HYDROGEOCHEMICAL DATA FROM AN ACIDIC DEPOSITION STUDY AT MCDONALDS BRANCH BASIN IN THE NEW JERSEY PINELANDS, 1983-86

By Deborah G. Lord, Julia L. Barringer, Patricia A. Johnsson, Paul F. Schuster, Richard L. Walker, James E. Fairchild, Bernard N. Sroka, and Eric Jacobsen

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CONVERSION FACTORS

Multiply inch-pound unit	by	To obtain SI unit
	Length	
inch (in.)	2.54	centimeter (cm)
foot (ft)	30.48	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
foot per mile (ft/mi)		meter per kilometer (m/km)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallons	3.785	liter (L)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
cubic foot (ft^3)	28.32	liter (L)
	Flow	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

Temperature conversion formula: $^{o}F = 1.8 \times {}^{o}C + 32$

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Sea Level Datum of 1929."

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ABSTRACT

This report presents data from an acidic deposition study at McDonalds Branch basin from 1983-1986. These data include mineralogy of soil and depositional clays; physical and chemical analyses of soils; hydrologic measurements (precipitation and throughfall amounts, stream stage and discharge, and water-table altitudes); and water-quality data from precipitation, throughfall, soil water, surface water, and ground water. Site locations, collector designs, and well-construction data also are presented.

Precipitation was collected weekly and amount measured continuously at the upstream and downstream ends of the basin. Throughfall was collected and amount measured weekly beneath four major canopy types in the basin: pitch pine/black oak, pitch pine/blackjack oak, red maple/black gum, and Atlantic white cedar. Precipitation and throughfall samples each were composited into monthly samples. Soil water was collected monthly from the O, A and/or E, and B or C horizons of four major soil series in the basin: Atsion, Lakehurst, Lakewood, and Evesboro. Ground water was collected bimonthly from wells located in downgradient order along ground-water flow paths into a hardwood swamp, a pond community (open-channel area), and a cedar swamp. Ground-water levels were measured monthly at 65 wells and recorded continuously at four wells in the basin. Surface water was collected monthly from up to 10 sites along the stream. Stream-stage levels were measured monthly at three sites and continuously recorded at McDonalds Branch gaging station.

Temperature, pH, and specific conductance of water samples were measured in the field, or in the laboratory following collection. Dissolved oxygen in surface and ground waters also was measured in the field. Major cations (calcium, magnesium, sodium, potassium, and ammonium), major anions (sulfate, nitrate, chloride, phosphate, and fluoride), selected trace metals (aluminum, iron, manganese, and lead), dissolved organic carbon, pH, specific conductance, acidity, and alkalinity were analyzed at the U.S. Geological Survey Central laboratory in Denver, Colorado. Alkalinity also was determined by the Gran titration method at the New Jersey District laboratory.

Physical and chemical properties of soils in the basin that were analyzed include particle-size distribution, pH, exchange acidity, cation exchange capacity, percent organic matter, base cations, extractable and exchangeable aluminum, iron, and soluble sulfate. These soils are composed of greater than 89 percent sand-sized particles, have low pH (pH less than 4.9), have low cation exchange capacities (less than 0.5 to 10.5 milliequivalents per 100 grams), and contain up to 1,686 micrograms per liter extractable aluminum and up to 4,088 micrograms per liter extractable iron. Mineralogy of the fine-silt/clay fraction of selected soil and

depositional clay samples also was determined. The fine-silt/clay fraction of these soils is composed primarily of kaolinite, fine-grained quartz, illite, and aluminum-interlayered vermiculite. Some chlorite, aluminum-interlayered montmorillonite, and gibbsite also were present. The depositional clay lenses in the basin are composed primarily of fine-grained quartz, kaolinite, and illite.

From February 1985 through January 1986, McDonalds Branch basin received approximately 37.9 inches of rainfall, and discharge at McDonalds Branch gaging station totaled approximately 6.5 inches. Bulk precipitation in McDonalds Branch basin over the sampling period had a mean pH of approximately 4.3, and stream pH generally increased in the downstream direction, ranging from 3.2 to 4.8. Aluminum concentrations were often high in the basin's waters; the highest aluminum concentration, 10,000 micrograms per liter, was observed at the farthest upstream sampling site. Sulfate was generally the dominant anion in waters in the basin. Dissolved organic carbon in stream water generally ranged from 1.1 to 37 milligrams per liter. Hydrogen ion, aluminum, and sulfate concentrations were generally higher in shallow ground water than in deeper ground water in the basin. In ground water, the highest concentrations of hydrogen ion, aluminum, iron, sulfate, and dissolved organic carbon were found in shallow ground waters near wetlands and lowlands in the hardwood swamp and pond community (open-channel) areas of the basin.

INTRODUCTION

The New Jersey Pinelands is a unique and sensitive natural area, spanning 1,700 mi^2 (square miles) of the Atlantic Coastal Plain in New Jersey, as shown in figure 1 (New Jersey Pinelands Commission, 1980). Overlying mostly sands and gravels, the Pinelands supports a variety of habitats, including extensive pine-oak and oak-pine forests interspersed with swamps and cranberry bogs. A number of rare plant species, including delicate orchids, attract botanists from around the world. The necessity of preserving the Pinelands as a natural area was recognized by the U.S. Government in 1978, when the region became the nation's first National Reserve. The importance of the area is underscored by the more than 10.8 trillion gallons of fresh water which the Pinelands holds within its streams and aquifers (Rhodehamel, 1970, p. 24). This water currently is used for drinking water in some areas and also constitutes a potentially important reservoir for the growing metropolitan areas in and around New Jersey. A portion of the Pinelands was purchased by the State of New Jersey in 1954 for conservation and recreational needs, and to meet the future water demands of the State (Means and others, 1981).

The location of the Pinelands within the heavily industrialized northeastern corridor makes it probable that the region will be subject to the deleterious effects of acidic deposition. The streams and shallow ground water in the Pinelands are acidic, with low alkalinities and generally low buffering capacities. Concentrations of organic acids also are elevated at times, especially during the warmer months of the year. The soils also are acidic and generally nutrient-poor. Johnson (1979a and 1979b) recognized trends toward decreasing pH in two small Pinelands streams (McDonalds Branch and Oyster Creek) between 1963 and 1978 and suggested that acidic deposition might be the cause of this phenomenon.

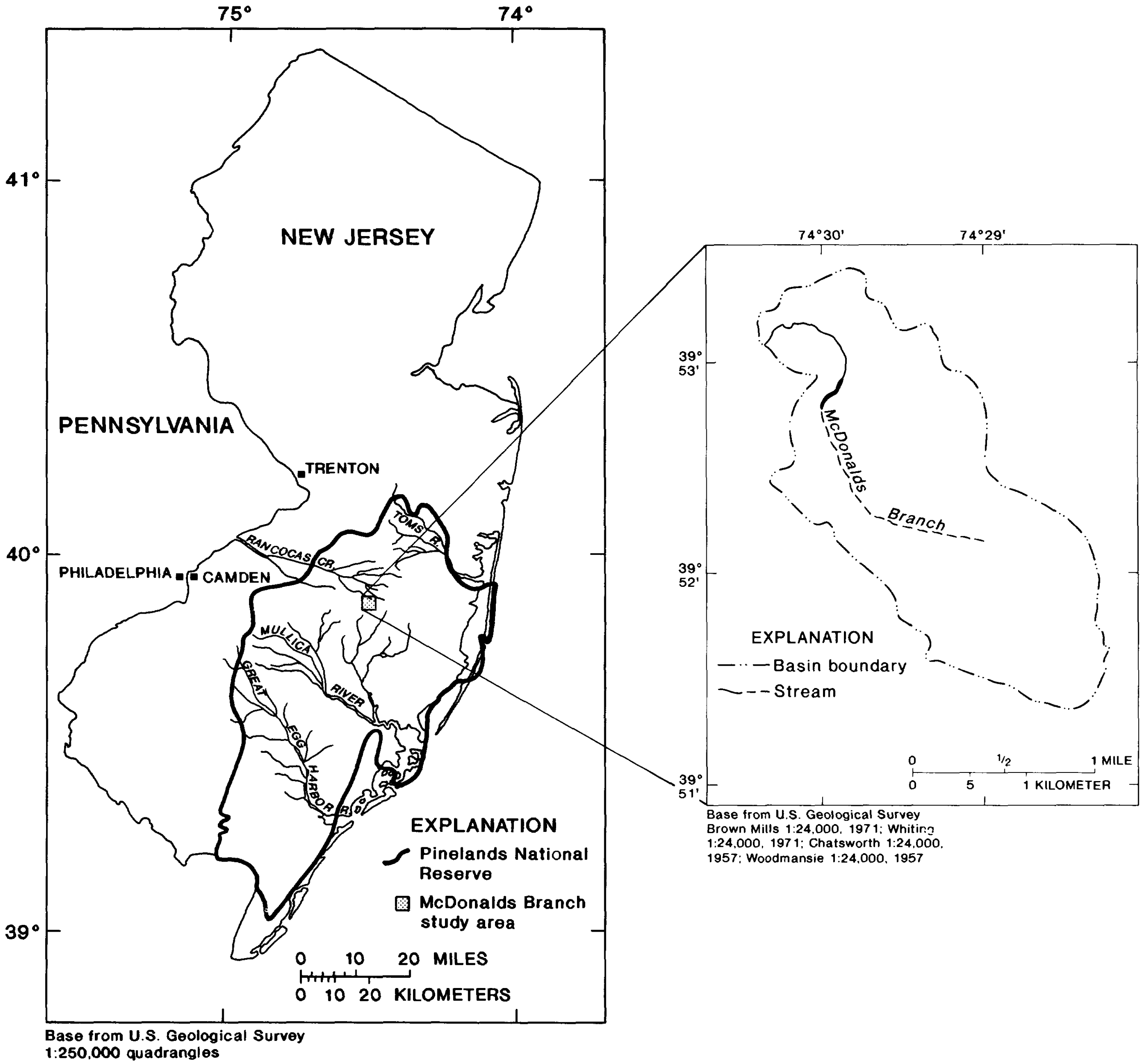

Figure 1.--Location of study area in the Pinelands of New Jersey.

Purpose and Scope

From 1983-1986, the U.S. Geological Survey conducted a study of the effects of acidic deposition on McDonalds Branch basin, a small (2.35 mi^2) forested watershed located in Lebanon State Forest, near the center of the Pinelands (fig. 1). This report is a compilation of the hydrogeochemical data collected during that study. The geology, hydrology, soils, and vegetation are discussed in considerable detail because (1) they differ greatly with location in the basin, (2) they affect the quality of basin waters, and (3) they were important in determining the design of the study.

The framework for this study was provided by the work of Rhodehamel (1970, 1979b) on the Pinelands hydrology, of Means and others (1981) on the hydrogeochemistry of the Pinelands, of Swanson (1979) and Turner (1983) on the chemistry of trace metals in McDonalds Branch basin, of Markley (1955) on the soils of McDonalds Branch basin, and of McCormick (1955) on the vegetation of McDonalds Branch basin. Madsen and others (1986) also studied biochemical processes in McDonalds Branch basin. Additionally, water-quality and streamflow data have been collected at McDonalds Branch by the U.S. Geological Survey since 1963 and 1953, respectively, as part of the nationwide hydrologic bench-mark studies program.

The design of the data-collection network used in the 1983-86 study at McDonalds Branch basin was based on the following project objectives: (1) to identify the components contributing to the acidity of waters (strong acidity versus organic acidity); (2) to examine the components of the flow system and determine their relative contributions to the volume and chemistry of streamflow; (3) to examine trace-metal mobilization and the role of organic matter in this mobilization; and (4) to develop conceptual hydrologic and chemical models to describe the system.

During 1984 and 1985, the basin was instrumented. In 1985 and 1986, water-quality samples of precipitation, throughfall, soil water, surface water, and ground water were collected. Water samples were analyzed for major ions, selected trace metals, dissolved organic carbon, pH, specific conductance, and alkalinity. Hydrologic data also were collected, including precipitation and throughfall amounts, stage measurements, and ground-water levels. Geologic and soil investigations included location of major clay lenses, identification of clay mineralogy, and chemical analysis and particle-size distributions of mineral soil horizons.

Acknowledgments

The authors express their appreciation to Arthur H. Johnson of the University of Pennsylvania, Philadelphia, Pa., for his helpful suggestions, guidance, and encouragement through all phases of this study. We also thank H. Christopher Smith of the U.S. Soil Conservation Service, Somerset, N.J., for assistance in soils and geologic work, and for numerous suggestions that improved the soils section of this report. We appreciate the cooperation and assistance of Christian M. Bethmann, Superintendent of Lebanon State Forest, and his staff in providing labor and equipment, particularly during Hurricane Gloria. The support of both Robert Runyon and Gail Carter of the New Jersey Department of Environmental Protection, Division of Water Resources, also is appreciated.

The maps in the figures of this report were generated using the New Jersey Geographic Information System (GIS).

This study was performed in cooperation with the New Jersey Department of Environmental Protection, Division of Water Resources.

STUDY AREA

Hydrology

The Pinelands have a humid and temperate climate that is mostly continental (Markley, 1971), with a small oceanic influence. The mean annual air temperature is approximately 11.5 °C (degrees Celsius) (53.3 °F (degrees Fahrenheit)), with the lowest mean monthly temperature, -0.5 °C (31.4 °F), occurring in January, and the highest mean monthly temperature, 23.5 °C (62.0 °F), occurring in July. The average annual precipitation to the Pinelands, based on data from 1951-1980, is 45.8 in. (inches), and the highest average monthly precipitation, 5.3 in., occurs in August (National Oceanic and Atmospheric Administration, 1982).

The Pinelands lies within the Northern Atlantic Coastal Plain physiographic province in New Jersey and is underlain by the Kirkwood-Cohansey aquifer system. This aquifer system is generally unconfined, with small localized confined units. The hydrology of the Pinelands is strongly influenced by the sandy composition of the aquifer system, which, in most areas, facilitates the rapid infiltration of precipitation. Precipitation is the only source of water to the aquifer system; all Pinelands streams originate within the region (Rhodehamel, 1979b).

In McDonalds Branch basin and other upland areas, there often is recharge to the aquifer system. Ground water discharges to the peripheral, low-lying streams as shown in figure 2 (Rhodehamel, 1970, fig. 2). Rhodehamel (1970, p. 14) estimated that ground-water discharge comprises 89 percent of streamflow in the Pinelands region. McDonalds Branch flows westward from its origin in the central uplands region of the Pinelands toward the North Branch of the Rancocas Creek, which ultimately discharges to the Delaware River.

The average discharge of McDonalds Branch is 2.26 ft^3/s (cubic feet per second), or 13.06 in./yr (inches per year), based on 33 years of record (Bauersfeld and others, 1987, p. 110). The average annual minimum discharge for a 7-day period with a recurrence of 10 years is 1.0 ft^3/s, calculated for the period 1955-75 (Gillespie and Schopp, 1982, p. 149).

Rhodehamel (1970, p. 6-7) estimated a long-term hydrologic budget for the entire Pinelands region, using the equation $P = R + ET$, where the average yearly precipitation, P, based on data collected from 1931-1964 was 45 in.; the average annual stream runoff, R, was 22.5 in.; and the estimated average annual evapotranspiration, ET, was 22.5 in.

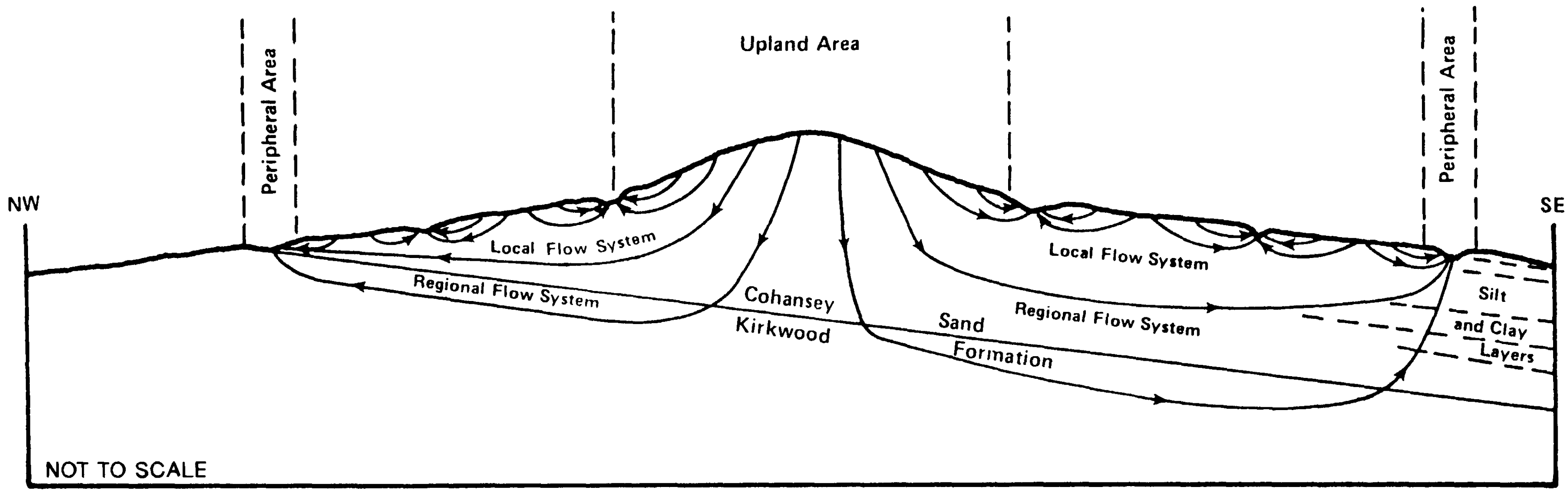

Figure 2.--Idealized vertical section showing ground-water flow patterns in the Pinelands (from Rhodehamel, 1970, figure 2).

Geology

The Pinelands region lies within the Northern Atlantic Coastal Plain physiographic province in southern New Jersey. The Coastal Plain deposits in New Jersey are mainly marine or nearshore sediments representing a series of transgressions and regressions ranging from Cretaceous to Tertiary time (Owens and Sohl, 1969). These marine sediments are overlain by discontinuous late Tertiary fluvial deposits (Owens and Minard, 1975). During the Quaternary Period, surficial sediments were transported from the Pinelands area by strong winds travelling south from the Pleistocene ice sheets, and by fluvial erosion. Deposition of sediments in the valleys resulted in a widespread inversion of topography (Rhodehamel, 1979a; Salisbury and Knapp, 1917); today, older stream deposits are present at higher altitudes, and younger deposits lie in the valleys (Rhodehamel, 1979a).

Cohansey Sand

McDonalds Branch basin is underlain by the Cohansey Sand, the youngest and most widespread of the marine Coastal Plain deposits (fig. 3). This formation, which reaches 250 ft (feet) in thickness, is underlain by the finer-grained Kirkwood Formation (Markewicz, 1969). The contact between the Cohansey Sand and the Kirkwood Formation is sharp and dips gently to the southeast at approximately 10 feet per mile (Minard and Owens, 1960).

In southern New Jersey, the Cohansey Sand probably was deposited in a deltaic environment (Owens and Sohl, 1969). Although lithologically variable, the Cohansey Sand is predominantly a yellow, limonitic, poorly sorted, quartz sand, interbedded with minor amounts of clays and silty and clayey sand. Minor amounts of feldspar, chert, vein quartz, and ironstone pebbles also are present. Ilmenite is present as a dominant heavy mineral in the area that includes the McDonalds Branch basin (Rhodehamel, 1979a; Markewicz, 1969).

Both parallel bedding and cross-stratification can be observed within the Cohansey Sand. In the area of McDonalds Branch basin, thick sequences of carbonaceous, irregularly shaped, lenticular and laminated clays also have been noted (Rhodehamel, 1979a). The clay lenses in McDonalds Branch basin are composed primarily of fine-grained quartz, kaolinite, and illite (table 1).

Beacon Hill Gravel

The Cohansey Sand is unconformably overlain by a thin, discontinuous veneer of the Beacon Hill Gravel (Owens and Minard, 1975), outcrops of which have been identified to the east of and within McDonalds Branch basin. The Beacon Hill Gravel was deposited by fluvial processes and is composed of coarse-grained quartz sand and gravel, with pebbles of vein quartz, quartzite, and fossiliferous chert (Minard, 1966). The Beacon Hill Gravel is more resistant to erosion than the underlying sandy formations and thus caps many of the hills in the Pinelands (Minard, 1966).

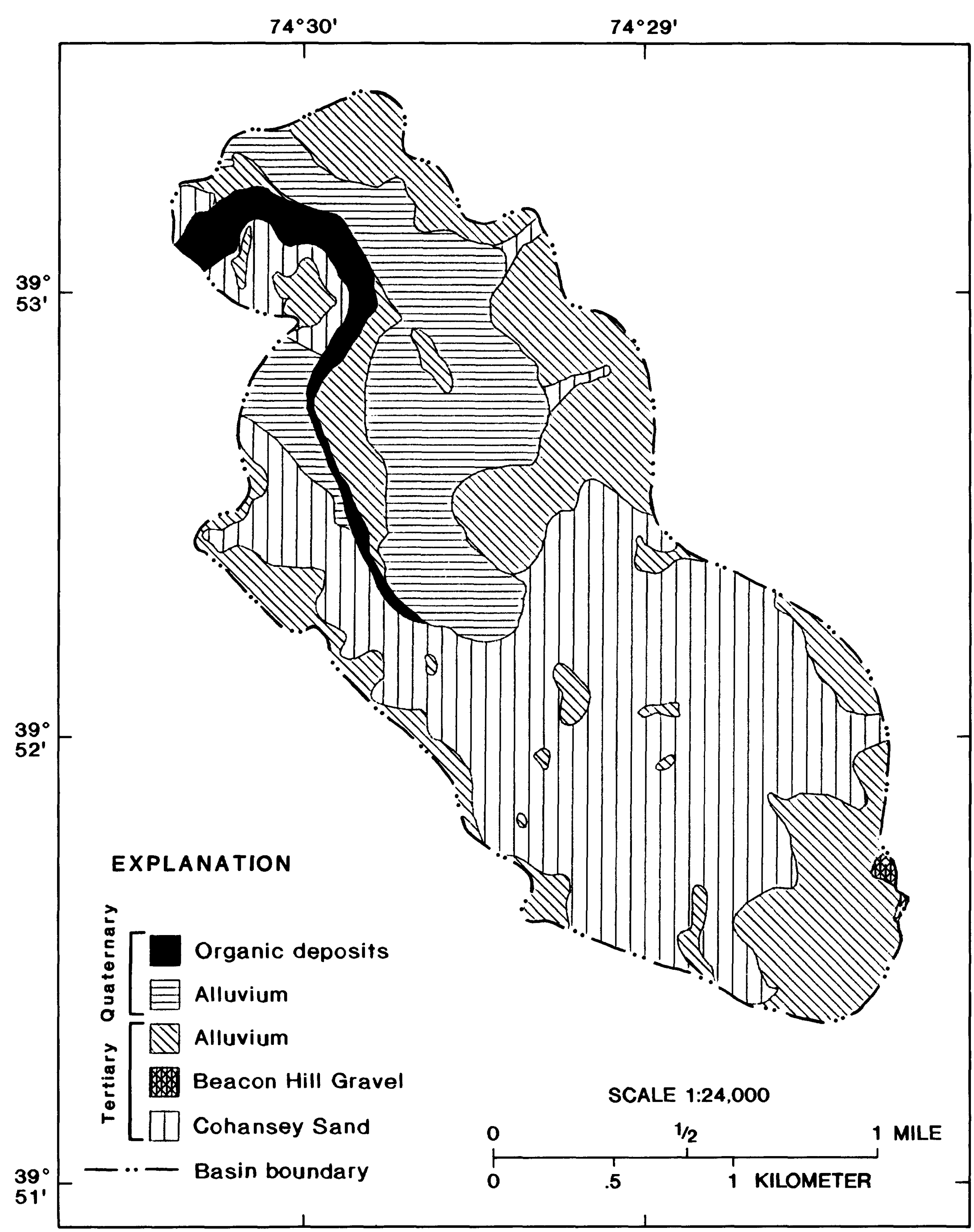

Figure 3.--Geology of the McDonalds Branch basin (modified from map prepared by E. C. Rhodehamel, U.S. Geological Survey, 1965. Permission to publish given by E.C. Rhodehamel.)

Table 1.--Mineralogy of clay/fine-silt fractions of selected clay lenses in McDonalds Branch basin

Site number[1]	Depth (feet)	Mineralogy[2]			
		Quartz	Kaolinite	Illite	Mixed-layer[3] expandable clay
QWH-5B	10	4	4	3	1
QWH-5B	39	4	4	2	1
CQ-1	29	5	4	2	1
CQ-1	30	5	4	2	1
CQ-1	30.5	5	3	2	nd
CQ-1	31	4	3	2	nd
C-6B	28-33	5	4	2	nd
C-6B	39	4	3	1	nd

[1] Site locations are shown in figures 8 and 9.

[2] Relative amounts: 5 = Dominant, 4 = Abundant, 3 = Moderate, 2 = Small, 1 = Trace, nd = None detected. Relative amounts for each sample determined from peak heights on diffractogram. The presence of gibbsite could not be positively determined due to the low intensity of possible gibbsite peaks.

[3] Expandable clays present in amounts too small to permit separation into montmorillonite and vermiculite.

Tertiary and Quaternary Alluvium

Alluvial deposits of late Tertiary age are present in lowlands and valleys of McDonalds Branch basin (J. P. Owens, U.S. Geological Survey, oral commun., 1986). This alluvium consists of reddish- to yellowish-brown quartz sand which was eroded from the Cohansey Sand and was redeposited by mostly fluvial processes. Surficial sediments of Quaternary age also are present in scattered locations throughout the basin (Rhodehamel, 1979a; Owens and Minard, 1975). These sediments include alluvial and aeolian deposits, as well as dark-brown organic deposits which are located along stream beds and within undrained depressions (E. C. Rhodehamel, U.S. Geological Survey, written commun., 1965).

Soils

Markley (1979) describes 13 soil series that cover most of the Pinelands region. Seven of these soils have been mapped in McDonalds Branch basin (fig. 4). The distribution of the different soil series is determined largely by topographic position (figs. 4 and 5). Evesboro and Downer soils occupy the highest landscape positions, including the higher divides. Lakewood soils cover most of the upland portions of the basin; Lakehurst, Atsion, and Berryland soils occupy successively lower topographic positions. Muck soils lie within most of the McDonalds Branch stream channel. With the exception of the Muck, these soils are predominantly deep or loamy sands with moderate to rapid permeabilities (Markley, 1971; Markley, 1979). The available water capacity of the upland and transitional soils (Evesboro, Downer, Lakewood, and Lakehurst) is generally very low to low, and the available water capacity for the lowland and wetland soils is excessive (Markley, 1979). The seven soils are extremely to very strongly acidic, with pH values that generally range from 3.6 to 5.0 (Markley, 1979). In surface horizons, pH values may be as low as 3.0 (R. D. Yeck, U.S. Soil Conservation Service, written commun., 1985). Muck soils have moderate fertility, but the remaining soils have low to very low fertility. Selected chemical characteristics and particle-size distributions for four of the seven soils are shown in tables 2 and 3.

Series

Evesboro, Downer, and Lakewood Soils

Evesboro and Downer soils are found at some of the highest elevations in McDonalds Branch basin, and each covers approximately 9 percent of the basin. The Evesboro, a Typic Quartzipsamment[1], is excessively drained, whereas the Downer, a Typic Hapludult, is well drained (Markley, 1971). The Lakewood is the predominant uplands soil, covering approximately 38 percent of the basin. This soil is a deep, excessively drained Spodic Quartzipsamment with a bleached horizon at least 7 in. thick (Markley, 1971). The three upland soils generally have low organic-matter content and support pitch pine-mixed oak forests. The Evesboro and Downer soils are more fertile than the Lakewood and support more oaks than pines. The Lakewood, which is more leached and acidic than the Downer or Evesboro soil, supports more pines than oaks.

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[1]The classifications of these seven soils are based on criteria contained in U.S. Department of Agriculture, 1975 (Soil Taxonomy).

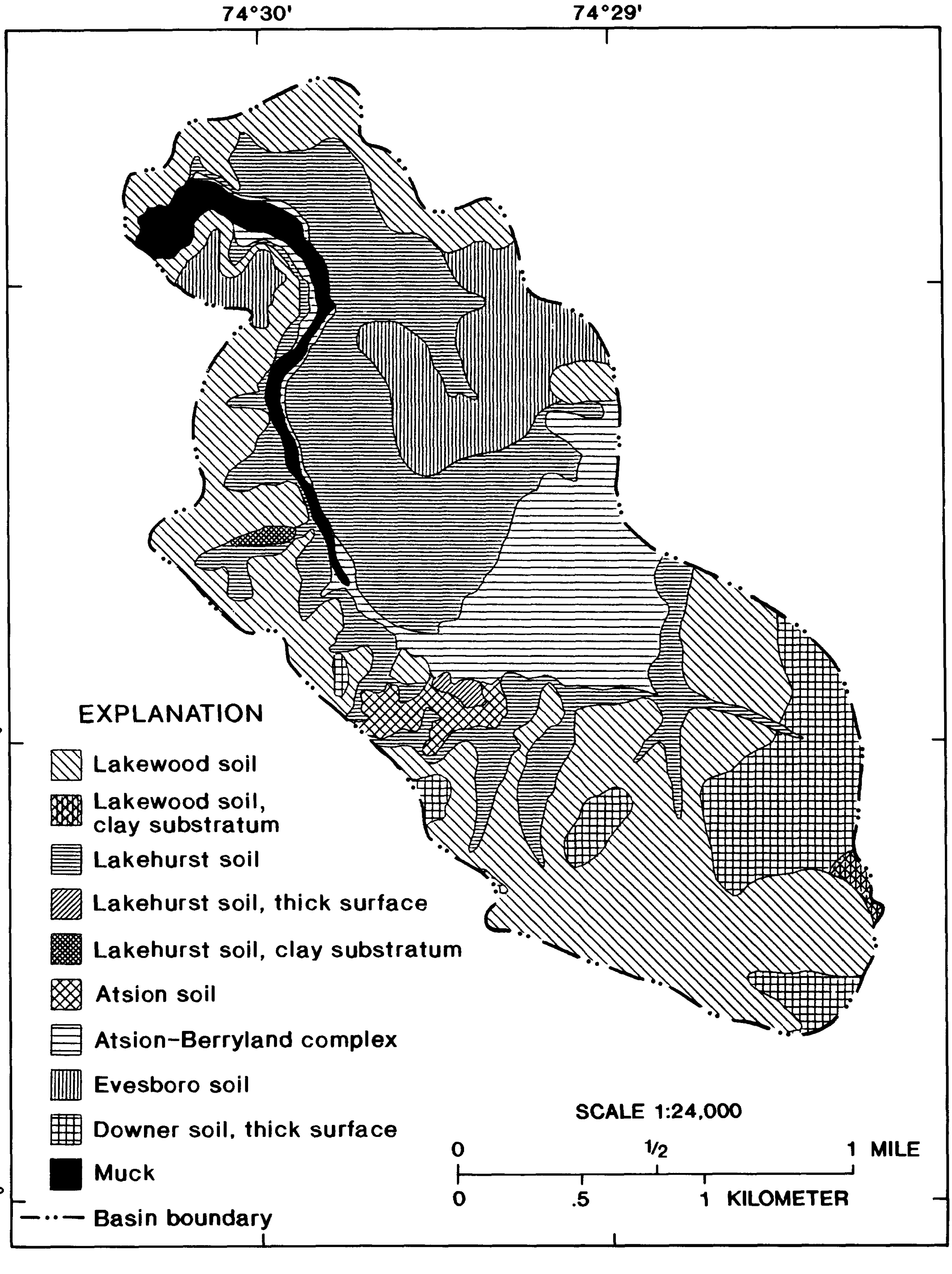

Figure 4.--Soils of McDonalds Branch basin (modified from Markley, 1955, figure 5).

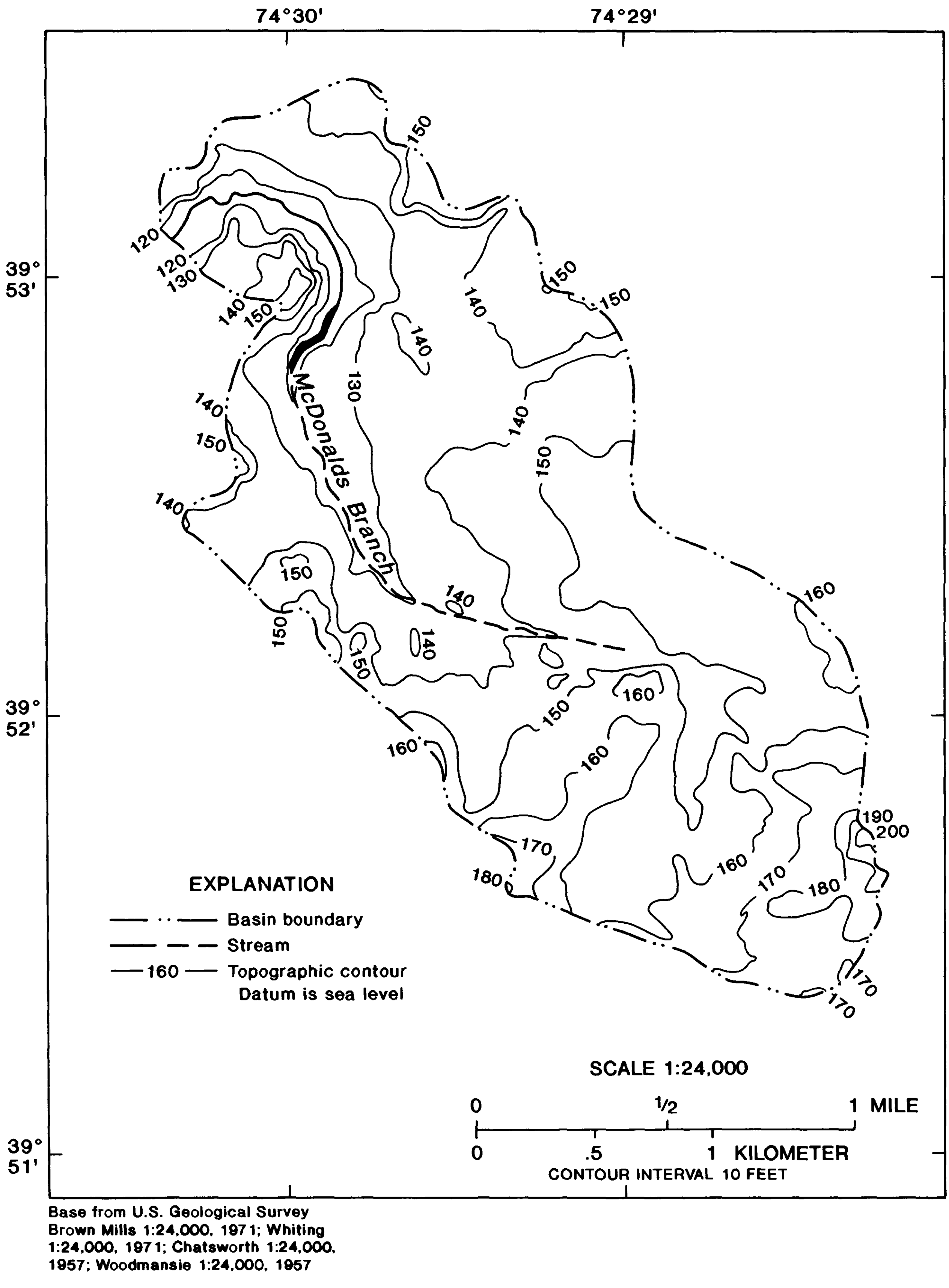

Figure 5.--Topography and surface-water drainage area of the MacDonalds Branch basin.

Table 2.--Chemical analyses of selected soils in McDonalds Branch basin*

[kg, kilograms; meq, milliequivalents; g, grams; μg, micrograms; cmol +/kg, centimoles ion charge per kilogram of soil; < indicates less than]

Soil series	Ho-ri-zon	Depth (inches)	pH (H_2O)	pH ($CaCl_2$)	Ex H+ (cmol +/kg)**	CEC (meq/ 100g)	OM (%)	Ca (meq/ 100g)	Mg (meq/ 100g)	K (meq/ 100g)	Na (meq/ 100g)	Ex-change-able Al*** ($\mu g/g$)	Ex-tract-able Al[†] ($\mu g/g$)	Ex-tract-able Fe[†] ($\mu g/g$)	Soluble SO_4-S (μg S/g)
Atsion	E[††]	3-19	4.5	3.6	1.0	<0.5	0.3	0.01	0.004	0.004	<0.01	<1	<1	44	<1
Atsion	Bh	19-27	4.1	3.7	11.0	10.5	2.1	.04	.009	.005	.01	397	1686	324	8
Atsion	C	>27	4.5	4.3	6.0	3.5	.9	.03	.005	.003	<.01	91	1484	1311	11
Lakehurst	E	3-17	4.4	3.4	1.0	<.5	.3	.02	.005	.004	<.01	11	55	41	<1
Lakehurst	Bh	17-19	4.5	4.0	4.0	3.0	1.0	.01	.006	.004	<.01	79	1129	2496	<1
Lakehurst	C	>38	4.6	4.3	1.0	.5	.3	.01	.002	.005	<.01	19	724	1390	8
Lakewood	E	4-17	4.3	3.5	1.0	<.5	.3	.02	.006	.001	<.01	7	79	333	<1
Lakewood	B	17-22	4.5	4.2	4.0	3.0	1.0	.02	.007	.005	<.01	58	1661	4088	3
Lakewood	C	>36	4.8	4.6	1.0	<.5	.3	.01	.003	.001	<.01	12	482	876	<1
Evesboro	A2	2-7	4.1	3.4	2.0	1.5	.6	.03	.008	.005	<.01	31	164	712	<1
Evesboro	C	7-24	4.5	4.4	1.0	1.0	.4	.01	.005	.008	<.01	26	1181	2110	<1

* Analyses were performed by the Agronomy Analytical Laboratory at Cornell University.

** Exchange acidity, expressed as centimoles of ion charge per kg of soil. These units are equivalent to meq/100g.

*** Extracted with 1N KCl.

† Extracted with citrate-dithionite.

†† See Glossary for soil-horizon definitions.

Table 3.--Particle-size distribution in Lakehurst, Lakewood, Atsion, and Evesboro soils in McDonalds Branch basin

[> indicates greater than, < indicates less than, mm indicates millimeter]

Soil series	Soil horizon	Percentage		
		Sand >230 mesh (>0.063 mm)	Medium to coarse silt 230-500 mesh (0.063-0.02 mm)	Fine silt/clay <500 mesh (<0.02 mm)
Lakehurst	B3	98.4	0.4	1.2
Lakehurst	C	98.7	.1	1.2
Lakewood	B3	97.6	.4	2.0
Lakewood	C	98.1	.3	1.6
Atsion	B3	91.5	2.9	5.6
Atsion	C	90.6	3.3	6.1
Evesboro	Upper C	91.0	2.7	6.3
Evesboro	Lower C	89.9	2.8	7.4

Lakehurst Soil

The Lakehurst soil covers approximately 27 percent of the basin and generally occupies areas topographically below Lakewood and above Atsion soils. A Haplaquodic Quartzipsamment (Markley, 1979), the Lakehurst is moderately well to somewhat poorly drained and has a fluctuating water table that rises to about 2 ft below the land surface in late winter (Markley, 1971). The Lakehurst has a bleached E horizon at least 7 in. thick, has very low organic-matter content, and supports mostly pitch pine and oak, gum, and hickory.

Atsion, Berryland, and Muck Soils

Atsion, Berryland, and Muck soils occupy lowland and wetland areas, and together cover approximately 16 percent of the basin. The Atsion soil is a poorly drained Aeric Haplaquod; the Berryland is a very poorly drained Typic Haplaquod (Markley, 1971). In Atsion soils, the water table is at or near the surface during winter and spring (Markley, 1979). Berryland soils are usually saturated in winter and spring, and the water table is usually within 2 ft of the land surface in summer. The Atsion and Berryland soils have moderate and high organic-matter contents, respectively, and typically support pitch pine, red maple, and black gum. Scattered Atlantic white cedar can also be found on Berryland soils (Markley, 1971). In one area of the basin, the Atsion and Berryland soils are mapped as the "Atsion-Berryland complex" (fig. 4). Although these soils have different morphologies, they are not mapped separately in this area because of limitations of map scale (H. C. Smith, U.S. Soil Conservation Service, oral commun., 1986). The Atsion and Berryland soils have standard geomorphic association--the Atsion soils are present at slightly higher elevations than the Berryland soils.

Muck soil, which lies within most of the stream channel, generally consists of 16 to 36 in. of decomposed organic matter over a sandy substratum (Markley, 1971; H. C. Smith, U.S. Soil Conservation Service, oral commun., 1986). This soil, classified as a Terric Medisaprist (Markley, 1979), usually is saturated and supports dense stands of Atlantic white cedar.

Soil Mineralogy

The mineralogy of Pinelands soils is discussed in detail by Douglas and Trela (1979). The sand and silt fractions are dominated by quartz, the dominant mineral of the Cohansey Sand. Heavy minerals, including ilmenite, leucoxene, zircon, rutile, anatase, staurolite, tourmaline, and chlorite, comprise one to two percent of the sand fraction. Sand and silt fractions contain less than 1 percent feldspar and muscovite (Douglas and Trela, 1979).

Clay-sized minerals in the Pinelands' soils include kaolinite, aluminum-interlayered dioctahedral vermiculite, aluminum-interlayered smectite (montmorillonite), and gibbsite (Douglas and Trela, 1979). The mineralogy of the clay/fine-silt fractions of selected soils in McDonalds Branch basin is shown in table 4. The data in table 4 are from X-ray diffraction analyses performed as part of this study and indicate the presence of illite and chlorite, as well as the minerals mentioned above.

Table 4.--Mineralogy of clay/fine-silt fractions of Lakehurst, Lakewood, Atsion, and Evesboro soils in McDonalds Branch basin

[Abbreviations: Qtz. = Quartz, Gibbs. = Gibbsite, Kaol. = Kaolinite, Ill. = Illite, Chlor. = Chlorite, Mont. = Aluminum-interlayered montmorillonite, Verm. = Aluminum-interlayered vermiculite]

Soil series	Soil horizon	Mineralogy[1]						
		Qtz.	Gibbs.	Kaol.	Ill.	Chlor.	Mont.	Verm.
Lakehurst	B3	3	1	5	nd	nd	nd	3
Lakehurst	C	3	1	5	3	nd	nd	[2]3
Lakewood	B3	3	2	5	1	nd	nd	2
Lakewood	C	3	1	5	2	nd	nd	2
Atsion	B2	4	1	4	3	1	3	1
Atsion	C	4	1	4	3	2	3	2
Atsion	IIC[3]	4	1	2	3	3	3	nd
Evesboro	Upper C	3	1	3	1	nd	1	3
Evesboro	Lower C	3	1	3	1	nd	3	nd

[1]Relative amounts 5 = Dominant, 4 = Abundant, 3 = Moderate, 2 = Small, 1 = Trace, nd = None detected.
Relative amounts for each sample determined from peak heights on diffractogram.

[2]There is some evidence that vermiculite that is not interlayered may be present.

[3]Abrupt change in parent material from sand to compact clay.

Vegetation

The vegetation of the New Jersey Pinelands is unique in appearance and composition and has been described in detail by a number of authors (McCormick, 1979; Olsson, 1979; Olsvig and others, 1979; Good and others, 1979; Little, 1979; and Whittaker, 1979). Figure 6 is a map of the vegetation in McDonalds Branch basin. Because of the importance of these communities in determining the locations of the throughfall sampling stations used in this study, the various plant communities are described in detail below.

McCormick (1979) separated the vegetation into two distinct floristic complexes: an upland complex and a lowland complex. The depth to the water table is the primary factor that determines which complex occupies a particular region: upland complexes occupy areas where the water table always lies more than 2 ft below the surface, whereas lowland complexes occupy areas where the water table is near or above the land surface during at least a part of the year (McCormick, 1979). The location of the water table determines the availability of water to the root zone as well as the probability of fire and thus acts as a selective agent in determining which plant species will survive and dominate the plant community (Little, 1979).

Upland Complex

The plants of the upland complex cover approximately 85 percent of the Pinelands. Pitch and shortleaf pines (*Pinus rigida*, *P. echinata*) and blackjack, black, white, chestnut, and post oaks (*Quercus marilandica*, *Q. veluntina*, *Q. alba*, *Q. prinus*, *Q. stellata*, respectively) dominate the canopy vegetation in the uplands. The understory contains largely lowbush blueberry, black huckleberry, and scrub oak. (See McCormick, 1979.)

Lowland Complex

The plants of the lowland complex cover approximately 10 to 15 percent of the Pinelands and include wetland communities and pitch-pine forests (McCormick, 1979). Three major wetland communities exist: Atlantic white-cedar swamp forests, broadleaf (hardwood) swamp forests, and shrubby wetland communities (Olsson, 1979; McCormick, 1979). In the first of these communities, Atlantic white cedar (*Chamaecyparis thyoides*) forms a dense upper canopy over a lower stratum of red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), and sweetbay magnolia (*Magnolia virginiana*) (Olsson, 1979; McCormick, 1979). The undergrowth is composed of a variety of shrubs, including highbush blueberry, clammy azalea, and sweet pepperbush. The underlying peat and muck are covered with *Sphagnum* mosses and various herbs (McCormick, 1979).

Broadleaf swamp forests which consist of red maple, black gum, and sweetbay magnolia commonly border cedar swamp forests and the upper portions of small streams. The undergrowth includes such shrub species as highbush blueberry and sweet pepperbush. Spongy mats of *Sphagnum* mosses comprise portions of the ground layer.

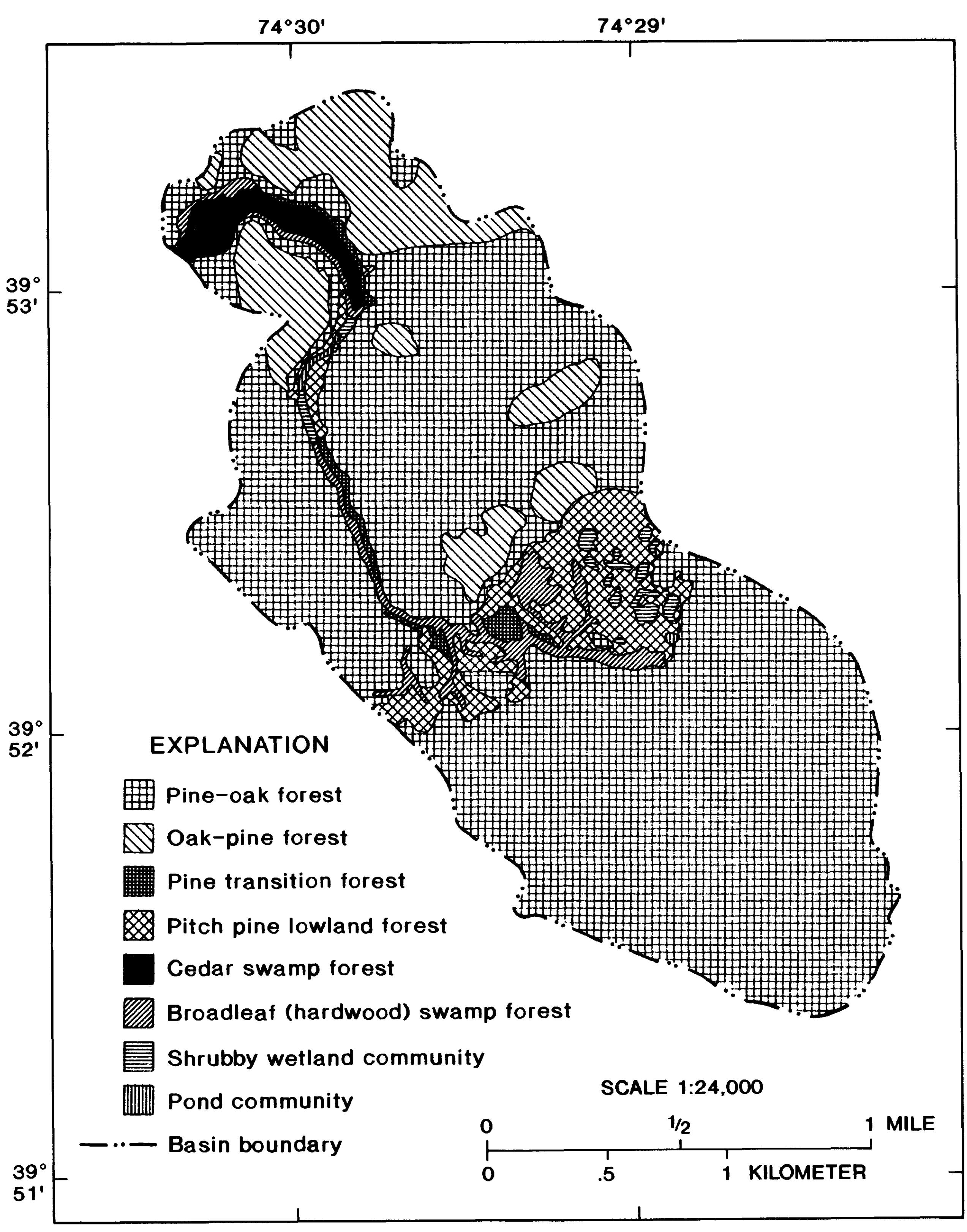

Figure 6.--Vegetation in McDonalds Branch basin (modified from McCormick, 1955, figures 2 and 3).

Shrubby wetland communities occur in wetland areas that are exposed to sunlight, such as the channels of intermittent streams and openings within cedar and broadleaf swamps. Sphagnum mosses form a dense ground cover below such shrubs as leatherleaf and highbush blueberry.

McCormick (1955) identified two regions that contain pond communities in McDonalds Branch basin, one in an intermittently ponded section of the streambed and another in a small depression (fig. 6). Various rooted hydrophytes are present in these pond communities, along with Sphagnum mats covered with rush and sedge species. Leatherleaf comprises a significant portion of the emergent vegetation.

Pitch-pine forests include pine-transition forests which occupy the transitional zones between upland forests and swamp forests, as well as pitch-pine lowland forests which are located in circular depressions and other poorly drained areas. The pine-transition forest is characterized by pitch pine in the canopy, and an understory of red maple, black gum, and gray birch. The shrub layer is dominated by sheep laurel and dangleberry. The pitch-pine lowland forest is similar to the transition forest, except that pines in the lowland forests are more dense and do not grow as tall as those of the transition forests. The lowland forests occupy slightly wetter areas than the transition forests and thus contain a larger percentage of shrubby-wetland-type vegetation and Sphagnum. (See McCormick, 1979.)

DATA COLLECTION

Network Design

During 1984-85, a network of water-quality and hydrologic data-collection sites was established in McDonalds Branch basin. The sites were located to best sample precipitation, throughfall, soil water, surface water, and ground water within the basin (figs. 7 to 9). Table 5 summarizes the number of each type of sampling site.

Precipitation

Precipitation was collected at two sites, one at each of the topographically upper (upstream) and lower (downstream) ends of the basin (fig. 7). Each site was located in a cleared area and contained wet and bulk precipitation collectors and two rain gages. Wet precipitation was collected using the Aerochem Metrics 301[2] automatic sensing wet/dry precipitation collector; this collector is recommended by the National Atmospheric Deposition Program (NADP) for collection of wet precipitation. A Belfort universal event-recording rain gage, 5-780 series, was connected to each Aerochem Metrics collector in order to record continuous precipitation volumes and the time and duration of precipitation events. Both the Aerochem Metrics collector and the Belfort gage were powered by 12-volt marine wet-cell batteries and installed on a wooden platform. The orifices of both the collector and the Belfort gage were positioned approximately 9 ft above the land surface. Elevation of the collecting orifice minimized contamination of samples by particulate matter and by precipitation rebounding from the forest floor or vegetative surfaces.

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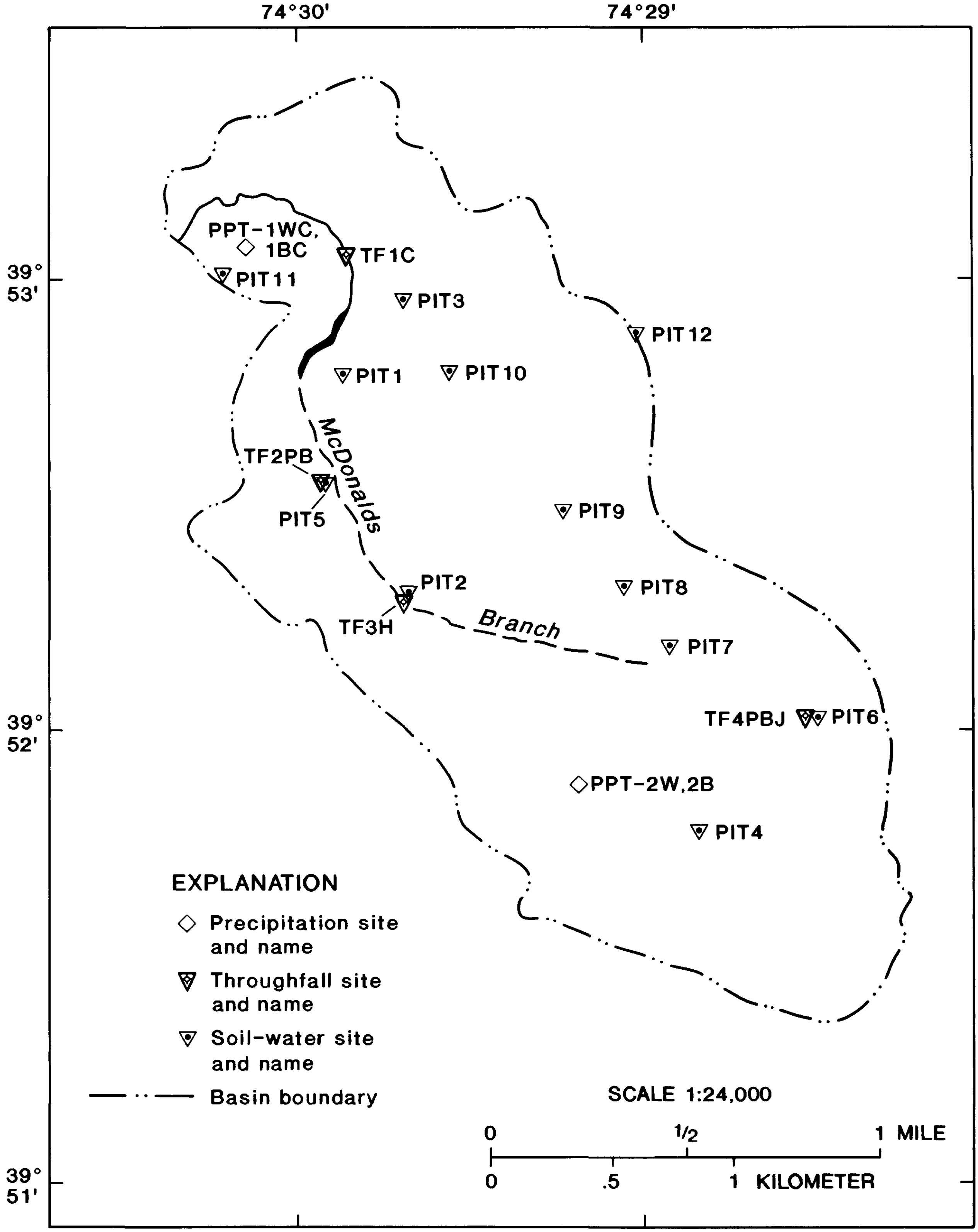
[2]Use of trade names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

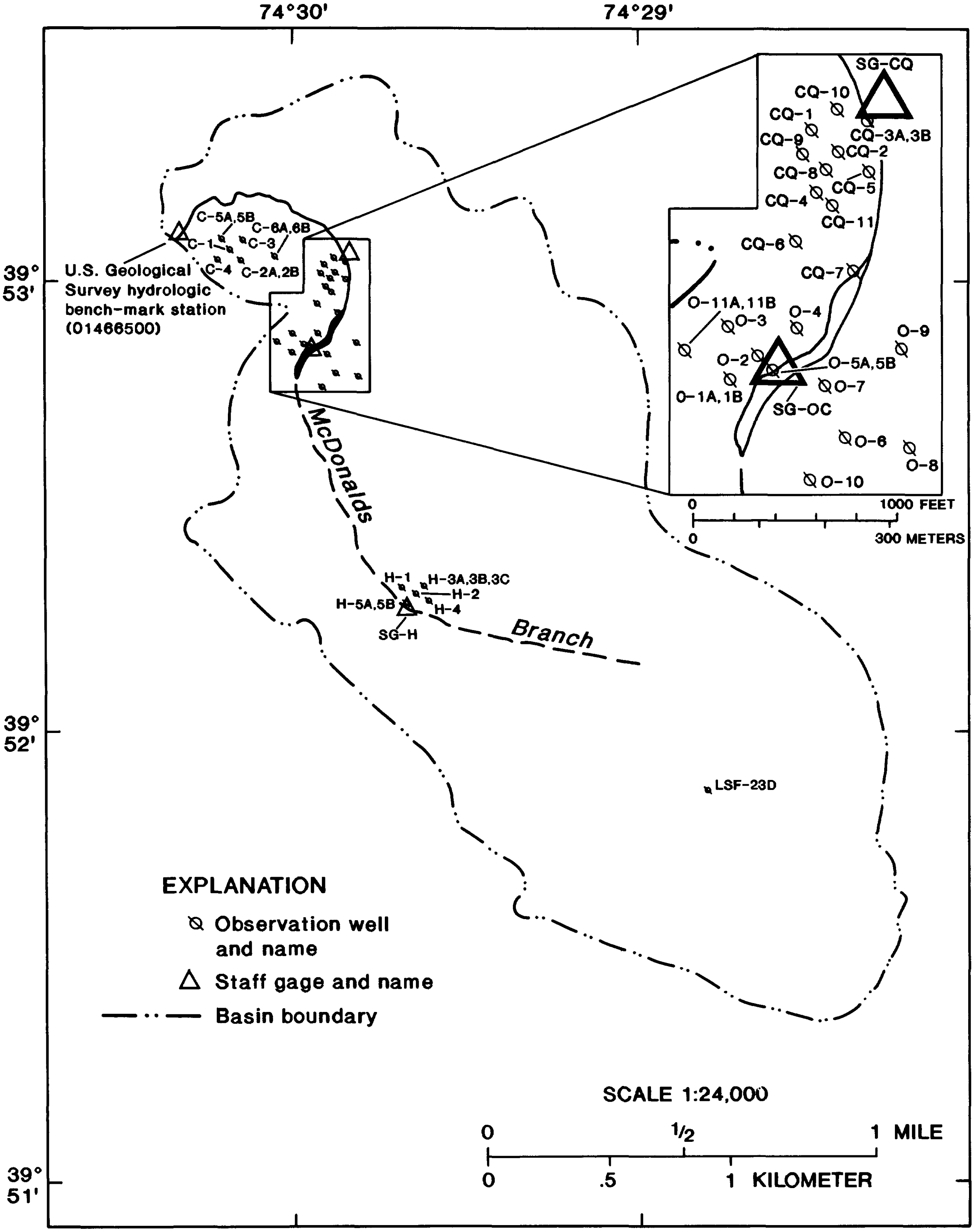
Table 5.--Data-collection sites in McDonalds Branch basin

Type	Number
Aerochem Metrics 301 wet/dry precipitation collectors	2
Bulk precipitation collectors	2
Belfort event-recording rain gages	2
Plastic wedge rain gages	6
Throughfall collectors	4
Soil lysimeters	33
Water-quality wells	26
Water-level wells	43
Water-level recorders	4
Surface-water sites	10
Staff gages	3
U.S. Geological Survey Hydrologic Benchmark station (01466500)	1



Base from U.S. Geological Survey Brown Mills 1:24,000, 1971; Whiting 1:24,000, 1971; Chatsworth 1:24,000, 1957; Woodmansie 1:24,000, 1957

Figure 7.--Locations of precipitation, throughfall, and soil-water sampling sites in McDonalds Branch basin.



Base from U.S. Geological Survey
Brown Mills 1:24,000, 1971; Whiting
1:24,000, 1971; Chatsworth 1:24,000,
1957; Woodmansie 1:24,000, 1957

Figure 8.--Locations of ground-water observation wells and staff gages in McDonalds Branch basin.

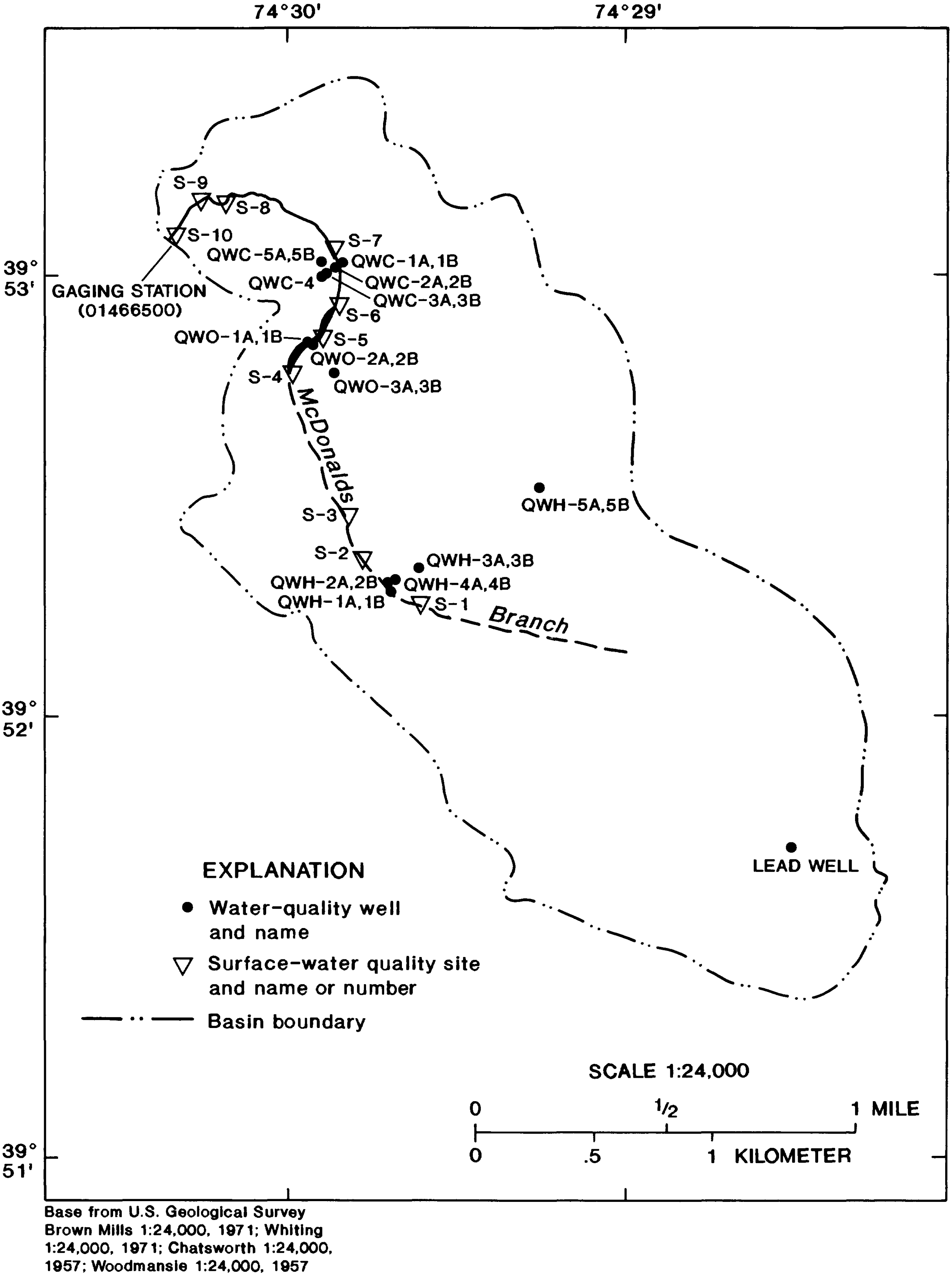


Figure 9.--Location of surface-water-quality sampling sites and water-quality wells in McDonalds Branch basin.

The bulk collector (fig. 10) at each site was constructed from an inverted 20-L (liter) low-density polyethylene bottle with the bottom removed. The collector was connected with Tygon tubing to a 4-L collection bottle. The entire bulk collector assembly was attached to a wooden post, positioned so that the mouth of the collector was approximately 6 ft above the ground. A plastic wedge rain gage was attached to the back of the post.

In conformance with NADP protocol, the collectors were placed in a cleared area such that vegetation was not present above an angle of 45 degrees from the plane of the collector orifice. Such placement limited contamination of samples from vegetation and allowed for accurate measurement of precipitation volumes.

Two sets of wet collection buckets and bulk collectors were maintained for each site and rotated weekly. After six months of use, these buckets and bottles were replaced with new collecting buckets and bottles.

Throughfall

A variety of throughfall collector designs have been reviewed in the literature (Eaton and others, 1973; Clesceri and Vasudevan, 1980; Reigner, 1964; Reynolds and Leyton, 1963; Helvey and Patric, 1965a, 1965b; Wilson, 1950). A trough design was chosen to account for the spatial variability in throughfall chemistry and volume under a single canopy type (Reigner, 1964; Reynolds and Leyton, 1963; Helvey and Patric, 1965a and 1965b; A. H. Johnson, University of Pennsylvania, oral commun., 1984; O. P. Bricker, U.S. Geological Survey, oral commun., 1985; M. Grant, University of Colorado, oral commun., 1985).

Four throughfall collectors were installed, one beneath each of the major canopy types in the basin: cedar swamp forest, hardwood swamp forest (red maple/black gum), pitch pine/black oak forest, and pitch pine/blackjack oak forest (fig. 7). Each trough was located beneath an area of relatively continuous canopy. The collectors (fig. 11) were constructed of 10-ft lengths of 4-in.-diameter Type I, schedule 80 polyvinylchloride (PVC) pipe, because of the PVC's chemical resistance and low cost (Barcelona and others, 1983). Each pipe was cut to make a longitudinal opening 2 in. wide; this cut allowed the trough to be slightly deeper and wider than its opening so as to minimize splashing. The trough opening was covered with polypropylene screening (mesh openings of .07 x .10 in. or 1.8 x 2.5 mm) to prevent foliage and debris from entering the collector. Each trough was braced along its length with PVC blocks and capped at its ends. Each trough was inclined at an angle of approximately 10 degrees and placed on wooden horses so that the trough outlet was about 3 ft above the ground surface.

Insulated Tygon tubing led from the outlet of the trough to a 20-L polyethylene collection bottle which was placed in an insulated wooden box. These boxes were left on the ground at the two swamp sites (cedar and broadleaf swamps) and were buried in the ground at the two upland sites (pine-oak forests). Inside the box, the tubing was looped, forming a vapor trap to minimize evaporation.

A plastic wedge rain gage was attached to each throughfall collector in order to measure throughfall volumes.

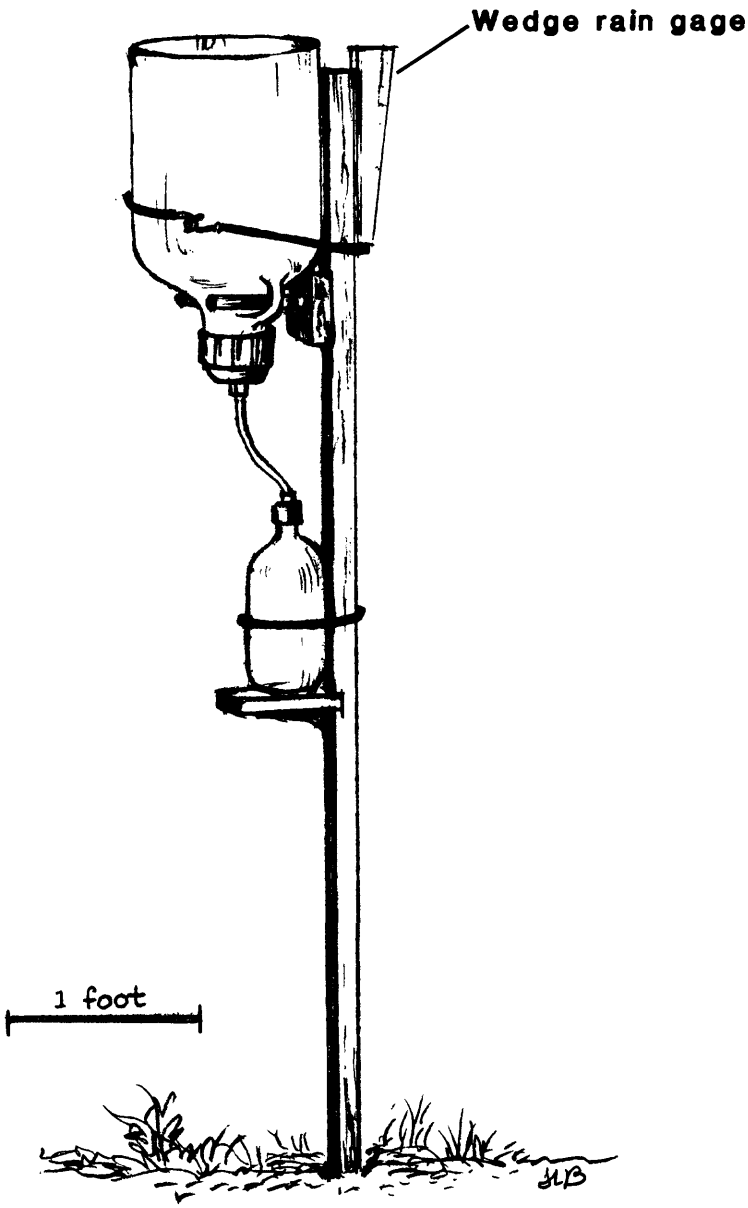


Figure 10.--A typical bulk precipitation collector.

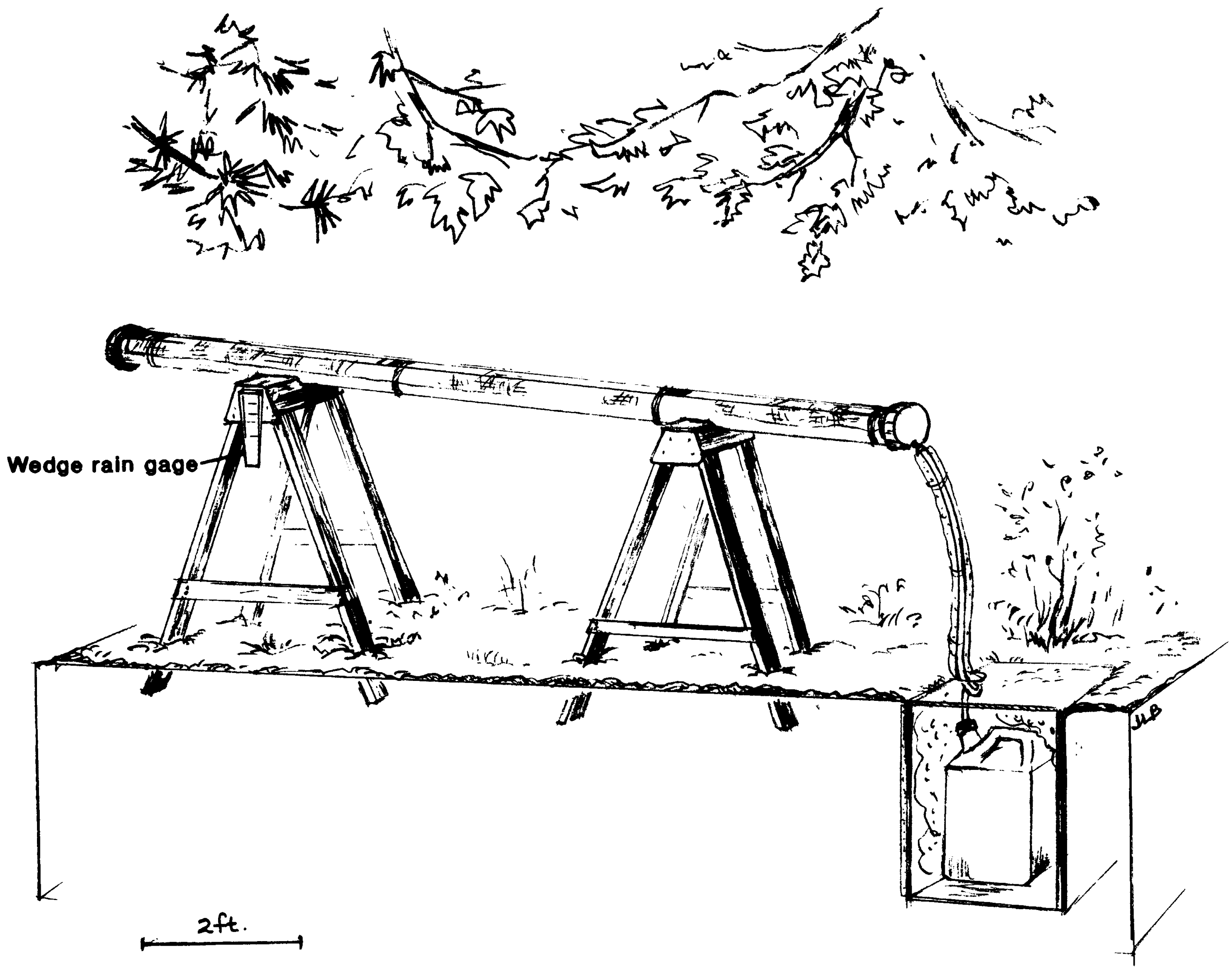


Figure 11.--A typical throughfall collector.

Soil Water

A variety of soil lysimeter designs have been described in the literature (Kohnke and others, 1940; Briggs and McCall, 1904; Wagner, 1962; Hansen and Harris, 1975; Cole, 1958; Zimmerman and others, 1978; and Jordan, 1966). The advantages and disadvantages of the various designs are reviewed by Jordan (1966), Leibfried (1982), Morrison (1983), and Turner (1983). A gravity trough lysimeter was developed for use in this study in order to (1) minimize contamination of the sample by the lysimeter material,(2) minimize adsorption of ions in solution to the lysimeter material, (3) minimize degassing and gas pressure changes, and (4) provide large sample volumes (O. P. Bricker, U.S. Geological Survey, oral commun., 1984).

A total of 33 soil lysimeters were installed in 12 pits in the basin to collect soil water (fig. 7). Three pits were located in areas covered by each of four soil series: Lakewood, Lakehurst, Atsion, and Evesboro. Lysimeters were placed at the bases of the O, E, and B horizons of the Lakewood, Lakehurst, and Atsion soils, and at the bases of the A and C horizons of the less well-developed Evesboro soil. Each lysimeter (fig. 12) was constructed of a 5-ft length of 4-in. diameter Type I, schedule 80 PVC pipe. One end of the pipe was left uncut and was capped; the remainder of the pipe was cut lengthwise to a tapered end to facilitate installation. In order to minimize soil disturbance during installation, lysimeters were pushed into the lower O, E, and B horizons using a modified truck jack. All lysimeters were installed at an angle of approximately 5 degrees from horizontal.

After installation, a hose barb containing nylon netting was inserted into the outlet of the lysimeter to prevent movement of soil particles into the collection bottle. Tygon tubing containing a check valve led from this outlet to a polypropylene collection bottle. Two additional tubes (to be used for sample collection) led from the collection bottle to the ground surface. The pit was then backfilled so that collection bottles and tubing were buried. Samples were evacuated using argon gas to prevent exposure to the atmosphere. Several problems were encountered with this design, including (1) development of holes in the tubing, (2) gas leaks from holes and fittings, (3) inability to collect a sample when some may have been present, and (4) inability to rinse collection bottles between sampling rounds. Therefore, this design was used only from October 1984 through October 1985. In late October 1985, this collection system was replaced by a simpler system in which a polypropylene bottle, connected to the lysimeter by Tygon tubing, was placed in a buried plastic trash can (fig. 12).

Surface Water

Surface water was sampled from up to 10 sites on McDonalds Branch. These samples included water that flowed through three types of wetlands: broadleaf swamp, pond community, and cedar swamp (see figs. 6 and 9). During the sampling period (January 24, 1985 through March 21, 1986), portions of the stream were dry at times because of drought conditions. Therefore, not all sites were sampled during each sampling round. In addition, sampling was discontinued at some sites because of chemical similarities among sites. Stream-stage levels were recorded monthly at three sites and continuously recorded at the gaging station. Figure 8 shows the locations of staff gages.

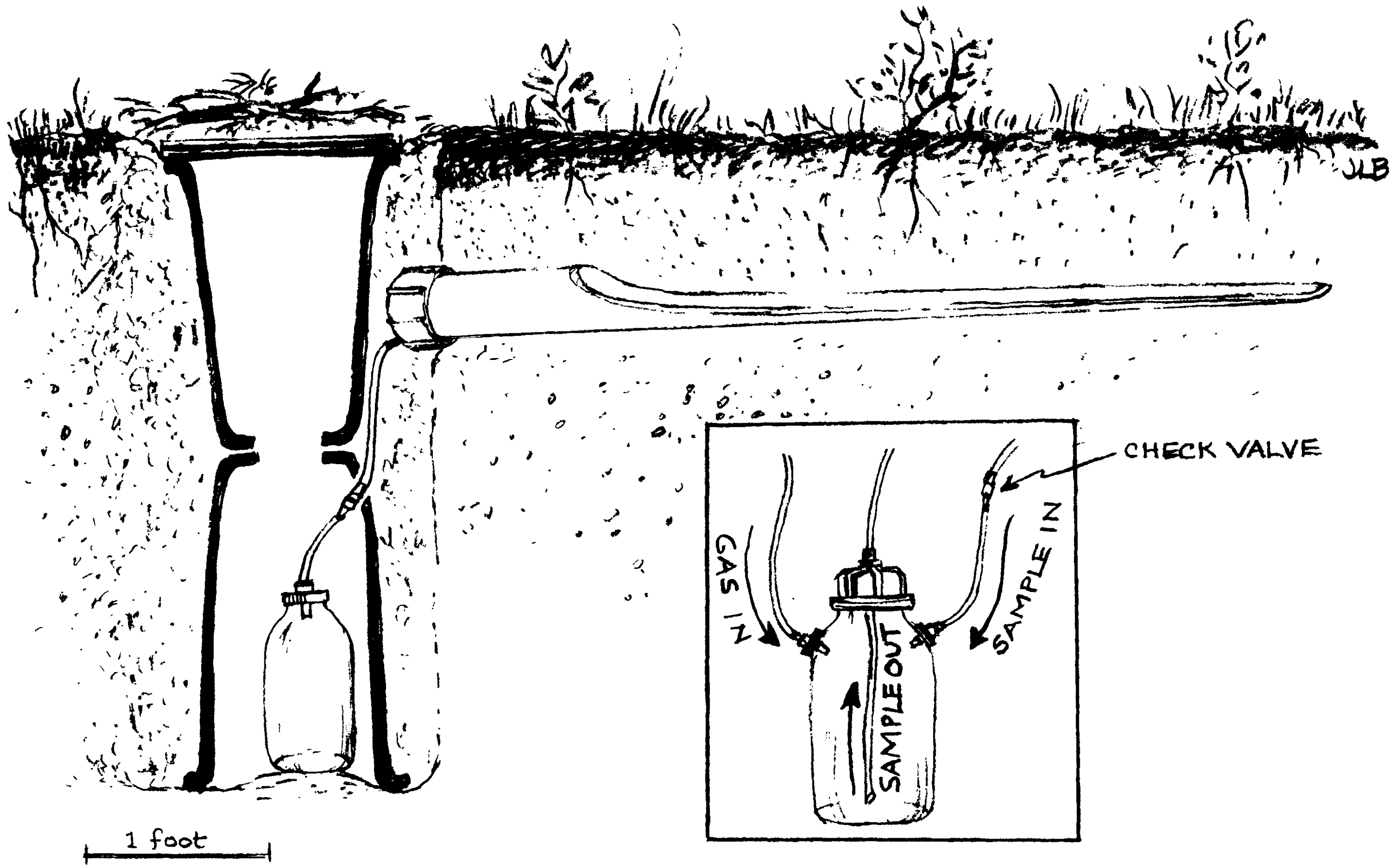


Figure 12.--A typical soil lysimeter. Insert shows the soil-water sample collection bottle which was used from February to October 1985.

Ground Water

The ground-water-quality network was designed to collect samples from the water-table aquifer along transects that were roughly coincident with paths of ground-water flow, from recharge to discharge areas.

During 1984, a network of ground-water observation wells was installed to determine the configuration of the water table and to define the direction of ground-water flow in each of the three transect areas (fig. 8). These areas are referred to in this report as the "hardwood (broadleaf) swamp," the "open channel" (a pond community), and the "cedar swamp." Wells in the hardwood-swamp transect contain an "H" in their site names, wells in the open-channel transect contain an "O" in their site names, and wells in the cedar-swamp transect contain either a "C" or "CQ" in their site names. The observation wells were constructed of 0.5-in.-diameter Type I schedule 80 PVC pipe with 3 ft of hacksaw slotted PVC screen and were capped at the top and bottom. Well-construction data are given in table 6. Nested wells were installed adjacent to the swamps and where clay lenses were found, in order to examine vertical head gradients.

Water-quality wells then were installed along hypothetical ground-water flow paths in each area (fig. 9). A pair of wells was installed at each well site to assess vertical head gradients and to determine differences in ground-water chemistry at various depths. At each site, a shallow well was screened just below the water table, and a deeper well was screened approximately 20 ft below the water table.

In addition to these wells installed along flow paths, three wells (QWH-5A, QWH-5B, and the lead well) were installed later in the study (fig. 9). QWH-5A and QWH-5B were installed adjacent to a swampy upland area to sample water chemistry at that location. The lead well was installed downgradient of a large gravel pit to determine whether ground water in that area contained elevated lead concentrations.

The water-quality wells were constructed of 2-in.-diameter, flush-joint, Type I, schedule 80 PVC casings and screens. Each well was screened at the bottom with a 3-ft length of 0.010- or 0.025-in. machine-slotted PVC. All wells were capped at the top and bottom. Well-construction data are shown in table 7. All wells were installed using a portable power auger combined with casing-driving techniques. Local sand was used as backfilling material. Analog-to-digital recorders were installed on four water-quality wells in the basin.

Hydrologic Data

Precipitation volumes were recorded continuously by the Belfort rain gages. Precipitation and throughfall volumes also were recorded weekly from plastic wedge rain gages at the time of sampling.

Stream-stage levels were recorded continuously at the gaging station (U.S. Geological Survey station no. 01466500), and daily stream discharges were computed on the basis of measured stage-discharge relationships. Stream-stage levels also were measured at three other sites on the stream at the time of sample collection.

Table 6.--Construction data for water-level observation wells

Site name[1]	Altitude of land surface (feet)[2]	Depth of well (feet)[3]	Casing and screen material	Diameter of screened interval (inches)	Depth to Top of screened interval (feet)[3]	Depth to bottom of screened interval (feet)[3]	Date well constructed
H-1	137.2	12.0	PVC[4]	0.5	9.0	12.0	5/18/84
H-2	138.0	12.1	PVC	.5	9.1	12.1	6/22/84
H-3A	138.2	9.0	PVC	.5	6.0	9.0	6/15/84
H-3B	138.1	13.7	PVC	.5	10.7	13.7	5/18/84
H-3C	138.1	25.3	PVC	.5	22.3	25.3	6/15/84
H-4	138.1	14.5	PVC	.5	11.5	14.5	5/18/84
H-5A	132.8	7.7	PVC	.5	4.7	7.7	6/15/84
H-5B	132.7	19.0	PVC	.5	16.0	19.0	6/15/84
O-1A	134.7	18.5	PVC	.5	15.5	18.5	5/22/84
O-1B	134.7	29.0	PVC	.5	26.0	29.0	6/21/84
O-2	137.5	23.3	PVC	.5	20.3	23.3	5/24/84
O-3	146.7	33.1	PVC	.5	30.1	33.1	6/14/84
O-4	137.9	19.0	PVC	.5	16.0	19.0	5/24/84
O-5A	127.5	7.0	PVC	.5	4.0	7.0	6/21/84
O-5B	127.4	16.3	PVC	2.0	13.3	16.3	6/21/84
O-6	130.4	11.8	PVC	.5	8.8	11.8	5/31/84
O-7	128.0	10.7	PVC	.5	7.7	10.7	8/02/84
O-8	134.7	14.4	PVC	.5	11.4	14.4	8/06/84
O-9	134.3	14.2	PVC	.5	11.2	14.2	[5]8/06/84
O-10	130.3	8.9	PVC	.5	5.9	8.9	8/06/84
O-11A	139.3	17.7	PVC	.5	14.7	17.7	8/06/84
O-11B	139.4	29.5	PVC	.5	26.5	29.5	8/22/84
CQ-1	143.3	30.5	PVC	.5	27.5	30.5	6/06/84
CQ-2	138.7	29.0	PVC	.5	26.0	29.0	6/06/84
CQ-3A	125.8	5.6	PVC	.5	2.6	5.6	6/06/84
CQ-3B	125.9	16.0	PVC	.5	13.0	16.0	6/14/84
CQ-4	152.9	36.0	PVC	.5	33.0	36.0	6/14/84
CQ-5	132.2	18.0	PVC	.5	15.0	18.0	6/14/84
CQ-6	155.8	38.8	PVC	.5	35.8	38.8	8/08/84
CQ-7	132.5	18.0	PVC	.5	15.0	18.0	8/08/84
CQ-8	145.1	28.2	PVC	.5	25.2	28.2	8/31/84
CQ-9	142.5	27.5	PVC	.5	24.5	27.5	8/22/84
CQ-10	132.1	14.6	PVC	.5	11.6	14.6	8/31/84
CQ-11	150.9	30.4	PVC	.5	27.4	30.4	8/02/84
C-1	141.4	27.0	PVC	.5	24.0	27.0	[6]5/31/84
C-2A	141.3	21.6	PVC	.5	18.6	21.6	5/31/84
C-2B	141.1	30.2	PVC	.5	27.2	30.2	5/31/84
C-3	138.7	29.0	PVC	.5	26.0	29.0	6/01/84
C-4	138.2	20.6	PVC	.5	17.6	20.6	6/01/84
C-5A	121.0	5.5	PVC	.5	2.5	5.5	6/01/84
C-5B	120.8	16.7	PVC	.5	13.7	16.7	6/01/84
C-6A	141.6	15.9	PVC	.5	12.9	15.9	6/21/84
C-6B	141.7	27.0	PVC	.5	24.0	27.0	6/21/84

[1] Well locations are shown in figure 8.
[2] Referenced to sea level.
[3] Referenced to land surface.
[4] Type I, Schedule 80 polyvinylchloride (PVC).
[5] Well was found vandalized on 1/30/85, reinstalled to original depth, and then resurveyed on 3/28/85.
[6] Well was found vandalized on 1/30/85, reinstalled to original depth, and then resurveyed on 3/29/85.

Table 7.--Construction data for water-quality wells

Site name[1]	Altitude of land surface (feet)[2]	Depth of well (feet)[3]	Casing and screen material	Diameter of screened interval (inches)	Depth to top of screened interval (feet)[3]	Depth to bottom of screened interval (feet)[3]	Date well constructed
QWH-1A	131.7	5.5	PVC[4]	2.0	2.5	5.5	08/24/1984
QWH-1B	131.4	29.6	PVC	2.0	26.6	29.6	08/24/1984
QWH-2A	133.0	11.8	PVC	2.0	8.8	11.8	08/30/1984
QWH-2B	133.1	31.3	PVC	2.0	28.3	31.3	08/10/1984
QWH-3A	138.5	16.7	PVC	2.0	13.7	16.7	08/31/1984
QWH-3B[5]	138.6	29.9	PVC	2.0	26.9	29.9	08/14/1984
QWH-4A	135.6	16.1	PVC	2.0	13.1	16.1	08/30/1984
QWH-4B	135.6	35.6	PVC	2.0	32.6	35.6	08/30/1984
QWH-5A	148.6	15.3	PVC	2.0	12.3	15.3	09/19/1985
QWH-5B	148.6	40.9	PVC	2.0	37.9	40.9	09/19/1985
QWO-1A	125.4	6.3	PVC	2.0	3.3	6.3	08/17/1984
QWO-1B	125.7	23.2	PVC	2.0	20.2	23.2	08/17/1984
QWO-2A	127.7	6.9	PVC	2.0	3.9	6.9	08/09/1984
QWO-2B	127.7	21.6	PVC	2.0	18.6	21.6	08/09/1984
QWO-3A	132.2	16.4	PVC	2.0	13.4	16.4	08/15/1984
QWO-3B[5]	132.3	31.5	PVC	2.0	28.5	31.5	08/15/1984
QWC-1A	124.9	7.9	PVC	2.0	4.9	7.9	09/26/1984
QWC-1B	125.0	28.7	PVC	2.0	25.7	28.7	09/26/1984
QWC-2A	126.9	6.1	PVC	2.0	3.1	6.1	09/06/1984
QWC-2B	127.0	26.4	PVC	2.0	23.4	26.4	09/06/1984
QWC-3A[5]	138.9	21.8	PVC	2.0	18.8	21.8	09/06/1984
QWC-3B[5]	138.9	36.6	PVC	2.0	33.6	36.6	09/06/1984
QWC-4	144.2	25.7	PVC	2.0	22.7	25.7	09/25/1984
QWC-5A	132.7	16.1	PVC	2.0	13.1	16.1	09/24/1984
QWC-5B	132.6	36.5	PVC	2.0	33.5	36.5	09/24/1984
LEAD WELL	172.7	44.6	PVC	2.0	41.6	44.6	09/18/1985

[1] Well locations are shown in figure 9.
[2] Referenced to national geodetic vertical datum of 1929.
[3] Referenced to land surface (or to muck surface for swamp wells QWH-1A, QWH-1B, QWO-1A, QWO-1B, QWC-1A, and QWC-1B).
[4] Type I, Schedule 80 polyvinylchloride (PVC).
[5] Continuous water-level measurements made at site.

Ground-water levels were recorded continuously at four wells in the basin: QWH-3B, QWO-3B, QWC-3A, and QWC-3B, and manually measured monthly at 65 wells. Manual water-level measurements were recorded at all wells at the time of sample collection. Measurements were made at water-level observation wells using the wetted-steel-tape method, and at water-quality wells using an electric tape.

Water-Quality Data Collection, Processing, and Preservation

Equipment Preparation

Before use in the field, all sample-collection devices and storage bottles, excluding well casings and screens, were scrubbed with phosphate-free laboratory detergent and tap water, and rinsed thoroughly with tap water. The equipment then received a minimum of three rinses with deionized water having a specific conductance of less than 0.05 μS/cm (microsiemens per centimeter at 25 degrees Celsius). This washing procedure was followed by an overnight soak in dilute hydrochloric acid; 0.1 N (normal) hydrochloric acid (HCl) was used for all precipitation, throughfall, and soil-water collection buckets, bottles, and compositing bottles as well as surface-water churns and all fittings and tubings. Soil lysimeters and throughfall collector troughs were soaked in 0.001 N HCl (pH = 3). All equipment was then rinsed with deionized water at least six times and allowed to dry thoroughly before use in the field. Equipment subjected to one of the above procedures is referred to as "acid-rinsed" in the remainder of this report.

All water-collection equipment, excluding ground-water pumps and hoses, was acid-rinsed before each use in the field. Prior to use, all sample bottles excluding dissolved organic carbon (DOC) were rinsed three times with deionized water, followed by one to three rinses with sample solution, depending on the amount of sample available. Plastic gloves were worn during the installation of equipment and sampling, where appropriate and technically feasible. In order to maintain cleanliness, any exposed or unsealed sampling equipment that would come in contact with water samples was transported to and from the field in clean, closed plastic bags or coolers. Surface-, ground-, and soil-water samples were transported from the field in coolers filled with ice.

Precipitation and Throughfall

Precipitation and throughfall samples were collected weekly, stored at 4 °C, and composited monthly into single samples. In the field, collection buckets and bottles were removed, sealed, and placed in clean plastic bags for transport to the District laboratory. These containers were replaced with clean, acid-rinsed buckets and bottles following each collection. Throughfall collector troughs and screens were cleared of debris and rinsed thoroughly with deionized water. Plastic gloves were worn while handling all bottles, buckets, and troughs.

In the District laboratory, weekly samples were composited into a single monthly sample. Specific conductance and pH determinations were made on filtered composite samples in the District laboratory at the time of sample processing. The composite samples were filtered using a peristaltic pump through 0.45-μm (micrometer) Gelman filters for laboratory pH, specific conductance, cations, anions, and trace metals. Throughfall was also filtered through 0.45-μm Selas silver filters for DOC analysis. Samples for metals analysis were acidified to a pH of less than 2 with nitric acid. All samples were preserved by chilling to 4 °C. Table 8 is a summary of sample types, frequency of collection, and chemical constituents analyzed for all samples collected. Alkalinity titrations were performed at the District laboratory within six months of collection.

Soil Water

Soil water was collected monthly from any of the 33 soil lysimeters in the basin that contained water. From October 1984 through October 1985, samples were flushed from the buried collection bottles using purified argon gas and collected in acid-rinsed polypropylene bottles. From November 1985 through March 1986, collection bottles were detached from the lysimeters, and samples were poured into acid-rinsed, high-density polyethylene bottles. Collection bottles were rinsed with deionized water and reconnected to the lysimeters. During the entire sampling period, samples were chilled and brought to the District laboratory for processing.

In the District laboratory, soil-water samples were filtered, acidified where appropriate, and chilled, as described above. Specific conductance and pH were measured in the laboratory, unless sample volumes were insufficient. When sample volumes were large, alkalinity determinations were also made at the District laboratory, within 6 months of collection. During the first year of data collection, small samples from the same horizon of a particular soil series were sometimes composited to provide a volume of sample sufficient for analysis.

Surface Water

Surface-water samples were collected monthly from up to 10 sites on McDonalds Branch. Grab samples were collected from the stream using an acid-rinsed polyethylene bottle and transported to the sampling vehicle in an acid-rinsed churn. Temperature, specific conductance, pH, and dissolved oxygen concentration were measured on raw samples at the time of collection. Samples were filtered in the field using a peristaltic pump, bottles for metals analysis were acidified, and samples were chilled for preservation, as described above. Collection and processing of samples, and measurement of pH and specific conductance were performed following protocol developed for the Aquatic Effects Task Group, Interagency Task Force on Acid Precipitation (O. P. Bricker, U.S. Geological Survey, written commun., 1984).

Ground Water

Ground-water samples were collected monthly from January through the first week of June 1985 and bimonthly thereafter. All wells were pumped and sampled using positive displacement mechanical pumps (Johnson-Keck and Fultz pumps) in order to preserve the integrity of the ground-water samples for analysis of chemical constituents under evaluation (Barcelona and others, 1985). Pumps were fitted with Teflon tubing to minimize contamination. Discharge was diverted as far from all nearby sampling sites as possible.

Table 8.--Summary of collection and analysis of samples from McDonalds Branch basin

Water-sample type	Number of sites	Frequency of sampling	Analyses performed
Wet precipitation	2	Collected weekly, Composited monthly	Major cations (calcium, magnesium, sodium, potassium) and anions (sulfate, chloride, fluoride, bromide), aluminum, lead, alkalinity, pH, specific conductance, nutrients (ammonium, phosphate, nitrate)
Bulk precipitation	2	Collected weekly, Composited monthly	Major cations and anions, aluminum, lead, alkalinity, pH, specific conductance, nutrients
Throughfall	4	Collected weekly, Composited monthly	Major cations and anions, aluminum, iron, manganese, lead, silica, alkalinity, pH, specific conductance, dissolved organic carbon, nutrients
Soil water	4 soils series 3 pits per series O, A/E, B horizons, (O/A, C, Evesboro)	Monthly	Major cations and anions, aluminum, iron, lead, pH, specific conductance, silica, alkalinity, dissolved organic carbon, nutrients
Surface water	up to 10	Monthly	Major cations and anions, aluminum, iron, manganese, lead, silica, alkalinity, dissolved oxygen, pH, specific conductance, dissolved organic carbon, nutrients
Ground water Shallow and deep wells	26 wells	Monthly for 6 months, then bimonthly	Major cations and anions, aluminum, iron, manganese, lead, silica, alkalinity, dissolved oxygen, pH, specific conductance, dissolved organic carbon, nutrients

Temperature, pH, and dissolved oxygen were measured in a flow-through chamber at regular intervals during pumping (Wood, 1976). Specific conductance also was measured during pumping. Each well was pumped to waste until these field characteristics stabilized. Upon stabilization of the characteristics, field measurements of pH, temperature, dissolved oxygen, and specific conductance were recorded. Ground water was then passed directly through the appropriate 0.45-μm filters and into sample bottles. Bottles for metals analysis were acidified immediately and all samples were chilled to 4 °C for preservation.

ANALYTICAL METHODS

Equipment Specifications

In the field, pH was measured with an Orion Model 231 digital pH meter fitted with a Ross glass combination electrode; in the laboratory, a Beckmann model PHI 21 pH meter and a Beckman Futura II star series epoxy-body combination electrode were used. Beckman standard-quality buffers of pH 4.00 and 7.00 (at 25 °C) were used to calibrate the pH meters. In the field, calibration and determination of electrode slope from millivolt data were performed prior to sample collection at each site. In the laboratory, calibration was performed at least once daily. A solution of $5x10^{-5}$ M (molar) sulfuric acid with a pH of 4 was used to check meter accuracy. Prior to measuring the pH of either a sample or a standard solution, the pH probe was rinsed with deionized water, followed by a rinse with a small amount of the solution itself.

In both the field and the laboratory, a Kent Model MC-1, Mark V conductivity meter was used to measure specific conductance. This meter was calibrated once daily, before use in either the field or the laboratory. The field measurement of dissolved-oxygen (DO) concentration was performed using a YSI Model 58 digital dissolved-oxygen meter. The DO meter was recalibrated at each site in the field prior to use.

Chemical Analysis

The majority of chemical analyses reported in this study were performed at the U.S. Geological Survey Central Laboratory in Arvada, Co. Some samples from October 1985 were analyzed at the U.S. Geological Survey National Water-Quality Laboratory in Doraville, Ga. Methods used for inorganic analyses are described in Fishman and Friedman (1985) and Skougstad and others (1979). Several constituents were analyzed using two different methods depending on the concentrations. Major cations, including calcium, magnesium, sodium, and potassium along with iron, manganese, and silica were analyzed using either atomic-absorption spectrometry (AA) or inductively-coupled plasma emission spectroscopy (ICP). Aluminum and lead were analyzed using AA until December 1985, and aluminum was analyzed using directly-coupled plasma emission spectroscopy (DCP) beginning in December 1985. Beginning in November 1985, lead was analyzed using an atomic-absorption spectrophotometer equipped with a graphite furnace. Ammonium was determined using colorimetry. Anions, including sulfate, chloride, fluoride, bromide, nitrate, and phosphate were analyzed using ion chromatography. Nitrate, phosphate, and chloride also were analyzed using colorimetry, and sulfate using turbidimetry. Dissolved organic carbon concentration (DOC) was determined by wet oxidation using the method described in Goerlitz and Brown (1972).

Alkalinity and acidity were measured both at the Central Laboratory and in the District laboratory using electrometric titrimetry. The equipment and procedure used in the District laboratory are described in Barringer and Johnsson (U.S. Geological Survey, written commun., 1986), and the titrations were performed using the technique developed by Gran (1952). The Central Laboratory used either fixed end-point titrations (Fishman and Friedman, 1985) or incremental titrations with alkalinity calculated by the second derivative method (Peters and others, 1974).

Mineralogic Analysis

Mineralogy of depositional clay lenses and soil clays in the basin was determined by X-ray diffraction (XRD) analysis. The analyses were performed on a Siemens model U8-006 X-ray diffractometer at Rutgers University, New Brunswick, N.J., using nickel-filtered copper radiation. Background radiation was determined by scanning a clean glass slide. Peak positions were calibrated using quartz and other reference samples from the National Bureau of Standards. Samples were prepared by wet sieving and ultrasonic disaggregation to remove sand and medium-to-coarse silt particles. In a modification of the method described in Soil Survey Investigations Report No. 1 (U.S. Department of Agriculture, 1984), the clay/fine-silt fraction was treated with sodium hexametaphosphate, sonified, and allowed to settle. The < (less than) 5-μm fraction was removed using a pipette. The solution containing this <5-μm fraction then was passed through a 0.45-μm Gelman filter, and the residue remaining on the filter was applied to a glass slide using a filter-peel method.

Further sample treatment included saturation with magnesium to improve peak resolution (U.S. Department of Agriculture, 1984). Treatment for identification of vermiculite and montmorillonite included saturation with KCl, heating to 250 °C and 375 °C (Black and others, 1965), and exposure to ethylene glycol (Warshaw and Roy, 1961). Interlayer aluminum was extracted with sodium citrate (Tamura, 1958). Mineralogy of the sand fraction of soils was determined by examination of sieved samples using a binocular microscope.

Soil Analysis

Analysis of selected soils was performed by the Agronomy Analytical Laboratory at Cornell University, Ithaca, N.Y. Most of the analytical methods used are described in Soil Survey Investigations Report No. 1 (U.S. Department of Agriculture, 1984) or in Black and others (1965). Soil pH was determined in both water and $CaCl_2$. The exchangeable calcium, magnesium, potassium, and sodium were extracted with ammonium acetate (NH_4OAc) at a pH of 7.0 and analyzed by AA. The cation-exchange capacity (CEC) also was determined by extraction in 1 N NH_4OAc at a pH of 7.0. The soluble sulfate was extracted with acid ammonium acetate and concentration determined turbidimetrically. Iron and aluminum concentrations were determined by citrate-dithionite extraction, and aluminum also was extracted with 1 N KCl (exchangeable Al). Exchange acidity was determined by extraction with a barium chloride/triethanolamine solution buffered to pH 8.0 followed by titration of the excess base. Percent organic matter was determined using a modification of the Walkley-Black procedure, as described by Heanes (1984).

QUALITY ASSURANCE

The water-quality data generated by the U.S. Geological Survey laboratories were subjected to the standard quality-assurance procedures in use at the time of analysis (Friedman and Erdmann, 1982; Fishman and Friedman, 1985). In addition, duplicate samples and blanks were sent to the laboratory for analysis. Duplicate samples comprised approximately 10 percent of the total number of surface- and ground-water samples. The percentages of duplicate precipitation, throughfall, and soil-water samples were smaller, because drought conditions during the study often resulted in collection of insufficient sample volumes. Duplicate values generally agreed within 1 percent. Constituent values that differed by more than 10 percent generally were at or near the detection limit of the particular analytical method employed.

Ten wash blanks of deionized water were processed according to the appropriate method and analyzed; results are shown in table 9. These blanks include deionized water samples stored for one week in precipitation collectors. The majority of parameters were below detection limits in all blanks. A limited number of values were reported at or near the detection limits. Lead was the only constituent that had concentrations frequently above the detection limit. Leaching of lead from a newly installed plumbing modification in the District laboratory (copper tubing joined with lead-tin solder) appeared to be the source of lead (G. R. Kish, U.S. Geological Survey, oral commun., 1986).

Quality assurance for alkalinity determinations performed in the District laboratory included analysis of duplicate and triplicate samples, and analysis of samples of known alkalinity (J. L. Barringer and P. A. Johnsson, U.S. Geological Survey, written commun., 1986). Agreement between duplicate and triplicate samples was within 5 percent for most samples. However, reproducibility for ground-water samples was relatively poor, ranging from 13 to 54 percent. Alkalinity determinations performed at the District laboratory on samples of known alkalinity were approximately 3 percent of the known values.

To check quality assurance of data reported and stored in the WATSTORE data base, all data were analyzed using a computer program called ARCHEM.F77 (Johnsson and Lord, 1987). This program was developed specifically for the low-pH, low-ionic strength, organic-rich waters present in the Pinelands. The program performs the following calculations which are described by Johnsson and Lord (1987), Friedman and Erdmann (1982), and Hem (1985):

1. the ion balance between cations (including trace metals) and anions (including the organic anion[3]),

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[3] The concentration of the organic anion was calculated from the pH and the DOC using the method of Oliver and others (1983).

Table 9.--Chemical analysis of wash blanks, January 1985 through December 1986

[µs/cm, microsiemens per centimeter; meq/L, milliequivalents per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; lab, laboratory; --- indicates missing data; < indicates less than]

Type of blank	Sample-collection dates	pH (units) District lab	pH (units) Central lab	Specific conductance (µs/cm) District lab	Specific conductance (µs/cm) Central lab	Alkalinity (meq/L) District lab	Dissolved organic carbon (mg/L)	Lead (µg/L)
Bulk precipitation	07/23/1985	5.4	5.2	2	2	< 1	---	5
Wet precipitation	07/23/1985	5.6	5.5	1	2	< 1	---	10
Bulk precipitation	07/23/1985	5.5	5.4	5	3	< 1	---	8
Wet precipitation	07/23/1985	5.6	5.5	1	1	< 1	---	7
Ground water	02/11/1985	---	7.5	---	4	< 1	0.2	4
Ground water	06/26/1985	---	6.8	---	< 2	< 1	.5	3
Ground water	08/27/1985	---	5.6	---	1	< 1	.3	1
Ground water	10/29/1985	---	5.3	---	1	< 1	1.6	1
Ground water	12/23/1985	---	5.79	---	1.3	< 0.5	.2	< .5
Soil water	03/12/1985	---	5.4	---	2	2.0	.7	10

Type of blank	Sample-collection dates	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Aluminum (µg/L)	Iron (µg/L)	Manganese (µg/L)
Bulk precipitation	07/23/1985	< 0.01	0.01	< 0.01	.03	< 10	---	---
Wet precipitation	07/23/1985	< .01	.01	.02	.08	10	---	---
Bulk precipitation	07/23/1985	< .01	.01	.02	.02	< 10	---	---
Wet precipitation	07/23/1985	< .01	.01	.02	.03	< 10	---	---
Ground water	02/11/1985	.05	.01	< .2	.02	< 10	4	4
Ground water	06/26/1985	< .02	.02	< .2	.03	< 10	4	< 1
Ground water	08/27/1985	< .02	< .02	< .2	.03	< 10	< 3	< 1
Ground water	10/29/1985	< .02	< .01	< .2	< .01	< 10	< 3	< 1
Ground water	12/23/1985	.010	< .010	< .20	< .01	8	3.2	< 1.0
Soil water	03/12/1985	.02	< .01	< .2	.01	< 10	< 3	< 1

Type of blank	Sample-collection dates	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
Bulk precipitation	07/23/1985	< 0.01	0.16	0.01	< .01	< .01	---	---
Wet precipitation	07/23/1985	< .01	< .01	.01	< .01	< .01	---	---
Bulk precipitation	07/23/1985	< .01	.20	.01	< .01	< .01	---	---
Wet precipitation	07/23/1985	.02	< .01	.01	< .01	< .01	---	---
Ground water	02/11/1985	< .01	< .01	< .10	< .01	< .01	---	0.08
Ground water	06/26/1985	< .01	< .01	< .01	< .01	< .01	---	.01
Ground water	08/27/1985	.04	.10	< .01	< .01	< .01	---	< .01
Ground water	10/29/1985	< .01	< .01	.02	< .01	< .01	---	< .01
Ground water	12/23/1985	.09	< .01	< .01	< .01	< .01	< 0.001	.03
Soil water	03/12/1985	.04	.12	.01	< .01	.02	---	< .01

2. the difference in measured specific conductance versus calculated specific conductance,
3. the ratio of the calculated sum of dissolved constituents to the measured specific conductance, and
4. the ratios of hydrogen-ion activity calculated from field pH to hydrogen-ion activity calculated from lab pH, and of field specific conductance to lab specific conductance.

Samples that failed the cation/anion balance by 30 percent or more were deleted from the data base (Friedman and Erdmann, 1982).

The Agronomy Analytical Laboratory at Cornell University used standard quality-control procedures for soils analysis. The laboratory analyzed replicate samples for approximately 10 percent of samples analyzed for aluminum, CEC, and exchangeable cations. Master soil samples also were run for most analyses. For every set of 50 samples analyzed, pH meters were recalibrated.

HYDROLOGIC AND WATER-QUALITY DATA

Hydrologic and water-quality data were collected from January 1985 through March 1986 as part of a study of the effects of acidic deposition on the geochemistry of McDonalds Branch basin in the New Jersey Pinelands. The hydrologic and water-quality data are available from the U.S. Geological Survey WATSTORE computer storage system. Table 10 is a list of the site names and WATSTORE identification numbers used by the U.S. Geological Survey computer storage and retrieval system.

Hydrologic Data

Hydrologic data, including rainfall and throughfall amounts, stream-stage measurements, ground-water elevations, daily stream discharge, and well hydrographs are presented in tables 11-16 and figures 13-18 (at end of report). Figure 7 shows the locations of the two precipitation sites containing the two Belfort event-recording rain gages and two plastic wedge rain gages used to record rainfall to the basin. Figure 7 also shows the locations of the throughfall sites containing the plastic wedge rain gages used to record throughfall amounts. The locations of ground-water observation wells and staff gages are shown in figure 8.

Water-Quality Data

Water-quality data from the 2 wet precipitation collectors, 2 bulk precipitation collectors, 4 throughfall collectors, 33 soil lysimeters, 26 water-quality wells, and 10 surface-water sites in the basin are reported in tables 17-21 (at end of report). Statistical summaries of precipitation, surface-water, and ground-water-quality data are presented in tables 22-24 (at end of report), respectively. The locations of precipitation, throughfall, and soil-water sampling sites are shown in figure 7. The locations of surface-water sampling sites and water-quality wells are shown in figure 9.

Table 10.--WATSTORE site-identification numbers and site descriptions for water-quality sites in McDonalds Branch basin

Site name[1]	WATSTORE site-identification number[2]	Site description
		Precipitation sites
PPT-1WC	395304074300931	Wet precipitation, cedar hill site
PPT-1BC	395304074300932	Bulk precipitation, cedar hill site
PPT-2W	395153074290731	Wet precipitation, Rogers' Road site
PPT-2B	395153074290732	Bulk precipitation, Rogers' Road site
		Throughfall sites
TF-1C	395302074295021	Cedar-swamp forest
TF-2PB	395232074295421	Pine-oak forest (pitch pine/black oak)
TF-3H	395216074294121	Hardwood-swamp forest
TF-4PBJ	395203074283521	Pine-oak forest (pitch pine/blackjack oak)
		Soil-water sites
PIT-1-LlO	395246074295211	Lakehurst sand, thick surface, O horizon
PIT-1-LlA	395246074295212	Lakehurst sand, thick surface, A horizon
PIT-1-LlB	395246074295213	Lakehurst sand, thick surface, B horizon
PIT-2-LlO	395218074294011	Lakehurst sand, thick surface, O horizon
PIT-2-LlA	395218074294012	Lakehurst sand, thick surface, A horizon
PIT-2-LlB	395218074294013	Lakehurst sand, thick surface, B horizon
PIT-3-LaO	395257074294111	Lakehurst sand, O horizon
PIT-3-LaA	395257074294112	Lakehurst sand, A horizon
PIT-3-LaB	395257074294113	Lakehurst sand, B horizon
PIT-4-LuO	395146074285011	Lakewood sand, thick surface, O horizon
PIT-4-LuA	395146074285012	Lakewood sand, thick surface, A horizon
PIT-4-LuB	395146074285013	Lakewood sand, thick surface, B horizon
PIT-5-LtO	395232074295411	Lakewood sand, O horizon
PIT-5-LtA	395232074295412	Lakewood sand, A horizon
PIT-5-LtB	395232074295413	Lakewood sand, B horizon
PIT-6-LuO	395203074283511	Lakewood sand, thick surface, O horizon
PIT-6-LuA	395203074283512	Lakewood sand, thick surface, A horizon
PIT-6-LuB	395203074283513	Lakewood sand, thick surface, B horizon
PIT-7-AuO	395210074285511	Atsion sand, loamy substratum, O horizon
PIT-7-AuA	395210074285512	Atsion sand, loamy substratum, A horizon
PIT-7-AuB	395210074285513	Atsion sand, loamy substratum, B horizon
PIT-8-AuO	395218074290211	Atsion sand, loamy substratum, O horizon
PIT-8-AuA	395218074290212	Atsion sand, loamy substratum, A horizon
PIT-8-AuB	395218074290213	Atsion sand, loamy substratum, B horizon
PIT-9-AuO	395229074291311	Atsion sand, loamy substratum, O horizon
PIT-9-AuA	395229074291312	Atsion sand, loamy substratum, A horizon
PIT-9-AuB	395229074291313	Atsion sand, loamy substratum, B horizon
PIT-10-EvO/A	395247074293211	Evesboro sand, O and A horizons
PIT-10-EvC	395247074293212	Evesboro sand, C horizon
PIT-11-EvO/A	395300074301211	Evesboro sand, O and A horizons
PIT-11-EvC	395300074301212	Evesboro sand, C horizon
PIT-12-EvO/A	395253074290011	Evesboro sand, O and A horizons
PIT-12-EvC	395253074290012	Evesboro sand, C horizon
		Surface-water sites
S-1	395216074294000	Surface water in hardwood swamp at well transect
S-2	395220074294500	Surface water in hardwood swamp just upstream from Butler Place Road
S-3	395222074294700	Surface water in hardwood swamp downstream from Butler Place Road
S-4	395248074295700	Surface water at upstream edge of open channel
S-5	395250074295500	Surface water in middle of open channel at well transect

Table 10.--WATSTORE site-identification numbers and site descriptions for water-quality sites in McDonalds Branch basin--Continued

Site name[1]	WATSTORE site-identification number[2]	Site description
		Surface-water sites, continued
S-6	395254074295000	Surface water at downstream edge of the open channel
S-7	395302074295000	Surface water in cedar swamp at well transect
S-8	395308074301000	Surface water in cedar swamp
S-9	395305074301300	Surface water in cedar swamp
S-10	01466500	Surface water at gaging station (collected by project personnel)
McDonalds Branch in Lebanon State Forest	01466500	Surface water at gaging station (collected for USGS Hydrologic Bench-Mark Network)
		Ground-water sites
QWC-1A	395302074295001	Shallow well in cedar-swamp forest, cedar transect; NJUID 050837*
QWC-1B	395302074295002	Deep well in cedar-swamp forest, cedar transect; NJUID 050838*
QWC-2A	395302074295101	Shallow lowland well in cedar transect; NJUID 050839*
QWC-2B	395302074295102	Deep lowland well in cedar transect; NJUID 050840*
QWC-3A	395301074295301	Shallow upland well in cedar transect; NJUID 050841*
QWC-3B	395301074295302	Deep upland well in cedar transect; NJUID 050842*
QWC-4	395300074295401	Shallow upland well in cedar transect; NJUID 050843*
QWC-5A	395302074295301	Shallow upland well in cedar transect; NJUID 050844*
QWC-5B	395302074295302	Deep upland well in cedar transect; NJUID 050845*
QWO-1A	395250074295501	Shallow well in open channel, open-channel transect; NJUID 050831*
QWO-1B	395250074295502	Deep well in open channel, open-channel transect; NJUID 050832*
QWO-2A	395250074295503	Shallow lowland well in open-channel transect; NJUID 050833*
QWO-2B	395250074295504	Deep lowland well in open-channel transect; NJUID 050834*
QWO-3A	395245074295201	Shallow upland well in open-channel transect; NJUID 050835*
QWO-3B	395245074295202	Deep upland well in open-channel transect; NJUID 050836*
QWH-1A	395216074294101	Shallow well in hardwood-swamp forest, hardwood transect; NJUID 050846*
QWH-1B	395216074294102	Deep well in hardwood-swamp forest, hardwood transect; NJUID 050847*
QWH-2A	395217074294101	Shallow lowland well in hardwood transect; NJUID 050848*
QWH-2B	395217074294102	Deep lowland well in hardwood transect; NJUID 050849*
QWH-3A	395217074293701	Shallow upland well in hardwood transect; NJUID 050850*
QWH-3B	395217074293702	Deep upland well in hardwood transect; NJUID 050851*
QWH-4A	395218074294001	Shallow upland well in hardwood transect; NJUID 050852*
QWH-4B	395218074294002	Deep upland well in hardwood transect; NJUID 050853*
QWH-5A	395231074291501	Shallow well adjacent to clay lens underlying upland swamp; NJUID 051072*
QWH-5B	395231074291502	Deep well adjacent to clay lens underlying upland swamp; NJUID 051073*
Lead well	395142074283001	Shallow upland well near gravel pit; NJUID 051074*

[1] Site locations are shown in figures 7 and 9.
[2] WATSTORE site identification number (latitude, longitude, and sequence number) is used for the USGS WATSTORE computer storage and retrieval system.
* NJUID is the New Jersey unique identification well number.

DISCUSSION OF DATA

The clay lenses analyzed in McDonalds Branch basin are composed primarily of fine-grained quartz, kaolinite, and illite (table 1). The fine silt/clay fraction of samples collected from the Lakewood, Lakehurst, Atsion, and Evesboro soils is composed primarily of kaolinite, fine-grained quartz, illite, and aluminum-interlayered vermiculite, with traces of gibbsite (table 4). The Atsion soil also contains trace to moderate amounts of chlorite, and the Atsion and Evesboro soils both contains trace to moderate amounts of aluminum-interlayered montmorillonite. The B and C horizons of these soils are composed of greater than 89 percent sand-sized particles (table 3).

The Lakewood, Lakehurst, Atsion, and Evesboro soils are very strongly to extremely acid (pH < 4.9) and have low cation-exchange capacities, < 0.5 to 10.5 meq/100g (milliequivalents per 100 grams), (table 2). Samples of these soils contained up to 1,686 μg/g (micrograms per gram) extractable aluminum and up to 4,088 μg/g extractable iron.

From February 1985 through January 1986, McDonalds Branch basin received approximately 37.9 inches of rainfall (data from site number PPT-1WC), and discharge at McDonalds Branch gaging station totaled approximately 6.5 in. Precipitation, throughfall, soil water, surface water, and ground water were sampled and analyzed for a variety of chemical constituents. The chemical characteristics of the different water types varied with both space and time. In general, waters in McDonalds Branch basin were acidic, and sulfate was commonly the dominant anion in basin waters. Waters often contained elevated concentrations of aluminum.

The pH of bulk precipitation (table 17) at site PPT-1BC ranged from 4.1 to 4.7 with a mean of 4.3 (based on District laboratory measurements; mean pH values were calculated by first converting all individual pHs to H+ concentrations; then the mean H+ concentration was calculated and converted to pH). At site PPT-2B, the pH of bulk precipitation ranged from 4.0 to 4.7 with a mean of 4.3. The pH of wet precipitation at site PPT-1WC ranged from 4.0 to 4.8 with a mean of 4.3; at site PPT-2W, the pH of wet precipitation ranged from 4.0 to 4.7 with a mean of 4.3. The pH of throughfall varied with time and canopy type in the basin; overall, pH ranged from 3.6 to 5.4 (based on District laboratory measurements; see table 18).

Soil-water chemistry varied according to location, series, and horizon. Overall, pH measured in the District laboratory ranged from 3.5 to 4.9; DOC ranged from 1.9 to 67 mg/L (milligrams per liter); sulfate ranged from 3.0 to 34 mg/L; aluminum ranged from <10 to 3,600 μg/L (micrograms per liter); and iron ranged from <3 to 1,500 μg/L (table 19). The highest concentrations of hydrogen ion, DOC, sulfate, aluminum, and iron were observed in water from the Atsion soil, the most poorly drained soil of the series sampled.

Surface-water chemistry varied with downstream location (tables 20 and 23). The pH tended to increase downstream, whereas DOC, sulfate, aluminum, and iron concentrations generally decreased downstream. The field pH at the farthest upstream site, S-1, ranged from 3.2 to 4.2, with a mean of 3.6, whereas the field pH at the farthest downstream site, the gaging station, ranged from 3.9 to 4.6, with a mean of 4.3. DOC concentration at upstream site S-1 ranged from 5.6 to 37 mg/L, with a mean of 19, whereas DOC concentration at the gaging station ranged from 1.7 to 7.3 mg/L with a mean of 3.1. Sulfate concentration at S-1 ranged from 1.1 to 120 mg/L, with a mean of 23 mg/L, whereas sulfate concentration at the gaging station ranged from 2.7 to 13 mg/L, with a mean of 5.6 mg/L. Aluminum and iron concentrations were particularly high at S-1, ranging from 550 to 10,000 and from 360 to 4,700 $\mu g/L$, respectively. At the gaging station, aluminum and iron concentrations were lower, ranging from 20 to 420 $\mu g/L$, and from 43 to 300 $\mu g/L$, respectively.

The chemistry of ground water varied with location in the basin and depth below the water table (tables 21 and 24). pH generally was lower in shallow ground water than in deeper ground water. In shallow ground water, field pH ranged from 3.3 to 5.6, whereas in deeper ground water, field pH ranged from 4.0 to 5.8. DOC concentration usually was low in ground water; higher DOC concentrations were found in shallow ground water near wetlands and lowlands in the hardwood swamp and open channel areas of the basin. In shallow ground water, DOC concentration ranged from 0.2 to 38 mg/L, whereas in deeper ground water, DOC concentration ranged from 0.2 to 4.4 mg/L.

Sulfate concentrations commonly were higher in shallow ground water than in deeper ground water; in shallow ground water, sulfate concentrations ranged from 0.4 to 58 mg/L, whereas in deeper ground water, they ranged from 1.2 to 9.9 mg/L. The highest ground-water sulfate concentrations were found in shallow ground water near wetlands and lowlands in the hardwood swamp and open channel areas of the basin. Aluminum concentrations, like sulfate, commonly were higher in shallow ground water than in deeper ground water, and the highest aluminum concentrations also were found in shallow ground water near wetlands and lowlands in the hardwood swamp and open channel areas of the basin. In shallow ground water, aluminum concentrations ranged from < 10 to 6,100 $\mu g/L$; in deeper ground water, they ranged from < 10 to 1,200 $\mu g/L$. Iron concentrations in shallow ground water ranged from < 2 to 11,000 $\mu g/L$, and in deeper ground water, they ranged from < 2 to 2,700 $\mu g/L$. Iron concentrations were less than 120 $\mu g/L$ except in ground water associated with the wetlands and lowlands near the hardwood swamp and open channel areas in the basin.

REFERENCES CITED

Barce, M. J., Gibb, J. P., and Miller, R. A., 1983, A guide to the selection of materials for monitoring well construction and ground-water sampling: Illinois State Water Survey, Champaign, Illinois, ISWS Contract Report 327, 78 p.

Barcelona, M. J., Gibb, J. P., Helfrich, J. A., and Garske, E. E., 1985, Practical guide for ground-water sampling: Illinois State Water Survey, Champaign, Illinois, ISWS Contract Report 374, 94 p.

Bauersfeld, W. R., Moshinsky, E. W., Pustay, E. A., and Jones, W. D., 1987, Water resources data, New Jersey, Water Year 1986, Volume 2. Delaware River Basin and tributaries to Delaware Bay: U. S. Geological Survey Water-Data Report NJ-86-2, 197 p.

Black, C. A., Evans, D. D., White, J. L., Ensminger, L. E., Clark, F. E., and Dinauer, R. C., eds., 1965, Methods of soil analysis: Agronomy No. 9, Madison, Wisconsin, American Society of Agronomy, Inc., 1572 p.

Briggs, L. J., and McCall, A. G., 1904, An artificial root for inducing capillary movement of soil moisture: Science, v. 20, p. 566-569.

Clesceri, N. L., and Vasudevan, C., 1980, Acid precipitation, throughfall chemistry, and canopy processes, in Drablos, D., and Tollan, A., eds., Ecological impact of acid precipitation, Oslo, Norway, SNSF Project, p. 258-259.

Cole, D. W., 1958, Alundum tension lysimeter: Soil Science, v. 85, p. 293-296.

Douglas, L. A., and Trela, J. J., 1979, Mineralogy of Pine Barrens soils, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 95-109.

Eaton, J. S., Likens, G. E., and Bormann, F. H., 1973, Throughfall and stemflow chemistry in a northern hardwood forest: Journal of Ecology, v. 61, p. 495-508.

Fishman, M. J., and Friedman, L. C., eds., 1985, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chap. A1, Open-File Report 85-495, 709 p.

Friedman, L. C., and Erdmann, D. G., 1982, Quality assurance practices for the chemical and biological analyses of water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, chap. A6, 181 p.

Gillespie, B. D., and Schopp, R. D., 1982, Low-flow characteristics and flow duration of New Jersey streams: U.S. Geological Survey Open-File Report 81-1110, 164 p.

Goerlitz, D. F., and Brown, E., 1972, Methods for analysis of organic substances in water: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, chap. A3, 40 p.

Good, R. E., Good, N. F., and Andresen, J. W., 1979, The Pine Barren Plains, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 283-295.

Gran, G., 1952, Determination of the equivalence point in potentiometric titrations. Part II: The Analyst, v. 77, p. 661-671.

Hansen, E. A., and Harris, A. R., 1975, Validity of soilwater samples collected with porous ceramic cups: Soil Science Society of America Proceedings, v. 39, p. 528-536.

Heanes, D. L., 1984, Determination of total organic-C in soils by an improved chromic acid digestion and spectrophotometric procedure: Communications in Soil Science and Plant Analysis, v. 15, no. 10, p. 1191-1213.

Helvey, J. D., and Patric, J. H., 1965a, Canopy and litter interception of rainfall by hardwoods of eastern United States: Water Resources Research, v. 1, p. 193-206.

_____ 1965b, Design criteria for interception studies: Publication no. 67 of the International Association of Scientific Hydrology Symposium Design of Hydrological Networks, p. 131-137.

Hem, J. D., 1985, Study and interpretation of the chemical characteristics of natural water, third edition: U.S. Geological Survey Water-Supply Paper 2254, 263 p.

Johnson, A. H., 1979a, Evidence of acidification of headwater streams in the New Jersey Pinelands: Science, v. 206, p. 834-836.

Johnson, A. H., 1979b, Acidification of headwater streams in the New Jersey Pine Barrens: Journal of Environmental Quality, v. 8, no. 3, p. 383-386.

Johnsson, P. A., and Lord, D. G., 1987, A computer program for geochemical analysis of acid-rain and other low-ionic strength samples, acidic waters: U.S. Geological Survey Water-Resources Investigations Report 87-4095A, 42 p.

Jordan, C. F., 1966, Quantity and composition of water in natural soil systems: A lysimeter study: New Brunswick, New Jersey, Rutgers, the State University, unpublished Ph.D. Dissertation, 70 p.

Kohnke, H., Dreibelbis, F. R., and Davidson, J. M., 1940, A survey and discussion of lysimeters and a bibliography on their construction and performance: U.S. Department of Agriculture Miscellaneous Publication 372, 63 p.

Leibfried, R. T., 1982, Chemical interactions between forest soils and acidic precipitation during a dormant season on Wildcat Run watershed in southwestern Pennsylvania: Master's thesis, Pennsylvania State University, Springfield, Va., National Technical Information Service, 86 p.

Little, S., 1979, Fire and plant succession in the New Jersey Pine Barrens, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 297-314.

Madsen, E. L., Morgan, M. D., and Godd, R. E., 1986, Simultaneous photoreduction and microbial oxidation of iron in a stream in the New Jersey Pinelands: Limnology and Oceanography, v. 31, no. 4, p. 832-838.

Markley, M. L., 1955, National cooperative soil studies, watershed research project areas, Middle Branch and McDonalds Branch, Lebanon State Forest, New Jersey: New Brunswick, New Jersey Soil Conservation Service, 8 p.

_____ 1971, Soil survey of Burlington County, New Jersey: Washington, D.C., U.S. Department of Agriculture, Cartographic Division, Soil Conservation Service, 103 p.

_____ 1979, Soil series of the Pine Barrens, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 81-93.

Markewicz, F. J., 1969, Ilmenite deposits of the New Jersey Coastal Plain, in Subitsky, S., ed., Geology of Selected Areas in New Jersey and Eastern Pennsylvania and Guidebook of Excursions: New Brunswick, N.J., Rutgers University Press, p. 363-382.

McCormick, J., 1955, A vegetation inventory of two watersheds in the New Jersey Pine Barrens: New Brunswick, N.J., Rutgers University, unpublished Ph.D. thesis, 125 p.

_____ 1979, The vegetation of the New Jersey Pine Barrens, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 229-243.

Means, J. L., Yuretich, R. F., Crerar, D. A., Kinsman, D. J. J., and Borcsik, M. P., 1981, Hydrogeochemistry of the New Jersey Pine Barrens: Department of Environmental Protection, New Jersey Geological Survey Bulletin 76, 107 p.

Minard, J. P., 1966, Sandblasted blocks on a hill in the Coastal Plain of New Jersey: U.S. Geological Survey Professional Paper 550-B, p. B87-B90.

Minard, J. P., and Owens, J. P., 1960, Differential subsidence of the southern part of the New Jersey Coastal Plain since Early Cretaceous times: U.S. Geological Survey Professional Paper 400B, p. B184-B186.

Morrison, R. D., 1983, Ground Water Monitoring Technology, Procedures, Equipment, and Applications: Prairie du Sac, Wis., Timco Mfg., Inc., 111 p.

National Oceanic and Atmospheric Administration, 1982, Monthly normals of temperature, precipitation, and heating and cooling degree days, 1951-1980, New Jersey, in Climatography of the United States No. 81: Asheville, N.C., National Oceanic and Atmospheric Administration, National Climate Center, 9 p.

New Jersey Pinelands Commission, 1980, New Jersey Pinelands Comprehensive Management Plan: State of New Jersey, Pinelands Commission, 446 p.

Oliver, B. G., Thurman, E. M., and Malcolm, R. L., 1983, The contribution of humic substances to the acidity of colored natural waters: Geochimica et Cosmochimica Acta, v. 47, p. 2031-2035.

Olsson, Hans, 1979, Vegetation of the New Jersey Pine Barrens: A phytosociological classification, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 245-264.

Olsvig, L. S., Cryan, J. F., and Whittaker, R. H., 1979, Vegetational gradients of the pine plains and barrens of Long Island, New York, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 265-282.

Owens, J. P., and Minard, J. P., 1975, Geologic map of the surficial deposits in the Trenton area, New Jersey and Pennsylvania: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-884.

Owens, J. P., and Sohl, N. F., 1969, Shelf and deltaic paleoenvironments in the Cretaceous-Tertiary formations of the New Jersey Coastal Plain, in Subitsky, S., ed., Geology of selected areas in New Jersey and eastern Pennsylvania and Guidebook of excursions: New Brunswick, N.J., Rutgers University Press, p. 235-278.

Peters, D. G., Hayes, J. M., and Hieftje, G. M., 1974, Chemical separation and measurement, in Theory and practice of analytical chemistry: Philadelphia, Pa., W. B. Sanders and Co., 379 p.

Reigner, I. C., 1964, Evaluation of the trough type rain gage: U.S. Forest Service Northeastern Forest Experimental Station Research Note 20, 4 p.

Reynolds, E. R. C., and Leyton, L., 1963, Measurement and significance of throughfall in forest stands, in Rutter, A. J., and Whitehead, F. H., eds., The water relations of plants: New York, John Wiley and Sons, Inc., p. 127-141.

Rhodehamel, E. C., 1970, A hydrologic analysis of the New Jersey Pine Barrens region: New Jersey Division of Water Policy Water Resources Circular No. 22, 35 p.

_____ 1979a, Geology of the Pine Barrens of New Jersey, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p.39-60.

_____ 1979b, Hydrology of the New Jersey Pine Barrens, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 147-168.

Salisbury, R. D., and Knapp, G. N., 1917, The Quaternary formations of southern New Jersey: Final Report, ser. v. 8, New Jersey Geological Survey, Trenton, N.J., 209 p.

Skougstad, M. W., Fishman, M. J., Friedman, L. C., Erdmann, D. E., and Duncan, S. S., eds., 1979, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, chap. A1, 626 p.

Swanson, K. A., 1979, Trace metal budgets for a forested watershed in the New Jersey Pine Barrens: Philadelphia, Pa., University of Pennsylvania, Masters thesis, 96 p.

Tamura, T., 1958, Identification of clay minerals from acid soils: Journal of Soil Science, v. 9, no. 1, p. 141-147.

Turner, R. S., 1983, Biogeochemistry of trace elements in the McDonalds Branch watershed, New Jersey Pine Barrens: Ph.D. thesis, University of Pennsylvania, Ann Arbor, Mich., University Microfilms International, 321 p.

U.S. Department of Agriculture, 1975, Soil Taxonomy: U.S. Department of Agriculture, Agricultural Handbook No. 436, 754 p.

_____ 1984, Procedures for collecting soil samples and methods of analysis for soil survey: Soil Conservation Service, Soil Survey Investigations Report No. 1, 68 p.

Wagner, G. H., 1962, Use of porous ceramic cups to sample soil water within the profile: Soil Science, v. 94, p. 379-386.

Warshaw, C. M., and Roy, Rustum, 1961, Classification and a scheme for the identification of layer silicates: Geological Society of America Bulletin, v. 72, p. 1455-1492.

Whittaker, R. H., 1979, Vegetational relationships of the Pine Barrens, in Forman, R. T. T., ed., Pine Barrens: Ecosystem and Landscape: New York, Academic Press, p. 315-332.

Wilson, W. T., 1950, Discussion of "comparative rain measurements and raingage performances on a steep slope adjacent to a pine stand": Transactions of the American Geophysical Union, v. 31, p. 131-133.

Wood, W. W., 1976, Guidelines for collection and field analysis of ground-water samples for selected unstable constituents: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 1, chap. D2, 24 p.

Zimmermann, C. F., Price, M. T., and Montgomery, J. R., 1978, A comparison of ceramic and teflon in situ samplers for nutrient pore water determinations: Estuarine and Coastal Marine Science, v. 7, p. 93-97.

GLOSSARY

Acid: A hydrogen-containing substance which dissociates upon solution in water to produce one or more hydrogen ions.

Acidic deposition: The transfer of acidic compounds from the atmosphere to the earth's surface. These compounds may be wet or dry. Wet deposition consists of dissolved sulfuric and nitric acids in rain, cloud droplets, and snow. Dry deposition consists of acidic compounds in gaseous or particle form.

Aeolian: Means pertaining to the wind.

Aeric: A modifying descriptive term in soil classification which connotes aeration of the soil.

Alkalinity: The acid-neutralizing capacity of a particular representative water sample.

Alluvial: Refers to unconsolidated terrestrial sediment that has been deposited by water.

Anion: An ion with a negative charge.

Aquifer: A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs. An aquifer containing water under sufficient pressure to rise above the top of the aquifer when penetrated by a well is called a confined aquifer.

Canopy: The uppermost spreading branched layer of a forest.

Cation: An ion with a positive charge.

Cation-exchange capacity: The sum total of exchangeable cations that a soil can adsorb. It is expressed in milliequivalents per 100 grams of soil.

Clay: Sedimentary or soil material consisting of particles <0.002 mm in equivalent diameter.

Clay mineral: A naturally occurring inorganic material, usually crystalline. Clay minerals are layer silicates.

Deltaic: Means pertaining to river deltas.

Dissolved: Refers to that material in a representative water sample which passes through a 0.45-micrometer membrane filter. This is a convenient operational definition used by federal agencies that collect water data. Determinations of "dissolved" constituents are made on subsamples of the filtrate.

Drainage basin: A part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Evapotranspiration: The passage of water vapor into the atmosphere by the combined processes of evaporation and plant transpiration.

Fluvial: Refers to processes associated with streams and rivers.

Ground water: Water saturating a geologic stratum (layer) beneath the land surface.

Haplaquods: Represent a Great Group within the Spodosol Order of soils. Haplaquods have spodic horizons in which >50 percent of the horizon has a free Fe/C ratio <0.2.

Hydrophytes: Vascular plants that grow wholly or partly in water.

Ion: An atom or group of atoms that has gained or lost electrons and so has a net electric charge.

Leaching: Refers to the removal of materials in solution from the soil.

Limonitic: Containing limonite, a hydrous iron oxide.

Lithology: The systematic description of rocks in terms of mineral composition and texture.

Medisaprist: A Great Group soil classification applied to soils with a subsurface layer dominated by highly decomposed organic matter, in which the accumulation of illuviated humus is not thicker than 2 centimeters.

Micrograms per liter (μg/L): A unit expressing the concentration of chemical constituents in solution as mass (microgram = 1×10^{-6} gram) of solute per unit volume (liter) of water. One μg/L is approximately equal to 1 part per billion (ppb) in aqueous solutions of low dissolved-solids concentration.

Microsiemens per centimeter (μS/cm): Units used to express electrical conductivity.

Milliequivalents per liter (meq/L): A unit expressing the concentration of chemical constituents in solution as 10^{-3} hydrogen equivalents.

Milligrams per liter (mg/L): A unit for expressing the concentration of chemical constituents in solution as the mass (1 milligram = 1×10^{-3} gram) of solute per unit volume (liter) of water. One mg/L is approximately equal to 1 part per million (ppm) in aqueous solutions of low dissolved-solids concentration.

Minimum detection limit: For a given type of sample and analytical procedure, that concentration below which the presence of the constituent being analyzed cannot be verified. In this report the minimum detection limits can be identified in the tables of chemical constituents where a less than (<) symbol precedes a value.

Nutrients: As used in this report, refers to one or more of the following water-quality constituents: ammonia, organic nitrogen plus ammonia, nitrite, nitrate-plus-nitrite, phosphorus, and orthophosphate.

Organic anion: A term applied to the group of carboxylate anions of naturally occurring organic acids (humic and fulvic). The organic anion is assumed to be monovalent.

pH: The negative logarithm of the hydrogen ion activity. A solution with a pH of 7.0 at 25 degrees Celsius is considered to be neutral. An acidic solution has a pH of less than 7.0, and an alkaline solution a pH of greater than 7.0.

Quartzipsamment: Soils without natural genetic horizons or with only the beginning of such horizons, that have textures of loamy fine sand or coarser, in which more than 95 percent of the sand fraction (by weight) is quartz, zircon, tourmaline, rutile, and other resistant minerals.

Sediment: A solid material that originates mostly from disintegrated rocks and is transformed by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material such as humus. Sediment may also be suspended in and deposited from moving air masses.

Soil horizon: A layer of soil, approximately parallel to the soil surface, with distinct characteristics produced by soil-forming processes.

O horizons or layers are layers dominated by inorganic material, except limnic layers that are organic. Some are saturated with water for long periods or were once saturated but now are artificially drained; others have never been saturated.

A horizon is a mineral horizon that formed at the surface or below an O horizon and (1) is characterized by an accumulation of humified organic matter intimately mixed with the mineral fraction and not dominated by properties characteristic of E or B horizons (defined below), or (2) has properties resulting from cultivation, pasturing, or similar kinds of disturbance.

E horizon is a mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these, leaving a concentration of sand and silt particles of quartz or other resistant minerals.

B horizon is a horizon that formed below an A, E, or O horizon and is dominated by obliteration of all or much of the original rock structure and by (1) illuvial concentration of silicate clay, iron, aluminum, humus, carbonates, gypsum, or silica, alone or in combination; (2) evidence of removal of carbonates; (3) residual concentration of sesquioxides; (4) coatings of sesquioxides that make the horizon conspicuously lower in value, higher in chroma, or redder in hue than overlying or underlying horizons without apparent illuviation of iron; (5) alteration that forms silicate clay or liberates oxides or both and that forms granular, blocky, or prismatic structure if volume changes accompany changes in moisture content; or (6) any combination of these.

C horizon or layer is a horizon or layer, excluding hard bedrock, that is little affected by pedogenic processes and lacks properties of O, A, E, or B horizons. Most are mineral layers, but limnic layers, whether organic or inorganic, are included. The material of C layers may be either like or unlike that from which the solum presumably formed. C horizons may have been modified even if there was no evidence of pedogenesis.

Soil series: The basic unit of soil classification, being a subdivision of a family and consisting of soils that are essentially alike in all major profile characteristics.

Specific conductance: A measure of the ability of water to conduct an electrical current. Conductance is expressed in units of microSiemens per centimeter at 25 ^{o}C.

Spodic horizon: A subsurface diagnostic horizon that contains an illuvial accumulation of free sesquioxides of iron and aluminum and of organic matter.

Terric: A modifying descriptive term in soil classification which connotes a mineral substratum.

Typic: A modifying descriptive term in soil classification which is applied to soils that represent the central concept or characteristics of their great group.

Throughfall: That portion of the gross precipitation that directly reaches the litter through spaces in the vegetative canopy and as drip from leaves, twigs, and stems.

Trace metals: Elements that would be chemically classified as metals (for example, iron) and that typically are present in solution at concentrations of micrograms per liter.

Water table: That surface in an unconfined water body at which the pressure is atmospheric.

Well screen: The slotted or pierced part of a well casing through which water enters the well.

X-ray diffraction: A technique by which mineral structures are identified by exposing crystalline material to X-rays and studying the resulting diffraction pattern.

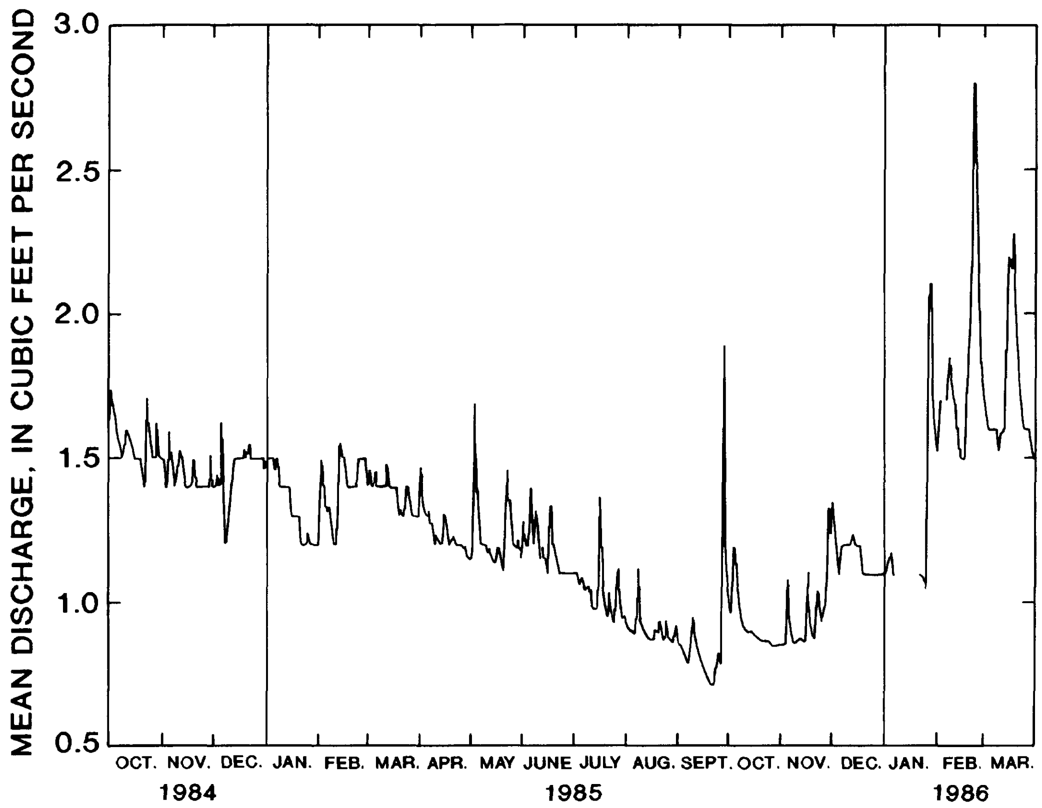

Figure 13.--Daily discharge at McDonalds Branch gaging station (01466500), October 1984 through March 1986.

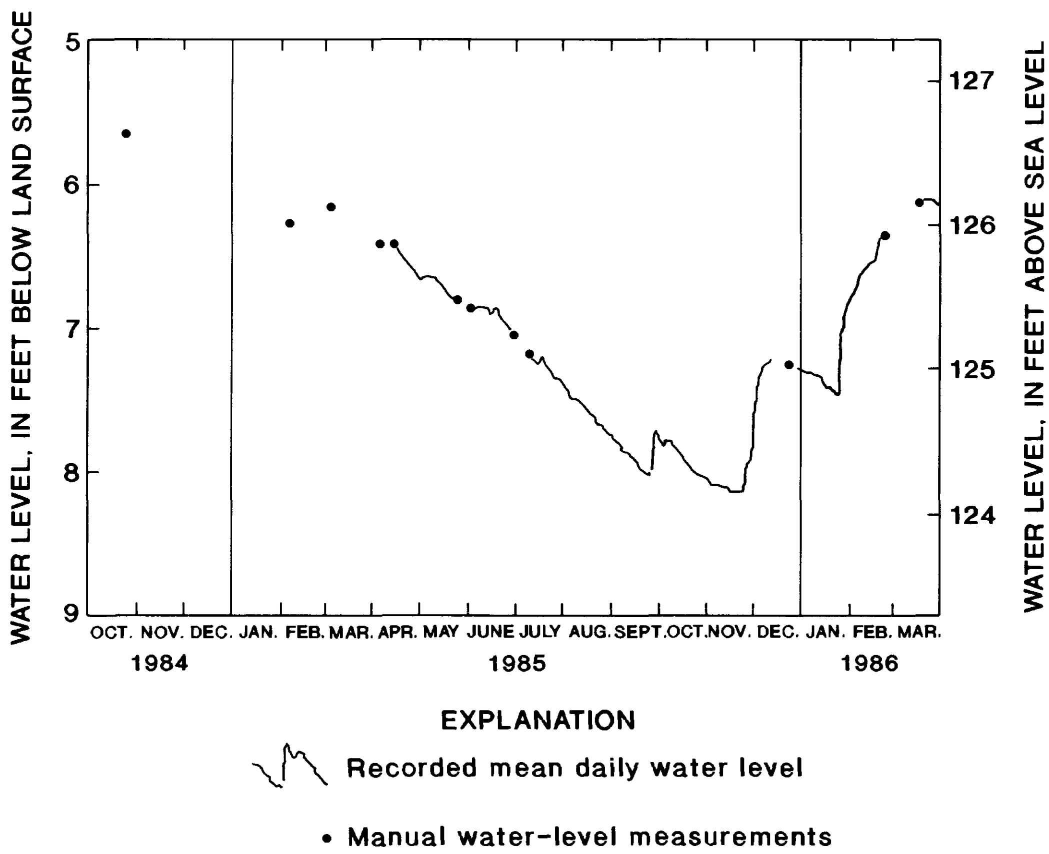

Figure 14.--Hydrograph for well QWO-3B, October 1984 through March 1986.

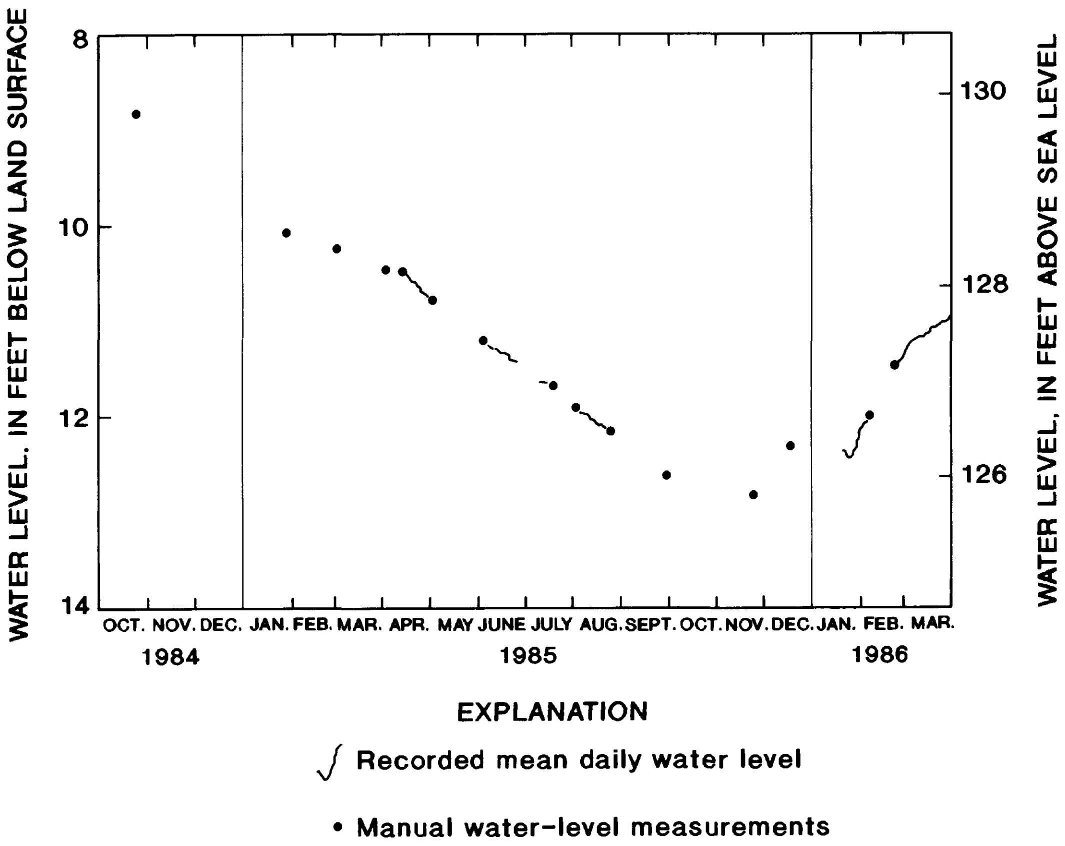

Figure 15.--Hydrograph for well QWH-3B, October 1984 through March 1986.

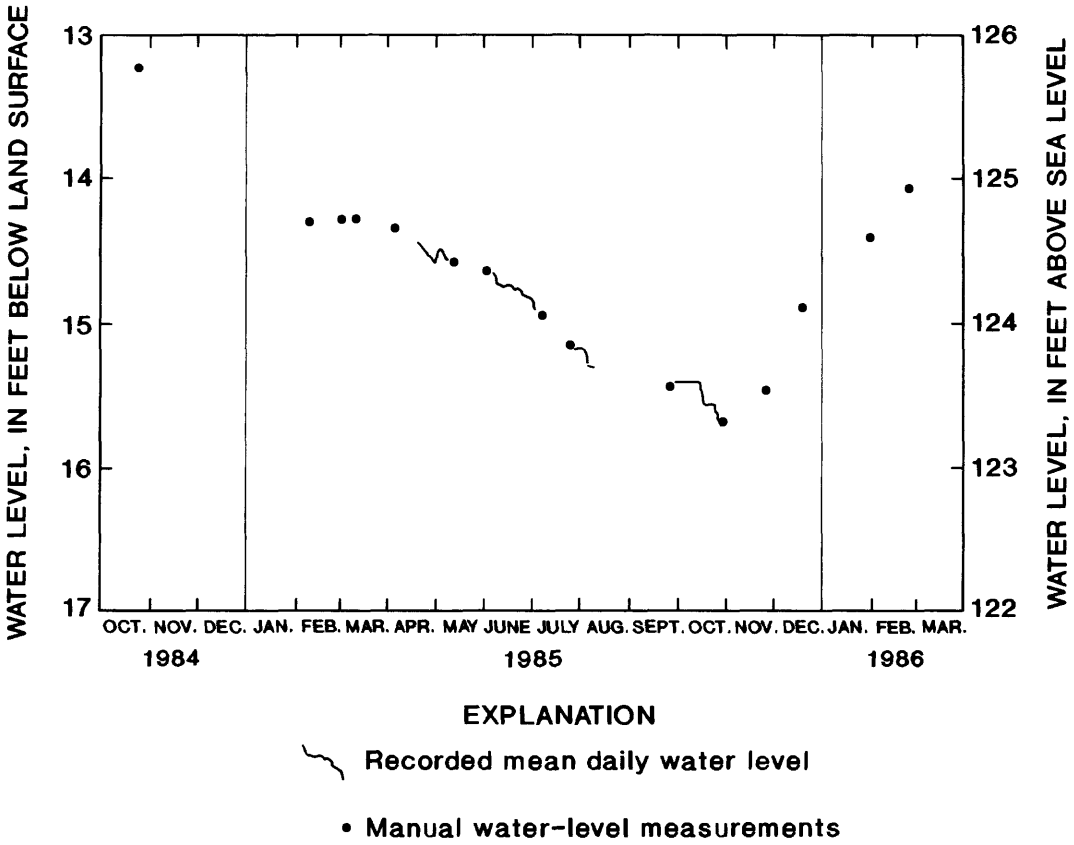

Figure 16.--Hydrograph for well QWC-3A, October 1984 through March 1986.

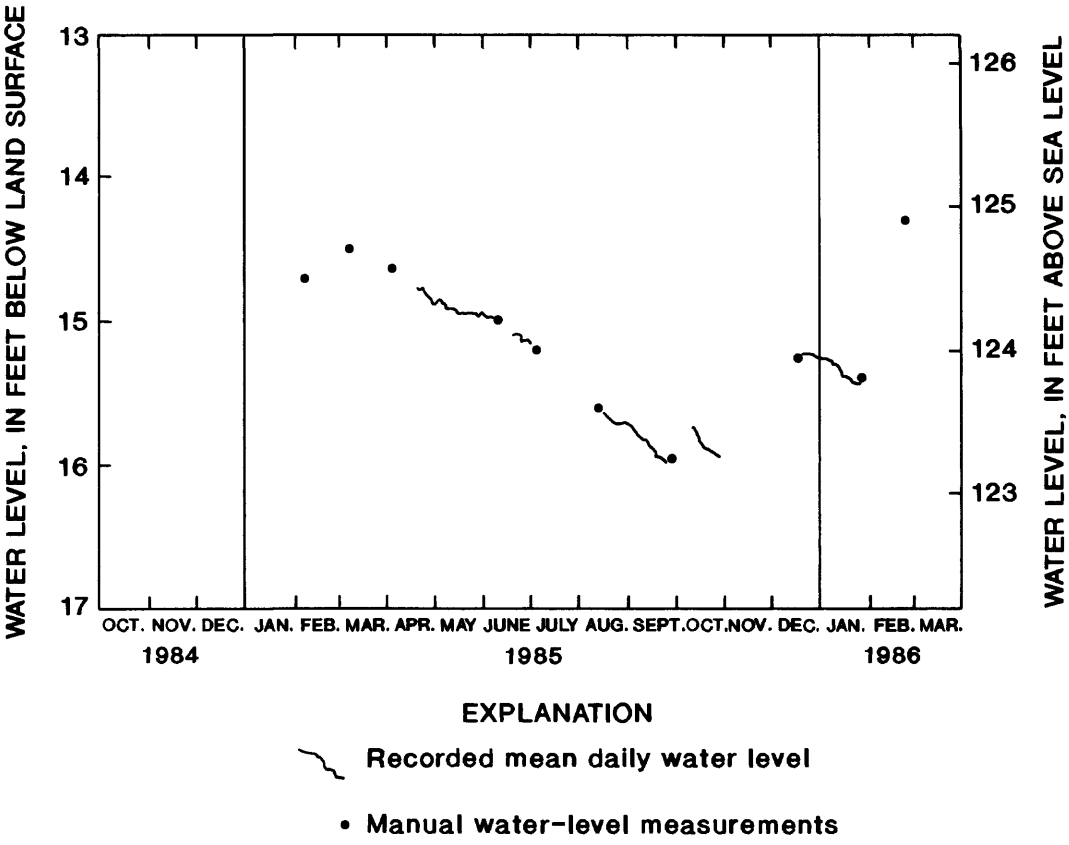

Figure 17.--Hydrograph for well QWC-3B, October 1984 through March 1986.

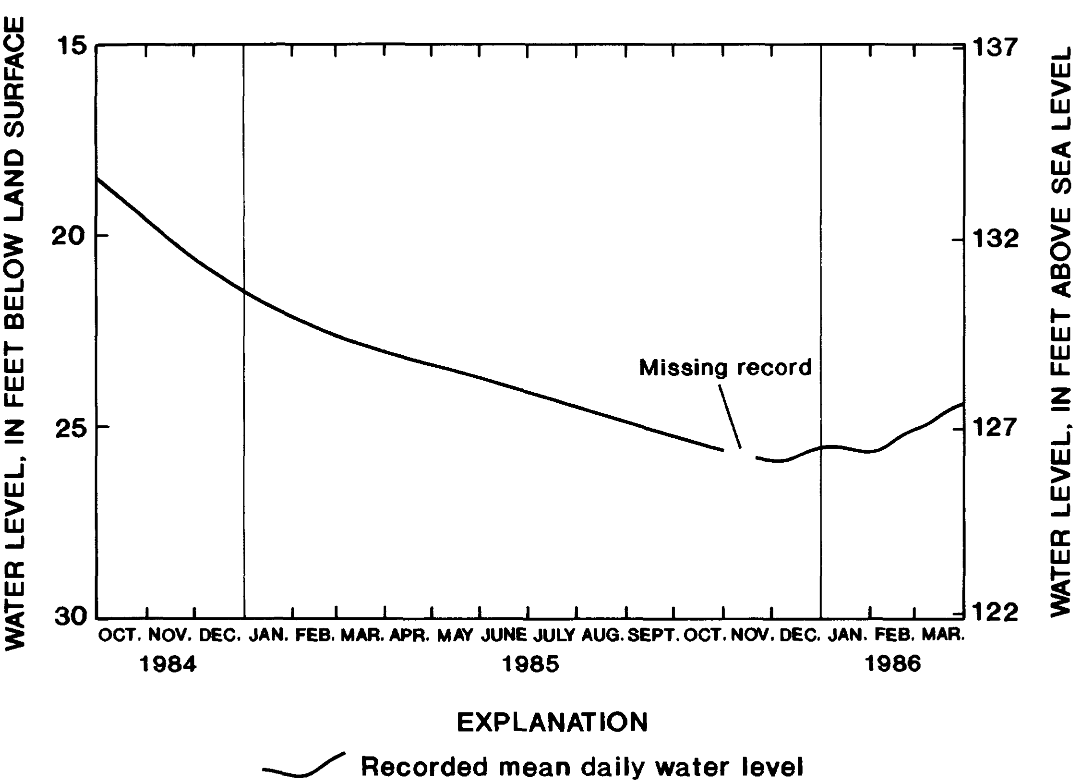

Figure 18.--Hydrograph for USGS long-term observation well LSF-23D, October 1984 through March 1986.

Table 11.--Rainfall (inches) to McDonalds Branch basin, January 24, 1985 through March 25, 1986--event-recording rain gages

[in., inches; --- indicates missing data]

SITE PPT-1WC

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
1	---	0.75	0.05	0.30	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00
2	---	.40	.10	.00	.25	.00	.00	.00	.00	.05	.00	.00	.00	.05	.00
3	---	.00	.00	.05	1.60	.15	.00	.00	.00	1.10	.00	.00	.55	.00	.00
4	---	.05	.05	.05	.00	.00	.00	.00	.00	.40	.45	.00	.00	.70	.00
5	---	.00	.15	.00	.00	.85	.00	.00	.00	.15	.70	.05	.10	.10	.00
6	---	.00	.00	.10	.00	.00	.00	.00	.00	.00	.00	.25	.00	.00	.00
7	---	.00	.00	.05	.00	.00	.05	[1]---	.00	.00	.00	.00	.00	.60	.00
8	---	.00	.15	.00	.00	.45	.05	[1]1.20	.10	.00	.00	.00	.00	.00	.00
9	---	.00	.00	.00	.00	.00	.00	[1]---	.85	.00	.00	.00	.00	.00	.00
10	---	.00	.00	.00	.00	.00	.05	[1]---	.05	.00	.00	.00	.00	.00	.00
11	---	.00	.00	.05	.00	.00	.00	[1]---	.00	.00	.00	.00	.00	.35	.10
12	---	.90	.50	.00	.00	.25	.00	[1]---	.00	.00	.00	.00	.00	.00	.00
13	---	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.50	.00	.00	1.20
14	---	.00	.00	.00	.00	.05	.00	.05	.00	.00	.05	.00	.00	.10	.40
15	---	.00	.00	.15	.00	.00	.40	.00	.00	.00	.00	.00	.00	.00	[2].20
16	---	.00	.00	.00	.00	1.20	1.40	.00	.00	.00	1.35	.00	.00	.00	[2]---
17	---	.00	.00	.00	.20	.00	[3]---	.00	.00	.00	.05	.00	.00	.05	.00
18	---	.00	.00	.00	.05	.05	[3]---	.10	.00	.00	.00	.00	.00	.75	.00
19	---	.00	.00	.00	.00	.00	.00	.10	.00	.00	.00	.00	.30	.00	.00
20	---	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.10	.00	.10	.00
21	---	.00	.00	.00	1.45	.00	.00	.45	.00	.00	.00	.00	.00	.30	.00
22	---	.00	.00	.05	.00	.00	.40	.00	.00	.00	1.15	.00	.00	.10	.00
23	---	.00	.25	.00	.35	.00	.00	.00	.25	.00	.00	.00	.00	.10	.00
24	0.00	.00	.25	.00	.00	.15	.00	.00	.20	.00	.00	.00	.00	.00	.00
25	.00	.00	.00	.05	.00	[4]---	.00	.45	.00	.00	.15	.00	.70	.00	.00
26	.00	.00	.00	.00	.00	[4]---	.85	.00	.80	.00	.20	.00	2.05	.00	---
27	.00	.00	.00	.00	.00	[4]---	.35	.00	2.85	.00	.20	.00	.25	.05	---
28	.00	.00	.05	.00	.30	[4]---	.00	.00	.00	.00	1.25	.00	.00	.00	---
29	.00		.00	.00	.15	[4]0.20	.00	.00	.00	.00	.00	.00	.10		---
30	.00		.00	.00	.00	[4]---	.00	.60	.00	.00	.55	.00	.00		---
31	.10		.20		.00		.30	.00		.00		.15	.00		---
TOTAL	---	2.10	1.80	0.85	4.35	3.85	[3]3.85	2.95	5.10	1.70	6.10	1.20	4.05	3.35	---

Table 11.--Rainfall (inches) to McDonalds Branch basin, January 24, 1985 through March 25, 1986--event-recording rain gages--Continued

SITE PPT-2W

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
1	---	0.70	[5]---	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00
2	---	.40	[5]0.25	.00	.25	.00	.00	.00	.00	.05	.00	.00	.00	.05	.00
3	---	.00	.00	.10	1.35	.05	.00	.00	.00	1.00	.00	.00	.50	.00	.00
4	---	.05	.05	.05	.00	.00	.00	.00	.00	.45	.55	.00	.00	[6] .80	.00
5	---	.00	.25	.00	.00	.65	.00	.00	.00	.10	.50	.00	.15	[6]---	.00
6	---	.00	.00	.10	.00	.00	.00	.00	.00	.00	.00	[7] .30	.00	.00	.00
7	---	.00	.00	.05	.00	.00	.05	.20	.00	.00	.00	---	.00	.60	.00
8	---	.00	.15	.05	.00	.45	.05	1.30	.05	.00	.00	---	.00	.00	.00
9	---	.00	.00	.00	.00	.00	.00	.00	.70	.00	.00	---	.00	.00	.00
10	---	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	---	.00	.00	.00
11	---	.00	.05	.05	.00	.00	.00	.05	.00	.00	.00	---	.00	.40	.05
12	---	.90	.50	.00	.00	.15	.00	.00	.00	.00	.00	---	.00	.00	.00
13	---	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	---	.00	.00	1.20
14	---	.00	.00	.00	.00	.00	.00	.15	.00	.00	.00	---	.00	.10	.35
15	---	.00	.00	.15	.00	.05	.25	.00	.00	.00	.00	---	.00	.00	.10
16	---	.00	.00	.00	.00	1.00	1.85	.00	.00	.00	1.30	---	.00	.00	.00
17	---	.00	.00	.00	.20	.00	.00	.00	.00	.00	.05	---	.00	.05	.00
18	---	.00	.00	.00	.05	.05	.00	.10	.00	.00	.00	---	.00	.65	.00
19	---	.00	.00	.00	.00	.00	.00	.15	.00	.00	.00	---	.30	.05	.00
20	---	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	---	.05	.10	.00
21	---	.00	.00	.00	.70	.00	.00	.30	.00	.00	.00	---	.00	.25	.00
22	---	.00	.05	.05	.00	.00	.35	.00	.00	.00	1.15	---	.00	.10	.00
23	---	.00	.25	.00	.35	.00	.00	.00	.25	.00	.00	---	.00	.05	.00
24	.00	.00	.25	.00	.00	.10	.00	.00	.25	.00	.00	.00	.00	.00	.00
25	.00	.00	.00	.05	.00	.00	.00	.45	.00	.00	.05	.00	.60	.00	.00
26	.00	.00	.00	.00	.00	.00	.75	.00	.65	.00	.25	.00	2.30	.00	---
27	.00	.00	.00	.00	.00	.00	.15	.00	2.80	.00	.15	.00	.25	.00	---
28	.00	.00	.05	.00	.30	.10	.00	.00	.00	.00	1.40	.00	.05	.00	---
29	.00		.00	.00	.15	.10	.00	.00	.00	.00	.00	.00	.05		---
30	.00		.05	.00	.00	.00	.15	.55	.00	.00	.60	.00	.00		---
31	.15		.20		.00		.25	.00		.00		.15	.00		---
TOTAL	---	2.05	2.15	0.90	3.35	2.95	3.90	3.25	4.70	1.60	6.00	---	4.25	3.20	---

[1] Missing record from 8/7/85 to 8/11/85. Event recorder indicated that rain fell on 8/7/85, 8/8/85, and 8/11/85. Record on 8/12/85 indicated that over the period 8/7/85 to 8/12/85, approximately 1.20 in. of rain fell; most of this rain probably fell on 8/7/85 and 8/8/85.

[2] Missing record from 8:00 p.m. on 3/15/86 to 3/17/86. Event recorder indicated that rain fell between 8:00 p.m. on 3/15/86 and 8/16/86, and no rain fell on 3/17/86. Record on 3/18/86 indicated that approximately 0.20 in. of rain fell over the period, probably on 3/15/86 and 3/16/86.

[3] Although record was missing at this site on 7/17/85 and 7/18/85, no rainfall (0.00 in.) was recorded at PPT-2W on 7/17/85 and 7/18/85. For the purposes of calculating total rainfall for February 1985 to January 1986, rainfall at PPT-1W was estimated as 0.00 in. on 7/17/85 and 7/18/85.

[4] Missing record from 6/25/85 to 7/1/85. Event recorder indicated that rain fell on 6/28/85 to 6/29/85. Record on 7/1/85 and 7/2/85 indicated that approximately 0.20 in. of rain fell over the period 6/25/85 to 7/1/85; this rain probably fell on 6/28/85 and 6/29/85.

[5] Missing record on 3/1/85 and 3/2/85. Event recorder and record on 3/3/85 indicated that approximately 0.25 in. of rain fell during these two days between about 11:00 p.m., 3/1/85, and 3:00 a.m., 3/2/85.

[6] Missing record on 2/4/86 and 2/5/86. Event recorder and record at 2:00 p.m. on 2/5/86 indicated that approximately 0.80 in. of rain fell on those two days, most of which probably fell on 2/4/86.

[7] Collector was removed at 12:00 noon on 12/6/85 to prevent vandalism during hunting season and was reinstalled on 12/24/85. Before removal on 12/6/85, 0.30 in. of rain fell. It is possible that some additional rain fell later in the day; however, total rainfall at site number PPT-2W on 12/6/85 was 0.25 in.

Table 12.--Rainfall (inches) to McDonalds Branch basin, February 7, 1985 through March 25, 1986--wedge rain gages

[< indicates less than]

Dates	Site name	
	PPT-1BC (inches)	PPT-2B (inches)
02/07/1985-02/14/1985	[1]0.9	[1]0.78
02/14/1985-02/20/1985	.00	.01
02/20/1985-02/26/1985	.00	.00
02/26/1985-03/05/1985	.35	.48
03/05/1985-03/12/1985	.60	.64
03/12/1985-03/19/1985	.00	.00
03/19/1985-03/26/1985	.55	.57
03/26/1985-04/02/1985	.53	.53
04/02/1985-04/09/1985	.14	.16
04/09/1985-04/16/1985	.18	.22
04/16/1985-04/23/1985	.02	.03
04/23/1985-04/30/1985	.03	.03
04/30/1985-05/07/1985	1.62	1.45
05/07/1985-05/14/1985	.00	.00
05/14/1985-05/21/1985	.18	.24
05/21/1985-05/28/1985	1.45	.84
05/28/1985-06/04/1985	.80	.58
06/04/1985-06/11/1985	1.15	1.05
06/11/1985-06/18/1985	1.35	1.18
06/18/1985-06/25/1985	.15	.07
06/25/1985-07/02/1985	.19	.21
07/02/1985-07/09/1985	.07	.07

Table 12.--Rainfall (inches) to McDonalds Branch basin, February 7, 1985 through March 25, 1986--wedge rain gages--Continued.

Dates	Site name	
	PPT-1BC (inches)	PPT-2B (inches)
07/09/1985-07/16/1985	1.15	1.20
07/16/1985-07/23/1985	.68	.96
07/23/1985-07/30/1985	1.00	.83
07/30/1985-08/06/1985	.19	.30
08/06/1985-08/13/1985	1.08	1.32
08/13/1985-08/20/1985	.21	.40
08/20/1985-08/27/1985	.80	.76
08/27/1985-09/03/1985	.52	.50
09/03/1985-09/10/1985	.90	.78
09/10/1985-09/17/1985	.00	.00
09/17/1985-09/24/1985	.42	.52
09/24/1985-10/01/1985	3.20	3.00
10/01/1985-10/08/1985	1.60	1.55
10/08/1985-10/15/1985	.00	.00
10/15/1985-10/22/1985	.00	.00
10/22/1985-10/29/1985	.00	.05
10/29/1985-11/05/1985	1.15	1.05
11/05/1985-11/12/1985	.04	.04
11/12/1985-11/19/1985	1.35	1.35
11/19/1985-11/26/1985	1.30	1.32
11/26/1985-12/03/1985	2.25	[2]2.55
12/03/1985-12/10/1985	.42	[3]---

Table 12.--Rainfall (inches) to McDonalds Branch basin, February 7, 1985 through March 25, 1986--wedge rain gages--Continued.

Dates	Site name	
	PPT-1BC (inches)	PPT-2B (inches)
12/10/1985-12/17/1985	0.50	[3]---
12/17/1985-12/24/1985	.13	[3]---
12/24/1985-12/31/1985	.00	0.00
12/31/1985-01/07/1986	.80	1.00
01/07/1986-01/14/1986	.00	.00
01/14/1986-01/21/1986	.34	.41
01/21/1986-01/28/1986	[2]3.45	[2]3.65
01/28/1986-02/05/1986	.86	.86
02/05/1986-02/12/1986	[2].72	[2]1.05
02/12/1986-02/19/1986	.96	.86
02/19/1986-02/25/1986	.60	.60
02/25/1986-03/04/1986	.02	.04
03/04/1986-03/11/1986	.09	.06
03/11/1986-03/18/1986	1.70	1.60
03/18/1986-03/25/1986	.00	< .01

[1] Precipitation partially frozen (ice and water).

[2] Precipitation frozen.

[3] Missing data--collector was removed 12/6/85 because of hunting season and reinstalled 12/24/85.

Table 13.--Throughfall (inches) to the McDonalds Branch basin, December 24, 1985 through March 25, 1986--wedge rain gages

[< indicates less than]

Dates	Site name			
	TF-1C (inches)	TF-2PB (inches)	TF-3H (inches)	TF-4PBJ (inches)
12/24/1985-12/31/1985	0.00	0.00	0.00	0.00
12/31/1985-01/07/1986	[1] .50	.74	[2]---	.55
01/07/1986-01/14/1986	.00	.00	.00	.00
01/14/1986-01/21/1986	.26	.28	.27	.36
01/21/1986-01/28/1986	2.50	[1]3.35	2.65	[1]2.15
01/28/1986-02/05/1986	.52	.49	.66	.70
02/05/1986-02/12/1986	[1] .40	[1] .65	[1] .74	[1] .63
02/12/1986-02/19/1986	.56	[3]---	.64	.55
02/19/1986-02/25/1986	.38	.44	.48	.46
02/25/1986-03/04/1986	.02	.04	.05	.04
03/04/1986-03/11/1986	.02	.05	.05	.03
03/11/1986-03/18/1986	1.25	1.30	1.35	1.60
03/18/1986-03/25/1986	< .01	.01	.01	< .01

[1] Throughfall frozen.

[2] Value deleted because gage contained liquid other than precipitation.

[3] Missing data.

Table 14.--Stage measurements from upstream sites in McDonalds Branch basin

Site name	Date of measurement	Water altitude[1] (feet)
SG-H[2]	08/24/1984	132.17
SG-H	08/29/1984	131.97
SG-H	01/25/1985	132.23
SG-H	02/27/1985	132.32
SG-H	04/01/1985	132.32
SG-H	05/09/1985	132.17
SG-H	06/04/1985	131.82
SG-H	07/02/1985	---[3]
SG-H	07/30/1985	---[3]
SG-H	08/29/1985	---[3]
SG-H	09/30/1985	131.70
SG-H	11/01/1985	---[3]
SG-H	11/26/1985	132.06
SG-H	12/20/1985	132.16
SG-H	01/23/1986	132.08
SG-H	02/26/1986	132.32
SG-H	03/21/1986	132.24
SG-H	05/21/1986	131.92
SG-OC[4]	08/13/1984	127.02
SG-OC	08/29/1984	126.76
SG-OC	10/26/1984	126.44
SG-OC	01/25/1985	---[5]
SG-OC	02/26/1985	126.31
SG-OC	02/28/1985	126.27
SG-OC	04/01/1985	126.02
SG-OC	05/09/1985	---[3]
SG-OC	06/04/1985	---[3]
SG-OC	07/02/1985	---[3]
SG-OC	07/30/1985	---[3]
SG-OC	08/29/1985	---[3]
SG-OC	09/30/1985	---[3]
SG-OC	11/01/1985	---[3]
SG-OC	11/26/1985	---[3]
SG-OC	12/20/1985	---[5]
SG-OC	01/23/1986	---[3]
SG-OC	02/26/1986	126.33
SG-OC	03/21/1986	126.25
SG-OC	05/21/1986	125.95
SG-CQ[6]	08/14/1984	125.52
SG-CQ	10/25/1984	125.34
SG-CQ	01/24/1985	124.97
SG-CQ	02/28/1985	---[7]
SG-CQ	04/01/1985	124.95
SG-CQ	05/09/1985	---[3]

Table 14.--Stage measurements from upstream sites in McDonalds Branch basin--Continued

Site name	Date of measurement	Water altitude[1] (feet)
SG-CQ	06/04/1985	---[3]
SG-CQ	07/30/1985	---[3]
SG-CQ	08/29/1985	---[3]
SG-CQ	09/30/1985	---[3]
SG-CQ	11/26/1985	---[3]
SG-CQ	12/20/1985	---[3]
SG-CQ	01/23/1986	---[3]
SG-CQ	02/26/1986	125.08
SG-CQ	03/21/1986	124.92
SG-CQ	05/21/1986	---[3]

[1] Referenced to sea level.

[2] SG-H is the staff gage located in the hardwood swamp near wells H-5A, 5B (fig. 8). The zero altitude of this gage after installation (August 10, 1984) was 130.389 feet. After the winter, the gage was releveled (May 7, 1985), and zero altitude was then 130.425 feet.

[3] Dash indicates missing data because of dry conditions.

[4] SG-OC is the staff gage located at the open channel near wells O-5A, 5B (fig. 8). The zero altitude of this gage after installation (August 10, 1984) was 124.764 feet. After the winter, the gage was releveled (May 7, 1985), and zero altitude was then 124.845 feet.

[5] Dash indicates missing data because of ice.

[6] SG-CQ is the staff gage located at the edge of the cedar swamp near wells CQ-3A, 3B (fig. 8). The zero altitude of this gage, measured on May 7, 1985, was 124.464 feet.

[7] Stream stage was not measured.

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells

Site name	Date of measurement	Altitude[1] (feet)
C-1	07/20/1984	121.61
C-1	07/25/1984	121.58
C-1	07/31/1984	121.53
C-1	10/26/1984	121.17
C-1	01/30/1985	[2]---
C-1	03/01/1985	[2]---
C-1	04/02/1985	120.94
C-1	05/09/1985	120.87
C-1	06/05/1985	120.78
C-1	07/02/1985	120.69
C-1	07/30/1985	120.54
C-1	08/29/1985	120.37
C-1	10/02/1985	120.46
C-1	11/01/1985	120.27
C-1	11/26/1985	120.60
C-1	12/20/1985	120.73
C-1	01/23/1986	120.63
C-1	02/26/1986	121.20
C-1	03/21/1986	121.22
C-1	05/21/1986	121.15
C-2A	06/29/1984	129.82
C-2A	07/20/1984	128.84
C-2A	07/25/1984	128.84
C-2A	07/31/1984	128.65
C-2A	10/26/1984	127.10
C-2A	01/30/1985	126.67
C-2A	03/01/1985	126.92
C-2A	04/02/1985	127.05
C-2A	05/09/1985	126.78
C-2A	06/05/1985	126.65
C-2A	07/02/1985	126.51
C-2A	07/30/1985	126.30
C-2A	08/29/1985	126.13
C-2A	10/02/1985	125.74
C-2A	11/01/1985	125.57
C-2A	11/26/1985	125.44
C-2A	12/20/1985	126.43
C-2A	01/23/1986	126.80
C-2A	02/26/1986	127.79
C-2A	03/21/1986	128.10
C-2A	05/21/1986	128.39
C-2B	06/29/1984	122.45
C-2B	07/20/1984	122.28
C-2B	07/25/1984	122.20
C-2B	07/31/1984	122.13
C-2B	10/26/1984	122.09
C-2B	01/30/1985	121.43
C-2B	03/01/1985	121.56
C-2B	04/02/1985	121.46
C-2B	05/09/1985	121.31
C-2B	06/05/1985	121.29
C-2B	07/02/1985	121.12
C-2B	07/30/1985	120.95
C-2B	08/29/1985	120.74
C-2B	10/02/1985	120.82
C-2B	11/01/1985	120.64
C-2B	11/26/1985	120.83
C-2B	12/20/1985	121.26
C-2B	01/23/1986	121.05
C-2B	02/26/1986	121.70
C-2B	03/21/1986	121.72
C-2B	05/21/1986	121.71
C-3	07/20/1984	122.00
C-3	07/25/1984	121.87
C-3	07/31/1984	121.80
C-3	10/26/1984	121.42
C-3	01/30/1985	121.20
C-3	03/01/1985	121.35
C-3	04/02/1985	121.43
C-3	05/09/1985	121.10
C-3	06/05/1985	121.10
C-3	07/02/1985	120.92
C-3	07/30/1985	120.73
C-3	08/29/1985	120.57
C-3	10/02/1985	120.67
C-3	11/01/1985	120.49
C-3	11/26/1985	120.68
C-3	12/20/1985	121.00
C-3	01/23/1986	120.89
C-3	02/26/1986	121.50
C-3	03/21/1986	121.49
C-3	05/21/1986	121.46
C-4	07/20/1984	122.61
C-4	07/25/1984	122.31
C-4	07/31/1984	[3]---

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
C-4	10/26/1984	122.36
C-4	01/30/1985	[3]---
C-4	03/01/1985	[3]---
C-4	04/02/1985	[3]---
C-4	07/02/1985	[3]---
C-4	07/30/1985	[3]---
C-4	08/29/1985	[3]---
C-4	10/02/1985	[3]---
C-4	11/01/1985	[3]---
C-4	11/29/1985	[3]---
C-4	12/20/1985	[3]---
C-4	01/23/1986	[3]---
C-4	02/26/1986	[3]---
C-4	03/21/1986	[3]---
C-4	05/21/1986	[3]---
C-5A	06/29/1984	120.51
C-5A	07/20/1984	120.44
C-5A	07/25/1984	120.42
C-5A	07/31/1984	120.39
C-5A	10/26/1984	120.26
C-5A	01/30/1985	120.14
C-5A	03/01/1985	119.21
C-5A	04/02/1985	120.13
C-5A	05/09/1985	120.07
C-5A	06/05/1985	120.25
C-5A	07/02/1985	119.99
C-5A	07/30/1985	120.11
C-5A	08/29/1985	119.79
C-5A	10/02/1985	119.87
C-5A	11/01/1985	119.76
C-5A	11/26/1985	119.90
C-5A	12/20/1985	120.16
C-5A	01/23/1986	119.99
C-5A	02/26/1986	120.30
C-5A	03/21/1986	120.33
C-5A	05/21/1986	120.25
C-5B	06/29/1984	120.72
C-5B	07/20/1984	120.66
C-5B	07/25/1984	120.62
C-5B	07/31/1984	120.57
C-5B	10/26/1984	120.41

Site name	Date of measurement	Altitude[1] (feet)
C-5B	01/30/1985	120.23
C-5B	03/01/1985	120.32
C-5B	04/02/1985	120.31
C-5B	05/09/1985	120.17
C-5B	06/05/1985	120.26
C-5B	07/02/1985	120.07
C-5B	07/30/1985	119.79
C-5B	08/29/1985	119.87
C-5B	10/02/1985	119.94
C-5B	11/01/1985	119.82
C-5B	11/26/1985	119.96
C-5B	12/20/1985	120.14
C-5B	01/23/1986	120.07
C-5B	02/26/1986	120.44
C-5B	03/21/1986	120.45
C-5B	05/21/1986	120.37
C-6A	07/20/1984	129.90
C-6A	07/25/1984	129.79
C-6A	07/31/1984	129.61
C-6A	10/26/1984	127.99
C-6A	01/30/1985	127.48
C-6A	03/01/1985	127.75
C-6A	04/02/1985	127.73
C-6A	05/09/1985	127.54
C-6A	07/02/1985	127.33
C-6A	10/02/1985	126.59
C-6A	11/01/1985	126.52
C-6A	11/26/1985	126.48
C-6A	12/20/1985	127.66
C-6A	01/23/1986	127.55
C-6A	02/26/1986	128.71
C-6A	03/21/1986	128.96
C-6B	07/20/1984	130.53
C-6B	07/25/1984	129.96
C-6B	07/31/1984	129.49
C-6B	10/26/1984	126.72
C-6B	01/30/1985	125.57
C-6B	03/01/1985	125.55
C-6B	04/02/1985	125.54
C-6B	05/09/1985	125.53
C-6B	07/02/1985	125.42

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
C-6B	10/02/1985	124.92
C-6B	11/01/1985	124.94
C-6B	11/26/1985	124.87
C-6B	12/20/1985	125.38
C-6B	01/23/1986	125.70
C-6B	02/26/1986	126.36
C-6B	03/21/1986	126.75
CQ-1	06/29/1984	128.01
CQ-1	07/20/1984	127.62
CQ-1	07/25/1984	127.51
CQ-1	07/31/1984	127.39
CQ-1	08/06/1984	127.38
CQ-1	08/13/1984	127.31
CQ-1	08/22/1984	127.11
CQ-1	08/29/1984	126.96
CQ-1	08/31/1984	126.94
CQ-1	10/25/1984	126.38
CQ-1	01/30/1985	125.91
CQ-1	03/01/1985	126.05
CQ-1	04/01/1985	126.00
CQ-1	05/09/1985	125.86
CQ-1	06/04/1985	125.71
CQ-1	07/02/1985	125.61
CQ-1	07/30/1985	125.51
CQ-1	08/29/1985	125.18
CQ-1	09/30/1985	125.33
CQ-1	11/01/1985	125.01
CQ-1	11/26/1985	125.17
CQ-1	12/20/1985	125.60
CQ-1	01/23/1986	125.72
CQ-1	02/26/1986	126.54
CQ-1	03/21/1986	126.85
CQ-1	05/21/1986	127.15
CQ-2	06/29/1984	126.15
CQ-2	07/20/1984	125.98
CQ-2	07/25/1984	125.91
CQ-2	08/06/1984	125.70
CQ-2	08/13/1984	125.77
CQ-2	08/22/1984	125.59
CQ-2	08/29/1984	125.48
CQ-2	08/31/1984	125.46
CQ-2	10/25/1984	124.96
CQ-2	01/30/1985	124.54
CQ-2	03/01/1985	124.75
CQ-2	04/01/1985	124.56
CQ-2	05/09/1985	124.31
CQ-2	06/04/1985	124.15
CQ-2	07/02/1985	123.98
CQ-2	07/30/1985	123.72
CQ-2	08/29/1985	123.40
CQ-2	09/30/1985	123.47
CQ-2	11/01/1985	123.16
CQ-2	11/26/1985	123.32
CQ-2	12/20/1985	124.01
CQ-2	01/23/1986	123.81
CQ-2	02/26/1986	124.90
CQ-2	03/21/1986	124.95
CQ-2	05/21/1986	125.00
CQ-3A	06/29/1984	125.68
CQ-3A	07/20/1984	125.69
CQ-3A	07/25/1984	125.65
CQ-3A	07/31/1984	125.61
CQ-3A	08/06/1984	125.79
CQ-3A	08/13/1984	125.69
CQ-3A	08/22/1984	125.57
CQ-3A	08/29/1984	125.54
CQ-3A	08/31/1984	125.50
CQ-3A	10/25/1984	125.47
CQ-3A	01/30/1985	125.11
CQ-3A	03/01/1985	125.26
CQ-3A	04/01/1985	125.28
CQ-3A	05/09/1985	124.88
CQ-3A	06/04/1985	124.69
CQ-3A	07/02/1985	124.42
CQ-3A	07/30/1985	124.33
CQ-3A	08/29/1985	123.95
CQ-3A	09/30/1985	124.61
CQ-3A	11/01/1985	123.89
CQ-3A	11/26/1985	124.52
CQ-3A	12/20/1985	124.67
CQ-3A	01/23/1986	124.69
CQ-3A	02/26/1986	125.35
CQ-3A	03/21/1986	125.36
CQ-3A	05/21/1986	125.36

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
CQ-3B	06/29/1984	126.34
CQ-3B	07/20/1984	125.96
CQ-3B	07/25/1984	125.89
CQ-3B	07/31/1984	125.77
CQ-3B	08/06/1984	125.90
CQ-3B	08/13/1984	125.77
CQ-3B	08/22/1984	125.61
CQ-3B	08/29/1984	125.52
CQ-3B	10/25/1984	124.99
CQ-3B	01/30/1985	124.58
CQ-3B	03/01/1985	124.78
CQ-3B	04/01/1985	124.61
CQ-3B	05/09/1985	124.37
CQ-3B	06/04/1985	124.22
CQ-3B	07/02/1985	124.06
CQ-3B	07/30/1985	123.79
CQ-3B	08/29/1985	123.48
CQ-3B	09/30/1985	123.53
CQ-3B	11/01/1985	123.23
CQ-3B	11/26/1985	123.41
CQ-3B	12/20/1985	124.09
CQ-3B	01/23/1986	123.88
CQ-3B	02/26/1986	124.98
CQ-3B	03/21/1986	125.03
CQ-3B	05/21/1986	125.07
CQ-4	07/20/1984	[4]---
CQ-4	07/25/1984	[4]---
CQ-4	07/31/1984	127.55
CQ-4	08/06/1984	127.15
CQ-4	08/13/1984	127.29
CQ-4	08/22/1984	127.11
CQ-4	08/29/1984	126.91
CQ-4	08/31/1984	126.92
CQ-4	10/25/1984	126.15
CQ-4	01/30/1985	125.55
CQ-4	03/01/1985	125.66
CQ-4	04/01/1985	125.57
CQ-4	05/09/1985	125.47
CQ-4	06/04/1985	125.38
CQ-4	07/02/1985	125.29
CQ-4	07/30/1985	125.15
CQ-4	08/29/1985	124.88
CQ-4	09/30/1985	124.72
CQ-4	11/01/1985	124.54
CQ-4	11/26/1985	124.49
CQ-4	12/20/1985	125.01
CQ-4	01/23/1986	125.16
CQ-4	02/26/1986	125.91
CQ-4	03/21/1986	126.43
CQ-5	06/29/1984	126.55
CQ-5	07/20/1984	126.19
CQ-5	07/25/1984	126.20
CQ-5	07/31/1984	126.06
CQ-5	08/06/1984	126.20
CQ-5	08/13/1984	126.06
CQ-5	08/22/1984	125.89
CQ-5	08/29/1984	125.78
CQ-5	10/25/1984	125.28
CQ-5	01/30/1985	124.82
CQ-5	03/01/1985	125.06
CQ-5	04/01/1985	124.85
CQ-5	05/09/1985	124.57
CQ-5	06/04/1985	124.41
CQ-5	07/02/1985	124.25
CQ-5	07/30/1985	123.97
CQ-5	08/29/1985	123.65
CQ-5	09/30/1985	123.73
CQ-5	11/01/1985	123.3
CQ-5	11/26/1985	123.58
CQ-5	12/20/1985	124.246
CQ-5	01/23/1986	124.06
CQ-5	02/26/1986	125.18
CQ-5	03/21/1986	125.29
CQ-5	05/21/1986	125.31
CQ-6	08/13/1984	126.27
CQ-6	08/22/1984	126.12
CQ-6	08/29/1984	125.95
CQ-6	10/25/1984	125.29
CQ-6	01/30/1985	124.82
CQ-6	03/01/1985	125.00
CQ-6	04/01/1985	124.83
CQ-6	05/09/1985	124.58
CQ-6	06/04/1985	124.43
CQ-6	07/02/1985	124.26
CQ-6	07/30/1985	124.03

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
CQ-6	08/29/1985	123.68
CQ-6	09/30/1985	123.70
CQ-6	11/01/1985	123.38
CQ-6	11/26/1985	123.49
CQ-6	12/20/1985	124.17
CQ-6	01/23/1986	124.02
CQ-6	02/26/1986	124.12
CQ-6	03/21/1986	125.28
CQ-6	05/21/1986	125.47
CQ-7	08/13/1984	126.40
CQ-7	08/22/1984	126.23
CQ-7	08/29/1984	126.11
CQ-7	10/25/1984	125.53
CQ-7	01/30/1985	125.00
CQ-7	03/01/1985	125.16
CQ-7	04/01/1985	125.00
CQ-7	05/09/1985	124.73
CQ-7	06/04/1985	124.56
CQ-7	07/02/1985	124.38
CQ-7	07/30/1985	124.10
CQ-7	08/29/1985	123.77
CQ-7	10/02/1985	123.76
CQ-7	11/01/1985	123.49
CQ-7	11/26/1985	123.62
CQ-7	12/20/1985	124.34
CQ-7	01/23/1986	124.13
CQ-7	02/26/1986	125.31
CQ-7	03/21/1986	125.37
CQ-7	05/21/1986	125.47
CQ-8	08/31/1984	126.80
CQ-8	10/25/1984	126.92
CQ-8	01/30/1985	125.59
CQ-8	04/01/1985	125.60
CQ-8	05/09/1985	125.48
CQ-8	06/04/1985	125.36
CQ-8	07/02/1985	125.25
CQ-8	07/30/1985	125.08
CQ-8	08/29/1985	124.81
CQ-8	09/30/1985	124.74
CQ-8	11/01/1985	124.51
CQ-8	11/26/1985	124.53
CQ-8	12/20/1985	125.05
CQ-8	01/23/1986	125.15
CQ-8	02/26/1986	125.99
CQ-8	03/21/1986	126.38
CQ-8	05/21/1986	126.82
CQ-9	08/22/1984	127.27
CQ-9	08/29/1984	127.10
CQ-9	08/31/1984	127.12
CQ-9	10/25/1984	126.33
CQ-9	01/30/1985	125.77
CQ-9	02/26/1985	126.23
CQ-9	04/01/1985	125.90
CQ-9	05/09/1985	125.69
CQ-9	06/04/1985	125.59
CQ-9	07/02/1985	125.51
CQ-9	07/30/1985	125.33
CQ-9	08/29/1985	125.08
CQ-9	09/30/1985	124.99
CQ-9	11/01/1985	124.77
CQ-9	11/26/1985	124.76
CQ-9	12/20/1985	125.26
CQ-9	01/23/1986	125.41
CQ-9	02/26/1986	126.23
CQ-9	03/21/1986	126.68
CQ-9	05/21/1986	127.25
CQ-10	08/31/1984	126.64
CQ-10	10/25/1984	126.23
CQ-10	01/30/1984	125.68
CQ-10	04/01/1985	125.75
CQ-10	05/09/1985	125.60
CQ-10	06/04/1985	125.42
CQ-10	07/02/1985	125.31
CQ-10	07/30/1985	125.13
CQ-10	08/29/1985	[5]124.83
CQ-10	09/30/1985	[5]125.23
CQ-10	11/01/1985	[5]124.65
CQ-10	11/26/1985	[5]124.95
CQ-10	12/20/1985	[5]125.34
CQ-10	01/23/1986	[5]125.34
CQ-10	02/26/1986	[5]126.38
CQ-10	03/21/1986	[5]126.58
CQ-10	05/21/1986	[5]126.72

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
CQ-11	08/06/1984	127.11
CQ-11	08/13/1984	127.28
CQ-11	08/22/1984	127.10
CQ-11	08/29/1984	126.92
CQ-11	10/25/1984	126.13
CQ-11	01/30/1985	125.57
CQ-11	03/01/1985	125.67
CQ-11	04/01/1985	125.57
CQ-11	05/09/1985	125.47
CQ-11	06/04/1985	125.38
CQ-11	07/02/1985	125.30
CQ-11	07/30/1985	125.11
CQ-11	08/29/1985	124.89
CQ-11	09/30/1985	124.72
CQ-11	11/01/1985	124.56
CQ-11	11/26/1985	124.50
CQ-11	12/20/1985	124.96
CQ-11	01/23/1986	125.16
CQ-11	02/26/1986	125.90
CQ-11	03/21/1986	126.39
CQ-11	05/21/1986	127.02
H-1	06/29/1984	132.39
H-1	07/20/1984	131.80
H-1	07/25/1984	131.70
H-1	07/31/1984	131.52
H-1	08/07/1984	131.65
H-1	08/10/1984	131.44
H-1	10/25/1984	129.49
H-1	01/30/1985	128.36
H-1	02/27/1985	[3]---
H-1	04/01/1985	[3]---
H-1	05/09/1985	[3]---
H-1	06/04/1985	[3]---
H-1	07/02/1985	[3]---
H-1	07/30/1985	[3]---
H-1	08/29/1985	[3]---
H-1	09/30/1985	[3]---
H-1	11/01/1985	[3]---
H-1	11/26/1985	[3]---
H-1	12/20/1985	[3]---
H-1	01/23/1986	[3]---
H-1	02/26/1986	[6]---

Site name	Date of measurement	Altitude[1] (feet)
H-2	06/29/1984	132.65
H-2	07/20/1984	132.09
H-2	07/25/1984	131.99
H-2	07/31/1984	131.79
H-2	08/07/1984	131.94
H-2	08/10/1984	131.70
H-2	10/25/1984	129.66
H-2	01/30/1985	128.41
H-2	02/27/1985	128.36
H-2	04/01/1985	128.11
H-2	05/09/1985	[3]---
H-2	06/04/1985	[3]---
H-2	07/02/1985	[3]---
H-2	07/30/1985	[3]---
H-2	08/29/1985	[3]---
H-2	09/30/1985	[3]---
H-2	11/01/1985	[3]---
H-2	11/26/1985	[3]---
H-2	12/20/1985	[3]---
H-2	01/23/1986	[3]---
H-2	02/26/1986	[3]---
H-2	03/21/1986	[7]---
H-2	05/21/1986	[7]---
H-3A	06/29/1984	133.11
H-3A	07/20/1984	132.62
H-3A	07/25/1984	132.55
H-3A	07/31/1984	132.37
H-3A	08/07/1984	132.66
H-3A	08/10/1984	132.56
H-3A	10/25/1984	130.17
H-3A	01/30/1985	129.61
H-3A	02/27/1985	129.90
H-3A	04/01/1985	[3]---
H-3A	05/09/1985	[3]---
H-3A	06/04/1985	[3]---
H-3A	07/02/1985	[3]---
H-3A	07/30/1985	[3]---
H-3A	08/29/1985	[3]---
H-3A	09/30/1985	[3]---
H-3A	11/01/1985	[3]---
H-3A	11/26/1985	130.46
H-3A	12/20/1985	130.21

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
H-3A	01/23/1986	[3]---
H-3A	02/26/1986	[6]---
H-3B	06/29/1984	132.73
H-3B	07/20/1984	132.09
H-3B	07/25/1984	131.99
H-3B	07/31/1984	131.79
H-3B	08/07/1984	131.78
H-3B	08/10/1984	131.64
H-3B	10/25/1984	129.68
H-3B	01/30/1985	128.46
H-3B	02/27/1985	128.43
H-3B	04/01/1985	128.18
H-3B	05/09/1985	127.79
H-3B	06/04/1985	127.53
H-3B	07/02/1985	126.24
H-3B	07/30/1985	126.90
H-3B	08/29/1985	126.52
H-3B	09/30/1985	126.18
H-3B	11/01/1985	125.99
H-3B	11/26/1985	125.85
H-3B	12/20/1985	126.52
H-3B	01/23/1986	[8]126.41
H-3B	02/26/1986	128.41
H-3B	03/21/1986	128.30
H-3B	05/21/1986	128.65
H-3C	06/29/1984	132.67
H-3C	07/20/1984	132.06
H-3C	07/25/1984	131.94
H-3C	07/31/1984	131.75
H-3C	08/07/1984	131.79
H-3C	08/10/1984	131.65
H-3C	10/25/1984	129.70
H-3C	01/30/1985	128.46
H-3C	02/27/1985	128.41
H-3C	04/01/1985	128.18
H-3C	05/09/1985	127.79
H-3C	06/04/1985	127.52
H-3C	07/02/1985	127.24
H-3C	07/30/1985	126.88
H-3C	08/29/1985	126.51
H-3C	09/30/1985	126.17
H-3C	11/01/1985	125.99
H-3C	11/26/1985	125.86
H-3C	12/20/1985	126.51
H-3C	01/23/1986	[8]126.41
H-3C	02/26/1986	127.44
H-3C	03/21/1986	127.84
H-3C	05/21/1986	128.54
H-4	06/29/1984	132.91
H-4	07/20/1984	132.49
H-4	07/25/1984	132.46
H-4	07/31/1984	132.21
H-4	08/07/1984	132.49
H-4	08/10/1984	132.17
H-4	10/25/1984	130.09
H-4	01/30/1985	128.75
H-4	02/27/1985	128.71
H-4	04/01/1985	128.41
H-4	05/09/1985	127.99
H-4	06/04/1985	127.73
H-4	07/02/1985	127.43
H-4	07/30/1985	126.91
H-4	08/29/1985	126.66
H-4	09/30/1985	126.13
H-4	11/01/1985	126.00
H-4	11/26/1985	125.81
H-4	12/20/1985	126.52
H-4	01/23/1986	126.36
H-4	02/26/1986	127.45
H-4	03/21/1986	127.77
H-4	05/21/1986	128.50
H-5A	06/29/1984	132.23
H-5A	07/20/1984	132.26
H-5A	07/25/1984	132.27
H-5A	07/31/1984	132.20
H-5A	08/07/1984	132.38
H-5A	08/10/1984	132.24
H-5A	10/25/1984	131.89
H-5A	01/30/1985	131.91
H-5A	02/27/1985	132.10
H-5A	04/01/1985	132.13
H-5A	05/09/1985	131.88
H-5A	06/04/1985	131.57
H-5A	07/02/1985	131.19

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)	Site name	Date of measurement	Altitude[1] (feet)
H-5A	07/30/1985	130.14	O-1A	04/01/1985	124.59
H-5A	08/29/1985	128.87	O-1A	05/09/1985	124.34
H-5A	09/30/1985	131.16	O-1A	06/04/1985	124.15
H-5A	11/01/1985	130.93	O-1A	07/02/1985	123.95
H-5A	11/26/1985	131.76	O-1A	07/30/1985	[7]---
H-5A	12/20/1985	131.79	O-1A	08/29/1985	123.33
H-5A	01/23/1986	131.77	O-1A	09/30/1985	123.35
H-5A	02/26/1986	132.07	O-1A	11/01/1985	123.05
H-5A	03/21/1986	131.98	O-1A	11/26/1985	123.18
H-5A	05/21/1986	131.73	O-1A	12/20/1985	123.94
			O-1A	01/23/1986	123.69
H-5B	06/29/1984	132.64	O-1A	02/26/1986	124.94
H-5B	07/20/1984	132.01	O-1A	03/21/1986	124.98
H-5B	07/25/1984	131.93	O-1A	05/21/1986	125.03
H-5B	07/31/1984	131.73			
H-5B	08/07/1984	131.81	O-1B	06/29/1984	126.19
H-5B	08/10/1984	131.62	O-1B	07/20/1984	126.30
H-5B	10/25/1984	129.61	O-1B	07/25/1984	126.23
H-5B	01/30/1985	128.03	O-1B	07/31/1984	126.12
H-5B	02/27/1985	127.90	O-1B	08/13/1984	126.13
H-5B	04/01/1985	127.62	O-1B	10/25/1984	125.14
H-5B	05/09/1985	127.25	O-1B	10/26/1984	125.13
H-5B	06/04/1985	126.97	O-1B	01/30/1985	124.60
H-5B	07/02/1985	126.70	O-1B	02/28/1985	124.79
H-5B	07/30/1985	126.33	O-1B	04/01/1985	124.59
H-5B	08/29/1985	125.94	O-1B	05/09/1985	124.31
H-5B	09/30/1985	125.63	O-1B	06/04/1985	124.13
H-5B	11/01/1985	125.43	O-1B	07/02/1985	123.94
H-5B	11/26/1985	125.32	O-1B	07/30/1985	123.67
H-5B	12/20/1985	125.93	O-1B	08/29/1985	123.33
H-5B	01/23/1986	125.83	O-1B	09/30/1985	123.38
H-5B	02/26/1986	126.86	O-1B	11/01/1985	123.05
H-5B	03/21/1986	127.21	O-1B	11/26/1985	123.19
H-5B	05/21/1986	127.94	O-1B	12/20/1985	123.89
			O-1B	01/23/1986	123.67
O-1A	06/29/1984	126.64	O-1B	02/26/1986	124.84
O-1A	07/20/1984	126.26	O-1B	03/21/1986	124.91
O-1A	07/25/1984	126.19	O-1B	05/21/1986	125.01
O-1A	07/31/1984	126.07			
O-1A	08/13/1984	126.13	O-2	07/20/1984	126.41
O-1A	10/25/1984	125.13	O-2	07/25/1984	126.36
O-1A	10/26/1984	125.13	O-2	07/31/1984	126.24
O-1A	01/30/1985	124.60	O-2	08/13/1984	126.24
O-1A	02/28/1985	124.80	O-2	10/26/1984	125.28

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
0-2	01/30/1985	124.73
0-2	02/28/1985	124.91
0-2	04/01/1985	124.72
0-2	05/09/1985	124.45
0-2	06/04/1985	124.37
0-2	07/02/1985	124.09
0-2	07/30/1985	123.80
0-2	08/29/1985	123.48
0-2	09/30/1985	123.53
0-2	11/01/1985	123.19
0-2	11/26/1985	123.32
0-2	12/20/1985	124.03
0-2	01/23/1986	123.81
0-2	02/26/1986	124.98
0-2	03/21/1986	125.05
0-2	05/21/1986	125.16
0-3	06/29/1984	126.31
0-3	07/20/1984	125.97
0-3	07/25/1984	125.90
0-3	07/31/1984	125.79
0-3	08/13/1984	125.79
0-3	08/29/1984	125.45
0-3	10/26/1984	124.85
0-3	01/30/1985	124.36
0-3	02/28/1985	124.53
0-3	04/01/1985	124.35
0-3	05/09/1985	124.09
0-3	06/04/1985	123.91
0-3	07/02/1985	123.74
0-3	07/30/1985	123.45
0-3	08/29/1985	123.14
0-3	09/30/1985	123.20
0-3	11/01/1985	122.89
0-3	11/26/1985	123.01
0-3	12/20/1985	123.69
0-3	01/23/1986	123.49
0-3	02/26/1986	124.60
0-3	03/21/1986	124.69
0-3	05/21/1986	124.79
0-4	07/20/1984	126.49
0-4	07/25/1984	126.43
0-4	07/31/1984	126.30
0-4	08/13/1984	126.32
0-4	08/22/1984	125.98
0-4	08/29/1984	125.98
0-4	10/25/1984	125.36
0-4	01/30/1985	124.81
0-4	02/28/1985	125.00
0-4	04/01/1985	124.80
0-4	05/09/1985	124.54
0-4	06/04/1985	124.36
0-4	07/02/1985	124.16
0-4	07/30/1985	123.87
0-4	08/29/1985	123.55
0-4	09/30/1985	123.60
0-4	11/01/1985	123.26
0-4	11/26/1985	123.39
0-4	12/20/1985	124.11
0-4	01/23/1986	123.91
0-4	02/26/1986	125.07
0-4	03/21/1986	125.15
0-4	05/21/1986	125.26
0-5A	06/29/1984	126.97
0-5A	07/20/1984	126.78
0-5A	07/25/1984	126.76
0-5A	07/31/1984	126.65
0-5A	08/13/1984	126.73
0-5A	10/25/1984	125.87
0-5A	10/26/1984	125.85
0-5A	01/30/1985	125.14
0-5A	02/28/1985	125.62
0-5A	04/01/1985	125.38
0-5A	05/09/1985	125.08
0-5A	06/04/1985	124.72
0-5A	07/02/1985	124.41
0-5A	07/30/1985	124.18
0-5A	08/29/1985	123.77
0-5A	09/30/1985	124.42
0-5A	11/01/1985	123.73
0-5A	11/26/1985	124.51
0-5A	12/20/1985	124.87
0-5A	01/23/1986	124.57
0-5A	02/26/1986	125.91
0-5A	03/21/1986	125.90
0-5A	05/21/1986	125.77

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
O-5B	06/29/1984	127.08
O-5B	07/20/1984	126.90
O-5B	07/25/1984	126.87
O-5B	07/31/1984	126.81
O-5B	08/13/1984	126.58
O-5B	10/25/1984	126.18
O-5B	10/26/1984	126.18
O-5B	01/30/1985	125.77
O-5B	02/28/1985	125.67
O-5B	04/01/1985	125.61
O-5B	05/09/1985	125.43
O-5B	06/04/1985	125.28
O-5B	07/02/1985	125.04
O-5B	07/30/1985	124.18
O-5B	08/29/1985	123.74
O-5B	09/30/1985	123.78
O-5B	11/01/1985	123.42
O-5B	11/26/1985	123.54
O-5B	12/20/1985	124.24
O-5B	01/23/1986	124.07
O-5B	02/26/1986	125.22
O-5B	03/21/1986	125.32
O-5B	05/21/1986	125.43
O-6	07/20/1984	127.62
O-6	07/25/1984	127.55
O-6	07/31/1984	127.42
O-6	08/06/1984	127.65
O-6	08/13/1984	127.43
O-6	10/25/1984	126.29
O-6	01/30/1985	125.64
O-6	02/28/1985	125.81
O-6	04/01/1985	125.60
O-6	05/09/1985	125.31
O-6	06/04/1985	125.11
O-6	07/02/1985	124.91
O-6	07/30/1985	124.60
O-6	08/29/1985	124.25
O-6	09/30/1985	124.29
O-6	11/01/1985	123.92
O-6	11/26/1985	124.03
O-6	12/20/1985	124.77
O-6	01/23/1986	124.56
O-6	02/26/1986	125.81
O-6	03/21/1986	125.92
O-6	05/21/1986	126.06
O-7	08/06/1984	126.89
O-7	08/13/1984	126.93
O-7	10/26/1984	125.87
O-7	01/30/1985	125.24
O-7	02/28/1985	125.45
O-7	04/01/1985	125.23
O-7	05/09/1985	124.95
O-7	06/04/1985	124.75
O-7	07/02/1985	124.56
O-7	07/30/1985	124.26
O-7	08/29/1985	123.92
O-7	09/30/1985	124.01
O-7	11/01/1985	123.63
O-7	11/26/1985	123.77
O-7	12/20/1985	124.50
O-7	01/23/1986	124.26
O-7	02/26/1986	125.48
O-7	03/21/1986	125.57
O-7	05/21/1986	125.68
O-8	08/06/1984	128.20
O-8	08/13/1984	128.08
O-8	10/26/1984	126.82
O-8	01/30/1985	126.15
O-8	02/28/1985	126.31
O-8	04/01/1985	126.08
O-8	05/09/1985	125.77
O-8	06/04/1985	125.56
O-8	07/02/1985	125.36
O-8	07/30/1985	125.03
O-8	08/29/1985	124.68
O-8	09/30/1985	124.64
O-8	11/01/1985	124.31
O-8	11/26/1985	124.37
O-8	12/20/1985	125.18
O-8	01/23/1986	124.95
O-8	02/26/1986	126.26
O-8	03/21/1986	126.39
O-8	05/21/1986	126.56

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
O-9	08/06/1984	127.43
O-9	08/13/1984	127.55
O-9	10/26/1984	126.31
O-9	01/30/1985	[9]---
O-9	02/28/1985	[9]---
O-9	04/01/1985	125.57
O-9	05/09/1985	125.42
O-9	06/04/1985	125.22
O-9	07/02/1985	125.03
O-9	07/30/1985	124.74
O-9	08/29/1985	124.39
O-9	09/30/1985	124.23
O-9	11/01/1985	124.05
O-9	11/26/1985	124.08
O-9	12/20/1985	124.87
O-9	01/23/1986	124.67
O-9	03/21/1986	126.05
O-9	02/26/1986	125.88
O-9	05/21/1986	126.15
O-10	08/06/1984	127.81
O-10	08/13/1984	127.65
O-10	10/26/1984	126.40
O-10	01/30/1985	125.70
O-10	02/28/1985	125.91
O-10	04/01/1985	125.65
O-10	05/09/1985	125.40
O-10	06/04/1985	125.17
O-10	07/02/1985	124.93
O-10	07/30/1985	124.66
O-10	08/29/1985	124.29
O-10	09/30/1985	124.54
O-10	11/01/1985	123.94
O-10	11/26/1985	124.20
O-10	12/20/1985	124.85
O-10	01/23/1986	124.58
O-10	02/26/1986	125.96
O-10	03/21/1986	126.01
O-10	05/21/1986	126.09
O-11A	08/13/1984	127.3
O-11A	10/26/1984	126.16
O-11A	01/30/1985	125.756
O-11A	02/28/1985	125.96
O-11A	04/01/1985	125.83
O-11A	05/09/1985	125.62
O-11A	06/04/1985	125.48
O-11A	07/02/1985	125.34
O-11A	07/30/1985	125.10
O-11A	08/29/1985	124.80
O-11A	09/30/1985	124.54
O-11A	11/01/1985	124.50
O-11A	11/26/1985	124.46
O-11A	12/20/1985	125.35
O-11A	01/23/1986	125.46
O-11A	02/26/1986	126.57
O-11A	03/21/1986	126.83
O-11A	05/21/1986	127.09

Table 15.--Altitude of the water table in McDonalds Branch basin: Data from water-level observation wells--Continued

Site name	Date of measurement	Altitude[1] (feet)	Site name	Date of measurement	Altitude[1] (feet)
O-11B	10/26/1984	129.70	O-11B	09/30/1985	123.04
O-11B	01/30/1985	124.16	O-11B	11/01/1985	122.70
O-11B	02/28/1985	124.32	O-11B	11/26/1985	122.84
O-11B	04/01/1985	124.14	O-11B	12/20/1985	123.49
O-11B	05/09/1985	123.90	O-11B	01/23/1986	123.29
O-11B	06/04/1985	123.71	O-11B	02/26/1986	124.39
O-11B	07/02/1985	123.54	O-11B	03/21/1986	124.45
O-11B	07/30/1985	123.26	O-11B	05/21/1986	124.56
O-11B	08/29/1985	122.94			

[1] Referenced to sea level.
[2] Well found vandalized on 1/30/85, was reinstalled, and resurveyed on 3/29/85.
[3] Well was dry.
[4] Well was not developed yet.
[5] The altitude of measuring point (133.473) of well CQ-10 was altered by vandalism sometime prior to 11/10/1986, when the change was first noted in the field. The new altitude of measuring point (133.876) was determined by levels on 01/19/1988. Comparisons of water levels with those from nearby well QWC-5A suggest that the change occurred between 07/30/1985 and 09/30/1985. Because no comparisons were possible for 08/29/1985, water levels were adjusted beginning 09/30/1985.
[6] Well was vandalized, removed, and not reinstalled.
[7] Water level was not measured.
[8] Well was vandalized between 1/23/86 and 2/26/86 and was resurveyed.
[9] Well found vandalized on 1/30/85, was reinstalled, and resurveyed on 3/28/85.

Table 16.--Altitude of the water table in McDonalds Branch basin: Data from water-quality wells

[--- indicates missing data]

Site name	Date of measurement	Altitude[1] (feet)
LEAD WELL	11/29/1985	131.63
LEAD WELL	12/23/1985	131.92
LEAD WELL	01/23/1986	131.76
LEAD WELL	02/26/1986	132.09
LEAD WELL	05/21/1986	133.78
QWC-1A	10/25/1984	125.24
QWC-1A	02/07/1985	124.86
QWC-1A	03/06/1985	124.95
QWC-1A	04/03/1985	124.83
QWC-1A	05/06/1985	124.73
QWC-1A	05/09/1985	124.57
QWC-1A	06/05/1985	124.62
QWC-1A	07/01/1985	124.19
QWC-1A	07/30/1985	123.96
QWC-1A	08/23/1985	123.76
QWC-1A	08/29/1985	123.53
QWC-1A	09/30/1985	124.09
QWC-1A	10/28/1985	123.38
QWC-1A	11/26/1985	123.83
QWC-1A	12/20/1985	124.25
QWC-1A	01/23/1986	124.26
QWC-1A	02/24/1986	125.13
QWC-1A	03/21/1986	125.15
QWC-1A	05/21/1986	125.18
QWC-1B	10/25/1984	124.69
QWC-1B	02/07/1985	124.80
QWC-1B	03/06/1985	124.88
QWC-1B	04/03/1985	124.72
QWC-1B	05/06/1985	124.59
QWC-1B	05/09/1985	124.51
QWC-1B	06/05/1985	124.42
QWC-1B	07/01/1985	124.19
QWC-1B	07/30/1985	123.92
QWC-1B	09/30/1985	123.61
QWC-1B	10/28/1985	123.38
QWC-1B	11/26/1985	123.53
QWC-1B	12/20/1985	124.16
QWC-1B	01/23/1986	124.00
QWC-1B	02/24/1986	125.03
QWC-1B	03/21/1986	125.16
QWC-1B	05/21/1986	125.29
QWC-2A	10/25/1984	125.61
QWC-2A	02/08/1985	125.28
QWC-2A	03/06/1985	125.32
QWC-2A	04/05/1985	125.23
QWC-2A	05/06/1985	125.19
QWC-2A	06/06/1985	125.01
QWC-2A	07/02/1985	124.77
QWC-2A	07/30/1985	124.50
QWC-2A	08/26/1985	124.37
QWC-2A	09/30/1985	124.66
QWC-2A	10/28/1985	124.05
QWC-2A	11/26/1985	124.40
QWC-2A	12/20/1985	124.70
QWC-2A	01/23/1986	124.71
QWC-2A	02/24/1986	125.53
QWC-2A	03/21/1986	125.59
QWC-2A	05/21/1986	125.65
QWC-2B	10/25/1984	126.11
QWC-2B	02/08/1985	125.69
QWC-2B	03/06/1985	125.82
QWC-2B	04/03/1985	125.70
QWC-2B	05/06/1985	125.52
QWC-2B	06/06/1985	125.37
QWC-2B	07/02/1985	125.15
QWC-2B	07/30/1985	124.97
QWC-2B	08/26/1985	124.61
QWC-2B	09/30/1985	124.58
QWC-2B	10/28/1985	124.33
QWC-2B	11/26/1985	124.46
QWC-2B	12/20/1985	125.16
QWC-2B	01/23/1986	124.97
QWC-2B	02/24/1986	125.94
QWC-2B	03/21/1986	126.12
QWC-2B	05/20/1986	126.25
QWC-3A	10/25/1984	125.76
QWC-3A	02/08/1985	124.69
QWC-3A	03/07/1985	124.71
QWC-3A	04/04/1985	124.66
QWC-3A	04/05/1985	124.65
QWC-3A	05/08/1985	124.43
QWC-3A	06/07/1985	124.31
QWC-3A	07/02/1985	124.12

Table 16.--Altitude of the water table in McDonalds Branch basin: Data from water-quality wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)	Site name	Date of measurement	Altitude[1] (feet)
QWC-3A	07/30/1985	123.83	QWC-5A	10/25/1984	126.14
QWC-3A	08/26/1985	123.59	QWC-5A	02/07/1985	125.77
QWC-3A	09/30/1985	123.59	QWC-5A	03/07/1985	125.75
QWC-3A	10/28/1985	123.28	QWC-5A	04/04/1985	125.71
QWC-3A	11/26/1985	123.48	QWC-5A	05/07/1985	125.65
QWC-3A	12/20/1985	124.14	QWC-5A	06/06/1985	125.49
QWC-3A	01/23/1986	124.11	QWC-5A	07/01/1985	125.19
QWC-3A	02/25/1986	124.89	QWC-5A	07/30/1985	125.07
QWC-3A	03/21/1986	---	QWC-5A	08/23/1985	124.89
QWC-3A	05/21/1986	125.19	QWC-5A	09/30/1985	125.16
			QWC-5A	10/28/1985	124.75
QWC-3B	02/08/1985	124.49	QWC-5A	11/26/1985	124.90
QWC-3B	03/07/1985	124.68	QWC-5A	12/20/1985	125.32
QWC-3B	04/04/1985	124.54	QWC-5A	01/23/1986	125.32
QWC-3B	04/05/1985	124.56	QWC-5A	02/24/1986	126.23
QWC-3B	05/08/1985	124.30	QWC-5A	03/21/1986	126.45
QWC-3B	06/07/1985	124.19	QWC-5A	05/21/1986	126.76
QWC-3B	07/02/1985	124.02			
QWC-3B	07/30/1985	---	QWC-5B	10/25/1984	124.20
QWC-3B	08/26/1985	123.48	QWC-5B	02/07/1985	124.34
QWC-3B	09/30/1985	123.47	QWC-5B	03/07/1985	124.49
QWC-3B	10/29/1985	123.19	QWC-5B	04/04/1985	124.36
QWC-3B	11/26/1985	123.33	QWC-5B	05/07/1985	124.24
QWC-3B	12/20/1985	123.99	QWC-5B	06/06/1985	124.06
QWC-3B	01/23/1986	123.77	QWC-5B	07/01/1985	123.83
QWC-3B	02/25/1986	124.89	QWC-5B	07/30/1985	123.60
QWC-3B	03/21/1986	124.89	QWC-5B	08/23/1985	---
QWC-3B	05/21/1986	125.13	QWC-5B	09/30/1985	123.32
			QWC-5B	10/28/1985	123.06
QWC-4	10/25/1984	126.02	QWC-5B	11/26/1985	123.23
QWC-4	02/11/1985	125.52	QWC-5B	12/20/1985	123.90
QWC-4	03/08/1985	125.61	QWC-5B	01/23/1986	123.67
QWC-4	04/05/1985	125.52	QWC-5B	02/24/1986	124.64
QWC-4	05/08/1985	125.46	QWC-5B	03/21/1986	124.77
QWC-4	06/07/1985	---	QWC-5B	05/21/1986	124.95
QWC-4	07/30/1985	125.02			
QWC-4	08/27/1985	124.79	QWH-1A	10/25/1984	131.91
QWC-4	09/30/1985	124.69	QWH-1A	01/30/1985	132.07
QWC-4	10/29/1985	124.46	QWH-1A	02/27/1985	132.19
QWC-4	11/26/1985	124.47	QWH-1A	03/29/1985	132.08
QWC-4	12/20/1985	125.00	QWH-1A	05/01/1985	131.84
QWC-4	02/25/1986	125.90	QWH-1A	05/09/1985	131.97
QWC-4	03/21/1986	126.30	QWH-1A	05/29/1985	131.84
QWC-4	05/21/1986	126.85	QWH-1A	06/26/1985	131.12

Table 16.--Altitude of the water table in McDonalds Branch basin: Data from water-quality wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)	Site name	Date of measurement	Altitude[1] (feet)
QWH-1A	07/02/1985	130.75	QWH-2A	01/23/1986	126.19
QWH-1A	07/30/1985	129.56	QWH-2A	02/20/1986	127.10
QWH-1A	08/20/1985	129.02	QWH-2A	03/21/1986	127.60
QWH-1A	09/30/1985	131.41	QWH-2A	05/21/1986	128.38
QWH-1A	10/23/1985	131.22			
QWH-1A	11/26/1985	131.75	QWH-2B	10/25/1984	129.49
QWH-1A	12/16/1985	132.05	QWH-2B	01/30/1985	128.25
QWH-1A	01/23/1986	131.75	QWH-2B	03/01/1985	128.12
QWH-1A	02/20/1986	132.12	QWH-2B	03/28/1985	127.94
QWH-1A	03/21/1986	131.90	QWH-2B	04/30/1985	127.63
QWH-1A	05/21/1986	131.68	QWH-2B	05/29/1985	127.34
			QWH-2B	06/25/1985	127.10
QWH-1B	10/25/1984	129.39	QWH-2B	07/30/1985	126.64
QWH-1B	01/30/1985	128.27	QWH-2B	08/20/1985	126.33
QWH-1B	02/27/1985	128.24	QWH-2B	09/30/1985	125.82
QWH-1B	03/29/1985	127.95	QWH-2B	10/23/1985	125.83
QWH-1B	05/01/1985	127.65	QWH-2B	11/26/1985	125.62
QWH-1B	05/09/1985	127.59	QWH-2B	12/16/1985	126.21
QWH-1B	05/29/1985	127.37	QWH-2B	01/23/1986	126.15
QWH-1B	06/26/1985	127.10	QWH-2B	02/20/1986	126.97
QWH-1B	07/30/1985	126.67	QWH-2B	03/21/1986	127.52
QWH-1B	08/20/1985	126.39	QWH-2B	05/21/1986	128.32
QWH-1B	09/30/1985	125.96			
QWH-1B	10/23/1985	125.83	QWH-3A	10/25/1984	129.88
QWH-1B	11/26/1985	125.64	QWH-3A	02/01/1985	128.60
QWH-1B	12/16/1985	126.22	QWH-3A	03/04/1985	128.44
QWH-1B	01/23/1986	126.13	QWH-3A	04/01/1985	128.27
QWH-1B	02/20/1986	126.96	QWH-3A	05/01/1985	127.96
QWH-1B	03/21/1986	127.52	QWH-3A	05/31/1985	127.67
QWH-1B	05/21/1986	128.35	QWH-3A	06/26/1985	127.40
			QWH-3A	07/30/1985	125.97
QWH-2A	10/25/1984	129.50	QWH-3A	09/30/1985	126.22
QWH-2A	01/30/1985	128.37	QWH-3A	10/23/1985	---
QWH-2A	03/01/1985	128.22	QWH-3A	11/26/1985	125.91
QWH-2A	03/28/1985	128.02	QWH-3A	12/17/1985	126.54
QWH-2A	04/30/1985	127.63	QWH-3A	01/23/1986	126.43
QWH-2A	05/29/1985	127.35	QWH-3A	02/25/1986	127.47
QWH-2A	06/25/1985	127.11	QWH-3A	03/21/1986	127.80
QWH-2A	07/30/1985	126.64	QWH-3A	05/21/1986	128.63
QWH-2A	08/20/1985	126.37			
QWH-2A	09/30/1985	125.94	QWH-3B	10/25/1984	129.80
QWH-2A	10/23/1985	125.81	QWH-3B	02/01/1985	128.54
QWH-2A	11/26/1985	125.64	QWH-3B	03/04/1985	128.38
QWH-2A	12/16/1985	126.38	QWH-3B	04/01/1985	128.19

Table 16.--Altitude of the water table in McDonalds Branch basin: Data from water-quality wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)
QWH-3B	04/04/1985	128.16
QWH-3B	05/01/1985	127.87
QWH-3B	05/31/1985	127.61
QWH-3B	06/26/1985	127.34
QWH-3B	08/21/1985	126.62
QWH-3B	10/24/1985	126.07
QWH-3B	11/26/1985	125.80
QWH-3B	12/17/1985	126.47
QWH-3B	01/23/1986	126.19
QWH-3B	02/25/1986	127.39
QWH-3B	05/21/1986	128.37
QWH-4A	10/25/1984	129.52
QWH-4A	01/30/1985	128.25
QWH-4A	03/01/1985	128.18
QWH-4A	03/28/1985	127.95
QWH-4A	05/01/1985	127.66
QWH-4A	05/30/1985	127.38
QWH-4A	06/26/1985	127.09
QWH-4A	07/30/1985	126.27
QWH-4A	08/21/1985	126.40
QWH-4A	09/30/1985	125.93
QWH-4A	10/24/1985	125.83
QWH-4A	11/26/1985	125.64
QWH-4A	12/17/1986	126.25
QWH-4A	01/23/1986	126.18
QWH-4A	02/20/1986	127.01
QWH-4A	03/21/1986	127.55
QWH-4A	05/21/1986	128.37
QWH-4B	10/25/1984	129.52
QWH-4B	01/30/1985	128.27
QWH-4B	03/01/1985	128.18
QWH-4B	03/28/1985	127.98
QWH-4B	05/01/1985	127.65
QWH-4B	05/30/1985	127.37
QWH-4B	06/26/1985	127.11
QWH-4B	07/30/1985	126.67
QWH-4B	08/21/1985	126.41
QWH-4B	09/30/1985	125.95
QWH-4B	10/24/1985	125.82
QWH-4B	11/26/1985	125.65
QWH-4B	12/17/1985	126.28
QWH-4B	01/23/1986	126.18
QWH-4B	02/20/1986	127.00
QWH-4B	03/21/1986	127.55
QWH-4B	05/21/1986	128.35
QWH-5A	11/29/1985	136.95
QWH-5A	12/23/1985	136.45
QWH-5A	01/23/1986	136.47
QWH-5A	02/26/1986	136.82
QWH-5A	03/21/1986	136.46
QWH-5A	05/21/1986	136.14
QWH-5B	11/29/1985	127.24
QWH-5B	12/23/1985	127.87
QWH-5B	01/23/1986	127.84
QWH-5B	02/26/1986	129.06
QWH-5B	03/21/1986	129.39
QWH-5B	05/21/1986	130.02
QWO-1A	10/26/1984	123.06
QWO-1A	02/04/1985	125.33
QWO-1A	03/04/1985	125.38
QWO-1A	04/01/1985	124.98
QWO-1A	05/02/1985	124.62
QWO-1A	05/09/1985	124.91
QWO-1A	05/31/1985	124.52
QWO-1A	06/27/1985	124.56
QWO-1A	07/30/1985	124.21
QWO-1A	08/21/1985	123.97
QWO-1A	09/30/1985	123.99
QWO-1A	10/24/1985	123.68
QWO-1A	11/26/1985	123.78
QWO-1A	12/17/1985	124.49
QWO-1A	01/23/1986	124.18
QWO-1A	02/21/1986	125.27
QWO-1A	03/21/1986	125.49
QWO-1A	05/21/1986	125.66
QWO-1B	10/26/1984	125.75
QWO-1B	02/04/1985	125.23
QWO-1B	03/04/1985	125.03
QWO-1B	04/01/1985	125.13
QWO-1B	05/02/1985	124.80
QWO-1B	05/09/1985	124.84
QWO-1B	05/31/1985	124.67

Table 16.--Altitude of the water table in McDonalds Branch basin: Data from water-quality wells--Continued.

Site name	Date of measurement	Altitude[1] (feet)	Site name	Date of measurement	Altitude[1] (feet)
QWO-1B	06/27/1985	124.53	QWO-2B	11/26/1985	123.74
QWO-1B	07/30/1985	124.18	QWO-2B	12/20/1985	124.46
QWO-1B	09/30/1985	123.89	QWO-2B	01/23/1986	124.22
QWO-1B	10/24/1985	123.61	QWO-2B	02/21/1986	125.28
QWO-1B	11/26/1985	123.67	QWO-2B	03/21/1986	125.49
QWO-1B	12/17/1985	124.38	QWO-2B	05/21/1986	125.71
QWO-1B	01/23/1986	124.09			
QWO-1B	02/21/1986	125.09	QWO-3A	10/26/1984	126.68
QWO-1B	03/21/1986	125.35	QWO-3A	02/05/1985	126.07
QWO-1B	05/21/1986	125.57	QWO-3A	03/05/1985	126.12
			QWO-3A	04/02/1985	125.91
QWO-2A	10/26/1984	125.94	QWO-3A	05/03/1985	125.64
QWO-2A	02/04/1985	125.55	QWO-3A	06/04/1985	125.39
QWO-2A	03/05/1985	125.53	QWO-3A	06/28/1985	125.25
QWO-2A	04/02/1985	125.37	QWO-3A	07/30/1985	124.88
QWO-2A	05/02/1985	124.95	QWO-3A	08/22/1985	124.61
QWO-2A	05/09/1985	125.08	QWO-3A	09/30/1985	---
QWO-2A	06/04/1985	124.80	QWO-3A	10/25/1985	124.24
QWO-2A	06/27/1985	124.68	QWO-3A	11/26/1985	124.31
QWO-2A	07/30/1985	124.34	QWO-3A	12/20/1985	124.99
QWO-2A	08/22/1985	124.06	QWO-3A	01/23/1986	124.80
QWO-2A	09/30/1985	124.27	QWO-3A	02/21/1986	125.98
QWO-2A	10/25/1985	123.79	QWO-3A	03/21/1986	126.20
QWO-2A	11/26/1985	123.98	QWO-3A	05/21/1986	126.44
QWO-2A	12/20/1985	124.71			
QWO-2A	01/23/1986	124.38	QWO-3B	10/26/1984	126.62
QWO-2A	02/21/1986	125.62	QWO-3B	02/05/1985	126.01
QWO-2A	03/21/1986	125.69	QWO-3B	03/05/1985	126.11
QWO-2A	05/21/1986	125.83	QWO-3B	04/02/1985	125.87
			QWO-3B	04/04/1985	125.86
QWO-2B	10/26/1984	125.84	QWO-3B	05/03/1985	125.63
QWO-2B	02/04/1985	125.29	QWO-3B	06/04/1985	125.37
QWO-2B	03/05/1985	125.38	QWO-3B	06/28/1985	125.23
QWO-2B	04/02/1985	125.15	QWO-3B	07/30/1985	124.87
QWO-2B	05/02/1985	124.87	QWO-3B	08/22/1985	124.59
QWO-2B	05/09/1985	124.88	QWO-3B	09/30/1985	124.51
QWO-2B	06/04/1985	124.69	QWO-3B	10/25/1985	124.23
QWO-2B	06/27/1985	124.56	QWO-3B	12/20/1985	125.01
QWO-2B	07/30/1985	124.23	QWO-3B	01/23/1986	124.81
QWO-2B	08/22/1985	123.99	QWO-3B	02/21/1986	125.93
QWO-2B	09/30/1985	123.95	QWO-3B	05/21/1986	126.36
QWO-2B	10/25/1985	123.67			

[1] Referenced to sea level.

Table 17.--Chemical analyses of precipitation in McDonalds Branch basin, January 24, 1985 through March 18, 1986

[Precipitation was collected weekly and composited to monthly samples; all cations, anions, and trace metals were measured as dissolved constituents; µS/cm, microsiemens per centimeter; meq/L, milliequivalents per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; lab, laboratory; --- indicates missing data; < indicates less than]

Site name	Sample-collection dates	pH (units) District lab	pH (units) Central lab	Specific conductance (µS/cm) District lab	Specific conductance (µS/cm) Central lab	Alkalinity (meq/L) District lab	Lead (µg/L)
PPT-1BC	01/24/1985-02/05/1985	---	4.2	---	34	---	6
PPT-1BC	02/05/1985-02/14/1985	4.4	4.4	---	47	-0.05	8
PPT-1BC	02/14/1985-02/26/1985*						
PPT-1BC	02/26/1985-03/26/1985	---	5.0	---	22	---	12
PPT-1BC	03/26/1985-04/23/1985	4.2	4.3	58	61	---	5
PPT-1BC	04/23/1985-05/07/1985	4.7**	5.2	16	12	---	< 1
PPT-1BC	05/07/1985-05/28/1985	4.2	4.3	34	34	- .09	4
PPT-1BC	05/28/1985-06/25/1985	4.5	4.2	38	39	---	5
PPT-1BC	06/25/1985-07/30/1985	4.3**	4.3	35	35	- .09	10
PPT-1BC	07/30/1985-08/27/1985	4.1**	4.5	---	33	- .04	---
PPT-1BC	08/27/1985-10/01/1985	---	4.6	29**	24	- .03	2
PPT-1BC	10/01/1985-10/29/1985	4.4	4.5	20	19	---	2
PPT-1BC	10/29/1985-11/19/1985	4.6	4.7	23	17	---	2
PPT-1BC	11/19/1985-12/03/1985	4.4	4.49	26	23.1	- .05	1
PPT-1BC	12/03/1985-12/17/1985	4.1	4.14	35	34.0	- .09	3.4
PPT-1BC	12/17/1985-01/21/1986	4.3	4.43	25	25.7	---	2.6
PPT-1BC	01/21/1986-02/19/1986	4.6	4.49	28	21.9	---	3.8
PPT-1BC	02/19/1986-03/18/1986	4.4	4.23	35	32.9	---	2.4
PPT-1WC	01/24/1985-02/05/1985	4.2	4.2	23	26	---	5
PPT-1WC	02/05/1985-02/14/1985	4.8	4.6	---	36	---	6
PPT-1WC	02/14/1985-02/26/1985*						
PPT-1WC	02/26/1985-03/26/1985	---	5.0	---	19	---	2
PPT-1WC	03/26/1985-04/23/1985	4.2	4.3	49	46	---	4
PPT-1WC	04/23/1985-05/07/1985	4.8**	5.2	18	12	---	< 1
PPT-1WC	05/07/1985-05/28/1985	4.5	4.3	29	31	---	< 1
PPT-1WC	05/28/1985-06/25/1985	4.2	4.2	42	40	- .09	---
PPT-1WC	06/25/1985-07/30/1985	4.1	4.1	37	37	- .09	6
PPT-1WC	07/30/1985-08/27/1985	4.0	4.3	---	36	---	---
PPT-1WC	08/27/1985-09/24/1985	---	4.2	---	37	---	11
PPT-1WC	09/24/1985-10/01/1985	---	5.2	13**	12	---	3
PPT-1WC	10/01/1985-10/29/1985	4.3	4.5	16	17	---	2
PPT-1WC	10/29/1985-11/19/1985	4.4	4.5	21	13	---	3
PPT-1WC	11/19/1985-12/03/1985	4.4	4.49	22	19.1	- .03	< 1
PPT-1WC	12/03/1985-12/17/1985	4.1	4.11	33	34.6	- .10	3.4
PPT-1WC	12/17/1985-01/21/1986	4.3	4.38	23	22.3	---	1.8
PPT-1WC	01/21/1986-02/19/1986	4.5	4.50	21	18.2	- .02***	1.8
PPT-1WC	02/19/1986-03/18/1986	4.2	4.26	31	27.7	---	1.8

Table 17.--Chemical analyses of precipitation in McDonalds Branch basin, January 24, 1985 through March 18, 1986--Continued

Site name	Sample-collection dates	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (μg/L)
PPT-1BC	01/24/1985-02/05/1985	0.20	0.03	0.22	0.03	0.13	10
PPT-1BC	02/05/1985-02/14/1985	.36	.57	4.4	.19	.09	10
PPT-1BC	02/14/1985-02/26/1985*						
PPT-1BC	02/26/1986-03/26/1985	.42	.13	.49	.07	.41	< 10
PPT-1BC	03/26/1985-04/23/1985	.74	.44	3.3	.20	.89	40
PPT-1BC	04/23/1985-05/07/1985	.10	.10	.32	.07	.35	10
PPT-1BC	05/07/1985-05/28/1985	.08	.05	.32	.05	.49	10
PPT-1BC	05/28/1985-06/25/1985	.18	.07	.16	.10	.53	30
PPT-1BC	06/25/1985-07/30/1985	.15	.04	.15	.25	.86	20
PPT-1BC	07/30/1985-08/27/1985	.34	.08	.49	.14	.62	30
PPT-1BC	08/27/1985-10/01/1985	.37	.13	.77	.11	.32	10
PPT-1BC	10/01/1985-10/29/1985	< .01	.03	.18	.04	.14	< 10
PPT-1BC	10/29/1986-11/19/1985	.15	.13	1.2	.10	.14	12
PPT-1BC	11/19/1985-12/03/1985	.16	.09	.97	.07	.13	17
PPT-1BC	12/03/1985-12/17/1985	.09	.04	.42	.02	.15	20
PPT-1BC	12/17/1985-01/21/1986	.31	.07	.71	.09	.24	17
PPT-1BC	01/21/1986-02/19/1986	.25	.10	.96	.04	.10	8
PPT-1BC	02/19/1986-03/18/1986	.21	.08	.49	.06	.36	19
PPT-1WC	01/24/1985-02/05/1985	.14	.02	.11	.02	.13	20
PPT-1WC	02/05/1985-02/14/1985	.22	.45	3.5	.14	.06	20
PPT-1WC	02/14/1985-02/26/1985*						
PPT-1WC	02/14/1985-03/26/1985	.16	.10	.40	.04	.32	20
PPT-1WC	03/26/1985-04/23/1985	.44	.27	1.7	.11	.77	50
PPT-1WC	04/23/1985-05/07/1985	.10	.10	.30	.03	.37	20
PPT-1WC	05/07/1985-05/28/1985	.05	.02	.20	.05	.48	20
PPT-1WC	05/28/1985-06/25/1985	---	---	---	---	.54	---
PPT-1WC	06/25/1985-07/30/1985	.07	.02	.17	.06	.40	10
PPT-1WC	07/30/1985-08/27/1985	.07	.05	.40	.03	.30	20
PPT-1WC	08/27/1985-09/24/1985	.19	.11	.67	.08	.41	30
PPT-1WC	09/24/1985-10/01/1985	.14	.14	.93	.08	.05	20
PPT-1WC	10/01/1985-10/29/1985	< .01	.03	.14	.04	.12	< 10
PPT-1WC	10/29/1985-11/19/1985	< .01	.08	.75	.07	.12	15
PPT-1WC	11/19/1985-12/03/1985	< .01	.04	.50	.04	.11	15
PPT-1WC	12/03/1985-12/17/1985	< .01	.02	.36	.05	.14	24
PPT-1WC	12/17/1985-01/21/1986	.07	.04	.37	.04	.22	21
PPT-1WC	01/21/1986-02/19/1986	.10	.07	.61	.04	.09	7
PPT-1WC	02/19/1986-03/18/1986	.07	.05	.31	.04	.28	32

Table 17.--Chemical analyses of precipitation in McDonalds Branch basin, January 24, 1985 through March 18, 1986--Continued

Site name	Sample-collection dates	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)
PPT-1BC	01/24/1985-02/05/1985	2.1	0.70	0.02	0.02	1.7	< 0.003
PPT-1BC	02/05/1985-02/14/1985	2.1	8.6	.02	.04	1.1	< .003
PPT-1BC	02/14/1985-02/26/1985*						
PPT-1BC	02/26/1985-03/26/1985	3.1	.84	.02	.02	2.6	< .031
PPT-1BC	03/26/1985-04/23/1985	6.4	4.4	.04	.04	3.7	---
PPT-1BC	04/23/1985-05/07/1985	1.3	.60	.01	.01	1.0	---
PPT-1BC	05/07/1985-05/28/1985	3.2	.53	.04	.01	1.9	.031
PPT-1BC	05/28/1985-06/25/1985	3.8	.38	.03	.01	4.9	---
PPT-1BC	06/25/1985-07/30/1985	4.1	.55	.03	.02	2.6	---
PPT-1BC	07/30/1985-08/27/1985	4.3	.85	.04	.02	3.2	---
PPT-1BC	08/27/1985-10/01/1985	2.6	1.7	.03	< .01	1.2	< .031
PPT-1BC	10/01/1985-10/29/1985	1.5	.30	.02	< .01	1.2	---
PPT-1BC	10/29/1985-11/19/1985	2.1	2.2	.03	.01	.99	---
PPT-1BC	11/19/1985-12/03/1985	1.6	1.5	.03	.02	1.5	.092
PPT-1BC	12/03/1985-12/17/1985	2.6	.56	.02	.01	2.8	.215
PPT-1BC	12/17/1985-01/21/1986	2.5	.72	.03	< .01	2.1	.092
PPT-1BC	01/21/1986-02/19/1986	1.6	1.3	.03	.03	1.2	.002
PPT-1BC	02/19/1986-03/18/1986	2.9	.80	.04	.02	2.2	< .031
PPT-1WC	01/24/1985-02/05/1985	3.0	.22	.01	.02	1.4	.009
PPT-1WC	02/05/1985-02/14/1985	1.4	6.7	.02	.03	.75	< .003
PPT-1WC	02/14/1985-02/26/1985*						
PPT-1WC	02/26/1985-03/26/1985	2.5	.80	.02	.01	2.2	< .031
PPT-1WC	03/26/1985-04/23/1985	4.5	3.2	.03	.02	3.1	---
PPT-1WC	04/23/1985-05/07/1985	1.2	.81	.01	.01	.97	---
PPT-1WC	05/07/1985-05/28/1985	3.0	.39	.02	.01	1.8	.031
PPT-1WC	05/28/1985-06/25/1985	3.6	.37	.05	.02	2.8	---
PPT-1WC	06/25/1985-07/30/1985	3.6	.33	.04	.02	2.4	---
PPT-1WC	07/30/1985-08/27/1985	3.5	.73	.04	.02	3.1	---
PPT-1WC	08/27/1985-09/24/1985	3.7	1.7	.03	< .01	1.5	---
PPT-1WC	09/24/1985-10/01/1985	.61	2.2	.05	< .01	.22	---
PPT-1WC	10/01/1985-10/29/1985	1.2	.60	.01	< .01	.78	---
PPT-1WC	10/29/1985-11/19/1985	1.5	1.5	.03	.01	.40	---
PPT-1WC	11/19/1985-12/03/1985	1.2	.79	.03	.01	1.1	.061
PPT-1WC	12/03/1985-12/17/1985	2.1	.51	.02	.01	2.8	.245
PPT-1WC	12/17/1985-01/21/1986	1.5	.52	.02	< .01	1.7	.092
PPT-1WC	01/21/1986-02/19/1986	1.2	.84	.01	.01	1.0	< .031
PPT-1WC	02/19/1986-03/18/1986	2.3	.58	.02	.02	1.8	.061

Table 17.--Chemical analyses of precipitation in McDonalds Branch basin, January 24, 1985 through March 18, 1986--Continued

Site name	Sample-collection dates	pH (units) District lab	pH (units) Central lab	Specific conductance (µS/cm) District lab	Specific conductance (µS/cm) Central lab	Alkalinity (meq/L) District lab	Lead (µg/L)
PPT-2B	01/24/1985-02/05/1985	---	4.1	---	35	---	9
PPT-2B	02/05/1985-02/13/1985	4.5	4.4	---	50	---	6
PPT-2B	02/13/1985-02/26/1985*						
PPT-2B	02/26/1985-03/26/1985	---	5.3	---	22	---	10
PPT-2B	03/26/1985-04/23/1985	---	4.3	---	60	---	13
PPT-2B	04/23/1985-05/07/1985	4.7**	5.0	19	15	---	7
PPT-2B	05/07/1985-05/28/1985	4.2	4.2	39	37	---	4
PPT-2B	05/28/1985-06/25/1985	4.2	4.3	41	36	-0.07	< 1
PPT-2B	06/25/1985-07/30/1985	4.1**	4.1	45	43	---	5
PPT-2B	07/30/1985-08/27/1985	4.0**	4.3	---	40	---	6
PPT-2B	08/27/1985-10/01/1985	---	4.5	32**	28	---	1
PPT-2B	10/01/1985-10/29/1985	4.7	4.5	20	20	---	3
PPT-2B	10/29/1985-11/19/1985	4.5	4.6	25	20	- .04	2
PPT-2B	11/19/1985-12/03/1985	4.4	4.49	20	22.9	- .04	< 1
PPT-2B	12/03/1985-12/06/1985	---	4.05	---	42.3	---	2
PPT-2B	12/06/1985-12/24/1985†						
PPT-2B	12/24/1985-01/21/1986	4.3	4.50	25	24.9	---	2.2
PPT-2B	01/21/1985-01/28/1986††						
PPT-2B	01/28/1986-02/19/1986	4.2	4.25	36	30.7	- .05***	2.0
PPT-2B	02/19/1986-03/18/1986†††						
PPT-2W	01/24/1985-02/05/1985	4.2	4.2	22	28	---	16
PPT-2W	02/05/1986-02/13/1985	4.6	4.6	---	38	---	5
PPT-2W	02/13/1985-02/26/1985*						
PPT-2W	02/26/1985-03/26/1985	---	5.1	---	18	---	4
PPT-2W	03/26/1985-04/23/1985	4.2	4.3	56	51	---	10
PPT-2W	04/23/1985-05/07/1985	4.7**	5.2	17	12	---	< 1
PPT-2W	05/07/1985-05/28/1985	4.3	4.3	31	29	---	7
PPT-2W	05/28/1985-06/25/1985	4.3**	4.2	35	36	---	---
PPT-2W	06/25/1985-07/30/1985	4.0**	4.1	43	43	- .09	---
PPT-2W	07/30/1985-08/27/1985	4.0**	4.2	---	39	- .15	---
PPT-2W	08/27/1985-10/01/1985	---	---	---	---	---	---
PPT-2W	09/24/1985-10/01/1985‡	---	5.1	13**	15	---	1
PPT-2W	10/01/1985-10/29/1985	4.3	4.5	17	17	---	---
PPT-2W	10/29/1985-11/19/1985	4.5	4.5	20	14	---	4
PPT-2W	11/19/1985-12/03/1985	4.6**	4.51	20	18.8	- .04	< 1
PPT-2W	12/03/1985-12/06/1985	---	4.09	---	39.1	---	6
PPT-2W	12/06/1985-12/24/1985†						
PPT-2W	12/24/1985-01/21/1986	4.3	4.39	23	22.2	---	1.8
PPT-2W	01/21/1986-02/19/1986	4.6	4.50	21	17.9	---	1.0
PPT-2W	02/19/1986-03/19/1986†††						

Table 17.--Chemical analyses of precipitation in McDonalds Branch basin, January 24, 1985 through March 18, 1986--Continued

Site name	Sample-collection dates	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)
PPT-2B	01/24/1985-02/05/1985	0.24	0.02	0.24	0.04	0.15	10
PPT-2B	02/05/1985-02/13/1985	.39	.65	4.8	.21	.09	20
PPT-2B	02/13/1985-02/26/1985*						
PPT-2B	02/26/1985-03/26/1985	.40	.14	.61	.08	.44	10
PPT-2B	03/26/1985-04/23/1985	.68	.39	2.5	.18	.85	60
PPT-2B	04/23/1985-05/07/1985	.20	.12	.45	.06	.36	20
PPT-2B	05/07/1985-05/28/1985	.20	.05	.43	.06	.48	20
PPT-2B	05/28/1985-06/25/1985	.16	.07	.12	.10	.59	20
PPT-2B	06/25/1985-07/30/1985	.20	.04	.15	.06	.44	20
PPT-2B	07/30/1985-08/27/1985	.21	.07	.36	.05	.32	30
PPT-2B	08/27/1985-10/01/1985	.33	.15	.89	.08	.23	10
PPT-2B	10/01/1985-10/29/1985	.01	.02	.19	.04	.13	10
PPT-2B	10/29/1985-11/19/1985	.15	.14	1.5	.10	.15	12
PPT-2B	11/19/1985-12/03/1985	.11	.09	.95	.07	.12	14
PPT-2B	12/03/1985-12/06/1985	.10	.04	1.5	.05	.14	21
PPT-2B	12/06/1985-12/24/1985†						
PPT-2B	12/24/1985-01/21/1986	.45	.07	.64	.10	.24	20
PPT-2B	01/21/1986-01/28/1986††						
PPT-2B	01/28/1986-02/19/1986	.29	.08	.88	.04	.22	15
PPT-2B	02/19/1986-03/18/1986†††						
PPT-2W	01/24/1985-02/05/1985	.14	.03	.14	.02	.13	10
PPT-2W	02/05/1985-02/13/1985	.18	.49	3.7	.16	.06	10
PPT-2W	02/13/1985-02/26/1985*						
PPT-2W	02/26/1985-03/26/1985	.15	.09	.34	.04	.33	< 10
PPT-2W	03/26/1985-04/23/1985	.58	.33	1.8	.12	.91	60
PPT-2W	04/23/1985-05/07/1985	.10	.10	.32	.03	.37	20
PPT-2W	05/07/1985-05/28/1985	.06	.03	.24	.04	.44	10
PPT-2W	05/28/1985-06/25/1985	.13	.05	---	---	.55	---
PPT-2W	06/25/1985-07/30/1985	.15	.04	---	.03	.41	---
PPT-2W	07/30/1985-08/27/1985	.09	.06	.38	.03	.27	20
PPT-2W	08/27/1985-10/01/1985	---	---	---	---	---	---
PPT-2W	09/24/1985-10/01/1985‡	.19	.17	1.2	.08	.03	10
PPT-2W	10/01/1985-10/29/1985	< .01	.01	.14	.03	.13	< 10
PPT-2W	10/29/1985-11/19/1985	< .01	.09	.86	.06	.10	13
PPT-2W	11/19/1985-12/03/1985	< .01	.05	.57	.06	.10	21
PPT-2W	12/03/1985-12/06/1985	< .01	.01	.22	.09	.14	20
PPT-2W	12/06/1985-12/24/1985†						
PPT-2W	12/24/1985-01/21/1986	.04	.04	.40	.03	.22	15
PPT-2W	01/21/1986-02/19/1986	.53	.07	.64	.04	.08	9
PPT-2W	02/19/1986-03/18/1986†††						

Table 17.--Chemical analyses of precipitation in McDonalds Branch basin, January 24, 1985 through March 18, 1986--Continued

Site name	Sample-collection dates	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)
PPT-2B	01/24/1985-02/05/1985	2.3	0.50	0.01	0.02	2.0	< 0.003
PPT-2B	02/05/1985-02/13/1985	2.2	9.2	.03	.04	1.1	< .003
PPT-2B	02/13/1985-02/26/1985*						
PPT-2B	02/26/1985-03/26/1985	3.1	1.2	.02	.02	2.3	< .031
PPT-2B	03/26/1985-04/23/1985	6.1	3.7	.04	.03	3.6	---
PPT-2B	04/23/1985-05/07/1985	1.6	.79	.01	.01	1.2	---
PPT-2B	05/07/1985-05/28/1985	3.3	.66	.02	.02	2.4	.061
PPT-2B	05/28/1985-06/25/1985	4.1	.43	.04	.01	2.5	---
PPT-2B	06/25/1985-07/30/1985	4.5	.42	.05	.02	2.8	---
PPT-2B	07/30/1985-08/27/1985	4.2	.73	.03	.02	3.3	---
PPT-2B	08/27/1985-10/01/1985	2.8	2.0	.03	.33	1.2	---
PPT-2B	10/01/1985-10/29/1985	1.6	.33	.02	.01	1.1	---
PPT-2B	10/29/1985-11/19/1985	2.2	2.6	.03	.02	1.0	---
PPT-2B	11/19/1985-12/03/1985	1.6	1.5	.03	.02	1.4	.092
PPT-2B	12/03/1985-12/06/1985	2.2	.43	.02	.01	3.9	.429
PPT-2B	12/06/1985-12/24/1985†						
PPT-2B	12/24/1985-01/21/1986	2.7	.77	.04	< .01	1.9	.092
PPT-2B	01/21/1986-01/28/1986††						
PPT-2B	01/28/1986-02/19/1986	2.5	.90	.02	.03	2.1	< .031
PPT-2B	02/19/1986-03/18/1986†††						
PPT-2W	01/24/1985-02/05/1985	2.5	.15	.01	.02	1.4	.006
PPT-2W	02/05/1986-02/13/1985	1.5	7.2	.03	.04	.68	< .003
PPT-2W	02/13/1985-02/26/1985*						
PPT-2W	02/26/1985-03/26/1985	2.4	.79	.02	.02	2.0	< .031
PPT-2W	03/26/1985-04/23/1985	5.1	3.3	.04	.03	3.7	.006
PPT-2W	04/23/1985-05/07/1985	1.1	.89	< .01	< .01	.97	< .031
PPT-2W	05/07/1985-05/28/1985	2.6	.46	.02	.01	1.9	.031
PPT-2W	05/28/1985-06/25/1985	3.5	.34	.04	.01	2.5	---
PPT-2W	06/25/1985-07/30/1985	4.1	.35	.04	.02	3.0	---
PPT-2W	07/30/1985-08/27/1985	3.7	.73	.05	.02	3.2	---
PPT-2W	08/27/1985-10/01/1985	---	---	---	---	---	---
PPT-2W	09/24/1985-10/01/1985	.89	2.6	.03	< .01	.31	---
PPT-2W	10/01/1985-10/29/1985	1.3	.37	.01	< .01	.85	---
PPT-2W	10/29/1985-11/19/1985	1.6	1.8	.02	.02	.73	---
PPT-2W	11/19/1985-12/03/1985	1.2	.89	.03	.01	1.1	.092
PPT-2W	12/03/1985-12/06/1985	1.9	.39	.03	.01	3.4	.552
PPT-2W	12/06/1985-12/24/1985†						
PPT-2W	12/24/1985-01/21/1986	1.6	.51	.02	< .01	1.4	.092
PPT-2W	01/21/1986-02/19/1986	1.1	.76	.01	< .01	1.0	< .031
PPT-2W	02/19/1986-03/18/1986†††						

* No sample collected because no rain fell.
** Measurements of pH and specific conductance at the District lab were made on unfiltered samples.
*** Sample was titrated with .1 N HCl. All other alkalinities titrated at the District laboratory were titrated with .16 N H_2SO_4 which may induce a 2 percent to 5 percent error in the alkalinity value.
† Collector was removed from 12/06/85 to 12/24/85 because of hunting season.
†† No sample analyzed due to contamination.
††† No sample analyzed.
‡ The lid was removed from the wet bucket from 9/26/85 to 10/1/85.

Table 18.--Chemical analyses of throughfall in McDonalds Branch basin, September 23, 1985 through March 25, 1986

[All cations, anions, trace metals, and silica were measured as dissolved constituents; throughfall was collected weekly and composited into monthly samples; µS/cm, microsiemens per centimeter; meq/L, milliequivalents per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; lab, laboratory; --- indicates missing data; < indicates less than]

Site name	Sample-collection dates	pH (units) District lab	pH (units) Central lab	Specific conductance (µS/cm) District lab	Specific conductance (µS/cm) Central lab	Dissolved organic carbon (mg/L)	Alkalinity (meq/L) District lab
TF-1C	09/23/1985-10/01/1985	4.2*	4.7	---	42	16	---
TF-1C	10/01/1985-10/29/1985	4.1	4.4	60	42	16	---
TF-1C	10/29/1985-11/19/1985	3.8*	3.9	125	118	19	---
TF-1C	11/19/1985-12/17/1985	3.9	3.8	89	106	12	-0.15**
TF-1C	12/03/1985-12/10/1985***	3.7	3.7	175	158	---	---
TF-1C	12/17/1985-01/21/1986	---	3.5	275	231	16	---
TF-1C	01/21/1986-02/19/1986	3.8	3.9	120	95	8.1	- .18**
TF-1C	02/19/1986-03/25/1986	3.6	4.7	160	140	12	---
TF-3H	09/23/1985-10/01/1985	5.4*	6.6	18	21	4.4	---
TF-3H	10/01/1985-10/29/1985	5.1	5.7	20	20	10	---
TF-3H	10/29/1985-11/19/1985	4.8*	5.8	39	40	6.8	---
TF-3H	11/19/1985-12/17/1985	4.5	4.4	30	32	2.8	- .04**
TF-3H	12/17/1985-01/21/1986	---	4.6	---	30	6.8	---
TF-3H	01/21/1986-02/19/1986	4.5	5.6	27	16	2.1	- .02**
TF-3H	02/19/1986-03/25/1986	---	---	---	---	---	---
TF-2PB	10/01/1985-10/29/1985	4.6	4.6	25	19	6.7	---
TF-2PB	10/29/1985-11/19/1985	4.1*	4.5	93	87	11	- .07
TF-2PB	11/19/1985-12/17/1985	4.1	4.0	71	90	7.2	- .10**
TF-2PB	12/17/1985-01/21/1986	---	4.1	64	63	6.7	- .10
TF-2PB	01/21/1986-02/19/1986	4.2	4.5	52	36	4.3	- .07**
TF-2PB	02/19/1986-03/25/1986	3.9	4.1	83	67	7.6	---
TF-4PBJ	10/01/1985-10/29/1985	4.5	5.1	30	20	12	---
TF-4PBJ	10/29/1985-11/19/1985	4.4*	5.1	52	48	9.7	- .04
TF-4PBJ	11/19/1985-12/17/1985	4.3	4.2	45	49	6.8	- .06**
TF-4PBJ	12/03/1985-12/10/1985***	4.1	4.3	77	59	11	---
TF-4PBJ	12/17/1985-01/21/1986	---	4.4	74	61	13	---
TF-4PBJ	01/21/1986-02/19/1986	4.2	4.7	50	33	5.6	---
TF-4PBJ	02/19/1986-03/25/1986	4.2	4.3	63	51	7.6	---

Table 18.--Chemical analyses of throughfall in McDonalds Branch basin, September 23, 1985 through March 25, 1986 --Continued

Site namer	Sample-collection dates	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (µg/L)	Manganese (µg/L)	Lead (µg/L)
TF-1C	09/23/1985-10/01/1985	2.4	0.30	1.1	1.0	0.18	52	47	35	6
TF-1C	10/01/1985-10/29/1985	1.3	.22	1.0	.80	.22	31	38	24	3
TF-1C	10/29/1985-11/19/1985	3.3	.80	4.2	1.7	.31	84	69	78	8
TF-1C	11/19/1985-12/17/1985	2.1	.50	1.5	1.3	.10	53	52	54	4.6
TF-1C	12/03/1985-12/10/1985	4.5	1.0	3.4	---	---	120	62	120	---
TF-1C	12/17/1985-01/21/1986	9.2	1.8	3.1	2.7	.70	390	160	210	26
TF-1C	01/21/1986-02/19/1986	2.3	2.2	1.9	---	.10	100	46	47	6.2
TF-1C	02/19/1986-03/25/1986	3.3	.65	1.7	.90	.194	150	91	64	11
TF-3H	09/23/1985-10/01/1985	1.0	.15	1.3	1.1	.04	19	10	9	< 1
TF-3H	10/01/1985-10/29/1985	1.3	.30	.3	1.4	.03	15	14	23	2
TF-3H	10/29/1985-11/19/1985	1.4	.50	2.9	2.1	.08	18	9	28	2
TF-3H	11/19/1985-12/17/1985	.70	.10	.9	.90	.12	18	6	13	2.0
TF-3H	12/17/1985-01/21/1986	1.3	.30	.6	1.0	.21	47	25	39	4.8
TF-3H	01/21/1986-02/19/1986	.38	.17	.8	.31	.12	11	7	8	2.0
TF-3H	02/19/1986-03/25/1986	---	---	---	---	---	---	---	---	---
TF-2PB	10/01/1985-10/29/1985	1.0	.20	1.0	.90	.03	21	10	56	2
TF-2PB	10/29/1985-11/19/1985	2.0	1.1	7.5	.90	.14	79	23	77	2
TF-2PB	11/19/1985-12/17/1985	1.2	.50	3.1	.51	.12	57	19	47	3.8
TF-2PB	12/17/1985-01/21/1986	1.5	.48	1.3	.38	.35	96	40	49	7.0
TF-2PB	01/21/1986-02/19/1986	.76	.29	1.5	.19	.09	54	17	22	2.6
TF-2PB	02/19/1986-03/25/1986	1.2	.42	1.5	.28	.28	98	39	38	5.2
TF-4PBJ	10/01/1985-10/29/1985	1.0	.24	1.0	.70	.01	30	10	40	3
TF-4PBJ	10/29/1985-11/19/1985	1.3	.70	3.8	1.6	.04	58	28	110	2
TF-4PBJ	11/19/1985-12/17/1985	.80	.40	1.8	.90	.06	39	9	83	2.2
TF-4PBJ	12/03/1985-12/10/1985	1.1	.50	2.5	---	---	74	18	110	4.0
TF-4PBJ	12/17/1985-01/21/1986	2.2	.82	1.4	1.5	.53	140	39	180	6.8
TF-4PBJ	01/21/1986-02/19/1986	.82	.32	1.5	.37	.09	57	13	58	2.2
TF-4PBJ	02/19/1986-03/25/1986	1.0	.39	1.1	.51	.33	78	25	68	3.6

Table 18.--Chemical analyses of throughfall in McDonalds Branch basin, September 23, 1985 through March 25, 1986 --Continued

Site name	Sample-collection dates	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
TF-1C	09/23/1985-10/01/1985	4.9	2.5	0.12	0.02	4.0	< 0.03	0.34
TF-1C	10/01/1985-10/29/1985	5.2	1.4	.10	.02	3.4	< .03	.20
TF-1C	10/29/1985-11/19/1985	14	9.2	< .1	.047	8.0	< .03	.20
TF-1C	11/19/1985-12/17/1985	9.8	3.1	.11	.03	5.3	.06	.10
TF-1C	12/03/1985-12/10/1985	15	7.6	---	< .010	13	.03	.20
TF-1C	12/17/1985-01/21/1986	16	5.5	< .1	< .010	30	.03	.43
TF-1C	01/21/1986-02/19/1986	9.6	3.5	.16	.06	8.4	< .03	.11
TF-1C	02/19/1986-03/25/1986	14	4.0	.10	< .010	12	< .03	---
TF-3H	09/23/1985-10/01/1985	1.2	2.5	.03	.01	.44	< .03	.12
TF-3H	10/01/1985-10/29/1985	2.8	1.0	.06	.02	1.2	< .03	.30
TF-3H	10/29/1985-11/19/1985	4.0	5.4	.06	.03	1.5	< .03	.07
TF-3H	11/19/1985-12/17/1985	3.1	1.8	.04	.02	2.0	.09	.05
TF-3H	12/17/1985-01/21/1986	2.8	1.5	.09	.01	4.2	.12	.17
TF-3H	01/21/1986-02/19/1986	2.0	1.4	.04	.03	1.7	< .03	.02
TF-3H	02/19/1986-03/25/1986†	---	---		---	---	---	---
TF-2PB	10/01/1985-10/29/1985	3.0	.9	.05	.01	1.8	< .03	.14
TF-2PB	10/29/1985-11/19/1985	6.2	10	.10	.05	4.9	.03	.09
TF-2PB	11/19/1985-12/17/1985	5.6	5.9	.08	.03	4.4	.12	.07
TF-2PB	12/17/1985-01/21/1986	5.3	1.9	.11	.02	8.0	.12	.11
TF-2PB	01/21/1986-02/19/1986	3.5	2.4	.08	.04	3.9	< .03	.01
TF-2PB	02/19/1986-03/25/1986	6.4	2.5	.14	.06	6.2	< .03	.08
TF-4PBJ	10/01/1985-10/29/1985	3.1	.9	.07	.02	1.4	< .03	.10
TF-4PBJ	10/29/1985-11/19/1985	4.5	6.8	.08	.03	1.4	< .03	.05
TF-4PBJ	11/19/1985-12/17/1985	4.4	3.6	.06	.03	2.0	.06	.09
TF-4PBJ	12/03/1985-12/10/1985	8.9	2.1	.10	.02	6.2	.18	.14
TF-4PBJ	12/17/1985-01/21/1986	7.9	2.3	.16	.02	7.5	.12	.1
TF-4PBJ	01/21/1986-02/19/1986	4.0	2.6	.09	.03	2.7	.06	.03
TF-4PBJ	02/19/1986-03/25/1986	6.2	2.1	.12	.03	3.9	.34	.07

* Measurements of pH and specific conductance at the District lab were made on unfiltered samples.

** Sample titrated with .1 N HCL. All other alkalinities titrated at the District laboratory were titrated with .16 N H_2SO_4 which may induce a 2 percent to 5 percent error in the alkalinity value.

*** Sample not included in composited sample shown directly above, because contamination of sample suspected at time of sampling.

† Sample was contaminated and not analyzed.

Table 19.--Chemical analyses of soil water in McDonalds Branch basin, January 10, 1985 through March 21, 1986

[All cations, anions, and trace metals were measured as dissolved constituents; where more than one site name is listed, samples were composited; μS/cm, microsiemens per centimeter; meq/L, milliequivalents per liter; mg/L, milligrams per liter; lab, laboratory; --- indicates missing data; < indicates less than]

Site name	Sample-collection dates	pH (units) District lab	pH (units) Central lab	Specific conductance (μS/cm) District lab	Specific conductance (μS/cm) Central lab	Alkalinity (meq/L) District lab	Alkalinity as $CaCO_3$ (mg/L) Central lab	Dissolved organic carbon (mg/L)
PIT-1-LlO	01/23/1986-02/25/1986	---	3.9	---	70	---	---	18
PIT-1-LlA	05/09/1985-06/06/1985	3.8	3.7	145	131	---	---	9.5
PIT-1-LlA	10/01/1985-10/24/1985	---	3.9	---	69	---	---	19
PIT-1-LlA	10/24/1985-11/21/1985	3.8	3.8	120	100	---	<1	18
PIT-1-LlA	11/21/1985-12/20/1985	4.1	4.3	46	36	-0.08	<1	12
PIT-1-LlA	01/23/1986-02/25/1986	4.2	4.3	53	38	---	<1	10
PIT-2-LlO	01/23/1986-02/25/1986	---	3.8	---	107	---	---	28
PIT-1,2-LlO	05/02/1985-05/09/1985	3.9	3.7	106	102	---	---	30
PIT-3-LaO	01/23/1986-02/25/1986	4.1	4.2	63	52	---	---	22
PIT-3-LaB	01/10/1985-02/11/1985	4.6	---	---	---	---	---	2.7
PIT-3-LaB	03/29/1985-05/06/1985	---	4.7	---	33	---	---	11
PIT-3-LaB	10/24/1985-11/21/1985	---	4.9	---	37	---	---	6.1
PIT-3-LaB	11/21/1985-12/20/1985	4.6	5.4	33	25	---	---	4.5
PIT-3-LaB	01/23/1986-02/25/1986	4.9	4.9	41	39	---	<1	4.8
PIT-4-LuO	11/21/1985-12/20/1985	3.8	3.8	90	78	---	<1	23
PIT-4-LuO	01/23/1986-02/25/1986	3.8	3.9	93	78	- .15*	<1	25
PIT-4-LuA	09/30/1985-10/25/1985	3.9	4.0	64	61	---	<1	17
PIT-4-LuA	11/21/1985-12/20/1985	4.0	4.2	51	41	- .10	<1	16
PIT-4-LuA	01/23/1986-02/25/1986	4.1	4.2	69	47	- .10*	<1	11
PIT-5-LtO	10/29/1985-11/21/1985	---	4.0	---	59	---	---	---
PIT-5-LtO	11/21/1985-12/20/1985	4.0	4.2	52	41	---	<1	18
PIT-5-LtO	01/23/1986-02/25/1986	4.1	4.2	53	42	- .10*	---	16
PIT-5-LtA	05/02/1985-05/06/1985	---	4.2	---	54	---	---	10
PIT-5-LtA	09/30/1985-10/29/1985	4.0	4.1	55	56	---	<1	21
PIT-5-LtA	10/29/1985-11/21/1985	4.0	4.1	67	59	---	<1	20
PIT-5-LtA	11/21/1985-12/20/1985	4.0	4.2	56	45	- .10	<1	21
PIT-5-LtA	01/23/1986-02/25/1986	4.2	4.4	45	36	- .06*	<1	13
PIT-5-LtB	01/23/1986-02/25/1986	---	4.9	---	29	---	---	2.2
PIT-6-LuO	01/10/1985-02/11/1985	---	---	---	78	---	---	---
PIT-6-LuO	05/02/1985-05/06/1985	4.0	3.8	120	108	---	---	18
PIT-6-LuO	09/30/1985-10/29/1985	3.8	3.8	93	104	---	<1	31
PIT-6-LuO	11/21/1985-12/20/1985	3.8	3.9	88	79	---	---	20
PIT-6-LuO	01/23/1986-02/25/1986	3.9	4.1	79	58	- .12*	<1	19
PIT-6-LuB	11/21/1985-12/20/1985	4.4	4.7	48	46	---	---	1.9
PIT-6-LuB	01/23/1986-02/25/1986	4.6	4.7	43	37	---	---	2.8
PIT-7-AuO	01/23/1986-02/25/1986	3.8	3.8	97	86	- .17*	<1	45
PIT-7-AuA	01/23/1986-02/25/1986	3.8	3.7	106	92	---	---	28
PIT-7-AuB	01/23/1986-02/25/1986	---	4.4	---	52	---	---	8.4
PIT-8-AuO	01/23/1986-02/25/1986	4.2	4.3	76	65	- .03*	<1	18

Table 19.--Chemical analyses of soil water in McDonalds Branch basin, January 10, 1985 through March 21, 1986--Continued

Site name	Sample-collection dates	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (µg/L)	Manganese (µg/L)	Lead (µg/L)
PIT-1-LlO	01/23/1986-02/25/1986	0.60	0.20	1.2	1.3	---	330	130	26	---
PIT-1-LlA	05/09/1985-06/06/1985	1.1	.40	3.6	---	---	< 10	53	19	---
PIT-1-LlA	10/01/1985-10/24/1985	.50	.10	1.8	---	---	320	150	7	---
PIT-1-LlA	10/24/1985-11/21/1985	.61	.28	3.0	1.1	0.017	320	69	12	3
PIT-1-LlA	11/21/1985-12/20/1985	.20	.09	1.4	.53	---	220	150	4	< .5
PIT-1-LlA	01/23/1986-02/25/1986	.30	.10	1.0	.49	.028	230	140	10	< .5
PIT-2-LlO	01/23/1986-02/25/1986	1.8	.50	2.6	1.0	---	1,500	210	35	---
PIT-1,2-LlO	05/02/1985-05/09/1985	.93	.38	2.1	---	---	350	130	29	---
PIT-3-LaO	01/23/1986-02/25/1986	1.2	.50	1.3	.2	.148	460	310	230	---
PIT-3-LaB	01/10/1985-02/11/1985	---	---	---	.27	---	390	---	---	---
PIT-3-LaB	03/29/1985-05/06/1985	1.0	.31	1.1	---	---	390	6	78	---
PIT-3-LaB	10/24/1985-11/21/1985	1.1	.50	1.8	---	---	730	< 3	75	---
PIT-3-LaB	11/21/1985-12/20/1985	1.2	.40	1.5	---	.009	680	< 3	62	< .5
PIT-3-LaB	01/23/1986-02/25/1986	1.9	.60	1.6	.31	.026	800	8	90	1.0
PIT-4-LuO	11/21/1985-12/20/1985	.20	.10	1.4	.23	.019	---	180	10	< 1
PIT-4-LuO	01/23/1986-02/25/1986	.60	.30	2.6	.33	.082	430	170	11	< .5
PIT-4-LuA	09/30/1985-10/25/1985	.30	.22	1.1	.8	.024	310	140	10	1
PIT-4-LuA	11/21/1985-12/20/1985	.20	.10	1.4	1.0	.015	370	180	5	.8
PIT-4-LuA	01/23/1986-02/25/1986	.20	.20	1.3	.7	.050	320	120	6	.7
PIT-5-LtO	10/29/1985-11/21/1985	.30	.10	1.9	---	---	430	140	12	---
PIT-5-LtO	11/21/1985-12/20/1985	.43	.18	1.4	.43	.023	400	160	9	.6
PIT-5-LtO	01/23/1986-02/25/1986	.20	.20	1.3	.40	---	470	190	15	---
PIT-5-LtA	05/02/1985-05/06/1985	.45	.34	1.6	---	---	420	130	45	---
PIT-5-LtA	09/30/1985-10/29/1985	1.0	.50	1.0	.26	.021	900	210	68	< 1
PIT-5-LtA	10/29/1985-11/21/1985	.34	.31	2.1	.12	.014	790	180	44	2
PIT-5-LtA	11/21/1985-12/20/1985	.40	.30	2.0	.21	.014	1,100	350	42	.6
PIT-5-LtA	01/23/1986-02/25/1986	.40	.30	1.1	.27	.094	710	200	37	1.6
PIT-5-LtB	01/23/1986-02/25/1986	.30	.30	1.6	.20	---	670	8	50	---
PIT-6-LuO	01/10/1985-02/11/1985	.50	.30	2.3	.67	---	780	160	17	---
PIT-6-LuO	05/02/1985-05/06/1985	.70	.50	3.4	---	---	760	130	36	---
PIT-6-LuO	09/30/1985-10/29/1985	1.0	1.0	2.0	1.5	.019	830	210	79	2
PIT-6-LuO	11/21/1985-12/20/1985	.70	.60	1.8	---	.058	610	220	60	2.2
PIT-6-LuO	01/23/1986-02/25/1986	.60	.50	1.2	.48	.167	570	150	53	2.3
PIT-6-LuB	11/21/1985-12/20/1985	.50	.40	1.3	---	.006	780	< 3	75	---
PIT-6-LuB	01/23/1986-02/25/1986	.40	.40	1.3	.3	.027	1,200	< 3	67	---
PIT-7-AuO	01/23/1986-02/25/1986	.20	.50	1.3	1.1	.103	440	260	2	---
PIT-7-AuA	01/23/1986-02/25/1986	.30	.20	1.1	.2	---	830	240	8	---
PIT-7-AuB	01/23/1986-02/25/1986	.50	.20	1.3	.3	---	2,500	17	13	---
PIT-8-AuO	01/23/1986-02/25/1986	1.5	.60	2.5	.8	.107	2,100	190	49	1.9

Table 19.--Chemical analyses of soil water in McDonalds Branch basin, January 10, 1985 through March 21, 1986--Continued

Site name	Sample-collection dates	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
PIT-1-LlO	01/23/1986-02/25/1986	5.1	3.6	0.03	0.03	3.54	0.12	1.1
PIT-1-LlA	05/09/1985-06/06/1985	12	11	< .1	.16	3.54	---	.60
PIT-1-LlA	10/01/1985-10/24/1985	6.0	3.1	.03	.02	1.77	< .03	2.4
PIT-1-LlA	10/24/1985-11/21/1985	8.2	7.9	.10	.03	1.28	< .03	4.0
PIT-1-LlA	11/21/1985-12/20/1985	4.0	1.7	.03	.02	.09	< .03	.70
PIT-1-LlA	01/23/1986-02/25/1986	4.2	1.7	.04	.02	.58	< .03	.80
PIT-2-LlO	01/23/1986-02/25/1986	13	9.8	.1	.015	< .44	---	5.7
PIT-1,2-LlO	05/02/1985-05/09/1985	13	4.4	< .1	< .010	4.07	---	.77
PIT-3-LaO	01/23/1986-02/25/1986	5.1	3.6	.05	.02	.18	< .03	1.4
PIT-3-LaB	01/10/1985-02/11/1985	---	---	---	---	---	---	---
PIT-3-LaB	03/29/1985-05/06/1985	5.4	2.1	.04	.02	2.08	< .03	1.2
PIT-3-LaB	10/24/1985-11/21/1985	5.7	3.6	.05	.01	2.46	< .03	.80
PIT-3-LaB	11/21/1985-12/20/1985	4.3	2.1	.03	.01	1.46	< .03	1.2
PIT-3-LaB	01/23/1986-02/25/1986	6.2	4.3	.03	.03	1.59	< .03	1.3
PIT-4-LuO	11/21/1985-12/20/1985	6.4	4.4	.05	.02	.13	< .03	.60
PIT-4-LuO	01/23/1986-02/25/1986	6.3	4.5	.07	.03	.66	< .03	1.0
PIT-4-LuA	09/30/1985-10/25/1985	4.7	3.9	.04	.01	< .04	< .03	1.0
PIT-4-LuA	11/21/1985-12/20/1985	6.4	1.9	.03	< .010	.04	< .03	1.1
PIT-4-LuA	01/23/1986-02/25/1986	4.8	2.6	.03	.02	1.02	< .03	.90
PIT-5-LtO	10/29/1985-11/21/1985	4.9	3.8	.04	.02	.39	< .03	.60
PIT-5-LtO	11/21/1985-12/20/1985	3.7	1.9	.03	.02	.18	< .03	.66
PIT-5-LtO	01/23/1986-02/25/1986	4.0	1.6	.03	.02	1.11	< .03	.80
PIT-5-LtA	05/02/1985-05/06/1985	5.8	2.6	.05	.02	3.15	< .03	1.2
PIT-5-LtA	09/30/1985-10/29/1985	5.7	3.2	.05	.01	< .04	< .03	1.3
PIT-5-LtA	10/29/1985-11/21/1985	5.1	5.8	.05	.03	.13	< .03	1.0
PIT-5-LtA	11/21/1985-12/20/1985	4.6	2.3	.07	.02	.04	< .03	.80
PIT-5-LtA	01/23/1986-02/25/1986	4.3	2.3	.04	.02	.71	< .03	.50
PIT-5-LtB	01/23/1986-02/25/1986	5.5	3.1	.03	.02	.09	< .03	1.7
PIT-6-LuO	01/10/1985-02/11/1985	---	---	---	---	---	---	3.8
PIT-6-LuO	05/02/1985-05/06/1985	16	6.9	< .1	< .010	2.04	---	2.0
PIT-6-LuO	09/30/1985-10/29/1985	20	4.9	< .1	< .010	< .44	< .03	3.1
PIT-6-LuO	11/21/1985-12/20/1985	8.5	4.5	.05	.02	.09	< .03	2.4
PIT-6-LuO	01/23/1986-02/25/1986	6.5	3.4	.03	.03	.35	< .03	.90
PIT-6-LuB	11/21/1985-12/20/1985	7.7	5.2	.03	.02	.27	< .03	1.8
PIT-6-LuB	01/23/1986-02/25/1986	8.4	2.8	.03	.02	.13	< .03	1.8
PIT-7-AuO	01/23/1986-02/25/1986	4.9	3.0	.06	.09	< .04	.12	2.2
PIT-7-AuA	01/23/1986-02/25/1986	8.4	3.6	.05	.05	.09	< .03	2.2
PIT-7-AuB	01/23/1986-02/25/1986	8.0	2.5	.02	< .01	5.76	< .03	2.4
PIT-8-AuO	01/23/1986-02/25/1986	12	3.9	.02	.02	.53	< .03	2.4

Table 19.--Chemical analyses of soil water in McDonalds Branch basin, January 10, 1985 through March 21, 1986--Continued

Site name	Sample-collection dates	pH (units) District lab	pH (units) Central lab	Specific conductance (µS/cm) District lab	Specific conductance (µS/cm) Central lab	Alkalinity (meq/L) District lab	Alkalinity as $CaCO_3$ (mg/L) Central lab	Dissolved organic carbon (mg/L)
PIT-8-AuA	01/23/1986-02/25/1986	---	3.7	---	123	---	---	22
PIT-8-AuB	11/21/1985-12/20/1985	4.2	4.4	80	80	-0.01*	<1	8.0
PIT-8-AuB	12/20/1985-01/23/1986	---	4.3	---	58	---	<1	19
PIT-8-AuB	01/23/1986-02/25/1986	4.5	4.6	56	44	+ .03	<1	20
PIT-9-AuO	01/10/1985-02/07/1985	3.6	---	---	---	---	---	29
PIT-9-AuO	02/07/1985-03/04/1985	---	3.7	---	109	---	<1	33
PIT-9-AuO	03/28/1985-05/01/1985	---	3.7	---	113	---	<1	36
PIT-9-AuO	05/01/1985-05/07/1985	4.0**	3.9	---	102	---	---	32
PIT-9-AuO	11/21/1985-12/20/1985	---	4.0	---	70	---	---	45
PIT-9-AuO	01/23/1986-02/25/1986	4.3	4.4	71	63	+ .01*	<1	62
PIT-9-AuO	02/25/1986-03/21/1986	4.2	4.3	66	61	---	<3	44
PIT-9-AuA	05/01/1985-05/07/1985	---	3.5	---	148	---	<1	36
PIT-9-AuA	11/21/1985-12/20/1985	4.1	4.2	78	75	---	<1	52
PIT-9-AuA	01/23/1986-02/25/1986	3.8	3.8	107	100	- .22*	<1	51
PIT-9-AuA	02/25/1986-03/21/1986	3.9	4.0	85	75	---	<3	40
PIT-9-AuB	05/01/1985-05/07/1985	---	3.5	---	160	---	<1	32
PIT-9-AuB	12/20/1985***	3.6	3.6	165	147	---	<1	46
PIT-9-AuB	12/20/1985†	3.5	3.5	180	180	---	---	40
PIT-9-AuB	12/20/1985-01/23/1986	3.5	3.5	159	158	---	<1	41
PIT-9-AuB	01/23/1985-02/25/1986	3.6	3.6	144	133	---	<1	41
PIT-9-AuB	02/25/1986-03/21/1986	3.6	3.6	155	137	---	---	32
PIT-7,9-AuO	08/29/1985-09/30/1985	3.5	3.7	175	135	---	<1	67
PIT-8,9-AuO	03/04/1985-03/28/1985	4.0	3.8	100	104	---	---	32
PIT-8,9-AuA	01/10/1985-02/07/1985	3.6	3.7	---	117	---	<1	29
PIT-8,9-AuA	02/07/1985-03/04/1985	---	4.0	---	85	---	<1	19
PIT-8,9-AuA	03/04/1985-03/28/1985	3.9	3.8	140	93	---	<1	24
PIT-8,9-AuA	03/28/1985-05/01/1985	---	3.6	---	144	---	<1	32
PIT-8,9-AuB	01/10/1985-02/07/1985	3.7	4.0	---	89	---	<1	17
PIT-8,9-AuB	03/04/1985-03/28/1985	4.0	3.9	140	101	---	---	23
PIT-7,8,9-AuB	02/07/1985-03/04/1985	---	3.9	---	77	---	<1	15
PIT-7,8,9-AuB	03/28/1985-05/01/1985	3.9	3.8	106	105	---	<1	19
PIT-7,8,9-AuB	05/07/1985-06/07/1985	4.1	3.8	107	99	- .19	<1	21
PIT-7,8,9-AuB	06/07/1985-07/02/1985	3.6	3.5	154	164	---	<1	35
PIT-10-EvO/A	09/30/1985-10/29/1985	---	4.5	---	34	---	---	15
PIT-10-EvO/A	10/29/1985-11/21/1985	4.4	4.8	40	34	---	<1	12
PIT-10-EvO/A	11/21/1985-12/23/1985	---	5.1	---	26	---	<1	11
PIT-10-EvO/A	01/23/1985-02/25/1986	4.6	4.9	36	31	---	<1	11
PIT-11-EvO/A	10/29/1985-11/21/1985	---	4.3	---	87	---	---	8.8
PIT-11-EvO/A	11/21/1985-12/23/1985	---	4.6	---	64	---	---	9.4
PIT-11-EvO/A	01/23/1986-02/25/1986	4.4	4.8	54	50	---	---	9.4
PIT-10,11-EvO/A	08/02/1985-08/29/1985	4.7	5.7	48	42	---	---	14
PIT-10,11-EvO/A	08/29/1985-10/01/1985	4.3	4.5	69	60	---	<1	14
PIT-12-EvO/A	01/23/1986-02/25/1986	4.3	4.5	51	51	---	---	13

Table 19.--Chemical analyses of soil water in McDonalds Branch basin, January 10, 1985 through March 21, 1986--Continued

Site name	Sample-collection dates	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (µg/L)	Manganese (µg/L)	Lead (µg/L)
PIT-8-AuA	01/23/1986-02/25/1986	1.1	0.70	2.6	2.1	---	1,500	190	30	---
PIT-8-AuB	11/21/1985-12/20/1985	2.6	1.5	1.2	1.5	.010	2,400	48	130	1.2
PIT-8-AuB	12/20/1985-01/23/1986	1.5	.83	1.7	1.6	.115	2,100	440	81	2.8
PIT-8-AuB	01/23/1986-02/25/1986	1.2	.60	1.7	1.2	.129	2,100	650	61	2.0
PIT-9-AuO	01/10/1985-02/07/1985	1.6	1.2	3.1	2.8	---	2,500	950	9	20
PIT-9-AuO	02/07/1985-03/04/1985	1.2	.80	2.2	1.2	.053	2,500	650	5	18
PIT-9-AuO	03/28/1985-05/01/1985	1.3	.92	2.4	.46	.030	2,200	1,100	5	< 1
PIT-9-AuO	05/01/1985-05/07/1985	2.0	.95	2.6	---	---	2,500	370	23	---
PIT-9-AuO	11/21/1985-12/20/1985	2.0	1.2	2.4	---	.045	2,700	440	44	---
PIT-9-AuO	01/23/1986-02/25/1986	2.0	.90	3.9	1.7	.108	3,200	1,500	60	< .5
PIT-9-AuO	02/25/1986-03/21/1986	1.8	.87	3.2	1.3	.085	3,400	1,200	50	5
PIT-9-AuA	05/01/1985-05/07/1985	1.1	1.0	2.4	.35	.053	1,100	250	4	6
PIT-9-AuA	11/21/1985-12/20/1985	2.4	1.4	2.2	4.0	.027	3,600	350	74	3.0
PIT-9-AuA	01/23/1986-02/25/1986	1.1	.90	2.5	.70	.050	1,800	450	20	< .5
PIT-9-AuA	02/25/1986-03/21/1986	1.0	.77	2.8	.90	.082	2,900	820	23	3.0
PIT-9-AuB	05/01/1985-05/07/1985	1.9	.50	2.9	.11	.044	1,500	91	2	13
PIT-9-AuB	12/20/1985***	1.6	.60	3.3	.29	.030	2,500	140	4	3.0
PIT-9-AuB	12/20/1985†	1.4	.50	3.2	---	.028	1,800	34	< 1	---
PIT-9-AuB	12/20/1985-01/23/1986	1.6	.57	3.4	.15	.033	1,900	51	2	< .5
PIT-9-AuB	01/23/1985-02/25/1986	1.4	.60	3.3	.27	.041	1,800	250	5	---
PIT-9-AuB	02/25/1986-03/21/1986	1.1	.50	2.9	.07	.015	1,500	46	2	1.0
PIT-7,9-AuO	08/29/1985-09/30/1985	.70	.78	1.8	2.3	.100	1,600	410	3	9
PIT-8,9-AuO	03/04/1985-03/28/1985	1.7	.90	2.4	.87	.042	2,700	860	13	11
PIT-8,9-AuA	01/10/1985-02/07/1985	.80	.70	2.4	.57	.019	1,100	160	3	6
PIT-8,9-AuA	02/07/1985-03/04/1985	.40	.40	4.2	1.5	.026	1,100	150	7	5
PIT-8,9-AuA	03/04/1985-03/28/1985	.70	.60	1.6	.46	.030	1,200	180	5	21
PIT-8,9-AuA	03/28/1985-05/01/1985	.98	1.0	2.4	.39	.035	1,100	210	4	7
PIT-8,9-AuB	01/10/1985-02/07/1985	1.1	.40	2.4	.12	.018	1,500	45	3	2
PIT-8,9-AuB	03/04/1985-03/28/1985	1.3	.40	2.3	.14	.030	1,700	48	5	6
PIT-7,8,9-AuB	02/07/1985-03/04/1985	.90	.40	1.9	.13	.018	1,800	43	8	10
PIT-7,8,9-AuB	03/28/1985-05/01/1985	1.3	.43	2.4	.10	.023	1,800	48	5	7
PIT-7,8,9-AuB	05/07/1985-06/07/1985	1.0	.40	2.0	.13	.076	1,500	150	5	7
PIT-7,8,9-AuB	06/07/1985-07/02/1985	1.7	.60	3.1	.10	.078	1,300	260	< 1	7
PIT-10-EvO/A	09/30/1985-10/29/1985	1.0	1.0	.5	---	.067	740	180	78	---
PIT-10-EvO/A	10/29/1985-11/21/1985	1.0	1.0	1.3	1.3	.015	770	180	95	2
PIT-10-EvO/A	11/21/1985-12/23/1985	.70	.40	1.1	1.1	.013	770	270	61	1
PIT-10-EvO/A	01/23/1985-02/25/1986	1.1	.60	1.3	.8	.042	830	250	81	---
PIT-11-EvO/A	10/29/1985-11/21/1985	3.4	1.3	2.0	---	.018	470	140	220	---
PIT-11-EvO/A	11/21/1985-12/23/1985	2.6	1.0	1.8	---	---	470	220	170	---
PIT-11-EvO/A	01/23/1986-02/25/1986	1.6	.60	1.2	2.4	---	400	240	110	---
PIT-10,11-EvO/A	08/02/1985-08/29/1985	1.4	.56	1.1	---	1.42	560	260	140	---
PIT-10,11-EvO/A	08/29/1985-10/01/1985	2.0	1.0	1.2	3.5	.427	590	200	140	2
PIT-12-EvO/A	01/23/1986-02/25/1986	.60	.80	2.3	.2	---	1,400	120	56	---

Table 19.--Chemical analyses of soil water in McDonalds Branch basin, January 10, 1985 through March 21, 1986--Continued

Site name	Sample-collection dates	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
PIT-8-AuA	01/23/1986-02/25/1986	17	4.7	0.1	0.042	11.1	---	2.7
PIT-8-AuB	11/21/1985-12/20/1985	11	2.9	.05	< .04	11.5	< .03	4.4
PIT-8-AuB	12/20/1985-01/23/1986	8.5	3.4	.04	.02	3.06	< .03	2.9
PIT-8-AuB	01/23/1986-02/25/1986	7.3	3.5	.02	.031	.67	< .03	2.5
PIT-9-AuO	01/10/1985-02/07/1985	---	---	---	---	---	---	7.8
PIT-9-AuO	02/07/1985-03/04/1985	28	5.2	< .1	.16	< .44	< .03	5.2
PIT-9-AuO	03/28/1985-05/01/1985	34	5.3	< .1	.099	< .44	< .03	4.3
PIT-9-AuO	05/01/1985-05/07/1985	28	6.0	< .1	< .010	< .44	---	5.1
PIT-9-AuO	11/21/1985-12/20/1985	9.0	3.3	.04	.01	.44	< .03	4.2
PIT-9-AuO	01/23/1986-02/25/1986	7.5	3.8	.08	.05	.09	< .03	3.5
PIT-9-AuO	02/25/1986-03/21/1986	8.4	3.9	.06	.04	.18	< .03	2.9
PIT-9-AuA	05/01/1985-05/07/1985	31	5.0	.1	.030	< .44	< .03	4.7
PIT-9-AuA	11/21/1985-12/20/1985	10	3.7	.03	< .01	1.02	< .03	5.0
PIT-9-AuA	01/23/1986-02/25/1986	10	3.4	.11	.05	.18	< .03	3.3
PIT-9-AuA	02/25/1986-03/21/1986	9.2	3.7	.06	.041	.09	< .03	2.8
PIT-9-AuB	05/01/1985-05/07/1985	30	6.1	.2	< .010	< .44	.03	4.7
PIT-9-AuB	12/20/1985***	31	8.0	.1	.11	< .44	< .03	4.6
PIT-9-AuB	12/20/1985†	25	7.9	---	---	< .44	< .15	4.4
PIT-9-AuB	12/20/1985-01/23/1986	25	7.3	.1	.070	< .44	.06	4.9
PIT-9-AuB	01/23/1985-02/25/1986	27	6.7	.1	.095	< .44	< .03	4.0
PIT-9-AuB	02/25/1986-03/21/1986	20	6.4	.1	.08	< .44	.03	3.5
PIT-7,9-AuO	08/29/1985-09/30/1985	25	9.3	< .1	< .025	< .44	.06	3.6
PIT-8,9-AuO	03/04/1985-03/28/1985	28	6.1	< .1	< .010	< .44	< .03	4.6
PIT-8,9-AuA	01/10/1985-02/07/1985	13	3.7	.08	.02	.18	< .03	5.9
PIT-8,9-AuA	02/07/1985-03/04/1985	8.5	6.4	.06	.02	.89	< .03	3.3
PIT-8,9-AuA	03/04/1985-03/28/1985	11	3.5	.06	.02	.04	< .03	3.7
PIT-8,9-AuA	03/28/1985-05/01/1985	31	5.0	< .1	< .010	< .44	< .03	5.0
PIT-8,9-AuB	01/10/1985-02/07/1985	12	4.2	.06	.01	.18	< .03	3.1
PIT-8,9-AuB	03/04/1985-03/28/1985	23	4.2	.1	< .010	< .44	< .03	4.2
PIT-7,8,9-AuB	02/07/1985-03/04/1985	12	3.6	.05	.02	.49	< .03	3.7
PIT-7,8,9-AuB	03/28/1985-05/01/1985	24	4.2	< .1	< .010	< .44	< .03	4.0
PIT-7,8,9-AuB	05/07/1985-06/07/1985	12	4.0	.06	.01	< .04	< .03	3.6
PIT-7,8,9-AuB	06/07/1985-07/02/1985	29	7.4	.1	.036	< .44	< .03	4.2
PIT-10-EvO/A	09/30/1985-10/29/1985	4.8	1.5	.05	.01	.09	.06	2.4
PIT-10-EvO/A	10/29/1985-11/21/1985	4.8	3.7	.03	.01	.04	< .03	3.0
PIT-10-EvO/A	11/21/1985-12/23/1985	4.6	1.4	.02	.01	< .04	< .03	1.9
PIT-10-EvO/A	01/23/1985-02/25/1986	3.0	3.0	.02	.03	.09	< .03	1.7
PIT-11-EvO/A	10/29/1985-11/21/1985	17	9.4	< .1	< .010	< .44	< .03	7.0
PIT-11-EvO/A	11/21/1985-12/23/1985	9.6	5.8	.03	.02	1.28	< .03	5.2
PIT-11-EvO/A	01/23/1986-02/25/1986	10	3.1	.03	.03	1.46	< .03	2.7
PIT-10,11-EvO/A	08/02/1985-08/29/1985	8.0	2.9	.05	.02	.27	.25	4.8
PIT-10,11-EvO/A	08/29/1985-10/01/1985	9.7	4.9	.05	.03	.35	.09	6.0
PIT-12-EvO/A	01/23/1986-02/25/1986	9.5	4.1	.05	.04	.04	< .03	2.8

* Samples titrated with .1 N HCL. All other alkalinities titrated at the District laboratory were titrated with .16 N H_2SO_4 which may induce a 2 percent to 5 percent error in the alkalinity value.

** Measurements of pH and specific conductance at the District Lab were made on unfiltered samples.

*** Sample collected at 12:20 p.m..

† Sample collected at 12:35 p.m..

Table 20.--Chemical analyses of surface water in McDonalds Branch basin, January 24, 1985 through March 21, 1986

[All cations, anions, trace metals, and silica were measured as dissolved constituents; °C, degrees Celsius; µS/cm, microsiemens per centimeter; meq/L, milliequivalents per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; lab, laboratory; --- indicates missing data; indicates less than]

Site name or number	Sample-collection date	Temperature (°C)	pH (units) field	pH (units) lab	Specific conductance (µS/cm) field	Specific conductance (µS/cm) lab	Dissolved oxygen (mg/L)	Alkalinity (meq/L) District lab	Alkalinity as $CaCO_3$ (mg/L) Central lab	Dissolved organic carbon (mg/L)
S-1	01/24/1985	1.0	3.7	3.9	115	90	---	---	<1	5.6
S-1	02/25/1985	4.5	3.8	3.8	108	94	4.8	---	<1	8.8
S-1	03/26/1985	7.0	3.7	4.1	114	106	5.7	---	<1	9.8
S-1	04/25/1985	12.5	4.0	4.1	70	62	.8	---	<1	20
S-1	05/28/1985	17.0	4.2	4.1	60	61	.7	---	---	37
S-1	06/24/1985	17.5	4.0	4.1	91	59	.5	---	<1	30
S-1	09/30/1985	15.5	3.2	3.2	440	432	2.7	---	<1	17
S-1	11/18/1985	10.0	3.5	3.6	190	164	2.5	---	<1	18
S-1	12/16/1985	1.5	3.6	3.55	170	146	7.9	- .25 *	< .50	22
S-1	01/21/1986	1.0	3.2	3.66	150	129	6.2	---	< .50	19
S-1	02/19/1986	2.0	3.7	3.72	102	112	10.6	- .20 *	< .50	26
S-2	01/24/1985	2.0	3.7	3.9	112	82	---	---	<1	7.6
S-2	02/25/1985	4.0	3.7	3.8	102	93	4.7	---	<1	8.1
S-2	03/26/1985	6.0	3.7	3.9	116	106	4.3	---	<1	9.4
S-2	04/25/1985	12.0	3.9	4.0	77	67	1.3	---	<1	16
S-2	05/28/1985	20.0	3.9	4.1	71	62	2.0	- .14	---	27
S-2	06/24/1985	21.5	3.9	4.0	83	62	2.3	---	<1	30
S-2	07/22/1985	25.0	4.0	4.2	58	56	2.1	---	<1	---
S-2	09/30/1985	14.5	3.8	4.1	95	78	6.9	---	<1	8.9
S-2	10/21/1985	13.0	---	3.6	201	196	---	---	<1	22
S-2	11/18/1985	9.0	3.5	3.5	233	196	1.6	---	<1	19
S-2	01/21/1986	1.0	3.7	3.63	165	137	6.8	---	.50	20
S-3	01/25/1985	1.5	3.7	3.9	109	80	---	---	<1	6.6
S-3	02/25/1985	4.5	3.8	3.8	102	92	---	---	<1	8.5
S-3	03/26/1985	7.0	3.7	3.9	114	106	6.9	---	<1	9.2
S-4	02/26/1985	4.0	3.8	4.0	118	100	6.5	---	<1	6.3
S-5	02/26/1985	11.0	4.1	4.2	89	73	5.2	---	<1	11
S-5	03/27/1985	11.0	4.0	4.2	93	89	9.1	---	<1	9.7
S-5	09/30/1985	22.5	3.5	3.9	160	140	9.3	---	<1	10
S-5	12/16/1985	3.0	3.5	3.51	285	219	15.3	- .32 *	< .50	16
S-5	02/19/1986	.5	3.7	3.76	106	107	12.1	- .18 *	< .50	19
S-6	02/26/1985	8.5	4.1	4.2	75	71	4.9	---	<1	10
S-7	02/26/1985	1.5	4.0	4.0	88	79	7.5	---	<1	5.7
S-7	03/27/1985	9.0	4.3	4.2	79	80	---	---	<1	25
S-7	02/19/1986	.5	3.7	3.72	134	124	10.5	- .19 *	< .50	14
S-8	01/25/1985	6.5	3.9	4.4	56	33	---	---	<1	2.9
S-8	02/27/1985	5.0	3.9	3.9	89	79	5.8	---	<1	4.7
S-8	03/27/1985	8.0	3.9	4.1	78	69	8.0	---	<1	3.6
S-8	04/26/1985	11.0	4.3	4.6	39	31	.7	---	<1	4.7
S-8	05/28/1985	14.0	3.9	4.0	78	70	.5	- .31	<1	4.5
S-8	06/24/1985	13.5	4.3	4.6	44	33	1.1	---	<1	3.8

Table 20.--Chemical analyses of surface water in McDonalds Branch basin, January 24, 1985 through March 21, 1986--Continued

Site name or number	Sample-collection date	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (mg/L)	Manganese (µg/L)	Lead (µg/L)
S-1	01/24/1985	0.80	0.50	2.5	0.18	---	620	420	21	<1
S-1	02/25/1985	.80	.50	2.3	.22	---	630	580	23	5
S-1	03/26/1985	.94	.53	2.4	.06	---	790	370	20	8
S-1	04/25/1985	.30	.20	2.6	.18	---	550	3,400	10	<1
S-1	05/28/1985	.30	.20	2.3	.39	---	880	4,700	4	<1
S-1	06/24/1985	.30	.10	2.2	.28	---	840	3,400	7	5
S-1	09/30/1985	5.2	3.0	5.0	.28	---	10,000	370	96	8
S-1	11/18/1986	1.1	.70	3.2	.30	---	1,500	670	28	5
S-1	12/16/1985	1.1	.70	3.5	.10	0.023	1,800	500	28	2.4
S-1	01/21/1986	.90	.50	2.9	.11	.023	1,500	360	18	2.4
S-1	02/19/1986	.70	.40	2.8	.11	.022	1,300	600	18	2.6
S-2	01/24/1985	.70	.50	2.5	.11	---	580	350	19	<1
S-2	02/25/1985	.70	.50	2.3	.16	---	600	380	23	2
S-2	03/26/1985	.93	.60	2.5	.06	---	770	360	25	5
S-2	04/25/1985	.40	.20	2.5	.17	---	440	2,600	11	<1
S-2	05/28/1985	.30	.10	2.2	.48	---	700	3,500	6	4
S-2	06/24/1985	.30	.10	2.2	.49	---	740	3,100	9	7
S-2	07/22/1985	.66	.27	1.4	1.2	---	450	640	19	3
S-2	09/30/1985	2.0	1.0	1.4	1.0	---	950	750	36	2
S-2	10/21/1985	1.6	.86	3.3	.40	---	1,500	8,100	44	3
S-2	11/18/1985	1.7	.90	3.5	.55	---	2,000	2,100	37	4
S-2	01/21/1986	.90	.50	3.0	.08	.015	1,500	320	20	2.0
S-3	01/25/1985	.70	.50	2.4	.09	---	580	490	16	1
S-3	02/25/1985	.70	.50	2.3	.14	---	610	430	24	2
S-3	03/26/1985	.71	.59	2.5	.05	---	740	360	<1	8
S-4	02/26/1985	.90	.70	2.8	.63	---	680	270	39	<1
S-5	02/26/1985	.60	.40	2.5	.66	---	520	1,600	18	<1
S-5	03/27/1985	.70	.45	2.9	.65	---	620	550	22	10
S-5	09/30/1985	3.0	2.0	3.0	.24	---	740	200	140	2
S-5	12/16/1985	3.0	1.8	3.9	.33	.18	4,100	330	86	6.8
S-5	02/19/1986	1.0	.50	2.7	.18	.041	1,100	470	33	3.4
S-6	02/26/1985	.60	.40	2.2	.64	---	390	650	21	<1
S-7	02/26/1985	1.1	.90	2.5	.90	---	400	600	54	<1
S-7	03/27/1985	1.2	1.0	3.0	1.0	---	1,000	6,600	43	6
S-7	02/19/1986	1.6	1.0	2.8	.31	.089	1,300	290	55	3.0
S-8	01/25/1985	.30	.30	1.9	.21	---	100	140	11	1
S-8	02/27/1985	.70	.60	2.6	.47	---	250	190	35	<1
S-8	03/27/1985	< .02	.59	2.4	.36	---	220	160	31	2
S-8	04/26/1985	.20	.30	1.9	.25	---	90	260	10	<1
S-8	05/28/1985	.70	.50	2.6	.34	---	180	420	28	1
S-8	06/24/1985	.39	.21	1.9	.33	---	50	460	9	5

Table 20.--Chemical analyses of surface water in McDonalds Branch basin, January 24, 1985 through March 21, 1986--Continued

Site name or number	Sample-collection date	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
S-1	01/24/1985	13	4.3	0.03	0.02	< 0.04	< 0.03	5.3
S-1	02/25/1985	13	3.9	.05	.02	< .04	< .03	3.8
S-1	03/26/1985	17	4.5	< .1	.032	< .44	---	3.9
S-1	04/25/1985	4.7	5.1	.04	.03	< .04	< .03	4.9
S-1	05/28/1985	1.6	5.9	.04	.04	< .04	< .03	6.0
S-1	06/24/1985	1.1	6.3	.04	.05	< .04	< .03	6.9
S-1	09/30/1985	120	7.1	.6	< .010	< .44	< .03	6.4
S-1	11/18/1985	26	7.3	.1	.020	< .44	---	5.6
S-1	12/16/1985	19	7.4	.1	.033	< .44	.006	4.9
S-1	01/21/1986	16	5.7	---	.012	< .44	< .003	4.5
S-1	02/19/1986	19	5.0	< .1	.063	< .44	.006	3.4
S-2	01/24/1985	13	4.3	.03	.02	< .04	< .03	5.5
S-2	02/25/1985	12	3.8	.05	.02	< .04	< .03	3.7
S-2	03/26/1985	18	4.5	< .1	.033	< .44	---	4.0
S-2	04/25/1985	6.5	4.9	.04	.03	< .04	< .03	4.6
S-2	05/28/1985	3.4	5.9	.04	.04	.27	< .03	5.5
S-2	06/24/1985	1.7	6.5	.04	.04	< .04	< .03	6.3
S-2	07/22/1985	9.2	2.9	.07	.04	.09	< .03	2.1
S-2	09/30/1985	16	2.6	.09	.02	.13	< .03	2.4
S-2	10/21/1985	40	8.1	.2	.046	< .44	< .03	6.6
S-2	11/18/1985	34	8.1	.2	.038	< .44	---	6.6
S-2	01/21/1986	17	5.8	---	< .010	< .44	< .003	4.6
S-3	01/25/1985	13	4.2	.03	.02	.09	< .03	5.4
S-3	02/25/1985	13	3.8	.06	.02	< .04	< .03	3.7
S-3	03/26/1985	17	4.5	< .1	.026	< .44	---	4.0
S-4	02/26/1985	15	3.9	.07	.02	1.46	< .03	4.9
S-5	02/26/1985	14	4.4	.05	.03	.13	< .03	5.3
S-5	03/27/1985	16	4.6	.08	.03	.27	< .03	.27
S-5	09/30/1985	31	4.7	.1	< .010	3.8	---	2.0
S-5	12/16/1985	46	6.7	.3	< .010	3.9	.006	4.2
S-5	02/19/1986	16	4.8	< .1	.010	.58	< .003	3.3
S-6	02/26/1985	12	3.6	.06	.03	---	.06	5.0
S-7	02/26/1985	14	3.8	.06	.02	.44	< .03	4.7
S-7	03/27/1985	16	4.0	.05	.02	.31	< .03	7.4
S-7	02/19/1986	18	4.6	.1	< .010	2.5	.003	3.9
S-8	01/25/1985	4.8	3.4	.02	.02	< .04	< .03	4.7
S-8	02/27/1985	12	4.2	.07	.02	.13	< .03	4.2
S-8	03/27/1985	10	3.6	.06	.02	.18	< .03	4.7
S-8	04/26/1985	3.3	3.1	.02	.03	< .04	< .03	4.4
S-8	05/28/1985	9.9	3.9	.05	.03	< .04	< .03	5.1
S-8	06/24/1985	3.0	3.8	.03	.03	< .04	< .03	4.5

Table 20.--Chemical analyses of surface water in McDonalds Branch basin, January 24, 1985 through March 21, 1986--Continued

Site name or number	Sample-collection date	Temperature (°C)	pH (units) field	pH (units) lab	Specific conductance (µS/cm) field	Specific conductance (µS/cm) lab	Dissolved oxygen (mg/L)	Alkalinity (meq/L) District lab	Alkalinity as $CaCO_3$ (mg/L) Central lab	Dissolved organic carbon (mg/L)
S-8	07/22/1985	14.5	4.2	4.4	45	38	0.7	---	<1	4.2
S-8	08/19/1985	14.5	4.7	---	28	---	.4	---	<1	3.8
S-8	09/30/1985	15.0	3.4	3.5	235	203	.9	---	<1	13
S-8	10/21/1985	13.0	---	4.6	43	33	---	---	<1	12
S-8	11/18/1985	10.5	3.2	3.7	154	137	1.3	---	<1	7.2
S-9	01/24/1985	8.0	4.5	5.1	36	24	---	---	<1	1.6
S-9	02/27/1985	10.0	4.4	4.4	37	36	4.2	---	<1	1.4
S-9	03/27/1985	10.0	4.5	4.7	29	27	3.8	---	<1	1.1
S-9	04/26/1985	12.0	4.6	5.1	27	23	2.4	---	<1	2.1
S-9	05/28/1985	14.0	4.5	4.8	32	28	3.6	+0.01	<1	1.7
S-9	06/24/1985	14.0	4.5	4.8	31	26	2.4	---	<1	1.6
S-9	07/22/1985	14.5	4.5	4.8	29	24	2.8	---	---	3.0
S-9	08/19/1985	13.5	4.8	4.9	26	24	1.7	---	<1	1.2
S-9	09/24/1985	14.0	4.5	5.4	25	23	3.1	---	<1	1.5
S-9	09/30/1985	13.5	3.9	4.4	84	67	2.8	---	<1	4.1
S-9	10/22/1985	12.0	4.5	4.7	28	26	1.5	---	<1	2.9
S-9	11/18/1985	10.0	4.3	4.9	34	31	3.3	---	<1	2.2
S-9	12/16/1985	8.0	3.8	4.05	71	66.0	4.9	- .05 *	< .50	2.9
S-9	01/21/1986	8.5	4.4	4.34	45	41.3	5.3	---	< .50	---
01466500	01/24/1985	6.0	4.5	4.6	29	27	5.2	---	<1 **	2.3
01466500	02/26/1985	8.0	4.4	4.4	35	36	5.0	---	<1 **	1.9
01466500	03/26/1985	8.5	4.5	4.5	29	29	4.2	---	<1 **	2.3
01466500	04/26/1985	11.5	4.6	4.9	25	23	3.2	---	<1 **	2.5
01466500	05/29/1985	13.0	4.4	4.7	29	26	3.1	---	<1 **	2.6
01466500	06/25/1985	14.0	4.4	4.6	30	26	3.1	---	<1 **	1.7
01466500	07/22/1985	16.0	4.5	4.7	28	24	3.9	---	<1 **	2.6
01466500	08/19/1985	16.0	4.5	5.0	23	23	3.3	---	<1 **	2.2
01466500	10/22/1985	11.5	4.5	4.7	34	28	2.1	---	<1 **	2.8
01466500	11/18/1985	10.5	4.4	4.8	36	36	3.5	---	<1 **	3.7
01466500	12/17/1985	6.5	4.3	4.6	58	43	5.7	---	<1 **	3.0
01466500	01/21/1986	6.5	4.4	4.7	44	30	6.2	---	<1 **	3.5
01466500	02/18/1986	4.5	4.0	4.1	71	68	7.6	---	<1 **	5.5
01466500	03/21/1986	6.5	3.9	4.1	82	69	6.4	---	<1 **	7.3
S-10	04/26/1985	11.9	4.5	5.1	28	23	3.8	---	<1 **	2.2
S-10	07/22/1985	16.0	4.4	4.7	31	27	4.0	---	<1 **	3.7
S-10	09/30/1985	14.7	3.8	4.5	70	57	3.8	---	<1 **	5.3
S-10	10/22/1985	11.7	4.5	4.6	30	28	2.1	---	<1 **	2.4
S-10	11/18/1985	9.5	3.8	4.7	41	36	3.8	---	<1 **	3.6
S-10	12/16/1985	7.2	3.8	4.18	58	54.4	5.6	---	< .50	2.5
S-10	01/21/1986	6.8	4.4	4.36	42	39.2	6.3	---	< .50	4.0
S-10	02/19/1986	5.0	4.0	4.01	80	76.6	8.5	.11	< .50	7.2

Table 20.--Chemical analyses of surface water in McDonalds Branch basin, January 24, 1985 through March 21, 1986--Continued

Site name or number	Sample-collection date	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (mg/L)	Manganese (µg/L)	Lead (µg/L)
S-8	07/22/1985	0.20	0.22	2.0	0.14	---	70	530	9	2
S-8	08/19/1985	.20	.20	1.9	.19	---	90	670	7	2
S-8	09/30/1985	2.3	2.0	4.5	.51	---	1,300	790	80	3
S-8	10/21/1985	.24	.27	1.8	.14	---	60	380	12	<1
S-8	11/18/1985	1.5	1.6	4.1	.21	---	780	500	58	2
S-9	01/24/1985	.30	.40	1.7	.32	---	40	40	4	<1
S-9	02/27/1985	.60	.50	2.2	.35	---	70	42	13	<1
S-9	03/27/1985	.42	.47	1.8	.29	---	50	41	10	2
S-9	04/26/1985	.30	.30	1.9	.20	---	50	40	6	<1
S-9	05/28/1985	.40	.30	1.9	.27	---	50	35	11	<1
S-9	06/24/1985	.31	.29	1.8	.30	---	50	42	5	4
S-9	07/22/1985	.26	.30	1.7	.20	---	50	44	4	2
S-9	08/19/1985	.30	.30	1.7	.18	---	30	37	3	<1
S-9	09/24/1985	.27	.38	1.7	.25	---	40	37	4	1
S-9	09/30/1985	1.4	1.5	3.2	.48	---	220	90	36	3
S-9	10/22/1985	.33	.41	1.8	.22	---	50	35	8	<1
S-9	11/18/1985	.50	.50	2.0	.30	---	70	42	11	<1
S-9	12/16/1985	1.1	1.0	2.5	.35	0.012	350	63	28	1.0
S-9	01/21/1986	.50	.50	1.9	.31	.012	150	37	13	<0.5
01466500	01/24/1985	.28	.29	1.7	.3	< .013	110	43	5	3
01466500	02/26/1985	.50	.50	2.1	.4	< .026	60	50	7	<1
01466500	03/26/1985	.41	.43	1.8	.3	.026	40	45	7	3
01466500	04/26/1985	.34	.29	1.7	.3	< .013	50	58	5	2
01466500	05/29/1985	.39	.37	1.8	.2	.026	40	72	5	6
01466500	06/25/1985	.37	.37	1.7	.1	< .013	40	82	5	4
01466500	07/22/1985	.34	.36	1.7	.2	---	50	130	5	2
01466500	08/19/1985	.28	.35	1.7	.2	.013	20	140	4	2
01466500	10/22/1985	.40	.51	2.3	.2	< .01	60	110	9	<1
01466500	11/18/1985	.51	.61	2.4	.3	.03	---	---	13	2
01466500	12/17/1985	.80	.80	2.2	.5	.03	130	65	17	2
01466500	01/21/1986	.70	.60	2.1	.5	.01	70	47	10	<1
01466500	02/18/1986	.99	.79	2.2	.5	.04	310	92	27	5
01466500	03/21/1986	1.1	.80	2.4	.4	.01	370	130	27	1
S-10	04/26/1985	.30	.30	1.9	.20	---	60	64	4	<1
S-10	07/22/1985	.29	.36	1.8	.20	---	50	120	5	<1
S-10	09/30/1985	1.0	1.1	3.0	.50	---	150	190	22	2
S-10	10/22/1985	.41	.39	1.8	.34	---	60	300	10	1
S-10	11/18/1985	.50	.60	2.2	.32	---	80	110	13	2
S-10	12/16/1985	.90	.90	2.3	.39	.012	140	67	20	1.4
S-10	01/21/1986	.50	.50	1.9	.34	.006	82	47	11	<0.5
S-10	02/19/1986	1.1	1.0	2.5	.49	.012	420	100	30	1.4

Table 20.--Chemical analyses of surface water in McDonalds Branch basin, January 24, 1985 through March 21, 1986--Continued

Site name or number	Sample-collection date	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
S-8	07/22/1985	4.0	3.3	0.03	0.03	< 0.04	< 0.03	4.9
S-8	08/19/1985	1.6	3.6	.04	.03	< .04	< .03	4.5
S-8	09/30/1985	38	6.4	.2	< .010	< .44	---	9.0
S-8	10/21/1985	3.6	3.4	.04	.03	.04	< .03	4.5
S-8	11/18/1985	23	6.0	.2	< .010	< .44	---	7.9
S-9	01/24/1985	2.4	3.1	< .01	.02	.04	< .03	4.3
S-9	02/27/1985	4.9	3.4	.02	.02	.09	< .03	4.1
S-9	03/27/1985	3.2	3.3	.02	.02	.09	< .03	4.3
S-9	04/26/1985	2.2	3.1	.02	.02	< .04	< .03	4.3
S-9	05/28/1985	3.4	3.4	.02	.02	< .04	< .03	4.2
S-9	06/24/1985	2.5	3.3	.03	.02	< .04	< .03	4.3
S-9	07/22/1985	2.2	3.2	.02	.03	< .04	< .03	4.1
S-9	08/19/1985	1.9	3.4	.03	.03	.04	< .03	4.1
S-9	09/24/1985	2.0	3.1	.03	.03	< .04	< .03	4.4
S-9	09/30/1985	15	4.3	.07	.03	< .04	< .03	6.1
S-9	10/22/1985	3.1	3.1	.04	.02	< .04	< .03	4.3
S-9	11/18/1985	4.3	3.8	.03	.02	.04	< .03	4.5
S-9	12/16/1985	11	4.1	.06	.02	.09	.006	5.5
S-9	01/21/1986	5.6	3.9	.03	.02	.04	< .003	4.5
01466500	01/24/1985	2.8	3.4	< .10	---	< .44	---	4.2
01466500	02/26/1985	6.3	3.6	< .10	---	< .44	.031	4.3
01466500	03/26/1985	3.8	3.6	< .10	---	< .44	< .031	3.9
01466500	04/26/1985	2.7	3.4	< .10	---	< .44	< .031	4.0
01466500	05/29/1985	3.5	3.2	< .10	---	< .44	< .031	3.9
01466500	06/25/1985	2.8	3.5	< .10	---	< .44	< .031	3.9
01466500	07/22/1985	3.2	3.6	< .10	---	< .44	< .031	3.8
01466500	08/19/1985	2.7	3.5	< .10	---	.53	.092	4.0
01466500	10/22/1985	3.6	3.4	< .1	---	< .44	.03	4.2
01466500	11/18/1985	5.5	3.5	< .1	---	< .44	.03	4.4
01466500	12/17/1985	9.5	3.9	.2	---	< .44	< .03	4.9
01466500	01/21/1986	8.9	3.6	< .1	---	< .44	< .03	4.5
01466500	02/18/1986	11	4.1	< .1	---	< .44	< .03	4.4
01466500	03/21/1986	12	3.6	< .1	---	< .44	.03	4.1
S-10	04/26/1985	2.4	3.2	.03	.02	< .04	< .03	4.3
S-10	07/22/1985	2.6	3.1	< .01	.03	< .04	< .03	4.1
S-10	09/30/1985	11	4.2	.05	.04	< .04	.03	6.0
S-10	10/22/1985	3.6	3.2	.04	.02	< .04	< .03	4.4
S-10	11/18/1985	5.3	3.6	.03	.02	< .04	< .03	4.6
S-10	12/16/1985	8.3	3.7	.03	.02	.04	.006	5.1
S-10	01/21/1986	5.1	3.7	.03	.01	< .04	< .003	4.3
S-10	02/19/1986	13	3.5	.06	.01	.62	.003	4.2

* Samples titrated with .1 N HCL. All other alkalinities titrated at the District laboratory were titrated with .16 N H_2SO_4 which may induce a 2 percent to 5 percent error in the alkalinity value.

** Alkalinity determined in the field by titration to a pH of 4.5.

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986

[All cations, anions, trace metals, and silica were measured as dissolved constituents; °C, degrees Celsius; µS/cm, microsiemens per centimeter; meq/L, milliequivalents per liter; mg/L, milligrams per liter; µg/L, micrograms per liter; lab, laboratory; --- indicates missing data; < indicates less than]

Site name	Sample-collection date	Temperature (°C)	pH (units) field	pH (units) lab	Specific conductance (µS/cm) field	Specific conductance (µS/cm) lab	Dissolved oxygen (mg/l)	Alkalinity (meq/L) District lab	Alkalinity as $CaCO_3$ (mg/L) Central lab	Dissolved organic carbon (mg/L)
QWC-1A	02/07/1985	8.0	4.8	5.2	31	30	3.3	---	< 1	0.2
QWC-1A	03/06/1985	8.5	4.8	5.2	30	29	3.7	---	< 1	.3
QWC-1A	04/03/1985	8.0	4.8	5.4	29	30	3.9	---	< 1	1.3
QWC-1A	05/06/1985	10.0	4.9	5.1	31	29	2.4	- 0.04	< 1	1.6
QWC-1A	06/05/1985	10.0	5.0	4.9	30	30	1.5	---	< 1	.6
QWC-1A	07/01/1985	11.0	4.8	5.2	30	30	1.0	---	< 1	.5
QWC-1A	08/23/1985	13.5	4.5	5.3	29	30	.6	---	< 1	.7
QWC-1A	10/28/1985	12.0	4.7	5.2	30	31	.6	---	< 1	.9
QWC-1A	12/19/1985	10.0	4.4	4.97	30	26.4	1.4	+ .004*	< .50	.6
QWC-1A	02/24/1986	8.5	4.6	5.11	26	28.0	1.2	+ .012*	< .50	1.1
QWC-1B	02/07/1985	9.5	5.1	5.6	30	33	7.7	---	< 1	.4
QWC-1B	03/06/1985	11.0	5.1	5.6	28	31	7.9	---	< 1	.3
QWC-1B	04/03/1985	11.0	5.2	5.8	28	31	8.0	---	1	1.4
QWC-1B	05/06/1985	12.0	5.2	5.4	27	28	8.3	- .11	< 1	1.6
QWC-1B	06/05/1985	11.0	5.3	5.4	26	27	7.8	---	< 1	.5
QWC-1B	07/01/1985	11.0	5.2	5.8	24	29	7.6	---	< 1	.8
QWC-1B	08/23/1985	12.0	4.8	5.8	25	29	7.9	---	< 1	.7
QWC-1B	10/28/1985	10.0	5.2	5.8	28	32	8.0	---	< 1	1.2
QWC-1B	12/19/1985	9.0	5.0	5.33	29	27.4	7.9	---	.83	.7
QWC-1B	02/24/1986	11.0	5.2	5.37	26	27.2	7.7	---	.81	1.2
QWC-2A	02/08/1985	6.5	4.6	4.7	46	31	3.1	---	< 1	.7
QWC-2A	03/06/1985	8.0	---	4.7	43	43	3.9	---	< 1	.5
QWC-2A	04/05/1985	9.0	4.5	4.7	45	42	4.4	---	< 1	1.7
QWC-2A	05/06/1985	11.0	4.5	4.6	48	45	3.9	- .03	< 1	2.0
QWC-2A	06/06/1985	13.0	4.5	4.5	46	46	3.4	---	< 1	1.0
QWC-2A	07/02/1985	14.0	4.0	4.8	---	40	3.6	---	< 1	.8
QWC-2A	08/26/1985	18.0	4.4	4.7	37	41	3.2	---	< 1	1.2
QWC-2A	10/28/1985	14.0	4.0	4.7	49	45	2.5	---	< 1	1.3
QWC-2A	12/19/1985	9.5	4.3	4.50	54	52.7	2.4	---	< .50	1.4
QWC-2A	02/24/1986	7.5	4.5	4.47	46	54.0	5.8	- .02**	< .50	1.6
QWC-2B	02/08/1985	11.5	5.0	5.3	25	27	.5	---	< 1	.3
QWC-2B	03/06/1985	11.5	---	5.4	24	27	.7	---	< 1	.2
QWC-2B	04/03/1985	11.0	5.0	5.5	25	27	1.0	---	1	1.0
QWC-2B	05/06/1985	12.0	5.0	5.2	25	25	2.1	---	< 1	1.7
QWC-2B	06/06/1985	11.5	5.0	5.1	23	24	2.5	---	< 1	.6
QWC-2B	07/02/1985	11.5	5.2	5.7	---	26	3.0	---	< 1	3.2
QWC-2B	08/26/1985	13.0	5.0	5.4	21	25	3.9	---	1	.7
QWC-2B	10/28/1985	11.0	4.6	5.5	23	25	4.9	---	< 1	.8
QWC-2B	12/19/1985	10.5	4.9	5.23	23	19.2	5.5	---	.70	.5
QWC-2B	02/24/1986	11.5	4.8	5.14	20	19.1	5.8	---	.96	1.6
QWC-3A	02/08/1985	11.5	5.1	5.9	15	19	9.1	---	< 1	.3
QWC-3A	03/07/1985	11.5	4.9	5.4	15	16	9.0	---	< 1	.4
QWC-3A	04/04/1985	10.5	5.3	6.6	15	11	9.9	---	---	1.1
QWC-3A	05/08/1985	11.0	5.3	5.6	17	16	8.2	---	< 1	1.4
QWC-3A	06/07/1985	11.0	5.3	5.6	15	16	9.7	- .10	< 1	.5
QWC-3A	07/02/1985	13.0	5.2	6.1	---	19	9.1	---	< 1	.4
QWC-3A	08/26/1985	14.0	5.1	5.9	14	18	9.3	---	1	.8
QWC-3A	10/29/1985	12.0	5.2	6.0	15	18	9.3	---	< 1	.9
QWC-3A	12/20/1985	11.0	5.1	5.46	15	13.1	9.1	---	.52	.6
QWC-3A	02/25/1986	11.0	5.0	5.40	14	13.4	9.0	+ .014*	< .50	1.7
QWC-3B	02/08/1985	11.5	4.9	5.5	24	27	4.5	---	< 1	.4
QWC-3B	03/07/1985	11.5	4.6	5.0	24	24	5.1	---	< 1	.3
QWC-3B	04/04/1985	11.5	5.0	5.7	25	28	5.7	---	1	1.8
QWC-3B	05/08/1985	12.0	5.0	5.3	26	25	5.2	---	< 1	1.4
QWC-3B	06/07/1985	11.5	5.0	5.2	25	25	5.3	---	< 1	.5
QWC-3B	07/02/1985	12.0	4.9	5.7	---	27	5.0	---	< 1	.4
QWC-3B	08/26/1985	15.0	5.1	5.6	23	28	5.2	---	1	.8
QWC-3B	10/29/1985	11.0	5.0	5.6	25	28	4.9	---	< 1	1.7
QWC-3B	12/20/1985	10.5	4.5	5.28	26	22.9	3.4	+ .014*	< .50	.9
QWC-3B	02/25/1986	11.5	5.0	5.20	16	21.4	3.3	---	.61	1.4
QWC-4	02/11/1985	11.5	5.0	5.8	26	27	9.6	---	< 1	.5
QWC-4	03/08/1985	11.5	5.1	5.2	25	29	9.7	---	< 1	.3
QWC-4	04/05/1985	12.0	5.1	6.0	28	30	10.3	---	1	1.3
QWC-4	05/08/1985	12.0	5.1	5.5	26	26	8.9	---	< 1	1.5
QWC-4	06/07/1985	11.0	5.1	5.3	25	26	10.3	---	< 1	.7
QWC-4	07/03/1985	11.5	5.0	5.4	---	28	10.2	---	< 1	2.1
QWC-4	08/27/1985	13.5	5.0	6.0	20	32	10.0	---	< 1	.8
QWC-4	10/29/1985	12.0	5.0	5.7	30	33	10.1	---	< 1	1.4
QWC-4	12/20/1985	11.0	4.9	5.19	29	27.2	9.9	+ .008*	< .50	.5
QWC-4	02/25/1986	11.0	5.1	5.17	26	26.7	9.1	+ .01 **	< .50	1.6

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Sample-collection date	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (µg/L)	Manganese (µg/L)	Lead (µg/L)
QWC-1A	02/07/1985	0.70	0.70	1.8	0.31	---	140	17	27	< 1
QWC-1A	03/06/1985	.70	.60	1.9	.32	---	150	18	19	1
QWC-1A	04/03/1985	.70	.60	1.7	.31	---	150	6	25	5
QWC-1A	05/06/1985	.80	.70	1.8	.33	---	140	13	26	1
QWC-1A	06/05/1985	.70	.70	1.7	.20	---	150	7	25	7
QWC-1A	07/01/1985	.76	.72	1.8	.35	---	130	12	20	4
QWC-1A	08/23/1985	.66	.64	1.7	.37	---	120	< 3	22	1
QWC-1A	10/28/1985	1.0	1.0	2.0	.40	---	120	5	22	< 1
QWC-1A	12/19/1985	.70	.70	1.7	.36	0.006	140	5.5	20	< .5
QWC-1A	02/24/1986	.80	.80	2.1	.36	.010	160	< 2.0	23	---
QWC-1B	02/07/1985	1.2	.90	1.7	.35	---	60	11	30	< 1
QWC-1B	03/06/1985	1.2	.80	1.8	.36	---	60	13	25	< 1
QWC-1B	04/03/1985	1.2	.80	1.6	.34	---	40	13	30	4
QWC-1B	05/06/1985	1.1	.70	1.6	.33	---	50	17	29	< 1
QWC-1B	06/05/1985	1.1	.70	1.6	.22	---	70	40	28	6
QWC-1B	07/01/1985	1.2	.70	1.6	.31	---	40	16	24	3
QWC-1B	08/23/1985	1.0	.71	1.5	.39	---	40	9	27	< 1
QWC-1B	10/28/1985	1.1	1.0	2.0	.45	---	40	13	29	< 1
QWC-1B	12/19/1985	1.1	.90	1.5	.42	.006	54	15	26	1.6
QWC-1B	02/24/1986	1.1	.90	1.7	.49	.010	58	7.6	23	---
QWC-2A	02/08/1985	.90	.50	1.7	.16	---	920	93	100	< 1
QWC-2A	03/06/1985	.90	.40	1.8	.16	---	1,000	52	94	< 1
QWC-2A	04/05/1985	.90	.40	1.7	.17	---	900	10	92	3
QWC-2A	05/06/1985	1.0	.50	1.8	.19	---	880	33	99	< 1
QWC-2A	06/06/1985	1.0	.50	1.7	.14	---	820	64	99	4
QWC-2A	07/02/1985	.88	.40	1.6	.19	---	670	55	94	5
QWC-2A	08/26/1985	.90	.40	1.7	.20	---	640	51	87	1
QWC-2A	10/28/1985	1.0	1.0	2.0	.19	---	790	99	100	< 1
QWC-2A	12/19/1985	.90	.50	2.0	.17	.008	1,300	59	100	< .5
QWC-2A	02/24/1986	1.10	.60	2.6	.39	.008	1,100	5.7	120	---
QWC-2B	02/08/1985	.70	.50	1.6	.28	---	50	< 3	10	< 1
QWC-2B	03/06/1985	.80	.60	1.8	.30	---	60	11	7	1
QWC-2B	04/03/1985	.70	.60	1.6	.33	---	60	5	12	2
QWC-2B	05/06/1985	.70	.60	1.6	.32	---	60	12	10	< 1
QWC-2B	06/06/1985	.70	.60	1.7	.29	---	70	11	9	8
QWC-2B	07/02/1985	.72	.51	1.6	.32	---	60	14	10	6
QWC-2B	08/26/1985	.60	.40	1.6	.33	---	60	6	9	2
QWC-2B	10/28/1985	1.0	.48	1.6	.35	---	70	24	8	1
QWC-2B	12/19/1985	.50	.50	1.5	.32	.005	56	< 2	7	.5
QWC-2B	02/24/1986	.50	.50	1.7	.34	.004	64	4	7	---
QWC-3A	02/08/1985	.30	.30	1.7	.22	---	20	4	6	< 1
QWC-3A	03/07/1985	.30	.30	1.6	.21	---	10	46	5	4
QWC-3A	04/04/1985	.08	.02	.4	.06	---	< 10	< 3	< 1	2
QWC-3A	05/08/1985	.30	.30	1.6	.22	---	< 10	9	4	< 1
QWC-3A	06/07/1985	.20	.30	1.5	.14	---	10	5	2	10
QWC-3A	07/02/1985	.23	.23	1.5	.20	---	20	10	4	7
QWC-3A	08/26/1985	.20	.20	1.5	.23	---	20	21	3	< 1
QWC-3A	10/29/1985	.31	.33	2.0	.23	---	30	32	5	< 1
QWC-3A	12/20/1985	.20	.30	1.4	.21	.006	14	< 2.0	2.3	.6
QWC-3A	02/25/1986	.20	.30	1.6	.22	.019	19	< 2.0	1.9	< .5
QWC-3B	02/08/1985	.60	.50	1.8	.31	---	50	4	19	2
QWC-3B	03/07/1985	.60	.50	2.0	.32	---	50	7	19	6
QWC-3B	04/04/1985	---	---	---	---	---	< 10	< 3	10	2
QWC-3B	05/08/1985	.70	.60	1.9	.35	---	50	10	22	< 1
QWC-3B	06/07/1985	.70	.60	1.9	.31	---	60	10	22	< 1
QWC-3B	07/02/1985	.69	.47	1.8	.35	---	60	7	22	6
QWC-3B	08/26/1985	.70	.50	1.8	.33	---	60	13	26	1
QWC-3B	10/29/1985	1.0	1.0	2.0	.34	---	60	10	30	1
QWC-3B	12/20/1985	.70	.60	1.7	.36	.004	55	9	24	.5
QWC-3B	02/25/1986	.70	.60	1.9	.34	.018	59	< 2	23	---
QWC-4	02/11/1985	.80	.70	1.6	.35	---	20	10	11	3
QWC-4	03/08/1985	.90	.70	1.5	.36	---	< 10	< 3	10	4
QWC-4	04/05/1985	1.0	.80	1.5	.39	---	20	< 3	15	4
QWC-4	05/08/1985	.90	.80	1.7	.35	---	30	19	13	< 1
QWC-4	06/07/1985	.90	.70	1.5	.26	---	20	7	11	< 1
QWC-4	07/03/1985	.96	.79	1.5	.41	---	30	14	15	1
QWC-4	08/27/1985	1.2	.90	1.5	.46	---	30	20	17	< 1
QWC-4	10/29/1985	1.1	1.0	2.0	.51	---	20	12	18	< 1
QWC-4	12/20/1985	1.0	.90	1.5	.46	.005	27	6.7	12	< .5
QWC-4	02/25/1986	.90	.80	1.6	.44	.015	35	< 2.0	13	---

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Sample-collection date	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
QWC-1A	02/07/1985	4.8	3.1	0.02	0.03	0.13	< 0.03	3.8
QWC-1A	03/06/1985	4.7	3.3	.03	.03	.18	< .03	3.8
QWC-1A	04/03/1985	4.8	3.0	.02	.02	.18	< .03	3.7
QWC-1A	05/06/1985	4.9	3.1	.03	.03	.13	< .03	3.7
QWC-1A	06/05/1985	4.9	3.2	< .01	.03	.13	< .03	3.7
QWC-1A	07/01/1985	5.0	3.0	.02	.03	.09	< .03	3.8
QWC-1A	08/23/1985	4.7	3.1	.03	.04	.13	< .03	3.7
QWC-1A	10/28/1985	4.5	3.4	.03	.03	.13	< .03	4.0
QWC-1A	12/19/1985	4.7	3.3	.03	.04	.13	< .003	4.0
QWC-1A	02/24/1986	5.5	3.8	.02	.04	.13	.012	4.1
QWC-1B	02/07/1985	5.5	3.1	.02	.02	< .04	< .03	3.7
QWC-1B	03/06/1985	5.2	3.2	.01	.03	.09	< .03	3.5
QWC-1B	04/03/1985	5.1	2.7	.03	.03	.09	< .03	3.4
QWC-1B	05/06/1985	5.0	2.6	.02	.02	.04	< .03	3.3
QWC-1B	06/05/1985	4.7	2.6	< .01	.03	< .04	< .03	3.4
QWC-1B	07/01/1985	4.8	2.6	< .01	.02	< .04	< .03	3.5
QWC-1B	08/23/1985	4.9	2.6	.01	.03	.09	< .03	3.4
QWC-1B	10/28/1985	5.5	2.8	.03	.02	.09	< .03	3.5
QWC-1B	12/19/1985	6.1	2.8	.03	.02	.09	< .003	3.5
QWC-1B	02/24/1986	5.9	2.9	.02	.02	.09	---	3.5
QWC-2A	02/08/1985	9.7	3.3	.03	.02	< .04	< .03	2.7
QWC-2A	03/06/1985	9.5	3.6	.04	.02	< .04	< .03	2.5
QWC-2A	04/05/1985	9.5	3.1	.04	.03	< .04	.03	2.5
QWC-2A	05/06/1985	9.6	3.2	.03	.02	< .04	< .03	2.5
QWC-2A	06/06/1985	9.2	3.3	.03	.02	< .04	< .03	2.6
QWC-2A	07/02/1985	9.1	3.3	.03	.03	< .04	< .03	2.7
QWC-2A	08/26/1985	8.5	3.5	< .01	.02	< .04	< .03	2.9
QWC-2A	10/28/1985	9.2	3.8	.05	.02	.04	< .03	3.3
QWC-2A	12/19/1985	12	3.9	.04	.02	< .04	< .003	2.9
QWC-2A	02/24/1986	12	5.3	.03	.02	< .04	---	2.6
QWC-2B	02/08/1985	3.2	2.9	.02	.02	.00	< .03	4.3
QWC-2B	03/06/1985	3.1	3.3	.01	.03	.04	< .03	4.1
QWC-2B	04/03/1985	3.0	2.8	< .01	.03	.04	< .03	4.1
QWC-2B	05/06/1985	3.1	3.2	.02	.02	.04	< .031	4.0
QWC-2B	06/06/1985	2.9	3.1	< .01	.03	< .04	< .031	4.0
QWC-2B	07/02/1985	2.8	2.9	.02	.03	.04	< .031	3.9
QWC-2B	08/26/1985	2.8	3.0	< .01	.02	< .04	< .031	3.8
QWC-2B	10/28/1985	2.7	3.0	.03	.02	.09	< .031	4.0
QWC-2B	12/19/1985	2.7	3.0	.02	.03	.09	< .003	3.6
QWC-2B	02/24/1986	2.8	3.3	.02	.02	.09	---	3.7
QWC-3A	02/08/1985	.78	2.7	.02	.02	.13	< .03	3.4
QWC-3A	03/07/1985	.80	2.6	.01	.03	.31	< .03	3.5
QWC-3A	04/04/1985	.40	1.2	< .01	.02	.04	< .03	.90
QWC-3A	05/08/1985	.75	2.7	.01	.02	.13	< .03	3.4
QWC-3A	06/07/1985	.73	2.7	< .01	.02	.09	< .03	3.3
QWC-3A	07/02/1985	.74	2.7	< .01	.02	.09	< .03	3.3
QWC-3A	08/26/1985	.71	2.7	< .01	.02	.13	< .03	3.4
QWC-3A	10/29/1985	.72	2.8	.01	.02	.18	< .03	3.5
QWC-3A	12/20/1985	.67	2.7	.02	.02	.13	< .003	3.5
QWC-3A	02/25/1986	.70	2.7	.03	.03	.13	< .003	3.4
QWC-3B	02/08/1985	2.9	3.1	.01	.02	.09	< .031	4.1
QWC-3B	03/07/1985	3.1	3.1	.02	.03	.18	< .031	4.2
QWC-3B	04/04/1985	3.2	3.1	.02	.03	.13	< .031	1.6
QWC-3B	05/08/1985	3.4	3.1	.02	.02	.13	< .031	3.9
QWC-3B	06/07/1985	3.5	3.2	< .01	.03	.09	< .031	4.0
QWC-3B	07/02/1985	3.5	3.1	.02	.03	.09	.061	3.8
QWC-3B	08/26/1985	3.6	3.2	.01	.02	.09	< .031	3.8
QWC-3B	10/29/1985	3.6	3.5	.02	.02	.13	< .031	4.0
QWC-3B	12/20/1985	3.6	3.3	.03	.03	.13	< .003	4.0
QWC-3B	02/25/1986	3.6	3.2	.02	.03	.13	< .003	4.0
QWC-4	02/11/1985	4.4	2.8	.02	.02	.09	< .03	3.5
QWC-4	03/08/1985	4.4	3.0	.01	.02	.13	< .03	3.5
QWC-4	04/05/1985	4.9	2.9	.03	.02	.09	< .03	3.6
QWC-4	05/08/1985	4.5	2.9	.01	.02	.09	< .03	3.6
QWC-4	06/07/1985	4.2	2.9	< .01	.02	.04	< .03	3.5
QWC-4	07/03/1985	5.2	2.9	< .01	.03	.09	< .03	3.6
QWC-4	08/27/1985	6.3	2.9	.01	.02	< .04	< .03	3.7
QWC-4	10/29/1985	6.7	3.1	< .10	.011	< .44	---	4.0
QWC-4	12/20/1985	5.7	2.9	.02	.02	.13	< .003	3.8
QWC-4	02/25/1986	5.6	2.9	.03	.03	.13	.003	3.6

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Sample-collection date	Temperature (°C)	pH (units) field	pH (units) lab	Specific conductance (µS/cm) field	Specific conductance (µS/cm) lab	Dissolved oxygen (mg/l)	Alkalinity (meq/L) District lab	Alkalinity as CaCO3 (mg/L) Central lab	Dissolved organic carbon (mg/L)
QWC-5A	02/07/1985	8.5	5.0	5.6	31	33	8.9	---	< 1	0.3
QWC-5A	03/07/1985	10.0	5.0	5.8	29	32	---	- 0.02	< 1	.3
QWC-5A	04/04/1985	10.0	5.0	6.5	31	14	9.2	---	< 1	1.3
QWC-5A	05/07/1985	11.0	5.0	5.3	32	30	9.5	---	< 1	1.4
QWC-5A	06/06/1985	11.5	4.8	5.1	30	30	---	---	< 1	.5
QWC-5A	07/01/1985	12.0	4.9	5.5	31	31	---	---	< 1	.5
QWC-5A	08/23/1985	15.0	4.7	5.7	30	31	---	---	< 1	---
QWC-5A	10/28/1985	13.5	4.6	5.2	32	32	---	---	< 1	1.0
QWC-5A	12/20/1985	11.5	4.6	5.00	32	29.3	---	- .004*	< .50	.6
QWC-5A	02/24/1986	9.5	4.9	5.03	31	30.8	7.6	- .003*	< .50	1.3
QWC-5B	02/07/1985	10.0	4.8	5.7	19	20	.7	---	< 1	.3
QWC-5B	03/07/1985	12.0	---	5.6	18	16	.9	---	< 1	.2
QWC-5B	04/04/1985	12.0	5.0	5.6	19	21	1.2	---	1	1.6
QWC-5B	05/07/1985	12.0	5.0	5.3	20	19	1.1	---	< 1	1.7
QWC-5B	06/06/1985	12.0	4.9	5.2	19	19	.9	---	< 1	.7
QWC-5B	07/01/1985	12.0	4.9	5.3	19	21	.9	---	< 1	.6
QWC-5B	08/23/1985	13.0	4.8	5.4	19	21	1.8	---	< 1	.5
QWC-5B	10/28/1985	11.5	4.7	5.5	20	22	3.2	---	< 1	1.0
QWC-5B	12/20/1985	10.5	4.8	5.15	20	17.0	3.9	+ .018*	< .50	.6
QWC-5B	02/24/1986	11.5	5.0	5.15	19	16.3	5.4	+ .016*	< .50	1.4
QWH-1A	01/31/1985	4.5	4.0	4.2	74	58	.1	---	< 1	23
QWH-1A	02/27/1985	4.5	---	4.1	76	68	---	---	< 1	13
QWH-1A	02/28/1985	3.5	4.1	4.3	77	67	.1	---	< 1	13
QWH-1A	03/29/1985	7.5	4.0	4.1	77	73	.2	---	< 1	14
QWH-1A	05/01/1985	11.5	4.0	4.2	76	65	.1	---	< 1	18
QWH-1A	05/29/1985	13.5	4.0	4.1	68	65	.3	---	< 1	25
QWH-1A	06/26/1985	14.5	3.9	4.1	66	62	.2	---	< 1	30
QWH-1A	08/20/1985	18.0	3.8	4.0	101	94	.3	---	< 1	18
QWH-1A	10/23/1985	14.0	3.4	3.5	268	241	2.4	---	< 1	17
QWH-1A	12/16/1985	8.0	3.6	3.63	165	149	.4	---	< .50	18
QWH-1A	02/20/1986	4.0	3.7	3.74	138	125	1.1	- .21**	< .50	20
QWH-1B	01/31/1985	11.5	5.0	5.4	28	27	.5	---	< 1	1.1
QWH-1B	02/27/1985	11.5	4.6	5.2	27	29	---	---	1	.7
QWH-1B	02/28/1985	10.5	5.2	5.2	29	30	.9	---	< 1	.7
QWH-1B	03/29/1985	11.5	5.1	5.3	28	30	1.0	---	< 1	.7
QWH-1B	05/01/1985	11.5	5.2	5.4	29	30	1.2	---	< 1	2.0
QWH-1B	05/30/1985	11.0	5.1	5.3	27	29	1.0	.00	1	1.1
QWH-1B	06/26/1985	11.0	4.9	5.3	27	28	1.0	---	< 1	1.2
QWH-1B	08/20/1985	13.0	4.8	5.4	23	26	1.6	---	< 1	1.3
QWH-1B	10/23/1985	11.5	4.7	5.3	25	27	1.7	---	1	1.0
QWH-1B	12/16/1985	11.5	4.8	5.31	26	23.0	1.2	---	1.21	1.5
QWH-1B	02/20/1986	11.0	4.9	5.22	25	20.9	1.0	+ .015*	< .50	2.0
QWH-2A	01/30/1985	9.5	4.6	4.4	51	59	---	---	< 1	3.9
QWH-2A	03/01/1985	10.0	4.8	5.0	54	55	---	---	< 1	2.6
QWH-2A	03/28/1985	10.0	4.9	4.9	55	56	.3	---	< 1	3.1
QWH-2A	04/30/1985	12.5	4.8	---	62	66	---	---	< 1	4.0
QWH-2A	05/29/1985	11.0	4.8	4.7	58	60	---	---	< 1	4.0
QWH-2A	06/25/1985	13.5	4.9	4.7	---	56	---	---	< 1	4.5
QWH-2A	08/20/1985	17.0	5.2	4.9	55	55	---	---	< 1	4.8
QWH-2A	10/23/1985***									
QWH-2A	12/16/1985***									
QWH-2A	02/20/1986	9.0	4.4	4.12	61	74.2	---	- .07 **	< .50	4.6
QWH-2B	01/30/1985	11.5	4.5	5.2	27	27	1.6	---	< 1	.8
QWH-2B	03/01/1985	11.5	4.8	5.3	26	27	1.6	---	< 1	.5
QWH-2B	03/28/1985	12.0	4.8	5.0	27	26	1.6	---	4	.4
QWH-2B	04/30/1985	12.0	4.7	5.2	26	21	1.4	---	1	1.6
QWH-2B	05/29/1985	11.5	4.8	5.0	25	26	1.4	.00	< 1	.7
QWH-2B	06/25/1985	11.5	4.8	5.1	---	25	1.3	---	< 1	.9
QWH-2B	08/20/1985	13.0	5.8	5.4	24	26	1.7	---	< 1	.7
QWH-2B	10/23/1985***	11.5	4.7	5.4	25	26	1.5	---	< 1	1.1
QWH-2B	12/16/1985***	11.5	4.9	5.05	26	23.8	2.2	+ .010*	< .50	1.3
QWH-2B	02/20/1986	12.0	4.8	5.56	24	20.7	5.5	+ .009*	< .50	1.4
QWH-3A	02/01/1985	9.0	4.5	4.8	39	34	---	---	< 1	.6
QWH-3A	03/04/1985	8.5	4.5	4.8	37	34	---	---	< 1	.5
QWH-3A	04/01/1985	10.5	4.5	4.7	38	36	---	---	< 1	.5
QWH-3A	05/01/1985	15.5	5.3	4.8	39	33	8.5	---	< 1	1.5
QWH-3A	05/31/1985	13.5	5.6	4.6	38	36	---	---	< 1	.7
QWH-3A	06/26/1985***									
QWH-3A	08/20/1985***									
QWH-3A	10/24/1985***									
QWH-3A	12/17/1985***									
QWH-3A	02/25/1986	9.0	4.5	4.50	38	39.4	---	- .02**	< .50	5.2

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Collection date	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (µg/L)	Manganese (µg/L)	Lead (µg/L)
QWC-5A	02/07/1985	1.1	0.80	1.7	0.33	---	50	41	70	19
QWC-5A	03/07/1985	1.1	.80	1.6	.34	---	60	28	78	21
QWC-5A	04/04/1985	0.50	.30	.7	.14	---	20	< 3	35	11
QWC-5A	05/07/1985	1.1	.80	1.6	.39	---	50	22	73	6
QWC-5A	06/06/1985	1.2	.80	1.6	.33	---	70	24	82	10
QWC-5A	07/01/1985	1.2	.75	1.6	.36	---	60	21	80	7
QWC-5A	08/23/1985	1.1	.72	1.5	.41	---	50	29	81	---
QWC-5A	10/28/1985	1.1	1.0	2.0	.44	---	70	21	87	5
QWC-5A	12/20/1985	1.2	.80	1.6	.40	0.005	83	< 2.0	90	6.2
QWC-5A	02/24/1986	1.3	.80	1.7	.36	.001	100	< 2.0	100	6.6
QWC-5B	02/07/1985	.20	.30	1.8	.27	---	40	6	4	< 1
QWC-5B	03/07/1985	.30	.30	1.6	.26	---	40	5	5	9
QWC-5B	04/04/1985	---	---	---	---	---	10	< 3	< 1	< 1
QWC-5B	05/07/1985	.30	.30	1.6	.27	---	30	11	5	< 1
QWC-5B	06/06/1985	.30	.40	1.7	.28	---	40	7	5	5
QWC-5B	07/01/1985	.26	.28	1.6	.30	---	30	5	< 1	3
QWC-5B	08/23/1985	.26	.38	1.6	.33	---	30	15	5	< 1
QWC-5B	10/28/1985	.32	.31	2.0	.32	---	20	6	5	< 1
QWC-5B	12/20/1985	.30	.40	1.6	.33	.006	32	4.6	2.8	< .5
QWC-5B	02/24/1986	.30	.40	1.7	.32	.018	37	< 2.0	1.8	< .5
QWH-1A	01/31/1985	.40	.08	1.9	.13	---	1,000	3,300	10	4
QWH-1A	02/27/1985	.30	.20	2.3	.10	---	890	3,800	7	< 1
QWH-1A	02/28/1985	.30	.20	2.3	.09	---	880	3,700	4	< 1
QWH-1A	03/29/1985	.40	.30	2.2	.16	---	880	4,200	6	8
QWH-1A	05/01/1985	.40	.20	2.1	.15	---	920	3,500	11	2
QWH-1A	05/29/1985	.40	.20	2.0	.14	---	1,200	2,900	6	3
QWH-1A	06/26/1985	.34	.18	2.2	.16	---	1,200	2,900	9	1
QWH-1A	08/20/1985	.70	.60	3.0	.27	---	970	5,000	18	2
QWH-1A	10/23/1985	3.1	2.0	4.0	.58	---	5,200	1,300	70	< 1
QWH-1A	12/16/1985	.70	.60	1.7	.18	.060	2,700	539	20	1
QWH-1A	02/20/1986	.90	.50	3.0	.12	.051	2,200	320	22	2.8
QWH-1B	01/31/1985	.50	.30	1.7	.18	---	70	2,600	11	2
QWH-1B	02/27/1985	.40	.30	1.9	.17	---	90	2,700	< 1	< 1
QWH-1B	02/28/1985	.40	.30	1.9	.17	---	90	2,700	< 1	< 1
QWH-1B	03/29/1985	.36	.33	1.8	.18	---	100	2,600	4	< 1
QWH-1B	05/01/1985	.40	.30	1.8	.17	---	110	2,600	6	4
QWH-1B	05/30/1985	.40	.30	1.8	.15	---	110	2,600	1	1
QWH-1B	06/26/1985	.40	.30	1.8	.19	---	110	2,400	6	2
QWH-1B	08/20/1985	.40	.30	1.7	.20	---	120	1,200	6	1
QWH-1B	10/23/1985	.32	.30	2.0	.22	---	130	990	7	< 1
QWH-1B	12/16/1985	.30	.30	1.8	.20	.014	120	1,500	9.1	< 1
QWH-1B	02/20/1986	.30	.30	1.8	.19	.012	140	1,100	4.9	< .5
QWH-2A	01/30/1985	.30	.30	2.2	.08	---	910	4,600	14	< 1
QWH-2A	03/01/1985	.40	.30	2.0	.07	---	650	6,400	7	6
QWH-2A	03/28/1985	.41	.37	2.1	.08	---	570	7,000	7	3
QWH-2A	04/30/1985	.54	.40	1.9	.06	---	990	6,200	13	< 1
QWH-2A	05/29/1985	.30	.30	2.0	.08	---	1,000	6,700	7	< 1
QWH-2A	06/25/1985	.30	.30	2.0	.09	---	1,100	5,900	11	< 1
QWH-2A	08/20/1985	.30	.30	2.0	.12	---	1,000	6,000	8	3
QWH-2A	10/23/1985***									
QWH-2A	12/16/1985***									
QWH-2A	02/20/1986	.30	.30	2.5	.07	.032	1,600	2,700	9.5	< .5
QWH-2B	01/30/1985	.60	.60	1.5	.19	---	60	8	20	5
QWH-2B	03/01/1985	.70	.50	1.6	.18	---	60	12	11	10
QWH-2B	03/28/1985	.70	.59	1.7	.19	---	50	7	16	2
QWH-2B	04/30/1985	.70	.60	1.6	.18	---	50	15	19	< 1
QWH-2B	05/29/1985	.70	.60	1.7	.19	---	60	12	20	3
QWH-2B	06/25/1985	.70	.60	1.6	.21	---	60	16	17	4
QWH-2B	08/20/1985	.60	.60	1.6	.21	---	50	5	16	3
QWH-2B	10/23/1985	1.0	1.0	1.5	.22	---	50	7	17	< 1
QWH-2B	12/16/1985	.75	1.1	1.6	.21	.008	65	8.0	29	1.8
QWH-2B	02/20/1986	.70	.50	1.7	.21	.006	59	< 2.0	19	< .5
QWH-3A	02/01/1985	.60	.20	1.1	.10	---	740	110	110	2
QWH-3A	03/04/1985	.70	.20	1.4	.07	---	960	63	110	< 1
QWH-3A	04/01/1985	.69	.21	1.2	.09	---	800	24	110	6
QWH-3A	05/01/1985	.80	.20	1.1	.07	---	740	53	110	8
QWH-3A	05/31/1985	.70	.20	1.2	.09	---	760	41	110	1
QWH-3A	06/26/1985***									
QWH-3A	08/20/1985***									
QWH-3A	10/24/1985***									
QWH-3A	12/17/1985***									
QWH-3A	02/25/1986	.70	.20	1.4	.36	.069	880	25	130	---

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Sample-collection date	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
QWC-5A	02/07/1985	5.7	3.1	0.03	0.02	< 0.04	< 0.03	3.4
QWC-5A	03/07/1985	5.8	2.9	.03	.03	.09	< .03	3.1
QWC-5A	04/04/1985	2.2	.84	.02	.01	< .04	< .03	1.4
QWC-5A	05/07/1985	5.9	3.0	.03	.02	.09	< .03	3.1
QWC-5A	06/06/1985	6.1	3.0	.02	.03	.04	< .03	3.1
QWC-5A	07/01/1985	6.0	3.0	.02	.02	< .04	< .03	3.2
QWC-5A	08/23/1985	5.6	3.1	.03	.03	< .13	< .03	3.2
QWC-5A	10/28/1985	5.6	3.2	.04	.02	.09	< .03	3.4
QWC-5A	12/20/1985	6.3	3.1	.03	.02	.09	.003	3.1
QWC-5A	02/24/1986	6.9	3.3	.03	.02	.09	< .003	3.0
QWC-5B	02/07/1985	1.2	2.9	.03	.02	.09	< .03	4.2
QWC-5B	03/07/1985	1.3	2.8	< .01	.03	.13	< .03	4.0
QWC-5B	04/04/1985	1.2	2.9	< .01	.03	.09	< .03	1.1
QWC-5B	05/07/1985	1.2	3.0	.02	.02	.09	< .03	4.0
QWC-5B	06/06/1985	1.3	3.0	< .01	.03	.04	< .03	4.2
QWC-5B	07/01/1985	1.2	2.9	< .01	.02	.04	< .03	4.2
QWC-5B	08/23/1985	1.3	2.8	.01	.03	.09	< .03	4.1
QWC-5B	10/28/1985	1.4	3.1	.02	.02	.09	< .03	4.1
QWC-5B	12/20/1985	1.5	3.1	.03	.03	.09	< .003	4.1
QWC-5B	02/24/1986	1.7	3.0	.01	.03	.13	< .003	4.0
QWH-1A	01/31/1985	7.4	4.4	< .01	.03	< .04	< .03	5.4
QWH-1A	02/27/1985	9.8	4.9	.03	.03	< .04	.03	5.2
QWH-1A	02/28/1985	9.6	5.0	.03	.03	< .04	< .03	5.1
QWH-1A	03/29/1985	13	5.2	.04	.03	.13	.06	4.9
QWH-1A	05/01/1985	7.8	4.5	.04	.03	< .04	.09	4.8
QWH-1A	05/29/1985	4.5	5.9	.03	.04	< .04	.12	5.6
QWH-1A	06/26/1985	2.6	6.4	.05	.05	.09	.12	6.6
QWH-1A	08/20/1985	16	5.7	.04	.04	< .04	.06	7.4
QWH-1A	10/23/1985	58	7.3	.3	< .010	---	---	6.4
QWH-1A	12/16/1985	22	8.0	.1	< .010	< .44	.040	4.0
QWH-1A	02/20/1986	19	6.3	.1	< .010	< .44	.031	4.8
QWH-1B	01/31/1985	3.0	3.3	.01	.02	< .04	< .03	4.9
QWH-1B	02/27/1985	3.1	3.4	.02	.03	.09	< .03	4.9
QWH-1B	02/28/1985	3.1	3.4	.01	.03	.09	< .03	4.9
QWH-1B	03/29/1985	3.2	3.2	< .01	.03	.09	< .03	5.0
QWH-1B	05/01/1985	3.0	3.1	.02	.03	< .04	< .03	4.9
QWH-1B	05/30/1985	3.3	3.3	.02	.03	.22	< .03	4.9
QWH-1B	06/26/1985	3.0	3.5	.02	.03	< .04	< .03	4.9
QWH-1B	08/20/1985	2.8	3.5	.02	.03	.04	< .03	4.8
QWH-1B	10/23/1985	2.7	3.6	.02	.03	.09	< .03	5.0
QWH-1B	12/16/1985	2.6	3.2	.02	.03	.09	.006	5.0
QWH-1B	02/20/1986	2.9	3.5	.02	.03	.04	< .003	4.8
QWH-2A	01/30/1985	12	4.2	.02	.02	< .04	< .03	4.5
QWH-2A	03/01/1985	11	4.3	.04	.03	.09	.06	4.2
QWH-2A	03/28/1985	11	4.4	.05	.03	.04	< .03	4.2
QWH-2A	04/30/1985	12	4.6	.05	.03	< .04	< .03	4.2
QWH-2A	05/29/1985	14	4.8	.04	.03	< .04	< .03	4.2
QWH-2A	06/25/1985	13	4.8	.06	.03	< .04	< .03	4.1
QWH-2A	10/23/1985***							
QWH-2A	12/16/1985***							
QWH-2A	08/20/1985	12	5.0	.07	.04	< .04	< .03	4.2
QWH-2A	02/20/1986	12	5.6	.02	.03	< .04	< .003	4.2
QWH-2B	01/30/1985	2.4	3.4	< .01	.02	.09	< .03	3.9
QWH-2B	03/01/1985	2.5	3.0	.01	.03	.13	< .03	4.0
QWH-2B	03/28/1985	2.6	3.2	.02	.03	.09	.06	4.1
QWH-2B	04/30/1985	2.4	3.3	< .10	.022	< .44	---	3.9
QWH-2B	05/29/1985	2.7	3.5	.01	.03	.04	< .03	4.0
QWH-2B	06/25/1985	2.7	3.4	.01	.03	< .04	< .03	3.9
QWH-2B	08/20/1985	2.5	3.5	.02	.03	.09	< .03	3.9
QWH-2B	10/23/1985	2.5	3.6	.02	.03	.09	< .03	4.0
QWH-2B	12/16/1985	2.7	3.2	.02	.03	.13	.012	3.2
QWH-2B	02/20/1986	2.9	3.6	.01	.03	.13	< .003	3.6
QWH-3A	02/01/1985	7.3	2.3	< .01	.02	.04	< .03	1.9
QWH-3A	03/04/1985	7.3	2.7	.02	.02	.18	< .03	1.9
QWH-3A	04/01/1985	7.3	2.2	.04	.02	.18	< .03	1.9
QWH-3A	05/01/1985	7.2	2.1	.04	.02	.04	< .03	1.9
QWH-3A	05/31/1985	7.6	2.4	.04	.02	.09	< .03	1.9
QWH-3A	06/26/1985***							
QWH-3A	08/20/1985***							
QWH-3A	10/24/1985***							
QWH-3A	12/17/1985***							
QWH-3A	02/25/1986	7.8	2.6	.03	.03	.13	.077	1.9

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Sample-collection date	Temperature (°C)	pH (units) field	pH (units) lab	Specific conductance (µS/cm) field	Specific conductance (µS/cm) lab	Dissolved oxygen (mg/l)	Alkalinity (meq/L) District lab	Alkalinity as $CaCO_3$ (mg/L) Central lab	Dissolved organic carbon (mg/L)
QWH-3B	02/01/1985	11.5	4.8	5.2	40	41	8.3	---	< 1	0.8
QWH-3B	03/04/1985	11.0	4.9	5.3	39	41	---	---	< 1	.4
QWH-3B	04/01/1985	11.5	4.9	5.1	40	41	11.7	---	< 1	.4
QWH-3B	05/01/1985	12.5	4.8	5.3	41	36	9.2	---	1	1.7
QWH-3B	05/31/1985	11.5	4.9	5.2	40	40	9.1	---	< 1	.8
QWH-3B	06/26/1985	12.0	4.7	5.1	40	40	8.9	---	< 1	1.2
QWH-3B	08/21/1985	13.0	4.8	5.3	38	40	8.7	---	< 1	1.5
QWH-3B	10/24/1985	12.0	4.8	5.4	39	40	8.7	---	< 1	1.0
QWH-3B	12/17/1985	10.5	4.8	5.02	39	37.9	8.7	+0.002*	< .50	2.8
QWH-3B	02/25/1986	11.0	4.8	4.87	33	35.9	7.9	+ .002*	< .50	1.8
QWH-4A	01/30/1985	11.5	4.7	5.4	36	38	8.7	---	< 1	.7
QWH-4A	03/01/1985	10.5	5.0	5.6	36	39	8.6	---	< 1	.4
QWH-4A	03/28/1985	11.0	5.1	5.2	37	37	8.6	---	< 1	.3
QWH-4A	05/01/1985	11.0	5.0	5.4	38	37	8.2	---	1	1.6
QWH-4A	05/30/1985	11.0	5.0	5.1	37	38	7.6	---	< 1	.7
QWH-4A	06/26/1985	11.0	4.7	5.1	37	38	8.2	---	< 1	.8
QWH-4A	08/21/1985	14.0	4.8	5.5	35	37	8.2	---	< 1	1.4
QWH-4A	10/24/1985	13.0	4.7	5.1	35	36	7.3	---	< 1	1.0
QWH-4A	12/17/1985	11.5	4.8	5.03	35	34.2	7.2	- .001*	< .50	.7
QWH-4A	02/20/1986	11.0	4.9	4.97	33	33.6	7.3	- .001*	< .50	2.0
QWH-4B	01/31/1985	11.5	4.9	5.4	33	36	5.7	---	< 1	.7
QWH-4B	03/01/1985	11.5	5.1	5.6	33	37	5.7	---	< 1	.3
QWH-4B	03/28/1985	12.5	5.1	5.3	32	34	6.0	---	1	4.4
QWH-4B	05/01/1985	12.5	5.1	5.6	34	35	5.7	---	1	1.3
QWH-4B	05/30/1985	12.0	5.1	5.3	32	34	5.4	---	1	.8
QWH-4B	06/26/1985	11.5	5.1	5.1	32	36	5.8	---	< 1	.8
QWH-4B	08/21/1985	13.0	5.0	5.5	31	35	6.1	---	1	.8
QWH-4B	10/24/1985	11.5	5.0	5.6	32	35	5.5	---	< 1	.8
QWH-4B	12/17/1985	10.5	5.1	5.34	32	30.8	6.1	---	1.07	1.5
QWH-4B	02/20/1986	12.0	5.1	---	31	29.3	6.6	---	.85	1.4
QWH-5A†	12/23/1985††	---	4.4†††	---	96†††	---	---	---	---	---
QWH-5A	02/26/1986***									
QWH-5B†	12/23/1985	10.0	5.9	5.83	62	35.4	.3	---	4.29	3.0
QWH-5B	02/26/1986‡									
QWO-1A	02/04/1985	8.5	5.2	5.8	65	63	0.1	---	< 1	4.7
QWO-1A	03/04/1985	7.5	5.1	5.5	69	73	---	---	4	3.6
QWO-1A	04/01/1985	10.0	5.4	5.6	70	76	.2	---	< 1	5.2
QWO-1A	05/02/1985	10.5	5.4	5.5	66	66	.3	---	< 1	7.6
QWO-1A	05/31/1985	13.0	5.2	5.6	61	64	.2	- .15	< 1	4.1
QWO-1A	06/27/1985	14.0	5.4	5.7	59	63	.1	---	< 1	3.6
QWO-1A	08/21/1985	17.5	5.3	5.7	50	58	.2	---	3	3.5
QWO-1A	10/24/1985	15.0	5.3	5.6	62	66	.4	---	5	5.3
QWO-1A	12/17/1985	10.5	5.3	5.45	72	68.3	.3	---	5.45	8.0
QWO-1A	02/21/1986	8.0	5.4	4.68	76	68.4	.3	+ .004*	< .50	8.4
QWO-1B	02/04/1985	11.5	4.6	4.9	43	42	7.3	---	< 1	1.4
QWO-1B	03/04/1985	11.0	4.0	4.9	43	42	---	---	< 1	.5
QWO-1B	04/01/1985	12.0	4.6	5.0	44	42	7.9	---	---	1.4
QWO-1B	05/02/1985	12.5	4.8	4.9	42	41	7.6	---	< 1	3.0
QWO-1B	05/31/1985	11.5	6.1	4.7	43	43	7.5	- .07	< 1	.9
QWO-1B	06/27/1985	11.5	4.6	4.9	42	41	6.9	---	< 1	1.3
QWO-1B	08/21/1985	13.5	4.6	4.8	40	42	7.4	---	< 1	1.3
QWO-1B	10/24/1985	12.0	4.6	4.9	43	41	7.8	---	< 1	1.3
QWO-1B	12/17/1985	11.0	4.7	4.62	43	43.7	7.5	- .013*	< .50	.8
QWO-1B	02/21/1986	12.0	4.6	4.68	42	42.7	6.7	- .017*	< .50	1.4
QWO-2A	02/04/1985	6.5	3.8	3.7	115	122	.5	---	< 1	32
QWO-2A	03/05/1985	8.0	3.6	3.8	141	112	.6	---	< 1	17
QWO-2A	04/02/1985	8.5	3.8	3.7	148	124	.7	---	---	16
QWO-2A	05/02/1985	10.0	3.6	3.8	143	119	7.5	---	< 1	17
QWO-2A	06/04/1985	12.0	3.6	3.7	146	127	---	---	---	18
QWO-2A	06/27/1985	13.0	3.5	3.8	146	124	---	---	---	19
QWO-2A	08/22/1985	16.0	3.7	3.9	120	105	---	---	< 1	15
QWO-2A	10/25/1985	15.0	3.6	3.8	167	149	---	---	< 1	17
QWO-2A	12/18/1985	9.0	3.3	3.37	292	260	---	---	< .50	27
QWO-2A	02/21/1986	7.5	3.3	3.48	208	176	4.5	- .42**	< .50	38

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Collection date	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (µg/L)	Manganese (µg/L)	Lead (µg/L)
QWH-3B	02/01/1985	1.8	1.0	1.7	0.37	---	60	13	63	4
QWH-3B	03/04/1985	1.9	1.1	2.0	.37	---	80	7	60	< 1
QWH-3B	04/01/1985	1.8	1.1	1.9	.37	---	70	4	59	1
QWH-3B	05/01/1985	1.8	1.1	1.9	.38	---	100	11	59	1
QWH-3B	05/31/1985	1.7	1.1	1.9	.40	---	100	17	57	< 1
QWH-3B	06/26/1985	1.7	1.1	1.9	.38	---	110	14	61	2
QWH-3B	08/21/1985	1.7	1.1	1.8	.38	---	130	5	58	3
QWH-3B	10/24/1985	2.0	1.0	2.0	.42	---	100	12	60	2
QWH-3B	12/17/1985	1.7	1.0	1.9	.38	0.005	120	< 2.0	60	.6
QWH-3B	02/25/1986	1.6	.90	2.1	.40	.022	150	< 2.0	61	---
QWH-4A	01/30/1985	1.9	.50	1.7	.29	---	120	6	86	8
QWH-4A	03/01/1985	2.0	.80	1.8	.29	---	110	22	84	10
QWH-4A	03/28/1985	2.0	.78	1.9	.30	---	130	5	82	4
QWH-4A	05/01/1985	1.9	.70	1.9	.24	---	170	13	84	< 1
QWH-4A	05/30/1985	1.8	.80	2.1	.27	---	210	11	83	< 1
QWH-4A	06/26/1985	1.8	.65	2.1	.25	---	200	20	85	3
QWH-4A	08/21/1985	1.8	.70	1.9	.33	---	190	18	84	2
QWH-4A	10/24/1985	1.8	1.0	2.0	.36	---	190	12	87	< 1
QWH-4A	12/17/1985	1.8	.60	1.6	.31	.008	230	< 2.0	86	< .5
QWH-4A	02/20/1986	1.6	.50	1.6	.23	.006	370	< 2.0	73	< .5
QWH-4B	01/31/1985	1.5	1.0	1.4	.31	---	40	9	30	2
QWH-4B	03/01/1985	1.6	1.0	1.5	.30	---	30	< 3	26	10
QWH-4B	03/28/1985	1.6	1.0	1.5	.30	---	30	4	29	2
QWH-4B	05/01/1985	1.6	1.0	1.5	.30	---	30	12	30	3
QWH-4B	05/30/1985	1.6	1.1	1.6	.29	---	30	6	28	1
QWH-4B	06/26/1985	1.6	.99	1.6	.27	---	30	6	28	< 1
QWH-4B	08/21/1985	1.5	1.0	1.5	.30	---	20	5	26	< 1
QWH-4B	10/24/1985	1.5	1.0	1.4	.32	---	30	3	25	< 1
QWH-4B	12/17/1985	1.6	1.1	1.6	.32	.008	27	8.0	29	< .5
QWH-4B	02/20/1986	1.5	1.0	1.7	.29	.004	36	< 2.0	23	< .5
QWH-5A	12/23/1985	---	---	---	---	---	2,600	---	---	---
QWH-5A	02/26/1986									
QWH-5B	12/23/1985	.30	.30	1.6	.20	.067	26	14,000	28	< .5
QWH-5B	02/26/1986									
QWO-1A	02/04/1985	1.1	.70	1.8	.25	---	180	9,000	29	< 1
QWO-1A	03/04/1985	1.2	.70	2.1	.26	---	200	---	27	1
QWO-1A	04/01/1985	1.2	.80	2.0	.29	---	190	11,000	28	< 1
QWO-1A	05/02/1985	1.2	.70	1.9	.25	---	180	8,900	36	< 1
QWO-1A	05/31/1985	1.2	.70	1.8	.27	---	200	8,700	24	1
QWO-1A	06/27/1985	1.2	.63	1.8	.24	---	160	8,400	33	2
QWO-1A	08/21/1985	1.3	.60	1.8	.31	---	140	7,500	41	3
QWO-1A	10/24/1985	1.2	1.0	2.0	.33	---	180	8,600	39	< 1
QWO-1A	12/17/1985	1.3	.80	2.1	.38	1.0	270	10,000	60	< .5
QWO-1A	02/21/1986	1.2	.70	2.3	.37	1.2	300	10,000	52	---
QWO-1B	02/04/1985	1.2	.40	1.7	.27	---	830	7	77	< 1
QWO-1B	03/04/1985	1.3	.50	2.0	.26	---	880	10	67	< 1
QWO-1B	04/01/1985	1.3	.40	1.8	.27	---	860	7	7	< 1
QWO-1B	05/02/1985	1.2	.50	1.9	.27	---	820	6	68	< 1
QWO-1B	05/31/1985	1.3	.50	1.8	.24	---	840	9	68	< 1
QWO-1B	06/27/1985	1.2	.47	1.8	.21	---	860	8	61	2
QWO-1B	08/21/1985	1.1	.40	1.8	.21	---	970	39	63	2
QWO-1B	10/24/1985	1.0	.40	2.0	.21	---	1,000	8	63	1
QWO-1B	12/17/1985	1.0	.40	1.8	.26	.01	990	2.3	63	3.4
QWO-1B	02/21/1986	1.0	.40	1.8	.21	.005	1,100	< 2	63	---
QWO-2A	02/04/1985	.40	.40	1.7	.08	---	1,500	3,900	13	< 1
QWO-2A	03/05/1985	.40	.40	2.1	.08	---	1,700	3,800	< 1	< 1
QWO-2A	04/02/1985	.40	.30	1.9	.09	---	1,500	4,900	3	5
QWO-2A	05/02/1985	.40	.30	1.9	.10	---	1,400	5,900	8	3
QWO-2A	06/04/1985	.43	.41	2.1	.10	---	1,500	4,700	3	< 1
QWO-2A	06/27/1985	.45	.40	2.2	.15	---	1,400	3,900	2	4
QWO-2A	08/22/1985	.51	.42	1.9	.15	---	1,300	4,100	9	2
QWO-2A	10/25/1985	1.0	1.0	2.4	.11	---	4,000	980	11	1
QWO-2A	12/18/1985	.50	.70	3.3	.22	.037	6,100	560	8.7	1.8
QWO-2A	02/21/1986	.20	.40	2.4	.07	.031	3,600	540	4.2	1.0

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Sample-collection date	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
QWH-3B	02/01/1985	7.9	3.3	0.02	0.02	< 0.04	< 0.03	3.7
QWH-3B	03/04/1985	7.6	3.3	.03	.03	.18	< .03	3.8
QWH-3B	04/01/1985	7.6	3.4	.04	.03	.31	< .03	3.8
QWH-3B	05/01/1985	7.8	3.4	.03	.03	.04	< .03	3.7
QWH-3B	05/31/1985	7.9	3.5	.03	.03	.09	< .03	3.6
QWH-3B	06/26/1985	8.0	3.7	.03	.03	.04	< .03	3.7
QWH-3B	08/21/1985	7.8	3.6	.04	.03	.04	< .03	3.7
QWH-3B	10/24/1985	7.7	3.4	.05	.02	.09	< .03	4.0
QWH-3B	12/17/1985	7.6	3.5	.03	.03	.09	.006	3.9
QWH-3B	02/25/1986	8.1	3.8	.04	.03	.09	.003	3.8
QWH-4A	01/30/1985	7.3	3.4	.02	.02	.09	< .03	2.7
QWH-4A	03/01/1985	7.1	3.3	.03	.03	.18	< .03	2.7
QWH-4A	03/28/1985	7.2	3.3	.03	.03	.13	< .03	2.7
QWH-4A	05/01/1985	7.4	3.1	.03	.02	.09	< .03	2.7
QWH-4A	05/30/1985	7.7	3.4	.03	.02	.13	< .03	2.7
QWH-4A	06/26/1985	7.6	3.9	.03	.02	.09	< .03	2.8
QWH-4A	08/21/1985	7.5	3.5	.04	.03	.09	< .03	2.8
QWH-4A	10/24/1985	7.3	3.3	.05	.02	.13	< .03	3.0
QWH-4A	12/17/1985	7.3	3.2	.04	.04	.09	.006	2.9
QWH-4A	02/20/1986	7.3	3.3	.04	.02	< .04	< .003	2.8
QWH-4B	01/31/1985	6.6	2.8	.01	.02	.09	< .03	3.1
QWH-4B	03/01/1985	6.5	2.7	.02	.03	.18	< .03	3.1
QWH-4B	03/28/1985	6.6	2.8	.03	.03	.13	< .03	3.1
QWH-4B	05/01/1985	6.6	2.7	.02	.02	.09	< .03	3.1
QWH-4B	05/30/1985	6.8	3.0	.02	.03	.18	< .03	3.1
QWH-4B	06/26/1985	6.6	2.8	.03	.03	1.46	< .03	3.1
QWH-4B	08/21/1985	6.6	2.8	.04	.03	.13	.03	3.1
QWH-4B	10/24/1985	6.6	2.9	.04	.03	.13	< .03	3.1
QWH-4B	12/17/1985	6.4	3.0	.02	.03	.13	.006	3.2
QWH-4B	02/20/1986	6.1	3.4	.02	.03	.13	< .003	3.0
QWH-5A	12/23/1985	---	---	---	---	---	---	---
QWH-5A	02/26/1986							
QWH-5B	12/23/1985	7.5	4.0	.02	.03	< .04	< .003	5.2
QWH-5B	02/26/1986							
QWO-1A	02/04/1985	16	3.5	.03	.02	< 0.04	< .03	5.1
QWO-1A	03/04/1985	17	3.4	.02	.02	< .04	< .03	6.3
QWO-1A	04/01/1985	18	3.4	.04	.02	.04	< .03	7.5
QWO-1A	05/02/1985	15	4.0	.03	.02	< .04	< .03	6.0
QWO-1A	05/31/1985	15	3.8	.03	.02	< .04	< .03	5.2
QWO-1A	06/27/1985	14	3.6	.02	.02	< .04	< .03	5.1
QWO-1A	08/21/1985	12	3.7	.02	.03	< .04	< .03	3.9
QWO-1A	10/24/1985	13	4.1	.04	.03	< .04	< .03	5.3
QWO-1A	12/17/1985	16	4.9	.03	.03	< .04	.009	11
QWO-1A	02/21/1986	17	4.8	< .01	.05	< .04	.003	13
QWO-1B	02/04/1985	9.3	3.3	.02	.02	< .04	< .03	2.6
QWO-1B	03/04/1985	8.9	3.2	.03	.02	.04	< .03	2.6
QWO-1B	04/01/1985	8.8	3.3	< .10	< .01	< .04	< .03	2.6
QWO-1B	05/02/1985	9.0	3.3	.03	.02	< .04	< .03	2.5
QWO-1B	05/31/1985	8.8	3.8	.02	.02	< .04	< .03	2.6
QWO-1B	06/27/1985	9.5	3.4	.01	.02	< .04	< .03	2.6
QWO-1B	08/21/1985	9.6	3.5	.02	.02	< .04	< .03	2.0
QWO-1B	10/24/1985	9.4	3.3	.03	.02	.09	< .03	2.3
QWO-1B	12/17/1985	8.9	3.4	.02	.02	.09	.006	2.4
QWO-1B	02/21/1986	9.2	3.4	< .01	.02	< .04	< .003	2.5
QWO-2A	02/04/1985	24	5.0	< .1	.26	< .44	< .03	6.5
QWO-2A	03/05/1985	24	4.8	< .1	.066	---	---	5.8
QWO-2A	04/02/1985	27	5.3	< .1	< .010	< .44	< .03	5.2
QWO-2A	05/02/1985	25	4.6	.1	< .010	< .44	---	4.9
QWO-2A	06/04/1985	29	5.2	< .1	.20	< .44	---	6.0
QWO-2A	06/27/1985	23	4.9	< .1	.072	< .44	---	5.8
QWO-2A	08/22/1985	20	4.4	.1	< .010	< .44	---	5.1
QWO-2A	10/25/1985	42	4.7	.2	< .010	---	---	7.0
QWO-2A	12/18/1985	53	6.5	---	.035	< .44	.043	6.2
QWO-2A	02/21/1986	44	5.0	.1	.093	< .44	.031	3.6

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Sample-collection date	Temperature (°C)	pH (units) field	pH (units) lab	Specific conductance (µS/cm) field	Specific conductance (µS/cm) lab	Dissolved oxygen (mg/l)	Alkalinity (meq/L) District lab	Alkalinity as $CaCO_3$ (mg/L) Central lab	Dissolved organic carbon (mg/L)
QWO-2B	02/04/1985	11.5	4.5	4.8	43	42	4.4	---	< 1	1.1
QWO-2B	03/05/1985	11.5	4.5	---	45	42	4.8	---	< 1	.6
QWO-2B	04/02/1985	11.0	4.7	4.8	44	42	4.3	---	< 1	1.4
QWO-2B	05/02/1985	10.5	4.5	4.5	46	46	3.8	---	< 1	2.9
QWO-2B	06/04/1985	10.5	4.6	4.6	45	45	4.0	---	< 1	1.0
QWO-2B	06/27/1985	11.0	4.0	4.7	44	42	3.9	---	< 1	1.0
QWO-2B	08/22/1985	13.0	4.5	4.7	41	41	4.6	---	< 1	1.1
QWO-2B	10/25/1985	12.5	4.5	4.8	43	41	4.8	---	< 1	1.2
QWO-2B	12/18/1985	11.5	4.4	4.54	45	42.7	3.6	-0.011*	< .50	1.1
QWO-2B	02/21/1986	12.0	4.3	4.59	45	45.6	3.2	- .020*	< .50	2.1
QWO-3A	02/05/1985	10.0	4.6	4.8	47	46	8.4	---	< 1	1.1
QWO-3A	03/05/1985	10.0	4.5	4.8	48	45	8.4	---	< 1	.7
QWO-3A	04/02/1985	9.5	4.6	4.8	48	46	8.7	---	< 1	1.3
QWO-3A	05/03/1985	10.0	4.5	4.7	48	47	7.3	---	< 1	2.0
QWO-3A	06/04/1985	10.5	4.5	4.6	48	49	8.8	- .03	< 1	1.1
QWO-3A	06/28/1985	11.5	4.5	4.8	48	46	8.5	---	< 1	1.1
QWO-3A	08/22/1985	14.0	4.5	4.7	47	46	8.6	---	< 1	1.3
QWO-3A	10/25/1985	13.5	4.4	4.8	49	46	7.9	---	< 1	1.4
QWO-3A	12/18/1985	10.5	4.4	4.51	49	47.6	7.5	---	< .50	1.3
QWO-3A	02/21/1986	10.5	4.5	4.54	44	48.8	7.4	- .025*	< .50	1.4
QWO-3B	02/05/1985	11.0	4.7	5.3	38	36	8.6	---	< 1	.8
QWO-3B	03/05/1985	11.5	4.6	5.1	39	37	8.9	---	< 1	.5
QWO-3B	04/02/1985	11.5	4.7	5.1	39	37	9.0	---	< 1	1.3
QWO-3B	05/03/1985	11.0	4.7	4.7	40	40	7.9	---	< 1	1.5
QWO-3B	06/04/1985	11.0	4.7	4.7	39	40	9.2	---	< 1	.9
QWO-3B	06/28/1985	11.0	4.6	5.0	39	38	8.9	---	< 1	1.0
QWO-3B	08/22/1985	13.0	4.5	4.9	38	39	9.0	---	< 1	.8
QWO-3B	10/25/1985	11.5	4.6	4.9	42	39	9.3	---	< 1	1.2
QWO-3B	12/18/1985	10.0	4.6	4.65	38	40.8	8.8	- .015*	< .50	1.0
QWO-3B	02/21/1986	12.0	4.6	4.67	42	42.1	9.1	- .017*	< .50	1.4
LEAD WELL†	12/23/1985††	---	5.6†††	---	33†††	---	---	---	---	---
LEAD WELL	02/26/1986††	11.0	5.5	5.66	26	41.1	---	---	5.52	19

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Collection date	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Ammonium (mg/L)	Aluminum (µg/L)	Iron (µg/L)	Manganese (µg/L)	Lead (µg/L)
QWO-2B	02/04/1985	0.80	0.30	1.4	0.17	---	1,100	10	55	< 1
QWO-2B	03/05/1985	.90	.30	1.6	.15	---	1,100	16	46	< 1
QWO-2B	04/02/1985	.90	.30	1.5	.16	---	1,200	10	54	5
QWO-2B	05/02/1985	.90	.30	1.7	.14	---	1,200	27	49	< 1
QWO-2B	06/04/1985	1.0	.30	2.0	.14	---	1,200	12	43	10
QWO-2B	06/27/1985	.79	.24	1.5	.15	---	1,100	14	38	2
QWO-2B	08/22/1985	.75	.26	1.5	.15	---	1,100	12	43	< 1
QWO-2B	10/25/1985	1.0	.30	1.6	.16	---	1,100	12	46	< 1
QWO-2B	12/18/1985	.70	.30	1.8	.17	0.006	1,200	11	46	.6
QWO-2B	02/21/1986	.80	.30	1.9	.19	.004	1,100	6.7	44	< .5
QWO-3A	02/05/1985	1.3	.40	1.9	.17	---	920	44	87	1
QWO-3A	03/05/1985	1.3	.40	2.0	.15	---	1,000	25	83	< 1
QWO-3A	04/02/1985	1.3	.40	1.9	.16	---	1,000	7	86	5
QWO-3A	05/03/1985	1.4	.40	1.8	.15	---	1,100	20	83	1
QWO-3A	06/04/1985	1.3	.40	2.0	.13	---	1,000	19	86	4
QWO-3A	06/28/1985	1.3	.43	2.0	.18	---	950	19	81	< 1
QWO-3A	08/22/1985	1.2	.39	2.0	.20	---	910	27	84	1
QWO-3A	10/25/1985	1.2	.40	2.0	.19	---	900	27	88	1
QWO-3A	12/18/1985	1.2	.40	2.0	.17	.005	920	12	91	< .5
QWO-3A	02/21/1986	1.3	.40	2.0	.17	.010	1,000	< 2.0	89	< .5
QWO-3B	02/05/1985	1.2	.50	1.6	.38	---	440	4	67	< 1
QWO-3B	03/05/1985	1.3	.50	1.6	.41	---	520	16	63	< 1
QWO-3B	04/02/1985	1.3	.60	1.6	.39	---	540	8	70	< 1
QWO-3B	05/03/1985	1.3	.50	1.7	.39	---	590	16	64	< 1
QWO-3B	06/04/1985	1.2	.52	2.0	.36	---	550	5	59	< 1
QWO-3B	06/28/1985	1.2	.52	1.6	.33	---	610	8	57	2
QWO-3B	08/22/1985	1.1	.48	1.6	.45	---	700	10	61	< 1
QWO-3B	10/25/1985	1.1	1.0	2.0	.49	---	710	9	63	< 1
QWO-3B	12/18/1985	1.1	.50	1.6	.39	.005	670	< 2.0	63	< .5
QWO-3B	02/21/1986	1.2	.50	1.9	.38	.006	820	< 2.0	66	< .5
LEAD WELL	12/23/1985	---	---	---	---	---	---	---	---	59‡‡
LEAD WELL	02/26/1986	.98	.25	3.6	3.4	.18	56	11	8.3	1

Table 21.--Chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Site name	Sample-collection date	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Silica (mg/L)
QWO-2B	02/04/1985	9.0	3.2	0.02	0.02	< 0.04	< 0.03	2.2
QWO-2B	03/05/1985	8.9	2.9	.01	.03	.13	< .03	2.2
QWO-2B	04/02/1985	9.5	3.3	.02	.02	.09	< .03	2.1
QWO-2B	05/02/1985	9.8	3.4	.03	.03	< .04	< .03	2.2
QWO-2B	06/04/1985	9.9	3.2	.03	.03	< .04	< .03	2.1
QWO-2B	06/27/1985	9.7	2.9	.01	.03	< .04	< .03	2.0
QWO-2B	08/22/1985	8.9	3.2	.02	.03	< .18	< .03	2.0
QWO-2B	10/25/1985	8.7	3.7	.04	.03	.09	< .03	2.1
QWO-2B	12/18/1985	9.1	3.9	.04	.03	.09	< .003	2.2
QWO-2B	02/21/1986	9.9	3.4	.02	.03	< .04	< .003	2.2
QWO-3A	02/05/1985	10	3.3	.02	.02	< .04	< .03	2.3
QWO-3A	03/05/1985	9.9	3.2	.02	.03	.09	< .03	2.2
QWO-3A	04/02/1985	11	3.3	.03	.02	.09	< .03	2.2
QWO-3A	05/03/1985	10	3.4	.03	.03	< .04	< .03	2.0
QWO-3A	06/04/1985	10	4.0	.04	.02	< .04	< .03	2.3
QWO-3A	06/28/1985	10	3.7	.02	.02	< .04	< .03	2.3
QWO-3A	08/22/1985	9.9	3.8	.02	.03	< .09	< .03	2.3
QWO-3A	10/25/1985	9.9	4.1	.05	.02	.09	< .03	2.4
QWO-3A	12/18/1985	9.9	3.7	.04	.02	.09	< .003	2.3
QWO-3A	02/21/1986	11	3.5	.02	.02	< .04	< .003	2.2
QWO-3B	02/05/1985	8.2	3.0	.03	.02	< .04	< .03	3.4
QWO-3B	03/05/1985	8.1	3.3	.02	.02	.13	< .03	3.3
QWO-3B	04/02/1985	8.3	3.0	.04	.02	.13	< .03	3.5
QWO-3B	05/03/1985	8.6	3.1	.03	.02	< .04	< .03	3.4
QWO-3B	06/04/1985	8.3	3.1	.03	.02	.04	< .03	3.4
QWO-3B	06/28/1985	8.8	3.0	.02	.02	< .04	< .03	3.4
QWO-3B	08/22/1985	8.8	3.1	.03	.03	< .18	< .03	3.3
QWO-3B	10/25/1985	8.7	3.2	.03	.02	.09	< .03	3.3
QWO-3B	12/18/1985	8.6	3.3	.04	.02	.09	< .003	3.3
QWO-3B	02/21/1986	9.2	3.6	.02	.01	< .04	< .003	3.3
LEAD WELL	12/23/1985	---	---	---	---	---	---	---
LEAD WELL	02/26/1986	1.9	5.4	.08	.04	.13	< .003	6.2

* Titrations done at Central Lab, alkalinity calculated by Gran Function.

** Samples titrated with .1N HCL. All other alkalinities titrated at the District laboratory were titrated with .16 N H_2SO_4 which may induce a 2 percent to 5 percent error in the alkalinity value.

*** Sample was not obtained due to lack of water in well.

† Well was drilled in September 1985 and sampled only twice (12/23/85 and 02/26/86).

†† Well was sampled by bailing because the yield was too low to sample by pumping.

††† Value measured at District laboratory following sample collection.

‡ Analysis deleted because the cation-anion balance exceeded 30% difference.

‡‡ Value may be elevated due to disturbance of geologic materials when well was drilled.

Table 22.--Statistical summary of chemical analyses of precipitation in McDonalds Branch basin, January 24, 1985 through March 18, 1986

[μS/cm, microsiemens per centimeter; mg/L, milligrams per liter; μg/L, micrograms per liter; lab, laboratory; N is the number of samples; --- indicates mean value was not calculated bacause minimum values were balow the detection limit; < indicates less than]

Constituent, statistic	Site name PPT-1BC	PPT-1WC	PPT-2B	PPT-2W
pH District lab (units)				
N	14	15	11	13
Minimum	4.1	4.0	4.0	4.0
Median	4.4	4.3	4.3	4.3
Mean*	4.3	4.3	4.3	4.3
Maximum	4.7	4.8	4.7	4.7
pH Central lab (units)				
N	17	18	16	16
Minimum	4.14	4.1	4.05	4.09
Median	4.4	4.3	4.4	4.4
Mean*	4.4	4.4	4.3	4.4
Maximum	5.2	5.2	5.3	5.2
Specific conductance, District lab (μS/cm)				
N	13	14	10	12
Minimum	16	13	19	13
Median	29	23	28	22
Mean	31	27	30	26
Maximum	58	49	45	56
Specific conductance, Central lab (μS/cm)				
N	17	18	16	16
Minimum	12	12	15	12
Median	33	27	33	25
Mean	30	27	33	27
Maximum	61	46	60	51
Calcium (mg/L)				
N	17	17	16	16
Minimum	< .01	< .01	.01	< .01
Median	.20	.07	.20	.12
Mean	---	---	.26	---
Maximum	.74	.44	.68	.58
Magnesium (mg/L)				
N	17	17	16	16
Minimum	.03	.02	.02	.01
Median	.08	.05	.08	.06
Mean	.13	.09	.13	.10
Maximum	.57	.45	.65	.49
Sodium (mg/L)				
N	17	17	16	14
Minimum	.15	.11	.12	.14
Median	.49	.40	.62	.39
Mean	.92	.67	1.0	.78
Maximum	4.4	3.5	4.8	3.7
Potassium (mg/L)				
N	17	17	16	15
Minimum	.02	.02	.04	.02
Median	.07	.04	.06	.04
Mean	.10	.06	.08	.06
Maximum	.25	.14	.21	.16
Ammonium (mg/L)				
N	17	18	16	16
Minimum	.09	.05	.09	.03
Median	.32	.25	.24	.18
Mean	.35	.27	.31	.27
Maximum	.89	.77	.85	.91

Table 22.--Statistical summary of chemical analyses of precipitation in McDonalds Branch basin, January 24, 1985 through March 18, 1986--Continued

Constituent, statistic	Site name PPT-1BC	PPT-1WC	PPT-2B	PPT-2W
Aluminum (µg/L)				
N	17	17	16	14
Minimum	8, <10	7, <10	10	9, <10
Median	12	20	20	12
Mean	---	---	20	---
Maximum	40	50	60	60
Lead (µg/L)				
N	16	16	16	12
Minimum	<1	<1	<1	<1
Median	4	2	4	4
Mean	---	---	---	---
Maximum	12	11	13	16
Sulfate (mg/L)				
N	17	18	16	16
Minimum	1.3	.61	1.6	.89
Median	2.6	2.2	2.6	1.8
Mean	2.8	2.3	2.9	2.3
Maximum	6.4	4.5	6.1	5.1
Chloride (mg/L)				
N	17	18	16	16
Minimum	.03	.22	.33	.15
Median	.80	.76	.78	.74
Mean	1.6	1.3	1.6	1.3
Maximum	8.6	6.7	9.2	7.2
Fluoride (mg/L)				
N	17	18	16	16
Minimum	.01	.01	.01	< .01
Median	.03	.02	.03	.02
Mean	.03	.03	.03	---
Maximum	.04	.05	.05	.05
Bromide (mg/L)				
N	17	18	16	16
Minimum	< .01	< .01	< .01	< .01
Median	.02	.01	.02	.01
Mean	---	---	---	---
Maximum	.04	.03	.33	.04
Nitrate (mg/L)				
N	17	18	16	16
Minimum	.99	.22	1.0	.31
Median	1.9	1.6	2.0	1.4
Mean	2.1	1.7	2.1	1.8
Maximum	4.9	3.1	3.9	3.7
Phosphate (mg/L)				
N	10	9	8	10
Minimum	.002, < .003	< .003	< .003	< .003
Median	.031	.031	.046	.031
Mean	---	---	---	---
Maximum	.215	.245	.429	.552

* Mean pH values were calculated by first converting all individual pHs to hydrogen-ion concentrations. Then the mean hydrogen-ion concentration was calculated and converted to pH.

Table 23.--Statistical summary of chemical analyses of selected surface waters in McDonalds Branch basin, January 24, 1985 through March 21, 1986

[°C, degrees Celsius; μS/cm, microsiemens per centimeter; mg/L, milligrams per liter; μg/L, micrograms per liter; N is the number of samples; --- indicates mean value was not calculated because minimum values were below the detection limit; < indicates less than]

Constituent, statistic	Site name or number		
	S-1	S-9	01466500
Temperature (°C)			
N	11	14	14
Minimum	1.0	8.0	4.5
Mean	8.1	11.6	9.9
Median	7.0	12.0	9.5
Maximum	17.5	14.5	16.0
Field pH (units)			
N	11	14	14
Minimum	3.2	3.8	3.9
Mean*	3.6	4.3	4.3
Median	3.7	4.5	4.4
Maximum	4.2	4.8	4.6
Lab pH (units)			
N	11	14	14
Minimum	3.2	4.1	4.1
Mean*	3.7	4.6	4.5
Median	3.8	4.8	4.7
Maximum	4.1	5.4	5.0
Field specific conductance (μS/cm)			
N	11	14	14
Minimum	60	25	23
Mean	146	38	40
Median	114	32	32
Maximum	440	84	82
Lab specific conductance (μS/cm)			
N	11	14	14
Minimum	59	23	23
Mean	132	33	35
Median	106	27	29
Maximum	432	67	69
Dissolved oxygen (mg/L)			
N	10	13	14
Minimum	.5	1.5	2.1
Mean	4.2	3.2	4.5
Median	3.8	3.1	4.1
Maximum	10.6	5.3	7.6

Table 23.--Statistical summary of chemical analyses of selected surface waters in McDonalds Branch basin, January 24, 1985 through March 21, 1986--Continued

Constituent, statistic	Site name or number		
	S-1	S-9	01466500
Dissolved organic carbon (mg/L)			
N	11	13	14
Minimum	5.6	1.1	1.7
Mean	19	2.1	3.1
Median	19	1.7	2.6
Maximum	37	4.1	7.3
Calcium (mg/L)			
N	11	14	14
Minimum	.30	.26	.28
Mean	1.13	.50	.53
Median	.80	.37	.41
Maximum	5.20	1.40	1.10
Magnesium (mg/L)			
N	11	14	14
Minimum	.10	.29	.29
Mean	.67	.51	.51
Median	.50	.41	.47
Maximum	3.00	1.50	.80
Sodium (mg/L)			
N	11	14	14
Minimum	2.2	1.7	1.7
Mean	2.9	2.0	2.0
Median	2.6	1.9	2.0
Maximum	5.0	3.2	2.4
Potassium (mg/L)			
N	11	14	14
Minimum	.06	.18	.10
Mean	.20	.29	.31
Median	.18	.30	.30
Maximum	.39	.48	.50
Ammonium (mg/L)			
N	3	2	13
Minimum	.022	.012	< .013, < .026
Mean	.023	.012	---
Median	.023	.012	.013
Maximum	.023	.012	.04

Table 23.--Statistical summary of chemical analyses of selected surface waters in McDonalds Branch basin, January 24, 1985 through March 21, 1986--Continued

Constituent, statistic	Site name or number		
	S-1	S-9	01466500
Aluminum (μg/L)			
N	11	14	13
Minimum	550	30	20
Mean	1,855	91	104
Median	880	50	60
Maximum	10,000	350	370
Iron (μg/L)			
N	11	14	13
Minimum	360	35	43
Mean	1,397	45	82
Median	580	41	72
Maximum	4,700	90	140
Manganese (μg/L)			
N	11	14	14
Minimum	4	3	4
Mean	25	11	10
Median	20	9	7
Maximum	96	36	27
Lead (μg/L)			
N	11	14	14
Minimum	< 1	< .5, <1	< 1
Mean	---	---	---
Median	2.6	1.0	3
Maximum	8.0	4.0	6
Sulfate (mg/L)			
N	11	14	14
Minimum	1.1	1.9	2.7
Mean	23	4.6	5.6
Median	16	3.2	3.7
Maximum	120	15	12
Chloride (mg/L)			
N	11	14	14
Minimum	3.9	3.1	3.2
Mean	5.7	3.5	3.6
Median	5.7	3.4	3.6
Maximum	7.4	4.3	4.1

Table 23.--Statistical summary of chemical analyses of selected surface waters in McDonalds Branch basin, January 24, 1985 through March 21, 1986--Continued

Constituent, statistic	Site name or number		
	S-1	S-9	01466500
Fluoride (mg/L)			
N	10	14	14
Minimum	< .10, .03	< .01	< 0.10
Mean	---	---	---
Median	.08	.03	---
Maximum	.60	.07	.20
Bromide (mg/L)			
N	11	14	0
Minimum	< .010	.02	---
Mean	---	.02	---
Median	.03	.02	---
Maximum	.063	.03	---
Nitrate (mg/L)			
N	11	14	14
Minimum	< .04, < .44	< .04	< .44
Mean	---	---	---
Median	---	.04	---
Maximum	<0.44	.09	.53
Phosphate (mg/L)			
N	9	14	13
Minimum	< 0.003	< 0.003	< 0.03
Mean	---	---	---
Median	.03	---	---
Maximum	.006	.006, <0.03	.09
Silica (mg/L)			
N	11	14	14
Minimum	3.4	4.1	3.8
Mean	5.1	4.5	4.2
Median	4.9	4.3	4.2
Maximum	6.9	6.1	4.9

* Mean pH values were calculated by first converting all individual pHs to hydrogen-ion concentrations. Then the mean hydrogen-ion concentration was calculated and converted to pH.

Table 24.--Statistical summary of chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986

[°C, degrees Celsius; µS/cm, microsiemens per centimeter; mg/L, milligrams per liter; mg/L, micrograms per liter; N is the number of samples; --- indicates missing data; < indicates less than]

Constituent, statistic	Site name					
	QWC-1A	QWC-1B	QWC-2A	QWC-2B	QWC-3A	QWC-3B
Temperature (°C)						
N	10	10	10	10	10	10
Minimum	8.0	9.0	6.5	10.5	10.5	10.5
Mean	10.0	10.8	11.1	11.5	11.7	11.8
Median	10.0	11.0	10.3	11.5	11.3	11.5
Maximum	13.5	12.0	18.0	13.0	14.0	15.0
Field pH (units)						
N	10	10	9	9	10	10
Minimum	4.4	4.8	4.0	4.6	4.9	4.5
Mean*	4.7	5.1	4.3	4.9	5.1	4.9
Median	4.8	5.2	4.5	5.0	5.2	5.0
Maximum	5.0	5.3	4.6	5.2	5.3	5.1
Lab pH (units)						
N	10	10	10	10	10	10
Minimum	4.9	5.3	4.47	5.1	5.4	5.0
Mean*	5.1	5.6	4.6	5.3	5.7	5.3
Median	5.2	5.6	4.7	5.4	5.8	5.4
Maximum	5.4	5.8	4.8	5.7	6.6	5.7
Field specific conductance (µS/cm)						
N	10	10	9	9	9	9
Minimum	26	24	37	20	14	16
Mean	30	27	46	23	15	24
Median	30	28	46	23	15	25
Maximum	31	30	54	25	17	26
Lab specific conductance (µS/cm)						
N	10	10	10	10	10	10
Minimum	26.4	27	31	19.1	11	21.4
Mean	29	29	44	24	16	26
Median	30	29	44	25	16	26
Maximum	31	33	54	27	19	28
Dissolved oxygen (mg/L)						
N	10	10	10	10	10	10
Minimum	.6	7.6	2.4	.5	8.2	3.3
Mean	2.0	7.9	3.6	3.0	9.2	4.8
Median	1.5	7.9	3.5	2.8	9.1	5.1
Maximum	3.9	8.3	5.8	5.8	9.9	5.7
Dissolved organic carbon (mg/L)						
N	10	10	10	10	10	10
Minimum	.2	.3	.5	.2	.3	.3
Mean	.8	.9	1.2	1.1	.8	1.0
Median	.7	.8	1.3	.8	.7	.9
Maximum	1.6	1.6	2.0	3.2	1.7	1.8
Calcium (mg/L)						
N	10	10	10	10	10	9
Minimum	.66	1.0	.88	.50	.08	.6
Mean	.75	1.1	.95	.69	.23	.7
Median	.70	1.1	.90	.70	.22	.7
Maximum	1.0	1.2	1.1	1.0	.31	1.0
Magnesium (mg/L)						
N	10	10	10	10	10	9
Minimum	.60	.7	.40	.40	.02	.47
Mean	.72	.8	.52	.53	.26	.6
Median	.70	.8	.50	.51	.30	.6
Maximum	1.0	1.0	1.0	.60	.33	1.0
Sodium (mg/L)						
N	10	10	10	10	10	9
Minimum	1.7	1.5	1.6	1.5	.30	1.7
Mean	1.8	1.7	1.9	1.6	1.4	1.9
Median	1.8	1.6	1.8	1.6	1.6	1.9
Maximum	2.1	2.0	2.6	1.8	2.0	2.0
Potassium (mg/L)						
N	10	10	10	10	10	9
Minimum	.20	.22	.14	.28	.06	.31
Mean	.33	.37	.20	.32	.19	.33
Median	.34	.36	.18	.32	.22	.34
Maximum	.40	.49	.39	.35	.23	.36

Table 24.--Statistical summary of chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Constituent, statistic	Site name QWO-1A	QWO-1B	QWO-2A	QWO-2B	QWO-3A	QWO-3B
Aluminum (µg/L)						
N	10	10	10	10	10	10
Minimum	140	820	1,300	1,100	900	440
Mean	200	915	2,400	1,140	970	615
Median	185	870	1,500	1,100	975	600
Maximum	300	1,100	6,100	1,200	1,100	820
Iron (µg/L)						
N	9	10	10	10	10	10
Minimum	7,500	<2	540	6.7	<2.0	<2.0
Mean	9,122	--	3,328	13	--	8
Median	8,900	8	3,900	12	20	8
Maximum	11,000	39	5,900	27	44	16
Manganese (µg/L)						
N	10	10	10	10	10	10
Minimum	24	7	<1	38	81	57
Mean	37	60	--	46	86	63
Median	35	63	4.2	46	86	63
Maximum	60	77	13	55	91	70
Lead (µg/L)						
N	9	9	10	10	10	10
Minimum	<1, < .5	<1	<1	<1, < .5	<1, < .5	<1, < .5
Mean	--	--	--	--	--	--
Median	<1	<1	1.0	<1	1	<1
Maximum	3	3.4	5	10	5	2
Sulfate (mg/L)						
N	10	10	10	10	10	10
Minimum	12	8.8	20	8.7	9.9	8.1
Mean	15	9.1	31	9.3	10	8.6
Median	15	9.1	26	9.3	10	8.6
Maximum	18	9.6	53	9.9	11	9.2
Chloride (mg/L)						
N	10	10	10	10	10	10
Minimum	3.4	3.2	4.4	2.9	3.2	3.0
Mean	3.9	3.4	5.0	3.3	3.6	3.2
Median	3.8	3.4	5.0	3.3	3.6	3.1
Maximum	4.9	3.8	6.5	3.9	4.1	3.6
Fluoride (mg/L)						
N	10	10	9	10	10	10
Minimum	< .01	< .01,< .10	< .1	.01	.02	.02
Mean	--	--	--	.02	.03	.03
Median	.03	--	< .1	.02	.03	.03
Maximum	.04	.03, .10	.2	.04	.05	.04
Bromide (mg/L)						
N	10	10	10	10	10	10
Minimum	.02	< .01	< .01	.02	.02	.01
Mean	.03	--	--	.03	.02	.02
Median	.02	.02	.05	.03	.02	.02
Maximum	.05	.02	.26	.03	.03	.03
Nitrate (mg/L)						
N	10	10	8	10	10	10
Minimum	< .04	< .04	< .44	< .04, < .18	< .04, < .09	< .04, < .18
Mean	--	--	--	--	--	--
Median	< .04	< .04	--	--	--	--
Maximum	.04	.09	< .44	< .18, .13	< .09, .09	< .18, .13
Silica (mg/L)						
N	10	10	10	10	10	10
Minimum	3.9	2.0	3.6	2.0	2.0	3.3
Mean	6.8	2.5	5.6	2.1	2.3	3.4
Median	5.7	2.6	5.8	2.2	2.3	3.4
Maximum	13.0	2.6	7.0	2.2	2.4	3.5

* Mean pH values were calculatd by first converting all individual pHs to hydrogen-ion concentrations. Then the mean hydrogen-ion concentration was calculated and converted to pH.

Table 24.--Statistical summary of chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Constituent, statistic	Site name				
	QWC-4	QWC-5A	QWC-5B	QWH-1A	QWH-1B
Temperature (°C)					
N	10	10	10	11	11
Minimum	11.0	8.5	10.0	3.5	10.5
Mean	11.7	11.3	11.7	9.4	11.4
Median	11.5	11.3	12.0	8.0	11.3
Maximum	13.5	15.0	13.0	18.0	13.0
Field pH (units)					
N	10	10	9	10	11
Minimum	4.9	4.6	4.7	3.4	4.6
Mean*	5.0	4.8	4.9	3.8	4.9
Median	5.1	4.9	4.9	4.0	4.9
Maximum	5.1	5.0	5.0	4.1	5.2
Lab pH (units)					
N	10	10	10	11	11
Minimum	5.17	5.0	5.15	3.5	5.2
Mean*	5.4	5.3	5.4	3.9	5.3
Median	5.5	5.4	5.4	4.1	5.3
Maximum	6.0	6.5	5.7	4.3	5.4
Field specific conductance (μS/cm)					
N	9	10	10	11	11
Minimum	20	29	18	66	23
Mean	26	31	19	108	27
Median	26	31	19	77	27
Maximum	30	32	20	268	29
Lab specific conductance (μS/cm)					
N	10	10	10	11	11
Minimum	26	14	16	58	20.9
Mean	28	29	19	97	27
Median	27	30	20	68	28
Maximum	33	33	22	241	30
Dissolved oxygen (mg/L)					
N	10	4	10	10	10
Minimum	8.9	7.6	.7	.1	.5
Mean	9.8	8.8	2.0	.5	1.1
Median	10.0	9.1	1.2	.3	1.0
Maximum	10.3	9.5	5.4	2.4	1.7
Dissolved organic carbon (mg/L)					
N	10	9	10	11	11
Minimum	.3	.3	.2	13	.7
Mean	1.1	.8	.9	19	1.2
Median	1.1	.6	.7	18	1.1
Maximum	2.1	1.4	1.7	30	2.0
Calcium (mg/L)					
N	10	10	9	11	11
Minimum	.8	.5	.20	.30	.3
Mean	1.0	1.1	.30	.7	.4
Median	.9	1.1	.30	.4	.4
Maximum	1.2	1.3	.32	3.1	.5
Magnesium (mg/L)					
N	10	10	9	11	11
Minimum	.70	.30	.28	.08	.30
Mean	.81	.8	.34	.5	.30
Median	.80	.8	.31	.2	.30
Maximum	1.00	1.0	.40	2.0	.33
Sodium (mg/L)					
N	10	10	9	11	11
Minimum	1.5	.7	1.6	1.7	1.7
Mean	1.6	1.6	1.7	2.4	1.8
Median	1.5	1.6	1.6	2.2	1.8
Maximum	2.0	2.0	2.0	4.0	2.0
Potassium (mg/L)					
N	10	10	9	11	11
Minimum	.26	.14	.26	.09	.15
Mean	.40	.35	.30	.19	.18
Median	.40	.36	.30	.15	.18
Maximum	.51	.44	.33	.58	.22

Table 24.--Statistical summary of chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Constituent, statistic	Site name				
	QWC-4	QWC-5A	QWC-5B	QWH-1A	QWH-1B
Aluminum (mg/L)					
N	10	10	10	11	11
Minimum	<10	20	10	880	70
Mean	---	61	31	1,640	108
Median	24	60	31	1,000	110
Maximum	35	100	40	5,200	140
Iron (mg/L)					
N	10	10	10	11	11
Minimum	<2 <3	<2 <3	<2 <3	320	990
Mean	---	---	---	2,860	2,090
Median	9	22	6	3,300	2,600
Maximum	20	41	15	5,000	2,700
Manganese (mg/L)					
N	10	10	10	11	11
Minimum	10	35	<1.0	4	<1.0
Mean	14	78	---	17	---
Median	13	81	5	10	6
Maximum	18	100	5.0	70	11
Lead (mg/L)					
N	9	9	10	11	11
Minimum	<1, < .5	5	<1, < .5	<1	<1, < .5
Mean	---	10	---	---	---
Median	---	7	---	2	---
Maximum	4	21	9	8	4
Sulfate (mg/L)					
N	10	10	10	11	11
Minimum	4.2	2.2	1.2	2.6	2.6
Mean	5.2	5.6	1.3	15	3.0
Median	5.1	5.9	1.3	10	3.0
Maximum	6.7	6.9	1.7	58	3.3
Chloride (mg/L)					
N	10	10	10	11	11
Minimum	2.8	.84	2.8	4.4	3.1
Mean	2.9	2.9	3.0	5.8	3.4
Median	2.9	3.1	3.0	5.7	3.4
Maximum	3.1	3.3	3.1	8.0	3.6
Fluoride (mg/L)					
N	10	10	10	11	11
Minimum	< .01, < .1	.02	< .01	< .01	< .01
Mean	---	.03	---	---	---
Median	---	.03	.01	.04	.02
Maximum	.03, < .1	.04	.03	.30	.02
Bromide (mg/L)					
N	10	10	10	11	11
Minimum	.011	.01	.02	< .01	.02
Mean	.02	.02	.03	---	.03
Median	.02	.02	.03	.03	.03
Maximum	.03	.03	.03	.05	.03
Nitrate (mg/L)					
N	10	10	10	10	11
Minimum	< .04, < .4	< .04, < .13	.04	< .04, < .4	< .04
Mean	---	---	.09	---	---
Median	---	---	.09	---	.09
Maximum	.13	< .13, .09	.13	.13	.22
Silica (mg/L)					
N	10	10	10	11	11
Minimum	3.5	1.4	1.1	4.0	4.8
Mean	3.6	3.0	3.8	5.5	4.9
Median	3.6	3.1	4.1	5.2	4.9
Maximum	4.0	3.4	4.2	7.4	5.0

Table 24.--Statistical summary of chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Constituent, statistic	Site name					
	QWH-2A	QWH-2B	QWH-3A	QWH-3B	QWH-4A	QWH-4B
Temperature (°C)						
N	8	10	6	10	10	10
Minimum	9.0	11.5	8.5	10.5	10.5	10.5
Mean	11.6	11.8	11.0	11.6	11.6	11.9
Median	10.5	11.7	9.8	11.5	11.0	11.8
Maximum	17.0	13.0	15.5	13.0	14.0	13.0
Field pH (units)						
N	8	10	6	10	10	10
Minimum	4.4	4.5	4.5	4.7	4.7	4.9
Mean*	4.7	4.8	4.7	4.8	4.8	5.1
Median	4.8	4.8	4.5	4.8	4.9	5.1
Maximum	5.2	5.8	5.6	4.9	5.1	5.1
Lab pH (units)						
N	7	10	6	10	10	9
Minimum	4.12	5.0	4.5	4.87	4.97	5.1
Mean*	4.6	5.2	4.7	5.2	5.2	5.4
Median	4.7	5.2	4.8	5.2	5.2	5.4
Maximum	5.0	5.56	4.8	5.4	5.6	5.6
Field specific conductance (µS/cm)						
N	7	9	6	10	10	10
Minimum	51	24.0	37	33	33	31
Mean	57	25.6	38	39	36	32
Median	55	26.0	38	40	36	32
Maximum	62	27.0	39	41	38	34
Lab specific conductance (µS/cm)						
N	8	10	6	10	10	10
Minimum	55	20.7	33	35.9	33.6	29.3
Mean	60	25	35	39	37	34
Median	58	26	35	40	37	35
Maximum	74.2	27	39.4	41	39	37
Dissolved oxygen (mg/L)						
N	1	10	1	9	10	10
Minimum	---	1.3	---	7.9	7.2	5.4
Mean	---	2.0	---	9.0	8.0	5.9
Median	---	1.6	---	8.7	8.2	5.8
Maximum	---	5.5	---	11.7	8.7	6.6
Dissolved organic carbon (mg/L)						
N	8	10	6	10	10	10
Minimum	2.6	.4	.5	.4	.3	.3
Mean	3.9	.9	1.5	1.2	1.0	1.3
Median	4.0	.9	.7	1.1	.8	.8
Maximum	4.8	1.6	5.2	2.8	2.0	4.4
Calcium (mg/L)						
N	8	10	6	10	10	10
Minimum	.30	.60	.60	1.6	1.6	1.5
Mean	.36	.7	.70	1.8	1.8	1.6
Median	.30	.7	.70	1.8	1.8	1.6
Maximum	.54	1.0	.80	2.0	2.0	1.6
Magnesium (mg/L)						
N	8	10	6	10	10	10
Minimum	.30	.50	.20	.9	.5	.99
Mean	.32	.7	.20	1.1	.7	1.0
Median	.30	.6	.20	1.1	.7	1.0
Maximum	.40	1.1	.21	1.1	1.0	1.1
Sodium (mg/L)						
N	8	10	6	10	10	10
Minimum	1.9	1.5	1.1	1.7	1.6	1.4
Mean	2.1	1.6	1.2	1.9	1.9	1.5
Median	2.0	1.6	1.2	1.9	1.9	1.5
Maximum	2.5	1.7	1.4	2.1	2.1	1.7
Potassium (mg/L)						
N	8	10	6	10	10	10
Minimum	.06	.18	.07	.37	.23	.27
Mean	.08	.20	.13	.39	.29	.30
Median	.08	.20	.09	.38	.29	.30
Maximum	.12	.22	.36	.42	.36	.32

Table 24.--Statistical summary of chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Constituent, statistic	Site name					
	QWH-2A	QWH-2B	QWH-3A	QWH-3B	QWH-4A	QWH-4B
Aluminum (mg/L)						
N	8	10	6	10	10	10
Minimum	570	50	740	60	110	20
Mean	977	56	813	102	192	30
Median	995	60	780	100	190	30
Maximum	1,600	65	960	150	370	40
Iron (mg/L)						
N	8	10	6	10	10	10
Minimum	2,700	<2	24	<2.0	<2.0	<2 <3
Mean	5,687	---	53	---	---	---
Median	6,100	8	47	9	12	6
Maximum	7,000	16	110	17	22	12
Manganese (mg/L)						
N	8	10	6	10	10	10
Minimum	7	11	110	57	73	23
Mean	10	18	113	60	83	27
Median	9	18	110	60	84	28
Maximum	14	29	130	63	87	30
Lead (mg/L)						
N	8	10	5	9	10	10
Minimum	<1, < .5	<1, < .5	<1	<1, .6	<1, < .5	<1, < .5
Mean	---	---	---	---	---	---
Median	<1	3	2	1	<1	<1
Maximum	6.0	10	8	4	10	10
Sulfate (mg/L)						
N	8	10	6	10	10	10
Minimum	11	2.4	7.2	7.6	7.1	6.1
Mean	12	2.6	7.4	7.8	7.4	6.5
Median	12	2.6	7.3	7.8	7.3	6.6
Maximum	14	2.9	7.8	8.1	7.7	6.8
Chloride (mg/L)						
N	8	10	6	10	10	10
Minimum	4.2	3.0	2.1	3.3	3.1	2.7
Mean	4.7	3.4	2.4	3.5	3.4	2.9
Median	4.7	3.4	2.4	3.5	3.3	2.8
Maximum	5.6	3.6	2.7	3.8	3.9	3.4
Fluoride (mg/L)						
N	8	10	6	10	10	10
Minimum	.02	< .01, < .10	< .01	.02	.02	.01
Mean	.04	---	---	.03	.03	.03
Median	.05	---	.04	.03	.03	.02
Maximum	.07	.02, < .10	.04	.05	.05	.04
Bromide (mg/L)						
N	8	10	6	10	10	10
Minimum	.02	.02	.02	.02	.02	.02
Mean	.03	.03	.02	.03	.03	.03
Median	.03	.03	.02	.03	.02	.03
Maximum	.04	.03	.03	.03	.04	.03
Nitrate (mg/L)						
N	8	10	6	10	10	10
Minimum	< .04	< .04, < .40	.04	< .04	< .04	.09
Mean	---	---	.11	.10	---	.27
Median	< .04	---	.11	---	.09	.13
Maximum	.09	.13, < .40	.18	.31	.18	1.46
Silica (mg/L)						
N	8	10	6	10	10	10
Minimum	4.1	3.2	1.9	3.6	2.7	3.0
Mean	4.2	3.9	1.9	3.8	2.8	3.1
Median	4.2	3.9	1.9	3.8	2.8	3.1
Maximum	4.5	4.1	1.9	4.0	3.0	3.2

Table 24.--Statistical summary of chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Constituent, statistic	Site name					
	QWO-1A	QWO-1B	QWO-2A	QWO-2B	QWO-3A	QWO-3B
Temperature (°C)						
N	10	10	10	10	10	10
Minimum	7.5	11.0	6.5	10.5	9.5	10.0
Mean	11.5	11.9	10.6	11.5	11.0	11.4
Median	10.5	11.8	9.5	11.5	10.5	11.3
Maximum	17.5	13.5	16.0	13.0	14.0	13.0
Field pH (units)						
N	10	10	10	10	10	10
Minimum	5.1	4.0	3.3	4.0	4.4	4.5
Mean*	5.3	4.5	3.5	4.4	4.5	4.6
Median	5.3	4.6	3.6	4.5	4.5	4.6
Maximum	5.4	6.1	3.8	4.7	4.6	4.7
Lab pH (units)						
N	10	10	10	9	10	10
Minimum	4.7	4.6	3.37	4.5	4.51	4.65
Mean*	5.4	4.8	3.7	4.7	4.7	4.9
Median	5.6	4.9	3.8	4.7	4.8	4.9
Maximum	5.8	5.0	3.9	4.8	4.8	5.3
Field specific conductance (μS/cm)						
N	10	10	10	10	10	10
Minimum	50	40	115	41	44	38
Mean	65	43	163	44	48	39
Median	66	43	146	45	48	39
Maximum	76	44	292	46	49	42
Lab specific conductance (μS/cm)						
N	10	10	10	10	10	10
Minimum	58	41	105	41	45	36.0
Mean	67	42	142	43	47	39
Median	66	42	124	42	46	39
Maximum	76	43.7	260	46	49	42.1
Dissolved oxygen (mg/L)						
N	9	9	5	10	10	10
Minimum	.1	6.7	.5	3.2	7.3	7.9
Mean	.2	7.4	2.8	4.1	8.2	8.9
Median	.2	7.5	.7	4.2	8.4	9.0
Maximum	.4	7.9	7.5	4.8	8.8	9.3
Dissolved organic carbon (mg/L)						
N	10	10	10	10	10	10
Minimum	3.5	.5	15.0	.6	.7	.5
Mean	5.4	1.3	21.6	1.4	1.3	1.0
Median	5.0	1.3	17.5	1.1	1.3	1.0
Maximum	8.4	3.0	38.0	2.9	2.0	1.5
Calcium (mg/L)						
N	10	10	10	10	10	10
Minimum	1.1	1.0	.2	.70	1.2	1.1
Mean	1.2	1.2	.5	.9	1.3	1.2
Median	1.2	1.20	.4	.9	1.3	1.0
Maximum	1.3	1.30	1.0	1.0	1.4	1.3
Magnesium (mg/L)						
N	10	10	10	10	10	10
Minimum	.60	.40	.30	.24	.39	.48
Mean	.7	.41	.5	.29	.40	.6
Median	.7	.40	.4	.30	.40	.5
Maximum	1.0	.50	1.0	.30	.43	1.0
Sodium (mg/L)						
N	10	10	10	10	10	10
Minimum	1.8	1.7	1.7	1.4	1.8	1.6
Mean	2.0	1.8	2.2	1.7	2.0	1.7
Median	2.0	1.8	2.1	1.6	2.0	1.6
Maximum	2.3	2.0	3.3	2.0	2.0	2.0
Potassium (mg/L)						
N	10	10	10	10	10	10
Minimum	.24	.21	.07	.14	.13	.33
Mean	.30	.24	.12	.16	.17	.40
Median	.28	.25	.10	.16	.17	.39
Maximum	.38	.27	.22	.19	.20	.49

Table 24.--Statistical summary of chemical analyses of ground water in McDonalds Branch basin, January 30, 1985 through February 26, 1986--Continued

Constituent, statistic	Site name					
	QWO-1A	QWO-1B	QWO-2A	QWO-2B	QWO-3A	QWO-3B
Aluminum (µg/L)						
N	10	10	10	10	10	10
Minimum	140	820	1,300	1,100	900	440
Mean	200	915	2,400	1,140	970	615
Median	185	870	1,500	1,100	975	600
Maximum	300	1,100	6,100	1,200	1,100	820
Iron (µg/L)						
N	9	10	10	10	10	10
Minimum	7,500	<2	540	6.7	<2.0	<2.0
Mean	9,122	--	3,328	13	--	8
Median	8,900	8	3,900	12	20	8
Maximum	11,000	39	5,900	27	44	16
Manganese (µg/L)						
N	10	10	10	10	10	10
Minimum	24	7	<1	38	81	57
Mean	37	60	--	46	86	63
Median	35	63	4.2	46	86	63
Maximum	60	77	13	55	91	70
Lead (µg/L)						
N	9	9	10	10	10	10
Minimum	<1, < .5	<1	<1	<1, < .5	<1, < .5	<1, < .5
Mean	--	--	--	--	--	--
Median	<1	<1	1.0	<1	1	<1
Maximum	3	3.4	5	10	5	2
Sulfate (mg/L)						
N	10	10	10	10	10	10
Minimum	12	8.8	20	8.7	9.9	8.1
Mean	15	9.1	31	9.3	10	8.6
Median	15	9.1	26	9.3	10	8.6
Maximum	18	9.6	53	9.9	11	9.2
Chloride (mg/L)						
N	10	10	10	10	10	10
Minimum	3.4	3.2	4.4	2.9	3.2	3.0
Mean	3.9	3.4	5.0	3.3	3.6	3.2
Median	3.8	3.4	5.0	3.3	3.6	3.1
Maximum	4.9	3.8	6.5	3.9	4.1	3.6
Fluoride (mg/L)						
N	10	10	9	10	10	10
Minimum	< .01	< .01,< .10	< .1	.01	.02	.02
Mean	--	--	--	.02	.03	.03
Median	.03	--	< .1	.02	.03	.03
Maximum	.04	.03, .10	.2	.04	.05	.04
Bromide (mg/L)						
N	10	10	10	10	10	10
Minimum	.02	< .01	< .01	.02	.02	.01
Mean	.03	--	--	.03	.02	.02
Median	.02	.02	.05	.03	.02	.02
Maximum	.05	.02	.26	.03	.03	.03
Nitrate (mg/L)						
N	10	10	8	10	10	10
Minimum	< .04	< .04	< .44	< .04, < .18	< .04, < .09	< .04, < .18
Mean	--	--	--	--	--	--
Median	< .04	< .04	--	--	--	--
Maximum	.04	.09	< .44	< .18, .13	< .09, .09	< .18, .13
Silica (mg/L)						
N	10	10	10	10	10	10
Minimum	3.9	2.0	3.6	2.0	2.0	3.3
Mean	6.8	2.5	5.6	2.1	2.3	3.4
Median	5.7	2.6	5.8	2.2	2.3	3.4
Maximum	13.0	2.6	7.0	2.2	2.4	3.5

* Mean pH values were calculatd by first converting all individual pHs to hydrogen-ion concentrations. Then the mean hydrogen-ion concentration was calculated and converted to pH.

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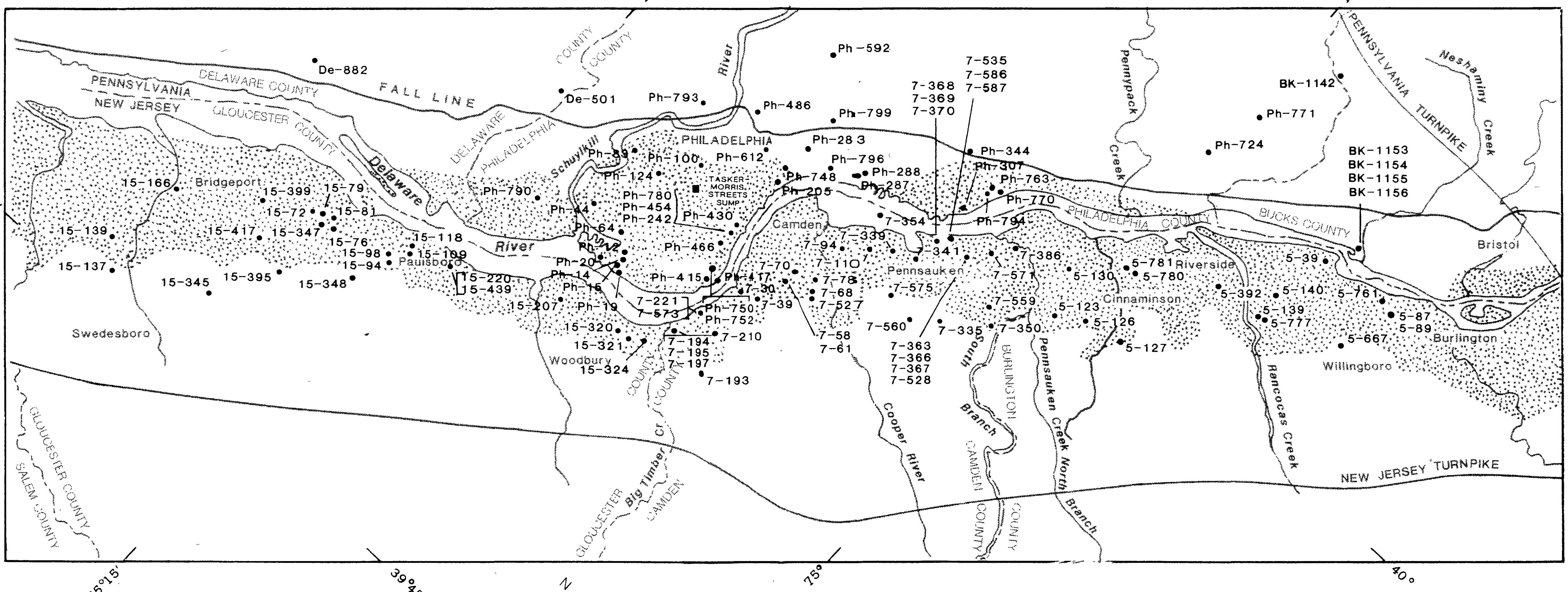

Base from U.S. Geological Survey, Newark 1969 and Wilmington 1972, 1:250 000.

Modified from Fusillo and others (1984).

0 1 2 3 4 5 MILES
0 1 2 3 4 5 KILOMETERS

EXPLANATION

OUTCROP OF POTOMAC-RARITAN-MAGOTHY AQUIFER SYSTEM

15-81 • WELL SAMPLED FOR WATER-QUALITY ANALYSIS AND LOCAL WELL NUMBER

■ TASKER-MORRIS STREETS SUMP

Plate 1.--Location of wells.