GROUND-WATER DATA

for

LOGAN COUNTY, NORTH DAKOTA

By

Robert L. Klausing

U.S. Geological Survey

COUNTY GROUND-WATER STUDIES 34 — PART II
North Dakota State Water Commission
Vernon Fahy, *State Engineer*

BULLETIN 77 — PART II
North Dakota Geological Survey
Don L. Halvorson, *State Geologist*

Prepared by the U.S. Geological Survey
in cooperation with the North Dakota State Water Commission,
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Bismarck, North Dakota

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OF METRIC UNITS

A dual system of measurements--inch-pound units and the International System (SI) of metric units--is given in this report. SI is an organized system of units adopted by the 11th General Conference of Weights and Measures in 1960. Selected factors for converting inch-pound units to SI units are given below.

Multiply inch-pound unit	By	To obtain SI unit
Acre	0.4047	hectare (ha)
Foot (ft)	0.3048	meter (m)
Inch (in.)	25.4	millimeter (mm)

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INTRODUCTION

The investigation of the geology and occurrence of ground water in Logan County (fig. 1) was made cooperatively by the U.S. Geological Survey, North Dakota State Water Commission, North Dakota Geological Survey, and Logan County Water Management District. The results of the investigation will be published in three separate parts. Part I, which has been published, is an interpretive report describing the geology of the study area; part II is a compilation of the ground-water data collected; and part III is an interpretive report describing the ground-water resources. Part II (this report) makes available the geologic and hydrologic data collected during the county investigation and functions as a reference for part III.

Purpose

The purpose of the investigation was to determine the availability and quality of ground water for municipal, domestic, livestock, industrial, and irrigation uses. Specifically, the objectives were to (1) determine the location, extent, and nature of the major aquifers and confining beds; (2) evaluate the occurrence and movement of ground water, including the sources of recharge and discharge; (3) estimate the quantities of water stored in the aquifers; (4) estimate the potential yields of wells tapping the major aquifers; (5) evaluate the chemical quality of the ground water; and (6) estimate the water use.

Location-Numbering System

The location-numbering system used in this report is based on the public land classification system used by the U.S. Bureau of Land Management. The system is illustrated in figure 2. The first numeral denotes the township north of a base line, the second numeral denotes the range west of the fifth principal meridian, and the third numeral denotes

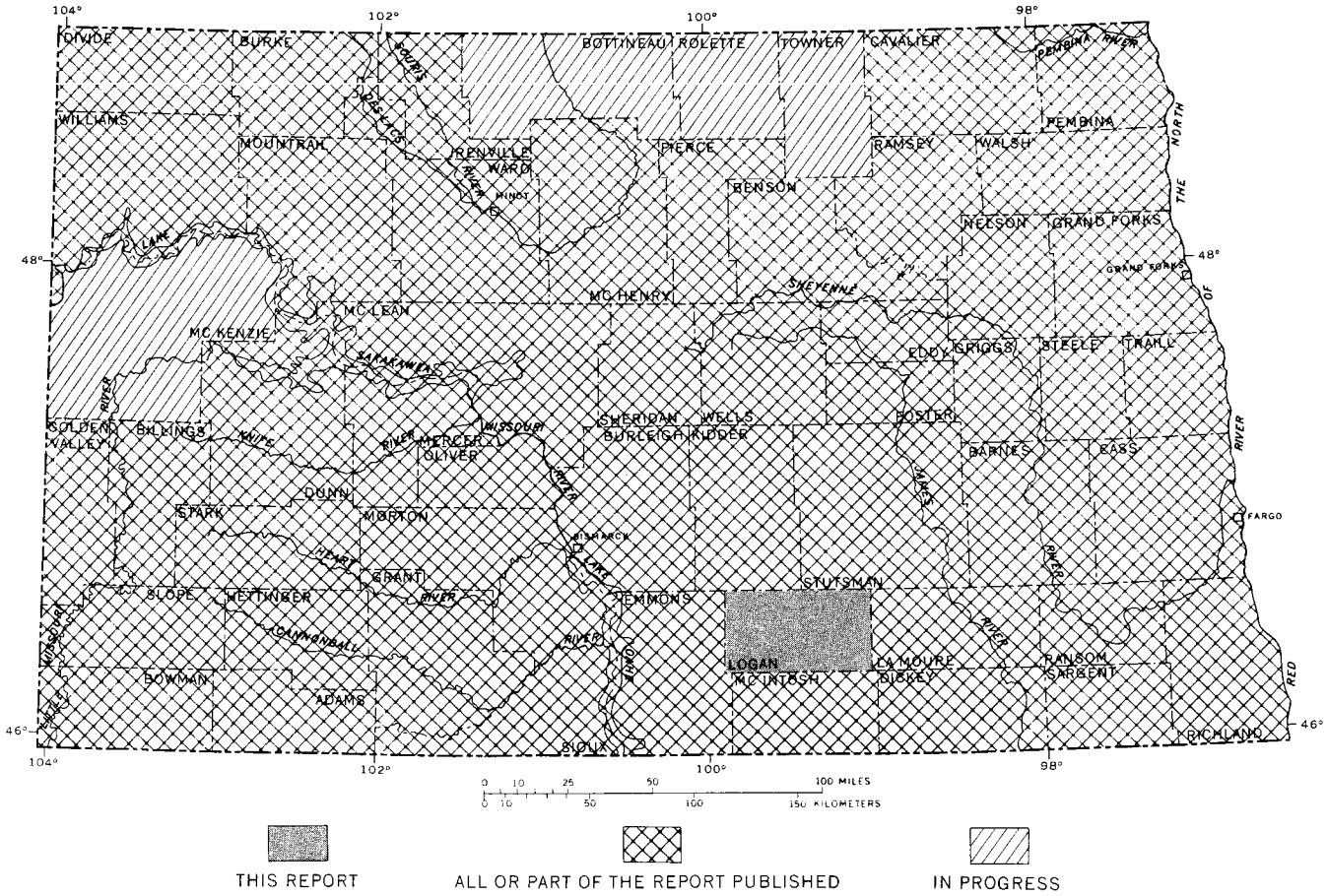

FIGURE 1.—County ground-water studies in North Dakota.

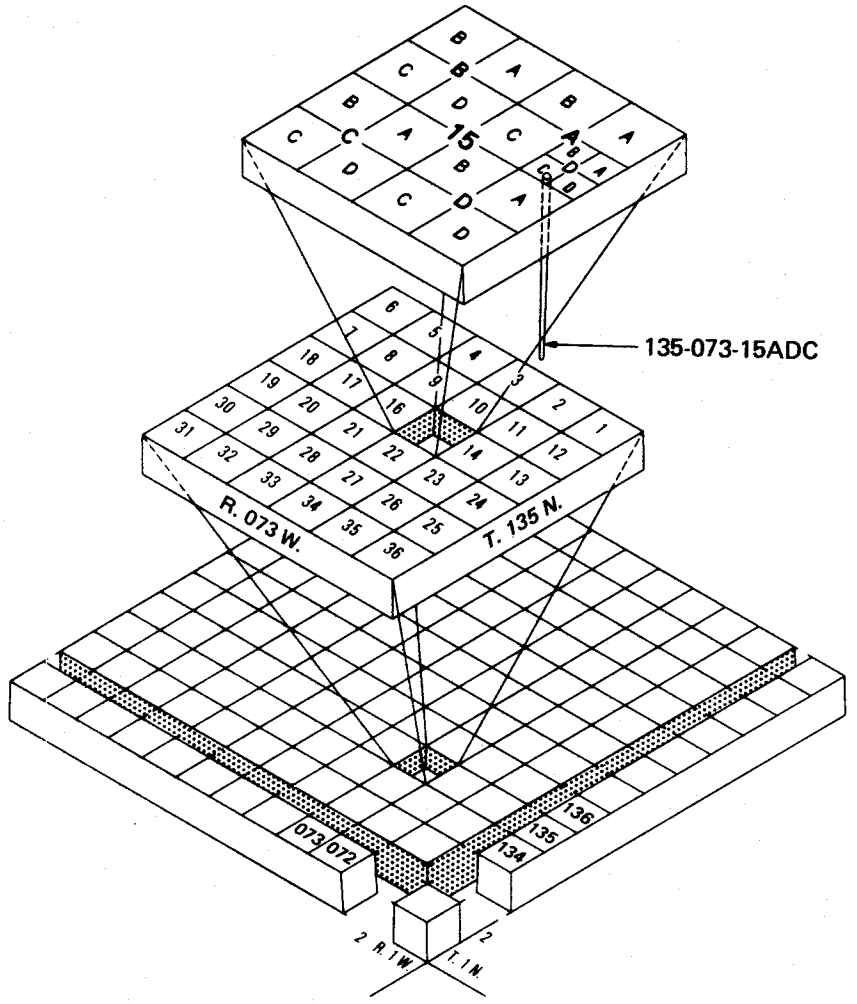

FIGURE 2.—Location-numbering system.

the section in which the well is located. The letters A, B, C, and D designate, respectively, the northeast, northwest, southwest, and southeast quarter section, quarter-quarter section, and quarter-quarter-quarter section (10-acre or 4-ha tract). For example, well 135-073-15ADC is in the SW1/4SE1/4NE1/4 sec. 15, T. 135 N., R. 73 W. Consecutive terminal numerals are added if more than one well or test hole is recorded within a 10-acre (4-ha) tract. The location of each well and test hole in the tables is shown on plate 1 (in pocket).

Acknowledgments

The collection of data for this report was made possible by the cooperation of residents and officials of Logan County, who furnished information on wells and permitted water-level measurements and the collection of water samples. Recognition is due to the following personnel of the North Dakota State Water Commission: P. A. Burke, A. E. Comeskey, and Gary Calheim for drilling and logging test holes; G. O. Muri for chemical analyses of water samples; T. L. Johnson for hydrologic testing; and M. O. Lindvig for scheduling of drilling. Thanks are due to the well drillers and drilling companies that furnished drillers' logs and other information in this report.

EXPLANATION OF TABLES AND METHODS OF DATA COLLECTION

The data in this report, which were collected chiefly between 1978 and 1980, are listed in tables 1-5. The points of collection are shown on plate 1. The data consist of the following: (1) Geologic and hydrologic records for 523 wells and test holes; (2) water-level measurements in 79 observation wells; (3) lithologic and geophysical logs of 422 test holes and wells; (4) chemical analyses of 224 ground-water samples; and (5) chemical analyses of trace elements in water from 3 selected wells. The data are useful for evaluating geologic and ground-water conditions in Logan County. For example, a person considering the construction of a new well can locate the proposed site on plate 1. Depths, lithologies, water levels, and water quality of nearby wells and test holes tapping the different aquifers can be determined from the tables. However, use of the data as a guide to conditions at different sites should be made with

caution because of the lenticular character of the water-bearing rocks and varying water quality in some aquifers.

Records of Wells and Test Holes

Records of selected wells and test holes are listed in table 1. Well depth is the depth of casing for open-bottom wells or the base of the well screen, if there is one. Many test holes drilled by the North Dakota State Water Commission were converted to observation wells for periodic water-level measurements and water-quality sampling. At some sites two or three observation wells were drilled in order to obtain water levels and water samples from several aquifers. The North Dakota State Water Commission observation wells were constructed of 1¼-inch (32-mm) plastic casing with 3- or 6-foot (1- or 2-m) metal galvanized screens. The observation wells were developed by backwashing and were pumped by airlift a minimum of 8 hours before water samples were collected for analysis.

Water Levels in Selected Wells

Table 2 lists the monthly and intermittent water levels in selected wells, in feet below (or + above) land surface that tap the major aquifers in Logan County. The water-level measurements made as part of this investigation began in the fall of 1978 and extended through November 1979. Measurements will continue to be made in several wells as part of the statewide observation-well network to monitor changes in water levels as the ground-water resources of the area are developed.

Logs of Wells and Test Holes

Logs collected from water-well drillers and other sources and logs of test holes drilled as part of this project are included in table 3. Minor changes in word order have been made on the drillers' logs; however, geologic interpretations shown on commercial and private well logs are those of the drillers. Most test holes drilled during this project and some municipal, industrial, and private wells have geophysical logs in addition to a description of the materials penetrated. The geophysical logs are extremely useful for geologic correlation purposes. Grain-size determinations refer to the Wentworth (1922) size scale. The color

descriptions were determined by comparing fresh samples with the Geological Society of America's rock color chart (1963).

Water Quality

The chemical constituents and physical properties of water are reported in the tables of analyses (tables 4-5). Water for samples was secured from privately owned wells by using the existing pumps and from the North Dakota State Water Commission observation wells by airlift. Generally enough water was pumped to clear the well column and plumbing, then the sample was collected in a polyethylene bottle. For those metals considered unstable, a separate sample was filtered and acidified before transport to the laboratory. Most of the samples were analyzed by the North Dakota State Water Commission, Bismarck, N. Dak. The analyses of trace elements (table 5) were made by the U.S. Geological Survey, Lakewood, Colo. Methods of analyses were qenerally those described by Brown and others (1970). The results are expressed in milligrams per liter (mg/L) or micrograms per liter (ug/L). A microgram per liter is one-thousandth of a milligram per liter.

According to regulations established by the North Dakota State Department of Health (1977) the maximum contaminant levels for inorganic chemicals in public water supplies are as follows.

Contaminant	*Maximum limit in mg/L*
Arsenic (As)	*0.05*
Barium (Ba)	*1.0*
Cadmium (Cd)	*.01*
Chromium (Cr)	*.05*
Fluoride (F)	*2.4*
Lead (Pb)	*.05*
Mercury (Hg)	*.002*
Nitrate (As N)[1]	*10.0*
Selenium (Se)	*.01*
Silver (Ag)	*.05*

[1]*The maximum contaminant level for nitrate is applicable to both community and noncommunity water systems. The levels for other inorganic chemicals apply only to community water supply systems. (Noncommunity water systems primarily provide service to transients.)*

Mineral Constituents in Solution

Silica (SiO_2)

Weathering processes dissolve silica from practically all rocks. Silica affects the usefulness of water because it contributes to the formation of scale in pipes, water heaters, and boilers. Concentrations of silica in ground water usually range from 10 to 30 mg/L.

Iron (Fe)

Iron compounds are common in rocks and are easily leached by ground water. On exposure to air, water with iron concentrations greater than 100 ug/L soon becomes turbid with the insoluble reddish ferric oxide produced by oxidation. The recommended limit of iron in water is 300 ug/L. Concentrations greater than this will impart a metallic taste to drinking water and cause reddish-brown stains on porcelain, enamelware and fixtures, and fabrics washed in the water. Concentrations of iron in ground water are usually less than 10,000 ug/L.

Manganese (Mn)

Water containing more than 50 ug/L of manganese is objectionable because of its effect on taste, staining of plumbing fixtures, spotting of laundered clothes, and accumulation of deposits in distribution systems. Ground water that contains high concentrations of iron may also have considerable amounts of manganese.

Calcium (Ca)

Calcium may be leached from most rocks. It is a major cause of hardness and forms scale on utensils, boilers, and pipes. Concentrations of calcium in ground water may be several hundred milligrams per liter.

Magnesium (Mg)

Magnesium is dissolved from many rocks, particularly from dolomitic rocks. Its effect in water is similar to that of calcium. Concentrations of magnesium in soft water range from 1 to about 5 mg/L, but in areas that contain large quantities of dolomite or other magnesium-bearing rocks the water may have magnesium concentrations exceeding 100 mg/L.

Sodium and Potassium (Na and K)

Sodium and potassium are dissolved from practically all rocks. Sodium dissolves readily and when brought into solution it tends to stay in solution. Potassium is dissolved with greater difficulty and exhibits a stronger tendency to be reincorporated into solid weathering products such as clay minerals. Moderate quantities of sodium and potassium have little effect on the usefulness of water, but water with concentrations of sodium and potassium exceeding 50 mg/L may cause foaming in steam boilers. More highly mineralized water that contains a large proportion of sodium salts may be unsatisfactory for irrigation. There is no recommended limit of intake of sodium for healthy persons; however, various restricted-sodium diets are recommended by physicians for persons suffering from hypertension, edema associated with congestive cardiac failure, and women with toxemias of pregnancy (National Academy of Sciences-National Academy of Engineering, 1972, p. 88).

Bicarbonate and Carbonate (HCO_3 and CO_3)

Bicarbonate and carbonate ions are the major cause of alkalinity in most water. The significance of alkalinity to the domestic, agricultural, and industrial user is usually dependent upon the nature of the cations (Ca, Mg, Na, and K) in the water. However, moderate amounts of alkalinity (400 to 500 mg/L as $CaCO_3$) do not adversely affect most uses.

Alkalinity, expressed as milligrams per liter, can be calculated from the analyses by using the formula:

$$\text{Alkalinity (as } CaCO_3) = 0.82(HCO_3)+1.67(CO_3)$$

Sulfate (SO_4)

Metallic sulfide minerals in both sedimentary and igneous rocks are converted to sulfates upon weathering or oxidation. Sulfate may also be dissolved from deposits of gypsum and sodium sulfate. Water having sulfate concentrations in excess of 250 mg/L may be distasteful and also may have a laxative effect.

Chloride (Cl)

Chlorides are generally very soluble compounds and are present in most rocks, especially in sedimentary rocks deposited in a marine environment. Large quantities of chloride may affect the industrial use of water by increasing the corrosiveness of water that contains large quantities of calcium and magnesium. Water having a concentration of more than 250 mg/L generally will have a salty taste.

Fluoride (F)

Fluoride in ground water is derived by dissolution of the minerals fluorite, apatite, and hornblende.

Investigations have shown that certain fluoride concentrations have a beneficial effect on the structure and resistance to decay of children's teeth, whereas ingestion of excessive concentrations of fluoride may cause staining or mottling of the teeth.

Excessive fluoride concentrations for a specific water supply depend on climatic conditions because the amount of water and, consequently, the amount of fluoride ingested by children is primarily influenced by air temperature. The following table (National Academy of Sciences-National Academy of Engineering, 1972, p. 66) relates air temperature to maximum intake of fluoride.

Annual average of daily air temperature[1]	*Fluoride maximum in mg/L*
80-91	*1.4*
72-79	*1.6*
65-71	*1.8*
59-64	*2.0*
55-58	*2.2*
50-54	*2.4*

[1]*Based on [Fahrenheit] temperature data obtained for a minimum of 5 years.*

Nitrate (NO_3)

High nitrate concentrations are found in many shallow wells on farms and in small rural communities. The origin of high nitrate concentrations in shallow ground water has been attributed to leaching from feedlots and barnyards, leakage from septic tanks, and seepage from irrigated fields fertilized with nitrogen compounds. Water containing nitrate concentrations in excess of 45 mg/L may cause methemoglobinemia in infants.

Boron (B)

Boron is a constituent of the mineral tourmaline and may be present in biotite and amphibole minerals. Boron is an essential element for the growth of plants; however, some plants are more tolerant of boron than others. The maximum boron concentration for sensitive plants is 750 ug/L, 1,000 and 2,000 ug/L, respectively, for semitolerant and tolerant plants. Additional information regarding sensitivity of plants can be found in "Water Quality Criteria, 1972," page 341, or in "U.S. Department of Agriculture Handbook 60, 1954."

Dissolved solids

The reported quantity of dissolved solids--the residue on evaporation--consists mainly of the dissolved mineral constituents in the water. It may also contain some organic material and water of crystallization. Water with less than 500 mg/L of dissolved solids is usually satisfactory for domestic and some industrial uses. Water containing more than about 2,000 mg/L is considered to be unsuitable for long-term irrigation under average conditions. However, water with dissolved-solids concentrations greater than 2,000 mg/L is sometimes successfully used for irrigation where practices permit the removal of soluble salts through the application of large volumes of water on well-drained lands.

Properties and Characteristics of Water

Hardness

Calcium and magnesium are the principal cause of hardness. Hardness exhibits the characteristics of requiring greater quantities of soap to produce a lather as the hardness increases. Hard water also can contribute to the formation of scale in boilers, water heaters, radiators, and pipes, with a resultant decrease in the rate of water flow and heat transfer.

The hardness that is equivalent to the alkalinity is called carbonate hardness, and any excess is called noncarbonate hardness. The carbonate hardness is the quantity that will contribute scale on heating and the noncarbonate hardness is the quantity of hardness that will remain after precipitation of the carbonate hardness. As a general reference, the

U.S. Geological Survey has provided the following classification of water hardness.

Calcium and magnesium hardness, as $CaCO_3$ (milligrams per liter)	Hardness description
0-60	Soft
61-120	Moderately hard
121-180	Hard
More than 181	Very hard

Percent sodium and sodium-adsorption ratio (SAR)

The percent sodium is the percentage of sodium to all cations, with the cations in milliequivalents per liter. The displacement of calcium and magnesium by sodium in soils is slight unless the percent sodium is considerably greater than 50.

The term sodium-adsorption ratio (SAR) was introduced by the U.S. Salinity Laboratory Staff, U.S. Department of Agriculture (1954). Their experiments show that the SAR relates to the degree water enters into cation-exchange reactions with soil. SAR is expressed by the equation:

$$SAR = \frac{Na^{+}}{\sqrt{\frac{Ca^{++}+Mg^{++}}{2}}}$$

where the concentrations of the ions are expressed in milliequivalents per liter. The U.S. Salinity Laboratory Staff (1954) divided water into 16 classes, depending upon the SAR and specific conductance. The classifications indicate the usefulness of water for irrigation of different crops on different types of soil.

Specific conductance (micromhos per centimeter at 25°C)

Specific conductance is a measure of the ability of water to conduct an electric current. Approximately 0.65 to 0.70 of the specific conductance (in micromhos) is an estimate of the amount of dissolved solids (in milligrams per liter) in water; however, this relation is not constant and will vary with the chemical composition of the water (Hem, 1970).

Hydrogen-ion concentration (pH)

Hydrogen-ion concentration (activity) is expressed in terms of pH units. The values of pH often are used as one measure of the solvent power of water.

The hydrogen-ion concentrations affect the corrosiveness of water. A pH of 7.0 indicates that the water is neutral, neither acidic nor basic. Readings progressively lower than 7.0 denote increasing acidity, and those progressively higher than 7.0 denote increasing alkalinity.

Temperature

Temperature is an important factor in evaluating the usefulness of water. This is evident for such a direct use as an industrial coolant. Temperature is also important, but perhaps not so evident, for its influence upon concentrations of dissolved gases and mineral matter in water. Water temperatures given in the tables are expressed in degrees Celsius (Centigrade). Degrees Celsius and the equivalent temperature in degrees Fahrenheit are given in the following table.

Degrees Celsius (°C)	Degrees Fahrenheit (°F)	Degrees Celsius (°C)	Degrees Fahrenheit (°F)	Degrees Celsius (°C)	Degrees Fahrenheit (°F)
3.5	38	12.5	54	21.5	71
4.0	39	13.0	55	22.0	72
4.5	40	13.5	56	22.5	72
5.0	41	14.0	57	23.0	73
5.5	42	14.5	58	23.5	74
6.0	43	15.0	59	24.0	75
6.5	44	15.5	60	24.5	76
7.0	45	16.0	61	25.0	77
7.5	45	16.5	62	25.5	78
8.0	46	17.0	63	26.0	79
8.5	47	17.5	63	26.5	80
9.0	48	18.0	64	27.0	81
9.5	49	18.5	65	27.5	81
10.0	50	19.0	66	28.0	82
10.5	51	19.5	67	28.5	83
11.0	52	20.0	68	29.0	84
11.5	53	20.5	69	29.5	85
12.0	54	21.0	70	30.0	86

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TABLE 1.--Records of wells and test holes

Owner

NDSPS, North Dakota State Park Service

NDSWC 5488, North Dakota State Water Commission, test hole number 5488

USGS 309, United States Geological Survey, test hole number 309

Water level (feet)

Water level, in feet below or (+) above land surface

D, dry
F, flowing
P, pumping
R, recently pumped
S, nearby pumping
Z, other

Use of water

D, dewater
H, domestic
I, irrigation
P, public supply
R, recreation
S, stock
U, unused
Z, other

Principal aquifer

112, Pleistocene
211, Upper Cretaceous
217, Lower Cretaceous

BGFV, buried glaciofluvial deposits
BVLK, Beaver Lake aquifer
DKOT, Dakota Formation
FXHL, Fox Hills Sandstone
HBRG, Hillsburg aquifer system
MCNS, McIntosh aquifer
NPLN, Napoleon aquifer
OTSH, outwash deposits
PIRR, Pierre Shale
STRR, Streeter aquifer
WSHK, Wishek aquifer system

Specific conductance

Value shown is the field specific conductance measured at the well at the time of inventory.

Altitude of land surface (feet)

National Geodetic Vertical Datum of 1929 (NGVD) is a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in this series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

LOCAL NUMBER	OWNER	DEPTH DRILLED (FEET)	DEPTH OF WELL (FEET)	DEPTH TO FIRST OPENING (FEET)	CASING DIAMETER (INCHES)	DATE COMPLETED	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED	USE OF WATER	PRINCIPAL AQUIFER	SPECIFIC CONDUCTANCE (µMHO/CM AT 25°C)	TEMPERATURE (DEGREES C)	ALTITUDE OF LAND SURFACE (FEET)
133-067-01CAB	MILLER, NORMAN	178	--	--	--	06/29/1977	--		--	--	--	--	--	--
133-067-02BAD1	SCHULTZ, RALPH	100	80	60	4	11/20/1975	40.00		11/20/1975	S	--	--	--	--
133-067-02BAD2	SCHULTZ, RALPH	--	80	--	--	04/01/1976	--		--	S	--	1800	8.5	--
133-067-02CBC	IRION, EUGENE	79	79	--	--	07/08/1977	39.00		07/08/1977	S,H	112BGFV	5000	8.0	--
133-067-08DDD	NDSWC 5488	377	--	--	--	07/09/1979	--		--	U	--	--	--	2061
133-067-11CCC	NDSWC 5487	407	--	--	--	07/04/1979	--		--	U	--	--	--	2034
133-067-14BBB	LAUTT, LORENZE	300	300	280	4	12/19/1975	160.00		12/19/1975	S	112BGFV	1500	7.0	--
133-067-15CDB	GUTSCHMIDT, R.	96	96	92	4	12/26/1972	30.00		12/26/1972	H	112BGFV	1550	--	--
133-067-18DAA	KREUGER, LLOYD	85	85	--	--	08/13/1975	5.00		08/13/1975	S	112BGFV	1250	--	--
133-067-24BBC	HERMAN, KENNETH	--	538	--	--	01/01/1918	--		--	S	211PIRR	8000	7.0	--
133-067-29CAA	WITTMAYER, HAROLD	56	56	--	24	07/10/1975	15.00		07/10/1975	S	112BGFV	--	--	--
133-067-29CCB1	NDSWC 5486	257	--	--	--	07/04/1979	--		--	U	--	--	--	2051
133-067-29CCB2	NDSWC 5486A	257	77	74	1.25	07/04/1979	12.14		07/17/1979	U	112BGFV	960	9.0	2051
133-067-29DCB	MUNSCH, HERMAN	38	38	34	4	05/03/1973	12.00		05/03/1973	S	112BGFV	3500	7.0	--
133-067-31CCC	NDSWC 5485	137	--	--	--	07/04/1979		D	--	U	--	--	--	2095
133-068-10BDB	RUFF, FLOYD	41	41	--	24	06/16/1975	15.00		06/16/1975	S	112BGFV	3300	7.0	--
133-068-11DAD	ENTZI, ANDY	22	22	--	24	11/22/1975	8.00		11/22/1975	S,H	112UTSH	1650	8.0	--
133-068-15CCC	NDSWC 5483	197	--	--	--	07/03/1979	--		--	U	--	--	--	2082
133-068-17BBB	BADER, ALVIN	19	19	--	24	05/27/1975	8.00		11/02/1977	S	112UTSH	--	--	--
133-068-21AAD	ENTZIE, ALVIN	74	74	--	24	05/29/1974	45.00		05/29/1974	S	112BGFV	3800	7.0	--
133-068-23CBC	KRUEGER, ELMER	35	35	--	24	09/16/1977	15.00		09/16/1977	H,S	112UTSH	--	--	--
133-068-23DAC	KRUEGER, RAYMOND	518	249	249	4	09/14/1974	--		--	--	211PIRR	--	--	--
133-068-28CCC	NDSWC 5481	197	--	--	--	07/02/1979	--		--	U	--	--	--	2035
133-068-30BCB	NDSWC 5479	152	121	118	1.25	06/29/1979	23.86		08/07/1979	U	112MCNS	2250	8.0	2059
133-068-32DDD	MAHONE, DONALD	50	50	--	24	05/03/1975	12.00		05/03/1975	S	112MCNS	1400	--	--
133-068-35BBB	NDSWC 5482	212	--	--	--	07/03/1979	--		--	U	--	--	--	2044
133-068-35BCC	NDSWC 11244	280	22	19	1.25	05/02/1980		D	05/06/1980	U	--	--	--	2037
133-068-36CCC	NDSWC 5484	227	--	--	--	07/03/1979	--		--	U	--	--	--	2062
133-069-01CDD	BUCHHOLZ, RALPH	48	48	--	24	05/29/1975	28.00		05/29/1975	H,S	112BGFV	2000	9.1	--
133-069-05DDD	NDSWC 5475	137	--	--	--	06/28/1979	--		--	U	--	--	--	1987
133-069-12BCD	BUCHHOLZ, LYDIA	140	140	120	4	10/28/1977	60.00		10/28/1977	S	211FXHL	2300	8.2	--
133-069-12CAA	BUCHHOLZ, LYDIA	92	52	--	24	06/07/1975	50.00		06/07/1975	H,S	--	--	--	--
133-069-12CCC	NDSWC 5478	197	--	--	--	06/28/1979	--		--	U	--	--	--	2056
133-069-21ABB	BOSCHEE, CLEO	26	26	--	24	02/25/1976	12.10	Z	07/18/1978	S	112BGFV	--	--	--
133-069-22BBB1	BELLON, JOHN	140	140	100	4	09/ /1973	60.00		09/ /1973	S	211FXHL	1250	7.9	--
133-069-22BBB2	NDSWC 5477	167	--	--	--	06/28/1979	--		--	U	--	--	--	2021
133-069-27CCC	NDSWC 1113	150	--	--	--	1956	--		--	--	--	--	--	--
133-069-31AAA	WETZEL, ARNOLD	20	20	--	24	06/12/1974	5.00		06/12/1974	H,S	112BGFV	1800	9.9	--
133-069-32DCD	NDSWC 1104	120	--	--	--	1956	--		--	--	--	--	--	--
133-069-33DBA	OPP, HERBERT	23	23	--	24	11/01/1974	8.60		07/19/1978	H,S	112BGFV	--	--	--

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133-069-33D8D	NDSWC 1114	130	--	--	--	1956	--		--	--	--	--	--	--
133-069-33DCD	NDSWC 1103	130	--	--	--	1956	--		--	--	--	--	--	--
133-069-33DDC1	NDSWC 1101	140	--	--	--	1956	--		--	--	--	--	--	--
133-069-33DDC2	LEHR, ND	160	--	--	--	04/26/1976	--		--	--	--	--	--	--
133-069-33DDC3	LEHR, ND	170	--	--	--	04/26/1976	--		--	--	--	--	--	--
133-069-33DDC4	LEHR, ND	170	--	--	--	04/28/1976	--		--	--	--	--	--	--
133-069-33DDC5	LEHR, ND	160	160	140	2.50	04/29/1976		F	--	U	112BGFV	--	--	--
133-069-33DDD1	LEHR, ND	160	--	--	--	04/22/1976	--		--	--	--	--	--	--
133-069-33DDD2	LEHR, ND	200	--	--	--	04/26/1976	--		--	--	--	--	--	--
133-069-33DDD3	LEHR, ND	180	--	--	--	04/28/1976	--		--	--	--	--	--	--
133-069-33DDD4	LEHR, ND	160	160	140	6	--		F	05/ /1976	P	112BGFV	1990	9.0	--
133-069-34ADD	NDSWC 5480	152	--	--	--	06/29/1979	--		--	U	--	--	--	2117
133-069-34BCC	NDSWC 1102	160	--	--	--	1956	--		--	--	--	--	--	--
133-069-34CCB	NDSWC 1099	450	--	--	--	1956	--		--	--	--	--	--	--
133-069-34CCC1	LEHR, ND	180	--	--	--	04/19/1976	--		--	--	--	--	--	--
133-069-34CCC2	LEHR, ND	180	--	--	--	04/20/1976	--		--	--	--	--	--	--
133-069-34CCC3	LEHR, ND	180	--	--	--	04/21/1976	--		--	--	--	--	--	--
133-069-34CCC4	LEHR, ND	180	--	--	--	04/21/1976	--		--	--	--	--	--	--
133-069-34CCC5	LEHR, ND	180	--	--	--	04/21/1976	--		--	--	--	--	--	--
133-069-35CCC	NDSWC 1112	190	--	--	--	1956	--		--	--	--	--	--	--
133-069-35CDC	HUCHHALTER, ELMER	75	75	--	24	08/22/1975	47.00		08/22/1975	S	112BGFV	1700	--	--
133-069-36DAC	BUCHHOLZ, LUTHER	21	21	--	24	05/07/1976	10.00		05/07/1976	S	112MCNS	1250	8.1	--
133-070-02DCC	NDSWC 11192	100	--	--	--	10/25/1979	--		--	U	--	--	--	--
133-070-04DDD	KAUTZ, EDWIN	--	59	--	24	1959		F	07/17/1978	H,S	211FXML	1700	8.1	2022
133-070-05CAA1	DIEDE, ALVIN	--	45	--	24	1971	22.00		--	S	--	1300	--	--
133-070-05CAA2	DIEDE, DON	45	45	41	24	05/20/1976		F	--	H	211FXML	1150	--	--
133-070-05DAA	NDSWC 11191	80	--	--	--	10/25/1979	--		--	U	--	--	--	2015
133-070-06CBC	PIATZ, PAUL	74	74	--	24	06/11/1974	42.90		07/18/1978	U	--	--	--	--
133-070-08BBD	PUDWILL, ART	28	28	--	24	06/06/1974	10.00		06/06/1974	S	211FXML	1000	8.0	--
133-070-14DDB	GOEBEL, DARVIN	180	110	--	4	1966	60.00		07/18/1978	H,S	211FXML	1850	9.1	--
133-070-24ADD	NDSWC 5476	107	--	--	--	06/28/1979	--		--	U	--	--	--	2091
133-070-28CAD	STUCK, JOHN	72	72	--	24	07/05/1974	52.00		07/05/1974	S	--	--	--	--
133-070-29CAB	STUCK, JOHN	60	60	--	24	1950	49.00		07/18/1978	H,S	211FXML	1800	--	--
133-070-29CCC	NDSWC 5469	137	--	--	--	06/26/1979	--		--	U	--	--	--	--
133-070-29DBA	STUCK, JOHN	60	60	--	24	07/26/1977	40.00		07/26/1977	S	112WSHK	--	--	2137
133-070-30CCD	NDSWC 5472	97	52	46	1.25	06/27/1979	28.60		07/17/1979	U	211FXML	1150	9.0	2109
133-070-31DAA	NDSWC 11190	80	41	38	1.25	10/25/1979	23.97		11/16/1979	U	112WSHK	830	7.5	2092
133-071-01BCC	HENK, CLIFTON	280	280	200	4	10/04/1976	120.00		10/04/1976	S	211FXML	2080	8.9	--
133-071-04AAD	BURGAU, ROD	180	180	160	4	07/14/1977	100.00		07/14/1977	S	211FXML	--	--	--
133-071-09ABC	NDSWC 5738	42	15	12	1.25	05/24/1979	2.95		07/17/1979	U	112BVLK	925	7.0	1976

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133-071-09BBB	BURGAD, ROD	180	180	160	4	07/15/1977	120.00	07/15/1977	H	211FXHL	1780	8.9	--
133-071-12DCA	HERR, MANLEY	260	260	240	4	07/12/1974	160.00	07/12/1974	S	211FXHL	--	--	--
133-071-23DDC1	WANNER, WILLIAM	40	40	--	24	05/20/1976	23.00	05/20/1976	S	211FXHL	--	--	--
133-071-23DDC2	WANNER, WILLIAM	39	39	--	15	06/18/1977	27.90	07/14/1978	H	211FXHL	--	--	--
133-071-25BBB	NDSWC 5470	107	--	--	--	06/27/1979	--	--	U	--	--	--	2050
133-071-25BCC	NDSWC 5471	201	--	--	--	06/27/1979	--	--	U	--	--	--	--
133-071-25BCD	MEIDINGER, ELMER	58	58	--	24	09/10/1973	20.00	09/10/1973	H,S	211FXHL	1150	8.9	--
133-071-27BBB	NDSWC 11188	20	--	--	--	10/24/1979	--	--	U	--	--	--	1992
133-071-27CDB1	KLEIN, EDWARD	24	24	--	24	04/11/1974	14.80	07/14/1978	H,S	112BVLK	810	--	--
133-071-27CDB2	KLEIN, EDWARD	47	47	--	24	04/22/1974	10.00	04/22/1974	U	--	--	--	--
133-071-27DCC	NDSWC 11189	40	13	10	1.25	10/24/1979	3.99	11/15/1979	U	112BVLK	1070	9.0	1956
133-071-28CAD	SCHAUER, CURTIS	36	36	--	24	06/14/1977	15.00	06/14/1977	H,S	--	--	--	--
133-071-33BBB	NDSWC 11187	40	--	--	--	--	--	--	U	--	--	--	2077
133-071-33DDD	NDSWC 11186	40	--	--	--	10/24/1979	--	--	U	--	--	--	--
133-071-34BBB	NDSWC 11185	120	85	82	1.25	10/24/1979	37.58	11/05/1979	U	112BVLK	740	7.0	2034
133-072-04BBC	BECKER, GEORGE	300	145	100	4	11/27/1975	70.00	11/27/1975	H,S	211FXHL	1270	8.9	--
133-072-06DDD	GRUSS, ALVIN	300	300	280	4	10/20/1972	220.00	10/20/1972	H,S	211FXHL	1420	9.8	--
133-072-07BBC	GLATT, JOE	260	260	250	4	11/25/1975	100.00	11/25/1975	S	211FXHL	1270	9.6	--
133-072-15CCC	NDSWC 5467	182	114	108	1.25	06/26/1979	67.65	07/17/1979	U	211FXHL	875	9.0	2110
133-072-24DBB	SCHUCK, THEODORE	77	77	--	--	1971	--	--	H,S	112BGFV	580	6.7	--
133-072-26DDD	NDSWC 5468	197	--	--	--	06/26/1979	--	--	U	--	--	--	2118
133-072-34CBB	BRENDEL, ALBERT	280	280	240	4	09/19/1972	200.00	09/19/1972	S	211FXHL	810	9.6	--
133-073-02DDC	NDSWC 5432	42	16	13	1.25	05/23/1979	7.42	06/05/1979	U	112BVLK	1180	7.5	1904
133-073-04BBB	LEIER, MARTIN	160	160	--	--	09/23/1974	--	--	H,S	211FXHL	825	9.1	--
133-073-08ADD	FETTIG, FRANK	100	100	70	4	11/17/1972	50.00	11/17/1972	H,S	211FXHL	720	--	--
133-073-08CDA	DOLL, STANLEY	63	63	40	4	10/07/1976	36.00	10/07/1976	S	112DTSH	--	--	--
133-073-24BBB1	NDSWC 5433	242	--	--	--	05/23/1979	--	--	U	--	--	--	1900
133-073-24BBB2	NDSWC 5433A	22	15	12	1.25	05/23/1979	5.65	06/05/1979	U	112BVLK	1080	8.0	1900
133-073-28CDD	NDSWC 11184	60	33	30	1.25	10/24/1979	8.15	11/09/1979	U	112BVLK	1130	8.0	1887
133-073-34CAD	WALD, JOE	50	50	--	24	10/15/1975	10.00	10/15/1975	S	211FXHL	2100	7.8	--
133-073-34DDB	WALD, MARKUS	2400	2400	--	--	1954		F 07/11/1978	H,S	217UKOI	2250	25.2	--
134-067-15CCD1	JANKE, PAUL	70	70	--	24	07/16/1974	6.23	11/02/1977	U	--	--	--	--
134-067-15CCD2	JANKE, PAUL	100	100	80	4	09/24/1976	8.00	09/24/1976	S	112BGFV	1650	7.0	--
134-067-17CCC1	NDSWC 5491	392	--	--	--	07/11/1979	--	--	U	--	--	--	2060
134-067-17CCC2	NDSWC 5491A	92	88	85	1.25	07/11/1979	64.55	07/25/1979	U	112BGFV	2600	9.0	2060
134-067-21BBD	JANKE, PAUL	540	540	440	2.50	09/22/1976	75.00	09/22/1976	H	211PIKK	1600	--	--
134-067-21BDB1	JANKE, PAUL	--	40	--	--	05/01/1973	--	--	S	112BGFV	1800	7.0	--
134-067-21BDB2	JANKE, PAUL	53	53	--	--	07/13/1974	8.00	07/13/1974	S	112BGFV	--	--	--
134-067-21BDB3	JANKE, PAUL	40	40	--	--	05/07/1976	25.00	05/07/1976	S	112BGFV	--	--	--
134-067-22BBA	NDSWC 5490	392	--	--	--	07/10/1979	--	--	U	--	--	--	1987

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134-067-30ABB	WOLF, ERVIN	--	98	--	24	1949	66.20+		06/21/1978	S	112BGFV	3000	8.3	--
134-067-33CCC	NDSWC 5489	407	--	--	--	07/10/1979	--		--	U	--	--	--	2070
134-068-05BCC	LAUTT, ARNOLD	83	83	--	24	09/13/1973	15.70	R	06/20/1978	S	112BGFV	3600	8.1	--
134-068-07DDD1	NDSWC 5494	227	--	--	--	07/16/1979	--		--	U	--	--	--	1950
134-068-07DDD2	NDSWC 5494A	77	68	65	1.25	07/16/1979	31.38		07/25/1979	U	112BGFV	1150	8.0	1950
134-068-08CCB1	DENNING, WILBERT	--	80	--	4	1966	--		--	H,S	112BGFV	1000	8.3	--
134-068-08CCB2	DENNING, WILBERT	15	15	--	24	08/11/1977	6.05		06/21/1978	U	112UTSH	--	--	--
134-068-09DAA	NDSWC 5493	257	--	--	--	07/13/1979	--		--	U	--	--	--	1978
134-068-18AAC	DALLMAN, ELDON	35	35	--	--	05/28/1974	30.00		05/28/1974	U	112BGFV	--	--	--
134-068-18ABD	DALLMAN, ELDON	--	170	--	--	1977	84.00		1977	H,S	112BGFV	1680	8.9	--
134-068-23BBA1	NDSWC 5492	227	--	--	--	07/12/1979	--		--	U	--	--	--	2001
134-068-23BBA2	NDSWC 5492A	122	116	113	1.25	07/12/1979	51.85		07/25/1979	U	112BGFV	1250	8.0	2001
134-068-26DCB	TERGESEN, EDWIN	--	60	--	4	1962	7.10		06/21/1978	U,S	112BGFV	4500	7.8	--
134-068-31BCB	MUNDT, NORMAN	16	16	--	6	09/29/1978	7.00		--	H,S	112UTSH	720	--	--
134-069-02DBC	ESSIG, CARMEN	--	65	--	--	1940	7.20		08/15/1979	H,S	112STRR	580	--	--
134-069-03DDD1	NDSWC 5495	212	165	162	1.25	07/16/1979	2.80+		08/ /1979	U	112HBRG	2200	8.5	1906
134-069-03DDD2	NDSWC 5495A	62	58	55	1.25	07/16/1979	5.50+		08/ /1979	U	112HBRG	1080	8.0	1906
134-069-04CDD	KLEIN, CLARENCE	35	35	--	24	09/27/1974	15.10		06/22/1978	S	112HBRG	1240	7.9	--
134-069-04DCC1	KLEIN, CLARENCE	45	45	--	--	06/16/1977		D	--	--	112HBRG	--	--	--
134-069-04DCC2	KLEIN, CLARENCE	140	140	120	4	09/25/1977	60.00		09/25/1977	H,S	112STHR	740	7.9	--
134-069-08AAD1	NDSWC 5445	242	--	--	--	05/30/1979	--		--	U	--	--	--	1978
134-069-08AAD2	NDSWC 5445A	35	30	27	1.25	05/30/1979	22.40		06/05/1979	U	112HBRG	--	--	1978
134-069-09DDD	NDSWC 11243	280	--	--	--	05/01/1980	--		--	U	112STRR	--	--	1933
134-069-20AAA	NDSWC 5446	242	--	--	--	05/31/1979	--		--	U	112STHR	--	--	1970
134-069-20BBA	FINCK, TOM	70	70	--	4	09/07/1974	8.00		09/07/1974	H,S	112HBRG	2450	8.3	--
134-069-20DDD1	NDSWC 5443	262	--	--	--	05/30/1979	--		--	U	112HBRG	--	--	1977
134-069-20DDD2	NDSWC 5443A	42	23	20	1.25	05/30/1979	12.74		06/05/1979	U	112HBRG	575	9.0	1977
134-069-22DDA	NDSWC 5440	230	--	--	--	05/29/1979	13.00		--	U	112STRR	--	--	1904
134-069-23AAA	NDSWC 5442	222	--	--	--	05/30/1979	--		--	U	--	--	--	1920
134-069-24CCC	FIECHTNER, MARVIN	28	28	--	24	06/01/1973	6.00		06/22/1978	U	112HBRG	900	7.6	--
134-069-26AAA	NDSWC 5441	122	--	--	--	05/29/1979	--		--	U	--	--	--	1938
134-069-27BBA	NDSWC 5739	342	261	258	1.25	05/24/1979	20.52		06/05/1979	U	112HBRG	1730	9.5	1945
134-069-30DCC	MUNNER, JOHN	44	44	--	24	07/20/1974	22.40		06/22/1978	S	112STRR	--	--	--
134-069-34BCB	MAUFF, WILBUR	--	30	--	30	1939	5.00		--	H,S	112STRR	725	--	--
134-069-34CCC1	NDSWC 5444	242	--	--	--	05/30/1979	--		--	U	--	--	--	1961
134-069-34CCC2	NDSWC 5444A	102	91	88	1.25	05/30/1979	16.92		07/17/1979	U	112HBRG	780	8.0	1961
134-070-01DDD1	NDSWC 5447	262	--	--	--	05/31/1979	--		--	U	--	--	--	2000
134-070-01DDD2	NDSWC 5447A	130	128	122	1.25	05/31/1979	25.90		06/05/1979	U	211FXHL	--	--	2000
134-070-02CDD1	SUKUT, SHELDON	--	510	--	2	1934	60.00		--	S	--	1800	--	--
134-070-02CDD2	SUKUT, SHELDON	--	132	--	4	1949	60.00		--	H,S	211FXHL	1700	--	--

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134-070-04CDD	NDSWC 5448	222	--	--	--	05/31/1979	--		--	U	--	--	--	--
134-070-06ADD	NDSWC 11240	140	--	--	--	04/30/1980	--		--	U	--	--	--	--
134-070-06BAC	NDSWC 11241	120	--	--	--	05/01/1980	--		--	U	--	--	--	--
134-070-06CAA1	LEHR, IVAN	--	18	--	36	1952	7.20		08/15/1979	H,S	--	1130	--	--
134-070-06CAA2	LEHR, IVAN	--	64	--	3	1959	30.00		--	S	--	1150	--	--
134-070-18AAA	NDSWC 11196	40	--	--	--	10/26/1979	--		--	U	--	--	--	2079
134-070-24CDC1	NDSWC 5474	212	--	--	--	06/27/1979	--		--	U	112STRR	--	--	1981
134-070-24CDC2	NDSWC 5474A	62	50	47	1.25	06/27/1979	10.07		08/07/1979	U	112HBRG	620	--	1981
134-070-26BBC	NDSWC 5449	182	--	--	--	06/01/1979	--		--	U	--	--	--	1988
134-070-27ADA	MEMULEN, JOHN	200	160	140	4	07/08/1976		F	--	S	211FXML	1400	8.1	--
134-070-29BBA	NDSWC 5473	197	--	--	--	06/29/1979	--		--	U	--	--	--	2063
134-070-30ACD	BECHTLE, OSCAR	--	200	--	4	1965	--		--	H,S	211FXML	2160	7.8	--
134-070-31DCB	NDSWC 11193	140	--	--	--	10/25/1979	--		--	U	--	--	--	--
134-070-34BCB	ABEL, BIRD	40	40	--	24	06/12/1974	10.00		06/12/1974	S	112HBRG	1060	9.0	--
134-070-35BCB1	NDSWC 5450	202	--	--	--	06/01/1979	--		--	U	--	--	--	1961
134-070-35BCB2	NDSWC 5450A	14	11	8	1.25	06/01/1979	6.74		06/05/1979	U	112BGFV	--	--	1961
134-070-35CCC	NDSWC 5451	262	--	--	--	06/01/1979	--		--	U	--	--	--	1982
134-071-03DDD	NDSWC 5463	107	61	58	1.25	06/19/1979	.45		07/17/1979	U	112BVLK	1000	10.0	1989
134-071-04DDD	NDSWC 5465	152	--	--	--	06/25/1979	--		--	U	--	--	--	2022
134-071-06DBD	NDSWC 11179	100	32	29	1.25	10/23/1979	2.95		11/07/1979	U	112BVLK	446	7.5	2023
134-071-08BBA	NDSWC 5436	122	51	48	1.25	05/25/1979	28.62		06/05/1979	U	112BVLK	--	--	2033
134-071-12BBB	NDSWC 5464	122	99	96	1.25	06/25/1979	.52		08/29/1979	U	112BVLK	1500	11.0	1990
134-071-13ACB	WANNER, WILBERT	105	105	--	4	1973	80.00		06/27/1978	S	211FXML	630	9.0	--
134-071-13CCB	WANNER, WILBERT	48	48	--	--	06/05/1974	29.07		08/15/1979	U	112BVLK	--	--	--
134-071-14DDD	NDSWC 5466	68	--	--	--	06/25/1979	--		--	U	--	--	--	2023
134-071-16ADA1	NDSWC 5462	150	--	--	--	06/19/1979	--		--	U	--	--	--	1980
134-071-16ADA2	NDSWC 5462A	85	77	74	1.25	06/19/1979	37.33		07/17/1979	U	112BVLK	1150	8.0	1980
134-071-17ABA	NDSWC 11180	140	62	59	1.25	10/23/1979	1.32		11/07/1979	U	112BVLK	680	7.5	1989
134-071-18AAD	FEIST, MIKE	194	194	165	4	11/03/1972	85.00		11/03/1972	H,S	211FXML	1450	8.5	--
134-071-20CBB	NDSWC 11181	100	98	92	1.25	10/23/1979	16.91		11/15/1979	U	211FXML	900	7.5	1994
134-071-20CCD	NDSWC 11182	40	--	--	--	10/23/1979	--		--	U	--	--	--	--
134-071-21BCC	LUBBERS, GEORGE	158	158	148	4	06/07/1972	70.00		06/07/1972	S	211FXML	640	8.9	--
134-071-21CDC	NDSPS	202	202	172	4	06/02/1975	80.00		06/02/1975	H	211FXML	900	8.8	--
134-071-22BBA	AUCH, ROBIN	160	160	140	4	06/22/1974	30.00		06/22/1974	S	211FXML	1220	--	--
134-071-24ABA	WANNER, WILBERT	43	43	--	24	05/29/1972	3.70		06/27/1978	S	112BGFV	890	9.4	--
134-071-26DAA	NDSWC 11194	80	43	40	1.25	10/25/1979	2.12		11/15/1979	U	112BVLK	875	7.0	1977
134-071-28BAD	NUBERG, GORDON	123	123	85	4	09/20/1972	24.00		09/20/1975	S	211FXML	1070	12.0	--
134-071-30CBB	NDSWC 11183	40	23	18	1.25	10/24/1979	4.59		11/07/1979	U	112BVLK	1250	7.0	1955
134-071-31ABA	HUBNER, PETER	202	180	160	4	07/14/1975	120.00		07/14/1975	S	211FXML	1330	9.0	--
134-071-32ABB	NDSWC 5435	202	--	--	--	05/24/1979	--		--	U	--	--	--	1970

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134-071-34BAB	NDSWC 11195	40	--	--	--	10/26/1979	--		--	U	--	--	--	1963
134-072-10DAA	NDSWC 5422	221	204	198	1.25	11/16/1978	23.40		11/28/1978	U	211FXML	640	7.0	2038
134-072-18C8C	JOHS, ANDREW	260	260	240	4	09/07/1974	200.00		09/07/1974	S	211FXML	1450	8.5	--
134-072-22B8C	GLATT, ANTON	280	280	260	4	07/09/1975	80.00		07/09/1975	S	211FXML	1040	8.6	--
134-072-26DDD	LEIER, CHRIST	110	110	90	4	07/12/1975	24.00		07/12/1975	H,S	211FXML	1320	8.9	--
134-072-32BAB	NDSWC 5431	82	24	21	1.25	05/22/1979	2.90		06/05/1979	U	--	--	--	1932
134-072-32BAD	BITZ, JOHN	30	25	--	--	1973	6.00		07/06/1978	S	1128VLK	1320	8.9	--
134-072-34BBD	NDSWC 5434	162	--	--	--	05/23/1979	--		--	U	--	--	--	1940
134-073-01CCC	NDSWC 5423	282	--	--	--	11/17/1978	--		--	U	--	--	--	1945
134-073-05AAD	REIS, PETER	178	178	160	4	07/28/1976	70.00		09/28/1976	H,S	211FXML	560	9.0	--
134-073-05CCC	NDSWC 5426	182	134	128	1.25	05/21/1979	84.50		07/17/1979	U	211FXML	1050	8.5	2070
134-073-11CCC1	NDSWC 5424	182	--	--	--	11/17/1978	--		--	U	--	--	--	1966
134-073-11CCC2	NDSWC 5424A	42	35	32	1.25	11/17/1978	8.62		11/28/1978	U	112DTSH	--	7.5	1966
134-073-12CDC	PIATZ, SIMON	260	260	230	4	10/17/1974	--		--	S	211FXML	1400	8.0	--
134-073-15BDB	WEIGEL, BALTZER	--	200	--	--	--	--		--	S	211FXML	800	8.0	--
134-073-21CDD	NDSWC 5429	182	74	68	1.25	05/22/1979	5.17		06/05/1979	U	211FXML	2780	8.0	1988
134-073-23DDD	NDSWC 5430	302	--	--	--	05/22/1979	--		--	U	--	--	--	1991
134-073-26B8B1	NDSWC 5427	202	--	--	--	05/21/1979	--		--	U	--	--	--	1997
134-073-26B8B2	NDSWC 5428	22	.11	8	1.25	05/22/1979		U	05/30/1979	U	--	--	--	1997
134-073-32ACC	VETTER, JULIUS	170	170	--	6	1968	30.00		07/07/1978	H,S	211FXML	650	--	--
134-073-35C8D	JOHS, CHARLES	100	100	--	--	1948	35.00		07/07/1978	H,S	211FXML	940	--	--
135-067-02CDD	BERG, MYRON	44	44	--	24	09/17/1977	2.50		06/07/1978	S	1128GFV	2900	7.0	--
135-067-06CDA1	SCHOTT, JOHN	--	12	--	96	1903	2.86		07/26/1979	S	1128GFV	1650	--	--
135-067-06CDA2	SCHOTT, JOHN	--	20	--	32	1946	15.00		--	H	1128GFV	1150	--	--
135-067-06DCD1	NDSWC 5505	362	247	241	1.25	07/24/1979	43.32		08/07/1979	U	1128GFV	800	9.0	1978
135-067-06DCD2	NDSWC 5505A	107	104	101	1.25	07/24/1979	42.55		08/07/1979	U	1128GFV	860	--	1978
135-067-12DCD	SCHOTT, JOE	--	485	--	2	1939	--		--	U	211PIRR	--	--	--
135-067-13A8A	SCHOTT, JOE	--	60	--	4	1973	36.00		--	H,S	1128GFV	1700	--	--
135-067-18DDD	KLEINGARTNER, RUPERT	470	470	--	--	09/ /1965		F	--	H,S	211PIRR	8000	--	--
135-067-20DCC1	SCHMIDT, ARTHUR	--	20	--	36	1940	10.00		--	H	1128GFV	1200	--	--
135-067-20DCC2	SCHMIDT, ARTHUR	--	20	--	36	1940	10.00		--	S	1128GFV	1200	--	--
135-067-25B8B	NDSWC 5504	437	203	197	1.25	07/24/1979	50.50		08/29/1979	U	--	--	--	1983
135-067-26BCC1	JANKE, EDMUND	--	10	--	--	1950	--		--	H	112DTSH	780	--	--
135-067-26BCC2	JANKE, EDMUND	--	15	--	--	1952	--		--	S	112DTSH	550	--	--
135-067-27BAD1	KUHN, MARVIN	--	20	--	--	04/01/1961	--		--	S	112DTSH	485	8.0	--
135-067-27BAD2	KUHN, MARVIN	17	17	--	--	09/08/1976	8.00		09/08/1976	U	112DTSH	--	--	--
135-067-27C8C1	NDSWC 5503	392	--	--	--	07/23/1979	--		--	U	--	--	--	1975
135-067-27C8C2	NDSWC 5503A	62	51	48	1.25	07/23/1979	21.77	S	08/07/1979	U	1128GFV	625	8.0	1975
135-067-28A8D	JANKE, WILBERT	--	25	--	--	1955	8.00		--	H,S	112DTSH	450	--	--
135-067-28DAA	JANKE, EDMUND	--	12	--	--	1942	4.00		--	H,S	112DTSH	490	--	--

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135-067-30AAA1	NDSWC 5502	392	--	--	--	07/19/1979	--		--	U	--	--	--	1964
135-067-30AAA2	NDSWC 5502A	47	33	30	1.25	07/19/1979	20.35		07/25/1979	U	112UTSH	585	9.5	1964
135-068-06DCD1	NDSWC 5500	377	45	37	1.25	07/18/1979	8.21		07/25/1979	U	112RGFV	875	8.5	1867
135-068-06DCD2	NDSWC 5500A	62	--	--	--	07/18/1979	--		--	U	--	--	--	1867
135-068-08DAB	PRESLER, RICHARD	178	178	144	4	06/29/1973	16.00		06/29/1973	S	112RGFV	1120	7.9	--
135-068-19AAA	NDSWC 11242	400	--	--	--	05/01/1980	--		--	U	--	--	--	1985
135-068-20CCB	FIECHTNER, ELROY	18	18	--	24	05/25/1974	2.50		1978	S	112UTSH	750	7.1	--
135-068-21CDD	NDSWC 5501	392	364	358	1.25	07/19/1979	4.50+		08/ /1979	U	211PIKR	8000	--	1873
135-068-24CCD	BATSCH, ELMER	65	60	--	24	1953	44.15	P	06/20/1978	H,S	112RGFV	3000	8.0	--
135-068-27ABC	KLEINGARTNER, NORMAN	--	520	--	2	1966	30.00	P	--	H,S	211PIKR	8000	9.0	--
135-068-28BBD	KLEINGARTNER, NORMAN	--	480	--	--	1919	3.30+		07/19/1979	S	211PIKR	6000	15.0	--
135-068-32CBC	DENNING, WILBERT	30	30	--	24	08/09/1977	3.85		06/19/1978	U	112UTSH	--	--	--
135-069-01CCC1	NDSWC 5498	242	--	--	--	07/17/1979	--		--	U	--	--	--	1880
135-069-01CCC2	NDSWC 5498A	92	77	74	1.25	07/17/1979	25.36		08/07/1979	U	112RGFV	1500	9.0	1880
135-069-06CAC	KETTERLING, HARLEY	42	--	--	--	04/11/1973	--		--	--	112STRR	--	--	--
135-069-06DAA	BUCK, LEROY	--	28	--	--	--	17.55		10/17/1979	H,S	112STRR	1700	12.0	--
135-069-07DDD1	NDSWC 5390	142	--	--	--	10/19/1978	--		--	U	--	--	--	1946
135-069-07DDD2	NDSWC 5390A	42	24	21	1.25	10/19/1978	18.07		10/10/1979	U	112STRR	--	--	1946
135-069-08BBC	KETTERLING, ORVILLE	--	29	--	--	--	9.66		10/17/1979	--	112STRR	875	9.0	--
135-069-08DAA	NDSWC 5389	202	--	--	--	10/19/1978	--		--	U	--	--	--	1960
135-069-09CCC	MILLER, BEN	33	33	--	24	09/12/1974	12.60	N	06/16/1978	S	112STRR	1750	7.9	--
135-069-09CCD	MILLER, BEN	23	23	--	24	09/11/1974	4.60		06/16/1978	U	112STRR	--	--	--
135-069-11BDC	MURLOCK, GERHARDT	--	--	--	--	--	--		--	H,S	112RGFV	600	8.0	--
135-069-12ABA1	NDSWC 5499	377	--	--	--	07/17/1979	--		--	U	112RGFV	--	--	1866
135-069-12ABA2	NDSWC 5499A	107	104	98	1.25	07/17/1979	8.43		10/10/1979	U	112RGFV	--	--	1866
135-069-12CBA	MILLER, MARVIN	--	--	--	--	--	--		--	H,S	112RGFV	650	9.0	--
135-069-12DDB	ERBELE, HARRY	--	14	--	--	--	10.00		09/ /1979	H,S	112RGFV	1280	8.5	--
135-069-18BBB	NDSWC 5388	142	--	--	--	10/18/1978	--		--	U	--	--	--	1940
135-069-18DAA1	MILLER, HERMAN	--	19	--	18	1916	12.00		--	H	112STRR	1350	--	--
135-069-18DAA2	MILLER, HERMAN	--	19	--	30	1954	12.00		--	S	112STRR	1650	--	--
135-069-18DAA3	MILLER, HERMAN	19	19	--	24	05/12/1975	14.20		06/16/1978	S	112STRR	1370	7.2	--
135-069-20AAA	SCHRENK, EARL	--	20	--	48	1946	14.26		08/14/1979	H,S	112STRR	540	--	--
135-069-21BAB1	NDSWC 5497	122	--	--	--	07/17/1979	--		--	U	--	--	--	1955
135-069-21BAB2	NDSWC 5497A	47	34	31	1.25	07/17/1979	10.00		07/26/1979	U	112STRR	530	8.0	1955
135-069-27BDB	ERBELE, ALVIN	--	52	--	24	09/ /1956	15.00		--	H,S	112RGFV	2100	--	--
135-069-27CCD1	NDSWC 5517	182	--	--	--	08/08/1979	--		--	U	112HBRG	--	--	1946
135-069-27CCD2	NDSWC 5517A	47	28	25	1.25	08/08/1979	15.00		08/15/1979	U	112HBRG	2800	6.5	1946
135-069-28CCC	NDSWC 5496	167	--	--	--	07/17/1979	--		--	U	--	--	--	1949
135-069-28DDA	ERBELE, ROBERT	28	28	--	24	12/13/1975	4.00		06/16/1978	U	112HBRG	1530	7.3	--
135-070-02BCC	BECKER, ROLAND	--	250	--	4	1964	34.00		--	H,S	211FXML	2000	8.0	--

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135-070-05CDD	NDSWC 5386	202	--	--	--	10/18/1978	--		--	U	--	--	--	1900
135-070-05DDB	OPP, REINHOLD	--	165	--	4	1971	0.70+		09/06/1979	S	211FXML	1490	9.0	--
135-070-12ADB	PERMAN, NORMAN	--	35	--	--	--	10.00		10/17/1979	H,S	112STKR	810	11.5	--
135-070-12CD	FREIER, LONNIE	50	50	--	--	06/13/1975	--		--	--	--	--	--	--
135-070-12CDD	FREIER, LONNIE	--	135	--	--	1975	20.81		05/25/1978	H,S	211FXML	1600	--	--
135-070-12DDD	PERMAN, GLEN	--	17	--	--	--	11.38		10/17/1979	H,S	112STKR	1030	10.5	1940
135-070-14CAD	GRENZ, MARVIN	200	200	180	4	07/09/1972	120.00		07/09/1972	H,S	211FXML	2150	8.8	--
135-070-26AAD	NDSWC 5516	137	--	--	--	08/07/1979	--		--	U	--	--	--	--
135-070-33DBD	WALTH, GORDON	100	100	80	4	07/19/1973	40.00		07/19/1973	H,S	112BGFV	1750	6.1	--
135-071-08BDC	RAU, DELANE	268	268	196	4	09/08/1977	159.00		09/08/1977	S	211FXML	680	9.4	--
135-071-13ABC	WENTZ, MARVIN	113	113	100	4	11/04/1975	--		--	S	211FXML	1430	8.0	--
135-071-15BBB	NDSWC 5461	197	176	170	1.25	06/18/1979	85.10		07/17/1979	U	211FXML	--	--	2072
135-071-15BBD	WENTZ, MARVIN	204	204	203	4	09/11/1975	75.00		09/11/1975	S	211FXML	1380	8.9	--
135-071-17BAB	KUHN, LORRAINE	221	221	180	4	05/20/1977	104.00		05/20/1977	S	211FXML	--	--	--
135-071-20ABA	MAMMOND, ROBERT	213	213	180	4	06/03/1974	80.00		06/03/1974	H	211FXML	1230	--	--
135-071-21BCB	MAMMOND, ALLEN	208	208	184	4	11/23/1972	61.00		11/23/1972	S	211FXML	--	--	--
135-071-27BBC	NDSWC 5460	163	--	--	--	06/18/1979	--		--	U	211FXML	--	--	--
135-071-30BBB	NDSWC 5459	200	194	188	1.25	06/15/1979	69.41		07/17/1979	U	211FXML	580	--	2087
135-072-01CDC	SCHUMACHER, MIKE	--	290	--	4	10/ /1976	90.00		10/ /1976	S	211FXML	750	8.0	--
135-072-02DAA	MILZENDRAGER, M.	280	280	260	4	11/10/1975	90.00		11/10/1975	U	211FXML	--	--	--
135-072-06BAA	NDSWC 5415	202	--	--	--	11/08/1978	3.00	Z	11/09/1978	U	--	--	--	1945
135-072-09AAD	NDSWC 5457	167	144	138	1.25	06/14/1979	27.53		07/17/1979	U	211FXML	900	9.0	2007
135-072-14BBB	NDSWC 5417	82	21	18	1.25	11/14/1978	19.66		12/06/1978	U	112NPLN	--	--	2016
135-072-15CBB1	NDSWC 5458	120	--	--	--	06/14/1979	--		--	U	--	--	--	1993
135-072-15CBB2	NDSWC 5458A	40	38	35	1.25	06/14/1979	23.40		07/17/1979	U	112NPLN	--	--	1993
135-072-15CCC	SCHUMACHER, TED	93	93	73	4	10/30/1972	41.00		10/30/1972	H,S	211FXML	--	--	--
135-072-16BBB	NDSWC 5416	122	67	64	1.25	11/14/1978	35.58		12/06/1978	U	112NPLN	945	7.5	1995
135-072-17CAB1	NAPOLEON, ND	--	70	--	4	1965	18.04	Z	07/12/1978	P	112NPLN	500	8.5	--
135-072-17CAB2	NAPOLEON, ND	110	102	92	10	04/06/1973	14.44		07/12/1978	P	112NPLN	790	8.5	--
135-072-17CBA	BRUNNER, WILLIAM	63	63	55	4	10/12/1976	13.00		10/12/1976	H	112NPLN	--	--	--
135-072-17CDD	BOHRER, VERNON	47	47	33	4	06/19/1973	23.00		06/19/1973	H	112NPLN	--	--	--
135-072-18AAD	WENTZ EQUIPMENT	75	75	61	4	07/06/1973	29.00		07/06/1973	H	112NPLN	770	10.5	--
135-072-18ACC	WENTZ, NORMAN	60	60	50	4	07/31/1974	10.00		07/31/1974	H	112NPLN	--	--	--
135-072-18ADC1	GRENZ, HARLEY	70	70	60	4	05/20/1975	20.00		05/20/1975	H	112NPLN	--	--	--
135-072-18ADC2	KAMBEITZ, JOHN	104	104	--	4	04/07/1976	20.00		04/07/1976	H	112NPLN	--	--	--
135-072-19BAA	NDSWC 11234	60	36	33	1.25	04/25/1980	19.35		05/06/1980	U	112NPLN	3500	8.5	1955
135-072-20CBB	NDSWC 11233	160	148	142	1.25	04/24/1980	5.60		05/06/1980	U	211FXML	--	9.0	1953
135-072-20CBB	WENTZ, CARL	160	160	100	4	08/19/1974	60.00		08/19/1974	H	211FXML	--	--	--
135-072-21BCB1	SCHUMACHER, MIKE	80	80	--	--	1930	--		--	S	--	915	--	--
135-072-21BCB2	SCHUMACHER, MIKE	160	160	--	4	1971	15.93		05/26/1978	U	--	--	--	--

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135-072-21BCB3	SCHUMACHER, MIKE	160	160	140	4	09/08/1972	--		--	H,S	211FXML	910	--	--
135-072-21DCD	NDSWC 5420	162	--	--	--	11/15/1978	--		--	U	--	--	--	2076
135-072-22BBB	SCHUMACHER, TED	168	168	140	4	06/07/1974	62.00		06/07/1974	H,S	211FXML	--	--	--
135-072-27BBD	REIS, SEBASTIAN	160	160	140	4	06/12/1972	28.08		05/26/1978	S	211FXML	780	5.5	--
135-072-27BD	REIS, SEBASTIAN	160	--	--	--	10/ /1973	--		--	U	211FXML	--	--	--
135-072-30CCC	NDSWC 5421	202	--	--	--	11/16/1978	--		--	U	--	--	--	1933
135-072-32BAB	KUNTZ, JOHN	224	224	160	4	04/28/1976	110.00		04/28/1976	S	211FXML	1520	8.9	--
135-072-36CDD	NDSWC 5437	122	--	--	--	05/24/1979	--		--	U	--	--	--	--
135-073-01AAB	NDSWC 5456	152	101	98	1.25	06/14/1979	49.35		08/06/1979	U	112NPLN	1050	8.0	1990
135-073-03BBB	NDSWC 5411	282	--	--	--	11/07/1978	--		--	U	--	--	--	1942
135-073-09ABB	NDSWC 5412	142	16	13	1.25	11/07/1978	5.80		11/29/1978	U	112NPLN	645	10.0	1940
135-073-11BBB	NDSWC 5413	162	31	28	1.25	11/07/1978	14.20		12/06/1978	U	112NPLN	490	7.5	1960
135-073-14DBA	NDSWC 11235	140	22	19	1.25	04/25/1980	7.01		05/06/1980	U	112NPLN	--	8.0	1943
135-073-15ADC	NDSWC	--	--	--	--	--	--		--	--	--	--	--	--
135-073-15DCC	NDSWC 5419	202	104	98	1.25	11/15/1978	14.87	S	01/09/1979	U	211FXML	1080	7.5	1948
135-073-20ADD	BRAUN, TONY	200	200	180	4	04/06/1972	102.25		06/08/1978	H,S	211FXML	950	9.0	--
135-073-20BAA	VOLK, GARY	220	220	180	4	05/06/1977	150.00	P	05/06/1977	S	211FXML	910	8.7	--
135-073-22CCC	JACOB, MIKE	260	180	170	4	09/20/1975	80.00		06/08/1978	H	211FXML	1480	8.6	--
135-073-24BBB	NDSWC 5418	302	--	--	--	11/15/1978	--		--	U	--	--	--	1934
135-073-29AAC	WEIGEL, BALTZER	220	220	200	4	05/25/1977	130.00		05/25/1977	S	211FXML	740	9.0	--
135-073-34DDD	NDSWC 5425	162	--	--	--	05/21/1979	--		--	U	--	--	--	1986
135-073-36DAC	WENTZ, RAYMOND	364	364	340	4	10/15/1974	160.00		10/15/1974	S	211FXML	1550	8.5	--
136-067-01DBA	MILLER, NORMAN	138	--	--	--	06/29/1977	--		--	--	--	--	--	--
136-067-01DBC	MILLER, NORMAN	110	110	90	5	06/29/1977	80.00		10/08/1977	--	--	--	--	--
136-067-01DCB	MILLER, NORMAN	280	--	--	--	06/29/1977	--		--	--	--	--	--	--
136-067-01DCD	MILLER, NORMAN	200	--	--	--	06/29/1977	--		--	--	--	--	--	--
136-067-05BBA	NDSWC 1451	283	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-05BBB	NDSWC 1452	252	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-05BCB	GACKLE, ND	--	77	--	--	--	43.00		01/ /1957	Z	--	1400	7.5	--
136-067-05BCC	NDSWC 1453	315	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-05BDD	NDSWC 1465	157	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-05DAA	NDSWC 1464	105	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-06ABA	NDSWC 1454	157	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-06ADA	GACKLE, ND	101	79	--	--	1946	52.00		01/ /1957	P	112BGFV	--	--	--
136-067-06BAB	NDSWC 1455	241	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-06BBA	NDSWC 1456	115	--	--	--	03/ /1959	--		--	--	112BGFV	--	--	--
136-067-06DAA	NDSWC 1458	126	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-07AAD	NDSWC 1459	84	--	--	--	03/ /1959	--		--	--	--	--	--	--
136-067-13CBC1	KLUNDT, KENNETH	40	40	--	--	02/07/1975	8.00		02/27/1975	U	112BGFV	--	--	--

LOCAL NUMBER	OWNER	DEPTH DRILLED (FEET)	DEPTH OF WELL (FEET)	DEPTH TO FIRST OPENING (FEET)	CASING DIAMETER (INCHES)	DATE COMPLETED	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	USE OF WATER	PRINCIPAL AQUIFER	SPECIFIC CONDUCTANCE (µMHO/CM AT 25°C)	TEMPERATURE (DEGREES C)	ALTITUDE OF LAND SURFACE (FEET)
136-067-13CBC2	KLUNDT, KENNETH	220	215	80	5	07/08/1976	73.00	07/08/1976	H	112BGFV	600	9.0	--
136-067-13CBD	KLUNDT, KENNETH	45	36	28	30	02/15/1975	14.00	02/15/1975	S	112BGFV	1800	6.0	--
136-067-14CBC1	NDSWC 5509	407	350	347	1.25	07/31/1979	17.89	08/29/1979	U	112BGFV	--	--	1934
136-067-14CBC2	NDSWC 5509A	107	100	97	1.25	07/31/1979	16.48	08/07/1979	U	112BGFV	1250	10.5	1934
136-067-14CDA	KLUNDT, EDWIN	89	89	84	4	11/29/1972	14.00	11/29/1972	S	112BGFV	650	--	--
136-067-17BBC	NDSWC 1461	105	--	--	--	03/ /1959	--	--	--	--	--	--	--
136-067-17BC6	NDSWC 1460	168	--	--	--	03/ /1959	--	--	--	--	--	--	--
136-067-17BCC1	NDSWC 1462	136	--	--	--	03/ /1959	--	--	P	--	1450	7.5	--
136-067-17BCC2	GACKLE, MD	136	115	107	4	08/ /1959	--	--	--	112BGFV	1450	7.5	--
136-067-17DAB	KUFF, JEROME	69	69	--	24	08/13/1977	7.40	10/27/1977	U	112BGFV	--	--	--
136-067-19AAA	GACKLE GULF CL.	158	80	70	4	03/17/1978	52.06	08/17/1979	U	112BGFV	--	--	--
136-067-19AAB	GACKLE GULF CL.	158	--	--	--	03/19/1978	--	--	U	--	--	--	--
136-067-19AAC	GACKLE GULF CL.	140	--	--	--	06/12/1978	--	--	U	--	--	--	--
136-067-19ABA	GACKLE GULF CL.	178	--	--	--	--	--	--	U	--	--	--	--
136-067-19ABC	GACKLE GULF CL.	130	--	--	--	06/12/1978	--	--	U	--	--	--	--
136-067-19ABD	GACKLE GULF CL.	150	--	--	--	03/19/1978	--	--	U	--	--	--	--
136-067-19ACA	GACKLE GULF CL.	158	--	--	--	--	--	--	U	--	--	--	--
136-067-19ACD	GACKLE GULF CL.	--	126	--	--	1960	--	--	R	112BGFV	735	9.0	--
136-067-20CCC	NDSWC 1463	84	--	--	--	03/ /1959	--	--	--	--	--	--	--
136-067-31DDC	NDSWC 5508	482	--	--	--	07/25/1979	--	--	U	--	--	--	1944
136-067-32CCC	SPEIDEL, CHRIST	--	13	--	36	1949	7.00	--	H	--	710	--	--
136-067-34ADA	MILEN, DALE	--	111	--	--	1951	20.00	--	H,S	112BGFV	1600	--	--
136-068-01AAD	NDSWC 1457	315	--	--	--	03/ /1959	--	--	--	--	--	--	--
136-068-04ACA1	SCHMIDT, ELDO	--	310	--	3	1956	20.00	--	--	112BGFV	2000	10.0	--
136-068-04ACA2	SCHMIDT, ELDO	--	90	--	3	1974	20.00	--	H,S	112BGFV	200	10.0	--
136-068-08ABB	MORLOCK, LEONARD	--	360	--	3	1920	180.00	--	S	211PIRR	--	--	--
136-068-08BBB1	MORLOCK, LEONARD	--	330	300	6	1964	--	--	H,S	211PIRR	3000	8.5	--
136-068-08BBB2	MORLOCK, LEONARD	--	330	--	6	1974	70.00	--	S	211PIRR	2900	--	--
136-068-10DDD	NDSWC 5511	167	141	138	1.25	08/01/1979	69.86	08/13/1979	U	112BGFV	1700	8.0	1937
136-068-13AAA	NDSWC 5510	302	--	--	--	08/01/1979	--	--	U	--	--	--	1915
136-068-16AAA	MAYER, JOHN	--	400	--	6	1973	60.00	--	H,S	211PIRR	2400	8.5	--
136-068-18DAC	ZENKER, ELMER	--	125	--	--	1963	60.00	--	H,S	112BGFV	1500	--	--
136-068-20BAD	MILLER, NORMAN	--	110	--	--	1970	40.00	--	H,S	112BGFV	1290	--	--
136-068-21BCC1	NDSWC 5512	287	--	--	--	08/02/1979	--	--	U	112BGFV	--	--	1898
136-068-21BCC2	NDSWC 5512A	122	122	119	1.25	08/02/1979	39.20	08/13/1979	U	112BGFV	1600	9.0	1898
136-069-02DAB	VANDEBERGHE, TOM	145	140	100	5	07/24/1976	45.00	07/24/1976	H	112BGFV	1100	--	--
136-069-02DDC	NDSWC 5514	332	--	--	--	08/03/1979	--	--	U	--	--	--	1919
136-069-04CCC1	NDSWC 5515	242	--	--	--	08/07/1979	--	--	U	112STRR	--	--	1854
136-069-04CCC2	NDSWC 5515A	77	74	71	1.25	08/07/1979	12.17	08/13/1979	U	112STRR	1600	8.5	1854
136-069-06DDD	NDSWC 11178	300	--	--	--	10/22/1979	--	--	U	--	--	--	1873

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136-069-08CCC	NDSWC 5394	202	--	--	--	10/24/1978	--		--	U	--	--	--	1881
136-069-08DCD	WETZEL, RAYMOND	26	26	--	--	09/16/1974	18.00		09/16/1974	H	112STKR	--	--	--
136-069-09DAD	DOCKTER, LAWRENCE	46	46	--	--	09/20/1974	8.00		09/20/1974	S	112STKR	1750	8.0	--
136-069-11ADD	DOCKTER, KENNETH	130	130	40	5	06/27/1978	21.00		--	H,S	112BGFV	2300	10.0	--
136-069-12BCC	DOCKTER, KENNETH	--	90	--	--	1932	10.50		08/02/1979	S	112BGFV	4630	--	--
136-069-12DCC	RIVINIUS, RALPH	130	130	105	4	07/24/1972	30.00		07/24/1972	H	112BGFV	1400	--	--
136-069-13DDD	NDSWC 5513	317	--	--	--	08/02/1979	--		--	U	--	--	--	1865
136-069-18CCC1	NDSWC 11177	180	--	--	--	10/14/1979	--		--	U	--	--	--	1918
136-069-18CCC2	NDSWC 11177A	60	56	53	1.25	10/14/1979	20.07		11/08/1979	U	112STKR	790	7.0	1918
136-069-20ABA	SCHULTES, CLARENCE	20	20	--	--	09/13/1974	10.00		09/13/1974	S	112BGFV	2500	8.0	--
136-069-21BAA	DOCKTER, ART	200	200	180	4	10/15/1972	80.00		10/15/1972	S	112BGFV	1400	8.5	--
136-069-24DBA	DOCKTER, DARREL	--	127	--	--	1952	40.00		--	H,S	112BGFV	1700	--	--
136-069-26ABC	NENOW, RICHARD	--	160	--	--	10/ /1975	65.00		--	H,S	112BGFV	1300	9.0	--
136-069-30CDD	FLEMMER, HERBERT	--	50	--	--	--	--		--	S	112STKR	925	8.0	--
136-069-31CBC	KETTERLING, HARLEY	62	--	--	--	04/12/1973	--		--	U	112STKR	--	--	--
136-069-31CCC1	NDSWC 5391	142	--	--	--	10/19/1978	--		--	U	--	--	--	1939
136-069-31CCC2	NDSWC 5391A	40	29	26	1.25	10/19/1978	23.75		10/24/1978	U	112STKR	--	--	1939
136-069-31DCC	RUEB, AARON	--	35	--	--	--	17.86		10/17/1979	H,S	112STKR	1200	10.0	--
136-070-02BBB	NDSWC 11239	180	32	29	1.25	04/30/1980	27.83		05/06/1980	U	112STKR	--	--	1951
136-070-03ABB	NDSWC 5401	162	42	39	1.25	10/30/1978	34.02		12/06/1978	U	112STKR	--	--	1912
136-070-03CAA	KIRSCHENMAN, ADAM	--	12	--	--	--	6.04		10/18/1979	S	112STKR	750	10.0	--
136-070-04BBC	SPITZER, BERT	24	24	--	--	06/03/1975	17.00		06/03/1975	S	112STKR	1300	9.5	--
136-070-04BCD	SPITZER, BERT	74	--	--	--	05/01/1973	--		--	U	112STKR	--	--	--
136-070-04CCB	NDSWC TH 4	60	51	48	1.25	08/28/1979	1.08	P	09/04/1979	U	112STKR	650	9.0	1870
136-070-04CCC1	NDSWC 5506	197	--	--	--	07/25/1979	--		--	U	--	--	--	1873
136-070-04CCC2	NDSWC TH 6	60	56	31	16	08/28/1979	4.06	P	09/04/1979	Z	112STKR	680	9.0	1873
136-070-04CCC3	NDSWC TH 2	60	59	39	4	08/28/1979	3.04	P	09/04/1979	U	112STKR	700	10.0	1873
136-070-04CCC4	NDSWC TH 3	60	53	48	1.25	08/28/1979	2.48	P	09/04/1979	U	112STKR	690	11.0	1872
136-070-04CCC5	NDSWC TH 3A	--	21	18	1.25	08/28/1979	4.00	P	09/04/1979	U	112STKR	690	12.0	1872
136-070-05AAA1	NDSWC 5400	182	115	112	1.25	10/27/1978	23.48		12/06/1978	U	112STKR	1380	9.0	1895
136-070-05AAA2	NDSWC 5400A	62	58	55	1.25	10/27/1978	24.54		10/30/1978	U	112STKR	530	8.5	1895
136-070-05AAD	NDSWC 5507	92	61	58	1.25	07/25/1979	10.33		08/14/1979	U	112STKR	530	8.0	1881
136-070-06BBB1	NDSWC 5403	202	161	158	1.25	11/01/1978	5.92		12/06/1978	U	112STKR	1520	9.0	1867
136-070-06BBB2	NDSWC 5403A	62	42	39	1.25	11/01/1978	8.23		12/06/1978	U	112STKR	570	8.0	1867
136-070-07DAD	KAISER, DAVID	20	20	--	--	07/27/1977	4.00		07/27/1977	S	112STKR	1400	9.5	--
136-070-08AAA	NDSWC TH 5	60	52	49	1.25	08/28/1979	1.83		10/18/1979	U	112STKR	600	--	1870
136-070-08CDB	KIRSCHENMANN, STEVE	--	17	--	--	1969	5.55		10/18/1979	S	112STKR	2900	10.0	1882
136-070-09CBB	DEWALD, ART	--	16	--	--	1945	4.77		10/18/1979	S	112STKR	950	11.0	--
136-070-10CCC	LANG, MARVIN	--	16	--	--	1936	9.64		10/18/1979	S	112STKR	580	10.0	1889
136-070-11DDD	USGS 309	190	--	--	--	1950	--		--	U	--	--	--	1958

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136-070-12CDD	WENTZ, JEROME	--	160	--	--	1968	49.38		10/18/1979	H,S	--	490	10.0	2001
136-070-13AAA	NDSWC 11238	160	--	--	--	04/29/1980	--		--	U	--	--	--	1960
136-070-13BCC	SCHULER, WILLIAM	60	60	40	4	10/20/1972	22.00		10/20/1972	S,H	112STRR	660	8.0	--
136-070-13DCD	DAHL, DAN	--	36	--	--	--	--		--	H,S	112STRR	870	10.0	--
136-070-15CCC1	NDSWC 5398	182	--	--	--	10/26/1978	--		--	U	--	--	--	1896
136-070-15CCC2	NDSWC 5398A	62	52	48	6	10/26/1978	13.40		11/15/1978	U	112STRR	525	9.5	1896
136-070-15DDD	USGS 307	210	--	--	--	1950	--		--	--	112STRR	--	--	1903
136-070-16BBB1	NDSWC 5399	222	--	--	--	10/26/1978	--		--	U	--	--	--	1881
136-070-16BBB2	NDSWC 5399A	60	52	49	1.25	10/26/1978	6.20		11/15/1978	U	112STRR	650	9.5	1881
136-070-17DDD1	NDSWC 5397	222	164	161	1.25	10/26/1978	6.67		12/06/1978	U	112STRR	1950	9.5	1885
136-070-17DDD2	NDSWC 5397A	52	42	39	1.25	10/26/1978	7.37		12/06/1978	U	112STRR	560	9.0	1885
136-070-18BBA1	NDSWC 11236	200	152	149	1.25	04/28/1980	2.24		05/06/1980	U	112STRR	--	7.5	1873
136-070-18BBA2	NDSWC 11236A	40	37	34	1.25	04/28/1980	2.80		05/06/1980	U	112STRR	--	8.0	1873
136-070-18CCC	NDSWC 5402	202	--	--	--	10/31/1978	--		--	U	--	--	--	1872
136-070-19BBB	MILLER, WAYNE	--	20	--	24	--	--		--	D,S	112STRR	2600	8.5	--
136-070-20DDA	NDSWC 11237	280	36	33	1.25	04/29/1980	3.83		05/06/1980	U	112STRR	--	8.5	1882
136-070-21CCA	LIECHTY, ED	50	35	15	4	06/26/1978	15.11		06/26/1978	U	112STRR	--	--	--
136-070-21CCC	NDSWC 5396	202	--	--	--	10/25/1978	--		--	U	--	--	--	1882
136-070-21DDB	LIECHTY, ED	55	45	25	4	06/26/1978	15.80		06/26/1978	U	112STRR	--	--	--
136-070-22CCA	OPP, REINHOLD	60	--	--	--	03/11/1980	--		--	U	--	--	--	--
136-070-22DCA	OPP, REINHOLD	60	--	--	--	03/11/1980	--		--	U	--	--	--	--
136-070-22DDD	USGS 308	50	--	--	--	1950	--		--	--	112STRR	--	--	1908
136-070-23AAA1	NDSWC 5393	262	116	113	1.25	10/20/1978	9.55		11/15/1978	U	112STRR	695	8.0	1906
136-070-23AAA2	NDSWC 5393A	62	47	44	1.25	10/20/1978	14.72		11/15/1978	U	112STRR	612	8.5	1906
136-070-23ACC	DAHL, JOHN	--	65	--	24	1961	22.82		05/25/1978	I	112STRR	660	8.0	--
136-070-23BBD	DAHL, JOHN	--	65	--	24	1964	24.06	Z	05/25/1978	I	112STRR	--	--	--
136-070-24DCD1	NDSWC 5392	182	--	--	--	10/20/1978	--		--	U	--	--	--	1917
136-070-24DCD2	NDSWC 5392A	42	24	21	1.25	10/20/1978	17.29		12/06/1978	U	112STRR	--	--	1917
136-070-26BAC1	BECKER, HENRY	62	--	--	--	04/26/1973	--		--	--	112STRR	--	--	--
136-070-26BAC2	BECKER, HENRY	57	51	31	16	04/26/1973	16.30		05/25/1976	I	112STRR	600	8.0	--
136-070-26BBB1	NDSWC 5395	182	--	--	--	10/24/1978	--		--	U	--	--	--	1910
136-070-26BBB2	NDSWC 5395A	62	43	38	6	10/24/1978	17.48		11/15/1978	U	112STRR	630	7.5	1910
136-070-26BBD	BECKER, HENRY	56	--	--	--	08/18/1972	--		--	--	112STRR	--	--	--
136-070-26BCD	BECKER, HENRY	60	--	--	--	03/19/1973	--		--	--	112STRR	--	--	--
136-070-26BDC	BECKER, HENRY	52	--	--	--	03/19/1973	--		--	--	112STRR	--	--	--
136-070-26CAC	BECKER, HENRY	47	--	--	--	03/19/1973	--		--	--	112STRR	--	--	--
136-070-26CCC	NDSWC 11176	160	--	--	--	10/19/1974		F	--	U	112STRR	--	--	1904
136-070-27ACA	BECKER, HENRY	70	--	--	--	02/22/1980	17.00		02/22/1980	U	112STRR	--	--	--
136-070-27DAA	BECKER, HENRY	60	--	--	--	02/19/1980	17.00		02/19/1980	U	112STRR	--	--	--
136-070-27DCA	BECKER, HENRY	50	--	--	--	02/21/1980	17.00		02/21/1980	U	112STRR	--	--	--

LOCAL NUMBER	OWNER	DEPTH DRILLED (FEET)	DEPTH OF WELL (FEET)	DEPTH TO FIRST OPENING (FEET)	CASING DIAMETER (INCHES)	DATE COMPLETED	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED	USE OF WATER	PRINCIPAL AQUIFER	SPECIFIC CONDUCTANCE (UMHO/CM AT 25°C)	TEMPERATURE (DEGREES C)	ALTITUDE OF LAND SURFACE (FEET)
136-070-28CCB	OPP, REINHOLD	--	190	--	5	1930	--		--	H,S	--	1630	9.0	--
136-070-29DDA	OPP, REINHOLD	--	190	--	5	1967		F	--	S	211FXML	1550	9.2	1882
136-070-33CCC	NDSWC 5387	162	--	--	--	10/18/1978	--		--	U	--	--	--	1893
136-071-02ABB	NDSWC 5404	182	--	--	--	11/01/1978	--		--	U	--	--	--	1885
136-071-02CDD	KAU, OWIGHT	--	200	--	4	06/ /1969	--		--	H,S	211FXML	1150	9.1	--
136-071-10DBA	KAU, EMMA	--	100	--	--	--		F	--	S	211FXML	1230	7.0	--
136-071-11CCC	NDSWC 5405	202	--	--	--	11/01/1978		F	--	U	--	--	--	1878
136-071-16CCC	NDSWC 5406	322	164	158	1.25	11/01/1978	54.78		11/21/1978	U	211FXML	1200	7.9	1978
136-071-18BCB	WANNEN, ED	208	208	182	4	11/16/1973	49.00		11/16/1973	H,S	211FXML	1020	8.0	--
136-071-24BBB	NDSWC 11175	80	--	--	--	10/18/1979	--		--	U	--	--	--	1889
136-071-28CCC	KAU, EUGENE	--	220	--	--	--	--		--	H,S	211FXML	1080	6.9	--
136-071-34CBB	BOLSTAD, KENNETH	193	140	--	--	1968	--		--	H,S	211FXML	960	9.5	--
136-071-35AAA	MENTZ, REUBEN	73	73	61	4.25	06/20/1972		F	--	S	211FXML	1450	8.0	1932
136-072-01AAA	NDSWC 11173	40	--	--	--	10/18/1979	--		--	U	--	--	--	--
136-072-03AAA	NDSWC 11172	60	--	--	--	10/18/1979	--		--	U	--	--	--	--
136-072-08CDC	NDSWC 5408	222	22	19	1.25	11/03/1978	8.35		11/06/1978	U	--	--	--	2025
136-072-13BBB	JOHNSON, WILLIAM	210	210	--	--	1962	--		--	H,S	211FXML	1200	9.1	--
136-072-17BBB	SCHNABEL, MARVIN	204	160	180	4	10/06/1974	160.00		10/06/1974	H,S	211FXML	490	8.5	--
136-072-19DAB	MARRISON, JIM	238	238	160	4	06/21/1974	52.00		06/21/1974	H	211FXML	950	8.4	--
136-072-22CCA	GROSS, ANDREW	240	240	210	4	08/31/1974	200.00		08/31/1974	S	211FXML	1210	7.8	--
136-072-22CCC	GROSS, ANDREW	230	195	--	6	03/20/1978	31.94		06/01/1978	H	211FXML	1200	8.2	--
136-072-29BBB	NDSWC 11174	40	--	--	--	10/18/1979	--		--	U	--	--	--	2017
136-072-30AAA	NDSWC 5407	362	--	--	--	11/02/1978	--		--	U	--	--	--	1984
136-073-05CCC	NDSWC 11170	160	--	--	--	10/18/1979	--		--	U	--	--	--	1992
136-073-07DDD	NDSWC 11169	160	--	--	--	10/17/1979	--		--	U	--	--	--	1950
136-073-12BBD	FOSTER, WILLIAM,JR	313	313	200	4	09/04/1976	90.00		09/04/1976	S	211FXML	1620	8.0	--
136-073-16CBB1	NDSWC 5452	179	164	158	1.25	06/12/1979	32.46		07/18/1979	U	211FXML	800	9.0	1948
136-073-16CBB2	NDSWC 5452A	94	90	87	1.25	06/12/1979	31.32		07/18/1979	U	112NPLN	825	8.0	1948
136-073-16CCC1	NDSWC 5410	242	195	192	1.25	11/06/1978	22.17		11/29/1978	U	112NPLN	750	8.0	1942
136-073-16CCC2	NDSWC 5410A	142	137	134	1.25	11/06/1978	19.61		11/16/1978	U	112NPLN	740	7.5	1942
136-073-18DDB	NDSWC 11171	200	--	--	--	10/18/1979	--		--	U	--	--	--	1905
136-073-18DDD	NDSWC 11168	260	--	--	--	10/17/1979	--		--	U	--	--	--	1952
136-073-20BCC	NDSWC 11232	180	--	--	--	04/24/1980	--		--	U	--	--	--	1937
136-073-20DDC	SUNDE, HAROLD	153	153	140	4	06/24/1972	42.00		06/24/1972	H	211FXML	810	8.5	--
136-073-22AAA	NDSWC 5409	342	203	197	1.25	11/03/1978	91.98		12/06/1978	U	211FXML	1400	7.5	2024
136-073-26CBB1	NDSWC 5455	197	160	157	1.25	06/13/1979	9.79		07/18/1979	U	112NPLN	1050	8.0	1942
136-073-26CBB2	NDSWC 5455A	107	94	91	1.25	06/13/1979	11.63		07/18/1979	U	112NPLN	780	8.0	1942
136-073-27DDB	SCHUMACHER, ALFRED	193	193	170	4	06/14/1974	52.00		06/14/1974	H	211FXML	1000	9.0	--
136-073-28BBB1	NDSWC 5453	182	--	--	--	06/13/1979	--		--	U	--	--	--	1940
136-073-28BBB2	NDSWC 5453A	182	87	84	1.25	06/13/1979	15.06		07/18/1979	U	112NPLN	735	8.0	1940

LOCAL NUMBER	OWNER	DEPTH DRILLED (FEET)	DEPTH OF WELL (FEET)	DEPTH TO FIRST OPENING (FEET)	CASING DIAMETER (INCHES)	DATE COMPLETED	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	USE OF WATER	PRINCIPAL AQUIFER	SPECIFIC CONDUCTANCE (µMHO/CM AT 25°C)	TEMPERATURE (DEGREES C)	ALTITUDE OF LAND SURFACE (FEET)
136-073-30AAA	ROTH, JACK	133	133	--	4	10/14/1974	59.00	10/14/1974	H	211FXHL	850	9.5	--
136-073-31ADC	NDSWC 5454	122	81	78	1.25	06/13/1979	4.50+	08/10/1979	U	112NPLN	650	8.0	1915
136-073-35DD01	NDSWC 5414	282	171	168	1.25	11/08/1978	33.95	04/03/1979	U	112NPLN	1200	7.0	1970
136-073-35DD02	NDSWC 5414A	122	121	118	1.25	11/08/1978	33.43	04/03/1979	U	112NPLN	1000	8.0	1970

TABLE 2.--Water levels in selected wells

Water levels shown have been adjusted to feet below or (+) above land surface

MP, measuring point lsd, land surface datum

Depth to water, in feet below or (+) above land surface

133-067-29CCB2 MP is top of 1¼-inch plastic pipe 1.50 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 17, 1979..	12.14	Aug. 29.....	12.19	Nov. 7.....	12.82
Aug. 7.....	12.03	Oct. 10.....	12.59		

133-068-30BCB MP is top of 1¼-inch plastic pipe 2.30 ft above lsd.

Aug. 7, 1979..	23.86	Oct. 10.....	23.64	Nov. 8.....	23.55
Aug. 29.....	23.57				

133-070-30CCD MP is top of 1¼-inch plastic pipe 2.20 ft above lsd.

July 17, 1979..	28.60	Aug. 30.....	28.73	Nov. 5.....	29.62
Aug. 7.....	28.52	Oct. 10.....	28.79		

133-071-09ABC MP is top of 1½-inch plastic pipe 1.95 ft above lsd.

June 5, 1979..	2.83	Aug. 7.....	3.59	Oct. 10.....	4.38
July 17.....	2.95	Aug. 29.....	4.12	Nov. 7.....	4.31

133-072-15CCC MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

July 17, 1979..	67.65	Aug. 30.....	67.39	Nov. 6.....	67.59
Aug. 7.....	67.60	Oct. 9.....	67.62		

133-073-02DDC MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

June 5, 1979..	7.42	Aug. 7.....	7.65	Oct. 9.....	8.00
July 17.....	7.47	Aug. 30.....	8.02	Nov. 6.....	8.10

133-073-24BBB2 MP is top of 1¼-inch plastic pipe 1.80 ft above lsd.

June 5, 1979..	5.65	Aug. 7.....	6.13	Oct. 9.....	6.90
July 17.....	5.83	Aug. 30.....	6.47	Nov. 6.....	7.08

134-067-17CCC2 MP is top of 1¼-inch plastic pipe 1.40 ft above lsd.

July 25, 1979..	64.55	Aug. 29.....	59.84	Nov. 8.....	55.57
Aug. 7.....	62.43	Oct. 10.....	56.69		

Depth to water, in feet below or (+) above land surface

134-068-07DDD2 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 25, 1979..	31.38	Aug. 29.....	31.25	Nov. 8.....	30.88
Aug. 7.....	31.34	Oct. 10.....	31.10		

134-068-23BBA2 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 25, 1979..	51.85	Aug. 29.....	51.76	Nov. 8.....	51.69
Aug. 7.....	51.80	Oct. 10.....	51.63		

134-069-08AAD2 MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
June 5, 1979..	22.40	Aug. 7.....	22.00	Oct. 10.....	22.00
July 17.....	22.10	Aug. 28.....	22.13	Nov. 8.....	22.05

134-069-20DDD2 MP is top of 1¼-inch plastic pipe 1.70 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
June 5, 1979..	12.74	Aug. 7.....	13.26	Oct. 10.....	14.06
June 17.....	13.06	Aug. 29.....	13.58	Nov. 8.....	14.20

134-069-27BBA MP is top of 1½-inch plastic pipe 2.20 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
June 5, 1979..	20.52	Aug. 7.....	20.61	Oct. 10.....	20.74
July 17.....	20.61	Aug. 28.....	20.68	Nov. 8.....	20.72

134-069-34CCC2 MP is top of 1¼-inch plastic pipe 2.10 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 17, 1979..	16.92	Aug. 28.....	17.13	Nov. 8.....	17.28
Aug. 7.....	17.05	Oct. 10.....	17.29		

134-070-01DDD2 MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
June 5, 1979..	25.90	Aug. 7.....	26.23	Oct. 10.....	26.33
July 17.....	26.12	Aug. 29.....	26.31	Nov. 8.....	26.26

134-070-24CDC2 MP is top of 1¼-inch plastic pipe 2.20 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Aug. 7, 1979..	10.07	Oct. 10.....	10.73	Nov. 8.....	10.92
Aug. 29.....	9.33				

134-070-35BCB2 MP is top of 1¼-inch plastic pipe 1.60 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
June 5, 1979..	6.74	Aug. 7.....	7.26	Oct. 10.....	8.23
July 17.....	7.10	Aug. 29.....	7.70	Nov. 8.....	8.40

Depth to water, in feet below or (+) above land surface

134-071-03DDD MP is top of 1¼-inch plastic pipe 1.70 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 17, 1979..	0.45	Aug. 28.....	0.42	Nov. 7.....	0.41
Aug. 7.....	.38	Oct. 10.....	.46		

134-071-08BBA MP is top of 1¼-inch plastic pipe 1.40 ft above lsd.

June 5, 1979..	28.62	Oct. 10.....	28.89	Nov. 7.....	30.53
Aug. 29.....	29.22				

134-071-12BBB MP is top of 1¼-inch plastic pipe 1.70 ft above lsd.

Aug. 29, 1979..	0.52	Oct. 10.....	0.56	Nov. 7.....	0.56

134-071-16ADA2 MP is top of 1¼-inch plastic pipe 1.50 ft above lsd.

July 17, 1979..	37.33	Aug. 29.....	37.32	Nov. 7.....	37.33
Aug. 7.....	37.34	Oct. 10.....	37.15		

134-072-10DAA MP is top of 1¼-inch plastic pipe 1.70 ft above lsd.

Nov. 28, 1978..	23.40	Apr. 3.....	24.00	Aug. 7.....	23.17
Dec. 5.....	23.59	May 2.....	23.40	Aug. 30.....	22.19
Jan. 9, 1979..	23.73	June 5.....	22.84	Oct. 9.....	22.40
Feb. 6.....	23.85	July 17.....	22.20	Nov. 7.....	22.41

134-072-32BAB MP is top of 1¼-inch plastic pipe 1.50 ft above lsd.

June 5, 1979..	2.90	July 17.....	3.00	Aug. 7.....	3.20

134-073-05CCC MP is top of 1¼-inch plastic pipe 1.80 ft above lsd.

June 5, 1979..	80.68	Aug. 7.....	82.93	Oct. 9.....	84.83
July 17.....	84.50	Aug. 30.....	82.55	Nov. 6.....	85.91

134-073-11CCC2 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Nov. 28, 1978..	8.62	May 2.....	6.70	Aug. 30.....	8.22
Dec. 5.....	8.65	May 31.....	7.39	Oct. 9.....	8.64
Jan. 9, 1979..	8.69	June 5.....	7.40	Nov. 6.....	8.69
Feb. 6.....	8.54	July 17.....	7.69		
Apr. 3.....	8.42	Aug. 7.....	7.95		

Depth to water, in feet below or (+) above land surface

134-073-21CDD MP is top of 1½-inch plastic pipe 1.60 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
June 5, 1979..	5.17	Aug. 7.....	6.06	Aug. 30.....	6.57
July 17.....	5.52				

135-067-06DCD1 MP is top of 1½-inch plastic pipe 3.10 ft above lsd.

Aug. 7, 1979..	43.32	Oct. 10.....	42.98	Nov. 8.....	43.55
Aug. 29.....	43.25				

135-067-06DCD2 MP is top of 1½-inch plastic pipe 2.20 ft above lsd.

Aug. 7, 1979..	42.53	Oct. 10.....	42.12	Nov. 8.....	42.17
Aug. 29.....	42.42				

135-067-25BBB MP is top of 1½-inch plastic pipe 3.20 ft above lsd.

Aug. 29, 1979..	50.50	Oct. 10.....	50.69	Nov. 8.....	49.83

135-067-27CBC2 MP is top of 1½-inch plastic pipe 2.90 ft above lsd.

Aug. 7, 1979..	21.77	Oct. 10.....	22.49	Nov. 8.....	22.50
Aug. 29.....	22.11				

135-067-30AAA2 MP is top of 1½-inch plastic pipe 2.20 ft above lsd.

July 25, 1979..	20.35	Aug. 29.....	20.65	Nov. 8.....	21.23
Aug. 7.....	20.43	Oct. 10.....	20.89		

135-068-06DCD1 MP is top of 1½-inch plastic pipe 2.70 ft above lsd.

July 25, 1979..	8.21	Aug. 29.....	8.75	Nov. 8.....	9.35
Aug. 7.....	8.38	Oct. 10.....	9.32		

135-069-01CCC2 MP is top of 1½-inch plastic pipe 2.30 ft above lsd.

Aug. 7, 1979..	25.36	Oct. 10.....	24.42	Nov. 8.....	24.38
Aug. 29.....	24.63				

135-069-07DDD2 MP is top of 1½-inch plastic pipe 2.20 ft above lsd.

Dec. 16, 1978..	18.71	Apr. 30.....	16.09	Aug. 28.....	17.43
Jan. 8, 1979..	18.84	June 6.....	15.80	Oct. 10.....	18.07
Feb. 5.....	18.97	July 18.....	16.25	Nov. 8.....	18.41
Apr. 3.....	19.47	Aug. 7.....	17.06		

Depth to water, in feet below or (+) above land surface

135-069-21BAB2 MP is top of 1¼-inch plastic pipe 1.80 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 26, 1979..	10.00	Aug. 28.....	10.81	Nov. 8.....	11.69
Aug. 7.....	10.36	Oct. 10.....	11.75		

135-069-27CCD2 MP is top of 1¼-inch plastic pipe 1.70 ft above lsd.

Aug. 15, 1979..	15.00	Oct. 10.....	15.94	Nov. 8.....	16.42
Aug. 28.....	15.09				

135-071-15BBB MP is top of 1¼-inch plastic pipe 1.60 ft above lsd.

July 17, 1979..	85.10	Aug. 7.....	84.72	Aug. 28.....	84.67

135-071-30BBB MP is top of 1¼-inch plastic pipe 2.10 ft above lsd.

July 17, 1979..	69.41	Aug. 28.....	68.82	Nov. 7.....	68.80
Aug. 7.....	69.30	Oct. 9.....	69.02		

135-072-09AAD MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

July 17, 1979..	27.53	Aug. 28.....	26.67	Nov. 7.....	26.61
Aug. 6.....	26.96	Oct. 9.....	26.62		

135-072-14BBB MP is top of 1¼-inch plastic pipe 1.80 ft above lsd.

Dec. 6, 1978..	19.66	June 6.....	18.79	Oct. 9.....	19.38
Jan. 8, 1979..	18.70	July 17.....	18.28	Nov. 7.....	19.72
Apr. 3.....	19.38	Aug. 6.....	18.48		
June 1.....	18.84	Aug. 28.....	18.76		

135-072-15CBB2 MP is top of 1¼-inch plastic pipe 1.60 ft above lsd.

July 17, 1979..	23.40	Aug. 28.....	23.03	Nov. 7.....	22.73
Aug. 6.....	23.20	Oct. 9.....	22.85		

135-072-16BBB MP is top of 1¼-inch plastic pipe 2.40 ft above lsd.

Dec. 6, 1978..	35.58	June 1.....	36.24	Nov. 7.....	35.10
May 1, 1979..	35.18	June 6.....	36.12		

Depth to water, in feet below or (+) above land surface

135-073-01AAB MP is top of 1½-inch plastic pipe 1.80 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Aug. 6, 1979..	49.35	Oct. 9.....	50.13	Nov. 6.....	50.17
Aug. 30.....	49.43				

135-073-09ABB MP is top of 1½-inch plastic pipe 2.00 ft above lsd.

Nov.	29, 1978..	5.80	June	5.....	4.61	Oct.	9.....	5.60
Jan.	1, 1979..	6.15	July	17.....	5.08	Nov.	6.....	5.62
May	2.....	4.80	Aug.	6.....	5.18			
June	1.....	4.56	Aug.	30.....	5.18			

135-073-11BBB MP is top of 1½-inch plastic pipe 1.70 ft above lsd.

Dec.	6, 1978..	14.20	June	5.....	12.89	Oct.	9.....	13.53
Jan.	9, 1979..	14.35	July	17.....	13.05	Nov.	6.....	13.70
May	2.....	12.74	Aug.	6.....	13.11			
June	1.....	12.99	Aug.	30.....	13.31			

135-073-15DCC MP is top of 1½-inch plastic pipe 2.50 ft above lsd.

Jan.	9, 1979..	14.87	June	1.....	12.00	Aug.	30.....	12.85
Feb.	6.....	14.93	June	5.....	12.00	Oct.	9.....	13.50
Apr.	3.....	14.07	June	17.....	12.27	Nov.	6.....	13.64
May	2.....	12.23	Aug.	17.....	12.51			

136-067-14CBC1 MP is top of 1½-inch plastic pipe 2.20 ft above lsd.

Aug.	29, 1979..	17.89	Oct.	10.....	18.13	Nov.	8.....	18.08

136-067-14CBC2 MP is top of 1½-inch plastic pipe 2.00 ft above lsd.

Aug.	7, 1979..	16.48	Oct.	10.....	15.17	Nov.	8.....	14.96
Aug.	29.....	15.48						

136-068-10DDD MP is top of 1½-inch plastic pipe 1.70 ft above lsd.

Aug.	13, 1979..	69.86	Oct.	10.....	69.75	Nov.	8.....	69.62
Aug.	29.....	69.80						

136-068-21BCC2 MP is top of 1½-inch plastic pipe 1.40 ft above lsd.

Aug.	13, 1979..	39.20	Oct.	10.....	39.25	Nov.	8.....	39.24
Aug.	29.....	39.15						

Depth to water, in feet below or (+) above land surface

136-069-04CCC2 MP is top of 1¼-inch plastic pipe 1.50 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Aug. 13, 1979..	12.17	Oct. 10.....	12.56	Nov. 8.....	12.60
Aug. 29.....	12.24				

136-069-31CCC2 MP is top of 1½-inch plastic pipe 2.00 ft above lsd.

Oct.	24, 1978..	23.75	Apr.	30.....	24.08	Oct.	10.....	23.02
Dec.	16.....	23.93	June	6.....	23.36	Nov.	8.....	23.20
Jan.	8, 1979..	24.07	July	18.....	22.93	May	6, 1980..	24.20
Feb.	5.....	24.22	Aug.	7.....	22.84			
Apr.	3.....	24.64	Aug.	28.....	22.82			

136-070-03ABB MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

Dec.	6, 1978..	34.02	July	18.....	33.24	Oct.	9.....	33.48
May	1, 1979..	33.54	Aug.	7.....	33.28	Nov.	8.....	33.49
June	6.....	33.21	Aug.	28.....	33.30	May	6, 1980..	33.55

136-070-05AAA1 MP is top of 1½-inch plastic pipe 1.90 ft above lsd.

Dec.	6, 1978..	23.48	July	18.....	24.08	Nov.	8.....	24.61
Jan.	9, 1979..	24.88	Aug.	7.....	24.22	May	6, 1980..	24.45
May	1.....	24.09	Aug.	28.....	24.34			
June	6.....	23.84	Oct.	9.....	24.70			

136-070-05AAA2 MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

Oct.	30, 1978..	24.54	June	6.....	23.22	Oct.	9.....	24.20
Dec.	6.....	24.40	July	18.....	23.52	Nov.	8.....	23.98
Jan.	9, 1979..	24.35	Aug.	7.....	23.72	May	6, 1980..	23.73
May	1.....	24.00	Aug.	28.....	23.79			

136-070-05AAD MP is top of 1¼-inch plastic pipe 2.10 ft above lsd.

Aug.	14, 1979..	10.33	Oct.	9.....	10.59	May	6, 1980..	9.98
Aug.	28.....	10.17	Nov.	8.....	10.42			

136-070-06BBB1 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Dec.	6, 1978..	5.92	May	1.....	4.88	Aug.	28.....	5.38
Jan.	9, 1979..	5.73	June	6.....	4.93	Oct.	9.....	5.60
Feb.	5.....	5.82	July	18.....	5.06	Nov.	8.....	5.60
Apr.	3.....	5.60	Aug.	7.....	5.17	May	6, 1980..	5.52

Depth to water, in feet below or (+) above land surface

136-070-06BBB2 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Dec. 6, 1978..	8.23	May 1.....	6.19	Aug. 28.....	7.24
Jan. 9, 1979..	8.22	June 6.....	6.44	Oct. 9.....	7.77
Feb. 5.....	8.20	July 18.....	6.70	Nov. 8.....	7.74
Apr. 3.....	7.90	Aug. 7.....	7.80	May 6, 1980..	7.54

136-070-08AAA MP is top of 1¼-inch plastic pipe 1.30 ft above lsd.

Oct.	18, 1979..	1.83	Nov.	8.....	1.63	May	6, 1980..	1.88

136-070-15CCC2 MP is top of 6-inch plastic pipe 1.90 ft above lsd.

Nov.	15, 1978..	13.40	June	25.....	12.47	Sept.	15.....	12.68
Jan.	8, 1979..	13.64	June	30.....	12.42	Sept.	20.....	12.74
Feb.	5.....	13.75	July	5.....	12.35	Sept.	25.....	12.78
Mar.	3.....	13.98	July	10.....	12.28	Oct.	10.....	12.83
Apr.	4.....	14.00	July	15.....	12.24	Oct.	15.....	12.94
Apr.	5.....	14.07	July	20.....	12.20	Oct.	20.....	12.95
Apr.	10.....	14.02	July	25.....	12.24	Oct.	25.....	12.99
Apr.	15.....	13.97	July	30.....	12.28	Oct.	30.....	13.02
Apr.	20.....	13.31	Aug.	5.....	12.32	Nov.	5.....	13.07
Apr.	25.....	13.36	Aug.	10.....	12.36	Nov.	10.....	13.02
Apr.	30.....	12.42	Aug.	15.....	12.42	Nov.	15.....	13.05
May	30.....	12.50	Aug.	20.....	12.42	Nov.	20.....	13.10
June	5.....	12.51	Aug.	25.....	12.49	Nov.	25.....	13.07
June	10.....	12.56	Aug.	30.....	12.54	Nov.	30.....	13.13
June	15.....	12.57	Sept.	5.....	12.61	May	6, 1980..	13.11
June	20.....	12.57	Sept.	10.....	12.63			

136-070-16BBB2 MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

Nov.	15, 1978..	6.20	Apr.	30.....	4.56	Oct.	9.....	6.16
Dec.	6.....	6.31	June	6.....	4.93	Nov.	9.....	5.99
Jan.	8, 1979..	6.58	July	18.....	5.20	May	6, 1980..	5.52
Feb.	5.....	6.52	Aug.	7.....	5.50			
Apr.	3.....	6.01	Aug.	28.....	5.64			

136-070-17DDD1 MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

Dec.	6, 1978..	6.67	Apr.	30.....	6.38	Aug.	28.....	6.37
Jan.	8, 1979..	6.52	June	6.....	6.30	Oct.	9.....	6.49
Feb.	5.....	6.57	July	18.....	6.30	Nov.	8.....	6.43
Apr.	3.....	6.31	Aug.	7.....	6.35	May	6, 1980..	6.43

Depth to water, in feet below or (+) above land surface

136-070-17DDD2 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Dec. 6, 1978..	7.37	Apr. 30.....	6.04	Aug. 28.....	6.62
Jan. 8, 1979..	7.61	June 6.....	6.29	Oct. 9.....	7.15
Feb. 5.....	7.76	July 18.....	6.31	Nov. 8.....	7.04
Apr. 3.....	7.49	Aug. 7.....	6.57	May 6, 1980..	6.85

136-070-23AAA1 MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Nov. 15, 1978..	9.55	Apr. 30.....	9.10	Oct. 10.....	8.26
Dec. 16.....	9.74	June 6.....	8.20	Nov. 8.....	8.45
Jan. 8, 1979..	9.72	July 18.....	7.85	May 6, 1980..	9.39
Feb. 5.....	9.43	Aug. 7.....	7.86		
Apr. 3.....	10.21	Aug. 28.....	7.85		

136-070-23AAA2 MP is top of 1¼-inch plastic pipe 2.10 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Nov. 15, 1978..	14.72	Apr. 30.....	12.07	Oct. 10.....	13.46
Dec. 6.....	14.74	June 6.....	12.10	Nov. 8.....	13.51
Jan. 8, 1979..	14.77	July 18.....	12.55	May 6, 1980..	14.07
Feb. 5.....	14.77	Aug. 7.....	12.69		
Apr. 3.....	15.05	Aug. 28.....	13.14		

136-070-24DCD2 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Dec. 6, 1978..	17.29	July 18.....	15.16	Nov. 8.....	15.90
Jan. 8, 1979..	17.50	Aug. 7.....	15.33	May 6, 1980..	17.35
Feb. 5.....	17.60	Aug. 28.....	15.35		
June 6.....	15.07	Oct. 10.....	15.66		

136-070-26BBB2 MP is top of 6-inch plastic pipe 1.80 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Nov. 15, 1978..	17.48	June 5.....	17.33	Sept. 5.....	17.18
Jan. 9, 1979..	17.68	June 10.....	17.43	Sept. 10.....	17.24
Feb. 5.....	17.67	June 15.....	17.41	Sept. 15.....	17.28
Mar. 3.....	17.51	June 20.....	17.41	Sept. 20.....	17.32
Apr. 3.....	17.66	June 25.....	17.33	Sept. 25.....	17.31
Apr. 5.....	17.09	June 30.....	17.15	Oct. 10.....	17.29
Apr. 10.....	17.06	July 5.....	17.03	Oct. 15.....	17.27
Apr. 15.....	17.07	July 15.....	16.97	Oct. 20.....	17.29
Apr. 20.....	16.87	July 20.....	16.92	Oct. 25.....	17.35
Apr. 25.....	17.11	July 25.....	16.99	Oct. 30.....	17.35
Apr. 30.....	17.58	July 30.....	17.10	Nov. 5.....	17.40
May 5.....	17.54	Aug. 5.....	17.07	Nov. 10.....	17.34
May 10.....	17.55	Aug. 10.....	17.14	Nov. 15.....	17.38
May 15.....	17.55	Aug. 15.....	17.20	Nov. 20.....	17.44
May 20.....	17.53	Aug. 20.....	17.22	Nov. 25.....	17.35
May 25.....	17.47	Aug. 25.....	17.25	Nov. 30.....	17.43
May 30.....	17.38	Aug. 30.....	17.17	May 6, 1980..	18.02

Depth to water, in feet below or (+) above land surface

136-071-16CCC MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Nov. 21, 1978..	34.78	June 6.....	34.23	Oct. 9.....	34.33
Dec. 6.....	34.75	July 18.....	34.14	Nov. 8.....	34.21
Jan. 8, 1979..	34.74	Aug. 7.....	34.11		
May 1.....	34.60	Aug. 28.....	34.09		

136-072-08CDC MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Nov.	6, 1978..	8.35	July	18.....	6.56	Oct.	9.....	8.74
Dec.	6.....	9.88	Aug.	6.....	7.03	Nov.	6.....	9.02
June	5, 1979..	5.60	Aug.	28.....	7.62			

136-073-16CBB1 MP is top of 1¼-inch plastic pipe 2.10 ft above lsd.

July	18, 1979..	32.46	Aug.	30.....	32.44	Nov.	6.....	32.52
Aug.	6.....	32.42	Oct.	9.....	32.52			

136-073-16CBB2 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

July	18, 1979..	31.32	Aug.	30.....	31.22	Nov.	6.....	31.33
Aug.	6.....	31.22	Oct.	9.....	31.22			

136-073-16CCC1 MP is top of 1¼-inch plastic pipe 1.80 ft above lsd.

Nov.	29, 1978..	22.17	May	2.....	20.07	Aug.	6.....	21.41
Jan.	9, 1979..	21.92	June	1.....	21.60	Aug.	30.....	21.47
Feb.	6.....	21.85	June	5.....	21.50	Oct.	9.....	21.53
Apr.	3.....	21.77	July	18.....	21.48	Nov.	6.....	21.53

136-073-16CCC2 MP is top of 1¼-inch plastic pipe 2.00 ft above lsd.

Nov.	16, 1978..	19.61	Apr.	3.....	19.82	Aug.	30.....	19.49
Dec.	6.....	19.90	June	5.....	19.58	Oct.	9.....	19.50
Jan.	9, 1979..	19.94	July	18.....	19.55	Nov.	6.....	19.50
Feb.	6.....	19.83	Aug.	6.....	19.49			

136-073-22AAA MP is top of 1¼-inch plastic pipe 1.90 ft above lsd.

Dec.	6, 1978..	91.98	June	1.....	91.90	Aug.	30.....	91.66
Jan.	9, 1979..	91.97	June	5.....	91.80	Oct.	9.....	91.75
Feb.	6.....	91.95	July	18.....	91.68	Nov.	6.....	91.71
Apr.	3.....	91.86	Aug.	6.....	91.65			

Depth to water, in feet below or (+) above land surface

136-073-26CBB1 MP is top of 1½-inch plastic pipe 1.80 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 18, 1979..	9.79	Aug. 30.....	9.75	Nov. 6.....	9.87
Aug. 6.....	9.74	Oct. 9.....	9.89		

136-073-26CBB2 MP is top of 1½-inch plastic pipe 2.60 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 18, 1979..	11.63	Aug. 30.....	11.53	Nov. 6.....	11.75
Aug. 6.....	11.52	Oct. 9.....	11.69		

136-073-28BBB2 MP is top of 1¾-inch plastic pipe 2.15 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
July 18, 1979..	15.06	Aug. 30.....	15.04	Nov. 6.....	15.18
Aug. 6.....	15.02	Oct. 9.....	15.16		

136-073-35DDD1 MP is top of 1¾-inch plastic pipe 1.80 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Apr. 3, 1979..	33.95	June 5.....	33.30	Aug. 30.....	33.19
May 3.....	33.69	July 17.....	33.18	Oct. 9.....	33.47
June 1.....	33.35	Aug. 6.....	33.06	Nov. 6.....	33.52

136-073-35DDD2 MP is top of 1¾-inch plastic pipe 1.90 ft above lsd.

Date	Water level	Date	Water level	Date	Water level
Apr. 3, 1979..	33.43	July 18.....	32.93	Oct. 9.....	33.47
June 1.....	33.18	Aug. 6.....	33.01	Nov. 6.....	33.50
June 5.....	32.95	Aug. 30.....	33.10		

TABLE 3.--Logs of wells and test holes

Depths are shown in feet below land surface.

Gamma-ray logs are uncalibrated.

Neutron logs are in API units.

Potential given in millivolts (mV).

Resistance given in ohms.

133-067-01CAB
(Log from Traut Wells Inc.)

Date drilled: 6/29/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	3	3
	Clay, brown	11	14
	Clay, gray	24	38
	Clay, sandy, gray	10	48
	Clay, sandy, dirty	12	60
	Clay, sandy, gray	118	178

133-067-02BAD1
(Log from Baumgartner Drilling Co.)

Date drilled: 11/20/75

	Clay, brown	12	12
	Clay, gray	53	65
	Sand, fine to coarse	15	80
	Clay, gray	20	100

133-067-02CRC
(Log from Jacob Thurm)

Date drilled: 7/08/77

Alluvium and glacial drift, undifferentiated:			
	Topsoil	2	2
	Clay, yellow	16	18
	Clay, blue	54	72
	Sand	7	79

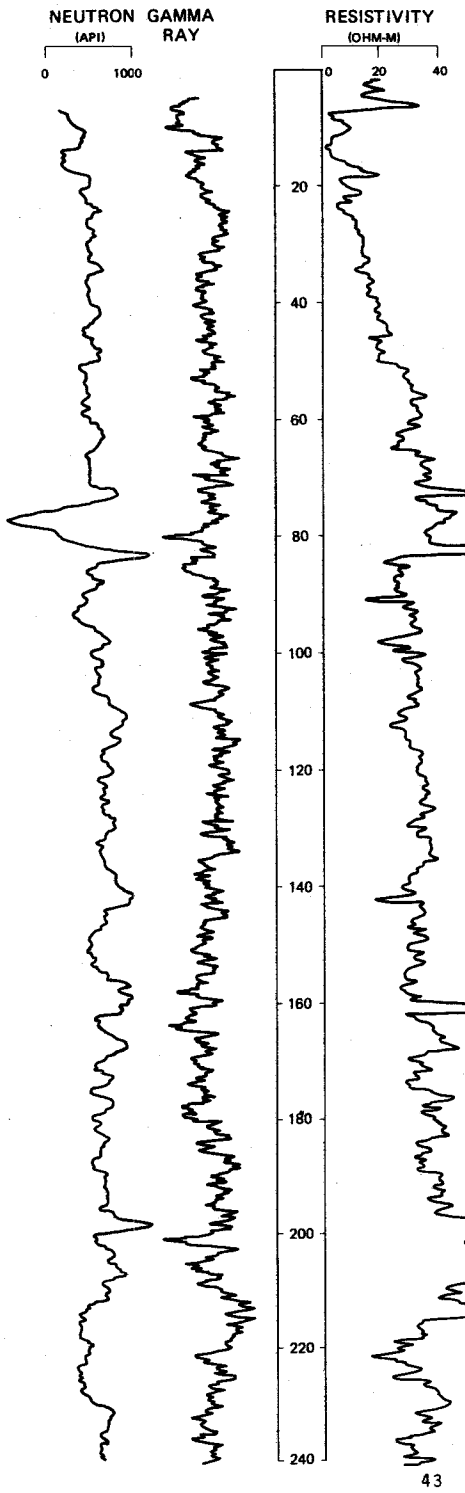
NDSWC 5488

LOCATION: 133-067-08DDD

DATE DRILLED: 7/09/79

ALTITUDE: 2061
(FT, NGVD)

DEPTH: 377
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

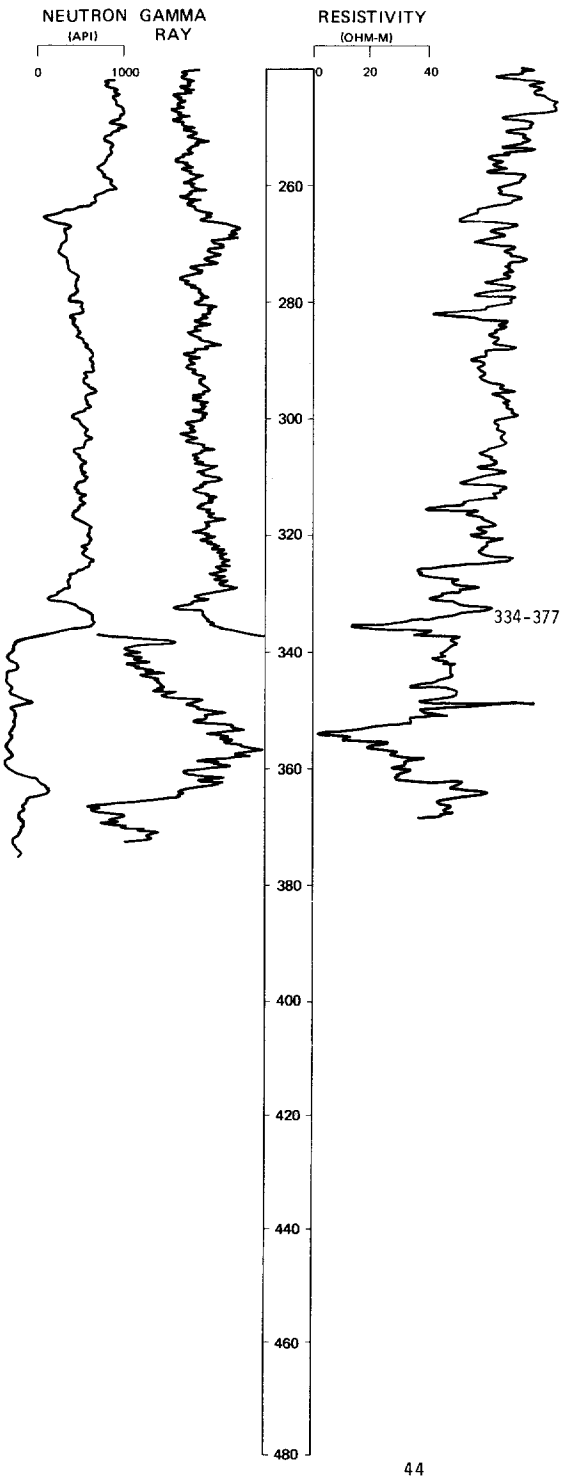
0-1	Topsoil, black.
1-20	Clay (till), silty, sandy, pebbly, yellowish-brown.
20-76	Clay (till), silty, sandy, pebbly, olive-gray.
76-86	Silt, clayey, sandy, olive-gray; few pebbles and lignite fragments; gravel lens from 82 to 84 feet.
86-132	Clay (till), sandy, silty, pebbly, olive-gray.
132-178	Clay (till), very sandy, pebbly, olive-gray; gravel lens from 157 to 158 feet.
178-218	Clay (till), silty, sandy, pebbly, olive-gray; gravel lens from 200 to 202 feet; clayey gravel lens from 204 to 208 feet.
218-334	Clay (till), silty, sandy, gravelly; lignite fragments and abundant shale pebbles.

LOCATION: 133-067-08DDD

DATE DRILLED: 7/09/79

ALTITUDE: 2061
(FT, NGVD)

DEPTH: 377
(FT)



DESCRIPTION OF DEPOSITS

PIERRE SHALE

334-377 Shale, slightly sandy, black, brittle.

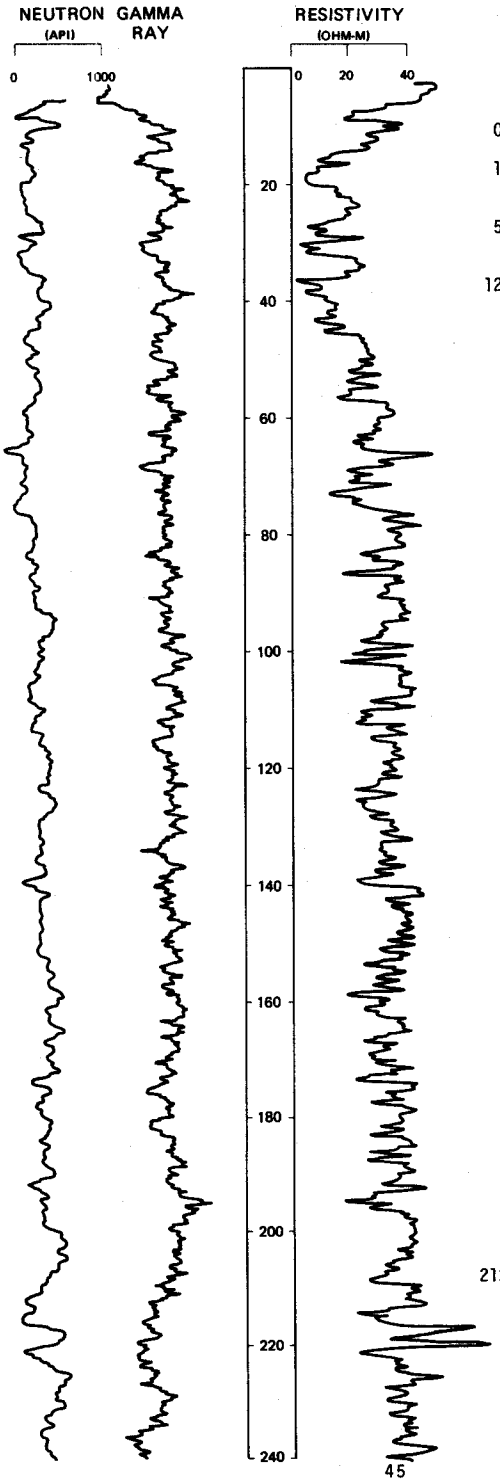
NDSWC 5487

LOCATION: 133-067-11CCC

DATE DRILLED: 7/04/79

ALTITUDE: 2034
(FT, NGVD)

DEPTH: 407
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

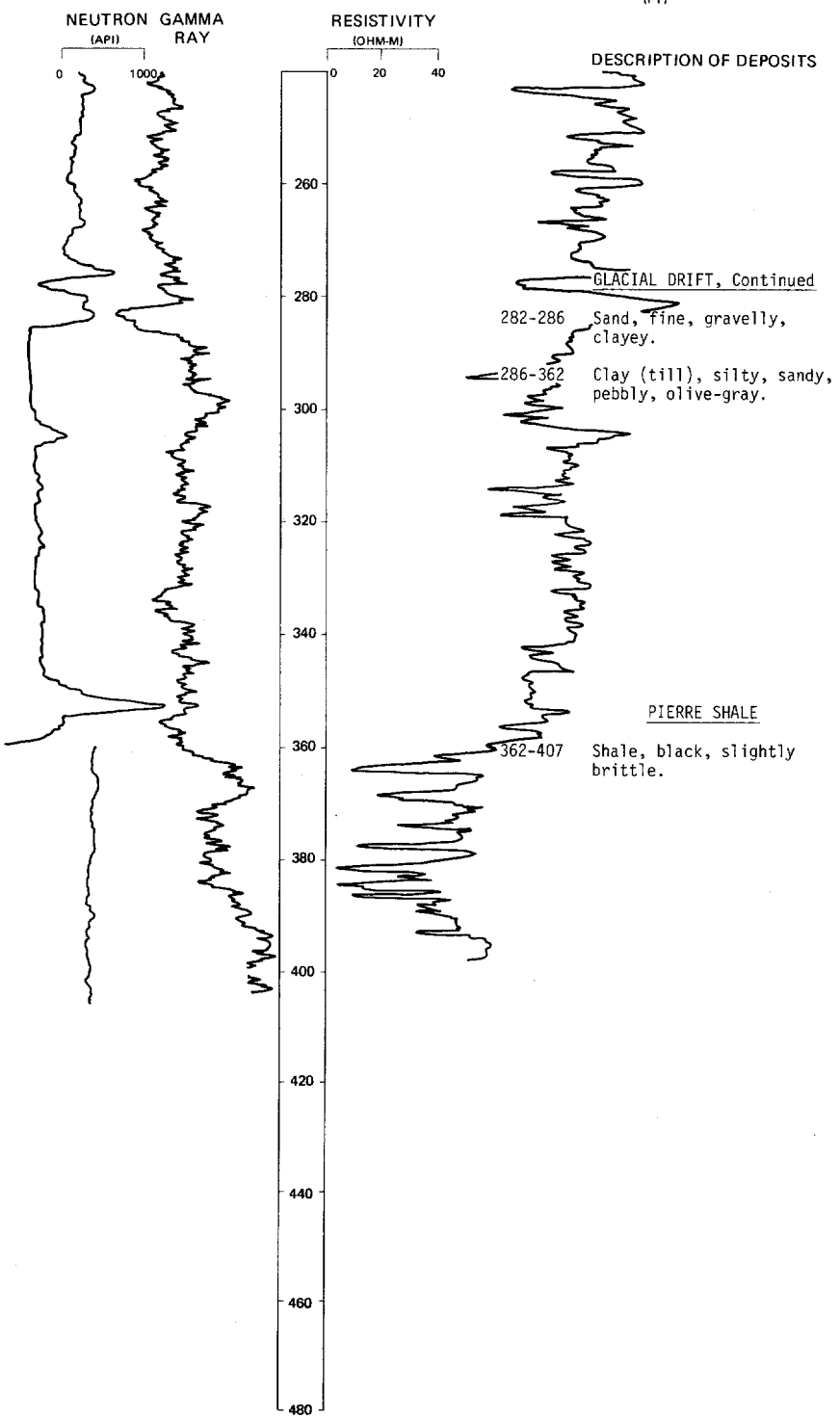
0-1	Topsoil, black.
1-5	Sand, very fine, gravelly, clayey.
5-12	Clay (till), silty, sandy, pebbly, yellowish-brown.
12-212	Clay (till), silty, sandy, pebbly, olive-gray; scattered lignite fragments.
212-282	Clay (till), sandy, silty, gravelly, olive-gray; gravel lenses from 216 to 217 and 219 to 220 feet.

LOCATION: 133-067-11CCC

DATE DRILLED: 7/04/79

ALTITUDE: 2034
(FT, NGVD)

DEPTH: 407
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

282-286 Sand, fine, gravelly, clayey.

286-362 Clay (till), silty, sandy, pebbly, olive-gray.

PIERRE SHALE

362-407 Shale, black, slightly brittle.

133-067-14BBB
(Log from Baumgartner Drilling Co.)

Date drilled: 12/19/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown	22	22
	Clay, blue	142	164
	Clay and pebbles	11	175
	Clay, blue	112	287
	Sand, coarse	13	300

133-067-15CDB
(Log from Lukes Schweigert)

Date drilled: 12/26/72

	Topsoil, black	3	3
	Clay, yellow	19	22
	Clay, gray	28	50
	Clay, blue	42	92
	Sand and gravel	4	96

133-067-18DAA
(Log from Jacob Thurn)

Date drilled: 8/13/75

	Topsoil	3	3
	Clay, yellow	17	20
	Clay, blue	60	80
	Sand	5	85

133-067-29CAA
(Log from Jacob Thurn)

Date drilled: 7/10/75

Glacial drift:			
	Topsoil	2	2
	Clay, yellow	13	15
	Clay, blue	38	53
	Sand	3	56

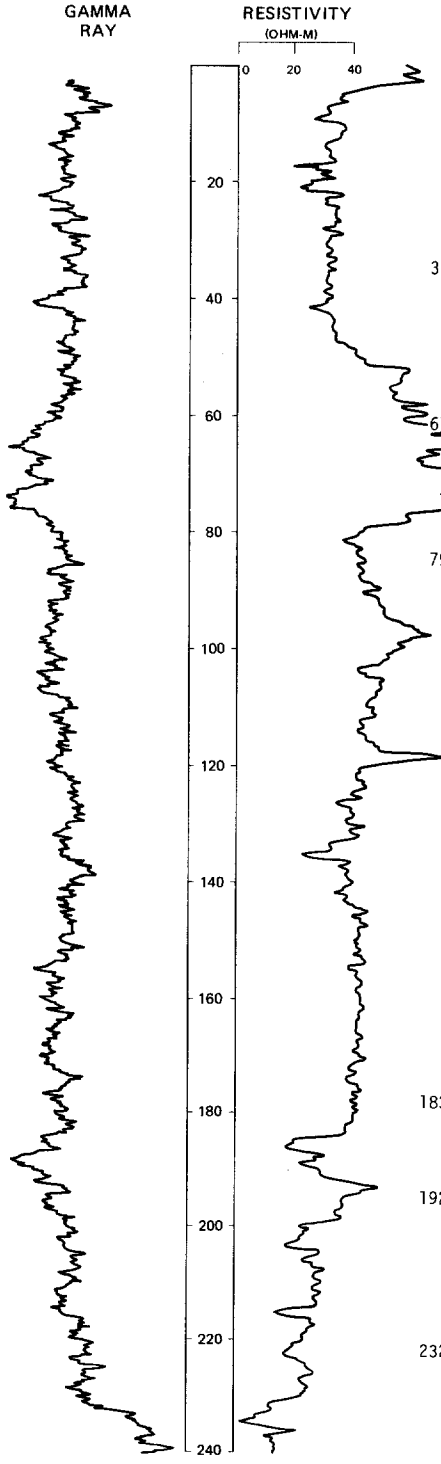
NDSWC 5486, 5486A

LOCATION: 133-067-29CCB1, 2

DATE DRILLED: 7/04/79

ALTITUDE: 2051
(FT, NGVD)

DEPTH: 257
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-33	Clay (till), silty, sandy, pebbly, yellowish-brown.
33-61	Clay (till), silty, sandy, pebbly, olive-gray.
61-79	Sand; very fine to coarse gravel; predominantly coarse angular sand; 60 percent carbonate, 30 percent shale, and 10 percent silicate grains.
79-183	Clay (till), silty, sandy, pebbly, olive-gray.
183-192	Gravel, medium, angular to subangular; 98 percent shale and 2 percent carbonate pebbles.
192-232	Clay (till), sandy, silty, olive-gray, well-compacted; few pebbles.

PIERRE SHALE

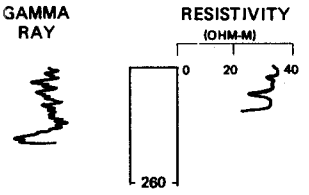
232-257	Shale, slightly sandy, black; interbedded with siltstone.

LOCATION: 133-067-29CCB1, 2

DATE DRILLED: 7/04/79

ALTITUDE: 2051
(FT, NGVD)

DEPTH: 257
(FT)



DESCRIPTION OF DEPOSITS

133-067-29DCB
(Log from Lukes Schweigert)

Date drilled: 5/03/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	1	1
	Soil, gray----------	19	20
	Clay, blue----------	14	34
	Gravel, sandy----------	4	38

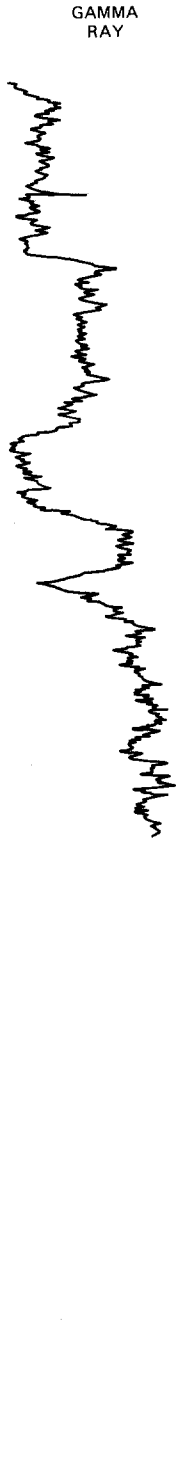
NDSWC 5485

LOCATION: 133-067-31CCC

DATE DRILLED: 7/04/79

ALTITUDE: 2095
(FT, NGVD)

DEPTH: 137
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-32	Sand; very fine to coarse gravel; predominantly coarse angular to rounded sand.
32-62	Clay (till), silty, sandy, pebbly, olive-gray.
62-76	Gravel, very clayey.
76-86	Clay (till), silty, sandy, pebbly, olive-gray.
86-95	Silt, sandy, pebbly, yellowish-brown.

PIERRE SHALE(?)

95-137	Siltstone and shale, olive-gray to black; interbedded.

133-068-10BDB
(Log from Jacob Thurn)

Date drilled: 6/16/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	2	2
	Clay, yellow----------	16	18
	Clay, blue----------	21	39
	Sand----------	2	41

133-068-11DAD
(Log from Jacob Thurn)

Date drilled: 11/22/75

	Topsoil----------	3	3
	Sand and gravel----------	19	22

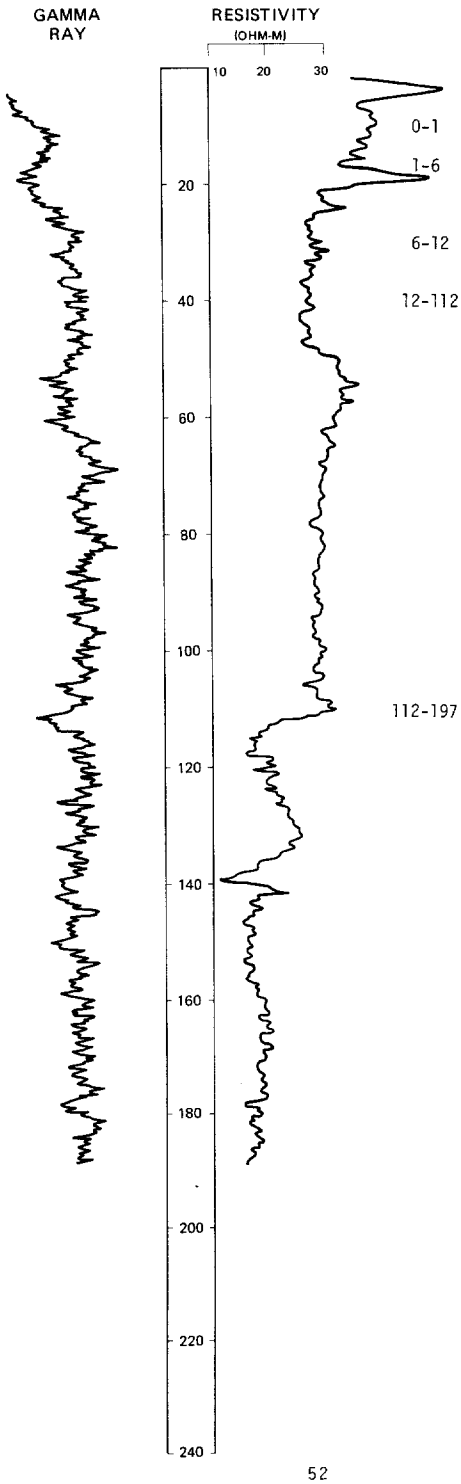
NDSWC 5483

LOCATION: 133-068-15CCC

DATE DRILLED: 7/03/79

ALTITUDE: 2082
(FT, NGVD)

DEPTH: 197
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-6	Sand, fine to coarse, gravelly, angular to rounded.
6-12	Clay (till), silty, sandy, pebbly, yellowish-brown.
12-112	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

112-197	Siltstone, sandy, clayey, yellowish-brown to black, brittle; clay content increases and color becomes darker with depth.

133-068-17BBB
(Log from Jacob Thurn)

Date drilled: 5/27/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Sand and gravel	17	19

133-068-21AAD
(Log from Jacob Thurn)

Date drilled: 5/29/74

	Clay, yellow	20	20
	Clay, blue	40	60
	Shale	14	74

133-068-23CBC
(Log from Jacob Thurn)

Date drilled: 9/16/77

	Topsoil	3	3
	Sand	32	35

133-068-23DAC
(Log from Olson Water Wells)

Date drilled: 9/14/74

	Topsoil	1.5	1.5
	Clay, rocky, gravelly, yellow	28.5	30
	Clay, blue	24	54
	Sand, very fine, gray, muddy	3	57
	Clay, blue	176	233
	Slate, soft, gray	15	248
	Slate, hard, gray	270	518

NDSWC 5481

LOCATION: 133-068-28CCC

DATE DRILLED: 7/02/79

ALTITUDE: 2035
(FT, NGVD)

DEPTH: 197
(FT)

DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-11	Clay (till), silty, sandy, pebbly, yellowish-brown.
11-26	Sand, fine to medium, predominantly coarse, gravelly, well-rounded to subangular.
26-30	Clay (till), silty, sandy, pebbly, olive-gray.
30-37	Sand, fine to medium, gravelly, well-rounded to subangular.
37-120	Clay (till), silty, sandy, pebbly, olive-gray.
120-123	Gravel, fine to coarse, sandy.
123-128	Clay (till), silty, sandy, olive-gray.
128-134	Gravel, fine to coarse, sandy.
134-138	Clay (till), silty, sandy, olive-gray to yellowish-brown.
138-142	Gravel, fine to coarse, sandy.

PIERRE SHALE

142-197	Shale, black, brittle.

NDSWC 5479

LOCATION: 133-068-30BCB

DATE DRILLED: 6/29/79

ALTITUDE: 2059
(FT, NGVD)

DEPTH: 152
(FT)

DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-12	Clay (till), silty, sandy, pebbly, yellowish-brown.
12-64	Clay (till), silty, sandy, pebbly, olive-gray.
64-84	Gravel, fine to coarse, sandy, angular to rounded; 50 percent carbonate, 30 percent shale, and 20 percent igneous and metamorphic pebbles.
84-96	Gravel, fine to coarse, rounded; predominantly shale gravel; interbedded with glacial till.
96-108	Gravel, fine to coarse, predominantly fine, rounded to angular; 33 percent shale, 33 percent carbonate, and 34 percent igneous and metamorphic pebbles.
108-127	Sand, fine to coarse, predominantly very coarse, gravelly, well-rounded to angular; 70 percent shale, 20 percent carbonate, and 10 percent igneous and metamorphic pebbles.
127-132	Clay (till), sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

132-152	Siltstone, sandy, olive-gray, hard; some carbonaceous material.

133-068-32DDD
(Log from Jacob Thurm)

Date drilled: 5/03/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	4	4
	Clay, yellow----------	11	15
	Clay, blue----------	20	35
	Sand----------	15	50

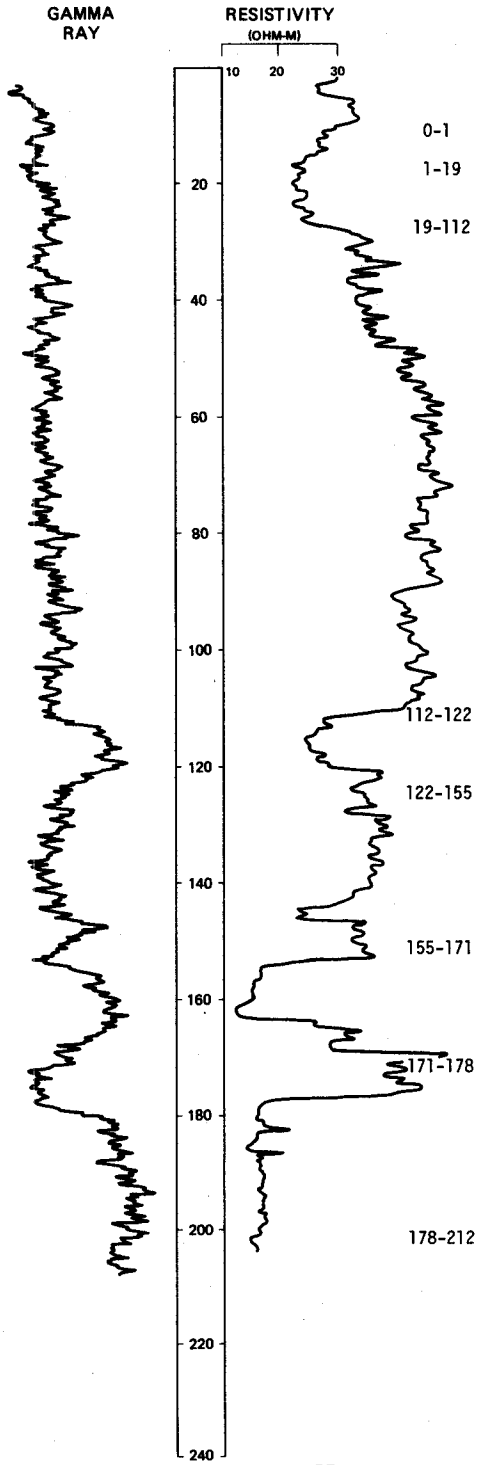
NDSWC 5482

LOCATION: 133-068-35BBB

DATE DRILLED: 7/03/79

ALTITUDE: 2044
(FT, NGVD)

DEPTH: 212
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-19	Clay (till), silty, sandy, pebbly, yellowish-brown.
19-112	Clay (till), silty, sandy, pebbly, olive-gray.
112-122	Clay.
122-155	Clay (till), silty, sandy, pebbly, olive-gray.
155-171	Shale (erratic), slightly sandy, olive-gray, hard; some carbonaceous material.
171-178	Gravel, medium, subrounded to angular; 30 percent carbonate, 30 percent shale, and 40 percent silicate, igneous, and cemented sandstone.

PIERRE SHALE

178-212	Shale, black, brittle; fossil shell fragments.

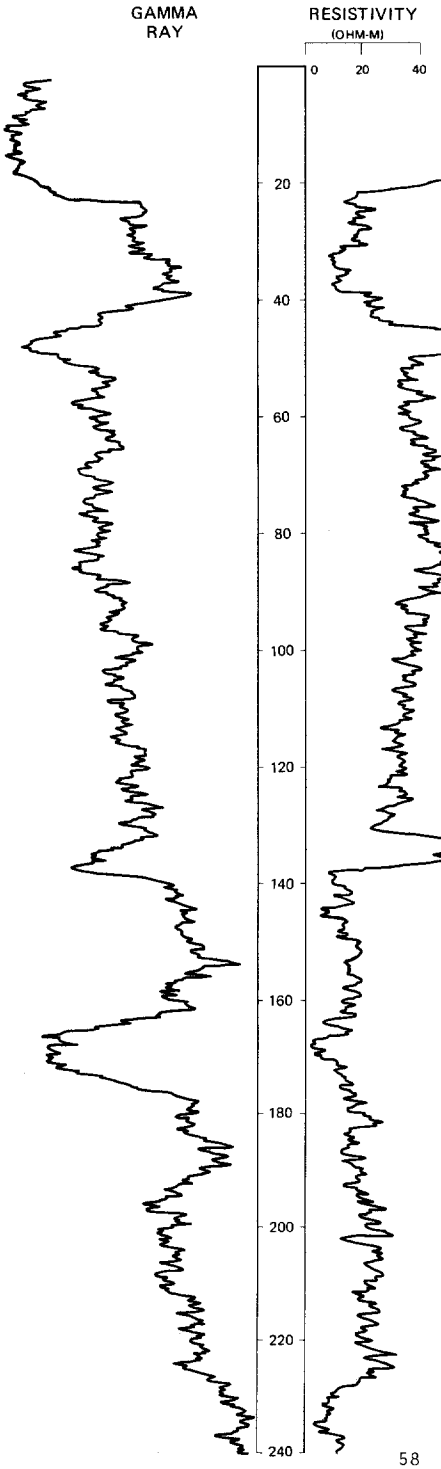
NDSWC 11244

LOCATION: 133-068-35BCC

DATE DRILLED: 5/02/80

ALTITUDE: 2037
(FT, NGVD)

DEPTH: 280
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-22	Sand, fine to very coarse, predominantly medium, gravelly, subangular to rounded.
22-32	Silt, clayey, moderate-yellowish-brown, calcareous.
32-45	Clay (till), silty, pebbly, olive-gray, calcareous.
45-50	Sand, medium to very coarse, gravelly, angular to rounded; 33 percent quartz, 33 percent shale, and 34 percent carbonate grains.
50-87	Clay (till), silty, pebbly, olive-gray.
87-134	Clay (till), sandy, pebbly, dark-greenish-gray, calcareous.
134-138	Sand, medium to coarse, predominantly coarse, subangular to rounded; 50 percent shale, 25 percent quartz, and 25 percent carbonate grains.
138-164	Clay (till), silty, pebbly, sandy, brownish-black, calcareous.
164-174	Gravel, coarse, sandy, angular; composed largely of shale pebbles.
174-230	Clay (till), pebbly, sandy, olive-gray, calcareous; composed largely of shale particles.

PIERRE SHALE

230-280	Shale, brownish-black, hard, noncalcareous.

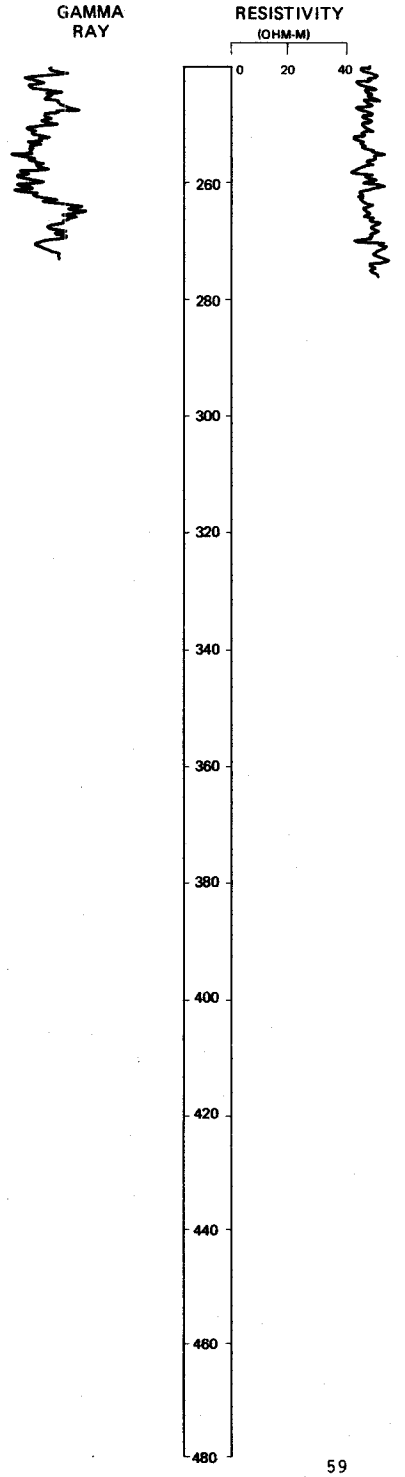
NDSWC 11244, Continued

LOCATION: 133-068-35BCC

DATE DRILLED: 5/02/80

ALTITUDE: 2037
(FT, NGVD)

DEPTH: 280
(FT)



DESCRIPTION OF DEPOSITS

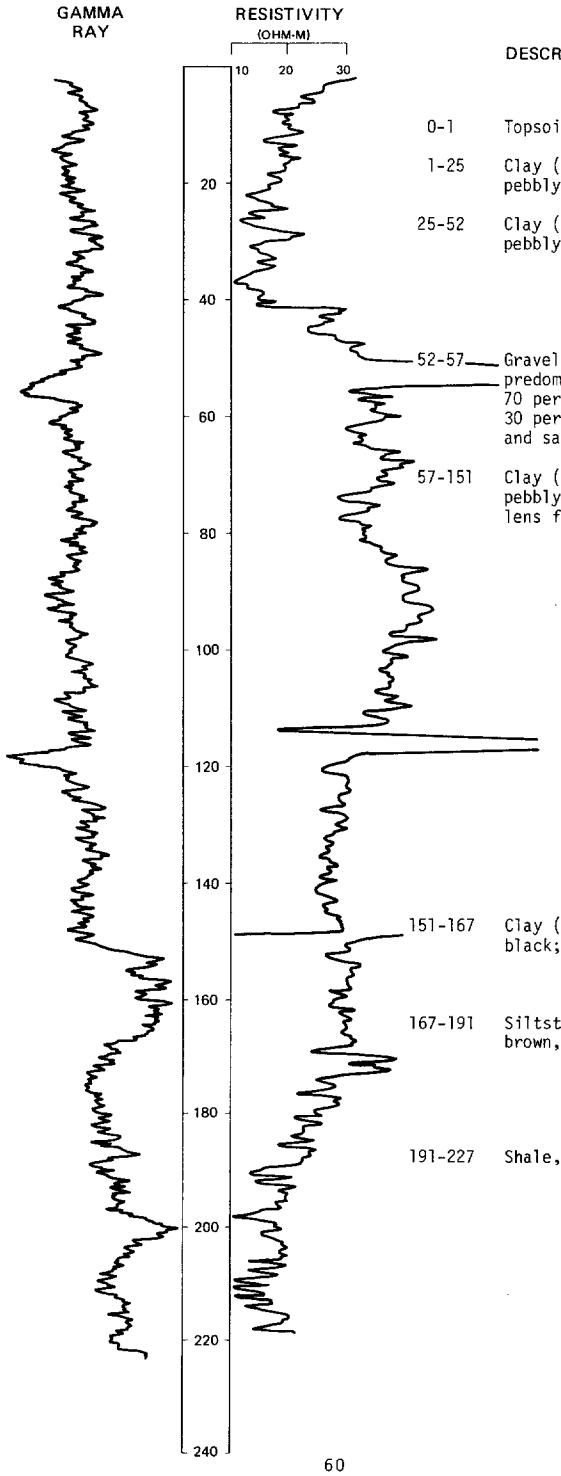
NDSWC 5484

LOCATION: 133-068-36CCC

DATE DRILLED: 7/03/79

ALTITUDE: 2062
(FT, NGVD)

DEPTH: 227
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-25	Clay (till), silty, sandy, pebbly, yellowish-brown.
25-52	Clay (till), silty, sandy, pebbly, olive-gray.
52-57	Gravel, fine to medium, predominantly fine, sandy; 70 percent carbonate and 30 percent shale, silicate, and sandstone pebbles.
57-151	Clay (till), silty, sandy, pebbly, olive-gray; sand lens from 117 to 120 feet.
151-167	Clay (till), sandy, silty, black; scattered pebbles.

PIERRE SHALE

167-191	Siltstone, sandy, yellowish-brown, brittle.
191-227	Shale, black, brittle, hard.

133-069-01CDD
(Log from Jacob Thurm)

Date drilled: 5/29/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Clay, yellow----------	32	35
	Sand----------	13	48

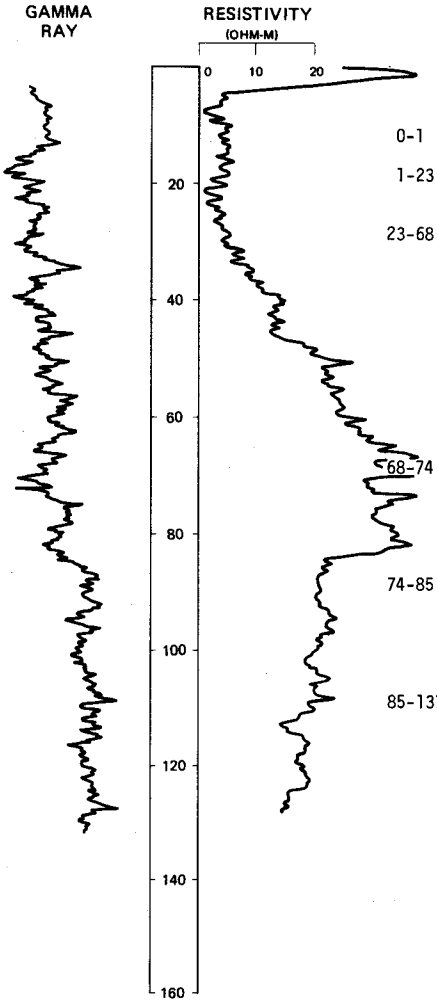
NDSWC 5475

LOCATION: 133-069-05DDD

DATE DRILLED: 6/28/79

ALTITUDE: 1987
(FT, NGVD)

DEPTH: 137
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-23	Clay (till), silty, sandy, pebbly, yellowish-brown.
23-68	Clay (till), silty, sandy, pebbly, olive-gray; sand lens from 64 to 66 feet.
68-74	Sand, very fine to very coarse, predominantly medium to coarse, gravelly; composed largely of quartz and carbonate grains.
74-85	Clay (till), silty, sandy, pebbly, olive-gray; few thin sand lenses.

FOX HILLS SANDSTONE

85-137	Siltstone, slightly sandy, olive-gray, brittle; some mica and carbonaceous material.

133-069-12BCD
(Log from Baumgartner Drilling Co.)

Date drilled: 10/28/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, black	118	120
	Shale, fractured	20	140

133-069-12CAA
(Log from Jacob Thurn)

Date drilled: 6/07/75

	Topsoil	3	3
	Clay, yellow	17	20
	Clay, blue	32	52

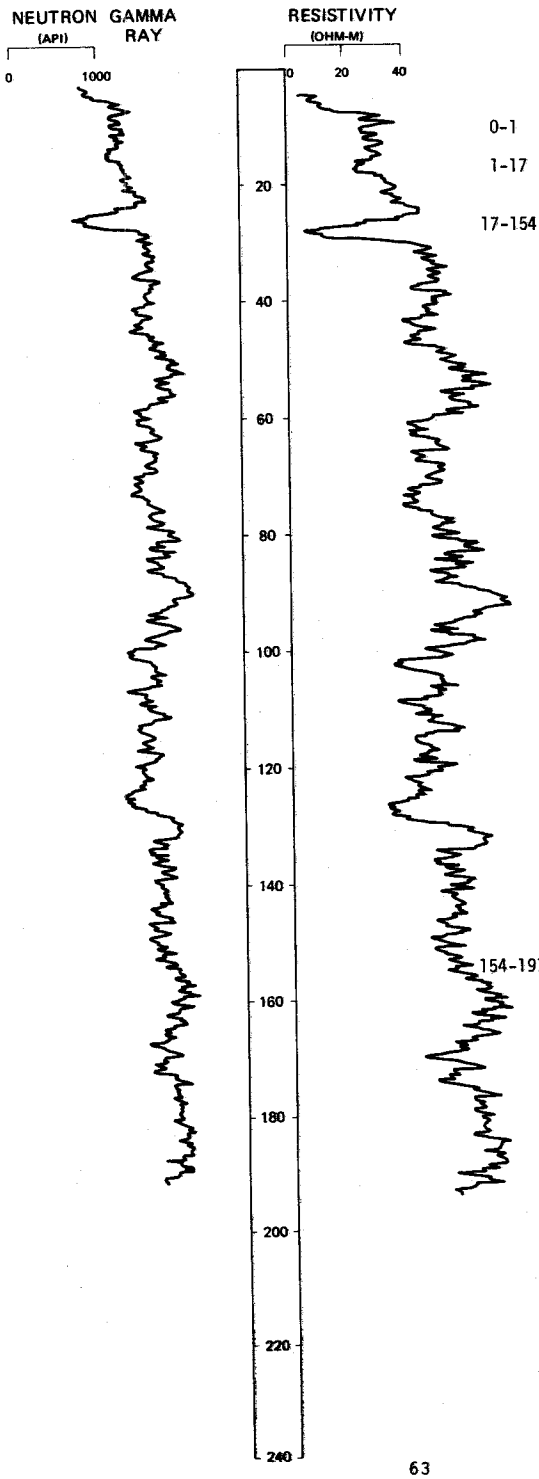
NDSWC 5478

LOCATION: 133-069-12CCC

DATE DRILLED: 6/28/79

ALTITUDE: 2056
(FT, NGVD)

DEPTH: 197
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-17	Clay (till), silty, sandy, pebbly, yellowish-brown.
17-154	Clay (till), silty, sandy, pebbly; sand and gravel lens from 25 to 27 feet; abundant shale pebbles from 137 to 152 feet.

FOX HILLS SANDSTONE

154-197	Siltstone, sandy; interbedded with thin glauconitic sand lenses; olive gray changing to greenish black with depth.

133-069-21ABB
(Log from Venturia Well Drilling)

Date drilled: 2/23/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Dirt, black----------	1	1
	Clay, brown----------	7	8
	Sand and gravel----------	18	26

133-069-22RBR1
(Log from Baumgartner Drilling Co.)

Date drilled: 9/ /73

	Clay, brown----------	36	36
	Clay, gray----------	84	120
	Shale, fractured----------	20	140

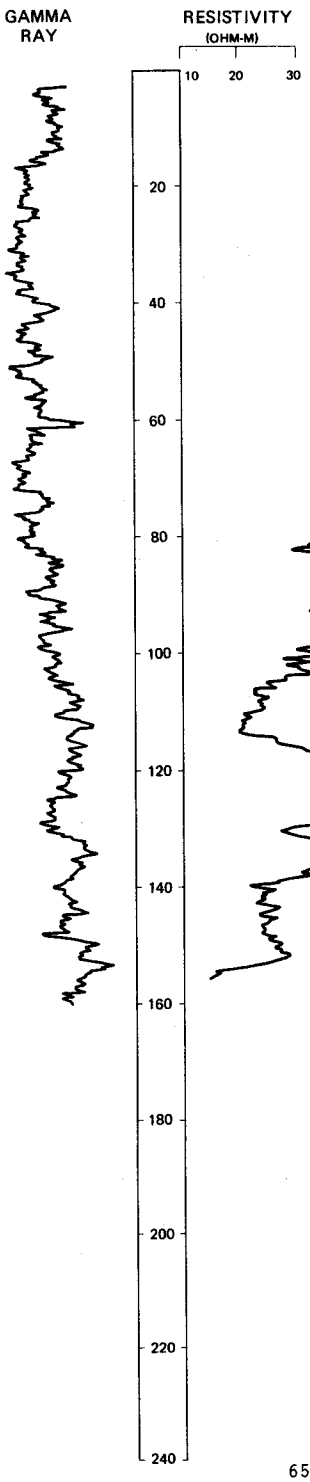
NDSWC 5477

LOCATION: 133-069-22BBB2

DATE DRILLED: 6/28/79

ALTITUDE: 2021
(FT, NGVD)

DEPTH: 167
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-19 Clay (till), silty, sandy, pebbly, yellowish-brown.

19-83 Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

83-120 Siltstone, slightly sandy, olive-gray; some carbonaceous and micaceous material; interbedded with thin fine-grained glauconitic sand lenses.

120-131 Sandstone, very fine to fine, well-rounded, glauconitic, micaceous; 30 percent greenish-black interstitial clay.

131-167 Siltstone, sandy, greenish-black, brittle.

133-069-27CCC
Test hole 1113
(Log modified from Adolphson, 1962)

Date drilled: 1956

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	2	2
	Clay, sandy, brown	4	6
	Clay, yellow; fine to medium gravel and shale pebbles	17	23
	Sand, fine to medium; medium to coarse gravel, cobblestones, and shale pebbles	7	30
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	63	93
	Gravel, fine to medium, and shale pebbles	2	95
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	39	134
Pierre Shale(?):			
	Clay, sandy, gray	16	150

133-069-31AAA
(Log from Jacob Thurn)

Date drilled: 6/12/74

	Topsoil	3	3
	Clay, yellow	9	12
	Clay, blue	4	16
	Sand and gravel	4	20

133-069-32DCD
Test hole 1104
(Log modified from Adolphson, 1962)

Date drilled: 1956

Glacial drift:			
	Topsoil, black	1	1
	Clay, dark-gray, smooth	1	2
	Clay, gray; fine to medium gravel	2	4
	Sand, fine to coarse; fine to medium gravel and shale pebbles	6	10
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	60	70
	Till, clayey, gray; fine to medium gravel and shale pebbles	24	94
Pierre Shale:			
	Shale, gray	26	120

133-069-33DBA
(Log from Jacob Thurn)

Date drilled: 11/01/74

	Topsoil	3	3
	Clay, yellow	15	18
	Sand	5	23

133-069-33DBD
Test hole 1114
(Log modified from Adolphson, 1962)

Date drilled: 1956

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	2	2
	Clay, gray	1	3
	Clay, yellow; fine to medium gravel and shale pebbles	3	6
	Sand, medium to coarse; fine to medium gravel and shale pebbles	2	8
	Clay, yellow; fine to medium gravel and shale pebbles	6	14
	Till, clayey, gray; fine to medium gravel and shale pebbles	20	34
	Clay, yellow; fine to medium gravel and shale pebbles	3	37
	Till, clayey, gray; fine to medium gravel and shale pebbles	4	41
	Sand, fine to coarse; fine to medium gravel and shale pebbles	3	44
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	66	110
	Gravel, fine to medium; shale pebbles	13	123
Pierre Shale(?):			
	Clay, sandy, gray	7	130

133-069-33DCD
Test hole 1103
(Log modified from Adolphson, 1962)

Date drilled: 1956

Glacial drift:			
	Topsoil, black	1	1
	Clay, dark-gray; fine to medium gravel	2	3
	Clay, yellow; fine to medium gravel	4	7
	Clay, yellow, smooth	6	13
	Gravel, fine to medium; shale pebbles	4	17
	Clay, yellow; fine to medium gravel and shale pebbles	7	24
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	43	67
	Till, clayey, gray; fine to medium gravel and shale pebbles	39	106
Pierre Shale:			
	Shale, gray	24	130

133-069-33DDC1
Test hole 1101
(Log modified from Adolphson, 1962)

Date drilled: 1956

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	4	4
	Clay, yellow; fine to medium gravel and shale pebbles	2	6
	Sand, fine to coarse; fine gravel and shale pebbles	9	15
	Sand, fine to medium; fine gravel and shale pebbles	7	22
	Till, clayey, gray; large proportion of fine to medium gravel and shale pebbles	35	57
	Sand, fine to coarse; fine to medium gravel and shale pebbles	8	65
	Gravel, fine; fine to coarse sand and shale pebbles	19	84
	Till, clayey, gray; large proportion of fine to medium gravel and shale pebbles	38	122
	Gravel, fine to medium, and shale pebbles	18	140

133-069-33DDC2
(Log from Baumgartner Drilling Co.)

Date drilled: 4/26/76

Clay	15	15
Sand	7	22
Clay	35	57
Gravel	2	59
Clay	70	129
Gravel	5	134
Clay	26	160

133-069-33DDC3
(Log from Baumgartner Drilling Co.)

Date drilled: 4/26/76

Clay	10	10
Gravel	8	18
Clay	22	40
Gravel	5	45
Clay	75	120
Gravel	9	129
Clay	31	160
Hard clay	10	170

133-069-33DDC4
(Log from Baumgartner Drilling Co.)

Date drilled: 4/28/76

Clay	80	80
Gravel	4	84
Gravel and sand	7	91
Clay	69	160
Hard clay and shale	10	170

133-069-33DDC5
(Log from Baumgartner Drilling Co.)

Date drilled: 4/29/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay	26	26
	Gravel	8	34
	Clay	6	40
	Sand	14	54
	Clay	21	75
	Sand, fine	2	77
	Clay	50	127
	Gravel, coarse	13	140
	Gravel, medium	20	160

133-069-33DDD1
(Log from Baumgartner Drilling Co.)

Date drilled: 4/22/76

	Clay	10	10
	Gravel	5	15
	Clay	5	20
	Gravel	2	22
	Clay	18	40
	Gravel	11	51
	Clay	49	100
	Sand and gravel	10	110
	Clay	10	120
	Gravel	20	140
	Clay	2	142
	Sand, medium to coarse	8	150
	Gravel	2	152
	Sand	8	160

133-069-33DDD2
(Log from Baumgartner Drilling Co.)

Date drilled: 4/26/76

	Clay	25	25
	Gravel	5	30
	Clay	25	55
	Rock	1	56
	Clay	24	80
	Gravel	4	84
	Clay	96	180
	Hard clay	20	200

133-069-33DDD3
(Log from Baumgartner Drilling Co.)

Date drilled: 4/28/76

	Clay	33	33
	Gravel	4	37
	Clay	63	100
	Gravel	14	114
	Clay	19	133
	Coarse sand	4	137
	Clay	3	140
	Coarse gravel	17	157
	Clay	23	180

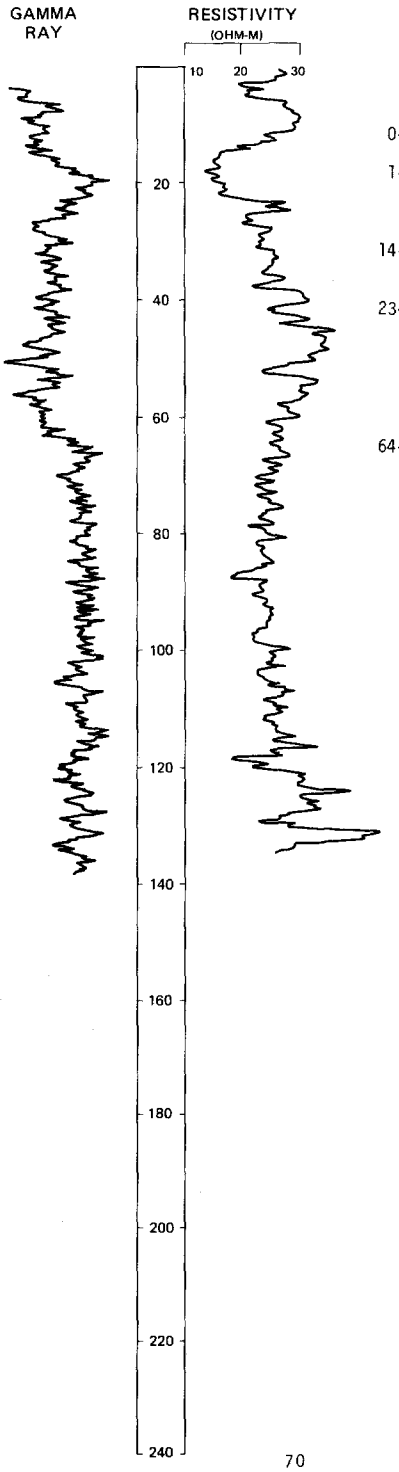
NDSWC 5480

LOCATION: 133-069-34ADD

DATE DRILLED: 6/29/79

ALTITUDE: 2117
(FT, NGVD)

DEPTH: 152
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-14	Clay (till), silty, sandy, yellowish-brown; few pebbles.
14-23	Clay (lacustrine), olive-gray, plastic.
23-64	Clay (till), silty, sandy, pebbly, olive-gray.
64-152	Clay, silty, olive-gray.

133-069-34BCC
Test hole 1102
(Log modified from Adolphson, 1962)

Date drilled: 1956

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Clay, dark-gray, smooth	2	3
	Clay, gray; fine to medium gravel and shale pebbles	4	7
	Clay, gray, smooth	12	19
	Sand, fine to coarse; fine to medium gravel and shale pebbles	7	26
	Gravel, fine to medium, and shale pebbles	4	30
	Till, clayey, gray; fine to medium gravel and shale pebbles	30	60
	Sand, medium to coarse; fine to medium gravel	2	62
	Till, clayey, gray; fine to medium gravel and shale pebbles	68	130
	Till, clayey, gray; large proportion of fine to medium gravel and shale pebbles	15	145
Pierre Shale:			
	Shale, gray	15	160

133-069-34CCB
Test hole 1099
(Log modified from Adolphson, 1962)

Date drilled: 1956

Glacial drift:			
	Topsoil, black	1	1
	Clay, gray, smooth	3	4
	Sand, fine to coarse; gravel and shale pebbles	12	16
	Sand, fine	5	21
	Sand, fine to coarse; fine gravel and shale pebbles; few clay lenses	11	32
	Gravel, fine to medium; few clay lenses and fine sand	18	50
	Till, clayey, gray; fine to medium gravel and shale pebbles	10	60
	Till, clayey, gray; large proportion of fine gravel and shale pebbles	5	65
	Till, clayey, gray; fine to medium gravel and shale pebbles	16	81
	Clay, sandy, gray	7	88
	Till, clayey, gray; large proportion of fine to medium gravel	47	135
	Till, clayey, gray; large proportion of fine to medium gravel with lignite fragments and shale pebbles	115	250
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	30	280
	Till, clayey, gray, smooth; fine to medium gravel, lignite fragments, and shale pebbles; clay content increases with depth	110	390
	Till, clayey, blue-gray; fine to medium gravel, lignite fragments, and shale pebbles	52	442
Pierre Shale:			
	Shale, gray	8	450

133-069-34CCC1
(Log from Baumgartner Drilling Co.)

Date drilled: 4/19/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown	22	22
	Gravel, fine	8	30
	Clay, black	5	35
	Gravel	3	38
	Clay, black	64	102
	Sand, medium	2	104
	Clay, black	18	122
	Sand, fine	3	125
	Clay, sandy	14	139
	Clay, black	14	153
	Gravel, fine	4	157
	Clay, black	23	180

133-069-34CCC2
(Log from Baumgartner Drilling Co.)

Date drilled: 4/20/76

	Clay, brown	20	20
	Gravel, coarse	10	30
	Clay, black	6	36
	Gravel	8	44
	Clay, black	56	100
	Sand, coarse	5	105
	Clay, black	15	120
	Sand, fine	6	126
	Sand, fine to coarse; interbedded with clay	6	132
	No sample	22	154
	Gravel	4	158
	No sample	3	161
	Rock	1	162
	Clay	18	180

133-069-34CCC3
(Log from Baumgartner Drilling Co.)

Date drilled: 4/21/76

	Clay, brown	33	33
	Gravel	4	37
	Clay, brown	3	40
	Clay, black	59	99
	Sand, coarse	6	105
	Gravel	5	110
	Clay, blue	10	120
	Clay	9	129
	Gravel	4	133
	Clay	15	148
	Gravel	5	153
	Clay	27	180

133-069-34CCC4
(Log from Baumgartner Drilling Co.)

Date drilled: 4/21/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown	18	18
	Gravel	6	24
	Clay, black	46	70
	Sand, fine; coal chips	8	78
	Clay	2	80
	Sand, fine	8	88
	Clay	22	110
	Gravel	8	118
	Clay	40	158
	Gravel	7	165
	Clay	15	180

133-069-34CCC5
(Log from Baumgartner Drilling Co.)

Date drilled: 4/21/76

	Clay	18	18
	Gravel	3	21
	Clay	59	80
	Clay and sand, mixed	5	85
	Clay	15	100
	No description	4	104
	Gravel and sand	6	110
	No description	10	120
	Clay	20	140
	Gravel	4	144
	No description	14	158
	Gravel	9	167
	Clay	13	180

133-069-35CCC
Test hole 1112
(Log modified from Adolphson, 1962)

Date drilled: 1956

Glacial drift:			
	Clay, sandy, brown; fine to medium gravel	1	1
	Clay, sandy, yellow; fine to medium gravel	2	3
	Sand, fine to coarse; fine to medium gravel and shale pebbles	10	13
	Gravel, fine to medium; shale pebbles	6	19
	Till, clayey, gray; fine to medium gravel and shale pebbles	12	31
	Sand, fine to coarse; fine gravel and shale pebbles	3	34
	Gravel, fine to medium; shale pebbles	3	37
	Till, clayey, gray; medium to fine gravel and shale pebbles	69	106
	Till, clayey, gray; medium to coarse sand, fine to medium gravel, and shale pebbles	11	117
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	59	176
Pierre Shale(?):			
	Clay, sandy	14	190

133-069-35CDC
(Log from Jacob Thurn)

Date drilled: 8/22/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	1	1
	Gravel	4	5
	Clay, yellow	15	20
	Clay, blue	50	70
	Sand	5	75

133-069-36DAC
(Log from Jacob Thurn)

Date drilled: 5/07/76

	Topsoil	3	3
	Gumbo	7	10
	Sand	2	12
	Clay, blue	9	21

133-070-02DCC
NDSWC 11192

Date drilled: 10/25/79

Glacial drift:			
	Topsoil, black	1	1
	Sand, fine to coarse, gravelly, subangular to rounded, oxidized; 60 percent quartz, 20 percent carbonate, and 20 percent igneous grains	4	5
	Clay (till), silty, sandy, pebbly, moderate-yellowish-brown	6	11
	Clay (till), silty, sandy, pebbly, olive-gray; numerous thin sand lenses	53	64
Fox Hills Sandstone:			
	Sandstone, very fine, grayish-green, rounded, glauconitic, noncalcareous; thin interbedded shale	36	100

133-070-05CAA2
(Log from Venturia Well Drilling)

Date drilled: 5/20/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Dirt, black	1	1
	Rock and gravel	3	4
	Clay, brown	5	9
	Clay, blue	15	24
	Clay, blue, and sand; mixed	21	45

133-070-05DAA
NDSWC 11191

Altitude: 2015 feet

Date drilled: 10/25/79

Glacial drift:			
	Topsoil	1	1
	Sand, fine to coarse, gravelly, subrounded to rounded; 50 percent quartz, 30 percent carbonate, and 20 percent shale grains	11	12
	Clay, olive-gray, plastic	5	17
	Gravel, fine to coarse, sandy, subrounded to rounded	2	19
	Clay (till), silty, sandy, pebbly	8	27
	Sand, fine to very coarse, angular to rounded; 60 percent carbonate, 20 percent shale, and 20 percent quartz grains; sand-gravel ratio is 50:50	7	34
	Clay (till), silty, sandy, pebbly, olive-gray	13	47
Fox Hills Sandstone:			
	Siltstone, clayey, olive-gray, hard, noncalcareous	33	80

133-070-06CBC
(Log from Jacob Thurn)

Date drilled: 6/11/74

	Topsoil	3	3
	Clay, yellow	17	20
	Shale, gray	54	74

133-070-08BBD
(Log from Jacob Thurn)

Date drilled: 6/06/74

	Topsoil	3	3
	Clay, brown	15	18
	Shale, blue	10	28

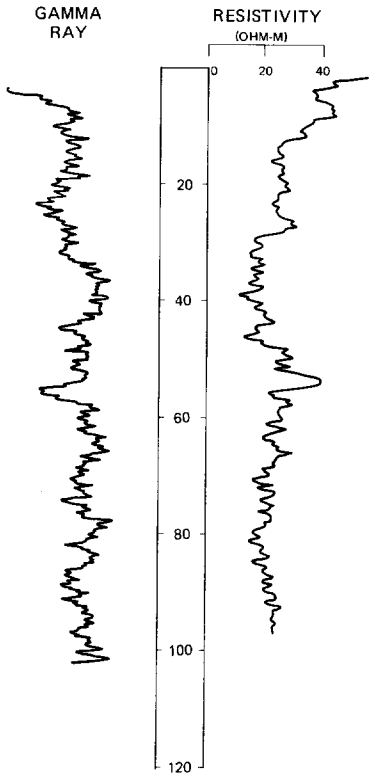
NDSWC 5476

LOCATION: 133-070-24ADD

DATE DRILLED: 6/28/79

ALTITUDE: 2091
(FT, NGVD)

DEPTH: 107
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-12	Clay (till), silty, sandy, pebbly, yellowish-brown.
12-54	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

54-107	Siltstone, slightly sandy, brittle; yellowish brown changing to olive gray at 65 feet.

133-070-28CAD
(Log from Jacob Thurn)

Date drilled: 7/05/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	8	8
	Clay, yellow----------	17	25
	Clay, blue----------	25	50
	Sand, gray----------	22	72

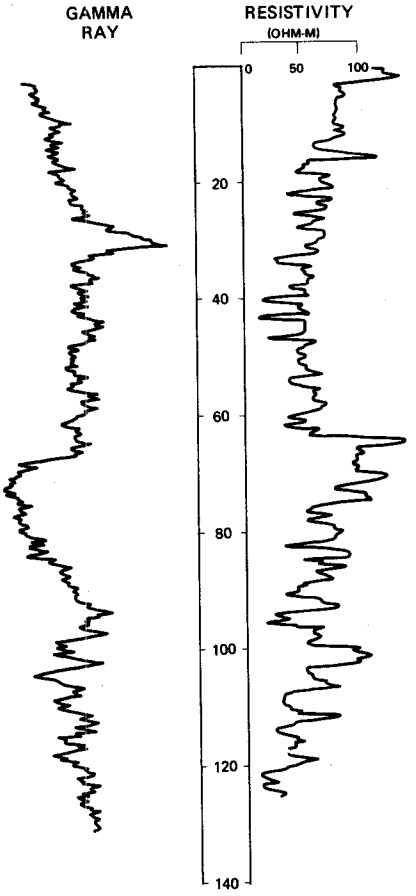
NDSWC 5469

LOCATION: 133-070-29CCC

DATE DRILLED: 6/26/79

ALTITUDE: 2137
(FT, NGVD)

DEPTH: 137
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-38	Clay (till), sandy, silty, pebbly, yellowish-brown; few small gravel lenses.
38-66	Clay (till), sandy, silty, pebbly, olive-gray.

FOX HILLS SANDSTONE

66-84	Sandstone, very fine to fine, grayish-green, angular to rounded, glauconitic.
84-137	Siltstone, dark-olive-gray, brittle.

133-070-29DBA
(Log from Jacob Thurn)

Date drilled: 7/26/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Sand and gravel----------	57	60

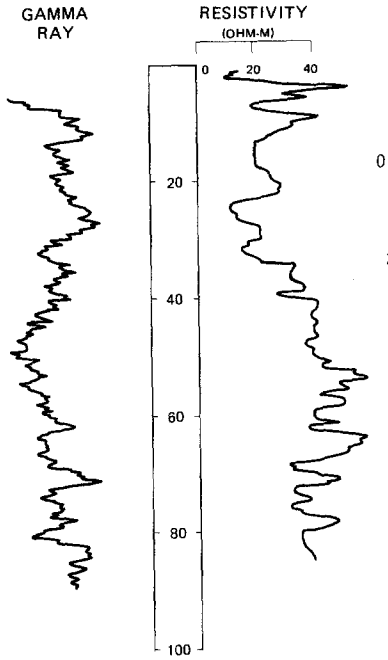
NDSWC 5472

LOCATION: 133-070-30CCD

DATE DRILLED: 6/27/79

ALTITUDE: 2109
(FT, NGVD)

DEPTH: 97
(FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE

0-0.5	Topsoil.
0.5-20	Sandstone, very fine to fine, yellowish-brown, subangular to well-rounded, micaceous.
20-24	Sandstone, very fine to fine, grayish-green, subangular to well-rounded, glauconitic, micaceous.
24-43	Siltstone, sandy, olive-gray, brittle.
43-56	Sandstone, very fine to fine, olive-gray, subangular to well-rounded, glauconitic, micaceous.
56-97	Siltstone, sandy, olive-gray, brittle; few thin sand interbeds.

133-070-31DAA
NDSWC 11190

Altitude: 2092 feet

Date drilled: 10/25/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Sand, fine to very coarse, subangular to rounded, and fine to coarse gravel; 40 percent carbonate, 30 percent shale, 20 percent igneous, and 10 percent quartz grains and pebbles; upper 20 feet oxidized	62	63
Fox Hills Sandstone:			
	Sandstone, fine, grayish-green, rounded, glauconitic	7	70
	Shale, silty, grayish-green	10	80

133-071-01BCC
(Log from Baumgartner Drilling Co.)

Date drilled: 10/04/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	30	32
	Clay, black	98	130
	Clay, black; mixed with sand	10	140
	Clay, gray	60	200
	Fox Hills sand and sandstone	80	280
	Shale	--	280

133-071-04AAD
(Log from Gross Well Drilling)

Date drilled: 7/14/77

	Clay, brown	30	30
	Clay, blue	130	160
	Sand, blue	20	180

133-071-09ABC
NDSWC 5738

Altitude: 1976 feet

Date drilled: 5/24/79

Glacial drift:			
	Topsoil, black	1	1
	Clay (till), silty, sandy, pebbly, yellowish-brown	5	6
	Gravel, fine, sandy	11	17
Fox Hills Sandstone:			
	Silt, clayey, sandy, olive-gray	25	42

133-071-09BBB
(Log from Gross Well Drilling)

Date drilled: 7/15/77

	Clay, brown	30	30
	Clay, blue	130	160
	Sand, water	20	180

133-071-12DCA
(Log from Gross Well Drilling)

Date drilled: 7/12/74

	Clay, brown	40	40
	Gravel, dry	20	60
	Clay	180	240
	Rocks	2	242
	Sand, blue	18	260

133-071-23DDC1
(Log from Jacob Thurn)

Date drilled: 5/20/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	2	2
	Clay, yellow----------	23	25
	Sand, yellow----------	7	32
	Sand, blue----------	8	40

133-071-23DDC2
(Log from Jacob Thurn)

Date drilled: 6/18/77

	Topsoil----------	3	3
	Sand, clay, and gravel----------	25	28
	Sand, blue----------	11	39

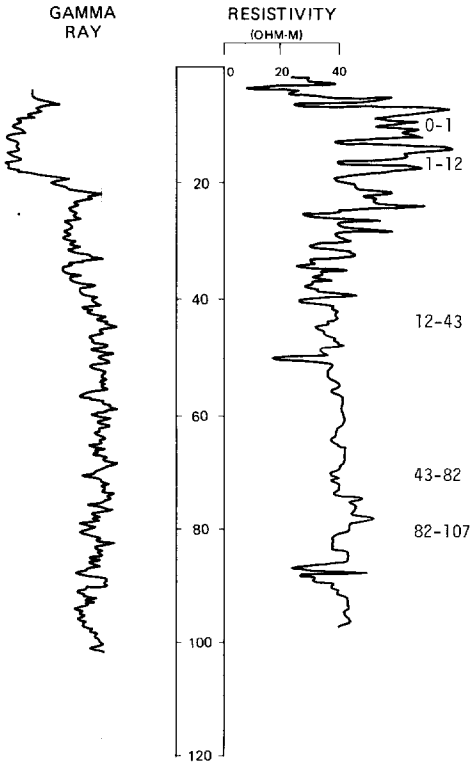
NDSWC 5470

LOCATION: 133-071-25BBB

DATE DRILLED: 6/27/79

ALTITUDE: 2050
(FT, NGVD)

DEPTH: 107
(FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE

0-1	Topsoil, black.
1-12	Sandstone, very fine to fine, clayey, yellowish-brown, subrounded to rounded; 90 percent quartz and 10 percent glauconite, mica, and magnetite.
12-43	Sandstone, very fine to fine, clayey, greenish-gray, subrounded to rounded; 90 percent quartz and 10 percent glauconite, mica, and magnetite.
43-82	Shale, silty, olive-gray, hard.
82-107	Siltstone, slightly sandy, olive-gray.

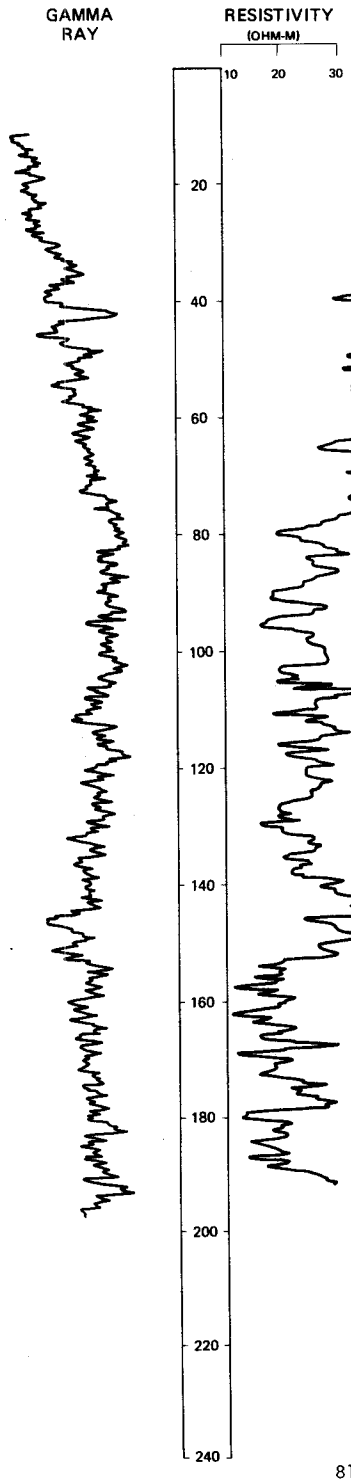
NDSWC 5471

LOCATION: 133-071-25BCC

DATE DRILLED: 6/27/79

ALTITUDE: (FT, NGVD)

DEPTH: 201 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-6	Gravel, fine to coarse, predominantly fine, sandy, angular to subrounded; 50 percent carbonate, 30 percent shale, and 20 percent igneous and metamorphic pebbles.

FOX HILLS SANDSTONE

6-30	Sandstone, fine to medium, predominantly fine, angular to rounded; yellowish brown to 20 feet and olive gray to 30 feet.
30-100	Siltstone, slightly sandy, olive-gray; glauconitic between 75 and 100 feet.
100-130	Siltstone, slightly sandy, olive-gray, hard, carbonaceous.
130-144	Siltstone, sandy, olive-gray.
144-201	Siltstone, slightly sandy, olive-gray, brittle; silty sandstone interbeds from 144 to 147 and 149 to 152 feet; some glauconite in sand lenses from 182 to 201 feet.

133-071-25BCD
(Log from Jacob Thurn)

Date drilled: 9/10/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Black dirt----------	3	3
	Sand----------	47	50
	Shale----------	8	58

133-071-27BBB
NDSWC 11188

Altitude: 1992 feet — Date drilled: 10/24/79

Glacial drift:			
	Topsoil, black----------	1	1
	Clay (till), silty, sandy, yellowish-brown----------	2	3
	Sand, fine to very coarse, gravelly, subrounded to rounded; 40 percent quartz, 40 percent carbonate, and 20 percent igneous grains----------	9	12
Fox Hills Sandstone:			
	Shale, olive-gray----------	8	20

133-071-27CDB1
(Log from Jacob Thurn)

Date drilled: 4/11/74

	Gravel----------	10	10
	Sand; mixed with clay----------	6	16
	Gravel----------	8	24

133-071-27CDB2
(Log from Jacob Thurn)

Date drilled: 4/22/74

	Topsoil, black----------	2	2
	Clay, yellow----------	23	25
	Shale----------	22	47

133-071-27DCC
NDSWC 11189

Altitude: 1956 feet — Date drilled: 10/24/79

Glacial drift:			
	Topsoil, black----------	1	1
	Clay (till), silty, sandy, pebbly, yellowish-brown to brown----------	4	5
	Sand, fine to very coarse, gravelly, subrounded to rounded; 40 percent carbonate, 30 percent quartz, 20 percent shale, and 10 percent igneous grains----------	8	13
Fox Hills Sandstone:			
	Shale, greenish-gray----------	27	40

133-071-28CAD
(Log from Jacob Thurn)

Date drilled: 6/14/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	2	2
	Clay, yellow----------	12	14
	Sand----------	6	20
	Shale----------	16	36

133-071-33BBB
NDSWC 11187

Altitude: 2077 feet

Glacial drift:			
	Topsoil, black----------	1	1
	Clay (till), silty, sandy, yellowish-brown----------	2	3
	Sand, fine, rounded----------	2	5
Fox Hills Sandstone:			
	Shale, silty, yellowish-brown----------	11	16
	Shale, silty, olive-gray, carbonaceous, glauconitic----------	20	36
	Siltstone, greenish-gray, glauconitic----------	4	40

133-071-33DDD
NDSWC 11186

Date drilled: 10/24/79

Glacial drift:			
	Topsoil, black----------	1	1
	Clay (till), silty, yellowish-brown----------	11	12
Fox Hills Sandstone:			
	Shale, silty; yellowish brown changing to olive gray with depth----------	28	40

133-071-34BBB
NDSWC 11185

Altitude: 2034 feet — Date drilled: 10/24/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Clay (till), silty, yellowish-brown	2	3
	Sand, fine to very coarse, gravelly, subrounded to rounded; 40 percent carbonate, 30 percent shale, and 30 percent quartz grains	39	42
	Clay (till), silty, olive-gray	10	52
	Clay (till), silty, olive-gray; numerous thin sand and gravel lenses	8	60
	Sand, fine to very coarse, subrounded to rounded, and fine to medium gravel; few clay lenses; 50 percent carbonate, 20 percent quartz, 15 percent shale, and 15 percent igneous grains and pebbles	40	100
Fox Hills Sandstone:			
	Siltstone, clayey, greenish-gray, noncalcareous	20	120

133-072-04BBC
(Log from Gross Well Drilling)

Date drilled: 11/27/75

Clay, brown	20	20
Clay, blue	110	130
Sand, blue	15	145
Clay	155	300

133-072-06DDD
(Log from Gross Well Drilling)

Date drilled: 10/20/72

Clay, yellow	20	20
Clay, blue	260	280
Blue water sand	20	300

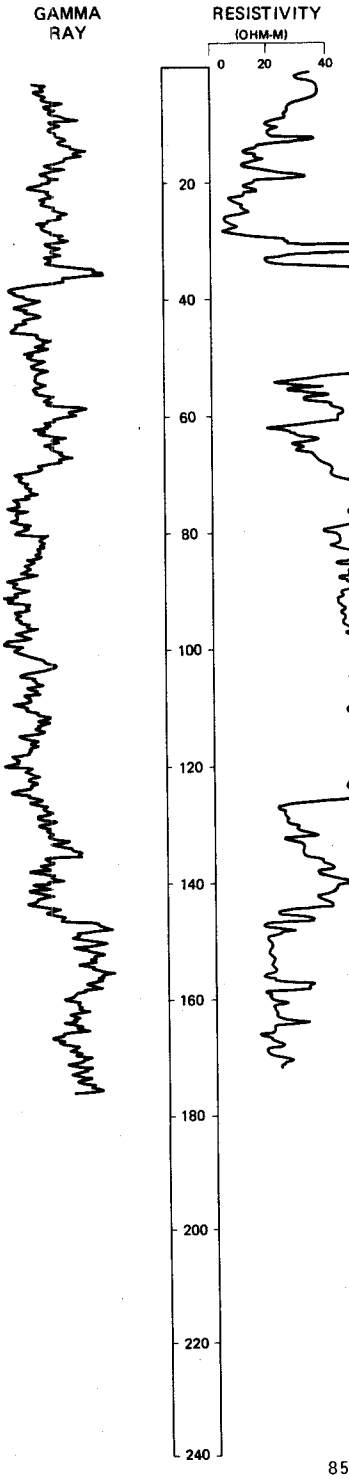
NDSWC 5467

LOCATION: 133-072-15CCC

DATE DRILLED: 6/26/79

ALTITUDE: 2110
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE

0-20	Siltstone, slightly sandy, yellowish-brown, brittle.
20-34	Siltstone, slightly sandy, olive-gray, brittle.
34-50	Sandstone, fine to medium, silty, clayey, yellowish-brown.
50-69	Sandstone, very fine to fine, clayey, yellowish-brown to reddish-brown, angular to well-rounded; abundant magnetite and some mica.
69-146	Sandstone, very fine to fine, grayish-green, angular to rounded, glauconitic.
146-182	Siltstone, olive-gray; few thin very fine sand beds.

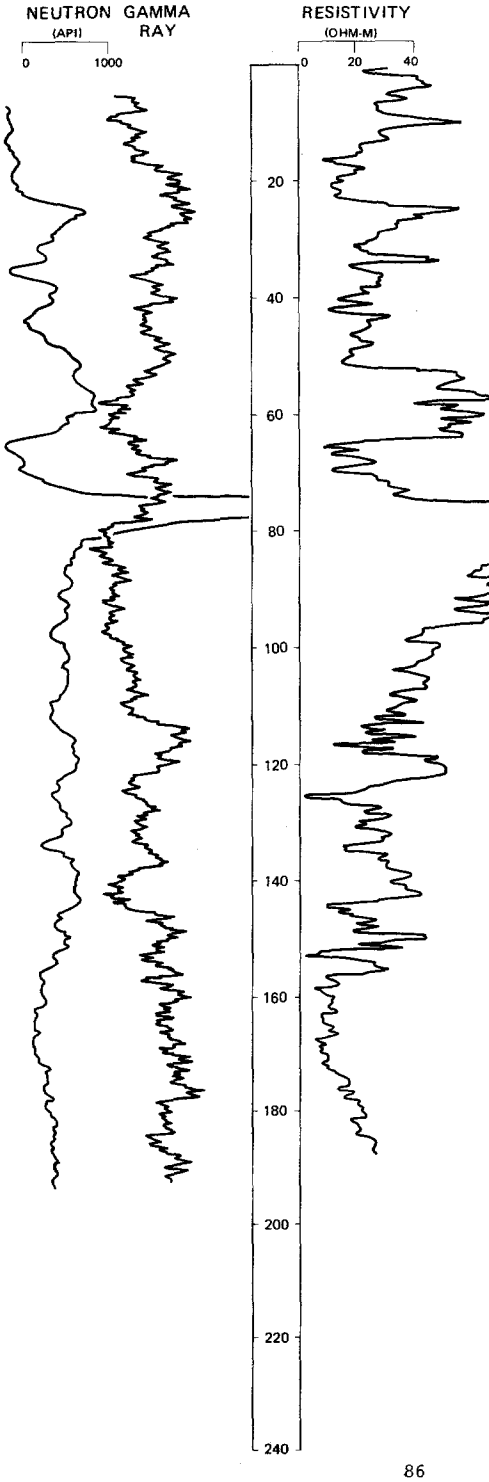
NDSWC 5468

LOCATION: 133-072-26DDD

DATE DRILLED: 6/26/79

ALTITUDE: 2118
(FT, NGVD)

DEPTH: 197
(FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE

0-1	Topsoil, black.
1-29	Siltstone, slightly sandy, brittle; yellowish brown changing to dusky yellowish brown at 10 feet.
29-41	Siltstone, sandy, brittle; olive gray changing to dusky red at 32 feet; some organic material.
41-52	Sandstone, very fine to fine, very silty, olive-gray.
52-64	Sandstone, very fine to fine, olive-gray, well-rounded, glauconitic, micaceous; some magnetite.
64-78	Siltstone, sandy, dusky-red, brittle, carbonaceous; cemented zone from 75 to 78 feet.
78-85	Sandstone, fine, grayish-green, hard; some mica, glauconite, and magnetite.
85-156	Sandstone, very fine to fine, silty, grayish-green, subangular to well-rounded, glauconitic, micaceous; some magnetite; silt and clay content increases with depth.
156-197	Siltstone, shaly, olive-gray, brittle.

133-072-34CBB
(Log from Gross Well Drilling)

Date drilled: 9/19/72

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, yellow	100	100
	Clay, blue	140	240
	Blue water sand	40	280

133-073-02DDC
NDSWC 5432

Altitude: 1904 feet — Date drilled: 5/23/79

Glacial drift:			
	Topsoil, black	1	1
	Sand, medium to very coarse, predominantly very coarse, gravelly; consists largely of quartz and carbonate particles	15	16
Fox Hills Sandstone:			
	Shale, sandy, olive-gray, brittle, hard	6	22
	Sandstone, very fine to fine, olive-gray to greenish-gray, hard, glaucomitic	20	42

133-073-04BBB
(Log from Baumgartner Drilling Co.)

Date drilled: 9/23/74

Clay, brown	25	25
Clay, gray	65	90
Fox Hills sandstone	70	160

133-073-08ADD
(Log from Gross Well Drilling)

Date drilled: 11/17/72

Clay, yellow	20	20
Clay, blue	55	75
Clay, blue, water	25	100

133-073-08CDA
(Log from Brunner Well Drilling)

Date drilled: 10/07/76

Topsoil	1	1
Gravel	3	4
Sand, yellow	8	12
Gravel	1	13
Sand, yellow	16	29
Sand, brown	11	40
Clay, brown	7	47
Sand, brown	7	54
Sand, blue; with layers of gravel	9	63

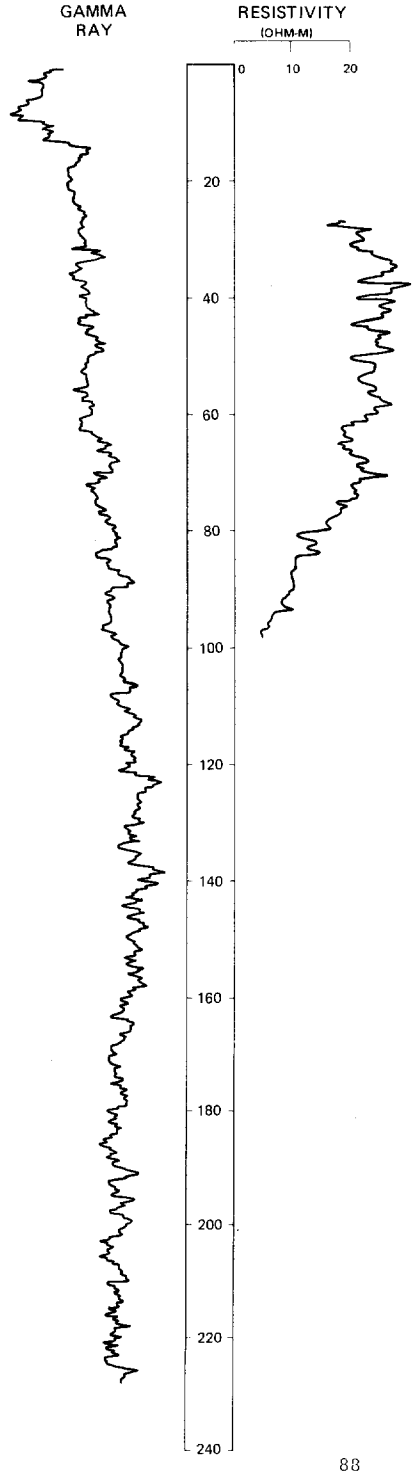
NDSWC 5433, 5433A

LOCATION: 133-073-24BBB1, 2

DATE DRILLED: 5/23/79

ALTITUDE: 1900
(FT, NGVD)

DEPTH: 242
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-14	Sand, fine to very coarse, predominantly very coarse, gravelly, subangular to well-rounded; consists largely of quartz and carbonate particles.

FOX HILLS SANDSTONE

14-18	Shale, sandy, olive-gray.
18-100	Sandstone, very fine to fine, slightly carbonaceous; some glauconite; fossil shell fragment interval from 80 to 100 feet.
100-120	Siltstone, clayey, sandy, olive-gray, hard.
120-160	Siltstone, clayey, sandy, olive-gray, hard; some organic material and fossil shell fragments.
160-226	Shale, black to dark-greenish-gray, brittle.

PIERRE SHALE(?)

226-242	Shale, black, brittle.

133-073-28CDD
NDSWC 11184

Altitude: 1887 feet — Date drilled: 10/24/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Clay (till), sandy, yellowish-brown	3	4
	Sand, fine to coarse, subrounded to rounded, oxidized; 60 percent quartz, 30 percent carbonate, and 10 percent shale grains	14	18
	Clay, sandy	3	21
	Sand, fine to coarse, gravelly, subrounded to rounded; 60 percent quartz, 30 percent carbonate, and 10 percent shale grains	12	33
Fox Hills Sandstone:			
	Shale, greenish-gray	7	40
	Sandstone, fine, hard, calcareous	6	46
	Siltstone, greenish-gray	14	60

133-073-34CAD
(Log from Jacob Thurn)

Date drilled: 10/15/75

Topsoil	2	2
Sand and clay	20	22
Sand, blue	13	35
Shale	15	50

134-067-15CCD1
(Log from Jacob Thurn)

Date drilled: 7/16/74

Topsoil	3	3
Clay, yellow	17	20
Clay, blue	48	68
Sand	2	70

134-067-15CCD2
(Log from Baumgartner Drilling Co.)

Date drilled: 9/24/76

Topsoil	2	2
Clay, brown	18	20
Clay, blue	14	34
Sand, fine, and silt	2	36
Clay, blue	42	78
Gravel, medium	1	79
Clay, blue	13	92
Coal	1	93
Clay, blue	7	100

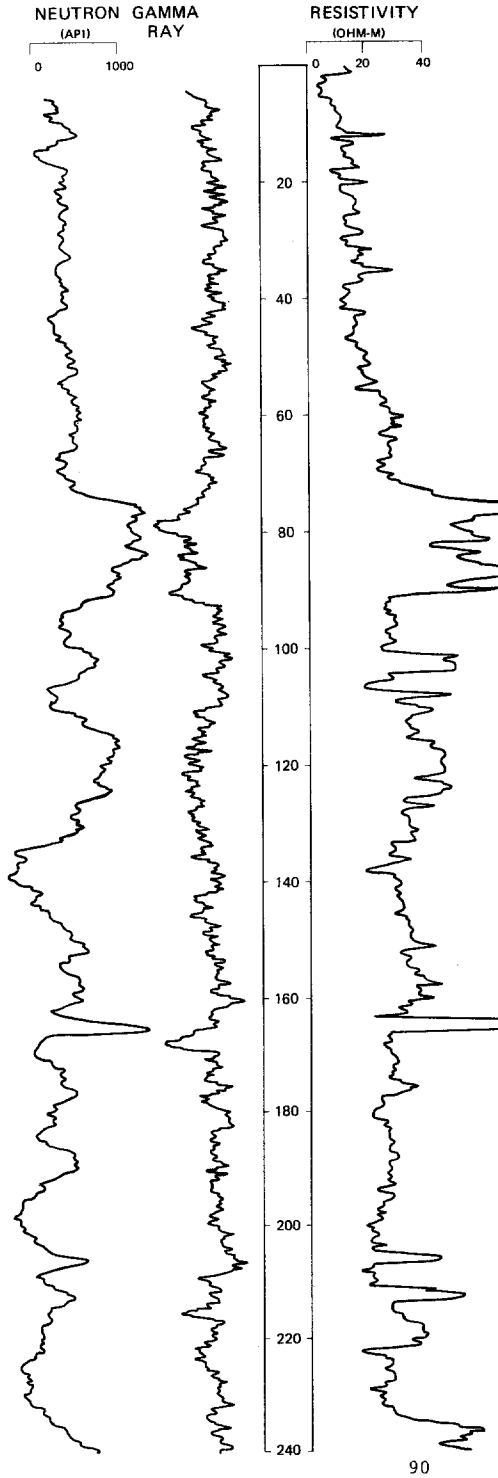
NDSWC 5491, 5491A

LOCATION: 134-067-17CCC1, 2

DATE DRILLED: 7/11/79

ALTITUDE: 2060
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

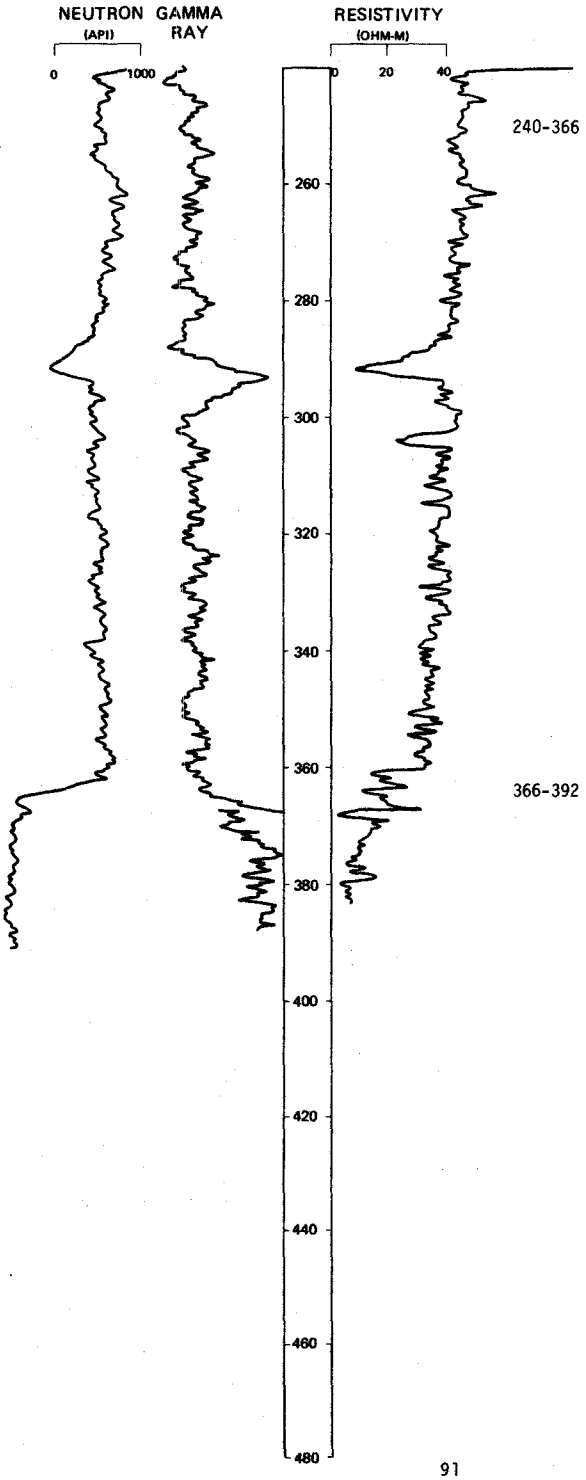
0-1	Topsoil, black.
1-40	Clay (till), silty, sandy, pebbly, yellowish-brown.
40-74	Clay (till), silty, sandy, pebbly, olive-gray.
74-91	Gravel, fine, sandy, angular to rounded; 30 percent carbonate, 30 percent silicate, 30 percent shale, and 10 percent unidentified pebbles; clay content increases in bottom 20 feet.
91-208	Clay (till), silty, sandy, pebbly, olive-gray; contains thin sand and gravel lenses.
208-225	Sand, fine to coarse, very clayey; predominantly quartz with some carbonate, shale, and lignite particles.
225-240	Clay (till), very sandy, silty, pebbly, olive-gray; sand and gravel lens from 235 to 240 feet.

LOCATION: 134-067-17CCC1, 2

DATE DRILLED: 7/11/79

ALTITUDE: 2060
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

240-366 Clay (till), very sandy, silty, pebbly, olive-gray.

PIERRE SHALE

366-392 Shale, slightly sandy, black, hard.

134-067-21BBD
(Log from Baumgartner Drilling Co.)

Date drilled: 9/22/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	38	40
	Clay, blue	185	225
	Sand, medium	1	226
	Clay, blue	38	264
	Sand, medium	1	265
	Clay, blue	55	320
	Shale	220	540

134-067-21BDB2
(Log from Jacob Thurn)

Date drilled: 7/13/74

	Topsoil	4	4
	Clay, gray	16	20
	Clay, blue	15	35
	Sand	3	38
	Clay, blue	15	53

134-067-21BDB3
(Log from Jacob Thurn)

Date drilled: 5/07/76

	Topsoil	3	3
	Clay, yellow	9	12
	Sand	8	20
	Clay, blue	6	26
	Sand	3	29
	Clay, blue	9	38
	Sand	2	40

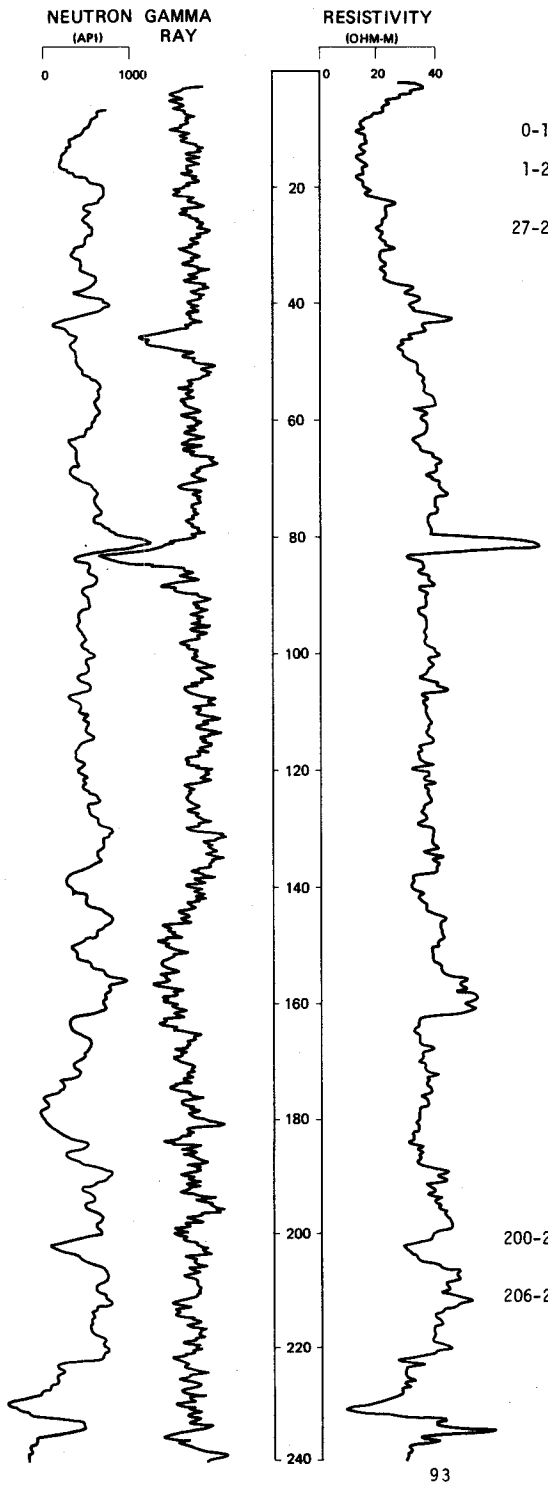
NDSWC 5490

LOCATION: 134-067-22BBA

DATE DRILLED: 7/10/79

ALTITUDE: 1987
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

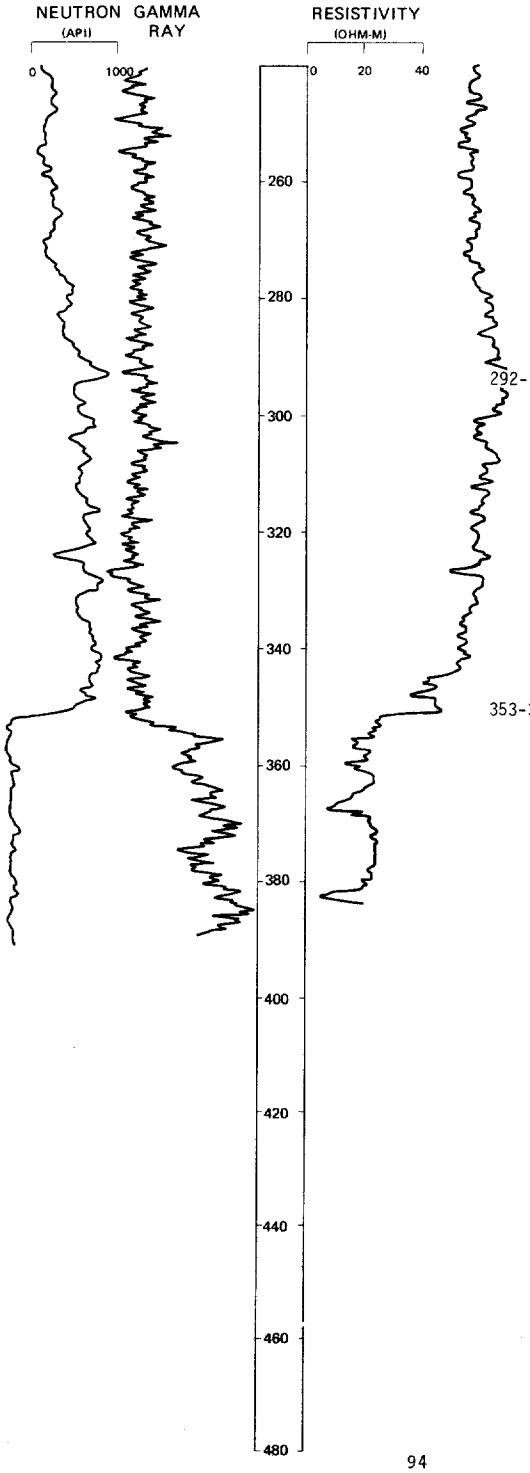
0-1	Topsoil, black.
1-27	Clay (till), silty, sandy, pebbly, yellowish-brown.
27-200	Clay (till), silty, sandy, olive-gray; sand and gravel lenses from 44 to 48 and 80 to 85 feet; some organic material between 45 and 78 feet.
200-206	Silt, sandy, pebbly, olive-gray.
206-292	Clay (till), very silty, sandy; scattered pebbles.

LOCATION: 134-067-22BBA

DATE DRILLED: 7/10/79

ALTITUDE: 1987
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

292-353 Clay (till), very silty, pebbly, olive-gray; scattered sand; abundant shale pebbles.

PIERRE SHALE

353-392 Shale, black, brittle.

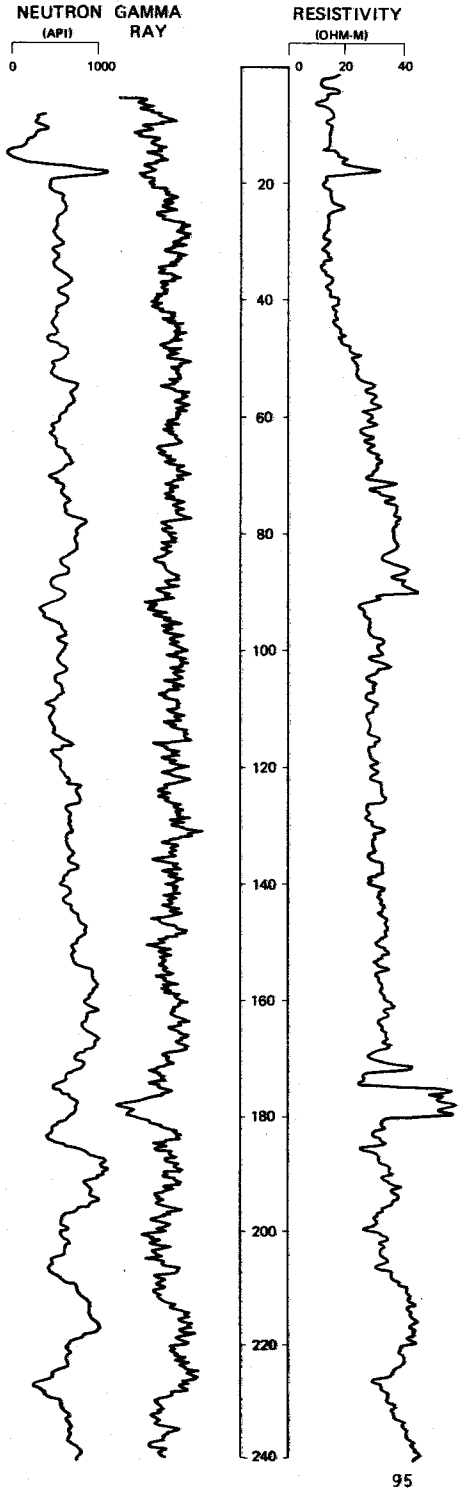
NDSWC 5489

LOCATION: 134-067-33CCC

DATE DRILLED: 7/10/79

ALTITUDE: 2070
(FT, NGVD)

DEPTH: 407
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

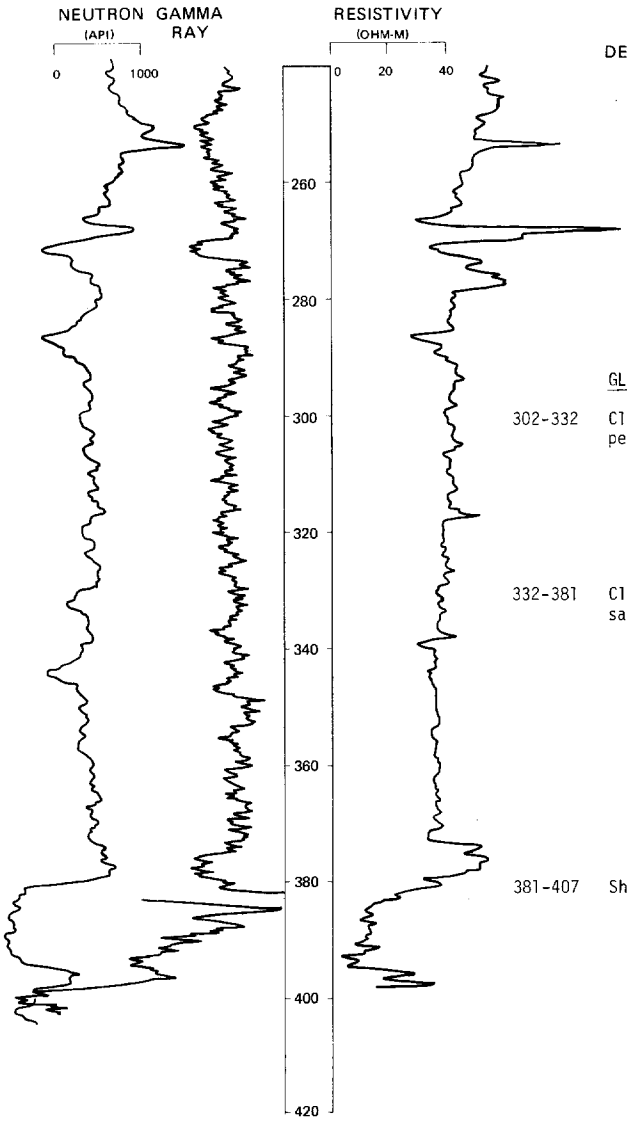
0-17	Clay (till), silty, sandy, gravelly, dark-yellowish-brown to moderate-yellowish-brown.
17-32	Clay (till), silty, sandy, gravelly, moderate-yellowish-brown; small boulder from 17 to 18 feet.
32-52	Clay (till), sandy, silty, olive-gray; gravelly from 46 to 52 feet.
52-77	Clay (till), sandy, silty; scattered pebbles.
77-137	Clay (till), sandy, silty, gravelly, olive-gray; scattered lignite fragments.
137-302	Clay (till), very sandy, silty, pebbly, olive-gray; few thin gravel lenses; abundant lignite fragments and some shale pebbles.

LOCATION: 134-067-33CCC

DATE DRILLED: 7/10/79

ALTITUDE: 2070
(FT, NGVD)

DEPTH: 407
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

302-332 Clay (till), silty, sandy, pebbly, olive-gray.

332-381 Clay (till), gravelly, sandy, olive-gray.

PIERRE SHALE

381-407 Shale, black, hard, brittle.

134-068-05BCC
(Log from Jacob Thurm)

Date drilled: 9/13/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil, black	3	3
	Clay, yellow	32	35
	Sand	1	36
	Clay, blue	47	83

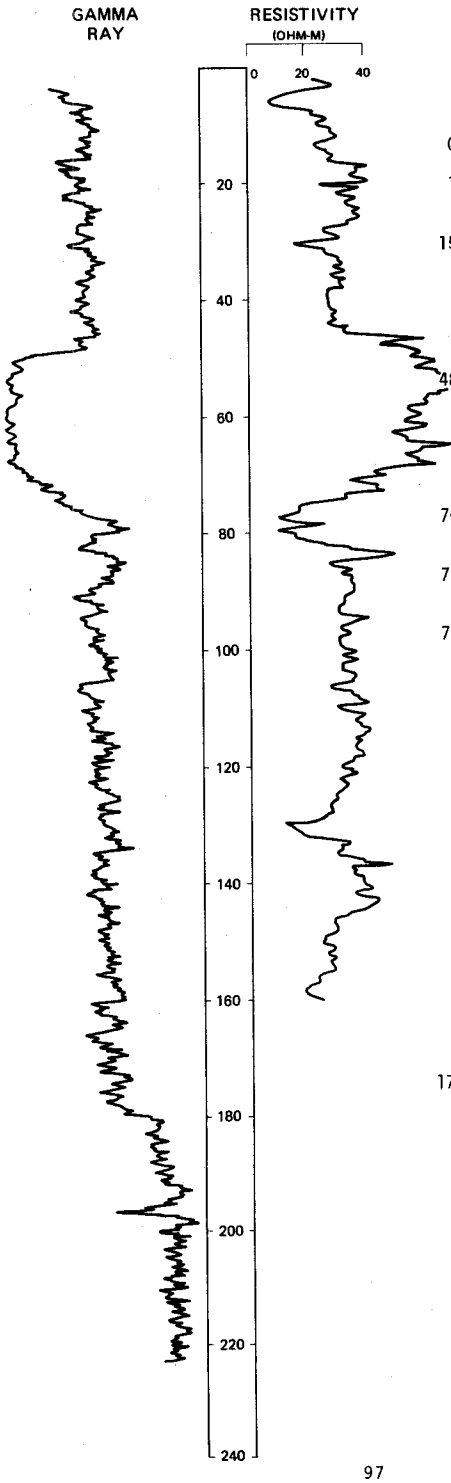
NDSWC 5494, 5494A

LOCATION: 134-068-07DDD1, 2

DATE DRILLED: 7/16/79

ALTITUDE: 1950
(FT, NGVD)

DEPTH: 227
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-15	Clay (till), silty, sandy, pebbly, yellowish-brown.
15-48	Clay (till), silty, sandy, pebbly, olive-gray.
48-70	Gravel, fine to medium, predominantly fine, sandy, angular to well-rounded; 90 percent shale and 10 percent carbonate and silicate pebbles.
70-73	Sand, fine to coarse, clayey.
73-77	Clay, slightly sandy, olive-gray.
77-179	Clay (till), sandy, pebbly, silty; abundant shale pebbles from 152 to 178 feet.

PIERRE SHALE

179-227	Shale, slightly sandy, olive-gray to black.

134-068-08CCB2
(Log from Jacob Thurn)

Date drilled: 8/11/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	4	4
	Sand----------	11	15

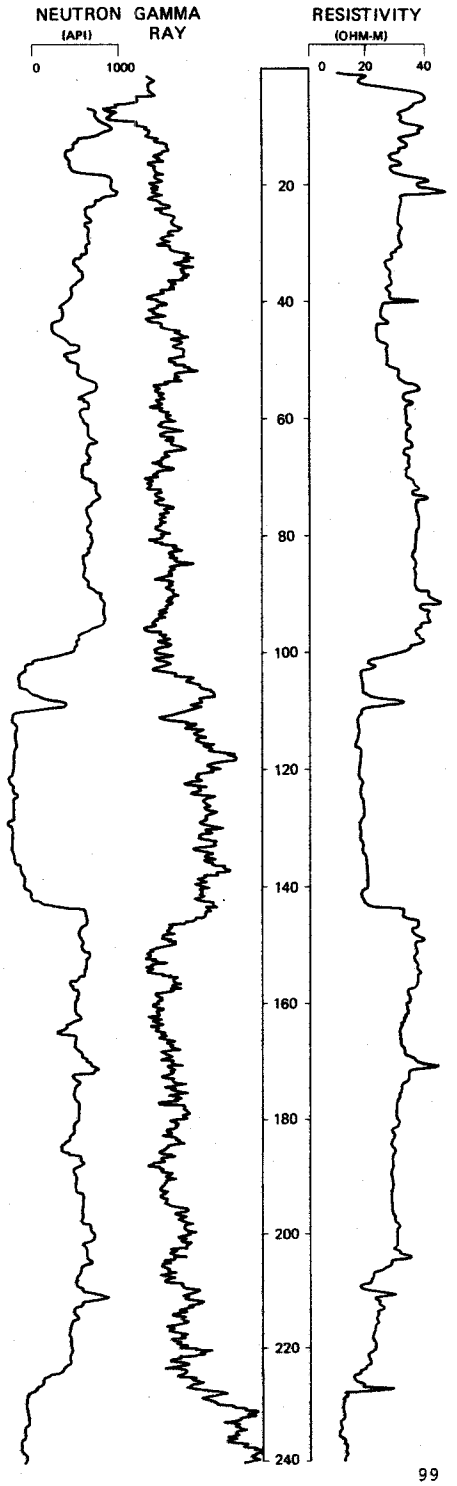
NDSWC 5493

LOCATION: 134-068-09DAA

DATE DRILLED: 7/13/79

ALTITUDE: 1978
(FT, NGVD)

DEPTH: 257
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-9	Sand, very fine to very coarse, gravelly, angular to well-rounded; 60 percent silicate, 30 percent carbonate, and 10 percent shale grains.
9-15	Clay (till), sandy, silty, pebbly, yellowish-brown.
15-47	Clay (till), sandy, silty, pebbly, olive-gray.
47-104	Clay (till), very silty, olive-gray; scattered sand and pebbles; sand lens from 100 to 101 feet.
104-146	Clay (lacustrine), plastic; becomes brittle near bottom of interval.
146-228	Clay (till), sandy, silty, pebbly, olive-gray.

PIERRE SHALE

228-257	Shale, black, brittle, hard.

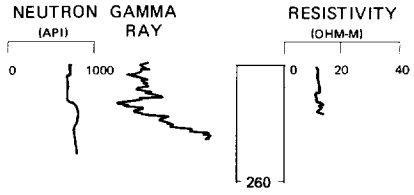
NDSWC 5493, Continued

LOCATION: 134-068-09DAA

DATE DRILLED: 7/13/79

ALTITUDE: 1978
(FT, NGVD)

DEPTH: 257
(FT)



DESCRIPTION OF DEPOSITS

134-068-18AAC
(Log from Jacob Thurn)

Date drilled: 5/28/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Clay, yellow----------	17	20
	Clay, blue----------	10	30
	Gravel----------	5	35

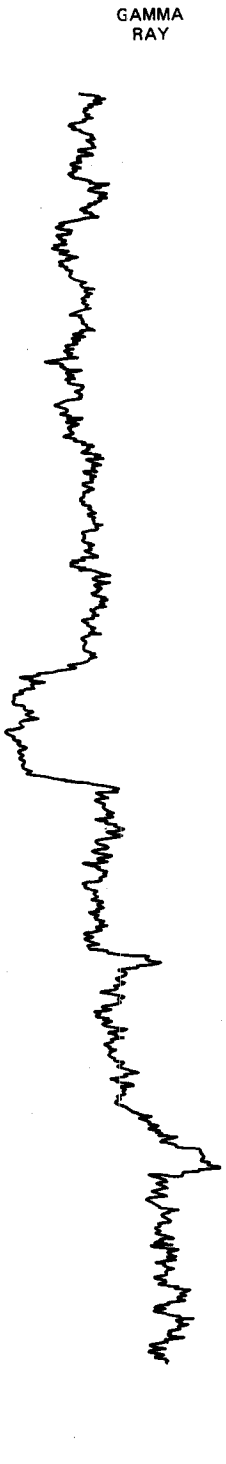
NDSWC 5492, 5492A

LOCATION: 134-068-23BBA1, 2

DATE DRILLED: 7/12/79

ALTITUDE: 2001
(FT, NGVD)

DEPTH: 227
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-25	Clay (till), silty, sandy, pebbly, yellowish-brown.
25-102	Clay (till), silty, sandy, pebbly, olive-gray.
102-122	Gravel, fine, sandy, angular to well-rounded; 60 percent shale, 30 percent carbonate, and 10 percent silicate pebbles.
122-182	Clay, very sandy, silty, olive-gray; scattered pebbles.

PIERRE SHALE

182-227	Shale, slightly sandy, black, brittle.

134-068-31BCB
(Log from Weispfenning Brothers Well Drilling)

Date drilled: 9/29/78

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Sand and gravel----------	16	16

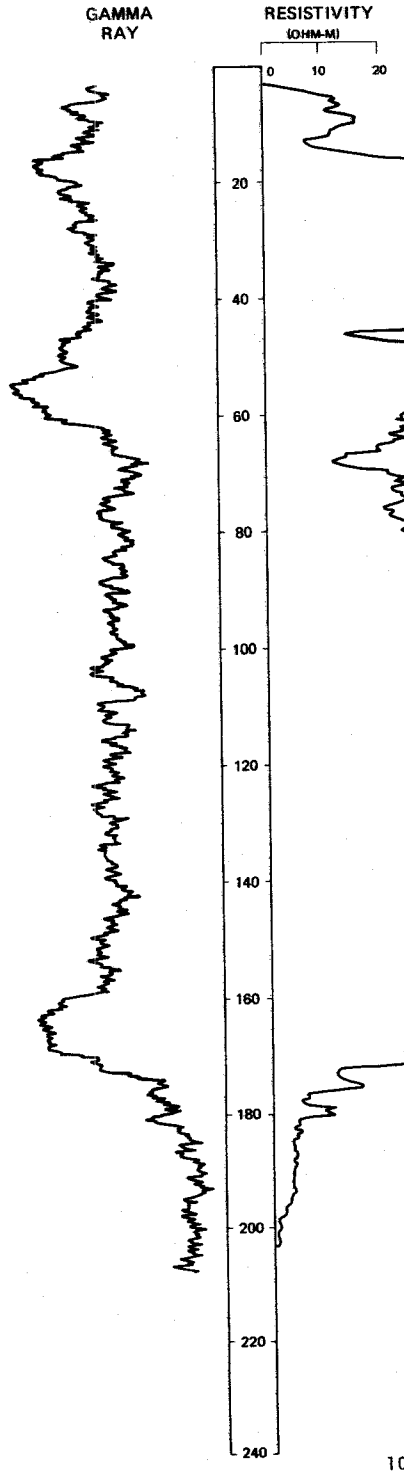
NDSWC 5495, 5495A

LOCATION: 134-069-03DDD1, 2

DATE DRILLED: 7/16/79

ALTITUDE: 1906
(FT, NGVD)

DEPTH: 212
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-10	Clay (till), silty, sandy, pebbly, yellowish-brown.
10-15	Clay (till), silty, sandy, pebbly, olive-gray.
15-19	Gravel, fine to medium, predominantly fine, sandy, angular to well-rounded.
19-46	Clay (till), very silty, very sandy, pebbly, olive-gray.
46-61	Sand, very fine to very coarse, predominantly very fine to fine, gravelly; 80 percent quartz, 10 percent shale, and 10 percent carbonate grains.
61-158	Clay (till), very sandy, very silty, pebbly, olive-gray.
158-169	Sand, very fine to very coarse, predominantly medium to coarse, gravelly, angular to well-rounded; composed largely of quartz and carbonate grains.
169-180	Clay (till), silty, sandy, pebbly, olive-gray.

PIERRE SHALE

180-212	Shale, slightly silty and sandy, black, brittle.

134-069-04CDD
(Log from Jacob Thurn)

Date drilled: 9/27/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	3	3
	Sand and gravel	32	35

134-069-04DCC1
(Log from Jacob Thurn)

Date drilled: 6/16/77

	Topsoil	3	3
	Sand and gravel	42	45

134-069-04DCC2
(Log from Baumgartner Drilling Co.)

Date drilled: 9/25/77

	Topsoil	2	2
	Clay, brown	20	22
	Sand, coarse	2	24
	Clay, blue	7	31
	Silt	3	34
	Clay, blue	92	126
	Sand, fine to coarse	6	132
	Clay, blue	8	140

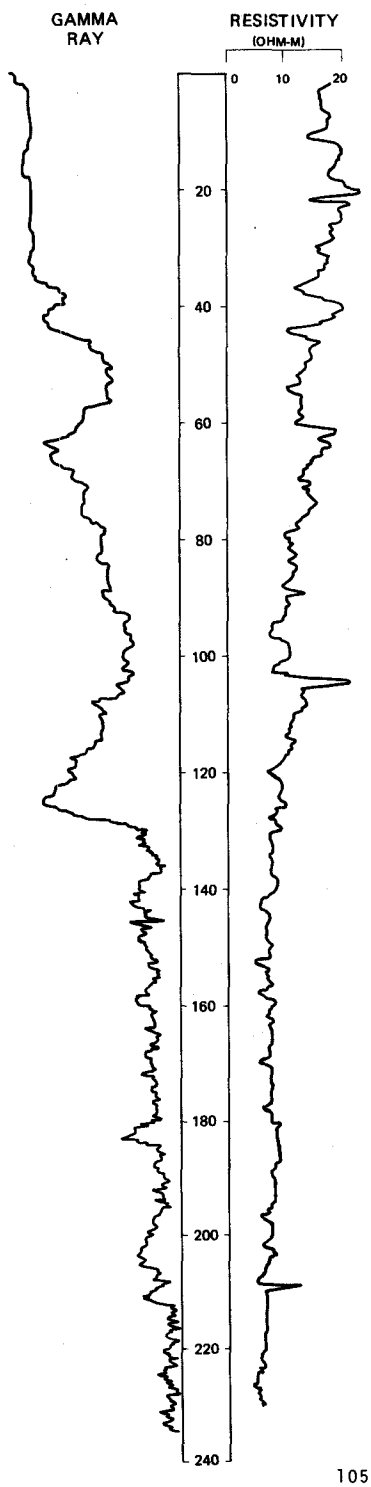
NDSWC 5445, 5445A

LOCATION: 134-069-08AAD1, 2

DATE DRILLED: 5/30/79

ALTITUDE: 1978
(FT, NGVD)

DEPTH: 242
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-36	Gravel, fine to medium, predominantly medium, sandy; composed largely of shale and carbonate pebbles.
36-107	Clay (glaciofluvial), silty, olive-gray.
107-130	Clay (till), very sandy, silty, olive-gray; scattered pebbles.
130-212	Clay (till), very silty, olive-gray; scattered sand.

PIERRE SHALE

212-242	Clay, silty, black.

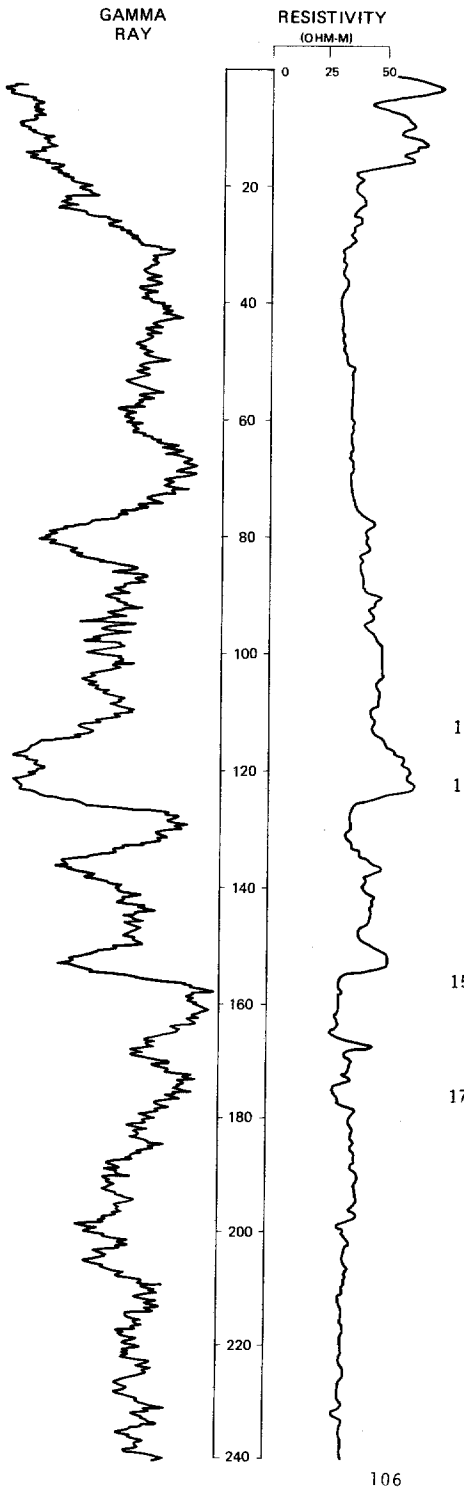
NDSWC 11243

LOCATION: 134-069-09DDD

DATE DRILLED: 5/01/80

ALTITUDE: 1933
(FT, NGVD)

DEPTH: 280
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

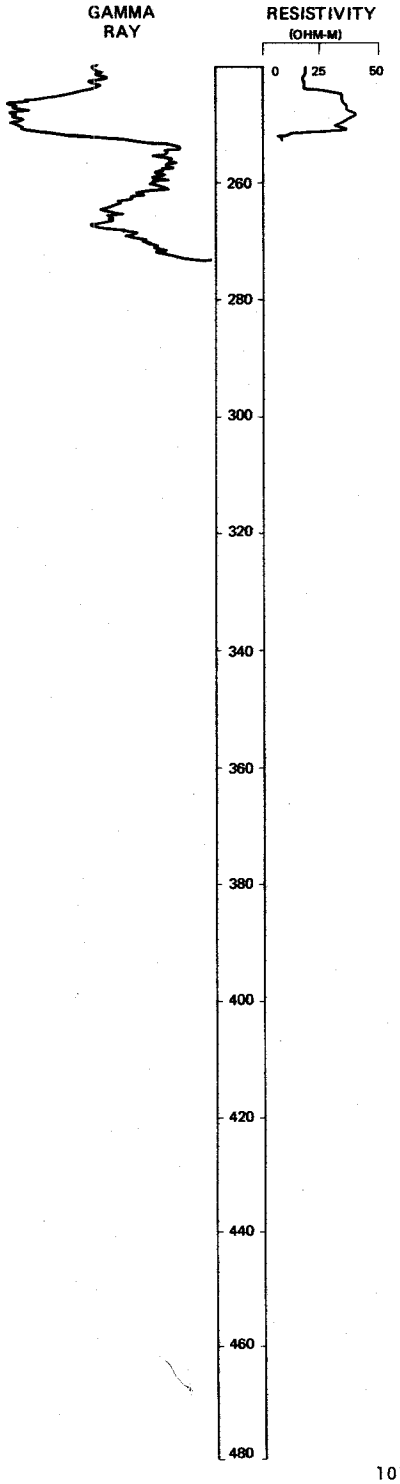
0-1	Topsoil, black.
1-17	Sand, medium to coarse, gravelly, subangular to subrounded, oxidized.
17-24	Silt, moderate-yellowish-brown, calcareous.
24-77	Silt, clayey, olive-gray, calcareous.
77-84	Clay (till), very sandy, silty, clayey, pebbly, dark-greenish-gray.
84-115	Clay (till), sandy, silty, clayey, pebbly, dark-greenish-gray to olive-gray.
115-124	Gravel; shale fragments (poor sample).
124-156	Clay (till), sandy, silty, dark-olive-gray.
156-177	Clay (till), silty.
177-244	Clay (till), sandy, silty, brownish-gray, calcareous.

LOCATION: 134-069-09DDD

DATE DRILLED: 5/01/80

ALTITUDE: 1933
(FT, NGVD)

DEPTH: 280
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

244-252 Sand, coarse, gravelly, angular to rounded.

PIERRE SHALE

252-280 Shale, brownish-gray, hard.

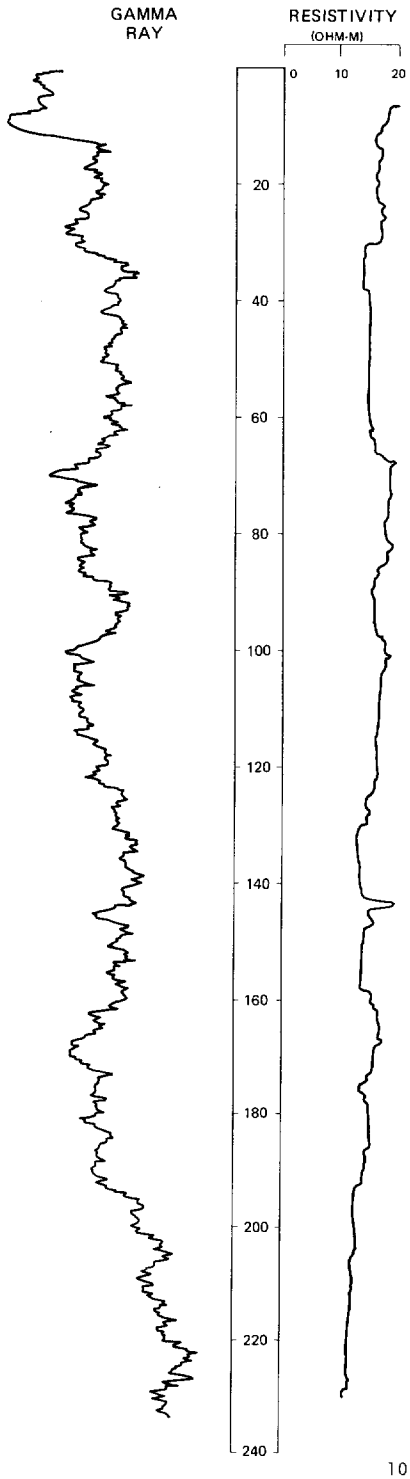
NDSWC 5446

LOCATION: 134-069-20AAA

DATE DRILLED: 5/31/79

ALTITUDE: 1970
(FT, NGVD)

DEPTH: 242
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-13	Sand, very fine to very coarse, gravelly, sub-angular to subrounded; 40 percent shale, 40 percent quartz, and 20 percent carbonate grains.
13-33	Clay (glaciofluvial), silty, slightly sandy, olive-gray.
33-68	Clay (till), silty, sandy, pebbly.
68-124	Clay (glaciofluvial), silty, olive-gray.
124-195	Clay (till), very sandy, silty, pebbly, olive-gray; few thin gravel lenses.

PIERRE SHALE

195-242	Shale, slightly sandy, olive-gray to black, brittle.

134-069-20BBA
(Log from Jacob Thurn)

Date drilled: 9/07/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Sand----------	7	10
	Clay, blue----------	55	65
	Sand----------	5	70

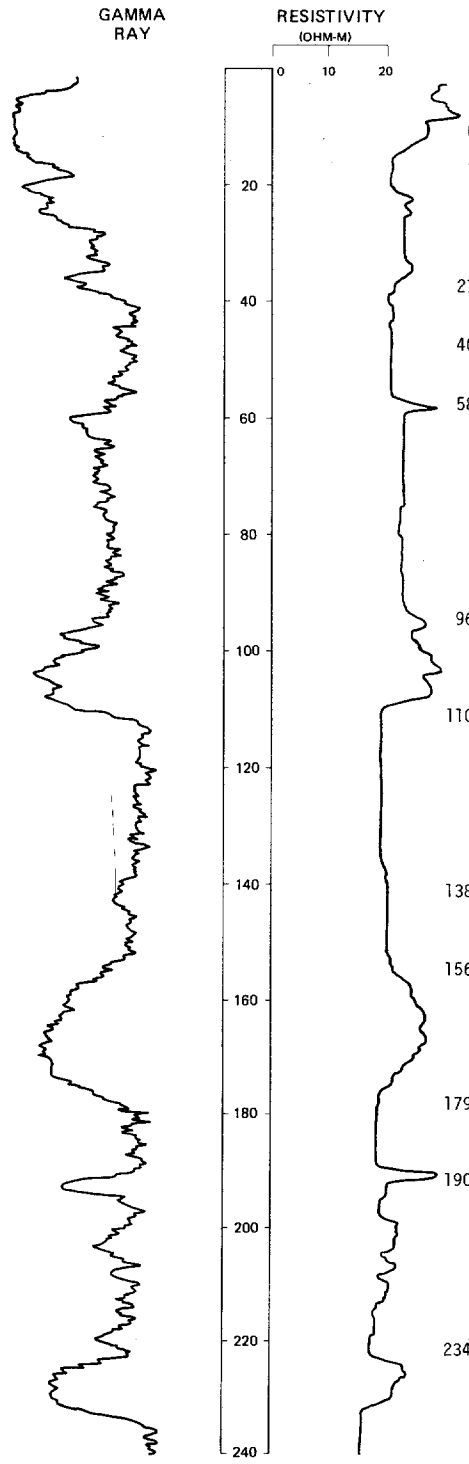
NDSWC 5443, 5443A

LOCATION: 134-069-20DDD1, 2

DATE DRILLED: 5/30/79

ALTITUDE: 1977
(FT, NGVD)

DEPTH: 262
(FT)



110

DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-27	Gravel, fine to coarse, predominantly medium, sandy, angular to well-rounded; clay lens from 17 to 19 feet.
27-40	Clay (till), silty, sandy, olive-gray.
40-58	Clay (lacustrine), slightly sandy.
58-96	Clay (till), silty, sandy, pebbly, olive-gray.
96-110	Clay (till), very sandy, silty, pebbly, olive-gray.
110-138	Clay (lacustrine), silty, slightly sandy, olive-gray.
138-156	Clay (till), silty, sandy, olive-gray.
156-179	Clay (till), very sandy, silty, olive-gray.
179-190	Clay (lacustrine), moderately plastic.
190-234	Clay (till), silty, sandy; few thin gravel lenses.

PIERRE SHALE

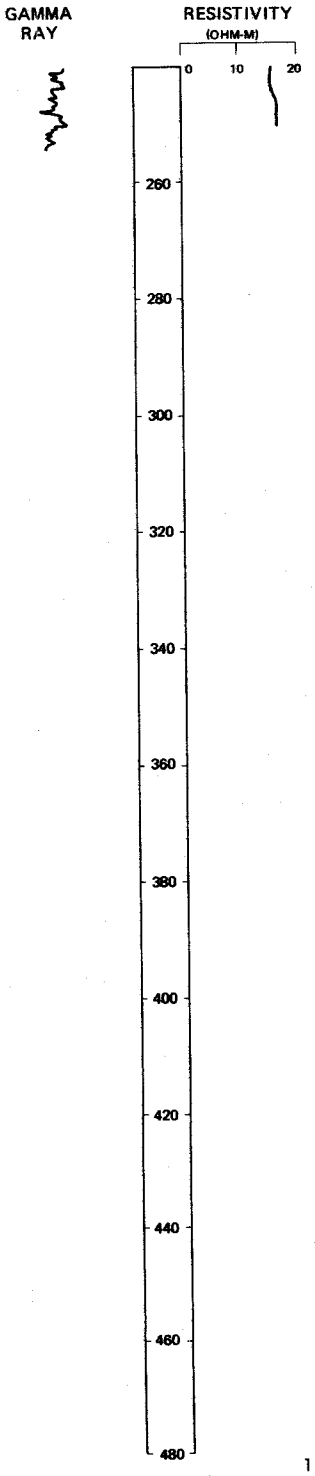
234-262	Shale, olive-gray to black, brittle, hard.

LOCATION: 134-069-20DDD1, 2

DATE DRILLED: 5/30/79

ALTITUDE: 1977
(FT, NGVD)

DEPTH: 262
(FT)



DESCRIPTION OF DEPOSITS

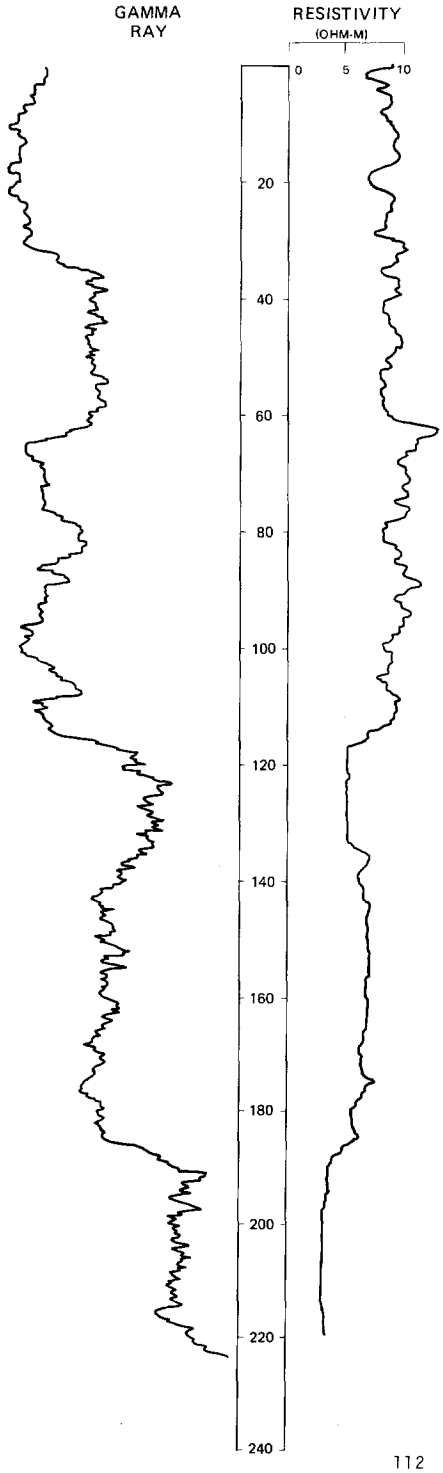
NDSWC 5440

LOCATION: 134-069-22DDA

DATE DRILLED: 5/29/79

ALTITUDE: 1904
(FT. NGVD)

DEPTH: 230
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-34	Gravel, fine to medium, predominantly fine, sandy; composed largely of shale pebbles.
34-62	Clay (till), very sandy, pebbly, olive-gray.
62-118	Clay (till), silty, sandy, pebbly, olive-gray; abundant shale and carbonate fragments.
118-136	Clay (lacustrine?), plastic.
136-188	Clay (till), silty, sandy, pebbly, olive-gray.

PIERRE SHALE

188-230	Shale, black, brittle.

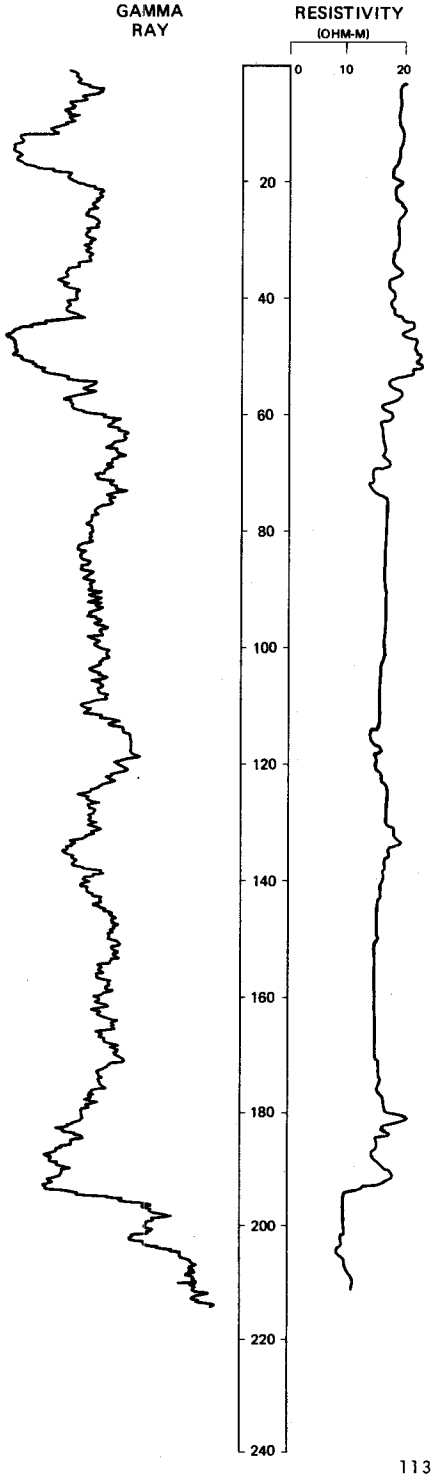
NDSWC 5442

LOCATION: 134-069-23AAA

DATE DRILLED: 5/30/79

ALTITUDE: 1920
(FT, NGVD)

DEPTH: 222
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-12	Clay (till), silty, sandy, pebbly, yellowish-brown.
12-18	Gravel, fine to coarse, predominantly fine to medium, sandy.
18-44	Clay (till), silty, sandy, pebbly, olive-gray.
44-60	Clay (till), very sandy, silty, pebbly; few thin gravel lenses.
60-191	Clay (till), silty, slightly sandy, dark-gray.
191-194	Gravel, fine, angular; composed largely of shale with some carbonates.

PIERRE SHALE

194-222	Shale, black, brittle, hard.

134-069-24CCC
(Log from Jacob Thurn)

Date drilled: 6/01/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	1	1
	Gravel	23	24
	Clay, blue	4	28

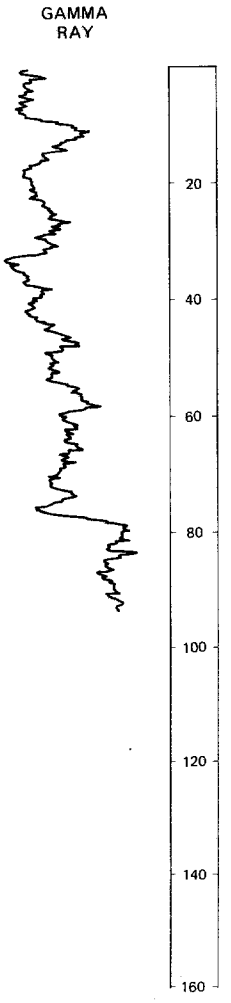
NDSWC 5441

LOCATION: 134-069-26AAA

DATE DRILLED: 5/29/79

ALTITUDE: 1938 (FT, NGVD)

DEPTH: 122 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-10	Gravel, fine to coarse, predominantly fine, sandy, angular to well-rounded; composed of shale and carbonate pebbles.
10-16	Clay (till), silty, sandy, pebbly; yellowish brown changing to olive gray near bottom.
16-88	Clay (till), very sandy, silty, pebbly, olive-gray.

PIERRE SHALE

88-122	Shale, black, brittle, hard.

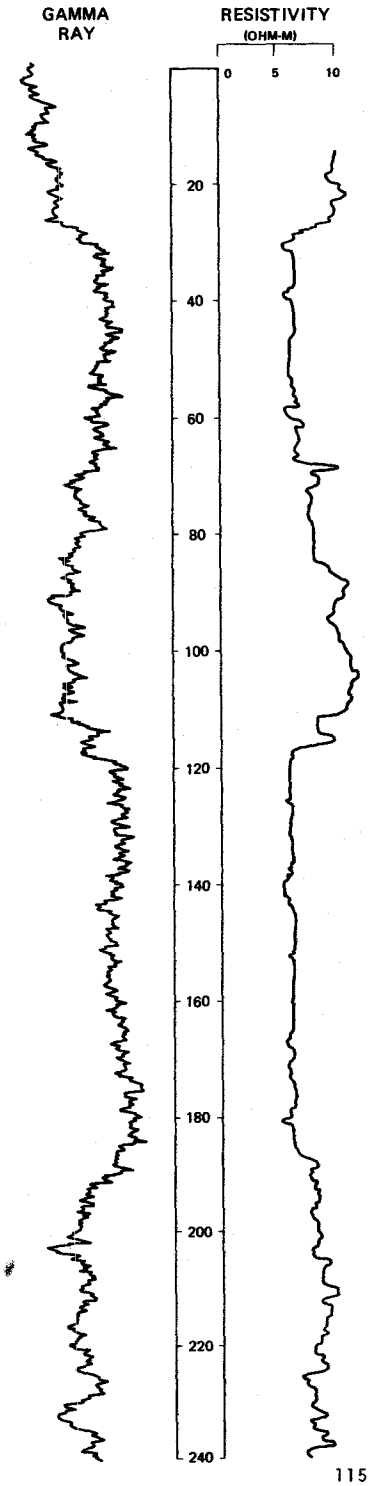
NDSWC 5739

LOCATION: 134-069-27BBA

DATE DRILLED: 5/24/79

ALTITUDE: 1945
(FT, NGVD)

DEPTH: 342
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-30	Gravel, medium, sandy, well-rounded to angular; composed largely of igneous and shale fragments.
30-50	Clay (lacustrine), olive-gray.
50-68	Clay (lacustrine), silty, olive-gray.
68-118	Clay (till), silty, sandy, pebbly, olive-gray; few thin gravel lenses.
118-191	Clay (lacustrine), olive-gray.
191-256	Clay (till), silty, sandy, pebbly, olive-gray; abundant shale pebbles and few gravel lenses.

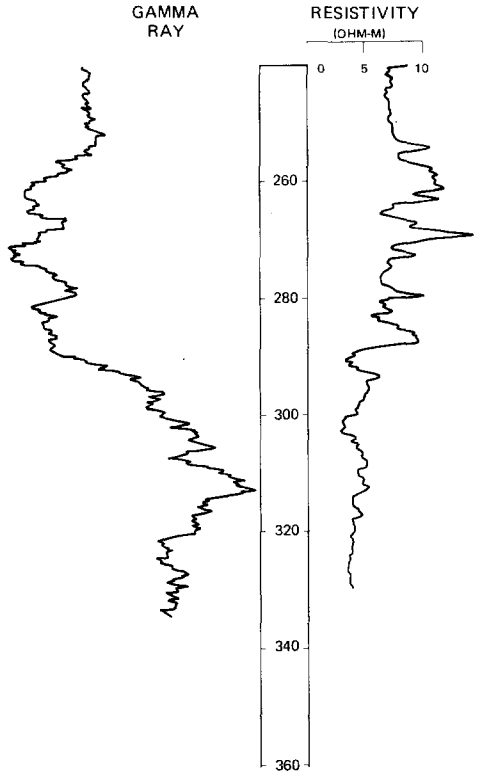
NDSWC 5739, Continued

LOCATION: 134-069-27BBA

DATE DRILLED: 5/24/79

ALTITUDE: 1945
(FT, NGVD)

DEPTH: 342
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

256-290 Gravel, fine, subrounded to angular; composed largely of shale fragments; interbedded with clay.

PIERRE SHALE

290-342 Shale, black, brittle.

134-069-30DCC
(Log from Jacob Thurn)

Date drilled: 7/20/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Clay, yellow----------	22	25
	Sand and gravel----------	19	44

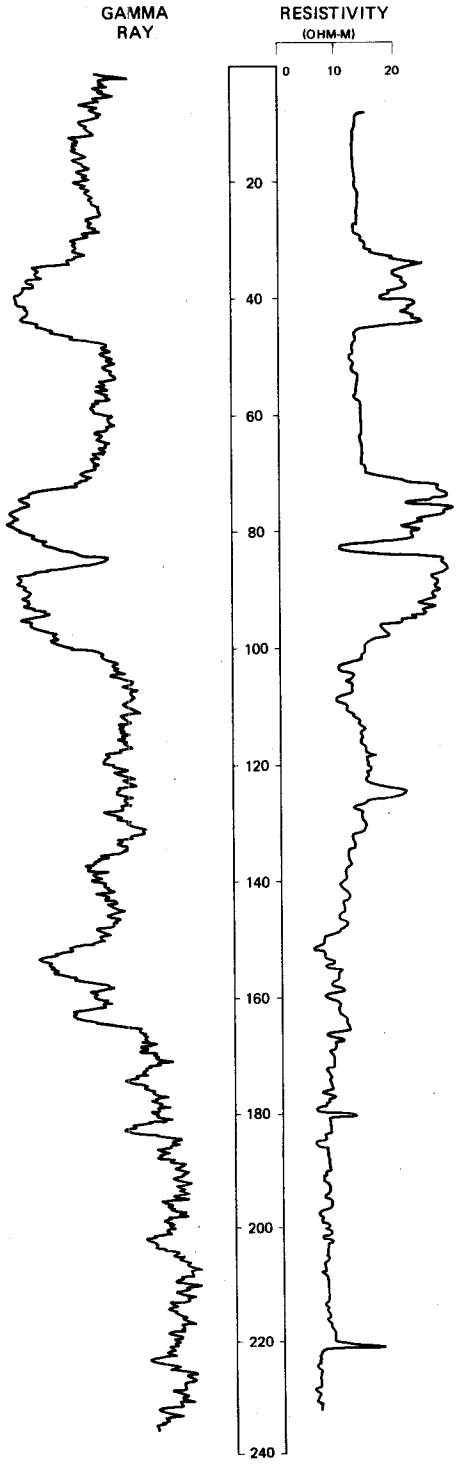
NDSWC 5444, 5444A

LOCATION: 134-069-34CCC1, 2

DATE DRILLED: 5/30/79

ALTITUDE: 1961
(FT, NGVD)

DEPTH: 242
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-17	Clay (till), silty, sandy, pebbly, yellowish-brown.
17-33	Clay (till), silty, sandy, pebbly, olive-gray.
33-46	Gravel, very fine to medium, predominantly fine, sandy.
46-72	Clay (till), very sandy, pebbly, olive-gray; few sand lenses.
72-100	Gravel, fine, well-rounded; composed largely of carbonate pebbles; clay lens from 82 to 86 feet.
100-151	Clay (till), very sandy, pebbly, olive-gray.
151-184	Clay (till), sandy, black; abundant shale pebbles.

PIERRE SHALE(?)

184-242	Shale, black, hard; bentonitic streaks.

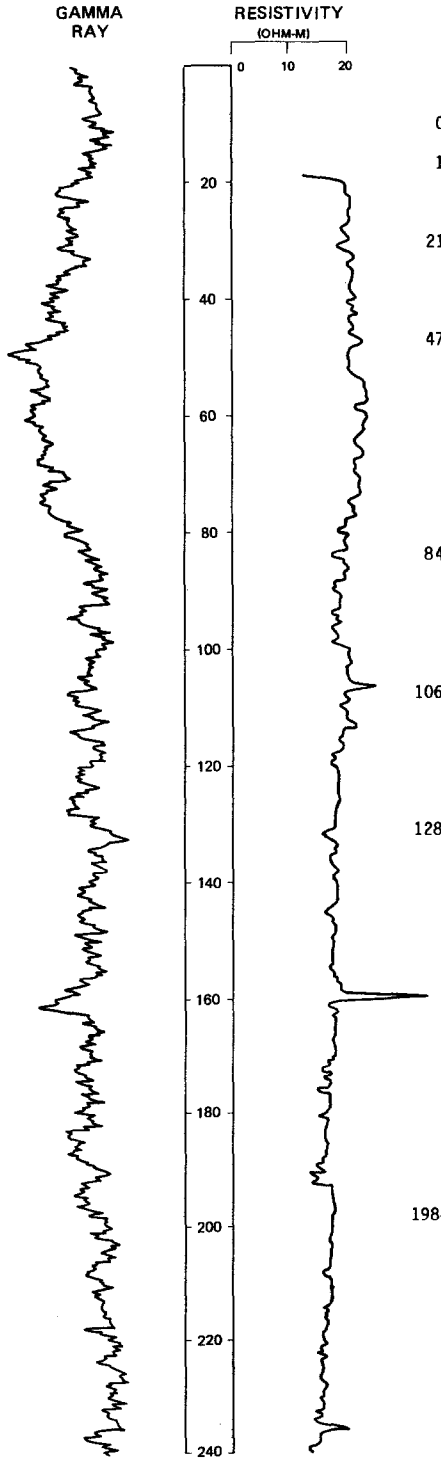
NDSWC 5447, 5447A

LOCATION: 134-070-01DDD1, 2

DATE DRILLED: 5/31/79

ALTITUDE: 2000
(FT, NGVD)

DEPTH: 262
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-21	Clay (till), silty, sandy, yellowish-brown; scattered pebbles.
21-47	Clay (lacustrine?), slightly sandy, medium-bluish-gray.
47-84	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

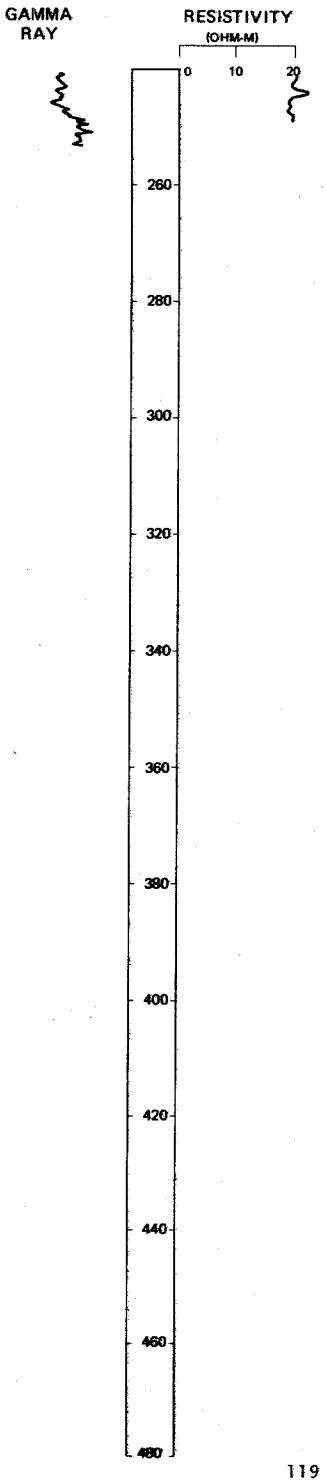
84-106	Siltstone, slightly sandy, brittle, hard.
106-128	Sandstone, very fine to fine, clayey, greenish-gray, well-rounded, glauconitic.
128-198	Sandstone, very fine, silty, clayey, greenish-gray to olive-gray.
198-248	Siltstone, clayey, slightly sandy, olive-gray to olive-black, bentonitic; some mica and magnetite.

LOCATION: 134-070-01DDD1, 2

DATE DRILLED: 5/31/79

ALTITUDE: 2000
(FT. NGVD)

DEPTH: 262
(FT)



DESCRIPTION OF DEPOSITS

PIERRE SHALE(?)

248-262 Siltstone, olive-gray, brittle, hard.

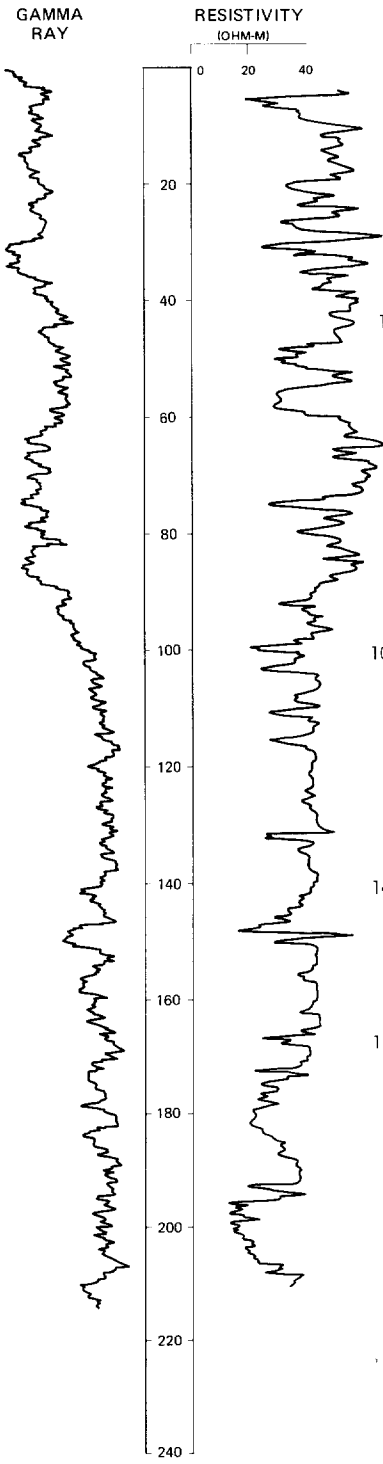
NDSWC 5448

LOCATION: 134-070-04CDD

DATE DRILLED: 5/31/79

ALTITUDE:
(FT, NGVD)

DEPTH: 222
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-5	Gravel, fine to coarse, predominantly medium, sandy, angular to well-rounded.
5-18	Clay (till), silty, sandy, pebbly, moderate-yellowish-brown.
18-100	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

100-140	Siltstone, very sandy, clayey, olive-gray.
140-168	Sandstone, very fine to fine, predominantly very fine, greenish-gray, glauconitic; some mica, magnetite, and carbonaceous material.
168-222	Sandstone, very fine, very silty, clayey, greenish-gray to olive-gray, brittle, glauconitic.

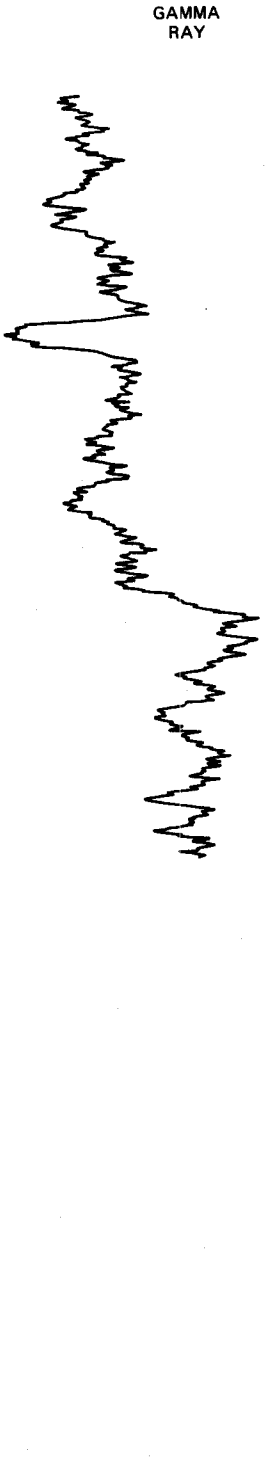
NDSWC 11240

LOCATION: 134-070-06ADD

DATE DRILLED: 4/30/80

ALTITUDE: (FT, NGVD)

DEPTH: 140 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-21	Clay (till), sandy, silty, pebbly, dark-yellowish-brown, calcareous.
21-43	Clay (till), silty, sandy, pebbly, dark-greenish-gray, calcareous.
43-49	Sand, medium to coarse, predominantly coarse, gravelly, subrounded to rounded; 50 percent carbonate, 25 percent quartz and igneous, and 25 percent shale grains.
49-92	Clay (till), silty, sandy, pebbly, greenish-black; boulders from 85 to 88 feet.

FOX HILLS SANDSTONE

92-140	Shale, silty, dark-brownish-gray, carbonaceous, bentonitic; interbedded with thin fine-grained cemented sandstone.

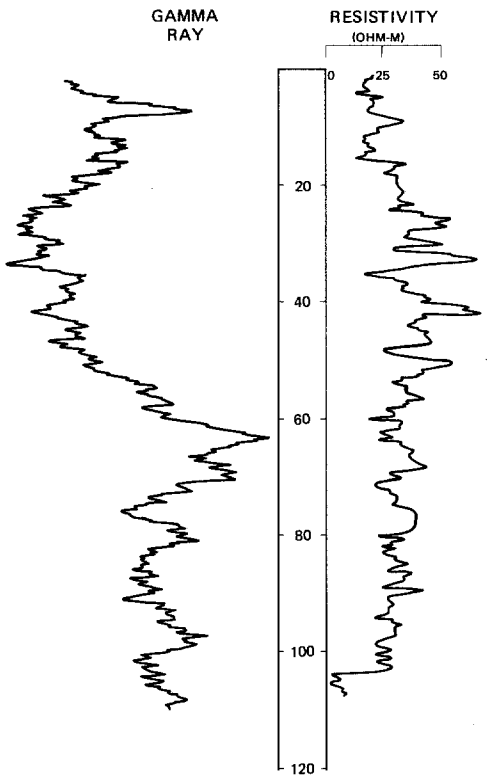
NDSWC 11241

LOCATION: 134-070-06BAC

DATE DRILLED: 5/01/80

ALTITUDE:
(FT, NGVD)

DEPTH: 120
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-22	Clay (till), sandy, pebbly, grayish-olive-green, calcareous.
22-43	Clay (till), sandy, pebbly, dark-greenish-gray; gravel lenses from 24 to 25, 33 to 34, and 42 to 43 feet.

FOX HILLS SANDSTONE

43-60	Sandstone, fine, moderate-yellowish-brown, rounded.
60-120	Sandstone, fine, clayey, rounded, glauconitic.

134-070-18AAA
NDSWC 11196

Altitude: 2079 feet

Date drilled: 10/26/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black----------	1	1
	Sand, fine to very coarse, gravelly, subrounded to rounded, oxidized; 50 percent carbonate, 20 percent shale, 20 percent quartz, and 10 percent igneous grains----------	22	23
Fox Hills Sandstone:			
	Sandstone, fine, pale-yellowish-brown to moderate-yellowish-brown, rounded; contains some mica, magnetite, and carbonaceous material----------	17	40

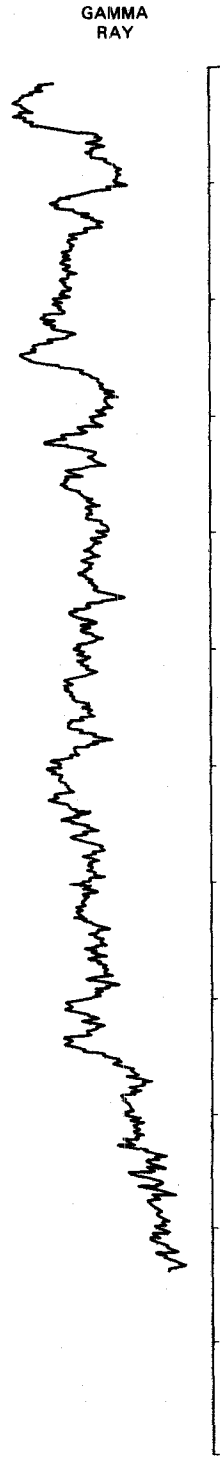
NDSWC 5474, 5474A

LOCATION: 134-070-24CDC1, 2

DATE DRILLED: 6/27/79

ALTITUDE: 1981
(FT, NGVD)

DEPTH: 212
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-11	Gravel, very fine to medium, sandy, angular to well-rounded, oxidized; 40 percent carbonate, 30 percent quartz, 15 percent shale, and 15 percent igneous and metamorphic pebbles.
11-22	Clay (lacustrine), olive-gray, plastic.
22-40	Clay (till), sandy, pebbly, olive-gray; abundant shale pebbles.
40-52	Gravel, fine, sandy, angular to rounded; 70 percent carbonate and 30 percent shale and silicate pebbles.
52-104	Clay (till), sandy, pebbly, olive-gray; abundant shale pebbles.
104-176	Clay (till), silty, sandy, pebbly, olive-gray.

PIERRE SHALE(?)

176-212	Shale, black, brittle, hard.

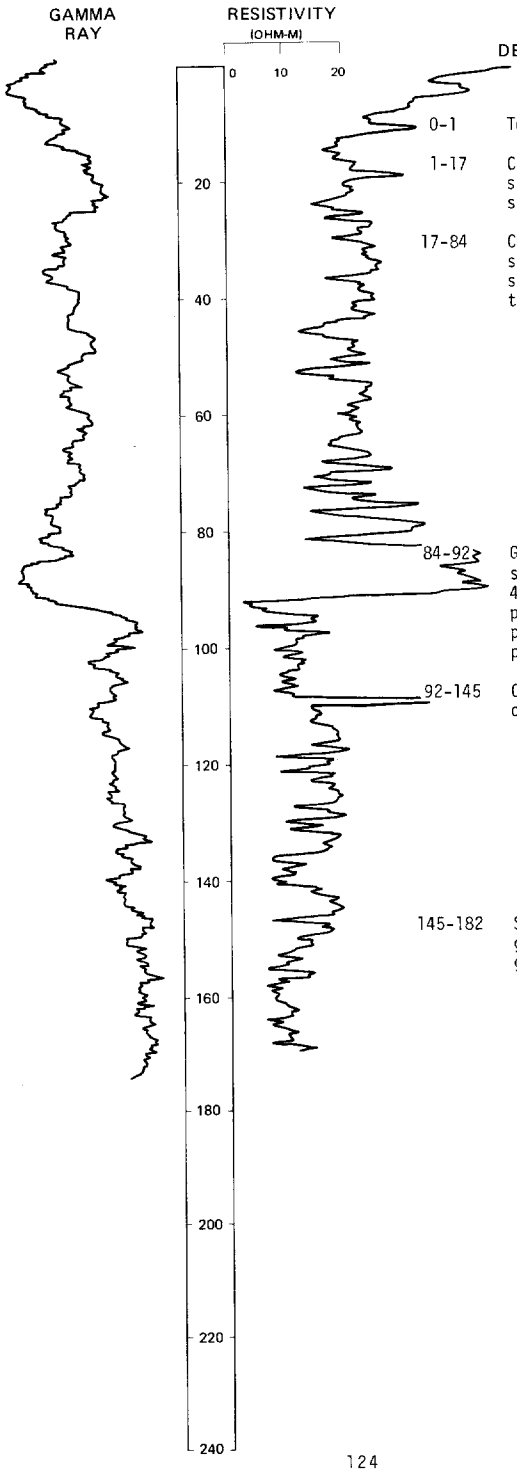
NDSWC 5449

LOCATION: 134-070-26BBC

DATE DRILLED: 6/01/79

ALTITUDE: 1988
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, light-brown.

1-17 Clay (till), very sandy, silty, yellowish-brown; scattered pebbles.

17-84 Clay (till), very sandy, silty, olive-gray; scattered pebbles; few thin gravel lenses.

84-92 Gravel, fine, sandy, subrounded to well-rounded; 40 percent carbonate, 40 percent shale, and 20 percent quartz and igneous pebbles.

92-145 Clay (till), sandy, silty, olive-gray.

FOX HILLS SANDSTONE

145-182 Siltstone, sandy, grayish-green, carbonaceous, glauconitic, micaceous.

134-070-27ADA
(Log from Baumgartner Drilling Co.)

Date drilled: 7/08/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	3	3
	Clay, brown	37	40
	Clay, blue	100	140
	Fox Hills sand	20	160
	Clay, gray	40	200

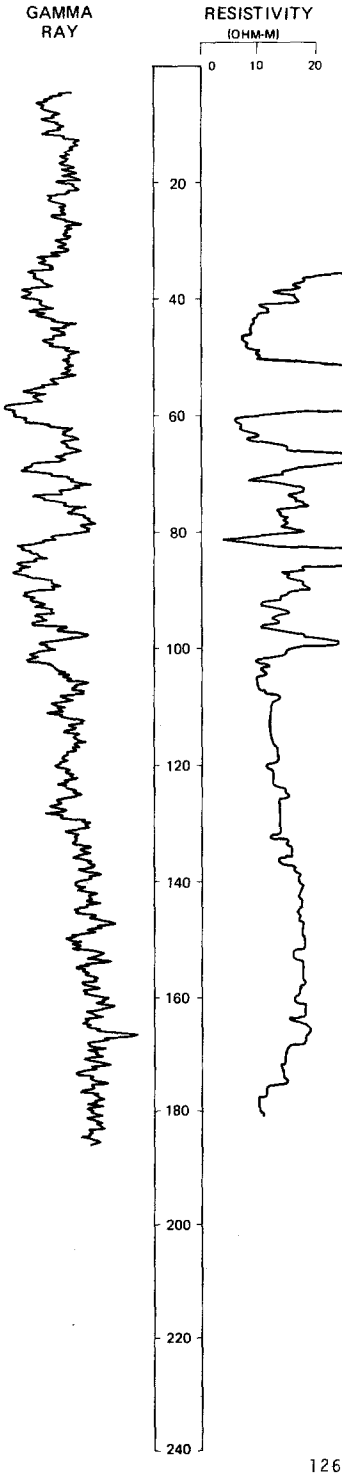
NDSWC 5473

LOCATION: 134-070-29BBA

DATE DRILLED: 6/29/79

ALTITUDE: 2063
(FT, NGVD)

DEPTH: 197
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, black.

1-22 Clay (till), silty, sandy, pebbly, yellowish-brown.

22-68 Clay (till), silty, sandy, pebbly, olive-gray; sand and gravel from 55 to 61 feet.

FOX HILLS SANDSTONE

68-104 Sandstone, very fine to fine, clayey, olive-gray to greenish-gray, glauconitic; scattered mica and magnetite; cemented zones from 68 to 70 and 82 to 86 feet.

104-135 Shale, olive-gray, hard.

135-197 Siltstone, slightly sandy, olive-gray, brittle, carbonaceous.

134-070-31DCB
NDSWC 11193

Date drilled: 10/25/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Sand, fine to very coarse, gravelly, subrounded to rounded	5	6
	Clay (lacustrine), slightly silty, dark-yellowish-orange, plastic; numerous carbonaceous streaks	55	61
	Clay (glaciofluvial), silty, olive-gray, plastic; sand from 75 to 82 feet; numerous thin sand lenses	55	116
Fox Hills Sandstone:			
	Shale, silty, greenish-gray; interbedded with fine-grained glauconitic grayish-green sandstone	24	140

134-070-34BCB
(Log from Jacob Thurn)

Date drilled: 6/12/74

Topsoil	3	3
Clay, yellow	5	8
Clay, blue	28	36
Sand and gravel	4	40

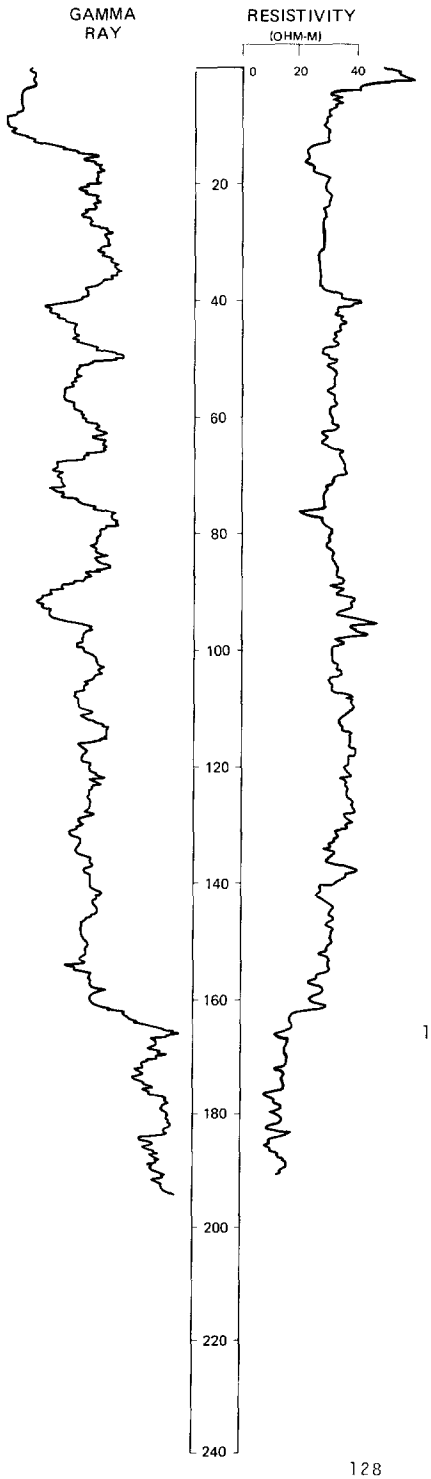
NDSWC 5450, 5450A

LOCATION: 134-070-35BCB1, 2

DATE DRILLED: 6/01/79

ALTITUDE: 1961
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-14	Sand, very coarse, gravelly, subangular to rounded; 50 percent carbonate, 20 percent shale, and 30 percent quartz and metamorphic grains.
14-38	Clay (till), sandy, silty, pebbly, olive-gray.
38-96	Silt, slightly sandy, olive-gray; interbedded with clay; some organic material.
96-165	Clay (till), very sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

165-202	Siltstone, sandy, olive-gray to black, brittle; scattered mica.

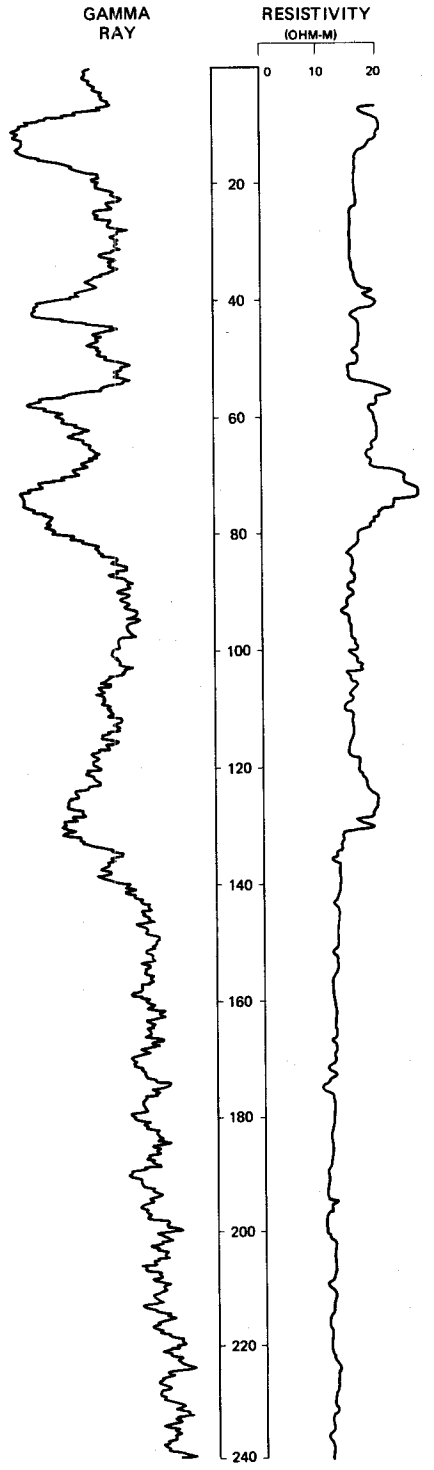
NDSWC 5451

LOCATION: 134-070-35CCC

DATE DRILLED: 6/01/79

ALTITUDE: 1982
(FT, NGVD)

DEPTH: 262
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-17	Clay (till), very sandy, silty, yellowish-brown.
17-38	Clay (lacustrine), silty, olive-gray, plastic.
38-84	Clay (till), silty, sandy, pebbly, olive-gray; few thin gravel lenses.
84-118	Clay (lacustrine), silty, olive-gray, plastic.
118-140	Clay (till), very sandy, silty, pebbly, olive-gray; few thin gravel lenses.

FOX HILLS SANDSTONE

140-218	Siltstone, sandy, olive-gray, brittle; scattered organic material.

PIERRE SHALE(?)

218-262	Siltstone, olive-black.

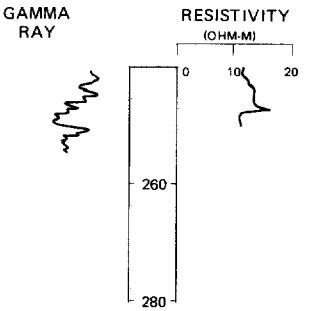
NDSWC 5451, Continued

LOCATION: 134-070-35CCC

DATE DRILLED: 6/01/79

ALTITUDE: 1982
(FT, NGVD)

DEPTH: 262
(FT)



DESCRIPTION OF DEPOSITS

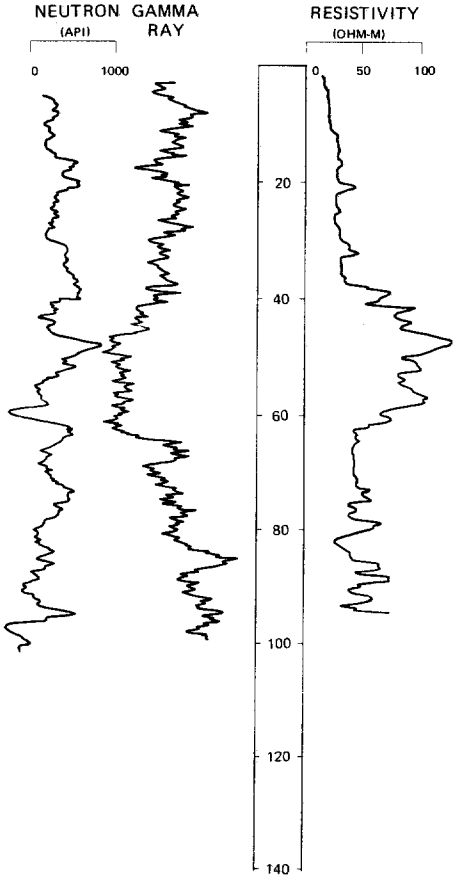
NDSWC 5463

LOCATION: 134-071-03DDD

DATE DRILLED: 6/19/79

ALTITUDE: 1989
(FT, NGVD)

DEPTH: 107
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-8	Clay (till), very sandy, silty, pebbly, yellowish-brown.
8-41	Clay (till), very sandy, silty, pebbly, olive-gray; few sand and gravel lenses; abundant shale pebbles.
41-50	Sand, very fine to very coarse, predominantly coarse, gravelly, sub-angular to well-rounded; 90 percent quartz and 10 percent carbonate and shale grains.
50-64	Gravel, fine, sandy, sub-rounded to well-rounded; 85 percent shale and 15 percent carbonate, igneous, and metamorphic pebbles.
64-92	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

92-107	Sandstone, very fine to fine, dusky-green, angular to well-rounded, glauconitic; scattered magnetite.

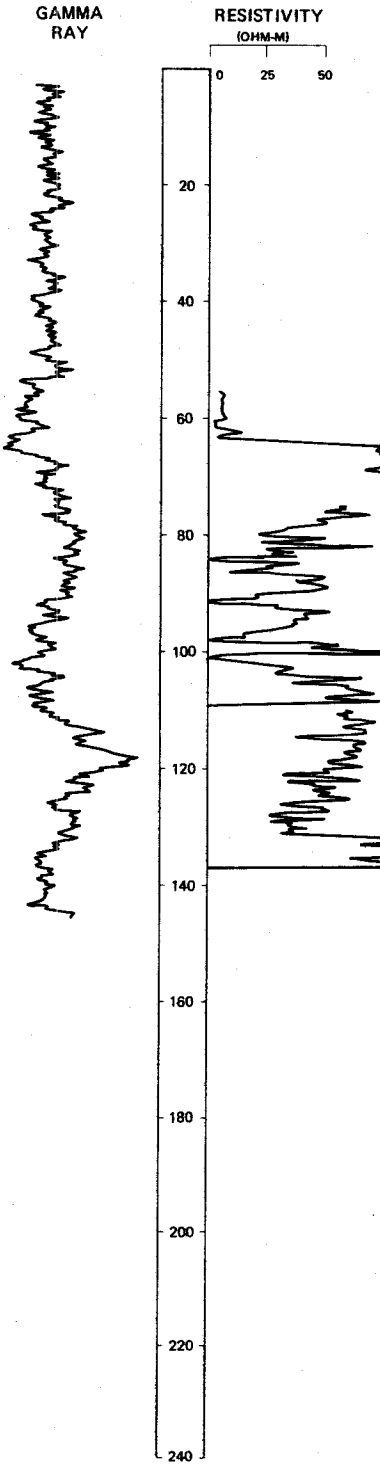
NDSWC 5465

LOCATION: 134-071-04DDD

DATE DRILLED: 6/25/79

ALTITUDE: 2022
(FT, NGVD)

DEPTH: 152
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-25	Clay (till), silty, sandy, pebbly, yellowish-brown.
25-72	Clay (till), silty, sandy, pebbly, olive-gray.
72-78	Siltstone (erratic), sandy, olive-gray.
78-91	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

91-112	Siltstone, sandy, olive-gray, brittle.
112-132	Siltstone, clayey, silty, olive-gray.
132-152	Sandstone, very fine to fine, dusky-green, glauconitic; scattered mica and magnetite; lost circulation at 152 feet.

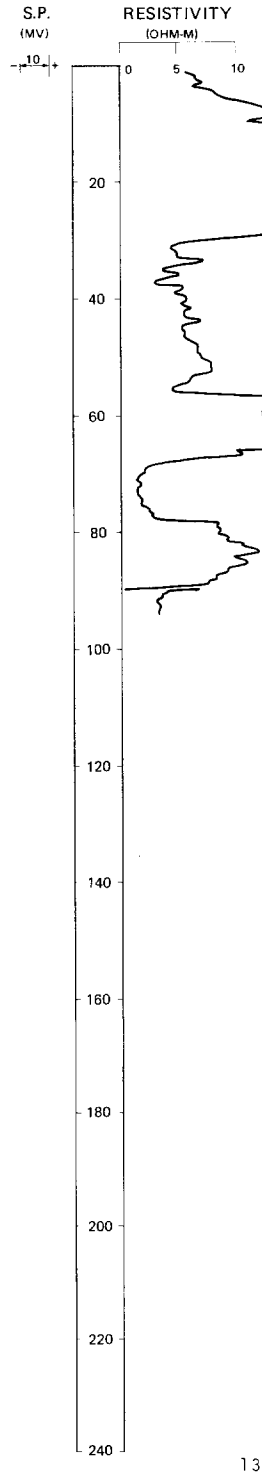
NDSWC 11179

LOCATION: 134-071-06DBD

DATE DRILLED: 10/23/79

ALTITUDE: 2023
(FT, NGVD)

DEPTH: 100
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-8	Clay (till), silty, sandy, pebbly, yellowish-brown.
8-16	Sand, fine to very coarse, gravelly, subangular to rounded, oxidized; 50 percent quartz, 30 percent carbonate, and 20 percent shale grains.
16-30	Sand, fine to very coarse, gravelly, subangular to rounded; 50 percent quartz, 30 percent shale, and 20 percent igneous and carbonate grains.
30-43	Clay (till), silty, sandy, pebbly, olive-gray.
43-56	Clay (till), silty, sandy, dark-yellowish-green.
56-66	Sand and gravel; numerous clay lenses.
66-78	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

78-89	Sandstone, fine, hard, carbonaceous.
89-100	Shale, silty, medium-gray.

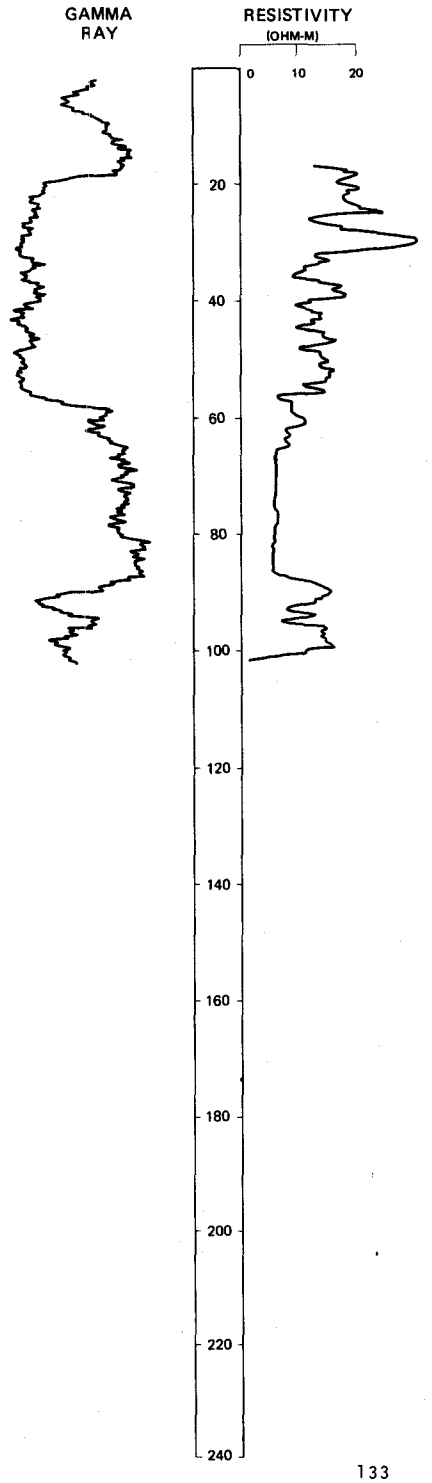
NDSWC 5436

LOCATION: 134-071-08BBA

DATE DRILLED: 5/25/79

ALTITUDE: 2033
(FT, NGVD)

DEPTH: 122
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-19	Clay (till), gravelly, silty, sandy.
19-58	Sand, fine to very coarse, predominantly coarse, gravelly; interbedded with sandy clay.
58-88	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

88-122	Sandstone, very fine to fine, hard; scattered magnetite and carbonaceous material.

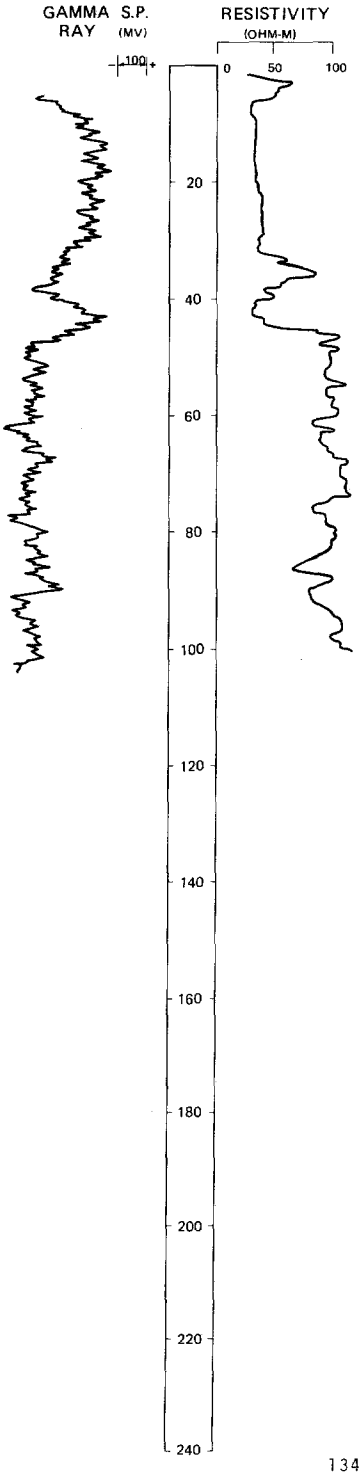
NDSWC 5464

LOCATION: 134-071-12BBB

DATE DRILLED: 6/25/79

ALTITUDE: 1990
(FT, NGVD)

DEPTH: 122
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-2	Topsoil, black.
2-6	Gravel, fine to coarse, predominantly fine, sandy, oxidized.
6-17	Clay (till), silty, sandy, pebbly, yellowish-brown.
17-46	Clay (till), silty, sandy, pebbly, olive-gray; gravel lens from 34 to 37 feet.
46-87	Sand, fine to very coarse, predominantly very coarse, gravelly, subrounded to rounded; 50 percent carbonate, 25 percent shale, and 25 percent igneous and metamorphic grains.
87-100	Gravel, fine to medium, predominantly medium, sandy; consists largely of carbonate fragments.

FOX HILLS SANDSTONE

100-122	Sandstone, very fine to fine, dusky-green, angular to well-rounded, glauconitic; predominantly very fine sand.

134-071-13CCB
(Log from Jacob Thurn)

Date drilled: 6/05/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Gravel and clay----------	22	25
	Sand----------	23	48

134-071-14DDD
NDSWC 5466

Altitude: 2023 feet

Date drilled: 6/25/79

Glacial drift:			
	Topsoil, black----------	1	1
	Sand, very fine to very coarse, predominantly coarse, gravelly, angular to well-rounded; 50 percent quartz, 20 percent shale, 20 percent igneous and metamorphic, and 10 percent carbonate grains----------	9	10
	Clay (till), sandy, silty, pebbly, yellowish-brown; few gravel lenses----------	25	35
	Clay (till), sandy, silty, pebbly, olive-gray; few gravel lenses----------	12	47
Fox Hills Sandstone:			
	Sandstone, very fine to fine, subangular to well-rounded, glauconitic; predominantly a very fine sand; scattered mica and magnetite; lost circulation at 65 feet----------	21	68

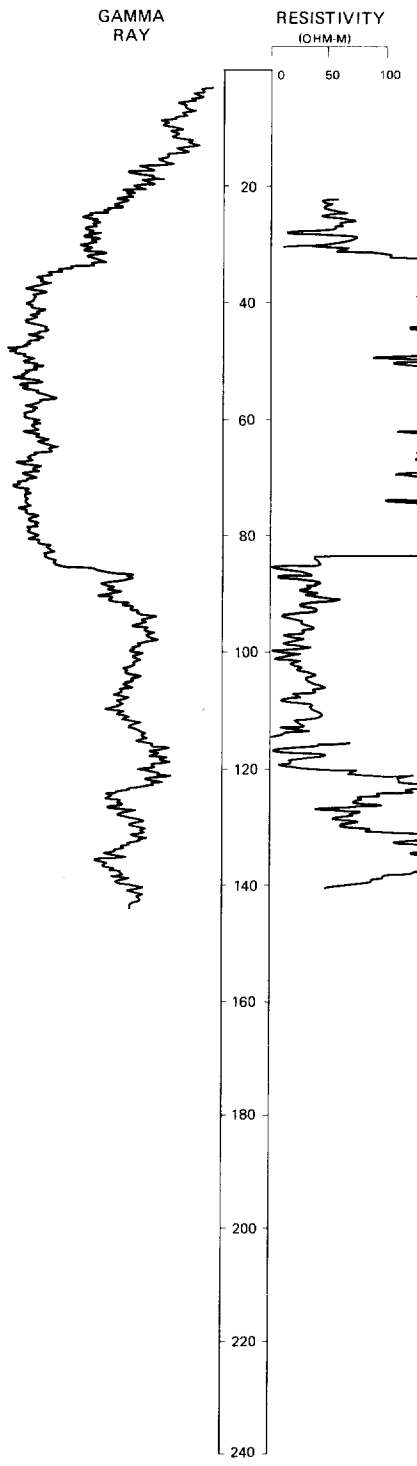
NDSWC 5462, 5462A

LOCATION: 134-071-16ADA1, 2

DATE DRILLED: 6/19/79

ALTITUDE: 1980
(FT, NGVD)

DEPTH: 150
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-19	Clay (till), silty, sandy, yellowish-brown; scattered pebbles.
19-34	Clay (till), silty, sandy, olive-gray; scattered pebbles.
34-56	Sand, fine to very coarse, predominantly coarse, gravelly, angular to well-rounded; 80 percent quartz, 10 percent carbonate, and 10 percent shale grains.
56-64	Gravel, fine to coarse, sandy, angular to well-rounded; 80 percent shale, 15 percent carbonate, and 5 percent silicate pebbles.
64-86	Sand, fine to coarse, predominantly very coarse, well-rounded to angular; 80 percent shale, 15 percent carbonate, and 5 percent silicate grains.
86-123	Clay (till), silty, sandy, pebbly, olive-gray; abundant shale pebbles.

FOX HILLS SANDSTONE

123-130	Siltstone, olive-gray; interbedded with very fine glauconitic sandstone.
130-150	Sandstone, very fine, dusky-blue-green, well-rounded to angular, glauconitic; scattered magnetite and mica.

134-071-17ABA
NDSWC 11180

Altitude: 1989 feet — Date drilled: 10/23/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Sand, fine to very coarse, gravelly, subangular to rounded, oxidized	3	4
	Clay (till), silty, pebbly, yellowish-brown	8	12
	Clay (till), silty, sandy, pebbly, olive-gray	8	20
	Sand, fine to very coarse, gravelly, subangular to rounded; 50 percent quartz, 30 percent carbonate, 10 percent igneous, and 10 percent shale grains	16	36
	Silt, greenish-gray	14	50
	Sand, fine to very coarse, gravelly, subangular to rounded; 50 percent quartz, 30 percent carbonate, 10 percent shale, and 10 percent igneous grains	20	70
	Clay (till), silty, sandy, pebbly, grayish-green; few sand and gravel lenses	40	110
Fox Hills Sandstone:			
	Sandstone, fine, dusky-blue-green, subrounded to rounded, glauconitic	30	140

134-071-18AAD
(Log from Brunner Well Drilling)

Date drilled: 11/03/72

Topsoil	1	1
Clay, yellow	6	7
Clay, blue	61	68
Sand, blue, and coal chips	27	95
Clay, blue	6	101
Rock	1	102
Clay, blue	71	173
Sand, blue-green	21	194

134-071-20CBB
NDSWC 11181

Altitude: 1994 feet — Date drilled: 10/23/79

Fox Hills Sandstone:			
	Topsoil, sandy; contains fossil shell fragments	1	1
	Shale, silty, yellowish-brown	11	12
	Shale, silty, light-brownish-gray, calcareous	74	86
	Sandstone, fine, dusky-blue-green, rounded, glauconitic	14	100

134-071-20CCD
NDSWC 11182

Date drilled: 10/23/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Clay (fluvial), yellowish-brown	2	3
	Sand, fine, gravelly, subangular to rounded; 40 percent carbonate, 30 percent quartz, 15 percent shale, and 15 percent igneous grains; upper 7 feet oxidized	9	12
Fox Hills Sandstone:			
	Shale, light-brownish-gray, calcareous	28	40

134-071-21BCC
(Log from Gross Well Drilling)

Date drilled: 6/07/72

Clay, brown	20	20
Clay, blue	20	40
Gravel	30	70
Clay, blue	78	148
Sand, blue, water	10	158

134-071-21CDC
(Log from Gross Well Drilling)

Date drilled: 6/02/75

Clay, brown	30	30
Clay and sand; mixed	50	80
Clay, blue	92	172
Sand, fine, blue	30	202

134-071-22BBA
(Log from Gross Well Drilling)

Date drilled: 6/22/74

Clay, brown	50	50
Gravel	20	70
Clay, blue	70	140
Sand, blue	20	160

134-071-24ABA
(Log from Jacob Thurn)

Date drilled: 5/29/72

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil, black----------	3	3
	Sand----------	40	43

134-071-26DAA
NDSWC 11194

Altitude: 1977 feet — Date drilled: 10/25/79

	Topsoil----------	1	1
	Sand and gravel, fine, poorly sorted, subangular to rounded, oxidized; 50 percent carbonate, 30 percent quartz, and 20 percent igneous grains and pebbles----------	7	8
	Till, silty, sandy, pebbly, yellowish-brown, uncohesive, oxidized----------	3	11
	Till, olive-gray----------	25	36
	Sand, fine to coarse, well-sorted, subangular to rounded; 50 percent quartz, 20 percent carbonate, and 10 percent shale grains----------	16	52
Fox Hills Sandstone:			
	Sandstone, very fine, light-gray, well-sorted, rounded, very well indurated----------	5	57
	Bedrock shale, greenish-gray----------	23	80

134-071-28BAD
(Log from Brunner Well Drilling)

Date drilled: 9/20/72

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	17	19
	Gravel	2	21
	Clay, gray; small stones	22	43
	Sand, blue; coal chips	2	45
	Clay, blue	43	88
	Sand, green	35	123

134-071-30CBB
NDSWC 11183

Altitude: 1955 feet

Date drilled: 10/24/79

	Topsoil	1	1
	Till, yellowish-brown, oxidized	2	3
	Sand and gravel, fine, poorly sorted, subangular to rounded, oxidized; 50 percent quartz, 30 percent carbonate, 10 percent igneous, and 10 percent shale grains and pebbles	17	20
Fox Hills Sandstone:			
	Bedrock shale, greenish-gray	20	40

134-071-31ABA
(Log from Gross Well Drilling)

Date drilled: 7/14/75

	Clay, brown	40	40
	Clay, blue	120	160
	Sand, blue	20	180
	Clay, blue; mixed with sand	22	202

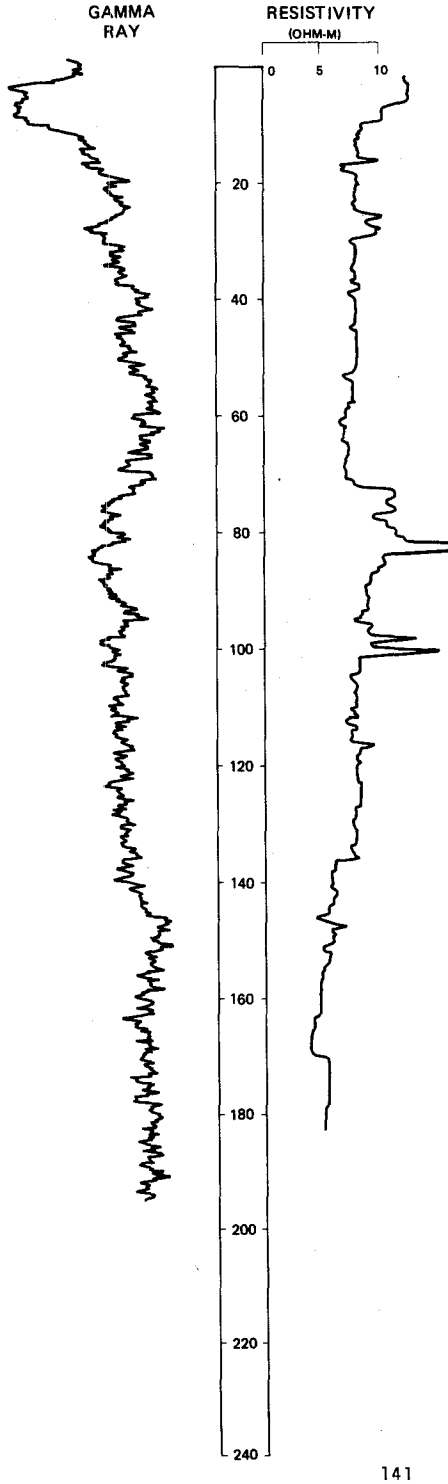
NDSWC 5435

LOCATION: 134-071-32ABB

DATE DRILLED: 5/24/79

ALTITUDE: 1970
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-12	Sand, fine to very coarse, predominantly very coarse, gravelly, well-rounded to angular.
12-20	Silt, clayey, sandy, olive-gray.

FOX HILLS SANDSTONE

20-72	Siltstone, sandy, clayey, olive-gray; sand and clay content increases with depth.
72-136	Sandstone, very fine to fine, predominantly very fine, dusky-green, carbonaceous, glauconitic; scattered mica and magnetite; cemented zones from 82 to 84 and 98 to 101 feet.
136-146	Sandstone, very fine, grayish-olive, carbonaceous.
146-152	Shale, silty, olive-gray.
152-178	Sandstone, very fine, very clayey, grayish-olive, carbonaceous; interbedded with siltstone.

PIERRE SHALE(?)

178-202	Shale, sandy, dark-greenish-gray to olive-gray, brittle, hard.

134-071-34BAB
NDSWC 11195

Altitude: 1963 feet

Date drilled: 10/26/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Silt, clayey, brown, carbonaceous	3	4
	Clay (till), silty, sandy, pebbly, moderate-yellowish-brown	2	6
	Clay (till), silty, sandy, pebbly, olive-gray	7	13
Fox Hills Sandstone:			
	Shale, silty, olive-gray	27	40

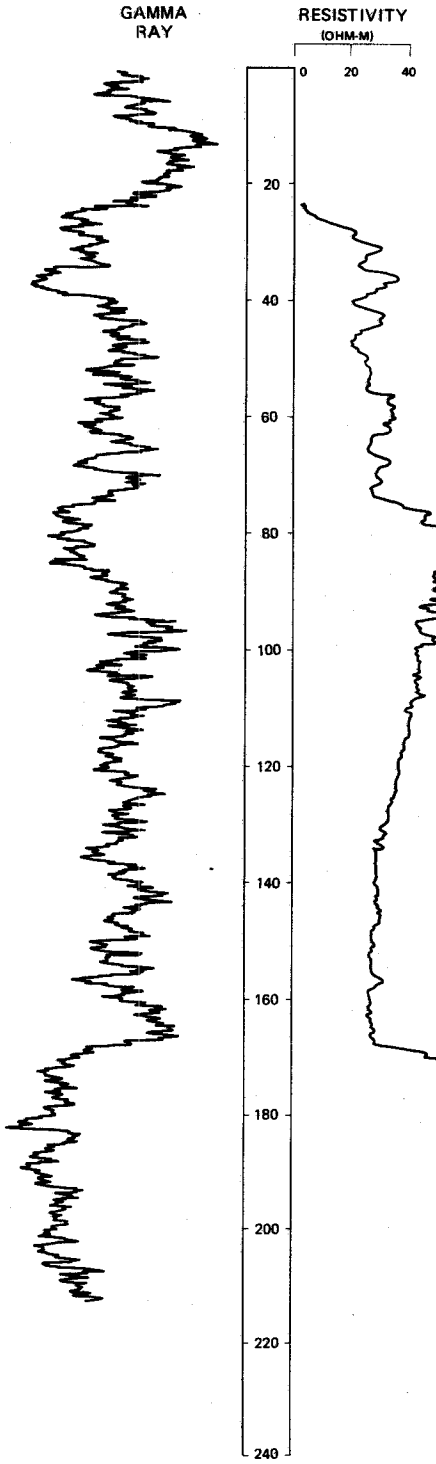
NDSWC 5422

LOCATION: 134-072-10DAA

DATE DRILLED: 11/16/78

ALTITUDE: 2038
(FT, NGVD)

DEPTH: 221
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-2	Topsoil, gravelly.
2-14	Silt (lacustrine?), dusky-yellow to reddish-brown; laminated with very fine sand and clay.
14-24	Silt, dark-yellowish-brown to dark-reddish-brown; interbedded with black to dusky-brown clay; abundant organic material.

FOX HILLS SANDSTONE

24-40	Sandstone, fine, silty, medium-bluish-gray, glauconitic.
40-75	Claystone, silty, sandy, dark-greenish-gray to olive-gray, glauconitic; some organic material; few thin sandstone interbeds.
75-94	Sandstone, fine, silty, dusky-green, glauconitic; some organic material.
94-102	Siltstone, clayey, sandy, medium-gray.
102-168	Shale, medium-gray to medium-bluish-gray, brittle, siliceous; thin interbeds of siltstone and sandstone.
168-221	Sandstone, fine to medium, dusky-green, glauconitic; some organic material and biotite.

134-072-18CBC
(Log from Gross Well Drilling)

Date drilled: 9/07/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	40	40
	Clay, blue----------	200	240
	Rock----------	1	241
	Sand, blue----------	19	260

134-072-22BBC
(Log from Gross Well Drilling)

Date drilled: 7/09/75

	Clay, brown----------	80	80
	Clay, blue----------	180	260
	Sand, blue----------	20	280

134-072-26DDD
(Log from Gross Well Drilling)

Date drilled: 7/12/75

	Clay, brown----------	30	30
	Clay, blue----------	60	90
	Sand, blue----------	20	110

134-072-32BAB
NDSWC 5431

Altitude: 1932 feet

Date drilled: 5/22/79

Glacial drift:			
	Topsoil, black----------	1	1
	Sand, fine to very coarse, predominantly very coarse, gravelly, angular to rounded; composed largely of carbonate, igneous, and metamorphic grains----------	30	31
Fox Hills Sandstone:			
	Sand, very fine to fine, olive-gray, semiconsolidated, carbonaceous, glauconitic----------	51	82

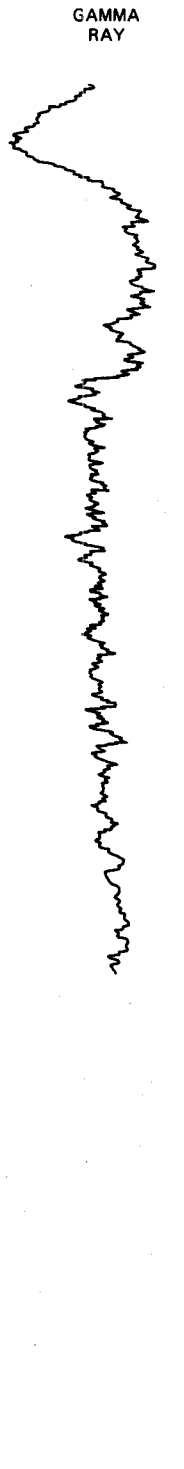
NDSWC 5434

LOCATION: 134-072-34BBD

DATE DRILLED: 5/23/79

ALTITUDE: 1940
(FT, NGVD)

DEPTH: 162
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-4 Clay, silty, sandy, olive-gray.

4-20 Sand, medium to very coarse, predominantly very coarse, gravelly, well-rounded to subangular; composed largely of carbonate and shale grains.

FOX HILLS SANDSTONE

20-53 Siltstone, light-greenish-gray, brittle, hard.

53-86 Sandstone, very fine to fine, dusky-green, glauconitic; scattered mica and pyrite; cemented zone from 54 to 56 feet.

86-140 Sandstone, very fine to fine, dusky-green, glauconitic; some bentonitic streaks; pyrite; cemented zone from 87 to 89 feet; clayey in bottom 40 feet.

140-162 Siltstone, sandy, grayish-olive-green, hard.

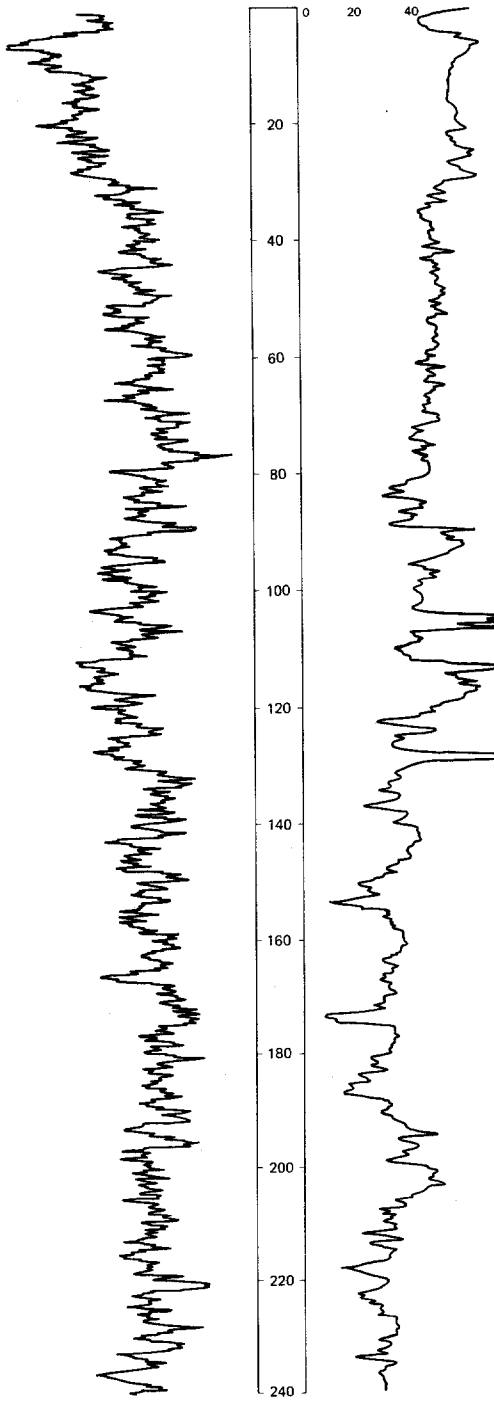
NDSWC 5423

LOCATION: 134-073-01CCC

DATE DRILLED: 11/17/78

ALTITUDE: 1945
(FT, NGVD)

DEPTH: 282
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-5	Clay (lacustrine), silty, moderate-yellowish-brown, laminated.
5-11	Gravel, fine to medium; 50 percent limestone, 40 percent shale, and 10 percent igneous and sandstone pebbles.
11-34	Clay (till), sandy, olive-gray.

FOX HILLS SANDSTONE

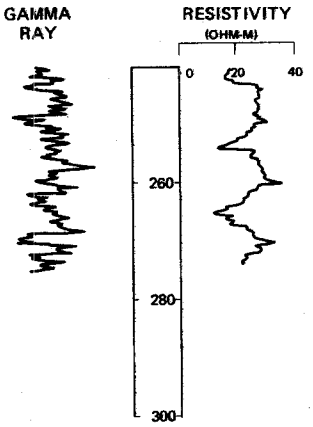
34-90	Siltstone, clayey, medium-dark-gray; few organic streaks.
90-130	Sandstone, fine, silty, slightly clayey, moderate-blue-green, glauconitic, micaceous; few organic streaks.
130-148	Sandstone, fine, silty, shaly, dark-gray to grayish-black, brittle, glauconitic, micaceous.
148-168	Shale, silty, sandy, olive-gray to grayish-black, brittle, glauconitic; contains thin sandstone interbeds, organic specks, and fossil shell fragments.
168-192	Shale, silty, olive-gray, brittle, waxy.
192-207	Shale, very sandy, dark-greenish-gray to moderate-green, glauconitic; organic spots and white specks.
207-234	Siltstone, sandy, dark-gray, glauconitic; numerous white specks.
234-282	Shale, gray-black to black, waxy; numerous white specks.

LOCATION: 134-073-01CCC

DATE DRILLED: 11/17/78

ALTITUDE: 1945
(FT, NGVD)

DEPTH: 282
(FT)



DESCRIPTION OF DEPOSITS

134-073-05AAD
(Log from Brunner Well Drilling)

Date drilled: 7/28/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	7	9
	Sand and gravel, yellow	10	19
	Clay, gray	3	22
	Clay, yellow	7	29
	Sand, yellow	3	32
	Rock	1	33
	Clay, yellow	4	37
	Rock	4	41
	Clay, yellow	18	59
	Clay, gray	27	86
	Sand, blue, and coal chips	12	98
	Clay, blue	3	101
	Sand, blue, and coal chips	57	158
	Rock, white	2	160
	Sand, blue	18	178

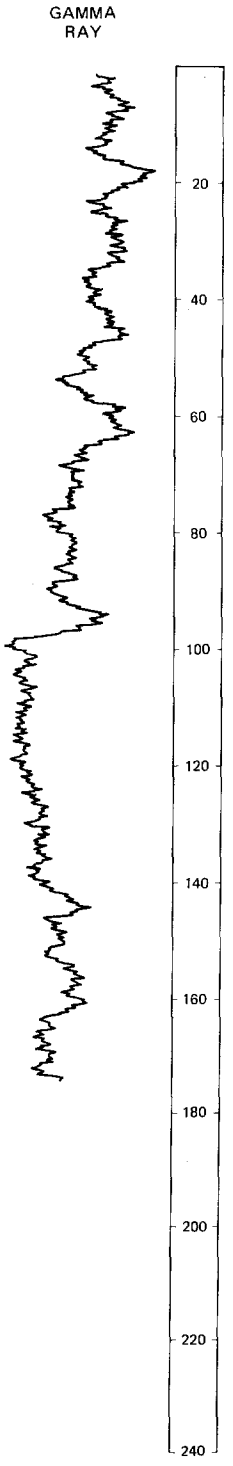
NDSWC 5426

LOCATION: 134-073-05CCC

DATE DRILLED: 5/21/79

ALTITUDE: 2070
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-34 Clay (till), silty, sandy, pebbly, yellowish-brown.

FOX HILLS SANDSTONE

34-97 Claystone, slightly sandy, olive-gray.

97-182 Sand, very fine to fine, greenish-gray, semiconsolidated; interstitial clay content increases with depth.

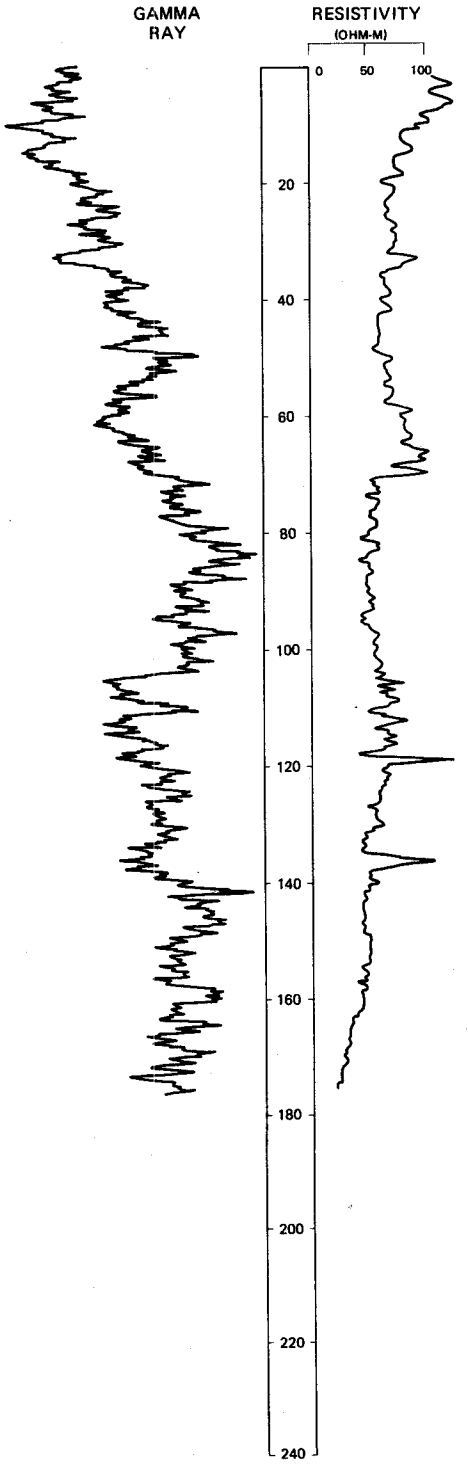
NDSWC 5424, 5424A

LOCATION: 134-073-11CCC1, 2

DATE DRILLED: 11/17/78

ALTITUDE: 1966
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-17	Gravel, fine to coarse, sandy, oxidized; 30 percent shale, 30 percent limestone, 20 percent sandstone, and 20 percent igneous and metamorphic pebbles.
17-35	Sand, fine to coarse, dark-gray; 70 percent quartz, 20 percent shale, and 10 percent igneous and metamorphic grains.
35-70	Clay (till), sandy, silty, olive-gray to dark-gray.

FOX HILLS SANDSTONE

70-104	Siltstone, clayey, medium-light-gray; scattered organic spots.
104-120	Sandstone, fine to medium, shaly, moderate-green, glauconitic, micaceous; some organic spots; cemented zone at 119 feet.
120-141	Sandstone, fine, clayey, silty, olive-gray, micaceous; contains white specks and organic spots; cemented zone at 136 feet.
141-182	Shale, grayish-black, glauconitic; interbedded with fine sand; fossil shell fragments.

134-073-12CDC
(Log from Gross Well Drilling)

Date drilled: 10/17/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	10	10
	Clay, blue----------	220	230
	Sand, blue----------	30	260

134-073-21CDD
NDSWC 5429

Altitude: 1988 feet — Date drilled: 5/22/79

Glacial drift:			
	Topsoil, black----------	1	1
	Clay (till), silty, sandy, yellowish-brown----------	14	15
	Clay (till), silty, sandy, olive-gray----------	31	46
Fox Hills Sandstone:			
	Sandstone, very fine to fine, olive-gray; some glauconite and carbonaceous material----------	36	82
	Siltstone, olive-black; interbedded with very fine to fine-grained sandstone; scattered fossil shell fragments----------	28	110
	Sandstone, very fine, very clayey, grayish-green----------	72	182

134-073-23DDD
NDSWC 5430

Altitude: 1991 feet — Date drilled: 5/22/79

Glacial drift:			
	Topsoil, black----------	1	1
	Sand, fine to very coarse, predominantly very coarse, gravelly, dry; consists of carbonate, quartz, and shale fragments----------	14	15
	Clay (till), silty, sandy, yellowish-brown----------	13	28
	Silt, clayey, olive-gray----------	22	50
	Clay (till), silty, sandy, pebbly, olive-gray; few sand and gravel lenses----------	28	78
Fox Hills Sandstone:			
	Sandstone, very fine to fine, clayey, olive-gray, semiconsolidated----------	62	140
	Siltstone, clayey, olive-gray----------	20	160
	Shale, sandy, olive-gray, hard, carbonaceous----------	12	172
	Sandstone, cemented, glauconitic----------	12	184
	Shale, sandy, silty, olive-gray, carbonaceous, glauconitic; few fossil shell fragments----------	76	260
	Shale, sandy, dusky-green; some glauconite and carbonaceous material----------	10	270
Pierre Shale:			
	Shale, olive-gray, fractured----------	32	302

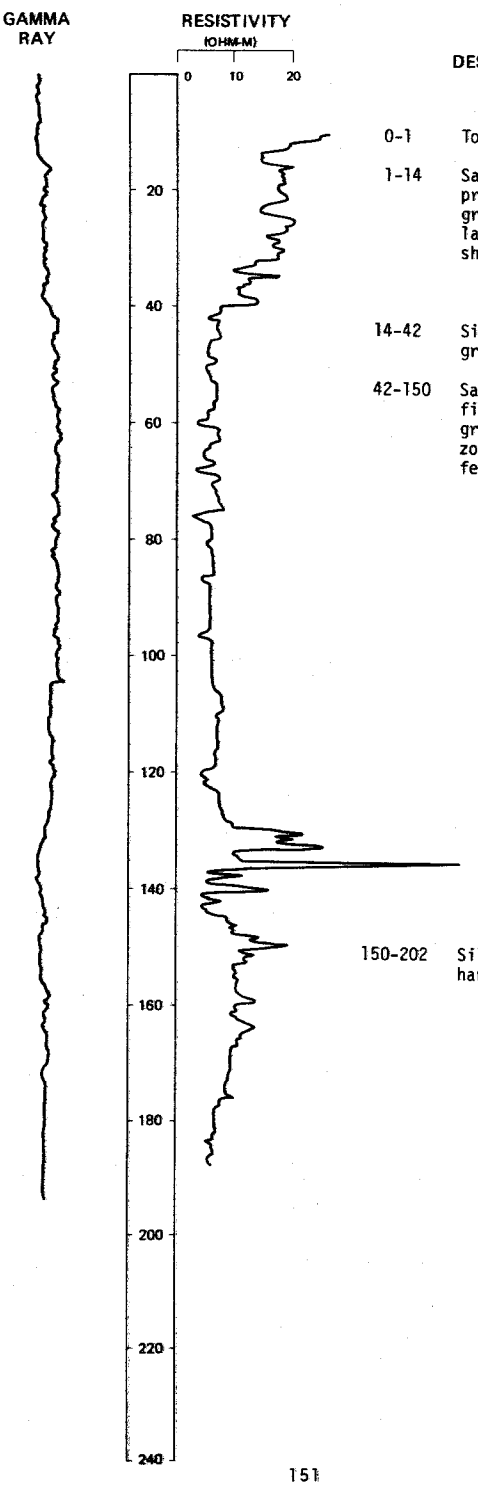
NDSWC 5427

LOCATION: 134-073-26BBB1

DATE DRILLED: 5/21/79

ALTITUDE: 1997
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-14	Sand, fine to very coarse, predominantly coarse, gravelly, dry; composed largely of carbonate, shale, and quartz grains.

FOX HILLS SANDSTONE

14-42	Siltstone, clayey, olive-gray.
42-150	Sandstone, very fine to fine, olive-gray to greenish-gray; cemented zone from 130 to 136 feet.
150-202	Siltstone, olive-gray, hard.

134-073-26BBB2
NDSWC 5428

Altitude: 1997 feet — Date drilled: 5/22/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Sand, fine to very coarse, predominantly coarse, gravelly; composed largely of carbonate, shale, and quartz grains	13	14
Fox Hills Sandstone:			
	Siltstone, clayey, olive-gray	8	22

135-067-02CDD
(Log from Jacob Thurn)

Date drilled: 9/17/77

Topsoil	6	6
Clay, yellow	14	20
Clay, blue	24	44

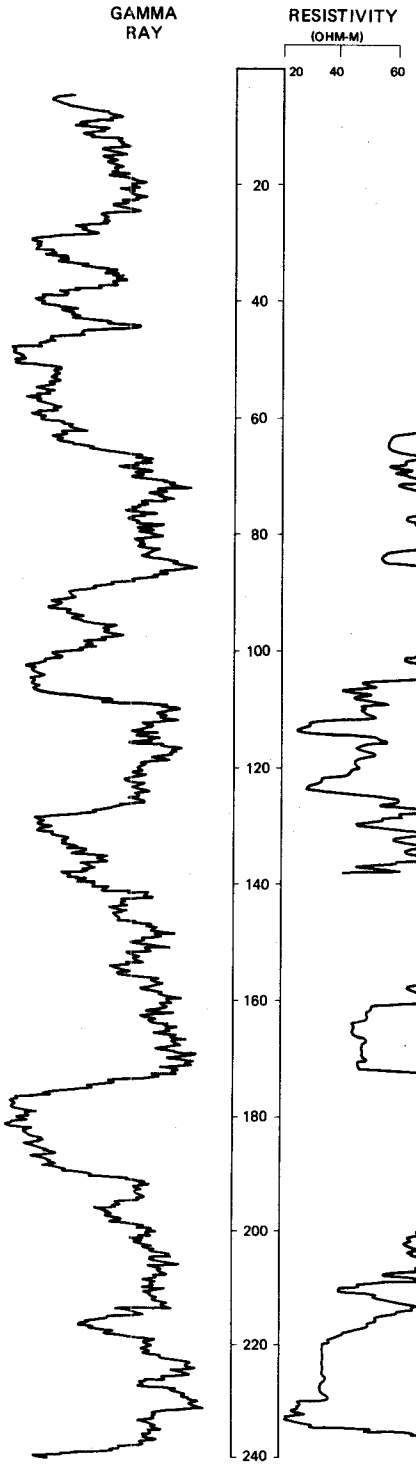
NDSWC 5505, 5505A

LOCATION: 135-067-06DCD1, 2

DATE DRILLED: 7/24/79

ALTITUDE: 1978
(FT, NGVD)

DEPTH: 362
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

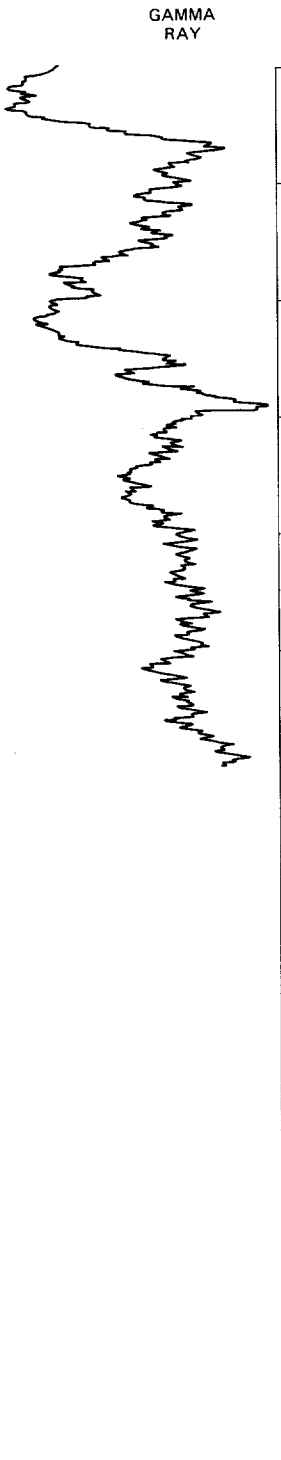
0.5-0.5	Topsoil, black.
0.5-7	Sand, very fine to coarse, predominantly medium, well-rounded to angular; composed largely of quartz; some carbonate and shale fragments.
7-20	Clay (till), sandy, silty, pebbly, yellowish-brown.
20-27	Clay (till), sandy, silty, pebbly, olive-gray.
27-64	Sand, very fine to very coarse, predominantly medium, gravelly, well-rounded to angular; composed largely of quartz; some carbonate, shale, and lignite fragments; clay lenses from 34 to 38 and 43 to 45 feet.
64-88	Silt, clayey, olive-gray; becomes sandy and pebbly near base.
88-109	Sand, very fine to coarse, well-rounded to subangular; predominantly quartz with some shale and carbonate grains.
109-126	Clay (till), silty, sandy, pebbly, olive-gray.
126-141	Sand, very fine to coarse, well-rounded to subangular; predominantly quartz with some shale and carbonate grains.
141-174	Silt, clayey, slightly sandy, olive-gray.
174-190	Sand, very fine to coarse, predominantly fine.
190-238	Silt, clayey, slightly sandy, olive-gray.
238-251	Sand, very fine to very coarse, predominantly fine, gravelly; 80 percent quartz and 20 percent shale, carbonate, and lignite fragments.

LOCATION: 135-067-06DCD1, 2

DATE DRILLED: 7/24/79

ALTITUDE: 1978
(FT, NGVD)

DEPTH: 362
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

251-272 Silt, clayey, sandy, olive-gray.

272-288 Sand, very fine to very coarse, predominantly medium; 60 percent shale, 30 percent quartz, and 10 percent carbonate grains.

288-354 Silt, clayey, sandy, olive-gray.

PIERRE SHALE

354-362 Shale, fractured; lost circulation.

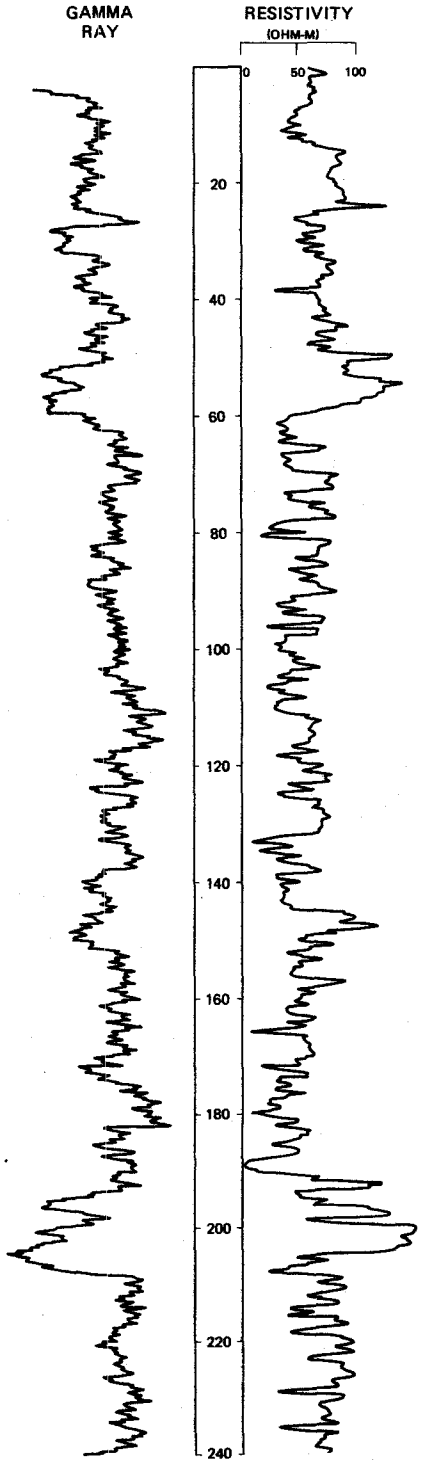
NDSWC 5504

LOCATION: 135-067-25BBB

DATE DRILLED: 7/24/79

ALTITUDE: 1983
(FT, NGVD)

DEPTH: 437
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

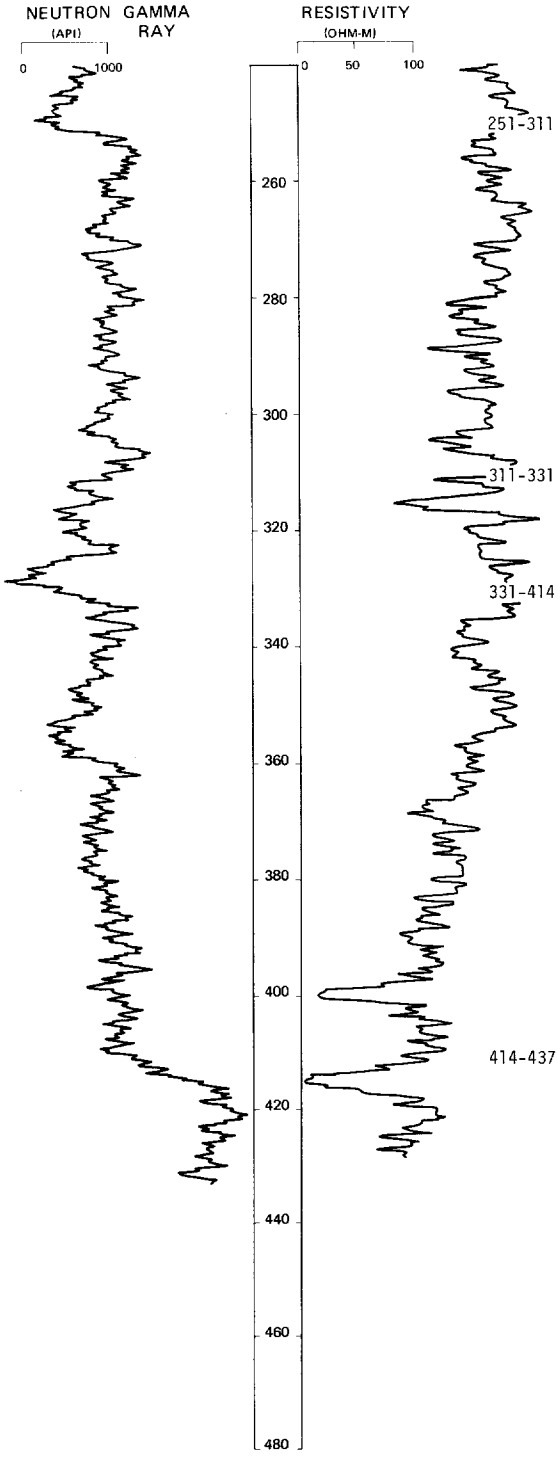
0-1	Topsoil, black.
1-20	Clay (till), silty, slightly sandy, pebbly, yellowish-brown.
20-51	Clay (till), silty, sandy, pebbly, greenish-gray to olive-gray.
51-59	Sand, silty.
59-200	Clay (till), silty, sandy, pebbly, greenish-gray to olive-gray; thin sand lens from 194 to 197 feet.
200-207	Sand.
207-239	Clay (till), very sandy, silty, pebbly, olive-gray.
239-251	Clay, very silty, slightly sandy.

LOCATION: 135-067-25BBB

DATE DRILLED: 7/24/79

ALTITUDE: 1983
(FT, NGVD)

DEPTH: 437
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

251-311 Clay (till), very sandy and pebbly, silty, olive-gray; scattered lignite fragments.

311-331 Sand, very fine to coarse, predominantly fine, clayey, silty; composed largely of quartz and shale grains.

331-414 Clay (till), silty, sandy, pebbly, olive-gray; very sandy from 352 to 359 feet.

PIERRE SHALE

414-437 Shale, slightly sandy, black.

135-067-27BAD2
(Log from Jacob Thurn)

Date drilled: 9/08/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	3	3
	Sand and gravel	14	17
	Clay, blue	--	17

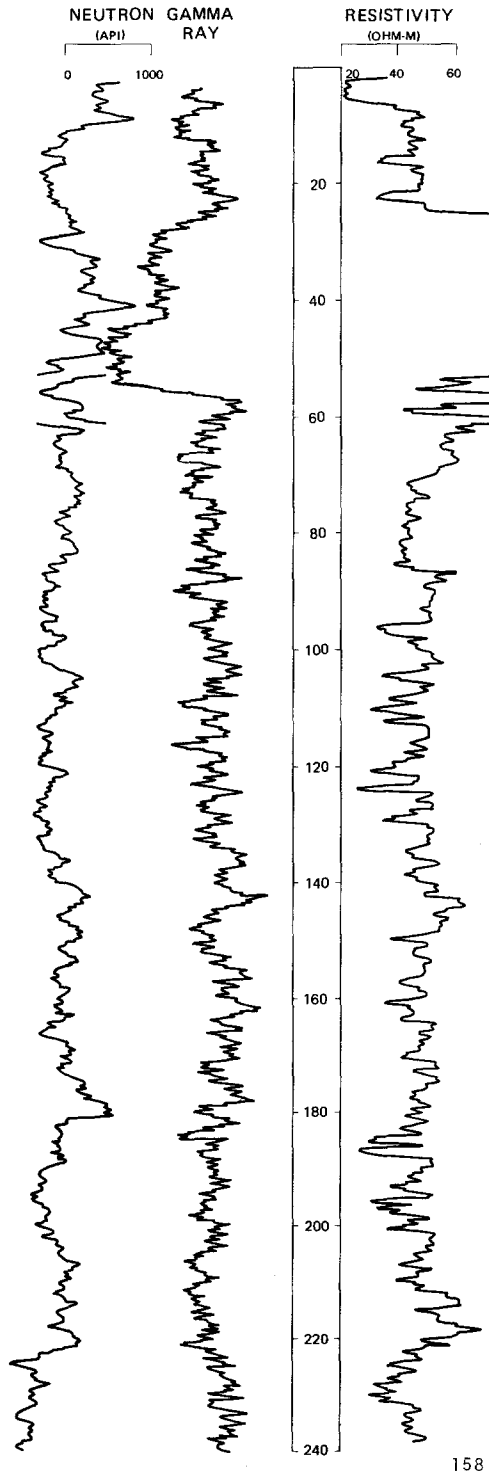
NDSWC 5503, 5503A

LOCATION: 135-067-27CBC1, 2

DATE DRILLED: 7/23/79

ALTITUDE: 1975
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

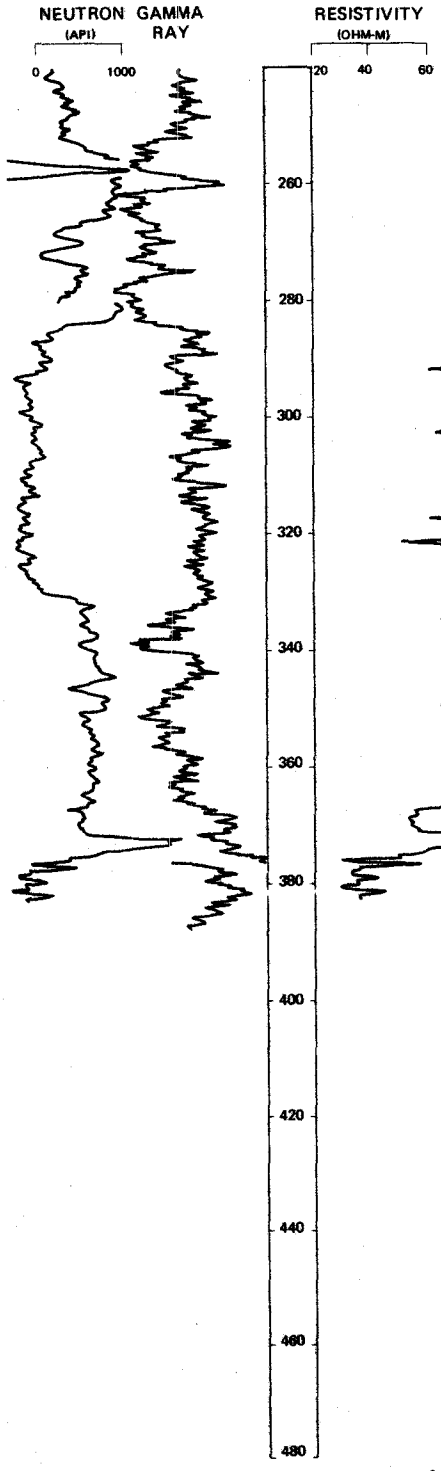
0-1	Topsoil, black.
1-17	Clay (till), silty, sandy, pebbly, moderate-yellowish-brown.
17-28	Clay (till), silty, sandy, gravelly, olive-gray.
28-44	Gravel, very fine to medium, predominantly fine, clayey; 40 percent carbonate, 40 percent shale, and 20 percent quartz and igneous fragments.
44-55	Gravel, very fine; 40 percent carbonate, 40 percent shale, and 20 percent quartz and igneous fragments.
55-284	Clay (till), silty, sandy, pebbly, olive-gray; boulder at 256 feet.

LOCATION: 135-067-27CBC1, 2

DATE DRILLED: 7/23/79

ALTITUDE: 1975
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

284-333 Clay (lacustrine?), silty, olive-gray, plastic.

333-375 Clay (till), silty, sandy, olive-gray to black; shale gravel from 347 to 357 feet.

PIERRE SHALE

375-392 Shale, black, brittle, hard.

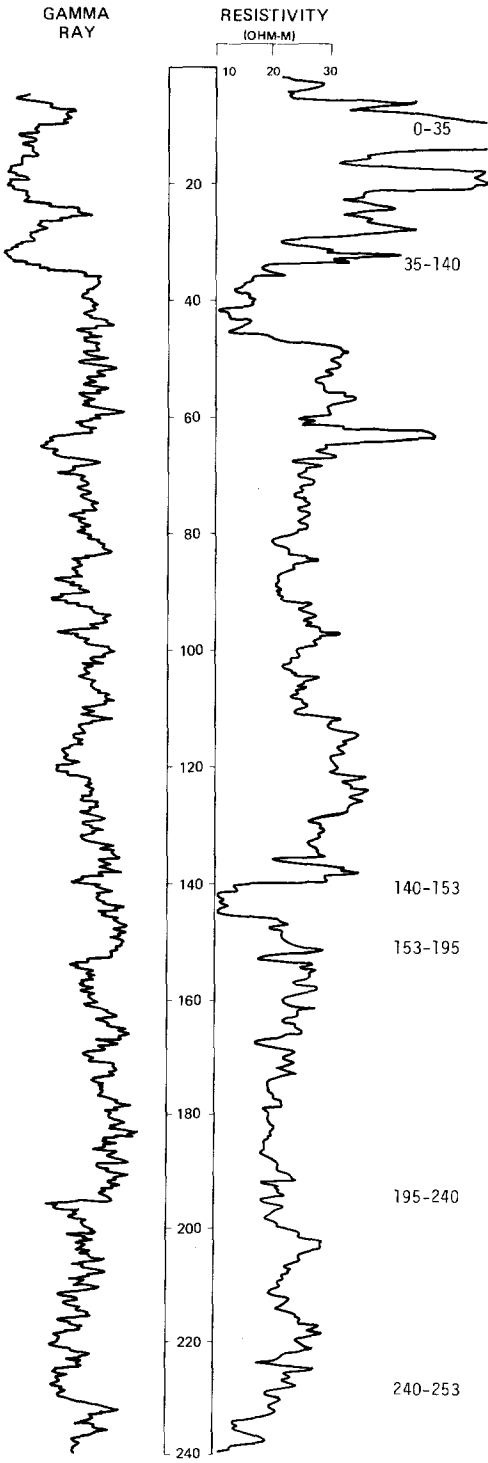
NDSWC 5502, 5502A

LOCATION: 135-067-30AAA1, 2

DATE DRILLED: 7/19/79

ALTITUDE: 1964
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

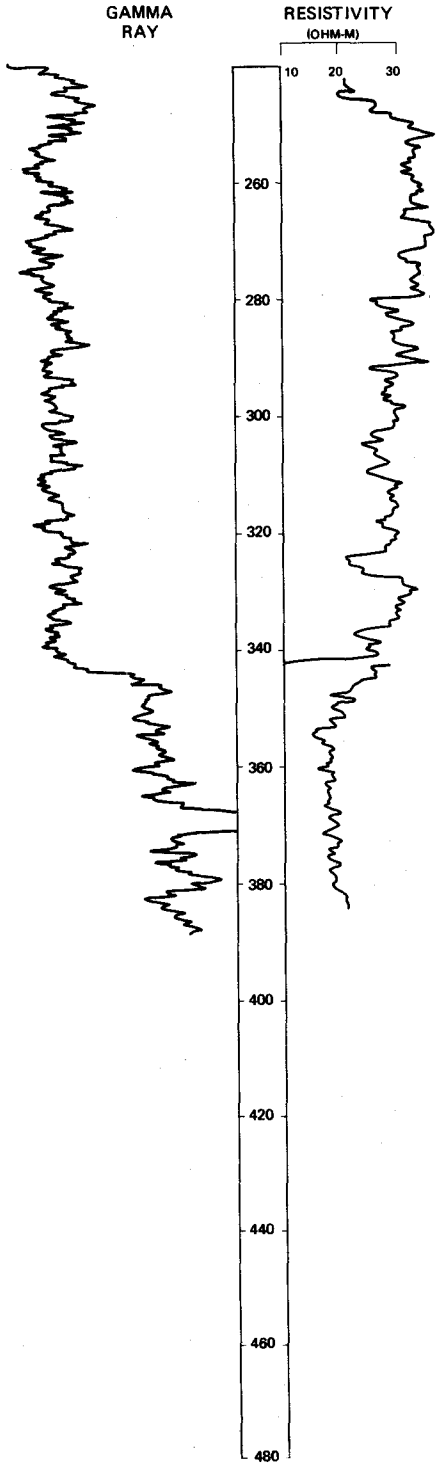
0-35	Sand, fine to very coarse, predominantly very coarse, gravelly, rounded to very angular; composed largely of carbonate and shale grains.
35-140	Clay (till), silty, sandy, pebbly, olive-gray.
140-153	Clay, silty, slightly plastic.
153-195	Clay (till), silty, sandy, pebbly; few sand and gravel lenses.
195-240	Clay (till), sandy, silty, pebbly, olive-gray.
240-253	Clay, silty, olive-gray, slightly plastic.

LOCATION: 135-067-30AAA1, 2

DATE DRILLED: 7/19/79

ALTITUDE: 1964
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

253-344 Clay (till), silty, sandy, pebbly, olive-gray.

PIERRE SHALE

344-392 Shale, slightly sandy, black, hard.

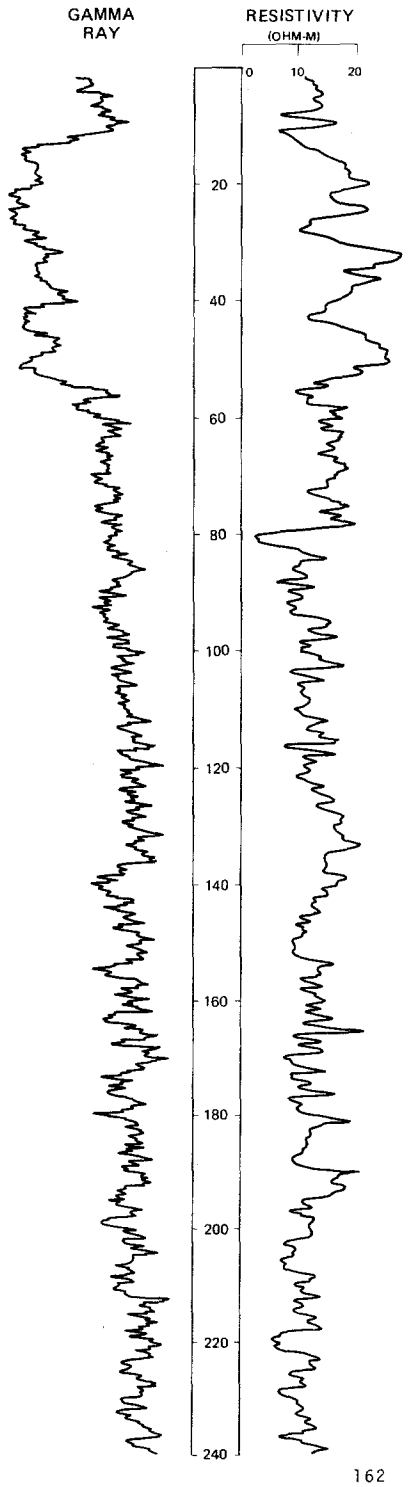
NDSWC 5500, 5500A

LOCATION: 135-068-06DCD1, 2

DATE DRILLED: 7/18/79

ALTITUDE: 1867
(FT, NGVD)

DEPTH: 377
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

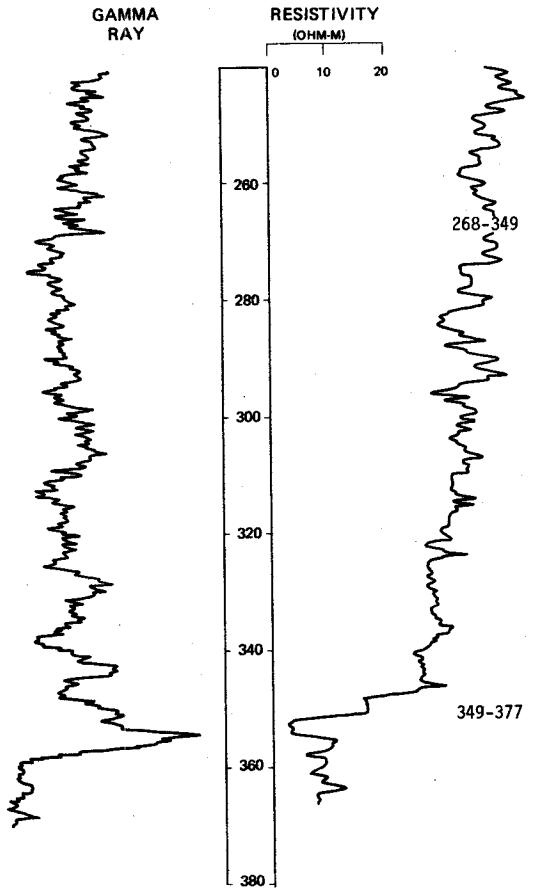
0-1	Topsoil, black.
1-13	Clay (till), silty, slightly sandy, yellowish-brown; scattered pebbles.
13-55	Sand, fine to very coarse, predominantly very coarse, gravelly, well-rounded to subangular; 60 percent carbonate and 40 percent quartz, shale, and igneous fragments.
55-60	Sand, gravelly, clayey.
60-136	Clay (till), silty, sandy, very pebbly, olive-gray.
136-268	Clay (till), silty, sandy, pebbly, olive-gray.

LOCATION: 135-068-06DCD1, 2

DATE DRILLED: 7/18/79

ALTITUDE: 1867
(FT, NGVD)

DEPTH: 377
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

268-349 Clay (till), very sandy, very pebbly, silty, olive-gray; numerous thin sand and gravel lenses.

PIERRE SHALE

349-377 Shale, slightly sandy, black, brittle.

135-068-08DAB
(Log from Brunner Well Drilling)

Date drilled: 6/29/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, yellow; some gravel	10	10
	Clay, gray; lignite and shale chips	10	20
	Clay, blue	98	118
	Clay and gravel; mixed	1	119
	Clay, gray; with thin gravel beds	49	168
	Layer of small rocks	4	172
	Gravel	6	178

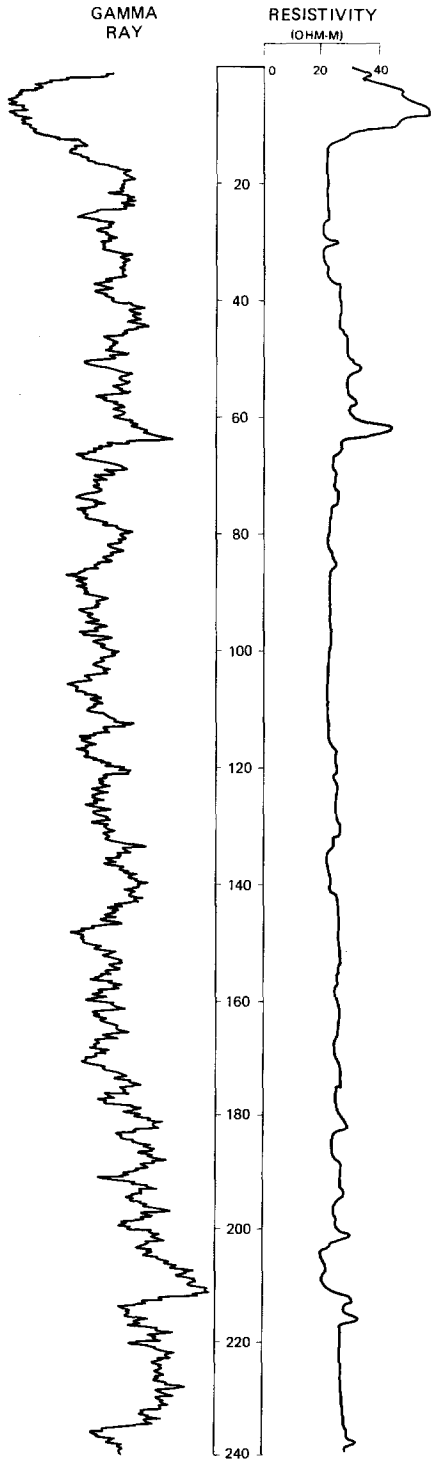
NDSWC 11242

LOCATION: 135-068-19AAA

DATE DRILLED: 5/01/80

ALTITUDE: 1985
(FT, NGVD)

DEPTH: 400
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

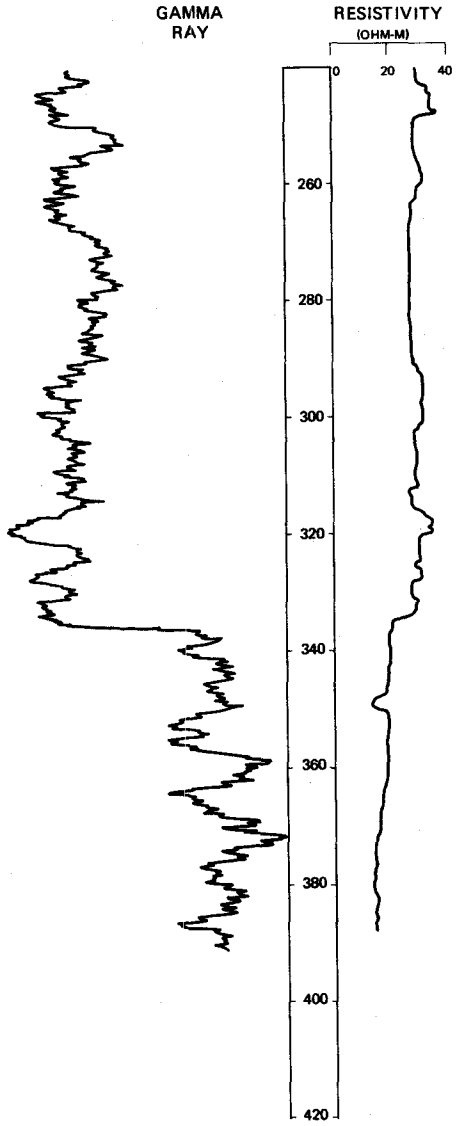
0-1	Topsoil, black.
1-3	Clay (till), silty, sandy, moderate-yellowish-brown.
3-14	Sand, coarse, gravelly, subangular to rounded.
14-15	Clay (till), silty, sandy, moderate-yellowish-brown.
15-292	Clay (till), silty, sandy, pebbly, brownish-gray; numerous thin sand and gravel lenses.

LOCATION: 135-068-19AAA

DATE DRILLED: 5/01/80

ALTITUDE: 1985 (FT, NGVD)

DEPTH: 400 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

292-336 Clay (till), sandy, silty, brownish-gray.

PIERRE SHALE

336-400 Shale, grayish-black, hard.

135-068-20CCB
(Log from Jacob Thurn)

Date drilled: 5/25/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Sand----------	15	18

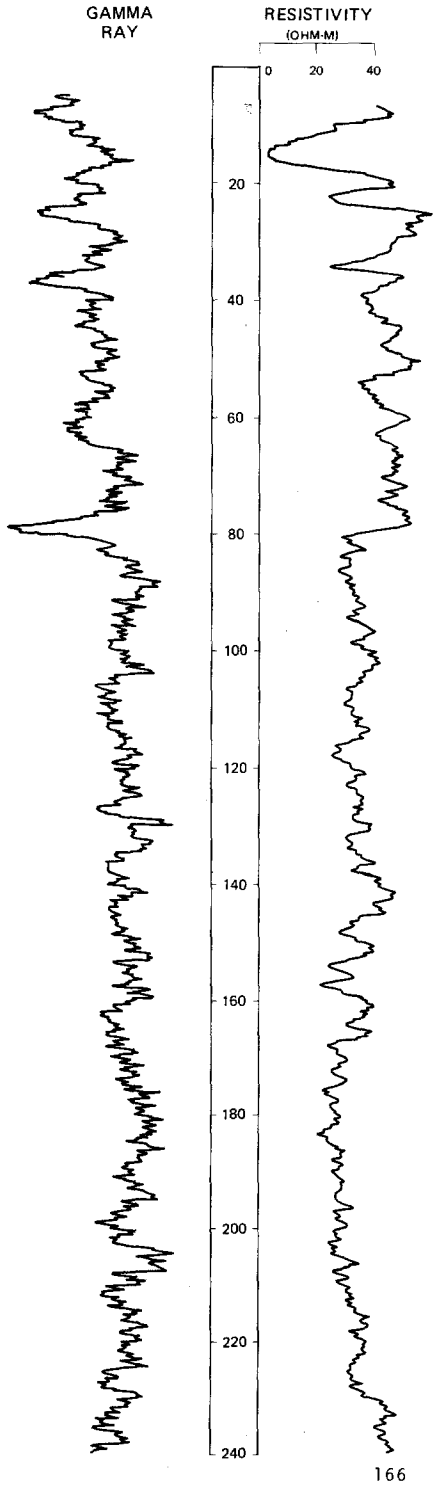
NDSWC 5501

LOCATION: 135-068-21CDD

DATE DRILLED: 7/19/79

ALTITUDE: 1873
(FT, NGVD)

DEPTH: 392
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-6	Clay (till), silty, sandy, pebbly, yellowish-brown.
6-12	Sand, very fine to very coarse, predominantly medium, gravelly; composed largely of quartz.
12-24	Clay (till), silty, olive-gray, plastic.
24-26	Sand, medium.
26-35	Clay (till), silty, olive-gray, plastic.
35-38	Sand, medium.
38-77	Clay (till), silty, very sandy, pebbly, olive-gray.
77-80	Gravel, medium.
80-274	Clay (till), very sandy, silty, pebbly, olive-gray.

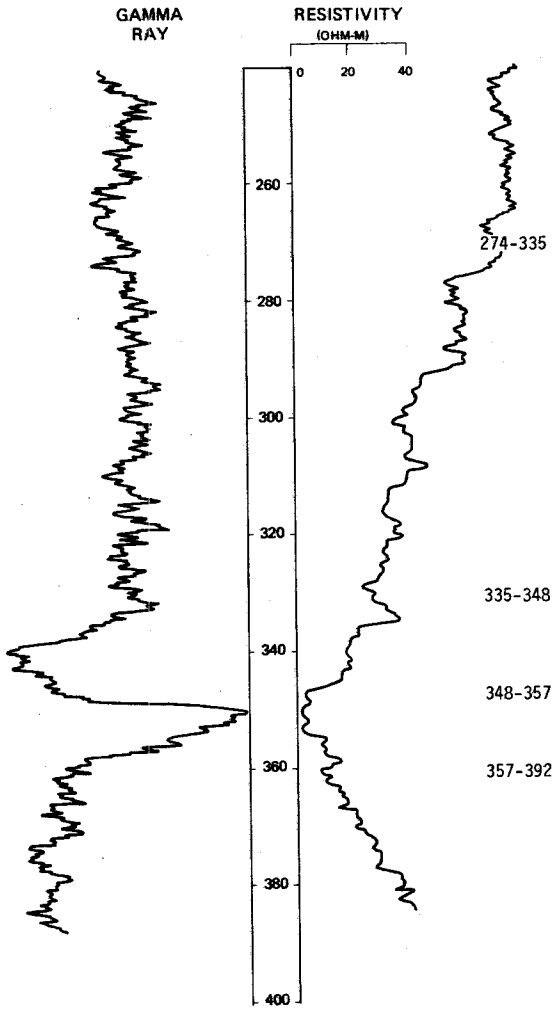
NDSWC 5501, Continued

LOCATION: 135-068-21CDD

DATE DRILLED: 7/19/79

ALTITUDE: 1873 (FT, NGVD)

DEPTH: 392 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

274-335 Clay (till), silty, sandy, olive-gray.

335-348 Gravel, fine, subrounded to angular; 95 percent shale and 5 percent quartz pebbles.

348-357 Clay.

PIERRE SHALE(?)

357-392 Shale, black, hard, fractured.

135-068-32CBC
(Log from Jacob Thurn)

Date drilled: 8/09/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Clay, yellow----------	4	7
	Sand and gravel----------	23	30

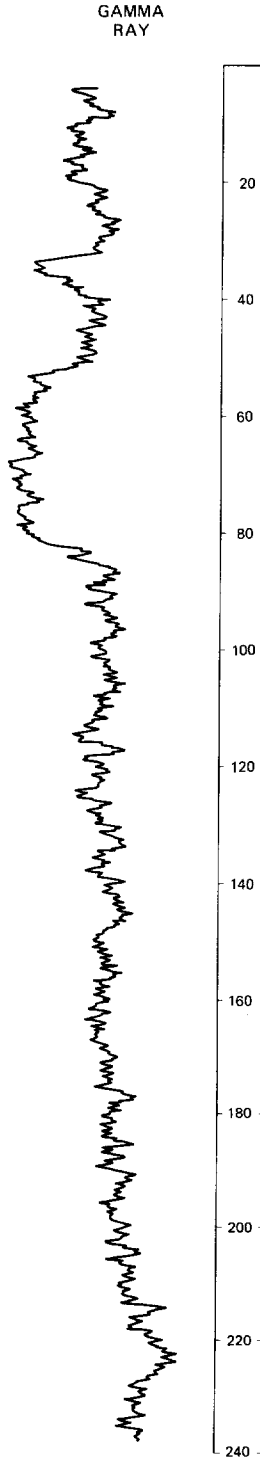
NDSWC 5498, 5498A

LOCATION: 135-069-01CCC1, 2

DATE DRILLED: 7/17/79

ALTITUDE: 1880
(FT, NGVD)

DEPTH: 242
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-17	Clay, silty, sandy, pebbly, yellowish-brown.
17-52	Clay, silty, sandy, pebbly, olive-gray; gravel lens from 32 to 36 feet.
52-82	Sand, very fine to very coarse, predominantly very coarse, gravelly, well-rounded to angular; 40 percent carbonate, 40 percent shale, and 20 percent silicate grains.
82-148	Clay (till), very sandy, pebbly, olive-gray; scattered lignite fragments.
148-212	Clay (till), silty, sandy, pebbly, olive-gray.

PIERRE SHALE

212-242	Shale, slightly sandy, black, brittle, hard.

135-069-06CAC
(Log from Frederickson's Inc.)

Date drilled: 4/11/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil, black----------	1	1
	Sand and gravel----------	28	29
	Sand and gravel; with lenses of clay----------	3	32
	Clay, sandy----------	10	42

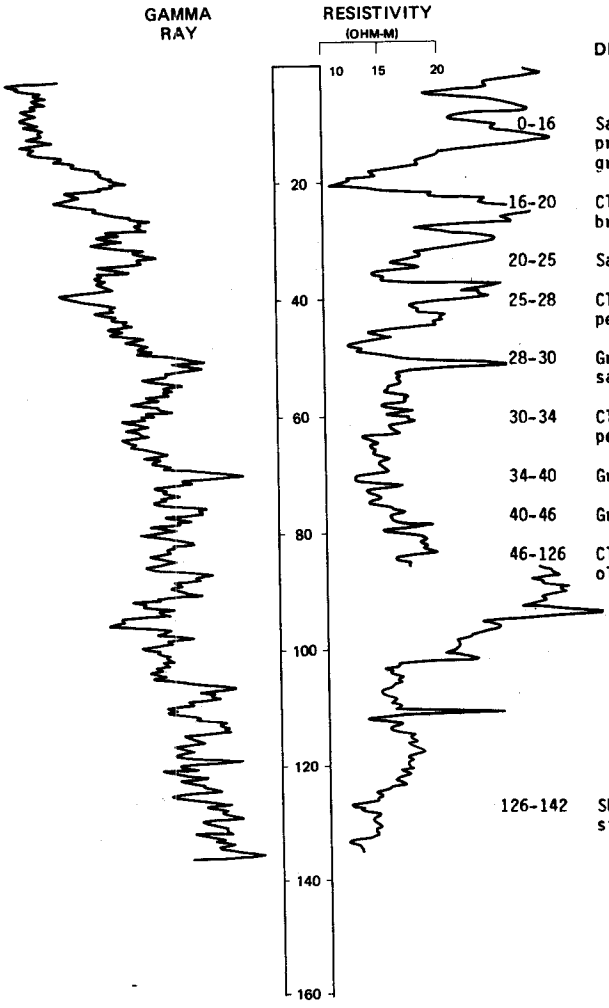
NDSWC 5390, 5390A

LOCATION: 135-069-07DDD1, 2

DATE DRILLED: 10/19/78

ALTITUDE: 1946 (FT, NGVD)

DEPTH: 142 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-16	Sand, fine to very coarse, predominantly medium, gravelly, oxidized.
16-20	Clay, silty, yellowish-brown.
20-25	Sand, medium.
25-28	Clay (till), silty, sandy, pebbly, olive-gray.
28-30	Gravel, fine to medium, sandy.
30-34	Clay (till), silty, sandy, pebbly, olive-gray.
34-40	Gravel, sandy.
40-46	Gravel, clayey.
46-126	Clay (till), silty, sandy, olive-gray.

PIERRE SHALE(?)

126-142	Shale, medium-dark-gray, siliceous.

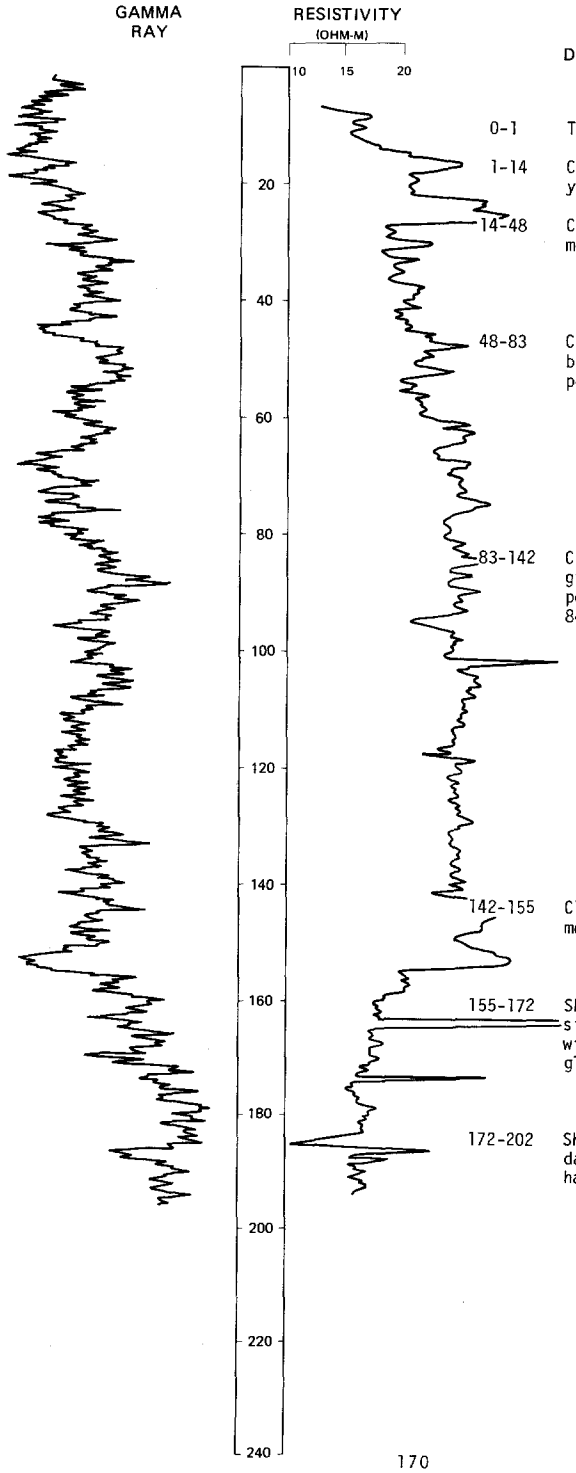
NDSWC 5389

LOCATION: 135-069-08DAA

DATE DRILLED: 10/19/78

ALTITUDE: 1960
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, black.

1-14 Clay (till), sandy, yellowish-brown.

14-48 Clay (till), gravelly, medium-dark-gray.

48-83 Clay (till), silty, medium-bluish-gray; abundant shale pebbles.

83-142 Clay (till), silty, dark-gray; abundant shale pebbles; gravel lenses at 84 and 102 feet.

142-155 Clay (till), silty, pebbly, medium-gray.

FOX HILLS SANDSTONE

155-172 Shale, medium-gray, siliceous; interbedded with thin very fine grained glauconitic sandstone.

PIERRE SHALE(?)

172-202 Shale, slightly silty, dark-gray to grayish-black, hard.

135-069-09CCC
(Log from Jacob Thurn)

Date drilled: 9/12/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	18	20
	Sand	13	33

135-069-09CCD
(Log from Jacob Thurn)

Date drilled: 9/11/74

	Topsoil	3	3
	Clay, yellow	12	15
	Clay, blue	5	20
	Sand	3	23

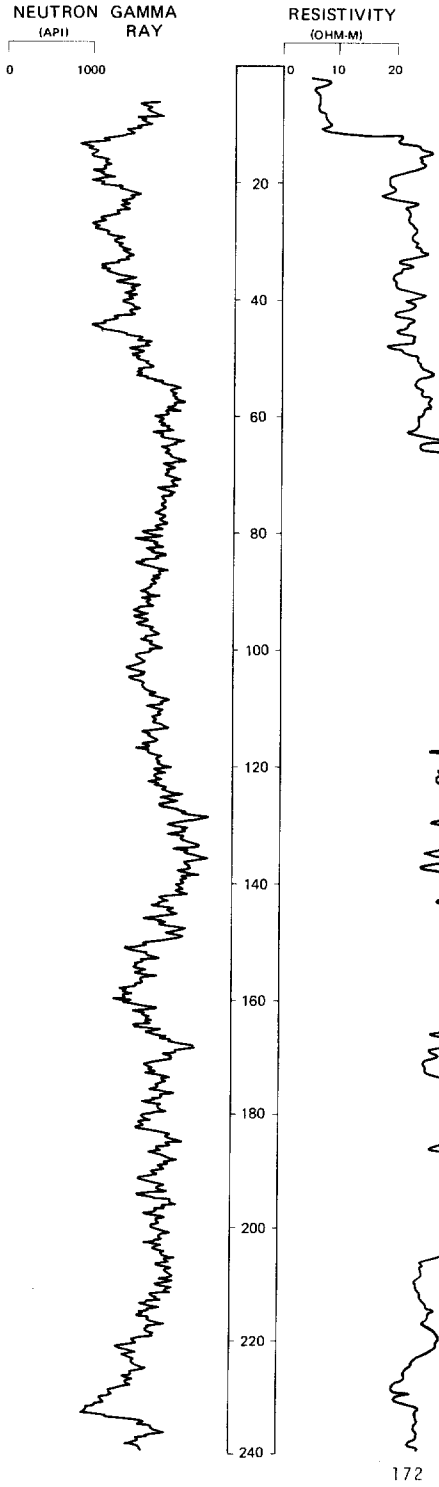
NDSWC 5499, 5499A

LOCATION: 135-069-12ABA1, 2

DATE DRILLED: 7/17/79

ALTITUDE: 1866
(FT, NGVD)

DEPTH: 377
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

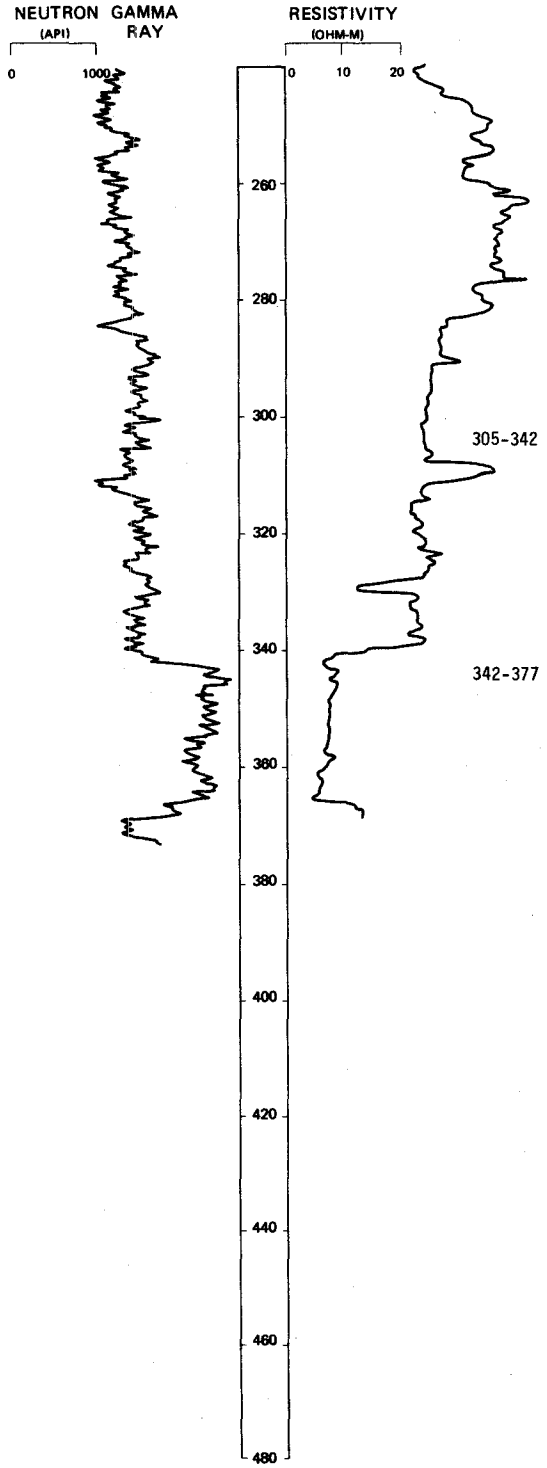
0-1	Topsoil, black.
1-12	Clay (till), silty, sandy, yellowish-brown.
12-66	Clay (till), silty, sandy, olive-gray.
66-115	Sand, very fine to coarse, predominantly fine, silty, clayey, well-rounded.
115-138	Clay (lacustrine), silty, slightly sandy, olive-gray, plastic.
138-166	Clay (till), very sandy, silty, olive-gray; scattered pebbles.
166-212	Clay (till), very sandy, silty, pebbly, olive-gray.
212-305	Clay (till), sandy, silty, olive-gray, brittle; abundant shale pebbles.

LOCATION: 135-069-12ABA1, 2

DATE DRILLED: 7/17/79

ALTITUDE: 1866
(FT, NGVD)

DEPTH: 377
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

305-342 Clay (till), very sandy, silty, pebbly, olive-gray; numerous thin sand and gravel lenses.

PIERRE SHALE

342-377 Shale, slightly sandy, olive-gray to black, brittle; bentonitic streaks.

NDSWC 5388

LOCATION: 135-069-18BBB

DATE DRILLED: 10/18/78

ALTITUDE: 1940
(FT, NGVD)

DEPTH: 142
(FT)

DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-18 Gravel, fine, and coarse sand; subangular to rounded.

18-82 Clay (till), silty, medium-gray.

FOX HILLS SANDSTONE

82-118 Shale, sandy, silty, greenish-gray.

118-120 Limestone, dark-gray, hard, calcareous.

120-142 Shale, grayish-black.

135-069-18DAA3
(Log from Jacob Thurn)

Date drilled: 5/12/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Sand and gravel----------	16	19

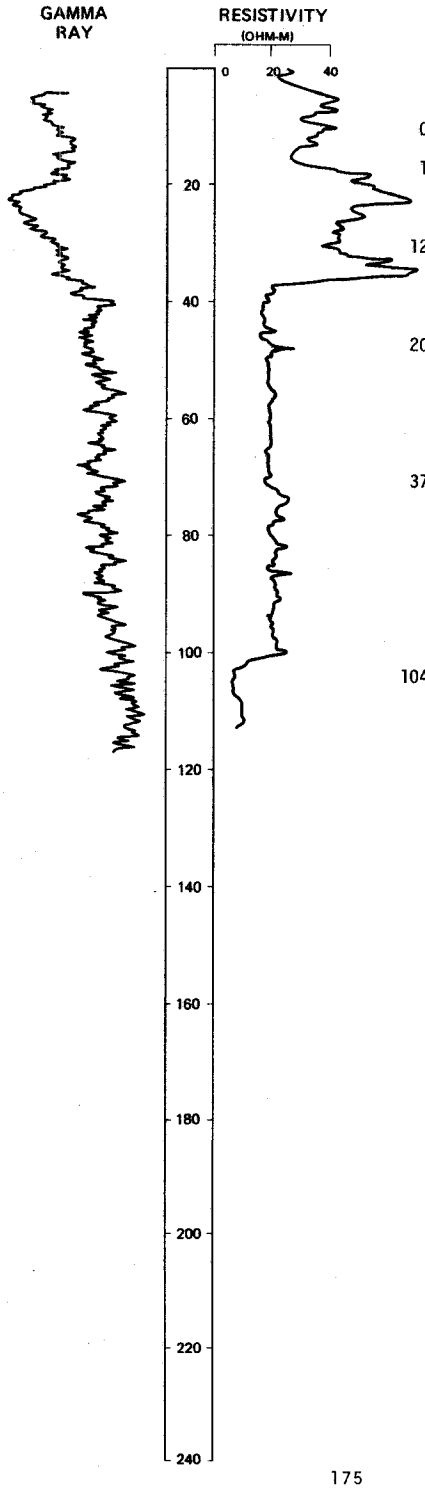
NDSWC 5497, 5497A

LOCATION: 135-069-21BAB1, 2

DATE DRILLED: 7/17/79

ALTITUDE: 1955
(FT, NGVD)

DEPTH: 122
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-12	Sand, very fine to very coarse, clayey, gravelly, well-rounded to subangular.
12-20	Clay (till), sandy, silty, pebbly, yellowish-brown; color changes to olive gray at 15 feet.
20-37	Sand, very fine to very coarse, predominantly very coarse, gravelly, well-rounded to angular; composed largely of carbonate and shale fragments.
37-104	Clay (till), silty, sandy, pebbly, olive-gray.

PIERRE SHALE(?)

104-122	Shale, slightly sandy, olive-gray to black.

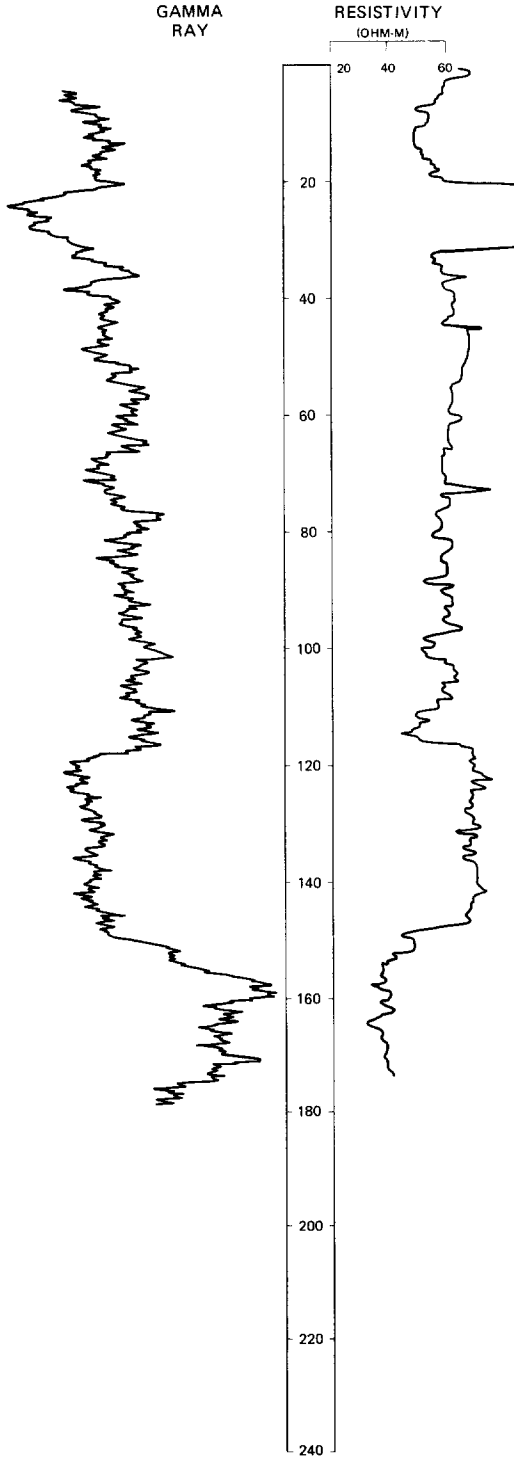
NDSWC 5517, 5517A

LOCATION: 135-069-27CCD1, 2

DATE DRILLED: 8/08/79

ALTITUDE: 1946
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-15	Clay (till), silty, sandy, pebbly, yellowish-brown.
15-20	Clay (till), silty, sandy, pebbly, olive-gray.
20-32	Sand, fine to very coarse, predominantly coarse, gravelly, well-rounded; 80 percent quartz, 10 percent carbonate, and 10 percent igneous and metamorphic grains.
32-118	Clay (till), silty, sandy, pebbly, olive-gray.
118-150	Clay (till), very sandy and silty, pebbly, olive-gray.

PIERRE SHALE

150-182	Shale, sandy, black, brittle, hard.

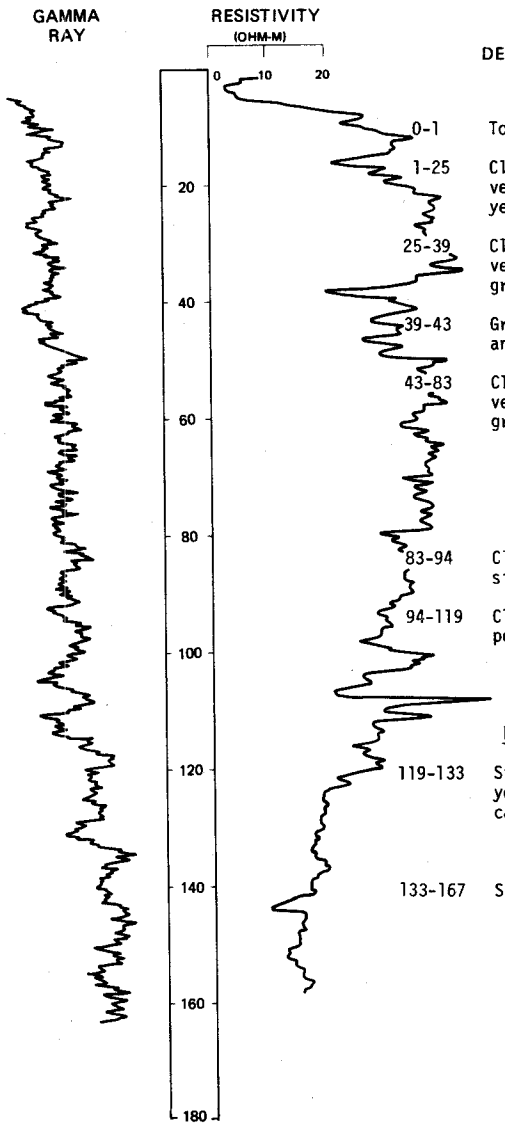
NDSWC 5496

LOCATION: 135-069-28CCC

DATE DRILLED: 7/17/79

ALTITUDE: 1949 (FT, NGVD)

DEPTH: 167 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, black.

1-25 Clay (till), very sandy, very silty, pebbly, yellowish-brown.

25-39 Clay (till), very sandy, very silty, pebbly, olive-gray.

39-43 Gravel, medium, sandy, angular.

43-83 Clay (till), very silty, very sandy, pebbly, olive-gray.

83-94 Clay (till), very sandy, silty, pebbly, olive-gray.

94-119 Clay (till), sandy, silty, pebbly, olive-gray.

FOX HILLS SANDSTONE(?)

119-133 Siltstone, slightly sandy, yellowish-brown, brittle, carbonaceous.

PIERRE SHALE(?)

133-167 Shale, olive-gray to black.

135-069-28DDA
(Log from Jacob Thurn)

Date drilled: 12/13/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	13	15
	Clay, blue	7	22
	Sand and gravel	6	28

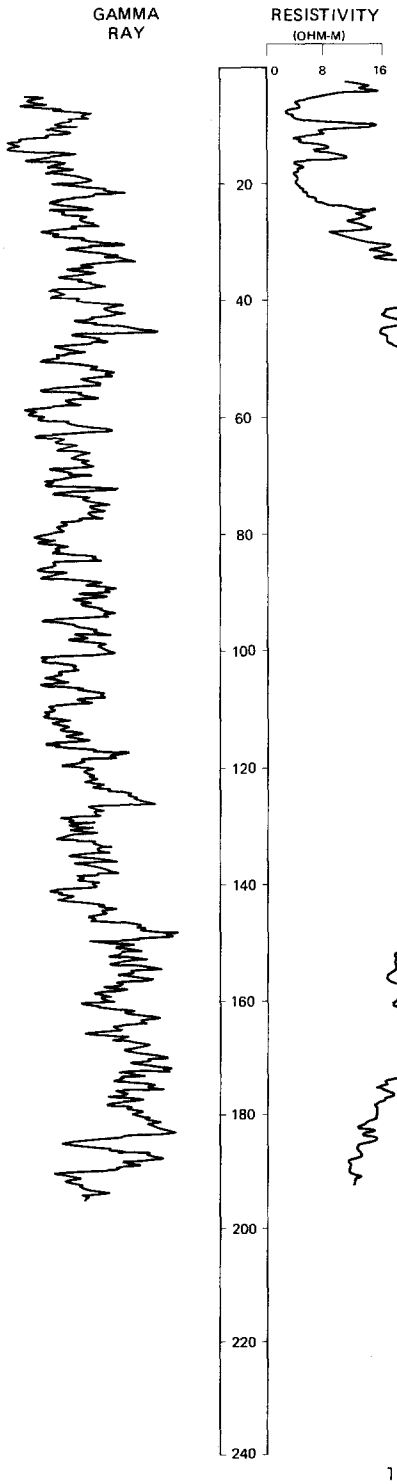
NDSWC 5386

LOCATION: 135-070-05CDD

DATE DRILLED: 10/18/78

ALTITUDE: 1900
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-5 Clay (till), very sandy, silty, yellowish-brown; abundant shale pebbles.

5-54 Clay (till), silty, sandy, pebbly, dark-gray.

54-69 Clay (lacustrine?), silty, dark-gray, plastic.

69-146 Clay (till), silty, sandy, pebbly, dark-gray.

FOX HILLS SANDSTONE

146-174 Shale, silty, slightly sandy, dark-gray, brittle; contains numerous thin very fine grained glauconitic sand beds.

PIERRE SHALE(?)

174-202 Shale, dark-gray, siliceous.

135-070-12CD
(Log from Jacob Thurn)

Date drilled: 6/13/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	1	1
	Sand and gravel	11	12
	Clay, blue	28	40
	Sand	10	50

135-070-14CAD
(Log from Gross Well Drilling)

Date drilled: 7/09/72

	Clay, yellow	30	30
	Clay, blue	70	100
	Sand, fine	7	107
	Clay	73	180
	Sand, blue	20	200

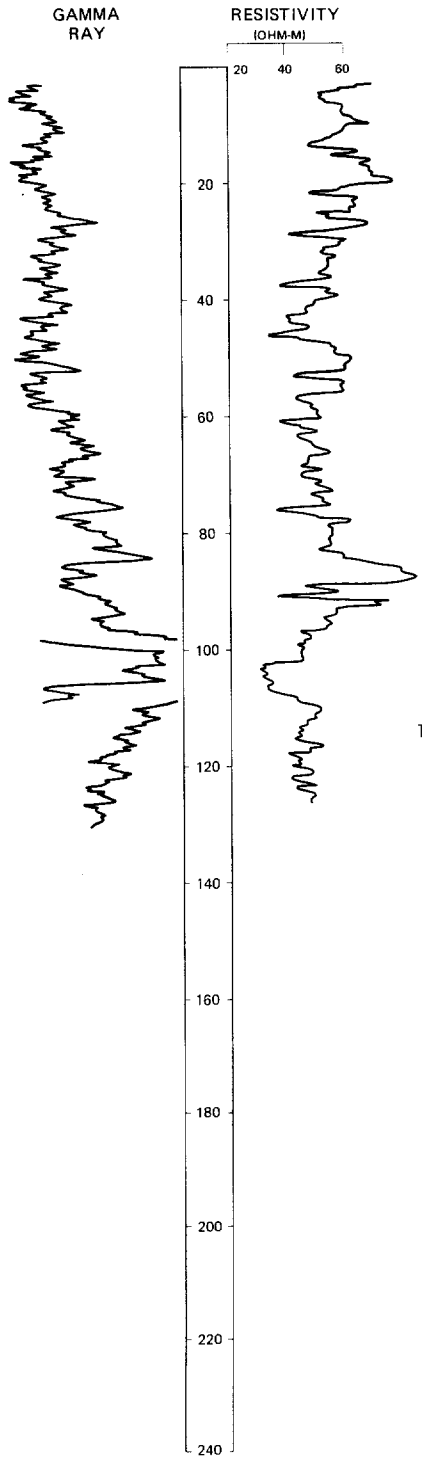
NDSWC 5516

LOCATION: 135-070-28AAD

DATE DRILLED: 8/07/79

ALTITUDE:
(FT, NGVD)

DEPTH: 137
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-25	Clay (till), silty, sandy, pebbly, yellowish-brown to dark-yellowish-brown.
25-42	Silt, sandy, olive-gray.
42-58	Clay (till), very sandy, silty, pebbly, olive-gray.
58-83	Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

83-96	Sandstone, very fine to fine, clayey, yellowish-orange, angular to well-rounded; predominantly very fine sand; contains some mica and magnetite.
96-110	Shale.
110-137	Siltstone, sandy, olive-gray, brittle; scattered mica.

135-070-33DBD
(Log from Gross Well Drilling)

Date drilled: 7/19/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	30	30
	Clay----------	55	85
	Clay and gravel; mixed----------	15	100

135-071-13ABC
(Log from Brunner Well Drilling)

Date drilled: 11/04/75

	Clay, yellow----------	7	7
	Gravel----------	1	8
	Clay, yellow----------	9	17
	Gravel----------	1	18
	Clay, gray----------	19	37
	Sand, blue, muddy----------	12	49
	Rock----------	2	51
	Clay, blue----------	27	78
	Gravel----------	1	79
	Clay, blue----------	18	97
	Sand, blue; with small black stone chips----------	16	113

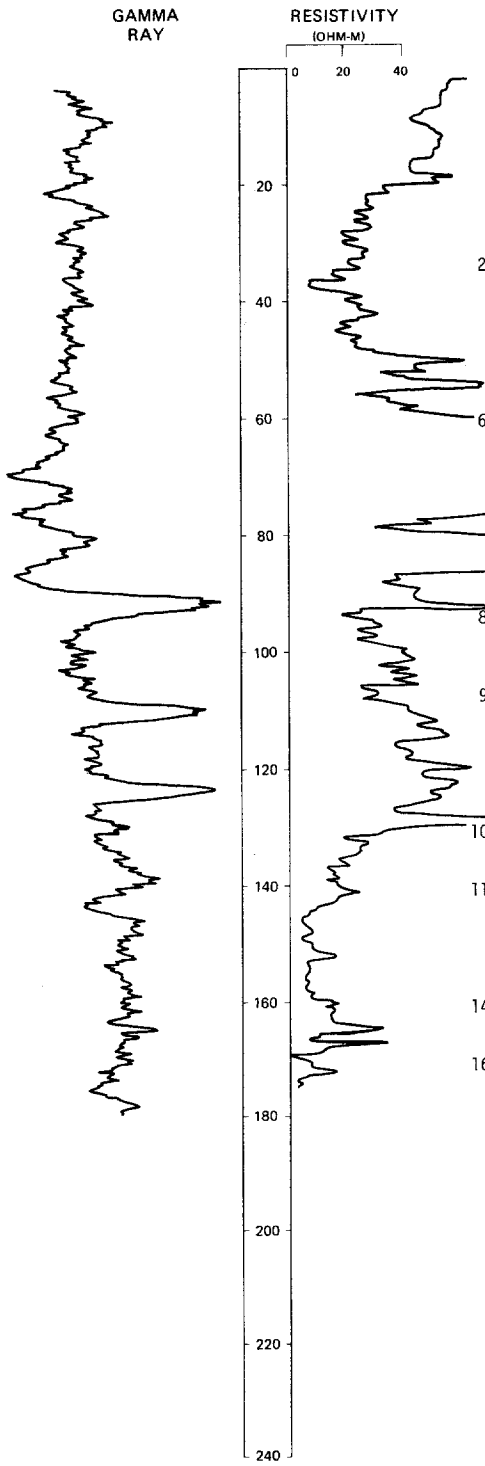
NDSWC 5461

LOCATION: 135-071-15BBB

DATE DRILLED: 6/18/79

ALTITUDE: 2072
(FT, NGVD)

DEPTH: 197
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-22	Clay (till), very silty, very sandy, moderate-yellowish-brown; few thin gravel lenses.
22-61	Clay (till), silty, sandy, dark-yellowish-brown; abundant shale pebbles.
61-89	Clay (till), sandy, pebbly, olive-gray; sand and gravel lenses from 68 to 71, 74 to 78, and 84 to 88 feet.

FOX HILLS SANDSTONE

89-94	Siltstone, moderate-yellowish-brown to dark-greenish-gray, brittle.
94-108	Sandstone, very fine to fine, clayey, grayish-green, hard, well-rounded to subrounded; contains small amounts of mica and glauconite.
108-112	Siltstone, sandy, grayish-green, brittle.
112-146	Sandstone, very fine to fine, silty, clayey, grayish-green, well-rounded to subrounded; interbedded with siltstone.
146-160	Siltstone, sandy, grayish-green, brittle.
160-197	Sandstone, very fine, grayish-green, glauconitic; some mica and magnetite; lost circulation at 197 feet.

135-071-15BBD
(Log from Brunner Well Drilling)

Date drilled: 9/11/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	7	9
	Sand	1	10
	Sand and gravel	2	12
	Clay, gray, and small stones	20	32
	Clay, yellow	13	45
	Rock	2	47
	Clay, blue	36	83
	Rock	1	84
	Clay, blue	85	169
	Rock	3	172
	Clay, blue	7	179
	Sand, blue-green	25	204

135-071-17BAB
(Log from Brunner Well Drilling)

Date drilled: 5/20/77

	Topsoil	2	2
	Clay, yellow	4	6
	Gravel	2	8
	Sand, yellow	2	10
	Clay, yellow	6	16
	Clay, gray	11	27
	Sand and gravel	2	29
	Clay, gray	17	46
	Sand, brown	5	51
	Clay, gray	33	84
	Shale	2	86
	Clay, gray	37	123
	Sand, brown	6	129
	Clay, blue	62	191
	Sand, green, and blue clay; interbedded	5	196
	Clay, blue	5	201
	Rock, white	3	204
	Sand, green	17	221

135-071-20ABA
(Log from Brunner Well Drilling)

Date drilled: 6/03/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	7	9
	Clay and gravel, yellow	7	16
	Clay, gray	27	43
	Gravel, fine, and coal chips	3	46
	Clay, blue	84	130
	Rock, white	2	132
	Clay, blue	54	186
	Sand, blue-green	27	213

135-071-21BCB
(Log from Brunner Well Drilling)

Date drilled: 11/23/72

	Topsoil	2	2
	Clay, yellow	7	9
	Gravel	3	12
	Clay, yellow	52	64
	Clay, blue	75	139
	Sand, blue, and coal chips	7	146
	Clay, blue	45	191
	Sand, blue-green	17	208

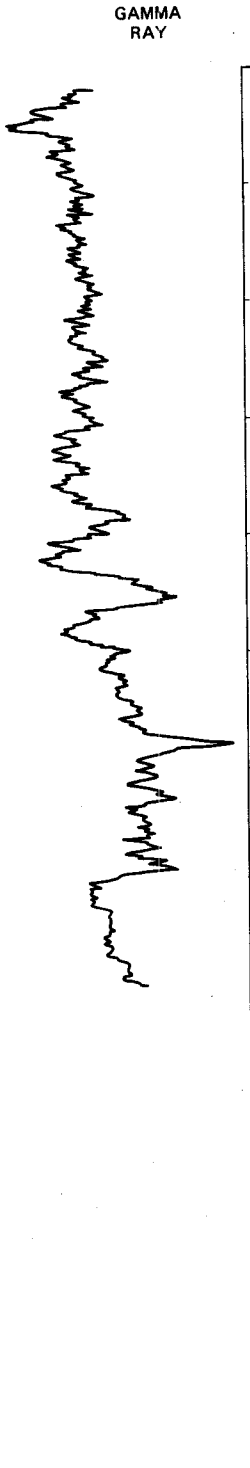
NDSWC 5460

LOCATION: 135-071-27BBC

DATE DRILLED: 6/18/79

ALTITUDE: (FT, NGVD)

DEPTH: 163 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, black.

1-19 Clay (till), silty, sandy, pebbly; yellowish brown changing to olive gray at 17 feet; gravel lens from 3 to 7 feet.

19-99 Clay (till), silty, slightly sandy and pebbly, olive-gray; sand and gravel lenses from 81 to 86 and 92 to 98 feet.

FOX HILLS SANDSTONE

99-138 Siltstone, sandy, olive-gray, brittle, carbonaceous.

138-163 Sandstone, very fine to fine, silty, clayey, olive-gray, well-rounded to sub-rounded; changing to dusky green with depth; contains small amounts of mica, glauconite, and magnetite; percentage of glauconite and magnetite increases with depth; lost circulation at 158 feet.

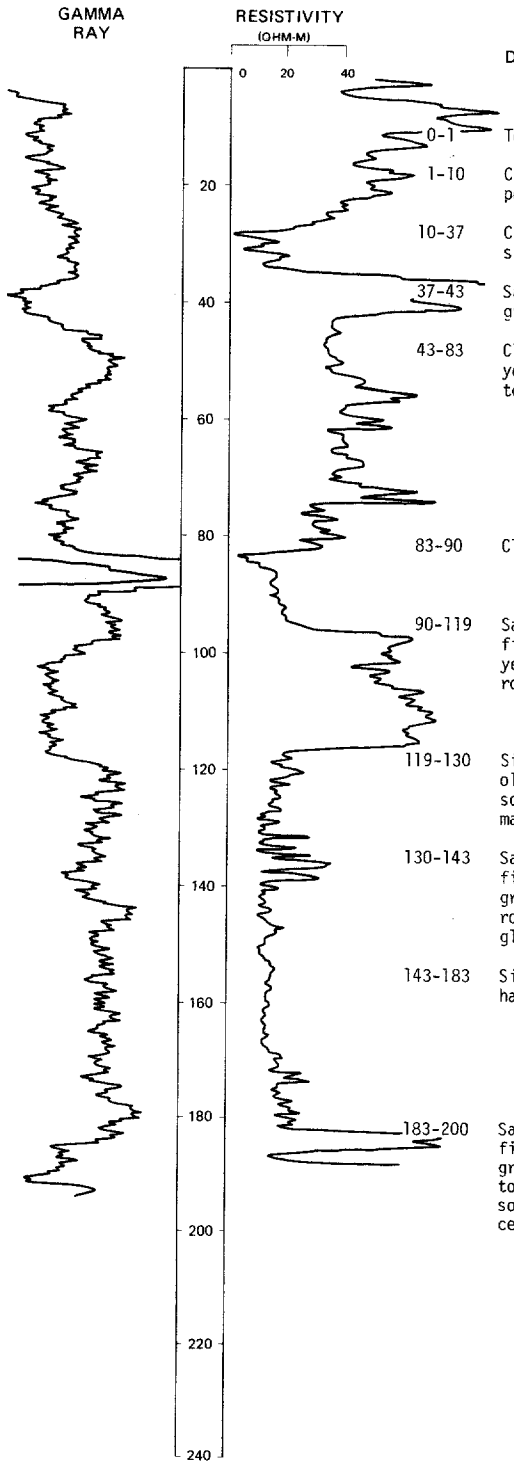
NDSWC 5459

LOCATION: 135-071-30BBB

DATE DRILLED: 6/15/79

ALTITUDE: 2087
(FT, NGVD)

DEPTH: 200
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, black.

1-10 Clay (till), sandy, silty, pebbly, yellowish-brown.

10-37 Clay (till), very sandy, silty, pebbly, olive-gray.

37-43 Sand, clayey, silty, olive-gray.

43-83 Clay (till), sandy, silty; yellowish brown changing to olive gray with depth.

83-90 Clay.

FOX HILLS SANDSTONE

90-119 Sandstone, very fine to fine, predominantly fine, yellowish-brown, well-rounded; some magnetite.

119-130 Siltstone, slightly sandy, olive-gray, brittle, hard; some mica and carbonaceous material.

130-143 Sandstone, very fine to fine, predominantly fine, grayish-green, well-rounded to subangular, glauconitic.

143-183 Siltstone, grayish-green, hard; scattered sand.

183-200 Sandstone, very fine to fine, predominantly fine, grayish-green, well-rounded to subangular, glauconitic; some magnetite and carbonaceous material.

135-072-02DAA
(Log from Gross Well Drilling)

Date drilled: 11/10/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	100	100
	Clay, blue----------	160	260
	Sand, fine----------	20	280

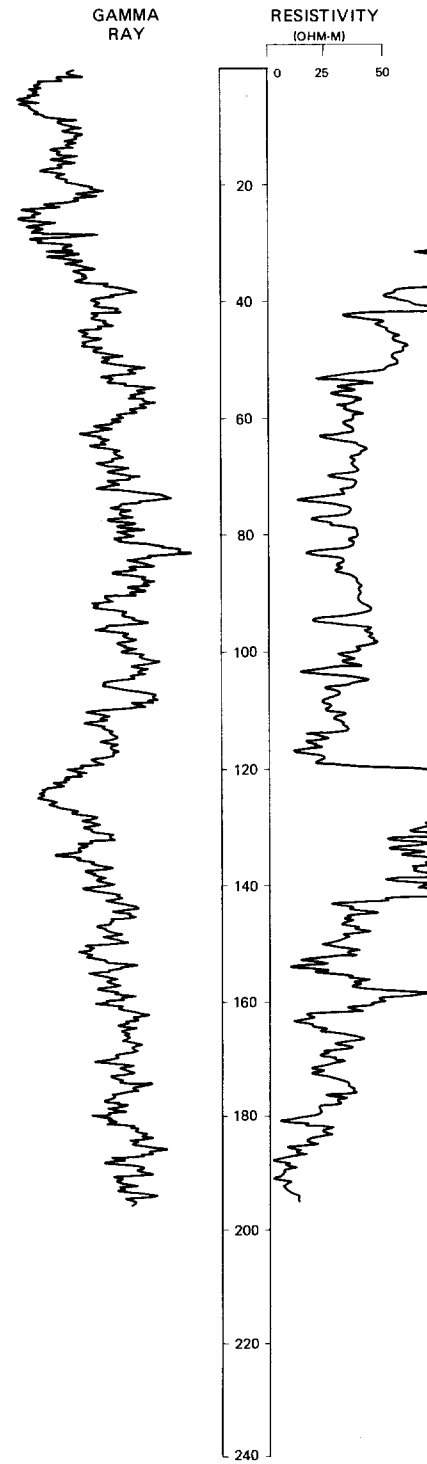
NDSWC 5415

LOCATION: 135-072-06BAA

DATE DRILLED: 11/08/78

ALTITUDE: 1945
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-8	Sand, fine to very coarse, gravelly; composed largely of quartz, carbonate, and shale fragments.
8-23	Silt (lacustrine), clayey, sandy, olive-gray to grayish-olive, plastic, laminated.
23-52	Clay (till), sandy, olive-gray.

FOX HILLS SANDSTONE

52-120	Siltstone, sandy, medium-gray, hard, glauconitic; thin sandstone interbeds and some lignite fragments.
120-142	Sandstone, medium, silty, dusky-blue-green, glauconitic.
142-150	Claystone, sandy, silty, dark-gray, glauconitic.
150-187	Sandstone, fine, silty, medium-bluish-gray, glauconitic.
187-202	Shale, silty, dark-gray, glauconitic, siliceous.

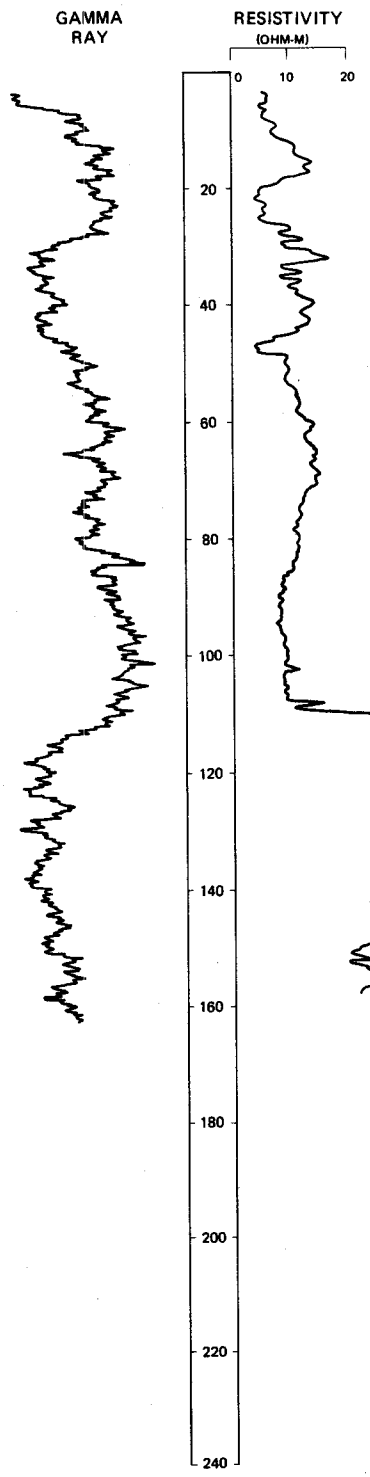
NDSWC 5457

LOCATION: 135-072-09AAD

DATE DRILLED: 6/14/79

ALTITUDE: 2007
(FT, NGVD)

DEPTH: 167
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-4	Clay (till), silty, sandy, pebbly, yellowish-brown.
4-11	Sand, fine to very coarse, predominantly very coarse, clayey, rounded to angular.
11-28	Clay, silty, dusky-red.
28-49	Clay, very silty, sandy, olive-gray.

FOX HILLS SANDSTONE

49-60	Sandstone, very fine to fine, predominantly fine, poorly consolidated, carbonaceous, glauconitic.
60-73	Siltstone, clayey, sandy, light-greenish-gray; some glauconite and mica.
73-92	Sandstone, very fine to fine, predominantly fine, dusky-blue-green; some glauconite and mica.
92-110	Siltstone, olive-gray.
110-167	Sandstone, very fine to fine, predominantly very fine, dusky-blue-green; abundant glauconite and magnetite.

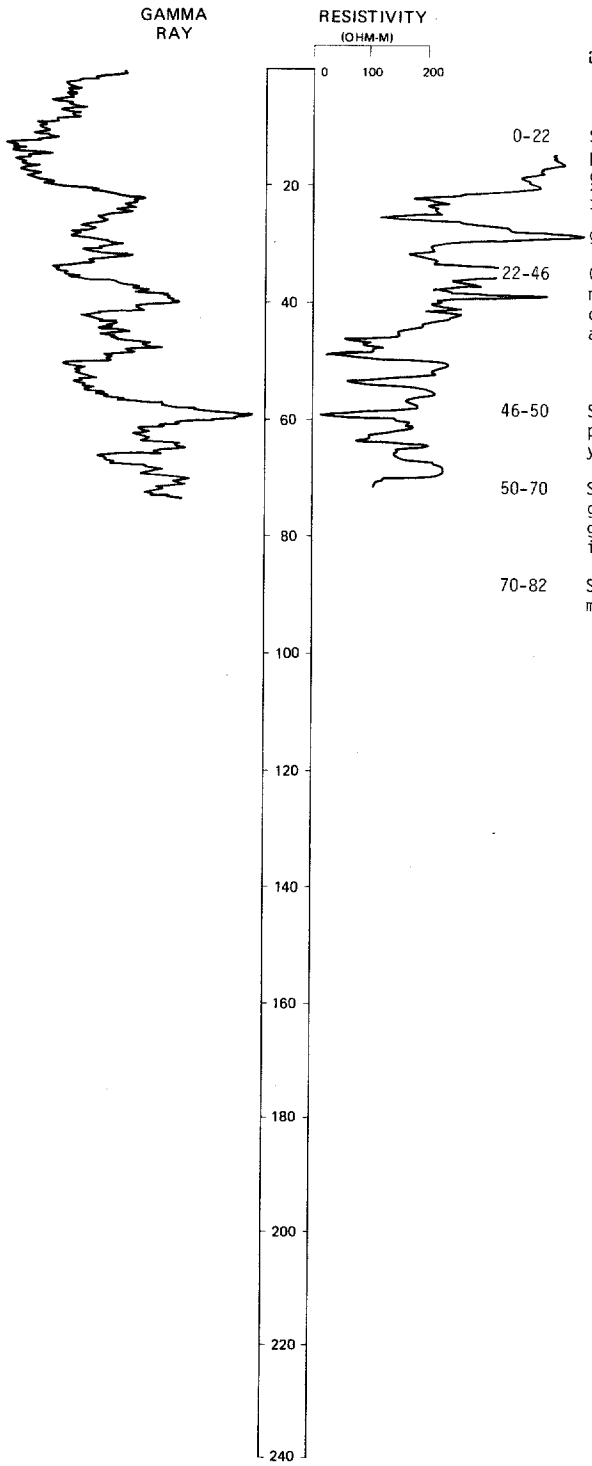
NDSWC 5417

LOCATION: 135-072-14BBB

DATE DRILLED: 11/14/78

ALTITUDE: 2016
(FT, NGVD)

DEPTH: 82
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-22 Sand, fine to very coarse, predominantly coarse, gravelly; 60 percent quartz, 30 percent limestone, and 10 percent shale and igneous grains.

22-46 Clay (till), silty, clayey; moderate yellowish brown changing to olive gray at about 25 feet.

FOX HILLS SANDSTONE

46-50 Sandstone, fine to medium, predominantly fine, yellowish-brown, glauconitic.

50-70 Sandstone, fine, silty, greenish-gray to medium-gray; contains thin siltstone interbeds.

70-82 Siltstone, clayey, sandy, medium-gray to dark-gray.

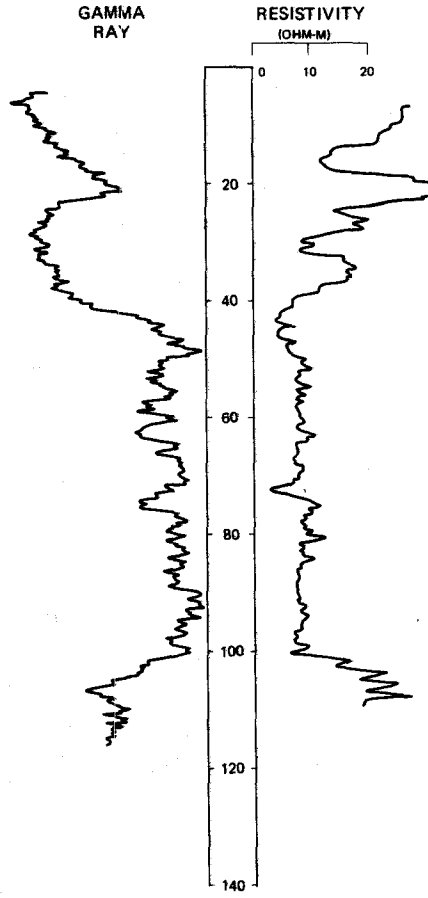
NDSWC 5458, 5458A

LOCATION: 135-072-15CBB1, 2

DATE DRILLED: 6/14/79

ALTITUDE: 1993
(FT, NGVD)

DEPTH: 120
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, black.

1-42 Gravel, fine, well-rounded to subangular; 50 percent silicate, 30 percent shale, and 20 percent carbonate pebbles.

FOX HILLS SANDSTONE

42-50 Siltstone, sandy, olive-gray, brittle.

50-101 Siltstone, slightly sandy, brittle; dusky blue changing to olive gray with depth; contains some mica and glauconite.

101-120 Sandstone, very fine to fine, predominantly very fine, dusky-blue-green, well-rounded, glauconitic; some mica and carbonaceous material.

135-072-15CCC
(Log from Brunner Well Drilling)

Date drilled: 10/30/72

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	7	9
	Sand and gravel	4	13
	Clay, yellow	33	46
	Clay, blue	28	74
	Sand, blue-gray	19	93

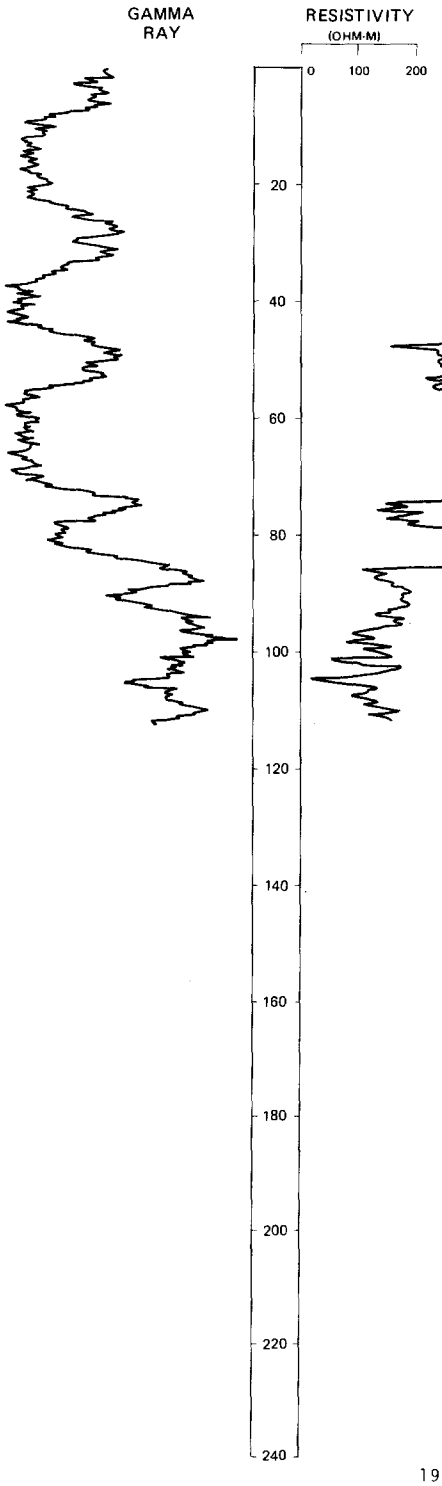
NDSWC 5416

LOCATION: 135-072-16BBB

DATE DRILLED: 11/14/78

ALTITUDE: 1995
(FT, NGVD)

DEPTH: 122
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-24 Sand, fine to very coarse, predominantly medium, oxidized; 90 percent quartz, 5 percent limestone, and 5 percent igneous and shale grains.

24-33 Silt, clayey, olive-gray.

33-46 Sand, fine to medium, predominantly medium, gravelly; 90 percent quartz, 5 percent limestone, and 5 percent igneous and shale grains.

46-54 Silt, clayey, olive-gray.

54-73 Sand, fine to medium, predominantly medium, gravelly; 90 percent quartz, 5 percent limestone, and 5 percent igneous and shale grains.

FOX HILLS SANDSTONE

73-78 Siltstone, sandy, yellowish-brown; some organic material.

78-84 Sandstone, very fine, silty, clayey, medium-gray.

84-122 Claystone, silty, sandy, medium-gray; few siltstone interbeds.

135-072-17CAB2
(Log from Frederickson's Inc.)

Date drilled: 4/06/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Sand	32	34
	Clay	4	38
	Sand; mixed with clay	7	45
	Sand	15	60
	Clay, sandy	15	75
	Sand	32	107
	Clay, sandy	3	110

135-072-17CBA
(Log from Brunner Well Drilling)

Date drilled: 10/12/76

	Clay, yellow	2	2
	Gravel	4	6
	Sand	13	19
	Clay, yellow	2	21
	Sand, blue-gray	18	39
	Clay, blue	2	41
	Sand, gray	5	46
	Shale, black (detrital lignite)	1	47
	Sand, gray	5	52
	Gravel	3	55
	Sand, coarse	8	63

135-072-17CDD
(Log from Brunner Well Drilling)

Date drilled: 6/19/73

	Dirt, black	2	2
	Sand and clay; mixed	9	11
	Gravel	8	19
	Sand and small coal chips	1	20
	Gravel	27	47

135-072-18AAD
(Log from Brunner Well Drilling)

Date drilled: 7/06/73

	Gravel and clay, fill	5	5
	Clay	4	9
	Clay and sand	17	26
	Sand, fine, yellow	8	34
	Sand, coarse, brown	18	52
	Gravel, fine	18	70
	Gravel, coarse; small stones	5	75

135-072-18ACC
(Log from Gross Well Drilling)

Date drilled: 7/31/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	20	20
	Gravel----------	40	60

135-072-18ADC1
(Log from Gross Well Drilling)

Date drilled: 5/20/75

	Clay, light-brown----------	16	16
	Clay, blue----------	34	50
	Gravel----------	20	70

135-072-18ADC2
(Log from Gross Well Drilling)

Date drilled: 4/07/76

	Clay, brown----------	10	10
	Clay, blue----------	20	30
	Gravel and sand----------	45	75
	Clay, blue----------	15	90
	Sand, coarse----------	14	104

135-072-19BAA
NDSWC 11234

Altitude: 1955 feet

Date drilled: 4/25/80

Glacial drift:			
	Topsoil, black----------	1	1
	Sand, fine to coarse, predominantly fine, rounded; 50 percent quartz, 40 percent carbonate, and 10 percent igneous grains----------	29	30
	Gravel, fine to coarse, predominantly medium, rounded----------	10	40
	Clay (till), silty, sandy, pebbly, olive-gray----------	8	48
Fox Hills Sandstone:			
	Sand, fine, clayey, yellowish-brown, rounded----------	2	50
	Sandstone, fine, dark-greenish-gray, rounded, glauconitic----------	10	60

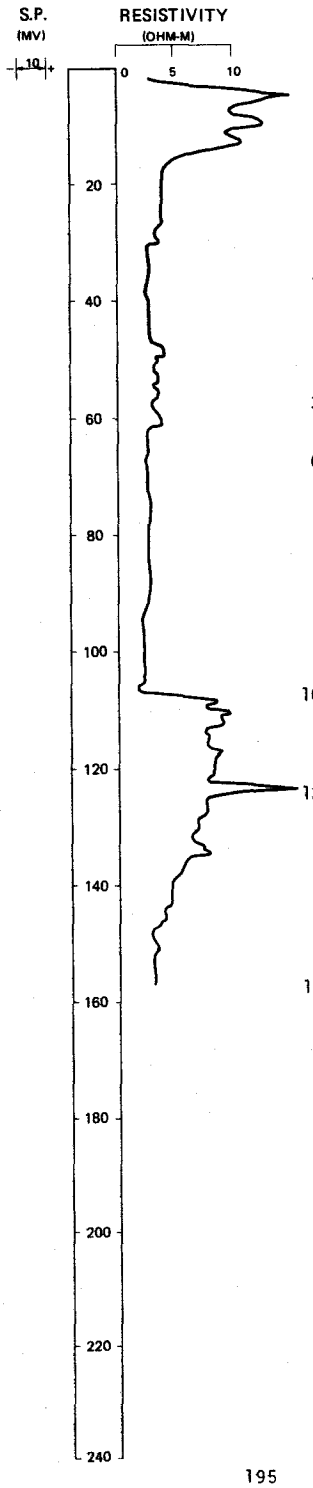
NDSWC 11233

LOCATION: 135-072-20BCB

DATE DRILLED: 4/24/80

ALTITUDE: 1953
(FT, NGVD)

DEPTH: 160
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-15	Sand, fine to coarse, gravelly; 50 percent quartz, 30 percent carbonate, and 20 percent shale grains.
15-30	Clay (till), silty, sandy, pebbly, brownish-gray, noncalcareous.

FOX HILLS SANDSTONE

30-62	Siltstone, clayey, light-brownish-gray, calcareous.
62-108	Shale, brownish-gray, calcareous.
108-125	Sandstone, fine, clayey, light-brownish-gray to grayish-green, rounded, glauconitic, calcareous.
125-158	Sandstone, fine, clayey, grayish-green, rounded, glauconitic.
158-160	Shale, brownish-gray.

135-072-20CBB
(Log from Gross Well Drilling)

Date drilled: 8/19/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	40	40
	Clay----------	90	130
	Sand, blue----------	30	160

135-072-21BCB3
(Log from Gross Well Drilling)

Date drilled: 9/08/72

	Clay----------	20	20
	Clay, blue----------	120	140
	Sand, blue----------	20	160

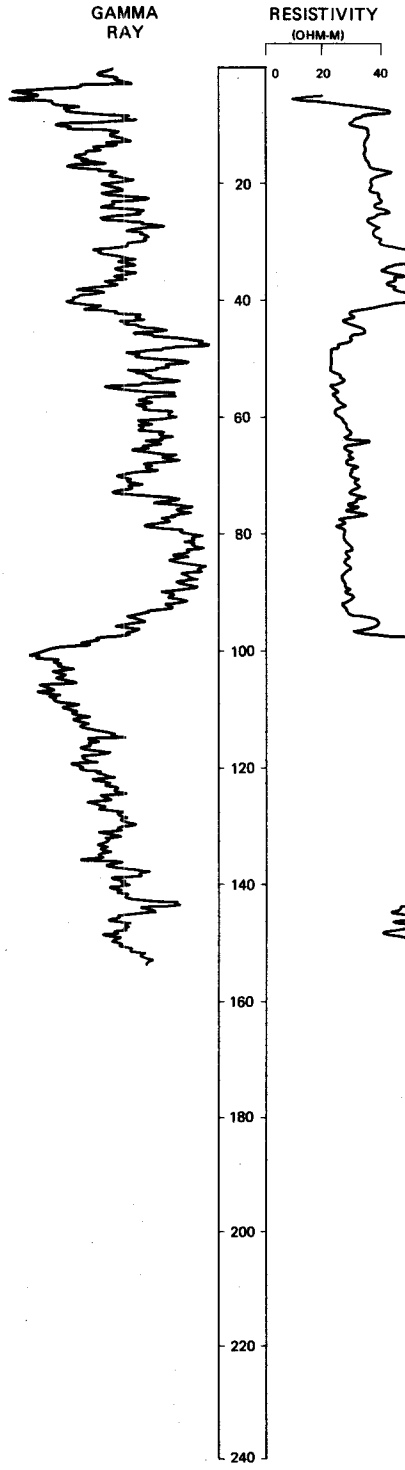
NDSWC 5420

LOCATION: 135-072-21DCD

DATE DRILLED: 11/15/78

ALTITUDE: 2076
(FT, NGVD)

DEPTH: 162
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-8	Sand, medium to very coarse, and fine to medium gravel; oxidized; predominantly quartz and limestone.
8-18	Clay (till), very sandy, moderate-yellowish-brown.
18-42	Clay (till), sandy, dark-gray; gravel lens from 38 to 42 feet.

FOX HILLS SANDSTONE

42-98	Siltstone, light-gray to medium-gray; sandstone lens from 48 to 56 feet.
98-130	Sandstone, very fine, silty, dusky-blue-green, glauconitic; some organic material.
130-140	Sandstone, very fine, moderate-blue-green; interbedded with thin shale beds.
140-149	Shale, dark-gray; few thin sandstone beds.
149-162	Sandstone, silty, dark-gray.

135-072-22BBB
(Log from Brunner Well Drilling)

Date drilled: 6/07/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	7	9
	Gravel	7	16
	Sand and clay	14	30
	Clay, gray	11	41
	Gravel	7	48
	Clay, gray	6	54
	Clay, blue	36	90
	Sand, gray; coal chips	39	129
	Clay, blue	11	140
	Sand, blue-green	28	168

135-072-27BBD
(Log from Gross Well Drilling)

Date drilled: 6/12/72

	Clay, blue	145	145
	Sand, blue, water	15	160

135-072-27BD
(Log from Farmers Supply Company)

Date drilled: 10/ /73

	Topsoil	2	2
	Gravel	13	15
	Clay, hard, yellow	7	22
	Clay, sandy, brown	8	30
	Clay, sandy, gray	31	61
	Sand, green	23	84
	Clay, hard, gray	59	143
	Sand, hard, green	17	160

135-072-30CCC
NDSWC 5421

Altitude: 1933 feet

Date drilled: 11/16/78

Glacial drift:			
	Gravel, fine to medium, sandy; 60 percent limestone, 30 percent quartz and igneous, and 10 percent shale and sandstone pebbles	6	6
	Silt, very sandy, moderate-yellowish-brown	9	15
	Silt, very sandy, dark-gray	10	25
	Clay (till), sandy, gravelly, dark-gray; abundant shale pebbles	11	36
	Silt, very sandy, medium-gray; some organic material	18	54
	Silt, clayey, slightly sandy, medium-gray	56	110
Fox Hills Sandstone:			
	Siltstone, sandy, dusky-blue-green to dark-greenish-gray, glauconitic	12	122
	Sandstone, silty, dark-gray, glauconitic; abundant organic material	24	146
	Shale, sandy, silty, dark-gray, glauconitic; some organic material	56	202

135-072-32BAB
(Log from Gross Well Drilling)

Date drilled: 4/28/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	20	20
	Clay, blue----------	180	200
	Sand, blue----------	24	224

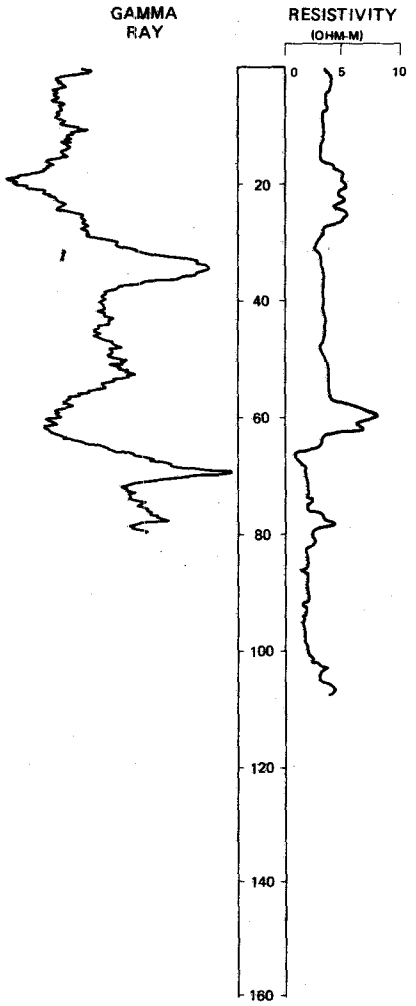
NDSWC 5437

LOCATION: 135-072-36CDD

DATE DRILLED: 5/24/79

ALTITUDE:
(FT, NGVD)

DEPTH: 122
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-16	Clay (till), silty, sandy, pebbly, yellowish-brown.
16-25	Gravel, fine, sandy.
25-54	Clay (till), silty, sandy, pebbly, yellowish-brown.
54-65	Clay (till), silty, olive-gray; scattered pebbles.

FOX HILLS SANDSTONE

65-122	Sandstone, very fine, greenish-gray; abundant glauconite and carbonaceous material.

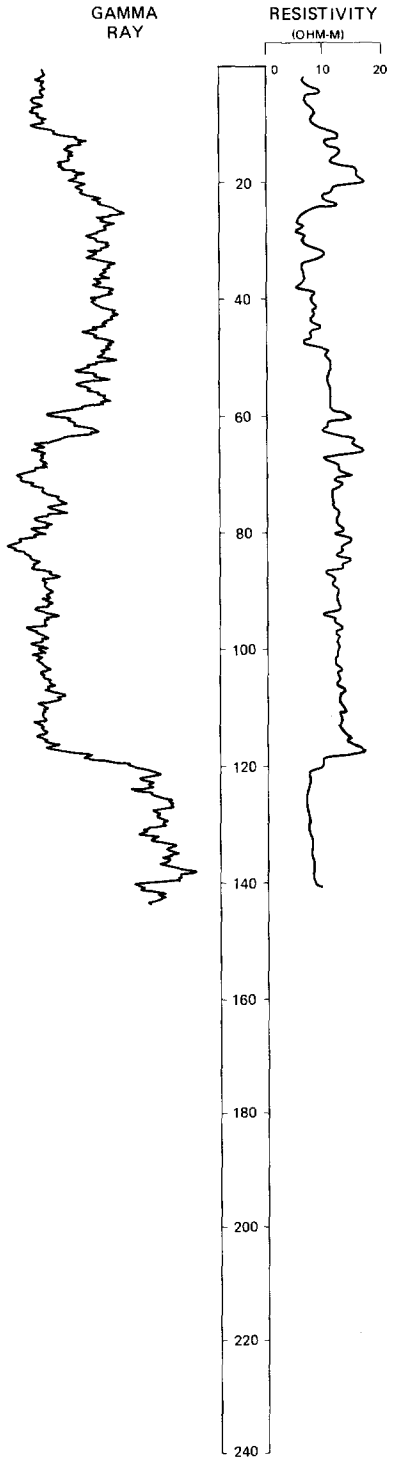
NDSWC 5456

LOCATION: 135-073-01AAB

DATE DRILLED: 6/14/79

ALTITUDE: 1990
(FT, NGVD)

DEPTH: 152
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-20	Sand, fine to very coarse, predominantly very coarse, gravelly; composed largely of quartz and carbonate grains.
20-25	Clay (till), silty, sandy, pebbly, yellowish-brown.
25-33	Clay (till), very silty, very sandy, pebbly, olive-gray.
33-59	Clay (till), silty, sandy, olive-gray; contains numerous thin sand and gravel lenses.
59-118	Gravel, fine to medium, predominantly fine, sandy, well-rounded to angular; 40 percent shale, 20 percent carbonate, 10 percent sandstone, and 20 percent igneous and metamorphic fragments.

FOX HILLS SANDSTONE

118-152	Siltstone, slightly sandy, light-olive-gray, brittle.

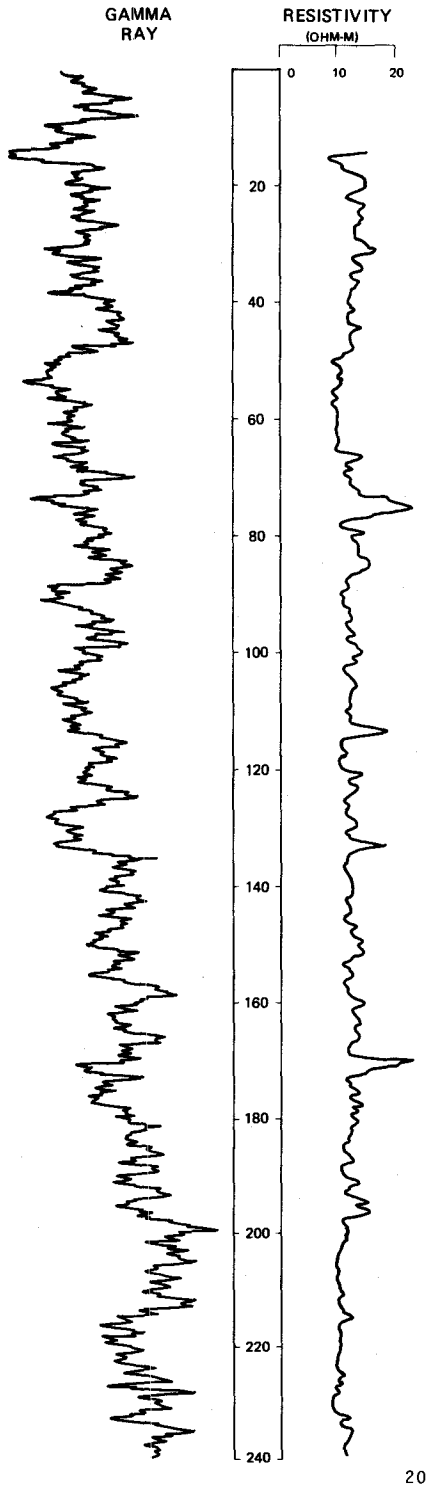
NDSWC 5411

LOCATION: 135-073-03BBB

DATE DRILLED: 11/07/78

ALTITUDE: 1942
(FT, NGVD)

DEPTH: 282
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-14	Silt, sandy, gravelly, dark-yellowish-brown.
14-20	Clay, silty, dark-gray.
20-30	Clay (till), olive-gray.
30-40	Clay (till), silty, sandy, olive-gray; thin gravel lenses and sandstone erratics.
40-47	Clay (till), sandy, olive-gray.

FOX HILLS SANDSTONE

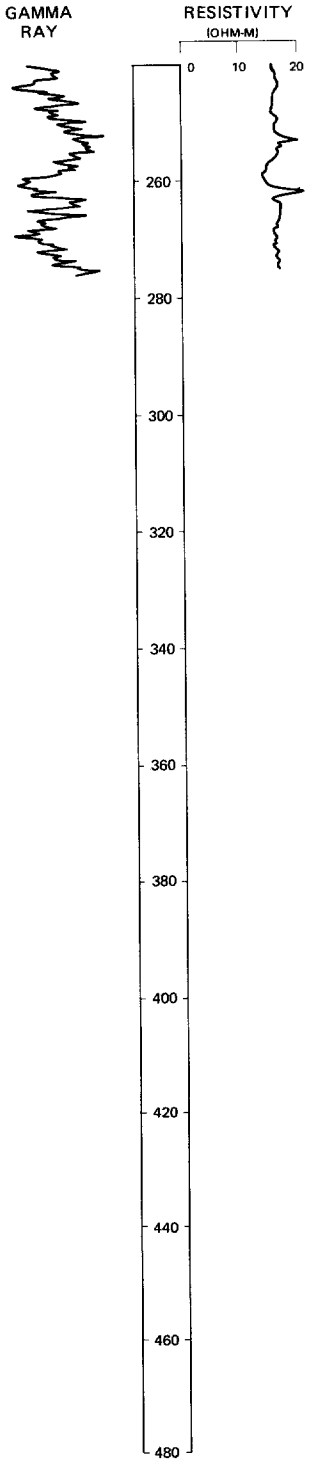
47-74	Sandstone, fine to medium, silty, medium-bluish-gray, glauconitic.
74-87	Sandstone, fine to medium, medium-bluish-gray, cemented.
87-114	Sandstone, fine to medium, silty, medium-dark-gray, glauconitic; thin light-gray bentonitic interbeds.
114-119	Clay, sandy, silty, plastic, glauconitic.
119-122	Sandstone, silty, clayey, medium-dark-gray, glauconitic.
122-126	Clay, sandy, silty, dark-gray, plastic, glauconitic.
126-134	Sandstone, silty, clayey, dark-bluish-gray, glauconitic.
134-156	Siltstone, dark-gray, glauconitic, siliceous.
156-170	Claystone, dark-gray, glauconitic, siliceous.
170-181	Siltstone, silty, sandy, dark-gray, glauconitic, siliceous; cemented sandstone from 170 to 172 feet.
181-198	Claystone, dark-gray, glauconitic, siliceous; interbedded with thin siltstone beds; some organic material.
198-214	Claystone, dark-gray, glauconitic, micaceous, siliceous; some organic material.

LOCATION: 135-073-03BBB

DATE DRILLED: 11/07/78

ALTITUDE: 1942
(FT, NGVD)

DEPTH: 282
(FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE, Continued

214-232 Shale, dark-gray, slightly glauconitic, very siliceous.

232-282 Shale, dark-gray to grayish-black, slightly siliceous; cemented zones from 252 to 253 and 261 to 262 feet.

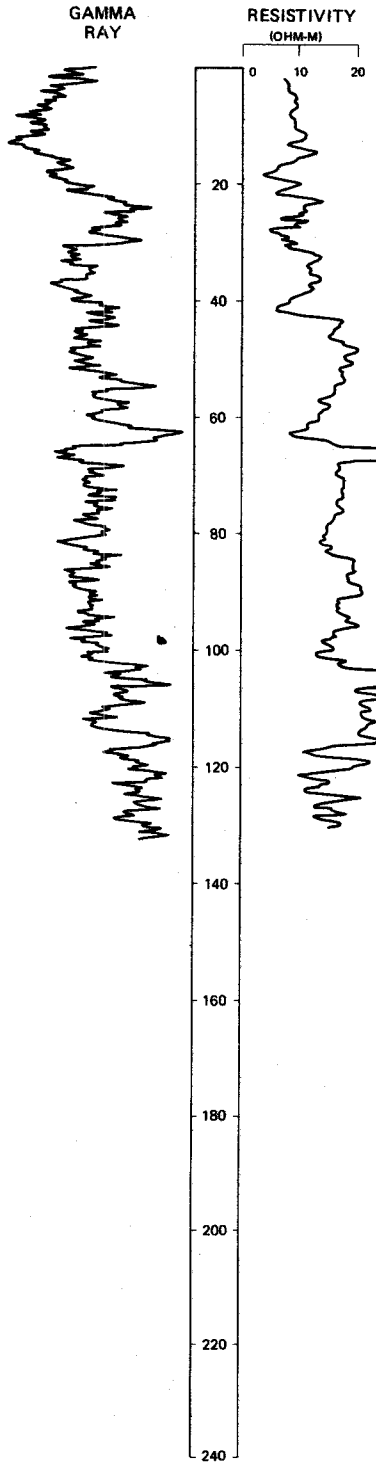
NDSWC 5412

LOCATION: 135-073-09ABB

DATE DRILLED: 11/07/78

ALTITUDE: 1940
(FT, NGVD)

DEPTH: 142
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-22 Gravel, fine to coarse, predominantly medium, sandy; 40 percent limestone, 25 percent igneous and quartz, 20 percent shale, 10 percent sandstone, and 5 percent silicate pebbles.

FOX HILLS SANDSTONE

22-30 Siltstone, sandy.

30-114 Sandstone, fine to medium, silty, clayey, grayish-blue-green to dusky-blue-green, glauconitic, micaceous; cemented zone from 65 to 68 feet; interbedded with siltstone from 102 to 114 feet.

114-142 Claystone, silty, sandy, dark-gray, glauconitic.

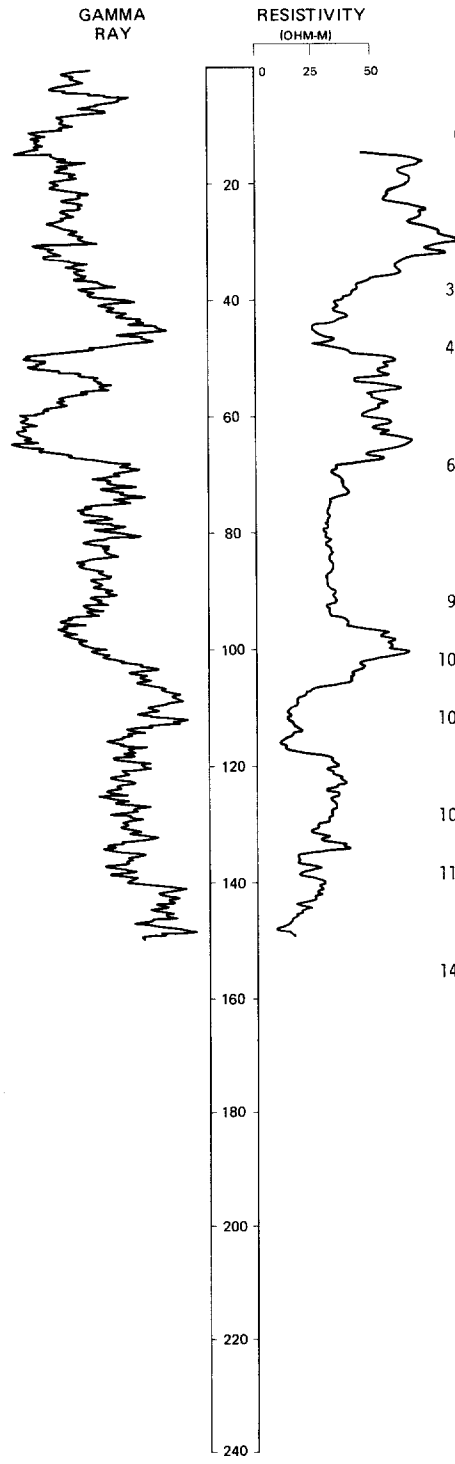
NDSWC 5413

LOCATION: 135-073-11BBB

DATE DRILLED: 11/07/78

ALTITUDE: 1960
(FT, NGVD)

DEPTH: 162
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-36	Gravel, fine to coarse, predominantly fine to medium, sandy; 50 percent igneous, 30 percent limestone, 10 percent quartz, 5 percent shale, and 5 percent sandstone pebbles.
36-48	Silt (lacustrine), olive-gray; laminated with clay.
48-67	Sand, very clayey, silty, olive-gray; clay lens from 52 to 56 feet.
67-94	Clay (till), very silty, very sandy, olive-gray.
94-101	Sand and gravel (no samples).
101-102	Limonite, moderate-yellowish-brown, hard.
102-106	Silt, medium-gray; scattered limestone pebbles.

FOX HILLS SANDSTONE

106-114	Claystone, sandy, medium-dark-gray; some glauconite.
114-140	Sandstone, very fine to fine, silty, clayey, dusky-blue-green, glauconitic, micaceous.
140-162	Claystone, dark-gray.

135-073-14DBA
NDSWC 11235

Altitude: 1943 feet | Date drilled: 4/25/80

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Clay, brownish-gray	2	3
	Sand, fine to very coarse, gravelly, subrounded to angular; abundant shale pebbles	20	23
	Clay (till), silty, sandy, pebbly, brownish-gray	31	54
	Gravel	4	58
	Clay (till), sandy, olive-gray	30	88
	Clay (till), sandy, silty, olive-gray; gravel lenses from 89 to 92, 93 to 96, 108 to 110, and 114 to 118 feet	30	118
	Silt, clayey, brownish-gray	10	128
Fox Hills Sandstone:			
	Shale, silty, brownish-gray, noncalcareous	12	140

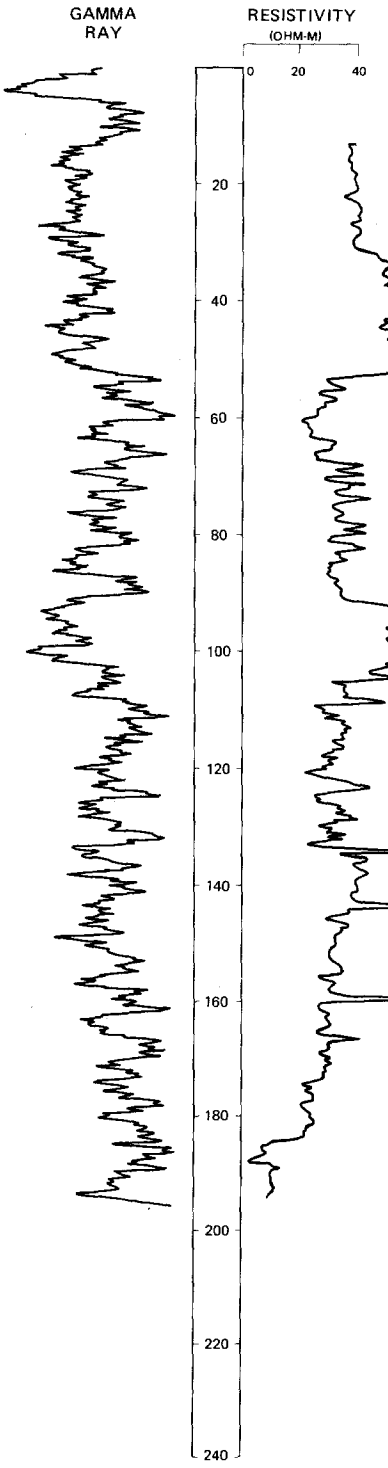
NDSWC 5419

LOCATION: 135-073-15DCC

DATE DRILLED: 11/15/78

ALTITUDE: 1948
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-5	Sand, fine to very coarse, predominantly medium, gravelly; 80 percent quartz, 10 percent limestone, and 10 percent igneous and shale fragments.
5-14	Clay (lacustrine), sandy, moderate-yellowish-brown.
14-33	Clay (till), sandy, olive-gray.

FOX HILLS SANDSTONE

33-52	Sandstone, very fine, silty, light-bluish-gray, hard.
52-61	Siltstone, clayey, sandy, medium-bluish-gray.
61-91	Siltstone, clayey, sandy, medium-bluish-gray; interbedded with dark-gray shale and dusky-blue-green fine-grained sandstone.
91-108	Sandstone, very fine to medium, medium-bluish-gray, glauconitic.
108-166	Sandstone, very fine to medium, medium-dark-gray, carbonaceous, glauconitic; interbedded with thin shale and thin cemented sandstone.
166-184	Sandstone, very fine to medium, silty, medium-dark-gray, carbonaceous, glauconitic; interbedded with thin shale and cemented sandstone; scattered fossil shell fragments.
184-202	Shale, very sandy, dark-gray, carbonaceous, glauconitic.

135-073-20ADD
(Log from Gross Well Drilling)

Date drilled: 4/06/72

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, sandy----------	40	40
	Clay, gravelly----------	40	80
	Rock----------	20	100
	Clay----------	80	180
	Sand, blue----------	20	200

135-073-20BAA
(Log from Gross Well Drilling)

Date drilled: 5/06/77

	Clay, brown----------	40	40
	Clay, blue----------	160	200
	Sand, blue----------	20	220

135-073-22CCC
(Log from Gross Well Drilling)

Date drilled: 9/20/75

	Clay, brown----------	40	40
	Clay, blue----------	130	170
	Sand, blue----------	10	180
	Clay, blue----------	80	260

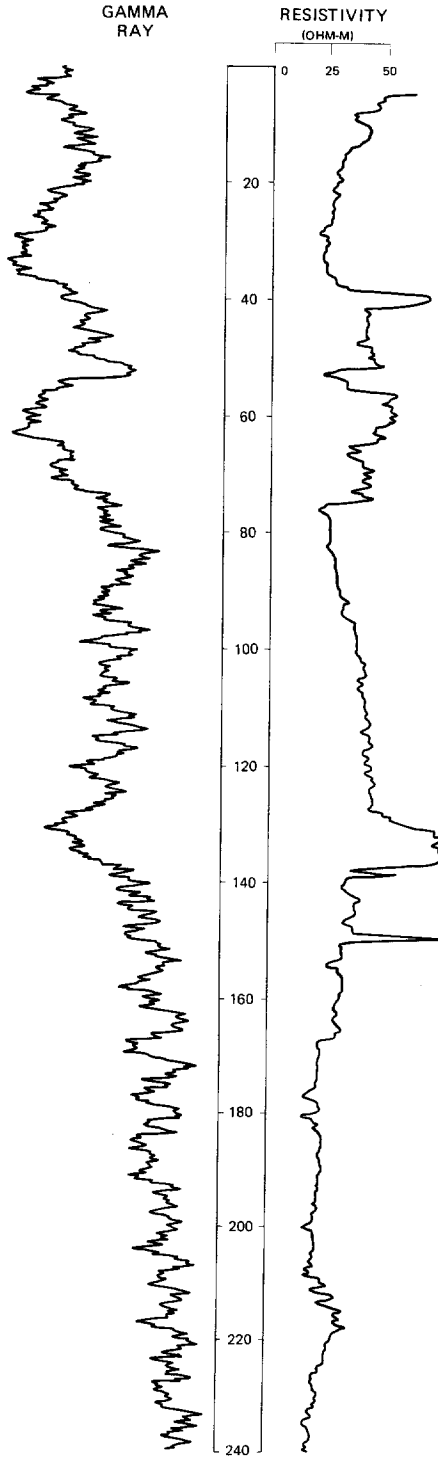
NDSWC 5418

LOCATION: 135-073-24BBB

DATE DRILLED: 11/15/78

ALTITUDE: 1934
(FT, NGVD)

DEPTH: 302
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-10	Sand, medium to very coarse, gravelly; 60 percent limestone, 25 percent igneous and quartz, and 15 percent shale grains.
10-39	Silt (lacustrine), clayey, sandy, light-olive-gray to greenish-gray, plastic; silt and sand content increases with depth.
39-41	Silt, clayey, sandy, light-brown, plastic; few shale pebbles.
41-54	Clay, silty, sandy, bluish-gray.
54-82	Silt, very sandy, greenish-gray; scattered shale pebbles.
82-128	Clay (till), silty, olive-gray to dark-gray; scattered shale and limestone pebbles.

FOX HILLS SANDSTONE

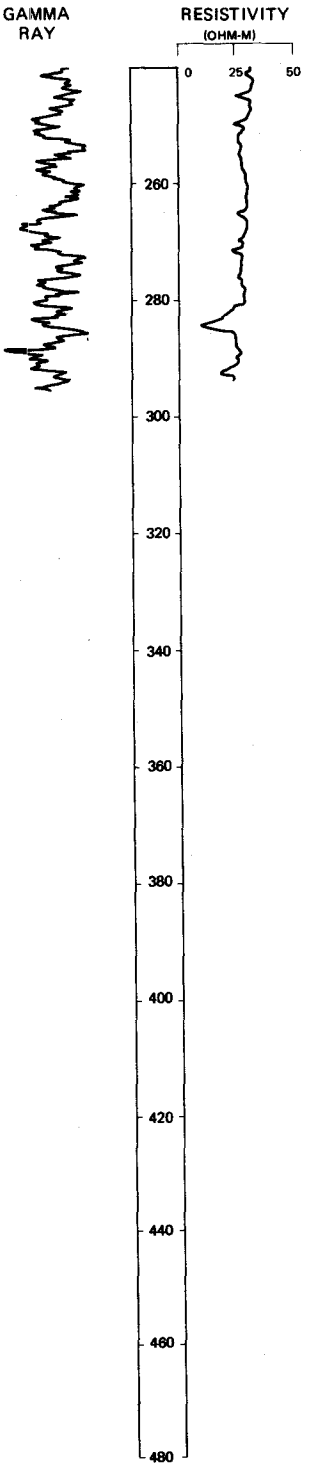
128-138	Sandstone, fine, silty, dusky-blue-green, glauconitic.
138-150	Siltstone, very silty, very sandy, dark-gray, glauconitic; thin sandstone interbeds.
150-193	Sandstone, fine, silty, dark-gray; interbedded with sandy dark-gray shale; scattered glauconite and fossil shell fragments.
193-240	Shale, dark-gray to olive-gray; numerous thin sandstone interbeds; scattered glauconite.

LOCATION: 135-073-24BBB

DATE DRILLED: 11/15/78

ALTITUDE: 1934
(FT, NGVD)

DEPTH: 302
(FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE, Continued

240-281	Shale, sandy, dark-gray; interbedded with sandstone; scattered glauconite and fossil shell fragments.
281-302	Shale, dark-gray, siliceous.

135-073-29AAC
(Log from Gross Well Drilling)

Date drilled: 5/25/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	60	60
	Clay, blue----------	140	200
	Sand, blue----------	20	220

135-073-34DDD
NDSWC 5425

Altitude: 1986 feet

Date drilled: 5/21/79

	Topsoil----------	1	1
	Gravel, fine to coarse, sandy, poorly sorted, well-rounded; some carbonate, quartz, and shale pebbles----------	17	18
	Clay (till), silty, very sandy, pebbly, yellowish-brown, moderately to poorly compacted----------	13	31
	Claystone (lacustrine), silty, sandy, olive-gray, well-compacted, poorly cohesive; some organic fragments; may be small interbedded gravel at 70 feet----------	89	120
	Claystone, silty, very slightly sandy, olive-gray to greenish-gray, very well compacted----------	15	135
	Sandstone, fine to very fine, greenish-gray, well-sorted, well-compacted; some interstitial clays----------	27	162

135-073-36DAC
(Log from Gross Well Drilling)

Date drilled: 10/15/74

	Clay, brown----------	20	20
	Clay, blue----------	320	340
	Sand, blue----------	24	364

136-067-01DBA
(Log from Traut Wells, Inc.)

Date drilled: 6/29/77

	Topsoil----------	3	3
	Clay, brown----------	17	20
	Clay, gray----------	23	43
	Sand, dirty----------	20	63
	Clay, sandy, gray----------	15	78
	Clay, hard, gray----------	60	138

136-067-01DCB
(Log from Traut Wells Inc.)

Date drilled: 6/29/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, brown	19	21
	Clay, gray	259	280

136-067-01DCD
(Log from Traut Wells Inc.)

Date drilled: 6/29/77

	Topsoil	2	2
	Clay, brown	19	21
	Clay, gray	29	50
	Sand, dirty	10	60
	Sand, clayey, dirty	15	75
	Clay, sandy	5	80
	Clay, hard, gray	120	200

136-067-05BBA
Test hole 1451
(Log from Adolphson, 1961)

Date drilled: 3/ /59

Glacial drift:			
	Topsoil, black	2	2
	Clay, sandy, buff to light-gray, oxidized	19	21
	Till, clayey, light-gray; fine gravel, lignite fragments, and shale pebbles	10	31
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	32	63
	Clay, silty, light-gray; conchoidal fracture	7	70
	Till, clayey, light-gray; fine gravel, lignite fragments, and shale pebbles	12	82
	Till, clayey, gray; fine gravel, lignite fragments, and shale pebbles	184	266
Pierre Shale:			
	Shale, blue-gray, dense	17	283

136-067-05BBB
Test hole 1452
(Log from Adolphson, 1961)

Date drilled: 3/ /59

Glacial drift:			
	Topsoil, black	2	2
	Till, clayey, mottled yellow to gray, oxidized; fine to medium gravel	18	20
	Till, clayey, light-gray; fine gravel and cobbles, lignite fragments, and shale pebbles	223	243
Pierre Shale:			
	Shale, blue to gray	9	252

136-067-05BCC
Test hole 1453
(Log from Adolphson, 1961)

Date drilled: 3/ /59

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	3	3
	Till, clayey, mottled buff to yellow, oxidized; fine gravel, lignite fragments, and shale pebbles	18	21
	Gravel, coarse, and coarse sand; large fraction of carbonate and shale pebbles	18	39
	Till, clayey, light-gray to gray; medium gravel, lignite fragments, and shale pebbles	34	73
	Till, clayey, gray; coarse sand and fine to medium gravel, lignite fragments, and shale pebbles	217	290
	Gravel, fine; large fraction of shale pebbles	3	293
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	17	310
Pierre Shale:			
	Shale, gray-blue	5	315

136-067-05BDD
Test hole 1465
(Log from Adolphson, 1961)

Date drilled: 3/ /59

Glacial drift:			
	Topsoil, black; weathers to gray when exposed to air	2	2
	Clay, light-gray to chalky white, highly oxidized	4	6
	Clay, smooth, yellow	6	12
	Clay, smooth, gray-blue; trace of tabular gypsum	31	43
	Till, clayey, gray; fine to medium gravel, shale pebbles, and selenite crystals	37	80
	Clay, smooth, gray-blue	49	129
	Till, gray; fine to coarse gravel and shale pebbles	28	157

136-067-05DAA
Test hole 1464
(Log from Adolphson, 1961)

Date drilled: 3/ /59

Glacial drift:			
	Topsoil, sandy	2	2
	Till, clayey, sandy, yellowish-gray to buff, highly oxidized; fine gravel and shale pebbles	4	6
	Till, clayey, gray; fine gravel and lignite fragments	40	46
	Gravel, fine to medium, and fine to coarse sand; clean; lignite fragments and shale pebbles	17	63
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	42	105

136-067-06ABA
Test hole 1454
(Log from Adolphson, 1961)

Date drilled: 3/ /59

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, dark-brown	2	2
	Till, clayey, sandy, mottled yellow, oxidized	14	16
	Till, clayey, gray; fine gravel and cobbles; shale pebbles	27	43
	Gravel, fine to medium, silty; large shale pebbles	4	47
	Till, clayey, gray; fine to medium gravel and lignite fragments	110	157

136-067-06ADA
Gackle city well 1
(Log from Adolphson, 1961)

Date drilled: 1946

Glacial drift:			
	Clay, yellow, and gravel	3	3
	Gravel and clay, yellow	9	12
	Clay, yellow, sandy	10	22
	Clay, yellow	13	35
	Sand, fine	5	40
	Clay, blue	18	58
	Clay, blue, sandy	2	60
	Sand, coarse	2	62
	Clay, blue	6	68
	Sand, coarse	11	79
	Clay, blue	22	101

136-067-06BAB
Test hole 1455
(Log from Adolphson, 1961)

Date drilled: 3/ /59

Glacial drift:			
	Topsoil, dark-brown to black	2	2
	Till, clayey, mottled yellow-buff; fine gravel; oxidized	19	21
	Gravel, fine to coarse, and fine to coarse sand; clean	15	36
	Clay, light-gray	7	43
	Gravel, fine to medium, very clean, rounded; shale pebbles	5	48
	Till, clayey, gray; fine to medium gravel, lignite fragments, and shale pebbles	193	241

136-067-06BBA
Test hole 1456
(Log from Adolphson, 1961)

Date drilled: 3/ /59

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, dark-brown to black	2	2
	Till, clayey, mottled yellow-buff, oxidized; fine gravel	13	15
	Till, clayey, gray; shale pebbles	15	30
	Gravel, fine to coarse, and fine to coarse sand; lignite fragments and shale pebbles	15	45
	Till, clayey, gray; fine to coarse gravel and cobbles, lignite fragments, and shale pebbles	49	94
	Gravel, fine to medium, and coarse sand; abundant shale pebbles	6	100
	Till, clayey, and fine to coarse gravel; abundant shale pebbles	15	115

136-067-06DAA
Test hole 1458
(Log from Adolphson, 1961)

Date drilled: 3/ /59

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	5	5
	Clay, sandy to silty	5	10
	Till, clayey, mottled yellow-buff, oxidized; fine to coarse gravel, lignite fragments, and shale pebbles	20	30
	Gravel, fine to coarse, and some cobbles; clean; fine to coarse sand, lignite fragments, and shale pebbles	11	41
	Till, clayey, light-gray to gray; fine to coarse gravel, lignite fragments, and shale pebbles	85	126

136-067-07AAD
Test hole 1459
(Log from Adolphson, 1961)

Date drilled: 3/ /59

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	2	2
	Clay, mottled yellow-buff to light-gray, oxidized; fine to medium gravel and shale pebbles	4	6
	Gravel, fine to medium; lignite fragments, shale pebbles, and fine to coarse sand	15	21
	Till, clayey, gray; fine to medium gravel, lignite fragments, and abundant shale pebbles	63	84

136-067-13CBC1
(Log from Central City Well Boring)

Date drilled: 2/07/75

Topsoil	1	1
Clay, sandy, yellow	5	6
Gravel	4	10
Clay, blue	30	40

136-067-13CBC2
(Log from Traut Wells Inc.)

Date drilled: 7/08/76

Topsoil	1	1
Clay, brown	15	16
Clay, sandy, brown	59	75
Clay, sandy, soft, gray	145	220

136-067-13CBD
(Log from Central City Well Boring)

Date drilled: 2/15/75

Topsoil	1	1
Clay, yellow	5	6
Sand	1	7
Clay, yellow	3	10
Sand and gravel	1	11
Clay, blue	19	30
Gravel	3	33
Clay, blue	12	45

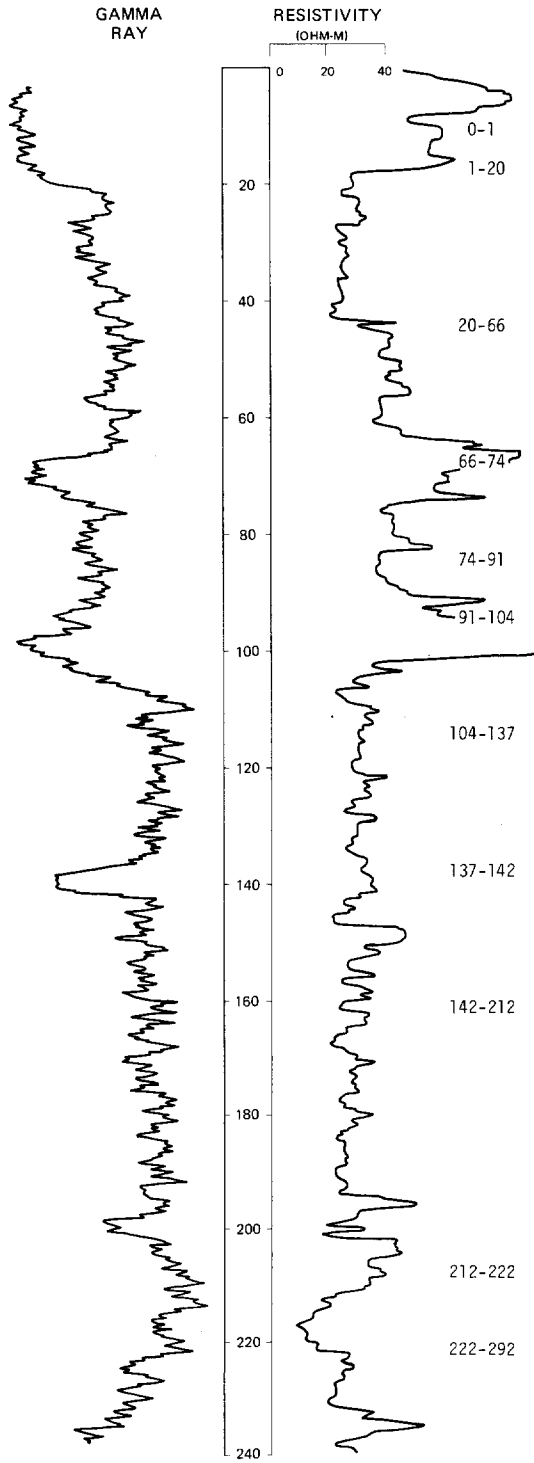
NDSWC 5509, 5509A

LOCATION: 136-067-14CBC1, 2

DATE DRILLED: 7/31/79

ALTITUDE: 1934
(FT, NGVD)

DEPTH: 407
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

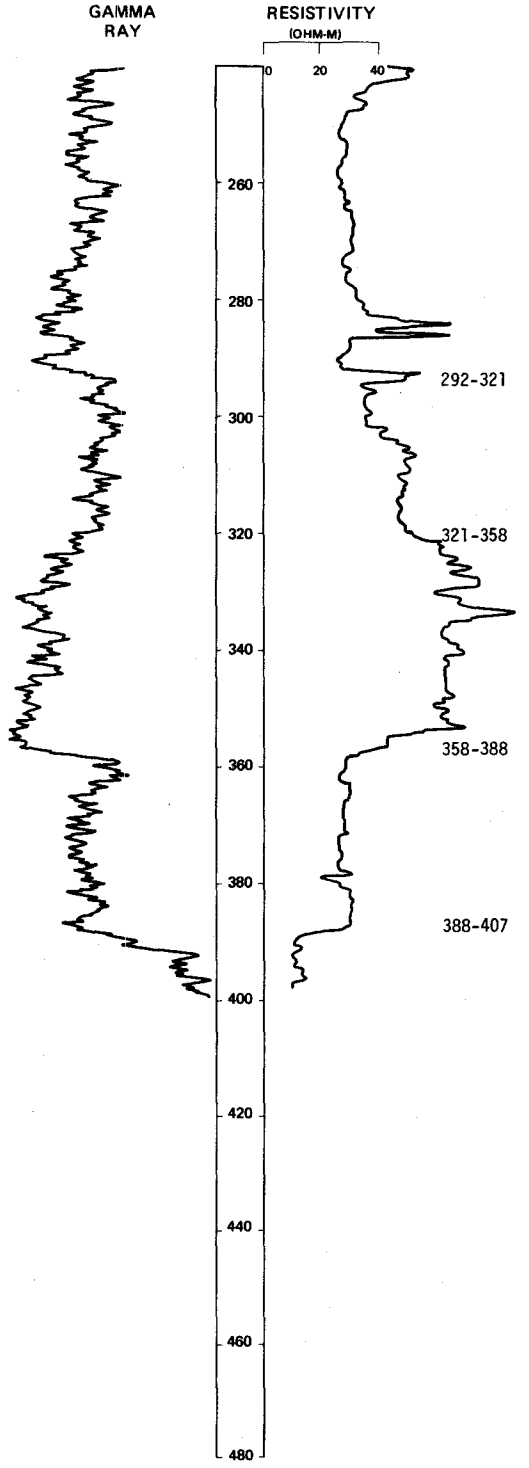
0-1	Topsoil, black.
1-20	Gravel, fine to very coarse, predominantly medium, sandy, subrounded to very angular; 35 percent sandstone, 35 percent igneous and metamorphic, and 30 percent carbonate pebbles.
20-66	Clay (till), silty, sandy, pebbly, olive-gray.
66-74	Sand, very fine to very coarse, predominantly coarse, well-rounded to angular.
74-91	Clay (till), silty, sandy, pebbly, olive-gray.
91-104	Sand, very fine to very coarse, predominantly medium, gravelly; composed largely of quartz, carbonate, and shale grains.
104-137	Clay (till), silty, sandy, pebbly, olive-gray.
137-142	Gravel, fine to medium, sandy, clayey, well-rounded to subangular; 80 percent shale and 20 percent carbonate and silicate pebbles.
142-212	Clay (till), silty, sandy, pebbly, olive-gray; gravel lens from 198 to 201 feet.
212-222	Clay (lacustrine), olive-gray to dark-olive-gray, plastic.
222-292	Clay (till), silty, sandy, pebbly, olive-gray; gravel lenses from 236 to 238, 284 to 286, and 289 to 292 feet.

LOCATION: 136-067-14CBC1, 2

DATE DRILLED: 7/31/79

ALTITUDE: 1934
(FT, NGVD)

DEPTH: 407
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

292-321 Clay (till), silty, sandy, pebbly, olive-gray.

321-358 Gravel, fine to very coarse, predominantly fine, sandy, angular to subrounded; 50 percent carbonate, 30 percent shale, and 20 percent sandstone and silicate pebbles.

358-388 Clay (till), sandy, silty, pebbly, olive-gray.

PIERRE SHALE

388-407 Shale, black, brittle.

136-067-14CDA
(Log from Kamoni Water Wells)

Date drilled: 11/29/72

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Dirt, black----------	1	1
	Clay, yellow----------	20	21
	Clay, gray----------	19	40
	Sand and brown clay----------	44	84
	Sand and gravel----------	5	89

136-067-17BBC
Test hole 1461
(Log from Adolphson, 1961)

Date drilled: 3/ /59

Glacial drift:			
	Topsoil, black----------	3	3
	Clay, white to light-gray, chalky to highly oxidized----------	5	8
	Till, clayey, gray, and fine to medium gravel; oxidized----------	7	15
	Sand, fine to coarse; fine gravel, lignite fragments, and abundant shale pebbles----------	6	21
	Till, clayey, gray; fine gravel, lignite fragments, and shale pebbles----------	84	105

136-067-17BCB
Test hole 1460
(Log from Adolphson, 1961)

Date drilled: 3/ /59

Glacial drift:			
	Topsoil, black----------	2	2
	Till, clayey, sandy, light-olive-gray, well-oxidized, and fine gravel----------	8	10
	Clay, light-yellow, oxidized----------	5	15
	Till, clayey, olive-gray, slightly oxidized; medium gravel, lignite fragments, and shale pebbles----------	27	42
	Till, clayey, dark-olive-gray; fine to medium gravel, lignite fragments, and shale pebbles----------	42	84
	Gravel, fine to medium; medium to coarse sand, clean, rounded; and large shale pebbles----------	31	115
	Gravel, very fine, well-rounded and sorted; almost entirely shale----------	11	126
	Clay, silty, gray, cohesive----------	22	148
	Till, clayey, gray; medium to coarse gravel; and large shale pebbles----------	20	168

136-067-17BCC1
Test hole 1462
(Log from Adolphson, 1961)

Date drilled: 3/ /59

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	3	3
	Till, clayey, mottled buff to yellow; fine gravel and shale pebbles	16	19
	Till, clayey, gray; fine to coarse gravel and shale pebbles	45	64
	Gravel, fine to coarse, clean; fine to coarse sand, lignite fragments, and abundant shale pebbles	64	128
	Till, clayey, gray; fine to coarse gravel and shale pebbles	8	136

136-067-17DAB
(Log from Jacob Thurn)

Date drilled: 8/13/77

Topsoil	3	3
Clay, gray	22	25
Clay, blue	34	59
Sand	10	69

136-067-19AAA
(Log from Traut Wells Inc.)

Date drilled: 3/17/78

Topsoil	2	2
Brown clay	15	17
Gray clay	37	54
40/50-slot sand and gravel with some clay	31	85
Gray clay	25	110
Gray sandy clay	48	158

136-067-19AAB
(Log from Traut Wells Inc.)

Date drilled: 3/19/78

50/60-slot brown sand	13	13
Brown sandy clay	4	17
Gray clay and cobbles	113	130
50/60-slot sand and gravel with some clay; mixed	5	135
Gray sandy clay	23	158

136-067-19AAC
(Log from Traut Wells Inc.)

Date drilled: 6/12/78

50/60-slot brown sand	13	13
Brown sandy clay	4	17
Gray clay and cobbles	113	130
Dirty sand	5	135
Gray clay	5	140

136-067-19ABA
(Log from Traut Wells Inc.)

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Brown clay and sand; mixed	6	8
	Brown clay	9	17
	Gray clay	19	36
	Gray clay and gravel	2	38
	Gray sandy clay	16	54
	50/60-slot sand and gravel	6	60
	Gray clay and cobbles	40	100
	Gray sandy clay	52	152
	Coarse sand, gravel, and clay	5	157
	Sandy gray clay	21	178

136-067-19ABC
(Log from Traut Wells Inc.)

Date drilled: 6/12/78

	Fine brown sand	1	1
	Brown clay	33	34
	Gray clay	90	124
	Shale	6	130

136-067-19ABD
(Log from Traut Wells Inc.)

Date drilled: 3/19/78

	Topsoil	2	2
	Fine brown sand	11	13
	Gray clay mixed with cobbles	37	50
	50/50-slot gray clay and sand	47	97
	Fine gray sand and clay	20	117
	Gray sand and clay with lignite and shale particles	33	150

136-067-19ACA
(Log from Traut Wells Inc.)

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Gravel and clay----------	19	19
	Gray clay----------	92	111
	Dirty sand----------	2	113
	Gray clay----------	20	133
	Rock----------	1	134
	Gray clay and shale; mixed----------	24	158

136-067-20CCC
Test hole 1463
(Log from Adolphson, 1961)

Date drilled: 3/ /59

Glacial drift:			
	Topsoil, dark-brown to brown, and very fine silty sand----------	1	1
	Till, clayey, light-brown to buff to yellow; abundant selenite crystals; oxidized gravel----------	11	12
	Till, clayey, gray; fine to medium gravel and cobbles; shale pebbles; a calcic lattice has formed through section of till immediately above gravel----------	45	57
	Gravel, fine to medium; fine to coarse sand, lignite fragments, and abundant shale pebbles--------	15	72
	Till, clayey, gray, and fine to medium gravel----------	12	84

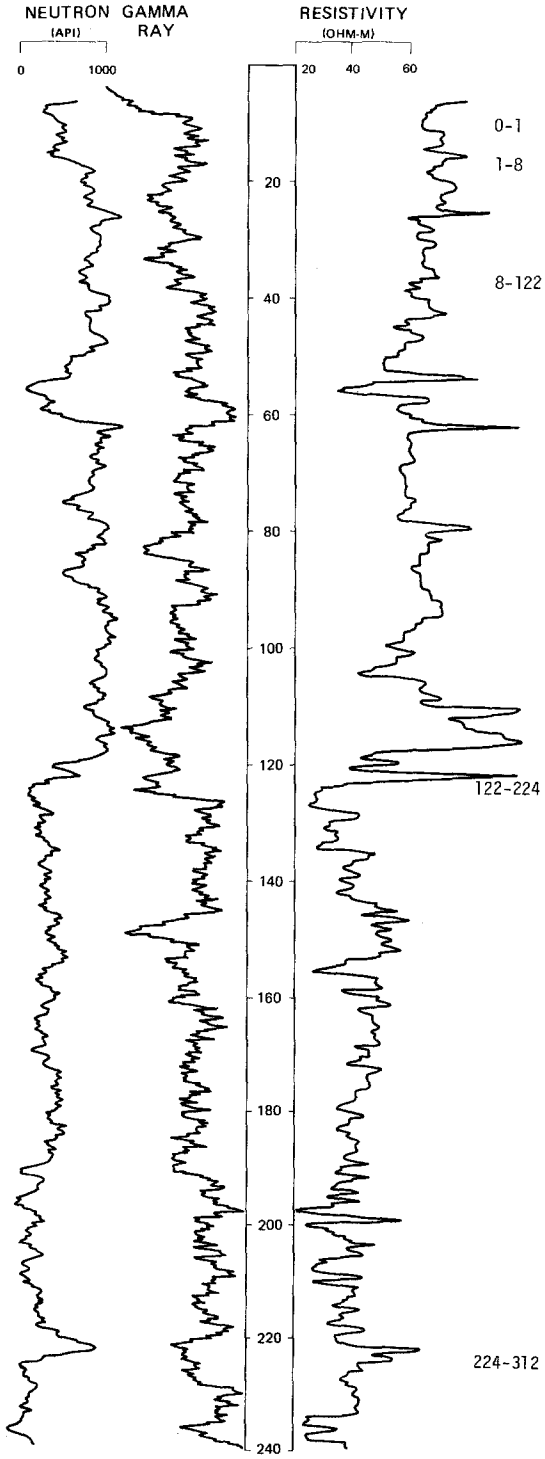
NDSWC 5508

LOCATION: 136-067-31DDC

DATE DRILLED: 7/25/79

ALTITUDE: 1944
(FT, NGVD)

DEPTH: 482
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

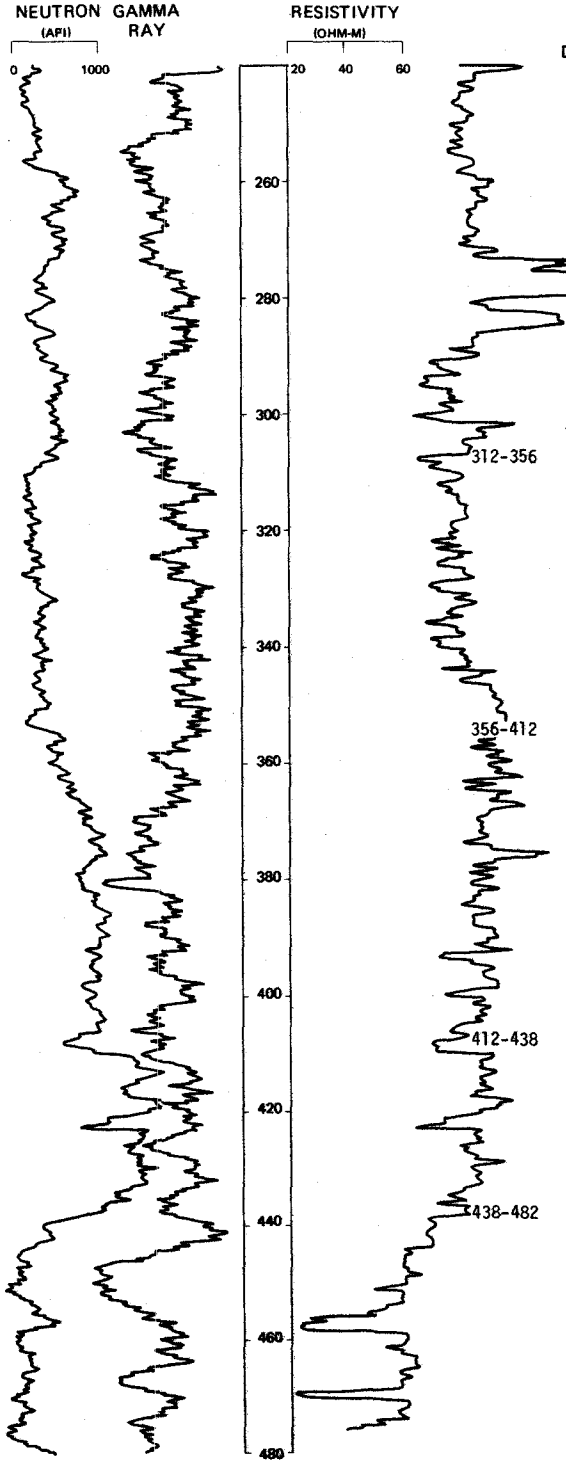
0-1	Topsoil, black.
1-8	Sand, fine to very coarse, predominantly very coarse, well-rounded; composed largely of quartz and carbonate grains.
8-122	Clay (till), silty, sandy, pebbly, olive-gray; clayey gravel lenses from 81 to 83 and 110 to 118 feet.
122-224	Clay (till), very sandy, pebbly, silty, olive-gray; sand and gravel lens from 147 to 150 feet.
224-312	Clay (till), very sandy, olive-gray; abundant shale pebbles.

LOCATION: 136-067-31DDC

DATE DRILLED: 7/25/79

ALTITUDE: 1944
(FT, NGVD)

DEPTH: 482
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

312-356 Clay (till), dark-olive-gray, silty; abundant shale pebbles.

356-412 Clay (till), very sandy; abundant pebbles.

412-438 Sand, very fine to very coarse, very clayey, gravelly, well-rounded to subangular; composed largely of shale fragments.

PIERRE SHALE

438-482 Shale, black, fractured.

136-068-01AAD
Test hole 1457
(Log from Adolpshon, 1961)

Date drilled: 3/ /59

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black----------	2	2
	Till, clayey, mottled yellow-buff, oxidized; fine to medium gravel, lignite fragments, and shale pebbles----------	14	16
	Sand, fine to coarse; fine to coarse gravel, lignite fragments, and shale pebbles----------	8	24
	Till, clayey, gray; fine to medium gravel, lignite fragments, and abundant shale pebbles--------	275	299
Pierre Shale:			
	Shale, gray-blue----------	16	315

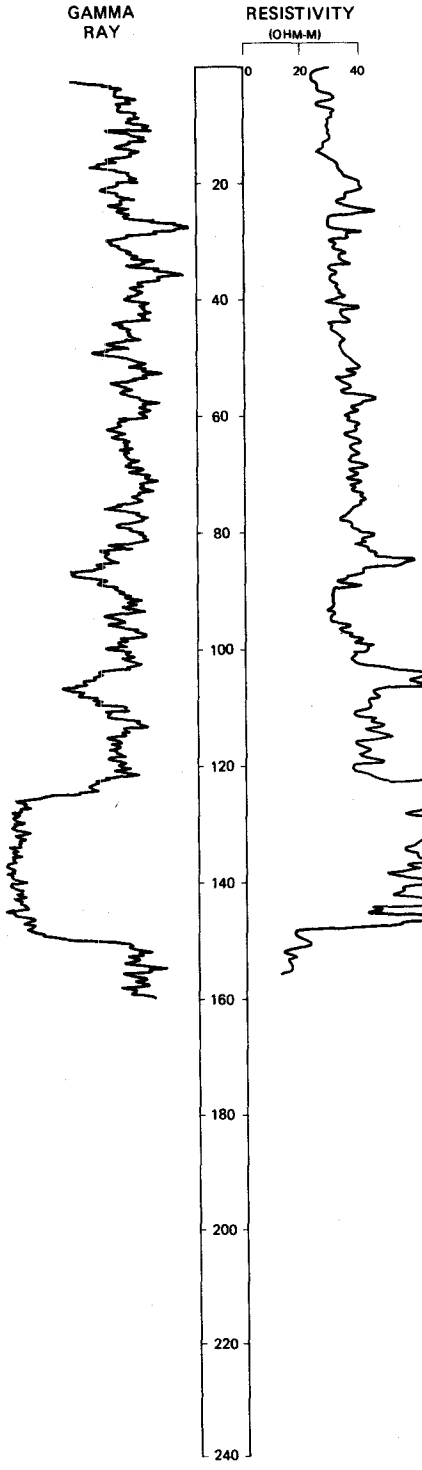
NDSWC 5511

LOCATION: 136-068-10DDD

DATE DRILLED: 8/01/79

ALTITUDE: 1937
(FT, NGVD)

DEPTH: 167
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-20	Clay (till), silty, sandy, pebbly, yellowish-brown.
20-124	Clay (till), silty, sandy, pebbly, olive-gray.
124-149	Gravel, fine to medium, predominantly fine, sandy, well-rounded to angular; 60 percent carbonate and 40 percent shale and silicate pebbles.

PIERRE SHALE

149-167	Shale, black, brittle, hard.

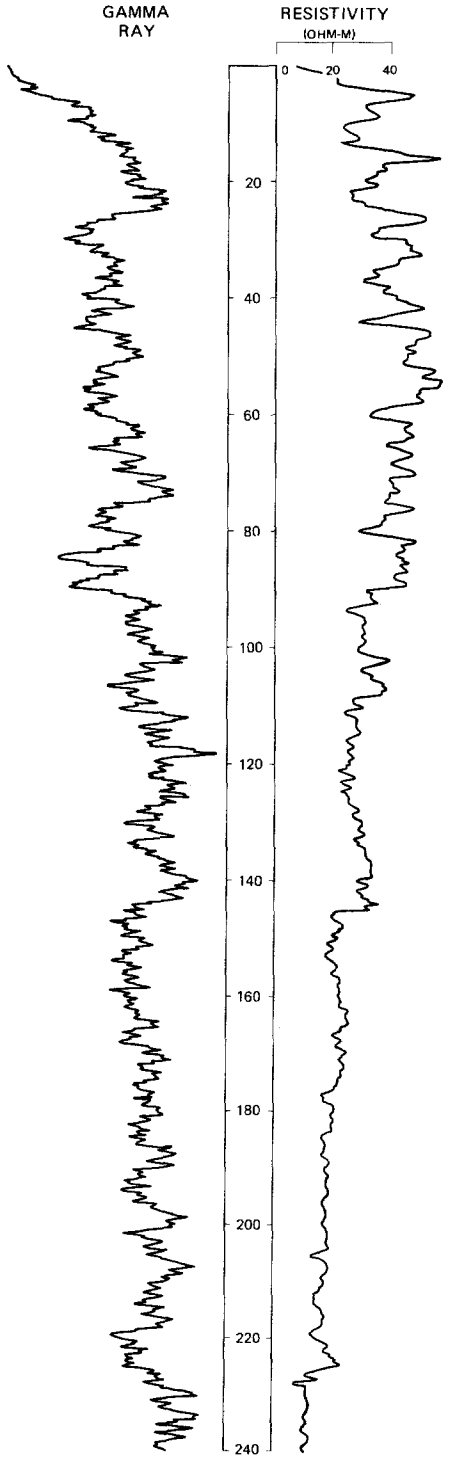
NDSWC 5510

LOCATION: 136-068-13AAA

DATE DRILLED: 8/01/79

ALTITUDE: 1915
(FT, NGVD)

DEPTH: 302
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

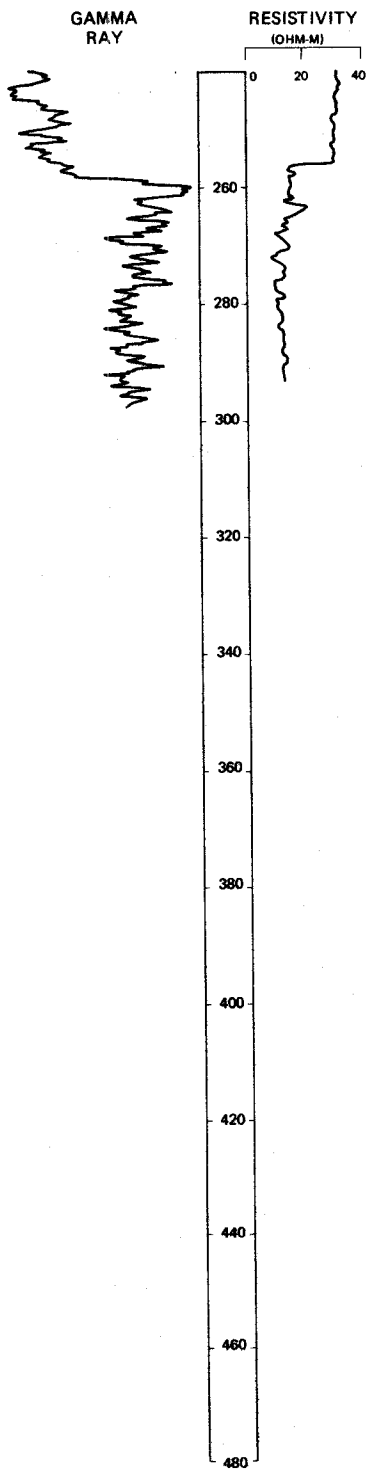
0-1	Topsoil, black.
1-6	Gravel, fine to coarse, predominantly fine to medium, sandy, well-rounded to subangular; 60 percent carbonate, 20 percent shale and sandstone, and 20 percent igneous and metamorphic pebbles.
6-17	Clay (till), silty, sandy, pebbly, yellowish-brown.
17-90	Clay (till), silty, sandy, pebbly, olive-gray; sand and gravel lenses from 83 to 86 and 88 to 90 feet.
90-144	Clay (till), silty, sandy, pebbly, olive-gray; few gravel lenses; scattered lignite fragments.
144-225	Clay (till), very silty, olive-gray; abundant shale pebbles; clayey sand from 218 to 225 feet.
225-258	Clay (till), very sandy, silty, olive-gray; abundant pebbles.

LOCATION: 136-068-13AAA

DATE DRILLED: 8/01/79

ALTITUDE: 1915
(FT, NGVD)

DEPTH: 302
(FT)



DESCRIPTION OF DEPOSITS

PIERRE SHALE

258-302 Shale, slightly sandy, black, brittle, hard.

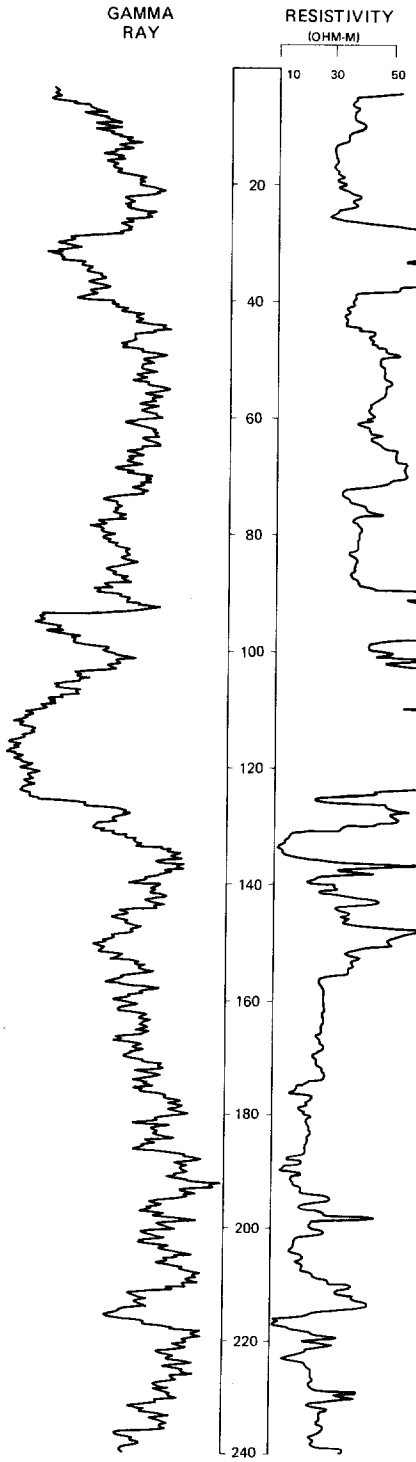
NDSWC 5512, 5512A

LOCATION: 136-068-21BCC1, 2

DATE DRILLED: 8/02/79

ALTITUDE: 1898
(FT, NGVD)

DEPTH: 287
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

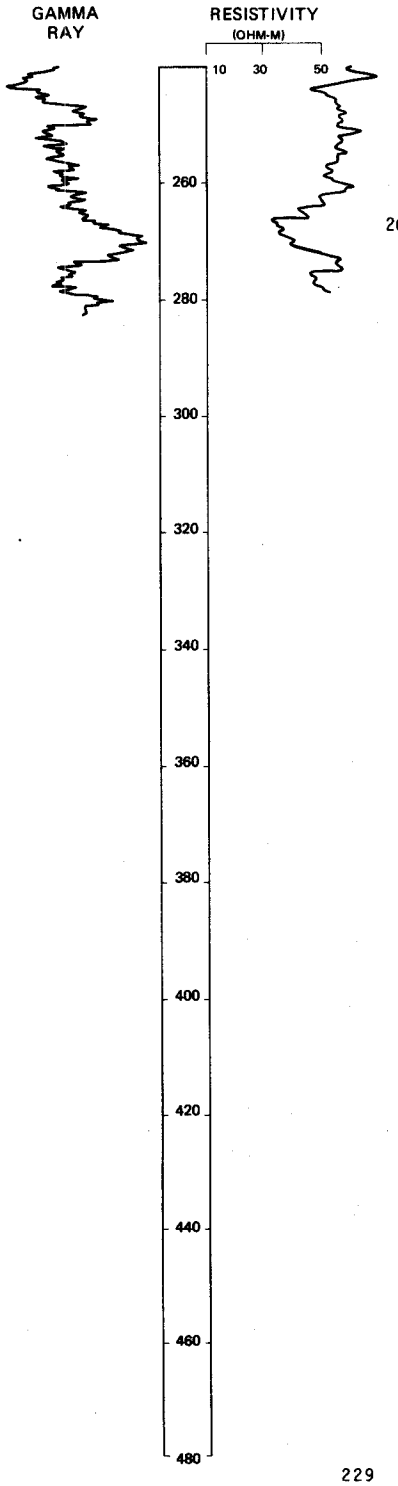
0-1	Topsoil, black.
1-5	Sand, coarse, gravelly, oxidized.
5-16	Clay (till), silty, sandy, pebbly, yellowish-brown.
16-29	Clay (till), silty, sandy, pebbly, olive-gray.
29-34	Sand, fine to medium; composed largely of quartz and carbonate grains.
34-40	Sand, very fine to very coarse, gravelly, well-rounded to subangular; 60 percent carbonate and 40 percent sandstone, shale, and silicate grains.
40-104	Clay (till), silty, sandy, pebbly, olive-gray; clayey sand from 94 to 97 feet.
104-126	Sand, fine to very coarse, predominantly very coarse, well-rounded to angular.
126-156	Clay (till), silty, sandy, pebbly, olive-gray.
156-228	Clay (till), silty, olive-gray; scattered sand, pebbles, and lignite fragments.
228-266	Clay (till), sandy, silty, olive-gray.

LOCATION: 136-068-21BCC1, 2

DATE DRILLED: 8/02/79

ALTITUDE: 1898
(FT, NGVD)

DEPTH: 287
(FT)



DESCRIPTION OF DEPOSITS

PIERRE SHALE(?)

266-287 Shale, black, fractured.

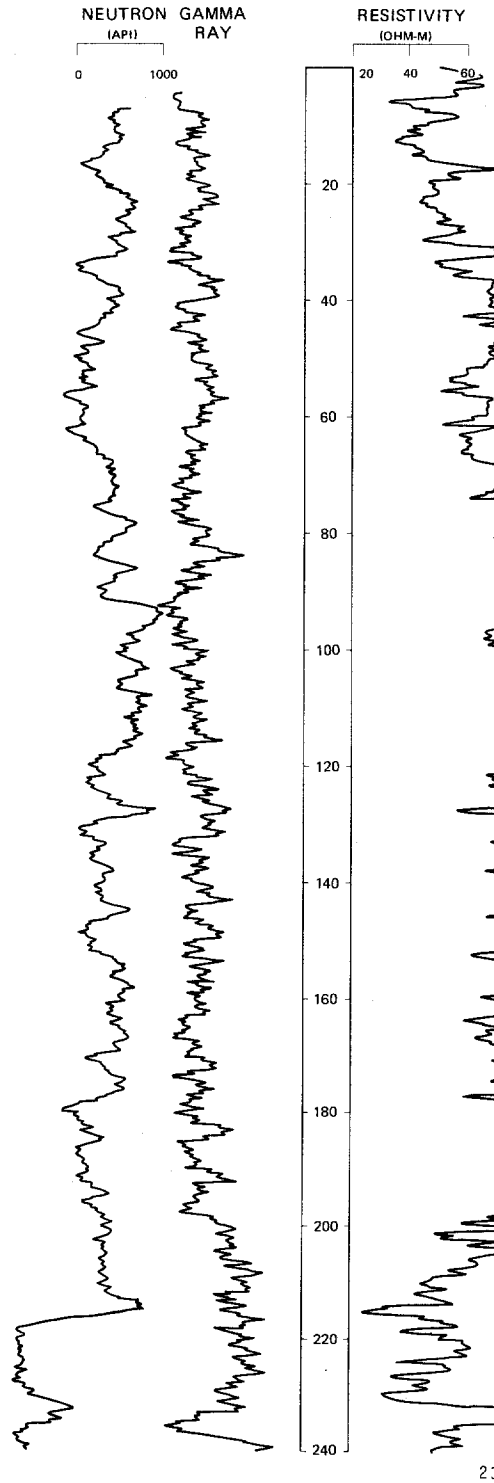
NDSWC 5514

LOCATION: 136-069-02DDC

DATE DRILLED: 8/03/79

ALTITUDE: 1919
(FT, NGVD)

DEPTH: 332
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-25	Clay (till), silty, sandy, pebbly, yellowish-brown.
25-82	Clay (till), silty, sandy, pebbly, olive-gray.
82-108	Clay (till), sandy, silty, pebbly, olive-gray.
108-198	Clay (till), sandy, silty, olive-gray; abundant shale pebbles.
198-316	Clay (till), silty, sandy, pebbly, olive-gray; sand and gravel lenses from 234 to 237 and 273 to 277 feet.

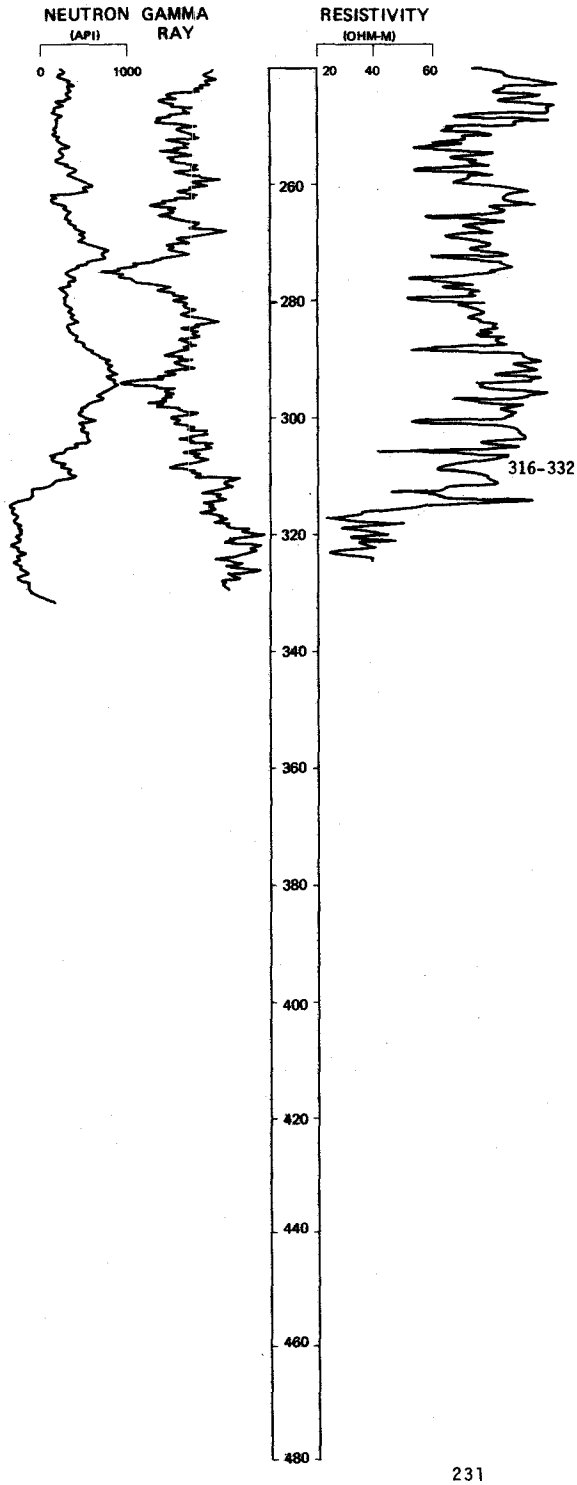
NDSWC 5514. Continued

LOCATION: 136-069-02DDC

DATE DRILLED: 8/03/79

ALTITUDE: 1919
(FT, NGVD)

DEPTH: 332
(FT)



DESCRIPTION OF DEPOSITS

PIERRE SHALE

316-332 Shale, black, brittle, hard.

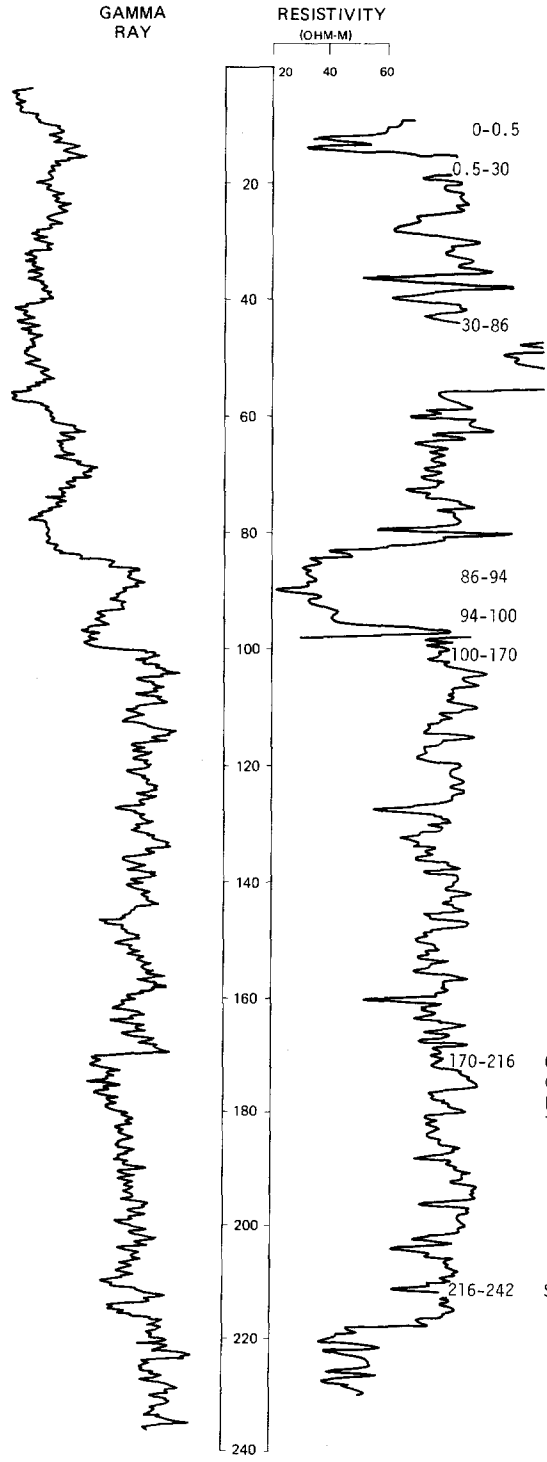
NDSWC 5515, 5515A

LOCATION: 136-069-04CCC1, 2

DATE DRILLED: 8/07/79

ALTITUDE: 1854
(FT, NGVD)

DEPTH: 242
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-0.5	Topsoil, black.
0.5-30	Gravel, fine to medium, predominantly fine, sandy, well-rounded to angular; 30 percent carbonate, 30 percent shale, 30 percent silicate, and 10 percent sandstone pebbles.
30-86	Sand, coarse, gravelly, well-rounded to angular; 60 percent shale, 10 percent carbonate, and 30 percent igneous and metamorphic grains.
86-94	Clay, sandy.
94-100	Sand, clayey.
100-170	Clay (till), silty, slightly sandy, olive-gray; clayey sand from 144 to 152 feet.
170-216	Clay (till), very sandy, olive-gray; abundant shale pebbles; scattered lignite fragments.

PIERRE SHALE

216-242	Shale, black, hard.

136-069-06DDD
NDSWC 11178

Altitude: 1873 feet | Date drilled: 10/22/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, dark-brown	1	1
	Clay (till), silty, sandy, pebbly, moderate-yellowish-brown	2	3
	Sand, fine to very coarse, gravelly, subangular to rounded; 50 percent quartz, 20 percent shale, 20 percent carbonate, and 10 percent igneous grains	12	15
	Clay (till), sandy, pebbly, olive-gray	118	133
	Sand, clayey	12	145
	Clay (till), silty, sandy, pebbly, olive-gray; numerous thin sand lenses	92	237
	Clay (till), very sandy, pebbly, silty, olive-gray; few thin sand and gravel lenses	19	256
	Clay (till), very silty, sandy, olive-brown	21	277
	Clay (till), very sandy	7	284
	Clay (till), silty, sandy, olive-brown	5	289
Pierre Shale:			
	Shale, brownish-gray, hard	11	300

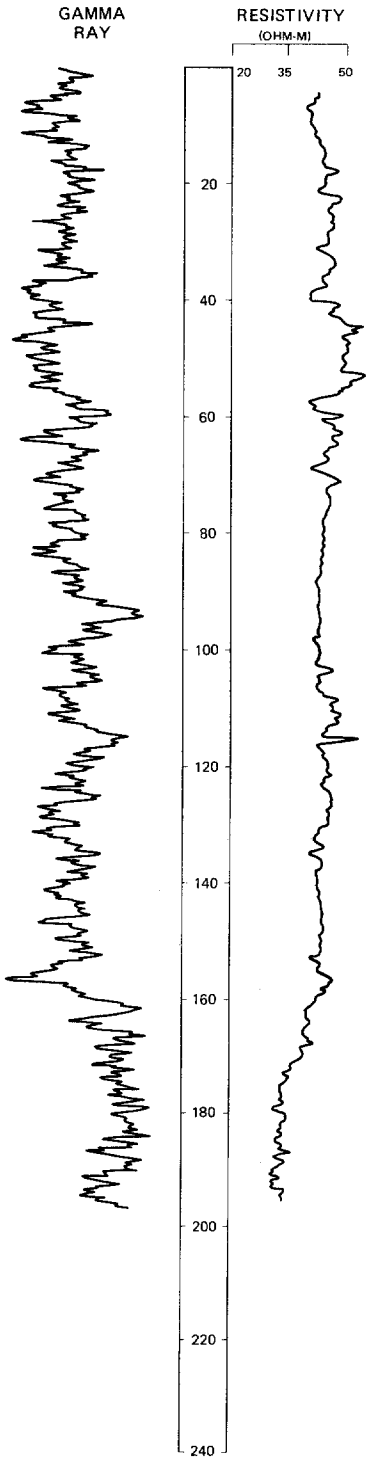
NDSWC 5394

LOCATION: 136-069-08CCC

DATE DRILLED: 10/24/78

ALTITUDE: 1881
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-22	Clay (till), silty, sandy, gravelly, yellowish-brown.
22-35	Clay (till), sandy, medium-gray.
35-45	Sand and gravel, clayey; interbedded with till.
45-62	Clay (till), silty, medium-dark-gray.
62-102	Clay (lacustrine), silty, medium-dark-gray to olive-gray, plastic.
102-160	Clay (till), silty, grayish-black; abundant shale pebbles.
160-184	Clay (till), dark-gray to grayish-black; abundant shale pebbles.

PIERRE SHALE(?)

184-202	Shale, dark-gray to grayish-black, fractured, siliceous.

136-069-09DAD
(Log from Jacob Thurn)

Date drilled: 9/20/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	3	3
	Gravel	17	20
	Clay	20	40
	Sand	6	46

136-069-11ADD
(Log from Traut Wells Inc.)

Date drilled: 6/27/78

	Topsoil	2	2
	Clay, sandy, brown	16	18
	Clay, sandy, gray	25	43
	Sand, fine, and gray clay	31	74
	Clay, gray; mixed with fine sand	26	100
	Gravel, dirty	30	130

136-069-12DCC
(Log from Baumgartner Drilling Co.)

Date drilled: 7/24/72

	Clay, brown	22	22
	Clay, blue	73	95
	Sand, coarse	13	108
	Gravel, coarse	9	117
	Clay, gray	13	130

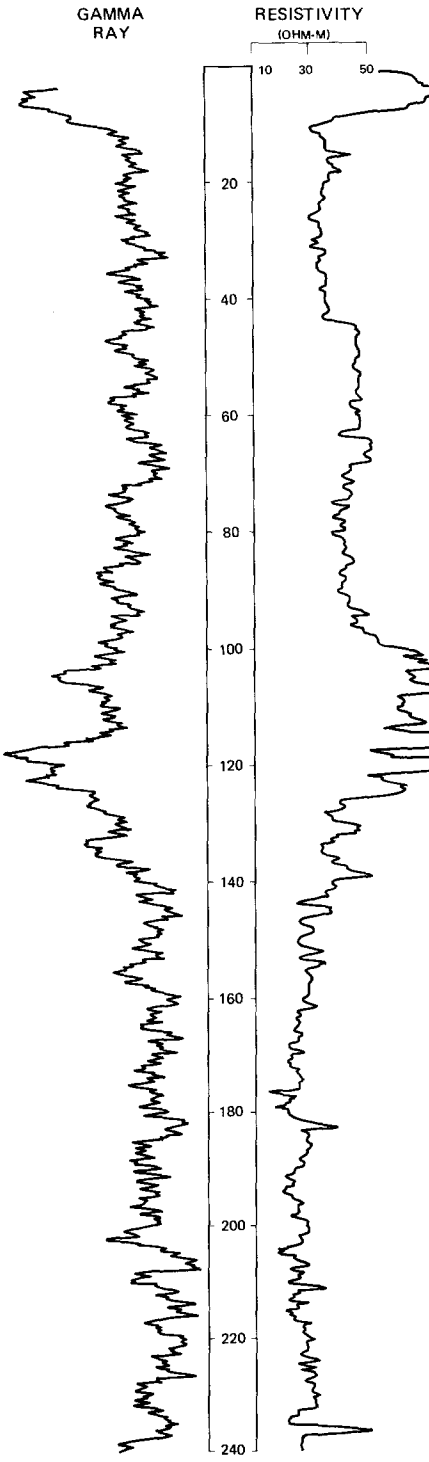
NDSWC 5513

LOCATION: 136-069-13DDD

DATE DRILLED: 8/02/79

ALTITUDE: 1865
(FT, NGVD)

DEPTH: 317
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

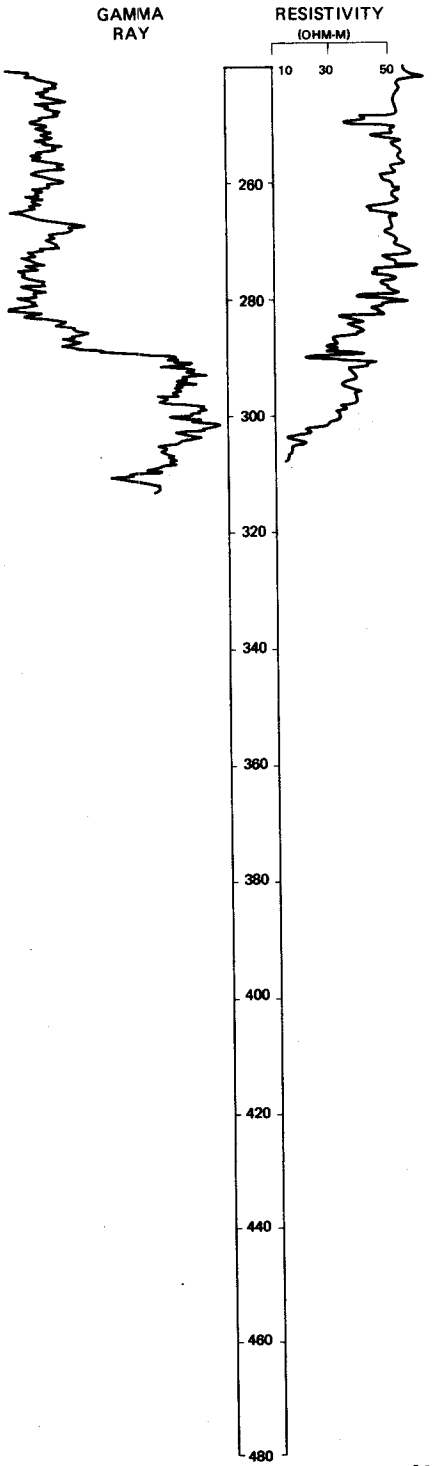
0-1	Topsoil, black.
1-8	Sand, medium to coarse, gravelly.
8-14	Clay (till), silty, sandy, pebbly, yellowish-brown.
14-100	Clay (till), silty, sandy, pebbly, olive-gray.
100-140	Clay (till), very sandy, silty, pebbly, olive-gray; sand lenses from 104 to 106, 116 to 117, and 119 to 122 feet.
140-288	Clay (till), very silty, slightly sandy, olive-gray; limestone boulder from 238 to 240 feet.

LOCATION: 136-069-13DDD

DATE DRILLED: 8/02/79

ALTITUDE: 1865
(FT, NGVD)

DEPTH: 317
(FT)



DESCRIPTION OF DEPOSITS

PIERRE SHALE

288-317 Shale, black, brittle, hard.

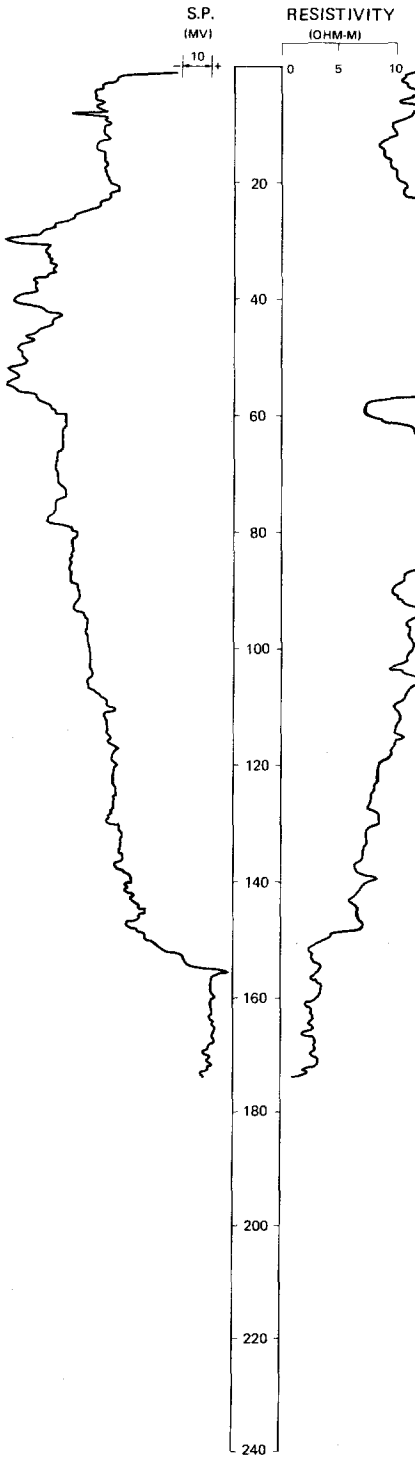
NDSWC 11177, 11177A

LOCATION: 136-069-18CCC1, 2

DATE DRILLED: 10/14/79

ALTITUDE: 1918
(FT, NGVD)

DEPTH: 180
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-16	Clay (till), silty, sandy, pebbly, yellowish-brown.
16-24	Clay (till), silty, sandy, pebbly, olive-gray.
24-33	Sand, fine to very coarse, gravelly, subangular to rounded; 40 percent carbonate, 40 percent shale, and 20 percent quartz grains.
33-55	Gravel, very fine to coarse, subrounded to rounded; 40 percent carbonate, 30 percent shale, and 30 percent igneous pebbles.
55-78	Clay, silty, olive-gray to dark-gray, plastic.
78-155	Clay (till), silty, sandy, pebbly, medium-dark-gray.

PIERRE SHALE

155-180	Shale, medium-dark-gray.

136-069-20ABA
(Log from Jacob Thurn)

Date drilled: 9/13/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	3	3
	Clay, yellow	12	15
	Sand	5	20

136-069-21BAA
(Log from Gross Well Drilling)

Date drilled: 10/15/72

	Clay, yellow	60	60
	Gravel	20	80
	Clay	100	180
	Gravel, coarse	20	200

136-069-31CBC
(Log from Frederickson's Inc.)

Date drilled: 4/12/73

	Topsoil, black	1	1
	Sand and gravel	31	32
	Clay, sandy, gravelly	28	60
	Clay, sandy, blue	2	62

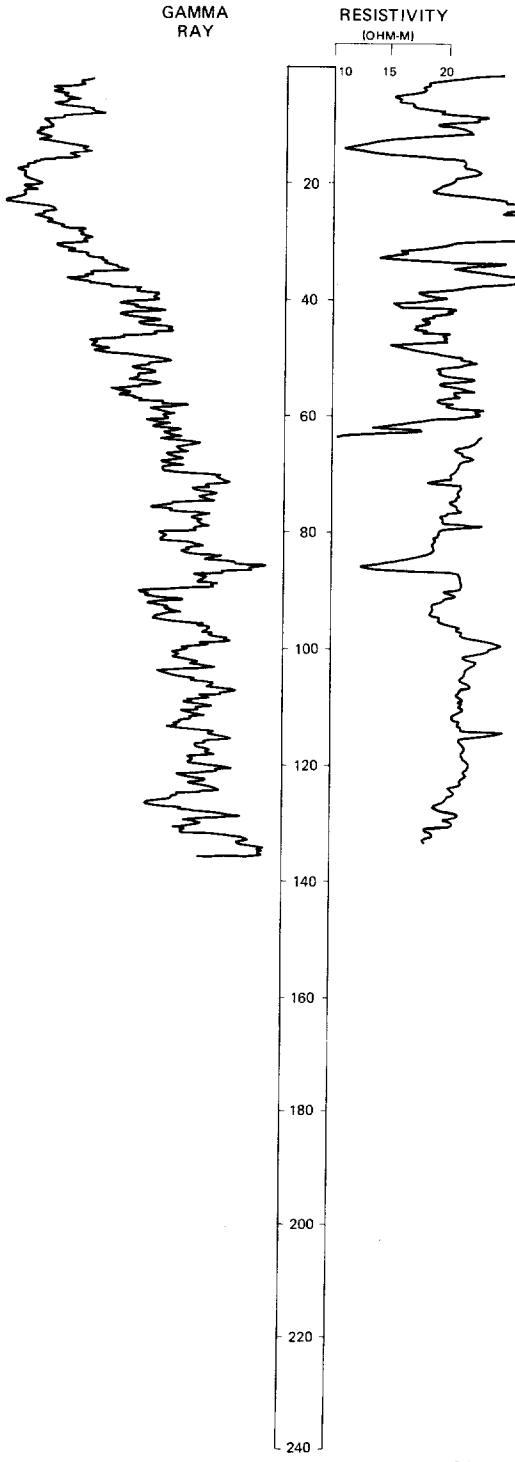
NDSWC 5391, 5391A

LOCATION: 136-069-31CCC1, 2

DATE DRILLED: 10/19/78

ALTITUDE: 1939
(FT, NGVD)

DEPTH: 142
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-32	Sand, fine to very coarse, gravelly; 30 percent quartz, 30 percent shale, and 40 percent carbonate and igneous grains.
32-35	Clay (till), silty, pebbly, medium-dark-gray.
35-37	Gravel, fine.
37-46	Clay (till), silty, pebbly, medium-dark-gray.
46-50	Sand, clayey.
50-64	Clay (till), sandy, silty, olive-gray to medium-dark-gray; abundant shale and limestone pebbles.

FOX HILLS SANDSTONE

64-98	Shale, medium-dark-gray, glauconitic; interbedded with very fine sandstone.
98-132	Sandstone, silty, clayey, medium-gray.

PIERRE SHALE(?)

132-142	Shale, medium-dark-gray to grayish-black, siliceous.

136-070-02BBB
NDSWC 11239

Altitude: 1951 feet | Date drilled: 4/30/80

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Sand, fine to very coarse, predominantly coarse; 15 percent gravelly; gravel is subangular to rounded	31	32
	Clay (till), silty, pebbly, olive-gray, calcareous; sand content increases with depth	70	102
	Silt, clayey, brownish-gray, calcareous	61	163
Pierre Shale:			
	Shale, grayish-black, hard, noncalcareous	17	180

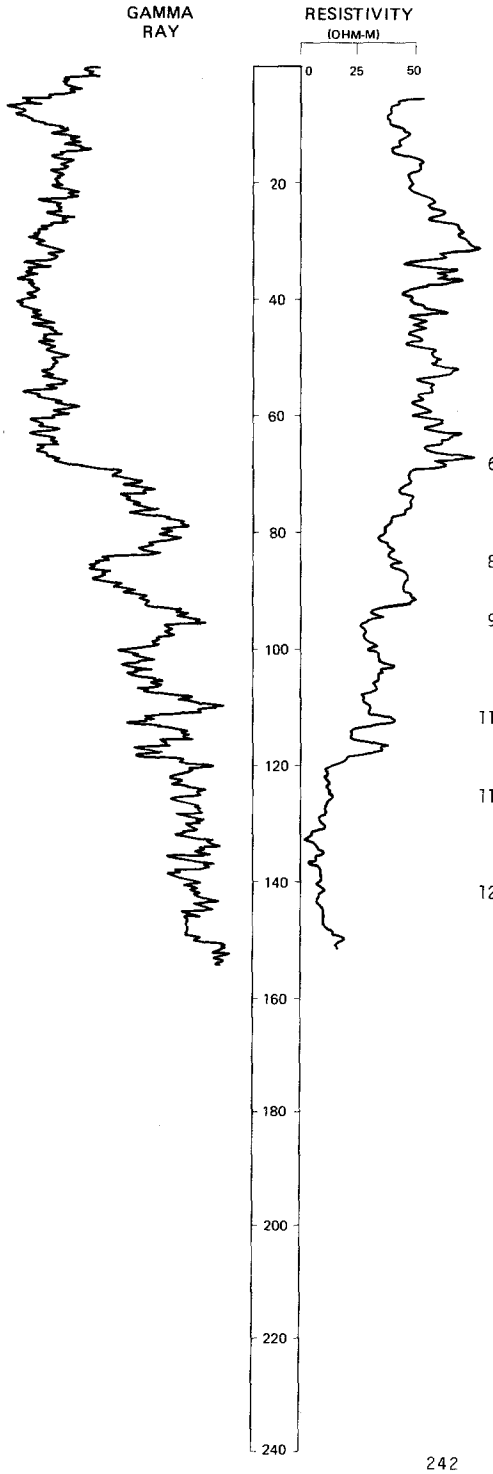
NDSWC 5401

LOCATION: 136-070-03ABB

DATE DRILLED: 10/30/78

ALTITUDE: 1912
(FT, NGVD)

DEPTH: 162
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-69	Gravel, fine to medium, sandy; 60 percent carbonate, 30 percent igneous and quartz, and 10 percent shale pebbles.
69-84	Clay (till), sandy, greenish-gray.
84-93	Clay (till), very sandy, greenish-gray.
93-111	Clay (till), silty, pebbly, olive-gray.
111-113	Clay (till), silty, medium-gray; with yellowish-brown mottling.
113-120	Clay (till), silty, dark-yellowish-brown.

PIERRE SHALE(?)

120-162	Shale, dark-gray.

136-070-04BBC
(Log from Jacob Thurn)

Date drilled: 6/03/75

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Sand----------	21	24

136-070-04BCD
(Log from Frederickson's Inc.)

Date drilled: 5/01/73

	Topsoil, black----------	2	2
	Sand and gravel----------	25	27
	Sand; mixed with clay----------	8	35
	Sand, gravel, and shale fragments----------	12	47
	Sand and shale fragments----------	24	71
	Clay, sandy----------	3	74

136-070-04CCB
NDSWC 4

Altitude: 1870 feet Date drilled: 8/28/79

	Topsoil----------	1	1
	Sand, fine to coarse, gravelly, light-brown----------	4	5
	Sand, fine to coarse, gravelly, silty, light-gray; light-gray clay layers from 16 to 22 feet----------	17	22
	Sand, medium to coarse, and fine to coarse gravel; some shale pebbles and lignite----------	34	56
	Clay, dark-olive-gray, sticky, compact, brittle----------	4	60

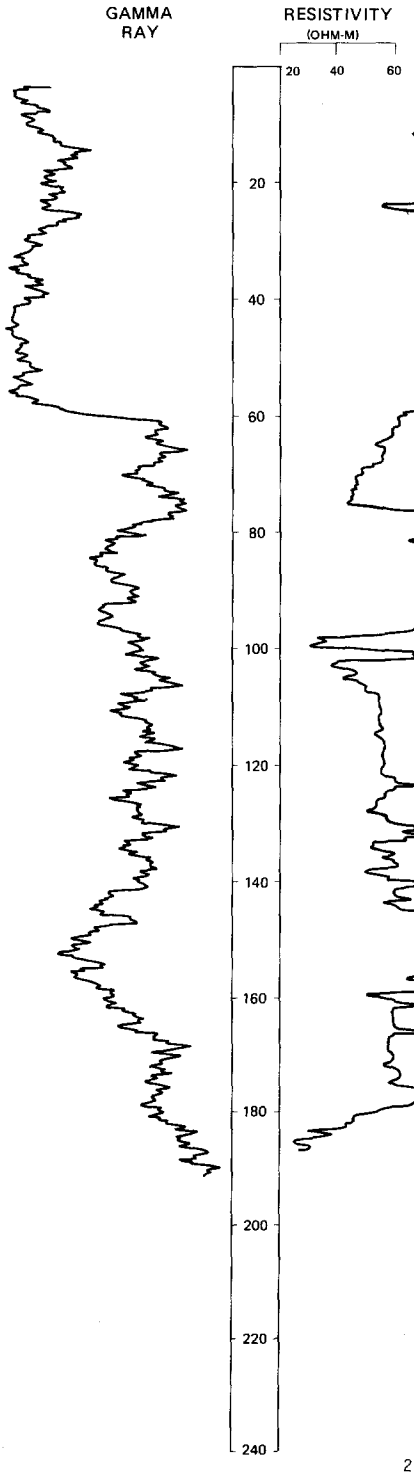
NDSWC 5506

LOCATION: 136-070-04CCC1

DATE DRILLED: 7/25/79

ALTITUDE: 1873
(FT, NGVD)

DEPTH: 197
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-22	Sand, very fine to very coarse, predominantly very coarse, gravelly, well-rounded to subangular; 60 percent quartz, 20 percent carbonate, and 20 percent shale and silicate grains.
22-40	Sand, fine to medium, well-rounded to subangular; 60 percent quartz, 20 percent carbonate, and 20 percent shale and silicate grains.
40-60	Sand, very coarse, well-rounded to subangular; 60 percent shale and 40 percent carbonate and silicate grains.
60-78	Clay, silty, slightly sandy, olive-gray.
78-145	Clay (till), very sandy, olive-gray; abundant pebbles.
145-159	Sand, very fine to very coarse, predominantly medium, gravelly, silty, clayey.
159-182	Clay (till), sandy, olive-gray; abundant pebbles.

PIERRE SHALE

182-197	Shale, black, brittle.

136-070-04CCC2
NDSWC 6

Altitude: 1873 feet — Date drilled: 8/28/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Sand, fine to medium, gravelly, light-brown	4	5
	Sand, fine to medium, gravelly, light-gray	15	20
	Sand, fine to coarse, and fine to coarse gravel	39	59
	Clay	1	60

136-070-04CCC3
NDSWC 2

Altitude: 1873 feet — Date drilled: 8/28/79

	Topsoil	1	1
	Sand, fine to medium, light-brown	7	8
	Sand, fine to medium, light-gray	7	15
	Sand, fine to coarse, gravelly	5	20
	Sand, fine, silty	3	23
	Clay, silty, sandy	3	26
	Sand, fine to coarse, predominantly coarse, gravelly	33	59
	Clay, light-olive-gray	1	60

136-070-04CCC4, 5
NDSWC 3, 3A

Altitude: 1872 feet — Date drilled: 8/28/79

Glacial drift:			
	Topsoil, black	1	1
	Sand, medium to coarse, gravelly, light-brown	4	5
	Sand, light-gray; scattered gravel; clay lenses from 10 to 23 feet	18	23
	Sand, coarse	35	58
	Clay	2	60

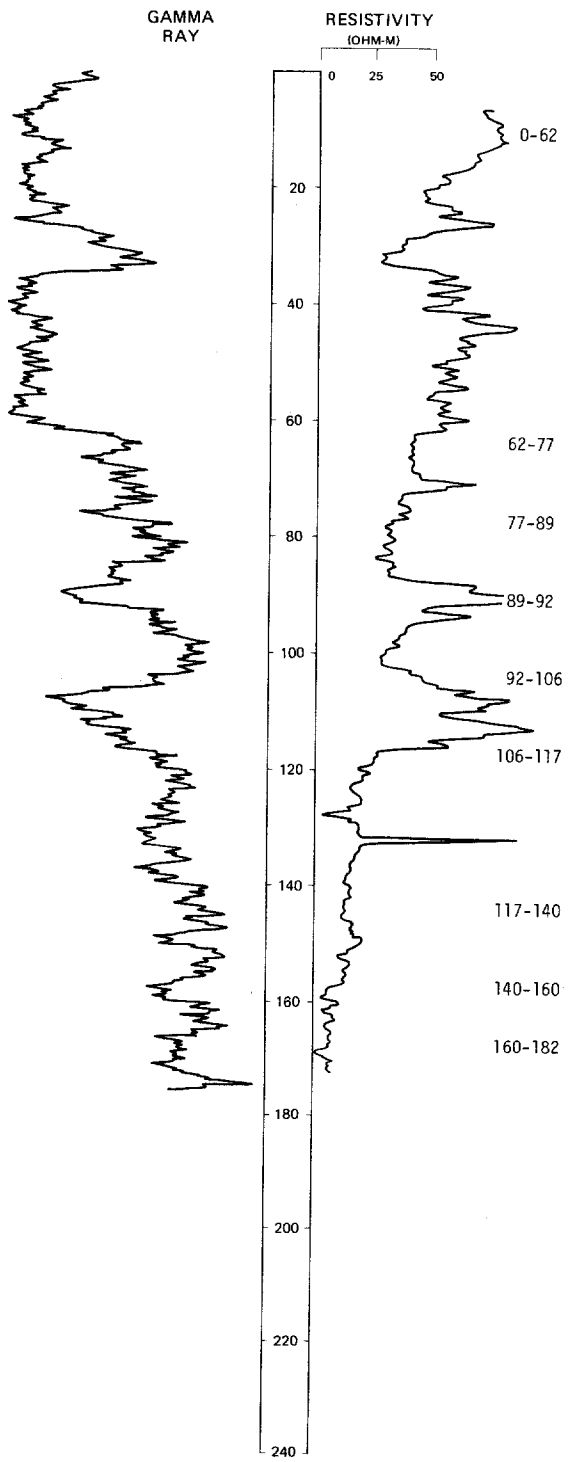
NDSWC 5400, 5400A

LOCATION: 136-070-05AAA1, 2

DATE DRILLED: 10/27/78

ALTITUDE: 1895
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-62	Sand, fine to very coarse, predominantly very coarse, gravelly; 75 percent quartz and igneous, 15 percent carbonate, and 10 percent shale grains; clay lens from 27 to 34 feet.
62-77	Clay (lacustrine), silty, olive-gray.
77-89	Clay (till), silty, sandy, olive-gray to medium-gray.
89-92	Clay (till), very sandy, silty, pale-yellowish-brown.
92-106	Clay, very silty, olive-gray; scattered shale pebbles.
106-117	Gravel, coarse, sandy; 50 percent carbonate, 40 percent quartz and igneous, and 10 percent shale pebbles.

FOX HILLS SANDSTONE

117-140	Sandstone, silty, dark-gray to dark-greenish-gray, glauconitic.
140-160	Shale, dark-gray to grayish-black, glauconitic.
160-182	Shale, grayish-black.

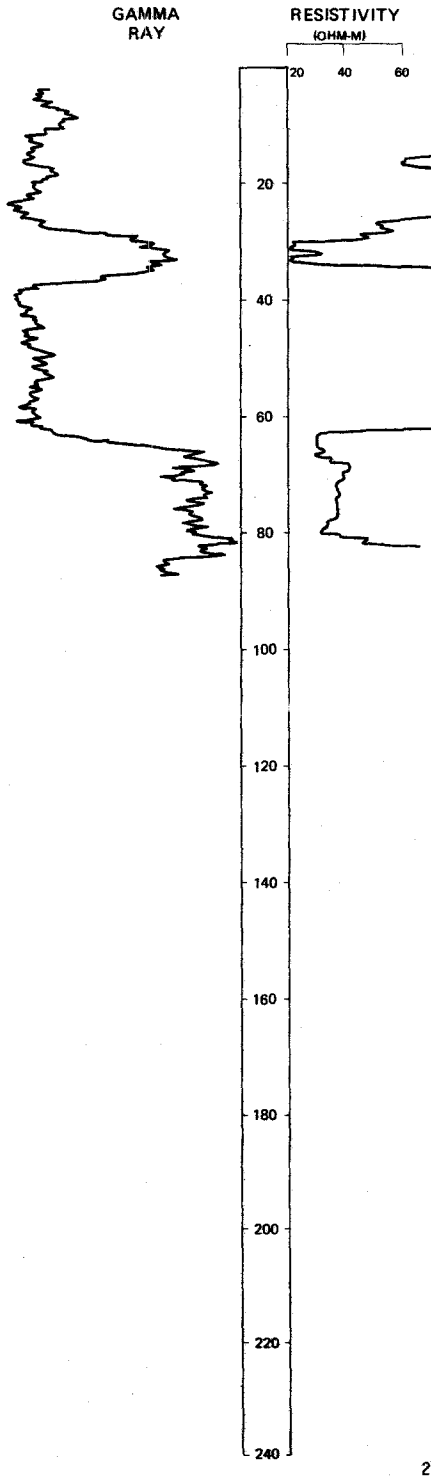
NDSWC 5507

LOCATION: 136-070-05AAD

DATE DRILLED: 7/25/79

ALTITUDE: 1881
(FT, NGVD)

DEPTH: 92
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-28	Sand, fine to very coarse, predominantly very coarse, gravelly, well-rounded to subangular; 50 percent shale, 25 percent carbonate, and 25 percent silicate grains.
28-36	Clay (lacustrine), silty, sandy, pebbly, olive-gray.
36-65	Sand, medium to coarse, gravelly; 33 percent shale, 33 percent carbonate, 33 percent silicate, and 1 percent lignite fragments.
65-92	Clay, silty, olive-gray.

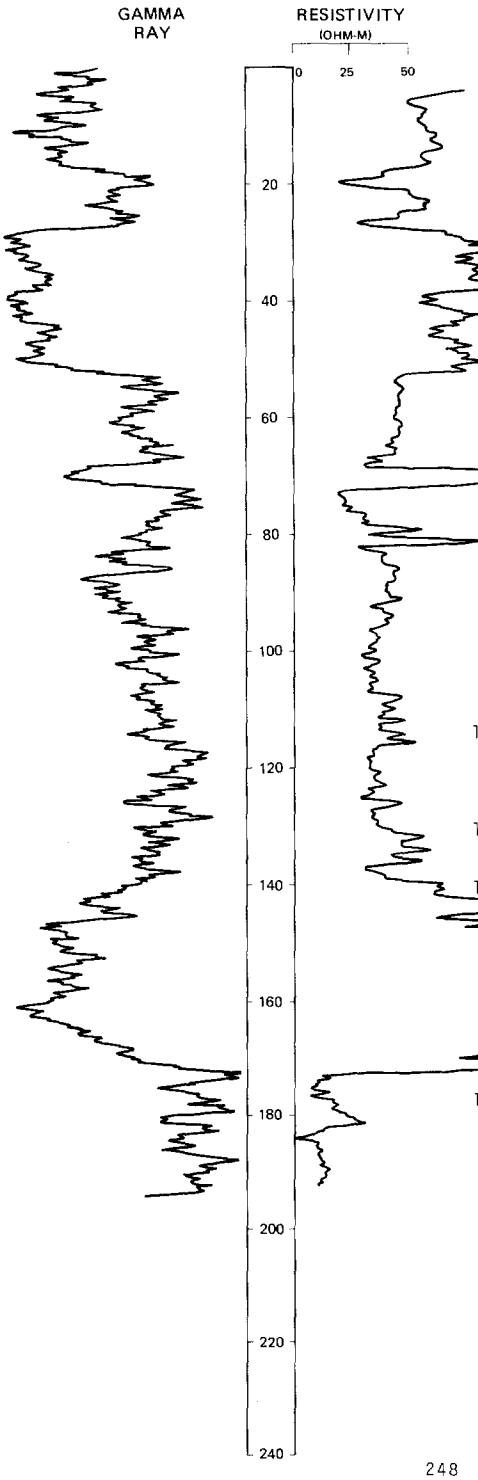
NDSWC 5403, 5403A

LOCATION: 136-070-06BBB1, 2

DATE DRILLED: 11/01/78

ALTITUDE: 1867
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-17	Gravel, fine to medium, and coarse to very coarse sand; 65 percent carbonate, 25 percent quartz and igneous, and 10 percent shale pebbles.
17-28	Clay (lacustrine), greenish-gray, plastic.
28-52	Sand, fine to coarse, predominantly medium, gravelly; 50 percent quartz, 30 percent shale, and 20 percent carbonate and igneous grains.
52-68	Clay (lacustrine?), silty, slightly sandy, plastic, olive-gray.
68-72	Sand and gravel.
72-82	Clay (till), silty, olive-gray, plastic; scattered shale and limestone pebbles.
82-108	Clay (till), sandy, silty, olive-gray to medium-gray.
108-130	Clay (till), sandy, olive-gray; abundant shale pebbles.
130-139	Silt, clayey, medium-gray.
139-172	Sand, medium, gravelly; 80 percent quartz, 15 percent carbonate, and 5 percent igneous and shale grains.

PIERRE SHALE

172-202	Shale, dark-gray to grayish-black, fractured, siliceous.

136-070-07DAD
(Log from Jacob Thurm)

Date drilled: 7/27/77

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	3	3
	Sand----------	17	20

136-070-08AAA
NDSWC 5

Altitude: 1870 feet Date drilled: 8/28/79

	Topsoil, black----------	1	1
	Sand, fine to coarse, gravelly, light-brown----------	4	5
	Sand, fine to coarse, gravelly, light-gray----------	13	18
	Sand, fine to medium----------	4	22
	Clay----------	1	23
	Sand, fine to coarse, gravelly; scattered shale pebbles----------	32	55
	Clay----------	5	60

136-070-11DDD
USGS test hole 309
(Log modified from Paulson, 1952)

Altitude: 1958 feet Date drilled: 1950

Glacial drift:			
	Soil, black, clayey----------	1	1
	Till, tan----------	8	9
	Gravel----------	2	11
	Clay (till), buff to dark-gray; containing very few pebbles; may be lacustrine clay----------	39	50
	Till, bluish-gray----------	134	184
	Clay, bluish-gray----------	6	190

136-070-13AAA
NDSWC 11238

Altitude: 1960 feet — Date drilled: 4/29/80

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	1	1
	Till, very silty, very sandy, pebbly, moderate-yellowish-brown, calcareous, moderately cohesive, plastic, oxidized; small lenses of oxidized silt	4	5
	Sand, medium, and fine gravel; poorly sorted, subrounded to rounded, oxidized; 30 percent carbonate, 30 percent quartz, 30 percent igneous, and 10 percent shale grains and pebbles	6	11
	Till, very silty, very sandy, pebbly, moderate-yellowish-brown, calcareous, moderately cohesive, plastic, oxidized; boulders from 12 to 13 feet	11	22
	Till, very silty, sandy, slightly pebbly, olive-black, calcareous, cohesive, unoxidized	99	121
	Sand, coarse, and gravel; poorly sorted, subangular to rounded	8	129
	Till, very silty, sandy, slightly pebbly, olive-black, calcareous, cohesive, unoxidized	4	133
	Bedrock shale, brownish-black, noncalcareous, well-indurated	27	160

136-070-13BCC
(Log from Gross Well Drilling)

Date drilled: 10/20/72

Clay, sandy	10	10
Gravel	25	35
Clay	3	38
Gravel	22	60
Clay	--	60

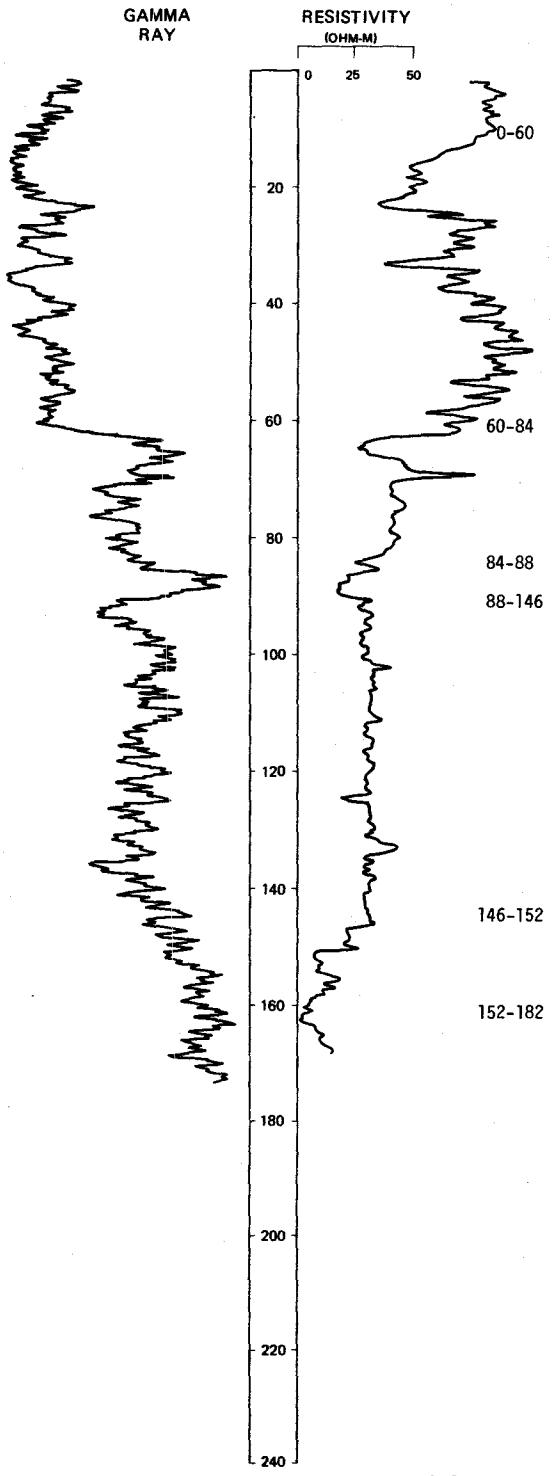
NDSWC 5398, 5398A

LOCATION: 136-070-15CCC1, 2

DATE DRILLED: 10/26/78

ALTITUDE: 1896
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-60	Sand, coarse to very coarse, and fine to medium gravel; sand is composed of 70 percent igneous and quartz, 15 percent carbonate, and 15 percent shale grains; gravel is composed of 70 percent carbonate, 15 percent igneous and quartz, and 15 percent shale pebbles; clay lenses from 20 to 24, 30 to 32, and 38 to 40 feet.
60-84	Silt, clayey, pebbly, olive-gray.
84-88	Clay.
88-146	Clay (till), silty, medium-gray to dark-gray; abundant limestone pebbles.
146-152	Clay (till), sandy, silty, pebbly, dark-gray.

PIERRE SHALE(?)

152-182	Shale, dark-gray, siliceous.

136-070-15DDD
USGS test hole 307
(Log modified from Paulson, 1952)

Altitude: 1903 feet Date drilled: 1950

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Soil, sandy, black	4	4
	Sand, fine to medium	1	5
	Sand, coarse to very coarse, and gravel	15	20
	Gravel; mostly shale	5	25
	Pebble gravel	25	50
	Pebble gravel; coarser than above	14	64
	Till, bluish-gray; layers of shale gravel occur from 125 to 130 and 155 to 160 feet	132	196
Pierre Shale:			
	Shale, bluish-gray	14	210

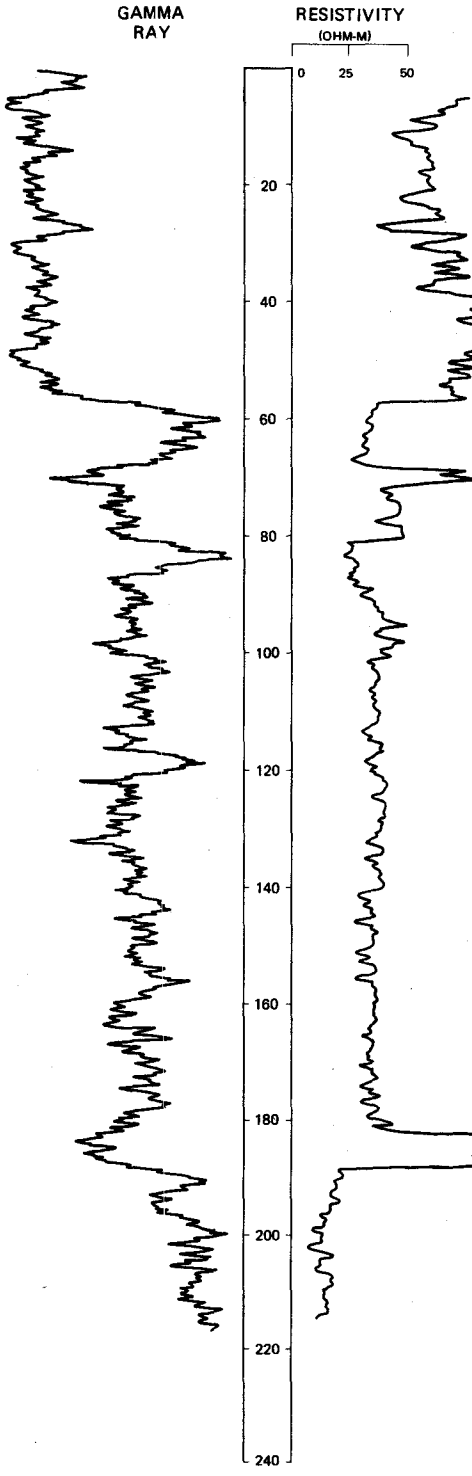
NDSWC 5399, 5399A

LOCATION: 136-070-16BBB1, 2

DATE DRILLED: 10/26/78

ALTITUDE: 1881
(FT, NGVD)

DEPTH: 222
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-57	Sand, fine to very coarse, predominantly coarse to very coarse, gravelly; 80 percent quartz and igneous, 15 percent carbonate, and 5 percent shale grains; silty clay lenses from 13 to 15 and 26 to 29 feet.
57-68	Clay (lacustrine), silty, olive-gray, plastic, laminated; scattered pebbles.
68-81	Clay (till), sandy, pebbly, olive-gray; sand lens from 68 to 71 feet.
81-86	Clay, dark-olive-gray, plastic.
86-101	Clay (till), silty, sandy, pebbly.
101-154	Clay (till), shaly, dark-gray; abundant shale pebbles.
154-169	Clay (till), shaly, brownish-gray; scattered shale pebbles.
169-182	Clay (till), sandy, shaly, dark-gray.
182-188	Gravel, medium, sandy; composed of 60 percent carbonate, 30 percent quartz and igneous, and 10 percent shale pebbles.

PIERRE SHALE(?)

188-222	Shale, dark-gray, siliceous; few fossil shell fragments.

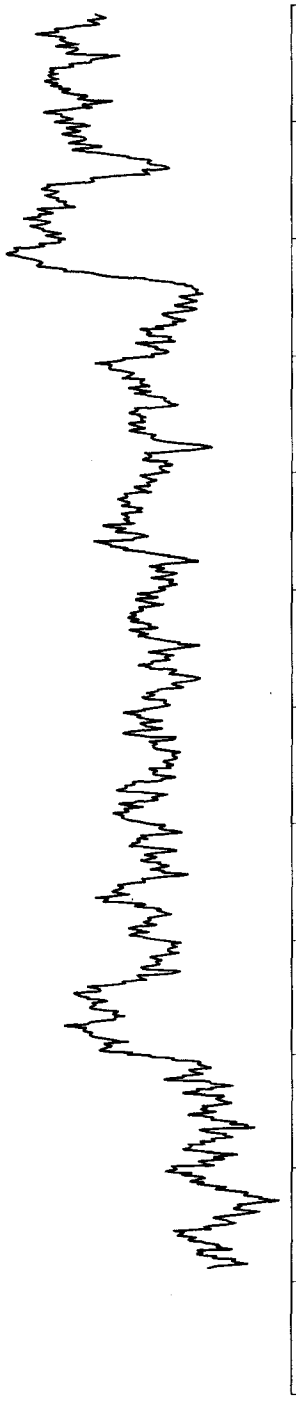
NDSWC 5397, 5397A

LOCATION: 136-070-17DDD1, 2

DATE DRILLED: 10/26/78

ALTITUDE: 1885 (FT, NGVD)

DEPTH: 222 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-46	Sand, fine to very coarse, predominantly coarse to very coarse, gravelly; composed of 60 percent quartz and igneous, 20 percent carbonate, and 20 percent shale; clayey silt bed from 25 to 29 feet.
46-57	Clay (till), silty, medium-gray.
57-94	Clay (till), sandy, medium-gray to dark-gray.
94-148	Clay (till), sandy, dark-gray; abundant shale pebbles.
148-167	Clay (till), pebbly, dark-olive-gray.
167-180	Gravel, fine to medium, and medium to very coarse sand; angular to well rounded; composed largely of quartz, igneous, and carbonate fragments.

PIERRE SHALE(?)

180-222	Shale, dark-gray, siliceous.

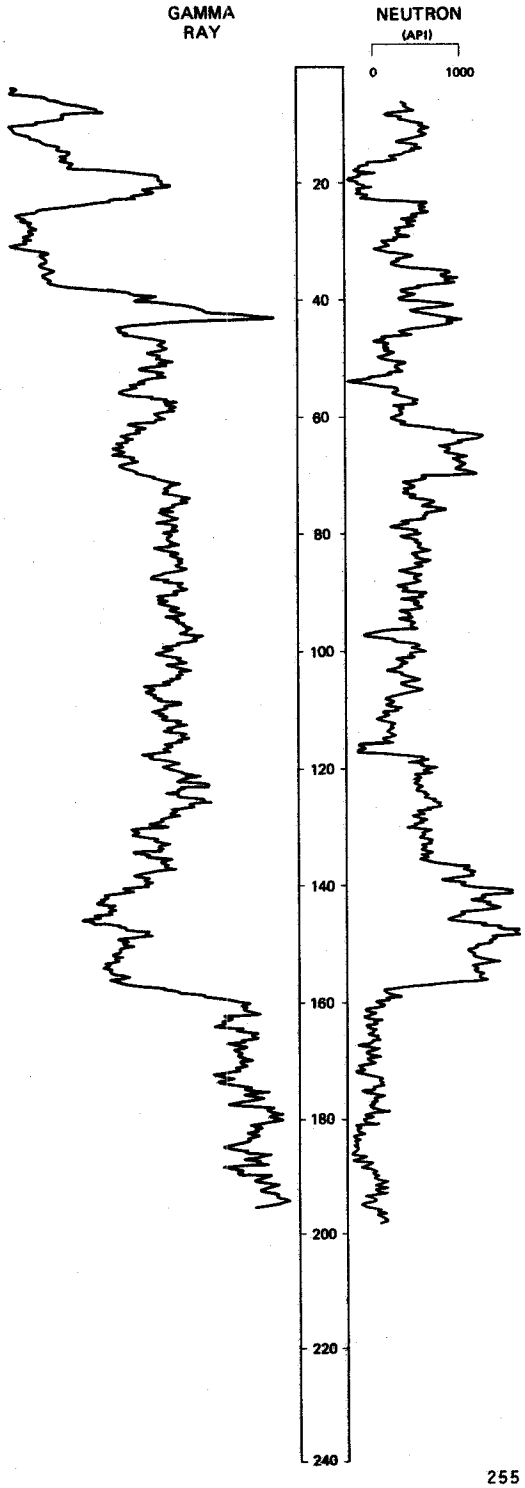
NDSWC 11236, 11236A

LOCATION: 136-070-18BBA1, 2

DATE DRILLED: 4/28/80

ALTITUDE: 1873
(FT, NGVD)

DEPTH: 200
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-6	Sand, fine to very coarse, gravelly, subangular to rounded.
6-8	Silt, clayey, moderate-yellowish-brown.
8-14	Sand.
14-23	Clay, silty, sandy.
23-30	Sand, fine to medium, predominantly fine, rounded; 50 percent quartz, 30 percent shale, and 20 percent carbonate grains.
30-38	Sand, coarse, gravelly.
38-140	Clay (till), silty, sandy, pebbly, brownish-gray; boulders at 42 feet.
140-156	Sand, coarse, gravelly, angular to rounded; 50 percent carbonate, 30 percent quartz, and 10 percent shale grains; 10 percent detrital lignite.

FOX HILLS SANDSTONE

156-200	Siltstone, clayey, brownish-black, hard, micaceous.

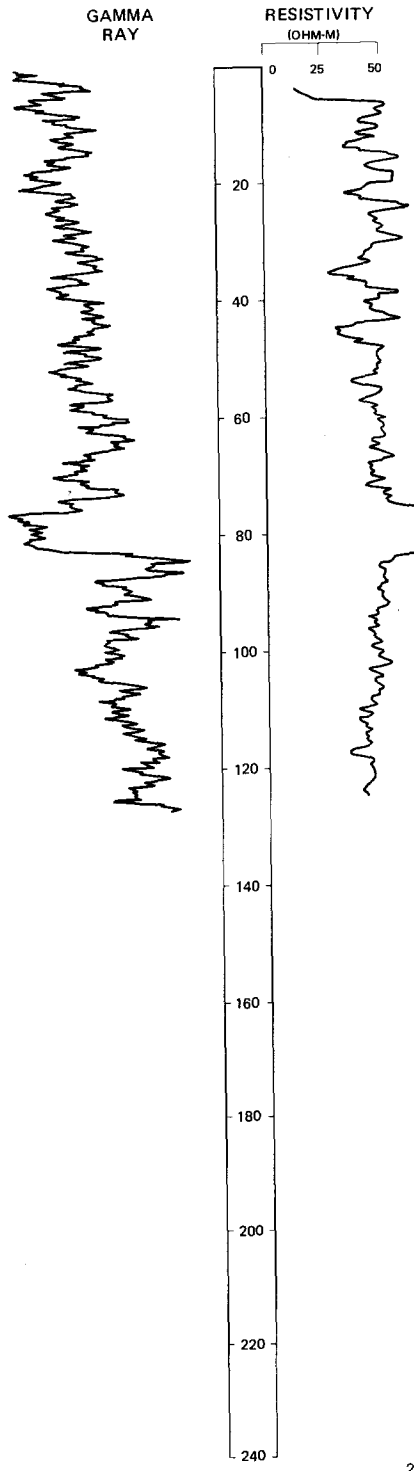
NDSWC 5402

LOCATION: 136-070-18CCC

DATE DRILLED: 10/31/78

ALTITUDE: 1872
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-6	Silt (lacustrine), very clayey, olive-gray, plastic.
6-23	Clay (lacustrine), silty, olive-gray to medium-dark-gray, plastic; scattered pebbles.
23-48	Clay (till), silty, medium-gray to dark-gray; abundant shale pebbles.
48-76	Clay (till), sandy, pebbly, dark-olive-gray.
76-83	Gravel, fine to coarse; 70 percent carbonate, 20 percent igneous, 5 percent quartz, and 5 percent shale fragments.

FOX HILLS SANDSTONE

83-105	Sandstone, silty, dusky-blue-green, glauconitic.
105-126	Shale, grayish-black, glauconitic, siliceous; thin sandstone interbeds.
126-170	Shale, grayish-black, slightly siliceous; scattered glauconite grains.
170-202	Shale, slightly silty, grayish-black, micaceous.

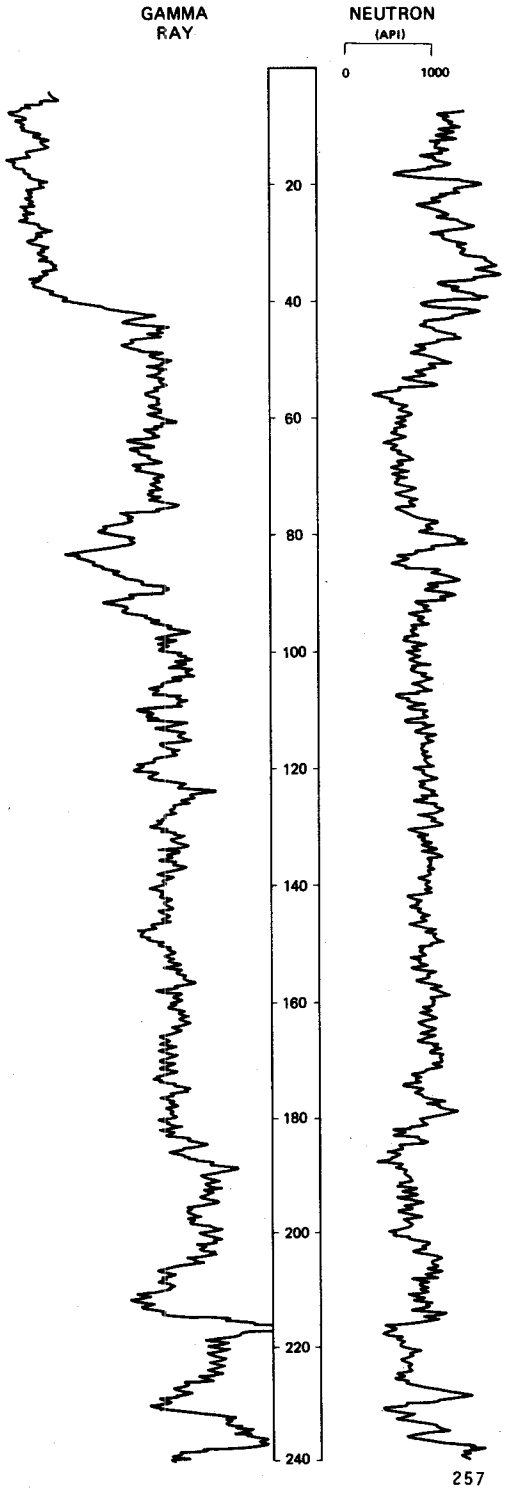
NDSWC 11237

LOCATION: 136-070-20DDA

DATE DRILLED: 4/29/80

ALTITUDE: 1882
(FT, NGVD)

DEPTH: 280
(FT)



257

DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-33	Sand, fine to very coarse, predominantly medium, gravelly, well-rounded.
33-42	Sand, coarse, and fine well-rounded gravel; 50 percent quartz, 30 percent shale, and 20 percent carbonate grains and pebbles.
42-92	Clay (till), sandy, silty, pebbly, olive-gray; gravel lenses from 77 to 80, 82 to 83, and 91 to 92 feet.
92-238	Clay (till), silty, sandy, pebbly, olive-gray.
238-242	Boulders.

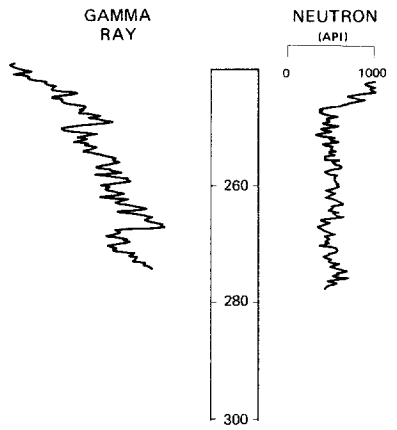
NDSWC 11237, Continued

LOCATION: 136-070-20DDA

DATE DRILLED: 4/29/80

ALTITUDE: 1882 (FT, NGVD)

DEPTH: 280 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT, Continued

242-246 Clay (till), sandy, silty, olive-gray.

FOX HILLS SANDSTONE(?)

246-280 Shale, silty, brownish-black, micaceous.

136-070-21CCA
(Log from Traut Wells Inc.)

Date drilled: 6/26/78

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Sand, medium to coarse, and gravel----------	40	40
	Sand, dirty; mixed with clay----------	5	45
	Clay, gray----------	5	50

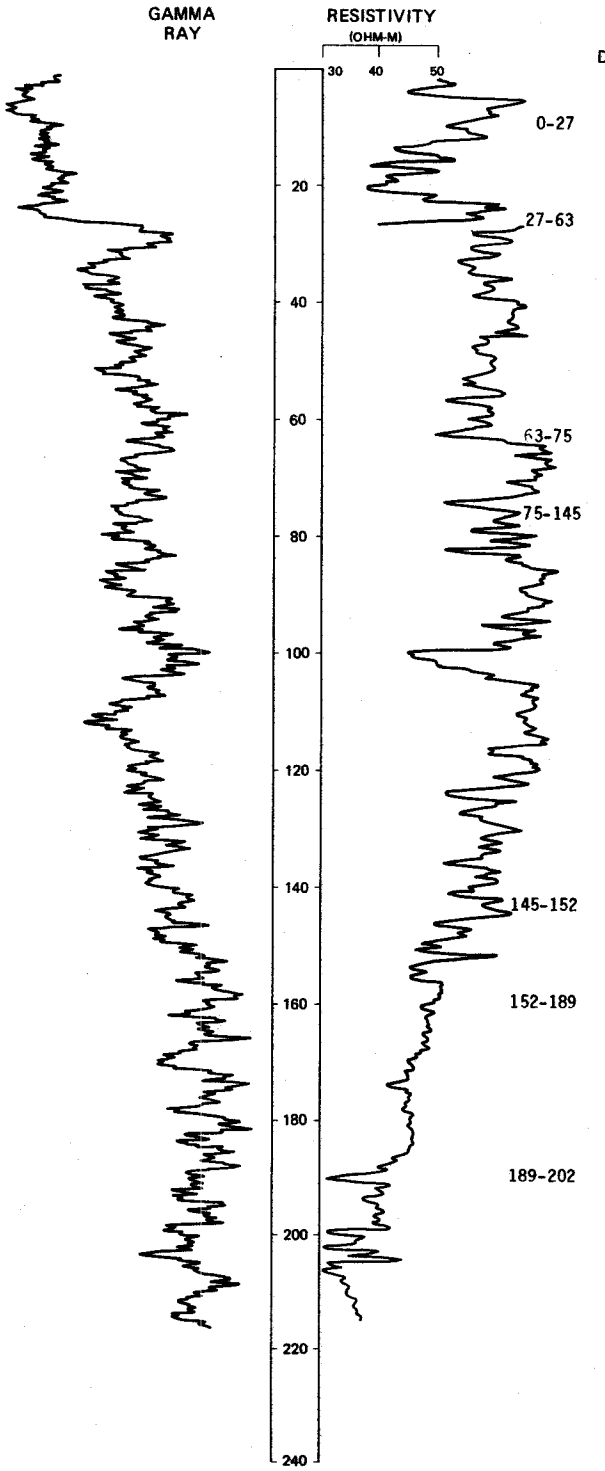
NDSWC 5396

LOCATION: 136-070-21CCC

DATE DRILLED: 10/25/78

ALTITUDE: 1882
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-27 Gravel, fine, and medium to very coarse sand; composed largely of carbonate, quartz, and igneous fragments.

27-63 Silt (lacustrine), clayey, medium-gray, plastic; few sand grains.

63-75 Clay (till), sandy; abundant shale pebbles.

75-145 Silt, sandy, olive-gray.

145-152 Clay (till), sandy, dark-gray to grayish-black.

FOX HILLS SANDSTONE

152-189 Shale, silty, greenish-gray to medium-gray, brittle, siliceous.

189-202 Shale, medium-dark-gray, fractured, siliceous.

136-070-21DDB
(Log from Traut Wells Inc.)

Date drilled: 6/26/78

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Sand and gravel, coarse	45	45
	Clay, gray	10	55

136-070-22CCA
(Log from Traut Wells Inc.)

Date drilled: 3/11/80

Glacial drift:			
	Topsoil, black	2	2
	Sand, fine to medium	21	23
	Clay, gray, and cobbles	11	34
	Sand, coarse, and gravel	16	50
	Clay, gray	10	60

136-070-22DCA
(Log from Traut Wells Inc.)

Date drilled: 3/11/80

	Topsoil, black	2	2
	Sand, fine to medium	18	20
	Clay, gray	7	27
	Sand and gravel	23	50
	Clay, gray	10	60

136-070-22DDD
USGS test hole 308
(Log modified from Paulson, 1952)

Altitude: 1908 feet Date drilled: 1950

Glacial drift:			
	Soil, sandy, brown	2	2
	Sand; mostly medium to coarse but also some very coarse	23	25
	Pebble gravel; becoming very coarse at bottom	14	39
	Till, bluish-gray	11	50

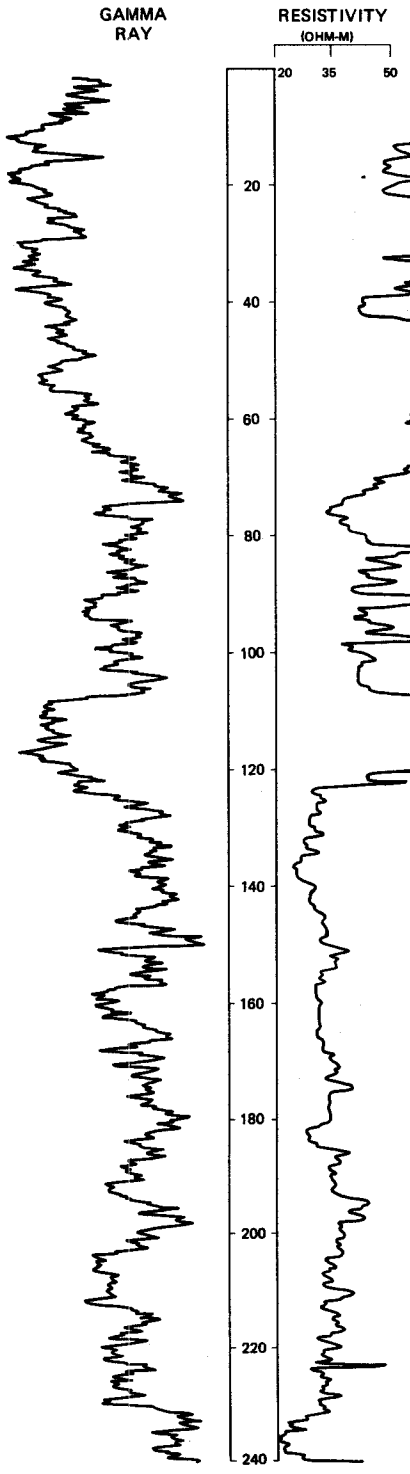
NDSWC 5393, 5393A

LOCATION: 136-070-23AAA1, 2

DATE DRILLED: 10/20/78

ALTITUDE: 1906 (FT, NGVD)

DEPTH: 262 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-56 Gravel, fine to medium, sandy; 30 percent igneous, 30 percent shale, 30 percent carbonate, and 10 percent quartz pebbles.

56-70 Sand, coarse to very coarse, gravelly; 60 percent carbonate, 20 percent igneous and quartz, and 20 percent shale grains.

70-82 Clay, silty, greenish-gray to medium-dark-gray, plastic; scattered sand grains.

82-107 Silt (lacustrine?), greenish-gray to olive-gray; laminated with fine sand; scattered shale and quartz grains.

107-123 Gravel, medium, sandy; composed of 60 percent carbonate, 30 percent shale, and 10 percent igneous pebbles.

123-231 Clay (till), very sandy, medium-dark-gray; few thin sand and gravel lenses.

PIERRE SHALE(?)

231-262 Shale, grayish-black, hard, siliceous.

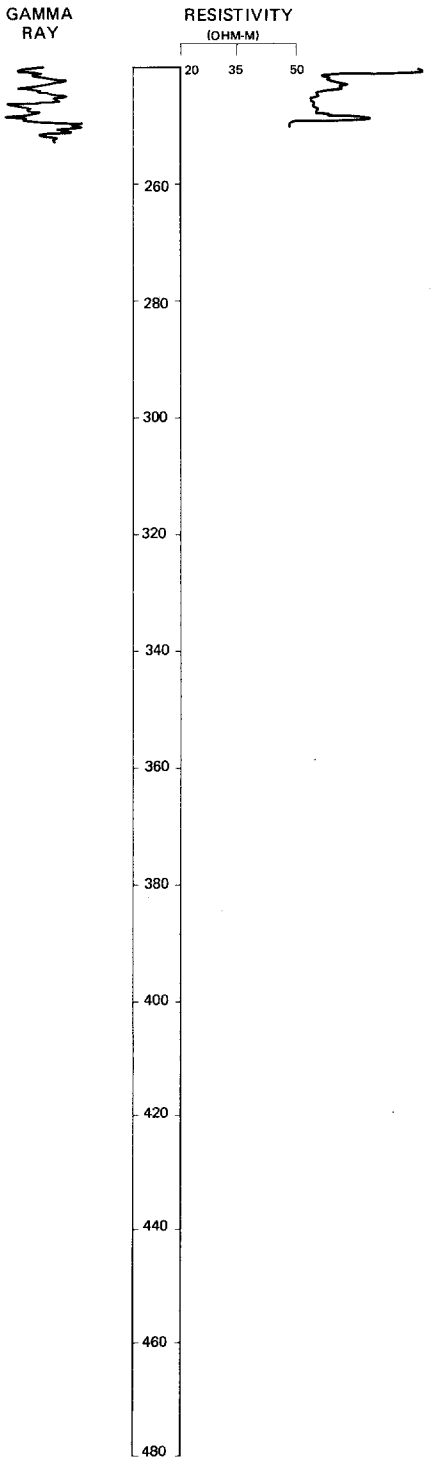
NDSWC 5393, 5393A, Continued

LOCATION: 136-070-23AAA1, 2

DATE DRILLED: 10/20/78

ALTITUDE: 1906
(FT, NGVD)

DEPTH: 262
(FT)



DESCRIPTION OF DEPOSITS

262

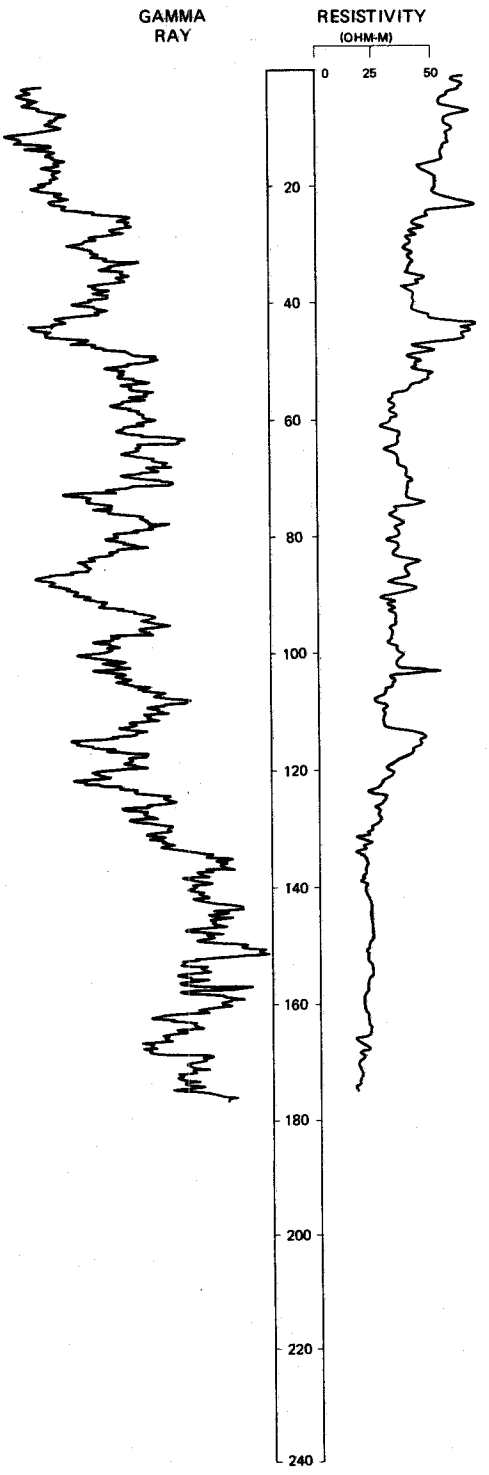
NDSWC 5392, 5392A

LOCATION: 136-070-24DCD1, 2

DATE DRILLED: 10/20/78

ALTITUDE: 1917
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

0-24	Sand, fine to very coarse, gravelly; 60 percent quartz, 20 percent carbonate, and 20 percent igneous and shale fragments.
24-48	Clay (till), silty, sandy, olive-gray to medium-dark-gray; gravel lens from 42 to 46 feet.
48-71	Clay (till), silty, sandy, olive-gray to dark-gray.
71-123	Clay (till), sandy, silty, medium-gray to dark-gray; sand and gravel lenses from 72 to 74, 84 to 90, and 114 to 116 feet.

FOX HILLS SANDSTONE

123-134	Shale, silty, sandy, greenish-gray to dark-gray, siliceous.
134-182	Shale, dark-gray, slightly siliceous.

136-070-26BAC1
(Log from Midwest Valley Inc.)

Date drilled: 4/26/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	1	1
	Sand and gravel, red, dry	17	18
	Sand and gravel, poorly sorted, hard, tight	27	45
	Sand, fine, silty, gray	3	48
	Clay, soft, gray	14	62

136-070-26BAC2
(Log from Frederickson's Inc.)

Date drilled: 4/26/73

	Topsoil, black	1	1
	Sand	29	30
	Sand and gravel	21	51
	Clay, sandy, blue	6	57

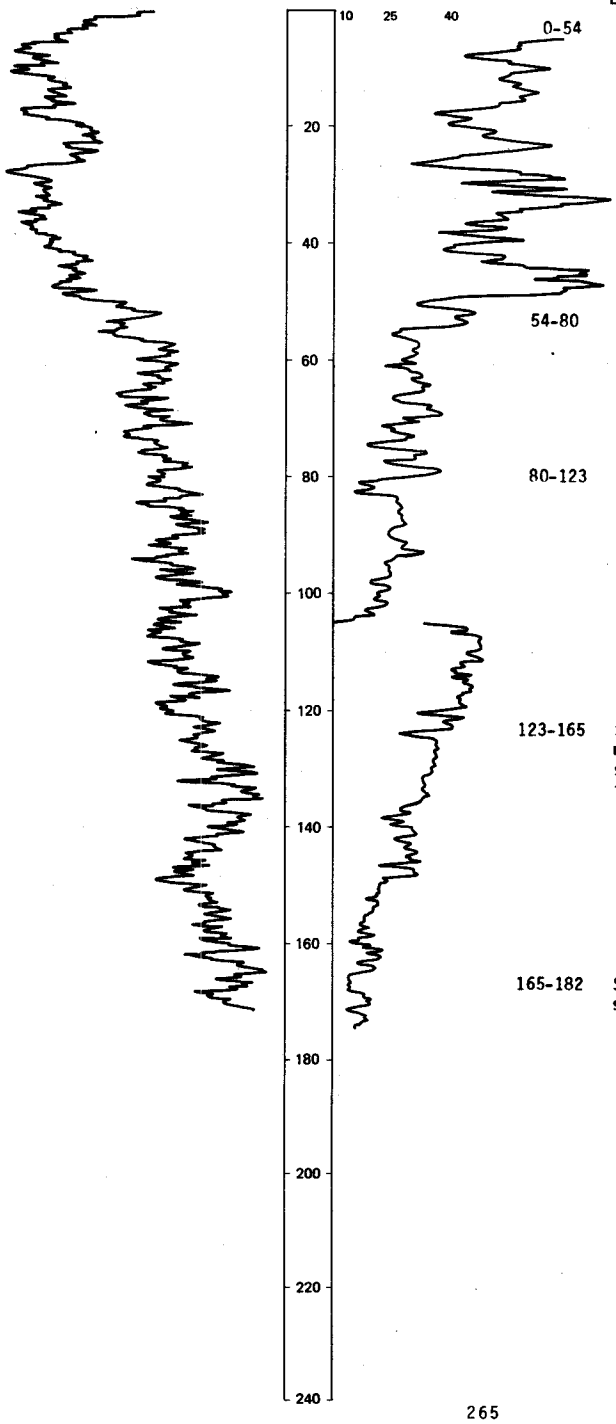
NDSWC 5395, 5395A

LOCATION: 136-070-26BBB1, 2

DATE DRILLED: 10/24/78

ALTITUDE: 1910
(FT, NGVD)

DEPTH: 182
(FT)



DESCRIPTION OF DEPOSITS

0-54	Sand, medium to very coarse, predominantly coarse to very coarse, gravelly; 60 percent quartz and igneous, 30 percent carbonate, and 10 percent shale grains; clayey silt lens from 19 to 26 feet; clay lens from 51 to 53 feet.
54-80	Clay (till), silty, sandy, pebbly, olive-gray; numerous thin beds of greenish-gray clay.
80-123	Clay (till), sandy, shaly, dark-gray.
	FOX HILLS SANDSTONE
123-165	Shale, greenish-gray to medium-gray, glauconitic, siliceous; few fossil shell fragments.
	PIERRE SHALE(?)
165-182	Shale, grayish-black, siliceous.

136-070-26BBD
(Log from Farmers Supply Company)

Date drilled: 8/18/72

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	1	1
	Gravel, fine to medium	18	19
	Gravel, fine	13	32
	Gravel, medium to coarse	10	42
	Sand, fine to medium	3	45
	Gravel, coarse	13	58
	Clay, gray	--	58

136-070-26BCD
(Log from Midwest Valley Inc.)

Date drilled: 3/19/73

	Topsoil	1	1
	Sand, dry	17	18
	Sand and gravel, coarse, very dirty, wet	12	30
	Sand, dirty, soft	5	35
	Sand and gravel, gray	9	44
	Sand, poorly sorted, dirty; some clay	16	60

136-070-26BDC
(Log from Midwest Valley Inc.)

Date drilled: 3/19/73

	Topsoil	1	1
	Sand and gravel, dry, red	17	18
	Sand and gravel, red	16	34
	Sand, fairly sorted, gray	16	50
	Clay, soft, gray	2	52

136-070-26CAC
(Log from Midwest Valley Inc.)

Date drilled: 3/19/73

	Topsoil	1	1
	Sand, dry	17	18
	Sand and gravel, wet, brown	12	30
	Gray sand and gravel	10	40
	Clay	7	47

136-070-26CCC
NDSWC 11176

Altitude: 1904 feet — Date drilled: 10/19/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Sand, medium to very coarse, gravelly, subangular to rounded; 50 percent quartz, 30 percent carbonate, and 20 percent igneous grains	23	24
	Clay (till), silty, sandy, pebbly, olive-gray; sand and pebble content increases with depth	101	125
Fox Hills Sandstone:			
	Shale, greenish-gray	35	160

136-070-27ACA
(Log from K & K Drilling)

Date drilled: 2/22/80

Topsoil	4	4
Sand and gravel, fine	13	17
Clay, yellow, and gravel	6	23
Sand and gravel, fine	14	37
Clay, gray	17	54
Sand and gravel, fine	5	59
Clay, gray	11	70

136-070-27DAA
(Log from K & K Drilling)

Date drilled: 2/19/80

Topsoil	2	2
Sand and gravel	15	17
Clay, yellowish-gray	6	23
Sand and gravel, fine	16	39
Clay, gray	21	60

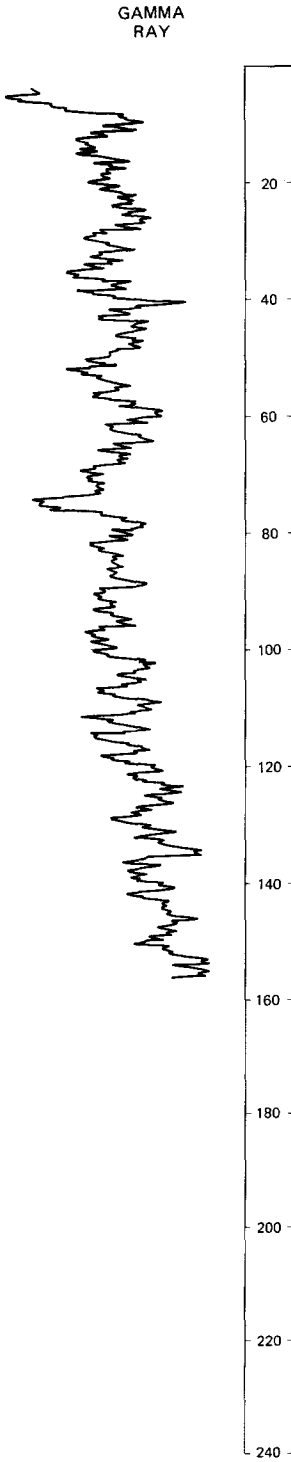
NDSWC 5387

LOCATION: 136-070-33CCC

DATE DRILLED: 10/18/78

ALTITUDE: 1893
(FT, NGVD)

DEPTH: 162
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-8	Gravel, fine to coarse, sandy, oxidized; composed largely of igneous and carbonate fragments.
8-33	Clay (till), silty, sandy, olive-gray; few shale pebbles.
33-126	Clay (till), silty, medium-dark-gray to dark-gray; becomes sandy near base.

FOX HILLS SANDSTONE

126-162	Shale, silty, sandy, medium-gray to dark-gray.

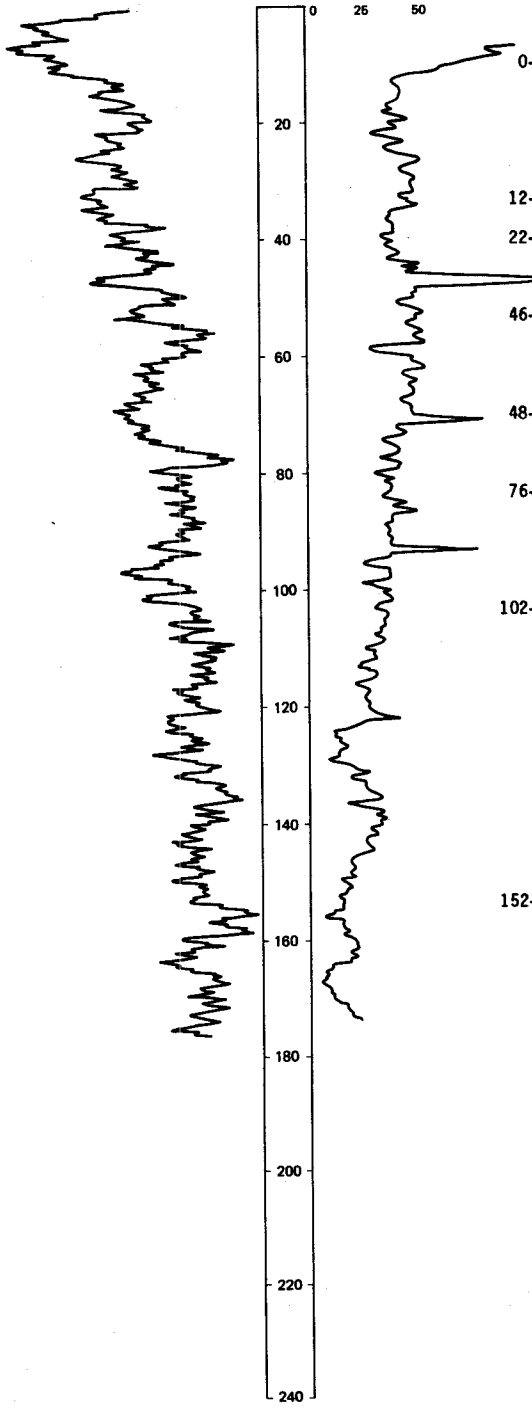
NDSWC 5404

LOCATION: 136-071-02ABB

DATE DRILLED: 11/01/78

ALTITUDE: 1885 (FT, NGVD)

DEPTH: 182 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-12	Sand, fine to very coarse, silty, gravelly, clayey, oxidized; 70 percent quartz, 20 percent igneous and carbonate, and 10 percent shale grains.
12-22	Clay, silty, olive-gray.
22-46	Clay (till), silty, sandy, olive-gray; scattered pebbles.
46-48	Gravel, fine to coarse, sandy.

FOX HILLS SANDSTONE

48-76	Sandstone, very fine to fine, moderate-blue-green to greenish-gray, glauconitic.
76-102	Sandstone, very fine to fine, silty, greenish-gray, glauconitic.
102-152	Shale, greenish-gray to dark-gray, slightly siliceous; glauconitic in places.
152-182	Shale, dark-gray to grayish-black, brittle, slightly siliceous.

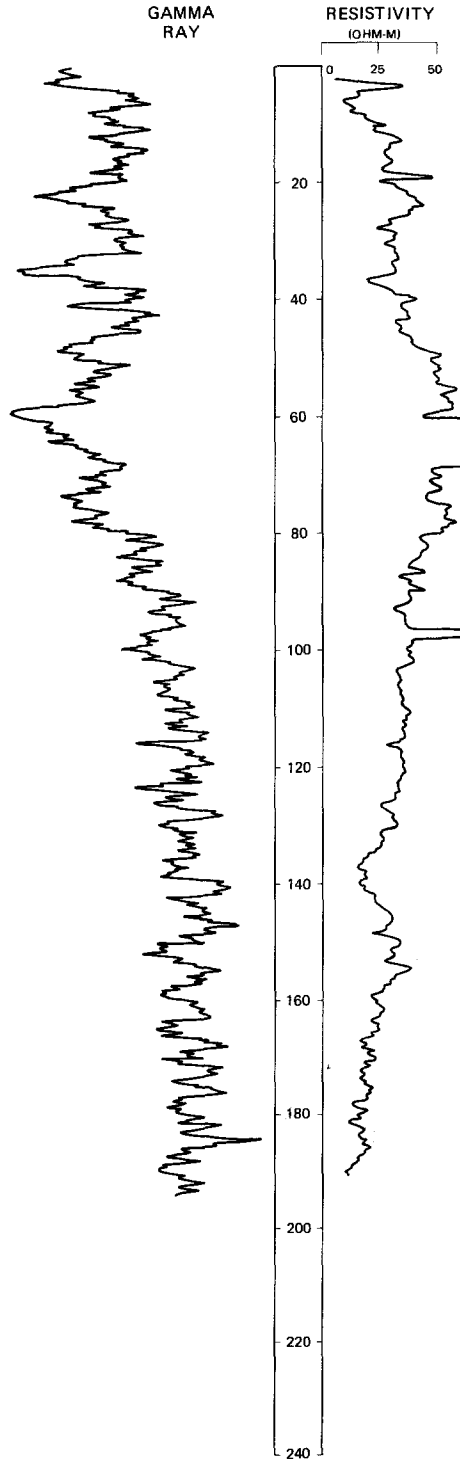
NDSWC 5405

LOCATION: 136-071-11CCC

DATE DRILLED: 11/01/78

ALTITUDE: 1878
(FT, NGVD)

DEPTH: 202
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-4	Clay (till), silty, gravelly, yellowish-brown.
4-14	Clay (till), silty, pebbly, medium-gray.
14-20	Clay (lacustrine?), medium-dark-gray, plastic.
20-32	Clay (till), silty, medium-gray; contains small pieces of glauconitic sandstone; shale gravel lens from 20 to 24 feet.
32-38	Sand, fine to coarse, gravelly.
38-46	Clay (till), silty, dark-gray; abundant shale pebbles.
46-50	Gravel, sandy.
50-58	Sand, medium to coarse, gravelly, silty, clayey.
58-66	Gravel, fine to coarse, predominantly fine, sandy; 50 percent limestone, 30 percent shale, and 20 percent igneous and quartz pebbles.
66-73	Sand, gravelly, clayey.
73-79	Gravel, sandy, silty (flow).

FOX HILLS SANDSTONE

79-103	Sandstone, fine, grayish-blue-green to greenish-gray, glauconitic; thin shale beds.
103-158	Shale, dark-gray, siliceous; numerous green spots.
158-202	Shale, medium-gray to dark-gray, siliceous.

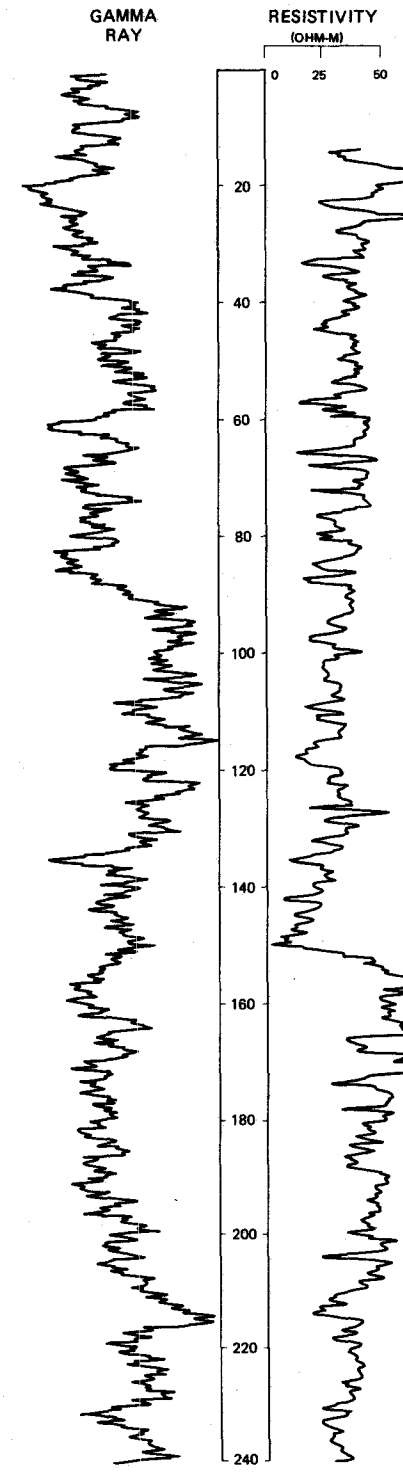
NDSWC 5406

LOCATION: 136-071-16CCC

DATE DRILLED: 11/01/78

ALTITUDE: 1978
(FT, NGVD)

DEPTH: 322
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-18	Clay (till), sandy, silty, dark-yellowish-brown; numerous thin gravel lenses.
18-26	Boulders and gravel lenses; clayey.
26-45	Clay (till), sandy, silty, dark-yellowish-brown.
45-58	Clay (till), sandy, silty, medium-gray; abundant limestone and shale pebbles.
58-91	Clay (till), silty, sandy, dark-olive-gray.

FOX HILLS SANDSTONE

91-151	Shale, very silty, medium-gray, slightly glauconitic; few thin sandstone interbeds.
151-210	Sandstone, fine, silty, clayey, very glauconitic.
210-246	Sandstone, fine, silty, dark-gray, glauconitic; thin shale interbeds.

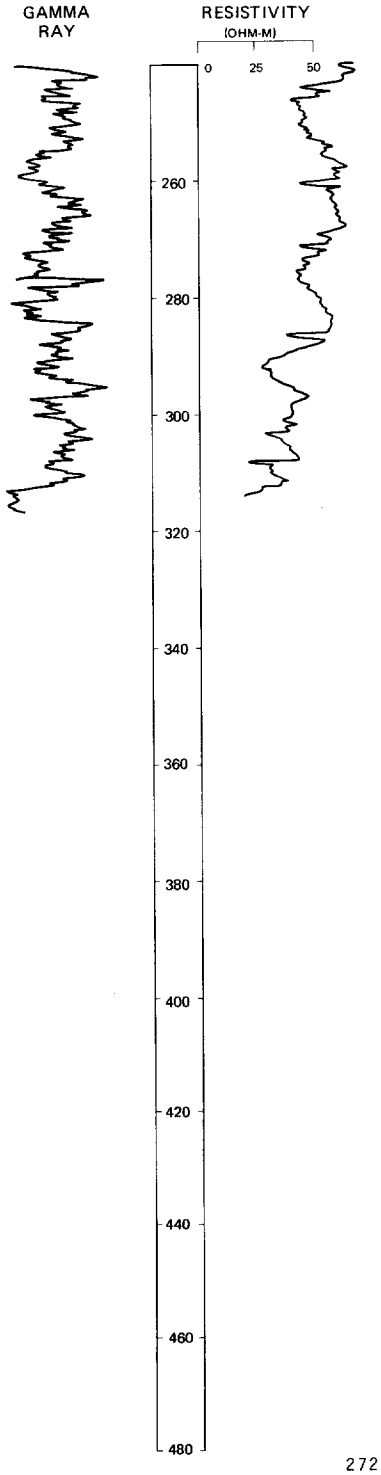
NDSWC 5406, Continued

LOCATION: 136-071-16CCC

DATE DRILLED: 11/01/78

ALTITUDE: 1978
(FT, NGVD)

DEPTH: 322
(FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE, Continued

246-254 Shale, very silty, dark-gray to grayish-black, slightly glauconitic, siliceous.

254-290 Siltstone, sandy, dark-gray to medium-gray.

290-322 Shale, grayish-blue, slightly siliceous.

136-071-18BCB
(Log from Brunner Well Drilling)

Date drilled: 11/16/73

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil, black	2	2
	Clay, yellow	7	9
	Clay and gravel, yellow	8	17
	Clay, gray	109	126
	Sand, brown	5	131
	Clay, blue	33	164
	Sandstone, white	2	166
	Clay, blue	33	199
	Sand, blue-green	9	208

136-071-24BBB
NDSWC 11175

Altitude: 1889 feet — Date drilled: 10/18/79

Glacial drift:			
	Topsoil, black	1	1
	Clay (till), silty, sandy, pebbly, yellowish-brown	13	14
	Clay (till), silty, sandy, pebbly, olive-gray	46	60
Fox Hills Sandstone:			
	Shale, silty, yellowish-brown	12	72
	Sandstone, fine, dusky-green, rounded, glauconitic	8	80

136-071-35AAA
(Log from Brunner Well Drilling)

Altitude: 1932 feet — Date drilled: 6/20/72

	Topsoil, black	1	1
	Clay, yellow	10	11
	Clay, blue	53	64
	Shale, sandy	9	73

136-072-01AAA
NDSWC 11173

Date drilled: 10/18/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Sand, fine to coarse, oxidized	2	3
	Clay (till), silty, sandy, pebbly, yellowish-gray	5	8
	Clay (till), olive-gray	4	12
	Sand, fine, gravelly, subangular to rounded; 50 percent quartz, 30 percent carbonate, and 20 percent shale grains	7	19
	Clay (till), silty, olive-gray	21	40

136-072-03AAA
NDSWC 11172

Date drilled: 10/18/79

Glacial drift:			
	Topsoil, black	1	1
	Clay (till), pebbly, yellowish-gray	5	6
	Clay (till), silty, sandy, pebbly, dark-yellowish-orange	42	48
Fox Hills Sandstone:			
	Shale, brown, carbonaceous; interbedded with fine-grained greenish-gray sandstone	12	60

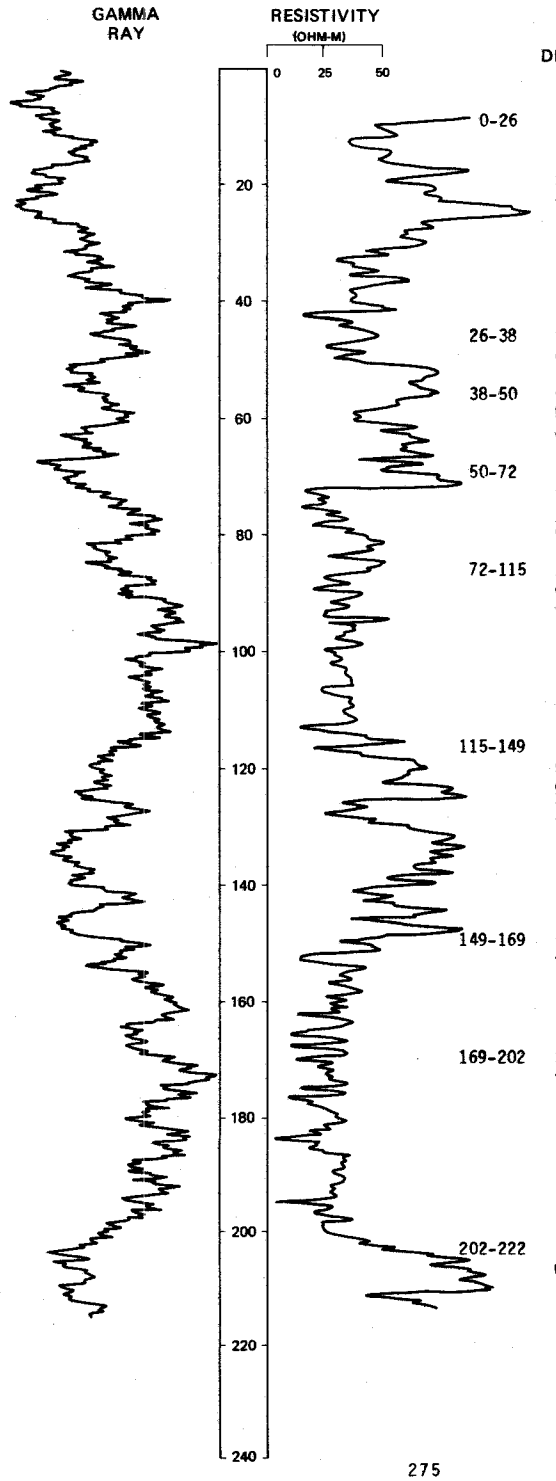
NDSWC 5408

LOCATION: 136-072-08CDC

DATE DRILLED: 11/03/78

ALTITUDE: 2025
(FT, NGVD)

DEPTH: 222
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-26 Sand, very fine to very coarse, predominantly coarse to very coarse, gravelly; 60 percent quartz, 20 percent carbonate, 10 percent igneous, and 10 percent shale grains; clay bed from 12 to 16 feet.

FOX HILLS SANDSTONE

26-38 Silt, sandy, brownish-gray, carbonaceous, lignitic.

38-50 Claystone, silty, medium-bluish-gray, slightly carbonaceous.

50-72 Sandstone, fine to medium, silty, medium-bluish-gray, slightly carbonaceous and glauconitic.

72-115 Siltstone, medium-bluish-gray; some carbonaceous spots.

115-149 Sandstone, fine to medium, silty, dusky-green, slightly glauconitic; shale interbeds from 126 to 130 and 140 to 144 feet.

149-169 Siltstone, medium-bluish-gray to medium-gray, carbonaceous.

169-202 Siltstone, medium-bluish-gray to medium-gray.

202-222 Sandstone, fine to medium, moderate-green, glauconitic.

136-072-17BBB
(Log from Gross Well Drilling)

Date drilled: 10/06/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Clay, brown----------	30	30
	Gravel and quicksand----------	40	70
	Clay, blue----------	110	180
	Sand, blue----------	24	204

136-072-19DAB
(Log from Brunner Well Drilling)

Date drilled: 6/21/74

	Topsoil----------	2	2
	Gravel----------	7	9
	Sand----------	2	11
	Gravel----------	37	48
	Clay, brown----------	6	54
	Clay, yellow----------	16	70
	Clay, gray----------	31	101
	Clay, blue----------	39	140
	Sand, blue----------	2	142
	Clay, blue----------	6	148
	Rock, white----------	1	149
	Clay, blue----------	43	192
	Sand, blue; some water----------	4	196
	Clay, blue----------	16	212
	Sand, green----------	26	238

136-072-22CCA
(Log from Gross Well Drilling)

Date drilled: 8/31/74

	Clay, brown----------	60	60
	Clay, blue----------	152	212
	Sand, blue----------	28	240

136-072-29BBB
NDSWC 11174

Altitude: 2017 feet — Date drilled: 10/18/79

Glacial drift:			
	Topsoil, black----------	1	1
	Sand, fine to very coarse, gravelly, subangular to rounded, oxidized; 50 percent quartz, 30 percent carbonate, and 20 percent igneous grains----------	11	12
	Clay (till), silty, yellowish-brown----------	18	30
Fox Hills Sandstone:			
	Shale, brownish-gray to brownish-black, carbonaceous; interbedded with greenish-gray siltstone----------	10	40

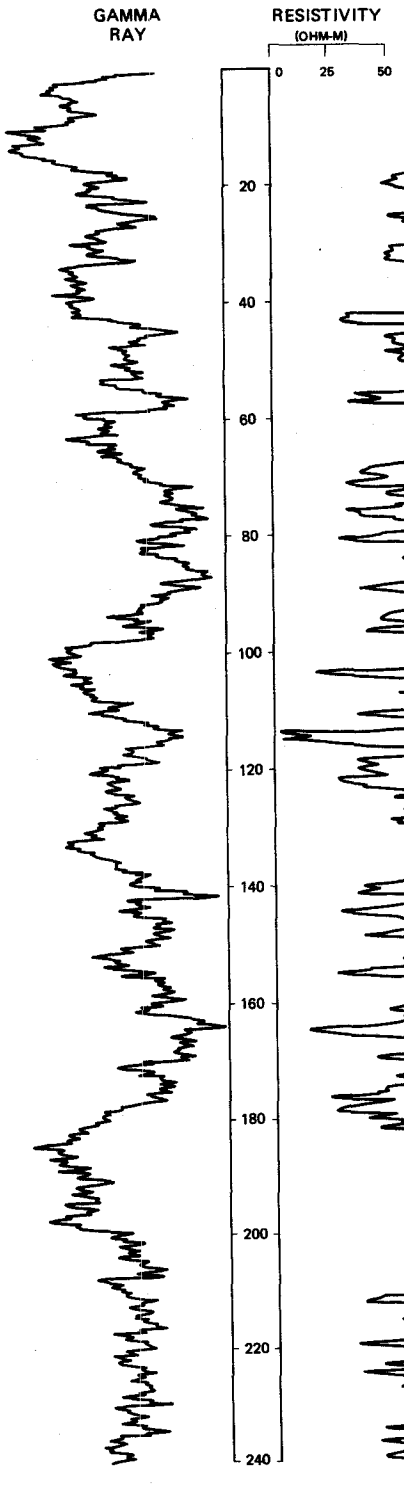
NDSWC 5407

LOCATION: 136-072-30ABA

DATE DRILLED: 11/02/78

ALTITUDE: 1984
(FT, NGVD)

DEPTH: 362
(FT)



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DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-16 Sand, fine to very coarse, gravelly; 80 percent quartz, 15 percent carbonate, and 5 percent igneous and shale grains; numerous limonite concretions and boulders.

FOX HILLS SANDSTONE

16-34 Siltstone, brownish-gray, siliceous.

34-68 Sandstone, fine, silty, medium-bluish-gray.

68-84 Siltstone, clayey, medium-dark-gray to dark-gray, slightly siliceous.

84-98 Claystone, silty, medium-bluish-gray to grayish-black, slightly siliceous; thin carbonaceous shale and bentonite streaks.

98-139 Sandstone, fine, light-bluish-gray, glauconitic; some organic spots.

139-182 Siltstone, light-gray, bentonitic, slightly siliceous; some organic specks.

182-242 Sandstone, fine, silty, medium-bluish-gray, glauconitic.

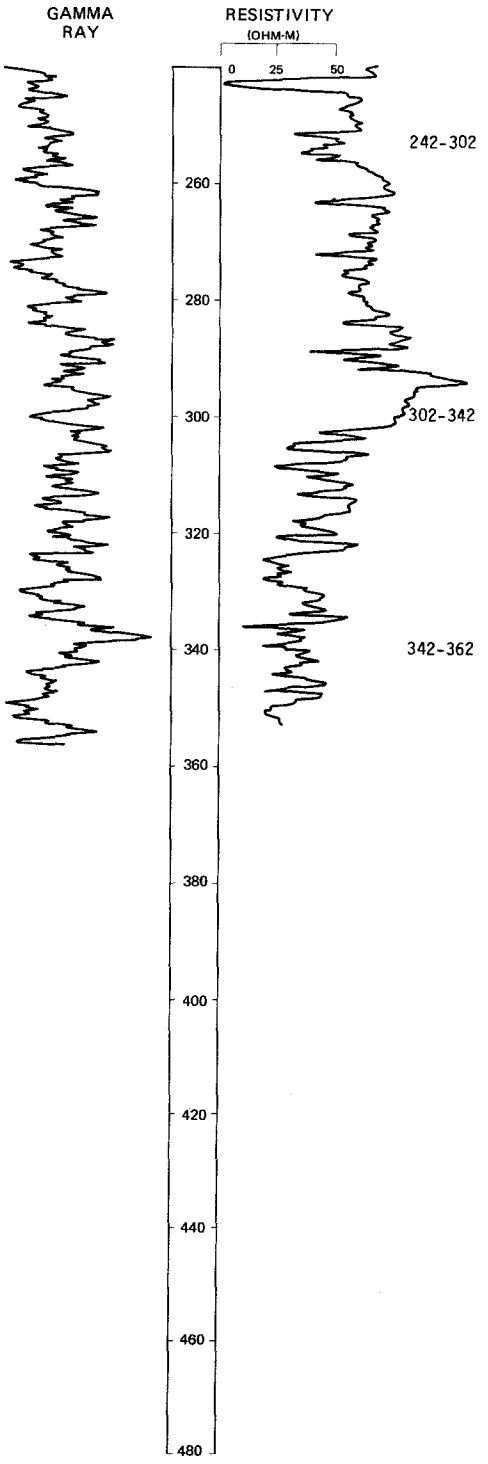
NDSWC 5407, Continued

LOCATION: 136-072-30ABA

DATE DRILLED: 11/02/78

ALTITUDE: 1984
(FT, NGVD)

DEPTH: 362
(FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE, Continued

242-302 Siltstone, olive-gray to dark-gray, glauconitic, siliceous.

302-342 Shale, dark-gray, glauconitic, siliceous.

PIERRE SHALE(?)

342-362 Shale, dark-gray to grayish-black, slightly siliceous.

136-073-05CCC
NDSWC 11170

Altitude: 1992 feet — Date drilled: 10/18/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	1	1
	Clay (till), sandy, pebbly, yellowish-brown	46	47
	Clay (till), sandy, pebbly, olive-gray; few sand and gravel lenses	11	58
	Clay (till), silty, olive-gray	5	63
	Clay (till), silty, yellowish-brown	21	84
	Clay (till), silty, sandy, olive-gray; abundant shale pebbles	20	104
	Gravel, medium to coarse	5	109
	Clay (till), silty, sandy, olive-gray; numerous boulders	14	123
Fox Hills Sandstone:			
	Sandstone, fine, dark-yellowish-orange, subangular to rounded; 90 percent quartz and 10 percent unidentified material; interbedded with dark-yellowish-orange shale	37	160

136-073-07DDD
NDSWC 11169

Altitude: 1950 feet — Date drilled: 10/17/79

Glacial drift:			
	Topsoil, dusky-brown	1	1
	Clay (till), silty, sandy, yellowish-brown	9	10
	Sand, medium to very coarse, gravelly, subangular to rounded; 50 percent carbonate, 30 percent igneous, and 20 percent quartz grains	8	18
	Clay (till), silty, sandy, yellowish-brown	10	28
	Clay (till), silty, olive-gray	10	38
	Clay (till), silty, sandy, olive-gray; contains numerous thin lenses of sand, shale gravel, and lignite fragments	56	94
	Clay (till), silty, sandy, pebbly, olive-gray; boulders	47	141
Fox Hills Sandstone:			
	Sandstone, very fine, light-brown, subrounded to rounded	4	145
	Shale, silty, brown, carbonaceous; interbedded with fine dusky-green sandstone	15	160

136-073-12BBD
(Log from Brunner Well Drilling)

Date drilled: 9/04/76

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	14	16
	Sand and gravel	2	18
	Clay, gray	23	41
	Clay, yellow	45	86
	Clay, gray	21	107
	Rock	1	108
	Clay, blue	75	183
	Sand, blue, and coal chips	5	188
	Clay, blue	58	246
	Sand, green	2	248
	Clay, blue	4	252
	Sand, green	6	258
	Clay, blue	5	263
	Sand, green	10	273
	Clay, blue	9	282
	Sand, green	5	287
	Clay, gray, and thin layers of green sand	23	310
	Clay, blue	3	313

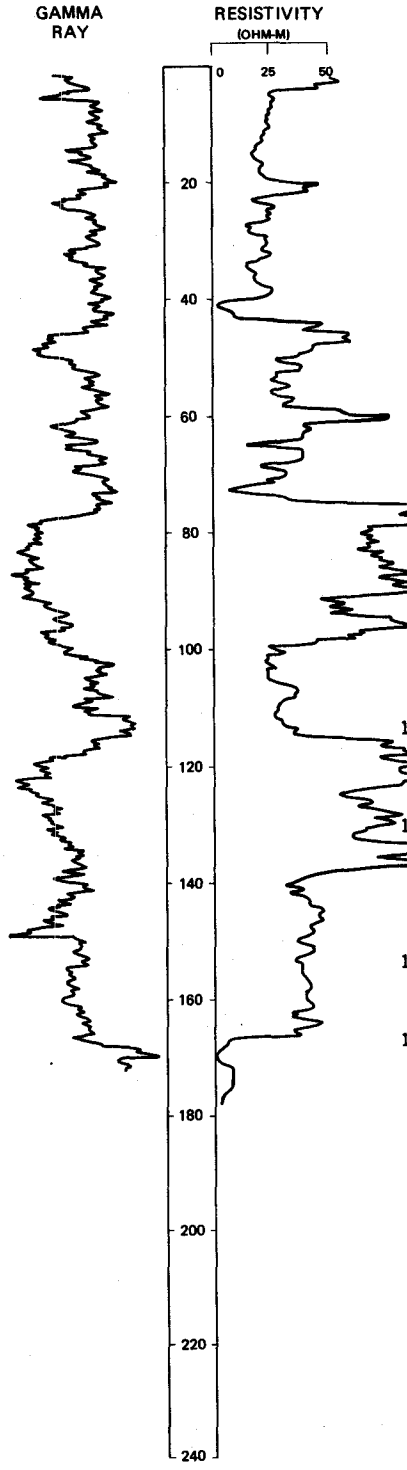
NDSWC 5452, 5452A

LOCATION: 136-073-16CBB1, 2

DATE DRILLED: 6/12/79

ALTITUDE: 1948 (FT, NGVD)

DEPTH: 179 (FT)



DESCRIPTION OF DEPOSITS

0-1	Topsoil, black.
1-44	Clay (till), sandy, silty, pebbly, yellowish-brown.
44-75	Clay (lacustrine), olive-gray, plastic.
75-99	Sand, very fine to very coarse, predominantly medium, gravelly, rounded to subangular; 60 percent shale, 30 percent limestone, and 10 percent igneous and metamorphic grains.
99-115	Clay (till), silty, sandy, dark-olive-gray.
115-124	Gravel, fine to very coarse, predominantly medium; composed largely of shale and carbonate pebbles.
124-138	Clay (till), silty, sandy, olive-gray; gravel lens from 128 to 130 feet; boulder from 133 to 135 feet.
	FOX HILLS SANDSTONE
138-144	Sandstone, very fine to fine, clayey, dark-yellowish-orange.
144-179	Sandstone, very fine to fine, olive-gray to greenish-gray, glauconitic.

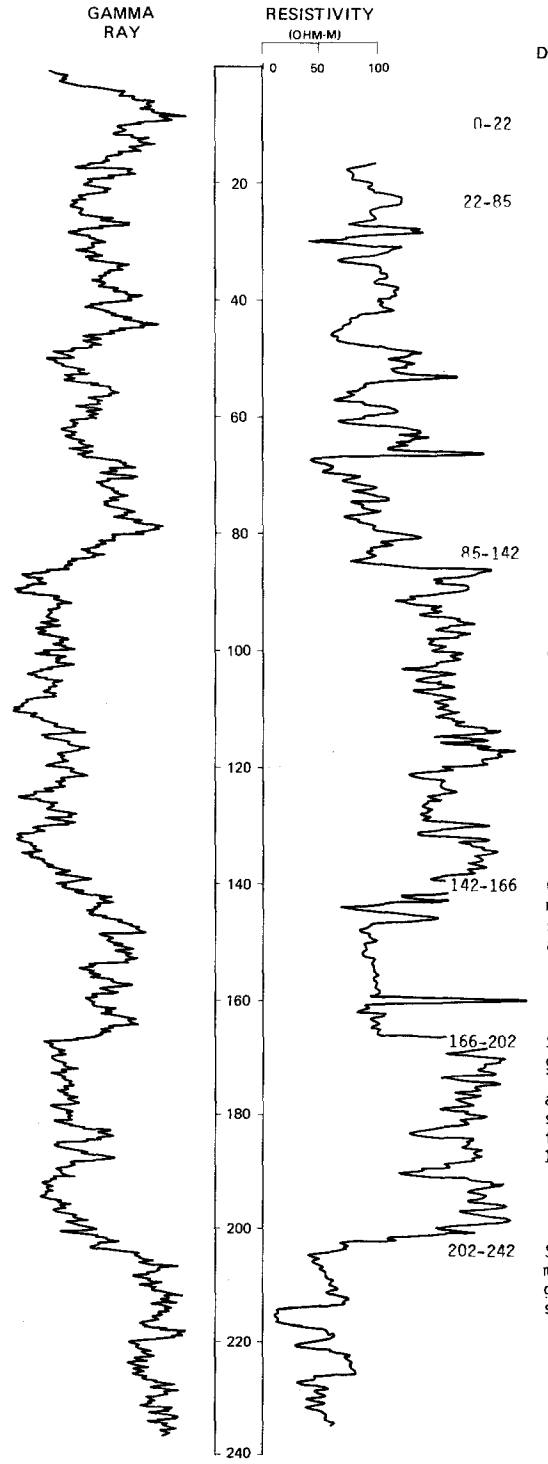
NDSWC 5410, 5410A

LOCATION: 136-073-16CCCC1, 2

DATE DRILLED: 11/06/78

ALTITUDE: 1942 (FT, NGVD)

DEPTH: 242 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-22 Clay (till), sandy, dark-yellowish-brown.

22-85 Silt, sandy, clayey, olive-gray to medium-dark-gray, plastic; scattered shale pebbles.

85-142 Sand, medium to very coarse, silty, and fine to medium silty gravel; composed largely of quartz, igneous, and shale fragments; silt and clay content greater in interval from 122 to 132 feet.

142-166 Clay (till), olive-gray to medium-dark-gray; numerous shale and limestone pebbles and thin silt lenses.

166-202 Sand, medium to very coarse, gravelly; 70 percent limestone, 20 percent quartz and igneous, and 10 percent shale grains; clay lenses from 182 to 184 and 186 to 188 feet.

FOX HILLS SANDSTONE

202-242 Sandstone, silty, medium-bluish-gray; numerous glauconitic green spots and sandy shale beds.

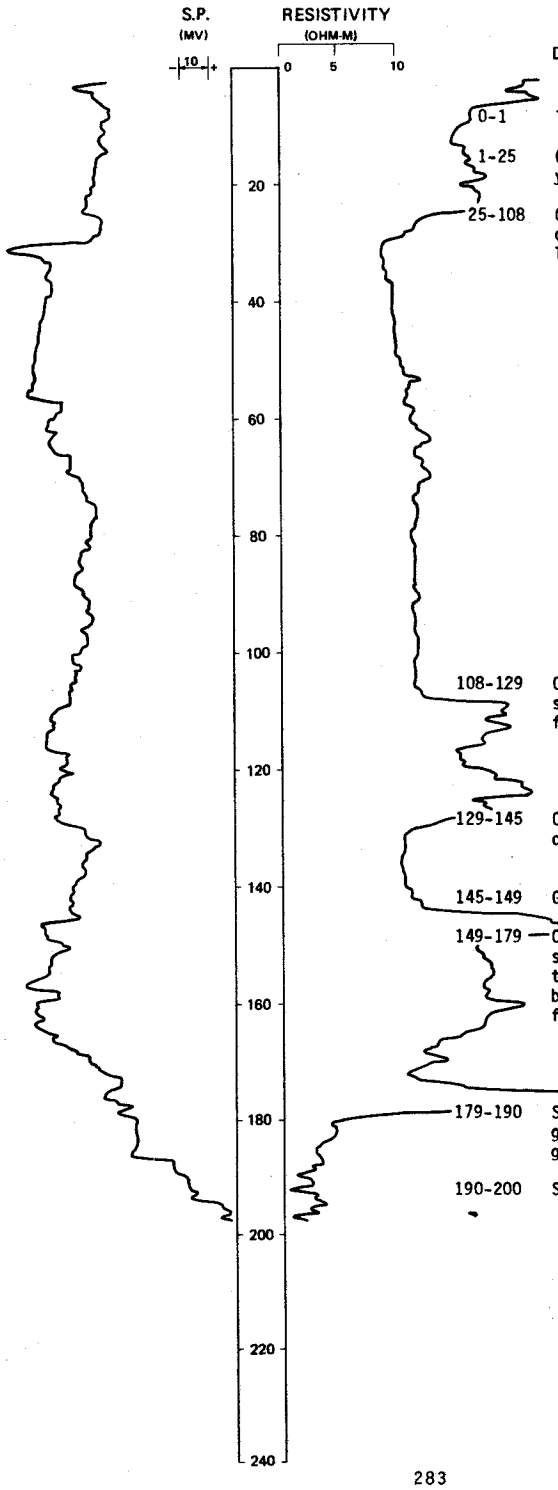
NDSWC 11171

LOCATION: 136-073-18DDB

DATE DRILLED: 10/18/79

ALTITUDE: 1905
(FT, NGVD)

DEPTH: 200
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, black.

1-25 Clay (till), silty, sandy, yellowish-brown.

25-108 Clay (till), silty, sandy, olive-gray; few thin sand lenses.

108-129 Clay (till), very sandy, silty, pebbly, olive-gray; few thin sand lenses.

129-145 Clay (till), silty, sandy, olive-gray.

145-149 Gravel and boulders.

149-179 Clay (till), very sandy, silty, pebbly, olive-gray; thin sand and gravel lenses; boulders from 175 to 178 feet.

FOX HILLS SANDSTONE

179-190 Sandstone, fine, greenish-gray, subangular to rounded, glauconitic.

190-200 Shale, silty, carbonaceous.

136-073-18DDD
NDSWC 11168

Altitude: 1952 feet — Date drilled: 10/17/79

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, black	2	2
	Sand, fine to very coarse, gravelly, subangular to rounded; 50 percent carbonate, 30 percent igneous, and 20 percent quartz grains	6	8
	Clay, silty, yellowish-brown	2	10
	Gravel	12	22
	Clay (till), silty, sandy, yellowish-brown	5	27
	Sand, fine to coarse, subangular to rounded, oxidized; 50 percent quartz, 25 percent carbonate, and 25 percent igneous grains	4	31
	Clay (till), silty, sandy, yellowish-brown	21	52
	Clay (till), silty, sandy, olive-gray	57	109
	Gravel	2	111
	Clay (till), silty, olive-gray	5	116
	Sand, medium to coarse, subangular to rounded; 50 percent quartz, 30 percent carbonate, and 20 percent igneous grains	8	124
	Clay (till), silty, olive-gray; few sand and gravel lenses	114	238
Fox Hills Sandstone:			
	Shale, greenish-gray; interbedded with fine greenish-gray sandstone	22	260

136-073-20BCC
NDSWC 11232

Altitude: 1937 feet — Date drilled: 4/24/80

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
Glacial drift:			
	Topsoil, dark-brown	1	1
	Clay (till), silty, sandy, pebbly, dark-yellowish-brown, calcareous; gravel lenses at 3, 9, and 12 feet	12	13
	Clay (till), silty, pebbly, sandy, brownish-gray, calcareous	13	26
	Silt, sandy, clayey, moderate-yellowish-brown, noncalcareous	8	34
	Silt, clayey, brownish-gray, calcareous	9	43
	Sand, fine to medium, predominantly medium, subrounded to rounded; 50 percent quartz, 30 percent igneous, and 20 percent carbonate grains	9	52
	Clay (lacustrine?), silty, brownish-gray, plastic	38	90
	Clay (till), silty, sandy, gravelly, brownish-gray; contains sandstone erratics	50	140
Fox Hills Sandstone:			
	Shale, hard, noncalcareous; interbedded with fine well-rounded glauconitic sand	40	180

136-073-20DDC
(Log from Brunner Well Drilling)

Date drilled: 6/24/72

Topsoil, black	3	3
Sand and gravel	14	17
Clay, yellow	23	40
Gravel	3	43
Clay, blue	47	90
Gravel and coal chips	4	94
Clay, blue	48	142
Sand, blue-green	11	153

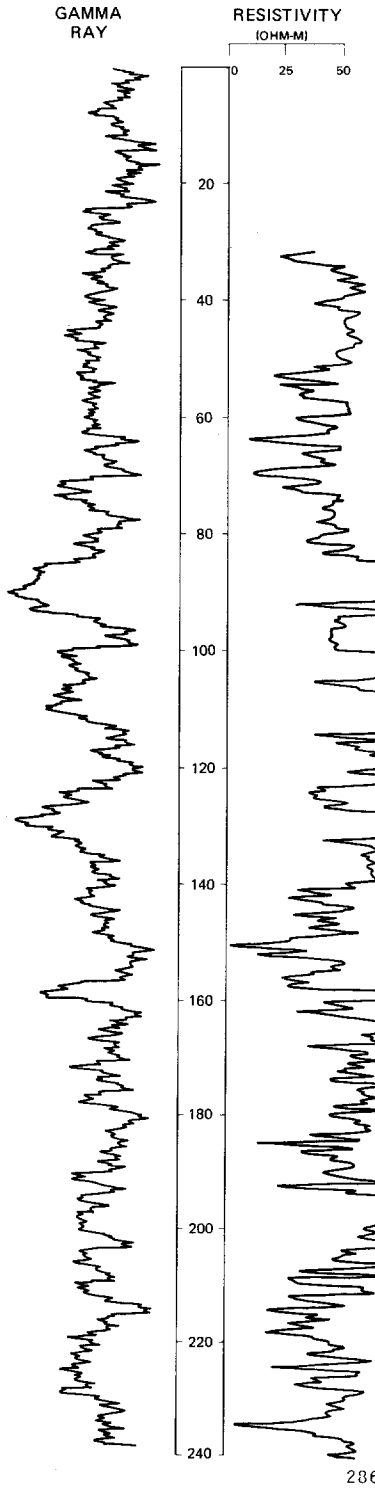
NDSWC 5409

LOCATION: 136-073-22AAA

DATE DRILLED: 11/03/78

ALTITUDE: 2024
(FT, NGVD)

DEPTH: 342
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-15	Clay (till), sandy, dark-yellowish-brown; few thin gravel lenses.
15-85	Clay (till), gravelly, silty, dark-gray to olive-gray.
85-94	Sand, very coarse; 70 percent limestone, 20 percent igneous and quartz, and 10 percent shale grains.
94-100	Clay (lacustrine), olive-gray.
100-112	Silt, sandy, clayey, dark-olive-gray.
112-124	Silt, clayey, dark-olive-gray.
124-134	Silt, sandy, clayey, dark-olive-gray; gravel lens from 128 to 132 feet.

FOX HILLS SANDSTONE

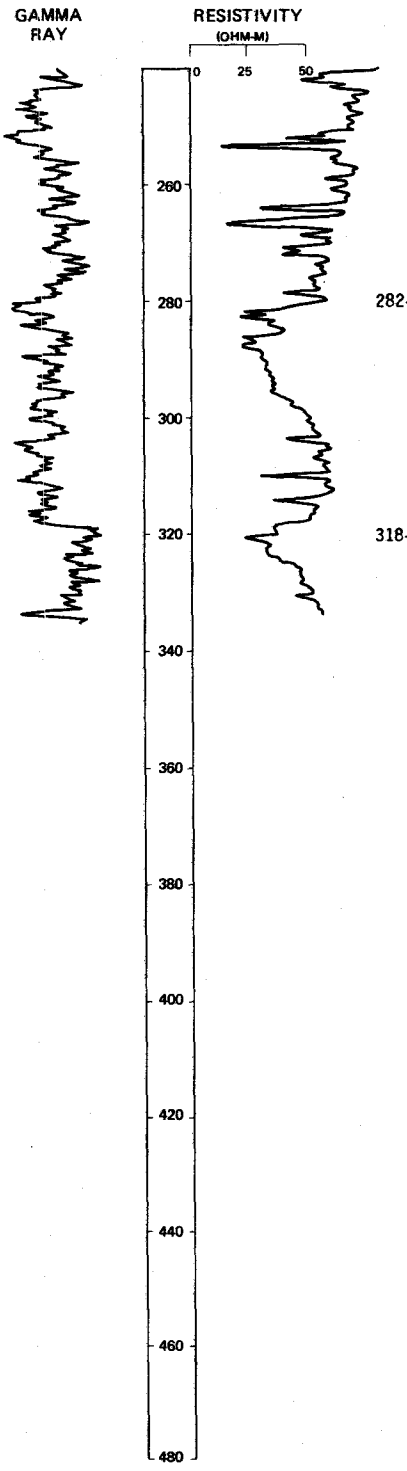
134-157	Siltstone, light-gray to medium-gray.
157-160	Sandstone, fine, cemented.
160-190	Sandstone, silty, greenish-gray, glauconitic; thin interbedded dark-gray shale.
190-230	Sandstone, fine to medium, silty, dark-gray, glauconitic; interbedded with grayish-black shale; some organic material.
230-282	Sandstone, fine to medium, dark-gray to bluish-gray, glauconitic; abundant organic material.

LOCATION: 136-073-22AAA

DATE DRILLED: 11/03/78

ALTITUDE: 2024 (FT, NGVD)

DEPTH: 342 (FT)



DESCRIPTION OF DEPOSITS

FOX HILLS SANDSTONE, Continued

282-318 Claystone, silty, medium-dark-gray to greenish-gray, siliceous; abundant fossil shell fragments.

PIERRE SHALE

318-342 Shale, dark-gray to grayish-black, siliceous.

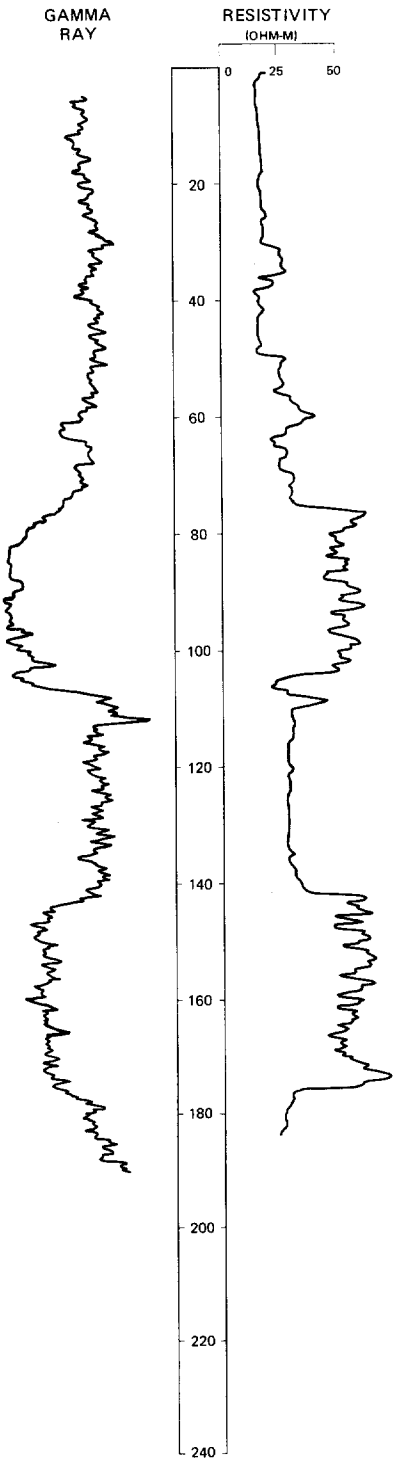
NDSWC 5455, 5455A

LOCATION: 136-073-26CBB1, 2

DATE DRILLED: 6/13/79

ALTITUDE: 1942 (FT, NGVD)

DEPTH: 197 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1	Topsoil, black.
1-20	Clay (till), silty, sandy, pebbly, yellowish-brown.
20-40	Clay (till), silty, sandy, pebbly, olive-gray.
40-50	Clay (lacustrine), olive-gray.
50-74	Clay (lacustrine), very silty.
74-104	Gravel, fine, sandy, well-rounded to subangular; composed of 60 percent shale, 20 percent silicate, and 20 percent carbonate pebbles.
104-133	Clay (till), silty, slightly sandy, olive-gray.
133-142	Clay (till), silty, sandy, pebbly, olive-gray.
142-175	Gravel, fine to coarse, predominantly fine to medium, sandy; 65 percent carbonate, 25 percent shale, and 10 percent silicate pebbles.

FOX HILLS SANDSTONE

175-197	Sandstone, very fine to fine, slightly clayey, dusky-blue-green; some glauconite and carbonaceous material.

136-073-27DDB
(Log from Brunner Well Drilling)

Date drilled: 6/14/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil	2	2
	Clay, yellow	10	12
	Gravel	8	20
	Clay, gray	16	36
	Sand, yellow	12	48
	Clay, gray	15	63
	Clay, blue	39	102
	Rock, white	1	103
	Sand and fine gravel; coal chips	37	140
	Gravel and small stones	24	164
	Clay, blue	2	166
	Sand, green	27	193

NDSWC 5453, 5453A

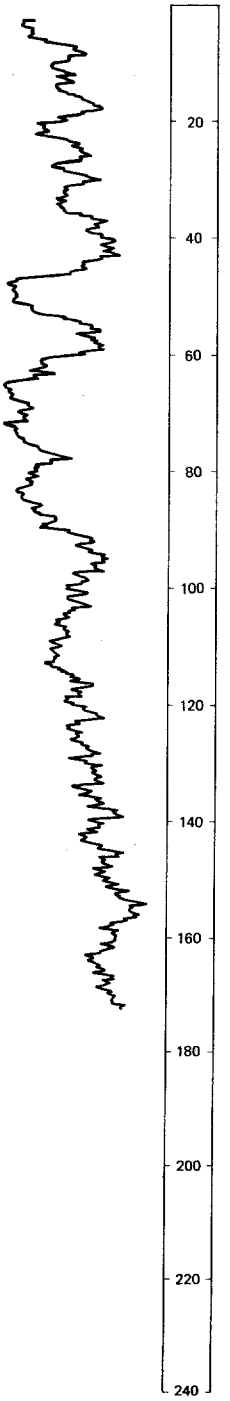
LOCATION: 136-073-28BBB1, 2

DATE DRILLED: 6/13/79

ALTITUDE: 1940
(FT, NGVD)

DEPTH: 182
(FT)

GAMMA RAY



DESCRIPTION OF DEPOSITS

0-1	Topsoil, black.
1-7	Sand, fine to very coarse, predominantly very coarse, gravelly, subangular to rounded; 60 percent carbonate, 20 percent shale, and 20 percent silicate grains.
7-46	Clay (till), silty, sandy, pebbly, olive-gray.
46-52	Sand, gravelly, clayey.
52-60	Clay (till), very sandy, olive-gray; scattered pebbles; few thin shale gravel lenses.
60-90	Sand, very fine to fine, predominantly very fine, gravelly, angular to subrounded; 50 percent quartz, 20 percent shale, 20 percent lignite, and 10 percent carbonate grains.
90-153	Sand, very fine to fine, silty, clayey; percentage of silt and clay increases with depth.

FOX HILLS SANDSTONE

153-182	Sand, very fine, greenish-gray, well-rounded, glauconitic; some mica and organic material.

136-073-30AAA
(Log from Brunner Well Drilling)

Date drilled: 10/14/74

GEOLOGIC SOURCE	MATERIAL	THICKNESS (FEET)	DEPTH (FEET)
	Topsoil----------	2	2
	Clay and sand, yellow----------	3	5
	Gravel----------	4	9
	Sand, yellow----------	27	36
	Clay, yellow----------	23	59
	Clay, gray----------	24	83
	Sand, yellow----------	6	89
	Clay, blue----------	30	119
	Sand, blue-green----------	14	133

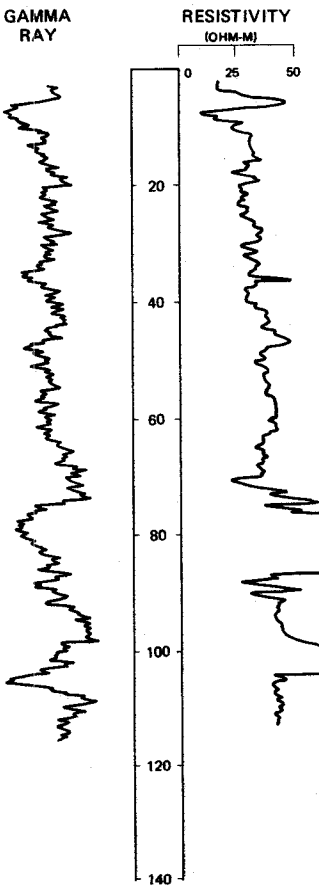
NDSWC 5454

LOCATION: 136-073-31ADC

DATE DRILLED: 6/13/79

ALTITUDE: 1915 (FT, NGVD)

DEPTH: 122 (FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-1 Topsoil, black.

1-10 Clay (till), silty, sandy, pebbly, yellowish-brown.

10-74 Clay (till), sandy, silty, pebbly, olive-gray; few thin sand lenses.

74-83 Sand, very fine to fine, moderate-brown to dark-yellowish-orange, iron-cemented.

83-104 Clay (till), silty, sandy, pebbly, olive-gray.

FOX HILLS SANDSTONE

104-122 Sandstone, very fine to fine, clayey, greenish-gray, glauconitic; some mica and magnetite.

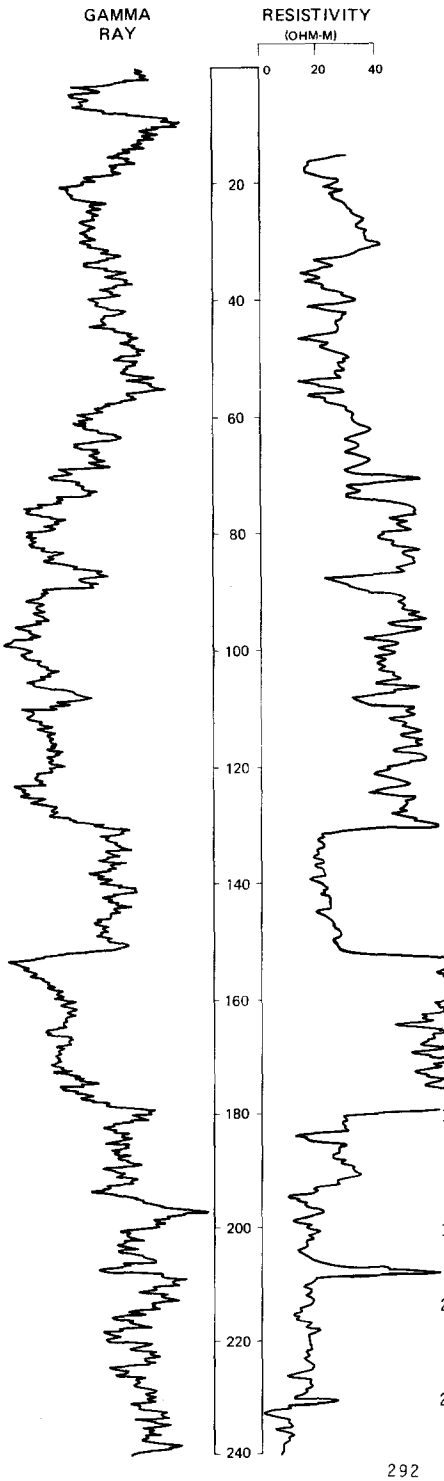
NDSWC 5414, 5414A

LOCATION: 136-073-35DDD1, 2

DATE DRILLED: 11/08/78

ALTITUDE: 1970
(FT, NGVD)

DEPTH: 282
(FT)



DESCRIPTION OF DEPOSITS

GLACIAL DRIFT

0-8	Gravel, fine to medium, and coarse to very coarse sand; oxidized; composed largely of limestone and quartz.
8-19	Clay, silty, moderate-yellowish-brown; very fine sand laminae.
19-58	Clay, silty, olive-gray; very fine sand laminae.
58-73	Silt (till), clayey, sandy, olive-gray.
73-130	Sand, fine to very coarse; 50 percent limestone, 30 percent shale, and 20 percent igneous and quartz grains.
130-151	Clay (till), sandy, dark-gray to olive-gray; few sand and gravel lenses.
151-178	Sand, fine to very coarse, predominantly medium to coarse, gravelly; few clay lenses.

FOX HILLS SANDSTONE

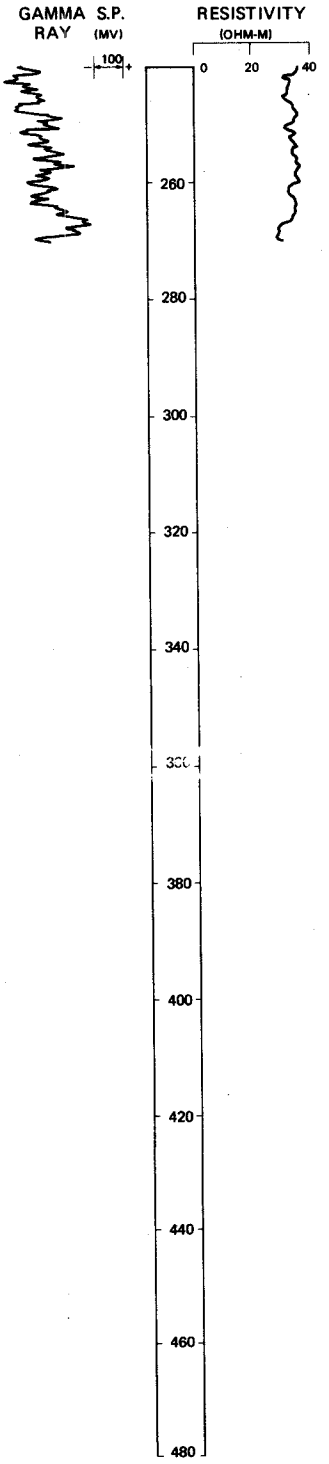
178-195	Sandstone, fine to medium, silty, grayish-blue-green to medium-bluish-gray, glauconitic; some mica and organic material.
195-208	Sandstone, fine to medium, silty, glauconitic; abundant organic material.
208-232	Claystone, silty, dark-gray to grayish-black, siliceous.
232-282	Shale, grayish-black, slightly siliceous; trace of glauconite at top.

LOCATION: 136-073-35DDD1, 2

DATE DRILLED: 11/08/78

ALTITUDE: 1970
(FT, NGVD)

DEPTH: 282
(FT)



DESCRIPTION OF DEPOSITS

TABLE 4.--Chemical analyses of ground water from wells

[Chemical analyses of ground water for major constituents are grouped according to aquifer.]

Principal aquifer

112, Pleistocene
211, Upper Cretaceous
217, Lower Cretaceous

BGFV, buried glaciofluvial deposits
BVLK, Beaver Lake aquifer
DKOT, Dakota Formation
FXHL, Fox Hills Sandstone
HBRG, Hillsburg aquifer system
MCNS, McIntosh aquifer
NPLN, Napoleon aquifer
OTSH, outwash deposits
PIRR, Pierre Shale
STRR, Streeter aquifer
WSHK, Wishek aquifer system

Specific conductance

Value shown is the field specific conductance measured at the well at the time of inventory.

LOCAL IDENTIFIER	PRINCIPAL AQUIFER	DEPTH OF WELL, TOTAL (FEET)	DATE OF SAMPLE	SPECIFIC CONDUCTANCE (UMHO/CM AT 25°C)	PH (UNITS)	TEMPERATURE (DEG C)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM ADSORPTION RATIO	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE FIELD-FLD (MG/L AS HCO3)	CARBONATE FIELD-FLD (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	BORON, DISSOLVED (UG/L AS B)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
133-067-02CBC	112GGFV	79	77-11-05	5600	7.5	8.0	2700	2400	680	240	140	10	1.2	16	293	0	1600	570	0.1	20	4220	360	<20	200	240
133-067-14ABB	112GGFV	300	77-11-02	1500	7.4	7.0	580	340	170	33	140	35	2.6	12	258	4	530	74	.1	16	1160	5.2	1000	2100	2400
133-067-15CDB	112GGFV	96	77-11-03	1550	7.3	--	350	0	87	32	270	62	6.3	9.5	619	15	370	31	.1	19	1130	1.0	520	910	760
133-067-20CCBB2	112GGFV	77	79-07-10	900	7.6	9.0	370	0	110	23	70	29	1.6	9.4	463	0	120	6.7	.2	15	593	1.0	270	100	640
133-067-29DCB	112GGFV	35	77-11-03	3500	7.1	7.0	1700	1200	380	190	360	32	3.8	18	515	10	1900	16	.1	19	3490	6.2	670	650	2100
133-068-10BBB	112GGFV	41	77-11-03	3300	7.6	7.0	1100	780	210	140	480	48	6.3	14	367	10	1700	53	.1	19	2920	8.5	1300	80	1400
133-068-21AAD	112GGFV	74	77-11-03	3800	6.8	7.0	1300	890	300	97	540	47	6.5	14	489	0	1900	66	.6	19	3960	24	1100	100	1500
133-069-01CDD	112GGFV	48	78-07-18	2000	7.5	9.1	1200	440	300	110	56	9	.7	13	459	0	850	74	.2	27	1840	19	420	<10	270
133-069-31AAA	112GGFV	20	78-07-18	1800	7.1	9.9	1000	660	280	73	39	8	.5	9.9	391	0	740	51	.2	28	1480	.30	420	200	3400
133-069-33DDD4	112GGFV	180	78-06-16	1990	7.1	9.0	790	360	220	58	200	35	3.1	12	575	0	670	68	.2	29	1590	1.0	360	710	2900
133-072-24DBB	112GGFV	77	78-07-13	580	7.0	8.7	310	5	82	26	6.1	4	.2	8.4	374	0	16	5.9	.1	23	339	1.0	340	2700	360
134-067-15CCD2	112GGFV	100	77-11-02	1650	--	7.0	380	0	110	26	280	61	6.2	12	652	10	450	14	.1	20	1650	1.0	570	1600	810
134-067-17CCC2	112GGFV	86	79-07-20	2600	8.0	9.0	1000	470	290	67	300	54	4.1	15	646	0	1000	25	.1	29	2020	1.0	1700	<20	1200
134-067-21BDB1	112GGFV	40	77-11-02	1800	7.4	7.0	920	550	230	84	160	19	1.4	5.7	435	7	750	18	.1	12	1520	1.0	240	6000	1800
134-067-34ABB	112GGFV	98	78-06-21	3000	7.2	8.3	1400	890	300	180	320	33	3.7	13	631	0	1400	42	.2	25	2830	55	540	200	540
134-068-09BCC	112GGFV	83	78-06-21	3600	7.1	8.1	2500	2200	530	290	190	14	1.6	25	445	0	2400	64	.2	25	4040	.70	100	790	13000
134-068-17DDD2	112GGFV	88	79-07-18	1150	7.2	8.0	420	91	120	29	110	36	2.3	9.4	400	0	310	29	.3	20	780	1.0	930	240	1500
134-068-18CCB1	112GGFV	80	78-06-21	1090	7.1	8.5	450	84	110	43	71	25	1.5	9.0	448	0	220	9.0	.3	20	745	.10	200	690	1400
134-068-18AAD	112GGFV	170	78-06-20	1680	7.0	8.9	950	620	240	55	44	9	.6	8.9	398	0	540	68	.2	18	1480	83	150	1200	3400
134-068-23BBA2	112GGFV	116	79-07-18	1650	7.2	8.6	540	230	150	40	100	28	1.9	9.2	373	0	400	17	.2	30	995	1.0	770	240	1800
134-068-28DCB	112GGFV	60	78-06-21	4500	6.8	7.8	2600	1700	430	370	180	13	1.5	52	1050	0	1100	230	.2	23	4320	920	100	3000	800
134-071-26ABA	112GGFV	45	78-06-27	890	7.6	9.4	470	140	120	41	13	6	.3	4.9	404	0	130	25	.1	16	660	18	780	220	3400
135-067-02CDD	112GGFV	44	78-06-07	2900	7.5	7.0	1600	1200	280	220	110	13	1.2	18	497	0	780	360	.2	25	2000	210	290	80	240
135-067-06DCD1	112GGFV	247	79-07-27	800	7.8	9.0	370	17	110	23	31	15	.7	7.2	430	0	190	3.6	.3	30	543	1.0	600	1300	680
135-067-06DCD2	112GGFV	104	79-08-01	860	9.2	--	430	81	130	26	53	14	.7	7.3	428	0	140	10	.2	28	630	1.0	<20	100	780
135-068-27CBC2	112GGFV	51	79-07-26	625	7.7	8.0	310	16	78	28	8.7	6	.2	4.2	356	0	37	1.6	.2	27	357	1.0	370	1200	640
135-068-06DCD1	112GGFV	45	79-07-24	875	7.7	8.5	430	140	100	44	27	12	.6	5.7	359	0	170	7.6	.2	26	586	1.0	570	60	840
135-068-08AAB	112GGFV	178	78-06-19	1120	7.4	7.9	370	65	110	23	130	43	2.9	9.8	373	0	340	18	.3	20	666	1.0	590	100	880
135-068-26CCD	112GGFV	60	78-06-20	3000	7.1	8.6	1500	1200	400	120	270	28	3.0	18	322	0	1000	150	.2	17	2950	4.7	590	690	1600
135-069-01CCC2	112GGFV	77	79-07-24	1500	8.1	9.0	480	180	120	44	150	40	3.0	11	371	0	480	24	.2	30	1010	1.0	970	220	1500
135-069-11CDC	112GGFV	--	79-09-05	600	6.6	8.0	320	26	79	30	26	15	.6	4.1	359	0	75	4.5	.2	29	408	.40	70	320	80
135-069-12CBA	112GGFV	--	79-09-05	650	6.8	9.0	410	95	110	33	16	8	.3	4.0	365	0	150	.7	.2	26	519	1.0	<20	80	480
135-069-12DDB	112GGFV	14	79-09-05	1280	6.9	8.5	550	210	110	67	52	11	.6	4.0	411	0	170	21	.3	29	776	99	<20	100	60
135-070-33DDD	112GGFV	100	78-06-15	1750	7.3	8.1	360	0	120	19	260	59	5.8	14	496	0	500	28	.2	23	1220	.40	490	280	1100
136-067-06AAA	112GGFV	79	59-01-22	--	--	--	490	180	120	46	160	40	3.1	16	371	0	480	28	.2	--	996	1.1	0	0	--
136-067-13CBC2	112GGFV	215	77-10-27	600	7.6	9.0	280	6	62	30	33	20	.9	5.6	330	0	68	7.1	.1	24	369	2.0	140	60	60
136-067-13CBD	112GGFV	36	77-10-27	1800	7.2	8.0	830	270	190	86	65	14	1.0	5.0	667	0	240	110	.1	23	1140	46	100	200	2400
136-067-14CBC2	112GGFV	100	79-08-03	1250	9.4	10.5	250	0	71	18	240	62	5.5	9.8	360	0	360	22	.4	29	902	.80	430	870	360
136-067-17BCC2	112GGFV	115	77-11-01	1450	7.2	7.5	570	210	170	34	140	34	2.6	14	430	0	480	59	.2	29	1100	--	660	20	1700
136-067-19ACD	112GGFV	115	78-02-16	1450	7.0	7.5	560	210	170	33	140	35	2.6	13	430	0	440	46	.2	29	1040	--	840	20	1800
136-067-19ACD	112GGFV	126	79-08-10	735	6.9	9.0	310	0	96	19	57	20	.9	6.7	396	0	81	<.1	.2	31	471	1.3	270	1000	---
136-068-04ACA1	112GGFV	310	79-08-02	2000	8.2	10.0	650	290	190	43	230	43	3.9	11	448	0	730	30	.2	29	1360	1.0	350	1300	560
136-068-10DDD	112GGFV	141	79-08-08	1700	7.7	8.0	500	170	140	36	210	47	4.1	11	398	0	540	85	.3	28	1180	.40	170	260	1200
136-068-21BCB2	112GGFV	122	79-08-08	1600	8.1	9.0	540	91	150	40	190	43	3.6	12	547	0	440	62	.2	26	1130	1.0	330	260	1300
136-069-02AAB	112GGFV	140	77-10-28	1100	7.3	--	280	0	76	17	180	59	4.9	9.4	405	0	270	22	.1	25	794	1.0	190	180	1000
136-069-11AAD	112GGFV	130	79-06-02	2300	8.2	10.0	1000	650	190	130	230	35	3.2	8.6	434	0	1100	36	.2	29	2150	.40	420	400	900
136-069-21BAA	112GGFV	200	77-10-27	1400	7.0	8.5	750	500	210	55	65	15	1.0	11	550	0	420	10	.1	28	1080	1.0	100	1900	2500
136-069-26ABC	112GGFV	180	79-08-03	1300	8.1	9.0	530	130	150	36	92	27	1.7	9.8	493	0	160	14	.1	31	922	2.0	<20	2800	980
133-071-05ABA	112GVLK	15	79-06-06	965	7.9	7.0	450	64	110	43	49	24	1.2	3.9	522	0	140	1.1	.2	22	607	1.0	<20	180	2300
133-071-27CDB1	112GVLK	28	78-07-14	810	7.1	--	380	76	100	32	34	16	.9	4.8	373	0	74	20	.1	23	571	48	340	100	220
133-071-27DCC	112GVLK	13	79-11-07	1070	7.6	9.0	390	96	90	40	100	35	2.2	6.2	381	0	280	16	.2	28	754	1.0	100	1100	700
134-071-14BBB	112GVLK	85	79-11-07	740	7.6	9.0	290	0	77	24	80	37	2.0	5.3	417	0	120	6.2	.2	28	525	1.0	100	100	1100
133-073-02DDC	112GVLK	16	79-05-30	1180	8.3	7.5	120	0	30	11	240	81	9.5	3.6	497	0	210	5.5	.2	18	809	7.0	270	40	20
133-073-24BBB2	112GVLK	15	79-05-31	1080	8.2	8.0	230	0	53	24	180	62	5.2	5.4	461	0	190	11	.4	17	729	1.2	510	100	90
133-073-28CDD	112GVLK	33	79-11-15	1130	8.1	8.0	280	0	75	23	180	57	4.7	6.1	507	0	220	8.8	.3	28	774	2.2	970	240	1500
134-071-03DDD	112GVLK	61	79-06-27	1000	8.5	10.0	280	0	65	18	120	47	3.1	9.7	346	0	230	18	.3	11	706	1.0	270	<10	1000
134-071-06DBD	112GVLK	32	79-10-24	446	7.8	7.5	260	5	75	16	2.6	2	.1	2.8	313	0	18	3.6	.1	26	302	1.0	60	530	760
134-071-12BBB	112GVWK	99	79-10-16	1500	8.0	11.0	340	0	36	02	230	59	5.4	10	541	0	380	8.7	.1	28	981	1.0	480	220	740
134-071-16ADA2	112GVLK	77	79-06-27	1150	7.9	8.0	270	0	77	19	160	55	4.2	8.4	494	0	210	7.5	.2	11	777	1.0	330	<10	1000
134-071-17ADA	112GVLK	62	79-10-24	680	7.4	7.5	370	30	100	29	12	7	.5	4.8	413	0	66	5.2	.2	28	444	1.0	60	0	1500

LOCAL IDENTIFIER	PRINCIPAL AQUIFER	DEPTH OF WELL, TOTAL (FEET)	DATE OF SAMPLE	SPECIFIC CONDUCTANCE (µMHO/CM AT 25°C)	PH (UNITS)	TEMPERATURE (DEG C)	HARDNESS (MG/L AS CACO3)	NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM ADSORPTION RATIO	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE FET-FLD (MG/L AS HCO3)	CARBONATE FET-FLD (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	BORON, DISSOLVED (UG/L AS B)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
134-071-26DAA	112BVLK	43	74-11-14	875	7.5	7.0	440	43	110	40	60	22	1.2	8.8	483	0	150	64	0.1	27	630	4.1	230	1400	410
134-071-30DDB	112BVLK	23	74-10-29	1250	7.5	7.0	550	160	100	68	95	27	1.8	10	456	0	250	94	.2	15	882	6.2	100	0	400
134-072-32DAU	112BVLK	25	78-07-06	1320	7.2	8.9	650	310	180	61	85	21	1.4	0.5	412	0	380	58	.1	23	1100	32	290	490	1500
134-069-03UUU1	112MBKG	165	79-07-20	2200	7.3	9.5	360	0	96	29	390	64	9.0	11	501	0	730	56	.4	29	1650	1.0	500	20	1400
134-069-03UUU2	112MBKG	38	79-07-20	1080	7.1	8.0	380	38	110	26	110	38	2.5	7.2	419	0	240	10	.2	29	772	1.0	<20	590	1200
134-069-04CDD	112MBKG	35	78-06-22	1240	7.1	7.9	740	330	190	65	17	5	.3	4.3	505	0	100	90	.1	18	1050	160	<20	40	40
134-069-20BBA	112MBKG	70	78-06-22	2450	7.5	8.3	1300	900	160	220	78	11	.9	7.1	492	0	270	110	.4	16	2130	760	<20	20	300
134-069-20UUU2	112MBKG	23	79-06-07	575	8.3	9.0	290	51	70	26	14	9	.4	2.8	292	0	79	2.0	.1	25	355	7.4	<20	140	300
134-069-22CCC	112MBKG	28	78-06-22	900	7.8	7.6	330	29	63	42	75	32	1.8	10	367	0	120	27	.2	18	632	55	<20	<10	120
134-069-27ADA	112MBKG	261	79-06-07	1730	8.4	9.5	260	0	75	18	300	70	8.1	11	358	0	250	280	.3	27	1100	1.0	<20	<10	1300
134-069-34CCC2	112MBKG	91	79-06-07	760	7.7	8.0	290	0	84	19	68	33	1.7	6.4	380	0	120	11	.2	26	514	1.0	30	40	1900
134-070-24CDC2	112MBKG	50	79-06-01	620	9.3	--	310	15	86	22	16	10	.4	5.1	340	10	51	3.7	.2	30	393	1.0	<20	260	920
134-070-34DCB	112MBKG	40	78-06-27	1080	7.5	9.0	520	200	120	54	55	18	1.0	5.4	391	0	240	28	.2	26	808	1.4	240	120	360
135-069-27CCD2	112MBKG	28	79-06-14	2800	7.7	9.5	1600	1400	360	170	120	14	1.3	13	<92	0	1500	44	.3	27	2840	1.0	70	430	600
135-069-28DDA	112MBKG	28	78-06-16	1530	7.7	7.3	860	300	170	57	110	26	1.9	16	435	0	500	29	.2	22	1160	1.0	<20	710	400
135-066-30DCB	112MCNS	121	79-06-01	2250	8.3	8.0	800	210	170	43	290	50	5.1	20	466	0	860	30	.2	29	1620	1.0	770	530	2400
135-069-36DAC	112MCNS	21	78-07-18	1250	7.5	8.1	860	480	150	64	25	8	.4	2.3	216	0	500	15	.2	25	985	1.0	<20	40	1300
135-072-10DDB	112MPLN	67	78-11-16	905	7.6	7.5	390	91	130	16	56	23	1.2	8.6	414	0	160	5.8	.2	23	676	1.0	70	40	1200
135-072-17CAB1	112MPLN	70	78-07-12	500	7.3	8.5	250	9	69	19	12	9	.3	3.1	294	0	41	.9	.1	24	316	1.0	<20	140	840
135-072-17CAB2	112MPLN	70	78-07-19	510	7.2	8.5	260	20	66	22	12	9	.3	6.7	293	0	40	2.0	.1	28	305	1.0	50	100	690
	112MPLN	70	78-07-19	510	7.2	8.5	270	44	73	22	12	9	.3	5.3	280	0	51	1.9	.1	26	334	--	80	70	--
	112MPLN	102	78-07-12	790	7.3	8.5	390	0	98	17	120	56	3.8	12	405	0	77	<.7	.2	24	526	1.0	590	360	800
	112MPLN	102	78-07-19	770	7.2	8.4	390	0	90	16	110	54	3.5	8.0	445	0	72	3.7	.2	27	514	.38	180	300	720
	112MPLN	102	78-09-08	817	6.6	9.0	390	--	90	16	120	57	3.8	7.6	--	--	90	4.0	.2	27	512	--	480	320	720
135-072-18AAU	112MPLN	75	79-05-08	770	7.8	10.5	380	18	100	32	28	14	.6	5.8	448	0	86	6.8	.2	29	546	1.0	500	100	1300
135-072-19BAA	112MPLN	36	80-05-05	3500	7.1	8.5	520	71	140	41	69	22	1.3	5.9	545	0	110	180	.1	27	780	1.4	100	330	1200
135-073-01AAB	112MPLN	101	79-06-21	1050	7.7	8.0	390	0	100	38	97	35	2.1	7.0	556	0	120	4.8	.1	15	700	1.0	200	60	1800
135-073-04ABB	112MPLN	16	78-11-16	645	8.1	10.0	190	0	26	22	63	46	2.3	17	278	0	57	2.7	.1	20	352	1.5	550	180	480
135-073-11DDB	112MPLN	31	78-11-16	490	8.1	7.5	220	52	64	15	7.7	7	.2	5.9	207	0	61	2.9	.1	17	308	1.0	60	120	260
136-073-16CBB2	112MPLN	90	79-06-14	825	7.7	8.0	310	0	83	24	59	28	1.5	8.8	408	0	100	5.2	.2	11	523	1.0	70	<10	1600
136-073-16CCC1	112MPLN	195	79-05-03	750	7.7	8.0	310	0	88	23	58	28	1.4	7.9	416	0	94	3.9	.1	30	514	1.0	300	140	1500
136-073-16CCC2	112MPLN	137	78-11-15	740	7.5	7.5	310	0	89	21	55	27	1.4	6.4	407	0	100	3.9	.1	28	540	1.0	70	100	1400
136-073-26DBB1	112MPLN	180	79-06-22	1050	7.4	8.0	470	30	100	56	43	16	4.3	7.8	575	0	120	14	.6	13	727	1.0	1000	160	1500
136-073-26DBB2	112MPLN	94	79-06-22	780	7.5	8.0	380	14	110	26	32	15	.7	7.9	448	0	84	7.0	.2	15	519	1.0	70	<10	1900
136-073-26BBB2	112MPLN	94	79-06-22	780	7.5	8.0	360	0	98	30	37	18	.9	8.0	--	--	100	<.5	.3	33	507	--	240	<10	1900
136-073-31ADC	112MPLN	67	79-06-14	735	7.7	8.0	320	0	87	25	43	22	1.0	7.2	398	0	88	3.2	.2	10	470	1.0	80	<10	1400
136-073-31AUC	112MPLN	81	79-06-21	650	8.0	8.0	250	0	60	24	43	27	1.2	7.8	335	0	75	2.2	.3	19	411	1.0	30	140	300
136-073-35DUU1	112MPLN	171	79-05-08	1200	8.3	7.0	260	0	78	21	180	57	4.7	7.5	591	0	170	22	.4	26	769	.20	390	160	2100
136-073-35DUU2	112MPLN	121	79-05-03	1000	8.1	8.0	330	0	99	20	110	41	2.6	6.4	541	0	110	4.2	.1	24	605	.20	270	120	1000
133-068-11DAU	112UTSH	22	77-11-03	1650	7.2	8.0	620	490	160	58	180	56	3.1	13	467	0	550	28	.1	21	1300	15	520	100	660
134-073-11CCC2	112UTSH	35	78-11-22	--	7.2	7.5	210	0	50	21	80	44	2.4	8.1	375	0	62	4.1	.3	45	461	.50	230	530	840
135-067-27AAU1	112UTSH	20	77-11-02	485	7.5	8.0	280	32	74	18	5.3	4	.1	2.6	264	0	45	6.6	.1	16	387	1.0	140	850	560
135-067-30AAA2	112UTSH	33	79-07-24	565	8.0	9.5	300	9	88	33	12	8	.3	2.9	298	0	40	2.0	.4	25	354	1.0	800	40	200
135-068-20CCB	112UTSH	18	78-06-20	750	7.7	7.1	380	87	100	32	8.0	4	.2	3.3	359	0	90	2.3	.1	15	478	1.0	30	40	3500
134-069-04DCC2	112STHK	140	78-06-22	740	7.5	7.9	400	95	100	36	7.9	4	.2	2.6	369	0	80	16	.1	18	371	34	<20	<10	160
135-069-09CCC	112STHK	33	78-06-16	1750	7.2	7.9	930	540	270	82	57	12	.8	8.2	476	0	450	150	.2	21	1270	51	200	<10	1100
135-069-16DAA3	112STHK	19	78-06-21	1370	7.5	7.2	690	420	140	83	51	9	.5	5.4	329	0	140	35	.5	19	1110	570	50	1100	80
135-069-21BAB2	112STHK	34	79-07-25	530	8.0	8.0	230	0	62	16	51	22	.9	5.6	292	0	51	2.8	.3	29	298	1.0	670	80	960
136-069-04CCC2	112STHK	74	79-06-19	1600	7.9	8.5	480	50	130	38	210	46	4.2	11	518	0	460	39	.2	29	1150	1.0	130	220	620
136-069-09DAU	112STHK	46	77-10-27	1750	7.3	8.0	790	470	210	64	64	15	1.0	5.0	568	0	340	160	<.1	28	1120	4.3	100	180	460
136-069-16CCC2	112STHK	56	79-10-23	790	7.4	7.0	440	82	110	40	41	17	.9	5.4	436	0	170	10	.2	26	561	1.0	30	280	880
136-070-04CCB	112STHK	51	79-09-11	650	--	9.0	300	11	74	26	27	16	.7	4.0	352	0	85	.7	.2	29	388	1.0	70	450	1200
136-070-04CCC2	112STHK	56	79-09-04	720	--	8.0	310	33	72	32	26	15	.6	3.9	340	0	90	<.1	.2	30	456	.90	<20	200	1100
	112STHK	56	79-09-05	680	--	9.0	310	32	71	32	26	15	.6	4.0	338	0	84	<.1	.2	29	470	1.0	70	180	1100
136-070-04CCC3	112STHK	56	79-09-06	--	--	9.0	326	90	73	33	26	15	.6	3.8	339	0	87	<.1	.2	29	426	1.0	330	180	1100
136-070-04CCC4	112STHK	59	79-09-11	700	--	10.0	310	82	74	34	26	15	.6	4.0	349	0	84	.6	.2	29	440	1.0	<20	20	1200
136-070-04CCD1	112STHK	53	79-09-11	690	--	11.0	330	93	74	35	25	14	.6	4.0	348	0	85	<.1	.2	28	404	1.0	100	60	1200
136-070-04LLL5	112STHK	21	79-09-11	690	--	12.0	320	59	71	35	25	14	.6	4.0	348	0	89	.9	.2	28	416	1.0	170	60	740
136-070-05AAA1	112STHK	115	79-10-11	1380	8.3	9.0	350	0	68	44	200	55	4.6	8.0	562	0	240	70	.4	27	905	1.0	360	520	760

LOCAL IDENTIFIER	PRINCIPAL AQUIFER	DEPTH OF WELL, TOTAL (FEET)	DATE OF SAMPLE	SPECIFIC CONDUCTANCE (UMHO/CM AT 25°C)	PH (UNITS)	TEMPERATURE (DEG C)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM ADSORPTION RATIO	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE FET-FLD (MG/L AS HCO3)	CARBONATE FET-FLD (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	BORON, DISSOLVED (UG/L AS B)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
136-070-05AAA2	112STRM	58	79-10-11	530	7.2	8.5	250	23	64	22	27	19	.7	3.4	277	0	81	7.0	0.2	29	374	1.0	30	20	980
136-070-05AAD	112STHM	61	79-08-08	530	7.5	8.0	250	51	68	20	9.5	7	.5	2.8	245	0	68	2.1	.1	29	364	1.0	<20	<10	1000
136-070-06BBB1	112STRM	161	78-11-08	1520	7.5	9.0	220	0	55	20	270	72	7.9	19	650	0	130	100	.4	22	948	1.0	680	60	860
136-070-06BBB2	112STHM	42	79-11-11	570	7.3	8.0	270	51	73	21	21	14	.6	3.3	290	0	75	5.7	.2	29	341	.50	0	140	980
136-070-07DAD	112STRM	20	77-11-01	1400	7.7	9.5	500	65	82	110	49	21	2.1	81	500	15	320	55	.2	17	984	4.5	280	60	160
136-070-08AAA	112STHM	52	79-09-11	600	--	--	300	29	74	28	27	16	.7	4.8	331	0	79	.5	.2	26	410	1.0	200	200	1200
136-070-13BCC	112STHM	80	77-10-28	680	7.4	8.0	260	0	69	21	26	18	.7	5.8	331	0	29	6.1	<.1	25	358	1.0	240	40	60
136-070-15CCC2	112STHM	52	78-11-02	525	7.6	9.5	270	30	67	25	30	19	.8	4.5	293	0	100	4.4	.2	26	417	.20	200	60	800
136-070-16BBB2	112STHM	52	78-11-01	650	7.2	9.5	290	42	70	28	27	17	.7	4.4	302	0	100	4.1	.1	27	432	.20	1	0	<10
136-070-17DDD1	112STHM	164	78-10-27	1950	7.6	9.5	270	0	84	15	320	71	8.5	12	664	0	190	190	.5	26	1220	.70	550	<10	1100
136-070-17DUU2	112STHM	42	79-10-11	560	7.8	9.0	290	75	74	26	12	8	.5	2.4	264	0	100	6.5	.1	29	373	1.0	60	60	980
136-070-18BBA1	112STHM	152	80-05-06	--	7.6	7.5	170	0	43	15	250	75	8.4	7.3	560	0	200	51	.5	25	842	1.0	640	10	910
136-070-18BBA2	112STHM	37	80-05-05	--	7.0	8.0	280	12	69	26	24	16	.6	2.8	326	0	61	6.6	.2	27	351	1.0	160	10	1200
136-070-20UUA	112STHM	36	80-05-05	--	7.0	8.5	270	56	69	24	25	17	.7	2.1	262	0	110	5.2	.1	27	407	1.0	160	10	650
136-070-23AAA1	112STHM	116	79-05-02	895	7.7	8.0	350	0	100	24	66	29	1.5	8.8	420	0	140	14	.2	27	547	1.0	530	80	1300
136-070-23AAA2	112STHM	47	79-10-11	612	7.8	8.5	330	77	82	30	17	10	.4	3.1	306	0	110	7.7	.2	29	432	1.0	0	550	810
136-070-23ACC	112STHM	65	79-06-15	660	7.1	8.0	310	56	82	28	23	14	.6	3.2	310	0	110	.4	.1	30	458	2.3	300	650	800
136-070-26ABAC2	112STRM	51	79-06-10	600	7.3	8.0	280	47	68	27	22	14	.6	3.6	285	0	87	1.7	.1	27	365	2.0	270	180	440
136-070-26BBB2	112STHM	43	78-11-31	630	7.5	7.5	290	25	68	29	37	21	.9	4.5	322	0	110	5.4	.1	26	435	1.0	<20	140	500
133-070-31DAA	112SHM	41	79-11-15	830	8.0	7.5	370	31	97	31	39	18	.9	8.5	413	0	93	7.9	.2	25	484	1.0	190	400	770
133-069-12BCD	211FXML	140	78-07-18	2300	7.4	8.2	400	0	96	38	450	84	9.5	11	502	0	800	51	.2	29	1710	.50	980	670	440
133-069-22BBB1	211FXML	140	78-07-18	1250	7.4	7.9	170	0	46	13	240	75	8.0	6.6	526	0	230	16	.1	28	863	.50	620	220	40
133-070-04DDD	211FXML	59	78-07-17	1700	7.3	8.1	270	0	70	23	330	72	8.7	11	772	0	300	56	.1	26	1200	.50	1100	180	420
133-070-05CAA2	211FXML	45	78-06-16	1150	7.5	--	130	0	33	12	220	77	8.3	6.6	505	0	190	4.1	.2	19	735	5.2	670	1200	140
133-070-08BBD	211FXML	28	78-07-18	1000	7.4	8.0	540	130	130	52	30	11	.6	7.8	494	0	200	6.7	.1	21	789	1.0	30	1400	210
133-070-14DDB	211FXML	110	78-07-18	1650	7.6	9.1	130	0	37	9.1	390	86	15	8.9	614	0	440	45	.2	24	1240	.40	1300	20	40
133-070-29CAB	211FXML	60	78-07-18	1800	6.7	--	1100	600	280	97	25	5	.5	14	608	0	650	14	.1	25	1540	1.0	30	1500	810
133-070-30CCD	211FXML	52	79-07-10	1150	7.5	9.0	880	680	140	80	18	5	.5	6.8	491	0	360	5.0	.2	13	869	1.0	<20	380	500
133-071-01BCC	211FXML	280	78-07-17	2080	6.6	6.9	1000	310	260	85	140	23	1.9	14	835	0	630	9.8	<.1	27	1760	1.0	420	2500	460
133-071-09BBB	211FXML	180	78-07-17	1780	8.1	8.9	23	0	5.8	2.1	290	96	26	4.8	457	0	75	32	.4	19	720	1.0	1200	40	30
133-071-25BCU	211FXML	58	78-07-13	1150	7.1	8.9	460	79	110	45	86	28	1.7	10	468	0	180	34	.2	16	808	75	280	100	100
133-072-04BBC	211FXML	145	78-07-12	1270	8.0	8.9	44	0	11	4.0	300	93	20	2.6	615	0	96	80	.5	14	794	1.0	2400	260	40
133-072-06DDD	211FXML	300	78-07-11	1420	8.2	9.8	36	0	9.1	3.3	350	95	25	1.5	634	0	230	16	.5	15	972	1.0	2000	450	60
133-072-07BBC	211FXML	260	78-07-11	1270	7.3	9.6	100	0	29	6.7	270	85	12	4.5	556	0	220	2.8	.2	18	650	1.0	980	320	120
133-072-15CCC	211FXML	114	79-07-10	875	--	9.0	340	0	84	32	68	30	1.6	9.3	529	0	66	.9	.1	23	579	1.0	170	510	<10
133-072-34CBB	211FXML	280	78-07-12	810	7.1	9.6	180	0	48	15	120	58	3.9	8.3	435	0	79	2.3	.1	39	534	1.0	490	3500	220
133-073-04DDD	211FXML	160	78-07-11	825	7.3	9.1	320	73	79	30	58	27	1.4	14	302	0	200	2.1	.3	24	581	1.0	240	3800	240
133-073-08AUU	211FXML	100	78-07-11	720	7.5	--	230	35	60	20	68	36	1.9	10	240	0	170	1.7	.2	17	497	1.0	640	490	180
133-073-34CAU	211FXML	50	78-07-10	2100	7.1	7.8	770	580	150	96	210	57	3.5	8.8	470	0	680	6.6	.2	19	1610	130	50	100	60
134-070-27ADA	211FXML	160	78-06-26	1400	7.4	8.1	250	0	61	24	220	65	6.0	7.4	478	0	330	21	.1	28	951	1.0	830	470	180
134-070-30ACD	211FXML	208	78-06-27	2180	7.3	7.8	540	0	86	30	450	74	11	10	900	0	510	50	.1	20	1650	3.2	1700	450	110
134-071-13ACG	211FXML	105	78-06-27	650	7.3	9.0	310	1	77	29	29	16	.7	7.3	379	0	66	2.5	.3	57	436	1.0	200	530	320
134-071-16AAU	211FXML	194	78-06-28	1450	--	8.5	690	110	170	65	120	27	2.0	13	712	0	340	4.7	<.1	22	1070	1.0	590	9500	170
134-071-20CBB	211FXML	98	79-11-14	900	7.8	7.5	370	0	83	40	95	35	2.1	9.7	455	0	190	4.4	.1	21	657	9.7	320	1100	120
134-071-21BCC	211FXML	158	78-06-28	840	--	8.9	380	25	98	32	28	14	.6	7.5	432	0	96	3.0	.1	22	505	1.1	420	550	160
134-071-21CDC	211FXML	202	78-07-06	900	7.1	8.8	390	0	100	34	66	26	1.5	8.7	504	0	110	3.2	.2	26	579	.30	290	510	230
134-071-22BBA	211FXML	160	78-07-06	1220	7.6	--	200	0	49	19	220	69	6.8	10	507	0	250	6.8	.2	21	833	5.2	980	260	70
134-071-31AAA	211FXML	180	78-06-28	1330	--	9.0	490	0	120	40	150	54	5.0	14	631	0	290	5.6	.2	19	948	18	830	910	220
134-072-10UAA	211FXML	204	78-11-22	640	8.4	7.0	16	0	5.1	.9	170	95	18	3.4	427	0	30	3.8	.1	14	458	.40	280	120	20
134-072-18CBC	211FXML	260	78-07-05	1450	6.7	8.5	670	210	170	60	110	26	1.8	14	560	0	350	27	.6	22	1230	61	930	<10	250
134-072-22BBC	211FXML	280	78-07-11	1040	7.2	8.6	410	0	100	39	96	33	2.1	6.9	540	0	170	1.2	.1	18	708	.60	760	690	120
134-072-26DDD	211FXML	110	78-07-05	1320	8.1	8.9	46	0	11	4.5	320	93	21	5.7	688	0	120	45	.3	17	877	1.0	1200	20	30
134-073-05AAD	211FXML	178	78-07-07	560	7.2	9.0	290	43	87	16	9.3	6	.2	3.7	303	0	42	11	.1	16	355	11	<20	160	90
134-073-05CCC	211FXML	134	79-05-30	1050	8.5	8.5	340	180	140	46	12	5	.2	9.5	441	0	200	6.8	.2	14	604	1.0	60	<10	240
134-073-12CUC	211FXML	260	78-07-06	1400	7.1	8.0	490	0	110	52	170	42	3.3	11	692	0	260	4.3	.1	24	1020	2.8	650	360	160
134-073-15BUB	211FXML	200	78-07-07	800	7.8	8.0	60	0	16	4.9	170	85	9.5	5.5	410	0	74	10	.4	17	538	4.5	420	200	<10
134-073-21CUU	211FXML	74	79-05-31	2780	7.8	8.0	1300	690	230	180	280	30	3.1	21	520	0	1400	1.1	.7	32	2490	1.0	110	1900	740
134-073-32ACC	211FXML	170	78-07-07	650	8.5	--	24	0	4.3	3.3	150	92	13	5.8	369	2	26	5.1	1.1	17	423	3.1	850	240	20
134-073-35CBD	211FXML	100	78-07-07	940	7.6	--	63	0	16	5.6	220	88	12	3.5	539	0	92	6.9	.4	16	630	4.3	690	570	30
135-070-02BCC	211FXML	250	79-08-14	2000	7.9	8.0	450	0	110	43	310	59	6.3	13	666	0	560	14	.1	21	1450	.00	730	14000	480

LOCAL IDENTIFIER	PRINCIPAL AQUIFER	DEPTH OF WELL, TOTAL (FEET)	DATE OF SAMPLE	SPECIFIC CONDUCTANCE (µMHO/CM AT 25°C)	PH (UNITS)	TEMPERATURE (DEG C)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM ADSORPTION RATIO	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE FET-FLD (MG/L AS HCO3)	CARBONATE FET-FLD (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	BORON, DISSOLVED (UG/L AS B)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
135-070-12CDD	211FXHL	135	78-05-25	1600	7.0	--	440	0	100	46	230	52	4.8	14	577	0	440	17	0.1	26	1190	4.8	640	400	650
135-070-14CAD	211FXHL	200	78-06-15	2150	6.9	8.8	740	110	210	52	260	43	4.2	15	764	0	680	12	.1	22	1660	4.8	640	1000	140
135-071-08BDC	211FXHL	200	78-06-14	680	7.4	9.4	280	0	78	21	42	24	1.1	8.8	386	0	66	2.6	.1	15	450	1.0	<20	450	80
135-071-13ABC	211FXHL	113	78-06-14	1430	7.4	8.0	340	0	110	16	210	56	5.0	13	591	0	290	20	.3	24	995	.50	730	1400	1400
135-071-15BBD	211FXHL	204	78-06-14	1380	7.0	8.9	620	98	180	41	98	25	1.7	13	834	0	320	3.9	.1	20	1010	1.0	100	810	160
135-071-20ABA	211FXHL	213	78-06-15	1230	7.5	--	310	0	89	21	180	55	4.5	9.1	574	0	220	3.9	.1	18	814	1.0	540	570	20
135-071-30BBB	211FXHL	194	79-06-26	580	8.3	--	230	0	55	23	40	27	1.1	6.8	332	0	40	5.4	.1	7.0	358	.00	<20	<10	300
135-072-01CDC	211FXHL	296	78-05-26	750	7.2	8.0	470	36	110	47	16	7	.5	10	527	0	81	3.7	.5	24	591	1.0	<20	1400	410
135-072-09AAD	211FXHL	144	79-06-26	900	8.3	9.0	330	0	79	32	82	34	2.0	9.5	504	0	110	6.7	.1	7.9	596	<.20	150	20	200
135-072-20BCB	211FXHL	148	80-05-05	--	8.5	9.0	51	0	12	5.1	370	93	23	4.8	812	0	190	7.1	.3	18	1000	1.0	1700	30	20
135-072-27DDD	211FXHL	180	78-05-26	780	7.5	5.5	190	0	47	18	110	54	3.5	7.5	437	0	57	4.2	.1	22	480	2.5	50	20	80
135-072-32BAB	211FXHL	224	78-06-09	1520	7.9	8.9	42	0	12	2.4	390	95	26	4.8	611	0	220	7.6	.3	20	1070	1.0	2300	100	40
135-073-15DCC	211FXHL	104	78-11-21	1080	6.9	7.5	160	0	36	17	200	72	6.9	7.9	579	0	100	7.3	.1	18	704	1.0	600	100	60
135-073-20AUU	211FXHL	200	78-06-06	950	7.3	9.0	270	0	60	29	110	46	2.9	8.5	457	0	150	4.4	.2	36	636	1.0	490	950	60
135-073-20BAA	211FXHL	220	78-06-08	910	7.2	8.7	440	5	100	46	50	19	1.0	12	529	0	150	2.8	.1	55	847	1.0	390	1100	140
135-073-22CCC	211FXHL	180	78-06-08	1480	7.6	8.6	210	0	51	20	300	74	9.0	11	795	0	210	6.1	.1	20	1020	1.0	880	430	60
135-073-24AAC	211FXHL	220	78-06-15	740	6.6	9.0	390	51	100	34	10	5	.2	6.5	413	0	82	1.7	.2	21	480	1.0	150	11000	300
135-073-36DAC	211FXHL	868	78-06-09	1550	8.4	8.5	24	0	7.3	1.5	380	97	33	3.7	672	0	250	31	.5	16	1030	1.0	2900	200	20
136-070-29UUA	211FXHL	190	79-09-06	1550	7.2	9.2	210	0	51	20	300	75	9.0	8.3	677	0	250	36	.4	28	893	.40	370	490	840
136-071-02CDD	211FXHL	200	78-06-07	1150	7.3	9.1	390	0	87	42	120	39	2.6	8.4	566	0	210	28	.2	21	780	3.3	540	40	200
136-071-10DBA	211FXHL	100	79-05-03	1230	8.7	7.0	350	0	79	37	170	51	4.0	10	580	0	230	6.6	.1	28	839	.30	390	1000	420
136-071-16CCC	211FXHL	184	79-05-02	1490	7.8	7.9	410	0	100	39	130	40	2.8	11	588	0	220	5.0	.1	25	736	1.0	300	<10	130
136-071-18DCB	211FXHL	208	78-06-06	1020	6.9	8.0	550	54	130	50	47	16	.9	13	575	0	170	1.4	.1	22	697	1.0	830	3200	340
136-071-28CCC	211FXHL	220	78-06-07	1088	7.4	6.9	320	0	70	35	150	50	3.7	9.9	599	0	150	4.1	.1	26	734	1.5	540	1400	60
136-071-34CDD	211FXHL	140	78-06-13	960	7.2	9.5	420	0	100	41	64	24	1.4	11	516	0	150	2.6	.1	25	655	1.0	100	1200	40
136-071-35AAA	211FXHL	75	79-05-03	1450	--	8.0	530	7	130	50	150	38	2.8	10	638	0	350	7.2	.1	6.4	1070	1.0	240	100	470
211FXHL	73	79-10-11	1480	7.3	8.0	560	27	130	57	150	36	2.8	9.9	649	0	370	7.2	.2	28	1060	1.0	100	1000	420
136-072-13BBB	211FXHL	210	78-06-07	1200	7.2	9.1	550	71	140	49	80	24	1.5	8.6	585	0	250	3.2	.2	21	845	1.0	<20	6100	1100
136-072-17BBB	211FXHL	180	78-06-01	490	7.5	8.5	250	27	71	18	8.6	7	.2	4.5	274	0	36	4.8	.1	10	347	9.1	<20	1100	200
136-072-19DAB	211FXHL	238	78-06-01	950	7.4	8.4	210	0	57	17	150	60	4.5	7.5	511	0	130	3.3	<.1	22	634	.40	730	1200	70
136-072-22CCA	211FXHL	240	78-06-01	1210	7.3	7.8	450	0	110	43	140	39	2.9	12	623	0	230	2.4	<.1	26	855	1.0	200	1500	240
136-072-22CCC	211FXHL	195	78-06-01	1200	7.2	8.2	440	0	120	34	140	40	2.9	13	623	0	240	1.9	<.1	24	868	.40	100	4300	240
136-073-12BBD	211FXHL	313	78-05-31	1620	8.4	8.0	28	0	9.2	1.2	370	96	30	4.3	694	0	170	50	.6	21	978	1.0	1900	1400	40
136-073-16CBB1	211FXHL	164	79-06-21	800	8.1	9.0	320	0	89	24	54	26	1.3	7.8	433	0	81	6.8	.2	13	520	1.0	130	<10	1800
136-073-20DDC	211FXHL	153	78-05-31	810	7.4	8.5	260	0	62	26	96	43	2.6	9.5	427	0	120	5.2	.3	35	563	1.0	<20	890	160
136-073-22AAA	211FXHL	203	79-05-02	1400	8.2	7.5	160	0	43	13	280	78	9.6	7.6	604	0	190	56	.2	27	933	1.0	940	40	80
136-073-27DDB	211FXHL	195	78-05-31	1000	7.8	9.0	220	0	49	24	170	62	5.0	8.0	560	0	120	8.5	.4	26	673	2.6	340	470	240
136-073-34AAA	211FXHL	133	78-05-31	850	7.4	9.5	350	0	88	32	54	28	1.3	13	421	0	130	2.7	.2	36	553	1.0	<20	510	940
133-067-29BBC	211PIRH	538	77-11-03	8000	7.9	7.0	390	0	110	26	2100	92	46	24	528	0	12	3200	.2	14	6590	.00	2900	15000	480
135-067-18DDD	211PIRH	470	79-07-19	8000	7.4	--	210	0	54	18	1700	94	51	16	712	0	7.4	2300	.2	30	5610	1.0	2100	890	100
135-068-21CDD	211PIRH	368	79-08-01	8000	8.2	--	250	0	70	18	1800	94	50	16	611	0	13	2300	.2	30	4720	1.0	1900	670	180
135-068-27ABC	211PIRH	520	79-07-19	8000	7.3	9.0	350	0	91	30	1600	90	37	15	649	0	7.8	2400	.2	29	4480	1.0	2500	380	240
136-068-08BBB1	211PIRH	330	79-08-09	3000	7.9	8.5	89	0	24	7.1	600	93	28	11	741	0	200	950	.2	25	1640	.10	1900	810	60
136-068-16AAA	211PIRH	400	77-10-27	2400	7.5	8.5	200	0	46	21	440	82	13	11	472	0	40	520	<.1	26	1300	1.0	50	410	260
133-073-34DDB	217UKOT	2409	78-07-11	8250	7.4	25.2	970	810	260	78	270	38	3.8	5.1	196	0	1200	86	2.7	12	2220	1.0	690	4300	200

TABLE 5.--Chemical analyses of ground water from selected municipal wells for trace elements[1/]

(Analyses reported in ug/L)

Location	135-072-17CAB1	135-072-17CA82	136-067-17BCC2
City	Napoleon	Napoleon	Gackle
Well depth (ft)	70	102	115
Date of collection	7/19/78	9/08/78	2/16/78
Aluminum (Al)	20	20	10
Arsenic (As)	2	3	1
Beryllium (Be)	0	0	10
Cadmium (Cd)	6	0	1
Chromium (Cr)	--	0	0
Cobalt (Co)	3	0	0
Copper (Cu)	0	0	7
Lead (Pb)	23	20	2
Lithium (Li)	--	100	100
Mercury (Hg)	0	0	0
Molybdenum (Mo)	8	7	11
Nickel (Ni)	0	0	2
Selenium (Se)	0	0	0
Strontium (Sr)	330	370	980
Vanadium (V)	0	0	0
Zinc (Zn)	60	20	20

[1/]Analyses by the U.S. Geological Survey Hydrologic Laboratory, Lakewood, Colo.