6 mg/L recorded at site W-2, and the maximum concentration was 7.7 mg/L at site W-5.

Composite potassium loads at site W-1 ranged from 0.74 to 31.6 kg/h. The minimum potassium load for the study area was 0.01 kg/h at site W-7. The maximum load was 36.7 kg/h at site W-9.

Mean potassium concentrations were 3.76 mg/L for the study area, 3.38 mg/L for the residential area and 4.07 mg/L for the nonresidential area.

Mean potassium loads were 106 kg/d for the study area, 42.3 kg/d for the residential area and 63.7 kg/d for the nonresidential area. The study area mean load was equaled or exceeded 25 percent of the time. The nonresidential area supplied potassium at a unit area rate of 4.62 $(kg/d)/km^2$ and the residential area at a rate of 4.26 $(kg/d)/km^2$. Forty-nine percent of the total potassium load was from the W-6 subbasin.

Nutrients

Nitrate, nitrite, organic nitrogen, ammonia, and phosphorus are called nutrients because they are essential for growth of plants and animals. Excessive concentrations of one or more of these can have adverse effects on a stream and any lake or estuary fed by the stream.

On a storm-by-storm basis, the highest maximum concentrations for both nitrate and phosphorous were measured at sites W-7 and W-8, which monitored two active agricultural subbasins. These data indicate favorable conditions for plant growth in the stream channels. Inspections of the streambed during late summer and early fall indicated large amounts of plant life that created shifts in stage-discharge relationships at sites W-5 and W-2.

Nitrate

The nitrate data indicate that most of the nitrate in Mill Creek was dissolved. The following discussion is based on whole sample concentration.

None of the nitrate-nitrogen (N) concentrations measured in this study exceeded the EPA criteria of 10 mg/L for domestic water supplies (U.S. Enviornmental Protection Agency, 1976). With the exception of sites W-3, W-7, and W-8, the maximum nitrate concentration was 3.3 mg/L. The composite concentrations at site W-1 ranged from 0.54 to 1.9 mg/L. Concentrations within the study area ranged from 0.24 mg/L at site W-3 to 8.8 mg/L at site W-8. The mean nitrate concentrations were 1.22 mg/L for the study area, 1.04 mg/L for the residential area and 1.37 mg/L for the nonresidential area.

The study area composite loads for nitrate at site W-1 ranged from 0.397 to 68 kg/h. Nitrate loads within the study area ranged from 0.004 kg/h at site W-7 to 26.4 kg/h at site W-9. The study area produced a mean total nitrate load of 34.5 kg/d, with the nonresidential area contributing at a unit area rate of 1.56 (kg/d)/km^2 and the residential area at a rate of 1.31 (kg/d)/km^2. The study area mean load was equaled or exceeded 28 percent of the time.

Nitrite

The nitrite data also indicate that all nitrite in Mill Creek was dissolved.

The recommended maximum concentration of nitrite in streams is 1 mg/L (U.S. Environmental Protection Agency, 1976). None of the nitrite values measured in this study exceeded this value. The maximum nitrite concentration recorded was 0.18 mg/L at site W-7. The composite nitrite concentrations at site W-1 ranged from 0.02 to 0.09 mg/L. The minimum nitrite concentration within the study area was 0.01 mg/L at sites W-2, W-3, W-5, and W-7.

The calculated mean nitrite concentrations were 0.07 mg/L for the study area, 0.06 mg/L for the nonresidential area, and 0.08 mg/L for the residential area.

Instantaneous composite nitrite loads at site W-1 ranged from 0.0183 to 0.479 kg/h for total nitrite. The minimum nitrite load was 0.0001 kg/h at site W-7, and the maximum load was 0.479 kg/h at site W-1.

The study area mean dissolved nitrite load was 1.18 kg/d. This value was equaled or exceeded 24 percent of the time. The mean nitrite load from the nonresidential area was 0.89 kg/d and from the residential area, 0.98 kg/d. The residential area contributed dissolved nitrite at a unit area rate value of 0.07 (kg/d)/km^2, whereas the nonresidential rate was only 8.03 (kg/d)/km^2.

Organic Nitrogen

Organic nitrogen and ammonia are reduced forms of nitrogen, which in a natural environment are usually the end products of animal metabolism. Organic nitrogen is usually in the form of an amino group attached to some organic molecule. Under oxidizing conditions, some of this organic nitrogen can be released as an ammonium ion which, in turn, can be oxidized to nitrite and nitrate when acted upon by nitrifying bacteria.

Dissolved organic nitrogen concentrations at site W-1 range from 0.25 to 1.2 mg/L, and total organic nitrogen ranged from 0.47 to 2.1 mg/L. The study area mean concentrations for dissolved and total organic nitrogen were 0.63 and 0.88 mg/L, respectively. The corresponding concentrations for the nonresidential area were 0.74 and 1.16 mg/L, and for the residential area the values were 0.49 and 0.53 mg/L.

Loads for dissolved and total organic nitrogen ranged from 0.0087 to 4.89 kg/h, and 0.193 to 12.7 kg/h, respectively, at site W-1. Measured minimum loads were 0.0 kg/h for both dissolved and total nitrogen at site W-4, while the maximum loads were 6.55 kg/h of dissolved organic nitrogen and 13.3 kg/h total organic nitrogen, both recorded at site W-9.

Mean loads of dissolved and total organic nitrogen in the study area were 17.7 and 24.8 kg/d, respectively. These values were equaled or exceeded 22 percent and 20 percent of the time, respectively. The nonresidential area contributed total organic nitrogen at a unit area rate of 1.31 $(kg/d)/km^2$ while the residential area was at a rate of 0.68 $(kg/d)/km^2$. Subbasin W-6 supplied 52 percent of the dissolved organic nitrogen load and 61 percent of total organic nitrogen load in the study area. Seventy-one percent of the organic nitrogen was dissolved and 35 percent of the nitrogen was organic.

Ammonia

Ammonia is a pungent, colorless, gaseous, alkaline compound that is very soluble in water. It is an important compound in biological processes and is produced as a normal biological degradation product from organic nitrogen compounds.

When ammonia dissolves in water, some of the ammonia reacts with water to form ammonium ions. As can be seen from the following equation, an aqueous solution of ammonia in equilibrium contains un-ionized hydrated ammonia ($NH_3 \cdot H_2O$), ionized ammonia (NH_4^+), and hydroxide ions (OH^-).

$$NH_3 + H_2O \rightleftharpoons NH_3 \cdot H_2O \rightleftharpoons NH_4^+ + OH^-$$

The ammonia values represent the sum of the un-ionized and ionized forms of ammonia ($NH_3 + NH_4^+$). The toxicity of an aqueous solution of ammonia is attributed to NH_3 (U.S. Environmental Protection Agency, 1976). The amount of NH_3 present in the solution is dependent upon the concentration of total ammonia, pH, temperature, and ionic strength. An un-ionized ammonia concentration of 0.020 mg/L NH_3 is the EPA criteria for freshwater aquatic life (U.S. Environmental Protection Agency, 1976).

Concentrations and loads for ammonia indicate that most, if not all, of the ammonia in the Mill Creek basin was dissolved. The following discussion is based on whole sample concentration and load values.

Ammonia concentrations ranged from 0.04 to 1.0 mg/L at site W-1. The minimum concentration found in the study area was 0.0 mg/L at sites W-2, W-3, W-5, W-6, W-7, and W-8. The maximum ammonia concentration was 1.3 mg/L at site W-9.

The mean ammonia concentrations were 0.31 mg/L for the study area, 0.20 mg/L for the residential area and 0.40 mg/L for the nonresidential area. The ammonia concentrations indicate that the EPA un-ionized ammonia concentration criteria of 0.02 mg/L was not exceeded under the conditions observed in Mill Creek basin.

Composite ammonia loads measured at site W-1 ranged from 0.019 to 3.07 kg/h. Within the study area the minimum ammonia load was 0.0 kg/h at sites W-2, W-3, W-5, W-6, W-7, and W-8, and the maximum load was 3.19 kg/h at site W-4.

The mean ammonia loads were 8.75 kg/d for the study area, 2.45 kg/d for the residential area and 6.30 kg/d for the nonresidential area. The study area mean load for total ammonia was equaled or exceeded 22 percent of the time. Eighty-six percent of the study area ammonia load came from the nonresidential area. The nonresidential area contributed total ammonia at a unit area rate of 0.46 $(kg/d)/km^2$ and the residential area at a rate of 0.25 $(kg/d)/km^2$. Sixty-five percent of the nonresidential total ammonia load came from the W-6 subbasin.

Phosphorus

The composite concentration of total phosphorus as P at site W-1 ranged from 0.04 to 0.88 mg/L. Dissolved phosphorus at W-1 ranged from 0.01 to 0.18 mg/L. The minimum total phosphorus concentration was 0.01 mg/L at sites W-3, W-5, and W-7, and the maximum concentration was 0.96 mg/L at site W-2. Dissolved phosphorus ranged from 0.0 mg/L at site W-5 to 0.56 mg/L at site W-3.

The mean total phosphorus concentrations for the total study area, residential area, and nonresidential area were 0.24 0.25, and 0.24 mg/L, respectively. The corresponding dissolved phosphorus means were 0.05, 0.03 and 0.07 mg/L, respectively.

The composite loads of dissolved phosphorus as P ranged from 0.007 to 0.57 kg/h, and the total phosphorus loads ranged from 0.025 to 3.41 kg/h. At individual sampling sites, total phosphorus ranged from 0.0001 kg/h at site W-7 to 4.89 kg/h at site W-9. Dissolved phosphorus ranged from 0.0 kg/h at site W-5 to 0.78 kg/h at site W-9.

Mean total phosphorus loads were 6.90 kg/d for the study area, 3.15 kg/d for the residential area and 3.75 kg/d for the nonresidential area. The corresponding dissolved phosphorus means were 1.40, 0.34, and 1.06 kg/d, respectively. The relationship of total phosphorus as P load versus discharge for the study area is shown in figure 9.

The residential area contributed total phosphorus at a unit area rate of 0.32 $(kg/d)/km^2$ while the nonresidential rate was 0.27 $(kg/d)/km^2$. Seventy-two percent of the phosphorus load from the nonresidential area was suspended, 89 percent of the residential area phosphorus was suspended, and 80 percent of the study area phosphorus load was suspended.

Based on "Quality Criteria for Water" (U.S. Environmental Protection Agency, 1976) and "Surface Water Quality Standards for New Jersey" (N.J. Department of Environmental Protection, 1974), suspended phosphorus is present in Mill Creek and its tributaries in excess of the maximum recommended levels. To control biological nuisances, such as excessive plant or animal growth, or possible eutrophication, the EPA and NJDEP recommend that total phosphate as phosphorus should not exceed 0.05 mg/L in any streams at the point where it enters any lake or reservoir. The desired concentration for streams not discharging directly to lakes or reservoirs, such as Mill Creek, is 0.1 mg/L. Mill Creek's mean total phosphorus concentration of 0.24 mg/L would be in violation of the recommended limit at least 80 percent of the time as shown in the load-duration table for total phosphorus (table 37).

Since the phosphorus load discharged by Mill Creek into the Delaware Estuary is small, it does not have an undesirable effect on the estuary. If the Delaware Estuary were to attain a phosphorus concentration greater than the EPA limit of 0.1 µg/L for estuarine waters, then Mill Creek would be considered as one of the contributors to the unsatisfactory phosphorus levels.

Biochemical Oxygen Demand

Biochemical oxygen demand (BOD) is the amount of oxygen required by bacteria to remove organic matter from the water. The data reported are 5-day BOD values and are indicative only of the carbonaceous oxygen demand in the stream.

The study area composite BOD concentrations at site W-1 ranged from 3.6 to 16.0 mg/L. The minimum value within the study area was 0.2 mg/L at site W-8, and the maximum value was 27 mg/L at site W-9. The mean BOD concentration for the study area was 8.98 mg/L, 6.46 mg/L for the nonresidential area, and 12.1 mg/L for the residential area.

Measured BOD loads ranged from 2.2 to 64.8 kg/h at site W-1. The minimum BOD load within the study area was 0.002 kg/h at site W-8, and the maximum load was 88 kg/h at site

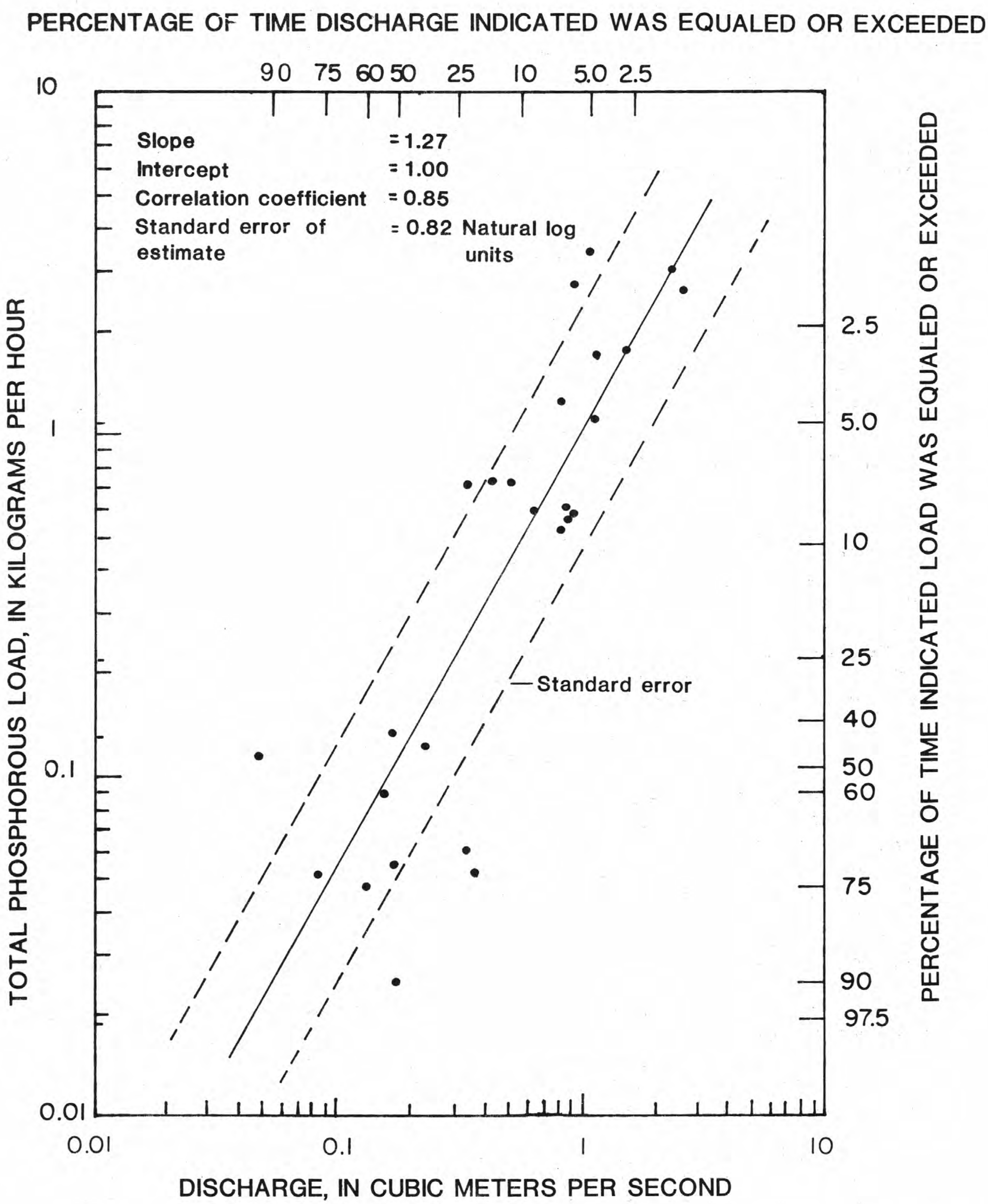

Figure 9.--Regression graph of total phosphorus, as P, load versus discharge for Mill Creek at bridge on Levitt Parkway at Willingboro, N.J. (site W-1).

W-9. The study area had a calculated mean BOD load of 253 kg/d, which was equaled or exceeded 20 percent of the time. The nonresidential area had a mean BOD load of 101 kg/d, and the residential area contributed 152 kg/d.

The mean load of BOD per square kilometer [15.3 $(kg/h)/km^2$] and the mean concentration (12.1 mg/L) for the residential area were two times greater than the corresponding values [7.33 $(kg/h)/km^2$ and 6.46 mg/L] for the nonresidential area.

Chemical Oxygen Demand

Chemical oxygen demand (COD) is a measure of the total amount of oxidizable material present in the water sample. The composite extremes for COD concentrations at site W-1 ranged from 8 to 150 mg/L. The minimum COD concentration in the study area was 1 mg/L, and the maximum concentration was 370 mg/L. Both values were recorded at site W-2. The mean COD concentrations were 33.1 mg/L for the study area, 30.9 mg/L for the residential area, and 34.9 mg/L for the nonresidential area.

The composite loads for COD at site W-1 ranged from 4.28 to 277 kg/h. Both the minimum and maximum loads for COD were recorded at site W-2 with a minimum value of 0.076 kg/h and a maximum value of 792 kg/h. The study area mean COD load was 933 kg/d, which was equaled or exceeded 19 percent of the time. The residential area had a mean COD load of 387 kg/d, and the nonresidential area had a mean load of 546 kg/d; however, the unit area rates were nearly equal with 39.0 $(kg/d)/km^2$ from the residential area and 39.6 $(kg/d)/km^2$ from the nonresidential area.

Organic Carbon

The minimum and maximum composite concentrations for dissolved organic carbon measured at site W-1 were 3.4 and 20 mg/L, respectively. Composite total organic carbon values ranged from 4.4 to 36 mg/L. The minimum concentration recorded within the study area was 0.90 mg/L for both total and dissolved organic carbon at site W-6. The maximum concentration of dissolved organic carbon at site W-1 was 20 mg/L, and the maximum concentration for total organic carbon at site W-2 was 55 mg/L.

The mean concentrations for dissolved organic carbon were 7.99 mg/L for the whole study area, 6.86 mg/L for the residential area, and 8.89 mg/L for the nonresidential area. The corresponding mean concentrations for total organic carbon were 11.5, 9.65, and 12.9 mg/L, respectively.

Study area composite organic carbon loads at site W-1 ranged from 1.39 to 60.3 kg/h for dissolved organic carbon and 2.77 to 118 kg/h for total organic carbon. The minimum dissolved organic carbon load within the study area was 0.008 kg/h, and the minimum total organic carbon load was 0.022 kg/h. Both values were recorded at site W-7. Maximum loads of 80.2 kg/h for dissolved carbon and 225 kg/h for total carbon were measured at site W-9.

The mean total organic carbon loads were 323 kg/d for the study area, 121 kg/d for the residential area and 202 kg/d for the nonresidential area. The corresponding dissolved organic carbon means were 225 kg/d, 86.0 kg/d, and 139 kg/d, respectively. The mean loads of total and dissolved organic carbon for the study area were equaled or exceeded 20 and 22 percent of the time, respectively. The contribution of total and dissolved organic carbon per unit area was greater in the nonresidential area than the residential area. Seventy percent of the organic carbon in the study area was dissolved.

Herbicides

Silvex and 2,4-D were the only herbicides detected in sufficient quantities to compute the relationships between their loads and streamflow. The insecticides, parathion, diazinon, and chlordane were detected, but only sporadically and in trace amounts.

2,4-D

The herbicide 2,4-D had a composite concentration range at site W-1 of 0.0 to 70 μg/L. The minimum 2,4-D concentration within the study area was 0.0 μg/L and was recorded at all sites. The maximum concentration was 130 μg/L at site W-2. The 2,4-D mean concentration was 2.84 μg/L for the study area, 3.99 μg/L for the residential area, and 1.92 μg/L for the nonresidential area.

Loads for 2,4-D ranged from 0.0 g/h at each of the nine sites to 33.5 g/h at site W-1. The mean 2,4-D loads for the study area, residential area, and nonresidential area were 0.08, 0.05, and 0.03 kg/d, respectively. The study area mean load was equaled or exceeded 9 percent of the time. Sixty-three percent of the 2,4-D originated in the residential area. The remaining 2,4-D was from subbasin W-3. Therefore, the primarily agricultural subbasins, W-6, W-7, and W-8, did not contribute any herbicides or insecticides to the streams in Mill Creek basin. The 2,4-D found in the streams in Mill Creek basin was washed off from lawns of homeowners.

The correlation coefficients obtained from the regression of 2,4-D load versus discharge were low (0.62 for W-1, 0.80 for W-3) compared to the other constituents. One possible explanation is that since herbicides are only applied a few months of the year, their occurrence in storm runoff will be sporadic. Perhaps with more extensive data better correlations can be made when the month of the year is considered. The relationship of 2,4-D load versus discharge for the study area is shown in figure 10.

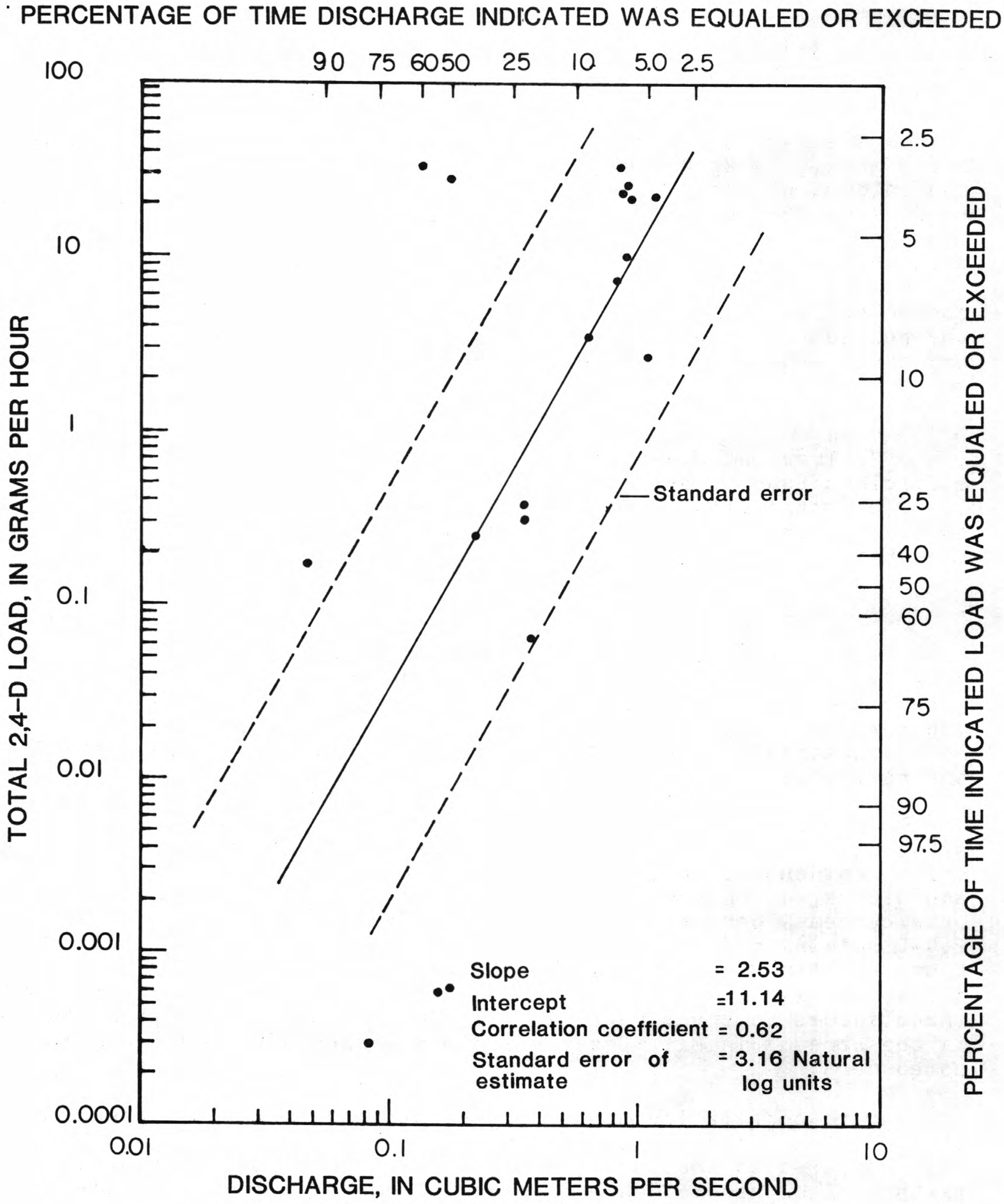

Figure 10.--Regression graph of total 2,4-D load versus discharge for Mill Creek at bridge on Levitt Parkway at Willingboro, N.J. (site W-1).

The 2,4-D concentrations in the Mill Creek basin and the maximum values recorded during storms exceed the recommended EPA limit of 100 µg/L briefly during heavy storms in late spring or early summer (U.S. Environmental Protection Agency, 1976). The 2,4-D concentrations in Mill Creek are 10 percent or less of the recommended EPA limit under most flow conditions.

Silvex

Silvex was distributed similar to 2,4-D. It was detected only at sites within the residential area and subbasin W-3. The minimum silvex concentration of 0.0 µg/L and the minimum load of 0.0 kg/h were recorded at all nine sites within the study area. The composite maximum concentration at site W-1 was 2.10 µg/L and the composite maximum load was 6.21 kg/h. The maximum silvex concentration in the study area was 5.3 ug/L at site W-5, and the maximum silvex load was 6.21 kg/h at site W-1.

The calculated mean silvex concentrations were 0.35 µg/L for the study area, 0.80 µg/L for the residential area, and 0.00 µg/L for the nonresidential area. The corresponding mean loads were 0.01, 0.01, and 0.00 kg/d, respectively. The study area mean load was equaled or exceeded 9 percent of the time.

The above values indicate that silvex in Mill Creek and its tributaries was within the EPA recommended criteria of 10 µg/L under all flow conditions (U.S. Environmental Protection Agency, 1976).

Metals

Eleven metals, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, selenium, and zinc were investigated, but only iron, manganese, lead, zinc, and arsenic were present in sufficient quantities under any flow conditions.

Iron

Iron was the most abundant of the metals found in Mill Creek. The composite dissolved iron concentrations at site W-1 ranged from a minimum of 10 µg/L to a maximum of 2,800 mg/L. Composite concentrations for total iron ranged from 1,400 to 480,000 µg/L at site W-1 contrasted with 830 to 46,000 µg/L at site W-9 just upstream of both site W-1 and the water-treatment plant. Thus, the water treatment plant increased the concentration of suspended iron in this portion of Mill Creek by as much as 434,000 µg/L.

Dissolved iron concentrations for all sites except W-1 ranged from 20 µg/L at site W-3 to 1,200 µg/L at site W-6. Total iron concentrations ranged from 150 µg/L at site W-7 to 46,000 µg/L at site W-9. The mean concentrations for dissolved iron were 281 µg/L for the study area, 228 µg/L for the residential area, and 324 μg/L for the nonresidential area. The corresponding mean concentrations for total iron were 7,240 13,400 and 2,330 μg/L, respectively.

The dissolved iron loads at site W-1 ranged from 6.11 kg/h to 2,110 kg/h, and total iron loads ranged from 884 kg/h to 587,000 kg/h. The study area minimum loads for dissolved and total iron were 0.071 kg/h and 1.12 kg/h, respectively, at site W-7. Except for site W-1, site W-9 had the maximum dissolved and total iron loads (2,640 and 450,000 kg/h, respectively). The computed mean loads for dissolved iron were 7.93 kg/d for the study area, 2.86 kg/d for the residential area and 5.07 kg/d for the nonresidential area. The study area mean dissolved iron load was equaled or exceeded 21 percent of the time. The study area had a mean total iron load of 204 kg/d; the nonresidential area had a mean load of 36.5 kg/d; and the residential area, 168 kg/d. The study area mean total iron load was equaled or exceeded 21 percent of the time. The relationship of total iron load and discharge is shown in figure 11.

Total iron was contributed at a unit area rate of 16.9 $(kg/d)/km^2$ by the residential area and only 2.65 $(kg/d)/km^2$ by the nonresidential area. The dissolved iron rates were 0.29 and 0.37 $(kg/d)/km^2$ for the residential and nonresidential areas, respectively. Four percent of the iron in the Mill Creek basin was dissolved.

The EPA and NJDEP standards for iron concentration in domestic water supplies is 300 μg/L, and for protection of freshwater aquatic life the recommended limit is 1,000 μg/L (U.S. Environmental Protection Agency, 1976; New Jersey Department of Environmental Protection, 1974). The total iron data indicate that suspended iron exceeded the 1,000 μg/L value at least 79 percent of the time. The nonresidential area data also indicate that suspended iron would be a problem in Mill Creek even if the releases of sludge from the water-treatment plant holding pond in the residential area were stopped.

Manganese

Dissolved manganese concentrations at site W-1 ranged from 0.0 to 200 μg/L. Total manganese ranged from 80 to 2,400 μg/L. Within the study area dissolved manganese ranged from 0.0 μg/L at site W-1 to 310 μg/L at site W-5. Total manganese ranged from 20 μg/L at site W-2 to 2,400 μg/L at site W-1. The calculated mean concentrations for dissolved manganese were 79.9 μg/L for the study area, 21.5 μg/L for the residential area, and 127 μg/L for the nonresidential area. The corresponding mean total manganese concentrations were 179, 163, and 191 μg/L, respectively.

The manganese loads at site W-1 ranged from 0.0 to 845 g/h for dissolved manganese, and from 34.6 to 2,940 g/h for total manganese. Study area loads ranged from 0.0 g/h at site W-1 to 1,120 g/h at W-4 for dissolved manganese, and 0.041 g/h at W-7 to

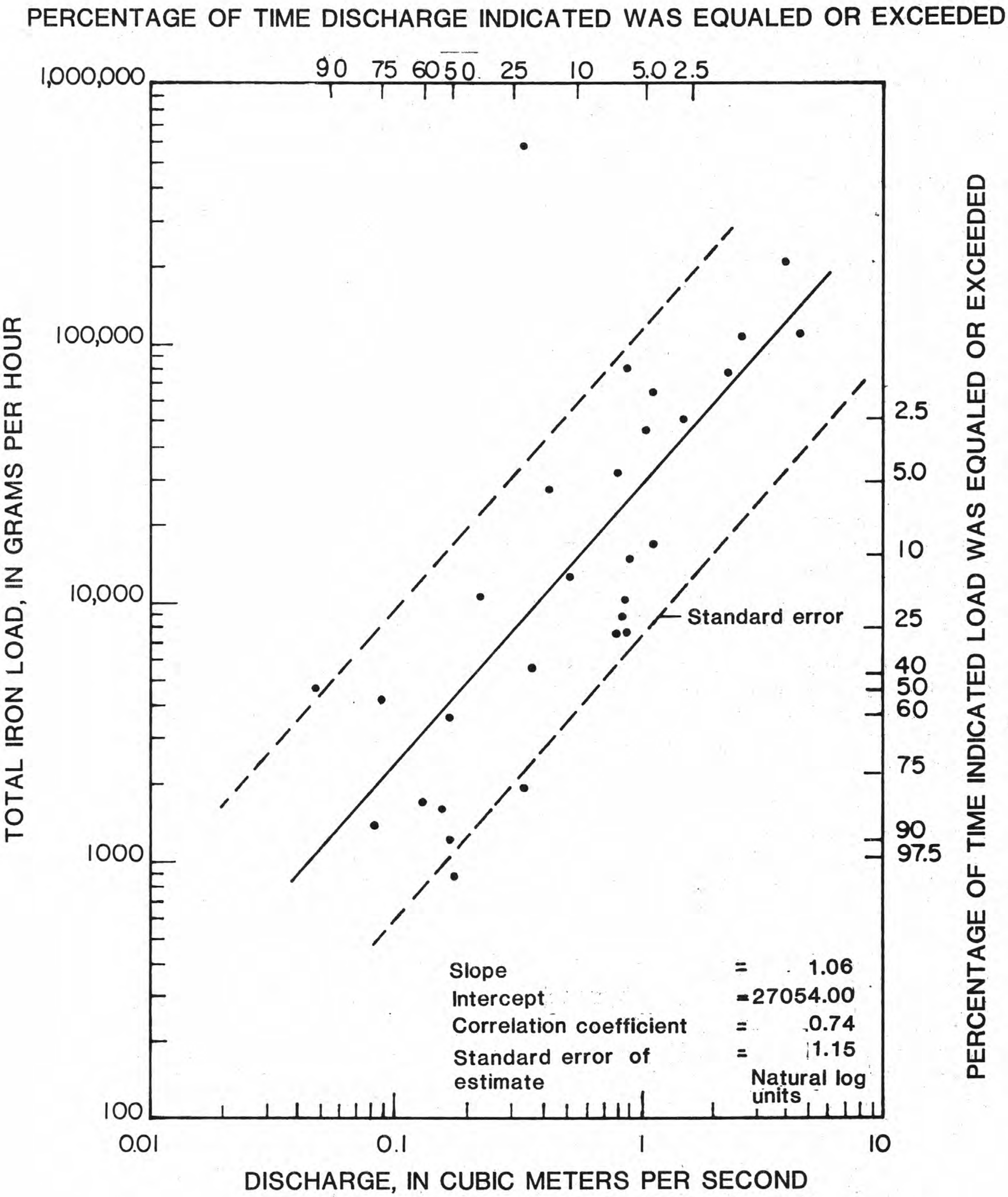

Figure 11.--Regression graph of total iron load versus discharge for Mill Creek at bridge on Levitt Parkway at Willingboro, N.J. (site W-1).

4,790 g/h at site W-9 for total manganese. The mean loads for dissolved manganese were 2.25 kg/d for the study area, 0.27 kg/d for the residential area, and 1.98 kg/d for the nonresidential area. The study area mean dissolved manganese load was equaled or exceeded 26 percent of the time. Eighty-eight percent of the dissolved manganese originated in the nonresidential area. Dissolved manganese was contributed at a unit area rate of 0.14 $(kg/d)/km^2$ for the nonresidential area and 0.03 $(kg/d)/km^2$ for the residential area. Total mean manganese loads were 5.03 kg/d for the study area, 2.04 kg/d for the residential area, and 2.99 kg/d for the nonresidential area. The study area mean total manganese load was equaled or exceeded 21 percent of the time. Forty-five percent of the manganese in the study area was dissolved.

The EPA and NJDEP recommended limit for manganese in domestic water supplies is 50 μg/L (U.S. Environmental Protection Agency, 1976; New Jersey Department of Environmental Protection, 1974). There is no recommended limit for manganese in streams like Mill Creek which are not used for domestic water supplies.

Lead

Composite concentration extremes for lead at site W-1 ranged from 2.0 to 16 μg/L for dissolved lead and 3.0 to 450 μg/L for total lead. Within the study area dissolved lead ranged from 1 μg/L at several sites to 55 μg/L at site W-3, and total lead ranged from 1 μg/L at several sites to 1,000 μg/L at site W-2.

The mean concentrations of dissolved lead were 7.81 μg/L for the study area, 11.2 μg/L for the residential area, and 4.47 μg/L for the nonresidential area. The corresponding mean concentrations of total lead were 72.8, 123, and 32.6 μg/L, respectively.

Lead loads at site W-1 ranged from 1.56 to 84.6 g/h for dissolved lead and from 1.90 to 2,790 g/h for total lead. Within the study area dissolved lead ranged from 0.006 to 157 g/h at site W-7. Total lead ranged from 0.013 g/h at site W-7 to a maximum of 9,390 g/h at site W-9.

Study area mean loads for lead were 0.22 kg/d for dissolved lead and 2.05 kg/d for total lead. These values were equaled or exceeded 19 percent and 17 percent of the time, respectively. The corresponding mean loads for the residential area were 0.14 and 1.54 kg/d, respectively, and for the nonresidential area the mean loads were 0.07 and 0.51 kg/d, respectively. The relationship of total lead load and discharge for the study area is shown in figure 12.

Dissolved lead was contributed at a unit area rate of 0.01 $(kg/d)/km^2$ from both the residential and nonresidential areas. Total lead was contributed at a rate of 0.16 $(kg/d)/km^2$ from the residential area and 0.04 $(kg/d)/km^2$ from the nonresidential area. Eleven percent of the lead in the streams of the Mill Creek basin

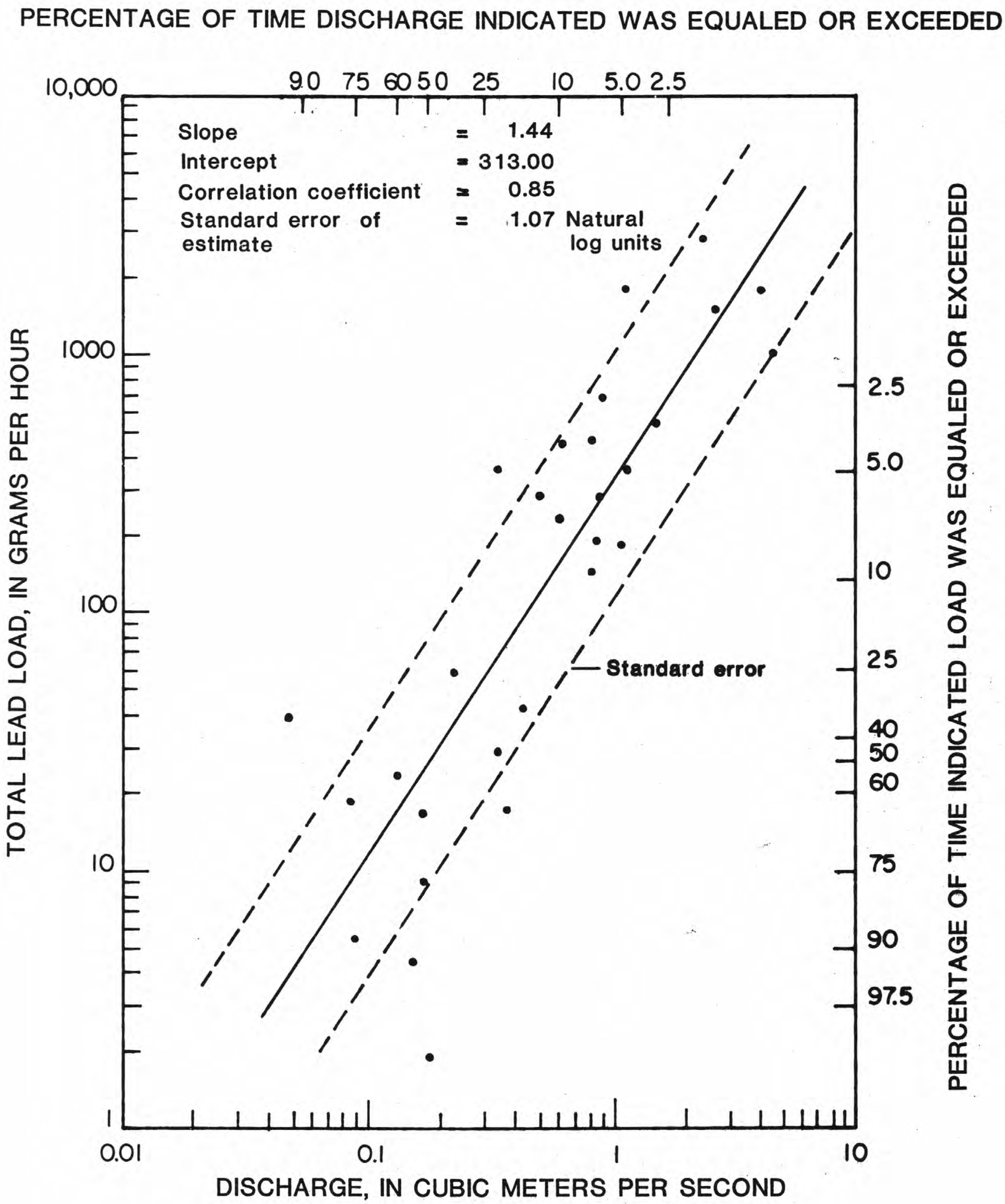

Figure 12.--Regression graph of total lead load versus discharge for Mill Creek at bridge on Levitt Parkway at Willingboro, N.J. (site W-1).

was dissolved. The calculated mean concentration of total lead within the residential area was in excess of 50 µg/L, the EPA limit for domestic water supplies and the NJDEP limit for all waters (U.S. Envirnmental Protection Agency, 1976; New Jersey Department of Environmental Protection, 1974), at least 79 percent of the time.

Zinc

The dissolved zinc concentration for the total study area ranged from 0.0 to 60 µg/L at site W-1. Total zinc ranged from 10.0 to 320 µg/L. Within the study area dissolved zinc ranged from 0.0 µg/L at sites W-1, W-2, W-4, W-7, W-8, and W-9 to 120 µg/L at sites W-3 and W-5. Total zinc concentrations ranged from 10 µg/L at sites W-1, W-2, W-7, and W-8 to 380 µg/L at site W-2.

The computed mean concentrations for dissolved zinc were 16.0 µg/L for the study area, 0.0 µg/L for the residential area, and 28.8 µg/L for the nonresidential area. The corresponding mean concentrations for total zinc were 57.9, 59.8, and 56.3 µg/L, respectively.

Composite dissolved zinc loads at site W-1 ranged from 0.0 to 338 g/h, and total zinc loads ranged from 3.26 to 1,050 g/h. The minimum dissolved zinc load recorded within the study area was 0.0 g/h at sites W-1, W-2, W-4, W-7, W-8, and W-9. The maximum dissolved zinc load was 359 g/h at site W-6. Total zinc loads ranged from 0.01 g/h at site W-7 to 1,050 g/h at site W-1.

The mean dissolved zinc loads were 0.45 kg/d for the study area, 0.0 kg/d for the residential area and 0.45 kg/d for the nonresidential area. Thus, the dissolved zinc originated within the nonresidential area. The mean dissolved zinc load for the study area was exceeded 24 percent of the time. The calculated mean values for total zinc show that the study area had a mean load of 1.63 kg/d; the residential area, 0.75 kg/d; and the nonresidential area, 0.88 kg/d. The mean total zinc load for the study area was equaled or exceeded 19 percent of the time. Although all of the dissolved zinc originated in the nonresidential area, total zinc was contributed at a unit area rate of 0.08 (kg/d)/km^2 in the residential area and 0.06 (kg/d)/km^2 in the nonresidential area.

The limit of zinc in domestic water supplies recommended by the EPA and the NJDEP is 5,000 µg/L (U.S. Environmental Protection Agency, 1976; New Jersey Department of Environmental Protection, 1974). Zinc did not have any adverse effect on the streams in the Mill Creek basin because the maximum zinc concentration was never more than 5 percent of the recommended limit during the period of study.

Arsenic

Dissolved arsenic was present in Mill Creek in insignificant amounts as compared to suspended arsenic and, therefore, will not be discussed. Suspended arsenic had a composite concentration range at site W-1 of 0 to 60 μg/L and a composite load range of 0 to 245 g/h. These values also represent the extremes found within the study area. Concentrations of 0 μg/L and loads of 0 g/h were recorded at all nine sampling sites.

Arsenic had computed mean concentrations and mean loads of 3.90 μg/L and 0.11 kg/d for the study area, 3.19 μg/L and 0.04 kg/d for the residential area, and 4.47 μg/L and 0.07 kg/d for the nonresidential area. The study area mean load of arsenic was equaled or exceeded 17 percent of the time. Sixty-four percent of the arsenic load originated in the nonresidential area, but on a load per unit area basis the contribution was nearly equal with 0.00 (kg/d)/km^2 from the residential and 0.01 (kg/d)/km^2 from the nonresidential area.

The EPA limit for arsenic in domestic water supplies is 50 μg/L (U.S. Environmental Protection Agency, 1976). Arsenic concentrations of up to 100 μg/L are allowed for irrigation of crops (U.S. Environmental Protection Agency, 1976). The NJDEP limit for arsenic in all water is 50 μg/L (New Jersey Department of Environmental Protection, 1974). Arsenic concentrations in excess of 50 μg/L were recorded at sites W-1, W-2, W-5, and W-7. The calculated mean concentrations for the study area, residential area, and nonresidential area were all less than 6 μg/L.

Fecal Coliform Bacteria

Fecal coliform bacteria found in streams indicates recent and possibly dangerous pathogenic contamination (Slack, K. V., Averett, R. C., Greeson, P. E. and Lipscomb, R. G., 1973). The EPA and NJDEP concentration limit for fecal coliform bacteria in water used in "primary contact" is currently 200 colonies/100 mL of water. Results are reported as a log mean based on not less than five samples within a 30-day period (U.S. Environmental Protection Agency, 1976; New Jersey Department of Environmental Protection, 1974). This value is currently under reexamination and may be higher. Fecal coliform bacteria in the Mill Creek basin represented the most severe environmental condition of any constituent investigated in this study. Single sample bacterial concentrations in excess of the 200 colonies/100 mL limit were measured under all flow conditions, including base flow, as shown for sites W-1 and W-6 in figures 13 and 14. Concentrations of less than 200 colonies/100 mL were measured during the winter.

Maximum fecal coliform concentrations were measured during storms, but the magnitude of the concentrations was affected by seasonal changes in water temperature. During the January 26, 1976, storm the maximum bacterial concentration at W-4 was 4,700

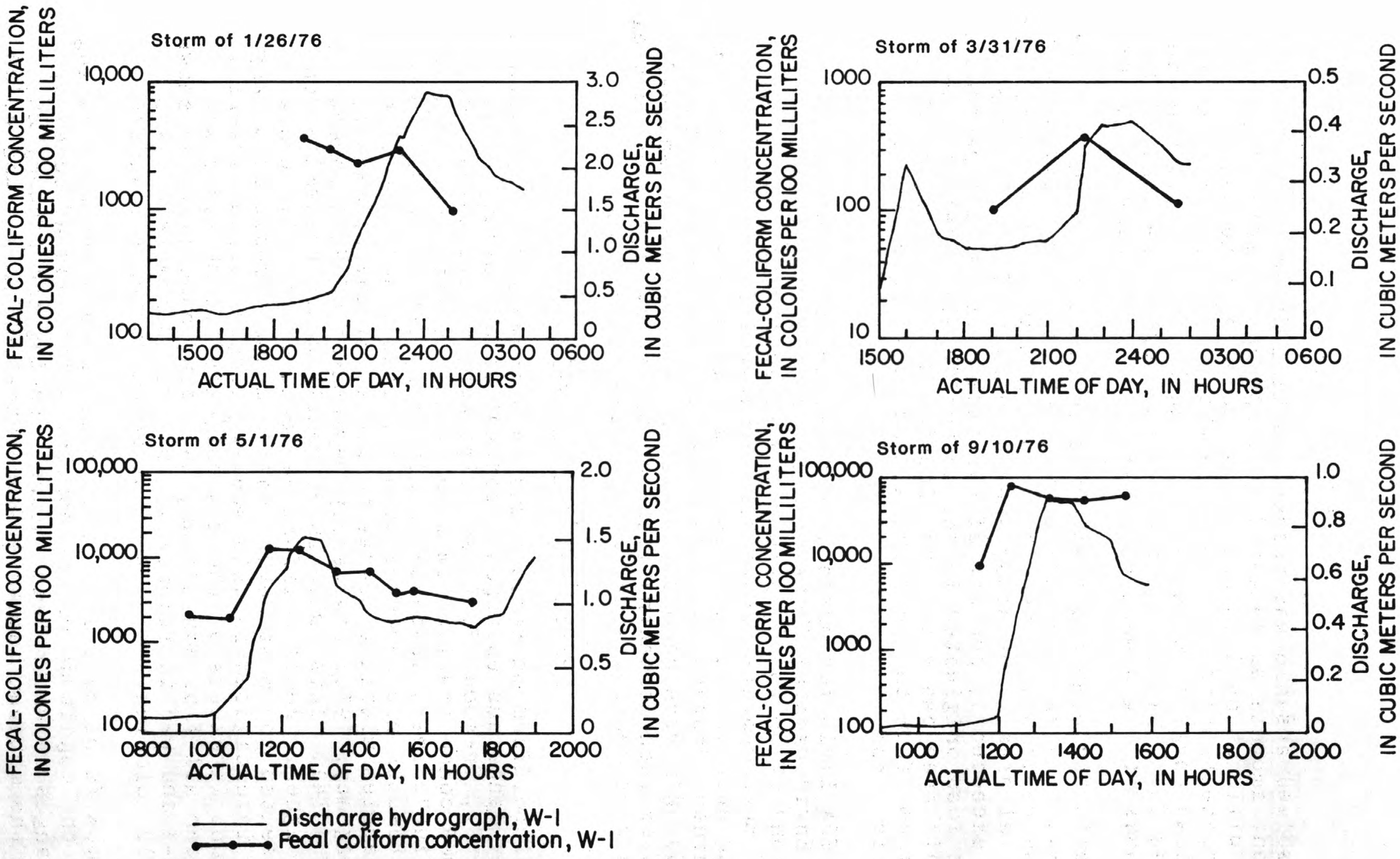

Figure 13.--Graph showing response of fecal coliform bacteria concentration during storms at Mill Creek at bridge on Levitt Parkway at Willingboro, N.J. (site W-1).

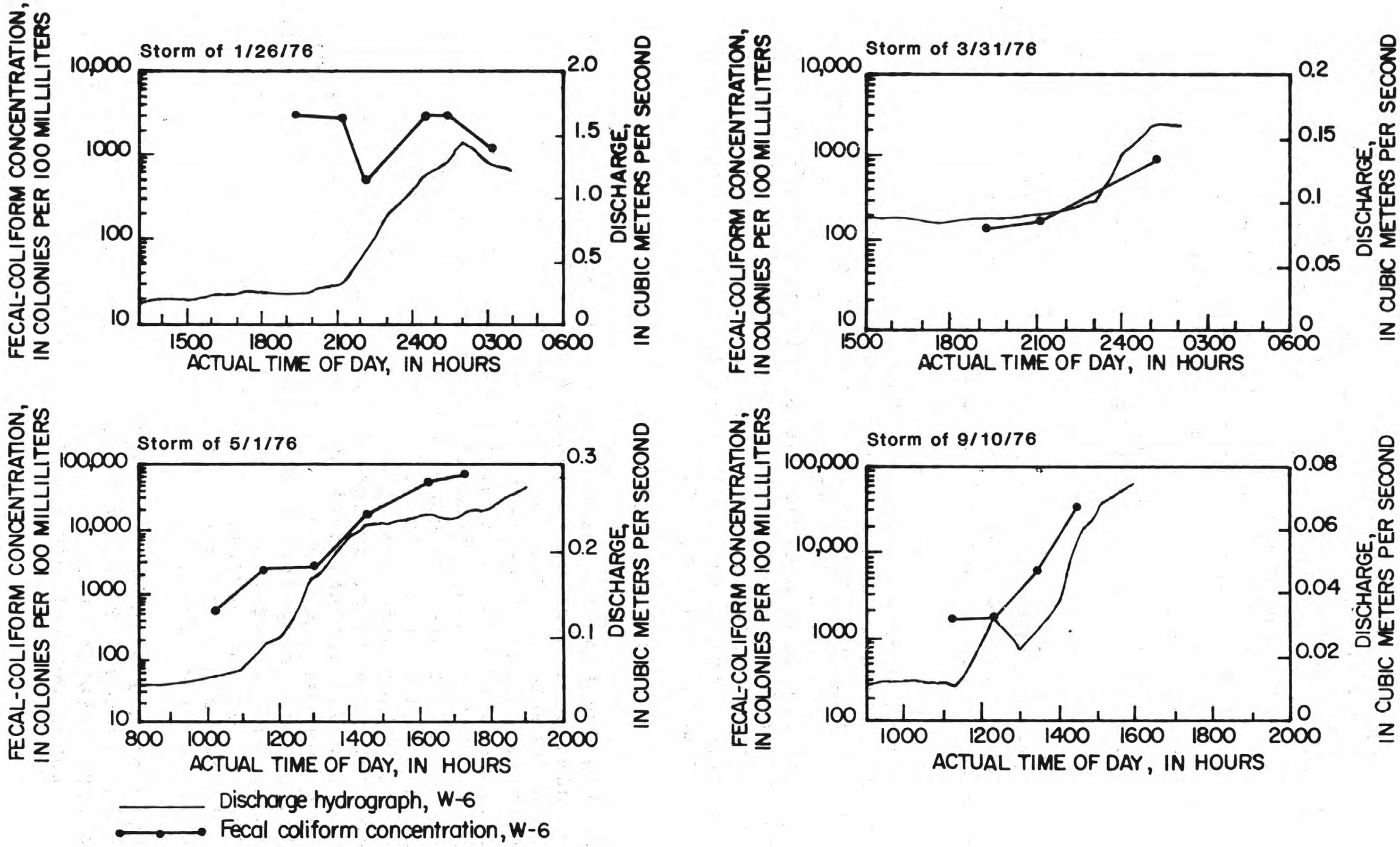

Figure 14.--Graph showing response of fecal coliform bacteria concentration during storms at Mill Creek at bridge on Springfield Road near Willingboro, N.J. (site W-6).

colonies/100 mL (water temperature, 4.1°C); and during the March 31, 1976, storm the bacterial concentration at W-2 was 5,600 colonies/100 mL (water temperature, 10.4°C). During the spring storm of May 1, 1976, the maximum concentration at W-6 was 75,000 colonies/100 mL (water temperature, 12.8°C); and during the September 10, 1976, storm the maximum concentration at site W-7 was 220,000 colonies/100 mL (water temperature, 18.2°C). Table 10 is a summary of the maximum, minimum, and mean bacterial concentrations for each storm. The mean fecal coliform concentrations should not be interpreted as true means, but only as indicators of bacterial density for different seasons of the year.

Attempts to correlate bacteria concentration with streamflow were unsuccessful because of the seasonal effect of temperature on bacteria. Partially, this is because fecal coliforms can survive for only short periods in a cold environment.

The relationship of land use and fecal coliform concentration is difficult to accurately assess because computations of true mean concentrations are not possible. An examination of the fecal coliform data summarized in table 10, however, suggests that land use did not significantly affect the concentration of fecal coliform in the Mill Creek basin. Samples collected within the residential area showed storm concentrations both higher and lower than samples from agricultural areas. The same was true for base-flow samples.

ACCURACY OF RESULTS

Streamflow duration and water-quality constituent duration curves can be used to evaluate the quality of water in a stream. The constituent duration curves used in this report were developed by first obtaining linear or geometric regression equations relating constituent load to streamflow and then using these equations and discharge values from the streamflow duration table to compute the constituent-load duration table. Similar duration curves based on concentration-streamflow regression equations would have greatly increased the effectiveness of the technique, but the concentration-streamflow correlation coefficients were considered too low and inconsistent to be useful. The reason is an inadequate number of samples collected during the storms and the difficulty in obtaining accurate stage-discharge relationships at some sites in the residential area. Also, useful correlations between concentration and streamflow were found for only selected constituents in certain areas during particular times of the year, such as with silvex and 2,4-D.

One hundred and eighty-four regression equations were developed in this study. Sixty-four percent of the correlation coefficients were greater than 0.90, 87 percent were greater than 0.80, and only three percent were less than 0.72.

Table 10.--Fecal coliform concentrations and water temperature during storm and base-flow conditions

	Site W-6	Site W-3	Site W-4	Site W-7	Site W-5	Site W-9	Site W-8	Site W-2	Site W-1
Storm									
1/26/76									
Number of samples	6	3	5	4	2	5	4	5	5
Maximum (colonies/100 mL)	3,000	1,700	4,700	2,000	2,900	1,700	1,200	2,200	3,600
Minimum (colonies/100 mL)	500	630	240	32	150	160	200	490	1,000
Mean (colonies/100 mL)	2,250	1,143	1,496	847	1,526	1,132	6,250	1,738	2,600
Mean water temperature (°C)	4.7	3.2	4.7	8.4	9.4	5.2	5.6	6.5	5.5
3/31/76									
Number of samples	3	4	2	4	2	3	4	3	3
Maximum (colonies/100 mL)	1,000	2,400	200	950	220	480	840	5,600	380
Minimum (colonies/100 mL)	150	130	20	32	20	16	50	90	100
Mean (colonies/100 mL)	483	852	110	270	120	250	505	2,271	197
Mean water temperature (°C)	9.3	10.3	9.8	9.0	10.1	8.8	8.3	10.8	10.2
5/1/76									
Number of samples	6	7	7	6	6	8	6	7	9
Maximum (colonies/100 mL)	75,000	29,000	22,000	18,000	12,000	11,000	16,000	44,000	13,000
Minimum (colonies/100 mL)	550	200	1,100	4,300	4,600	3,900	4,000	4,400	3,400
Mean (colonies/100 mL)	23,975	16,600	6,614	9,867	7,683	6,620	8,133	15,400	6,300
Mean water temperature (°C	12.8	13.7	13.4	12.8	14.7	15.7	13.5	14.8	9.0
9/10/76									
Number of samples	4	4	4	4	5	5	no flow	4	5
Maximum (colonies/100 mL)	34,000	18,000	35,000	220,000	11,000	29,000		75,000	84,000
Minimum (colonies/100 mL)	1,600	1	1,300	38,000	1,000	700		600	9,000
Mean (colonies/100 mL)	10,850	8,750	16,325	72,000	7,360	15,940		34,900	52,400
Mean water temperature (°C)	19.2	21.7	21.2	18.2	21.7	21.5		21.6	21.0
Base-flow conditions									
11/7/75									
Concentration (colonies/100 mL)	220	100	110	2,800	120	260	50	420	400
Water temperature (°C)	14.9	15.7	14.9	17.9	17.3	14.7	17.2	17.0	15.7
4/26/76									
Concentration (colonies/100 mL)	1,100	1,200	2,800	950	66	670	120	290	760
Water temperature (°C)	13.0	12.2	12.0	12.5	13.0	12.9	13.5	13.3	13.3
8/27/76									
Concentration (colonies/100 mL)	2,300	18,000	6,000	11,000	8,000	11,000	no flow	71,000	24,000
Water temperature (°C)	22.0	23.4	22.5	22.4	23.5	23.0		24.0	23.0

The mean constituent loads and concentrations were computed from the duration curves rather than from the mean of all the grab samples collected during the period of study. Thus, they are based on the expected frequency of occurrence, which is important in the proper management of storm runoff and waste water. Additional streamflow and concentration data should be collected if long-term predictions are needed. Miller (1951) and Colby (1956) state that estimates of mean sediment loads using the flow-duration method based on years of greater than 90 percent of mean discharge should produce results with a maximum error of 20 percent. The mean discharge determined by the flow-duration method for stations W-1 and W-6 produced errors of 3 percent and 1 percent, respectively, when compared with the mean discharge determined from gage-height records. There is no way of determining whether streamflow durations for the future will deviate from those determined for the period of study. Therefore, the linear and geometric relationships determined for discharge and constituent loads should not be used as absolute equations to obtain instantaneous values, but can be used in computing mean loads and mean concentrations from short-term records.

SUMMARY

The quality of water in Mill Creek is affected by ground-water inflow during base flow and surface runoff during storms. Periodic accidental releases from the sludge holding pond at the water treatment plant in the downstream end of the study area also affects the quality of the water. Discharge from this holding pond is the only significant point source in the basin, but it should be eliminated when the treatment plant implements a closed system for cycling the sludge materials.

Suspended sediment and 85 chemical constituents, which include both total and dissolved analyses for many constituents, were measured during base-flow and storms. However, only 38 constituents were detected in amounts significant enough to be reported. Good correlations between constituent load and discharge permitted the computation of a load duration curve for each consituent which made it possible to compute a mean load and mean concentration under all conditions of streamflow.

Runoff from the nonresidential part of the study area in the upstream part of the drainage basin had a more significant impact on stream quality than did the runoff from the residential area. The nonresidential area contributed 27 constituents with a higher mean load per day than the residential area, 21 with a higher load per unit area, 28 with a higher percentage of the total study area load, and 25 with a higher mean concentration. Included in this list are all the nutrients except nitrite, most of the common inorganics, sediment, and organic carbon. Only total and dissolved calcium, nitrite, lead, BOD, suspended iron, 2,4-D, and silvex had greater mean loads and concentrations contributed by the residential area.

Fecal coliform bacteria affected the quality of water in the Mill Creek basin more than any other constituent measured. Even during base flow, bacteria was in excess of the 200 colonies/100 mL limit recommended by the EPA and NJDEP by as much as two orders of magnitude. During storms, fecal coliform exceeded 100,000 colonies/100 mL. Land use did not seem to influence the bacteria populations since storm samples from the residential area had concentrations greater than, as well as less than, samples from primarily nonresidential areas. Other than limiting domestic animal wastes and increasing street cleaning, abatement of bacteria is probably not practical because specific sources of the bacteria have not been identified and the distribution of the bacteria throughout the study area appeared to be uniform.

High suspended-iron concentrations and loads were indigenous to all parts of the study area and exceeded the EPA recommended limit of 1,000 µg/L for aquatic life in streams more than 79 percent of the time. Occasional releases of suspended iron from the water treatment plant in the lower part of the drainage basin increased the naturally occurring high concentrations of suspended iron in the water and bottom material. Mill Creek and its tributaries will still have naturally occurring suspended iron concentrations above recommended limits even after the new sludge-removal procedure at the water treatment plant has been implemented. Additional abatement of suspended iron would probably be impractical, if not impossible.

Eighty-nine percent of the lead in the streams of the Mill Creek basin was suspended and 75 percent of the suspended lead originated in the residential area resulting in concentrations that exceeded the EPA and NJDEP recommended limit of 50 µg/L at least 79 percent of the time.

The mean concentration of suspended phosphorus (as P) was about two times greater than the recommended limit of 0.1 mg/L in all parts of the study area and this condition persisted at least 80 percent of the time. However, the mean concentration of dissolved phosphorus was well within the limit throughout the basin. The 2,4-D concentrations were in excess of the recommended limit of 100 ug/L and were detected in only a few samples in the late spring and early summer when homeowners were working on their lawns. The mean concentration, however, was less than 4 percent of the limit. Silvex was within the 10 µg/L limit established by EPA, but unlike 2,4-D, was restricted to the residential area.

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APPENDIX

(Tables 11-62)

Table 11.--Regression statistics for constituent loading versus discharge for Mill Creek at Levitt Parkway at Willingboro (W-1)

Dependent variable	Type of regression	Units	Intercept	Slope	Correlation coefficient	Standard error of estimate for dependent variable
Suspended sediment load	Geometric	kg/h - m^3/s	402.965	1.887	0.930	0.819 Base e log units
Dissolved solids load	Geometric	kg/h - m^3/s	515.196	.874	.916	.398 Base e log units
Total sodium load	Geometric	kg/h - m^3/s	59.010	.853	.722	.854 Base e log units
Dissolved sodium load	Geometric	kg/h - m^3/s	58.774	.851	.721	.854 Base e log units
Total potassium load	Geometric	kg/h - m^3/s	12.807	.918	.938	.353 Base e log units
Dissolved potassium load	Geometric	kg/h - m^3/s	11.578	.904	.952	.303 Base e log units
Total calcium load	Geometric	kg/h - m^3/s	50.172	.885	.956	.270 Base e log units
Dissolved calcium load	Geometric	kg/h - m^3/s	43.501	.778	.948	.271 Base e log units
Total magnesium load	Geometric	kg/h - m^3/s	16.867	.771	.913	.342 Base e log units
Dissolved magnesium load	Geometric	kg/h - m^3/s	14.836	.745	.937	.289 Base e log units
Dissolved chloride load	Geometric	kg/h - m^3/s	92.179	.848	.729	.830 Base e log units
Dissolved sulfate load	Geometric	kg/h - m^3/s	87.555	.870	.950	.296 Base e log units
Total phosphorus load	Geometric	kg/h - m^3/s	1.005	1.273	.851	.820 Base e log units
Dissolved phosphorus load	Geometric	kg/h - m^3/s	.202	1.237	.871	.727 Base e log units
Total nitrate load	Geometric	kg/h - m^3/s	3.389	.672	.910	.305 Base e log units
Dissolved nitrate load	Geometric	kg/h - m^3/s	3.516	.790	.931	.324 Base e log units
Total nitrite load	Geometric	kg/h - m^3/s	.189	.699	.514	1.161 Base e log units
Dissolved nitrite load	Geometric	kg/h - m^3/s	.144	.932	.952	.311 Base e log units
Total nitrogen load	Geometric	kg/h - m^3/s	8.572	.903	.952	.289 Base e log units
Total organic nitrogen load	Geometric	kg/h - m^3/s	3.423	1.144	.915	.501 Base e log units
Dissolved organic nitrogen load	Geometric	kg/h - m^3/s	2.280	1.015	.947	.357 Base e log units
Total ammonia load	Geometric	kg/h - m^3/s	1.134	1.024	.905	.477 Base e log units
Dissolved ammonia load	Geometric	kg/h - m^3/s	1.076	1.274	.905	.624 Base e log units
Biochemical oxygen demand load	Geometric	kg/h - m^3/s	34.212	1.102	.948	.386 Base e log units
Chemical oxygen demand load	Geometric	kg/h - m^3/s	134.647	1.247	.904	.612 Base e log units
Total organic carbon load	Geometric	kg/h - m^3/s	43.207	1.084	.925	.463 Base e log units
Dissolved organic carbon load	Geometric	kg/h - m^3/s	28.539	.990	.941	.371 Base e log units
Total organic carbon load	Geometric	g/h - m^3/s	18.651	1.558	.854	.991 Base e log units
Total iron load	Geometric	g/h - m^3/s	27054.000	1.061	.737	1.145 Base e log units
Dissolved iron load	Linear	g/h - m^3/s	102.338	683.437	.786	361.276 Load units
Total lead load	Geometric	g/h - m^3/s	313.492	1.438	.845	1.067 Base e log units
Dissolved lead load	Geometric	g/h - m^3/s	31.276	1.146	.936	.447 Base e log units
Total manganese load	Geometric	g/h - m^3/s	655.618	1.033	.895	.606 Base e log units
Dissolved manganese load	Geometric	g/h - m^3/s	260.837	.857	.820	.633 Base e log units
Total zinc load	Geometric	g/h - m^3/s	227.112	1.161	.905	.641 Base e log units
Dissolved zinc load	Geometric	g/h - m^3/s	56.067	.942	.856	.606 Base e log units
Total 2,4-D load	Geometric	g/h - m^3/s	11.143	2.535	.619	3.163 Base e log units
Total silvex load	Geometric	g/h - m^3/s	1.373	3.268	.853	1.964 Base e log units

Table 12.--Regression statistics for constituent loading versus discharge for Mill Creek near Willingboro

Dependent variable	Type of regression	Units	Intercept	Slope	Correlation coefficient	Standard error of estimate for dependent variable
Suspended sediment load	Geometric	kg/h - m³/s	873.237	1.952	0.936	0.928 Base e log units
Dissolved solids load	Geometric	kg/h - m³/s	591.346	1.008	.996	.121 Base e log units
Total sodium load	Geometric	kg/h - m³/s	121.468	1.181	.986	.273 Base e log units
Dissolved sodium load	Geometric	kg/h - m³/s	120.697	1.180	.986	.273 Base e log units
Total potassium load	Linear	kg/h - m³/s	-.129	16.776	.992	.825 Load units
Dissolved potassium load	Linear	kg/h - m³/s	-.088	15.876	.993	.754 Load units
Total calcium load	Geometric	kg/h - m³/s	40.641	.939	.976	.223 Base e log units
Dissolved calcium load	Geometric	kg/h - m³/s	36.436	.919	.986	.209 Base e log units
Total magnesium load	Geometric	kg/h - m³/s	18.396	.876	.971	.232 Base e log units
Dissolved magnesium load	Geometric	kg/h - m³/s	13.591	.782	.986	.177 Base e log units
Dissolved chloride load	Geometric	kg/h - m³/s	166.582	1.092	.983	.277 Base e log units
Dissolved sulfate load	Geometric	kg/h - m³/s	93.924	.925	.998	.075 Base e log units
Total phosphorus load	Geometric	kg/h - m³/s	1.228	1.261	.956	.535 Base e log units
Dissolved phosphorus load	Geometric	kg/h - m³/s	.249	1.024	.934	.540 Base e log units
Total nitrate load	Geometric	kg/h - m³/s	3.131	.668	.946	.244 Base e log units
Dissolved nitrate load	Geometric	kg/h - m³/s	3.501	.773	.970	.267 Base e log units
Total nitrite load	Geometric	kg/h - m³/s	.177	.826	.922	.371 Base e log units
Dissolved nitrite load	Geometric	kg/h - m³/s	.138	1.041	.880	.778 Base e log units
Total nitrogen load	Linear	kg/h - m³/s	.926	7.110	.987	.509 Load units
Total organic nitrogen load	Geometric	kg/h - m³/s	2.685	.682	.833	.486 Base e log units
Dissolved organic nitrogen load	Geometric	kg/h - m³/s	3.242	1.100	.910	.692 Base e log units
Total ammonia load	Linear	kg/h - m³/s	-.070	2.213	.995	.087 Load units
Dissolved ammonia load	Linear	kg/h - m³/s	-.060	2.074	.996	.067 Load units
Biochemical oxygen demand load	Geometric	kg/h - m³/s	25.635	1.046	.948	.484 Base e log units
Chemical oxygen demand load	Geometric	kg/h - m³/s	192.059	1.321	.975	.423 Base e log units
Total organic carbon load	Linear	kg/h - m³/s	-.328	49.592	.984	3.623 Load units
Dissolved organic carbon load	Linear	kg/h - m³/s	-.860	38.522	.977	3.386 Load units
Total organic carbon load	Geometric	kg/h - m³/s	24.577	1.497	.963	.578 Base e log units
Total iron load	Geometric	kg/h - m³/s	14096.600	1.317	.964	.491 Base e log units
Dissolved iron load	Geometric	kg/h - m³/s	1389.978	1.040	.926	.587 Base e log units
Total lead load	Linear	kg/h - m³/s	-2.450	131.657	.923	21.438 Load units
Dissolved lead load	Linear	kg/h - m³/s	.800	10.572	.896	2.146 Load units
Total manganese load	Linear	kg/h - m³/s	-24.635	938.485	.994	37.424 Load units
Dissolved manganese load	Linear	kg/h - m³/s	-30.312	691.068	.962	79.482 Load units
Total zinc load	Geometric	kg/h - m³/s	268.650	1.195	.989	.238 Base e log units
Dissolved zinc load	Geometric	kg/h - m³/s	116.848	1.114	.941	.552 Base e log units
Total 2,4-D load		*** No data ***				
Total silvex load		*** No data ***				

Table 13.--Regression statistics for constituent loading versus discharges for Mill Creek Tributary at Northampton Drive at Willingboro (W-3)

Dependent variable	Type of regression	Units	Intercept	Slope	Correlation coefficient	Standard error of estimate for dependent variable
Suspended sediment load	Geometric	kg/h - m^3/s	2737.900	2.122	0.931	1.098 Base e log units
Dissolved solids load	Linear	kg/h - m^3/s	2.207	231.435	.964	5.365 Load units
Total sodium load	Geometric	kg/h - m^3/s	10.558	.815	.785	.796 Base e log units
Dissolved sodium load	Geometric	kg/h - m^3/s	10.162	.809	.786	.788 Base e log units
Total potassium load	Geometric	kg/h - m^3/s	9.600	.998	.969	.310 Base e log units
Dissolved potassium load	Geometric	kg/h - m^3/s	8.667	.979	.966	.324 Base e log units
Total calcium load	Linear	kg/h - m^3/s	.155	25.758	.990	.277 Load units
Dissolved calcium load	Linear	kg/h - m^3/s	.312	19.771	.967	.441 Load units
Total magnesium load	Geometric	kg/h - m^3/s	8.175	.853	.959	.278 Base e log units
Dissolved magnesium load	Geometric	kg/h - m^3/s	4.774	.748	.911	.419 Base e log units
Dissolved chloride load	Geometric	kg/h - m^3/s	38.190	1.075	.903	.631 Base e log units
Dissolved sulfate load	Linear	kg/h - m^3/s	.762	51.882	.965	1.195 Load units
Total phosphorus load	Geometric	kg/h - m^3/s	3.502	1.553	.880	1.037 Base e log units
Dissolved phosphorus load	Geometric	kg/h - m^3/s	.566	1.241	.778	1.242 Base e log units
Total nitrate load	Linear	kg/h - m^3/s	.015	1.157	.932	.035 Load units
Dissolved nitrate load	Linear	kg/h - m^3/s	.004	2.386	.733	.187 Load units
Total nitrite load	Geometric	kg/h - m^3/s	.243	1.399	.959	.453 Base e log units
Dissolved nitrite load	Geometric	kg/h - m^3/s	.037	.880	.872	.610 Base e log units
Total nitrogen load	Geometric	kg/h - m^3/s	7.142	1.110	.928	.491 Base e log units
Total organic nitrogen load	Geometric	kg/h - m^3/s	3.473	1.084	.865	.694 Base e log units
Disssolved organic nitrogen load	Geometric	kg/h - m^3/s	2.303	1.009	.871	.703 Base e log units
Total ammonia load	Geometric	kg/h - m^3/s	3.430	1.705	.856	1.134 Base e log units
Dissolved ammonia load	Geometric	kg/h - m^3/s	3.057	1.648	.829	1.375 Base e log units
Biochemical oxygen demand load	Geometric	kg/h - m^3/s	25.706	1.062	.869	.748 Base e log units
Chemical oxygen demand load	Linear	kg/h - m^3/s	-1.648	189.120	.946	5.556 Load units
Total organic carbon load	Geometric	kg/h - m^3/s	73.620	1.194	.945	.509 Base e log units
Dissolved organic carbon load	Geometric	kg/h - m^3/s	35.518	1.046	.934	.493 Base e log units
Total organic carbon load	Linear	g/h - m^3/s	-.599	43.062	.937	1.358 Load units
Total iron load	Geometric	g/h - m^3/s	21431.345	1.464	.920	.837 Base e log units
Dissolved iron load	Geometric	g/h - m^3/s	665.039	.972	.823	.831 Base e log units
Total lead load	Geometric	g/h - m^3/s	616.700	1.504	.806	1.480 Base e log units
Dissolved lead load	Geometric	g/h - m^3/s	31.243	1.034	.749	1.132 Base e log units
Total manganese load	Geometric	g/h - m^3/s	704.000	1.157	.946	.528 Base e log units
Dissolved manganese load	Geometric	g/h - m^3/s	565.700	1.153	.906	.665 Base e log units
Total zinc load	Geometric	g/h - m^3/s	360.720	1.140	.935	.580 Base e log units
Dissolved zinc load	Geometric	g/h - m^3/s	362.140	1.218	.949	.496 Base e log units
Total 2,4-D load	Geometric	g/h - m^3/s	205.189	1.623	.796	1.357 Base e log units
Total silvex load	Geometric	g/h - m^3/s	6.771	1.192	.815	.979 Base e log units

Table 14.--Regression statistics for constituent loading versus discharge for Mill Creek tributary No. 2 at Rancocas (W-7)

Dependent variable	Type of regression	Units	Intercept	Slope	Correlation coefficient	Standard error of estimate for dependent variable
Suspended sediment load	Linear	kg/h - m^3/s	-6.485	2812.220	0.842	6.198 Load units
Dissolved solids load	Geometric	kg/h - m^3/s	257.480	.879	.980	.150 Base e log units
Total sodium load	Linear	kg/h - m^3/s	-.022	24.621	.977	.020 Load units
Dissolved sodium load	Linear	kg/h - m^3/s	-.023	24.631	.977	.020 Load units
Total potassium load	Linear	kg/h - m^3/s	.009	20.490	.899	.040 Load units
Dissolved potassium load	Linear	kg/h - m^3/s	.011	18.672	.884	.037 Load units
Total calcium load	Linear	kg/h - m^3/s	.115	33.427	.974	.030 Load units
Dissolved calcium load	Linear	kg/h - m^3/s	.107	23.586	.886	.046 Load units
Total magnesium load	Linear	kg/h - m^3/s	.070	12.084	.962	.013 Load units
Dissolved magnesium load	Linear	kg/h - m^3/s	.050	14.089	.936	.020 Load units
Dissolved chloride load	Linear	kg/h - m^3/s	-.038	64.021	.983	.045 Load units
Dissolved sulfate load	Geometric	kg/h - m^3/s	60.635	.830	.973	.166 Base e log units
Total phosphorus load	Linear	kg/h - m^3/s	-.004	1.929	.887	.003 Load units
Dissolved phosphorus load	Linear	kg/h - m^3/s	0	.193	.766	0 Load units
Total nitrate load	Geometric	kg/h - m^3/s	2.197	.691	.782	.470 Base e log units
Dissolved nitrate load	Geometric	kg/h - m^3/s	2.557	.731	.796	.474 Base e log units
Total nitrite load	Linear	kg/h - m^3/s	0	.328	.943	0 Load units
Dissolved nitrite load	Geometric	kg/h - m^3/s	0	.208	.217	.799 Base e log units
Total nitrogen load	Geometric	kg/h - m^3/s	.967	.465	.764	.212 Base e log units
Total organic nitrogen load	Geometric	kg/h - m^3/s	17.589	1.371	.847	.464 Base e log units
Disssolved organic nitrogen load	Linear	kg/h - m^3/s	0	2.589	.902	.004 Load units
Total ammonia load	Linear	kg/h - m^3/s	-.007	2.389	.979	.001 Load units
Dissolved ammonia load	Linear	kg/h - m^3/s	-.003	1.606	.911	.002 Load units
Biochemical oxygen demand load	Linear	kg/h - m^3/s	-.034	27.859	.881	.057 Load units
Chemical oxygen demand load	Linear	kg/h - m^3/s	-.458	266.120	.787	.814 Load units
Total organic carbon load	Linear	kg/h - m^3/s	-.272	115.415	.909	.201 Load units
Dissolved organic carbon load	Linear	kg/h - m^3/s	-.056	40.932	.944	.054 Load units
Total organic carbon load	Linear	g/h - m^3/s	-.244	98.932	.803	.280 Load units
Total iron load	Geometric	g/h - m^3/s	8435.800	1.107	.564	1.319 Base e log units
Dissolved iron load	Linear	g/h - m^3/s	-1.998	1264.460	.910	2.200 Load units
Total lead load	Geometric	g/h - m^3/s	16.980	.906	.515	1.230 Base e log units
Dissolved lead load	Linear	g/h - m^3/s	.001	10.450	.834	.026 Load units
Total manganese load	Linear	g/h - m^3/s	-1.614	884.300	.934	1.239 Load units
Dissolved manganese load	Linear	g/h - m^3/s	-1.187	658.500	.958	.752 Load units
Total zinc load	Geometric	g/h - m^3/s	787.900	1.359	.904	.521 Base e log units
Dissolved zinc load	Linear	g/h - m^3/s	-.392	197.200	.975	.169 Load units
Total 2,4-D load		*** No data ***				
Total silvex load		*** No data ***				

Table 15.--Regression statistics for constituent loading versus discharge for South Branch Mill Creek at Rancocas (W-8)

Dependent variable	Type of regression	Units	Intercept	Slope	Correlation coefficient	Standard error of estimate for dependent variable
Suspended sediment load	Linear	kg/h - m^3/s	-8.649	2111.732	0.827	18.514 Load units
Dissolved solids load	Linear	kg/h - m^3/s	-.158	421.809	.989	.851 Load units
Total sodium load	Geometric	kg/h - m^3/s	160.367	1.325	.972	.334 Base e log units
Dissolved sodium load	Geometric	kg/h - m^3/s	152.342	1.317	.973	.328 Base e log units
Total potassium load	Geometric	kg/h - m^3/s	15.357	1.076	.997	.085 Base e log units
Dissolved potassium load	Geometric	kg/h - m^3/s	14.828	1.082	.996	.101 Base e log units
Total calcium load	Geometric	kg/h - m^3/s	47.108	1.024	.965	.289 Base e log units
Dissolved calcium load	Geometric	kg/h - m^3/s	16.005	.856	.936	.335 Base e log units
Total magnesium load	Geometric	kg/h - m^3/s	9.238	.817	.932	.333 Base e log units
Dissolved magnesium load	Geometric	kg/h - m^3/s	7.314	.782	.918	.353 Base e log units
Dissolved chloride load	Geometric	kg/h - m^3/s	374.548	1.367	.981	.280 Base e log units
Dissolved sulfate load	Geometric	kg/h - m^3/s	31.715	.825	.952	.277 Base e log units
Total phosphorus load	Linear	kg/h - m^3/s	-.010	2.560	.837	.023 Load units
Dissolved phosphorus load	Linear	kg/h - m^3/s	0	.177	.919	.001 Load units
Total nitrate load	Geometric	kg/h - m^3/s	2.897	.713	.778	.605 Base e log units
Dissolved nitrate load	Geometric	kg/h - m^3/s	2.666	.715	.809	.559 Base e log units
Total nitrite load	Geometric	kg/h - m^3/s	.562	1.313	.977	.300 Base e log units
Dissolved nitrite load	Geometric	kg/h - m^3/s	.168	1.156	.962	.344 Base e log units
Total nitrogen load	Geometric	kg/h - m^3/s	11.124	.918	.915	.426 Base e log units
Total organic nitrogen load	Geometric	kg/h - m^3/s	4.545	1.092	.886	.601 Base e log units
Dissolved organic nitrogen load	Linear	kg/h - m^3/s	.005	1.329	.906	.008 Load units
Total ammonia load	Linear	kg/h - m^3/s	-.001	.722	.845	.006 Load units
Dissolved ammonia load	Linear	kg/h - m^3/s	0	.431	.799	.004 Load units
Biochemical oxygen demand load	Linear	kg/h - m^3/s	-.030	23.955	.984	.061 Load units
Chemical oxygen demand load	Geometric	kg/h - m^3/s	635.329	1.388	.894	.687 Base e log units
Total organic carbon load	Geometric	kg/h - m^3/s	112.592	1.218	.883	.678 Base e log units
Dissolved organic carbon load	Linear	kg/h - m^3/s	.002	31.569	.879	.235 Load units
Total organic carbon load	Linear	g/h - m^3/s	-.550	125.021	.830	1.159 Load units
Total iron load	Geometric	g/h - m^3/s	46970.000	1.379	.844	.973 Base e log units
Dissolved iron load	Geometric	g/h - m^3/s	234.960	.759	.830	.536 Base e log units
Total lead load	Geometric	g/h - m^3/s	1465.900	1.632	.840	1.169 Base e log units
Dissolved lead load	Linear	g/h - m^3/s	.025	9.267	.899	.062 Load units
Total manganese load	Linear	g/h - m^3/s	-2.658	863.600	.882	6.107 Load units
Dissolved manganese load	Geometric	g/h - m^3/s	191.800	.973	.922	.427 Base e log units
Total zinc load	Geometric	g/h - m^3/s	346.900	1.250	.949	.470 Base e log units
Dissolved zinc load	Linear	g/h - m^3/s	-.228	136.330	.883	1.025 Load units
Total 2,4-D load		*** No data	***			
Total silvex load		*** No data	***			

Table 16.--Measured extremes of concentration and load for Mill Creek at Levitt Parkway at Willingboro (W-1)

Parameter	Concentration Minimum	Concentration Maximum	Concentration Units	Load Minimum	Load Maximum	Load Units
Discharge	-	-	-	0.0480	17.80000	m^3/s
Temperature	4.70	21.70	deg C	-	-	
Specific conductance	60.00	698.00	siemens	-	-	
pH	6.20	8.80	units	-	-	
Dissolved oxygen	6.10	13.00	mg/L	-	-	
Suspended sediment	8.00	584.00	mg/L	5.6000	5000.0000	kg/h
Dissolved solids	73.00	390.00	mg/L	42.4000	1660.0000	kg/h
Total sodium	5.00	79.00	mg/L	7.3400	261.0000	kg/h
Dissolved sodium	4.90	79.00	mg/L	7.3400	261.0000	kg/h
Total potassium	2.20	5.60	mg/L	.7400	31.6000	kg/h
Dissolved potassium	2.10	5.60	mg/L	.7400	31.6000	kg/h
Total calcium	9.00	34.00	mg/L	3.8100	127.0000	kg/h
Dissolved calcium	8.00	34.00	mg/L	3.8100	91.0000	kg/h
Total magnesium	3.00	10.00	mg/L	.9000	42.3000	kg/h
Dissolved magnesium	2.80	10.00	mg/L	.9000	38.7000	kg/h
Dissolved chloride	8.70	140.00	mg/L	11.6000	431.0000	kg/h
Dissolved sulfate	15.00	42.00	mg/L	3.6400	245.0000	kg/h
Total phosphorus as P	.04	.88	mg/L	.0250	3.4100	kg/h
Dissolved phosphorus as P	.01	.18	mg/L	.0070	.5700	kg/h
Total nitrate as N	.54	1.90	mg/L	.3970	6.8000	kg/h
Dissolved nitrate as N	.26	1.90	mg/L	.2600	6.8000	kg/h
Total nitrite as N	.02	.09	mg/L	.0183	.4790	kg/h
Dissolved nitrite as N	.02	.08	mg/L	.0069	.2870	kg/h
Total nitrogen as N	1.60	4.30	mg/L	.7030	20.3000	kg/h
Total organic nitrogen as N	.47	2.10	mg/L	.1930	12.7000	kg/h
Dissolved organic nitrogen as N	.25	1.20	mg/L	.0870	4.8900	kg/h
Total ammonia (NH_4+NH_3) as N	.04	1.00	mg/L	.0190	3.0700	kg/h
Dissolved ammonia (NH_4+NH_3) as N	.04	.89	mg/L	.0190	2.9700	kg/h
Biochemical oxygen demand (5 day)	3.60	16.00	mg/L	2.2000	64.8000	kg/h
Chemical oxygen demand	8.00	150.00	mg/L	4.2800	277.0000	kg/h
Total organic carbon	4.40	36.00	mg/L	2.7700	118.0000	kg/h
Dissolved organic carbon	3.40	20.00	mg/L	1.3900	60.3000	kg/h
Total arsenic	0	60.00	µg/L	0	245.0000	g/h
Total iron	1400.00	480000.00	µg/L	884.0000	587000.0000	g/h
Dissolved iron	10.00	2800.00	µg/L	6.1100	2110.0000	g/h
Total lead	3.00	450.00	µg/L	1.9000	2790.0000	g/h
Dissolved lead	2.00	16.00	µg/L	1.5600	84.6000	g/h
Total manganese	80.00	2400.00	µg/L	34.6000	2940.0000	g/h
Dissolved manganese	0	200.00	µg/L	0	845.0000	g/h
Total zinc	10.00	320.00	µg/L	3.2600	1050.0000	g/h
Dissolved zinc	0	60.00	µg/L	0	338.0000	g/h
Total 2,4-D	0	70.00	µg/L	0	33.5000	g/h
Total silvex	0	2.10	µg/L	0	6.2100	g/h

Table 17.--Measured extremes of concentration and load for South Branch Mill Creek at Levitt Parkway at Willingboro (W-2)

Parameter	Concentration Minimum	Concentration Maximum	Concentration Units	Load Minimum	Load Maximum	Load Units
Discharge	-	-		0.0110	2.9700	m^3/s
Temperature	6.50	24.00	deg C	-	-	
Specific conductance	57.00	1034.00	siemens	-	-	
pH	6.20	7.70	units	-	-	
Dissolved oxygen	6.20	11.80	mg/L	-	-	
Suspended sediment	1.00	2110.00	mg/L	.0410	4520.0000	kg/h
Dissolved solids	48.00	580.00	mg/L	7.7100	491.0000	kg/h
Total sodium	2.20	140.00	mg/L	.4600	116.0000	kg/h
Dissolved sodium	2.20	140.00	mg/L	.4600	116.0000	kg/h
Total potassium	1.60	5.90	mg/L	.2290	9.7800	kg/h
Dissolved potassium	1.40	5.90	mg/L	.2290	9.4600	kg/h
Total calcium	8.00	35.00	mg/L	.9320	45.9000	kg/h
Dissolved calcium	5.00	35.00	mg/L	.9320	29.3000	kg/h
Total magnesium	2.30	9.40	mg/L	.3380	14.2000	kg/h
Dissolved magnesium	2.00	9.40	mg/L	.3380	9.4800	kg/h
Dissolved chloride	4.40	240.00	mg/L	.8080	199.0000	kg/h
Dissolved sulfate	10.00	51.00	mg/L	2.0800	48.9000	kg/h
Total phosphorus as P	.02	.96	mg/L	.0015	2.1200	kg/h
Dissolved phosphorus as P	.01	.20	mg/L	.0008	.4280	kg/h
Total nitrate as N	.36	2.40	mg/L	.0310	1.9900	kg/h
Dissolved nitrate as N	.36	2.40	mg/L	.0310	1.9900	kg/h
Total nitrite as N	.01	.09	mg/L	.0008	.1380	kg/h
Dissolved nitrite as N	0	.07	mg/L	0	.0611	kg/h
Total nitrogen as N	1.30	3.50	mg/L	.1530	4.2400	kg/h
Total organic nitrogen as N	.28	1.60	mg/L	.0170	2.5700	kg/h
Dissolved organic nitrogen as N	.19	1.60	mg/L	.0170	2.4500	kg/h
Total ammonia (NH_4+NH_3) as N	0	.76	mg/L	0	1.3900	kg/h
Dissolved ammonia (NH_4+NH_3) as N	0	.57	mg/L	0	.8130	kg/h
Biochemical oxygen demand (5 day)	1.00	21.00	mg/L	.0760	32.1000	kg/h
Chemical oxygen demand	1.00	370.00	mg/L	.760	792.0000	kg/h
Total organic carbon	3.40	55.00	mg/L	.2360	88.0000	kg/h
Dissolved organic carbon	2.80	15.00	mg/L	.1940	23.2000	kg/h
Total arsenic	0	55.00	µg/L	0	124.0000	g/h
Total iron	410.00	24000.00	µg/L	18.7000	65200.0000	g/h
Dissolved iron	50.00	230.00	µg/L	2.8500	685.0000	g/h
Total lead	2.00	1000.00	µg/L	.1530	2140.0000	g/h
Dissolved lead	2.00	30.00	µg/L	.1390	44.3000	g/h
Total manganese	20.00	880.00	µg/L	.8150	807.0000	g/h
Dissolved manganese	20.00	190.00	µg/L	.8150	214.0000	g/h
Total zinc	10.00	380.00	µg/L	.4080	581.0000	g/h
Dissolved zinc	0	90.00	µg/L	0	130.0000	g/h
Total 2,4-D	0	130.00	µg/L	0	25.2000	g/h
Total silvex	0	2.00	µg/L	0	1.3000	g/h

Table 18.--Measured extremes of concentration and load for Mill Creek tributary at Northampton Drive at Willingboro (W-3)

Parameter	Concentration Minimum	Concentration Maximum	Concentration Units	Load Minimum	Load Maximum	Load Units
Discharge	-	-		0.0030	1.6900	m^3/s
Temperature	2.40	23.40	deg C	-	-	
Specific conductance	45.00	292.00	siemens	-	-	
pH	5.50	7.20	units	-	-	
Dissolved oxygen	7.50	15.40	mg/L	-	-	
Suspended sediment	1.00	369.00	mg/L	.0130	331.0000	kg/h
Dissolved solids	33.00	177.00	mg/L	1.3500	70.8000	kg/h
Total sodium	1.40	20.00	mg/L	.1620	7.0800	kg/h
Dissolved sodium	1.10	16.00	mg/L	.1210	7.0800	kg/h
Total potassium	1.80	5.10	mg/L	.0400	4.8300	kg/h
Dissolved potassium	1.80	5.10	mg/L	.0400	4.8300	kg/h
Total calcium	4.40	17.00	mg/L	.1460	6.4200	kg/h
Dissolved calcium	4.40	17.00	mg/L	.1460	5.8300	kg/h
Total magnesium	.80	5.20	mg/L	.0420	3.1400	kg/h
Dissolved magnesium	.80	5.20	mg/L	.0420	2.3100	kg/h
Dissolved chloride	2.60	30.00	mg/L	.0820	15.2000	kg/h
Dissolved sulfate	9.00	35.00	mg/L	.1990	16.1000	kg/h
Total phosphorus as P	.01	.79	mg/L	.0010	.7490	kg/h
Dissolved phosphorus as P	.01	.56	mg/L	.0003	.5310	kg/h
Total nitrate as N	.24	6.90	mg/L	.0090	1.2300	kg/h
Dissolved nitrate as N	.23	6.90	mg/L	.0010	1.2300	kg/h
Total nitrite as N	.01	.06	mg/L	.0003	.0538	kg/h
Dissolved nitrite as N	.01	.05	mg/L	.0003	.0090	kg/h
Total nitrogen as N	.58	4.50	mg/L	.0160	.8700	kg/h
Total organic nitrogen as N	.22	2.60	mg/L	.0060	1.2800	kg/h
Dissolved organic nitrogen as N	.19	2.60	mg/L	.0050	1.1400	kg/h
Total ammonia (NH_4+NH_3) as N	.01	.99	mg/L	.0003	.9380	kg/h
Dissolved ammonia (NH_4+NH_3) as N	0	.99	mg/L	0	.9380	kg/h
Biochemical oxygen demand (5 day)	1.30	16.00	mg/L	.0360	15.2000	kg/h
Chemical oxygen demand	6.00	130.00	mg/L	.2080	65.4000	kg/h
Total organic carbon	3.30	27.00	mg/L	.0740	19.0000	kg/h
Dissolved organic carbon	3.20	15.00	mg/L	.0740	14.2000	kg/h
Total arsenic	0	15.00	µg/L	0	12.6000	g/h
Total iron	220.00	11000.00	µg/L	10.7000	6930.0000	g/h
Dissolved iron	20.00	530.00	µg/L	.9780	251.0000	g/h
Total lead	1.00	600.00	µg/L	.0350	569.0000	g/h
Dissolved lead	1.00	55.00	µg/L	.0350	34.1000	g/h
Total manganese	50.00	260.00	µg/L	.7950	224.0000	g/h
Dissolved manganese	30.00	240.00	µg/L	.6620	179.0000	g/h
Total zinc	20.00	210.00	µg/L	.2650	265.0000	g/h
Dissolved zinc	20.00	120.00	µg/L	.2650	85.3000	g/h
Total 2,4-D	0	31.00	µg/L	0	4.7400	g/h
Total silvex	0	4.80	µg/L	0	.6520	g/h

Table 19.--Measured extremes of concentration and load for Mill Creek at Willingboro Parkway at Willingboro (W-4)

Parameter	Concentration			Load		
	Minimum	Maximum	Units	Minimum	Maximum	Units
Discharge	-	-		.0080	7.8700	m^3/s
Temperature	3.70	22.50	deg C	-	-	
Specific conductance	76.00	512.00	siemens	-	-	
pH	5.90	9.90	units	-	-	
Dissolved oxygen	5.20	11.60	mg/L	-	-	
Suspended sediment	3.00	527.00	mg/L	.2850	1480.0000	kg/h
Dissolved solids	91.00	259.00	mg/L	11.0000	886.0000	kg/h
Total sodium	7.70	71.00	mg/L	1.5700	191.0000	kg/h
Dissolved sodium	7.70	70.00	mg/L	1.5700	191.0000	kg/h
Total potassium	2.60	6.30	mg/L	.3420	24.1000	kg/h
Dissolved potassium	2.60	6.30	mg/L	.3420	23.0000	kg/h
Total calcium	8.00	20.00	mg/L	.9990	49.9000	kg/h
Dissolved calcium	8.00	20.00	mg/L	.9990	47.6000	kg/h
Total magnesium	2.50	7.50	mg/L	.4990	28.0000	kg/h
Dissolved magnesium	2.00	7.50	mg/L	.4990	20.0000	kg/h
Dissolved chloride	14.00	87.00	mg/L	2.3500	336.0000	kg/h
Dissolved sulfate	19.00	35.00	mg/L	2.0700	135.0000	kg/h
Total phosphorus as P	.05	.51	mg/L	.0060	2.5800	kg/h
Dissolved phosphorus as P	.02	.33	mg/L	.0040	.3500	kg/h
Total nitrate as N	.70	3.10	mg/L	.2210	4.2900	kg/h
Dissolved nitrate as N	.70	3.10	mg/L	.2210	4.2900	kg/h
Total nitrite as N	.03	.15	mg/L	.0158	.2240	kg/h
Dissolved nitrite as N	.01	.13	mg/L	.0014	.0713	kg/h
Total nitrogen as N	1.60	5.70	mg/L	.8530	11.2000	kg/h
Total organic nitrogen as N	0	4.30	mg/L	0	4.0900	kg/h
Dissolved organic nitrogen as N	0	3.90	mg/L	0	3.5900	kg/h
Total ammonia (NH_4+NH_3) as N	.07	.64	mg/L	.0050	3.1900	kg/h
Dissolved ammonia (NH_4+NH_3) as N	.07	.64	mg/L	.0050	2.5800	kg/h
Biochemical oxygen demand (5 day)	.80	18.00	mg/L	.1280	47.4000	kg/h
Chemical oxygen demand	10.00	96.00	mg/L	.7130	189.0000	kg/h
Total organic carbon	4.50	42.00	mg/L	1.5200	110.0000	kg/h
Dissolved organic carbon	3.50	19.00	mg/L	1.4600	37.4000	kg/h
Total arsenic	0	28.00	µg/L	0	112.0000	g/h
Total iron	500.00	14000.00	µg/L	35.7000	69900.0000	g/h
Dissolved iron	80.00	870.00	µg/L	7.8500	1230.0000	g/h
Total lead	1.00	600.00	µg/L	.4590	1320.0000	g/h
Dissolved lead	1.00	22.00	µg/L	.4590	60.6000	g/h
Total manganese	30.00	330.00	µg/L	2.1400	1650.0000	g/h
Dissolved manganese	20.00	200.00	µg/L	1.4300	1120.0000	g/h
Total zinc	20.00	220.00	µg/L	1.4300	649.0000	g/h
Dissolved zinc	0	100.00	µg/L	0	336.0000	g/h
Total 2,4-D	0	11.00	µg/L	0	16.8000	g/h
Total silvex	0	1.10	µg/L	0	1.5700	g/h

Table 20.--Measured extremes of concentration and load for Mill Creek tributary No. 2 at Woodlane Road at Willingboro (W-5)

Parameter	Concentration Minimum	Concentration Maximum	Concentration Units	Load Minimum	Load Maximum	Load Units
Discharge	-	-		.0070	1.3600	m^3/s
Temperature	9.20	23.50	deg C	-	-	
Specific conductance	41.00	1164.00	siemens	-	-	
pH	5.50	7.10	units	-	-	
Dissolved oxygen	5.00	11.00	mg/L	-	-	
Suspended sediment	6.00	2392.00	mg/L	.2750	6580.0000	kg/h
Dissolved solids	30.00	644.00	mg/L	3.3000	227.0000	kg/h
Total sodium	1.00	180.00	mg/L	.1560	15.6000	kg/h
Dissolved sodium	1.00	180.00	mg/L	.1560	15.6000	kg/h
Total potassium	1.80	7.70	mg/L	.1050	4.6100	kg/h
Dissolved potassium	1.80	7.70	mg/L	.1050	4.6100	kg/h
Total calcium	2.70	37.00	mg/L	.4400	9.6700	kg/h
Dissolved calcium	2.70	37.00	mg/L	.4400	9.6700	kg/h
Total magnesium	2.00	11.00	mg/L	.2110	2.6800	kg/h
Dissolved magnesium	2.00	10.00	mg/L	.2110	2.6800	kg/h
Dissolved chloride	2.80	290.00	mg/L	.3020	26.5000	kg/h
Dissolved sulfate	4.60	57.00	mg/L	1.0300	24.5000	kg/h
Total phosphorus as P	.01	.47	mg/L	.0003	1.2900	kg/h
Dissolved phosphorus as P	0	.24	mg/L	0	.1650	kg/h
Total nitrate as N	.38	3.30	mg/L	.0370	1.0500	kg/h
Dissolved nitrate as N	.29	3.20	mg/L	.0370	.8930	kg/h
Total nitrite as N	.01	.06	mg/L	.0003	.0550	kg/h
Dissolved nitrite as N	.01	.05	mg/L	.0003	.0275	kg/h
Total nitrogen as N	1.20	3.60	mg/L	.0660	3.3000	kg/h
Total organic nitrogen as N	.16	1.80	mg/L	.0050	1.5400	kg/h
Dissolved organic nitrogen as N	.04	1.30	mg/L	.0010	1.4600	kg/h
Total ammonia (NH_4+NH_3) as N	.01	.53	mg/L	.0020	.6600	kg/h
Dissolved ammonia (NH_4+NH_3) as N	0	.53	mg/L	0	.4400	kg/h
Biochemical oxygen demand (5 day)	1.60	18.00	mg/L	.0860	22.6000	kg/h
Chemical oxygen demand	6.00	49.00	mg/L	.1830	79.8000	kg/h
Total organic carbon	2.10	16.00	mg/L	.0640	44.0000	kg/h
Dissolved organic carbon	1.20	15.00	mg/L	.0370	16.2000	kg/h
Total arsenic	0	55.00	µg/L	0	151.0000	g/h
Total iron	410.00	6900.00	µg/L	12.5000	19000.0000	g/h
Dissolved iron	40.00	360.00	µg/L	1.1400	134.0000	g/h
Total lead	10.00	440.00	µg/L	.3100	770.0000	g/h
Dissolved lead	2.00	54.00	µg/L	.0570	33.0000	g/h
Total manganese	40.00	340.00	µg/L	4.9500	440.0000	g/h
Dissolved manganese	30.00	310.00	µg/L	2.8500	248.0000	g/h
Total zinc	20.00	150.00	µg/L	1.1000	248.0000	g/h
Dissolved zinc	10.00	120.00	µg/L	.2850	82.5000	g/h
Total 2,4-D	0	15.00	µg/L	0	4.8100	g/h
Total silvex	0	5.30	µg/L	0	.3510	g/h

Table 21.--Measured extremes of concentration and load for Mill Creek near Willingboro (W-6)

Parameter	Concentration			Load		
	Minimum	Maximum	Units	Minimum	Maximum	Units
Discharge	-	-		0.0060	4.4500	m^3/s
Temperature	4.10	22.00	deg C	-	-	
Specific conductance	236.00	380.00	siemens	-	-	
pH	6.30	10.10	units	-	-	
Dissolved oxygen	4.50	13.10	mg/L	-	-	
Suspended sediment	0.00	803.00	mg/L	0	3360.0000	kg/h
Dissolved solids	136.00	193.00	mg/L	4.0000	806.0000	kg/h
Total sodium	16.00	46.00	mg/L	.4450	192.0000	kg/h
Dissolved sodium	16.00	45.00	mg/L	.4450	188.0000	kg/h
Total potassium	3.10	7.50	mg/L	.1500	22.5000	kg/h
Dissolved potassium	3.00	7.50	mg/L	.1500	20.6000	kg/h
Total calcium	9.50	25.00	mg/L	.3140	55.0000	kg/h
Dissolved calcium	8.50	25.00	mg/L	.3140	41.3000	kg/h
Total magnesium	3.50	8.60	mg/L	.1910	35.8000	kg/h
Dissolved magnesium	2.60	8.60	mg/L	.1910	18.8000	kg/h
Dissolved chloride	23.00	80.00	mg/L	.9420	334.0000	kg/h
Dissolved sulfate	24.00	35.00	mg/L	.7110	110.0000	kg/h
Total phosphorus as P	.05	.51	mg/L	.0010	2.1300	kg/h
Dissolved phosphorus as P	.03	.35	mg/L	.0010	.4480	kg/h
Total nitrate as N	.73	2.40	mg/L	.4160	3.6200	kg/h
Dissolved nitrate as N	.73	2.40	mg/L	.0450	3.6200	kg/h
Total nitrite as N	.04	.13	mg/L	.0153	.2750	kg/h
Dissolved nitrite as N	.01	.13	mg/L	.0007	.0920	kg/h
Total nitrogen as N	2.00	6.90	mg/L	.7740	10.3000	kg/h
Total organic nitrogen as N	.52	4.70	mg/L	.1940	3.9900	kg/h
Dissolved organic nitrogen as N	.21	4.30	mg/L	.0100	3.8600	kg/h
Total ammonia (NH_4+NH_3) as N	.31	.67	mg/L	.0760	2.8900	kg/h
Dissolved ammonia (NH_4+NH_3) as N	0	.66	mg/L	0	2.7100	kg/h
Biochemical oxygen demand (5 day)	2.70	19.00	mg/L	.0810	31.6000	kg/h
Chemical oxygen demand	10.00	76.00	mg/L	.3140	318.0000	kg/h
Total organic carbon	.90	21.00	mg/L	.0780	67.3000	kg/h
Dissolved organic carbon	.90	19.00	mg/L	.0650	55.0000	kg/h
Total arsenic	0	20.00	µg/L	0	83.6000	g/h
Total iron	480.00	5800.00	µg/L	24.7000	23400.0000	g/h
Dissolved iron	140.00	1200.00	µg/L	3.5900	1830.0000	g/h
Total lead	4.00	300.00	µg/L	.7740	221.0000	g/h
Dissolved lead	1.00	9.00	µg/L	.0670	18.3000	g/h
Total manganese	70.00	300.00	µg/L	2.0200	1240.0000	g/h
Dissolved manganese	30.00	210.00	µg/L	1.5700	917.0000	g/h
Total zinc	20.00	80.00	µg/L	.6730	359.0000	g/h
Dissolved zinc	10.00	80.00	µg/L	.4480	359.0000	g/h
Total 2,4-D	0	1.00	µg/L	0	.8250	g/h
Total silvex	0	.34	µg/L	0	.2810	g/h

Table 22.--Measured extremes of concentration and load for Mill Creek tributary No. 2 at Rancocas (W-7)

Parameter	Concentration			Load		
	Minimum	Maximum	Units	Minimum	Maximum	Units
Discharge	-	-		0.0003	0.0650	m^3/s
Temperature	7.70	22.40	deg C	-	-	
Specific conductance	160.00	300.00	siemens	-	-	
pH	6.30	7.30	units	-	-	
Dissolved oxygen	6.00	11.40	mg/L	-	-	
Suspended sediment	5.00	1363.00	mg/L	.0160	44.2000	kg/h
Dissolved solids	97.00	204.00	mg/L	.1530	5.8300	kg/h
Total sodium	2.90	7.30	mg/L	.0040	.3670	kg/h
Dissolved sodium	2.80	7.30	mg/L	.0040	.3670	kg/h
Total potassium	3.90	21.00	mg/L	.0100	.3730	kg/h
Dissolved potassium	3.60	21.00	mg/L	.0100	.3430	kg/h
Total calcium	11.00	24.00	mg/L	.0170	.6610	kg/h
Dissolved calcium	7.00	19.00	mg/L	.0170	.4210	kg/h
Total magnesium	4.30	11.00	mg/L	.0100	.2590	kg/h
Dissolved magnesium	4.30	11.00	mg/L	.0100	.2590	kg/h
Dissolved chloride	8.40	24.00	mg/L	.0120	1.0200	kg/h
Dissolved sulfate	31.00	59.00	mg/L	.0470	1.5000	kg/h
Total phosphorus as P	.01	.70	mg/L	.0001	.0320	kg/h
Dissolved phosphorus as P	.01	.24	mg/L	.0001	.0030	kg/h
Total nitrate as N	.93	7.80	mg/L	.0040	.0790	kg/h
Dissolved nitrate as N	.93	5.90	mg/L	.0040	.0760	kg/h
Total nitrite as N	.01	.18	mg/L	.0001	.0050	kg/h
Dissolved nitrite as N	.01	.18	mg/L	.0001	.0010	kg/h
Total nitrogen as N	2.30	8.60	mg/L	.0520	.1560	kg/h
Total organic nitrogen as N	.30	2.40	mg/L	.0008	.0730	kg/h
Dissolved organic nitrogen as N	.00	2.00	mg/L	.0000	.0420	kg/h
Total ammonia (NH_4+NH_3) as N	.03	.79	mg/L	.0001	.0320	kg/h
Dissolved ammonia (NH_4+NH_3) as N	.00	.79	mg/L	.0000	.0240	kg/h
Biochemical oxygen demand (5 day)	.60	21.00	mg/L	.0060	.4690	kg/h
Chemical oxygen demand	4.00	120.00	mg/L	.0250	4.8900	kg/h
Total organic carbon	1.70	35.00	mg/L	.0220	2.1000	kg/h
Dissolved organic carbon	1.60	17.00	mg/L	.0080	.6610	kg/h
Total arsenic	0	50.00	µg/L	0	1.5600	g/h
Total iron	150.00	26000.00	µg/L	1.1200	795.0000	g/h
Dissolved iron	30.00	760.00	µg/L	.0710	19.8000	g/h
Total lead	1.00	100.00	µg/L	.0130	3.0600	g/h
Dissolved lead	1.00	7.00	µg/L	.0060	.1800	g/h
Total manganese	40.00	330.00	µg/L	.0410	12.6000	g/h
Dissolved manganese	30.00	190.00	µg/L	.0310	10.2000	g/h
Total zinc	10.00	120.00	µg/L	.0100	3.6700	g/h
Dissolved zinc	0	50.00	µg/L	0	3.0100	g/h
Total 2,4-D	0	0	µg/L	0	0	g/h
Total silvex	0	0	µg/L	0	0	g/h

Table 23.--Measured extremes of concentration and load for South Branch Mill Creek at Rancocas (W-8)

Parameter	Concentration			Load		
	Minimum	Maximum	Units	Minimum	Maximum	Units
Discharge	-	-		0.0008	0.1170	m^3/s
Temperature	5.20	21.50	deg C	-	-	
Specific conductance	63.00	235.00	siemens	-	-	
pH	6.30	7.10	units	-	-	
Dissolved oxygen	5.60	10.80	mg/L	-	-	
Suspended sediment	1.00	745.00	mg/L	.0370	129.0000	kg/h
Dissolved solids	53.00	139.00	mg/L	.6480	18.9000	kg/h
Total sodium	5.30	25.00	mg/L	.0380	4.3300	kg/h
Dissolved sodium	5.30	24.00	mg/L	.0380	4.1600	kg/h
Total potassium	2.40	3.90	mg/L	.0150	.5370	kg/h
Dissolved potassium	2.10	3.60	mg/L	.0150	.5020	kg/h
Total calcium	7.00	21.00	mg/L	.0730	1.6800	kg/h
Dissolved calcium	5.00	14.00	mg/L	.0730	1.5700	kg/h
Total magnesium	2.30	10.00	mg/L	.0570	1.1200	kg/h
Dissolved magnesium	2.30	10.00	mg/L	.0570	1.1200	kg/h
Dissolved chloride	8.60	42.00	mg/L	.0920	7.2800	kg/h
Dissolved sulfate	9.10	31.00	mg/L	.1710	3.0300	kg/h
Total phosphorus as P	.02	.90	mg/L	.0002	.1560	kg/h
Dissolved phosphorus as P	.01	.06	mg/L	.0001	.0100	kg/h
Total nitrate as N	.82	8.80	mg/L	.0300	.9860	kg/h
Dissolved nitrate as N	.76	6.60	mg/L	.0300	.7400	kg/h
Total nitrite as N	.02	.07	mg/L	.0001	.0087	kg/h
Dissolved nitrite as N	.01	.04	mg/L	.0001	.0035	kg/h
Total nitrogen as N	1.90	9.10	mg/L	.0380	1.0200	kg/h
Total organic nitrogen as N	.33	2.40	mg/L	.0030	.3120	kg/h
Dissolved organic nitrogen as N	.07	.90	mg/L	.0010	.0710	kg/h
Total ammonia (NH_4+NH_3) as N	.01	.30	mg/L	.0001	.0400	kg/h
Dissolved ammonia (NH_4+NH_3) as N	0	.23	mg/L	0	.0250	kg/h
Biochemical oxygen demand (5 day)	.20	7.70	mg/L	.0020	1.0700	kg/h
Chemical oxygen demand	7.00	110.00	mg/L	.0860	9.4200	kg/h
Total organic carbon	2.10	29.00	mg/L	.0260	4.1600	kg/h
Dissolved organic carbon	2.10	15.00	mg/L	.0260	1.7300	kg/h
Total arsenic	0	45.00	µg/L	0	7.8000	g/h
Total iron	360.00	13000.00	µg/L	5.2600	1910.0000	g/h
Dissolved iron	90.00	500.00	µg/L	.9780	15.6000	g/h
Total lead	2.00	180.00	µg/L	.0090	31.1000	g/h
Dissolved lead	1.00	10.00	µg/L	.0120	.5200	g/h
Total manganese	40.00	520.00	µg/L	.7130	52.0000	g/h
Dissolved manganese	20.00	140.00	µg/L	.6110	8.9900	g/h
Total zinc	10.00	70.00	µg/L	.0310	10.4000	g/h
Dissolved zinc	0	60.00	µg/L	0	6.9300	g/h
Total 2,4-D	0	0	µg/L	0	0	g/h
Total silvex	0	0	µg/L	0	0	g/h

Table 24.--Measured extremes of concentration and load for Mill Creek at Willingboro (W-9)

Parameter	Concentration			Load		
	Minimum	Maximum	Units	Minimum	Maximum	Units
Discharge	-	-		0.0160	4.2200	m³/s
Temperature	4.00	23.00	deg C	-	-	
Specific conductance	32.00	549.00	siemens	-	-	
pH	6.30	9.70	units	-	-	
Dissolved oxygen	4.60	12.00	mg/L	-	-	
Suspended sediment	3.00	637.00	mg/L	.2850	6230.0000	kg/h
Dissolved solids	63.00	285.00	mg/L	15.1000	1690.0000	kg/h
Total sodium	5.40	77.00	mg/L	3.3700	391.0000	kg/h
Dissolved sodium	5.40	77.00	mg/L	3.3700	391.0000	kg/h
Total potassium	2.30	5.70	mg/L	.3140	36.7000	kg/h
Dissolved potassium	2.20	5.70	mg/L	.3140	33.3000	kg/h
Total calcium	7.50	18.00	mg/L	1.0300	137.0000	kg/h
Dissolved calcium	6.00	18.00	mg/L	1.0300	97.8000	kg/h
Total magnesium	3.00	7.90	mg/L	2.6300	44.0000	kg/h
Dissolved magnesium	2.80	7.90	mg/L	.3250	43.0000	kg/h
Dissolved chloride	8.90	99.00	mg/L	5.1900	616.0000	kg/h
Dissolved sulfate	14.00	38.00	mg/L	12.0000	205.0000	kg/h
Total phosphorus as P	.04	.50	mg/L	.0040	4.8900	kg/h
Dissolved phosphorus as P	.01	.20	mg/L	.0020	.7780	kg/h
Total nitrate as N	.68	2.70	mg/L	.1430	26.4000	kg/h
Dissolved nitrate as N	.51	2.50	mg/L	.1430	7.5300	kg/h
Total nitrite as N	.03	.10	mg/L	.0187	.4440	kg/h
Dissolved nitrite as N	.01	.08	mg/L	.0017	.1960	kg/h
Total nitrogen as N	2.00	4.10	mg/L	1.1200	34.2000	kg/h
Total organic nitrogen as N	.27	1.90	mg/L	.0190	13.3000	kg/h
Dissolved organic nitrogen as N	.13	1.60	mg/L	.0190	6.5500	kg/h
Total ammonia (NH_4+NH_3) as N	.10	1.30	mg/L	.0060	2.8900	kg/h
Dissolved ammonia (NH_4+NH_3) as N	.10	1.20	mg/L	.0060	2.3800	kg/h
Biochemical oxygen demand (5 day)	5.80	27.00	mg/L	.1370	88.0000	kg/h
Chemical oxygen demand	10.00	85.00	mg/L	.5700	114.0000	kg/h
Total organic carbon	2.90	25.00	mg/L	.4390	225.0000	kg/h
Dissolved organic carbon	1.60	18.00	mg/L	.7500	80.2000	kg/h
Total arsenic	0	24.00	µg/L	0	178.0000	g/h
Total iron	850.00	46000.00	µg/L	398.0000	450000.0000	g/h
Dissolved iron	110.00	800.00	µg/L	11.4000	2640.0000	g/h
Total lead	2.00	960.00	µg/L	.9370	9390.0000	g/h
Dissolved lead	2.00	33.00	µg/L	.2850	157.0000	g/h
Total manganese	50.00	490.00	µg/L	3.4200	4790.0000	g/h
Dissolved manganese	40.00	170.00	µg/L	3.4200	880.0000	g/h
Total zinc	20.00	310.00	µg/L	1.1400	3030.0000	g/h
Dissolved zinc	0	60.00	µg/L	0	333.0000	g/h
Total 2,4-D	0	12.00	µg/L	0	25.7000	g/h
Total silvex	0	1.70	µg/L	0	3.6400	g/h

Table 25.--Estimated daily flow and suspended sediment load durations for sites in the Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	28829.89	0.7080	10680.91	0.1870	1874.860	0.01735	1015.750	0.02178	896.411
5.0	1.0760	11105.52	.3681	2980.20	.1120	631.779	.01098	585.730	.01484	544.801
10	.5663	3307.73	.2407	1300.33	.0580	156.360	.00639	276.116	.00985	291.642
15	.4530	2171.00	.1925	841.17	.0460	95.611	.00537	207.313	.00874	235.385
20	.3398	1261.54	.1642	616.65	.0340	50.343	.00435	138.510	.00763	179.127
25	.3114	1070.52	.1444	479.74	.0310	41.382	.00410	121.309	.00735	165.063
30	.2548	733.06	.1246	359.62	.0250	26.217	.00359	86.908	.00679	136.934
35	.2321	614.97	.1132	298.57	.0226	21.162	.00338	73.147	.00657	125.682
40	.2095	506.67	.1047	256.42	.0202	16.677	.00318	59.386	.00635	114.431
45	.1897	420.03	.0934	205.10	.0181	13.211	.00300	47.346	.00615	104.586
50	.1783	373.97	.0877	181.53	.0169	11.422	.00290	40.466	.00604	98.960
55	.1642	319.94	.0792	148.82	.0154	9.377	.00277	31.865	.00590	91.928
60	.1500	269.89	.0708	119.29	.0139	7.545	.00265	23.265	.00577	84.896
65	.1302	206.59	.0594	84.87	.0118	5.330	.00247	11.224	.00557	75.050
70	.1076	144.05	.0481	56.19	.0094	3.290	.00226	0	.00535	63.799
75	.0934	110.38	.0368	33.28	.0079	2.275	.00214	0	.00521	56.767
80	.0792	80.96	.0283	19.94	.0064	1.455	.00201	0	.00507	49.735
85	.0622	51.36	.0226	12.90	.0046	.722	.00186	0	.00491	41.296
90	.0538	38.94	.0198	9.94	.0037	.455	.00178	0	.00482	37.077
95	.0481	31.57	.0169	7.35	.0031	.312	.00173	0	.00477	34.264
97.5	.0453	28.16	.0150	5.77	.0028	.251	.00170	0	.00474	32.857
Mean load	.3264	2583.84	.1369	934.93	.0325	148.502	.00430	135.917	.00771	173.034
Total load	10296292(m^3)	943102(kg)	4319475(m^3)	341250(kg)	1025181(m^3)	54203(kg)	135713(m^3)	49609(kg)	243288(m^3)	63157(kg)

Table 26.--Estimated daily flow and dissolved solids load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	20506.64	0.7080	10020.43	0.1870	1092.203	0.01735	175.155	0.02178	216.724
5.0	1.0760	13182.62	.3681	5183.43	.1120	675.400	.01098	117.164	.01484	146.492
10	.5663	7522.65	.2407	3377.66	.0580	375.301	.00639	72.846	.00985	95.924
15	.4530	6189.73	.1925	2697.31	.0460	308.613	.00537	2.537	.00874	84.687
20	.3398	4813.65	.1642	2297.72	.0340	241.924	.00435	51.988	.00763	73.450
25	.3114	4461.16	.1444	2018.33	.0310	225.252	.00410	49.306	.00735	70.640
30	.2548	3743.50	.1246	1739.25	.0250	191.908	.00359	43.880	.00679	65.022
35	.2321	3450.99	.1132	1579.93	.0226	178.570	.00338	41.684	.00657	62.774
40	.2095	3154.85	.1047	1460.52	.0202	165.232	.00318	39.472	.00635	60.527
45	.1897	2892.41	.0934	1301.44	.0181	153.562	.00300	37.523	.00615	58.560
50	.1783	2740.90	.0877	1221.95	.0169	146.893	.00290	36.402	.00604	57.437
55	.1642	2549.80	.0792	1102.80	.0154	138.557	.00277	34.995	.00590	56.032
60	.1500	2356.61	.0708	983.75	.0139	130.221	.00265	33.580	.00577	54.627
65	.1302	2082.19	.0594	825.20	.0118	118.550	.00247	31.585	.00557	52.661
70	.1076	1761.98	.0481	666.89	.0094	105.213	.00226	29.284	.00535	50.414
75	.0934	1557.58	.0368	508.88	.0079	96.877	.00214	27.833	.00521	49.009
80	.0792	1349.23	.0283	390.62	.0064	88.541	.00201	26.372	.00507	47.604
85	.0622	1092.81	.0226	311.94	.0046	78.537	.00186	24.603	.00491	45.919
90	.0538	961.39	.0198	272.66	.0037	73.536	.00178	23.712	.00482	45.076
95	.0481	872.33	.0169	233.42	.0031	70.201	.00173	23.116	.00477	44.514
97.5	.0453	827.31	.0150	205.98	.0028	68.534	.00170	22.816	.00474	44.233
Mean load	.3264	4403.52	.1369	1920.01	.0325	236.181	.00430	50.293	.00771	74.116
Total load	10296292(m^3)	1607285(kg)	4319475(m^3)	700803(kg)	1025181(m^3)	86206(kg)	135713(m^3)	18357(kg)	243288(m^3)	27052(kg)

Table 27.--Estimated daily flow and total sodium load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	2320.43	0.7080	1938.93	0.1870	64.644	0.01735	9.727	0.02178	24.172
5.0	1.0760	1507.60	0.3681	895.69	.1120	42.569	.01098	5.962	.01484	14.543
10	.5663	871.98	.2407	542.29	.0580	24.898	.00639	3.252	.00985	8.445
15	.4530	720.85	.1925	416.66	.0460	20.612	.00537	2.649	.00874	7.208
20	.3398	563.99	.1642	345.30	.0340	16.111	.00435	2.047	.00763	6.021
25	.3114	523.64	.1444	296.64	.0310	14.943	.00410	1.896	.00735	5.732
30	.2548	441.26	.1246	249.17	.0250	12.540	.00359	1.595	.00679	5.166
35	.2321	407.58	.1132	222.65	.0226	11.550	.00338	1.475	.00657	4.944
40	.2095	373.40	.1047	203.06	.0202	10.540	.00318	1.354	.00635	4.724
45	.1897	343.06	.0934	177.40	.0181	9.638	.00300	1.249	.00615	4.533
50	.1783	325.51	.0877	164.77	.0169	9.114	.00290	1.188	.00604	4.425
55	.1642	303.34	.0792	146.11	.0154	8.449	.00277	1.113	.00590	4.291
60	.1500	280.89	.0708	127.80	.0139	7.772	.00265	1.038	.00577	4.158
65	.1302	248.92	.0594	104.02	.0118	6.801	.00247	.932	.00557	3.974
70	.1076	211.48	.0481	81.05	.0094	5.650	.00226	.812	.00535	3.766
75	.0934	187.50	.0368	59.04	.0079	4.904	.00214	.737	.00521	3.637
80	.0792	162.98	.0283	43.31	.0064	4.131	.00201	.661	.00507	3.509
85	.0622	132.68	.0226	33.27	.0046	3.156	.00186	.571	.00491	3.357
90	.0538	117.08	.0198	28.42	.0037	2.643	.00178	.526	.00482	3.282
95	.0481	106.48	.0169	23.69	.0031	2.288	.00173	.496	.00477	3.232
97.5	.0453	101.12	.0150	20.46	.0028	2.106	.00170	.481	.00474	3.207
Mean load	.3264	512.59	.1369	305.99	.0325	14.253	.00430	1.988	.00771	6.316
Total load	10296292(m³)	187096(kg)	4319475(m³)	111686(kg)	1025181(m³)	5202(kg)	135713(m³)	725(kg)	243288(m³)	2305(kg)

Table 28.--Estimated daily flow and dissolved sodium load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	2308.47	0.7080	1927.28	0.1870	62.848	0.01735	9.707	0.02178	23.677
5.0	1.0760	1501.35	.3681	890.90	.1120	41.514	.01098	5.941	.01484	14.289
10	.5663	869.48	.2407	539.62	.0580	24.377	.00639	3.229	.00985	8.325
15	.4530	719.10	.1925	414.70	.0460	20.209	.00537	2.626	.00874	7.112
20	.3398	562.95	.1642	343.73	.0340	15.825	.00435	2.024	.00763	5.947
25	.3114	522.77	.1444	295.33	.0310	14.685	.00410	1.873	.00735	5.664
30	.2548	440.70	.1246	248.11	.0250	12.340	.00359	1.572	.00679	5.107
35	.2321	407.13	.1132	221.72	.0226	11.372	.00338	1.451	.00657	4.889
40	.2095	373.08	.1047	202.23	.0202	10.385	.00318	1.331	.00635	4.673
45	.1897	342.82	.0934	176.69	.0181	9.502	.00300	1.225	.00615	4.485
50	.1783	325.33	.0877	164.12	.0169	8.989	.00290	1.165	.00604	4.379
55	.1642	303.22	.0792	145.55	.0154	8.338	.00277	1.090	.00590	4.247
60	.1500	280.83	.0708	127.33	.0139	7.675	.00265	1.014	.00577	4.116
65	.1302	248.93	.0594	103.65	.0118	6.722	.00247	.909	.00557	3.935
70	.1076	211.58	.0481	80.78	.0094	5.593	.00226	.788	.00535	3.730
75	.0934	187.64	.0368	58.86	.0079	4.859	.00214	.713	.00521	3.603
80	.0792	163.16	.0283	43.18	.0064	4.098	.00201	.638	.00507	3.477
85	.0622	132.88	.0226	33.19	.0046	3.137	.00186	.547	.00491	3.328
90	.0538	117.30	.0198	28.35	.0037	2.631	.00178	.502	.00482	3.254
95	.0481	106.70	.0169	23.63	.0031	2.280	.00173	.472	.00477	3.205
97.5	.0453	101.34	.0150	20.41	.0028	2.100	.00170	.457	.00474	3.180
Mean load	.3264	511.34	.1369	304.47	.0325	13.974	.00430	1.964	.00771	6.231
Total load	10296292(m^3)	186640(kg)	4319475(m^3)	111132(kg)	1025181(m^3)	5100(kg)	135713(m^3)	716(kg)	243288(m^3)	2274(kg)

Table 29.--Estimated daily flow and total potassium load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	522.91	0.7080	281.96	0.1870	43.252	0.01735	8.750	0.02178	6.002
5.0	1.0760	328.75	.3681	145.13	.1120	25.931	.01098	5.617	.01484	3.973
10	.5663	182.38	.2407	93.82	.0580	13.446	.00639	3.361	.00985	2.555
15	.4530	148.59	.1925	74.43	.0460	10.669	.00537	2.860	.00874	2.246
20	.3398	114.11	.1642	63.03	.0340	7.891	.00435	2.359	.00763	1.941
25	.3114	105.34	.1444	55.05	.0310	7.196	.00410	2.233	.00735	1.865
30	.2548	87.62	.1246	47.07	.0250	5.805	.00359	1.983	.00679	1.714
35	.2321	80.44	.1132	42.51	.0226	5.249	.00338	1.882	.00657	1.654
40	.2095	73.21	.1047	39.09	.0202	4.693	.00318	1.782	.00635	1.594
45	.1897	66.83	.0934	34.53	.0181	4.206	.00300	1.694	.00615	1.541
50	.1783	63.15	.0877	32.25	.0169	3.927	.00290	1.644	.00604	1.512
55	.1642	58.54	.0792	28.83	.0154	3.580	.00277	1.582	.00590	1.474
60	.1500	53.89	.0708	25.40	.0139	3.232	.00265	1.519	.00577	1.437
65	.1302	47.32	.0594	20.84	.0118	2.744	.00247	1.431	.00557	1.385
70	.1076	39.70	.0481	16.28	.0094	2.187	.00226	1.331	.00535	1.326
75	.0934	34.88	.0368	11.72	.0079	1.839	.00214	1.268	.00521	1.289
80	.0792	30.00	.0283	8.30	.0064	1.490	.00201	1.206	.00507	1.252
85	.0622	24.04	.0226	6.02	.0046	1.072	.00186	1.131	.00491	1.208
90	.0538	21.01	.0198	4.88	.0037	.862	.00178	1.093	.00482	1.186
95	.0481	18.97	.0169	3.74	.0031	.723	.00173	1.068	.00477	1.171
97.5	.0453	17.94	.0150	2.94	.0028	.653	.00170	1.055	.00474	1.164
Mean load	.3264	105.98	.1369	51.89	.0325	7.532	.00430	2.343	.00771	1.974
Total load	10296292(m^3)	38684(kg)	4319475(m^3)	18942(kg)	1025181(m^3)	2749(kg)	135713(m^3)	855(kg)	243288(m^3)	720(kg)

Table 30.--Estimated daily flow and dissolved potassium load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	468.91	0.7080	267.65	0.1870	40.312	0.01735	8.041	0.02178	5.664
5.0	1.0760	296.90	.3681	138.16	.1120	24.405	.01098	5.186	.01484	3.740
10	.5663	166.19	.2407	89.60	.0580	12.814	.00639	3.130	.00985	2.399
15	.4530	135.83	.1925	71.26	.0460	10.213	.00537	2.673	.00874	2.108
20	.3398	104.73	.1642	60.47	.0340	7.596	.00435	2.217	.00763	1.820
25	.3114	96.80	.1444	52.92	.0310	6.940	.00410	2.102	.00735	1.748
30	.2548	80.74	.1246	45.36	.0250	5.622	.00359	1.874	.00679	1.606
35	.2321	74.23	.1132	41.05	.0226	5.093	.00338	1.783	.00657	1.549
40	.2095	67.65	.1047	37.81	.0202	4.563	.00318	1.691	.00635	1.493
45	.1897	61.83	.0934	33.49	.0181	4.098	.00300	1.611	.00615	1.443
50	.1783	58.49	.0877	31.33	.0169	3.832	.00290	1.566	.00604	1.415
55	.1642	54.27	.0792	28.10	.0154	3.498	.00277	1.508	.00590	1.380
60	.1500	50.03	.0708	24.86	.0139	3.164	.00265	1.451	.00577	1.345
65	.1302	44.01	.0594	20.54	.0118	2.695	.00247	1.371	.00557	1.296
70	.1076	37.03	.0481	16.23	.0094	2.157	.00226	1.280	.00535	1.240
75	.0934	32.60	.0368	11.91	.0079	1.820	.00214	1.223	.00521	1.206
80	.0792	28.10	.0283	8.67	.0064	1.481	.00201	1.166	.00507	1.171
85	.0622	22.59	.0226	6.52	.0046	1.072	.00186	1.097	.00491	1.130
90	.0538	19.79	.0198	5.44	.0037	.866	.00178	1.063	.00482	1.109
95	.0481	17.89	.0169	4.36	.0031	.728	.00173	1.040	.00477	1.095
97.5	.0453	16.94	.0150	3.60	.0028	.659	.00170	1.029	.00474	1.088
Mean load	.3264	96.78	.1369	49.97	.0325	7.181	.00430	2.205	.00771	1.852
Total load	10296292(m³)	35325(kg)	4319475(m³)	18239(kg)	1025181(m³)	2621(kg)	135713(m³)	805(kg)	243288(m³)	676(kg)

Table 31.--Estimated daily flow and total calcium load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	2009.78	0.7080	705.27	0.1870	119.383	0.01735	16.683	0.02178	22.466
5.0	1.0760	1284.81	.3681	381.66	.1120	72.994	.01098	11.572	.01484	15.170
10	.5663	728.02	.2407	256.10	.0580	39.594	.00639	7.892	.00985	9.967
15	.4530	597.55	.1925	207.69	.0460	32.172	.00537	7.074	.00874	8.818
20	.3398	463.24	.1642	178.87	.0340	24.750	.00435	6.256	.00763	7.673
25	.3114	428.90	.1444	158.52	.0310	22.894	.00410	6.051	.00735	7.388
30	.2548	359.11	.1246	138.00	.0250	19.183	.00359	5.643	.00679	6.817
35	.2321	330.71	.1132	126.19	.0226	17.699	.00338	5.479	.00657	6.589
40	.2095	301.99	.1047	117.28	.0202	16.214	.00318	5.315	.00635	6.362
45	.1897	276.57	.0934	105.33	.0181	14.915	.00300	5.172	.00615	6.162
50	.1783	261.90	.0877	99.32	.0169	14.173	.00290	5.090	.00604	6.049
55	.1642	243.42	.0792	90.27	.0154	13.245	.00277	4.988	.00590	5.907
60	.1500	224.75	.0708	81.16	.0139	12.318	.00265	4.886	.00577	5.765
65	.1302	198.27	.0594	68.90	.0118	11.019	.00247	4.743	.00557	5.566
70	.1076	167.43	.0481	56.50	.0094	9.534	.00226	4.579	.00535	5.339
75	.0934	147.78	.0368	43.92	.0079	8.606	.00214	4.477	.00521	5.198
80	.0792	127.78	.0283	34.33	.0064	7.679	.00201	4.375	.00507	5.056
85	.0622	103.22	.0226	27.84	.0046	6.565	.00186	4.252	.00491	4.886
90	.0538	90.66	.0198	24.56	.0037	6.009	.00178	4.191	.00482	4.801
95	.0481	82.16	.0169	21.25	.0031	5.638	.00173	4.150	.00477	4.745
97.5	.0453	77.87	.0150	18.91	.0028	5.452	.00170	4.130	.00474	4.717
Mean load	.3264	425.30	.1369	147.09	.0325	24.002	.00430	6.350	.00771	7.772
Total load	10296292(m^3)	155234(kg)	4319475(m^3)	53690(kg)	1025181(m^3)	8760(kg)	135713(m^3)	2317(kg)	243288(m^3)	2836(kg)

Table 32.--Estimated daily flow and dissolved calcium load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	1637.90	0.7080	636.68	0.1870	96.267	0.01735	12.392	0.02178	14.517
5.0	1.0760	1105.28	.3681	349.08	.1120	60.661	.01098	8.785	.01484	10.455
10	.5663	670.81	.2407	236.23	.0580	35.024	.00639	6.189	.00985	7.359
15	.4530	563.90	.1925	192.43	.0460	29.327	.00537	5.612	.00874	6.643
20	.3398	450.82	.1642	166.26	.0340	23.630	.00435	5.035	.00763	5.914
25	.3114	421.31	.1444	147.73	.0310	22.205	.00410	4.890	.00735	5.729
30	.2548	360.41	.1246	128.98	.0250	19.357	.00359	4.602	.00679	5.357
35	.2321	335.23	.1132	118.17	.0226	18.217	.00338	4.486	.00657	5.207
40	.2095	309.50	.1047	110.00	.0202	17.078	.00318	4.371	.00635	5.056
45	.1897	286.47	.0934	99.02	.0181	16.081	.00300	4.270	.00615	4.923
50	.1783	273.07	.0877	93.49	.0169	15.511	.00290	4.212	.00604	4.847
55	.1642	256.06	.0792	85.14	.0154	14.799	.00277	4.140	.00590	4.752
60	.1500	238.71	.0708	76.72	.0139	14.087	.00265	4.068	.00577	4.656
65	.1302	213.80	.0594	65.36	.0118	13.090	.00247	3.967	.00557	4.522
70	.1076	184.27	.0481	53.82	.0094	11.951	.00226	3.852	.00535	4.367
75	.0934	165.12	.0368	42.06	.0079	11.239	.00214	3.779	.00521	4.270
80	.0792	145.30	.0283	33.05	.0064	10.526	.00201	3.707	.00507	4.173
85	.0622	120.44	.0226	26.92	.0046	9.672	.00186	3.621	.00491	4.055
90	.0538	107.46	.0198	23.81	.0037	9.245	.00178	3.577	.00482	3.996
95	.0481	98.55	.0169	20.66	.0031	8.960	.00173	3.549	.00477	3.957
97.5	.0453	94.01	.0150	18.44	.0028	8.817	.00170	3.534	.00474	3.937
Mean load	.3264	401.92	.1369	136.20	.0325	23.287	.00430	5.132	.00771	5.935
Total load	10296292(m^3)	146703(kg)	4319475(m^3)	49715(kg)	1025181(m^3)	8500(kg)	135713(m^3)	1873(kg)	243288(m^3)	2166(kg)

Table 33.--Estimated daily flow and total magnesium load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	632.50	0.7080	326.25	0.1870	46.965	0.01735	6.713	0.02178	9.728
5.0	1.0760	428.34	.3681	183.98	.1120	30.330	.01098	4.865	.01484	7.111
10	.5663	261.13	.2407	126.80	.0580	17.302	.00639	3.535	.00985	5.086
15	.4530	219.86	.1925	104.29	.0460	14.198	.00537	3.239	.00874	4.613
20	.3398	176.12	.1642	90.72	.0340	10.971	.00435	2.943	.00763	4.128
25	.3114	164.69	.1444	81.05	.0310	10.140	.00410	2.870	.00735	4.005
30	.2548	141.09	.1246	71.22	.0250	8.440	.00359	2.722	.00679	3.756
35	.2321	131.31	.1132	65.51	.0226	7.744	.00338	2.663	.00657	3.656
40	.2095	121.32	.1047	61.19	.0202	7.036	.00318	2.603	.00635	3.555
45	.1897	112.37	.0934	55.35	.0181	6.407	.00300	2.552	.00615	3.466
50	.1783	107.16	.0877	52.40	.0169	6.043	.00290	2.522	.00604	3.414
55	.1642	100.54	.0792	47.93	.0154	5.583	.00277	2.485	.00590	3.350
60	.1500	93.79	.0708	43.40	.0139	5.115	.00265	2.448	.00577	3.286
65	.1302	84.09	.0594	37.25	.0118	4.448	.00247	2.397	.00557	3.195
70	.1076	72.57	.0481	30.96	.0094	3.664	.00226	2.337	.00535	3.091
75	.0934	65.09	.0368	24.47	.0079	3.159	.00214	2.300	.00521	3.025
80	.0792	57.35	.0283	19.45	.0064	2.640	.00201	2.263	.00507	2.959
85	.0622	47.61	.0226	15.99	.0046	1.992	.00186	2.219	.00491	2.880
90	.0538	42.52	.0198	14.23	.0037	1.654	.00178	2.197	.00482	2.840
95	.0481	39.03	.0169	12.43	.0031	1.422	.00173	2.182	.00477	2.813
97.5	.0453	37.25	.0150	11.15	.0028	1.304	.00170	2.175	.00474	2.800
Mean load	.3264	156.79	.1369	73.80	.0325	9.828	.00430	3.012	.00771	4.138
Total load	10296292(m³)	57229(kg)	4319475(m³)	26939(kg)	1025181(m³)	3587(kg)	135713(m³)	1099(kg)	243288(m³)	1510(kg)

Table 34.--Estimated daily flow and dissolved magnesium load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	548.03	0.7080	248.99	0.1870	32.704	0.01735	7.068	0.02178	8.805
5.0	1.0760	376.04	.3681	149.31	.1120	22.288	.01098	4.914	.01484	6.524
10	.5663	233.11	.2407	107.10	.0580	13.624	.00639	3.363	.00985	4.734
15	.4530	197.41	.1925	89.95	.0460	11.455	.00537	3.018	.00874	4.311
20	.3398	159.32	.1642	79.43	.0340	9.137	.00435	2.673	.00763	3.877
25	.3114	149.32	.1444	71.83	.0310	8.527	.00410	2.587	.00735	3.766
30	.2548	128.59	.1246	63.99	.0250	7.260	.00359	2.415	.00679	3.542
35	.2321	119.97	.1132	59.40	.0226	6.732	.00338	2.346	.00657	3.451
40	.2095	111.14	.1047	55.88	.0202	6.189	.00318	2.277	.00635	3.359
45	.1897	103.21	.0934	51.10	.0181	5.702	.00300	2.216	.00615	3.279
50	.1783	98.58	.0877	48.66	.0169	5.416	.00290	2.182	.00604	3.232
55	.1642	92.69	.0792	44.94	.0154	5.053	.00277	2.139	.00590	3.174
60	.1500	86.67	.0708	41.13	.0139	4.680	.00265	2.096	.00577	3.116
65	.1302	77.99	.0594	35.89	.0118	4.140	.00247	2.035	.00557	3.034
70	.1076	67.64	.0481	30.42	.0094	3.493	.00226	1.967	.00535	2.939
75	.0934	60.89	.0368	24.66	.0079	3.067	.00214	1.923	.00521	2.879
80	.0792	53.88	.0283	20.09	.0064	2.620	.00201	1.880	.00507	2.819
85	.0622	45.02	.0226	16.87	.0046	2.046	.00186	1.829	.00491	2.746
90	.0538	40.36	.0198	15.20	.0037	1.739	.00178	1.803	.00482	2.710
95	.0481	37.15	.0169	13.47	.0031	1.523	.00173	1.786	.00477	2.685
97.5	.0453	35.51	.0150	12.22	.0028	1.412	.00170	1.777	.00474	2.673
Mean load	.3264	141.12	.1369	64.03	.0325	7.940	.00430	2.715	.00771	3.883
Total load	10296292(m^3)	51512(kg)	4319475(m^3)	23371(kg)	1025181(m^3)	2898(kg)	135713(m^3)	991(kg)	243288(m^3)	1417(kg)

Table 35.--Estimated daily flow and dissolved chloride load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	3614.24	0.7080	2742.05	0.1870	151.230	0.01735	25.755	0.02178	48.075
5.0	1.0760	2354.14	.3681	1342.61	.1120	87.160	.01098	15.965	.01484	28.462
10	.5663	1366.00	.2407	844.21	.0580	42.963	.00639	8.917	.00985	16.246
15	.4530	1130.50	.1925	661.64	.0460	33.487	.00537	7.350	.00874	13.796
20	.3398	885.77	.1642	556.14	.0340	24.197	.00435	5.784	.00763	11.458
25	.3114	822.76	.1444	483.27	.0310	21.909	.00410	5.392	.00735	10.892
30	.2548	694.02	.1246	411.31	.0250	17.386	.00359	4.609	.00679	9.784
35	.2321	641.34	.1132	370.65	.0226	15.598	.00338	4.296	.00657	9.350
40	.2095	587.87	.1047	340.40	.0202	13.825	.00318	3.983	.00635	8.921
45	.1897	540.36	.0934	300.42	.0181	12.286	.00300	3.709	.00615	8.550
50	.1783	512.88	.0877	280.60	.0169	11.413	.00290	3.552	.00604	8.340
55	.1642	478.15	.0792	251.08	.0154	10.328	.00277	3.356	.00590	8.080
60	.1500	442.95	.0708	221.85	.0139	9.250	.00265	3.160	.00577	7.822
65	.1302	392.82	.0594	183.39	.0118	7.757	.00247	2.886	.00557	7.464
70	.1076	334.06	.0481	145.60	.0094	6.075	.00226	2.573	.00535	7.061
75	.0934	296.39	.0368	108.63	.0079	5.039	.00214	2.377	.00521	6.812
80	.0792	257.85	.0283	81.56	.0064	4.019	.00201	2.181	.00507	6.565
85	.0622	210.16	.0226	63.92	.0046	2.818	.00186	1.946	.00491	6.273
90	.0538	185.59	.0198	55.25	.0037	2.230	.00178	1.829	.00482	6.128
95	.0481	168.88	.0169	46.69	.0031	1.844	.00173	1.751	.00477	6.032
97.5	.0453	160.42	.0150	40.77	.0028	1.653	.00170	1.711	.00474	5.984
Mean load	.3264	803.86	.1369	476.60	.0325	24.123	.00430	5.654	.00771	12.105
Total load	10296292(m^3)	293409(kg)	4319475(m^3)	173961(kg)	1025181(m^3)	8805(kg)	135713(m^3)	2063(kg)	243288(m^3)	4418(kg)

Table 36.--Estimated daily flow and dissolved sulfate load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	3476.94	0.7080	1637.82	0.1870	251.258	0.01735	50.311	0.02178	32.390
5.0	1.0760	2239.66	.3681	894.48	.1120	157.821	.01098	34.417	.01484	23.606
10	.5663	1281.34	.2407	603.79	.0580	90.547	.00639	21.973	.00985	16.829
15	.4530	1055.25	.1925	491.18	.0460	75.597	.00537	19.025	.00874	15.248
20	.3398	821.59	.1642	423.97	.0340	60.647	.00435	15.979	.00763	13.632
25	.3114	761.69	.1444	376.42	.0310	56.909	.00410	15.199	.00735	13.221
30	.2548	639.67	.1246	328.37	.0250	49.434	.00359	13.615	.00679	12.392
35	.2321	589.91	.1132	300.66	.0226	46.444	.00338	12.971	.00657	12.057
40	.2095	539.51	.1047	279.74	.0202	43.455	.00318	12.320	.00635	11.720
45	.1897	494.83	.0934	251.65	.0181	40.838	.00300	11.744	.00615	11.424
50	.1783	469.02	.0877	237.51	.0169	39.343	.00290	11.413	.00604	11.254
55	.1642	436.46	.0792	216.16	.0154	37.475	.00277	10.996	.00590	11.040
60	.1500	403.54	.0708	194.65	.0139	35.606	.00265	10.576	.00577	10.826
65	.1302	356.75	.0594	165.66	.0118	32.990	.00247	9.981	.00557	10.525
70	.1076	302.12	.0481	136.25	.0094	30.000	.00226	9.293	.00535	10.178
75	.0934	267.22	.0368	106.30	.0079	28.131	.00214	8.858	.00521	9.960
80	.0792	231.63	.0283	83.40	.0064	26.262	.00201	8.418	.00507	9.740
85	.0622	187.79	.0226	67.84	.0046	24.020	.00186	7.884	.00491	9.476
90	.0538	165.30	.0198	59.96	.0037	22.898	.00178	7.614	.00482	9.343
95	.0481	150.05	.0169	51.99	.0031	22.151	.00173	7.433	.00477	9.255
97.5	.0453	142.34	.0150	46.35	.0028	21.777	.00170	7.342	.00474	9.210
Mean load	.3264	750.63	.1369	347.71	.0325	59.680	.00430	15.368	.00771	13.666
Total load	10296292(m³)	273982(kg)	4319475(m³)	126915(kg)	1025181(m³)	21783(kg)	135713(m³)	5609(kg)	243288(m³)	4988(kg)

Table 37.--Estimated daily flow and total phosphorus load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	50.39	0.7080	19.06	0.1870	6.223	0.01735	0.707	0.02178	1.098
5.0	1.0760	26.47	.3681	8.35	.1120	2.807	.01098	.412	.01484	.672
10	.5663	11.69	.2407	4.89	.0580	1.010	.00639	.200	.00985	.365
15	.4530	8.80	.1925	3.69	.0460	.704	.00537	.152	.00874	.296
20	.3398	6.10	.1642	3.02	.0340	.440	.00435	.105	.00763	.228
25	.3114	5.46	.1444	2.56	.0310	.381	.00410	.093	.00735	.211
30	.2548	4.23	.1246	2.13	.0250	.273	.00359	.070	.00679	.177
35	.2321	3.75	.1132	1.89	.0226	.233	.00338	.060	.00657	.164
40	.2095	3.29	.1047	1.71	.0202	.196	.00318	.051	.00635	.150
45	.1897	2.90	.0934	1.48	.0181	.165	.00300	.043	.00615	.138
50	.1783	2.68	.0877	1.37	.0169	.148	.00290	.038	.00604	.131
55	.1642	2.41	.0792	1.20	.0154	.128	.00277	.032	.00590	.123
60	.1500	2.15	.0708	1.04	.0139	.109	.00265	.026	.00577	.114
65	.1302	1.80	.0594	.83	.0118	.085	.00247	.018	.00557	.102
70	.1076	1.41	.0481	.64	.0094	.059	.00226	.009	.00535	.088
75	.0934	1.18	.0368	.45	.0079	.045	.00214	.003	.00521	.080
80	.0792	.95	.0283	.32	.0064	.032	.00201	0	.00507	.071
85	.0622	.70	.0226	.24	.0046	.019	.00186	0	.00491	.061
90	.0538	.58	.0198	.20	.0037	.014	.00178	0	.00482	.056
95	.0481	.50	.0169	.17	.0031	.010	.00173	0	.00477	.053
97.5	.0453	.46	.0150	.14	.0028	.009	.00170	0	.00474	.051
Mean load	.3264	6.90	.1369	2.77	.0325	.655	.00430	.101	.00771	.221
Total load	10296292(m³)	2518(kg)	4319475(m³)	1012(kg)	1025181(m³)	239(kg)	135713(m³)	36(kg)	243288(m³)	81(kg)

Table 38.--Estimated daily flow and dissolved phosphorus load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	9.92	0.7080	4.19	0.1870	1.696	0.01735	0.080	0.02178	0.092
5.0	1.0760	5.30	0.3681	2.14	.1120	.898	.01098	.050	.01484	.063
10	.5663	2.39	.2407	1.39	.0580	.396	.00639	.029	.00985	.041
15	.4530	1.82	.1925	1.10	.0460	.297	.00537	.024	.00874	.037
20	.3398	1.27	.1642	.93	.0340	.204	.00435	.020	.00763	.032
25	.3114	1.14	.1444	.82	.0310	.182	.00410	.019	.00735	.031
30	.2548	.89	.1246	.70	.0250	.139	.00359	.016	.00679	.028
35	.2321	.79	.1132	.64	.0226	.123	.00338	.015	.00657	.027
40	.2095	.70	.1047	.59	.0202	.107	.00318	.014	.00635	.026
45	.1897	.62	.0934	.52	.0181	.093	.00300	.013	.00615	.026
50	.1783	.57	.0877	.49	.0169	.085	.00290	.013	.00604	.025
55	.1642	.51	.0792	.44	.0154	.076	.00277	.012	.00590	.025
60	.1500	.46	.0708	.39	.0139	.067	.00265	.012	.00577	.024
65	.1302	.38	.0594	.33	.0118	.055	.00247	.011	.00557	.023
70	.1076	.30	.0481	.26	.0094	.041	.00226	.010	.00535	.022
75	.0934	.25	.0368	.20	.0079	.033	.00214	.009	.00521	.022
80	.0792	.21	.0283	.15	.0064	.025	.00201	.009	.00507	.021
85	.0622	.15	.0226	.12	.0046	.017	.00186	.008	.00491	.020
90	.0538	.13	.0198	.10	.0037	.013	.00178	.008	.00482	.020
95	.0481	.11	.0169	.09	.0031	.010	.00173	.008	.00477	.020
97.5	.0453	.10	.0150	.08	.0028	.009	.00170	.007	.00474	.020
Mean load	.3264	1.40	.1369	.78	.0325	.228	.00430	.019	.00771	.032
Total load	10296292(m^3)	513(kg)	4319475(m^3)	287(kg)	1025181(m^3)	83(kg)	135713(m^3)	7(kg)	243288(m^3)	11(kg)

Table 39.--Estimated daily flow and total nitrate load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	120.00	0.7080	59.66	0.1870	5.555	0.01735	3.202	0.02178	4.541
5.0	1.0760	85.44	.3681	38.54	.1120	3.471	.01098	2.334	.01484	3.455
10	.5663	55.50	.2407	29.02	.0580	1.971	.00639	1.606	.00985	2.579
15	.4530	47.77	.1925	25.00	.0460	1.638	.00537	1.425	.00874	2.368
20	.3398	39.37	.1642	22.48	.0340	1.304	.00435	1.232	.00763	2.149
25	.3114	37.14	.1444	20.63	.0310	1.221	.00410	1.182	.00735	2.093
30	.2548	32.45	.1246	18.69	.0250	1.054	.00359	1.078	.00679	1.979
35	.2321	30.48	.1132	17.54	.0226	.987	.00338	1.036	.00657	1.933
40	.2095	28.45	.1047	16.65	.0202	.921	.00318	.992	.00635	1.886
45	.1897	26.61	.0934	15.42	.0181	.862	.00300	.953	.00615	1.845
50	.1783	25.53	.0877	14.79	.0169	.829	.00290	.931	.00604	1.821
55	.1642	24.15	.0792	13.82	.0154	.787	.00277	.902	.00590	1.791
60	.1500	22.73	.0708	12.81	.0139	.746	.00265	.874	.00577	1.761
65	.1302	20.67	.0594	11.40	.0118	.687	.00247	.833	.00557	1.719
70	.1076	18.18	.0481	9.90	.0094	.621	.00226	.784	.00535	1.670
75	.0934	16.53	.0368	8.27	.0079	.579	.00214	.754	.00521	1.639
80	.0792	14.80	.0283	6.94	.0064	.537	.00201	.722	.00507	1.607
85	.0622	12.59	.0226	5.98	.0046	.487	.00186	.684	.00491	1.570
90	.0538	11.41	.0198	5.47	.0037	.462	.00178	.664	.00482	1.551
95	.0481	10.59	.0169	4.93	.0031	.446	.00173	.651	.00477	1.538
97.5	.0453	10.16	.0150	4.54	.0028	.437	.00170	.645	.00474	1.531
Mean load	.3264	34.53	.1369	18.12	.0325	1.280	.00430	1.174	.00771	2.151
Total load	10296292(m³)	12605(kg)	4319475(m³)	6617(kg)	1025181(m³)	467(kg)	135713(m³)	428(kg)	243288(m³)	785(kg)

Table 40.--Estimated daily flow and dissolved nitrate load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	133.30	0.7080	64.33	0.1870	10.810	0.01735	3.169	0.02178	4.147
5.0	1.0760	89.41	.3681	38.81	.1120	6.513	.01098	2.268	.01484	3.153
10	.5663	53.85	.2407	27.94	.0580	3.419	.00639	1.527	.00985	2.351
15	.4530	45.14	.1925	23.51	.0460	2.731	.00537	1.345	.00874	2.159
20	.3398	35.96	.1642	20.79	.0340	2.044	.00435	1.154	.00763	1.959
25	.3114	33.57	.1444	18.82	.0310	1.872	.00410	1.104	.00735	1.907
30	.2548	28.65	.1246	16.79	.0250	1.528	.00359	1.002	.00679	1.803
35	.2321	26.62	.1132	15.60	.0226	1.390	.00338	.960	.00657	1.761
40	.2095	24.55	.1047	14.69	.0202	1.253	.00318	.917	.00635	1.718
45	.1897	22.69	.0934	13.44	.0181	1.133	.00300	.880	.00615	1.681
50	.1783	21.61	.0877	12.81	.0169	1.064	.00290	.858	.00604	1.659
55	.1642	20.25	.0792	11.84	.0154	.978	.00277	.830	.00590	1.632
60	.1500	18.86	.0708	10.85	.0139	.892	.00265	.802	.00577	1.604
65	.1302	16.86	.0594	9.48	.0118	.772	.00247	.762	.00557	1.565
70	.1076	14.50	.0481	8.05	.0094	.634	.00226	.716	.00535	1.520
75	.0934	12.97	.0368	6.54	.0079	.548	.00214	.686	.00521	1.492
80	.0792	11.39	.0283	5.34	.0064	.462	.00201	.656	.00507	1.464
85	.0622	9.41	.0226	4.49	.0046	.359	.00186	.619	.00491	1.429
90	.0538	8.38	.0198	4.05	.0037	.308	.00178	.600	.00482	1.412
95	.0481	7.68	.0169	3.60	.0031	.273	.00173	.588	.00477	1.400
97.5	.0453	7.32	.0150	3.27	.0028	.256	.00170	.581	.00474	1.394
Mean load	.3264	32.15	0.1369	16.75	0.0325	1.962	0.00430	1.101	0.00771	1.961
Total load	10296292(m^3)	11735(kg)	4319475(m^3)	6116(kg)	1025181(m^3)	716(kg)	135713(m^3)	402(kg)	243288(m^3)	715(kg)

Table 41.--Estimated daily flow and total nitrite load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	6.79	0.7080	3.19	0.1870	0.559	0.01735	0.136	0.02178	0.088
5.0	1.0760	4.77	.3681	1.86	.1120	.272	.01098	.086	.01484	.053
10	.5663	3.04	.2407	1.31	.0580	.108	.00639	.050	.00985	.031
15	.4530	2.60	.1925	1.08	.0460	.078	.00537	.042	.00874	.026
20	.3398	2.13	.1642	.95	.0340	.051	.00435	.034	.00763	.022
25	.3114	2.00	.1444	.85	.0310	.045	.00410	.032	.00735	.021
30	.2548	1.74	.1246	.76	.0250	.033	.00359	.028	.00679	.019
35	.2321	1.63	.1132	.70	.0226	.029	.00338	.026	.00657	.018
40	.2095	1.52	.1047	.65	.0202	.024	.00318	.025	.00635	.017
45	.1897	1.41	.0934	.59	.0181	.021	.00300	.023	.00615	.016
50	.1783	1.35	.0877	.56	.0169	.019	.00290	.022	.00604	.016
55	.1642	1.28	.0792	.52	.0154	.017	.00277	.021	.00590	.015
60	.1500	1.20	.0708	.47	.0139	.014	.00265	.020	.00577	.015
65	.1302	1.09	.0594	.41	.0118	.011	.00247	.019	.00557	.014
70	.1076	.95	.0481	.34	.0094	.008	.00226	.017	.00535	.014
75	.0934	.86	.0368	.27	.0079	.006	.00214	.016	.00521	.013
80	.0792	.77	.0283	.22	.0064	.004	.00201	.015	.00507	.013
85	.0622	.65	.0226	.18	.0046	.003	.00186	.014	.00491	.012
90	.0538	.58	.0198	.16	.0037	.002	.00178	.014	.00482	.012
95	.0481	.54	.0169	.14	.0031	.001	.00173	.013	.00477	.012
97.5	.0453	.52	.0150	.13	.0028	.001	.00170	.013	.00474	.011
Mean load	.3264	1.87	.1369	.77	.0325	.065	.00430	.033	.00771	.023
Total load	10296292(m^3)	684(kg)	4319475(m^3)	282(kg)	1025181(m^3)	24(kg)	135713(m^3)	12(kg)	243288(m^3)	8(kg)

Table 42.--Estimated daily flow and dissolved nitrite load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	5.92	0.7080	2.31	0.1870	0.203	0.01735	0.007	0.02178	0.048
5.0	1.0760	3.70	.3681	1.17	.1120	.129	.01098	.006	.01484	.031
10	.5663	2.03	.2407	.75	.0580	.072	.00639	.006	.00985	.019
15	.4530	1.65	.1925	.59	.0460	.059	.00537	.005	.00874	.016
20	.3398	1.26	.1642	.50	.0340	.045	.00435	.005	.00763	.014
25	.3114	1.16	.1444	.44	.0310	.041	.00410	.005	.00735	.013
30	.2548	.96	.1246	.37	.0250	.034	.00359	.005	.00679	.012
35	.2321	.88	.1132	.34	.0226	.031	.00338	.005	.00657	.012
40	.2095	.80	.1047	.31	.0202	.028	.00318	.005	.00635	.011
45	.1897	.73	.0934	.28	.0181	.026	.00300	.005	.00615	.011
50	.1783	.69	.0877	.26	.0169	.024	.00290	.005	.00604	.010
55	.1642	.64	.0792	.23	.0154	.022	.00277	.005	.00590	.010
60	.1500	.59	.0708	.21	.0139	.020	.00265	.005	.00577	.010
65	.1302	.51	.0594	.17	.0118	.017	.00247	.004	.00557	.010
70	.1076	.43	.0481	.14	.0094	.014	.00226	.004	.00535	.009
75	.0934	.37	.0368	.10	.0079	.012	.00214	.004	.00521	.009
80	.0792	.32	.0283	.08	.0064	.010	.00201	.004	.00507	.008
85	.0622	.26	.0226	.06	.0046	.007	.00186	.004	.00491	.008
90	.0538	.22	.0198	.05	.0037	.006	.00178	.004	.00482	.008
95	.0481	.20	.0169	.04	.0031	.005	.00173	.004	.00477	.008
97.5	.0453	.19	.0150	.04	.0028	.005	.00170	.004	.00474	.008
Mean load	.3264	1.18	.1369	.42	.0325	.041	.00430	.005	.00771	.014
Total load	10296292(m^3)	430(kg)	4319475(m^3)	155(kg)	1025181(m^3)	14(kg)	135713(m^3)	2(kg)	243288(m^3)	5(kg)

Table 43.--Estimated daily flow and total nitrogen load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	346.97	0.7080	143.03	0.1870	26.670	0.01735	3.523	0.02178	7.959
5.0	1.0760	219.80	.3681	85.04	.1120	15.098	.01098	2.848	.01484	5.597
10	.5663	123.11	.2407	63.30	.0580	7.272	.00639	2.215	.00985	3.841
15	.4530	100.64	.1925	55.08	.0460	5.622	.00537	2.043	.00874	3.441
20	.3398	77.62	.1642	50.25	.0340	4.020	.00435	1.853	.00763	3.038
25	.3114	71.75	.1444	46.86	.0310	3.628	.00410	1.801	.00735	2.936
30	.2548	59.86	.1246	43.48	.0250	2.857	.00359	1.694	.00679	2.732
35	.2321	55.03	.1132	41.55	.0226	2.554	.00338	1.648	.00657	2.650
40	.2095	50.16	.1047	40.10	.0202	2.255	.00318	1.601	.00635	2.568
45	.1897	45.86	.0934	38.17	.0181	1.996	.00300	1.559	.00615	2.496
50	.1783	43.38	.0877	37.20	.0169	1.850	.00290	1.534	.00604	2.454
55	.1642	40.25	.0792	35.75	.0154	1.669	.00277	1.503	.00590	2.403
60	.1500	37.11	.0708	34.30	.0139	1.489	.00265	1.470	.00577	2.351
65	.1302	32.65	.0594	32.37	.0118	1.241	.00247	1.423	.00557	2.278
70	.1076	27.48	.0481	30.43	.0094	.964	.00226	1.367	.00535	2.195
75	.0934	24.19	.0368	28.50	.0079	.795	.00214	1.331	.00521	2.142
80	.0792	20.85	.0283	27.05	.0064	.629	.00201	1.294	.00507	2.090
85	.0622	16.77	.0226	26.09	.0046	.436	.00186	1.247	.00491	2.027
90	.0538	14.69	.0198	25.60	.0037	.342	.00178	1.223	.00482	1.995
95	.0481	13.29	.0169	25.12	.0031	.281	.00173	1.207	.00477	1.974
97.5	.0453	12.58	.0150	24.78	.0028	.251	.00170	1.198	.00474	1.964
Mean load	.3264	71.70	.1369	46.70	.0325	4.096	.00430	1.779	.00771	3.056
Total load	10296292(m³)	26173(kg)	4319475(m³)	17048(kg)	1025181(m³)	1495(kg)	135713(m³)	649(kg)	243288(m³)	1115(kg)

Table 44.--Estimated daily flow and total organic nitrogen load durations for sites in the Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	159.29	0.7080	50.91	0.1870	13.547	0.01735	1.628	0.02178	1.670
5.0	1.0760	89.33	.3681	32.59	.1120	7.771	.01098	.869	.01484	1.099
10	.5663	42.86	.2407	24.39	.0580	3.808	.00639	.414	.00985	.702
15	.4530	33.21	.1925	20.95	.0460	2.962	.00537	.326	.00874	.616
20	.3398	23.89	.1642	18.79	.0340	2.134	.00435	.244	.00763	.531
25	.3114	21.63	.1444	17.22	.0310	1.931	.00410	.225	.00735	.510
30	.2548	17.19	.1246	15.57	.0250	1.529	.00359	.187	.00679	.468
35	.2321	15.45	.1132	14.59	.0226	1.371	.00338	.173	.00657	.451
40	.2095	13.74	.1047	13.83	.0202	1.213	.00318	.159	.00635	.435
45	.1897	12.26	.0934	12.79	.0181	1.077	.00300	.147	.00615	.420
50	.1783	11.43	.0877	12.26	.0169	1.000	.00290	.140	.00604	.412
55	.1642	10.40	.0792	11.44	.0154	.904	.00277	.132	.00590	.402
60	.1500	9.38	.0708	10.58	.0139	.809	.00265	.123	.00577	.391
65	.1302	7.97	.0594	9.40	.0118	.677	.00247	.112	.00557	.377
70	.1076	6.41	.0481	8.14	.0094	.529	.00226	.100	.00535	.361
75	.0934	5.45	.0368	6.77	.0079	.438	.00214	.092	.00521	.350
80	.0792	4.52	.0283	5.66	.0064	.349	.00201	.084	.00507	.340
85	.0622	3.43	.0226	4.86	.0046	.244	.00186	.076	.00491	.328
90	.0538	2.90	.0198	4.44	.0037	.192	.00178	.071	.00482	.322
95	.0481	2.55	.0169	4.00	.0031	.159	.00173	.069	.00477	.318
97.5	.0453	2.38	.0150	3.67	.0028	.142	.00170	.067	.00474	.316
Mean load	.3264	24.78	.1369	15.14	.0325	2.139	.00430	.272	.00771	.541
Total load	10296292(m^3)	9047(kg)	4319475(m^3)	5528(kg)	1025181(m^3)	781(kg)	135713(m^3)	99(kg)	243288(m^3)	197(kg)

Table 45.--Estimated daily flow and dissolved organic nitrogen load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	98.46	0.7080	53.21	0.1870	10.186	0.01735	1.078	0.02178	0.814
5.0	1.0760	58.94	.3681	25.92	.1120	6.072	.01098	.682	.01484	.593
10	.5663	30.72	.2407	16.24	.0580	3.126	.00639	.397	.00985	.434
15	.4530	24.49	.1925	12.70	.0460	2.474	.00537	.334	.00874	.398
20	.3398	18.29	.1642	10.66	.0340	1.823	.00435	.270	.00763	.363
25	.3114	16.74	.1444	9.26	.0310	1.661	.00410	.254	.00735	.354
30	.2548	13.66	.1246	7.87	.0250	1.337	.00359	.223	.00679	.336
35	.2321	12.43	.1132	7.08	.0226	1.207	.00338	.210	.00657	.329
40	.2095	11.20	.1047	6.50	.0202	1.078	.00318	.197	.00635	.322
45	.1897	10.12	.0934	5.73	.0181	.965	.00300	.186	.00615	.316
50	.1783	9.51	.0877	5.35	.0169	.900	.00290	.180	.00604	.312
55	.1642	8.74	.0792	4.78	.0154	.820	.00277	.172	.00590	.308
60	.1500	7.98	.0708	4.22	.0139	.739	.00265	.164	.00577	.304
65	.1302	6.91	.0594	3.48	.0118	.627	.00247	.153	.00557	.297
70	.1076	5.69	.0481	2.76	.0094	.498	.00226	.140	.00535	.290
75	.0934	4.93	.0368	2.05	.0079	.418	.00214	.133	.00521	.286
80	.0792	4.17	.0283	1.54	.0064	.338	.00201	.125	.00507	.281
85	.0622	3.26	.0226	1.20	.0046	.242	.00186	.115	.00491	.276
90	.0538	2.81	.0198	1.04	.0037	.194	.00178	.110	.00482	.273
95	.0481	2.51	.0169	.87	.0031	.162	.00173	.107	.00477	.272
97.5	.0453	2.36	.0150	.76	.0028	.146	.00170	.106	.00474	.271
Mean load	.3264	17.70	.1369	9.16	.0325	1.751	.00430	.267	.00771	.372
Total load	10296292(m³)	6461(kg)	4319475(m³)	3346(kg)	1025181(m³)	639(kg)	135713(m³)	97(kg)	243288(m³)	135(kg)

Table 46.--Estimated daily flow and total ammonia (NH_4 + NH_3) as N load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	49.23	0.7080	35.92	0.1870	4.724	0.01735	0.827	0.02178	0.353
5.0	1.0760	29.33	.3681	17.87	.1120	1.971	.01098	.461	.01484	.233
10	.5663	15.20	.2407	11.10	.0580	.642	.00639	.198	.00985	.146
15	.4530	12.09	.1925	8.54	.0460	.432	.00537	.140	.00874	.127
20	.3398	9.01	.1642	7.04	.0340	.258	.00435	.081	.00763	.108
25	.3114	8.24	.1444	5.99	.0310	.220	.00410	.067	.00735	.103
30	.2548	6.71	.1246	4.93	.0250	.152	.00359	.038	.00679	.093
35	.2321	6.10	.1132	4.33	.0226	.128	.00338	.026	.00657	.089
40	.2095	5.49	.1047	3.88	.0202	.106	.00318	.014	.00635	.086
45	.1897	4.96	.0934	3.28	.0181	.088	.00300	.004	.00615	.082
50	.1783	4.65	.0877	2.98	.0169	.078	.00290	0	.00604	.080
55	.1642	4.28	.0792	2.53	.0154	.066	.00277	0	.00590	.078
60	.1500	3.90	.0708	2.08	.0139	.056	.00265	0	.00577	.075
65	.1302	3.37	.0594	1.47	.0118	.042	.00247	0	.00557	.072
70	.1076	2.77	.0481	.87	.0094	.028	.00226	0	.00535	.068
75	.0934	2.40	.0368	.27	.0079	.021	.00214	0	.00521	.066
80	.0792	2.03	.0283	0	.0064	.014	.00201	0	.00507	.063
85	.0622	1.58	.0226	0	.0046	.008	.00186	0	.00491	.061
90	.0538	1.36	.0198	0	.0037	.005	.00178	0	.00482	.059
95	.0481	1.21	.0169	0	.0031	.004	.00173	0	.00477	.058
97.5	.0453	1.14	.0150	0	.0028	.003	.00170	0	.00474	.058
Mean load	.3264	8.75	.1369	5.65	.0325	.452	.00430	.093	.00771	.108
Total load	10296292(m^3)	3196(kg)	4319475(m^3)	2065(kg)	1025181(m^3)	165(kg)	135713(m^3)	33(kg)	243288(m^3)	39(kg)

Table 47.--Estimated daily flow and dissolved ammonia (NH_4 + NH_3) as N load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	53.98	0.7080	33.80	0.1870	4.633	0.01735	0.596	0.02178	0.225
5.0	1.0760	28.35	.3681	16.88	.1120	1.990	.01098	.351	.01484	.153
10	.5663	12.51	.2407	10.54	.0580	.673	.00639	.174	.00985	.101
15	.4530	9.41	.1925	8.14	.0460	.459	.00537	.135	.00874	.090
20	.3398	6.52	.1642	6.73	.0340	.279	.00435	.095	.00763	.078
25	.3114	5.84	.1444	5.74	.0310	.239	.00410	.086	.00735	.076
30	.2548	4.52	.1246	4.76	.0250	.168	.00359	.066	.00679	.070
35	.2321	4.01	.1132	4.19	.0226	.142	.00338	.058	.00657	.068
40	.2095	3.52	.1047	3.77	.0202	.118	.00318	.050	.00635	.065
45	.1897	3.10	.0934	3.21	.0181	.098	.00300	.043	.00615	.063
50	.1783	2.87	.0877	2.92	.0169	.088	.00290	.039	.00604	.062
55	.1642	2.58	.0792	2.50	.0154	.075	.00277	.035	.00590	.061
60	.1500	2.30	.0708	2.08	.0139	.063	.00265	.030	.00577	.059
65	.1302	1.92	.0594	1.52	.0118	.048	.00247	.023	.00557	.057
70	.1076	1.50	.0481	.95	.0094	.033	.00226	.015	.00535	.055
75	.0934	1.26	.0368	.39	.0079	.025	.00214	.010	.00521	.053
80	.0792	1.02	.0283	0	.0064	.017	.00201	.005	.00507	.052
85	.0622	.75	.0226	0	.0046	.010	.00186	0	.00491	.050
90	.0538	.62	.0198	0	.0037	.007	.00178	0	.00482	.049
95	.0481	.54	.0169	0	.0031	.005	.00173	0	.00477	.049
97.5	.0453	.50	.0150	0	.0028	.004	.00170	0	.00474	.049
Mean load	.3264	7.38	.1369	5.40	.0325	.459	.00430	.091	.00771	.079
Total load	10296292(m^3)	2695(kg)	4319475(m^3)	1974(kg)	1025181(m^3)	167(kg)	135713(m^3)	33(kg)	243288(m^3)	29(kg)

Table 48.--Estimated daily flow and biochemical oxygen demand (5-day) load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	1553.87	0.7080	428.72	0.1870	104.037	0.01735	10.788	0.02178	11.803
5.0	1.0760	890.15	.3681	216.33	.1120	60.361	.01098	6.528	.01484	7.814
10	.5663	438.81	.2407	138.70	.0580	30.009	.00639	3.461	.00985	4.943
15	.4530	343.14	.1925	109.83	.0460	23.461	.00537	2.779	.00874	4.304
20	.3398	249.91	.1642	92.99	.0340	17.019	.00435	2.097	.00763	3.666
25	.3114	227.06	.1444	81.29	.0310	15.428	.00410	1.927	.00735	3.507
30	.2548	182.01	.1246	69.66	.0250	12.277	.00359	1.586	.00679	3.188
35	.2321	164.27	.1132	63.05	.0226	11.029	.00338	1.450	.00657	3.060
40	.2095	146.70	.1047	58.11	.0202	9.790	.00318	1.314	.00635	2.932
45	.1897	131.48	.0934	51.55	.0181	8.713	.00300	1.194	.00615	2.821
50	.1783	122.86	.0877	48.29	.0169	8.100	.00290	1.126	.00604	2.757
55	.1642	112.16	.0792	43.41	.0154	7.339	.00277	1.041	.00590	2.677
60	.1500	101.55	.0708	38.56	.0139	6.582	.00265	.956	.00577	2.597
65	.1302	86.87	.0594	32.13	.0118	5.531	.00247	.837	.00557	2.486
70	.1076	70.38	.0481	25.76	.0094	4.345	.00226	.700	.00535	2.358
75	.0934	60.24	.0368	19.45	.0079	3.612	.00214	.615	.00521	2.278
80	.0792	50.27	.0283	14.78	.0064	2.888	.00201	.530	.00507	2.198
85	.0622	38.53	.0226	11.71	.0046	2.034	.00186	.428	.00491	2.103
90	.0538	32.78	.0198	10.18	.0037	1.614	.00178	.376	.00482	2.055
95	.0481	29.00	.0169	8.66	.0031	1.338	.00173	.342	.00477	2.023
97.5	.0453	27.13	.0150	7.61	.0028	1.201	.00170	.325	.00474	2.007
Mean load	.3264	252.96	.1369	78.54	.0325	16.835	.00430	2.020	.00771	3.679
Total load	10296292(m^3)	92331(kg)	4319475(m^3)	28668(kg)	1025181(m^3)	6145(kg)	135713(m^3)	737(kg)	243288(m^3)	1342(kg)

Table 49.--Estimated daily flow and chemical oxygen demand load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	6650.97	0.7080	2921.05	0.1870	809.672	0.01735	99.856	0.02178	75.251
5.0	1.0760	3540.77	0.3681	1231.34	.1120	469.076	.01098	59.163	.01484	44.194
10	.5663	1590.34	.2407	702.46	.0580	223.847	.00639	29.865	.00985	25.009
15	.4530	1204.05	.1925	523.12	.0460	169.351	.00537	23.354	.00874	21.185
20	.3398	841.09	.1642	423.98	.0340	114.856	.00435	16.843	.00763	17.545
25	.3114	754.61	.1444	357.73	.0310	101.232	.00410	15.215	.00735	16.665
30	.2548	587.55	.1246	294.34	.0250	73.984	.00359	11.960	.00679	14.945
35	.2321	523.15	.1132	259.52	.0226	63.085	.00338	10.658	.00657	14.272
40	.2095	460.29	.1047	234.12	.0202	52.186	.00318	9.355	.00635	13.608
45	.1897	406.65	.0934	201.28	.0181	42.649	.00300	8.216	.00615	13.034
50	.1783	376.60	.0877	185.33	.0169	37.200	.00290	7.565	.00604	12.709
55	.1642	339.70	.0792	162.01	.0154	30.338	.00277	6.751	.00590	12.306
60	.1500	303.58	.0708	139.48	.0139	23.576	.00265	5.937	.00577	11.907
65	.1302	254.42	.0594	110.79	.0118	14.039	.00247	4.798	.00557	11.354
70	.1076	200.49	.0481	83.80	.0094	3.140	.00226	3.496	.00535	10.731
75	.0934	168.14	.0368	58.80	.0079	0	.00214	2.682	.00521	10.347
80	.0792	136.99	.0283	41.57	.0064	0	.00201	1.868	.00507	9.967
85	.0622	101.41	.0226	30.96	.0046	0	.00186	.891	.00491	9.516
90	.0538	84.47	.0198	25.95	.0037	0	.00178	.403	.00482	9.293
95	.0481	73.53	.0169	21.17	.0031	0	.00173	.078	.00477	9.145
97.5	.0453	68.17	.0150	17.97	.0028	0	.00170	0	.00474	9.071
Mean load	.3264	933.35	.1369	401.34	.0325	111.414	.00430	15.948	.00771	18.603
Total load	10296292(m^3)	340674(kg)	4319475(m^3)	146490(kg)	1025181(m^3)	40666(kg)	135713(m^3)	5821(kg)	243288(m^3)	6790(kg)

Table 50.--Estimated daily flow and total organic carbon load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	1942.08	0.7080	834.79	0.1870	238.815	0.01735	41.546	0.02178	25.558
5.0	1.0760	1122.70	.3681	430.31	.1120	129.494	.01098	23.898	.01484	16.021
10	.5663	559.88	.2407	278.63	.0580	59.023	.00639	11.191	.00985	9.721
15	.4530	439.59	.1925	221.33	.0460	44.753	.00537	8.367	.00874	8.403
20	.3398	321.82	.1642	187.62	.0340	31.194	.00435	5.544	.00763	7.122
25	.3114	292.85	.1444	164.03	.0310	27.937	.00410	4.838	.00735	6.808
30	.2548	235.60	.1246	140.43	.0250	21.609	.00359	3.426	.00679	6.187
35	.2321	212.98	.1132	126.95	.0226	19.156	.00338	2.861	.00657	5.942
40	.2095	190.55	.1047	116.84	.0202	16.753	.00318	2.296	.00635	5.698
45	.1897	171.09	.0934	103.36	.0181	14.695	.00300	1.802	.00615	5.487
50	.1783	160.05	.0877	96.61	.0169	13.539	.00290	1.520	.00604	5.367
55	.1642	146.33	.0792	86.50	.0154	12.117	.00277	1.167	.00590	5.217
60	.1500	132.70	.0708	76.39	.0139	10.722	.00265	.814	.00577	5.068
65	.1302	113.81	.0594	62.91	.0118	8.817	.00247	.320	.00557	4.861
70	.1076	92.52	.0481	49.42	.0094	6.721	.00226	0	.00535	4.627
75	.0934	79.40	.0368	35.94	.0079	5.461	.00214	0	.00521	4.481
80	.0792	66.45	.0283	25.83	.0064	4.247	.00201	0	.00507	4.336
85	.0622	51.16	.0226	19.09	.0046	2.863	.00186	0	.00491	4.164
90	.0538	43.64	.0198	15.72	.0037	2.208	.00178	0	.00482	4.078
95	.0481	38.68	.0169	12.35	.0031	1.787	.00173	0	.00477	4.021
97.5	.0453	36.22	.0150	9.99	.0028	1.583	.00170	0	.00474	3.992
Mean load	.3264	322.51	.1369	154.75	.0325	33.675	.00430	5.479	.00771	7.358
Total load	10296292(m^3)	117716(kg)	4319475(m^3)	56486(kg)	1025181(m^3)	12291(kg)	135713(m^3)	2000(kg)	243288(m^3)	2685(kg)

Table 51.--Estimated daily flow and dissolved organic carbon load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	1214.84	0.7080	633.92	0.1870	147.655	0.01735	15.705	0.02178	16.551
5.0	1.0760	736.47	.3681	319.73	.1120	86.374	.01098	9.446	.01484	11.295
10	.5663	390.11	.2407	201.91	.0580	43.396	.00639	4.940	.00985	7.510
15	.4530	312.79	.1925	157.40	.0460	34.052	.00537	3.938	.00874	6.669
20	.3398	235.26	.1642	131.21	.0340	24.822	.00435	2.937	.00763	5.828
25	.3114	215.85	.1444	112.89	.0310	22.536	.00410	2.687	.00735	5.618
30	.2548	176.95	.1246	94.56	.0250	17.995	.00359	2.186	.00679	5.198
35	.2321	161.38	.1132	84.09	.0226	16.192	.00338	1.986	.00657	5.029
40	.2095	145.78	.1047	76.23	.0202	14.398	.00318	1.785	.00635	4.861
45	.1897	132.12	.0934	65.76	.0181	12.836	.00300	1.610	.00615	4.714
50	.1783	124.31	.0877	60.52	.0169	11.948	.00290	1.510	.00604	4.630
55	.1642	114.54	.0792	52.67	.0154	10.841	.00277	1.385	.00590	4.525
60	.1500	104.76	.0708	44.81	.0139	9.739	.00265	1.259	.00577	4.420
65	.1302	91.05	.0594	34.34	.0118	8.205	.00247	1.084	.00557	4.273
70	.1076	75.36	.0481	23.87	.0094	6.469	.00226	.884	.00535	4.104
75	.0934	65.53	.0368	13.39	.0079	5.393	.00214	.759	.00521	3.999
80	.0792	55.70	.0283	5.54	.0064	4.327	.00201	.634	.00507	3.894
85	.0622	43.87	.0226	.30	.0046	3.063	.00186	.483	.00491	3.768
90	.0538	37.94	.0198	0	.0037	2.439	.00178	.408	.00482	3.705
95	.0481	33.98	.0169	0	.0031	2.027	.00173	.358	.00477	3.663
97.5	.0453	32.00	.0150	0	.0028	1.823	.00170	.333	.00474	3.642
Mean load	.3264	225.03	.1369	105.66	.0325	24.327	.00430	2.816	.00771	5.895
Total load	10296292(m³)	82137(kg)	4319475(m³)	38566(kg)	1025181(m³)	8879(kg)	135713(m³)	1027(kg)	243288(m³)	2151(kg)

Table 52.--Estimated daily flow and total arsenic load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	1.10	0.7080	0.35	0.1870	0.178	0.01735	0.035	0.02178	0.052
5.0	1.0760	.50	.3681	.13	.1120	.101	.01098	.020	.01484	.031
10	.5663	.18	.2407	.06	.0580	.045	.00639	.009	.00985	.016
15	.4530	.13	.1925	.05	.0460	.033	.00537	.006	.00874	.013
20	.3398	.08	.1642	.03	.0340	.020	.00435	.004	.00763	.009
25	.3114	.07	.1444	.03	.0310	.017	.00410	.003	.00735	.008
30	.2548	.05	.1246	.02	.0250	.011	.00359	.002	.00679	.007
35	.2321	.04	.1132	.02	.0226	.008	.00338	.002	.00657	.006
40	.2095	.03	.1047	.02	.0202	.006	.00318	.001	.00635	.005
45	.1897	.03	.0934	.01	.0181	.004	.00300	.001	.00615	.005
50	.1783	.03	.0877	.01	.0169	.003	.00290	.001	.00604	.004
55	.1642	.02	.0792	.01	.0154	.001	.00277	0	.00590	.004
60	.1500	.02	.0708	.01	.0139	0	.00265	0	.00577	.004
65	.1302	.01	.0594	0	.0118	0	.00247	0	.00557	.003
70	.1076	.01	.0481	0	.0094	0	.00226	0	.00535	.002
75	.0934	.01	.0368	0	.0079	0	.00214	0	.00521	.002
80	.0792	0	.0283	0	.0064	0	.00201	0	.00507	.002
85	.0622	0	.0226	0	.0046	0	.00186	0	.00491	.001
90	.0538	0	.0198	0	.0037	0	.00178	0	.00482	.001
95	.0481	0	.0169	0	.0031	0	.00173	0	.00477	.001
97.5	.0453	0	.0150	0	.0028	0	.00170	0	.00474	.001
Mean load	.3264	.11	.1369	.04	.0325	.021	.00430	.004	.00771	.009
Total load	10296292(m^3)	43(kg)	4319475(m^3)	15(kg)	1025181(m^3)	7(kg)	135713(m^3)	1(kg)	243288(m^3)	3(kg)

Table 53.--Estimated daily flow and total iron load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	1199.94	0.7080	214.69	0.1870	44.215	0.01735	2.277	0.02178	5.758
5.0	1.0760	701.79	.3681	90.73	.1120	20.876	.01098	1.372	.01484	3.393
10	.5663	355.18	.2407	51.85	.0580	7.966	.00639	.754	.00985	1.927
15	.4530	280.30	.1925	38.64	.0460	5.673	.00537	.622	.00874	1.634
20	.3398	206.57	.1642	31.34	.0340	3.645	.00435	.493	.00763	1.355
25	.3114	188.35	.1444	26.46	.0310	3.183	.00410	.461	.00735	1.287
30	.2548	152.23	.1246	21.78	.0250	2.323	.00359	.398	.00679	1.155
35	.2321	137.91	.1132	19.21	.0226	2.004	.00338	.373	.00657	1.103
40	.2095	123.68	.1047	17.34	.0202	1.700	.00318	.348	.00635	1.052
45	.1897	111.30	.0934	14.91	.0181	1.448	.00300	.327	.00615	1.008
50	.1783	104.27	.0877	13.73	.0169	1.309	.00290	.314	.00604	.983
55	.1642	95.51	.0792	12.01	.0154	1.143	.00277	.299	.00590	.952
60	.1500	86.79	.0708	10.34	.0139	.984	.00265	.284	.00577	.922
65	.1302	74.68	.0594	8.22	.0118	.774	.00247	.263	.00557	.879
70	.1076	60.98	.0481	6.22	.0094	.555	.00226	.239	.00535	.831
75	.0934	52.50	.0368	4.37	.0079	.430	.00214	.224	.00521	.802
80	.0792	44.10	.0283	3.09	.0064	.316	.00201	.209	.00507	.772
85	.0622	34.14	.0226	2.30	.0046	.194	.00186	.192	.00491	.738
90	.0538	29.22	.0198	1.93	.0037	.141	.00178	.183	.00482	.720
95	.0481	25.97	.0169	1.57	.0031	.109	.00173	.177	.00477	.709
97.5	.0453	24.35	.0150	1.34	.0028	.094	.00170	.174	.00474	.703
Mean load	.3264	204.49	.1369	29.60	.0325	4.954	.00430	.499	.00771	1.434
Total load	10296292(m³)	74640(kg)	4319475(m³)	10807(kg)	1025181(m³)	1808(kg)	135713(m³)	182(kg)	243288(m³)	523(kg)

Table 54.--Estimated daily flow and dissolved iron load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	31.71	0.7080	23.29	0.1870	3.129	0.01735	0.478	0.02178	0.308
5.0	1.0760	20.10	.3681	11.80	.1120	1.901	.01098	.285	.01484	.230
10	.5663	11.74	.2407	7.58	.0580	1.003	.00639	.146	.00985	.169
15	.4530	9.88	.1925	6.01	.0460	.800	.005[illegible]7	.115	.00874	.154
20	.3398	8.02	.1642	5.09	.0340	.596	.00435	.084	.00763	.139
25	.3114	7.56	.1444	4.45	.0310	.545	.00410	.076	.00735	.135
30	.2548	6.63	.1246	3.82	.0250	.442	.00359	.061	.00679	.127
35	.2321	6.26	.1132	3.46	.0226	.401	.00338	.054	.00657	.124
40	.2095	5.89	.1047	3.19	.0202	.359	.00318	.048	.00635	.121
45	.1897	5.56	.0934	2.83	.0181	.323	.00300	.043	.00615	.118
50	.1783	5.38	.0877	2.65	.0169	.302	.00290	.040	.00604	.116
55	.1642	5.15	.0792	2.39	.0154	.276	.00277	.036	.00590	.114
60	.1500	4.91	.0708	2.12	.0139	.250	.00265	.032	.00577	.112
65	.1302	4.59	.0594	1.77	.0118	.213	.00247	.027	.00557	.109
70	.1076	4.22	.0481	1.42	.0094	.171	.00226	.020	.00535	.106
75	.0934	3.98	.0368	1.07	.0079	.144	.00214	.017	.00521	.104
80	.0792	3.75	.0283	.81	.0064	.117	.00201	.013	.00507	.102
85	.0622	3.47	.0226	.64	.0046	.085	.00186	.008	.00491	.099
90	.0538	3.33	.0198	.56	.0037	.069	.00178	.006	.00482	.098
95	.0481	3.24	.0169	.48	.0031	.058	.00173	.004	.00477	.097
97.5	.0453	3.19	.0150	.42	.0028	.052	.00170	.003	.00474	.097
Mean load	.3264	7.93	.1369	4.29	.0325	.562	.00430	.080	.00771	.139
Total load	10296292(m^3)	2895(kg)	4319475(m^3)	1568(kg)	1025181(m^3)	205(kg)	135713(m^3)	29(kg)	243288(m^3)	50(kg)

Table 55.--Estimated daily flow and total lead load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m³/s)	W-1 Load (kg/d)	W-6 Q (m³/s)	W-6 Load (kg/d)	W-3 Q (m³/s)	W-3 Load (kg/d)	W-7 Q (m³/s)	W-7 Load (kg/d)	W-8 Q (m³/s)	W-8 Load (kg/d)
2.5	1.7839	17.29	0.7080	2.17	0.1870	1.189	0.01735	0.010	0.02178	0.068
5.0	1.0760	8.36	.3681	1.10	.1120	.550	.01098	.006	.01484	.036
10	.5663	3.32	.2407	.70	.0580	.204	.00639	.004	.00985	.018
15	.4530	2.40	.1925	.54	.0460	.144	.00537	.003	.00874	.015
20	.3398	1.59	.1642	.46	.0340	.091	.00435	.002	.00763	.012
25	.3114	1.40	.1444	.39	.0310	.079	.00410	.002	.00735	.011
30	.2548	1.05	.1246	.33	.0250	.057	.00359	.002	.00679	.010
35	.2321	.92	.1132	.29	.0226	.049	.00338	.002	.00657	.009
40	.2095	.79	.1047	.27	.0202	.041	.00318	.002	.00635	.009
45	.1897	.68	.0934	.23	.0181	.035	.00300	.002	.00615	.008
50	.1783	.63	.0877	.21	.0169	.032	.00290	.002	.00604	.008
55	.1642	.56	.0792	.19	.0154	.027	.00277	.001	.00590	.008
60	.1500	.49	.0708	.16	.0139	.023	.00265	.001	.00577	.007
65	.1302	.40	.0594	.12	.0118	.018	.00247	.001	.00557	.007
70	.1076	.30	.0481	.09	.0094	.013	.00226	.001	.00535	.006
75	.0934	.24	.0368	.05	.0079	.010	.00214	.001	.00521	.006
80	.0792	.19	.0283	.03	.0064	.007	.00201	.001	.00507	.006
85	.0622	.13	.0226	.01	.0046	.004	.00186	.001	.00491	.006
90	.0538	.11	.0198	0	.0037	.003	.00178	.001	.00482	.005
95	.0481	.09	.0169	0	.0031	.002	.00173	.001	.00477	.005
97.5	.0453	.08	.0150	0	.0028	.002	.00170	.001	.00474	.005
Mean load	.3264	2.05	.1369	.37	.0325	.129	.00430	.002	.00771	.013
Total load	10296292(m³)	750(kg)	4319475(m³)	135(kg)	1025181(m³)	47(kg)	135713(m³)	1(kg)	243288(m³)	5(kg)

Table 56.--Estimated daily flow and dissolved lead load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	1.45	0.7080	0.19	0.1870	0.132	0.01735	0.004	0.02178	0.005
5.0	1.0760	.81	.3681	.11	.1120	.078	.01098	.002	.01484	.003
10	.5663	.39	.2407	.08	.0580	.039	.00639	.001	.00985	.002
15	.4530	.30	.1925	.06	.0460	.031	.00537	.001	.00874	.002
20	.3398	.21	.1642	.06	.0340	.022	.00435	.001	.00763	.002
25	.3114	.19	.1444	.05	.0310	.020	.00410	.001	.00735	.002
30	.2548	.15	.1246	.05	.0250	.016	.00359	0	.00679	.002
35	.2321	.14	.1132	.04	.0226	.014	.00338	0	.00657	.002
40	.2095	.12	.1047	.04	.0202	.013	.00318	0	.00635	.002
45	.1897	.11	.0934	.04	.0181	.011	.00300	0	.00615	.001
50	.1783	.10	.0877	.04	.0169	.011	.00290	0	.00604	.001
55	.1642	.09	.0792	.03	.0154	.010	.00277	0	.00590	.001
60	.1500	.08	.0708	.03	.0139	.009	.00265	0	.00577	.001
65	.1302	.07	.0594	.03	.0118	.007	.00247	0	.00557	.001
70	.1076	.05	.0481	.03	.0094	.006	.00226	0	.00535	.001
75	.0934	.04	.0368	.02	.0079	.005	.00214	0	.00521	.001
80	.0792	.04	.0283	.02	.0064	.004	.00201	0	.00507	.001
85	.0622	.03	.0226	.02	.0046	.002	.00186	0	.00491	.001
90	.0538	.02	.0198	.02	.0037	.002	.00178	0	.00482	.001
95	.0481	.02	.0169	.02	.0031	.001	.00173	0	.00477	.001
97.5	.0453	.02	.0150	.02	.0028	.001	.00170	0	.00474	.001
Mean load	.3264	.22	.1369	.05	.0325	.022	.00430	.001	.00771	.002
Total load	10296292(m^3)	82(kg)	4319475(m^3)	20(kg)	1025181(m^3)	8(kg)	135713(m^3)	0(kg)	243288(m^3)	0(kg)

Table 57.--Estimated daily flow and total manganese load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	28.61	0.7080	15.35	0.1870	2.429	0.01735	0.329	0.02178	0.387
5.0	1.0760	16.97	.3681	7.70	.1120	1.342	.01098	.194	.01484	.243
10	.5663	8.74	.2407	4.83	.0580	.627	.00639	.097	.00985	.140
15	.4530	6.94	.1925	3.74	.0460	.479	.00537	.075	.00874	.117
20	.3398	5.15	.1642	3.10	.0340	.338	.00435	.053	.00763	.094
25	.3114	4.71	.1444	2.66	.0310	.303	.00410	.048	.00735	.088
30	.2548	3.83	.1246	2.21	.0250	.236	.00359	.037	.00679	.077
35	.2321	3.48	.1132	1.96	.0226	.210	.00338	.033	.00657	.072
40	.2095	3.13	.1047	1.76	.0202	.185	.00318	.028	.00635	.067
45	.1897	2.82	.0934	1.51	.0181	.163	.00300	.025	.00615	.063
50	.1783	2.65	.0877	1.38	.0169	.150	.00290	.022	.00604	.061
55	.1642	2.43	.0792	1.19	.0154	.135	.00277	.020	.00590	.058
60	.1500	2.21	.0708	1.00	.0139	.120	.00265	.017	.00577	.055
65	.1302	1.91	.0594	.74	.0118	.099	.00247	.013	.00557	.051
70	.1076	1.57	.0481	.49	.0094	.076	.00226	.009	.00535	.047
75	.0934	1.35	.0368	.23	.0079	.062	.00214	.006	.00521	.044
80	.0792	1.14	.0283	.04	.0064	.048	.00201	.003	.00507	.041
85	.0622	.89	.0226	0	.0046	.033	.00186	0	.00491	.037
90	.0538	.76	.0198	0	.0037	.025	.00178	0	.00482	.036
95	.0481	.68	.0169	0	.0031	.021	.00173	0	.00477	.035
97.5	.0453	.64	.0150	0	.0028	.018	.00170	0	.00474	.034
Mean load	.3264	5.03	.1369	2.49	.0325	.355	.00430	.050	.00771	.092
Total load	10296292(m^3)	1838(kg)	4319475(m^3)	911(kg)	1025181(m^3)	129(kg)	135713(m^3)	18(kg)	243288(m^3)	33(kg)

Table 58.--Estimated daily flow and dissolved manganese load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	10.28	0.7080	11.01	0.1870	1.965	0.01735	0.245	0.02178	0.111
5.0	1.0760	6.66	.3681	5.37	.1120	1.088	.01098	.145	.01484	.076
10	.5663	3.84	.2407	3.26	.0580	.509	.00639	.072	.00985	.051
15	.4530	3.17	.1925	2.46	.0460	.390	.00537	.056	.00874	.045
20	.3398	2.48	.1642	1.99	.0340	.275	.00435	.040	.00763	.040
25	.3114	2.30	.1444	1.66	.0310	.247	.00410	.036	.00735	.038
30	.2548	1.93	.1246	1.33	.0250	.193	.00359	.028	.00679	.035
35	.2321	1.79	.1132	1.15	.0226	.171	.00338	.025	.00657	.034
40	.2095	1.64	.1047	1.01	.0202	.151	.00318	.021	.00635	.033
45	.1897	1.50	.0934	.82	.0181	.133	.00300	.019	.00615	.032
50	.1783	1.42	.0877	.72	.0169	.122	.00290	.017	.00604	.031
55	.1642	1.33	.0792	.58	.0154	.110	.00277	.015	.00590	.031
60	.1500	1.23	.0708	.44	.0139	.098	.00265	.013	.00577	.030
65	.1302	1.09	.0594	.25	.0118	.081	.00247	.010	.00557	.029
70	.1076	.92	.0481	.07	.0094	.062	.00226	.007	.00535	.028
75	.0934	.82	.0368	0	.0079	.051	.00214	.005	.00521	.027
80	.0792	.71	.0283	0	.0064	.040	.00201	.003	.00507	.026
85	.0622	.58	.0226	0	.0046	.027	.00186	0	.00491	.026
90	.0538	.51	.0198	0	.0037	.021	.00178	0	.00482	.025
95	.0481	.46	.0169	0	.0031	.017	.00173	0	.00477	.025
97.5	.0453	.44	.0150	0	.0028	.015	.00170	0	.00474	.025
Mean load	.3264	2.25	.1369	1.61	.0325	.288	.00430	.038	.00771	.040
Total load	10296292(m^3)	824(kg)	4319475(m^3)	587(kg)	1025181(m^3)	105(kg)	135713(m^3)	13(kg)	243288(m^3)	14(kg)

Table 59.--Estimated daily flow and total zinc load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	10.67	0.7080	4.26	0.1870	1.280	0.01735	0.076	0.02178	0.069
5.0	1.0760	5.93	.3681	1.95	.1120	.714	.01098	.041	.01484	.043
10	.5663	2.81	.2407	1.17	.0580	.337	.00639	.019	.00985	.025
15	.4530	2.17	.1925	.90	.0460	.258	.00537	.015	.00874	.022
20	.3398	1.55	.1642	.74	.0340	.183	.00435	.011	.00763	.018
25	.3114	1.40	.1444	.63	.0310	.165	.00410	.010	.00735	.017
30	.2548	1.11	.1246	.53	.0250	.129	.00359	.009	.00679	.016
35	.2321	1.00	.1132	.47	.0226	.115	.00338	.008	.00657	.015
40	.2095	.88	.1047	.43	.0202	.101	.00318	.007	.00635	.014
45	.1897	.79	.0934	.37	.0181	.089	.00300	.007	.00615	.014
50	.1783	.73	.0877	.35	.0169	.082	.00290	.006	.00604	.014
55	.1642	.66	.0792	.31	.0154	.074	.00277	.006	.00590	.013
60	.1500	.60	.0708	.27	.0139	.066	.00265	.005	.00577	.013
65	.1302	.51	.0594	.22	.0118	.054	.00247	.005	.00557	.012
70	.1076	.40	.0481	.17	.0094	.042	.00226	.004	.00535	.012
75	.0934	.34	.0368	.12	.0079	.034	.00214	.004	.00521	.011
80	.0792	.28	.0283	.09	.0064	.027	.00201	.004	.00507	.011
85	.0622	.21	.0226	.06	.0046	.018	.00186	.003	.00491	.010
90	.0538	.18	.0198	.05	.0037	.014	.00178	.003	.00482	.010
95	.0481	.16	.0169	.04	.0031	.011	.00173	.003	.00477	.010
97.5	.0453	.15	.0150	.04	.0028	.010	.00170	.003	.00474	.010
Mean load	.3264	1.63	.1369	.66	.0325	.190	.00430	.012	.00771	.019
Total load	10296292(m^3)	595(kg)	4319475(m^3)	242(kg)	1025181(m^3)	69(kg)	135713(m^3)	4(kg)	243288(m^3)	7(kg)

Table 60.--Estimated daily flow and dissolved zinc load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	2.32	0.7080	1.90	0.1870	1.128	0.01735	0.072	0.02178	0.065
5.0	1.0760	1.44	.3681	.92	.1120	.604	.01098	.042	.01484	.043
10	.5663	.78	.2407	.57	.0580	.271	.00629	.020	.00985	.026
15	.4530	.63	.1925	.44	.0460	.204	.00537	.016	.00874	.023
20	.3398	.48	.1642	.37	.0340	.141	.00435	.011	.00763	.019
25	.3114	.44	.1444	.32	.0310	.126	.00410	.010	.00735	.018
30	.2548	.37	.1246	.27	.0250	.097	.00359	.007	.00679	.016
35	.2321	.34	.1132	.24	.0226	.086	.00338	.006	.00657	.016
40	.2095	.30	.1047	.22	.0202	.075	.00318	.005	.00635	.015
45	.1897	.28	.0934	.20	.0181	.065	.00300	.004	.00615	.014
50	.1783	.26	.0877	.18	.0169	.060	.00290	.004	.00604	.014
55	.1642	.24	.0792	.16	.0154	.053	.00277	.003	.00590	.013
60	.1500	.22	.0708	.14	.0139	.047	.00265	.003	.00577	.013
65	.1302	.19	.0594	.12	.0118	.038	.00247	.002	.00557	.012
70	.1076	.16	.0481	.09	.0094	.029	.00226	.001	.00535	.012
75	.0934	.14	.0368	.07	.0079	.023	.00214	0	.00521	.011
80	.0792	.12	.0283	.05	.0064	.018	.00201	0	.00507	.011
85	.0622	.09	.0226	.04	.0046	.012	.00186	0	.00491	.010
90	.0538	.08	.0198	.03	.0037	.009	.00178	0	.00482	.010
95	.0481	.07	.0169	.02	.0031	.007	.00173	0	.00477	.010
97.5	.0453	.07	.0150	.02	.0028	.006	.00170	0	.00474	.010
Mean load	.3264	.45	.1369	.32	.0325	.155	.00430	.010	.00771	.019
Total load	10296292(m^3)	166(kg)	4319475(m^3)	118(kg)	1025181(m^3)	56(kg)	135713(m^3)	3(kg)	243288(m^3)	7(kg)

Table 61.--Estimated daily flow and total 2,4-D load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	1.16	0.7080	0	0.1870	0.324	0.01735	0	0.02178	0
5.0	1.0760	.32	.3681	0	.1120	.141	.01098	0	.01484	0
10	.5663	.06	.2407	0	.0580	.048	.00639	0	.00985	0
15	.4530	.03	.1925	0	.0460	.033	.00537	0	.00874	0
20	.3398	.01	.1642	0	.0340	.020	.00435	0	.00763	0
25	.3114	.01	.1444	0	.0310	.017	.00410	0	.00735	0
30	.2548	0	.1246	0	.0250	.012	.00359	0	.00679	0
35	.2321	0	.1132	0	.0226	.010	.00338	0	.00657	0
40	.2095	0	.1047	0	.0202	.008	.00318	0	.00635	0
45	.1897	0	.0934	0	.0181	.007	.00300	0	.00615	0
50	.1783	0	.0877	0	.0169	.006	.00290	0	.00604	0
55	.1642	0	.0792	0	.0154	.005	.00277	0	.00590	0
60	.1500	0	.0708	0	.0139	.004	.00265	0	.00577	0
65	.1302	0	.0594	0	.0118	.003	.00247	0	.00557	0
70	.1076	0	.0481	0	.0094	.002	.00226	0	.00535	0
75	.0934	0	.0368	0	.0079	.001	.00214	0	.00521	0
80	.0792	0	.0283	0	.0064	.001	.00201	0	.00507	0
85	.0622	0	.0226	0	.0046	0	.00186	0	.00491	0
90	.0538	0	.0198	0	.0037	0	.00178	0	.00482	0
95	.0481	0	.0169	0	.0031	0	.00173	0	.00477	0
97.5	.0453	0	.0150	0	.0028	0	.00170	0	.00474	0
Mean load	.3264	.08	.1369	0	.0325	.032	.00430	0	.00771	0
Total load	10296292(m^3)	30(kg)	4319475(m^3)	0(kg)	1025181(m^3)	11(kg)	135713(m^3)	0(kg)	243288(m^3)	0(kg)

Table 62.--Estimated daily flow and total silvex load durations for sites in Mill Creek basin

Duration limits (percent)	W-1 Q (m^3/s)	W-1 Load (kg/d)	W-6 Q (m^3/s)	W-6 Load (kg/d)	W-3 Q (m^3/s)	W-3 Load (kg/d)	W-7 Q (m^3/s)	W-7 Load (kg/d)	W-8 Q (m^3/s)	W-8 Load (kg/d)
2.5	1.7839	0.21	0.7080	0	0.1870	0.022	0.01735	0	0.02178	0
5.0	1.0760	.04	.3681	0	.1120	.011	.01098	0	.01484	0
10	.5663	0	.2407	0	.0580	.005	.00639	0	.00985	0
15	.4530	0	.1925	0	.0460	.004	.00537	0	.00874	0
20	.3398	0	.1642	0	.0340	.002	.00435	0	.00763	0
25	.3114	0	.1444	0	.0310	.002	.00410	0	.00735	0
30	.2548	0	.1246	0	.0250	.002	.00359	0	.00679	0
35	.2321	0	.1132	0	.0226	.001	.00338	0	.00657	0
40	.2095	0	.1047	0	.0202	.001	.00318	0	.00635	0
45	.1897	0	.0934	0	.0181	.001	.00300	0	.00615	0
50	.1783	0	.0877	0	.0169	.001	.00290	0	.00604	0
55	.1642	0	.0792	0	.0154	.001	.00277	0	.00590	0
60	.1500	0	.0708	0	.0139	0	.00265	0	.00577	0
65	.1302	0	.0594	0	.0118	0	.00247	0	.00557	0
70	.1076	0	.0481	0	.0094	0	.00226	0	.00535	0
75	.0934	0	.0368	0	.0079	0	.00214	0	.00521	0
80	.0792	0	.0283	0	.0064	0	.00201	0	.00507	0
85	.0622	0	.0226	0	.0046	0	.00186	0	.00491	0
90	.0538	0	.0198	0	.0037	0	.00178	0	.00482	0
95	.0481	0	.0169	0	.0031	0	.00173	0	.00477	0
97.5	.0453	0	.0150	0	.0028	0	.00170	0	.00474	0
Mean load	.3264	.01	.1369	0	.0325	.003	.00430	0	.00771	0
Total load	10296292(m^3)	4(kg)	4319475(m^3)	0(kg)	1025181(m^3)	1(kg)	135713(m^3)	0(kg)	243288(m^3)	0(kg)