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GROUND-WATER QUALITY AND SUSCEPTIBILITY OF GROUND WATER TO EFFECTS FROM DOMESTIC WASTEWATER DISPOSAL IN EASTERN BERNALILLO COUNTY, CENTRAL NEW MEXICO, 1990-91

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 99-4096

Prepared in cooperation with

BERNALILLO COUNTY

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Blanchard and Kues—GROUND-WATER QUALITY AND SUSCEPTIBILITY OF GROUND WATER TO EFFECTS FROM DOMESTIC WASTEWATER DISPOSAL IN EASTERN BERNALILLO COUNTY, CENTRAL NM, 1990-91—U.S. Geological Survey Water-Resources Investigations Report 99-4096

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Albuquerque, New Mexico
1999

U.S. DEPARTMENT OF THE INTERIOR
BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY
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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
inch	2.540	centimeter
foot	0.3048	meter
mile	1.609	kilometer
acre	4,047	square meter
square mile	2.590	square kilometer
gallons per minute	0.06309	liter per second

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

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By Paul J. Blanchard and G.E. Kues

Abstract

Eastern Bernalillo County is a historically rural, mountainous area east of Albuquerque, New Mexico. Historically, the primary economic activity consisted of subsistence farming and ranching and support of these activities from small communities. During the last 40 to 50 years, however, the area increasingly has become the site of residential developments. Homes in these developments typically are on 1- to 2-acre lots and are serviced by individual wells and septic systems. Between 1970 and 1990, the population of the area increased from about 4,000 to more than 12,000, and housing units increased from about 1,500 to more than 5,000.

Results of analysis of water samples collected from 121 wells throughout eastern Bernalillo County in 1990 indicated that (1) total-nitrate concentrations in 10 samples exceeded the U.S. Environmental Protection Agency national primary drinking-water regulation maximum contaminant level of 10 milligrams per liter as nitrogen; (2) total-nitrate concentrations may be related to the length of time an area has been undergoing development; and (3) large dissolved-chloride concentrations may result from geologic origins, such as interbedded salt deposits or upward movement of saline ground water along faults and fractures, as well as from domestic wastewater disposal.

Ground water throughout eastern Bernalillo County was assessed to be highly susceptible to contamination by overlying domestic wastewater disposal because (1) soils in more than 95 percent of eastern Bernalillo County were determined by the U.S. Department of Agriculture Natural Resources Conservation Service to have severe limitations for use as septic-system absorption fields and (2) a fractured carbonate geologic terrane, which typically has large secondary permeability and limited sorption capacity, is at the surface or underlying unconsolidated material in 73 percent of the area. Ground-water-level rises following an episodal precipitation event during July 22-27, 1991, were large and rapid, particularly in the fractured carbonate terrane. This response indicates a significant hydraulic connection between the land surface and the water table.

INTRODUCTION

Eastern Bernalillo County is a historically rural, mountainous area east of the city of Albuquerque, the largest population center in New Mexico (fig. 1). Historically, economic activity in the area consisted of subsistence farming and ranching and the support of these activities from small communities. During the last 40 to 50 years, however, parts of the area have become increasingly used for residential developments, typically consisting of single-family homes on 1- to 2-acre lots. The population in the area increased rapidly after the 1940's and tripled between 1970 and 1990 (Summers, 1991, p. 59).

Ground water is the source of drinking water for almost all the approximately 5,100 homes in eastern Bernalillo County (Summers, 1991, p. 59). A few community water systems exist, but individual, private wells supply most homes with water. Nearly all homes in eastern Bernalillo County use some type of individual wastewater collection and treatment system, usually septic tanks and absorption fields, for domestic wastewater disposal. These septic systems are the most abundant and widespread potential sources of ground-water contamination in eastern Bernalillo County. Typical constituents exiting septic-system absorption fields include species of nitrogen and phosphorus, chloride, organic carbon, and boron.

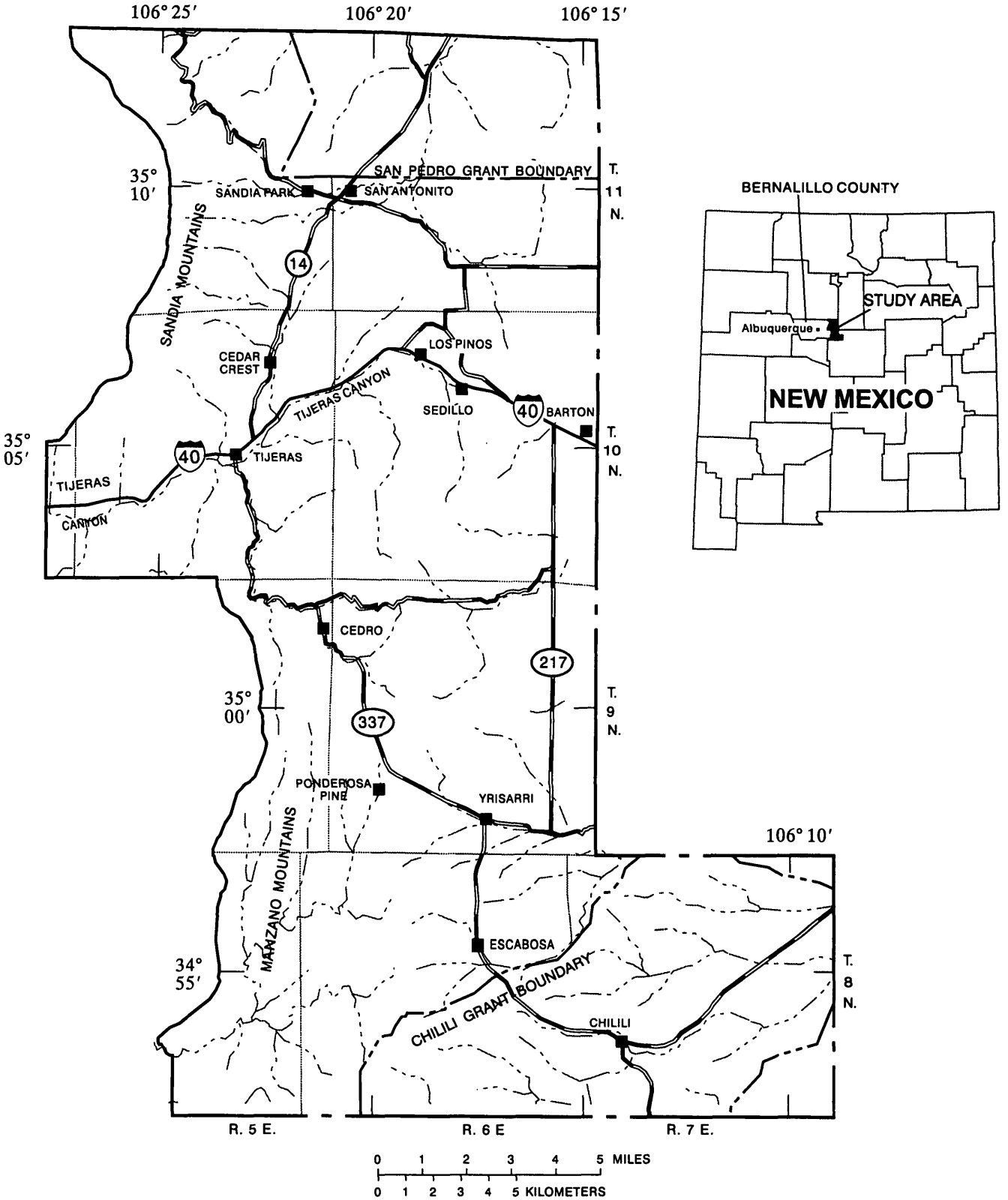


Figure 1.--Location of eastern Bernalillo County, New Mexico.

Continuing rapid residential development in eastern Bernalillo County has raised concern among residents and local water-resource managers about the degradation of ground-water quality from domestic wastewater disposal. To address some of these concerns, Bernalillo County entered into a cooperative study with the U.S. Geological Survey (USGS) to determine the effects of past and current land-use practices on ground-water quality and to evaluate aquifer susceptibility. This report was prepared in cooperation with Bernalillo County.

Purpose and Scope

The purpose of this report is to present (1) an assessment of the suitability of geologic and soil conditions in eastern Bernalillo County for domestic wastewater disposal; (2) a summary and evaluation of ground-water concentrations of constituents typically associated with domestic wastewater in samples collected during 1990-91; (3) a comparison of concentrations of these constituents over time; and (4) an evaluation of the susceptibility of ground water to contamination by domestic wastewater disposal. The report is based on (1) review of available geologic, hydrologic, soil, and land-use data; (2) one-time sample collection and analysis from 121 wells throughout eastern Bernalillo County; and (3) monthly water-level measurement and sample collection and analysis from 20 of these wells.

Previous Studies

Previous studies conducted in eastern Bernalillo County by Titus (1980) and Kues (1990) identified total-nitrate concentrations that exceeded the U.S. Environmental Protection Agency (USEPA) national primary drinking-water regulations (primary standards) of 10 milligrams per liter (mg/L) for nitrate as nitrogen and 4 mg/L for fluoride (U.S. Environmental Protection Agency, 1998). These standards apply to community water systems and are legally enforceable. In addition, the New Mexico Environment Department determined the presence of synthetic organic compounds in ground water at selected sites in the study area, primarily in Tijeras Canyon (fig. 1) (Doremus, 1989).

Titus (1980) discussed overall geohydrologic conditions in an area approximating eastern Bernalillo County, including major water-yielding units, ground-water levels, directions of ground-water flow, and ground-water quality. His report included water-quality analyses for 74 wells and 25 springs. Titus (1980, p. 38-39) also studied the association of septic systems and nitrate concentrations in ground water in Tijeras Canyon and documented large nitrate concentrations in and near Chilili and large fluoride concentrations in ground water near Barton in the far east-central part of Bernalillo County (fig. 1). In each of these areas, concentrations exceeded the applicable primary standard.

Kues (1990) studied the general availability and quality of ground water in eastern Bernalillo County and vicinity and described in detail the hydrogeology of three smaller areas representative of the three distinct hydrologic settings in the study area. Kues also resampled selected wells previously sampled by Titus (1980); results of analyses of samples from these wells provide a comparison of concentrations of selected constituents in 1962 and 1984.

Acknowledgments

Personnel of the Office of the State Engineer in Albuquerque and of the New Mexico Environment Department in Santa Fe and Albuquerque contributed information and data from their files. Ms. Cynthia Ardito and Mr. Richard M. Renn, both formerly of the City of Albuquerque Environmental Health Department, provided help and support in this study. Thanks are extended to the owners of wells visited during this study, especially to owners of wells used for monthly sampling. The interest, support, and assistance of these individuals were necessary for the successful completion of this study.

Well-Numbering System

The system of numbering wells in New Mexico is based on the common subdivision of public lands into sections (fig. 2). The well number, in addition to designating the well, locates its position to the nearest 10-acre tract in the land network. This number is divided into four segments. The first segment denotes the township north of the New Mexico base line, the second denotes the range east of the New Mexico principal meridian, and the third denotes the section. The fourth segment of the number, which consists of

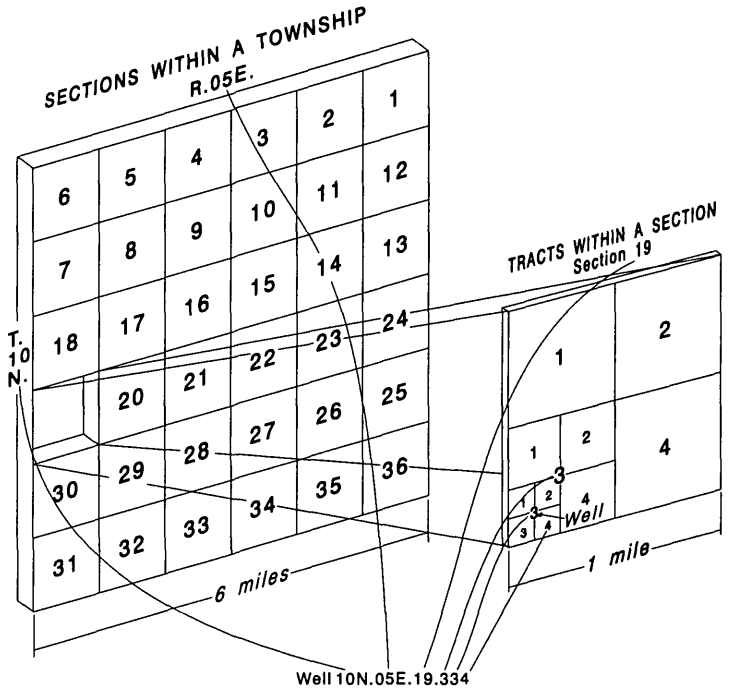


Figure 2.--System of numbering wells in New Mexico.

three digits, denotes the 160-, 40-, and 10-acre tracts, respectively, in which the well is situated. For this purpose, the section is divided into four quarters, numbered 1, 2, 3, and 4, in the normal reading order, for the northwest, northeast, southwest, and southeast quarters. The first digit of the fourth segment gives the quarter section, which is a tract of 160 acres. Similarly, the quarter section is divided into four 40-acre tracts numbered in the same manner, and the second digit denotes the 40-acre tract. Finally, the 40-acre tract is divided into four 10-acre tracts, and the third digit denotes the 10-acre tract. For example, well 10N.05E.19.334 is in the SE 1/4 of the SW 1/4 of the SW 1/4 of section 19, T. 10 N., R. 05 E. (fig. 2). Letters A, B, C, and so on, are added to the last segment of the well number, where necessary, to designate the second, third, fourth, and succeeding wells in the same 10-acre tract.

DESCRIPTION OF THE STUDY AREA

The area of study, referred to herein as eastern Bernalillo County or the study area, includes about 250 square miles. The study area is bounded on the west by the crest lines of the Sandia and Manzano Mountains, and on the north, east, and south by the borders of the county (fig. 1). Altitudes range from 5,760 feet above sea level in Tijeras Canyon, which separates the Sandia and Manzano Mountains on the west-central boundary, to 10,678 feet along the crest line of the Sandia Mountains (fig. 1). The study area is primarily mountainous and forested and generally slopes to the east away from the north-trending Sandia and Manzano Mountains.

Precipitation

The Sandia Park Climatological Station (altitude 7,021 feet) was the only official weather station operating in eastern Bernalillo County during 1990-91. The U.S. Department of Commerce (1990, 1991) and C. C. "Bill" Tilton (weather station observer, oral commun., January 6, 1992) provided precipitation data for 1939-91 collected at this station.

Average annual precipitation (1951-80) at the Sandia Park Climatological Station was 17.72 inches (U.S. Department of Commerce, 1990, p. 28). About one-half of this precipitation typically falls from July through October. Average monthly precipitation varies little during the rest of the year, ranging from 0.85 inch in April to 1.21 inches in December.

From 1986 through 1991, annual precipitation typically was above normal amounts, and probably resulted in above-average recharge of the ground-water system. In 1986-88, annual precipitation ranged from 16 to 61 percent above normal. During this study, annual precipitation was 25.71 inches in 1990 and 30.63 inches in 1991, about 45 and 73 percent above normal, respectively. From 1986 to 1991, precipitation was below normal only in 1989, by about 16 percent. Precipitation in July 1991 was 7.40 inches, the largest amount of monthly precipitation ever recorded at the Sandia Park Climatological Station and 260 percent of normal July precipitation.

Geohydrology

Titus (1980) subdivided eastern Bernalillo County into several geologic terranes, five of which he designated as significant sources of water. These included a carbonate terrane, three terranes of primarily clastic sedimentary rocks that were divided by geologic age, and a crystalline terrane. For the present study, the three clastic terranes of Titus were combined into one terrane, and ground-water quality was characterized and compared in three terranes labeled the carbonate, clastic, and crystalline terranes (fig. 3). The areas in figure 3, labeled as undifferentiated, were not characterized by Titus.

The carbonate terrane crops out or underlies unconsolidated material in about 73 percent of eastern Bernalillo County and in about 88 percent of the study area for which geologic terrane was determined (fig. 3). It consists primarily of limestone of Pennsylvanian age and is the dominant water source in most of the southern one-half and eastern one-third of the study area. The unconsolidated material consists of alluvium along drainages and valley-fill deposits along the eastern boundary of the study area.

The clastic terrane crops out in the north-central part of eastern Bernalillo County (fig. 3); the outcrop area is roughly triangular in shape and trends northeast. The west boundary parallels and is west of State Highway 14 from Tijeras to Sandia Park, and the east-southeast boundary parallels and is southeast of Interstate Highway 40 (I-40) from Tijeras to the northeast. The clastic terrane consists of Permian through Cretaceous interbedded sandstones, shales, and occasional limestones; some Permian rock units are primarily limestone. The clastic terrane has only minor areas of unconsolidated material.

The crystalline terrane lies along the axis of Tijeras Canyon from about 1 mile west of the community of Tijeras to the western boundary of the study area (fig. 3). It consists of Precambrian igneous and metamorphic rocks and overlying alluvium derived primarily from the Precambrian rocks. The alluvium occurs on the floor of Tijeras Arroyo and on the floors of tributary canyons. Although both the alluvium and Precambrian rocks provide water to wells and springs, the alluvium is the primary source of water in Tijeras Canyon.

Faults and associated fractures are common throughout eastern Bernalillo County and are more frequent immediately east of the Sandia Mountains. They trend primarily in two directions: north, subparallel to the axis of the Sandia and Manzano Mountains, and northeast, subparallel to the Tijeras and Gutierrez Faults (Titus, 1980, fig. 4). Major faults are shown in figure 3.

Faults and fractures contribute significant secondary permeability to the bedrock of eastern Bernalillo County. Secondary permeability typically is dominant in igneous, metamorphic, and carbonate rocks. In carbonate rocks, solution channels that have developed from ground-water movement along faults, fractures, and bedding planes are common, and these further increase secondary permeability. Secondary permeability may provide conduits between the surface and the water table.

Although primary permeability, relating to ground-water movement through intergranular space in sandstones and conglomerates, typically provides adequate water for various uses, secondary permeability may still dominate in these clastic rocks where they are intensely faulted and fractured. Consequently, ground-water availability and movement are strongly influenced by faults and fractures in all terranes in the study area.

Titus (1980) and Kues (1990) described the general ground-water-flow system. An approximate ground-water divide and general direction of ground-water flow in eastern Bernalillo County are shown in figure 4.

The sole natural source of recharge in eastern Bernalillo County is from infiltration of precipitation. No ground water flows into the study area. In the Sandia Mountains, ground water initially moves downslope to the east and then flows out of the study area to the north or to the west. Closer to but still west of the ground-water divide, ground water moves

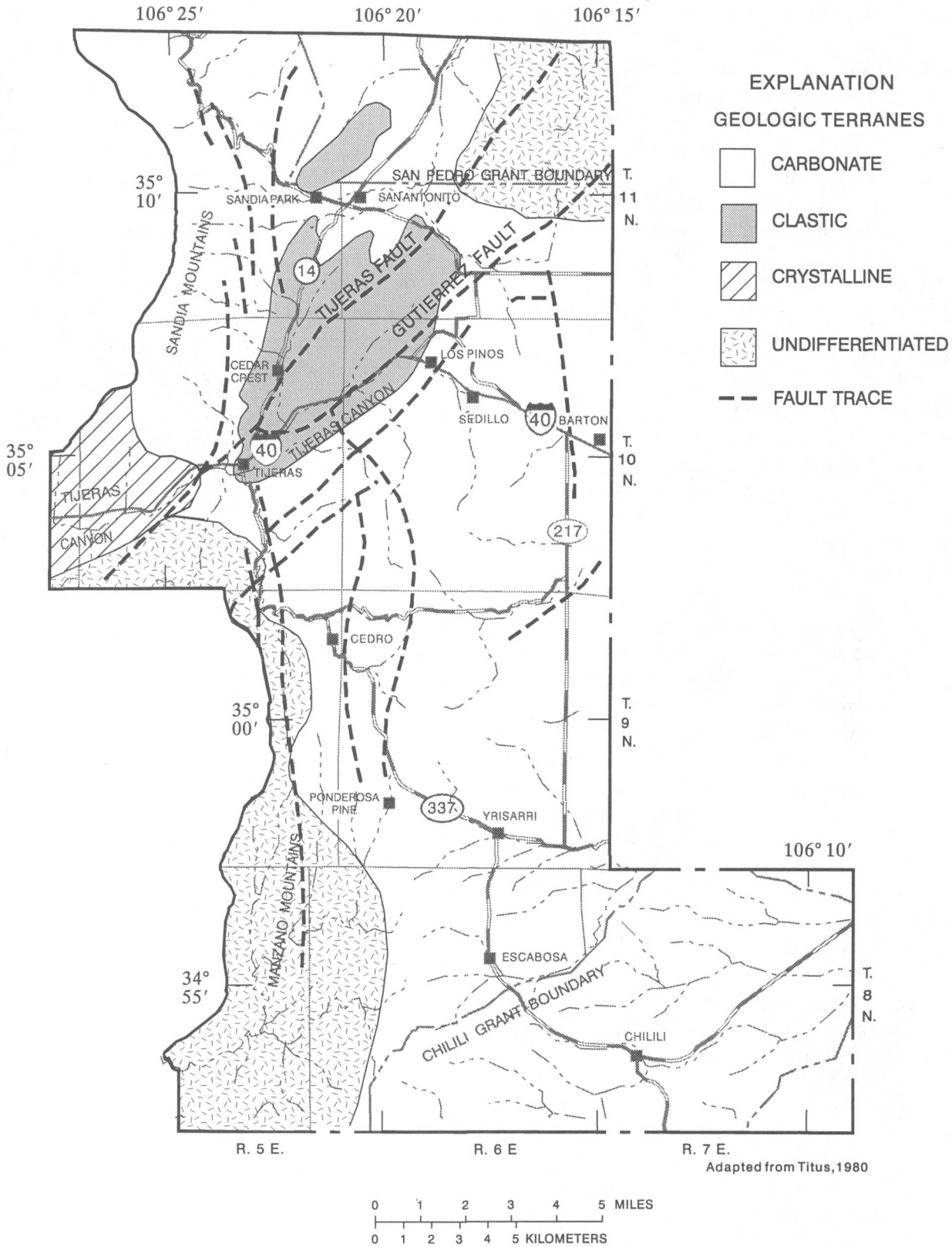
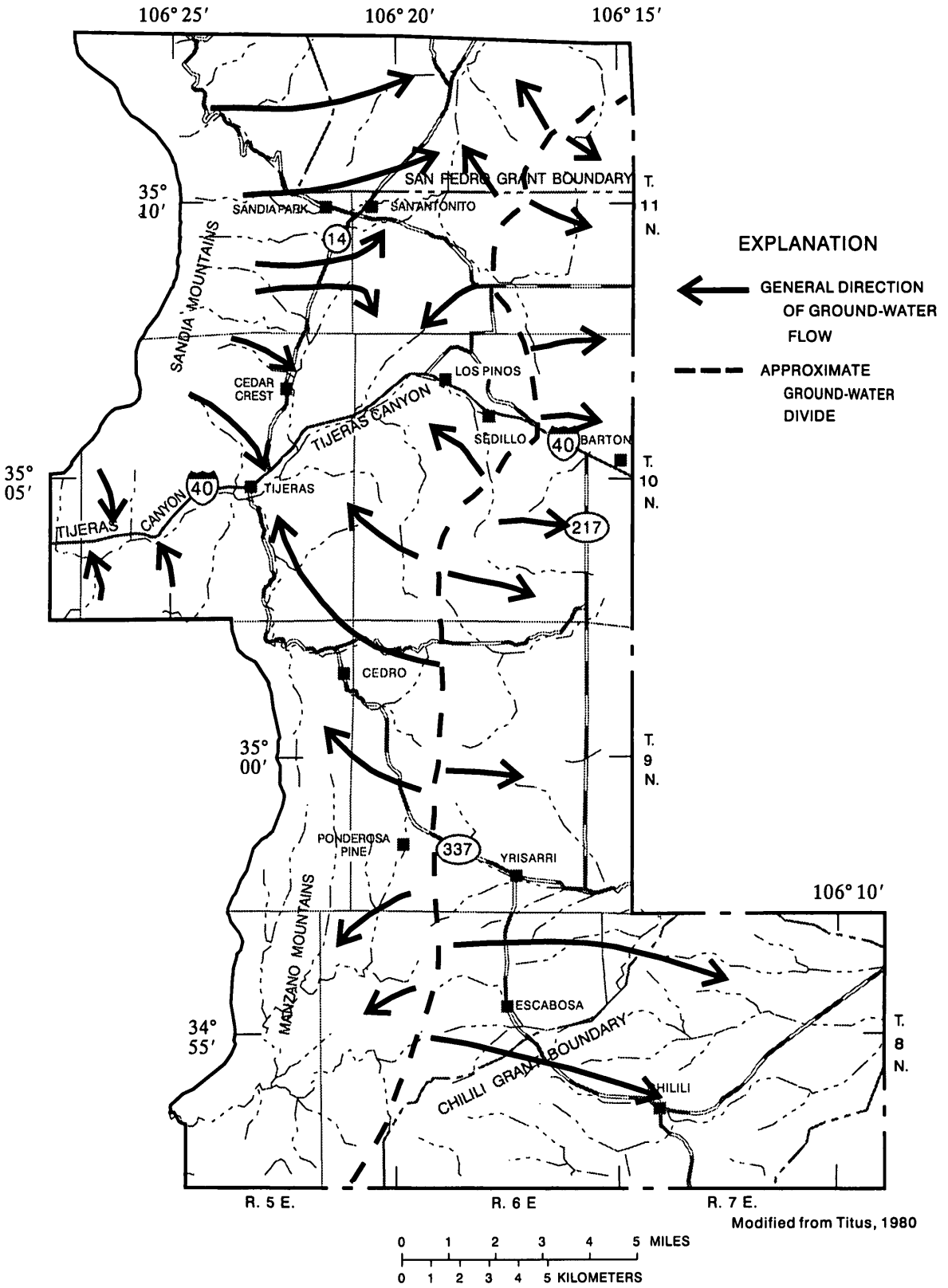


Figure 3.--Geologic terranes and major faults in eastern Bernalillo County.



Modified from Titus, 1980

Figure 4.--Approximate ground-water divide and general direction of ground-water flow in eastern Bernalillo County.

initially downslope to the west and then flows out of the study area to the north, to the west through Tijeras Canyon, or to the south. East of the ground-water divide, ground water moves generally eastward out of the study area.

Soils

Soils in eastern Bernalillo County were surveyed by the U.S. Department of Agriculture, Natural Resources Conservation Service, to be typically thin and poorly developed (Hacker, 1977). Slopes are particularly steep in the Manzano and Sandia Mountains. Soils in and near the mountains are shallow and stoney to cobbly in texture. Farther east, slopes typically are flatter and soils are of greater depth and higher clay content, although steep slopes and shallow soils also are found locally.

Hacker (1977, p. 74-83) classified the degree of limitation of each soil type in eastern Bernalillo County for use as septic-system absorption fields. Limiting factors included soil composition and texture, thickness, and slope steepness. All soils in eastern Bernalillo County were classified as having some degree of limitation for use as septic-system absorption fields (fig. 5). Soils in more than 95 percent of the study area had severe limitations for this use. About 2 percent had limitations ranging from slight to severe and about 3 percent had limitations ranging from slight to moderate.

History of Development

The first non-Native Americans to occupy eastern Bernalillo County arrived in the early 1800's. Subsistence crop production and livestock grazing were the primary economic activities, and these activities were supported by small communities. This pattern of land use and attendant low population density continued until about the end of World War II.

An exception to this development history is along the present I-40 corridor that transects the study area (fig. 1). Prior to the construction of I-40, U.S. Highway 66 followed the same route. These highways have been the principal route between the Midwest and the west coast; commercial development began in this corridor in the 1930's.

Since the late 1940's, parts of the area have increasingly become the site of residential developments. Homes in these developments typically are on 1- to 2-acre lots, and are served by individual wells and septic systems. During this time, the population has increased dramatically in eastern Bernalillo County. From 1970 to 1990, the population and number of housing units more than tripled (Summers, 1991, p. 59). The population and number of housing units in selected years are listed in table 1.

Table 1.--Population and housing units in eastern Bernalillo County, 1970-90

[Data from Summers, 1991, p. 59]

	1970	1980	1990
Population	4,055	7,265	12,480
Housing units	1,481	2,968	5,078

Domestic Wastewater Treatment and Disposal

In 1990, eastern Bernalillo County had no public sewage treatment facilities. Typically, each home was served by an individual septic system (Summers, 1991, p. 59); therefore, about 5,000 septic systems were in the study area in 1990.

The density of septic systems increased as land parcels were subdivided to facilitate residential development, which increased the absorption requirements of soils and the capacity requirements of aerobic biological activity. These increases also increased the risk of exceeding limits of absorption of soils and biological alteration.

Inadequate size, improper placement, lack of maintenance, and failure of septic systems can result in movement of untreated or undertreated domestic wastewater directly into surrounding soils. Maintenance requirements typically increase with time, and accordingly the risk of septic-tank failure increases with time. Therefore, the earliest developed areas are at the greatest risk for septic-tank failure and subsequent ground-water contamination.

Land Use

The most detailed land-use data available for the entire eastern Bernalillo County area was compiled in 1977 at a map scale of 1:250,000 (Fegeas and others, 1983). This small scale limited land-use delineations to about 10 to 40 acres.

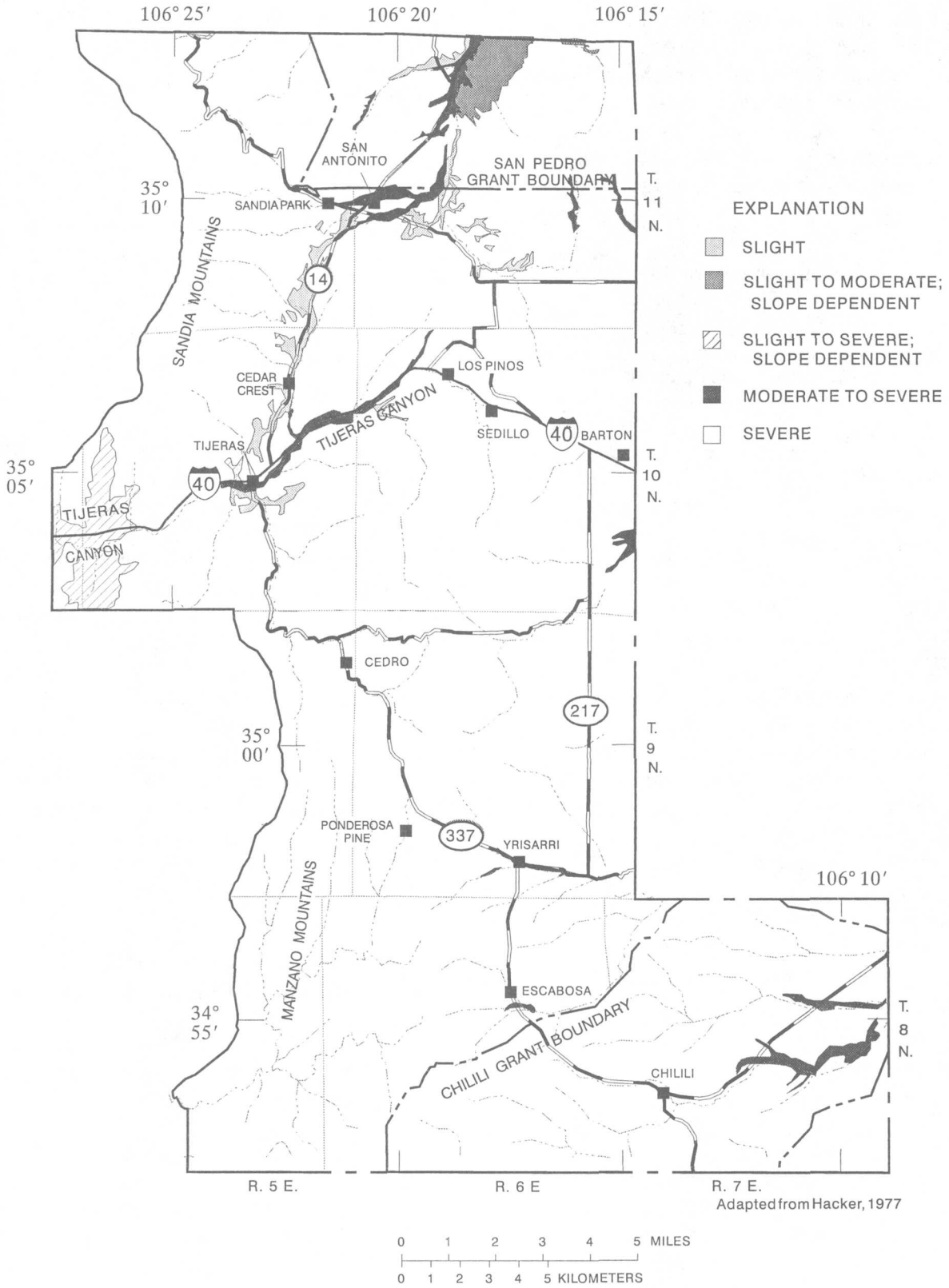


Figure 5.--Limitation of soils in eastern Bernalillo County for use as septic-system absorption fields.

Fegeas and others (1983) classified about 79 percent of the study area as forest land (table 2). Most residential areas, however, are delineated as forest land because these areas typically were too small to be delineated as urban or built-up land at the 1:250,000 map scale. Additional forest land has been converted to residential areas (urban or built-up land) since these data were compiled in 1977. Consequently, urban or built-up land currently (1999) occupies more than the 3 percent of eastern Bernalillo County identified by Fegeas.

Table 2.--Land use in eastern Bernalillo County, 1977

[Fegeas and others, 1983]

Land-use classification	Area (square miles)	Percentage of study area
Forest land	196	79
Agricultural land	32	13
Rangeland	10	4
Urban or built-up land	8	3
Barren land	2	1
Total	248	100

Urban or built-up land along the I-40 corridor and New Mexico State Highway 14 (fig. 6) is the location of the earliest commercial development in the study area. Urban or built-up land along New Mexico Highway 14 typically has been developed more recently than that along I-40. Most agricultural and range land is east of the areas being considered for residential development.

Commercial activity in eastern Bernalillo County generally is service oriented. The only heavy industrial operation is a mine and an adjacent plant that mills limestone and produces cement.

STUDY DESIGN

This study was designed to assess water quality and the effects from domestic wastewater disposal on water quality from three different perspectives. First, the entire eastern Bernalillo County study area was assessed to determine overall water quality and effects; second, the study area was examined, from the perspective of the three geologic terranes described earlier (fig. 3), to assess the effect of geology on water quality; and third, the study area was examined from the perspective of six geographic areas (fig. 7), based on history and intensity of development, to assess the effects of development on water quality.

Sampling Sites and Frequency of Sample Collection

Water-quality samples from 121 wells throughout eastern Bernalillo County were collected and analyzed to provide an inventory of water-quality conditions. The location of these wells, designated "inventory wells," is shown in figure 7. Inventory wells were selected to provide geographically and geohydrologically representative coverage. Their proximity to faults or other geologic features, however, was not considered.

Well construction data were obtained from the Office of the State Engineer in Albuquerque and from well owners. Selected information about these wells is listed in table 11 (tables 11-14 are at the back of this report). All 121 inventory wells were used to supply water primarily to private homes, commercial enterprises, or public buildings and were equipped with permanent pumps. Each inventory well was sampled once during April-October 1990.

Twenty of the 121 inventory wells were selected for additional, monthly sampling during 1990-91. Water levels were measured in and water-quality samples were collected from these wells to monitor short-term variations in water levels and water quality and the response of water levels and water quality to environmental effects, including unusual precipitation events. The location of these wells, designated "monthly monitoring wells," is shown in figure 8.

Field-Data and Sample-Collection Procedures and Laboratory Analysis

Inventory and monthly monitoring samples were collected using the permanently installed pumps; samples were collected as close to the well head as the water delivery system permitted. Samples were processed in the field and subsequently shipped to the USGS National Water Quality Laboratory (NWQL) in Arvada, Colorado. Flow rate, temperature, specific conductance, pH, and alkalinity were measured in the field at the time of sample collection. Water levels were measured prior to sample collection when access permitted.

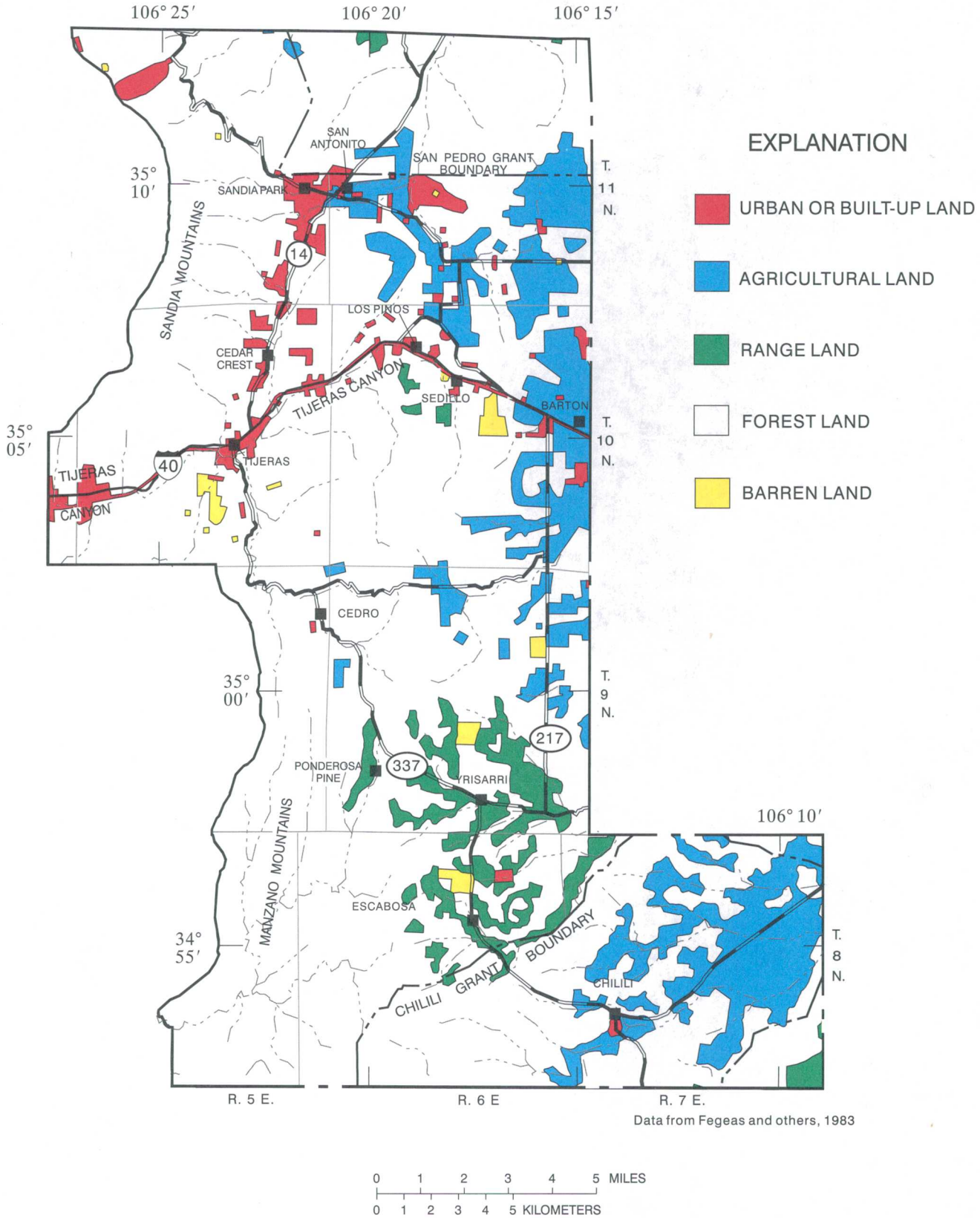


Figure 6.--Land use in eastern Bernalillo County, 1977.

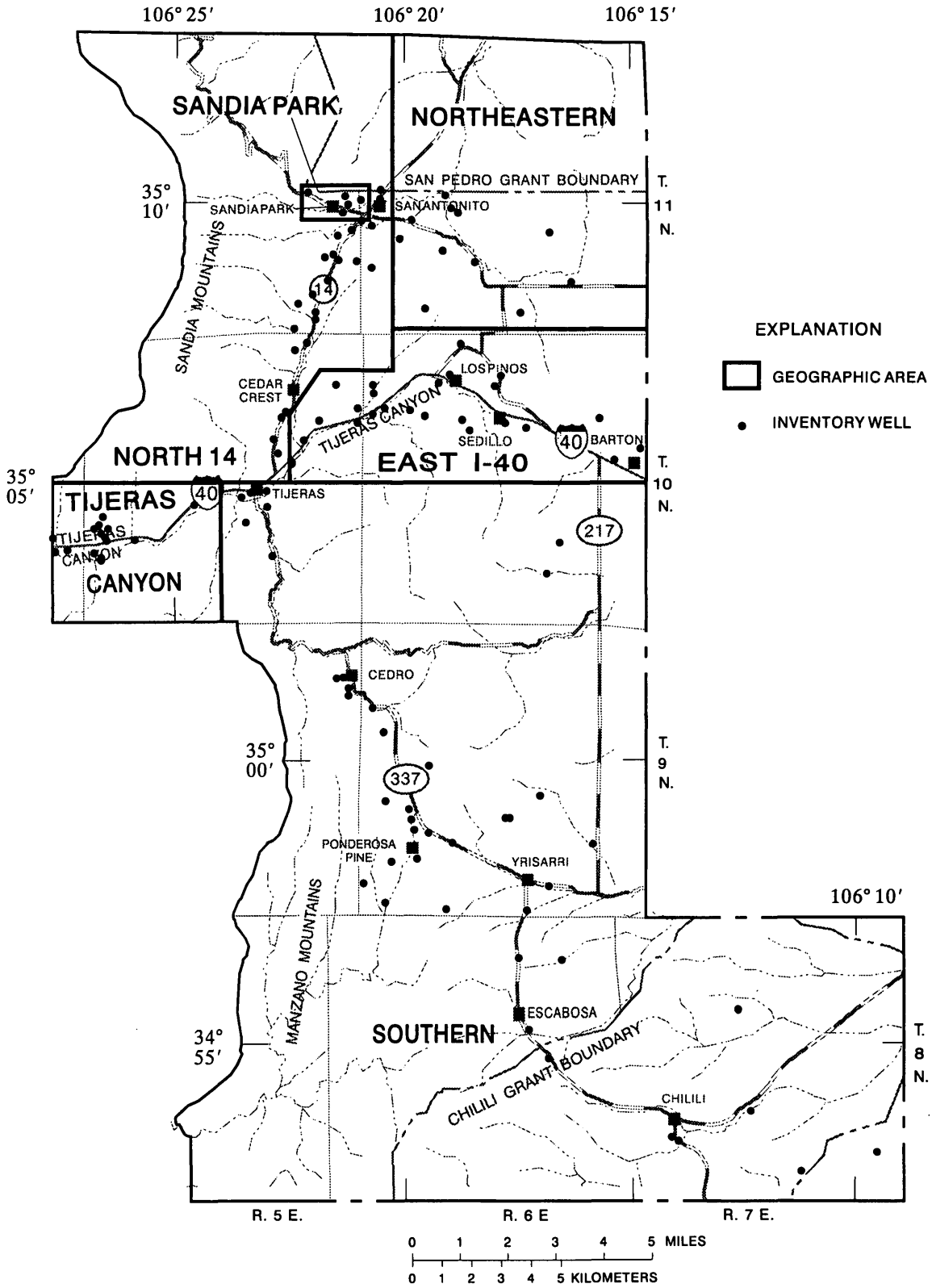


Figure 7.--Location and distribution of inventory wells sampled in April-October 1990 and geographic areas in eastern Bernalillo County.

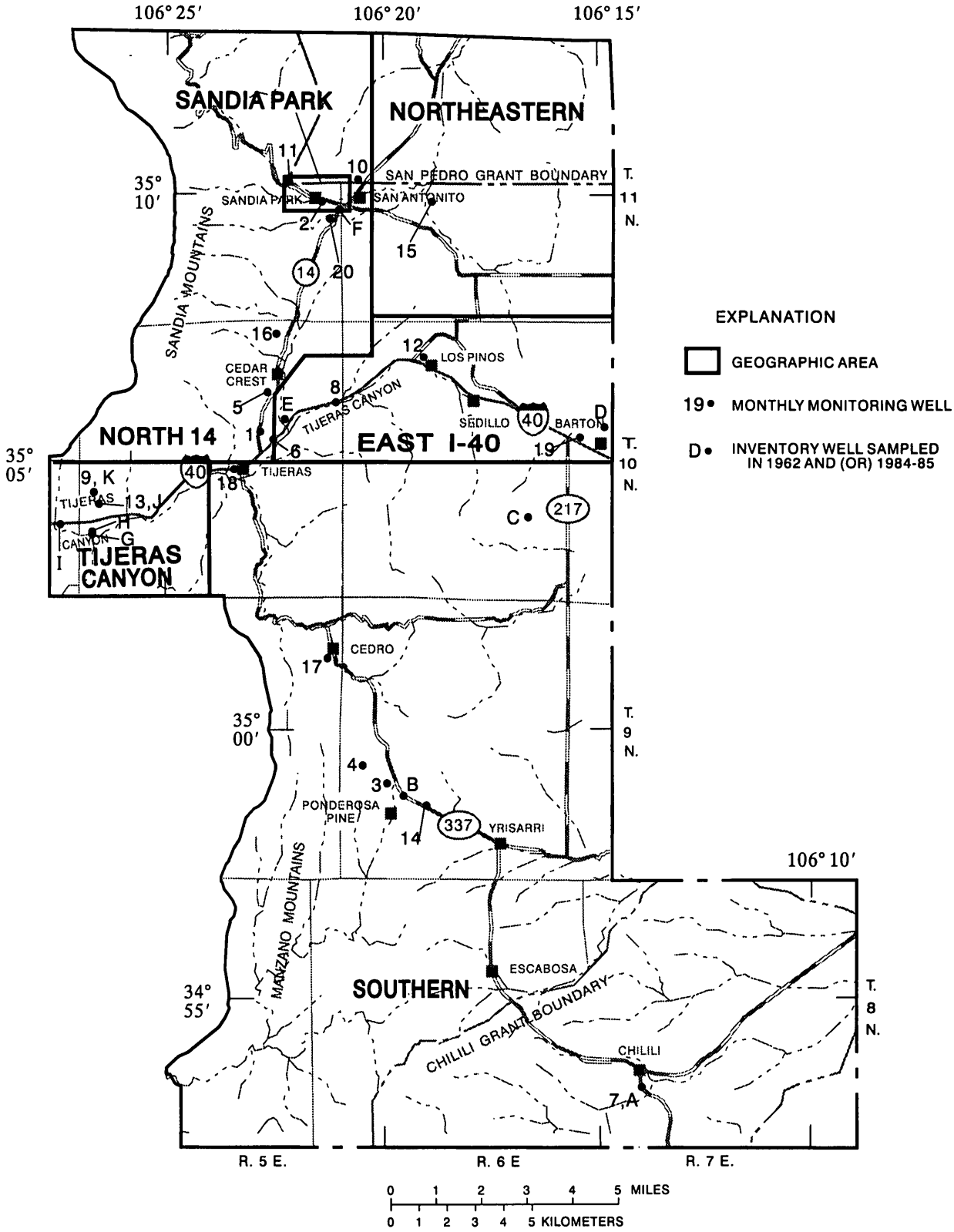


Figure 8.--Location of monthly monitoring wells sampled in 1990-91 and inventory wells sampled prior to 1990-91.

The NWQL conducted all laboratory water-quality analyses, using techniques described by Fishman and Friedman (1989). Inventory samples were analyzed for nutrients (total and dissolved nitrite plus nitrate, total nitrite, total ammonia plus organic nitrogen, total ammonia, and total phosphorus); total organic carbon (TOC); major dissolved constituents; dissolved fluoride, boron, iron, and manganese; and methylene-blue active substances (MBAS). Monthly monitoring samples were analyzed for a smaller group of constituents whose concentrations may be affected by domestic wastewater. These constituents included total nitrite plus nitrate, total nitrite, total ammonia plus organic nitrogen, total ammonia, total phosphorus, TOC, dissolved chloride, dissolved boron, dissolved iron, and MBAS. Selected samples also were analyzed for dissolved nitrite plus nitrate, total orthophosphate, dissolved fluoride, and dissolved sulfate.

In November 1990, water samples from all 20 monthly monitoring wells and two selected inventory wells were analyzed for seven volatile organic compounds (VOCs). The analyses for VOCs were conducted in the field using a Photovac 10S portable gas chromatograph according to methods described by Brock (1990). The NWQL prepared standard solutions to calibrate the portable gas chromatograph.

Water-quality data produced as part of this study are published in tabular form in annual USGS Water-Data Reports (Borland and others, 1991; Borland and others, 1992; Cruz and others, 1993), and are listed in table 12. These data also have been entered into the USGS National Water Information System (NWIS) data base. Selected water-quality data collected between January 1990 and June 1993 are shown in graphical form in Kues and Garcia (1995).

Quality Assurance

Thirty-one replicate samples were collected and subsequently analyzed by the NWQL for quality assurance. These samples were collected immediately following the collection of the original samples using the same procedures. Comparison of results of laboratory analyses of replicate samples and the corresponding original samples indicated no systematic problems in sample collection and processing or in laboratory analysis. Results of analyses of environmental samples and the associated replicate quality assurance samples are listed in table 13.

Data Analysis

Constituents that can be indicative of ground-water contamination from domestic wastewater include several species of nitrogen and phosphorus, dissolved chloride, total organic carbon, MBAS, and in some cases, VOCs (Canter and Knox, 1985, p. 58). In eastern Bernalillo County, concentrations of total nitrite plus nitrate, dissolved chloride, and total organic carbon were the most useful and were used extensively for determination of ground-water conditions and susceptibility. They are referred to in this report as "indicator constituents."

The study area assessment of water quality and the effects on water quality from domestic wastewater disposal was conducted using indicator-constituent concentrations in the 121 inventory samples (only 120 analyses were conducted for concentrations of total nitrate and total organic carbon). To assess the effect of geology on water quality, the inventory wells were assigned to one of the three geologic terranes (fig. 3). The terrane of completion for each well was determined from well records; for wells without records of completion, the terrane of completion was determined by plotting the well location on a geologic map of the Sandia and northern Manzano Mountains (Titus, 1980, fig. 4). The terrane of completion, however, could not be determined for two wells; the terrane of completion for these two wells is designated as "unknown." Wells completed in unconsolidated material were assigned to the underlying terrane.

To assess the relations between different histories and intensities of development and water quality, the inventory wells were assigned to one of six geographic areas. Three areas are north of I-40 and are designated the Sandia Park, the Northeastern, and the North State Highway 14 or North 14 areas; two areas are along I-40 and are designated the Tijeras Canyon and the East I-40 areas; and one area is south of I-40 and is designated the Southern area (fig. 7). All inventory wells in the Sandia Park and North 14 areas are completed in the clastic terrane, all inventory wells in the Tijeras Canyon Area are completed in the crystalline terrane, and all inventory wells in the Southern area are completed in the carbonate terrane.

Each of the six geographic subdivisions has unique characteristics of development. Residential development in the Sandia Park area began several decades ago, although little additional development was occurring at the time of this study (1990-91). At

the time of this study, intensive development was occurring in the Northeastern area; it also is the location of some older development. The North 14 area has been the site of ongoing intensive development for approximately the past three decades. This development began shortly after that in Tijeras Canyon and has been continuing since that time. Cedar Crest, San Antonito, and several other communities are in the North 14 area.

The Tijeras Canyon and East I-40 areas are each bisected by I-40 and, prior to the completion of I-40, by U.S. Highway 66. Commercial activity has served travelers along these highways since the 1930's. The Tijeras Canyon area also is the site of the earliest post-World War II residential development in eastern Bernalillo County because of its proximity to Albuquerque and the access provided by U.S. Highway 66 and I-40. Development in the Tijeras Canyon area was minimal at the time of this study (1990-91).

The Southern area is the least developed. Although some development is occurring near I-40 in the northern part of the Southern area, much of the area still contains elements of subsistence ranching and farming. Tijeras, which is adjacent to I-40, is the largest community in the Southern area.

Data were analyzed statistically to determine the minimum, 25th-percentile, median, 75th-percentile, and maximum concentrations for each indicator constituent. These statistics were determined for the study area as a whole, for each terrane, and for each geographic area.

The 25th-percentile concentrations (25 percent of the samples had concentrations smaller than these values and 75 percent of the samples had concentrations larger than these values) were chosen to approximate background or naturally occurring water quality. The median concentrations (one-half of the analyses had concentrations larger than these values, and one-half of the analyses had concentrations smaller than these values) were chosen to approximate typical ground-water quality. The 75th-percentile concentrations (75 percent of the samples had concentrations smaller than these values and 25 percent of the samples had concentrations larger than these values) were chosen to approximate concentrations that indicate a substantial effect on water quality.

INVENTORY OF WATER-QUALITY CONDITIONS IN THE STUDY AREA

This section briefly discusses the natural sources, human-induced sources, geochemistry, and concentrations of selected constituents analyzed in the 121 inventory samples. Major ions, species of nitrogen, dissolved chloride, TOC, and other selected constituents are included in the discussion.

Major Ions

Calcium and bicarbonate plus carbonate were the dominant cation and anion, respectively, in most ground water in eastern Bernalillo County (field alkalinity concentrations, in milligrams per liter as $CaCO_3$, were used as a surrogate for bicarbonate plus carbonate). Median concentrations of these constituents in samples from the 121 inventory wells were 110 mg/L for calcium and 260 mg/L for alkalinity. According to the classification of Durfor and Becker (1964, p. 27), ground water from 110 of the 121 inventory wells was classified as very hard (equivalent to 180 mg/L $CaCO_3$ or more); the median hardness in samples from the 121 inventory wells was equivalent to 390 mg/L $CaCO_3$.

Species of Nitrogen

The chemical species in which nitrogen is found in the subsurface depends on several factors, including the source of nitrogen, the amount of soil oxygen, and the type and concentration of soil microorganisms. Nitrogen species commonly are present in domestic wastewater, and ground-water contamination from septic systems may be indicated by one or more of these species.

Organic nitrogen occurs as part of certain organic substances and is present naturally in soils and some sedimentary rocks. Geologic sources of nitrate include organic-rich shales and carbonate rocks. Carbonate rocks, which crop out or are the uppermost bedrock unit in most of eastern Bernalillo County, typically do not contain large amounts of naturally occurring organic nitrogen; they are, however, a minor source of naturally occurring nitrate (Feth, 1966).

Nitrogen in domestic wastewater originates as organic nitrogen and ammonia. Typically, these species oxidize to nitrite (NO_2) and subsequently into nitrate

(NO_3) in the septic-system absorption field. In systems that are not completely effective, oxidation may not be completed in the absorption field and may occur in adjacent soils outside the absorption field (Freeze and Cherry, 1979, p. 413). Nitrate is stable in an aerobic environment, which typically is characteristic of shallow ground water.

Oxidation of organic nitrogen and ammonia most often is completed in absorption fields and in soils above the saturated zone, and nitrogen typically enters the ground-water system as nitrate. Concentrations of organic nitrogen and ammonia in ground water indicate incomplete oxidation and a potential for increased ground-water concentrations of nitrate in the presence of dissolved oxygen.

The 25th-percentile, median, and 75th-percentile concentrations of total ammonia plus organic nitrogen for the 121 inventory samples were 0.2, 0.4, and 0.5 mg/L as nitrogen, respectively; concentrations ranged from less than the minimum reporting level (MRL) of 0.2 to 2.3 mg/L (table 12). The concentration was less than the MRL in 38 samples, or approximately 31 percent of the inventory samples. The similar 25th-percentile, median, and 75th-percentile concentrations; small range; and large number of samples with concentrations less than the MRL indicate that concentrations of total ammonia plus organic nitrogen are not a concern in eastern Bernalillo County. These small concentrations preclude using total ammonia plus organic nitrogen as an indicator of the effects on the ground-water system from domestic wastewater disposal.

Water samples were analyzed for total nitrite plus nitrate and for total nitrite; total-nitrate concentrations can be calculated by subtracting the total-nitrite concentration from the total nitrite plus nitrate concentration. In this study, total-nitrite concentrations, expressed in milligrams per liter of nitrogen, were larger than the MRL of 0.01 mg/L in only 7 of 121 samples, and the maximum concentration was 0.04 mg/L. When rounded to three significant figures, the subtraction of the total-nitrite concentration did not change the value of any total nitrite plus nitrate concentration. Therefore, the laboratory-determined total nitrite plus nitrate concentrations are considered equivalent to calculated total-nitrate concentrations. These values are referred to as total-nitrate concentrations in this discussion and are used as an indicator constituent.

The 25th-percentile, median, and 75th-percentile concentrations of total nitrate for 120 inventory samples were 0.5, 1.9, and 4.6 mg/L as nitrogen; concentrations ranged from less than the MRL of 0.1 to 29 mg/L (table 3 and table 12). Total-nitrate concentration was less than the MRL in 17 samples, or approximately 14 percent of the inventory samples. In 10 samples concentrations exceeded the USEPA primary standard of 10 mg/L. The large number of samples with concentrations exceeding the primary standard and the maximum concentration of 29 mg/L, nearly three times the primary standard, indicate that nitrate is a constituent of substantial concern in eastern Bernalillo County.

Table 3.--Ranges of concentrations and 25th-percentile, median, and 75th-percentile concentrations of indicator constituents in the 121 inventory wells

[Concentrations are in milligrams per liter; <, less than]

Concentration	Total nitrate (as nitrogen)	Dissolved chloride	Total organic carbon
Number of analyses	120	121	120
Concentration			
Minimum	<0.1	5.8	<0.1
25th percentile	0.5	27	0.6
Median	1.9	66	1.0
75th percentile	4.6	150	2.0
Maximum	29	780	6.6

The correlation between concentrations of total ammonia plus organic nitrogen and total nitrate appears to be strong in samples with large concentrations of these constituents. Of the 29 samples in which the concentration of total nitrate was equal to or greater than the 75th-percentile concentration of 4.6 mg/L, 22 also had concentrations of total ammonia plus organic nitrogen equal to or greater than the 75th-percentile concentration of 0.5 mg/L. This suggests a potential for larger concentrations of nitrate at these sites if dissolved oxygen is available to oxidize the ammonia and organic nitrogen.

Total-nitrate concentrations for 10 wells in part of the Tijeras Canyon area are shown in figure 9. The direction of ground-water flow in this area is toward Tijeras Arroyo from the north and south, and total-nitrate concentrations increase substantially in the direction of ground-water flow north of Tijeras Arroyo. In the upgradient area, near the northern margin of development, concentrations ranged from 0.7 to 2.7 mg/L; farther downgradient, concentrations ranged from 9.3 to 15 mg/L. South of I-40 and north of Tijeras Arroyo, concentrations ranged from 9.2 to 27 mg/L. The concentration in the only well south of Tijeras Arroyo and south of the effects of development north of the arroyo was 1.1 mg/L. These total-nitrate concentrations indicate that in this area of residential development, total-nitrate concentrations increased dramatically along the direction of ground-water flow.

Dissolved Chloride

Chloride is a common constituent in several rock types, including evaporites and marine shales, and also is found in small concentrations in some igneous rocks. Thus dissolved chloride is naturally present in ground water. Localized evaporite deposits occur east of Sandia Park, but these deposits are not associated with known high chloride concentrations in ground water. Near-surface ground water high in dissolved chloride may occur along faults, where hydraulic connections may be present between deeper, more saline ground water and near-surface ground water.

Human activities can increase chloride concentrations in ground water. Principal sources of chloride resulting from human activities are from domestic wastewater, including water softening, and from municipal, commercial, and residential pavement deicing.

Because nearly all ground water in eastern Bernalillo County is very hard, many households chemically soften water for domestic use. The operation of water softening systems typically contributes chloride to wastewater. Concentrations of dissolved chloride of about 50 mg/L have been reported in septic-tank effluent (Canter and Knox, 1985). The use of chloride salts for pavement deicing does not increase chloride concentrations in domestic wastewater, but potentially contributes chloride to ground-water systems.

The 25th-percentile, median, and 75th-percentile dissolved-chloride concentrations for 121 inventory samples were 27, 66, and 150 mg/L, respectively, and the range of concentrations was large, from 5.8 to 780 mg/L (tables 3 and 12). Concentrations in 13 inventory samples were equal to or larger than the USEPA national secondary drinking-water regulation (secondary standard) of 250 mg/L. Secondary standards are non-enforceable guidelines regulating concentrations of constituents that may cause cosmetic effects on humans or cause aesthic degradation of drinking water (U.S. Environmental Protection Agency, 1998).

Ten of the 13 inventory samples having dissolved-chloride concentrations equal to or larger than 250 mg/L were from wells along I-40 east of Tijeras, which coincides with Gutierrez Fault and related faults and fractures (fig. 3). These large chloride concentrations could originate from a geologic source, such as upward movement of saline ground water along these faults and fractures and subsequent mixing with freshwater.

Total Organic Carbon

Organic carbon is found in soils and some sedimentary rocks, and these natural sources can contribute organic carbon to ground water. Septic systems are a known human source of organic carbon (Canter and Knox, 1985).

The 25th-percentile, median, and 75th-percentile concentrations of TOC for 120 inventory samples were 0.6, 1.0, and 2.0 mg/L, respectively, and concentrations ranged from less than the MRL of 0.1 to 6.6 mg/L (tables 3 and 12). The concentration was less than the MRL in only two samples. The similar 25th-percentile, median, and 75th-percentile concentrations and small range of concentrations limit the usefulness of TOC as an indicator constituent in eastern Bernalillo County.

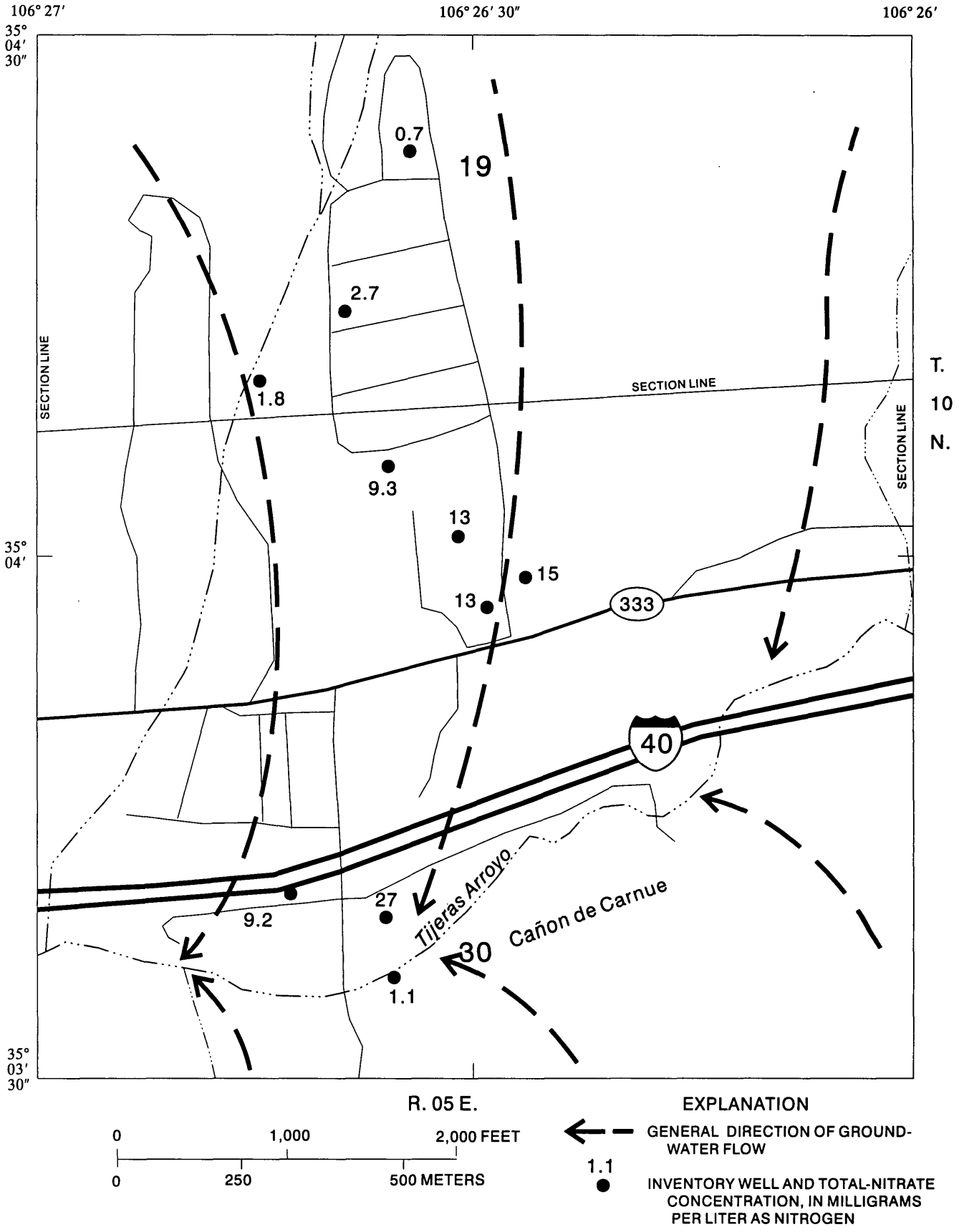


Figure 9.--Total-nitrate concentrations and general direction of ground-water flow in part of the Tijeras Canyon area.

Other Constituents

Naturally occurring concentrations of phosphorus in ground water typically are no more than several tenths of a milligram per liter (Hem, 1985, p. 126). Phosphorus is readily removed from soil water by reactions with soil particles and typically is not found in large concentrations in ground water unless the water is contaminated. Phosphorous species typically include organic phosphorus and orthophosphate.

Total-phosphorus concentrations in 79 of the 121 inventory samples were equal to or less than the MRL of 0.01 mg/L. Five samples had concentrations larger than 0.03 mg/L, and the largest concentration was 0.20 mg/L. Total-phosphorus concentrations typically did not exceed expected naturally occurring levels and did not indicate intense or widespread ground-water contamination resulting from domestic wastewater disposal.

Boron occurs naturally in evaporite deposits and in granitic rocks such as those forming the core of the Sandia and Manzano Mountains, and "concentrations up to a few tenths of a milligram per liter [a few hundred micrograms per liter] can be expected in a good many types of surface and ground water" (Hem, 1985, p. 129). The principal source of boron resulting from human activities is as an additive to soap products and therefore may be present in domestic wastewater (Hem, 1985, p. 129).

The median concentration of dissolved boron in the 121 inventory samples was 80 micrograms per liter (μg/L). Four samples had concentrations more than 400 μg/L, and the largest concentration was 640 μg/L. Dissolved-boron concentrations typically did not exceed expected naturally occurring levels and did not indicate intense or widespread ground-water contamination resulting from domestic wastewater disposal.

VOCs typically enter ground-water systems because of improper disposal of solvents or leaking fuel-storage tanks. In previous studies in other areas, septic systems have been identified as the probable source of selected VOCs, such as trichloroethylene (Canter and Knox, 1985, p. 59).

Water samples were collected from the 20 monthly monitoring wells and from two selected inventory wells in November 1990; these samples were analyzed for seven common VOCs: benzene; trans 1, 2-dichloroethylene; cis 1, 2-dichloroethylene; trichloroethylene; tetrachloroethylene; toluene; and m-xylene. Two samples contained detectable concentrations of VOCs; one was adjacent to an operating gasoline station and one was adjacent to an abandoned gasoline station. The detected VOCs were benzene, toluene, and m-xylene.

The close proximity of these wells to underground storage tanks and the lack of detectable concentrations of VOCs in samples from the other 20 wells indicate that no widespread contamination of ground water by VOCs has occurred in the study area, and that septic systems are not a typical source of ground-water VOC concentrations.

In 1993, following completion of field work for this study, the NWQL advised that its analyses for MBAS between January 1, 1970, and August 29, 1993, were positively biased (Mark Burkhardt and Jeff Pritt, U.S. Geological Survey, written commun., 1993). This bias was caused by dissolved nitrite plus nitrate and dissolved chloride in the samples. The NWQL provided an equation for correcting the MBAS data and increased the minimum reporting level of the corrected MBAS data from 0.01 to 0.02 mg/L.

In samples collected as part of this study, 10 MBAS concentrations were less than 0.02 mg/L prior to application of the correction equation. Corrected MBAS concentrations could not be calculated for another 14 samples because they lacked dissolved nitrite plus nitrate or MBAS analyses. For 83 of the remaining 97 analyses, applying the correction equation resulted in MBAS concentrations less than or equal to the revised reporting level of 0.02 mg/L. Only 14 samples had concentrations larger than the revised reporting level; therefore, MBAS data were inadequate to use in assessing water-quality conditions.

INDICATOR-CONSTITUENT CONCENTRATIONS IN THE THREE GEOLOGIC TERRANES

The chemistry of ground water is in part the result of its interaction with the geologic terrane in which it occurs. For example, the carbonate terrane may have a limited ability to sorb contaminants, whereas interbedded clays in the clastic terrane may contain sorption sites for contaminants. In addition, faults in the bedrock can cause different geologic units to be juxtaposed and ground waters in these units to be mixed, and fractures can create connections between geologic units with differing ground-water chemistry. Because of the potential for these and other possible chemical alterations of ground water by local geologic conditions, indicator-constituent concentrations in the three terranes were compared.

In the carbonate and clastic terranes the 25th-percentile, median, and 75th-percentile total-nitrate

concentrations were similar; in the crystalline terrane, however, concentrations were about three times those in the other terranes (fig. 10; table 4). These larger concentrations may be related to the history and intensity of development; all crystalline terrane wells are in the Tijeras Canyon area, which has the longest history of development. Larger concentrations also may be related to typically shallower depths to water in the crystalline terrane (table 5) or to the nature of the geologic material--severely fractured crystalline bedrock that is in places overlain by alluvium. All these factors probably play a role in the larger nitrate concentrations in the crystalline terrane.

The 25th-percentile, median, and 75th-percentile dissolved-chloride concentrations were similar in the carbonate and crystalline terranes (table 4). The clastic terrane, however, had the smallest 25th-percentile and median concentrations but the largest 75th-percentile concentration, suggesting a bimodal distribution of concentrations (fig. 11; table 4). Dissolved-chloride concentrations in 30 of the 43 inventory samples in the clastic terrane were less than 100 mg/L, and concentrations in 22 of these samples were less than 50 mg/L. Concentrations in nine samples from the clastic terrane, however, were equal to or greater than 200 mg/L, and concentrations in five samples exceeded the secondary standard of 250 mg/L. Concentrations were between 100 and 200 mg/L in only four wells in the clastic terrane. These larger dissolved-chloride concentrations in the clastic terrane may result from several sources, including domestic wastewater disposal, geologic sources, and road salt applied to I-40 during the winter.

The median and 75th-percentile TOC concentrations in the carbonate terrane were about twice those in the clastic and crystalline terranes (fig. 12; table 4). These larger concentrations suggest that this terrane may not have the capacity to biochemically alter organic carbon and/or it may have less sorption capacity than is present in clastic and crystalline terranes.

INDICATOR-CONSTITUENT CONCENTRATIONS IN THE SIX GEOGRAPHIC AREAS

In addition to comparison of 25th-percentile, median, and 75th-percentile indicator-constituent concentrations in each geographic area (table 6), the number of samples in each geographic area having indicator-constituent concentrations larger than the entire study area 75th-percentile concentration was determined. This number was compared with the number of samples expected to have concentrations larger than the study area 75th-percentile concentration (table 7). The expected number for each geographic area is the number of samples that would be larger than the entire study area 75th-percentile concentration if the concentration distribution in each area were the same as in the entire study area. The expected number for each geographic area, then, is the number of samples in the area divided by four.

The Sandia Park area is upgradient from all other residential development (figs. 4, 6, and 7); the area farther upgradient is a probable recharge area and is nearly devoid of development. Indicator-constituent concentrations in the Sandia Park area reflect little effect from development and represent nearly naturally occurring concentrations. The small number of samples in the area, however, precludes meaningful determination of indicator-constituent 25th-percentile, median, and 75th-percentile concentrations. Only the largest dissolved-chloride concentration was substantially larger than the median indicator-constituent concentration for the entire study area, and this concentration was less than the study area 75th-percentile concentration.

Indicator-constituent concentrations in the Northeastern area also typically were small. Median concentrations exceeded for the entire study area were total nitrate at four sites, dissolved chloride at two sites, and TOC at three sites. Of these nine exceedances of study area median concentrations, however, five also exceeded study area 75th-percentile concentrations, and one total-nitrate concentration also exceeded the primary standard of 10 mg/L. All five 75th-percentile exceedances occurred at 3 of 11 sites, suggesting local effects on ground-water quality.

Of the four remaining geographic areas, total-nitrate concentrations in the North 14 area typically were most representative of the study area in general. The median total-nitrate concentration in the North 14 area was slightly larger than that in the entire study area, and the 75th-percentile concentration was slightly smaller than that in the entire study area. The number of samples exceeding the study area 75th-percentile concentration was 5, compared to an expected value of 5.75 samples. The total-nitrate concentration in one sample, however, exceeded the primary standard of 10 mg/L, suggesting local effects on ground-water quality.

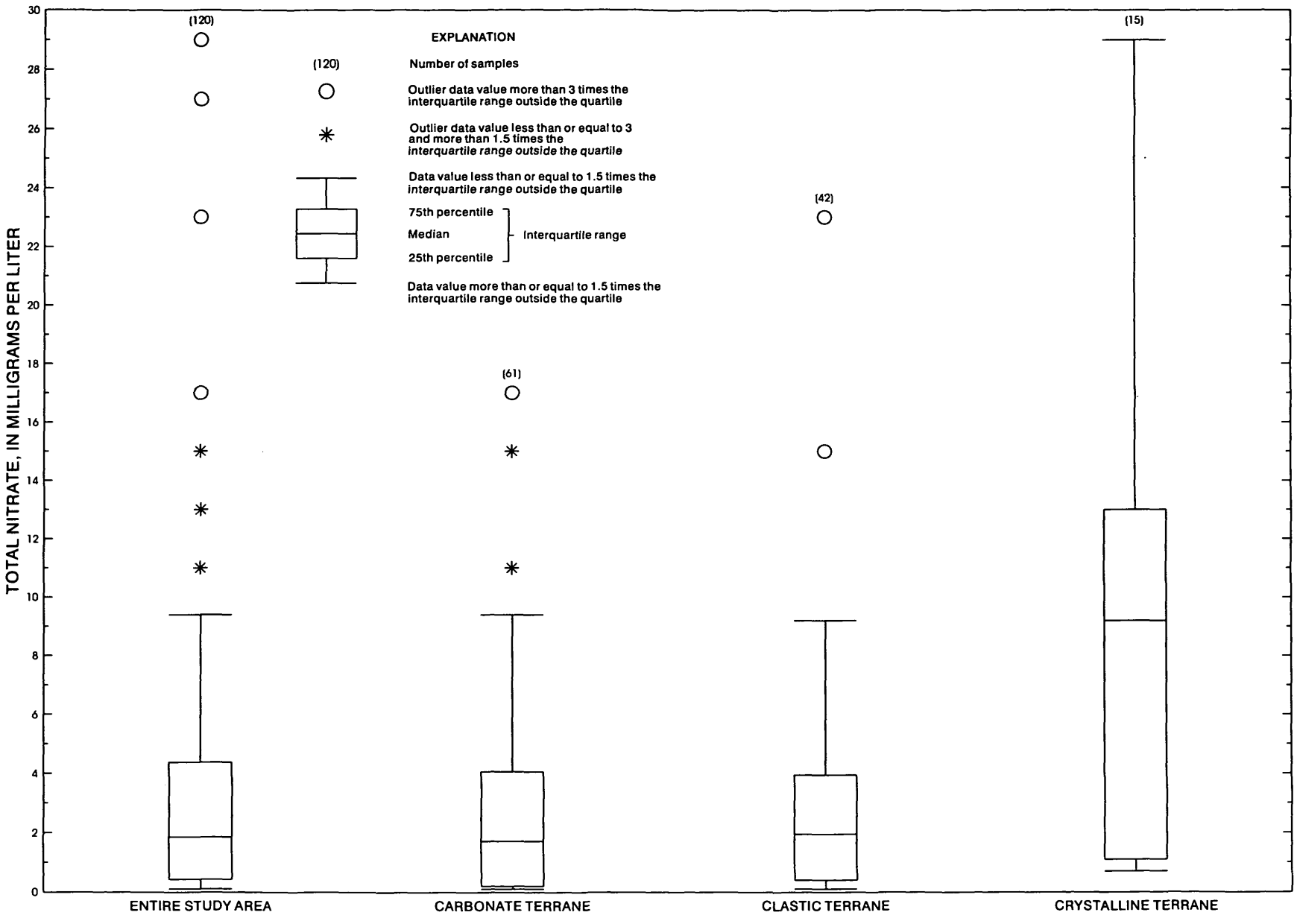


Figure 10.--Concentration distribution of total nitrate in the entire study area and in each geologic terrane.

Table 4.--25th-percentile (first value), median (second value), and 75th-percentile (third value) concentrations of indicator constituents in the entire study area and in each geologic terrane

[Concentrations are in milligrams per liter. Number of analyses shown in parentheses]

Area or terrane	Total nitrate (as nitrogen)	Dissolved chloride	Total organic carbon
Study area	0.5/ 1.9/ 4.6 (120)[1]	27/ 66/ 150 (121)[1]	0.6/ 1.0/ 2.0 (120)[1]
Carbonate terrane	0.2/ 1.7/ 4.1 (61)	37/ 76/ 155 (61)	0.7/ 1.6/ 2.6 (60)
Clastic terrane	0.4/ 2.0/ 4.0 (42)	15/ 42/ 160 (43)	0.4/ 0.7/ 1.4 (43)
Crystalline terrane	1.0/ 6.1/ 14 (15)	30/ 79/ 110 (15)	0.6/ 0.8/ 1.1 (15)

[1]Includes 2 wells completed in unknown terrane.

Table 5.--25th-percentile (first value), median (second value), and 75th-percentile (third value) well depth and depth to water in the entire study area and in each geologic terrane

[Number of analyses shown in parentheses]

Area or terrane	Depth of completed well, in feet below land surface	Depth to water, in feet below land surface
Study area	138/ 200/ 308 (73)[1]	43/ 77/ 140 (85)[2]
Carbonate terrane	144/ 250/ 356 (40)	44/ 108/ 173 (41)
Clastic terrane	154/ 198/ 282 (22)	49/ 77/ 124 (31)
Crystalline terrane	68/ 125/ 173 (9)	33/ 43/ 69 (12)

[1]Includes 2 wells completed in unknown terrane.
[2]Includes 1 well completed in unknown terrane.

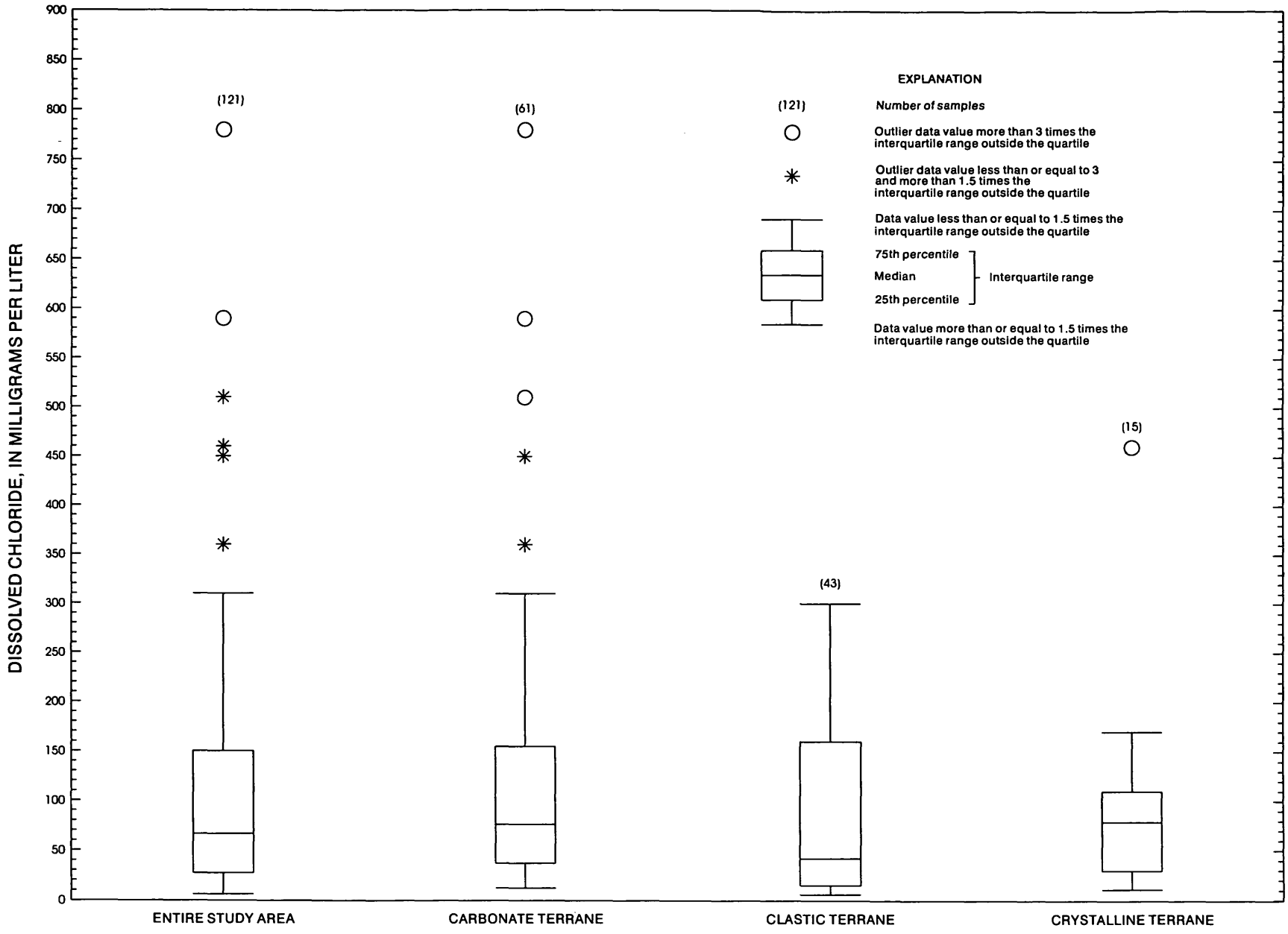


Figure 11.--Concentration distribution of dissolved chloride in the entire study area and in each geologic terrane.

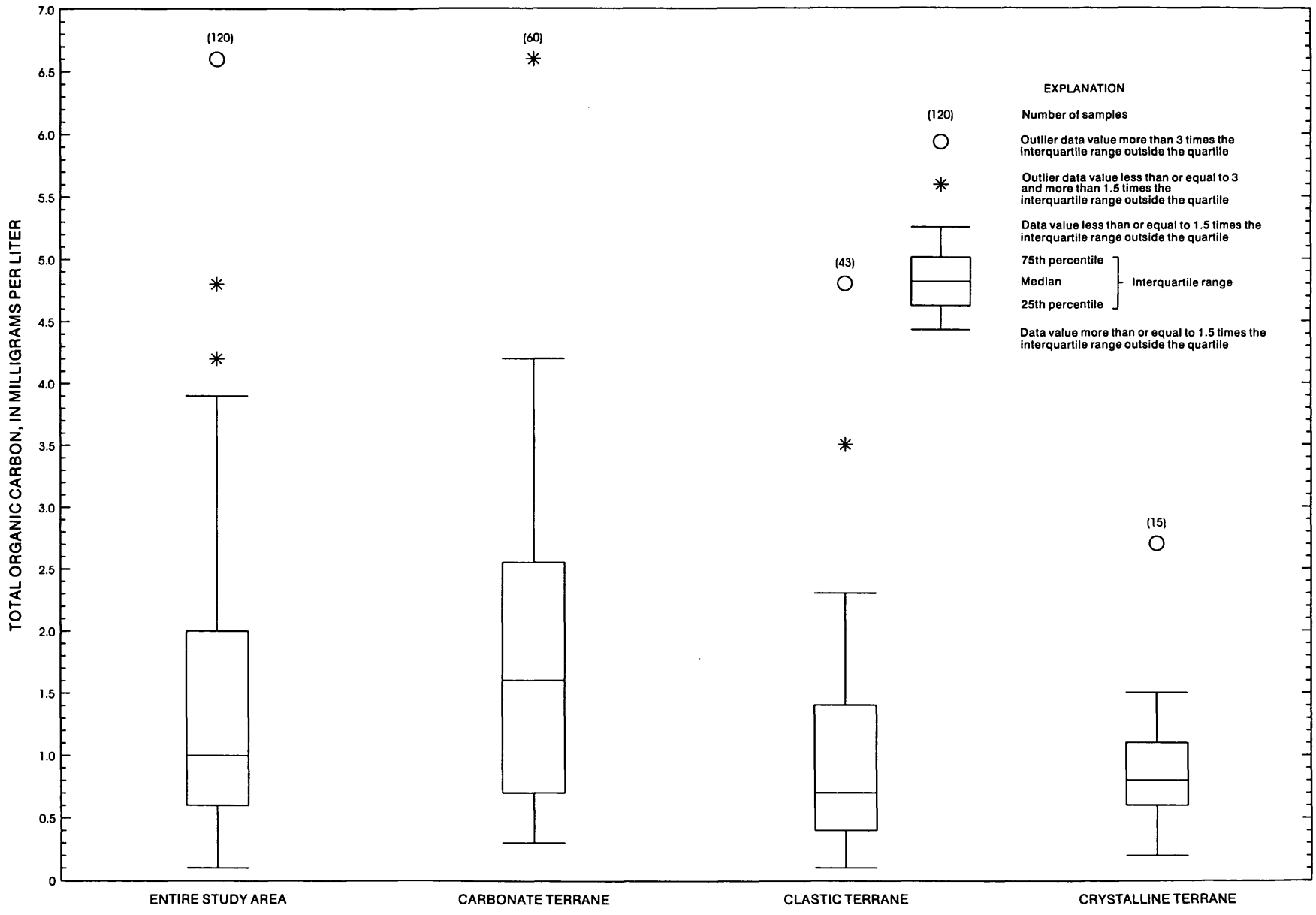


Figure 12.--Concentration distribution of total organic carbon in the entire study area and in each geologic terrane.

Table 6.--25th-percentile (first value), median (second value), and 75th-percentile (third value) concentrations of indicator constituents in the entire study area and in each geographic area

[Concentrations are in milligrams per liter; <, less than]

Area (number of analyses)	Total nitrate (as nitrogen)	Dissolved chloride	Total organic carbon
Study area (121)[1]	0.5/ 1.9/ 4.6	27/ 66/ 150	0.6/ 1.0/ 2.0
Sandia Park (5)[2]	0.4 - 2.0	10 - 96	<0.1 - 0.8
Northeastern (11)	0.3/ 1.2/ 3.7	7.2/ 13/ 35	0.3/ 0.5/ 1.1
North 14 (23)	1.1/ 2.6/ 4.3	24/ 66/ 160	0.6/ 0.7/ 1.4
Tijeras Canyon (15)	1.0/ 6.1/ 14	30/ 79/ 110	0.6/ 0.8/ 1.1
East I-40 (25)[3]	0.4/ 2.8/ 6.8	32/ 170/ 290	0.6/ 1.5/ 2.8
Southern (42)	0.2/ 1.7/ 3.2	36/ 62/ 150	0.8/ 1.6/ 2.3

[1]120 analyses for total nitrate and total organic carbon.
[2]Range of concentrations was used for the Sandia Park area because of the small number of samples.
[3]24 analyses for total nitrate and total organic carbon.

Table 7.--Number of samples in each geographic area having indicator-constituent concentrations larger than the study area 75th-percentile concentration

	Expected and actual number of samples having concentrations larger than the study area 75th-percentile concentration			
		Actual number of samples		
Area (number of analyses)	Expected number of samples	Total nitrate (as nitrogen)	Dissolved chloride	Total organic carbon
Sandia Park (5)	1.25	0	0	0
Northeastern (11)	2.75	2	1	2
North 14 (23)	5.75	5	6	1
Tijeras Canyon (15)	3.75	8	2	1
East I-40 (25)[1]	6.25	11	13	9
Southern (42)	10.5	4	6	14

[1]24 analyses for total nitrate and total organic carbon.

The Tijeras Canyon area had the largest median and 75th-percentile total-nitrate concentrations, approximately twice the next largest concentrations, which occurred in the East I-40 area. The Tijeras Canyon and the East I-40 areas had about twice the expected number of samples with total-nitrate concentrations larger than the study area 75th-percentile concentration (fig. 13; tables 6 and 7), and 8 of the 10 samples in the entire study area that exceeded the primary standard of 10 mg/L were from these areas. These areas contain substantial land area classified as urban or built up (fig. 6) and also were the earliest areas to be developed. The large total-nitrate concentrations may be the result of decades-old septic systems that are failing or operating less than optimally, cesspools at some of the earliest residences, and/or the long period of domestic wastewater inputs to the ground-water system in these areas.

Total-nitrate concentrations in the Tijeras Canyon area were at a level that prompts concern for human health. Concentrations in 5 of 15 samples exceeded the primary standard of 10 mg/L for nitrate as nitrogen, and two other samples had concentrations larger than 9 mg/L.Total-nitrate concentrations also exceeded the primary standard in 3 of 25 samples in the East I-40 area, in 1 of 23 samples in the North 14 area, and in 1 of 11 samples in the Northeastern area. Although 8 of 10 exceedances were in the Tijeras Canyon and East I-40 areas, the two isolated exceedances in the North 14 and Northeastern areas suggest that elevated nitrate concentrations may result from local activities.

The Southern area, the least developed of all areas, had the smallest 25th-percentile and 75th-percentile total-nitrate concentrations; only the Northeastern area had a smaller median total-nitrate concentration (fig. 13; table 6). The Southern area also had less than one-half the expected number of samples with total-nitrate concentrations larger than the study area 75th-percentile concentration (table 7).

The 25th-percentile, median, and 75th-percentile dissolved-chloride concentrations in the Northeastern area were only about one-third to one-fifth those in the geographic area with the next largest concentration. Dissolved-chloride concentrations in the North 14, Tijeras Canyon, and Southern areas were similar. The ranges of 25th-percentile, median, and 75th-percentile concentrations in these areas were 24-36 mg/L, 62-79 mg/L, and 110-160 mg/L, respectively. The North 14 area had about the expected number of samples, and the Northeastern, Tijeras Canyon, and Southern areas had fewer than the expected number of samples with dissolved-chloride concentrations larger than the study area 75th-percentile concentration.

Dissolved-chloride concentrations were largest in the East I-40 area. Although the 25th-percentile dissolved-chloride concentration in this area was similar to that in other areas, the median and 75th-percentile concentrations were about twice those in any other area (fig. 14; table 6). More than twice the expected number of samples in the East I-40 area had dissolved-chloride concentrations larger than the study area 75th-percentile concentration (table 7). In addition to domestic wastewater disposal, other possible sources of these concentrations include geologic conditions such as interbedded salt deposits or upward movement of saline ground water and (or) road salt.

The East I-40 and Southern areas had the largest median and 75th-percentile TOC concentrations of any geographic area, about twice the typical concentrations in other geographic areas (fig. 15; table 6). The East I-40 and Southern areas were the only areas to have more than the expected number of samples with concentrations larger than the study area 75th-percentile concentration (table 7). Of the 27 samples in the study area having TOC concentrations larger than the study area 75th-percentile concentration, 23 were in these two areas. The larger TOC concentrations in the East I-40 area coincide with large concentrations of total nitrate and particularly dissolved chloride. The reason for the large concentrations in the Southern area is not known, but these concentrations may be due to a smaller capacity to biochemically alter organic carbon and (or) a smaller sorptive capacity of carbonate rocks, which are present in most of the Southern area.

Of all six areas, ground water in the Tijeras Canyon (total nitrite) and East I-40 areas (all indicator constituents) has shown the largest effects from sources of the indicator constituents. Because these are the areas of earliest development, they consequently have had the longest periods of domestic wastewater disposal and contain the oldest septic systems.

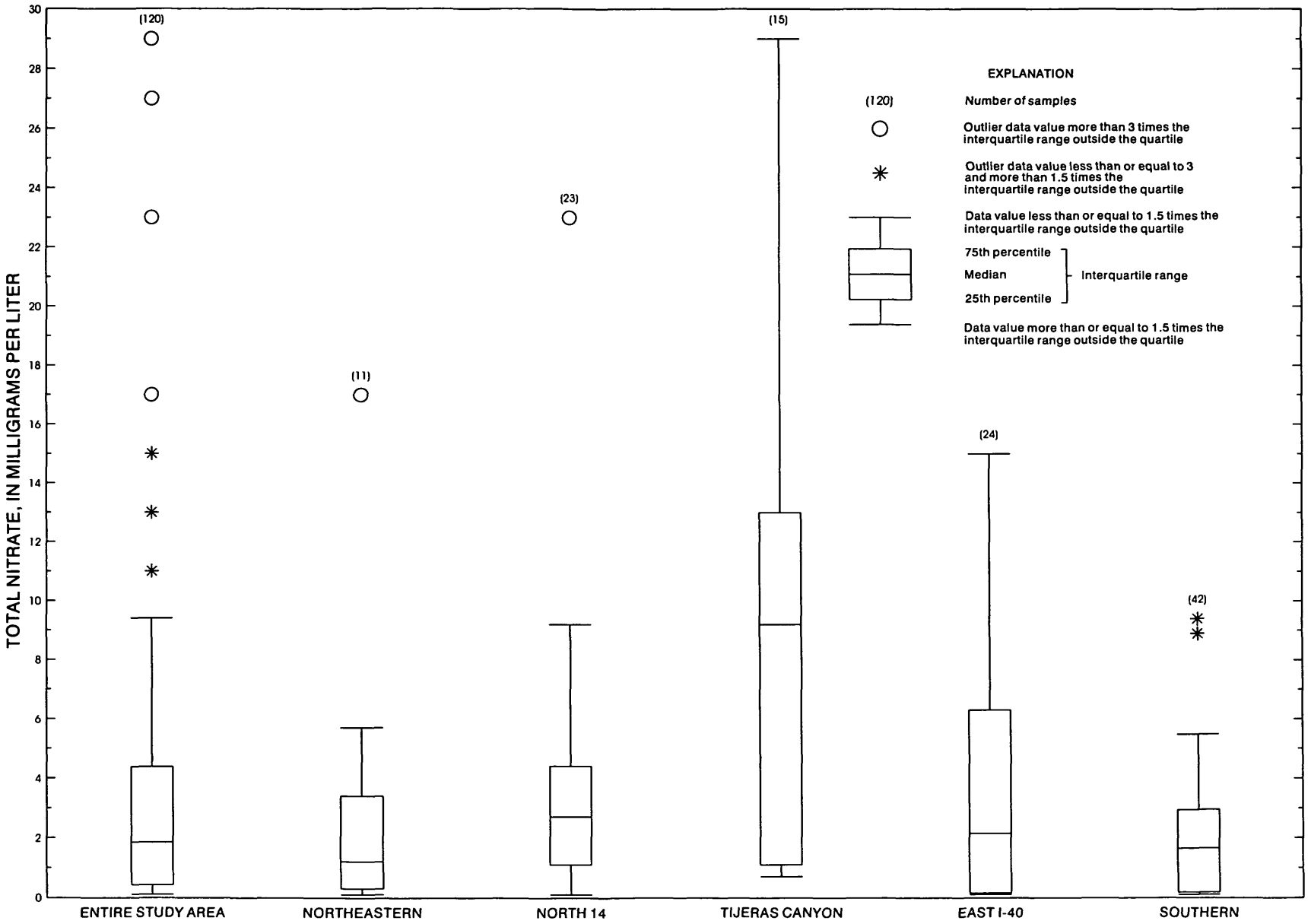


Figure 13.--Concentration distribution of total nitrate in the entire study area and in five geographic areas.

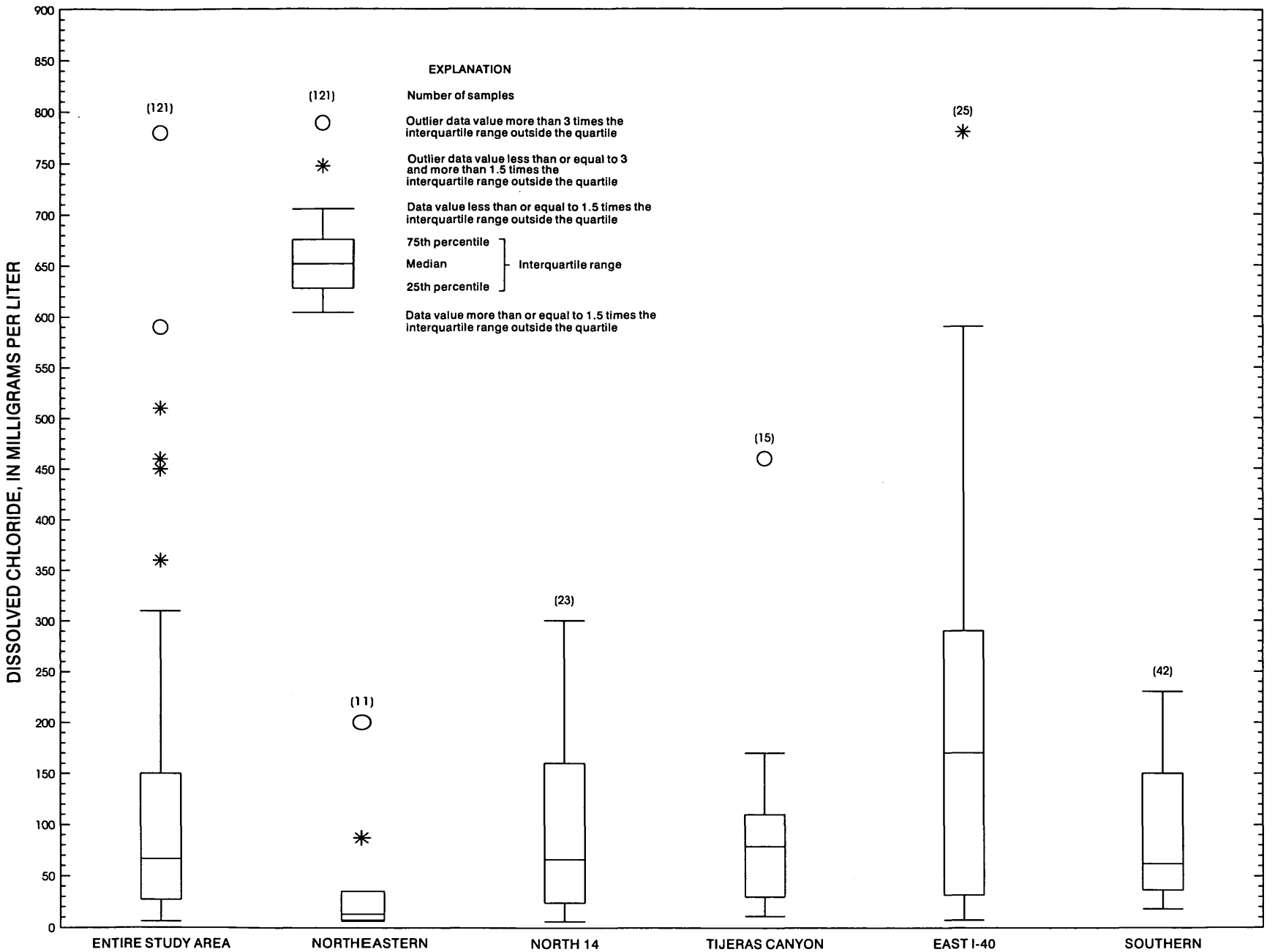


Figure 14.--Concentration distribution of dissolved chloride in the entire study area and in five geographic areas.

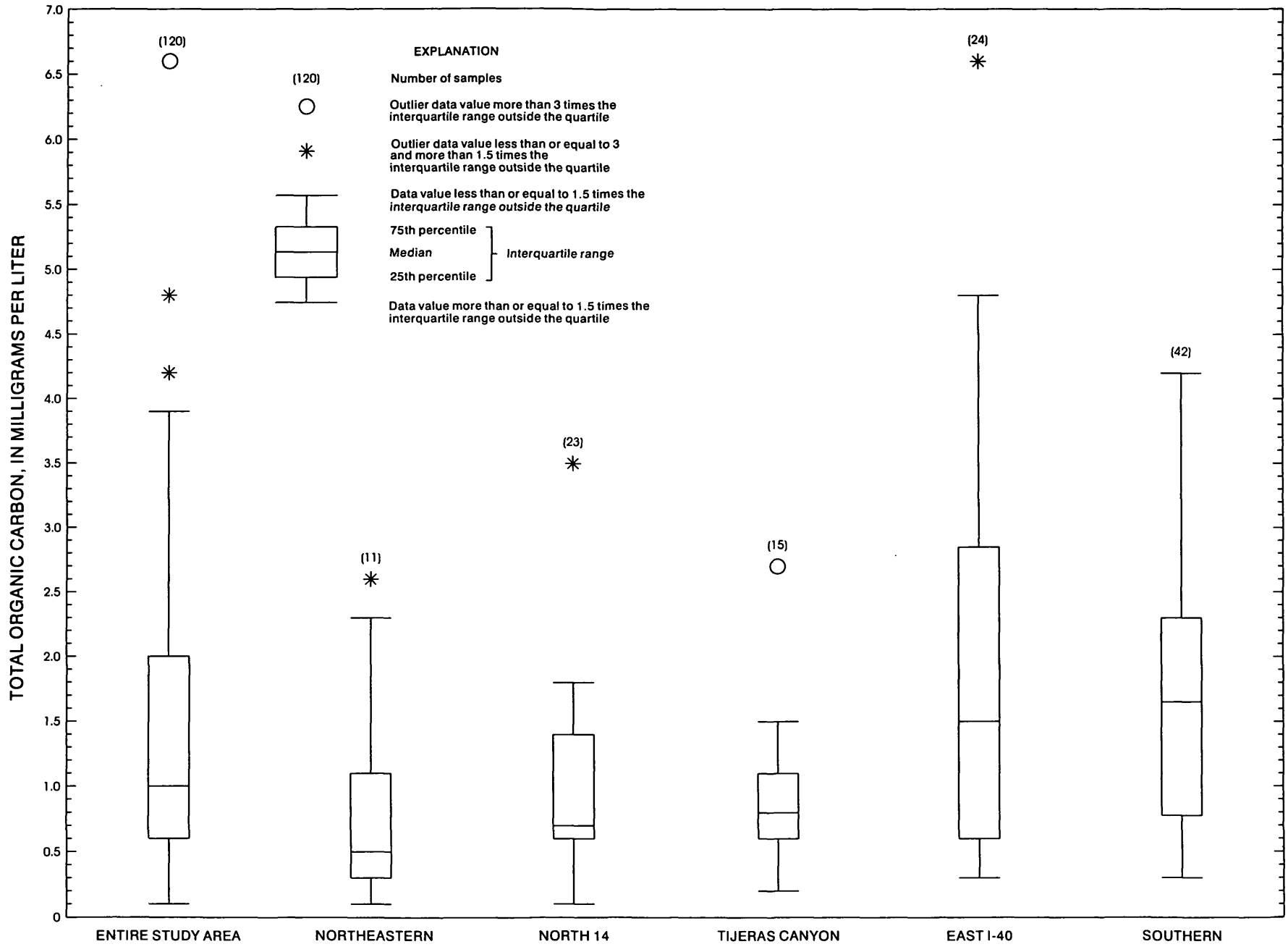


Figure 15.--Concentration distribution of total organic carbon in the entire study area and in five geographic areas.

COMPARISON OF INDICATOR-CONSTITUENT CONCENTRATIONS, 1962-90

Eleven of the 121 inventory wells were sampled previously in 1984-85 and analyzed for dissolved and (or) total nitrite plus nitrate concentrations, and 8 of these wells also were analyzed for dissolved-chloride concentrations (fig. 8). Three of these 11 wells also were sampled in 1962; the 1962 analyses, however, did not include either dissolved or total nitrite plus nitrate. Four of the 11 wells were in the carbonate terrane, two were in the clastic terrane, and five were in the crystalline terrane. Total nitrite plus nitrate and dissolved-chloride concentrations were compared (the dissolved nitrite plus nitrate analysis was used when the total analysis was not available) to determine whether concentrations had notably changed over time. In this section of the report, total nitrite plus nitrate concentrations are used because nitrite concentrations in historic analyses were not determined. Results of these analyses are shown in table 8.

Three of the four carbonate terrane wells are in the Southern area. Wells A and B are near Chilili and Ponderosa Pine, respectively, and well C is near the eastern boundary of Bernalillo County (fig. 8). Well D is in the East I-40 area, near Barton.

Nitrite plus nitrate concentrations in wells B, C, and D either did not change or decreased between 1984 and 1990. The nitrite plus nitrate concentration in well A increased from less than the MRL of 0.1 mg/L in 1984 to 2.1 mg/L in 1990, indicating a small increase in the contribution of nitrite plus nitrate to the ground-water system at or near this well. The 1990 concentration in well A (2.1 mg/L) and the 1984 and 1990 concentrations in well B (2.6 and 2.5 mg/L, respectively) were slightly larger than the median value (1.9 mg/L) for the entire study area, but were substantially less than the study area 75th-percentile concentration (4.6 mg/L) and the primary standard (10 mg/L).

The dissolved-chloride concentration in well C increased by a factor of 1.5 between 1962 and 1984, suggesting an increased contribution of chloride to the ground-water system prior to 1985 near this well. From 1984-85 to 1990, dissolved-chloride concentrations in wells A, B, and D increased by about a factor of 1.5 or more, suggesting an increased contribution of chloride to the ground-water system near these wells. The 1990 dissolved-chloride concentration of 150 mg/L in well B was the only one in the carbonate terrane larger than the study area median concentration; this concentration was equal to the study area 75th-percentile concentration. On the basis of this small sample size, dissolved-chloride concentrations in the carbonate terrane have increased over time, indicating an increased contribution of chloride to the ground-water system at or near these wells, but typical concentrations were still small in 1990.

The two clastic terrane wells, E and F (table 8), are located near Tijeras in the East I-40 area and near San Antonito in the North 14 area, respectively (fig. 8). Total nitrite plus nitrate and dissolved-chloride concentrations were substantial in both wells in 1984 and increased more between 1984 and 1990. All 1984 and 1990 concentrations of these constituents were the same as or more than the study area 75th-percentile concentrations. In addition, the 1990 total nitrite plus nitrate concentration in well F (9.2 mg/L) was near the primary standard of 10 mg/L, and the 1984 and 1990 dissolved-chloride concentrations in both wells exceeded the secondary standard of 250 mg/L.

Between 1984 and 1990, total nitrite plus nitrate concentrations increased about 20 percent in both wells E and F, and dissolved-chloride concentrations increased about 15 percent in well F, indicating increased contributions of these constituents to the ground-water system. The dissolved-chloride concentration in well F also had increased about 400 percent between 1962 and 1984, indicating a substantially increased contribution of chloride to the ground-water system prior to 1984 near this well. The dissolved-chloride concentration in well E increased only about 3 percent between 1984 and 1990.

All five crystalline terrane wells are in the Tijeras Canyon area. Total nitrite plus nitrate concentrations in wells G and K in 1984 and 1990 were less than the median concentration for the entire study area. Between 1984 and 1990, the total nitrite plus nitrate concentration in well G increased slightly and the concentration in well K decreased slightly; the changes in these wells were less than 1 mg/L.

The total nitrite plus nitrate concentrations in wells H and J were larger than the primary standard of 10 mg/L in 1984 and 1990 and increased from 21 to 27 mg/L in well H and from 13 to 15 mg/L in well J. The large 1984 concentrations in these wells indicate substantial effects prior to 1984 and may be the result of the early development in the Tijeras Canyon area. The 1990 concentrations indicate a continuing increase in effects from 1984 to 1990, suggesting that septic systems in this area may be decreasing in efficiency over time.

Table 8.--Concentrations of selected constituents, 1962, 1984-85, and 1990

[Concentrations are in milligrams per liter; --, no data; <, less than]

Well number	Well identification (fig. 8)	Other well identification (Kues, 1990)	Date	Nitrite plus nitrate		Dissolved chloride
				Total	Dissolved	
		Carbonate terrane				
08N.07E.29.324A	A[1]	21	08/09/84	--	<0.1	11
			04/12/90	2.1	2.1	27
09N.06E.29.142	B	46	09/27/84	2.6	2.6	58
			08/07/90	2.5	2.5	150
10N.06E.26.132	C	171	11/09/62	--	--	33
			09/24/84	--	<0.1	49
			09/21/90	0.1	--	51
10N.06E.13.224	D	164	04/27/85	--	<0.1	14
			06/29/90	<0.1	<0.1	20
		Clastic terrane				
10N.05E.14.223	E	109	08/04/84	4.6	4.6	300
			04/24/90	5.4	5.6	310
11N.06E.19.313	F	238	07/12/62	--	--	60
			12/12/84	7.8	7.8	260
			04/13/90	9.2	9.2	300
		Crystalline terrane				
10N.05E.30.324A	G	147	12/06/84	0.6	0.6	--
			05/07/90	1.1	1.0	84
10N.05E.30.322	H	141	12/05/84	21	21	--
			05/07/90	27	27	110
10N.04.5E.25.234B	I	65	12/03/84	30	30	130
			05/09/90	29	6.1	170
10N.05E.30.213A	J[2]	139	12/17/84	13	13	--
			04/17/90	15	15	110
10N.05E.19.322	K[3]	114	06/13/62	--	--	12
			09/27/84	1.6	1.6	11
			04/17/90	0.7	0.7	11

[1]Also monthly monitoring well 7.
[2]Also monthly monitoring well 13.
[3]Also monthly monitoring well 9.

The total nitrite plus nitrate concentration in well I decreased slightly from 30 mg/L in 1984 to 29 mg/L in 1990. The dissolved-nitrate concentration, however, decreased from 30 mg/L in 1984 to 6.1 mg/L in 1990. The reason for this decrease is unknown.

In the crystalline terrane/Tijeras Canyon area, pre-1990 dissolved-chloride concentrations were available only for wells I and K. The concentration in well K decreased minimally between 1962 and 1984, from 12 to 11 mg/L, and was the same in 1984 and 1990. The concentration in well I increased about 30 percent between 1984 and 1990, from 130 to 170 mg/L, and the 1990 concentration was larger than the study area 75th-percentile concentration.

The 1984-90 trend in nitrite plus nitrate concentrations is bimodal. The 1984-85 concentrations in six wells (A, B, C, D, G, and K) were equal to or less than 2.6 mg/L; between 1984-85 and 1990 concentrations decreased, stayed about the same, or increased by 0.5 mg/L or less in five of these wells (wells B, C, D, G, and K). The 1984 concentrations in the other five wells (E, F, H, I, and J) were equal to or larger than the study area 75th-percentile concentration of 4.6 mg/L; between 1984 and 1990 concentrations increased by 0.8 to 6.0 mg/L in four of these wells (wells E, F, H, and J). Typically, at sites where concentrations were small in 1984, no large increases occurred between 1984 and 1990; at sites where concentrations were large in 1984, large increases occurred between 1984 and 1990.

The 1984-90 trend for dissolved chloride is similar to that for nitrite plus nitrate. The 1990 concentrations in four of five wells (A, C, D, and K) with 1984-85 concentrations less than the study area median value of 66 mg/L increased by 16 mg/L or less. The concentration in one of these wells (C) also increased by 16 mg/L between 1962 and 1984. The concentration in the fifth well (B) increased by 92 mg/L between 1984 and 1990.

The 1990 concentrations in the two wells with 1984 concentrations larger than the study area 75th-percentile concentration of 150 mg/L (E and F) increased by 10 and 40 mg/L, respectively; the concentration in well F also increased by 200 mg/L between 1962 and 1984. The 1984 dissolved-chloride concentration in one well (I) was between the study area median and 75th-percentile concentrations (130 mg/L); the concentration in this well increased by 40 mg/L between 1984 and 1990.

SUSCEPTIBILITY OF GROUND WATER TO EFFECTS FROM DOMESTIC WASTEWATER DISPOSAL

The susceptibility of ground water to contamination from domestic wastewater disposal is dependent on the medium between the source of wastewater and the saturated zone. More specifically, susceptibility is dependent on soil characteristics, including slope, thickness, and composition; and on composition and permeability, both primary and secondary, of the geologic units above the saturated zone.

Hacker (1977) identified all of eastern Bernalillo County as having soils with at least some degree of limitation for use as septic-tank absorption fields (fig. 5). Hacker classified about 95 percent of the soils in the area as having severe limitations for use as absorption fields and the remaining 5 percent as having slight to severe limitations for this use.

The carbonate terrane, composed primarily of fractured limestone, crops out or underlies unconsolidated material in about 73 percent of the entire eastern Bernalillo County area and in about 88 percent of the area for which geologic terrane was determined (fig. 3). According to Drever (1982, p. 58-59), fractured carbonate rocks are "particularly susceptible to contamination because water commonly moves rapidly both vertically and horizontally * * * and because the aquifer material has little sorptive capacity." Water moves rapidly through solution channels that typically develop along fractures.

In addition to soil and geologic characteristics that are favorable for contamination of ground water from overlying domestic wastewater disposal, residential development during the past 40 to 50 years has increased housing density and caused an attendant increase in septic-system density. This increased density accordingly increases domestic wastewater loading per unit area of land and therefore increases the absorption requirements of the underlying medium.

Rises in ground-water levels in response to precipitation are qualitatively indicative of the hydraulic connection between the surface and the ground-water system, and therefore indicate the sensitivity of an aquifer to environmental changes at or near the surface. Changes in indicator-constituent concentrations in response to precipitation also are a measure of sensitivity to environmental changes, but these changes occur only if a source of indicator constituents is present. Therefore, rises in ground-

water levels are a more reliable indicator of hydraulic connection between the surface and the underlying ground water.

As stated earlier, precipitation at the Sandia Park Climatological Station in July 1991 was 7.40 inches, about 260 percent of normal July precipitation; this is the largest monthly precipitation on record at the Sandia Park station. More than two-thirds of this precipitation, 5.40 inches, fell during July 22-27. This unusually large amount of precipitation during July 22-27, 1991, provided an opportunity to measure changes in ground-water levels in response to this 6-day episodal precipitation event and subsequently to infer the susceptibility of ground water to contamination by domestic wastewater disposal. Water levels in and results of field determinations and laboratory analyses of samples collected from monthly monitoring wells are listed in table 14, and hydrographs for these wells are shown in figure 16.

July 1991 water levels in monthly monitoring wells were measured between July 9 and 17, prior to the 6-day precipitation event, and therefore established ground-water levels prior to the event. August and September 1991 water levels in these wells indicate responses to the July 22-27 precipitation event.

Water-level changes in monthly monitoring wells between June and July 1991 were similar to those between June and July 1990. Between June and July 1990, water levels rose in 1 well and declined in 12 wells; between June and July 1991, water levels rose in 3 wells and declined in 14 wells. The median decline for both years was 0.94 foot. Water levels in well 16 were not included in this analysis because they were significantly affected by a nearby pumping well.

Water-level changes between July and August 1991, however, were dissimilar to changes between July and August 1990, which suggests that the July 22-27, 1991, episodic precipitation significantly affected ground-water levels. Between July and August 1990, water levels rose in six wells by a median value of 0.62 foot and declined in seven wells by a median value of 0.40 foot. Between July and August 1991, however, water levels rose in 16 wells by a median value of 5.14 feet, and no wells had declining water levels. These water levels were measured between August 12 and August 21, less than 1 month following the July 22-27 precipitation event. Wells 4 and 16 were not included in this analysis: water levels in well 4 were not measured in May, June, or July 1991, and water levels in well 16 were substantially influenced by a nearby pumping well.

Water levels in seven wells (2, 5, 6, 9, 11, 17, and 19) declined between August and September 1991 measurements; water levels in nine wells (1, 3, 7, 8, 10, 13, 14, 15, and 20) continued to rise. Water levels in two wells (12 and 18) rose between July and September 1991; water levels in these wells were not measured in August 1991.

Hydrographs of water levels in wells 9, 11, and 19, which are completed in the crystalline, clastic, and carbonate terranes, respectively, demonstrate the hydraulic connection between the land surface and the water table, and therefore the susceptibility of the ground-water system to surface and near-surface activities, such as domestic wastewater disposal. The hydrographs shown in figure 16 show the effects of the July 22-27, 1991, precipitation event on water levels in these wells.

The water level in well 9, located in the Tijeras Canyon area and completed in the crystalline terrane, slowly declined from February 1990 to July 1991 from 41.28 feet below land surface in February 1990 to 43.25 feet below land surface in July 1991 (fig. 16; table 14). Following the July 22-27, 1991, precipitation event, however, the water level rose 5.86 feet, to 37.39 feet below land surface, between July and August 1991. By September 1991, the water level had resumed its gradual decline and was 43.90 feet below land surface, the lowest water level measured in this well during 1990-91.

The water level in well 11, located in the Sandia Park area and completed in the clastic terrane, had a similar pattern of rises and declines in 1990 and 1991 (fig. 16; table 14). In 1990, the water level rose from January to April and then declined from April to July. In 1991, the water level rose from January to March and then declined from March to July. In both years, the water level rose from July to August, then declined from August to November, and then rose from November to December. The primary difference between 1990 and 1991 is the magnitude of the water-level rise between July and August. In 1990 the water level rose 0.68 foot, from 16.13 to 15.45 feet below land surface; in 1991, following the July 22-27 precipitation event, the water level rose 5.63 feet, from 16.36 to 10.73 feet below land surface.

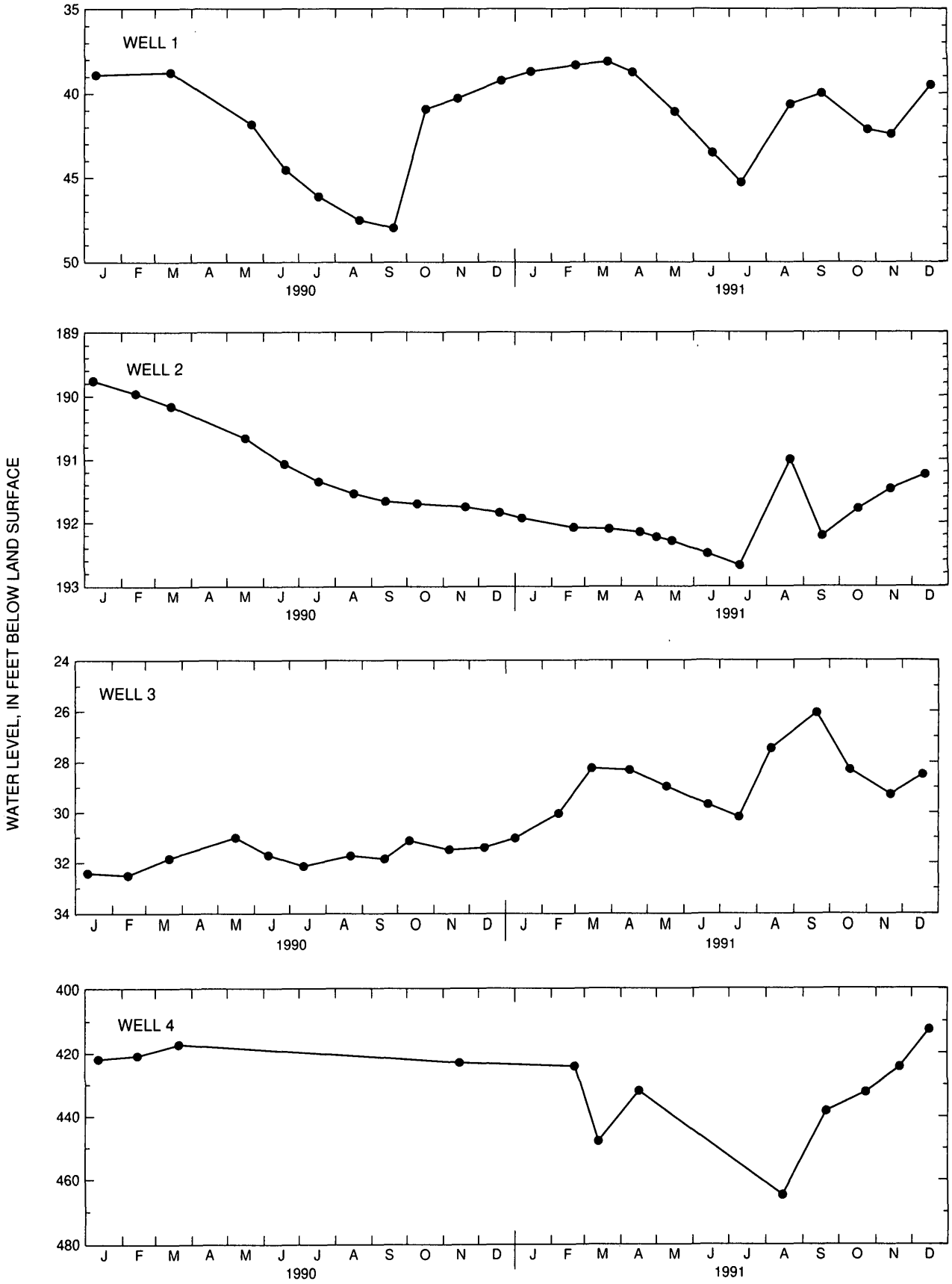


Figure 16.--Water levels in monthly monitoring wells, 1990-91 (see figure 8 for well location).

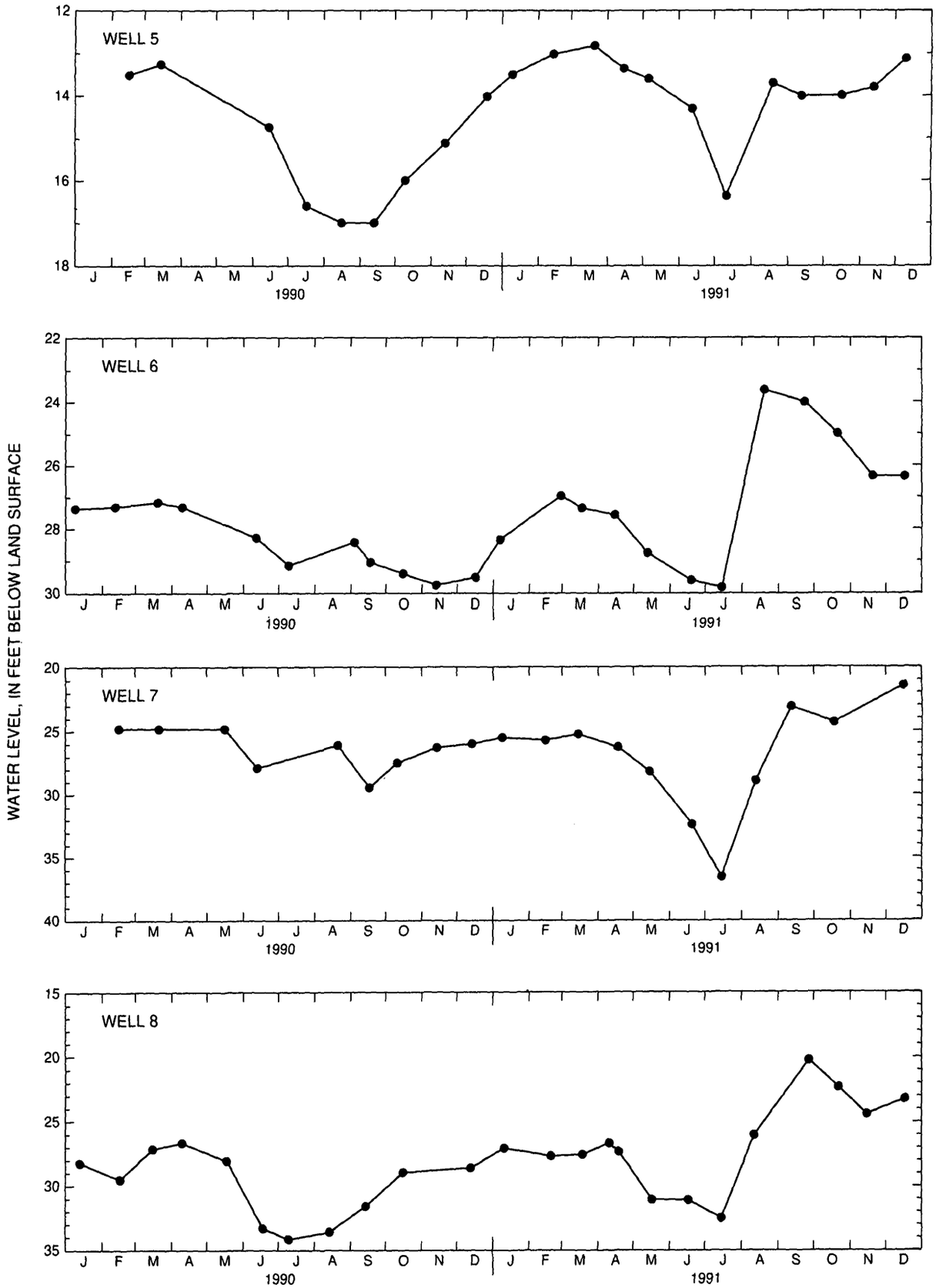


Figure 16.--Water levels in monthly monitoring wells, 1990-91 (see figure 8 for well location)--Continued.

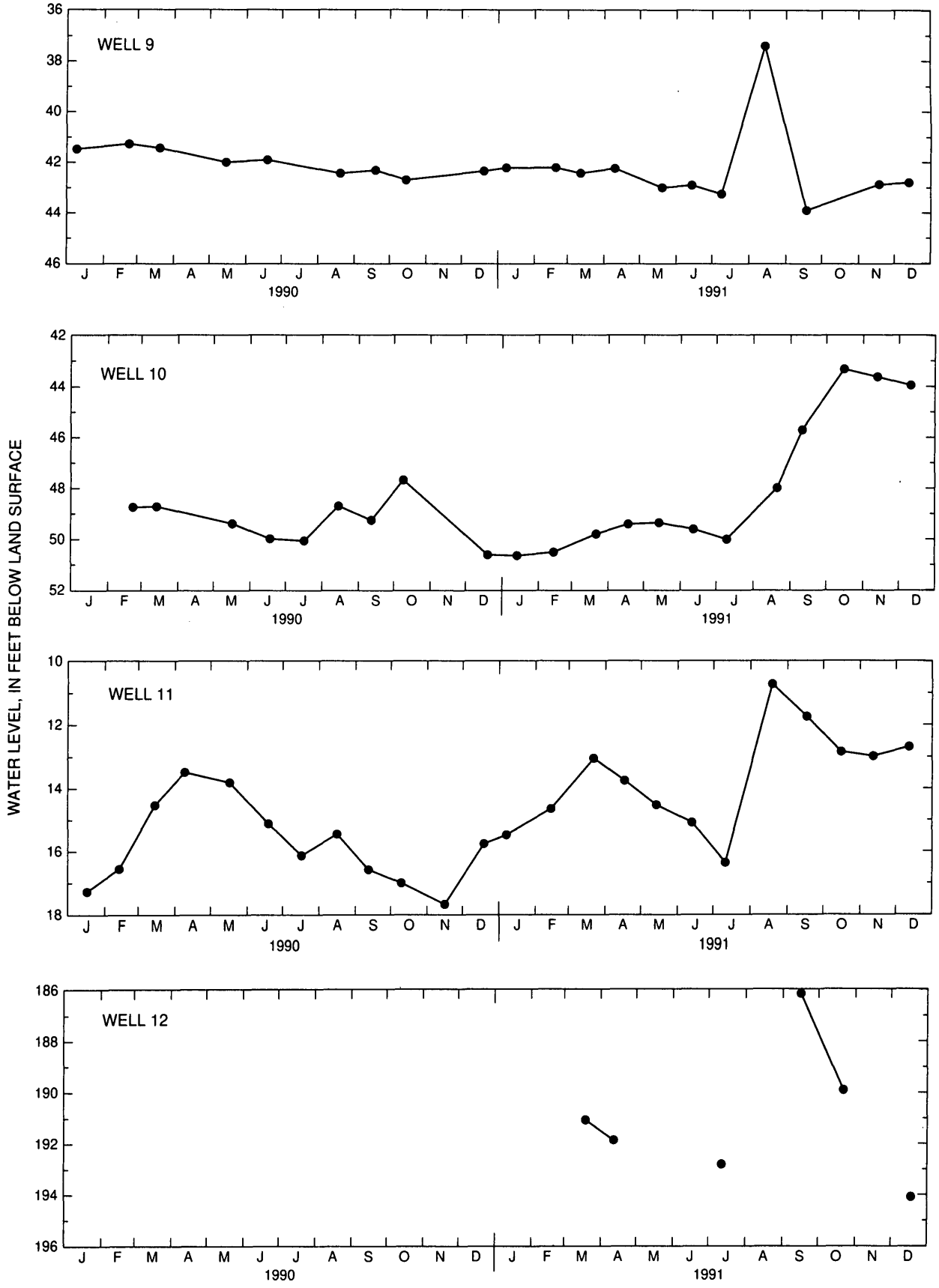


Figure 16.--Water levels in monthly monitoring wells, 1990-91 (see figure 8 for well location)--Continued.

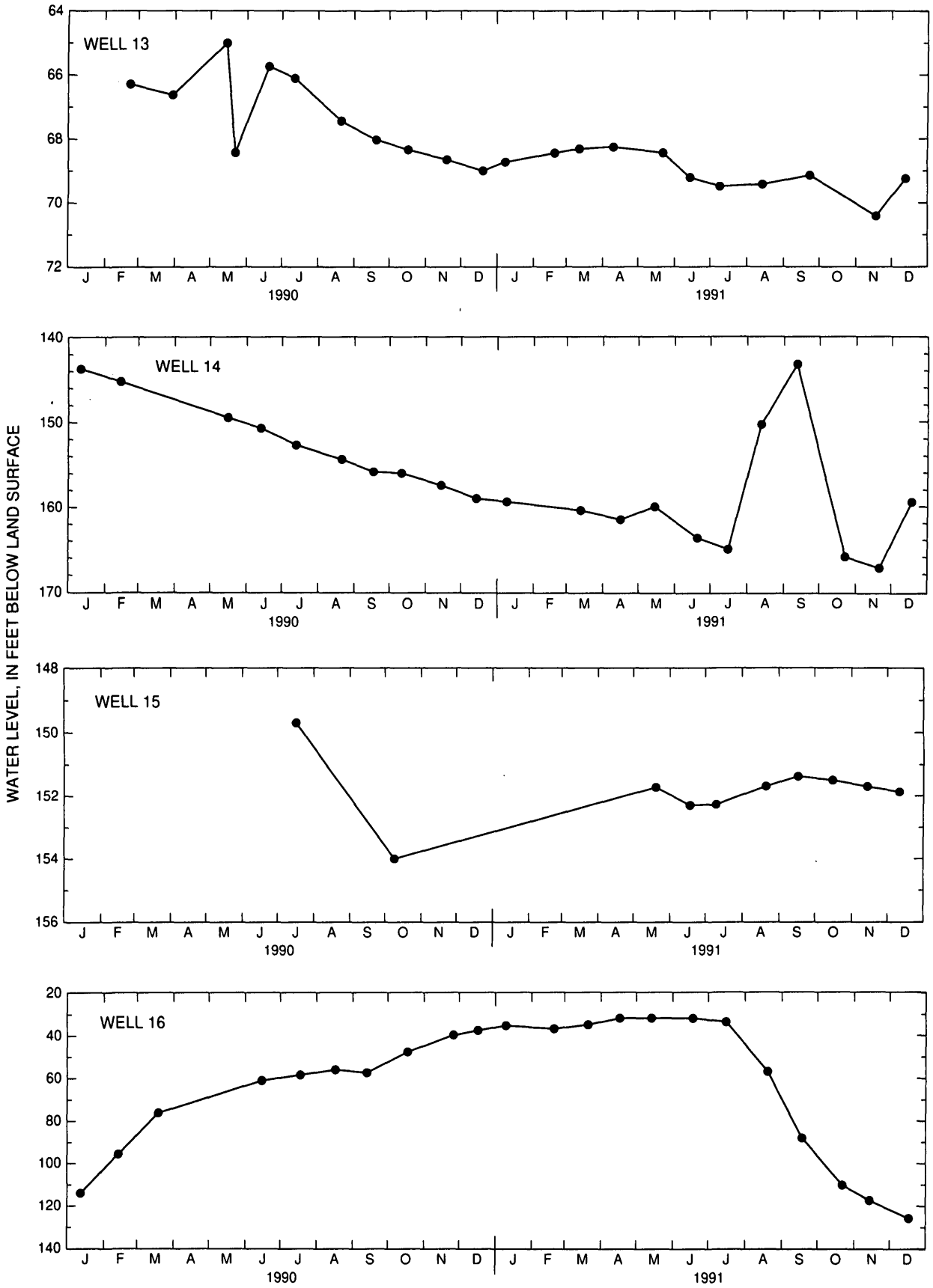


Figure 16.--Water levels in monthly monitoring wells, 1990-91 (see figure 8 for well location)--Continued.

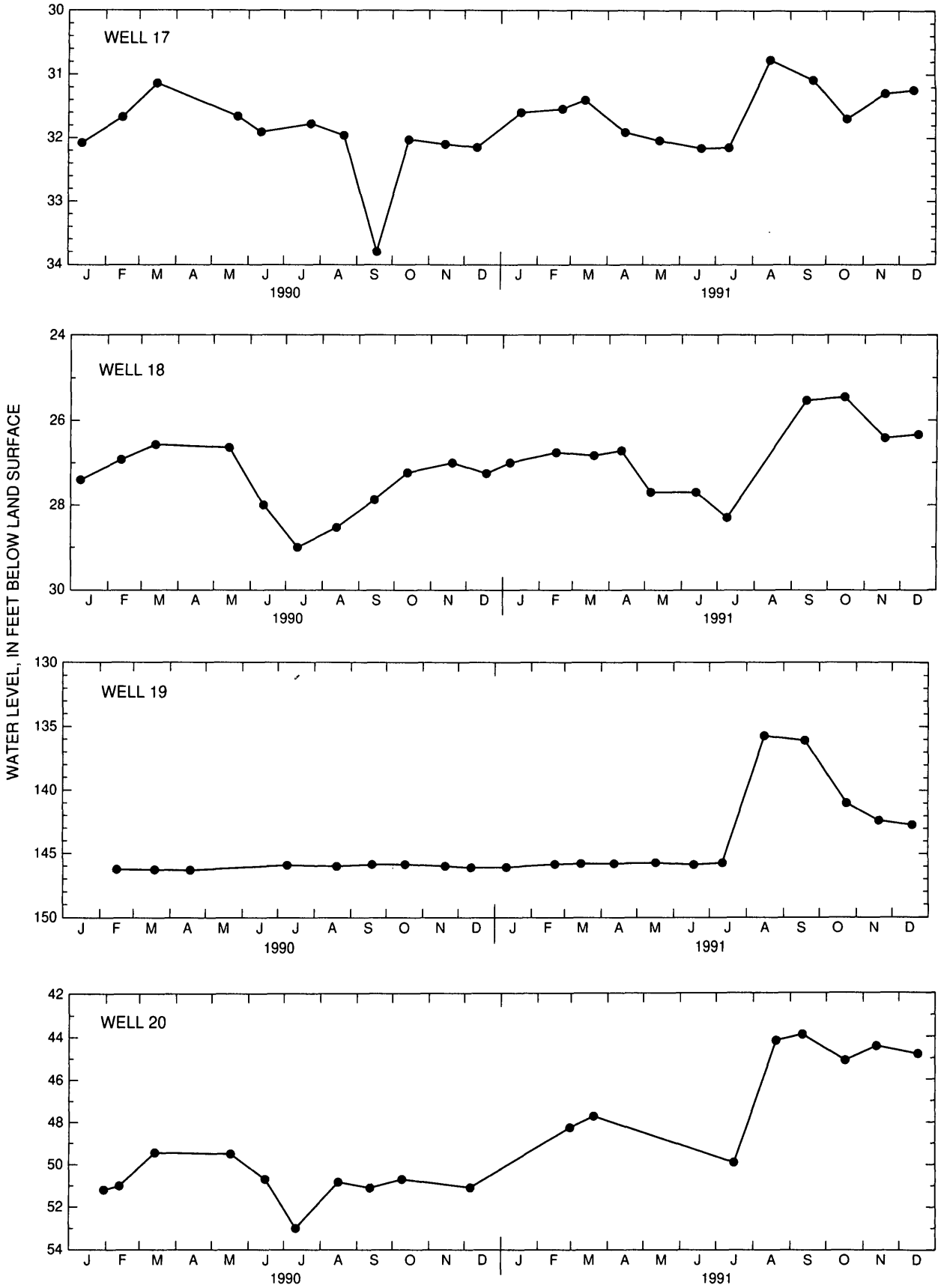


Figure 16.--Water levels in monthly monitoring wells, 1990-91 (see figure 8 for well location)--Concluded.

The water level in well 19, located in the East I-40 area near Barton and completed in the carbonate terrane, was nearly constant from February 1990 through July 1991, ranging from 145.73 to 146.31 feet below land surface (fig. 16; table 14). Following the July 22-27, 1991, precipitation event, however, the water level rose 10 feet between July and August 1991, from 145.73 feet below land surface in July to 135.73 feet below land surface in August. The water level began declining in September 1991, to 142.71 feet below land surface in December 1991.

The effects of the July 22-27, 1991, precipitation event on water levels in wells 9, 11, and 19, each located in a different geographic area, completed in a different terrane, and having different depths to water, are substantial. In each well, the water-level response to this precipitation event indicates an effective hydraulic connection between the surface and the ground-water system and indicates that the ground-water system is susceptible to contamination from surface and near-surface activities, including domestic wastewater disposal.

To further establish the significance of these post-July 22-27, 1991, water-level changes, the percentage of total 1990-91 water-level fluctuation that was associated with the precipitation event was determined for 18 monitoring wells. The percentages ranged from 6 percent in well 13 in the Tijeras Canyon area to 100 percent in well 19 in the East I-40 area. The median percentage for the 18 wells was 81 percent. Table 9 lists median percentages and the range of percentages for geologic terranes; table 10 lists these percentages for geographic areas.

The median percentages in the carbonate and clastic terranes were 86 and 64 percent, respectively (table 9). These median percentages indicate that water levels in carbonate terrane wells typically were more intensely affected by the July 22-27, 1991, precipitation event than those in clastic terrane wells, therefore suggesting that the carbonate terrane is more susceptible to the effects from surface or near-surface activities.

Three geographic areas contained more than two monitoring wells used in the analysis: the North 14 area (four wells), the East I-40 area (four wells), and the Southern area (five wells). Wells 4 and 16 were not included in the analysis. The smallest median percentage (62 percent) was in the North 14 area, where all four monitoring wells were completed in the clastic terrane. The median percentage in the Southern area, where all five wells were completed in the carbonate terrane, was 64 percent, similar to that in the North 14 area. The maximum percentages were quite different, however: 66 percent in the North 14 area and 91 percent in the Southern area. The median percentage in the East I-40 area, where three wells were completed in the carbonate terrane and one well was completed in the clastic terrane, was substantially larger than that in the North 14 and Southern areas; the East I-40 area had a median percentage of 93.

Analysis of water levels in monthly monitoring wells substantiates an effective hydraulic connection between the land surface and the ground-water system in all geologic terranes and especially in the carbonate terrane. The analysis also indicates an especially effective hydraulic connection in the East I-40 area where concentrations of all three indicator constituents were large. The effective hydraulic connection indicates that the ground-water system has a substantial degree of susceptibility to surface and near-surface activities, including domestic wastewater disposal.

SUMMARY

Eastern Bernalillo County is a historically rural, mountainous area east of Albuquerque, the largest population center in New Mexico. The study area consists of about 250 square miles and is bounded by the crest lines of the Sandia and Manzano Mountains on the west and the Bernalillo County boundary on the north, east, and south.

Historically, economic activity in eastern Bernalillo County consisted of subsistence farming and ranching and support of these activities from small communities. During the last 40 to 50 years, however, parts of the area have become increasingly the site of residential developments. Between 1970 and 1990, the population of the area increased from about 4,000 to more than 12,000, and housing units increased from about 1,500 to more than 5,000. Homes in these developments typically are on 1- to 2-acre lots and are served by individual wells and septic systems. Ground water is the source of drinking water for almost all the housing units.

Prior to this study, total nitrate, typically present in domestic wastewater, had been found in ground water in eastern Bernalillo County at concentrations exceeding the USEPA national primary drinking-water regulation maximum contaminant level of 10 mg/L for nitrate as nitrogen. To address concerns

Table 9.--Percentages of total 1990-91 water-level fluctuation, in monitoring wells in each geologic terrane, that was associated with the July 22-27, 1991, precipitation event

[--, median not calculated because of small number of wells]

Area/terrane (number of wells)	Median percentage	Range of percentages
Study area (18)	81	6 - 100
Carbonate terrane (8)	86	46 - 100
Clastic terrane (7)	64	54 - 88
Crystalline terrane (2)	--	6 - 90
Unknown terrane (1)	--	21

Table 10.--Percentages of total 1990-91 water-level fluctuation, in monitoring wells in each geographic area, that was associated with the July 22-27, 1991, precipitation event

[--, median not calculated because of small number of wells]

Area (well number)	Median percentage	Range of percentages
Study area	65	6 - 100
Sandia Park (2, 11)	--	58 - 81
Northeastern (15)	--	21
North 14 (1, 5, 10, 20)	62	54 - 66
Tijeras Canyon (9, 13)	--	6 - 90
East I-40 (6, 8, 12, 19)	93	84 - 100
Southern (3, 7, 14, 17, 18)	64	46 - 91

regarding this problem, this study was conducted to (1) assess the suitability of geologic and soil conditions for domestic wastewater disposal, (2) summarize and evaluate ground-water concentrations of constituents typically associated with domestic wastewater disposal, (3) compare concentrations of these constituents over time, and (4) evaluate the susceptibility of ground water to contamination by domestic wastewater disposal.

Fractured carbonate rock crops out or underlies unconsolidated material in about 73 percent of the entire eastern Bernalillo County area and about 88 percent of the area for which geologic terrane was determined. Fractured carbonate terranes typically contain solution channels in which carbonate material has been dissolved by moving ground water, and they have a small sorptive capacity.

Soils in eastern Bernalillo County were surveyed by the U.S. Department of Agriculture, Natural Resources Conservation Service, and determined to be typically thin, poorly developed, and located on steep slopes. Because of these conditions, all soils in the study area were assessed to have some degree of limitation for use as septic-system absorption fields; soils in 95 percent of the area were assessed to have severe limitations for use as absorption fields.

Ground-water samples were collected in 1990 from 121 wells, designated "inventory wells," located throughout eastern Bernalillo County. The samples were analyzed for concentrations of selected constituents that might indicate the effects of domestic wastewater disposal. Total nitrate, dissolved chloride, and TOC were determined to be the constituents most useful in evaluating these effects and were designated "indicator constituents."

Concentrations of indicator constituents in the entire study area were evaluated to determine areawide conditions; concentrations in three geologic terranes (carbonate, clastic, and crystalline) were evaluated to determine relations between geology and water quality; and concentrations in six geographic areas (from north to south: Sandia Park, Northeastern, North 14, Tijeras Canyon, East I-40, and Southern areas) were assessed to determine relations between past development and water quality. The primary basis for delineating geographic areas was the length of time an area had been undergoing residential or commercial development. Concentrations of indicator constituents were summarized by determining the 25th-percentile, median, and 75th-percentile concentrations of these constituents in the entire study area, in each geologic terrane, and in each geographic area.

The 25th-percentile, median, and 75th-percentile concentrations of indicator constituents for the entire study area, in milligrams per liter, were: total nitrate, 0.5/1.9/4.6; dissolved chloride, 27/66/150; and TOC, 0.6/1.0/2.0. The relatively large 75th-percentile concentrations for total nitrate and dissolved chloride indicate that, when compared to typical study area concentrations represented by the median values, a small percentage of samples have comparatively large concentrations of these constituents. This suggests that ground water at some locations has been affected by activities that produce these constituents.

The following observations were made regarding geologic terrane indicator-constituent concentrations:

(1) Total-nitrate concentrations in the crystalline terrane were about three times those in the carbonate and clastic terranes. This appears to be the result of early residential development; all crystalline terrane wells are also in the Tijeras Canyon area, which has the longest history of development. Total-nitrate concentrations may also be affected by the typically shallower depths to water in this terrane.

(2) The 25th-percentile and median dissolved-chloride concentrations in the clastic terrane were less than those in the carbonate and crystalline terranes. However, the 75th-percentile concentration in the clastic terrane was substantially larger than those in the carbonate and crystalline terranes, indicating that a small number of samples having large dissolved-chloride concentrations are present in the clastic terrane. Possible sources of this dissolved chloride include domestic wastewater disposal, local geologic conditions, and (or) road salt.

(3) The median and 75th-percentile TOC concentrations in the carbonate terrane were about twice those in the clastic and crystalline terranes. These larger concentrations in the carbonate terrane suggest that this terrane may not have the capacity to biochemically alter organic carbon and (or) may have less sorption capacity than is present in the other terranes.

The following observations were made regarding geographic area indicator-constituent concentrations:

(1) Total-nitrate concentrations were largest in the Tijeras Canyon and East I-40 areas, the areas having the longest history of development. Eight of the

10 samples in the entire study area that exceeded the USEPA national primary drinking-water standard maximum contaminant Level of 10 mg/L were in the Tijeras Canyon and East I-40 areas.

(2) Total-nitrate and dissolved-chloride concentrations were smallest in the Sandia Park, Northeastern, and Southern areas, the areas with the least intense development.

(3) Dissolved-chloride concentrations were largest in the East I-40 area. Possible sources of these concentrations include geologic conditions, such as interbedded salt deposits or upward movement of saline ground water along faults and fractures, in addition to domestic wastewater disposal and (or) road salt.

(4) TOC concentrations in the East I-40 and Southern areas were about twice those in other geographic areas. The larger concentrations in the East I-40 area coincide with large concentrations of total nitrite and particularly dissolved chloride. The reason for the large concentrations in the Southern area is not known, but may be a smaller capacity to biochemically alter organic carbon and (or) a smaller sorptive capacity of carbonate rocks, which are present in most of the Southern area.

Water samples were collected from 11 inventory wells in 1984-85 and analyzed for dissolved and (or) total nitrite plus nitrate; 8 of these wells also were analyzed for dissolved chloride. Samples were collected from three of these wells in 1962 and analyzed for dissolved chloride. Results were evaluated to determine changes in total and dissolved nitrite plus nitrate and dissolved-chloride concentrations over time. Evaluation of the results indicated no clear concentration trend for either constituent. The most notable observations were:

(1) Five of six wells with nitrite plus nitrate concentrations of 2.6 mg/L or less in 1984-85 had the same concentrations, smaller concentrations, or increases in concentrations of 0.5 mg/L or less in 1990.

(2) Four of five wells that had nitrite plus nitrate concentrations the same or larger than the study area 75th-percentile concentration of 4.6 mg/L in 1984 had increases in concentrations of 0.8 to 6.0 mg/L in 1990.

(3) Four of five wells with dissolved-chloride concentrations less than the study area median value of 66 mg/L in 1984-85 had increases of 16 mg/L or less in 1990.

(4) The dissolved-chloride concentration increased by 200 mg/L in one well between 1962 and 1984, indicating effects to the ground-water system prior to 1984.

Water levels were measured monthly during 1990-91 in 20 of the inventory wells, designated "monthly monitoring wells." The resulting data were evaluated to determine the response of water levels to precipitation.

During July 1991, 7.40 inches of precipitation fell at the Sandia Park Climatological Station; 5.40 inches fell during July 22-27. July 1991 precipitation was the largest recorded amount of precipitation to fall in 1 month during 1939-91 and was about 260 percent of normal July precipitation. Responses of water levels in monthly monitoring wells to the episodal precipitation event of July 22-27, 1991, of 5.40 inches were evaluated by comparing July, August, and September 1990 water levels, which were not affected by the precipitation event, with those in 1991, which were affected.

Water-level changes between June and July 1990 were similar to those in 1991: between June and July 1990, water levels rose in 1 well and declined in 12 wells; between June and July 1991, water levels rose in 3 wells and declined in 14 wells. The median water-level decline in these wells in both years was 0.94 foot.

Water-level changes between July and August 1991 were dissimilar to those in 1990, reflecting the effect of the July 22-27, 1991, precipitation event. Between July and August 1990, water levels rose in six wells by a median value of 0.62 foot and declined in seven wells by a median value of 0.40 foot. Between July and August 1991, water levels rose in 16 of 16 wells by a median value of 5.14 feet. This suggests that, at or near these well sites, there is a considerable hydraulic connection between the land surface and the ground-water system, and that, therefore, surface or near-surface activities can rapidly affect ground-water quality.

The percentage of total 1990-91 water-level fluctuation that occurred between July and August or September 1991 following the July 22-27, 1991, precipitation event, was determined for 18 monthly monitoring wells. The median percentage for all 18 wells was 81 percent; the median percentages in the carbonate and clastic terranes were 86 and 64 percent, respectively. Each of these values is large, and the carbonate terrane median value of 86 percent indicates its greater susceptibility to the effects of surface or near-surface activities because of the fractured

condition of the bedrock and attendant solution channeling.

The data collected and analyzed during this study substantiate the expected effects of domestic wastewater disposal in an area having the geologic and soil conditions that are present in eastern Bernalillo County. These data indicate that concentrations of constituents typically associated with domestic wastewater disposal are largest in areas that have the longest history of development and that therefore have had the greatest effect on the ground-water system. These data also indicate a substantial hydraulic connection between the land surface and the ground-water system, and, therefore, a substantial degree of susceptibility of the ground-water system to domestic wastewater disposal.

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Table 11.--Selected records of inventory wells

[--, no data]

Well number	Site ID	Altitude of land surface (feet)	Date well constructed	Depth of well (feet)	Top of open interval (feet)	Bottom of open interval (feet)	Geologic terrane	Geographical area
08N.06E.02.331	345630106172301	7,380	01-01-78	250	--	--	Carbonate	Southern
08N.06E.11.222	345628106162601	7,262	01-01-72	133	--	--	Carbonate	Southern
08N.06E.14.131	345516106170901	7,287	05- -54	142	--	--	Carbonate	Southern
08N.06E.23.211	345446106164301	7,362	03-08-80	345	305	345	Carbonate	Southern
08N.07E.12.323	345312106093301	6,520	--	238	--	--	Carbonate	Southern
08N.07E.16.141	345535106122001	6,715	08-11-80	400	--	--	Carbonate	Southern
08N.07E.28.221	345348106122601	6,660	08-24-74	45	25	45	Carbonate	Southern
08N.07E.29.321	345323106140001	7,020	--	--	--	--	Carbonate	Southern
08N.07E.29.324A	345319106135101	6,790	--	100	--	--	Carbonate	Southern
08N.07E.34.222	345254106111201	6,705	01-01-73	500	--	--	Carbonate	Southern
09N.05E.12.213	350130106212501	7,160	04-27-83	160	110	160	Carbonate	Southern
09N.05E.12.214	350131106211601	7,120	--	--	--	--	Carbonate	Southern
09N.05E.12.241	350119106210901	7,060	--	--	--	--	Carbonate	Southern
09N.05E.12.421	350111106210901	7,100	--	--	--	--	Carbonate	Southern
09N.06E.07.341	350058106203701	7,100	--	--	--	--	Carbonate	Southern
09N.06E.17.142	345956106192301	7,520	--	--	--	--	Carbonate	Southern
09N.06E.18.131	350032106202301	7,280	11-11-82	320	280	320	Carbonate	Southern
09N.06E.19.413	345918106202001	7,660	10-07-80	680	460	480	Carbonate	Southern
09N.06E.20.331	345909106194901	7,520	12-03-80	105	40 85	60 104	Carbonate	Southern
09N.06E.20.333	345858106194601	7,490	09-21-77	100	60	100	Carbonate	Southern
09N.06E.22.234	345924106165501	7,342	12-01-83	140	--	--	Carbonate	Southern
09N.06E.22.333	345900106174101	7,416	01-01-78	240	--	--	Carbonate	Southern
09N.06E.22.334	345900106173501	7,415	--	250	--	--	Carbonate	Southern
09N.06E.26.244	345832106154501	7,180	--	103	--	--	Carbonate	Southern
09N.06E.29.114	345847106194201	7,462	09-29-82	300	160 260	200 300	Carbonate	Southern

Table 11.--Selected records of inventory wells--Continued

Well number	Site ID	Altitude of land surface (feet)	Date well constructed	Depth of well (feet)	Top of open interval (feet)	Bottom of open interval (feet)	Geologic terrane	Geographical area
09N.06E.29.142	345844106192301	7,520	09-25-81	440	400	440	Carbonate	Southern
09N.06E.29.244	345833106185101	7,420	10-19-79	315	280	300	Carbonate	Southern
09N.06E.29.332	345816106193801	7,440	--	--	--	--	Carbonate	Southern
09N.06E.30.432	345813106201201	7,500	--	--	--	--	Carbonate	Southern
09N.06E.31.131	345750106204901	7,440	01-01-79	345	--	--	Carbonate	Southern
09N.06E.31.413	345729106202001	7,320	--	--	--	--	Carbonate	Southern
09N.06E.32.442	345722106185901	7,430	10-03-77	360	300	360	Carbonate	Southern
09N.06E.34.242A	345747106164301	7,165	09-28-84	155	80	155	Carbonate	Southern
09N.06E.34.431	345721106171201	7,260	05-16-83	160	80 140	100 160	Carbonate	Southern
10N.04.5E.25.124	350400106273801	5,955	--	--	--	--	Crystalline	Tijeras Canyon
10N.04.5E.25.144C	350345106273501	5,760	--	--	--	--	Crystalline	Tijeras Canyon
10N.04.5E.25.234B	350347106271901	5,840	01-01-79	200	--	--	Crystalline	Tijeras Canyon
10N.05E.02.233A	350721106222101	6,765	01-01-65	200	--	--	Clastic	North 14
10N.05E.02.241	350729106220501	6,760	--	--	--	--	Clastic	North 14
10N.05E.11.324	350615106223301	6,580	10-11-67	80	20	80	Clastic	North 14
10N.05E.11.341	350609106223901	6,600	--	--	--	--	Clastic	North 14
10N.05E.12.122	350644106212701	6,660	--	--	--	--	Clastic	East I-40
10N.05E.12.332	350606106214901	6,490	11-04-69	423	358	400	Clastic	East I-40
10N.05E.12.422	350619106205801	6,500	--	--	--	--	Clastic	East I-40
10N.05E.12.442	350604106205801	6,520	--	85	--	--	Clastic	East I-40
10N.05E.14.132	350546106224901	6,520	--	--	--	--	Clastic	North 14
10N.05E.14.223	350545106220901	6,430	--	125	--	--	Carbonate	East I-40
10N.05E.14.312	350531106224301	6,540	--	160	--	--	Clastic	North 14
10N.05E.14.413A	350522106222501	6,400	--	73	--	--	Carbonate	East I-40
10N.05E.14.431B	350520106222502	6,440	--	--	--	--	Carbonate	East I-40

Table 11.--Selected records of inventory wells--Continued

Well number	Site ID	Altitude of land surface (feet)	Date well constructed	Depth of well (feet)	Top of open interval (feet)	Bottom of open interval (feet)	Geologic terrane	Geographical area
10N.05E.19.322	350423106263301	6,255	01-01-60	146	--	--	Crystalline	Tijeras Canyon
10N.05E.19.334	350410106264401	6,085	--	--	--	--	Crystalline	Tijeras Canyon
10N.05E.19.341	350414106263801	6,085	--	--	--	--	Crystalline	Tijeras Canyon
10N.05E.21.322	350436106243301	6,160	--	--	--	--	Crystalline	Tijeras Canyon
10N.05E.22.234	350449106231901	6,355	--	--	--	--	Carbonate	Southern
10N.05E.22.344A	350417106232501	6,385	01-01-57	1,100	--	--	Carbonate	Southern
10N.05E.22.411	350444106233101	6,280	--	--	--	--	Carbonate	Southern
10N.05E.23.131	350451106225801	6,320	--	--	--	--	Carbonate	Southern
10N.05E.23.313	350434106225701	6,350	03-18-69	253	60	253	Carbonate	Southern
10N.05E.26.332	350341106225001	6,440	--	--	--	--	Carbonate	Southern
10N.05E.29.132	350358106255101	5,960	--	--	--	--	Crystalline	Tijeras Canyon
10N.05E.30.122	350405106263501	6,075	07-29-82	125	65	125	Crystalline	Tijeras Canyon
10N.05E.30.124	350401106263001	6,040	08-02-82	160	90 135	110 155	Crystalline	Tijeras Canyon
10N.05E.30.213	350357106262801	6,005	10-17-80	85	45	85	Crystalline	Tijeras Canyon
10N.05E.30.213A	350400106262601	6,030	01-01-57	120	--	--	Crystalline	Tijeras Canyon
10N.05E.30.321	350344106264401	5,840	--	--	--	--	Crystalline	Tijeras Canyon
10N.05E.30.322	350339106263501	5,860	--	50	--	--	Crystalline	Tijeras Canyon
10N.05E.30.324A	350336106263501	5,870	01-01-71	50	20	50	Crystalline	Tijeras Canyon
10N.06E.04.113	350728106184101	6,840	01-11-78	565	500	565	Carbonate	East I-40
10N.06E.04.444	350654106174801	6,998	03-14-79	175	135	175	Carbonate	East I-40
10N.06E.05.441	350655106185601	6,880	--	300	--	--	Carbonate	East I-40
10N.06E.07.112	350644106203801	6,620	--	--	--	--	Clastic	East I-40
10N.06E.07.114	350635106203701	6,600	--	185	--	--	Clastic	East I-40
10N.06E.07.314	350613106203801	6,530	--	--	--	--	Clastic	East I-40
10N.06E.07.322	350619106202201	6,560	--	--	--	--	Clastic	East I-40

Table 11.--Selected records of inventory wells--Continued

Well number	Site ID	Altitude of land surface (feet)	Date well constructed	Depth of well (feet)	Top of open interval (feet)	Bottom of open interval (feet)	Geologic terrane	Geographical area
10N.06E.07.422	350617106194901	6,780	--	--	--	--	Clastic	East I-40
10N.06E.08.211	350646106191101	6,780	--	--	--	--	Carbonate	East I-40
10N.06E.08.323	350611106192901	6,970	--	--	--	--	Carbonate	East I-40
10N.06E.09.122	350643106175601	6,910	--	--	--	--	Carbonate	East I-40
10N.06E.09.341	350607106183901	6,883	10-02-83	400	300	400	Carbonate	East I-40
10N.06E.10.331	350604106174201	6,940	--	--	--	--	Carbonate	East I-40
10N.06E.10.344	350559106171401	6,980	--	--	--	--	Carbonate	East I-40
10N.06E.12.313	350609106153701	6,840	--	--	--	--	Carbonate	East I-40
10N.06E.13.224	350537106144301	6,742	--	485	--	--	Carbonate	East I-40
10N.06E.13.321	350525106151701	6,775	07-28-80	275	175	275	Carbonate	East I-40
10N.06E.16.121	350556106182901	6,970	--	--	--	--	Carbonate	East I-40
10N.06E.26.132	350356106162901	7,030	--	329	--	--	Carbonate	Southern
10N.06E.27.444	350323106164601	6,994	04-06-80	250	192	250	Carbonate	Southern
11N.05E.23.222B	351011106220401	7,100	--	--	--	--	Clastic	Sandia Park
11N.05E.24.213	351007106211501	7,020	--	--	--	--	Clastic	Sandia Park
11N.05E.24.241	350958106211101	6,920	05-20-74	175	145	175	Clastic	Sandia Park
11N.05E.24.412	350949106211801	6,940	--	260	--	--	Clastic	Sandia Park
11N.05E.24.443	350930106210701	6,860	--	120	--	--	Clastic	North 14
11N.05E.25.143	350901106214201	6,978	07-27-84	300	220	300	Clastic	North 14
11N.05E.25.144B	350904106213101	6,975	03-28-81	210	160	180	Clastic	North 14
11N.05E.25.211	350924106212501	6,940	--	--	--	--	Clastic	North 14
11N.05E.25.343	350836106213801	6,960	--	--	--	--	Clastic	North 14
11N.05E.25.411	350858106212401	7,060	--	--	--	--	Clastic	North 14
11N.05E.25.422	350857106210001	6,970	--	--	--	--	Clastic	North 14
11N.05E.35.244A	350811106221701	6,960	11-07-83	293	100	293	Clastic	North 14

Table 11.--Selected records of inventory wells--Concluded

Well number	Site ID	Altitude of land surface (feet)	Date well constructed	Depth of well (feet)	Top of open interval (feet)	Bottom of open interval (feet)	Geologic terrane	Geographical area
11N.05E.35.434	350744106222201	6,965	03-17-78	176	116	126	Clastic	North 14
					166	176		
11N.05E.36.113	350821106215801	6,915	03-14-79	200	110	120	Clastic	North 14
					170	180		
11N.05E.36.313	350754106215401	6,840	--	--	--	--	Clastic	North 14
11N.05E.36.314	350802106215401	6,855	08-28-81	200	125	200	Clastic	North 14
11N.06E.19.113	351003106205401	6,855	--	--	--	--	Clastic	Sandia Park
11N.06E.19.122	351014106202801	6,798	--	--	--	--	Clastic	North 14
11N.06E.19.124	351004106202901	6,785	--	125	--	--	Clastic	North 14
11N.06E.19.313	350940106205401	6,865	01-01-42	136	--	--	Clastic	North 14
11N.06E.19.341A	350935106204001	6,840	--	--	--	--	Clastic	North 14
11N.06E.20.223	351008106190201	6,600	--	197	--	--	Clastic	Northeast
11N.06E.20.244	350954106185401	6,670	01-22-78	300	280	300	Clastic	Northeast
11N.06E.20.432	350941106194701	6,720	09-09-83	278	60	100	Clastic	Northeast
					120	140		
					240	278		
11N.06E.21.133	350949106184501	6,700	--	280	--	--	Unknown	Northeast
11N.06E.22.444	350928106164401	6,970	--	460	--	--	Unknown	Northeast
11N.06E.26.344	350835106161501	6,840	--	--	--	--	Carbonate	Northeast
11N.06E.28.322	350856106182301	6,720	07-01-82	150	--	--	Carbonate	Northeast
11N.06E.29.232	350908106190601	6,800	--	178	--	--	Clastic	Northeast
11N.06E.30.221	350921106200301	6,800	--	--	--	--	Clastic	Northeast
11N.06E.30.323	350850106204001	6,940	--	--	--	--	Clastic	North 14
11N.06E.32.144	350806106192901	6,865	01-01-84	485	--	--	Clastic	Northeast
11N.06E.34.322	350802106172201	6,900	03-20-72	935	450	900	Carbonate	Northeast

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells

[gal/min, gallons per minute (min); deg C, degrees Celsius; µS/cm, microsiemens per centimeter at 25 deg C; --, not determined; mg/L, milligrams per liter; <, less than; µg/L, micrograms per liter; wat wh gran t, water whole gran titration]

Well number	Date	Water-level depth below land surface (feet)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Temperature water (deg C)	Specific conductance (µS/cm)
08N.06E.02.331	08-28-90	--	4.0	28	15.0	620
08N.06E.11.222	08-27-90	--	10.0	9	14.0	1,280
08N.06E.14.131	08-28-90	41.66	3.0	7	12.5	650
08N.06E.23.211	08-27-90	252.43	10.0	16	14.5	650
08N.07E.12.323	09-04-90	108.29	10.0	11	15.0	550
08N.07E.16.141	09-05-90	49.66	7.0	8	14.5	800
08N.07E.28.221	08-24-90	20.36	3.0	24	13.0	750
08N.07E.29.321	08-29-90	89.10	12.0	3	16.0	880
08N.07E.29.324A	04-12-90	24.56	--	17	12.0	710
08N.07E.34.222	09-05-90	303.48	4.0	31	16.5	700
09N.05E.12.213	07-27-90	120.76	6.0	5	13.0	820
09N.05E.12.214	07-27-90	91.06	8.0	8	13.0	1,110
09N.05E.12.241	04-13-90	--	--	15	11.0	1,180
09N.05E.12.421	07-27-90	--	4.0	6	15.0	1,010
09N.06E.07.341	08-16-90	72.14	3.0	21	12.5	1,000
09N.06E.17.142	06-24-90	--	--	--	13.5	820
09N.06E.18.131	08-28-90	212.95	3.0	19	14.0	710
09N.06E.19.413	04-13-90	--	--	5	14.5	720
09N.06E.20.331	07-30-90	51.14	3.0	12	12.0	1,000
09N.06E.20.333	04-13-90	31.83	--	11	10.5	1,150
09N.06E.22.234	08-20-90	124.46	6.0	9	13.0	1,100
09N.06E.22.333	08-22-90	113.15	2.0	3	12.0	600
09N.06E.22.334	08-29-90	--	10.0	11	16.0	500
09N.06E.26.244	08-25-90	68.59	4.0	7	13.0	1,250
09N.06E.29.114	08-07-90	198.01	6.0	12	14.0	800
09N.06E.29.142	08-07-90	268.39	10.0	17	14.0	1,030
09N.06E.29.244	04-13-90	147.50	--	9	13.0	1,290
09N.06E.29.332	08-10-90	--	2.0	23	15.0	750
09N.06E.30.432	08-08-90	177.08	6.0	17	15.0	1,150
09N.06E.31.131	09-06-90	252.58	6.0	15	14.5	710
09N.06E.31.413	09-06-90	129.19	4.0	6	13.0	650
09N.06E.32.442	08-24-90	168.20	10.0	10	13.5	800
09N.06E.34.242A	08-16-90	35.59	3.0	17	13.5	790
09N.06E.34.431	08-21-90	62.80	4.0	23	13.5	1,020
10N.04.5E.25.124	05-08-90	77.40	2.0	24	18.0	1,110
10N.04.5E.25.144C	09-20-90	--	4.0	16	16.5	900
10N.04.5E.25.234B	05-09-90	43.44	5.0	26	17.5	1,400
10N.05E.02.233A	04-11-90	64.58	--	15	14.5	700
10N.05E.02.241	05-09-90	47.85	--	--	14.0	1,190
10N.05E.11.324	04-16-90	13.46	--	12	13.5	990

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Specific conductance, lab (µS/cm)	pH water whole, field (standard units)	pH water whole, lab (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, NO_2+NO_3, total (mg/L as N)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N)
08N.06E.02.331	08-28-90	689	7.1	7.8	<0.01	<0.2	<0.01	<0.1	<0.1
08N.06E.11.222	08-27-90	1,370	7.1	8.0	<.01	1.0	<.01	<.1	<.1
08N.06E.14.131	08-28-90	699	7.4	7.8	<.01	<.2	<.01	.1	.1
08N.06E.23.211	08-27-90	717	7.1	7.5	<.01	<.2	<.01	<.1	<.1
08N.07E.12.323	09-04-90	562	7.8	8.2	.04	.3	<.01	1.8	1.8
08N.07E.16.141	09-05-90	870	7.5	7.8	.04	.3	<.01	1.9	1.9
08N.07E.28.221	08-24-90	820	7.2	7.4	<.01	.8	<.01	5.5	5.8
08N.07E.29.321	08-29-90	883	7.8	8.2	<.01	<.2	<.01	<.1	<.1
08N.07E.29.324A	04-12-90	771	7.3	7.5	<.01	<.2	<.01	2.1	2.1
08N.07E.34.222	09-05-90	716	8.3	8.3	.04	<.2	<.01	1.3	1.3
09N.05E.12.213	07-27-90	729	7.1	8.1	.02	.5	<.01	2.3	2.4
09N.05E.12.214	07-27-90	1,180	7.0	7.6	<.01	.6	<.01	4.6	4.8
09N.05E.12.241	04-13-90	1,230	7.1	7.3	<.01	.4	<.01	4.2	4.2
09N.05E.12.421	07-27-90	1,080	7.1	7.6	<.01	.5	<.01	1.6	1.7
09N.06E.07.341	08-16-90	1,020	7.1	7.5	<.01	.3	<.01	1.3	1.4
09N.06E.17.142	06-24-90	875	7.3	7.4	.05	.5	<.01	.6	.5
09N.06E.18.131	08-28-90	739	7.2	7.9	<.01	<.2	<.01	.6	.6
09N.06E.19.413	04-13-90	745	8.2	8.3	.05	<.2	<.01	<.1	<.1
09N.06E.20.331	07-30-90	1,030	7.2	7.7	<.01	.5	<.01	2.6	2.8
09N.06E.20.333	04-13-90	1,200	7.1	7.3	<.01	.6	<.01	9.4	9.8
09N.06E.22.234	08-20-90	1,140	7.2	7.9	<.01	.9	<.01	4.3	4.3
09N.06E.22.333	08-22-90	630	7.3	7.4	<.01	<.2	<.01	.2	.2
09N.06E.22.334	08-29-90	540	7.5	8.0	<.01	<.2	<.01	<.1	<.1
09N.06E.26.244	08-25-90	1,370	7.2	7.4	.01	.4	<.01	3.3	3.3
09N.06E.29.114	08-07-90	834	7.8	8.1	.13	.5	<.01	<.1	.1
09N.06E.29.142	08-07-90	1,120	7.1	7.9	.01	.5	<.01	2.5	2.5
09N.06E.29.244	04-13-90	1,330	7.1	7.4	<.01	.5	.02	2.9	3.4
09N.06E.29.332	08-10-90	820	7.1	8.0	<.01	.6	<.01	3.2	3.3
09N.06E.30.432	08-08-90	1,200	7.1	7.9	.02	.7	<.01	3.9	4.0
09N.06E.31.131	09-06-90	798	7.2	7.7	.05	.9	<.01	1.7	1.7
09N.06E.31.413	09-06-90	711	7.4	7.9	.04	.2	<.01	.5	.5
09N.06E.32.442	08-24-90	840	7.1	7.4	.02	.4	<.01	<.1	<.1
09N.06E.34.242A	08-16-90	820	7.1	7.5	<.01	<.2	<.01	.2	.2
09N.06E.34.431	08-21-90	1,120	7.0	7.2	<.01	.6	<.01	2.8	2.9
10N.04.5E.25.124	05-08-90	1,020	7.4	7.6	<.01	<.2	<.01	2.1	2.1
10N.04.5E.25.144C	09-20-90	911	7.3	7.9	.03	<.2	<.01	.9	--
10N.04.5E.25.234B	05-09-90	1,460	7.2	7.3	.01	.5	<.01	29	6.1
10N.05E.02.233A	04-11-90	735	9.5	9.3	<.01	<.2	.01	.5	.5
10N.05E.02.241	05-09-90	1,220	7.2	7.5	<.01	.5	<.01	3.	2.7
10N.05E.11.324	04-16-90	1,010	7.4	7.6	<.01	.2	<.01	6.	6.1

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Chloride, dissolved (mg/L as Cl)
08N.06E.02.331	08-28-90	<0.01	--	0.5	83	22	32	4.3	27
08N.06E.11.222	08-27-90	<.01	--	3.9	180	25	49	3.4	230
08N.06E.14.131	08-28-90	<.01	--	1.0	78	30	21	4.6	47
08N.06E.23.211	08-27-90	.02	--	1.7	81	16	58	2.6	18
08N.07E.12.323	09-04-90	<.01	--	.9	39	18	55	3.8	23
08N.07E.16.141	09-05-90	.01	--	3.0	120	11	54	1.4	49
08N.07E.28.221	08-24-90	<.01	--	2.1	130	13	29	.7	40
08N.07E.29.321	08-29-90	<.01	--	1.6	27	12	160	6.8	37
08N.07E.29.324A	04-12-90	.02	--	2.0	120	12	31	1.2	27
08N.07E.29.324A	09-05-90	<.01	--	.5	20	9.3	130	3.1	34
09N.05E.12.213	07-27-90	.02	--	1.2	<3	<1	140	1.6	51
09N.05E.12.214	07-27-90	.02	--	1.6	160	28	41	2.1	150
09N.05E.12.241	04-13-90	.01	--	2.0	160	30	46	1.6	160
09N.05E.12.421	07-27-90	.01	--	1.8	150	29	39	2.1	120
09N.06E.07.341	08-16-90	.02	--	2.2	150	30	31	1.5	130
09N.06E.17.142	06-24-90	<.01	--	1.6	110	35	23	4.0	45
09N.06E.18.131	08-28-90	<.01	--	1.0	99	26	32	2.3	37
09N.06E.19.413	04-13-90	<.01	--	.5	9	7.1	150	3.9	28
09N.06E.20.331	07-30-90	.02	--	2.6	160	17	19	1.1	160
09N.06E.20.333	04-13-90	.03	--	3.4	200	14	24	1.0	160
09N.06E.22.234	08-20-90	.02	--	3.6	160	21	39	1.4	180
09N.06E.22.333	08-22-90	<.01	--	.6	77	16	37	1.8	29
09N.06E.22.334	08-29-90	<.01	--	.5	58	15	34	2.4	24
09N.06E.26.244	08-25-90	<.01	--	3.5	190	35	37	2.0	150
09N.06E.29.114	08-07-90	<.01	--	1.8	29	24	120	9.6	71
09N.06E.29.142	08-07-90	<.01	--	2.0	150	30	30	3.3	150
09N.06E.29.244	04-13-90	.01	--	4.2	140	39	71	5.6	150
09N.06E.29.332	08-10-90	<.01	--	2.2	110	26	22	3.1	76
09N.06E.30.432	08-08-90	<.01	--	3.4	150	33	43	2.6	170
09N.06E.31.131	09-06-90	.02	--	2.3	120	18	22	1.8	52
09N.06E.31.413	09-06-90	<.01	--	.9	75	26	41	4.6	35
09N.06E.32.442	08-24-90	<.01	--	2.0	110	22	27	2.5	66
09N.06E.34.242A	08-16-90	<.01	--	1.4	91	30	39	2.7	76
09N.06E.34.431	08-21-90	.02	--	2.3	180	22	27	1.9	130
10N.04.5E.25.124	05-08-90	.03	--	.8	120	33	50	9.0	77
10N.04.5E.25.144C	09-20-90	<.01	0.01	.4	120	38	40	10	30
10N.04.5E.25.234B	05-09-90	<.01	--	1.5	180	39	69	10	170
10N.05E.02.233A	04-11-90	.01	--	<.1	.93	.08	170	.1	14
10N.05E.02.241	05-09-90	.11	--	.7	220	14	37	.9	95
10N.05E.11.324	04-16-90	.03	--	.8	150	27	33	.8	24

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Sulfate, dis-solved (mg/L as SO_4)	Alka-linity wat wh gran t, field $CaCO_3$ (mg/L)	Alka-linity, lab (mg/L as $CaCO_3$)	Fluo-ride, dis-solved (mg/L as F)	Silica, dis-solved (mg/L as SiO_2)	Boron, dis-solved (µg/L as B)	Iron, dis-solved (µg/L as Fe)	Manga-nese, dis-solved (µg/L as Mn)
08N.06E.02.331	08-28-90	37	310	215	1.3	14	110	27	28
08N.06E.11.222	08-27-90	110	210	123	.4	17	90	11	<1
08N.06E.14.131	08-28-90	41	270	269	.7	16	150	8	2
08N.06E.23.211	08-27-90	42	330	291	.8	15	160	<3	<1
08N.07E.12.323	09-04-90	44	210	216	.7	15	160	<3	<1
08N.07E.16.141	09-05-90	87	310	312	.6	17	100	13	5
08N.07E.28.221	08-24-90	59	280	251	.5	18	40	4	1
08N.07E.29.321	08-29-90	74	370	336	1.1	9.2	260	3	8
08N.07E.29.324A	04-12-90	42	340	328	.1	19	50	21	2
08N.07E.29.324A	09-05-90	73	--	252	1.1	11	240	<3	<1
09N.05E.12.213	07-27-90	36	350	88	.2	17	40	20	21
09N.05E.12.214	07-27-90	59	350	279	.4	16	40	11	<1
09N.05E.12.241	04-13-90	53	350	299	.2	17	50	5	<1
09N.05E.12.421	07-27-90	64	350	260	1.0	14	70	5	1
09N.06E.07.341	08-16-90	68	340	172	.4	16	40	--	<1
09N.06E.17.142	06-24-90	71	370	360	.2	13	70	6	3
09N.06E.18.131	08-28-90	52	320	211	.5	17	80	8	<1
09N.06E.19.413	04-13-90	21	340	325	4.4	11	280	8	<1
09N.06E.20.331	07-30-90	47	260	155	.3	16	30	<3	<1
09N.06E.20.333	04-13-90	48	290	281	.1	21	30	<3	<1
09N.06E.22.234	08-20-90	88	230	98	.2	16	50	<3	<1
09N.06E.22.333	08-22-90	53	250	245	.4	18	100	6	4
09N.06E.22.334	08-29-90	45	210	215	.6	19	140	<3	7
09N.06E.26.244	08-25-90	240	240	171	.4	16	60	8	<1
09N.06E.29.114	08-07-90	49	290	293	1.0	15	240	8	4
09N.06E.29.142	08-07-90	66	320	116	.1	14	60	4	<1
09N.06E.29.244	04-13-90	120	330	317	.7	17	120	18	4
09N.06E.29.332	08-10-90	49	270	165	.4	15	80	3	2
09N.06E.30.432	08-08-90	120	260	188	.1	17	50	9	<1
09N.06E.31.131	09-06-90	52	300	176	.2	16	40	<3	1
09N.06E.31.413	09-06-90	45	290	229	1.0	13	120	9	2
09N.06E.32.442	08-24-90	51	300	250	.3	16	50	<3	<1
09N.06E.34.242A	08-16-90	61	270	209	.6	14	100	10	7
09N.06E.34.431	08-21-90	120	290	295	.2	25	40	9	1
10N.04.5E.25.124	05-08-90	180	250	250	2.7	27	90	7	<1
10N.04.5E.25.144C	09-20-90	170	340	216	1.9	18	80	7	3
10N.04.5E.25.234B	05-09-90	180	--	319	1.7	26	100	3	1
10N.05E.02.233A	04-11-90	39	--	312	.5	10	640	11	3
10N.05E.02.241	05-09-90	270	270	262	<.1	27	80	22	<1
10N.05E.11.324	04-16-90	120	380	368	.4	22	40	13	4

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Water-level depth below land surface (feet)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Temperature water (deg C)	Specific conductance (µS/cm)
10N.05E.11.341	04-26-90	79.95	4.0	14	15.0	1,620
10N.05E.12.122	07-11-90	117.39	2.0	6	15.0	3,700
10N.05E.12.332	07-17-90	27.03	6.0	32	17.5	4,000
10N.05E.12.422	06-25-90	64.74	6.0	13	14.0	730
10N.05E.12.442	04-10-90	26.67	--	15	14.0	1,470
10N.05E.14.132	07-24-90	10.64	1.0	16	16.0	600
10N.05E.14.223	04-24-90	--	3.0	18	15.0	2,650
10N.05E.14.312	04-11-90	--	--	13	14.0	980
10N.05E.14.413A	04-10-90	27.31	--	15	12.5	1,120
10N.05E.14.431B	04-09-90	45.20	3.5	55	13.0	1,270
10N.05E.19.322	04-17-90	41.47	--	15	16.5	510
10N.05E.19.334	04-20-90	43.75	--	17	17.0	720
10N.05E.19.341	04-20-90	32.35	--	36	17.0	620
10N.05E.21.322	04-24-90	99.00	4.0	23	15.5	1,850
10N.05E.22.234	04-16-90	26.21	--	22	14.0	890
10N.05E.22.344A	04-25-90	--	5.0	20	20.0	710
10N.05E.22.411	04-25-90	26.50	10.0	27	14.5	940
10N.05E.23.131	07-10-90	23.18	10.0	9	12.5	1,000
10N.05E.23.313	06-24-90	--	--	--	16.0	680
10N.05E.26.332	09-04-90	12.35	10.0	10	14.0	700
10N.05E.29.132	10-10-90	--	.2	52	16.5	--
10N.05E.30.122	04-24-90	42.73	4.0	20	17.0	830
10N.05E.30.124	04-19-90	70.56	--	41	17.5	950
10N.05E.30.213	04-19-90	35.33	--	48	17.0	1,000
10N.05E.30.213A	04-17-90	65.43	--	17	16.0	1,100
10N.05E.30.321	08-31-90	--	10.0	12	18.0	950
10N.05E.30.322	05-07-90	8.29	4.0	12	16.0	1,290
10N.05E.30.324A	05-07-90	16.61	4.0	17	13.0	890
10N.06E.04.113	07-17-90	--	5.0	10	17.0	860
10N.06E.04.444	07-18-90	146.36	4.0	13	16.0	3,020
10N.06E.05.441	04-10-90	--	--	12	13.5	2,500
10N.06E.07.112	07-03-90	99.57	3.0	44	15.5	3,210
10N.06E.07.114	07-25-90	108.94	3.0	24	15.5	590
10N.06E.07.314	06-22-90	60.51	4.0	--	14.0	1,400
10N.06E.07.322	06-22-90	99.47	5.0	23	15.0	860
10N.06E.07.422	09-24-90	--	--	--	--	--
10N.06E.08.211	06-26-90	232.20	5.0	23	16.0	660
10N.06E.08.323	06-26-90	--	4.0	13	16.0	720
10N.06E.09.122	06-25-90	161.64	5.0	23	15.0	2,150
10N.06E.09.341	07-11-90	210.32	10.0	15	14.5	1,350

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Specific conductance, lab (µS/cm)	pH water whole, field (standard units)	pH water whole, lab (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, NO_2+NO_3, total (mg/L as N)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N)
10N.05E.11.341	04-26-90	1,610	7.4	7.6	0.27	0.4	0.03	2.0	2.2
10N.05E.12.122	07-11-90	3,560	7.1	7.7	.90	1.0	<.01	<.1	<.1
10N.05E.12.332	07-17-90	4,020	7.2	7.3	.27	.5	.01	.6	.6
10N.05E.12.422	06-25-90	768	7.3	7.5	<.01	.4	<.01	5.8	6.2
10N.05E.12.442	04-10-90	1,530	7.2	7.3	<.01	.4	<.01	15	15
10N.05E.14.132	07-24-90	656	7.4	7.8	<.01	<.2	<.01	<.1	<.1
10N.05E.14.223	04-24-90	2,700	7.3	7.4	.04	.4	<.01	5.4	5.6
10N.05E.14.312	04-11-90	1,020	7.2	7.5	<.01	<.2	<.01	<.1	<.1
10N.05E.14.413A	04-10-90	1,150	7.3	7.6	<.01	.3	<.01	1.7	1.7
10N.05E.14.431B	04-09-90	1,290	7.4	7.6	<.01	.4	<.01	3.5	3.6
10N.05E.19.322	04-17-90	566	7.7	7.9	<.01	.3	<.01	.7	.7
10N.05E.19.334	04-20-90	739	7.6	7.7	<.01	.2	<.01	1.8	1.8
10N.05E.19.341	04-20-90	640	7.7	7.8	<.01	<.2	<.01	2.7	3.0
10N.05E.21.322	04-24-90	1,990	7.1	7.2	<.01	.9	<.01	13	14
10N.05E.22.234	04-16-90	904	7.6	7.8	<.01	.2	.04	.5	.6
10N.05E.22.344A	04-25-90	718	7.6	7.6	.02	.2	.02	.2	.2
10N.05E.22.411	04-25-90	978	7.4	7.5	<.01	.3	<.01	1.8	1.9
10N.05E.23.131	07-10-90	1,060	7.3	8.0	.01	<.2	<.01	1.7	1.7
10N.05E.23.313	06-24-90	735	7.4	7.6	<.01	.4	<.01	1.1	1.2
10N.05E.26.332	09-04-90	735	7.4	7.8	.04	.5	<.01	3.1	3.1
10N.05E.29.132	10-10-90	914	7.2	7.3	<.01	.2	<.01	.8	--
10N.05E.30.122	04-24-90	867	7.8	7.8	.01	.3	<.01	9.3	9.5
10N.05E.30.124	04-19-90	769	7.6	7.6	<.01	.5	<.01	13	14
10N.05E.30.213	04-19-90	1,050	7.5	7.6	<.01	.8	<.01	13	13
10N.05E.30.213A	04-17-90	1,140	7.6	7.7	<.01	1.1	<.01	15	15
10N.05E.30.321	08-31-90	995	7.6	7.9	.04	.9	<.01	9.2	10
10N.05E.30.322	05-07-90	1,320	7.4	7.5	<.01	1.0	<.01	27	27
10N.05E.30.324A	05-07-90	929	7.3	7.6	<.01	.4	<.01	1.1	1.0
10N.06E.04.113	07-17-90	845	8.3	8.4	.02	<.2	<.01	.3	.5
10N.06E.04.444	07-18-90	3,060	7.2	7.3	.02	.2	<.01	<.1	<.1
10N.06E.05.441	04-10-90	2,520	7.3	7.5	<.01	.5	<.01	11	12
10N.06E.07.112	07-03-90	3,330	7.4	8.1	1.00	1.2	<.01	<.1	<.1
10N.06E.07.114	07-25-90	597	7.5	8.0	.01	<.2	<.01	1.2	1.3
10N.06E.07.314	06-22-90	1,480	7.3	7.4	.02	.6	<.01	9.1	9.5
10N.06E.07.322	06-22-90	916	7.3	7.7	.01	.8	<.01	--	6.6
10N.06E.07.422	09-24-90	623	--	7.8	.03	<.2	<.01	.1	--
10N.06E.08.211	06-26-90	680	7.5	7.6	.02	<.2	<.01	.9	.9
10N.06E.08.323	06-26-90	758	7.3	7.6	.01	.7	<.01	2.6	2.8
10N.06E.09.122	06-25-90	2,240	7.2	7.3	.02	.6	<.01	6.4	7.8
10N.06E.09.341	07-11-90	1,460	7.1	8.4	.02	.7	<.01	15	16

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Chloride, dissolved (mg/L as Cl)
10N.05E.11.341	04-26-90	<0.01	--	0.7	130	38	180	3.6	120
10N.05E.12.122	07-11-90	.02	--	4.8	320	210	330	8.0	230
10N.05E.12.332	07-17-90	.02	--	1.5	510	220	230	7.5	230
10N.05E.12.422	06-25-90	.04	--	.6	110	23	21	1.3	25
10N.05E.12.442	04-10-90	.02	--	2.0	180	44	60	2.5	250
10N.05E.14.132	07-24-90	<.01	--	.6	100	16	17	1.2	6.8
10N.05E.14.223	04-24-90	.02	--	1.5	260	97	210	4.3	310
10N.05E.14.312	04-11-90	<.01	--	1.1	150	28	32	1.6	66
10N.05E.14.413A	04-10-90	.02	--	.6	140	29	59	1.9	130
10N.05E.14.431B	04-09-90	.02	--	1.1	150	44	54	1.8	150
10N.05E.19.322	04-17-90	<.01	--	.2	69	17	23	3.8	11
10N.05E.19.334	04-20-90	<.01	--	2.7	96	22	31	4.5	23
10N.05E.19.341	04-20-90	<.01	--	.3	130	16	34	4.0	29
10N.05E.21.322	04-24-90	<.01	--	.8	240	61	44	1.2	460
10N.05E.22.234	04-16-90	<.01	--	.8	64	44	54	5.4	100
10N.05E.22.344A	04-25-90	<.01	--	.3	57	35	40	2.5	40
10N.05E.22.411	04-25-90	<.01	--	1.1	110	35	42	2.4	82
10N.05E.23.131	07-10-90	.02	--	.7	140	33	40	1.5	110
10N.05E.23.313	06-24-90	<.01	--	.3	74	39	26	2.4	35
10N.05E.26.332	09-04-90	<.01	--	.5	110	27	17	1.9	58
10N.05E.29.132	10-10-90	<.01	<0.01	1.2	110	25	42	2.2	93
10N.05E.30.122	04-24-90	<.01	--	.6	110	24	38	4.5	46
10N.05E.30.124	04-19-90	<.01	--	1.1	73	16	34	4.0	69
10N.05E.30.213	04-19-90	<.01	--	.7	120	26	53	5.6	110
10N.05E.30.213A	04-17-90	<.01	--	.9	150	32	37	5.6	110
10N.05E.30.321	08-31-90	<.01	--	1.0	130	27	48	6.2	79
10N.05E.30.322	05-07-90	<.01	--	1.1	160	35	60	8.0	110
10N.05E.30.324A	05-07-90	.02	--	.8	120	24	41	4.0	84
10N.06E.04.113	07-17-90	<.01	--	.5	16	6.5	170	2.4	67
10N.06E.04.444	07-18-90	<.01	--	3.3	260	90	210	4.3	780
10N.06E.05.441	04-10-90	<.01	--	3.0	280	75	100	5.3	590
10N.06E.07.112	07-03-90	<.01	--	.8	120	120	540	8.5	22
10N.06E.07.114	07-25-90	.20	--	.3	81	20	20	1.4	7.1
10N.06E.07.314	06-22-90	.01	--	1.5	160	43	66	2.8	270
10N.06E.07.322	06-22-90	.01	--	2.2	97	30	57	2.3	65
10N.06E.07.422	09-24-90	.01	<.01	.3	79	24	18	1.5	17
10N.06E.08.211	06-26-90	<.01	--	.4	73	33	22	1.8	38
10N.06E.08.323	06-26-90	<.01	--	1.5	110	21	16	1.5	46
10N.06E.09.122	06-25-90	.02	--	3.1	260	92	77	2.5	360
10N.06E.09.341	07-11-90	.03	--	2.4	180	50	47	2.7	170

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Sulfate, dis-solved (mg/L as SO_4)	Alka-linity wat wh gran t, field $CaCO_3$ (mg/L)	Alka-linity, lab (mg/L as $CaCO_3$)	Fluo-ride, dis-solved (mg/L as F)	Silica, dis-solved (mg/L as SiO_2)	Boron, dis-solved (µg/L as B)	Iron, dis-solved (µg/L as Fe)	Manga-nese, dis-solved (µg/L as Mn)
10N.05E.11.341	04-26-90	360	380	338	0.5	16	140	10	10
10N.05E.12.122	07-11-90	1,400	570	521	.3	11	170	27,000	260
10N.05E.12.332	07-17-90	2,200	210	101	<.1	11	100	30	210
10N.05E.12.422	06-25-90	84	270	270	.2	23	50	<3	<1
10N.05E.12.442	04-10-90	74	280	280	<.1	19	130	7	<1
10N.05E.14.132	07-24-90	89	260	202	.7	18	30	3	7
10N.05E.14.223	04-24-90	710	360	345	<.1	25	110	20	10
10N.05E.14.312	04-11-90	160	310	299	.2	20	40	120	7
10N.05E.14.413A	04-10-90	140	270	268	.2	18	50	3	1
10N.05E.14.431B	04-09-90	160	300	281	<.1	24	60	5	<1
10N.05E.19.322	04-17-90	86	190	194	2.1	21	30	10	1
10N.05E.19.334	04-20-90	110	260	227	2.5	21	50	7	<1
10N.05E.19.341	04-20-90	110	170	166	2.8	22	30	9	11
10N.05E.21.322	04-24-90	26	230	244	<.1	23	50	17	3
10N.05E.22.234	04-16-90	93	240	226	1.1	18	200	110	68
10N.05E.22.344A	04-25-90	37	270	259	1.4	19	80	43	4
10N.05E.22.411	04-25-90	150	250	265	<.1	20	90	8	<1
10N.05E.23.131	07-10-90	160	260	235	.2	18	40	<3	<1
10N.05E.23.313	06-24-90	71	270	265	.2	17	60	14	<1
10N.05E.26.332	09-04-90	77	250	165	.3	17	50	7	2
10N.05E.29.132	10-10-90	100	240	245	.3	18	50	<3	8
10N.05E.30.122	04-24-90	110	240	218	2.0	23	50	6	<1
10N.05E.30.124	04-19-90	140	230	60	1.7	20	30	9	11
10N.05E.30.213	04-19-90	120	240	205	1.6	21	80	11	<1
10N.05E.30.213A	04-17-90	130	250	216	1.7	22	40	8	2
10N.05E.30.321	08-31-90	170	220	152	2.1	20	110	<3	18
10N.05E.30.322	05-07-90	140	250	242	1.4	2.2	90	7	<1
10N.05E.30.324A	05-07-90	99	250	245	.3	17	40	17	2
10N.06E.04.113	07-17-90	53	300	299	1.7	12	250	<3	<1
10N.06E.04.444	07-18-90	310	210	213	.2	14	90	40	10
10N.06E.05.441	04-10-90	120	240	220	.3	18	50	40	<10
10N.06E.07.112	07-03-90	1,500	520	392	.3	14	350	30	10
10N.06E.07.114	07-25-90	100	210	208	.3	21	50	4	2
10N.06E.07.314	06-22-90	60	260	254	.1	19	100	<3	32
10N.06E.07.322	06-22-90	100	280	276	.5	22	100	8	<1
10N.06E.07.422	09-24-90	64	--	213	.2	22	50	5	<1
10N.06E.08.211	06-26-90	52	250	249	1.0	11	80	21	16
10N.06E.08.323	06-26-90	70	260	219	.1	16	50	<3	<1
10N.06E.09.122	06-25-90	450	270	276	.2	19	70	30	10
10N.06E.09.341	07-11-90	190	280	281	.2	16	50	11	<1

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Water-level depth below land surface (feet)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Temperature water (deg C)	Specific conductance (µS/cm)
10N.06E.10.331	09-26-90	--	--	--	--	--
10N.06E.10.344	07-02-90	--	2.0	15	16.5	1,510
10N.06E.12.313	09-21-90	--	--	--	--	--
10N.06E.13.224	06-29-90	--	.3	30	16.0	1,190
10N.06E.13.321	04-18-90	146.31	--	10	14.5	2,050
10N.06E.16.121	07-24-90	288.50	9.0	7	16.0	1,280
10N.06E.26.132	09-21-90	--	--	--	--	--
10N.06E.27.444	07-18-90	76.23	6.0	21	15.0	1,150
11N.05E.23.222B	04-09-90	13.48	--	14	10.5	910
11N.05E.24.213	09-21-90	--	--	--	--	--
11N.05E.24.241	04-27-90	137.72	3.0	17	14.0	510
11N.05E.24.412	04-17-90	190.41	--	12	11.5	430
11N.05E.24.443	04-11-90	49.16	--	17	13.5	1,190
11N.05E.25.143	07-16-90	142.11	6.0	5	14.5	600
11N.05E.25.144B	07-13-90	77.03	4.0	19	13.0	790
11N.05E.25.211	09-25-90	--	--	--	--	--
11N.05E.25.343	07-25-90	136.76	5.0	110	14.0	910
11N.05E.25.411	09-27-90	--	--	--	--	--
11N.05E.25.422	05-08-90	308.88	5.0	28	15.0	1,010
11N.05E.35.244A	05-09-90	66.28	10.0	28	14.0	650
11N.05E.35.434	07-24-90	123.65	4.0	18	15.0	600
11N.05E.36.113	05-08-90	64.32	5.0	10	14.0	600
11N.05E.36.313	05-04-90	--	4.0	28	13.5	2,150
11N.05E.36.314	05-04-90	44.63	1.0	14	14.5	1,710
11N.06E.19.113	04-10-90	102.63	--	20	13.5	580
11N.06E.19.122	04-09-90	48.99	--	20	12.0	670
11N.06E.19.124	01-12-90	--	--	--	13.5	550
11N.06E.19.313	04-13-90	78.28	--	52	14.0	1,450
11N.06E.19.341A	09-26-90	--	--	--	--	--
11N.06E.20.223	04-11-90	48.69	--	8	14.0	520
11N.06E.20.244	04-11-90	230.53	--	80	15.5	820
11N.06E.20.432	09-19-90	--	--	--	--	--
11N.06E.21.133	04-09-90	--	--	12	13.5	660
11N.06E.22.444	08-31-90	287.00	--	--	--	415
11N.06E.26.344	08-23-90	118.15	--	--	16.0	500
11N.06E.28.322	08-24-90	87.18	--	4	15.5	810
11N.06E.29.232	07-20-90	--	--	12	14.0	750
11N.06E.30.221	09-25-90	--	--	--	--	--
11N.06E.30.323	04-27-90	281.25	4.0	28	15.0	680
11N.06E.32.144	09-27-90	--	--	--	--	--
11N.06E.34.322	08-24-90	--	--	10	15.0	920

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Specific conductance, lab (µS/cm)	pH water whole, field (standard units)	pH water whole, lab (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, NO_2+NO_3, total (mg/L as N)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N)
10N.06E.10.331	09-26-90	2,910	--	7.4	0.02	0.5	<0.01	4.9	--
10N.06E.10.344	07-02-90	1,650	6.9	7.6	<.01	.2	<.01	1.7	1.7
10N.06E.12.313	09-21-90	649	--	8.5	.03	<.2	<.01	<.1	--
10N.06E.13.224	06-29-90	1,180	8.5	8.9	.01	.4	<.01	<.1	<.1
10N.06E.13.321	04-18-90	2,060	7.3	7.4	.021	.3	<.01	6.6	6.3
10N.06E.16.121	07-24-90	1,280	7.1	7.8	<.01	.6	<.01	6.0	7.1
10N.06E.26.132	09-21-90	1,110	--	8.6	<.01	<.2	<.01	.1	--
10N.06E.27.444	07-18-90	1,240	7.4	7.4	.02	.7	<.01	8.9	8.2
11N.05E.23.222B	04-09-90	942	7.2	7.4	<.01	<.2	<.01	.4	.4
11N.05E.24.213	09-21-90	625	--	7.8	<.01	<.2	<.01	.7	--
11N.05E.24.241	04-27-90	513	7.4	7.6	<.01	.4	.02	.7	.8
11N.05E.24.412	04-17-90	485	7.4	7.6	<.01	<.2	<.01	.4	.4
11N.05E.24.443	04-11-90	1,250	7.1	7.4	<.01	.5	<.01	23	24
11N.05E.25.143	07-16-90	577	7.3	8.0	.02	.3	<.01	1.4	1.4
11N.05E.25.144B	07-13-90	810	7.3	8.1	.01	.5	<.01	5.7	5.8
11N.05E.25.211	09-25-90	550	--	7.7	.03	<.2	<.01	1.3	--
11N.05E.25.343	07-25-90	950	7.5	8.1	<.01	.4	<.01	3.2	3.2
11N.05E.25.411	09-27-90	1,280	--	7.3	.03	.4	<.01	3.9	--
11N.05E.25.422	05-08-90	1,030	7.4	7.6	<.01	<.2	<.01	.5	.5
11N.05E.35.244A	05-09-90	685	7.4	7.5	<.01	.4	<.01	4.4	4.3
11N.05E.35.434	07-24-90	610	7.4	7.6	<.01	.4	<.01	3.5	3.6
11N.05E.36.113	05-08-90	601	7.5	7.5	<.01	2.3	<.01	2.3	2.3
11N.05E.36.313	05-04-90	2,230	7.2	7.3	<.01	.3	<.01	4.1	4.0
11N.05E.36.314	05-04-90	1,780	7.2	7.3	<.01	.4	<.01	6.0	6.3
11N.06E.19.113	04-10-90	571	7.6	8.0	<.01	<.2	<.01	2.0	2.0
11N.06E.19.122	04-09-90	689	7.5	7.7	<.01	.3	<.01	2.7	2.6
11N.06E.19.124	01-12-90	--	7.5	--	.02	<.2	<.01	1.1	--
11N.06E.19.313	04-13-90	1,530	7.3	7.5	<.01	.6	<.01	9.2	9.2
11N.06E.19.341A	09-26-90	634	--	7.7	<.01	<.2	<.01	2.4	--
11N.06E.20.223	04-11-90	554	7.7	7.9	<.01	.2	.02	3.4	3.7
11N.06E.20.244	04-11-90	889	6.6	7.1	<.01	<.2	<.01	1.9	1.9
11N.06E.20.432	09-19-90	1,900	--	7.9	.02	.5	<.01	2.8	--
11N.06E.21.133	04-09-90	672	7.4	7.9	<.01	.4	<.01	1.2	1.2
11N.06E.22.444	08-31-90	429	8.3	8.3	<.01	<.2	<.01	.4	.4
11N.06E.26.344	08-23-90	545	7.7	7.6	.05	.7	<.01	17	19
11N.06E.28.322	08-24-90	863	7.6	7.6	<.01	.7	<.01	5.7	6.1
11N.06E.29.232	07-20-90	771	7.3	7.5	.01	<.2	<.01	.2	.2
11N.06E.30.221	09-25-90	1,680	--	7.6	<.01	<.2	<.01	.3	--
11N.06E.30.323	04-27-90	694	7.4	7.4	.08	.3	.02	<.1	<.1
11N.06E.32.144	09-27-90	938	--	7.3	.02	<.2	<.01	.3	--
11N.06E.34.322	08-24-90	956	8.4	8.4	.02	<.2	<.01	<.1	<.1

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Continued

Well number	Date	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Chloride, dissolved (mg/L as Cl)
10N.06E.10.331	09-26-90	0.02	<0.01	6.6	340	92	150	2.0	510
10N.06E.10.344	07-02-90	.02	--	--	180	70	60	3.2	250
10N.06E.12.313	09-21-90	.03	.01	.4	80	25	32	2.7	12
10N.06E.13.224	06-29-90	<.01	--	.6	2.5	1.5	290	3.7	20
10N.06E.13.321	04-18-90	.01	--	3.1	280	42	52	1.6	450
10N.06E.16.121	07-24-90	.03	--	2.4	170	43	40	2.3	180
10N.06E.26.132	09-21-90	<.01	<.01	.7	19	16	210	5.1	51
10N.06E.27.444	07-18-90	.02	--	3.7	120	38	69	2.4	150
11N.05E.23.222B	04-09-90	<.01	--	.7	140	15	30	1.5	96
11N.05E.24.213	09-21-90	.02	.02	.8	110	9.9	8.8	.9	32
11N.05E.24.241	04-27-90	<.01	--	.2	87	9.4	9.6	.8	15
11N.05E.24.412	04-17-90	<.01	--	<.1	87	7.6	6.5	.6	10
11N.05E.24.443	04-11-90	.02	--	1.4	190	22	31	1.1	160
11N.05E.25.143	07-16-90	.01	--	.7	82	12	27	.5	26
11N.05E.25.144B	07-13-90	.03	--	1.2	110	21	24	1.2	96
11N.05E.25.211	09-25-90	<.01	<.01	.3	56	8.8	54	.5	14
11N.05E.25.343	07-25-90	.03	--	1.7	98	36	32	2.1	180
11N.05E.25.411	09-27-90	<.01	<.01	1.8	130	25	76	1.7	230
11N.05E.25.422	05-08-90	.01	--	.6	100	47	42	5.3	130
11N.05E.35.244A	05-09-90	.02	--	.7	81	19	28	.7	41
11N.05E.35.434	07-24-90	.02	--	.5	74	16	29	1.0	27
11N.05E.36.113	05-08-90	.01	--	.5	70	15	39	.8	23
11N.05E.36.313	05-04-90	<.01	--	1.4	380	27	85	1.2	290
11N.05E.36.314	05-04-90	<.01	--	1.6	260	54	55	2.8	250
11N.06E.19.113	04-10-90	<.01	--	.7	60	21	25	1.3	63
11N.06E.19.122	04-09-90	.01	--	1.2	94	19	17	1.1	74
11N.06E.19.124	01-12-90	<.01	--	.7	--	--	--	--	42
11N.06E.19.313	04-13-90	.02	--	3.5	180	47	40	2.1	300
11N.06E.19.341A	09-26-90	<.01	<.01	.7	82	18	22	1.3	56
11N.06E.20.223	04-11-90	.01	--	.1	51	22	32	1.5	12
11N.06E.20.244	04-11-90	.04	--	.2	100	49	23	1.7	7.2
11N.06E.20.432	09-19-90	<.01	<.01	2.3	250	25	130	2.1	200
11N.06E.21.133	04-09-90	.02	--	.5	78	30	24	1.4	23
11N.06E.22.444	08-31-90	.01	--	.7	34	21	30	1.6	6.8
11N.06E.26.344	08-23-90	.04	--	.9	64	16	16	2.1	35
11N.06E.28.322	08-24-90	.02	--	2.6	100	22	49	1.3	87
11N.06E.29.232	07-20-90	.02	--	.3	120	22	24	2.1	5.9
11N.06E.30.221	09-25-90	<.01	<.01	.4	390	8.7	18	.9	9.7
11N.06E.30.323	04-27-90	<.01	--	.3	72	25	46	2.9	5.8
11N.06E.32.144	09-27-90	.01	<.01	1.1	86	42	63	4.1	17
11N.06E.34.322	08-24-90	<.01	--	.3	6.5	4.1	220	4.7	13

Table 12.--Results of field determinations and laboratory analyses of samples collected from inventory wells--Concluded

Well number	Date	Sulfate, dis-solved (mg/L as SO_4)	Alka-linity wat wh gran t, field $CaCO_3$ (mg/L)	Alka-linity, lab (mg/L as $CaCO_3$)	Fluo-ride, dis-solved (mg/L as F)	Silica, dis-solved (mg/L as SiO_2)	Boron, dis-solved (µg/L as B)	Iron, dis-solved (µg/L as Fe)	Manga-nese, dis-solved (µg/L as Mn)
10N.06E.10.331	09-26-90	510	--	305	0.1	19	130	30	<10
10N.06E.10.344	07-02-90	170	350	307	.3	19	140	8	2
10N.06E.12.313	09-21-90	62	--	296	1.8	13	100	29	18
10N.06E.13.224	06-29-90	47	--	558	11	10	410	5	7
10N.06E.13.321	04-18-90	94	180	176	.8	21	50	40	<10
10N.06E.16.121	07-24-90	170	270	201	.3	15	60	5	<1
10N.06E.26.132	09-21-90	87	--	436	6.3	9.8	360	<3	2
10N.06E.27.444	07-18-90	150	250	256	.4	15	100	4	<1
11N.05E.23.222B	04-09-90	41	320	253	.2	18	20	17	<1
11N.05E.24.213	09-21-90	25	--	227	.3	20	<10	<3	<1
11N.05E.24.241	04-27-90	16	260	223	.2	20	10	9	<1
11N.05E.24.412	04-17-90	15	230	230	.7	17	10	3	<1
11N.05E.24.443	04-11-90	20	300	269	<.1	28	70	<3	<1
11N.05E.25.143	07-16-90	17	250	240	.1	24	120	<3	<1
11N.05E.25.144B	07-13-90	28	230	228	<.1	28	70	4	<1
11N.05E.25.211	09-25-90	17	--	269	.3	18	100	<3	<1
11N.05E.25.343	07-25-90	15	210	178	.2	23	130	9	6
11N.05E.25.411	09-27-90	28	--	222	<.1	18	210	4	<1
11N.05E.25.422	05-08-90	120	250	244	.2	22	100	4	<1
11N.05E.35.244A	05-09-90	25	250	246	.2	27	110	4	<1
11N.05E.35.434	07-24-90	30	240	220	.3	24	100	12	<1
11N.05E.36.113	05-08-90	23	270	264	.4	26	150	5	<1
11N.05E.36.313	05-04-90	630	210	203	<.1	19	80	70	10
11N.05E.36.314	05-04-90	410	220	209	<.1	21	270	5	<1
11N.06E.19.113	04-10-90	18	170	174	.3	24	110	5	<1
11N.06E.19.122	04-09-90	42	190	187	.2	26	50	7	<1
11N.06E.19.124	01-12-90	--	--	--	--	--	20	--	--
11N.06E.19.313	04-13-90	53	210	199	.2	31	110	16	9
11N.06E.19.341A	09-26-90	19	--	234	.3	22	60	7	2
11N.06E.20.223	04-11-90	36	220	221	.2	19	260	4	<1
11N.06E.20.244	04-11-90	130	350	362	.4	40	60	43	2
11N.06E.20.432	09-19-90	580	--	110	.3	18	410	11	14
11N.06E.21.133	04-09-90	49	290	292	.2	28	430	<10	<10
11N.06E.22.444	08-31-90	31	190	191	.4	29	110	<3	<1
11N.06E.26.344	08-23-90	23	130	137	.6	26	50	<3	10
11N.06E.28.322	08-24-90	48	250	248	.2	24	160	<3	<1
11N.06E.29.232	07-20-90	230	230	189	.3	22	60	23	4
11N.06E.30.221	09-25-90	800	--	166	.2	22	40	15	<1
11N.06E.30.323	04-27-90	88	310	294	.3	26	110	630	26
11N.06E.32.144	09-27-90	95	--	394	.1	23	150	8	19
11N.06E.34.322	08-24-90	35	440	447	11	8.9	380	32	7

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; wat wh gran t, water whole gran titration; mg/L, milligrams per liter; <, less than; --, no data; µg/L, micrograms per liter]

Well number	Date	Specific conductance, field (µS/cm)	Specific conductance, lab (µS/cm)	pH water whole, field (standard units)	pH water whole, lab (standard units)	Alkalinity wat wh gran t, field $CaCO_3$ (mg/L)	Alkalinity, lab (mg/L as $CaCO_3$)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)
10N.05E.22.234	04-16-90	890	904	7.6	7.8	240	226	<0.01	0.04	0.2
		--	927	--	--	240	226	<0.01	0.04	<0.2
10N.05E.30.213	04-19-90	1,000	1,050	7.5	7.6	240	205	<0.01	<0.01	0.8
		--	975	--	--	--	201	<0.01	0.01	0.4
10N.05E.21.322	04-24-90	1,850	1,990	7.1	7.2	230	244	<0.01	<0.01	0.9
		--	--	--	--	250	--	<0.01	<0.01	0.5
11N.05E.25.422	05-08-90	1,010	1,030	7.4	7.6	250	244	<0.01	<0.01	<0.2
		--	1,050	--	--	--	247	<0.01	<0.01	0.4
10N.05E.02.241	05-09-90	1,190	1,220	7.2	7.5	270	262	<0.01	<0.01	0.5
		--	1,220	--	--	--	264	<0.01	<0.01	<0.2
10N.05E.11.324	06-15-90	830	--	7.5	--	360	--	<0.01	<0.01	0.5
		--	--	--	--	330	--	0.04	0.03	0.4
10N.06E.07.322	06-22-90	860	916	7.4	7.7	280	276	0.01	<0.01	0.8
		--	917	--	--	--	273	<0.01	<0.01	0.4
10N.06E.13.321	07-09-90	2,010	--	7.5	--	180	--	0.02	<0.01	0.3
		--	--	--	--	180	--	0.01	<0.01	0.7
10N.05E.12.332	07-17-90	4,000	4,020	7.2	7.3	210	101	0.27	0.01	0.5
		--	3,870	--	--	--	50	0.27	0.01	0.4

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples--Continued

Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)
10N.05E.22.234	04-16-90	0.6	0.6	<0.01	--	0.8	64	44	54
		0.5	0.5	<0.01	--	0.6	66	44	54
10N.05E.30.213	04-19-90	13	13	<0.01	--	0.7	120	26	53
		13	13	<0.01	--	0.6	130	27	32
10N.05E.21.322	04-24-90	14	14	<0.01	--	0.8	240	61	44
		15	--	<0.01	--	0.6	--	--	--
11N.05E.25.422	05-08-90	0.5	0.5	0.01	--	0.6	100	47	42
		0.6	0.6	<0.01	--	0.8	100	47	43
10N.05E.02.241	05-09-90	2.7	2.7	0.11	--	0.7	220	14	37
		3.0	3.0	0.02	--	0.9	220	14	37
10N.05E.11.324	06-15-90	2.9	--	0.02	--	0.5	--	--	--
		2.4	--	0.01	--	2.0	--	--	--
10N.06E.07.322	06-22-90	6.6	6.6	0.01	--	2.2	97	30	57
		6.7	6.7	0.02	--	1.5	97	29	58
10N.06E.13.321	07-09-90	6.7	--	0.02	--	3.2	--	--	--
		6.7	--	0.02	--	3.3	--	--	--
10N.05E.12.332	07-17-90	0.6	0.6	0.02	--	1.5	510	220	230
		0.7	0.7	0.02	--	1.5	500	220	230

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples--Continued

Well number	Date	Potassium, dissolved (mg/L as K)	Chloride, dissolved (mg/L as Cl)	Sulfate, dissolved (mg/L as SO_4)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Boron, dissolved (µg/L as B)	Iron, dissolved (µg/L as Fe)	Manganese, dissolved (µg/L as Mn)
10N.05E.22.234	04-16-90	5.4	100	93	1.1	18	200	110	68
		5.4	100	84	0.8	18	200	110	70
10N.05E.30.213	04-19-90	5.6	110	120	1.6	21	80	11	<1
		5.3	74	140	1.7	20	30	5	<1
10N.05E.21.322	04-24-90	1.2	460	26	<0.1	23	50	17	3
		--	130	--	--	--	30	2	
11N.05E.25.422	05-08-90	5.3	130	120	0.2	22	100	4	<1
		5.9	130	120	0.5	22	90	5	<1
10N.05E.02.241	05-09-90	0.90	95	270	<0.1	27	80	22	<1
		0.70	90	290	0.1	27	80	22	<1
10N.05E.11.324	06-15-90	--	22	--	--	--	50	10	--
		--	26	--	--	--	40	10	--
10N.06E.07.322	06-22-90	2.3	65	100	0.5	22	100	8	<1
		2.2	65	100	0.6	22	100	<3	<1
10N.06E.13.321	07-09-90	--	530	--	--	--	50	30	--
		--	530	--	--	--	50	30	--
10N.05E.12.332	07-17-90	7.5	230	2,200	<0.1	11	100	30	210
		7.5	220	2,100	<0.1	11	100	40	210

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples--Continued

Well number	Date	Specific conductance, field (µS/cm)	Specific conductance, lab (µS/cm)	pH water whole, field (standard units)	pH water whole, lab (standard units)	Alkalinity wat wh gran t, field $CaCO_3$ (mg/L)	Alkalinity, lab (mg/L as $CaCO_3$)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)
10N.06E.27.444	07-18-90	1,150	1,240	7.4	7.4	250	256	0.02	<0.01	0.7
		--	1,240	--	--	--	257	<0.01	<0.01	0.6
09N.06E.29.142	08-07-90	1,030	1,120	7.1	7.9	320	116	0.01	<0.01	0.5
		--	1,130	--	--	--	257	0.02	<0.01	1.0
10N.05E.12.442	08-14-90	1,510	--	7.2	--	290	--	<0.01	<0.01	0.8
		--	--	--	--	--	--	<0.01	<0.01	0.7
08N.06E.23.211	08-27-90	650	717	7.1	7.5	330	291	<0.01	<0.01	<0.2
		--	537	--	--	--	213	<0.01	<0.01	<0.2
11N.05E.24.443	09-12-90	1,190	--	7.1	--	290	--	<0.01	<0.01	0.4
		--	--	--	--	290	--	<0.01	<0.01	0.9
11N.06E.32.144	09-27-90	--	938	--	7.3	--	394	0.02	<0.01	<0.2
		--	935	--	7.4	--	427	0.02	<0.01	<0.2
09N.06E.20.333	10-11-90	1,110	--	7.1	--	270	--	<0.01	<0.01	1.5
		--	--	--	--	270	--	<0.01	<0.01	0.9
10N.05E.02.233A	11-26-90	700	--	9.5	--	--	--	0.02	0.02	<0.2
		--	--	--	--	320	--	--	--	--
10N.06E.05.441	12-13-90	2,600	--	7.2	--	230	--	0.02	<0.01	0.8
		2,600	--	7.2	--	230	--	0.02	<0.01	0.6
11N.05E.23.222B	01-07-91	870	--	7.2	--	330	--	0.02	<0.01	<0.2
		870	--	7.2	--	330	--	0.02	<0.01	<0.2
10N.05E.14.413A	02-28-91	1,230	--	7.4	--	270	--	<0.01	<0.01	0.6
		--	--	--	--	--	--	0.01	<0.01	0.6

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples--Continued

Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)
10N.06E.27.444	07-18-90	8.2	8.2	0.02	--	3.7	120	38	69
		8.7	8.7	0.01	--	4.0	130	40	73
09N.06E.29.142	08-07-90	2.5	2.5	<0.01	--	2.0	150	30	30
		2.5	2.5	0.01	--	2.1	160	31	31
10N.05E.12.442	08-14-90	15	--	0.03	--	1.8	--	--	--
		15	--	0.03	--	1.8	--	--	--
08N.06E.23.211	08-27-90	<0.1	<0.1	0.02	--	1.7	81	16	58
		0.1	0.1	<0.01	--	1.6	80	16	58
11N.05E.24.443	09-12-90	23	--	0.02	--	1.2	--	--	--
		21	--	0.02	--	1.3	--	--	--
11N.06E.32.144	09-27-90	0.3	--	0.01	<0.01	1.1	86	42	63
		0.3	--	0.02	<0.01	1.1	86	42	62
09N.06E.20.333	10-11-90	8.8	--	0.03	0.03	3.7	--	--	--
		9.0	--	<0.01	0.02	3.5	--	--	--
10N.05E.02.233A	11-26-90	0.3	--	0.03	<0.01	0.5	--	--	--
		--	--	--	--	0.2	--	--	--
10N.06E.05.441	12-13-90	14	--	<0.01	<0.01	3.0	--	--	--
		14	--	<0.01	<0.01	3.1	--	--	--
11N.05E.23.222B	01-07-91	0.3	--	<0.01	<0.01	0.7	--	--	--
		0.3	--	<0.01	<0.01	0.6	--	--	--
10N.05E.14.413A	02-28-91	2.0	--	0.01	<0.01	1.0	--	--	--
		2.0	--	<0.01	<0.01	1.2	--	--	--

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples--Continued

Well number	Date	Potassium, dissolved (mg/L as K)	Chloride, dissolved (mg/L as Cl)	Sulfate, dissolved (mg/L as SO_4)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Boron, dissolved (µg/L as B)	Iron, dissolved (µg/L as Fe)	Manganese, dissolved (µg/L as Mn)
10N.06E.27.444	07-18-90	2.4	150	150	0.4	15	100	4	<1
		2.4	150	150	0.5	15	100	<3	<1
09N.06E.29.142	08-07-90	3.3	150	66	0.1	14	60	4	<1
		3.2	130	61	0.1	14	30	4	1
10N.05E.12.442	08-14-90	--	260	--	--	--	120	20	--
		--	250	--	--	--	130	10	--
08N.06E.23.211	08-27-90	2.6	18	42	0.8	15	160	<3	<1
		5.7	17	37	0.7	15	160	6	2
11N.05E.24.443	09-12-90	--	170	--	--	--	70	20	--
		--	160	--	--	--	70	10	--
11N.06E.32.144	09-27-90	4.1	17	95	0.1	23	150	8	19
		4.1	17	97	0.2	23	160	10	18
09N.06E.20.333	10-11-90	--	190	52	<0.1	--	30	20	--
		--	190	52	<0.1	--	30	10	--
10N.05E.02.233A	11-26-90	--	14	42	0.9	--	640	<10	--
		--	13	41	0.8	--	640	<10	--
10N.06E.05.441	12-13-90	--	640	180	0.1	--	50	20	--
		--	650	180	0.2	--	50	30	--
11N.05E.23.222B	01-07-91	--	83	41	0.6	--	20	<10	--
		--	83	40	0.6	--	20	<10	--
10N.05E.14.413A	02-28-91	--	170	--	--	--	50	20	--
		--	170	--	--	--	40	20	--

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples--Continued

Well number	Date	Specific conductance, field (µS/cm)	Specific conductance, lab (µS/cm)	pH water whole, field (standard units)	pH water whole, lab (standard units)	Alkalinity wat wh gran t, field $CaCO_3$ (mg/L)	Alkalinity, lab (mg/L as $CaCO_3$)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)
09N.06E.19.413	03-13-91	730	--	8.1	--	--	--	0.07	0.01	<0.2
		--	--	--	--	--	--	0.09	<0.01	<0.2
11N.05E.24.443	03-20-91	1,190	--	7.2	--	300	--	0.03	0.01	0.4
		--	--	--	--	--	--	0.02	<0.01	0.5
10N.05E.14.312	04-10-91	1030	--	7.2	--	280	--	0.01	<0.01	<0.2
		--	--	--	--	--	--	<0.01	<0.01	<0.2
11N.06E.21.133	06-18-91	660	--	7.5	--	290	--	<0.01	<0.01	<0.2
		660	--	7.5	--	290	--	<0.01	<0.01	<0.2
10N.05E.19.322	07-09-91	560	--	7.6	--	200	--	0.03	<0.01	<0.2
		560	--	7.6	--	200	--	0.02	0.01	0.3
11N.06E.19.122	08-21-91	800	--	7.5	--	180	--	<0.01	<0.01	0.5
		800	--	7.5	--	180	--	<0.01	<0.01	0.4
09N.05E.12.241	09-20-91	1,100	--	7.2	--	350	--	<0.01	<0.01	0.6
		1,100	--	7.2	--	350	--	<0.01	<0.01	0.4
11N.05E.24.412	10-17-91	445	--	7.4	--	230	--	<0.01	<0.01	<0.2
		--	--	--	--	--	--	<0.01	<0.01	<0.2
09N.06E.29.244	11-21-91	1,450	--	7.3	--	350	--	0.02	<0.01	0.3
		1,450	--	7.3	--	350	--	0.02	<0.01	0.3
10N.05E.11.324	12-10-91	710	--	7.4	--	330	--	<0.01	<0.01	<0.2
		710	--	7.4	--	330	--	<0.01	<0.01	<0.2

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples--Continued

Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)
09N.06E.19.413	03-13-91	0.06	--	<0.01	<0.01	0.5	--	--	--
		<0.05	--	<0.01	<0.01	0.8	--	--	--
11N.05E.24.443	03-20-91	18	--	0.02	<0.01	1.2	--	--	--
		18	--	0.02	<0.01	--	--	--	--
10N.05E.14.312	04-10-91	0.056	--	<0.01	<0.01	1.5	--	--	--
		<0.05	--	<0.01	<0.01	1.4	--	--	--
11N.06E.21.133	06-18-91	1.20	--	0.01	0.01	0.5	--	--	--
		1.30	--	0.01	0.01	0.6	--	--	--
10N.05E.19.322	07-09-91	0.90	--	<0.01	<0.01	0.4	--	--	--
		1.10	--	<0.01	<0.01	0.3	--	--	--
11N.06E.19.122	08-21-91	2.30	--	0.01	<0.01	2.0	--	--	--
		2.40	--	0.01	<0.01	1.9	--	--	--
09N.05E.12.241	09-20-91	5.50	--	0.01	0.01	1.8	--	--	--
		5.40	--	0.01	0.01	1.8	--	--	--
11N.05E.24.412	10-17-91	0.33	--	<0.01	<0.01	0.4	--	--	--
		0.33	--	0.01	<0.01	0.4	--	--	--
09N.06E.29.244	11-21-91	0.56	--	0.02	<0.01	6.1	--	--	--
		0.59	--	0.02	<0.01	6.1	--	--	--
10N.05E.11.324	12-10-91	1.30	--	0.04	0.05	0.8	--	--	--
		1.30	--	0.04	0.04	0.9	--	--	--

Table 13.--Results of analyses of environmental samples and associated replicate quality assurance samples--Concluded

Well number	Date	Potassium, dissolved (mg/L as K)	Chloride, dissolved (mg/L as Cl)	Sulfate, dissolved (mg/L as SO_4)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Boron, dissolved (µg/L as B)	Iron, dissolved (µg/L as Fe)	Manganese, dissolved (µg/L as Mn)
09N.06E.19.413	03-13-91	--	35	--	--	--	260	20	--
		--	35	--	--	--	260	<10	--
11N.05E.24.443	03-20-91	--	160	--	--	--	70	10	--
		--	--	--	--	--	--	--	--
10N.05E.14.312	04-10-91	--	69	--	--	--	30	90	--
		--	71	--	--	--	40	90	--
11N.06E.21.133	06-18-91	--	26	--	--	--	70	160	--
		--	29	--	--	--	70	<10	--
10N.05E.19.322	07-09-91	--	11	--	--	--	40	20	--
		--	12	--	--	--	40	10	--
11N.06E.19.122	08-21-91	--	100	--	--	--	50	<10	--
		--	110	--	--	--	50	<10	--
09N.05E.12.241	09-20-91	--	130	--	--	--	40	10	--
		--	30	--	--	--	40	110	--
11N.05E.24.412	10-17-91	--	8.9	--	--	--	10	<10	--
		--	9.1	--	--	--	20	<10	--
09N.06E.29.244	11-21-91	--	180	--	--	--	170	40	--
		--	170	--	--	--	180	30	--
10N.05E.11.324	12-10-91	--	16	--	--	--	40	<10	--
		--	17	--	--	--	40	<10	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells

[deg C, degrees Celsius; gal/min, gallons per minute; min, minutes; µS/cm, microsiemens per centimeter at 25 deg C; mg/L, milligrams per liter; --, no data; <, less than; µg/L, micrograms per liter; wat wh, water whole]

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
1	10N.05E.14.312	01-10-90	38.90	12.5	--	--	1,000	7.2	0.04	<0.2	<0.01
		02-12-90	--	13.5	--	--	990	7.2	<0.01	0.8	<0.01
		03-14-90	38.76	14.5	--	15	980	7.2	<0.01	<0.2	<0.01
		05-22-90	41.84	14.5	--	13	990	7.1	<0.01	<0.2	<0.01
		06-20-90	44.56	18.5	--	18	980	7.2	0.02	<0.2	<0.01
		07-18-90	46.13	14.5	--	10	980	7.1	<0.01	<0.2	<0.01
		08-22-90	47.53	14.0	--	6	970	7.1	0.03	<0.2	<0.01
		09-20-90	47.99	14.0	3.0	11	930	7.2	<0.01	<0.2	<0.01
		10-17-90	40.94	14.0	4.0	9	920	7.2	<0.01	0.3	<0.01
		11-13-90	40.29	14.0	3.5	10	970	7.2	<0.01	<0.2	<0.01
		12-20-90	39.23	14.0	6.0	5	990	7.2	0.02	<0.2	<0.01
		01-14-91	38.70	13.5	5.0	10	1,020	7.2	<0.01	0.2	<0.01
		02-21-91	38.32	14.0	5.0	8	990	7.1	0.01	<0.2	<0.01
		03-20-91	38.11	13.5	6.0	20	990	7.2	0.02	<0.2	<0.01
		04-10-91	38.74	14.0	4.5	19	1,030	7.2	0.01	<0.2	<0.01
		05-16-91	41.09	14.5	4.0	9	910	7.2	<0.01	<0.2	<0.01
		06-17-91	43.54	14.5	5.0	12	980	7.2	<0.01	0.2	<0.01
		07-11-91	45.31	14.5	4.0	10	980	7.1	0.01	<0.2	<0.01
		08-21-91	40.65	14.5	4.0	10	990	7.2	<0.01	<0.2	<0.01
		09-16-91	40.00	14.5	4.0	10	990	7.1	0.03	0.2	<0.01
		10-25-91	42.16	14.5	4.0	20	1,040	7.2	0.01	<0.2	0.01
		11-14-91	42.43	14.0	7.0	10	1,030	7.2	<0.01	<0.2	<0.01
		12-17-91	39.51	13.5	--	--	990	7.3	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
1	10N.05E.14.312	01-10-90	<0.1	<0.01	--	1.2	67	40	--	--
		02-12-90	<0.1	0.04	--	0.80	63	50	--	--
		03-14-90	<0.1	<0.01	--	1.2	69	30	--	--
		05-22-90	<0.1	<0.01	--	1.4	58	40	--	--
		06-20-90	<0.1	<0.01	--	1.9	70	40	--	--
		07-18-90	<0.1	<0.01	--	1.0	72	40	--	--
		08-22-90	<0.1	<0.01	--	1.1	67	40	--	--
		09-20-90	<0.1	<0.01	--	1.7	63	50	--	--
		10-17-90	<0.1	<0.01	<0.01	1.0	63	40	--	--
		11-13-90	<0.1	<0.01	<0.01	1.6	62	40	--	--
		12-20-90	<0.1	<0.01	<0.01	1.5	67	40	--	--
		01-14-91	<0.1	0.05	<0.01	1.3	64	40	--	--
		02-21-91	<0.1	<0.01	<0.01	2.2	70	40	--	--
		03-20-91	0.098	<0.01	<0.01	0.90	56	40	--	--
		04-10-91	0.056	<0.01	<0.01	1.5	69	30	--	--
		05-16-91	0.078	<0.01	<0.01	0.90	73	40	--	--
		06-17-91	0.14	<0.01	<0.01	1.1	77	40	--	--
		07-11-91	<0.05	0.02	0.01	1.3	79	40	--	--
		08-21-91	<0.05	<0.01	<0.01	1.4	72	40	<0.010	<0.2
		09-16-91	<0.05	<0.01	<0.01	1.0	83	40	0.016	<0.2
		10-25-91	0.056	0.02	0.01	1.9	81	40	--	--
		11-14-91	<0.05	<0.01	<0.01	1.4	82	40	--	--
		12-17-91	0.053	<0.01	0.01	1.3	63	40	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
2	11N.05E.24.412	01-08-90	189.76	11.0	--	--	462	7.3	0.03	<0.2	<0.01
		02-13-90	189.96	11.0	--	--	453	7.4	<0.01	<0.2	<0.01
		03-15-90	190.16	11.0	--	20	455	7.4	0.01	<0.2	<0.01
		05-17-90	190.66	12.0	--	10	438	7.3	<0.01	<0.2	<0.01
		06-19-90	191.07	17.0	--	13	463	7.3	<0.01	1.3	<0.01
		07-18-90	191.35	15.5	--	7	460	7.3	<0.01	<0.2	<0.01
		08-17-90	191.54	13.5	12.0	10	465	7.4	0.01	0.3	<0.01
		09-13-90	191.66	13.0	9.0	10	442	7.3	<0.01	<0.2	<0.01
		10-10-90	191.70	12.0	5.0	10	438	7.5	<0.01	0.3	<0.01
		11-20-90	191.75	11.0	7.0	8	448	7.4	0.04	<0.2	<0.01
		12-19-90	191.84	11.0	5.0	12	440	7.5	0.01	<0.2	<0.01
		01-07-91	191.93	12.5	6.0	7	438	7.4	0.02	<0.2	<0.01
		02-20-91	192.08	10.5	6.0	9	430	7.3	<0.01	<0.2	<0.01
		03-22-91	192.10	11.0	12.0	15	470	7.3	<0.01	<0.2	0.01
		04-17-91	192.15	12.0	12.0	15	484	7.4	<0.01	<0.2	<0.01
		05-01-91	192.23	11.5	5.0	5	479	7.3	<0.01	<0.2	<0.01
		05-14-91	192.29	12.5	5.0	7	429	7.4	<0.01	<0.2	<0.01
		06-13-91	192.49	12.5	5.0	10	430	7.4	<0.01	<0.2	<0.01
		07-10-91	192.68	13.0	5.5	13	420	7.4	<0.01	0.3	<0.01
		08-21-91	191.00	13.0	7.5	10	470	7.4	<0.01	<0.2	<0.01
		09-17-91	192.21	13.0	6.0	15	445	7.3	<0.01	<0.2	<0.01
		10-17-91	191.78	12.5	6.0	11	445	7.4	<0.01	<0.2	<0.01
		11-13-91	191.47	12.0	9.0	10	458	7.4	<0.01	<0.2	<0.01
		12-12-91	191.24	11.0	9.5	10	449	7.5	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
2	11N.05E.24.412	01-08-90	0.4	0.01	--	0.2	8.5	10	--	--
		02-13-90	0.4	0.01	--	0.3	8.1	10	--	--
		03-15-90	0.3	<0.01	--	0.1	12	20	--	--
		05-17-90	0.4	0.01	--	0.1	9.0	<10	--	--
		06-19-90	0.3	0.02	--	0.1	9.4	<10	--	--
		07-18-90	0.4	<0.01	--	0.3	9.8	10	--	--
		08-17-90	0.4	0.01	--	0.2	9.7	20	--	--
		09-13-90	0.4	0.01	--	0.3	8.2	<10	--	--
		10-10-90	0.4	<0.01	<0.01	0.2	9.0	<10	--	--
		11-20-90	0.4	<0.01	<0.01	0.2	10	<10	--	--
		12-19-90	0.3	<0.01	<0.01	0.3	11	<10	--	--
		01-07-91	0.3	0.02	<0.01	0.2	9.4	<10	--	--
		02-20-91	0.3	<0.01	<0.01	0.7	9.2	<10	--	--
		03-22-91	0.36	0.01	0.03	0.2	8.8	10	--	--
		04-17-91	0.33	0.01	0.02	0.3	9.1	20	--	--
		05-01-91	0.33	0.02	<0.01	0.6	9.6	<10	--	--
		05-14-91	0.34	0.01	<0.01	0.3	9.3	10	--	--
		06-13-91	0.34	<0.01	0.01	0.7	9.5	10	--	--
		07-10-91	0.35	<0.01	<0.01	0.3	9.5	10	--	--
		08-21-91	0.35	0.01	<0.01	0.2	9.5	20	<0.010	<0.2
		09-17-91	0.33	0.02	0.01	0.3	10	20	0.022	<0.2
		10-17-91	0.33	<0.01	<0.01	0.4	8.9	10	--	--
		11-13-91	0.36	<0.01	0.02	0.4	12	<10	--	--
		12-12-91	0.36	0.01	0.03	0.3	15	<10	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature, water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
3	09N.06E.20.333	01-11-90	32.42	10.0	--	--	1,020	7.1	0.04	0.4	<0.01
		02-14-90	32.51	10.0	--	--	1,080	7.1	<0.01	0.5	<0.01
		03-21-90	31.84	10.5	--	12	1,160	7.2	<0.01	0.7	<0.01
		05-16-90	31.01	11.0	--	12	1,200	7.1	<0.01	0.7	<0.01
		06-13-90	31.71	13.5	--	14	1,210	7.1	0.02	0.6	<0.01
		07-13-90	32.14	11.5	--	8	1,130	7.1	0.13	0.7	0.01
		08-22-90	31.73	11.0	--	10	1,130	7.0	0.03	0.6	<0.01
		09-20-90	31.85	14.5	6.0	9	1,090	7.1	<0.01	0.5	<0.01
		10-11-90	31.13	10.0	6.0	10	1,110	7.1	<0.01	1.5	<0.01
		11-14-90	31.49	10.0	4.0	12	1,110	7.1	<0.01	0.6	<0.01
		12-14-90	31.40	10.0	5.0	10	1,110	7.1	0.02	0.6	<0.01
		01-09-91	31.03	12.5	4.0	11	1,170	7.2	<0.01	0.9	<0.01
		02-15-91	30.04	10.0	2.0	7	1,190	7.0	<0.01	0.7	<0.01
		03-15-91	28.24	10.5	10.0	15	1,110	7.2	0.04	0.6	0.01
		04-16-91	28.31	11.0	10.0	12	1,250	7.0	<0.01	<0.2	<0.01
		05-17-91	28.97	10.5	3.0	12	1,200	7.1	0.02	1.1	0.02
		06-21-91	29.68	11.0	5.0	10	1,200	7.1	<0.01	0.6	<0.01
		07-17-91	30.18	11.0	5.0	10	1,120	7.1	<0.01	1.0	<0.01
		08-13-91	27.46	11.0	4.0	--	1,020	7.0	<0.01	0.5	<0.01
		09-20-91	26.06	10.5	5.0	7	815	7.1	<0.01	0.2	<0.01
		10-18-91	28.30	11.0	6.0	8	1,080	7.1	<0.01	0.4	<0.01
		11-21-91	29.29	10.5	7.0	9	1,050	7.1	0.02	0.2	<0.01
		12-18-91	28.49	10.0	5.0	17	1,010	7.2	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
3	09N.06E.20.333	01-11-90	5.8	0.03	--	3.6	140	30	--	--
		02-14-90	6.1	0.02	--	3.0	150	30	--	--
		03-21-90	9.1	0.04	--	3.0	160	30	--	--
		05-16-90	13	0.03	--	3.3	200	30	--	--
		06-13-90	<0.1	0.04	--	3.4	180	40	--	--
		07-13-90	11	0.05	--	3.9	170	40	--	--
		08-22-90	9.8	0.03	--	3.1	190	30	--	--
		09-20-90	8.2	0.02	--	3.4	180	40	--	--
		10-11-90	8.8	0.03	0.03	3.7	190	30	--	--
		11-14-90	7.4	0.02	<0.01	3.3	170	30	--	--
		12-14-90	8.5	0.04	0.03	3.4	180	40	--	--
		01-09-91	1.8	0.02	0.03	3.3	190	30	--	--
		02-15-91	11	0.02	0.05	3.1	190	40	--	--
		03-15-91	7.1	0.03	<0.01	2.8	170	30	--	--
		04-16-91	10	0.02	0.02	3.3	170	30	--	--
		05-17-91	13	0.08	0.05	3.0	--	40	--	--
		06-21-91	5.5	0.02	0.02	3.6	--	50	--	--
		07-17-91	11	0.03	<0.01	3.1	180	40	--	--
		08-13-91	3.3	0.04	0.03	3.0	160	30	0.024	<0.2
		09-20-91	1.2	0.03	0.03	2.2	69	20	0.039	<0.2
		10-18-91	7.4	0.04	0.03	2.7	140	30	--	--
		11-21-91	7.1	0.04	0.04	2.9	130	30	--	--
		12-18-91	5.7	0.03	0.04	2.7	130	30	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
4	09N.06E.19.413	01-12-90	421.90	14.5	--	--	710	8.3	0.04	<0.2	<0.01
		02-14-90	420.84	14.5	--	--	710	8.3	0.05	0.8	<0.01
		03-21-90	417.24	15.0	--	14	710	8.3	0.05	0.3	<0.01
		05-21-90	--	14.0	--	5	710	8.2	0.04	<0.2	<0.01
		06-15-90	--	17.5	--	5	720	8.1	0.06	<0.2	<0.01
		07-18-90	--	15.0	--	3	750	8.1	<0.01	0.2	<0.01
		08-22-90	--	14.0	12.0	4	720	8.1	<0.01	<0.2	<0.01
		09-18-90	--	14.5	6.0	4	695	8.1	0.04	<0.2	<0.01
		10-15-90	--	15.0	6.0	5	705	8.2	0.03	0.4	<0.01
		11-15-90	423.00	12.5	6.0	4	780	8.2	<0.01	<0.2	<0.01
		12-18-90	--	14.5	6.0	7	690	8.2	0.05	<0.2	<0.01
		01-09-91	--	16.0	6.0	2	720	8.1	0.06	<0.2	<0.01
		02-21-91	424.18	14.5	8.0	3	710	8.2	0.04	<0.2	<0.01
		03-13-91	447.83	14.0	8.0	10	730	8.1	0.07	<0.2	0.01
		04-16-91	431.96	15.5	10.0	10	737	8.0	0.04	0.8	<0.01
		05-17-91	--	14.5	4.0	5	720	8.1	0.03	0.3	0.04
		06-20-91	--	13.5	6.0	4	725	8.2	0.01	<0.2	0.01
		07-17-91	--	15.5	5.5	4	725	8.1	0.04	0.2	<0.01
		08-15-91	464.79	14.0	3.0	15	730	8.1	0.08	<0.2	<0.01
		09-20-91	438.34	14.5	8.0	5	715	8.1	0.05	<0.2	<0.01
		10-23-91	432.35	15.5	9.0	12	711	8.2	0.07	<0.2	0.02
		11-21-91	424.44	14.5	12.0	5	720	8.2	0.06	<0.2	<0.01
		12-16-91	412.62	15.0	--	--	710	8.2	0.06	<0.2	0.02

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
4	09N.06E.19.413	01-12-90	<0.1	<0.01	--	0.7	27	270	--	--
		02-14-90	<0.1	0.01	--	0.6	28	270	--	--
		03-21-90	<0.1	<0.01	--	0.2	21	260	--	--
		05-21-90	<0.1	<0.01	--	0.3	24	270	--	--
		06-15-90	<0.1	<0.01	--	0.2	27	280	--	--
		07-18-90	<0.1	<0.01	--	0.5	35	270	--	--
		08-22-90	<0.1	0.01	--	0.6	34	260	--	--
		09-18-90	<0.1	0.03	--	0.5	28	270	--	--
		10-15-90	<0.1	<0.01	0.01	0.4	27	280	--	--
		11-15-90	<0.1	0.02	<0.01	0.8	39	280	--	--
		12-18-90	<0.1	<0.01	<0.01	0.5	27	280	--	--
		01-09-91	<0.1	<0.01	<0.01	0.6	29	270	--	--
		02-21-91	<0.1	0.02	<0.01	0.3	29	270	--	--
		03-13-91	0.06	<0.01	<0.01	0.5	35	260	--	--
		04-16-91	<0.05	<0.01	<0.01	0.6	28	280	--	--
		05-17-91	0.064	0.04	0.03	0.5	22	280	--	--
		06-20-91	<0.05	0.01	<0.01	0.7	35	270	--	--
		07-17-91	<0.05	0.01	<0.01	0.4	32	270	--	--
		08-15-91	<0.05	<0.01	<0.01	0.6	30	270	<0.010	<0.2
		09-20-91	<0.05	<0.01	<0.01	0.6	30	270	0.011	<0.2
		10-23-91	<0.05	<0.01	<0.01	0.8	30	260	--	--
		11-21-91	<0.05	0.01	<0.01	0.6	32	270	--	--
		12-16-91	<0.05	<0.01	0.01	0.5	34	280	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
5	10N.05E.11.324	01-10-90	--	13.5	--	--	950	7.2	0.03	<0.2	<0.01
		02-16-90	13.51	12.5	--	--	990	7.3	0.01	0.4	<0.01
		03-15-90	13.26	13.0	--	--	990	7.4	0.02	0.4	<0.01
		05-14-90	--	13.5	--	10	905	7.2	<0.01	0.3	<0.01
		06-15-90	14.74	16.5	--	10	830	7.5	<0.01	0.5	<0.01
		07-17-90	16.60	14.5	--	10	730	7.4	<0.01	0.3	<0.01
		08-16-90	17.00	14.0	--	10	730	7.4	0.01	0.5	<0.01
		09-13-90	17.00	17.0	--	5	710	7.3	<0.01	<0.2	<0.01
		10-10-90	16.00	15.0	--	--	720	7.4	<0.01	0.3	<0.01
		11-13-90	15.12	13.0	3.0	--	780	7.4	<0.01	0.3	<0.01
		12-19-90	14.02	13.5	3.0	5	820	7.4	0.02	0.4	<0.01
		01-10-91	13.50	14.5	2.0	6	810	7.4	<0.01	0.4	<0.01
		02-14-91	13.02	12.5	2.0	4	792	7.3	<0.01	0.3	<0.01
		03-21-91	12.82	12.5	2.0	10	790	7.4	<0.01	0.2	<0.01
		04-15-91	13.36	13.0	4.0	10	827	7.3	<0.01	0.3	<0.01
		05-06-91	13.60	14.5	2.0	1	800	7.2	<0.01	0.3	<0.01
		06-12-91	14.30	14.5	5.0	6	770	7.4	0.01	0.4	<0.01
		07-11-91	16.37	14.5	3.0	8	760	7.4	0.01	0.4	<0.01
		08-20-91	13.70	15.5	2.0	12	720	7.4	<0.01	<0.2	<0.01
		09-13-91	14.00	15.0	3.0	10	730	7.4	<0.01	0.5	<0.01
		10-17-91	13.99	15.0	3.0	5	690	7.3	<0.01	<0.2	<0.01
		11-13-91	13.80	14.0	4.0	6	750	7.3	0.01	<0.2	<0.01
		12-10-91	13.12	12.0	3.0	6	710	7.4	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
5	10N.05E.11.324	01-10-90	8.6	0.03	--	1.0	25	50	--	--
		02-16-90	7.3	0.04	--	0.8	29	50	--	--
		03-15-90	8.3	0.04	--	0.6	33	40	--	--
		05-14-90	4.2	0.03	--	0.7	26	40	--	--
		06-15-90	2.9	0.02	--	0.5	22	50	--	--
		07-17-90	1.6	0.02	--	0.6	18	40	--	--
		08-16-90	1.1	0.02	--	0.7	18	50	--	--
		09-13-90	1.1	0.02	--	0.9	17	40	--	--
		10-10-90	1.3	0.02	<0.01	0.7	18	40	--	--
		11-13-90	2.4	0.01	0.01	1.3	17	60	--	--
		12-19-90	4.6	0.04	0.04	1.7	24	50	--	--
		01-10-91	5.3	0.02	0.04	0.7	23	50	--	--
		02-14-91	4.7	0.04	0.05	0.5	19	40	--	--
		03-21-91	3.1	0.04	0.05	1.0	15	40	--	--
		04-15-91	3.5	0.03	0.02	0.7	14	40	--	--
		05-06-91	3.4	0.03	0.03	1.0	16	40	--	--
		06-12-91	2.8	0.04	0.04	1.5	16	40	--	--
		07-11-91	1.8	0.03	0.03	0.7	13	40	--	--
		08-20-91	1.4	0.05	0.01	0.3	15	50	0.028	<0.2
		09-13-91	2.6	0.03	0.01	0.7	24	50	<0.010	<0.2
		10-17-91	1.7	0.05	0.03	0.6	12	40	--	--
		11-13-91	1.8	0.03	0.03	0.8	15	50	--	--
		12-10-91	1.3	0.04	0.05	0.8	16	40	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
6	10N.05E.14.413A	01-09-90	27.36	12.0	--	--	--	7.4	0.03	<0.2	<0.01
		02-12-90	27.30	12.5	--	--	1,140	7.4	<0.01	0.3	<0.01
		03-20-90	27.16	12.0	--	13	1,130	7.4	<0.01	<0.2	<0.01
		05-15-90	--	13.5	--	10	1,180	7.3	<0.01	0.3	<0.01
		06-12-90	28.28	16.0	--	19	1,200	7.3	0.02	0.3	<0.01
		07-10-90	29.15	15.5	--	12	1,110	7.4	0.01	0.2	<0.01
		09-04-90	28.42	21.0	3.0	10	1,100	7.3	0.04	0.4	<0.01
		09-18-90	29.05	17.0	5.0	12	1,120	7.3	<0.01	0.5	0.01
		10-16-90	29.40	13.5	5.0	10	1,120	7.3	<0.01	0.4	<0.01
		11-13-90	29.76	12.0	2.0	5	1,130	7.4	<0.01	0.4	<0.01
		12-17-90	29.52	11.0	3.0	10	1,200	7.5	<0.01	0.3	<0.01
		01-07-91	28.34	13.5	3.0	7	1,160	7.4	0.02	<0.2	<0.01
		02-28-91	26.96	12.5	--	20	1,230	7.4	<0.01	0.6	<0.01
		03-18-91	27.35	13.0	8.0	20	1,220	7.3	0.02	<0.2	0.01
		04-15-91	27.56	13.0	8.0	18	1,250	7.2	<0.01	0.5	<0.01
		05-13-91	28.76	13.5	3.0	5	1,280	7.3	<0.01	0.4	<0.01
		06-19-91	29.61	14.0	3.0	5	1,240	7.3	<0.01	0.5	0.01
		07-15-91	29.84	13.5	5.0	11	1,220	7.3	0.07	0.4	<0.01
		08-16-91	--	14.0	3.0	10	1,300	7.3	0.01	0.3	<0.01
		08-20-91	23.62	--	--	--	--	--	--	--	--
		09-23-91	24.00	13.5	6.0	14	1,320	7.3	0.04	0.4	0.01
		10-21-91	24.99	13.5	3.0	17	1,370	7.2	<0.01	<0.2	<0.01
		11-20-91	26.34	11.5	3.0	11	1,400	7.3	0.02	<0.2	<0.01
		12-17-91	26.35	9.0	4.0	15	1,350	7.3	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
6	10N.05E.14.413A	01-09-90	2.1	<0.01	--	0.8	130	40	--	--
		02-12-90	1.8	0.02	--	0.6	120	50	--	--
		03-20-90	1.6	<0.01	--	0.4	130	50	--	--
		05-15-90	1.8	0.01	--	0.5	150	40	--	--
		06-12-90	2.0	<0.01	--	0.7	140	50	--	--
		07-10-90	1.7	0.01	--	0.6	130	50	--	--
		09-04-90	1.7	<0.01	--	0.7	120	50	--	--
		09-18-90	1.7	0.02	--	0.7	130	40	--	--
		10-16-90	1.6	0.01	<0.01	0.7	130	--	--	--
		11-13-90	1.7	<0.01	<0.01	0.9	130	40	--	--
		12-17-90	1.6	<0.01	<0.01	0.9	130	40	--	--
		01-07-91	1.7	0.04	<0.01	0.7	140	30	--	--
		02-28-91	2.0	0.01	<0.01	1.0	170	50	--	--
		03-18-91	2.1	<0.01	<0.01	0.7	160	50	--	--
		04-15-91	2.0	0.01	<0.01	0.7	140	40	--	--
		05-13-91	2.1	<0.01	<0.01	0.9	160	40	--	--
		06-19-91	2.0	0.03	0.02	0.9	170	50	--	--
		07-15-91	2.0	0.03	0.02	0.5	160	50	--	--
		08-16-91	1.9	0.01	<0.01	1.0	160	40	<0.010	<0.2
		08-20-91	--	--	--	--	--	--	--	--
		09-23-91	2.4	<0.01	0.02	0.8	190	40	<0.010	<0.2
		10-21-91	2.3	<0.01	<0.01	1.3	190	50	--	--
		11-20-91	2.4	<0.01	0.01	0.9	200	50	--	--
		12-17-91	2.4	<0.01	<0.01	0.9	170	50	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
7	08N.07E.29.324A	01-17-90	--	--	--	10	710	7.3	0.03	<0.2	<0.01
		02-15-90	24.79	11.5	--	--	760	7.4	<0.01	0.3	<0.01
		03-21-90	24.82	12.0	--	10	705	7.3	<0.01	<0.2	<0.01
		05-16-90	24.81	12.5	--	12	720	7.3	<0.01	0.2	<0.01
		06-13-90	27.90	16.0	--	17	700	7.3	0.02	0.5	<0.01
		07-13-90	--	15.5	--	10	720	7.3	0.03	0.2	<0.01
		08-21-90	26.11	15.0	--	15	710	7.3	0.01	0.5	<0.01
		09-17-90	29.46	14.0	4.0	10	700	7.3	<0.01	0.2	<0.01
		10-11-90	27.50	13.0	3.0	10	690	7.4	<0.01	0.4	<0.01
		11-14-90	26.29	12.0	2.5	10	720	7.4	<0.01	<0.2	<0.01
		12-14-90	26.00	12.5	3.0	8	690	7.3	0.01	<0.2	<0.01
		01-09-91	25.51	13.5	2.0	10	760	7.3	0.01	0.3	0.01
		02-15-91	25.72	10.5	2.0	10	740	7.3	<0.01	0.3	<0.01
		03-15-91	25.25	12.0	6.0	18	730	7.2	0.02	<0.2	0.01
		04-18-91	26.27	13.0	6.0	10	818	7.2	<0.01	0.2	<0.01
		05-15-91	28.21	13.0	2.0	10	700	7.3	<0.01	<0.2	<0.01
		06-20-91	32.38	14.5	2.0	10	710	7.3	0.02	0.3	<0.01
		07-15-91	36.59	13.5	2.0	13	710	7.3	0.07	0.6	<0.01
		08-13-91	28.93	15.0	3.0	--	730	7.3	<0.01	0.2	<0.01
		09-12-91	23.08	13.5	3.0	10	900	7.3	<0.01	0.6	<0.01
		10-18-91	24.32	13.5	3.0	15	830	7.3	<0.01	<0.2	<0.01
		11-19-91	--	11.5	3.5	12	900	7.2	0.02	<0.2	0.02
		12-16-91	21.42	11.5	3.0	15	880	7.3	0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
7	08N.07E.29.324A	01-17-90	2.1	0.03	--	1.9	25	40	--	--
		02-15-90	2.2	0.01	--	1.9	27	50	--	--
		03-21-90	2.1	0.02	--	1.6	27	40	--	--
		05-16-90	2.2	0.02	--	1.8	31	40	--	--
		06-13-90	2.3	0.03	--	1.8	28	40	--	--
		07-13-90	2.4	0.03	--	2.3	26	40	--	--
		08-21-90	2.2	0.02	--	1.8	26	40	--	--
		09-17-90	2.1	0.07	--	1.8	23	40	--	--
		10-11-90	1.9	0.02	<0.01	1.9	24	40	--	--
		11-14-90	1.8	<0.01	<0.01	2.0	23	50	--	--
		12-14-90	1.8	0.02	0.01	1.7	28	50	--	--
		01-09-91	2.3	0.01	0.02	1.8	29	50	--	--
		02-15-91	2.5	0.02	0.03	1.6	29	50	--	--
		03-15-91	2.1	0.03	<0.01	1.7	37	50	--	--
		04-18-91	2.2	0.01	0.02	1.6	42	50	--	--
		05-15-91	2.4	0.02	0.01	1.9	31	40	--	--
		06-20-91	2.2	<0.01	<0.01	1.6	33	40	--	--
		07-15-91	2.3	0.02	0.01	1.3	28	40	--	--
		08-13-91	2.5	0.02	0.02	1.9	28	40	0.025	<0.2
		09-12-91	5.1	0.04	0.01	2.7	28	70	0.019	<0.2
		10-18-91	2.8	0.03	0.03	2.6	27	60	--	--
		11-19-91	2.1	0.04	0.06	2.2	27	40	--	--
		12-16-91	2.7	0.04	0.04	2.5	37	70	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
8	10N.05E.12.442	01-13-90	28.24	13.5	--	--	1,490	7.3	0.04	0.4	<0.01
		02-16-90	29.52	13.0	--	--	1,510	7.3	<0.01	0.5	<0.01
		03-16-90	27.15	13.5	--	15	1,500	7.4	0.01	0.3	<0.01
		05-18-90	28.05	14.0	--	16	1,510	7.3	0.02	0.9	<0.01
		06-18-90	33.33	17.5	--	14	1,580	7.2	<0.01	0.2	<0.01
		07-10-90	34.17	15.0	--	12	1,550	7.2	0.01	0.6	<0.01
		08-14-90	33.61	13.5	--	12	1,510	7.2	<0.01	0.8	<0.01
		09-14-90	31.60	14.0	8.0	11	1,520	7.2	<0.01	0.8	<0.01
		10-16-90	28.96	13.5	6.0	10	1,520	7.3	0.01	0.9	<0.01
		11-26-90	--	12.0	4.0	10	1,500	7.3	0.03	0.7	<0.01
		12-13-90	28.60	13.0	5.0	12	1,490	7.3	0.02	0.7	<0.01
		01-11-91	27.06	13.5	6.0	10	1,530	7.3	0.02	0.8	<0.01
		02-20-91	27.67	13.5	3.0	13	1,460	7.1	<0.01	0.7	<0.01
		03-19-91	27.56	14.0	12.0	21	1,480	7.4	0.03	0.5	0.02
		04-11-91	26.65	15.5	2.0	20	1,520	7.1	0.01	1.1	0.02
		04-19-91	27.33	14.5	4.0	12	1,420	7.3	<0.01	0.4	0.02
		05-17-91	31.07	13.5	5.0	15	1,430	7.2	0.01	0.7	0.02
		06-17-91	31.10	13.5	5.0	25	1,520	7.2	<0.01	0.6	<0.01
		07-15-91	32.52	13.5	5.0	10	1,490	7.3	0.07	0.6	<0.01
		08-12-91	26.03	13.5	4.0	--	1,450	7.2	<0.01	0.8	<0.01
		09-27-91	20.22	13.5	6.0	15	1,590	7.2	0.05	0.5	0.02
		10-22-91	22.32	7.0	10.0	13	1,550	7.3	<0.01	<0.2	<0.01
		11-15-91	24.40	14.0	10.0	14	1,500	7.3	<0.01	<0.2	0.02
		12-17-91	23.22	13.5	--	21	1,510	7.4	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
8	10N.05E.12.442	01-13-90	15	0.020	--	1.8	250	120	--	--
		02-16-90	17	0.020	--	1.8	250	110	--	--
		03-16-90	14	0.021	--	1.4	260	120	--	--
		05-18-90	14	0.030	--	2.0	290	110	--	--
		06-18-90	14	0.010	--	1.6	270	110	--	--
		07-10-90	14	0.020	--	2.1	280	120	--	--
		08-14-90	15	0.030	--	1.8	260	120	--	--
		09-14-90	14	<0.010	--	1.7	280	120	--	--
		10-16-90	15	0.020	0.01	1.9	260	10	--	--
		11-26-90	5.1	0.020	0.01	1.9	270	120	--	--
		12-13-90	14	0.020	0.02	2.0	260	110	--	--
		01-11-91	18	0.020	0.03	1.7	280	110	--	--
		02-20-91	12	0.010	0.02	2.2	250	140	--	--
		03-19-91	11	0.020	<0.01	1.6	260	120	--	--
		04-11-91	13	0.020	<0.01	2.2	270	120	--	--
		04-19-91	2.5	0.020	0.02	1.8	--	--	--	--
		05-17-91	16	0.080	0.05	1.8	--	120	--	--
		06-17-91	15	<0.010	0.01	1.7	280	120	--	--
		07-15-91	14	0.040	0.02	1.6	280	110	--	--
		08-12-91	12	0.030	0.02	2.0	270	120	0.011	<0.2
		09-27-91	11	0.060	0.04	1.5	320	100	0.049	<0.2
		10-22-91	11	0.040	0.03	2.1	310	100	--	--
		11-15-91	12	0.030	0.02	2.0	290	110	--	--
		12-17-91	11	0.020	0.02	1.8	280	100	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
9	10N.05E.19.322	01-09-90	41.48	16.0	--	--	515	7.6	<0.01	0.2	<0.01
		02-22-90	41.28	16.5	--	--	550	7.7	--	--	--
		03-20-90	41.44	17.5	--	12	515	7.8	<0.01	<0.2	<0.01
		05-15-90	42.00	17.5	--	11	530	7.6	<0.01	<0.2	<0.01
		06-19-90	41.91	21.0	--	15	550	7.6	<0.01	0.4	<0.01
		07-12-90	--	19.0	--	6	585	7.6	<0.01	<0.2	<0.01
		08-20-90	42.44	17.0	--	8	550	7.6	<0.01	0.2	<0.01
		09-19-90	42.32	17.0	6.0	10	570	7.7	<0.01	<0.2	<0.01
		10-15-90	42.70	16.5	5.0	10	560	7.6	<0.01	0.3	<0.01
		11-19-90	--	16.0	4.0	12	570	7.6	0.04	<0.2	<0.01
		12-20-90	42.35	16.5	1.5	11	580	7.7	0.01	<0.2	<0.01
		01-08-91	42.22	18.0	4.0	12	540	7.6	<0.01	<0.2	<0.01
		02-19-91	42.21	16.5	4.5	8	555	7.7	<0.01	0.2	<0.01
		03-12-91	42.43	17.0	4.0	20	570	7.6	0.01	<0.2	<0.01
		04-10-91	42.24	17.0	12.0	17	579	7.6	<0.01	0.2	<0.01
		05-20-91	43.00	16.5	3.0	8	550	7.3	0.01	1.1	0.02
		06-14-91	42.90	16.5	4.0	6	540	7.7	<0.01	<0.2	<0.01
		07-09-91	43.25	17.0	4.0	15	560	7.6	0.03	<0.2	<0.01
		08-14-91	37.39	17.5	3.0	--	540	7.6	0.02	0.3	<0.01
		09-18-91	43.90	16.5	3.0	10	580	7.7	<0.01	<0.2	<0.01
		10-21-91	--	17.0	3.5	10	580	7.6	<0.01	<0.2	<0.01
		11-18-91	42.87	17.0	4.5	16	560	7.6	0.03	<0.2	<0.01
		12-13-91	42.80	16.5	9.5	9	560	7.6	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
9	10N.05E.19.322	01-09-90	1.0	<0.01	--	0.5	9.1	30	--	--
		02-22-90	--	--	--	1.0	8.9	30	--	--
		03-20-90	0.7	<0.01	--	0.3	14	30	--	--
		05-15-90	1.0	<0.01	--	0.3	11	30	--	--
		06-19-90	0.8	<0.01	--	0.3	10	30	--	--
		07-12-90	0.9	<0.01	--	0.7	9.4	30	--	--
		08-20-90	0.8	<0.01	--	0.4	12	30	--	--
		09-19-90	1.0	<0.01	--	0.5	12	30	--	--
		10-15-90	0.9	<0.01	0.01	0.5	11	30	--	--
		11-19-90	0.9	<0.01	<0.01	0.8	11	30	--	--
		12-20-90	0.8	<0.01	<0.01	0.8	11	30	--	--
		01-08-91	0.7	0.02	<0.01	0.6	11	30	--	--
		02-19-91	0.7	<0.01	<0.01	0.7	11	30	--	--
		03-12-91	0.97	<0.01	<0.01	0.7	11	30	--	--
		04-10-91	0.83	<0.01	<0.01	0.7	12	30	--	--
		05-20-91	0.95	0.02	0.01	0.5	--	40	--	--
		06-14-91	0.87	<0.01	<0.01	0.3	11	30	--	--
		07-09-91	0.90	<0.01	<0.01	0.4	11	40	--	--
		08-14-91	0.59	0.01	<0.01	0.6	12	20	<0.010	<0.2
		09-18-91	0.88	<0.01	<0.01	0.6	8.2	40	0.011	<0.2
		10-21-91	0.84	<0.01	<0.01	1.0	10	30	--	--
		11-18-91	0.95	<0.01	0.01	0.5	11	30	--	--
		12-13-91	0.72	<0.01	<0.01	0.5	11	30	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
10	11N.06E.19.122	02-22-90	48.74	10.5	--	--	680	7.6	<0.01	0.2	<0.01
		03-14-90	48.72	11.0	--	20	670	7.6	<0.01	<0.2	<0.01
		05-17-90	49.39	13.0	--	15	670	7.5	0.05	0.3	<0.01
		06-18-90	49.98	17.5	--	10	690	7.5	<0.01	0.9	<0.01
		07-17-90	50.06	17.0	--	--	625	7.5	<0.01	0.6	<0.01
		08-15-90	48.70	14.5	--	13	700	7.5	<0.01	0.3	<0.01
		09-12-90	49.26	16.0	1.0	12	685	7.4	<0.01	0.5	<0.01
		10-09-90	47.68	14.0	2.0	5	710	7.5	<0.01	0.5	<0.01
		11-26-90	--	11.0	2.0	6	680	7.5	0.02	0.3	<0.01
		12-20-90	50.61	12.5	3.0	12	730	7.6	0.02	<0.2	<0.01
		01-14-91	50.64	9.0	2.5	11	700	7.5	<0.01	0.3	<0.01
		02-14-91	50.51	10.5	1.5	8	695	7.5	<0.01	0.3	<0.01
		03-22-91	49.80	10.0	1.3	25	710	7.4	<0.01	0.8	<0.01
		04-18-91	49.41	11.5	1.5	12	776	7.4	<0.01	<0.2	<0.01
		05-14-91	49.36	13.0	3.5	15	670	7.5	<0.01	0.4	<0.01
		06-12-91	49.61	14.5	1.7	10	680	7.5	<0.01	0.2	<0.01
		07-10-91	50.01	14.0	2.0	10	700	7.5	0.02	0.3	0.01
		08-21-91	47.99	16.5	1.5	10	800	7.5	<0.01	0.5	<0.01
		09-11-91	45.71	16.5	2.5	10	770	7.5	<0.01	0.4	<0.01
		10-16-91	43.32	14.5	3.0	9	800	7.4	<0.01	<0.2	<0.01
		11-13-91	43.63	12.0	3.0	10	800	7.5	<0.01	<0.2	<0.01
		12-11-91	43.95	10.0	2.0	5	680	7.5	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
10	11N.06E.19.122	02-22-90	2.7	0.01	--	1.6	76	40	--	--
		03-14-90	2.7	0.02	--	1.5	72	50	--	--
		05-17-90	2.8	0.02	--	1.5	85	50	--	--
		06-18-90	2.9	<0.01	--	1.2	79	50	--	--
		07-17-90	3.0	<0.01	--	1.1	84	50	--	--
		08-15-90	2.7	0.02	--	1.8	100	50	--	--
		09-12-90	2.5	0.02	--	1.6	92	50	--	--
		10-09-90	2.3	<0.01	<0.01	2.0	110	50	--	--
		11-26-90	2.1	<0.01	<0.01	2.1	87	60	--	--
		12-20-90	2.4	<0.01	<0.01	2.1	100	50	--	--
		01-14-91	2.2	0.03	<0.01	1.7	88	50	--	--
		02-14-91	2.3	<0.01	0.02	1.6	99	50	--	--
		03-22-91	2.3	0.02	0.04	2.2	95	50	--	--
		04-18-91	2.3	0.02	0.02	1.9	97	50	--	--
		05-14-91	2.4	0.01	<0.01	1.7	99	50	--	--
		06-12-91	2.4	0.01	0.01	1.6	98	50	--	--
		07-10-91	2.5	<0.01	<0.01	1.3	97	50	--	--
		08-21-91	2.3	0.01	<0.01	2.0	100	50	<0.010	<0.2
		09-11-91	2.2	0.01	<0.01	1.9	110	50	<0.010	<0.2
		10-16-91	2.1	0.02	<0.01	1.8	120	40	--	--
		11-13-91	2.1	<0.01	0.01	2.1	110	50	--	--
		12-11-91	2.0	<0.01	0.03	1.9	110	50	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
11	11N.05E.23.222B	01-17-90	17.27	11.0	--	--	850	7.2	0.03	<0.2	<0.01
		02-13-90	16.55	10.5	--	--	880	7.2	<0.01	0.5	<0.01
		03-15-90	14.53	11.0	--	14	860	7.2	0.02	<0.2	<0.01
		04-09-90	13.48	--	--	--	--	--	--	--	--
		05-17-90	13.81	11.0	--	6	890	7.1	<0.01	0.7	<0.01
		06-19-90	15.12	15.0	--	7	880	7.1	<0.01	<0.2	<0.01
		07-17-90	16.13	12.5	--	10	810	7.1	<0.01	<0.2	<0.01
		08-16-90	15.45	12.0	--	6	890	7.2	<0.01	0.2	<0.01
		09-12-90	16.58	12.0	3.0	10	870	7.1	<0.01	<0.2	<0.01
		10-10-90	17.00	12.0	6.0	10	855	7.1	<0.01	0.3	<0.01
		11-16-90	17.68	11.5	6.0	8	875	7.2	0.03	<0.2	<0.01
		12-19-90	15.76	11.5	4.0	8	830	7.2	<0.01	<0.2	<0.01
		01-07-91	15.48	12.5	5.0	10	870	7.2	0.02	<0.2	<0.01
		02-14-91	14.65	10.5	6.0	9	880	7.2	<0.01	<0.2	<0.01
		03-22-91	13.05	10.5	10.0	19	920	7.2	0.01	<0.2	0.02
		04-17-91	13.75	11.0	10.0	12	979	7.1	<0.01	<0.2	<0.01
		05-14-91	14.53	10.5	4.0	11	780	7.2	<0.01	<0.2	<0.01
		06-13-91	15.09	10.5	4.0	9	830	7.2	<0.01	<0.2	<0.01
		07-11-91	16.36	11.0	6.0	10	820	7.2	0.04	<0.2	<0.01
		08-19-91	10.73	11.5	6.0	10	910	7.1	0.01	0.2	<0.01
		09-17-91	11.75	12.0	4.0	10	900	7.1	<0.01	<0.2	<0.01
		10-16-91	12.85	13.0	5.5	10	900	7.1	<0.01	0.3	<0.01
		11-12-91	12.99	12.0	6.0	10	980	7.1	<0.01	<0.2	<0.01
		12-12-91	12.69	11.5	6.5	10	820	7.1	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
11	11N.05E.23.222B	01-17-90	0.5	<0.01	--	0.8	75	20	--	--
		02-13-90	0.4	0.02	--	0.6	75	20	--	--
		03-15-90	0.4	<0.01	--	0.5	85	20	--	--
		04-09-90	--	--	--	--	--	--	--	--
		05-17-90	0.4	<0.01	--	0.9	110	20	--	--
		06-19-90	0.2	<0.01	--	0.6	90	20	--	--
		07-17-90	0.2	<0.01	--	0.7	95	20	--	--
		08-16-90	0.2	0.01	--	0.7	86	20	--	--
		09-12-90	0.3	<0.01	--	0.8	89	20	--	--
		10-10-90	0.3	<0.01	0.01	0.9	88	20	--	--
		11-16-90	0.3	<0.01	<0.01	0.9	87	160	--	--
		12-19-90	0.3	<0.01	<0.01	1.0	79	20	--	--
		01-07-91	0.3	<0.01	<0.01	0.7	83	20	--	--
		02-14-91	0.3	<0.01	0.02	0.7	93	30	--	--
		03-22-91	0.46	<0.01	0.03	1.1	110	20	--	--
		04-17-91	0.32	<0.01	<0.01	0.7	94	20	--	--
		05-14-91	0.27	<0.01	<0.01	1.0	94	20	--	--
		06-13-91	0.21	<0.01	<0.01	0.8	95	20	--	--
		07-11-91	0.24	<0.01	<0.01	0.6	99	20	--	--
		08-19-91	0.74	<0.01	<0.01	1.1	110	30	<0.010	<0.2
		09-17-91	0.22	<0.01	<0.01	1.0	120	30	0.010	<0.2
		10-16-91	0.22	<0.01	<0.01	0.9	110	<10	--	--
		11-12-91	0.22	<0.01	<0.01	1.3	100	20	--	--
		12-12-91	0.16	0.01	0.03	2.1	99	30	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
12	10N.06E.05.441	01-10-90	--	--	--	--	2,590	7.2	0.06	0.4	<0.01
		02-16-90	--	12.0	--	--	2,470	7.1	<0.01	0.4	<0.01
		03-20-90	--	13.0	--	12	2,460	7.2	0.01	0.9	<0.01
		05-22-90	--	15.0	--	16	2,590	7.1	<0.01	0.7	<0.01
		06-18-90	--	18.0	--	15	2,600	7.1	<0.01	4.9	<0.01
		07-10-90	--	6.0	--	10	2,590	7.1	0.01	0.6	<0.01
		08-17-90	--	14.5	--	--	2,580	7.1	<0.01	0.5	<0.01
		09-19-90	--	14.5	6.0	10	2,530	7.2	<0.01	0.4	<0.01
		10-16-90	--	14.0	5.0	11	2,530	7.2	0.02	1.0	<0.01
		11-15-90	--	13.5	6.0	10	2,510	7.2	<0.01	0.5	<0.01
		12-13-90	--	12.0	6.0	14	2,600	7.2	0.02	0.8	<0.01
		01-11-91	--	12.5	3.0	10	2,620	7.1	0.02	0.9	<0.01
		02-20-91	--	11.5	2.5	16	2,690	7.1	0.02	0.6	<0.01
		03-19-91	191.06	13.5	4.0	21	2,710	7.1	0.03	0.7	<0.01
		04-12-91	191.85	14.5	8.0	20	2,780	7.2	0.01	0.9	0.01
		05-13-91	--	14.0	4.0	6	2,680	7.1	<0.01	1.0	<0.01
		06-17-91	--	14.5	4.0	12	2,650	7.1	<0.01	0.6	<0.01
		07-12-91	192.80	14.5	6.0	13	2,670	7.1	0.02	0.5	<0.01
		08-16-91	--	14.5	4.0	12	2,580	7.2	0.05	0.9	0.04
		09-16-91	186.16	14.0	7.5	12	2,620	7.2	0.02	0.2	<0.01
		10-22-91	189.90	14.5	8.8	13	2,460	7.2	<0.01	<0.2	<0.01
		11-20-91	--	13.5	6.0	15	2,280	7.2	0.03	<0.2	<0.01
		12-18-91	194.09	13.0	7.0	--	2,130	7.2	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, P total as N (mg/L)
12	10N.06E.05.441	01-10-90	12	0.02	--	2.8	570	50	--	--
		02-16-90	10	<0.01	--	2.7	580	50	--	--
		03-20-90	11	<0.01	--	3.7	600	60	--	--
		05-22-90	8.4	<0.01	--	2.8	580	50	--	--
		06-18-90	12	<0.01	--	2.6	570	60	--	--
		07-10-90	12	0.02	--	3.0	630	60	--	--
		08-17-90	13	<0.01	--	2.8	600	70	--	--
		09-19-90	13	<0.01	--	2.9	580	60	--	--
		10-16-90	14	<0.01	<0.01	1.1	590	50	--	--
		11-15-90	14	<0.01	<0.01	3.3	600	60	--	--
		12-13-90	14	<0.01	<0.01	3.0	640	50	--	--
		01-11-91	18	<0.01	<0.01	2.9	660	50	--	--
		02-20-91	13	<0.01	<0.01	3.0	670	50	--	--
		03-19-91	12	<0.01	<0.01	2.7	610	60	--	--
		04-12-91	14	0.01	<0.01	2.9	650	60	--	--
		05-13-91	16	<0.01	<0.01	2.7	700	50	--	--
		06-17-91	15	<0.01	<0.01	2.8	670	60	--	--
		07-12-91	13	<0.01	<0.01	2.7	700	50	--	--
		08-16-91	14	<0.01	<0.01	2.7	730	50	<0.010	<0.2
		09-16-91	14	<0.01	0.05	2.7	610	60	0.030	<0.2
		10-22-91	11	<0.01	<0.01	2.6	630	50	--	--
		11-20-91	11	<0.01	0.01	2.8	540	50	--	--
		12-18-91	8.6	<0.01	<0.01	2.5	460	60	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
13	10N.05E.30.213A	01-30-90	--	14.5	--	15	1,050	7.7	<0.01	0.2	<0.01
		02-22-90	66.29	16.0	--	--	1,110	7.6	--	--	--
		03-30-90	66.63	16.0	--	23	1,120	7.6	0.01	0.6	<0.01
		05-15-90	65.00	17.5	--	16	1,130	7.5	<0.01	0.6	<0.01
		05-22-90	68.43	17.0	2.5	13	1,140	7.6	--	--	--
		06-20-90	65.74	21.5	--	13	1,140	7.5	0.03	0.3	<0.01
		07-12-90	66.11	19.5	--	13	1,130	7.5	0.12	0.4	0.01
		08-21-90	67.44	18.5	--	15	1,120	7.5	0.07	0.5	<0.01
		09-20-90	68.03	17.0	3.5	11	1,090	7.6	<0.01	0.4	<0.01
		10-17-90	68.34	16.5	4.0	11	1,090	7.5	0.06	1.0	<0.01
		11-19-90	68.65	16.0	6.0	8	1,110	7.5	0.06	0.7	<0.01
		12-20-90	69.00	15.0	3.0	11	1,100	7.6	0.03	0.5	<0.01
		01-08-91	68.72	16.5	3.0	11	1,030	7.6	<0.01	0.8	<0.01
		02-19-91	68.44	13.0	4.0	9	1,110	7.6	<0.01	0.7	<0.01
		03-12-91	68.31	16.0	4.0	20	1,100	7.6	0.09	0.7	0.01
		04-10-91	68.25	16.0	8.0	14	1,150	7.6	<0.01	0.9	<0.01
		05-22-91	68.43	17.0	2.5	13	1,140	7.6	<0.01	2.4	0.02
		06-14-91	69.20	16.5	3.0	10	1,080	7.5	<0.01	0.5	<0.01
		07-09-91	69.48	18.0	4.0	12	1,160	7.5	0.01	0.6	<0.01
		08-14-91	69.42	18.0	3.0	--	1,060	7.5	0.02	0.6	<0.01
		09-23-91	69.14	17.0	5.0	12	1,110	7.6	0.04	0.3	0.01
		11-18-91	70.41	14.0	4.0	12	1,090	7.5	0.02	<0.2	<0.01
		12-13-91	69.24	15.0	6.0	14	1,110	7.6	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, P total as N (mg/L)
13	10N.05E.30.213A	01-30-90	15	<0.01	--	0.7	100	30	--	--
		02-22-90	--	--	--	0.4	110	40	--	--
		03-30-90	15	<0.01	--	0.8	9.1	40	--	--
		05-15-90	15	<0.01	--	0.9	120	40	--	--
		05-22-90	--	--	--	--	--	--	--	--
		06-20-90	15	<0.01	--	0.6	130	40	--	--
		07-12-90	15	0.54	--	1.4	120	40	--	--
		08-21-90	2.8	<0.01	--	0.9	120	30	--	--
		09-20-90	15	<0.01	--	1.0	120	40	--	--
		10-17-90	15	<0.01	0.01	0.8	120	40	--	--
		11-19-90	15	<0.01	<0.01	0.9	120	30	--	--
		12-20-90	15	<0.01	<0.01	1.0	120	30	--	--
		01-08-91	18	<0.01	<0.01	0.7	120	40	--	--
		02-19-91	13	<0.01	<0.01	0.9	110	40	--	--
		03-12-91	15	<0.01	<0.01	0.9	130	30	--	--
		04-10-91	15	<0.01	<0.01	0.3	120	30	--	--
		05-22-91	16	0.05	0.02	0.9	--	40	--	--
		06-14-91	15	<0.01	<0.01	1.0	120	40	--	--
		07-09-91	15	<0.01	<0.01	0.7	140	40	--	--
		08-14-91	14	0.02	<0.01	1.0	110	30	<0.010	<0.2
		09-23-91	15	<0.01	0.01	0.7	120	40	<0.010	<0.2
		11-18-91	15	<0.01	0.01	0.9	120	30	--	--
		12-13-91	14	0.01	<0.01	1.0	110	40	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
14	09N.06E.29.244	01-11-90	143.70	13.0	--	--	1,280	7.2	0.03	0.4	<0.01
		02-14-90	145.19	13.0	--	--	1,270	7.2	<0.01	0.3	<0.01
		03-21-90	--	13.5	--	8	1,260	7.2	<0.01	0.7	<0.01
		05-16-90	149.43	13.0	--	12	1,300	7.1	<0.01	0.6	<0.01
		06-13-90	150.70	16.0	--	7	1,310	7.2	0.03	0.8	<0.01
		07-13-90	152.70	14.5	--	8	1,270	7.1	0.02	0.5	<0.01
		08-21-90	154.37	13.0	--	8	1,200	7.1	<0.01	0.8	0.02
		09-17-90	155.83	13.5	8.0	10	1,140	7.2	<0.01	0.8	<0.01
		10-11-90	156.00	12.0	5.0	10	1,120	7.2	<0.01	0.7	<0.01
		11-14-90	157.44	13.0	4.0	10	1,100	7.2	<0.01	0.4	<0.01
		12-14-90	159.00	12.5	5.0	13	1,030	7.2	0.03	0.3	<0.01
		01-09-91	159.38	15.0	4.0	11	1,060	7.2	<0.01	0.4	<0.01
		02-15-91	--	12.0	6.0	4	1,020	7.3	<0.01	<0.2	0.02
		03-13-91	160.44	13.0	12.0	10	2,220	7.1	<0.01	0.6	<0.01
		04-16-91	161.53	13.5	12.0	14	961	7.3	0.01	0.9	<0.01
		05-15-91	160.00	13.0	4.0	12	1,190	7.3	0.02	<0.2	0.03
		06-20-91	163.71	13.5	3.5	12	990	7.4	0.03	0.3	0.05
		07-16-91	165.04	13.0	3.0	10	1,080	7.5	0.09	<0.2	0.03
		08-13-91	150.32	13.0	6.0	--	2,390	7.1	0.02	0.9	<0.01
		09-12-91	143.21	13.0	6.0	12	2,400	7.2	0.02	1.7	<0.01
		10-23-91	165.95	13.5	12.0	12	1,510	7.1	0.02	0.3	0.02
		11-21-91	167.29	13.5	6.0	10	1,450	7.3	0.02	0.3	<0.01
		12-18-91	159.45	13.0	12.0	8	1,340	7.3	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, P total as N (mg/L)
14	09N.06E.29.244	01-11-90	3.5	0.03	--	4.3	170	120	--	--
		02-14-90	3.4	<0.01	--	4.0	160	120	--	--
		03-21-90	3.1	0.01	--	3.7	150	110	--	--
		05-16-90	2.9	0.02	--	4.3	180	120	--	--
		06-13-90	3.2	<0.01	--	4.6	170	120	--	--
		07-13-90	3.0	<0.01	--	4.5	150	120	--	--
		08-21-90	3.0	0.01	--	3.5	150	120	--	--
		09-17-90	2.7	0.04	--	3.1	140	120	--	--
		10-11-90	2.2	0.02	0.01	3.4	140	130	--	--
		11-14-90	2.1	<0.01	<0.01	3.3	130	140	--	--
		12-14-90	1.6	<0.01	<0.01	3.0	130	150	--	--
		01-09-91	1.6	<0.01	<0.01	2.8	120	160	--	--
		02-15-91	0.5	<0.01	0.02	2.5	110	200	--	--
		03-13-91	1.2	0.01	0.02	9.5	340	90	--	--
		04-16-91	0.95	0.01	0.03	2.3	82	190	--	--
		05-15-91	0.26	0.01	<0.01	2.9	130	200	--	--
		06-20-91	0.38	<0.01	0.02	2.7	110	200	--	--
		07-16-91	0.15	0.02	0.01	1.9	120	210	--	--
		08-13-91	6.00	0.05	0.05	15	340	30	0.056	0.8
		09-12-91	6.70	0.05	0.03	13	350	30	0.033	0.8
		10-23-91	0.73	0.02	0.02	6.6	230	140	--	--
		11-21-91	0.56	0.02	<0.01	6.1	180	170	--	--
		12-18-91	0.68	<0.01	<0.01	5.0	140	180	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
15	11N.06E.21.133	01-31-90	--	13.5	--	--	650	7.5	<0.01	<0.2	<0.01
		02-12-90	--	14.0	--	--	640	7.5	<0.01	0.7	<0.01
		03-20-90	--	15.0	--	13	660	7.5	<0.01	0.2	<0.01
		05-17-90	--	13.5	--	10	660	7.5	<0.01	0.4	<0.01
		06-18-90	--	17.5	--	14	650	7.4	<0.01	1.1	<0.01
		07-17-90	149.69	13.0	--	7	640	7.4	<0.01	<0.2	<0.01
		08-15-90	--	14.0	--	11	655	7.4	<0.01	0.2	<0.01
		09-11-90	--	14.0	--	6	610	7.5	<0.01	0.2	<0.01
		10-09-90	154.00	13.5	--	10	710	7.5	<0.01	0.4	<0.01
		05-20-91	151.72	13.5	3.0	6	610	7.3	<0.01	0.6	0.02
		06-18-91	152.30	14.0	2.0	13	660	7.5	<0.01	<0.2	<0.01
		07-10-91	152.27	14.0	--	5	680	7.4	0.01	0.6	<0.01
		08-21-91	151.69	14.0	0.5	10	680	7.4	<0.01	<0.2	<0.01
		09-17-91	151.38	13.5	3.0	5	620	7.4	<0.01	0.3	<0.01
		10-16-91	151.50	14.0	9.0	6	680	7.4	<0.01	<0.2	<0.01
		11-14-91	151.70	14.0	2.0	7	700	7.5	<0.01	<0.2	<0.01
		12-11-91	151.87	12.5	1.0	5	815	7.5	<0.01	<0.2	0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
15	11N.06E.21.133	01-31-90	1.2	0.01	--	0.4	24	60	--	--
		02-12-90	1.2	0.02	--	0.4	24	70	--	--
		03-20-90	1.2	0.02	--	0.4	19	70	--	--
		05-17-90	1.3	0.01	--	0.6	25	70	--	--
		06-18-90	1.2	<0.01	--	0.3	23	70	--	--
		07-17-90	1.2	0.03	--	0.6	21	70	--	--
		08-15-90	1.2	0.02	--	0.6	23	70	--	--
		09-11-90	1.1	0.02	--	0.6	22	70	--	--
		10-09-90	1.3	0.02	<0.01	0.6	23	80	--	--
		05-20-91	1.3	0.04	0.03	0.7	--	70	--	--
		06-18-91	1.2	0.01	0.01	0.5	26	70	--	--
		07-10-91	1.3	0.01	<0.01	0.5	24	70	--	--
		08-21-91	1.2	0.02	<0.01	1.0	27	70	<0.010	<0.2
		09-17-91	0.98	0.02	0.01	0.7	24	70	0.021	<0.2
		10-16-91	1.3	0.03	0.01	0.7	25	60	--	--
		11-14-91	1.3	<0.01	0.01	0.8	27	80	--	--
		12-11-91	1.2	0.01	0.02	0.8	28	70	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
16	10N.05E.02.233A	01-12-90	113.97	13.5	--	--	700	9.5	<0.01	0.2	0.02
		02-13-90	95.66	13.5	--	--	720	9.5	<0.01	0.2	0.01
		03-19-90	76.18	14.0	--	10	710	9.5	<0.01	0.3	0.02
		05-21-90	--	14.5	--	--	720	9.3	<0.01	0.3	0.02
		06-15-90	61.03	17.0	--	5	710	9.2	<0.01	0.2	0.02
		07-18-90	58.42	14.0	--	6	725	9.3	<0.01	<0.2	0.02
		08-17-90	56.00	15.0	--	--	710	9.4	0.02	0.2	0.01
		09-13-90	57.38	14.0	9.0	5	705	9.3	<0.01	<0.2	0.02
		10-18-90	47.59	14.0	6.0	4	705	9.4	0.01	0.2	0.01
		11-26-90	39.65	12.5	8.0	5	700	9.5	0.02	<0.2	0.02
		12-17-90	37.47	14.5	5.0	3	715	9.3	<0.01	<0.2	0.02
		01-10-91	35.24	13.5	6.0	3	710	9.4	0.02	0.4	0.01
		02-20-91	36.75	14.0	7.0	6	694	9.5	<0.01	0.2	0.01
		03-21-91	34.89	13.5	6.0	12	720	9.4	<0.01	<0.2	0.03
		04-17-91	31.81	14.5	6.0	10	739	9.2	<0.01	0.3	0.02
		05-14-91	31.77	14.0	4.0	4	810	9.4	<0.01	0.2	0.02
		06-18-91	31.92	13.5	6.0	5	730	9.4	<0.01	0.3	0.02
		07-16-91	33.63	14.0	4.0	5	720	9.4	0.07	0.2	0.03
		08-20-91	56.92	14.0	6.0	10	710	9.3	<0.01	<0.2	0.04
		09-18-91	88.07	13.5	6.0	5	710	9.3	<0.01	0.3	0.03
		10-22-91	110.21	14.5	9.0	5	730	9.6	<0.01	<0.2	0.05
		11-14-91	117.38	14.5	7.0	5	730	9.4	<0.01	<0.2	0.03
		12-17-91	125.79	13.5	8.0	5	710	9.4	<0.01	<0.2	0.03

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
16	10N.05E.02.233A	01-12-90	0.5	0.01	--	0.1	14	630	--	--
		02-13-90	0.3	0.21	--	0.4	15	630	--	--
		03-19-90	0.4	0.01	--	<0.1	15	620	--	--
		05-21-90	0.3	<0.01	--	0.1	12	650	--	--
		06-15-90	0.4	<0.01	--	0.1	15	640	--	--
		07-18-90	0.3	<0.01	--	0.5	13	640	--	--
		08-17-90	0.5	0.01	--	0.1	14	640	--	--
		09-13-90	0.3	0.01	--	0.3	13	650	--	--
		10-18-90	0.3	0.02	<0.01	0.3	13	630	--	--
		11-26-90	0.3	0.03	<0.01	0.5	14	640	--	--
		12-17-90	0.3	<0.01	<0.01	0.2	63	650	--	--
		01-10-91	0.4	<0.01	<0.01	0.3	14	630	--	--
		02-20-91	0.3	<0.01	<0.01	0.2	14	650	--	--
		03-21-91	0.31	0.02	0.03	0.6	13	50	--	--
		04-17-91	0.29	<0.01	<0.01	0.2	14	640	--	--
		05-14-91	0.25	0.01	<0.01	0.1	16	650	--	--
		06-18-91	0.21	<0.01	<0.01	0.3	16	630	--	--
		07-16-91	0.23	<0.01	0.03	0.4	13	630	--	--
		08-20-91	0.24	0.01	<0.01	0.7	15	650	<0.010	<0.2
		09-18-91	0.49	0.02	0.01	0.2	14	650	0.018	<0.2
		10-22-91	0.13	<0.01	<0.01	0.6	16	650	--	--
		11-14-91	0.24	<0.01	<0.01	0.4	19	640	--	--
		12-17-91	0.30	<0.01	<0.01	0.3	21	680	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
17	09N.05E.12.241	01-12-90	32.08	11.0	--	--	1,030	7.1	0.03	<0.2	<0.01
		02-15-90	31.67	11.0	--	--	--	7.2	<0.01	0.5	<0.01
		03-16-90	31.14	10.5	--	--	1,190	7.2	0.01	0.6	<0.01
		05-23-90	31.66	12.0	--	5	1,180	7.1	<0.01	0.3	<0.01
		06-12-90	31.91	14.0	--	11	1,160	7.2	0.01	0.5	<0.01
		07-24-90	31.78	11.5	--	10	1,140	7.3	0.01	0.6	<0.01
		08-21-90	31.96	11.5	--	8	1,130	7.3	0.02	0.5	<0.01
		09-18-90	33.80	13.0	4.0	12	1,130	7.5	<0.01	0.5	<0.01
		10-15-90	32.03	11.5	4.0	10	1,090	7.1	<0.01	0.8	<0.01
		11-15-90	--	11.0	4.0	3	1,130	7.1	<0.01	0.5	<0.01
		12-12-90	32.15	12.0	6.0	10	1,170	7.5	0.02	0.5	<0.01
		01-18-91	31.60	--	6.0	5	1,100	7.1	<0.01	0.8	<0.01
		02-22-91	31.54	11.5	6.0	6	1,030	7.1	<0.01	0.5	<0.01
		03-13-91	31.40	12.0	5.0	15	1,180	7.3	0.05	0.5	<0.01
		04-16-91	31.91	11.5	12.0	60	1,260	7.1	<0.01	0.3	<0.01
		05-15-91	32.04	12.5	3.0	4	1,110	7.1	0.01	0.4	0.01
		06-19-91	32.16	11.5	6.0	10	1,180	7.1	0.02	0.4	<0.01
		07-12-91	32.15	11.0	6.0	10	1,180	7.1	0.05	0.5	<0.01
		08-15-91	30.77	11.5	3.0	15	1,010	7.1	0.01	0.5	<0.01
		09-20-91	31.08	11.5	6.0	10	1,100	7.2	<0.01	0.6	<0.01
		10-18-91	31.69	11.5	15.0	5	1,130	7.1	<0.01	<0.2	<0.01
		11-19-91	31.29	13.5	7.0	10	1,110	7.1	0.01	<0.2	<0.01
		12-13-91	31.24	11.0	12.0	8	1,130	7.2	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
17	09N.05E.12.241	01-12-90	2.8	0.03	--	1.9	110	50	--	--
		02-15-90	2.9	0.02	--	1.8	130	50	--	--
		03-16-90	5.9	0.01	--	1.5	160	40	--	--
		05-23-90	4.3	0.01	--	1.9	150	40	--	--
		06-12-90	4.3	0.02	--	2.2	160	50	--	--
		07-24-90	4.0	0.01	--	1.8	150	50	--	--
		08-21-90	3.8	0.02	--	1.9	140	40	--	--
		09-18-90	4.1	0.03	--	1.9	140	50	--	--
		10-15-90	4.0	<0.01	<0.01	1.6	140	50	--	--
		11-15-90	3.7	<0.01	<0.01	2.0	140	50	--	--
		12-12-90	3.9	0.01	<0.01	2.2	140	50	--	--
		01-18-91	4.1	<0.01	<0.01	1.9	160	50	--	--
		02-22-91	3.7	<0.01	<0.01	1.9	140	40	--	--
		03-13-91	5.3	<0.01	<0.01	2.4	170	50	--	--
		04-16-91	5.2	<0.01	<0.01	1.6	140	50	--	--
		05-15-91	4.9	0.02	<0.01	1.8	170	40	--	--
		06-19-91	5.0	0.01	0.01	2.0	170	50	--	--
		07-12-91	5.2	0.02	0.02	1.7	170	40	--	--
		08-15-91	6.8	0.02	<0.01	2.1	130	50	<0.010	<0.2
		09-20-91	5.5	0.01	0.01	1.8	130	40	0.021	<0.2
		10-18-91	5.1	0.01	0.01	1.7	150	50	--	--
		11-19-91	4.9	0.01	0.02	1.9	140	50	--	--
		12-13-91	5.0	0.03	0.03	1.8	160	40	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
18	10N.05E.22.234	01-09-90	27.40	14.0	--	--	910	7.6	0.01	<0.2	0.02
		02-12-90	26.92	14.0	--	--	900	7.6	0.01	0.3	0.02
		03-13-90	26.57	13.5	--	20	910	7.7	<0.01	<0.2	0.03
		05-14-90	26.64	14.5	--	10	890	7.6	<0.01	0.3	0.04
		06-12-90	28.00	16.0	16.0	9	820	7.6	0.01	0.2	0.01
		07-11-90	29.00	15.5	--	15	990	7.3	<0.01	<0.2	<0.01
		08-13-90	28.53	14.0	--	13	930	7.2	0.01	0.2	<0.01
		09-14-90	27.87	14.0	9.0	12	1,030	7.2	<0.01	0.4	<0.01
		10-12-90	27.23	14.0	5.0	12	1,070	7.3	<0.01	0.3	<0.01
		11-19-90	27.00	14.0	4.0	13	920	7.5	0.04	<0.2	<0.01
		12-18-90	27.25	14.5	6.0	11	930	7.4	<0.01	<0.2	<0.01
		01-07-91	27.00	16.0	5.0	15	980	7.6	0.02	0.3	<0.01
		02-15-91	26.76	14.0	7.0	11	910	7.4	<0.01	<0.2	<0.01
		03-19-91	26.83	14.5	10.0	17	825	7.6	0.02	<0.2	0.01
		04-11-91	26.72	14.5	12.0	30	879	7.5	<0.01	<0.2	<0.01
		05-06-91	27.70	15.0	3.0	12	860	7.4	<0.01	<0.2	<0.01
		06-13-91	27.70	14.5	4.0	4	990	7.3	0.01	<0.2	<0.01
		07-09-91	28.30	14.0	5.0	12	980	7.4	<0.01	<0.2	<0.01
		08-14-91	--	14.5	5.0	--	980	7.5	<0.01	<0.2	<0.01
		09-13-91	25.53	14.0	6.0	9	920	7.5	0.03	0.6	<0.01
		10-15-91	25.45	14.5	7.5	14	880	7.6	--	--	--
		10-16-91	--	--	--	--	--	--	<0.01	<0.2	0.02
		11-18-91	26.42	14.5	8.0	29	875	7.6	0.02	<0.2	0.02
		12-12-91	--	--	--	--	--	--	0.01	<0.2	0.03
		12-16-91	26.34	14.0	10.0	16	880	7.6	--	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
18	10N.05E.22.234	01-09-90	0.7	0.02	--	1.1	110	190	--	--
		02-12-90	0.6	0.01	--	0.7	100	190	--	--
		03-13-90	0.5	<0.01	--	0.9	110	190	--	--
		05-14-90	0.4	0.01	--	0.6	110	200	--	--
		06-12-90	0.3	<0.01	--	0.5	85	220	--	--
		07-11-90	0.8	0.01	--	1.0	110	170	--	--
		08-13-90	0.8	0.02	--	0.6	100	160	--	--
		09-14-90	1.3	<0.01	--	0.7	120	150	--	--
		10-12-90	1.3	<0.01	0.01	0.7	130	160	--	--
		11-19-90	0.5	<0.01	<0.01	0.9	110	180	--	--
		12-18-90	0.4	<0.01	<0.01	1.2	89	190	--	--
		01-07-91	0.5	<0.01	<0.01	0.7	110	190	--	--
		02-15-91	0.5	<0.01	0.02	0.7	110	180	--	--
		03-19-91	0.33	<0.01	<0.01	0.9	93	200	--	--
		04-11-91	0.36	<0.01	<0.01	0.8	89	200	--	--
		05-06-91	0.45	<0.01	<0.01	0.7	100	210	--	--
		06-13-91	0.70	<0.01	<0.01	0.8	120	160	--	--
		07-09-91	0.72	<0.01	<0.01	0.7	130	170	--	--
		08-14-91	1.10	<0.01	<0.01	0.9	120	190	<0.010	<0.2
		09-13-91	0.34	<0.01	<0.01	0.9	110	190	0.013	<0.2
		10-15-91	--	--	--	--	--	--	--	--
		10-16-91	0.64	0.01	<0.01	0.7	100	190	--	--
		11-18-91	0.57	<0.01	<0.01	0.7	100	200	--	--
		12-12-91	0.45	<0.01	<0.01	0.8	--	200	--	--
		12-16-91	--	--	--	--	--	--	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
19	10N.06E.13.321	01-29-90	--	13.0	--	--	2,000	7.4	<0.01	<0.2	<0.01
		02-15-90	146.25	13.5	--	--	2,030	7.4	<0.01	<0.2	<0.01
		03-19-90	146.28	14.5	--	--	2,020	7.5	<0.01	0.5	<0.01
		04-18-90	146.31	--	--	--	--	--	--	--	--
		06-12-90	--	16.5	--	11	2,090	7.3	<0.01	0.7	<0.01
		07-09-90	145.91	16.0	--	18	2,010	7.5	0.02	0.3	<0.01
		08-20-90	146.00	14.5	--	12	2,050	7.2	0.02	0.6	<0.01
		09-19-90	145.85	14.5	6.0	10	2,010	7.3	<0.01	0.6	<0.01
		10-17-90	145.85	14.0	4.0	16	1,900	7.3	0.02	0.9	<0.01
		11-20-90	145.99	12.5	8.0	8	1,900	7.3	0.06	0.6	0.01
		12-12-90	146.11	14.5	8.0	12	1,890	7.3	0.02	0.6	<0.01
		01-11-91	146.09	13.5	3.0	15	2,000	7.3	0.02	0.7	<0.01
		02-21-91	145.85	14.5	7.0	6	1,910	7.3	<0.01	0.6	<0.01
		03-15-91	145.79	14.5	12.0	10	1,920	7.4	0.03	0.5	0.01
		04-12-91	145.80	13.5	12.0	16	2,010	7.2	0.01	0.6	<0.01
		05-13-91	--	15.5	3.0	12	1,910	7.1	0.01	0.3	<0.01
		05-17-91	145.73	--	--	--	--	--	--	--	--
		06-18-91	145.88	14.5	6.0	8	1,900	7.3	<0.01	0.5	<0.01
		07-12-91	145.73	14.5	9.0	8	1,960	7.3	0.02	0.5	<0.01
		08-16-91	135.73	14.5	3.0	10	2,100	7.2	0.03	0.5	<0.01
		09-19-91	136.09	14.0	4.0	12	1,460	7.3	<0.01	0.5	<0.01
		10-24-91	141.00	15.0	15.0	12	1,660	7.3	0.02	0.2	<0.01
		11-20-91	142.37	14.5	10.0	9	1,690	7.4	0.02	<0.2	<0.01
		12-18-91	142.71	13.0	15.0	8	1,740	7.3	0.02	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
19	10N.06E.13.321	01-29-90	6.2	0.03	--	2.9	470	50	--	--
		02-15-90	5.8	0.01	--	3.2	470	50	--	--
		03-19-90	6.3	0.02	--	2.9	470	50	--	--
		04-18-90	--	--	--	--	--	--	--	--
		06-12-90	6.1	0.01	--	3.1	480	50	--	--
		07-09-90	6.7	0.02	--	3.2	530	50	--	--
		08-20-90	6.1	0.02	--	3.1	460	50	--	--
		09-19-90	6.6	<0.01	--	3.0	470	50	--	--
		10-17-90	6.8	<0.01	<0.01	3.2	460	50	--	--
		11-20-90	6.7	<0.01	<0.01	2.9	470	50	--	--
		12-12-90	6.6	0.02	<0.01	3.1	440	50	--	--
		01-11-91	8.6	0.02	0.01	3.0	470	50	--	--
		02-21-91	4.3	<0.01	<0.01	3.0	450	50	--	--
		03-15-91	5.8	0.02	<0.01	3.1	250	60	--	--
		04-12-91	6.9	<0.01	<0.01	3.1	480	50	--	--
		05-13-91	6.9	0.03	<0.01	2.6	480	50	--	--
		05-17-91	--	--	--	--	--	--	--	--
		06-18-91	7.1	0.01	0.01	3.2	480	50	--	--
		07-12-91	7.1	0.02	0.02	3.0	520	50	--	--
		08-16-91	7.1	0.02	<0.01	2.9	510	50	<0.010	<0.2
		09-19-91	5.8	0.02	0.02	3.2	300	70	0.025	0.3
		10-24-91	7.1	0.03	0.02	4.5	290	70	--	--
		11-20-91	7.6	<0.01	0.03	3.2	340	60	--	--
		12-18-91	7.2	0.02	0.02	3.3	380	60	--	--

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Continued

Monitoring well number	Well number	Date	Water level, in feet below land surface	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Pump or flow period prior to sampling (min)	Specific conductance (µS/cm)	pH water whole, field (standard units)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)
20	11N.05E.24.443	01-30-90	51.20	13.0	--	10	1,190	7.2	<0.01	<0.2	0.01
		02-12-90	51.01	13.0	--	--	1,190	7.2	<0.01	1.2	<0.01
		03-14-90	49.44	13.5	--	18	1,190	7.3	<0.01	<0.2	<0.01
		05-17-90	49.50	14.0	--	16	1,210	7.1	<0.01	0.7	<0.01
		06-15-90	50.69	16.0	--	15	1,200	7.1	<0.01	0.4	<0.01
		07-11-90	53.00	17.0	--	16	1,250	7.3	<0.01	0.6	<0.01
		08-16-90	50.83	14.0	--	12	1,180	7.2	<0.01	1.3	<0.01
		09-12-90	51.10	14.0	2.0	10	1,190	7.1	<0.01	0.4	<0.01
		10-09-90	50.70	14.0	4.0	14	1,140	7.2	<0.01	1.5	<0.01
		12-06-90	51.09	3.0	5.0	12	1,190	7.3	0.02	0.6	<0.01
		02-28-91	48.25	13.5	7.0	30	1,180	7.2	0.01	0.8	<0.01
		03-20-91	47.71	13.5	8.0	20	1,190	7.2	0.03	0.4	0.01
		07-16-91	49.90	13.5	4.0	12	1,160	7.2	0.08	1.0	<0.01
		08-20-91	44.18	13.5	12.0	10	1,180	7.2	<0.01	0.3	<0.01
		09-11-91	43.90	13.5	7.5	9	1,170	7.1	<0.01	1.0	<0.01
		10-17-91	45.10	14.0	6.5	11	1,180	7.2	<0.01	<0.2	<0.01
		11-12-91	44.44	13.5	12.0	7	1,160	7.2	<0.01	<0.2	<0.01
		12-17-91	44.81	13.0	3.0	15	1,180	7.1	<0.01	<0.2	<0.01

Table 14.--Results of field determinations and laboratory analyses of samples collected from monthly monitoring wells--Concluded

Monitoring well number	Well number	Date	Nitrogen, NO_2+NO_3, total (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus, ortho, total (mg/L as P)	Carbon, organic, total (mg/L as C)	Chloride, dissolved (mg/L as Cl)	Boron, dissolved (µg/L as B)	Phosphorus, total wat wh, modified Jirka, total as P (mg/L)	Nitrogen, ammonia + organic wat wh, modified Jirka, total as N (mg/L)
20	11N.05E.24.443	01-30-90	2.1	0.02	--	1.3	150	60	--	--
		02-12-90	5.1	0.10	--	--	150	70	--	--
		03-14-90	23	0.02	--	1.5	160	70	--	--
		05-17-90	24	0.03	--	1.6	160	60	--	--
		06-15-90	24	0.01	--	1.5	150	60	--	--
		07-11-90	24	0.03	--	1.7	180	60	--	--
		08-16-90	22	0.02	--	1.5	150	60	--	--
		09-12-90	23	0.02	--	1.2	170	70	--	--
		10-09-90	22	0.04	<0.01	1.6	150	60	--	--
		12-06-90	18	0.02	0.02	1.5	160	60	--	--
		02-28-91	20	0.02	0.02	1.5	160	60	--	--
		03-20-91	18	0.02	<0.01	1.2	160	70	--	--
		07-16-91	20	0.05	0.02	1.0	160	70	--	--
		08-20-91	18	0.02	<0.01	1.3	150	70	<0.010	<0.2
		09-11-91	19	0.03	<0.01	1.3	170	70	<0.010	<0.2
		10-17-91	19	0.04	0.02	1.0	160	50	--	--
		11-12-91	19	0.03	0.03	1.6	170	60	--	--
		12-17-91	18	0.02	0.02	1.2	150	70	--	--

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