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<td>17.</td>
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Factors for converting U.S. inch-pound units to metric units are shown to four significant figures.

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<td>foot squared per day (ft^2/d)</td>
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<td>liter per second (L/s)</td>
</tr>
<tr>
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<td>meter squared per day ($m^2$/d)</td>
</tr>
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<td>foot per day (ft/d)</td>
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<tr>
<td>gallon per minute per foot of drawdown [(gal/min)/ft]</td>
<td>$2.070 \times 10^{-1}$</td>
<td>liter per second per meter [(L/s)/m]</td>
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<tr>
<td>microsecond per foot (ms/ft)</td>
<td>3.280</td>
<td>microsecond per meter (ms/m)</td>
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HYDROGEOLOGIC DATA FOR THE BEAR CREEK SUBSURFACE-INJECTION TEST SITE, ST. PETERSBURG, FLORIDA

By J. J. Hickey and G. L. Barr

ABSTRACT

Lithologic, hydraulic, geophysical, and water-quality data were collected at the Bear Creek subsurface-injection test site. The data will assist in evaluating the feasibility of subsurface injection of storm runoff.

An exploratory hole and five observation wells were constructed at this site between October 1974 and April 1976. The exploratory hole, drilled to 1,290 feet below land surface, was the second exploratory hole drilled at the test site. The first, 540 feet distant, was 3,504 feet deep. The observation wells constructed within the second exploratory hole ranged in depth between 340 to 1,267 feet.

The lithology of the upper 185 feet at the test site is predominantly sand and marl. From 185 to 3,504 feet, limestone and dolomite predominate. Below 1,290 feet, gypsum is also present.

Vertical intrinsic permeability of cores extracted during the drilling of the second exploratory hole ranges from $1.20 \times 10^{-8}$ to $9.87 \times 10^{-14}$ centimeters squared. Porosity of the cores ranges from 0.5 to 39.5 percent. Compressibility of the cores ranges from $1.2 \times 10^{-7}$ to $1.5 \times 10^{-7}$ square inches per pound.

A 73-hour withdrawal test was run in the test injection well. Water was pumped at a rate of 3,450 gallons per minute. At the site, chloride concentration in water from 192 to 340 feet ranged from 150 to 680 milligrams per liter, and from 500 to 1,267 feet ranged from 16,000 to 20,000 milligrams per liter. The chloride concentrations in water from 11 additional wells near the test site ranged from 72 to 1,100 milligrams per liter. The wells were 45 to 400 feet deep.
INTRODUCTION

The city of St. Petersburg, a municipality within Pinellas County, Florida, is experiencing a rapid population growth with increased water-supply demands. Limits have been placed on ground-water withdrawals from the city's well fields which has caused the city to investigate the potential for subsurface storage of storm runoff at the Bear Creek site (fig. 1). The city would like to create a potential water resource for future non-potable use.

The city of St. Petersburg and the State of Florida Department of Natural Resources drilled a test injection well at the Bear Creek site between October 1972 and April 1974 (Black, Crow and Eidsness, 1974). A stream intake structure for the test injection well was completed in 1976. At present (1978), long-term injection of storm runoff has not been performed.

Five observation wells, within 540 ft (feet) of the test injection well, were completed by the city in April 1976. Data collected during the construction of the observation wells and a subsequent withdrawal test on the injection well is the principal subject of this report.

The U.S. Geological Survey, in cooperation with the city of St. Petersburg, is investigating storage of storm runoff in permeable saline water zones within the carbonate rocks that underlie the Bear Creek test injection site (fig. 1). The U.S. Geological Survey's principal interest in this investigation is to understand and to document the hydrodynamic and chemical behavior of the stored water.

Purpose and Scope

This report presents the hydrogeologic data collected during the test drilling and withdrawal testing at the Bear Creek test site. The data, presented in tables and illustrations, include lithologic descriptions and laboratory analyses of drill cuttings and cores, results of a withdrawal test, hydrographs, geophysical logs, and chemical analyses.

The data were collected from the Bear Creek site to assist in the evaluation of the following objectives: (1) determine if there are transmissive zones which can accept large volumes of storm runoff; (2) determine the water-quality profile at the site; (3) evaluate effects of well injection on freshwater; and (4) design a long-term monitoring program. These and other determinations will be given in subsequent interpretive reports.

To achieve these objectives, an exploratory hole and five observation wells were constructed and a withdrawal test was run on a previously constructed injection test well. Water samples were collected from wells at the test site and also from selected wells near the site. These samples were analyzed for water quality.
Figure 1.—Location of the Bear Creek injection test site, other proposed injection sites, and Tampa Bay area municipal well fields.
Previous Investigations

Various aspects of the geology and hydrology of Pinellas County have been the subject of several previous investigations. Chen (1965) described the lithologies penetrated from 500 to 5,000 ft below land surface by an oil test hole in Pinellas County as part of his regional stratigraphic analysis of the Paleocene and Eocene rocks of Florida. Hydrologic investigations by Heath and Smith (1954), Cherry, Stewart and Mann (1970), and Black, Crow and Eidsness (1970), evaluated the upper carbonate rock section to depths of about 400 ft, principally from a water-supply point of view. Greenleaf and Telesca (1975) described the construction of wells at the South Cross Bayou test injection site. Black, Crow and Eidsness (1974) investigated the potential for storing storm-water runoff and recovering it from saline zones within the carbonate rocks at the Bear Creek site for the city of St. Petersburg, Florida, and the State of Florida Department of Natural Resources. As part of their investigation, an exploratory hole was drilled to a depth of 3,504 ft. They concluded that most of the zones capable of accepting large volumes of storm-water runoff were above a depth of 1,270 ft. In addition to other tests, two injection tests, each lasting 1 day, were run on a zone between 1,180 and 1,270 ft. A transmissibility of 800,000 (gal/d)/ft (transmissivity of 107,000 ft²/d) for the test injection zone was reported. Rosenshein and Hickey (1977) discussed the vertical distribution of permeable zones within the carbonate strata underlying the Pinellas peninsula and their potential use for the storage of treated sewage effluent and storm water. Hickey (1977) presented the hydrogeologic data collected at the McKay Creek injection test site (fig. 1).

Regional Hydrogeologic Setting

The Tampa Bay area, including the Bear Creek test site, is underlain by carbonate strata to a depth of about 10,000 ft below land surface (Applin, 1951), except for a thin surficial cover of sand, marl, and clay. The upper 1,300 ft of the carbonate strata is highly transmissive and constitutes one of the most productive aquifers in the world—the Floridan aquifer. The transmissivity of the aquifer, where it is tapped for water supplies, is estimated to range from 32,000 ft²/d to more than 270,000 ft²/d (Rosenshein and Hickey, 1977). The aquifer is thought to be made up of permeable zones separated by carbonate strata of low permeability (Rosenshein and Hickey, 1977). The aquifer contains potable water in its entire thickness east and north of Tampa Bay. In general, the flow of potable ground water in the aquifer is toward the Gulf of Mexico and Tampa Bay.

The upper part of the carbonate strata in the Tampa Bay area generally is overlain by less than 200 ft of sand, marl, and clay. The clay commonly forms the basal strata of these surficial deposits and, in northwest Hillsborough County, is in part a weathered residue of the underlying carbonate rock. There, according to Sinclair (1974, p. 24-26), the clay has a vertical hydraulic conductivity of less than 0.003 ft/d.
The surficial sand is generally less than 35 ft thick and during dry weather is generally saturated to within 5 to 10 ft of the land surface. During wet weather, the water table in the sand is at or near land surface. The sand in northwest Hillsborough County has a horizontal hydraulic conductivity of 13 ft/d and a vertical hydraulic conductivity in the range of 0.36 ft/d to 13 ft/d (Sinclair, 1974, p. 13).

**Summary of Bear Creek Test Site Data**

<table>
<thead>
<tr>
<th>Depth of exploratory holes</th>
<th>3,504 ft&lt;br&gt;1,290 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test injection well</td>
<td>Cased to 1,016 ft, open hole to 1,270 ft</td>
</tr>
<tr>
<td>Observation wells</td>
<td>1 within injection zone&lt;br&gt;5 above injection zone</td>
</tr>
<tr>
<td>Lithology</td>
<td>0 to 185 ft; sand, clay, shell and marl&lt;br&gt;185 to 3,504 ft; limestone, and dolomite, gypsum present below 1,290 ft</td>
</tr>
<tr>
<td>Cored intervals</td>
<td>720 to 741 ft&lt;br&gt;760 to 770 ft&lt;br&gt;900 to 903 ft&lt;br&gt;905 to 920 ft&lt;br&gt;930 to 950 ft&lt;br&gt;1,140 to 1,150 ft</td>
</tr>
<tr>
<td>Vertical intrinsic permeability of cores</td>
<td>$1.2 \times 10^{-8}$ to $9.87 \times 10^{-14}$ cm$^2$</td>
</tr>
<tr>
<td>Porosity of cores</td>
<td>0.7 to 39.5 percent</td>
</tr>
<tr>
<td>Compressibility of cores</td>
<td>$1.5 \times 10^{-7}$ to $1.2 \times 10^{-5}$ in$^2$/lb</td>
</tr>
<tr>
<td>Hydraulic tests</td>
<td>1 withdrawal test at 3,450 gal/min</td>
</tr>
<tr>
<td>Chloride concentration</td>
<td>192 to 250 ft, 150 mg/L; 192 to 340 ft, 680 mg/L; 500 to 1,267 ft, 16,000 to 20,000 mg/L</td>
</tr>
</tbody>
</table>
WELL CONSTRUCTION

Exploratory hole E2 and five observation wells, B1, B2, B3, B4, and B5 (table 1), were constructed at the test site between October 1974 and April 1976. Already in existence at the site were test injection well A1, observation well A2, and exploratory hole E1. Black, Crow and Eidsness (1974) describe these wells. Figure 2 shows the location of the exploratory holes and wells at the site.

Prior Construction at the Test Site

Exploratory hole E1, injection well A1, and observation well A2 (table 1), were constructed about 2 years before the observation wells discussed in this report were drilled. Exploratory hole E1 (fig. 3), was drilled to 3,504 ft below land surface. Test injection well A1 (fig. 3) has a 16-in (inch) casing set at 1,016 ft below land surface and is open hole to 1,270 ft. Well A2 (fig. 3) has a 2-in casing and is open between 550 and 570 ft in the annulus of A1. There is also a plugged well (fig. 3) in the annulus of A1 with a 1-1/4-in galvanized pipe which was to have been open to the interval between 800 and 870 ft. This plugged well has no value and is unnumbered in table 1.

Exploratory Hole

Exploratory hole E2 was drilled during this investigation to a depth of 1,290 ft for preliminary identification of a permeable and semi-confining strata at the Bear Creek test site. Location of this well and other wells at the site is shown on figure 2. The upper 500 ft of hole was drilled with cable tool. From 500 to 1,290 ft, the hole was drilled with air-reverse rotary. A 20-in casing was driven and set at 192 ft and a 14-in casing was set at 500 ft with its annulus cemented back to 340 ft. From land surface to 192 ft and 500 to 780 ft, freshwater was periodically added to the hole to aid drilling.

During drilling with the cable tool equipment, the bit dropped 2 ft between 318 and 320 ft below land surface, probably because of a cavity in the limestone.

Cores were taken in some strata during the drilling of well E2. Descriptions and laboratory analyses of these cores are presented later in this report.
Figure 2.--Location of exploratory holes and wells at the test site.
Figure 3.—Construction diagram of wells A1, A2, B1, B2, B3, B4, B5, E1 and E2.
Observation Wells

Five observation wells, B1, B2, B3, B4, and B5, were constructed in exploratory hole E2 from 192 ft to 1,267 ft below land surface (fig. 3). Exploratory hole E2, drilled to 1,290 ft, was plugged back to 1,267 ft with cement. Well B1 has a 4-in casing and monitors the depth interval between 1,170 and 1,267 ft. Well B2 has a 2-in casing and monitors the interval between 930 and 1,070 ft. Well B3 has a 2-in casing and monitors the interval between 750 and 830 ft. Well B4 has a 14-in casing and monitors the interval between 500 and 573 ft. Well B5 is the annular space between the 14-in and 20-in casings and monitors the interval between 192 and 340 ft. Wells B1, B2, and B3 have gravel packed intervals with stainless steel screens and wells B4 and B5 have open-hole intervals. The screen in well B2 became plugged after well construction and had to be perforated. All wells are separated by cement plugs between their screened or open-hole intervals. Wells B1, B2, B3, B4, and B5 are located 540 ft from test injection well A1 (fig. 2).

HYDROGEOLOGIC DATA

The data collected at the Bear Creek test injection site include lithologic descriptions of drill cuttings and cores, laboratory core analyses, specific capacity and withdrawal test results, water-level hydrographs, geophysical logs, and water analyses.

Drill Cuttings and Cores

Drill cuttings were collected every 5 ft from well E1 and every 10 ft from well E2. These cuttings have been forwarded, as required by state law, to the Florida State Bureau of Geology. The cuttings from well E1 are described in table 2, except for the interval between 50 to 130 ft which could not be identified. The drill cuttings from well E2 describe this interval as follows: 50 to 70 ft, sand; 70 to 110 ft, dark gray marl; 110 to 120 ft, dark gray clay; and from 120 to 130 ft, dark gray marl. A graphic lithologic log for well E1 and depth of cores from well E2 are shown in figure 4. A graphic lithologic log for well E2 is shown on the geophysical log illustrations discussed later in this report.

Cores of strata were taken during the drilling of well E2 for the following depth intervals: 720 to 741 ft (5 ft of core recovery), 760 to 770 ft (1 ft of core recovery), 900 to 950 ft (8.5 ft of core recovery), and 1,140 to 1,150 ft (3 ft of core recovery). Descriptions of these cores are given in table 3. Laboratory measurements of the cores
Figure 4.—Lithologic log of well El.
included air and water vertical intrinsic permeability, porosity, interval transit time, and compressibility. The results of these measurements are presented in tables 4 through 6.

**Specific Capacity Tests During Drilling of Well E2**

Specific capacity tests were run on well E2 while it was being drilled. These data can be used to indicate major differences in permeability between intervals of drilled hole, from 192 to 1,290 ft below land surface. Table 7 lists the specific capacities in well E2.

**Withdrawal Test**

From May 18, 1976, to May 21, well Al was pumped at a rate of 3,450 gal/min. During the 73-hour test, water levels were measured in wells A2, B1, B2, B3, B4, and B5. The measurements for A2 are shown in table 8 and for the remainder of the wells in table 9.

None of the water-level measurements obtained during the withdrawal test have been adjusted for natural fluctuations. These fluctuations, which have to be considered in preparing the data for hydraulic analysis, are caused by tidal changes in the Gulf of Mexico, periodic dilation of the rock column caused by earth tides, barometric pressure changes, and regional ground-water trends.

Hydrographs of wells A2, B1, and B2, which include the withdrawal test period, are shown on figure 5 and those of wells B3, B4, and B5 are shown on figure 6.

**Geophysical Logs**

Table 10 lists the geophysical logs run in well E2 and table 11 lists those run in well Al. Lithologic, caliper, and flowmeter logs for well Al are shown on figure 7. For the upper part of well E2, lithologic, caliper, single point resistance, flowmeter, pumping temperature, and specific capacity logs are shown on figure 8, and for the lower part, lithologic, caliper, deep induction, static and pumping temperature, and specific capacity logs are shown on figure 9.

**Chemical Analyses of Water from Selected Wells**

Water samples from wells at the test site were collected and analyzed after all wells were constructed and again during the withdrawal test. Tables 12 through 14 show the results of these analyses.
Figure 5.—Hydrographs of wells A2, B1, and B2, 1976-77.
Figure 6.—Hydrographs of wells B3, B4, and B5, 1976-77.
Figure 7.--Caliper and flowmeter logs of well A1.
Figure 8—Lithologic and geophysical logs of well E2, from 160 to 540 feet.
Figure 9.—Lithologic and geophysical logs of well E2, from 460 to 1,290 feet.
Concentration of chloride in water from wells at the site increase with depth. For example, from 192 to 340 ft the chloride concentration ranged from 150 to 680 mg/L (milligrams per liter), and from 500 to 1,267 ft it ranged from 16,000 to 20,000 mg/L.

The following water-quality sampling procedures were used at the wells. Each water sample was collected either with a centrifugal or a turbine pump. Before collecting the initial pumped water sample, the quantity of water equal to the total volume within the well was removed at least one time. Specific gravity, specific conductance, and temperature measurements of the discharging water were then made. Only after the specific gravity or specific conductance and temperature became constant during pumping were the initial water samples for chemical analysis collected. All subsequent samples were collected after the total volume of each well was removed.

Freshwater was introduced into the observation wells during drilling and construction. After placement of cement in wells B1 - B5, freshwater was used to wash cement from the work pipe. The disposition of this water and how it blended with the native saline water is unknown.

WATER QUALITY NEAR THE INJECTION TEST SITE

Water from 11 wells, other than those described earlier and ranging in depth from 45 to 400 ft near the test injection site, was collected and analyzed to provide background quality data prior to any long-term injection at the test site. Location of the wells is shown on figure 10 and construction details are given in table 15. Analyses of water from the wells are given in tables 16 and 17. Chloride concentration of water from these wells ranged from 72 to 1,100 mg/L.
Figure 10. Location of selected wells near the Bear Creek test site.
SELECTED REFERENCES


Black, Crow and Eidsness, Inc., 1970, Water resources investigations for the Pinellas County water system, Pinellas County, Florida.

____ 1974, Results of drilling and testing of the test storm water injection well for the City of St. Petersburg, Florida.

____ 1978, Drilling and testing of the monitoring and injection wells at the Southwest Wastewater treatment plant for the City of St. Petersburg, Florida.


Greenleaf and Telesca, Inc., 1975, Construction of test wells, South Cross Bayou Pollution Control Facility, Pinellas County, Florida.


<table>
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<th>Well number</th>
<th>Latitude Longitude</th>
<th>Bear Creek name</th>
<th>Land surface elevation (ft above mean sea level)</th>
<th>Total depth (ft below land surface)</th>
<th>Open interval (ft below land surface)</th>
<th>Casing diameter (in)</th>
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<td>570</td>
<td>550- 570</td>
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<td>Injection monitor 1267'</td>
<td>19.10</td>
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<tr>
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<td>Injection monitor 1070'</td>
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<td>1,070</td>
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<td>540</td>
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1/ Well is unnumbered because no data were obtained concerning hydrologic characteristics.
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<th>Description</th>
<th>Thickness (ft)</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No sample</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Clay, brown; shell; some sand</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Shell; some clay, brown; sand</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Shell; some sand</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Shell</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td>Shell; some sand</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>Shell; sand; clay, brown</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>Unidentifiable, mostly black sooty, compact material that looks carbonaceous; clay, dark brown to black; shell; sand</td>
<td>80</td>
<td>130</td>
</tr>
<tr>
<td>Marl; clay, pale gray, some sand, coarse; shell</td>
<td>5</td>
<td>135</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>140</td>
</tr>
<tr>
<td>Marl; sand; shell; clay, pale gray</td>
<td>10</td>
<td>150</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>155</td>
</tr>
<tr>
<td>Dolomite, gray; marl; sand</td>
<td>10</td>
<td>165</td>
</tr>
<tr>
<td>Marl; clay, gray; sand</td>
<td>20</td>
<td>185</td>
</tr>
<tr>
<td>Limestone; marl; clay, gray; sand, coarse</td>
<td>20</td>
<td>205</td>
</tr>
<tr>
<td>Limestone, gray cream, fossiliferous; much chert</td>
<td>5</td>
<td>210</td>
</tr>
<tr>
<td>Limestone, gray cream; sand, coarse; chert</td>
<td>5</td>
<td>215</td>
</tr>
<tr>
<td>Limestone, cream, hard, fossiliferous; chert</td>
<td>20</td>
<td>235</td>
</tr>
<tr>
<td>Sand, clear, fine</td>
<td>5</td>
<td>240</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>245</td>
</tr>
<tr>
<td>Limestone, cream white, chalky; sand</td>
<td>10</td>
<td>255</td>
</tr>
<tr>
<td>Limestone, cream white, chalky, fossiliferous</td>
<td>5</td>
<td>260</td>
</tr>
<tr>
<td>Limestone, cream white; chert</td>
<td>20</td>
<td>280</td>
</tr>
<tr>
<td>No sample</td>
<td>30</td>
<td>310</td>
</tr>
<tr>
<td>Limestone, cream white, vugular, fossiliferous</td>
<td>15</td>
<td>325</td>
</tr>
<tr>
<td>No sample</td>
<td>10</td>
<td>335</td>
</tr>
</tbody>
</table>
Table 2.—Lithologic log of well E1—continued

<table>
<thead>
<tr>
<th>Limestone, cream brown, chalky; chert, fossiliferous</th>
<th>Thickness (ft)</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>340</td>
</tr>
<tr>
<td>Limestone, cream brown, chalky; some chert; clay, black</td>
<td>5</td>
<td>345</td>
</tr>
<tr>
<td>Limestone, cream, some vugs, fossiliferous; much chert</td>
<td>15</td>
<td>360</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>365</td>
</tr>
<tr>
<td>Limestone, cream, some vugs, fossiliferous; much chert</td>
<td>5</td>
<td>370</td>
</tr>
<tr>
<td>No sample</td>
<td>10</td>
<td>380</td>
</tr>
<tr>
<td>Limestone, cream, fossiliferous; chert</td>
<td>40</td>
<td>420</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>425</td>
</tr>
<tr>
<td>Limestone, cream, fossiliferous; sand, coarse; chert</td>
<td>10</td>
<td>435</td>
</tr>
<tr>
<td>Limestone, cream, fossiliferous (Dictyconus at 470 feet); chert</td>
<td>65</td>
<td>500</td>
</tr>
<tr>
<td>Limestone, cream; some dolomite, cream brown</td>
<td>15</td>
<td>515</td>
</tr>
<tr>
<td>No sample</td>
<td>35</td>
<td>550</td>
</tr>
<tr>
<td>Limestone, cream buff, vugular, granular, platy, fossiliferous, (Lepidocyclina at 590 feet, Camerina at 615 feet)</td>
<td>100</td>
<td>650</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>655</td>
</tr>
<tr>
<td>Limestone, cream buff, vugular, granular, platy</td>
<td>15</td>
<td>670</td>
</tr>
<tr>
<td>Limestone, cream white, vugular, coquinitid</td>
<td>45</td>
<td>715</td>
</tr>
<tr>
<td>Limestone, cream buff, granular; much calcite, fossiliferous</td>
<td>40</td>
<td>755</td>
</tr>
<tr>
<td>Dolomite, brown, vugular, sucrosic; chert</td>
<td>10</td>
<td>765</td>
</tr>
<tr>
<td>Dolomite, gray brown; some limestone, white, fossiliferous</td>
<td>10</td>
<td>775</td>
</tr>
<tr>
<td>Dolomite, gray brown, vugular, sucrosic; some limestone, white, very fossiliferous</td>
<td>75</td>
<td>850</td>
</tr>
<tr>
<td>Dolomite, yellow brown to dark brown, vugular</td>
<td>10</td>
<td>860</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>865</td>
</tr>
<tr>
<td>Dolomite, brown, vugular, coarsely crystalline</td>
<td>15</td>
<td>880</td>
</tr>
</tbody>
</table>
Table 2.--Lithologic log of well El -- continued

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Thickness (ft)</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolomite, brown black, vugular, coarsely crystalline; chert</td>
<td>90</td>
<td>970</td>
</tr>
<tr>
<td>Dolomite, brown black, vugular, coarsely crystalline; limestone, cream, fossiliferous</td>
<td>15</td>
<td>985</td>
</tr>
<tr>
<td>Dolomite, gray brown; chert</td>
<td>35</td>
<td>1,020</td>
</tr>
<tr>
<td>Dolomite, gray brown, crystalline; some limestone, cream, crystalline, some calcite crystals</td>
<td>50</td>
<td>1,070</td>
</tr>
<tr>
<td>Dolomite, brown, sucrosic; some limestone; some chert</td>
<td>10</td>
<td>1,080</td>
</tr>
<tr>
<td>Limestone, cream, vugular, sucrosic, dolomitic</td>
<td>50</td>
<td>1,130</td>
</tr>
<tr>
<td>Limestone, cream buff, vugular; dolomitic; chert</td>
<td>70</td>
<td>1,200</td>
</tr>
<tr>
<td>Dolomite, brown, vugular; some limestone</td>
<td>15</td>
<td>1,215</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>1,220</td>
</tr>
<tr>
<td>Dolomite, brown, vugular; some limestone</td>
<td>10</td>
<td>1,230</td>
</tr>
<tr>
<td>Limestone, brown, crystalline, fossiliferous; some dolomite</td>
<td>15</td>
<td>1,245</td>
</tr>
<tr>
<td>Dolomite, yellow brown, vugular, crystalline; chert</td>
<td>5</td>
<td>1,250</td>
</tr>
<tr>
<td>Limestone, dark brown, crystalline; some dolomite, little chert</td>
<td>40</td>
<td>1,290</td>
</tr>
<tr>
<td>Limestone, dark brown, crystalline; some gypsum or anhydrite</td>
<td>10</td>
<td>1,300</td>
</tr>
<tr>
<td>Limestone, cream buff, vugular, chalky; dolomitic; more gypsum</td>
<td>30</td>
<td>1,330</td>
</tr>
<tr>
<td>Dolomite, gray brown, platy; some limestone, cream brown, crystalline; chert; some gypsum</td>
<td>20</td>
<td>1,350</td>
</tr>
<tr>
<td>Limestone, cream, vugular, dolomitic, crystalline; dolomite, cream tan, vugular; chert; gypsum</td>
<td>40</td>
<td>1,390</td>
</tr>
<tr>
<td>Limestone, cream brown, crystalline, slightly fossiliferous; much gypsum</td>
<td>10</td>
<td>1,400</td>
</tr>
<tr>
<td>Dolomite, cream brown, vugular, some platy; some limestone; chert; gypsum</td>
<td>20</td>
<td>1,420</td>
</tr>
<tr>
<td>Limestone, cream brown, crystalline, fossiliferous, dolomitic; more gypsum</td>
<td>10</td>
<td>1,430</td>
</tr>
<tr>
<td>Thickness (ft)</td>
<td>Depth (ft)</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1,450</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1,515</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1,525</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,530</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1,540</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1,560</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1,595</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,600</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,605</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,610</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,615</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,620</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>1,665</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1,675</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,680</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1,700</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1,730</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1,740</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1,800</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1,815</td>
<td></td>
</tr>
<tr>
<td>Lithology Description</td>
<td>Thickness (ft)</td>
<td>Depth (ft)</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------</td>
<td>----------------</td>
<td>------------</td>
</tr>
<tr>
<td>Dolomite, cream to dark brown, crystalline; much chert; gypsum</td>
<td>20</td>
<td>1,835</td>
</tr>
<tr>
<td>Limestone, cream brown, vugular, chalky, dolomitic; chert; gypsum</td>
<td>15</td>
<td>1,850</td>
</tr>
<tr>
<td>Dolomite, cream brown; chert; gypsum</td>
<td>5</td>
<td>1,855</td>
</tr>
<tr>
<td>Limestone, cream brown, some chalky, platy, dolomitic; chert</td>
<td>35</td>
<td>1,890</td>
</tr>
<tr>
<td>Dolomite, cream to dark brown, vugular, coarsely crystalline; chert; gypsum</td>
<td>60</td>
<td>1,950</td>
</tr>
<tr>
<td>Limestone, gray brown to cream buff, crystalline, very fossiliferous</td>
<td>50</td>
<td>2,000</td>
</tr>
<tr>
<td>Limestone, cream buff, hard, fossiliferous, dolomitic; gypsum</td>
<td>40</td>
<td>2,040</td>
</tr>
<tr>
<td>Limestone, yellow brown, crystalline; some dolomite; chert; trace lignite?</td>
<td>25</td>
<td>2,065</td>
</tr>
<tr>
<td>Limestone, cream, oolitic, very fossiliferous</td>
<td>35</td>
<td>2,100</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>2,105</td>
</tr>
<tr>
<td>Limestone, brown, crystalline; some dolomite; chert; gypsum</td>
<td>15</td>
<td>2,120</td>
</tr>
<tr>
<td>Limestone, yellow to cream brown, very fossiliferous</td>
<td>30</td>
<td>2,150</td>
</tr>
<tr>
<td>Dolomite, yellow brown, crystalline; some limestone, cream, fossiliferous; gypsum</td>
<td>50</td>
<td>2,200</td>
</tr>
<tr>
<td>Limestone, cream, crystalline, very fossiliferous; trace gypsum</td>
<td>55</td>
<td>2,255</td>
</tr>
<tr>
<td>Dolomite, yellow brown, crystalline; limestone, crystalline, fossiliferous; some chert; gypsum</td>
<td>100</td>
<td>2,355</td>
</tr>
<tr>
<td>Limestone, yellow brown, crystalline, chalky; some dolomite, fossiliferous</td>
<td>90</td>
<td>2,445</td>
</tr>
<tr>
<td>Limestone, yellow to brown, crystalline; some dolomite, chert; gypsum</td>
<td>30</td>
<td>2,475</td>
</tr>
<tr>
<td>Limestone, cream, chalky, granular, fossiliferous; some dolomite</td>
<td>15</td>
<td>2,490</td>
</tr>
<tr>
<td>Limestone, cream, very fossiliferous; some dolomite; much chert</td>
<td>50</td>
<td>2,540</td>
</tr>
</tbody>
</table>
Table 2.—Lithologic log of well El—continued

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Thickness (ft)</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone, cream, very fossiliferous; much dolomite; some gypsum</td>
<td>30</td>
<td>2,570</td>
</tr>
<tr>
<td>Limestone, cream; some lignite?</td>
<td>35</td>
<td>2,605</td>
</tr>
<tr>
<td>Limestone, cream, chalky, granular, fossiliferous</td>
<td>30</td>
<td>2,635</td>
</tr>
<tr>
<td>Dolomite, buff brown, vugular; chert</td>
<td>5</td>
<td>2,640</td>
</tr>
<tr>
<td>Limestone, cream, chalky, granular, fossiliferous</td>
<td>30</td>
<td>2,670</td>
</tr>
<tr>
<td>Dolomite, gray brown, sucrosic, platy; chert</td>
<td>5</td>
<td>2,675</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>2,680</td>
</tr>
<tr>
<td>Dolomite, gray brown, sucrosic, platy</td>
<td>5</td>
<td>2,685</td>
</tr>
<tr>
<td>Limestone, cream, crystalline; some dolomite; some gypsum</td>
<td>20</td>
<td>2,705</td>
</tr>
<tr>
<td>Dolomite, tan to brown, vugular, crystalline</td>
<td>10</td>
<td>2,715</td>
</tr>
<tr>
<td>Limestone, cream, chalky</td>
<td>5</td>
<td>2,720</td>
</tr>
<tr>
<td>Limestone, cream; dolomite; gypsum</td>
<td>10</td>
<td>2,730</td>
</tr>
<tr>
<td>Limestone, cream, crystalline, chalky, platy, granular, dolomitic, fossiliferous</td>
<td>35</td>
<td>2,765</td>
</tr>
<tr>
<td>Limestone, cream, some coarsely crystalline, granular, very fossiliferous; some gypsum</td>
<td>60</td>
<td>2,825</td>
</tr>
<tr>
<td>No sample</td>
<td>5</td>
<td>2,830</td>
</tr>
<tr>
<td>Limestone, cream, coarsely crystalline, chalky, fossiliferous; some gypsum</td>
<td>70</td>
<td>2,900</td>
</tr>
<tr>
<td>Dolomite, yellow, brown, black, coarsely crystalline, platy; chert; some gypsum</td>
<td>85</td>
<td>2,985</td>
</tr>
<tr>
<td>Limestone, cream, vugular, chalky, fossiliferous</td>
<td>5</td>
<td>2,990</td>
</tr>
<tr>
<td>Dolomite, dark brown, vugular, coarsely crystalline, some platy; gypsum</td>
<td>40</td>
<td>3,030</td>
</tr>
<tr>
<td>Limestone, brown black, coarsely crystalline, some dolomitic</td>
<td>5</td>
<td>3,035</td>
</tr>
<tr>
<td>Dolomite, gray brown, crystalline, platy; gypsum</td>
<td>30</td>
<td>3,065</td>
</tr>
<tr>
<td>Dolomite, tan, brown, black, finely to coarsely crystalline; gypsum</td>
<td>75</td>
<td>3,140</td>
</tr>
<tr>
<td>Dolomite, gray</td>
<td>10</td>
<td>3,150</td>
</tr>
</tbody>
</table>
Table 2.—Lithologic log of well El—continued

<table>
<thead>
<tr>
<th>Thickness (ft)</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolomite, cream brown, finely crystalline, some platy</td>
<td>70</td>
</tr>
<tr>
<td>Limestone, cream, chalky, dolomitic; gypsum</td>
<td>5</td>
</tr>
<tr>
<td>Dolomite, cream to gray buff, vugular, finely crystalline; some chert; some gypsum; some lignite</td>
<td>95</td>
</tr>
<tr>
<td>Limestone, cream to gray buff, chalky, granular or micro-oolitic, dolomitic; some lignite</td>
<td>50</td>
</tr>
<tr>
<td>Limestone, cream, fossiliferous; some dolomite, gray; chert; gypsum</td>
<td>10</td>
</tr>
<tr>
<td>Gypsum</td>
<td>5</td>
</tr>
<tr>
<td>Limestone, cream, fossiliferous; some dolomite, gray</td>
<td>10</td>
</tr>
<tr>
<td>Limestone, gray cream, granular, platy, dolomitic; some gypsum</td>
<td>25</td>
</tr>
<tr>
<td>Dolomite, cream to gray buff, vugular, crystalline, some platy, some mottled, black streaked; gypsum</td>
<td>40</td>
</tr>
<tr>
<td>Dolomite, cream to gray buff, vugular, crystalline, some platy, some mottled; some limestone, gray cream, chalky, dolomitic; gypsum</td>
<td>30</td>
</tr>
<tr>
<td>Dolomite, gray cream, some vugular, some crystalline; gypsum</td>
<td>14</td>
</tr>
</tbody>
</table>
Table 3.--Description of cores from well E2

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Core interval (ft below land surface)</th>
<th>Core recovery (ft)</th>
<th>Largest core segment (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone, cream, granular, few vugs; few closed vertical fractures, fossil fragments, casts, molds, core very broken</td>
<td>720-740</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Limestone, cream, granular, some vugs; small black carbonaceous rods, fossil fragments, casts, molds</td>
<td>740-741</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Limestone, cream, vugular, some granular; fossiliferous</td>
<td>760-770</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Dolomite, gray brown, microcrystalline, very hard, some vugs; several closed and partially opened vertical, horizontal and oblique fractures</td>
<td>900-903</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Dolomite, gray brown, microcrystalline, very hard, some vugs, dolomite rhombs in vugs; no fractures observed</td>
<td>905-920</td>
<td>3.0</td>
<td>4</td>
</tr>
<tr>
<td>Dolomite, gray brown, microcrystalline to coarse, very hard, some vugs; several closed horizontal, vertical and oblique fractures, dolomite rhombs on surface of several core fragments</td>
<td>930-940</td>
<td>0.5</td>
<td>3</td>
</tr>
<tr>
<td>Dolomite, gray brown, microcrystalline, very hard, some vugs; no fractures</td>
<td>940-950</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Dolomite, tan, finely crystalline, many vugs; several closed and partially opened vertical fractures, fossil molds</td>
<td>1,140-1,150</td>
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</table>
Table 4.—Vertical intrinsic permeability of cores from well E2

[Analyses performed by Core Laboratories, Inc., Dallas, Texas. Nitrogen gas intrinsic permeabilities corrected for Klinkenberg effect (Klinkenberg, 1941) by Core Laboratories. Kinematic viscosity of the formation and distilled waters used in the tests were 0.960 centistokes and 0.955 centistokes, respectively. Kinematic viscosity of the nitrogen gas was 15.391 centistokes. Temperature of all of the fluids was 75°F. Intrinsic permeabilities may be converted to hydraulic conductivity as shown in Lohman and others (1972, p. 10).]

<table>
<thead>
<tr>
<th>Core depth (ft)</th>
<th>Nitrogen gas intrinsic permeability (cm²)</th>
<th>Water intrinsic permeability</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Formation water (cm²)</td>
<td>Distilled water (cm²)</td>
</tr>
<tr>
<td>740-741</td>
<td>9.67 x 10⁻¹⁰</td>
<td>5.5 x 10⁻¹⁰</td>
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</tr>
<tr>
<td>760-761</td>
<td>1.20 x 10⁻⁸</td>
<td>8.78 x 10⁻⁹</td>
<td>8.46 x 10⁻⁹</td>
</tr>
<tr>
<td>905-908</td>
<td>9.87 x 10⁻¹⁴</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>940-944</td>
<td>9.87 x 10⁻¹⁴</td>
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</tr>
</tbody>
</table>
Table 5.--Porosity and interval transit time of cores from well E2

[Analyses performed by Core Laboratories, Inc., Dallas, Texas. Porosity determined at zero gage pressure. Interval transit time for 740-741 feet and 760-761 feet cores determined at 200 lb/in² and 750 lb/in² effective overburden pressure, respectively. Interval transit time for all other cores determined at 1,000 lb/in² effective overburden pressure. Effective overburden pressure is the external pressure minus internal pressure exerted on core.]

<table>
<thead>
<tr>
<th>Core depth (ft)</th>
<th>Core porosity (percent)</th>
<th>Interval transit time (microseconds/ft, reciprocal of the velocity of a compressional sound wave)</th>
</tr>
</thead>
<tbody>
<tr>
<td>740-741</td>
<td>39.5</td>
<td>123.8</td>
</tr>
<tr>
<td>760-761</td>
<td>35.9</td>
<td>115.8</td>
</tr>
<tr>
<td>905-908</td>
<td>0.5</td>
<td>44.2</td>
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<td>940-944</td>
<td>4.9</td>
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<td>940-944</td>
<td>0.7</td>
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</table>
Table 6.—Compressibility of cores from well E2

[Analyses performed by Core Laboratories, Inc., Dallas, Texas. Core Laboratories calculated pore volume compressibility, which is change in pore volume divided by average pore volume divided by initial bulk volume divided by pressure change. Compressibility was calculated from the Core Laboratory results by multiplying pore volume compressibility by average pore volume divided by initial bulk volume. Average pore volume was calculated from values measured over a selected range of pressures. Initial bulk volume was measured at the first pressure in the selected pressure range.]

<table>
<thead>
<tr>
<th>Depth of core (ft)</th>
<th>Average pore volume (percent)</th>
<th>Pressure (lb/in²)</th>
<th>Compressibility (in²/lb)</th>
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<tr>
<td></td>
<td>Initial bulk volume</td>
<td>External</td>
<td>Internal</td>
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Uniaxial loading of core samples

Hydrostatic loading of core samples
(Corrected to uniaxial loading by Core Laboratories, Inc.)

<table>
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<th>Depth of core (ft)</th>
<th>Average pore volume (percent)</th>
<th>Pressure (lb/in²)</th>
<th>Compressibility (in²/lb)</th>
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</thead>
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Table 7.—Specific-capacity data for well E2

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<th>Date pumping began</th>
<th>Depth interval (ft)</th>
<th>Elapsed time (min)</th>
<th>Discharge (gal/min)</th>
<th>Specific capacity [(gal/min)/ft of drawdown]</th>
<th>Comments</th>
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<tbody>
<tr>
<td>11/6/74</td>
<td>192-250</td>
<td>30</td>
<td>150</td>
<td>13</td>
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<td>265</td>
<td>241</td>
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<td>260</td>
<td>228</td>
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<td>75</td>
<td>6</td>
<td>Drill rod and bit in hole at 665 feet</td>
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<tr>
<td>1/21/75</td>
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<td>30</td>
<td>145</td>
<td>91</td>
<td>Drill rod and bit in hole at 862 feet</td>
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<tr>
<td>8/29/75</td>
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<td>90</td>
<td>226</td>
<td>461</td>
<td>Drill rod and bit out of hole</td>
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</table>
Table 8.--Water levels in well A2 during well Al withdrawal test

[Test began 5-18-76 at 1545 and ended 5-21-76 at 1630. Discharge of well Al was 3,450 gallons per minute.]

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<th>Time (hr)</th>
<th>Water level (ft below mean sea level)</th>
<th>Time (hr)</th>
<th>Water level (ft below mean sea level)</th>
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34
Table 9.—Water levels in wells B1, B2, B3, B4, and B5 during well Al withdrawal test

[Test began 5-18-76 at 1545 and ended 5-21-76 at 1630. Discharge of well Al was 3,450 gal/min. Water levels are in feet below mean sea level.]

<table>
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<tr>
<th>Date</th>
<th>Time (hr)</th>
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<th>Well B3</th>
<th>Well B4</th>
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35
Table 9.--Water levels in wells B1, B2, B3, B4, and B5 during well Al withdrawal test - continued

[Test began 5-18-76 at 1545 and ended 5-21-76 at 1630. Discharge of well Al was 3,450 gal/min. Water levels are in feet below mean sea level.]

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<th>Well B3</th>
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Table 10.—Summary of geophysical logs of well E2
[Logs are on file in the U.S. Geological Survey Southwest Florida Subdistrict office.]

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WELL NUMBER A1  BEAR CR INJECTION WELL (LAT 27 46 19 LONG 082 42 52.01)

WELL NUMBER A2  BEAR CR 570 ANNULUS (LAT 27 46 19 LONG 082 42 52.02)

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Table 12.—Chemical analyses of water from selected wells at the test site - continued

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Table 12.--Chemical analyses of water from selected wells at the test site - continued

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<th>Ca²⁺</th>
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<th>SO₄²⁻</th>
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<th>K⁺</th>
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Table 12.—Chemical analyses of water from selected wells at the test site—continued

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| WELL NUMBER H1 | BEAR CR INJECTION MONITOR 1267 (LAT 27° 46' 14" LNG U82 42° 52'.01"

Jan. 1976  | 1.3         | 50          | 74          | 1100        | 12000       | 410         | 9.1         | 38600       | 37900       |
|            |             |             |             |             |             |             |             |             |             |
| WELL NUMBER H2 | BEAR CR INJECTION MONITOR 1070 (LAT 27° 46' 14" LNG U82 42° 52'.02"

Apr. 1976  | .98         | 84          | 680         | 1200        | 11000       | 380         | 9.4         | 31900       | 37800       |
|            |             |             |             |             |             |             |             |             |             |
| WELL NUMBER H3 | BEAR CR INJECTION MONITOR 800 (LAT 27° 46' 14" LNG U82 42° 52'.03"

Dec. 1975  | 1.0         | 70          | 140         | 350         | 16000       | 430         | 6.7         | 35700       | 34800       |
|            |             |             |             |             |             |             |             |             |             |
| WELL NUMBER H4 | BEAR CR INJECTION MONITOR 573 (LAT 27° 46' 14" LNG U82 42° 52'.04"

Jan. 1976  | .5          | 70          | 120         | 730         | 9400        | 320         | 3.4         | 30400       | 29200       |
|            |             |             |             |             |             |             |             |             |             |
| WELL NUMBER H5 | BEAR CR INJECTION MONITOR 300 (LAT 27° 46' 14" LNG U82 42° 52'.05"

Dec. 1975  | 1.2         | 3.0         | 230         | 30          | 240         | 3.6         | 30          | 1330        | 1360        |
|            |             |             |             |             |             |             |             |             |             |
| WELL NUMBER H6 | BEAR CR EXPLORATORY HOLE (LAT 27° 46' 14" LNG U82 42° 52'.06"

Nov. 1974  | .3          | --          | 110         | 10          | 39          | 2.0         | 36          | 566         | 487         |
|            |             |             |             |             |             |             |             |             |             |
| WELL NUMBER H7 | BEAR CR EXPLORATORY HOLE (LAT 27° 46' 14" LNG U82 42° 52'.07"
Table 13.—Concentrations of trace elements in water from selected wells at the test site

| DATE | VAL (FT) | VAL (UG/L) | SAMPLT | TIME | DEPTH TO BOTTOM | DEPTH TO TOP | Fe | Cu | Zn | Pb | Sb | As | Hg | CO | Cr | Cu | Fe |
|------|----------|-------------|--------|------|---------------|-------------|----|----|----|----|----|----|----|----|----|----|
| Dec. 1975 | 17... 1470 | 250 | 150 | 200 | 120 |
| Jan. 1976 | 14... 1300 | 75 | 150 | 0 | 690 |
| Nov. 1974 | 15... 1515 | 192 | 250 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Well Number 42 | Bear CH 570 Annulus (LAT 27 40 14 LUNG 082 42 52.02) | | | | | | | | | | | | | | | | |
| Well Number 41 | Bear CH INJ Monitor 1667 (LAT 27 40 14 LUNG 082 42 52.01) | | | | | | | | | | | | | | | | |
| Well Number 42 | Bear CH INJ Monitor 1070 (LAT 27 40 14 LUNG 082 42 52.02) | | | | | | | | | | | | | | | | |
| Well Number 43 | Bear CH INJ Monitor 100 (LAT 27 40 14 LUNG 082 42 52.03) | | | | | | | | | | | | | | | | |
| Well Number 45 | Bear CH INJ Monitor 300 (LAT 27 40 14 LUNG 082 42 52.05) | | | | | | | | | | | | | | | | |
| Well Number 45 | Bear CH Exploratory Hole (LAT 27 46 14 LUNG 082 42 52) | | | | | | | | | | | | | | | | |
| Well Number 46 | Bear CH 570 Annulus (LAT 27 40 14 LUNG 082 42 52.02) | | | | | | | | | | | | | | | | |
Table 13.—Concentrations of trace elements in water from selected wells at the test site—continued

<table>
<thead>
<tr>
<th>Date</th>
<th>Agn-</th>
<th>Mn-</th>
<th>Zn-</th>
<th>Cu-</th>
<th>Zr-</th>
<th>Hg-</th>
<th>Li-</th>
<th>Pb-</th>
<th>Sn-</th>
<th>Cr-</th>
<th>V-</th>
<th>Ni-</th>
<th>Mg-</th>
</tr>
</thead>
<tbody>
<tr>
<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
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<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
<td>(UG/L)</td>
</tr>
</tbody>
</table>

**WELL NUMBER 62**  
CAEN CR 570 ANNULUS (LAT 27 46 14 LUNG UBC 42 52.02)

| DEC. 1975 | | |
|-----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/00   | 1.30 | 0.0 | 0.0 | 1.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**WELL NUMBER 61**  
BEAK CR INJ MONITOR 1267 (LAT 27 46 14 LUNG UBC 42 52.01)

| JAN. 1976 | | |
|-----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05/00   | 1.00 | 0.0 | 0.0 | 2.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**WELL NUMBER 62**  
BEAK CR INJ MONITOR 1070 (LAT 27 46 14 LUNG UBC 42 52.02)

| APR. 1976 | | |
|-----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17/00   | 1.20 | 4.0 | 0.0 | 3.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**WELL NUMBER 63**  
BEAK CR INJ MONITOR 500 (LAT 27 46 14 LUNG UBC 42 52.03)

| DEC. 1975 | | |
|-----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17/00   | 1.00 | 0.0 | 0.0 | 7.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**WELL NUMBER 63**  
BEAK CR INJ MONITOR 300 (LAT 27 46 14 LUNG UBC 42 52.05)

| DEC. 1975 | | |
|-----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17/00   | 1.00 | 0.0 | 0.0 | 1.0000 | 17.00 | 20.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**WELL NUMBER 62**  
BEAK CR EXPLORATORY HOLE (LAT 27 46 14 LUNG UBC 42 52)

| NOV. 1974 | | |
|-----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 06/00   | 1.00 | 2.0 | 3.0 | 1.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
Table 14.—Concentrations of nitrogen, phosphorus, coliform, and streptococci from selected wells at the test site

<table>
<thead>
<tr>
<th>DATE</th>
<th>DEPTH TO SAMPLE</th>
<th>DEPTH TO BOTTOM OF SAMPLE</th>
<th>TOTAL ORGANIC AMMONIA</th>
<th>TOTAL NITRITE</th>
<th>TOTAL NITRATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TIME (h)</td>
<td>TIME (FT)</td>
<td>(N) (MG/L)</td>
<td>(N) (MG/L)</td>
<td>(N) (MG/L)</td>
</tr>
<tr>
<td>WELL NUMBER B1</td>
<td>BEAR CR INJ MONITOR 1267 (LAT 27 46 14 LONG 082 42 52.01)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAN. 1976</td>
<td>07... 1112 11/0</td>
<td>1267</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>WELL NUMBER B3</td>
<td>BEAR CR INJ MONITOR 800 (LAT 27 46 14 LONG 082 42 52.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAN. 1976</td>
<td>07... 1140 150</td>
<td>830</td>
<td>0.91</td>
<td>0.24</td>
<td>0.67</td>
</tr>
<tr>
<td>WELL NUMBER B4</td>
<td>BEAR CR INJ MONITOR 573 (LAT 27 46 14 LONG 082 42 52.04)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAN. 1976</td>
<td>07... 1040 560</td>
<td>573</td>
<td>1.1</td>
<td>0.18</td>
<td>1.0</td>
</tr>
<tr>
<td>WELL NUMBER B5</td>
<td>BEAR CR INJ MONITOR 300 (LAT 27 46 14 LONG 082 42 52.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>JAN. 1976</td>
<td>07... 0945 192</td>
<td>340</td>
<td>0.78</td>
<td>0.11</td>
<td>0.67</td>
</tr>
<tr>
<td>WELL NUMBER E2</td>
<td>BEAR CR EXPLORATORY HOLE (LAT 27 46 14 LONG 082 42 52)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOV. 1974</td>
<td>06... 1515 192</td>
<td>250</td>
<td>0.79</td>
<td>0.12</td>
<td>0.67</td>
</tr>
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</table>
Table 14.—Concentrations of nitrogen, phosphorus, coliform, and streptococci from selected wells at the test site—continued

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOTAL CORT</th>
<th>IMME-</th>
<th>Fecal. CORT</th>
<th>Fecal. THORUS</th>
<th>STREP- CORT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(mpn)</td>
<td>(mpn)</td>
<td>(mpn)</td>
<td>(mpn)</td>
<td>(mpn)</td>
</tr>
<tr>
<td></td>
<td>(mg/l)</td>
<td>(mg/l)</td>
<td>100 ml</td>
<td>100 ml</td>
<td>100 ml</td>
</tr>
<tr>
<td>WELL NUMBER A1</td>
<td>BEAR CR INJ MONITOR 1267 (LAT 27 46 14 LONG U82 42 52.01)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAN * 1974</td>
<td>07...</td>
<td>0.03</td>
<td>&lt;3</td>
<td>&lt;3</td>
<td>--</td>
</tr>
<tr>
<td>WELL NUMBER B3</td>
<td>BEAR CR INJ MONITOR 800 (LAT 27 46 14 LONG U82 42 52.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAN * 1976</td>
<td>01...</td>
<td>0.01</td>
<td>&lt;1</td>
<td>--</td>
<td>&lt;1</td>
</tr>
<tr>
<td>WELL NUMBER B4</td>
<td>BEAR CR INJ MONITOR 573 (LAT 27 46 14 LONG U82 42 52.04)</td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>JAN * 1976</td>
<td>01...</td>
<td>0.03</td>
<td>&lt;3</td>
<td>&lt;3</td>
<td>--</td>
</tr>
<tr>
<td>WELL NUMBER B5</td>
<td>BEAR CR INJ MONITOR 300 (LAT 27 46 14 LONG U82 42 52.05)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>JAN * 1976</td>
<td>07...</td>
<td>0.07</td>
<td>&lt;1</td>
<td>--</td>
<td>&lt;1</td>
</tr>
<tr>
<td>WELL NUMBER E2</td>
<td>BEAR CR EXPLORATORY HOLE (LAT 27 46 14 LONG U82 42 52)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOV * 1974</td>
<td>06...</td>
<td>0.11</td>
<td>0.10</td>
<td>--</td>
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</table>
Table 15.—Record of wells near the Bear Creek test site

[Location of wells is shown in figure 10.]

<table>
<thead>
<tr>
<th>Well number</th>
<th>Latitude Longitude</th>
<th>Name or owner</th>
<th>Land surface elevation (ft above mean sea level)</th>
<th>Total depth (ft below land surface)</th>
<th>Open interval (ft below land surface)</th>
<th>Casing diameter (in)</th>
<th>Distance from injection well Al (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>27450N0824237.01</td>
<td>Boca Ciega High School</td>
<td>23</td>
<td>400</td>
<td>--</td>
<td>--</td>
<td>4,150</td>
</tr>
<tr>
<td>S2</td>
<td>27455N0824250.01</td>
<td>Floyd Shu</td>
<td>25</td>
<td>45</td>
<td>185-285</td>
<td>1-1/4</td>
<td>2,550</td>
</tr>
<tr>
<td>S3</td>
<td>27460N0824236.01</td>
<td>Royal Palm Corp.</td>
<td>24</td>
<td>285</td>
<td>92-153</td>
<td>3</td>
<td>1,950</td>
</tr>
<tr>
<td>S4</td>
<td>27460N0824253.01</td>
<td>Woodlawn Cemetery</td>
<td>20</td>
<td>153</td>
<td>55</td>
<td>--</td>
<td>1,100</td>
</tr>
<tr>
<td>S5</td>
<td>27461N0824318.01</td>
<td>White Cross Hospital</td>
<td>20</td>
<td>55</td>
<td>--</td>
<td>--</td>
<td>2,450</td>
</tr>
<tr>
<td>S6</td>
<td>27461N0824304.01</td>
<td>Second Church of Christ Scientist</td>
<td>20</td>
<td>270</td>
<td>--</td>
<td>2</td>
<td>1,100</td>
</tr>
<tr>
<td>S7</td>
<td>27462N0824238.01</td>
<td>D. Benton</td>
<td>22</td>
<td>163</td>
<td>--</td>
<td>1-1/4</td>
<td>1,200</td>
</tr>
<tr>
<td>S8</td>
<td>27462N0824256.01</td>
<td>Charley Davy</td>
<td>20</td>
<td>60</td>
<td>190-380</td>
<td>4</td>
<td>4,200</td>
</tr>
<tr>
<td>S9</td>
<td>27464N0824249.01</td>
<td>St. Judes School</td>
<td>20</td>
<td>380</td>
<td>6</td>
<td>--</td>
<td>2,250</td>
</tr>
<tr>
<td>S10</td>
<td>27465N0824322.01</td>
<td>Diocese of St. Petersburg</td>
<td>20</td>
<td>380</td>
<td>190-380</td>
<td>4</td>
<td>4,200</td>
</tr>
<tr>
<td>S11</td>
<td>27465N0824318.01</td>
<td>Bishop Barry High School</td>
<td>20</td>
<td>220</td>
<td>--</td>
<td>3</td>
<td>4,100</td>
</tr>
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</table>
Table 16. Chemical analyses of water from selected wells near the test site

<table>
<thead>
<tr>
<th>TIME</th>
<th>WELL NUMBER 51</th>
<th>HIGH SCHOOL (LAT 27 45 40 LONG 082 42 37.01)</th>
<th>WELL NUMBER 52</th>
<th>FLOYD SHH (LAT 27 45 54 LONG 082 42 50.01)</th>
<th>WELL NUMBER 53</th>
<th>ROYAL PALM CORP (LAT 27 46 06 LONG 082 42 36.01)</th>
<th>WELL NUMBER 54</th>
<th>WOODLAND CEMETARY (LAT 27 46 07 LONG 082 42 53.01)</th>
<th>WELL NUMBER 55</th>
<th>WHITE CROSS HOSPITAL (LAT 27 46 13 LONG 082 43 18.01)</th>
<th>WELL NUMBER 56</th>
<th>SECOND CHURCH OF CHRIST (LAT 27 46 16 LONG 082 43 04.01)</th>
<th>WELL NUMBER 57</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MAR '74</td>
<td>1145 400</td>
<td>25.0 4010 7.0 191 221 0 1.3 1100</td>
<td>MAR '74</td>
<td>1145 45</td>
<td>24.0 287 4.4 0 0 0 1.9 72</td>
<td>MAR '74</td>
<td>0700 285</td>
<td>21.0 1560 7.2 194 276 0 0.7 310</td>
<td>MAR '74</td>
<td>0830 153</td>
<td>24.5 1000 7.2 201 295 0 0 3.1 180</td>
<td>MAR '74</td>
<td>1025 55</td>
<td>23.0 1190 7.2 196 239 0 0 3.1 230</td>
</tr>
</tbody>
</table>
Table 16. -- Chemical analyses of water from selected wells near the test site -- continued

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(MG/L)</td>
<td>(MG/L)</td>
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<td>(MG/L)</td>
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<tr>
<td>MAR 1974</td>
<td>09...</td>
<td>180</td>
<td>0.2</td>
<td>240</td>
<td>54</td>
<td>440</td>
<td>14</td>
<td>28</td>
<td>2700</td>
<td>2160</td>
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<tr>
<td>WELL NUMBER 51</td>
<td>Gitia Gieua High School (LAT 27.45.40 LONG 082.42 37.01)</td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>MAR 1974</td>
<td>07...</td>
<td>97</td>
<td>0.7</td>
<td>18</td>
<td>4.2</td>
<td>9.6</td>
<td>24</td>
<td>4.4</td>
<td>9.9</td>
<td>13.8</td>
</tr>
<tr>
<td>WELL NUMBER 52</td>
<td>FLOYD MIN (LAT 27.45.54 LONG 082.42 50.01)</td>
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<tr>
<td>MAR 1974</td>
<td>07...</td>
<td>41</td>
<td>0.2</td>
<td>180</td>
<td>27</td>
<td>44</td>
<td>34</td>
<td>10.3</td>
<td>774</td>
<td>0.998</td>
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<tr>
<td>WELL NUMBER 53</td>
<td>ROYAL PALM CORP (LAT 27.46.06 LONG 082.42 36.01)</td>
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<td></td>
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</tr>
<tr>
<td>MAR 1974</td>
<td>12...</td>
<td>18</td>
<td>0.7</td>
<td>120</td>
<td>14</td>
<td>4.4</td>
<td>3.5</td>
<td>37</td>
<td>760</td>
<td>445</td>
</tr>
<tr>
<td>WELL NUMBER 54</td>
<td>WOODLIEVO CEMETARY (LAT 27.46.07 LONG 082.42 43 53.01)</td>
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<tr>
<td>MAR 1974</td>
<td>09...</td>
<td>26</td>
<td>0.7</td>
<td>130</td>
<td>22</td>
<td>97</td>
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<td>7.7</td>
<td>744</td>
<td>622</td>
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<tr>
<td>WELL NUMBER 55</td>
<td>WHITE CROSS HOSPITAL (LAT 27.46.11 LONG 082.43 10.01)</td>
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</tr>
<tr>
<td>MAR 1974</td>
<td>07...</td>
<td>29</td>
<td>0.7</td>
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<td>24</td>
<td>4.7</td>
<td>35</td>
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<td>715</td>
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<td>WELL NUMBER 56</td>
<td>SECOND CHURCH OF CHRIST (LAT 27.46.16 LONG 082.43 04.01)</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

SUM OF DENSITY DEVIATIONS AT 20 C
Table 16.—Chemical analyses of water from selected wells near the test site—continued

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>DEPTH</th>
<th>TEMP (°F)</th>
<th>PH</th>
<th>TOTAL SULFIDE (MG/L)</th>
<th>DISOLVED CHLORIDE (MG/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELL NUMBER S7</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>MAR, 1974</td>
<td>0940</td>
<td>163</td>
<td>24.0</td>
<td>7.3</td>
<td>217</td>
<td>265</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>MAR, 1974</td>
<td>1000</td>
<td>60</td>
<td>24.5</td>
<td>4.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>WELL NUMBER S9</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<td>MAR, 1974</td>
<td>1130</td>
<td>380</td>
<td>25.0</td>
<td>7.1</td>
<td>194</td>
<td>236</td>
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<td></td>
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<tr>
<td>SEP, 1975</td>
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<td>380</td>
<td>24.6</td>
<td>900</td>
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<td>--</td>
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</tr>
<tr>
<td>MAR, 1974</td>
<td>1000</td>
<td>220</td>
<td>22.0</td>
<td>7.2</td>
<td>230</td>
<td>280</td>
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Table 16.--Chemical analyses of water from selected wells near the test site - continued

<table>
<thead>
<tr>
<th>WELL NUMBER</th>
<th>LOCATION</th>
<th>DATE</th>
<th>FLUORIDE (MG/L)</th>
<th>SULFATE (MG/L)</th>
<th>CALCIUM (MG/L)</th>
<th>MAGNESIUM (MG/L)</th>
<th>POTASSIUM (MG/L)</th>
<th>SILICA (MG/L)</th>
<th>SOLIDS AS RESIDUE (MG/L)</th>
<th>SOLIDS AS SUM OF CONSTITUENTS (MG/L)</th>
<th>DENSITY AT 180 DEG. C (GM/ML)</th>
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</thead>
<tbody>
<tr>
<td>S7</td>
<td>D. REATON (LAT 27 46 20 LONG 082 42 38.01)</td>
<td>MAR '74 08... 0940</td>
<td>17  .5  98</td>
<td>20  36</td>
<td>3.1  40</td>
<td>599  496</td>
<td>998</td>
<td>998</td>
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<tr>
<td>S8</td>
<td>CHAPLEY DAVY (LAT 27 46 28 LONG 082 42 56.01)</td>
<td>MAR '74 12... 1000</td>
<td>39  .2  5.3</td>
<td>11  26</td>
<td>6.3  8.8</td>
<td>210  170</td>
<td>997</td>
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<tr>
<td>S9</td>
<td>ST. JUDFS SCHOOL (LAT 27 46 42 LONG 082 42 49.01)</td>
<td>MAR '74 12... 1130</td>
<td>27  .3  150</td>
<td>26  140</td>
<td>4.6  35</td>
<td>1250  899</td>
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<td>DIOCESE OF ST PETERSBURG (LAT 27 46 52 LONG 082 43 22.01)</td>
<td>SEP '75 18... 1115</td>
<td>4.6  --  110</td>
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<td>--  999</td>
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<td>BISHOP BARRY HIGH SCHOOL (LAT 27 46 53 LONG 082 43 18.01)</td>
<td>MAR '74 13... 1000</td>
<td>14  .3  120</td>
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<td>4.9  40</td>
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Table 17. Concentrations of nitrogen and phosphorus in water from selected wells near the test site

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<tr>
<th>DATE</th>
<th>TIME</th>
<th>TOTAL NITRO-</th>
<th>ORGANIC NITRO-</th>
<th>TOTAL NITRITE</th>
<th>TOTAL NITRATE</th>
<th>TOTAL AMMONIA</th>
<th>TOTAL ORTHO PHOS-</th>
<th>TOTAL PHOS-</th>
<th>WELL NUMBER</th>
<th>LOCATION</th>
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<td>MAR 1974</td>
<td>08...</td>
<td>.38</td>
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<td>.00</td>
<td>.11</td>
<td>.10</td>
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<td>HIGH SCHOOL (LAT 27 45 40 LONG 082 42 37.01)</td>
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<td>.07</td>
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<td>.00</td>
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<td>FLOYD SHU (LAT 27 45 54 LONG 082 42 50.01)</td>
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<td>.08</td>
<td>.03</td>
<td>.01</td>
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<td>ROYAL PALM CORP (LAT 27 46 06 LONG 082 42 36.01)</td>
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<td>.05</td>
<td>.05</td>
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<td>WHITE CROSS HOSPITAL (LAT 27 46 13 LONG 082 43 18.01)</td>
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<td>.05</td>
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<th>CHARLEY DAVY (LAT 27 46 28 LONG 082 42 56.01)</th>
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<th>ST. JUDES SCHOOL (LAT 27 46 47 LONG 082 42 49.01)</th>
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<td>MAR 1974</td>
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<th>WELL NUMBER 51</th>
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<tr>
<td>MAR 1974</td>
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