WSRC-TR--92-393

DE93 007456

SECOND QUARTER 1992

F-AREA ACID/CAUSTIC BASIN GROUNDWATER MONITORING REPORT (U)

PUBLICATION DATE: SEPTEMBER 1992

WESTINGHOUSE SAVANNAH RIVER COMPANY
SAVANNAH RIVER SITE
AIKEN, SC 29808

Prepared for the U.S. Department of Energy under Contract No. DE-AC09-89SR18035

DISCLAIMER

WSRC-TR-92-393

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KEY WORDS

FAC wells
gross alpha
hazardous waste

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Authorized Derivative Classifier:

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Abstract

During second quarter 1992, samples from the six FAC monitoring wells at the F-Area Acid/Caustic Basin were analyzed for herbicides, indicator parameters, major ions, pesticides, radionuclides, turbidity, volatile organic compounds, and other constituents. Monitoring results that exceeded the U.S. Environmental Protection Agency's Primary Drinking Water Standards (PDWS) or the Savannah River Site flagging criteria or turbidity standards during the quarter are the focus of this report.

Gross alpha exceeded the PDWS in well FAC 4. Manganese exceeded the Flag 2 criterion in well FAC 4; total organic carbon was elevated in wells FAC 6 and 7; and total organic halogens were similarly elevated in wells FAC 3, 5, 6, 7, and 8.

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Executive Summary

The six monitoring wells at the F-Area Acid/Caustic Basin are sampled quarterly as part of the Savannah River Site (SRS) Groundwater Monitoring Program and to comply with South Carolina Hazardous Waste Management Regulations. During second quarter 1992, samples from the monitoring wells were analyzed for herbicides, major ions, pesticides, pH, radionuclides, specific conductance, total dissolved solids, total organic carbon, total organic halogens, turbidity, volatile organic compounds, and other constituents. Monitoring results that exceeded the U.S. Environmental Protection Agency's Primary Drinking Water Standards (PDWS) or the SRS flagging criteria or turbidity standards are the focus of this report.

During second quarter 1992, wells FAC 5, 6, 7, and 8 at the F-Area Acid/Caustic Basin did not yield four well volumes prior to sampling; thus, the samples collected from these wells may not be representative groundwater samples. Gross alpha exceeded the PDWS in well FAC 4, with activities up to 1.5E+01 pCi/L. Manganese exceeded the Flag 2 criterion in well FAC 4, with a concentration of 434 μg/L; total organic carbon exceeded Flag 2 criteria in wells FAC 6 and 7, with concentrations up to 19,500 μg/L; and total organic halogens were elevated in wells FAC 3, 5, 6, 7, and 8, with a maximum concentration of 235 μg/L in well FAC 6.

Samples from wells FAC 3 and 5 exceeded the SRS turbidity standard.

Water-table elevations at the F-Area Acid/Caustic Basin indicate that the groundwater flow direction is west. Upgradient wells FAC 3 and 5 contained elevated levels of total organic halogens. Among the downgradient wells, FAC 4 contained elevated levels of gross alpha and manganese; FAC 6 and 7 contained elevated total organic carbon; and FAC 6, 7, and 8 contained elevated total organic halogens.

Introduction

The F-Area Acid/Caustic Basin is located east of F Area at the Savannah River Site (SRS) on a slope that leads to an unnamed tributary of Upper Three Runs Creek. The basin, constructed in the early 1950s, is an unlined earthen pit that received dilute sulfuric acid and sodium hydroxide solutions and other wastes from several areas within SRS. The basin provided mixing and neutralization of the dilute solutions before their discharge to nearby streams. The F-Area Acid/Caustic Basin remained in service until new neutralization facilities became operational in 1982 (Heffner and Exploration Resources, 1991).

Four groundwater monitoring wells were installed at the F-Area Acid/Caustic Basin between August 1983 and July 1984. Under the terms of a consent decree executed May 26, 1988, by the U.S. District Court (District of South Carolina, Aiken Division), the basin became subject to requirements of Subtitle C of the Resource Conservation and Recovery Act (RCRA), the South Carolina Hazardous Waste Management Regulations (SCHWMR), and associated regulations. The monitoring wells were re-evaluated during the summer of 1988 to ensure compliance with SCHWMR. As part of this compliance effort, four additional wells were installed at the F-Area Acid/Caustic Basin during third quarter 1988. Wells FAC 1 and 2 were abandoned in March 1989 because they were dry and were not included in the RCRA monitoring program.

The monitoring wells at the F-Area Acid/Caustic Basin are sampled quarterly as part of the SRS Groundwater Monitoring Program and to comply with SCHWMR. Because the screen zone elevations of the monitoring wells vary, the pattern of water elevations makes interpretation of horizontal flow direction beneath the basin difficult. The revised Groundwater Quality Assessment Plan for the F-Area Acid/Caustic Basin (WSRC, 1991), submitted to the South Carolina Department of Health and Environmental Control on April 30, 1991, proposes the installation of six permanent piezometers to provide additional water-elevation data, to help define the groundwater flow direction, and to assess the current monitoring well network as required by SCHWMR.

Discussion

Groundwater Monitoring Data

During second quarter 1992, samples from six monitoring wells at the F-Area Acid/Caustic Basin were analyzed for herbicides, major ions, pesticides, pH, radionuclides, specific conductance, total dissolved solids, total organic carbon, total organic halogens, turbidity, volatile organic compounds, and other constituents. This report describes results that exceeded U.S. Environmental Protection Agency (EPA) Primary Drinking Water Standards (PDWS) (Appendix A), SRS flagging criteria (Appendix B), or SRS turbidity standards.

In general, the flagging criteria established by the Environmental Monitoring Section of the Environmental Protection Department at SRS for identifying constituents in high concentrations in groundwater are as follows:

- Flag 2 criteria are based on the PDWS; for constituents that do not have PDWS, Flag 2 criteria are based on the Secondary Drinking Water Standards (SDWS) or 10 times the method detection limits (MDL) as described in Appendix B. Constituent levels that equal or exceed Flag 2 criteria are described as *elevated*.

- Flag 1 criteria are based on half the PDWS; for constituents that do not have PDWS, Flag 1 criteria are based on half the SDWS or 5 times the MDL as described in Appendix B. A Flag 1 value for a constituent may reflect analytical error or it may indicate the initial detection of a constituent. Thus, constituents exceeding Flag 1 criteria are included in this report and are described as *slightly elevated*.

- Flag 0 criteria are based on constituent levels below Flag 1 criteria or below the sample detection limit.

Illustrations of the monitored waste management unit at SRS (Figure 1), the individual monitoring wells (Figure 2), and the flow direction of the groundwater beneath the basin (Figure 3) are in Appendix C; monitoring results as well as analyses that exceeded holding times or PDWS are presented in Appendix D.

Analytical Results Exceeding Standards

Results for analytes that exceeded the PDWS (see Appendix A) during second quarter 1992 are summarized in Table 1 (Appendix D). Gross alpha exceeded the PDWS in well FAC 4 at a value of 1.5E+01 pCi/L.

Constituents that exceeded other Flag 1 or 2 criteria (see Appendix B) during second quarter 1992 are summarized in Table 2 (Appendix D). Manganese exceeded the Flag 2 criterion in well FAC 4, with a concentration of 434 μg/L; total organic carbon exceeded Flag 2 in wells FAC 6 and 7 with a maximum concentration of 19,500 μg/L in well FAC 7; and total organic halogens were elevated in wells FAC 3, 5, 6, 7, and 8, with a maximum concentration of 230 μg/L in well FAC 6. All results for individual wells are presented in Table 3 (Appendix D). Table 3 also indicates those analyses that exceeded holding times or PDWS.

The standard practice at SRS is to purge a minimum of four well volumes from each well and ensure that the field parameters have stabilized before sample collection. If a well that goes dry during purging recovers sufficiently for sampling within 24 hours, the procedure is considered a single sampling event. Table 3 (Appendix D) lists the amount of water purged from each well during second quarter 1992 at the F-Area Acid/Caustic Basin. Wells FAC 5, 6, 7, and 8 did not yield four well volumes prior to sampling.

Turbidity Results Exceeding Standards

Turbidity results, in nephelometric turbidity units (NTU), are reported here for well samples exceeding 5 NTU or the SRS standard of 50 NTU. During second quarter 1992, the turbidity in the sample from well FAC 4 was below 5 NTU. Wells FAC 6, 7, and 8 did not exceed the 50 NTU turbidity standard. Wells FAC 3 and 5 exhibited turbidity values greater than 50 NTU, with values ranging up to 271 NTU in well FAC 3 (Table 3, Appendix D).

A value of 5 NTU, established by EPA (1986) as a general standard for acceptability of groundwater samples, is considered unrealistic for monitoring wells at SRS. Gass (1989) has documented turbidity measurements ranging up to 5,000 NTU from properly designed wells screened in poorly productive formations. During the 1989 RCRA Compliance Evaluation Inspection, officials from EPA Region IV indicated that the SRS turbidity standard of 50 NTU is conservative. These officials also agreed that water-table wells in this area often correspond to nonaquifer formations, rendering development of these wells more difficult due to the low yield and high proportion of mobile fines typical of these formations (Bergren and Bennett, 1989).

Water Elevations, Flow Directions, and Flow Rates

Water-table elevations and the groundwater flow direction beneath the F-Area Acid/Caustic Basin are shown in Figure 3 (Appendix C). The groundwater flow direction is west (using SRS grid coordinates); historically, groundwater flow at this waste management unit has been toward the northwest.

The groundwater flow rate in the water table (Aquifer Zone IIB_2) beneath the F-Area Acid/Caustic Basin is estimated using the following equation:

$$\text{Flow (ft/day)} = \frac{\text{Hydraulic Conductivity (ft/day)}}{\text{Porosity (unitless)}} \times \frac{dh\ \text{(ft)}}{dl\ \text{(ft)}}$$

A hydraulic conductivity constant of 10 ft/day (Geraghty & Miller, Inc., 1990) is a conservative estimate (i.e., the actual hydraulic conductivity should be somewhat less than 10 ft/day). The effective porosity value is estimated at 20% (Killian et al., 1987), *dh* is the difference in head, and *dl* is the length of the flow path. Flow rate estimates vary depending on the vertical gradient between wells, the size of the area under consideration, and the number of data points. For this reason, the estimation of flow rate should be considered accurate only to an order of magnitude.

Using the above equation with dh = 6 ft and dl = 30 ft (see Figure 3 in Appendix C), the flow rate estimate for groundwater in the water table beneath the F-Area Acid/Caustic Basin is as follows:

$$\frac{10}{0.20} \times \frac{6}{30} = 10 \text{ ft/day}$$

$$10 \text{ ft/day} \times 365 \text{ days} = 3{,}700 \text{ ft/yr}$$

Water-level measurements at this unit do not provide a clear pattern and, thus, make groundwater flow rate estimates difficult. The additional piezometers that will be installed after approval of the Groundwater Quality Assessment Plan (WSRC, 1991) (see Figure 3, Appendix C) will provide more accurate water elevations and groundwater flow estimates.

Results for Upgradient vs. Downgradient Wells

Wells FAC 3 and 5 are the designated upgradient wells at the F-Area Acid/Caustic Basin. During second quarter 1992, upgradient well FAC 3 contained elevated total organic halogens at 55 µg/L, as did upgradient well FAC 5, at 93 µg/L. Among downgradient wells, FAC 4 contained elevated levels of gross alpha and manganese; FAC 6 and 7 contained elevated levels of total organic carbon; and wells FAC 6, 7, and 8 contained elevated levels of total organic halogens.

Conclusions

Gross alpha, manganese, total organic carbon, and total organic halogens exceeded drinking water standards or other Flag 2 criteria in FAC wells at the F-Area Acid/Caustic Basin during second quarter 1992. Upgradient wells FAC 3 and 5 contained elevated levels of total organic halogens. Downgradient well FAC 4 contained elevated levels of gross alpha and manganese; wells FAC 6 and 7 contained elevated total organic carbon; and wells FAC 6, 7, and 8 contained elevated total organic halogens. Generally, elevated levels of constituents found in downgradient wells but not in upgradient wells at a waste management unit are considered products of the waste management unit.

Because historic records indicate that no radionuclides were disposed of at this waste management unit (Heffner and Exploration Resources, 1991), the elevated levels of gross alpha in the FAC wells are not considered to be due to seepage from the F-Area Acid/Caustic Basin.

Samples from wells FAC 3 and 5 exceeded the turbidity standard of 50 NTU.

Water-table elevations at the F-Area Acid/Caustic Basin indicate that the groundwater flow direction is west relative to SRS grid coordinates; the historical flow pattern is toward the northwest. However, the anomalous water-table data from FAC wells make the estimation of groundwater flow rates difficult. The revised Groundwater Quality Assessment Plan for the F-Area Acid/Caustic Basin (WSRC, 1991) proposes the installation of six permanent piezometers to provide additional water-elevation data and to help define the groundwater flow direction.

Errata

Third Quarter 1991:

- Errors in the computer program used to mark analyses that exceed holding times caused a number of analyses to be incorrectly flagged as exceeding holding time.

- The nitrate as nitrogen analysis for well FAC 7 was the only analysis performed by General Engineering Laboratories on samples from the FAC well series during third quarter 1991 that exceeded holding time.

Fourth Quarter 1991 and 1991 Summary:

- Page D-2, Holding Time: The statement concerning holding time for pH is incorrect. The statement should read "South Carolina Department of Health and Environmental Control allows only 15 minutes to elapse between sampling and analysis for pH. Thus, laboratory pH analyses always exceed holding time."

- The results of analyses performed using EPA Method 900.1 have been incorrectly referred to in the past as total radium results and have been inappropriately evaluated against the drinking water standard for combined radium-226 and radium-228. EPA Method 900.1 should be considered a gross screening procedure for radium alpha; it may be used to screen drinking water for the necessity of performing a specific radium-226 analysis, but it gives no indication of the presence or quantity of radium-228 in the sample. This analysis will be referred to in the future as total alpha-emitting radium.

First Quarter 1992:

- The definitions for the abbreviations *TM* and *WA* were not included in the "Key to Reading the Tables" in Appendix D. *TM* and *WA* represent TMA/Eberline and Roy F. Weston, Inc. laboratories, respectively.

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Appendix A – Primary Drinking Water Standards

Primary Drinking Water Standards

Analyte	Unit	Level	Status	Reference
Americium-241	pCi/L	6.34E+00	Proposed	EPA, 1991
Americium-243	pCi/L	6.37E+00	Proposed	EPA, 1991
Antimony	µg/L	5[a]	Proposed	EPA, 1990
Antimony-125	pCi/L	3E+02	Final	EPA, 1977
Arsenic	µg/L	50	Final	CFR, 1991
Barium	µg/L	2,000	Final	CFR, 1991
Barium-140	pCi/L	9E+01	Final	EPA, 1977
Benzene	µg/L	5	Final	CFR, 1991
Benzo[*a*]anthracene	µg/L	0.1	Proposed	EPA, 1990
Benzo[*b*]fluoranthene	µg/L	0.2	Proposed	EPA, 1990
Benzo[*k*]fluoranthene	µg/L	0.2	Proposed	EPA, 1990
Benzo[*a*]pyrene	µg/L	0.2	Proposed	EPA, 1990
Beryllium	µg/L	1	Proposed	EPA, 1990
Beryllium-7	pCi/L	6E+03	Final	EPA, 1977
Bromodichloromethane	µg/L	100	Final	CFR, 1991
Bromoform	µg/L	100	Final	CFR, 1991
2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	µg/L	7	Proposed	EPA, 1990
Cadmium	µg/L	5	Final	CFR, 1991
Carbon-14	pCi/L	2E+03	Final	EPA, 1977
Carbon tetrachloride	µg/L	5	Final	CFR, 1991
Cerium-141	pCi/L	3E+02	Final	EPA, 1977
Cerium-144	pCi/L	2.61E+02	Proposed	EPA, 1991
Cesium-134	pCi/L	8.13E+02[b]	Proposed	EPA, 1991
Cesium-137	pCi/L	2E+02	Final	EPA, 1977
Chlordane	µg/L	2	Final	CFR, 1991
Chloroethene (Vinyl chloride)	µg/L	2	Final	CFR, 1991
Chloroform	µg/L	100	Final	CFR, 1991
Chromium	µg/L	100	Final	CFR, 1991
Chromium-51	pCi/L	6E+03	Final	EPA, 1977
Chrysene	µg/L	0.2	Proposed	EPA, 1990
Cobalt-57	pCi/L	1E+03	Final	EPA, 1977
Cobalt-58	pCi/L	9E+03	Final	EPA, 1977
Cobalt-60	pCi/L	1E+02	Final	EPA, 1977
Copper	µg/L	1,300	Final	CFR, 1991
Curium-242	pCi/L	1.33E+02	Proposed	EPA, 1991
Curium-243	pCi/L	8.3E+00	Proposed	EPA, 1991
Curium-244	pCi/L	9.84E+00	Proposed	EPA, 1991
Curium-246	pCi/L	6.27E+00	Proposed	EPA, 1991
Cyanide	µg/L	200	Proposed	EPA, 1990
Dibenz[*a,h*]anthracene	µg/L	0.3	Proposed	EPA, 1990
Dibromochloromethane	µg/L	100	Final	CFR, 1991
Dibromochloropropane	µg/L	0.2	Final	CFR, 1991
1,2-Dichlorobenzene	µg/L	600	Final	CFR, 1991
1,4-Dichlorobenzene	µg/L	75	Final	CFR, 1991
1,2-Dichloroethane	µg/L	5	Final	CFR, 1991
1,1-Dichloroethylene	µg/L	7	Final	CFR, 1991
cis-1,2-Dichloroethylene	µg/L	70	Final	CFR, 1991
trans-1,2-Dichloroethylene	µg/L	100	Final	CFR, 1991
Dichloromethane (Methylene chloride)	µg/L	5	Proposed	EPA, 1990
2,4-Dichlorophenoxyacetic acid	µg/L	70	Final	CFR, 1991
1,2-Dichloropropane	µg/L	5	Final	CFR, 1991
Endrin	µg/L	0.2	Final	CFR, 1991
Ethylbenzene	µg/L	700	Final	CFR, 1991
Europium-154	pCi/L	2E+02	Final	EPA, 1977

Analyte	Unit	Level	Status	Reference
Europium-155	pCi/L	6E+02	Final	EPA, 1977
Fluoride	µg/L	4,000	Final	CFR, 1991
Gross alpha[c]	pCi/L	1.5E+01	Final	CFR, 1991
Heptachlor	µg/L	0.4	Final	CFR, 1991
Heptachlor epoxide	µg/L	0.2	Final	CFR, 1991
Hexachlorobenzene	µg/L	1	Proposed	EPA, 1990
Hexachlorocyclopentadiene	µg/L	50	Proposed	EPA, 1990
Iodine-129	pCi/L	1E+00	Final	EPA, 1977
Iodine-131	pCi/L	3E+00	Final	EPA, 1977
Iron-55	pCi/L	2E+03	Final	EPA, 1977
Iron-59	pCi/L	2E+02	Final	EPA, 1977
Lanthanum-140	pCi/L	6E+01	Final	EPA, 1977
Lead	µg/L	15	Final	CFR, 1991
Lindane	µg/L	0.2	Final	CFR, 1991
Manganese-54	pCi/L	3E+02	Final	EPA, 1977
Mercury	µg/L	2	Final	CFR, 1991
Methoxychlor	µg/L	40	Final	CFR, 1991
Neptunium-237	pCi/L	7.06E+00	Proposed	EPA, 1991
Nickel	µg/L	100	Proposed	EPA, 1990
Nickel-59	pCi/L	3E+02	Final	EPA, 1977
Nickel-63	pCi/L	5E+01	Final	EPA, 1977
Niobium-95	pCi/L	3E+02	Final	EPA, 1977
Nitrate as nitrogen	µg/L	10,000	Final	CFR, 1991
Nitrite as nitrogen	µg/L	1,000	Final	CFR, 1991
Nonvolatile beta	pCi/L	5E+01	Proposed	EPA, 1986
PCBs[d]	µg/L	0.5	Final	CFR, 1991
Pentachlorophenol	µg/L	1	Final	CFR, 1991
Plutonium-238	pCi/L	7.02E+00	Proposed	EPA, 1991
Plutonium-239	pCi/L	6.21E+01	Proposed	EPA, 1991
Plutonium-239/240[e]	pCi/L	6.21E+01	Proposed	EPA, 1991
Plutonium-240	pCi/L	6.22E+01	Proposed	EPA, 1991
Plutonium-241	pCi/L	6.26E+01	Proposed	EPA, 1991
Plutonium-242	pCi/L	6.54E+01	Proposed	EPA, 1991
Potassium-40	pCi/L	3E+02	Proposed	EPA, 1986
Radium-226	pCi/L	1.57E+01	Proposed	EPA, 1991
Radium-228	pCi/L	7.85E+00	Proposed	EPA, 1991
Radon-222	pCi/L	3E+02	Proposed	EPA, 1991
Ruthenium-103	pCi/L	2E+02	Final	EPA, 1977
Ruthenium-106	pCi/L	3E+01	Final	EPA, 1977
Selenium	µg/L	50	Final	CFR, 1991
Silver	µg/L	50	Final	CFR, 1991
Sodium-22	pCi/L	4.66E+02	Proposed	EPA, 1991
Strontium-89	pCi/L	2E+01[f]	Final	EPA, 1977
Strontium-89/90[e]	pCi/L	8E+00	Final	CFR, 1991
Strontium-90	pCi/L	8E+00	Final	CFR, 1991
Styrene	µg/L	100	Final	CFR, 1991
Sulfate	µg/L	400,000[g]	Proposed	EPA, 1990
Technetium-99	pCi/L	9E+02	Final	EPA, 1977
Tetrachloroethylene	µg/L	5	Final	CFR, 1991
Thallium	µg/L	1	Proposed	EPA, 1990
Thorium-228	pCi/L	1.25E+02	Proposed	EPA, 1991
Thorium-230	pCi/L	7.92E+01	Proposed	EPA, 1991
Thorium-232	pCi/L	8.8E+01	Proposed	EPA, 1991
Thorium-234	pCi/L	4.01E+02	Proposed	EPA, 1991
Tin-113	pCi/L	3E+02	Final	EPA, 1977
Toluene	µg/L	1,000	Final	CFR, 1991

Analyte	Unit	Level	Status	Reference
Total radium	pCi/L	5E+00	Final	CFR, 1991
Total trihalomethanes	µg/L	100	Final	CFR, 1991
Toxaphene	µg/L	3	Final	CFR, 1991
2,4,5-TP (Silvex)	µg/L	50	Final	CFR, 1991
1,2,4-Trichlorobenzene	µg/L	9	Proposed	EPA, 1990
1,1,1-Trichloroethane	µg/L	200	Final	CFR, 1991
1,1,2-Trichloroethane	µg/L	5	Proposed	EPA, 1990
Trichloroethylene	µg/L	5	Final	CFR, 1991
Tritium	pCi/mL	2E+01	Final	CFR, 1991
Uranium	µg/L	20	Proposed	EPA, 1991
Uranium alpha activity	pCi/L	3E+01	Proposed	EPA, 1991
Uranium-233/234[e]	pCi/L	1.38E+01	Proposed	EPA, 1991
Uranium-234	pCi/L	1.39E+01	Proposed	EPA, 1991
Uranium-235	pCi/L	1.45E+01	Proposed	EPA, 1991
Uranium-238	pCi/L	1.46E+01	Proposed	EPA, 1991
Xylenes	µg/L	10,000	Final	CFR, 1991
Zinc-65	pCi/L	3E+02	Final	EPA, 1977
Zirconium-95	pCi/L	2E+02	Final	EPA, 1977
Zirconium/Niobium-95[e]	pCi/L	2E+02	Final	EPA, 1977

Note: Drinking water standards set by EPA (1977) correspond to the level at which each radionuclide contributes 4 mrem/yr of dose to an individual consuming 2 L of contaminated liquid a day. See EPA (1977) for details.

[e] This value is the lower of two proposed levels.
[b] EPD/EMS uses the proposed standard because it is a lower value; the final PDWS in 1977 may have been in error.
[c] The standard given is for gross alpha including radium-226 but excluding radon and uranium.
[d] Analyses were conducted in 1992 for the following: PCB 1016, PCB 1221, PCB 1232, PCB 1242, PCB 1248, PCB 1254, and PCB 1260.
[e] For double radionuclide analyses where each separate radionuclide has its own standard, the more stringent standard is used.
[f] This value is the lower of two levels given for strontium-89.

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Appendix B – Flagging Criteria

Flagging Criteria

Beginning in 1991, the Environmental Monitoring Section of the Environmental Protection Department (EPD/EMS) modified its guidelines for flagging constituents in the Groundwater Monitoring Program. These flagging criteria are as follows:

- Flag 2 criteria for constituents equal the U.S. Environmental Protection Agency (EPA) Primary Drinking Water Standard, the EPA proposed Primary Drinking Water Standard, or the EPA Secondary Drinking Water Standard. If a constituent does not have a drinking water standard, the Flag 2 criterion equals 10 times the method detection limit (MDL) calculated as the 90th percentile detection limit obtained recently by one of the primary analytical laboratories.

- Flag 1 criteria for constituents equal one-half of the EPA Primary Drinking Water Standard, one-half the EPA proposed Primary Drinking Water Standard, or one-half the EPA Secondary Drinking Water Standard. If a constituent does not have an EPA drinking water standard, the Flag 1 criterion equals 5 times the MDL calculated as the 90th percentile detection limit obtained recently by one of the primary analytical laboratories.

- Analytical results for constituents below Flag 1 or below sample detection limits are classified as Flag 0.

The following parameters are not assigned flagging criteria: alkalinity, calcium, carbonate, color, corrosivity, magnesium, odor, potassium, Eh, silica, sodium, total dissolved solids, total phosphorus, total phosphates (as P), and turbidity. In addition, common laboratory contaminants and cleaners including phthalates, methylene chloride, ketones, and toluene are not assigned flagging criteria.

Analyte	Unit	Flag 1	Flag 2	Source
Acenaphthene	µg/L	50	100	EPA Method 8270
Acenaphthylene	µg/L	50	100	EPA Method 8270
Acetone	µg/L	50	100	EPA Method 8240
Acetonitrile (Methyl cyanide)	µg/L	500	1,000	EPA Method 8240
Acetophenone	µg/L	50	100	EPA Method 8270
2-Acetylaminofluorene	µg/L	50	100	EPA Method 8270
Acrolein	µg/L	100	200	EPA Method 8240
Acrylonitrile	µg/L	100	200	EPA Method 8240
Aldrin	µg/L	2.5	5	EPA Method 8080
Alkalinity (as $CaCO_3$)		No flag	No flag	Set by EPD/EMS
Allyl chloride	µg/L	250	500	EPA Method 8240
Aluminum	µg/L	100	200	EPA Method 6010
Americium-241	pCi/L	3.17E+00	6.34E+00	Proposed DWS (EPA, 1991)
Americium-243	pCi/L	3.19E+00	6.37E+00	Proposed DWS (EPA, 1991)
4-Aminobiphenyl	µg/L	50	100	EPA Method 8270
Ammonia	µg/L	500	1,000	APHA Method 417B
Ammonia nitrogen	µg/L	50	100	EPA Method 350.1
Aniline	µg/L	50	100	EPA Method 8270
Anthracene	µg/L	50	100	EPA Method 8270
Antimony	µg/L	2.5	5	Proposed DWS (EPA, 1990)
Antimony-125	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)

Analyte	Unit	Flag 1	Flag 2	Source
Aramite	µg/L	50	100	EPA Method 8270
Arsenic	µg/L	25	50	Final DWS (CFR, 1991a)
Azobenzene	µg/L	50	100	EPA Method 625
Barium	µg/L	1,000	2,000	Final DWS (CFR, 1991a)
Barium-140	pCi/L	4.5E+01	9E+01	Final DWS (EPA, 1977)
Benzene	µg/L	2.5	5	Final DWS (CFR, 1991a)
alpha-Benzene hexachloride	µg/L	2.5	5	EPA Method 8080
beta-Benzene hexachloride	µg/L	2.5	5	EPA Method 8080
delta-Benzene hexachloride	µg/L	2.5	5	EPA Method 8080
Benzidine	µg/L	250	500	EPA Method 8270
Benzo[*a*]anthracene	µg/L	0.05	0.1	Proposed DWS (EPA, 1990)
Benzo[*b*]fluoranthene	µg/L	0.1	0.2	Proposed DWS (EPA, 1990)
Benzo[*k*]fluoranthene	µg/L	0.1	0.2	Proposed DWS (EPA, 1990)
Benzo[*g,h,i*]perylene	µg/L	50	100	EPA Method 8270
Benzo[*a*]pyrene	µg/L	0.1	0.2	Proposed DWS (EPA, 1990)
Benzoic acid	µg/L	250	500	EPA Method 8270
1,4-Benzoquinone	µg/L	50	100	EPA Method 8270
Benzyl alcohol	µg/L	100	200	EPA Method 8270
Beryllium	µg/L	0.5	1	Proposed DWS (EPA, 1990)
Beryllium-7	pCi/L	3E+03	6E+03	Final DWS (EPA, 1977)
Bis(2-chloroethoxy) methane	µg/L	50	100	EPA Method 8270
Bis(2-chloroethyl) ether	µg/L	50	100	EPA Method 8270
Bis(2-chloroisopropyl) ether	µg/L	50	100	EPA Method 8270
Bis(chloromethyl) ether	µg/L	50	100	EPA Method 8270
Bis(chloromethyl-ethyl) ether	µg/L	50	100	EPA Method 8270
Bis(2-ethylhexyl) phthalate		No flag	No flag	Set by EPD/EMS
Bromide	µg/L	5,000	10,000	EPA Method 300.0
Bromodichloromethane	µg/L	50	100	Final DWS (CFR, 1991a)
Bromoform	µg/L	50	100	Final DWS (CFR, 1991a)
Bromomethane (Methyl bromide)	µg/L	5	10	EPA Method 8240
4-Bromophenyl phenyl ether	µg/L	50	100	EPA Method 8270
2-sec-Butyl-4,6-dinitrophenol	µg/L	3.5	7	Proposed DWS (EPA, 1990)
Butylbenzyl phthalate		No flag	No flag	Set by EPD/EMS
Cadmium	µg/L	2.5	5	Final DWS (CFR, 1991a)
Calcium		No flag	No flag	Set by EPD/EMS
Carbon disulfide	µg/L	5	10	EPA Method 8240
Carbon tetrachloride	µg/L	2.5	5	Final DWS (CFR, 1991a)
Carbon-14	pCi/L	1E+03	2E+03	Final DWS (EPA, 1977)
Carbonate	µg/L	500	1,000	EPA Method 310.1
Cerium-141	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Cerium-144	pCi/L	1.31E+02	2.61E+02	Proposed DWS (EPA, 1991)
Cesium-134	pCi/L	4.07E+01	8.13E+01	Proposed DWS (EPA, 1991)
Cesium-137	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Chlordane	µg/L	1	2	Final DWS (CFR, 1991a)
Chloride	µg/L	125,000	250,000	Secondary DWS (CFR, 1991b)
4-Chloroaniline	µg/L	50	100	EPA Method 8270
Chlorobenzene	µg/L	5	10	EPA Method 8240
Chlorobenzilate	µg/L	50	100	EPA Method 8270
Chloroethane	µg/L	5	10	EPA Method 8240
Chloroethene (Vinyl chloride)	µg/L	1	2	Final DWS (CFR, 1991a)
Chloroethyl vinyl ether	µg/L	5	10	EPA Method 8240
2-Chloroethyl vinyl ether	µg/L	5	10	EPA Method 8240
Chloroform	µg/L	50	100	Final DWS (CFR, 1991a)
para-Chloro-meta-cresol	µg/L	50	100	EPA Method 8270
Chloromethane (Methyl chloride)	µg/L	5	10	EPA Method 8240
2-Chloronaphthalene	µg/L	50	100	EPA Method 8240

Analyte	Unit	Flag 1	Flag 2	Source
2-Chlorophenol	µg/L	50	100	EPA Method 8270
4-Chlorophenyl phenyl ether	µg/L	50	100	EPA Method 8270
Chloroprene	µg/L	1,000	2,000	EPA Method 8240
Chromium	µg/L	50	100	Final DWS (CFR, 1991a)
Chromium-51	pCi/L	3E+03	6E+03	Final DWS (EPA, 1977)
Chrysene	µg/L	0.1	0.2	Proposed DWS (EPA, 1990)
Cobalt	µg/L	20	40	EPA Method 6010
Cobalt-57	pCi/L	5E+02	1E+03	Final DWS (EPA, 1977)
Cobalt-58	pCi/L	4.5E+03	9E+03	Final DWS (EPA, 1977)
Cobalt-60	pCi/L	5E+01	1E+02	Final DWS (EPA, 1977)
Color		No flag	No flag	Set by EPD/EMS
Copper	µg/L	650	1,300	Final DWS (CFR, 1991a)
Corrosivity		No flag	No flag	Set by EPD/EMS
m-Cresol (3-Methylphenol)	µg/L	50	100	EPA Method 8270
o-Cresol (2-Methylphenol)	µg/L	50	100	EPA Method 8270
p-Cresol (4-Methylphenol)	µg/L	50	100	EPA Method 8270
Curium-242	pCi/L	6.65E+01	1.33E+02	Proposed DWS (EPA, 1991)
Curium-243	pCi/L	4.15E+00	8.3E+00	Proposed DWS (EPA, 1991)
Curium-244	pCi/L	4.92E+00	9.84E+00	Proposed DWS (EPA, 1991)
Curium-246	pCi/L	3.14E+00	6.27E+00	Proposed DWS (EPA, 1991)
Cyanide	µg/L	100	200	Proposed DWS (EPA, 1990)
p,p'-DDD	µg/L	2.5	5	EPA Method 8080
p,p'-DDE	µg/L	2.5	5	EPA Method 8080
p,p'-DDT	µg/L	2.5	5	EPA Method 8080
Di-n-butyl phthalate		No flag	No flag	Set by EPD/EMS
Di-n-octyl phthalate		No flag	No flag	Set by EPD/EMS
Dialiate	µg/L	50	100	EPA Method 8270
Dibenz[a,h]anthracene	µg/L	0.15	0.3	Proposed DWS (EPA, 1990)
Dibenzofuran	µg/L	50	100	EPA Method 8270
Dibromochloromethane	µg/L	50	100	Final DWS (CFR, 1991a)
Dibromochloropropane	µg/L	0.1	0.2	Final DWS (CFR, 1991a)
1,2-Dibromo-3-chloropropane	µg/L	250	500	EPA Method 8240
1,2-Dibromoethane	µg/L	100	200	EPA Method 8240
Dibromomethane (Methylene bromide)	µg/L	5	10	EPA Method 8240
1,2-Dichlorobenzene	µg/L	300	600	Final DWS (CFR, 1991a)
1,3-Dichlorobenzene	µg/L	50	100	EPA Method 8270
1,4-Dichlorobenzene	µg/L	37.5	75	Final DWS (CFR, 1991a)
3,3'-Dichlorobenzidine	µg/L	50	100	EPA Method 8270
trans-1,4-Dichloro-2-butene	µg/L	150	300	EPA Method 8240
Dichlorodifluoromethane	µg/L	5	10	EPA Method 8240
1,1-Dichloroethane	µg/L	5	10	EPA Method 8240
1,2-Dichloroethane	µg/L	2.5	5	Final DWS (CFR, 1991a)
cis-1,2-Dichloroethene	µg/L	35	70	Final DWS (CFR, 1991a)
1,1-Dichloroethylene	µg/L	3.5	7	Final DWS (CFR, 1991a)
1,2-Dichloroethylene	µg/L	25	50	EPA Method 8240
trans-1,2-Dichloroethylene	µg/L	50	100	Final DWS (CFR, 1991a)
Dichloromethane (Methylene chloride)		No flag	No flag	Set by EPD/EMS
2,4-Dichlorophenol	µg/L	50	100	EPA Method 8270
2,6-Dichlorophenol	µg/L	50	100	EPA Method 8270
2,4-Dichlorophenoxyacetic acid	µg/L	35	70	Final DWS (CFR, 1991a)
1,2-Dichloropropane	µg/L	2.5	5	Final DWS (CFR, 1991a)
cis-1,3-Dichloropropene	µg/L	5	10	EPA Method 8240
trans-1,3-Dichloropropene	µg/L	5	10	EPA Method 8240
Dieldrin	µg/L	2.5	5	EPA Method 8080

Analyte	Unit	Flag 1	Flag 2	Source
Diethyl phthalate		No flag	No flag	Set by EPD/EMS
Dimethoate	µg/L	50	100	EPA Method 8270
p-Dimethylaminoazobenzene	µg/L	50	100	EPA Method 8270
p-(Dimethylamino)ethylbenzene	µg/L	50	100	EPA Method 8270
7,12-Dimethylbenz[a]anthracene	µg/L	50	100	EPA Method 8270
3,3'-Dimethylbenzidine	µg/L	50	100	EPA Method 8270
a,a-Dimethylphenethylamine	µg/L	50	100	EPA Method 8270
2,4-Dimethyl phenol	µg/L	50	100	EPA Method 8270
Dimethyl phthalate		No flag	No flag	Set by EPD/EMS
1,3-Dinitrobenzene	µg/L	50	100	EPA Method 8270
4,6-Dinitro-ortho-cresol	µg/L	250	500	EPA Method 8270
2,4-Dinitrophenol	µg/L	250	500	EPA Method 8270
2,4-Dinitrotoluene	µg/L	50	100	EPA Method 8270
2,6-Dinitrotoluene	µg/L	50	100	EPA Method 8270
1,4-Dioxane	µg/L	50	100	EPA Method 8270
Diphenylamine	µg/L	50	100	EPA Method 8270
1,2-Diphenylhydrazine	µg/L	50	100	EPA Method 8270
Dissolved organic carbon	µg/L	5,000	10,000	EPA Method 9060
Disulfoton	µg/L	50	100	EPA Method 8270
Eh		No flag	No flag	Set by EPD/EMS
alpha-Endosulfan	µg/L	50	100	EPA Method 8270
beta-Endosulfan	µg/L	50	100	EPA Method 8270
Endosulfan I	µg/L	2.5	5	EPA Method 8080
Endosulfan II	µg/L	2.5	5	EPA Method 8080
Endosulfan sulfate	µg/L	2.5	5	EPA Method 8080
Endrin	µg/L	0.1	0.2	Final DWS (CFR, 1991a)
Endrin aldehyde	µg/L	2.5	5	EPA Method 8080
Endrin ketone		No flag	No flag	Set by EPD/EMS
Ethyl methacrylate	µg/L	50	100	EPA Method 8270
Ethyl methanesulfonate	µg/L	50	100	EPA Method 8270
Ethylbenzene	µg/L	350	700	Final DWS (CFR, 1991a)
Europium-154	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Europium-155	pCi/L	3E+02	6E+02	Final DWS (EPA, 1977)
Famphur	µg/L	50	100	EPA Method 8270
Fluoranthene	µg/L	50	100	EPA Method 8270
Fluorene	µg/L	50	100	EPA Method 8270
Fluoride	µg/L	2,000	4,000	Final DWS (CFR, 1991a)
Gross alpha	pCi/L	7.5E+00	1.5E+01	Final DWS (CFR, 1991a)
Heptachlor	µg/L	0.2	0.4	Final DWS (CFR, 1991a)
Heptachlor epoxide	µg/L	0.1	0.2	Final DWS (CFR, 1991a)
Heptachlorodibenzo-p-dioxin isomers	µg/L	0.00325	0.0065	EPA Method 8280
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	µg/L	0.00325	0.0065	EPA Method 8280
Heptachlorodibenzo-p-furan isomers	µg/L	0.00225	0.0045	EPA Method 8280
1,2,3,4,6,7,8-Heptachlorodibenzo-p-furan	µg/L	0.00225	0.0045	EPA Method 8280
Hexachlorobenzene	µg/L	0.5	1	Proposed DWS (EPA, 1990)
Hexachlorobutadiene	µg/L	50	100	EPA Method 8270
Hexachlorocyclopentadiene	µg/L	25	50	Proposed DWS (EPA, 1990)
Hexachlorodibenzo-p-dioxin isomers	µg/L	0.00225	0.0045	EPA Method 8280
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	µg/L	0.00225	0.0045	EPA Method 8280
Hexachlorodibenzo-p-furan isomers	µg/L	0.002	0.004	EPA Method 8280

Analyte	Unit	Flag 1	Flag 2	Source
1,2,3,4,7,8-Hexachlorodibenzo-p-furan	µg/L	0.002	0.004	EPA Method 8280
Hexachloroethane	µg/L	50	100	EPA Method 8270
Hexachlorophene	µg/L	250	500	EPA Method 8270
Hexachloropropene	µg/L	50	100	EPA Method 8270
2-Hexanone	µg/L	100	200	EPA Method 8240
Indeno(*1,2,3-c,d*)pyrene	µg/L	50	100	EPA Method 8270
Iodine	µg/L	500	1,000	EPA Method 415
Iodine-129	pCi/L	5E-01	1E+00	Final DWS (EPA, 1977)
Iodine-131	pCi/L	1.5E+00	3E+00	Final DWS (EPA, 1977)
Iodomethane (Methyl iodide)	µg/L	75	150	EPA Method 8240
Iron	µg/L	150	300	Secondary DWS (CFR, 1991b)
Iron-55	pCi/L	1E+03	2E+03	Final DWS (EPA, 1977)
Iron-59	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Isobutyl alcohol	µg/L	500	1,000	EPA Method 8240
Isodrin	µg/L	50	100	EPA Method 8270
Isophorone	µg/L	50	100	EPA Method 8270
Isosafrole	µg/L	50	100	EPA Method 8270
Kepone	µg/L	50	100	EPA Method 8270
Lanthanum-140	pCi/L	3E+01	6E+01	Final DWS (EPA, 1977)
Lead	µg/L	7.5	15	Final DWS (CFR, 1991a)
Lindane	µg/L	0.1	0.2	Final DWS (CFR, 1991a)
Lithium	µg/L	25	50	EPA Method 6010
Magnesium		No flag	No flag	Set by EPD/EMS
Manganese	µg/L	25	50	Secondary DWS (CFR, 1991b)
Manganese-54	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Mercury	µg/L	1	2	Final DWS (CFR, 1991a)
Methacrylonitrile	µg/L	250	500	EPA Method 8240
Methapyrilene	µg/L	50	100	EPA Method 8270
Methoxychlor	µg/L	20	40	Final DWS (CFR, 1991a)
3-Methylcholanthrene	µg/L	50	100	EPA Method 8270
2-Methyl-4,6-dinitrophenol	µg/L	250	500	EPA Method 8270
Methyl ethyl ketone		No flag	No flag	Set by EPD/EMS
Methyl isobutyl ketone		No flag	No flag	Set by EPD/EMS
Methyl methacrylate	µg/L	50	100	EPA Method 8270
Methyl methanesulfonate	µg/L	50	100	EPA Method 8270
2-Methylnaphthalene	µg/L	50	100	EPA Method 8270
Molybdenum	µg/L	250	500	EPA Method 6010
Naphthalene	µg/L	50	100	EPA Method 8270
1,4-Naphthoquinone	µg/L	50	100	EPA Method 8270
1-Naphthylamine	µg/L	50	100	EPA Method 8270
2-Naphthylamine	µg/L	50	100	EPA Method 8270
Neptunium-237	pCi/L	3.53E+00	7.06E+00	Proposed DWS (EPA, 1991)
Nickel	µg/L	50	100	Proposed DWS (EPA, 1990)
Nickel-59	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Nickel-63	pCi/L	2.5E+01	5E+01	Final DWS (EPA, 1977)
Niobium-95	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Nitrate as nitrogen	µg/L	5,000	10,000	Final DWS (CFR, 1991a)
Nitrite as nitrogen	µg/L	500	1,000	Final DWS (CFR, 1991a)
2-Nitroaniline	µg/L	50	100	EPA Method 8270
3-Nitroaniline	µg/L	50	100	EPA Method 8270
4-Nitroaniline	µg/L	50	100	EPA Method 8270
Nitrobenzene	µg/L	50	100	EPA Method 8270
Nitrogen by Kjeldahl method	µg/L	500	1,000	EPA Method 351.2
2-Nitrophenol	µg/L	50	100	EPA Method 8270
4-Nitrophenol	µg/L	50	100	EPA Method 8270

Analyte	Unit	Flag 1	Flag 2	Source
4-Nitroquinoline-1-oxide	µg/L	50	100	EPA Method 8270
N-Nitrosodi-n-butylamine	µg/L	50	100	EPA Method 8270
N-Nitrosodiethylamine	µg/L	50	100	EPA Method 8270
N-Nitrosodimethylamine	µg/L	50	100	EPA Method 8270
N-Nitrosodiphenylamine	µg/L	50	100	EPA Method 8270
N-Nitrosodi-propylamine	µg/L	50	100	EPA Method 8270
N-Nitrosomethylethylamine	µg/L	50	100	EPA Method 8270
N-Nitrosomorpholine	µg/L	50	100	EPA Method 8270
N-Nitrosopiperidine	µg/L	50	100	EPA Method 8270
N-Nitrosopyrrolidine	µg/L	50	100	EPA Method 8270
5-Nitro-o-toluidine	µg/L	50	100	EPA Method 8270
Nonvolatile beta	pCi/L	2.5E+01	5E+01	Proposed DWS (EPA, 1986)
Octachlorodibenzo-p-dioxin isomers	µg/L	0.005	0.01	EPA Method 8280
Octachlorodibenzo-p-furan isomers	µg/L	0.005	0.01	EPA Method 8280
Odor		No flag	No flag	Set by EPD/EMS
Oil & Grease	µg/L	5,000	10,000	EPA Method 413.1
Parathion	µg/L	2.5	5	EPA Method 8080
Parathion methyl	µg/L	2.5	5	EPA Method 8080
PCB 1016	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1221	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1232	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1242	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1248	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1254	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1260	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1262	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
Pentachlorobenzene	µg/L	50	100	EPA Method 8270
Pentachlorodibenzo-p-dioxin isomers	µg/L	0.00275	0.0055	EPA Method 8280
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	µg/L	0.00275	0.0055	EPA Method 8280
Pentachlorodibenzo-p-furan isomers	µg/L	0.00275	0.0055	EPA Method 8280
1,2,3,7,8-Pentachlorodibenzo-p-furan	µg/L	0.00275	0.0055	EPA Method 8280
Pentachloroethane	µg/L	50	100	EPA Method 8270
Pentachloronitrobenzene	µg/L	50	100	EPA Method 8270
Pentachlorophenol	µg/L	0.5	1	Final DWS (CFR, 1991a)
pH	pH	8	10	Set by EPD/EMS
pH	pH	4	3	Set by EPD/EMS
Phenacetin	µg/L	50	100	EPA Method 8270
Phenanthrene	µg/L	50	100	EPA Method 8270
Phenol	µg/L	50	100	EPA Method 8270
Phenols	µg/L	25	50	EPA Method 420.2
p-Phenylenediamine	µg/L	50	100	EPA Method 8270
Phorate	µg/L	2.5	5	EPA Method 8080
2-Picoline	µg/L	50	100	EPA Method 8270
Plutonium-238	pCi/L	3.51E+00	7.02E+00	Proposed DWS (EPA, 1991)
Plutonium-239	pCi/L	3.11E+01	6.21E+01	Proposed DWS (EPA, 1991)
Plutonium-239/240[a]	pCi/L	3.11E+01	6.21E+01	Proposed DWS (EPA, 1991)
Plutonium-240	pCi/L	3.11E+01	6.22E+01	Proposed DWS (EPA, 1991)
Plutonium-241	pCi/L	3.13E+01	6.26E+01	Proposed DWS (EPA, 1991)
Plutonium-242	pCi/L	3.27E+01	6.54E+01	Proposed DWS (EPA, 1991)
Potassium		No flag	No flag	Set by EPD/EMS
Potassium-40	pCi/L	1.5E+02	3E+02	Proposed DWS (EPA, 1986)
Pronamid	µg/L	50	100	EPA Method 8270
Propionitrile	µg/L	1,000	2,000	EPA Method 8240

Analyte	Unit	Flag 1	Flag 2	Source
Pyrene	µg/L	50	100	EPA Method 8270
Pyridine	µg/L	50	100	EPA Method 8270
Radium-226	pCi/L	7.85E+00	1.57E+01	Proposed DWS (EPA, 1991)
Radium-228	pCi/L	3.93E+00	7.85E+00	Proposed DWS (EPA, 1991)
Radon-222	pCi/L	1.5E+02	3E+02	Proposed DWS (EPA, 1991)
Ruthenium-103	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Ruthenium-106	pCi/L	1.5E+01	3E+01	Final DWS (EPA, 1977)
Safrole	µg/L	50	100	EPA Method 8270
Selenium	µg/L	25	50	Final DWS (CFR, 1991a)
Silica		No flag	No flag	Set by EPD/EMS
Silver	µg/L	25	50	Final DWS (CFR, 1991a)
Sodium		No flag	No flag	Set by EPD/EMS
Sodium-22	pCi/L	2.33E+02	4.66E+02	Proposed DWS (EPA, 1991)
Specific conductance	µS/cm	250	500	Set by EPD/EMS
Strontium-89	pCi/L	1E+01	2E+01	Final DWS (EPA, 1977)
Strontium-89/90[a]	pCi/L	4E+00	8E+00	Final DWS (CFR, 1991a)
Strontium-90	pCi/L	4E+00	8E+00	Final DWS (CFR, 1991a)
Styrene	µg/L	50	100	Final DWS (CFR, 1991a)
Sulfate	µg/L	200,000	400,000	Proposed DWS (EPA, 1990)
Sulfide	µg/L	5,000	10,000	EPA Method 9030
Sulfotepp	µg/L	50	100	EPA Method 8270
Surfactants		No flag	No flag	Set by EPD/EMS
2,3,7,8-TCDD	µg/L	0.00225	0.0045	EPA Method 8280
2,3,7,8-TCDF	µg/L	0.002	0.004	EPA Method 8280
Technetium-99	pCi/L	4.5E+02	9E+02	Final DWS (EPA, 1977)
1,2,4,5-Tetrachlorobenzene	µg/L	50	100	EPA Method 8270
Tetrachlorodibenzo-p-dioxin isomers	µg/L	0.00225	0.0045	EPA Method 8280
Tetrachlorodibenzo-p-furan isomers	µg/L	0.002	0.004	EPA Method 8280
1,1,1,2-Tetrachloroethane	µg/L	5	10	EPA Method 8240
1,1,2,2-Tetrachloroethane	µg/L	5	10	EPA Method 8240
Tetrachloroethylene	µg/L	2.5	5	Final DWS (CFR, 1991a)
2,3,4,6-Tetrachlorophenol	µg/L	50	100	EPA Method 8270
Tetraethyl dithiopyrophosphate	µg/L	50	100	EPA Method 8270
Thallium	µg/L	0.5	1	Proposed DWS (EPA, 1990)
Thionazin	µg/L	50	100	EPA Method 8270
Thorium-228	pCi/L	6.25E+01	1.25E+02	Proposed DWS (EPA, 1991)
Thorium-230	pCi/L	3.96E+01	7.92E+01	Proposed DWS (EPA, 1991)
Thorium-232	pCi/L	4.4E+01	8.8E+01	Proposed DWS (EPA, 1991)
Thorium-234	pCi/L	2E+02	4.01E+02	Proposed DWS (EPA, 1991)
Tin	µg/L	10	20	EPA Method 282.2
Tin-113	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Toluene	µg/L	500	1,000	Final DWS (CFR, 1991a)
o-Toluidine	µg/L	50	100	EPA Method 8270
Total carbon	µg/L	5,000	10,000	EPA Method 9060
Total dissolved solids		No flag	No flag	Set by EPD/EMS
Total hydrocarbons	µg/L	5,000	10,000	EPA Method 418.1
Total inorganic carbon	µg/L	5,000	10,000	EPA Method 9060
Total organic carbon	µg/L	5,000	10,000	EPA Method 9060
Total organic halogens	µg/L	25	50	EPA Method 9020
Total organic nitrogen	µg/L	500	1,000	EPA Method 420
Total petroleum hydrocarbons	µg/L	5,000	10,000	EPA Method 418.1
Total phosphates (as P)		No flag	No flag	Set by EPD/EMS
Total phosphorus		No flag	No flag	Set by EPD/EMS
Total radium	pCi/L	2.5E+00	5E+00	Final DWS (CFR, 1991a)

Analyte	Unit	Flag 1	Flag 2	Source
Total silica	µg/L	500	1,000	EPA Method 6010
Total trihalomethanes	µg/L	50	100	Final DWS (CFR, 1991a)
Toxaphene	µg/L	1.5	3	Final DWS (CFR, 1991a)
2,4,5-TP (Silvex)	µg/L	25	50	Final DWS (CFR, 1991a)
Tributyl phosphate	µg/L	50	100	EPA Method 8270
1,2,4-Trichlorobenzene	µg/L	4.5	9	Proposed DWS (EPA, 1990)
1,1,1-Trichloroethane	µg/L	100	200	Final DWS (CFR, 1991a)
1,1,2-Trichloroethane	µg/L	2.5	5	Proposed DWS (EPA, 1990)
Trichloroethylene	µg/L	2.5	5	Final DWS (CFR, 1991a)
Trichlorofluoromethane	µg/L	5	10	EPA Method 8240
2,4,5-Trichlorophenol	µg/L	50	100	EPA Method 8270
2,4,6-Trichlorophenol	µg/L	50	100	EPA Method 8270
2,4,5-Trichlorophenoxyacetic acid	µg/L	2.5	5	EPA Method 8150
1,2,3-Trichloropropane	µg/L	5	10	EPA Method 8240
O,O,O-Triethyl phosphorothioate	µg/L	50	100	EPA Method 8270
1,3,5-Trinitrobenzene	µg/L	50	100	EPA Method 8270
Tritium	pCi/mL	1E+01	2E+01	Final DWS (CFR, 1991a)
Turbidity		No flag	No flag	Set by EPD/EMS
Uranium	µg/L	10	20	Proposed DWS (EPA, 1991)
Uranium alpha activity	pCi/L	1.5E+01	3E+01	Proposed DWS (EPA, 1991)
Uranium-233/234[a]	pCi/L	6.9E-00	1.38E+01	Proposed DWS (EPA, 1991)
Uranium-234	pCi/L	6.95E+00	1.39E+01	Proposed DWS (EPA, 1991)
Uranium-235	pCi/L	7.25E+00	1.45E+01	Proposed DWS (EPA, 1991)
Uranium-238	pCi/L	7.3E+00	1.46E+01	Proposed DWS (EPA, 1991)
Vanadium	µg/L	50	100	EPA Method 6010
Vinyl acetate	µg/L	5	10	EPA Method 8240
Xylenes	µg/L	5,000	10,000	Final DWS (CFR, 1991a)
Zinc	µg/L	2,500	5,000	Secondary DWS (CFR, 1991b)
Zinc-65	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Zirconium-95	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Zirconium/Niobium-95[a]	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)

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[a] For double radionuclide analyses where each separate radionuclide has its own standard, the more stringent standard is used.

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Appendix C – Figures

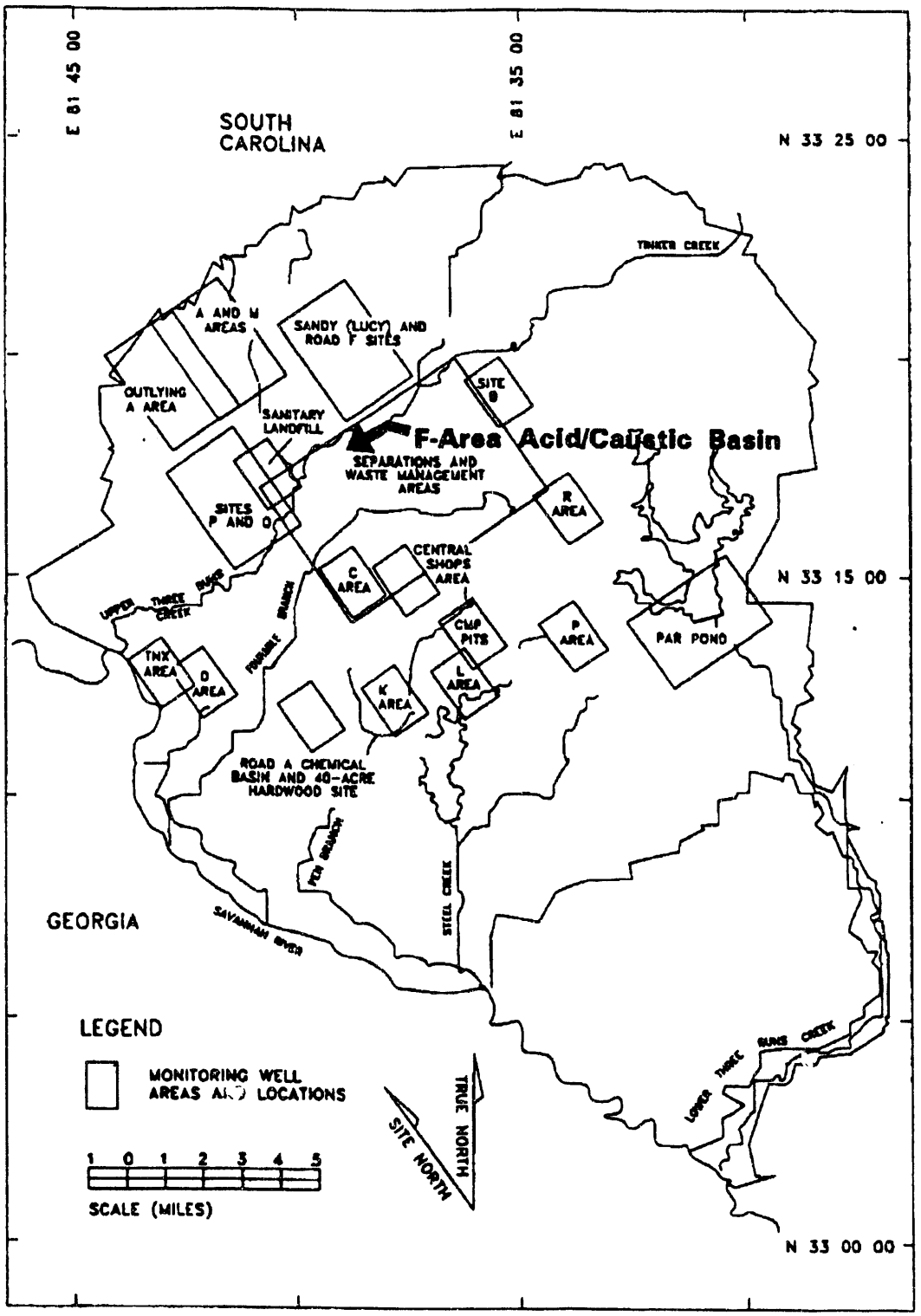

Figure 1. Location of the F-Area Acid/Caustic Basin at the Savannah River Site

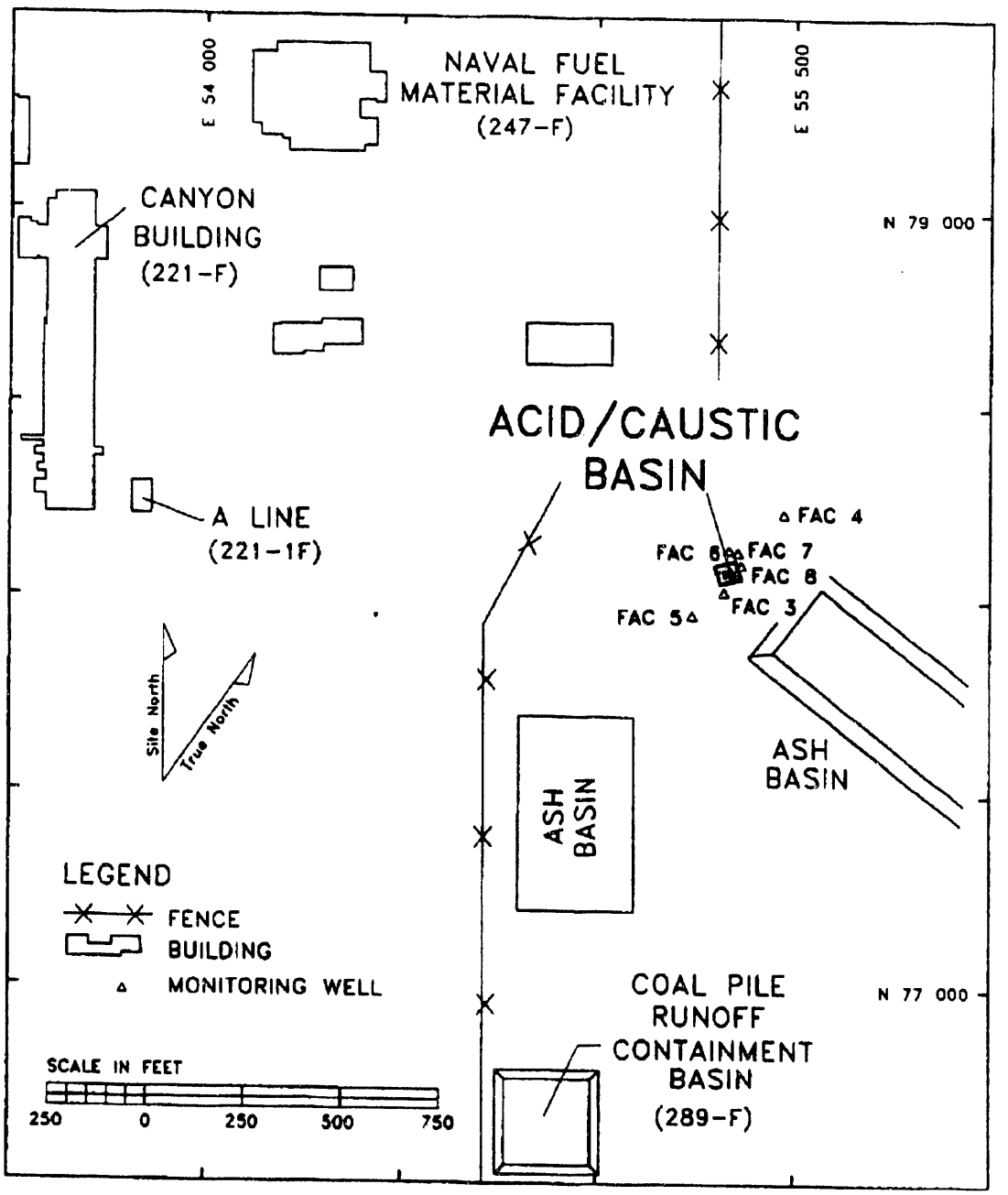

Figure 2. Location of Groundwater Monitoring Wells at the F-Area Acid/Caustic Basin

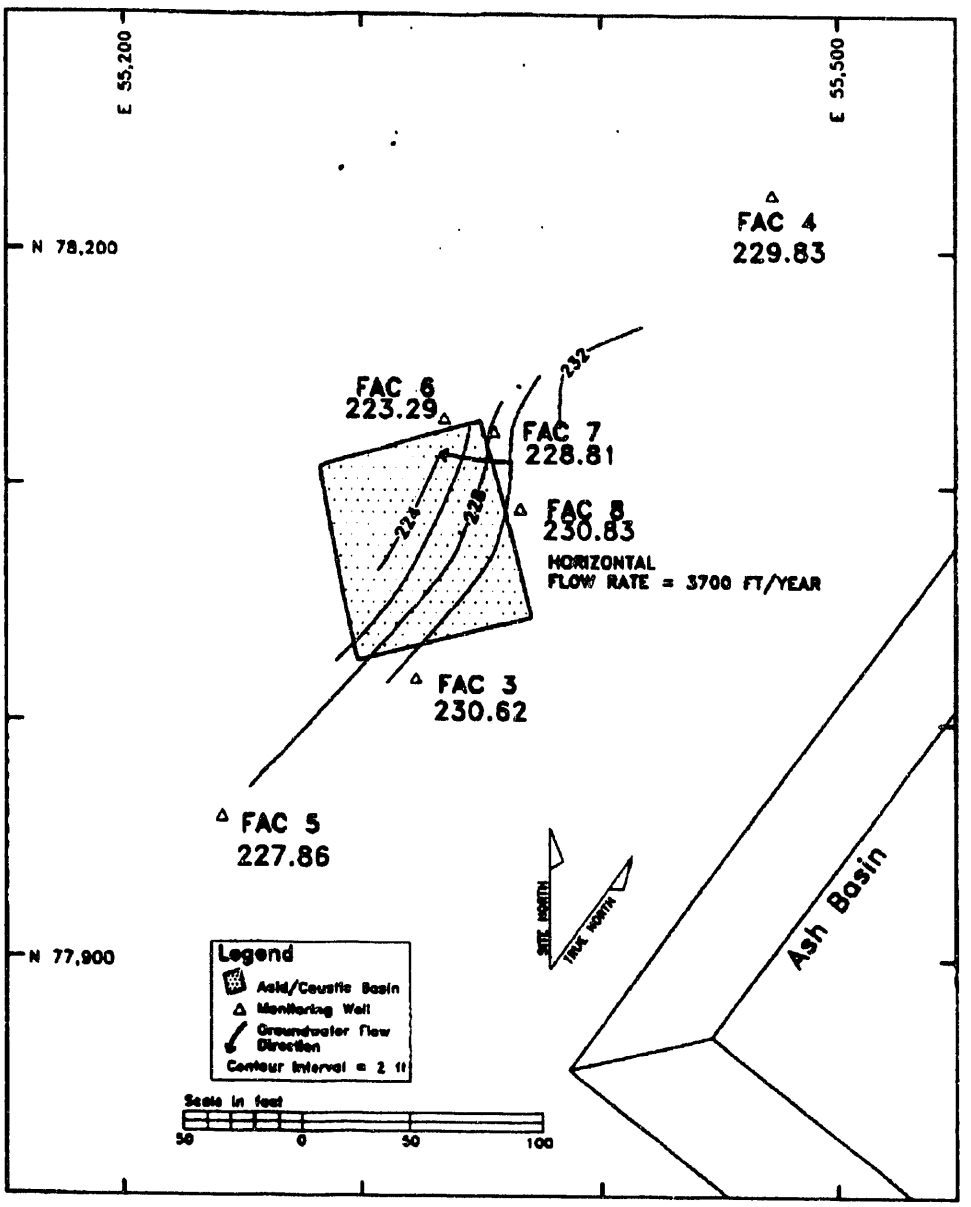

Figure 3. Water-Elevation Contour Map of the Water Table at the F-Area Acid/Caustic Basin

Appendix D – Groundwater Monitoring Results Tables

Key to Reading the Tables

The following abbreviations may appear in the tabular data:

BA = Barringer Laboratories, Inc.
CN = Clemson Technical Center, Inc.
D = drinking water standard
E = exponential notation (e.g., 1.1E−09 = 1.1×10^{-9} = 0.0000000011)
EM = EPD/EMS Laboratory
GE = General Engineering Laboratories
GP = Environmental Physics, Inc.
H = holding time
1,2,3,4,6,7,8-HPCDD = 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-HPCDF = 1,2,3,4,6,7,8-heptachlorodibenzo-p-furan
1,2,3,4,7,8-HXCDD = 1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
1,2,3,4,7,8-HXCDF = 1,2,3,4,7,8-heptachlorodibenzo-p-furan
Lindane = gamma-benzene hexachloride
MA = M-Area Laboratory
msl = mean sea level
MSL = million structures/liter
NTU = turbidity unit
pH = pH unit
pCi/L = picocuries per liter
pCi/mL = picocuries per milliliter
Sp. = specific
PVC = polyvinyl chloride
TCDD = tetrachlorodibenzo-p-dioxin
TCDF = tetrachlorodibenzo-p-furan
TE = Teledyne Isotopes, Inc.
TM = TMA/Eberline
TOC = top of casing
WA = Roy F. Weston, Inc.
μg/L = micrograms per liter
μS/cm = microsiemens per centimeter

Holding Times

Standard analytical methods include a limit, called holding time, on the maximum elapsed time between sample collection and extraction or analysis by the laboratory. In the data tables, a large dot (●) in the H (holding time) column indicates that holding time was exceeded. Analyses performed beyond holding time may not yield valid results.

South Carolina Department of Health and Environmental Control (SCDHEC) allows only 15 minutes to elapse between sampling and analysis for pH. Thus, laboratory pH analyses always exceed holding time.

Laboratory-initiated procedures for reducing the number of other analyses performed out of holding time include subcontracting analyses when difficulties with equipment, personnel, or work load would prevent timely analyses. Beginning fourth quarter 1991, SRS reduced the compensation to laboratories for analyses performed out of holding time.

Table 1. Constituents Exceeding the Primary Drinking Water Standards

Well	Constituent	Unit	1Q92	2Q92
FAC 4	Gross alpha	pCi/L	4.6E+01[a]	1.5E+01[a]
	Gross alpha	pCi/L	6.2E+01[a]	1.5E+01[a]
	Gross alpha	pCi/L	3.3E+01[a]	N[d]
	Gross alpha	pCi/L	3.5E+01[a]	N
	Lead	µg/L	98	N
	Total alpha-emitting radium[b]	pCi/L	1.8E+01[c]	N
	Total alpha-emitting radium	pCi/L	1.8E+01[c]	N
FAC 5	Gross alpha	pCi/L	3.3E+01	N

[a] Duplicate samples of gross alpha.
[b] The PDWS for total radium was applied to total alpha-emitting radium for 1Q92.
[c] Duplicate samples of total alpha-emitting radium.
[d] Not analyzed or not above standard.

Table 2. Constituents Exceeding Half the Primary Drinking Water Standards or Other Flag 1 or Flag 2 Criteria

Well	Constituent	Unit	2Q92	Flag
FAC 3	*Gross alpha*	pCi/L	7.8	1
	Total organic halogens	µg/L	55	2
	pH	pH	8.0*	1
	pH	pH	8.0*	1
FAC 4	Manganese	µg/L	434	2
	Radium-226	pCi/L	1.0E+01	1
	Total organic carbon	µg/L	6,450	1
FAC 5	Manganese	µg/L	41	1
	Total organic carbon	µg/L	5,980	1
	Total organic halogens	µg/L	93	2
FAC 6	Total organic carbon	µg/L	18,000	2
	Total organic halogens	µg/L	235	2
FAC 7	Total organic carbon	µg/L	19,500	2
	Total organic halogens	µg/L	152	2
FAC 8	Total organic halogens	µg/L	53	2

Note: Constituents exceeding half the PDWS appear italicized.

* Duplicate samples for pH.

Table 3. Groundwater Monitoring Results for Individual Wells

WELL FAC 3

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Formation
N78018.3 E55322.7	33.288592 °N 81.672674 °W	254.8-224.8 ft msl	311.8 ft msl	4" PVC	Water table

FIELD MEASUREMENTS

Sample date: 05/27/92
Depth to water: 81.18 ft (24.74 m) below TOC
Water elevation: 230.62 ft (70.29 m) msl
Sp. conductance: 181 µS/cm
Water evacuated before sampling: 15 gal
Time: 12:10
pH: 6.2
Alkalinity: 32 mg/L
Water temperature: 20.5°C

LABORATORY ANALYSES

H	D	Analyte	Result	Unit	Flag	Lab
•		pH	8.0	pH	1	WA
■		pH	8.0	pH	1	WA
•		Specific conductance	164	µS/cm	0	WA
•		Specific conductance	166	µS/cm	0	WA
		Turbidity	271	NTU	0	WA
		Turbidity	271	NTU	0	WA
		Arsenic	<2.0	µg/L	0	WA
		Barium	20	µg/L	0	WA
		Benzene	<5.0	µg/L	0	WA
		Bromodichloromethane	<5.0	µg/L	0	WA
		Bromoform	<5.0	µg/L	0	WA
		Bromomethane (Methyl bromide)	<10	µg/L	0	WA
		Cadmium	1.2	µg/L	0	WA
		Calcium	22,200	µg/L	0	WA
		Carbon tetrachloride	<5.0	µg/L	0	WA
		Chloride	3,450	µg/L	0	WA
		Chlorobenzene	<5.0	µg/L	0	WA
		Chloroethane	<10	µg/L	0	WA
		Chloroethene (Vinyl chloride)	<10	µg/L	0	WA
		2-Chloroethyl vinyl ether	<10	µg/L	0	WA
		Chloroform	<5.0	µg/L	0	WA
		Chloromethane (Methyl chloride)	<10	µg/L	0	WA
		Chromium	4.0	µg/L	0	WA
		Dibromochloromethane	<5.0	µg/L	0	WA
		1,1-Dichloroethane	<5.0	µg/L	0	WA
		1,2-Dichloroethane	<5.0	µg/L	0	WA
		cis-1,2-Dichloroethene	<5.0	µg/L	0	WA
		1,1-Dichloroethylene	<5.0	µg/L	0	WA
		Dichloromethane (Methylene chloride)	7.2	µg/L	0	WA
		2,4-Dichlorophenoxyacetic acid	<1.1	µg/L	0	WA
		2,4-Dichlorophenoxyacetic acid	<2.3	µg/L	0	WA
		1,2-Dichloropropane	<5.0	µg/L	0	WA
		cis-1,3-Dichloropropene	<5.0	µg/L	0	WA
		trans-1,3-Dichloropropene	<5.0	µg/L	0	WA
		Endrin	<0.11	µg/L	0	WA
		Ethylbenzene	<5.0	µg/L	0	WA
		Fluoride	<100	µg/L	0	WA
		Iron	<1.9	µg/L	0	WA
		Lead	<2.0	µg/L	0	WA

• = exceeded holding time. ■ = exceeded primary drinking water standard.

WELL FAC 3 collected on 05/27/92, laboratory analyses (cont.)

H	D	Analyte	Result	Unit	Flag	Lab
		Lindane	<0.057	µg/L	0	WA
		Magnesium	3,040	µg/L	0	WA
		Manganese	3.8	µg/L	0	WA
		Mercury	<0.20	µg/L	0	WA
		Methoxychlor	<0.57	µg/L	0	WA
		Nitrate as nitrogen	448	µg/L	0	WA
		Nitrate as nitrogen	460	µg/L	0	WA
		Phenols	<5.0	µg/L	0	WA
		Phenols	<5.0	µg/L	0	WA
		Potassium	4,620	µg/L	0	WA
		Selenium	<2.0	µg/L	0	WA
		Silica	10,700	µg/L	0	WA
		Silver	<0.70	µg/L	0	WA
		Sodium	6,090	µg/L	0	WA
		Sulfate	29,600	µg/L	0	WA
		1,1,2,2-Tetrachloroethane	<5.0	µg/L	0	WA
		Tetrachloroethylene	<5.0	µg/L	0	WA
		Toluene	1.0	µg/L	0	WA
		Total dissolved solids	124,000	µg/L	0	WA
		Total organic carbon	3,070	µg/L	0	WA
		Total organic halogens	55	µg/L	2	WA
		Total phosphates (as P)	185	µg/L	0	WA
		Toxaphene	<1.1	µg/L	0	WA
		2,4,5-TP (Silvex)	<0.56	µg/L	0	WA
		2,4,5-TP (Silvex)	<1.1	µg/L	0	WA
		1,1,1-Trichloroethane	<5.0	µg/L	0	WA
		1,1,2-Trichloroethane	<5.0	µg/L	0	WA
		Trichloroethylene	<5.0	µg/L	0	WA
		Trichlorofluoromethane	<5.0	µg/L	0	WA
		Gross alpha	7.8E+00 ± 1.3E+00	pCi/L	1	CN
		Nonvolatile beta	8.3E+00 ± 1.6E+00	pCi/L	0	CN
		Radium-226	4.5E+00 ± 5.0E-01	pCi/L	0	CN
		Tritium	<2.0E+00	pCi/mL	0	CN
		Tritium	<2.0E+00	pCi/mL	0	CN

• = exceeded holding time. ■ = exceeded primary drinking water standard.

WELL FAC 4

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Formation
N78223.8 E55472.9	33.289292 °N 81.672678 °W	237.8-207.8 ft msl	309.9 ft msl	4" PVC	Water table

FIELD MEASUREMENTS

Sample date: 05/27/92
Depth to water: 80.07 ft (24.41 m) below TOC
Water elevation: 229.83 ft (70.05 m) msl
Sp. conductance: 169 µS/cm
Water evacuated before sampling: 58 gal

Time: 14:30
pH: 4.5
Alkalinity: 0 mg/L
Water temperature: 21.7°C

LABORATORY ANALYSES

H	D	Analyte	Result	Unit	Flag	Lab
•		pH	5.6	pH	0	WA
•		Specific conductance	150	µS/cm	0	WA
		Turbidity	2.9	NTU	0	WA
		Arsenic	<2.0	µg/L	0	WA
		Barium	45	µg/L	0	WA
		Benzene	<5.0	µg/L	0	WA
		Bromodichloromethane	<5.0	µg/L	0	WA
		Bromoform	<5.0	µg/L	0	WA
		Bromomethane (Methyl bromide)	<10	µg/L	0	WA
		Cadmium	0.42	µg/L	0	WA
		Calcium	8,800	µg/L	0	WA
		Carbon tetrachloride	<5.0	µg/L	0	WA
		Chloride	5,440	µg/L	0	WA
		Chlorobenzene	<5.0	µg/L	0	WA
		Chloroethane	<10	µg/L	0	WA
		Chloroethene (Vinyl chloride)	<10	µg/L	0	WA
		2-Chloroethyl vinyl ether	<10	µg/L	0	WA
		Chloroform	<5.0	µg/L	0	WA
		Chloromethane (Methyl chloride)	<10	µg/L	0	WA
		Chromium	1.7	µg/L	0	WA
		Dibromochloromethane	<5.0	µg/L	0	WA
		1,1-Dichloroethane	<5.0	µg/L	0	WA
		1,2-Dichloroethane	<5.0	µg/L	0	WA
		cis-1,2-Dichloroethene	<5.0	µg/L	0	WA
		1,1-Dichloroethylene	<5.0	µg/L	0	WA
		Dichloromethane (Methylene chloride)	5.9	µg/L	0	WA
		2,4-Dichlorophenoxyacetic acid	<1.1	µg/L	0	WA
		1,2-Dichloropropane	<5.0	µg/L	0	WA
		cis-1,3-Dichloropropene	<5.0	µg/L	0	WA
		trans-1,3-Dichloropropene	<5.0	µg/L	0	WA
		Endrin	<0.11	µg/L	0	WA
		Ethylbenzene	<5.0	µg/L	0	WA
		Fluoride	<100	µg/L	0	WA
		Fluoride	<100	µg/L	0	WA
		Iron	27	µg/L	0	WA
		Lead	<2.0	µg/L	0	WA
		Lindane	<0.056	µg/L	0	WA
		Magnesium	3,520	µg/L	0	WA
		Manganese	434	µg/L	2	WA

• = exceeded holding time. ■ = exceeded primary drinking water standard.

WELL FAC 4 collected on 05/27/92, laboratory analyses (cont.)

H	D	Analyte	Result	Unit	Flag	Lab
		Mercury	<0.20	µg/L	0	WA
		Methoxychlor	<0.56	µg/L	0	WA
		Nitrate as nitrogen	3,480	µg/L	0	WA
		Phenols	<5.0	µg/L	0	WA
		Potassium	3,400	µg/L	0	WA
		Selenium	<2.0	µg/L	0	WA
		Silica	8,160	µg/L	0	WA
		Silver	1.4	µg/L	0	WA
		Sodium	11,800	µg/L	0	WA
		Sulfate	33,300	µg/L	0	WA
		1,1,2,2-Tetrachloroethane	<5.0	µg/L	0	WA
		Tetrachloroethylene	<5.0	µg/L	0	WA
		Toluene	<5.0	µg/L	0	WA
		Total dissolved solids	125,000	µg/L	0	WA
		Total organic carbon	6,450	µg/L	1	WA
		Total organic halogens	<20	µg/L	0	WA
		Total phosphates (as P)	20	µg/L	0	WA
		Toxaphene	<1.1	µg/L	0	WA
		2,4,5-TP (Silvex)	<0.54	µg/L	0	WA
		1,1,1-Trichloroethane	<5.0	µg/L	0	WA
		1,1,2-Trichloroethane	<5.0	µg/L	0	WA
		Trichloroethylene	<5.0	µg/L	0	WA
		Trichlorofluoromethane	<5.0	µg/L	0	WA
	■	Gross alpha	1.5E+01 ± 1.8E+00	pCi/L	2	CN
	■	Gross alpha	1.5E+01 ± 1.9E+00	pCi/L	2	CN
		Nonvolatile beta	1.1E+01 ± 1.4E+00	pCi/L	0	CN
		Nonvolatile beta	7.9E+00 ± 1.3E+00	pCi/L	0	CN
		Radium-226	1.0E+01 ± 7.6E-01	pCi/L	1	CN
		Tritium	7.5E+00 ± 5.6E-01	pCi/mL	0	CN

WELL FAC 5

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Formation
N77960.3 E55241.3	33.288331 °N 81.672776 °W	234.0-214.0 ft msl	315.8 ft msl	4" PVC	Water table

FIELD MEASUREMENTS

Sample date: 05/27/92
Depth to water: 87.94 ft (26.80 m) below TOC
Water elevation: 227.86 ft (69.45 m) msl
Sp. conductance: 97 µS/cm
Water evacuated before sampling: 15 gal
The well went dry during purging.
Time: 11:05
pH: 5.2
Alkalinity: 5 mg/L
Water temperature: 20.5°C

LABORATORY ANALYSES

H	D	Analyte	Result	Unit	Flag	Lab
•		pH	5.8	pH	0	WA
•		Specific conductance	89	µS/cm	0	WA
		Turbidity	58	NTU	0	WA
		Arsenic	<2.0	µg/L	0	WA
		Barium	<4.0	µg/L	0	WA

• = exceeded holding time. ■ = exceeded primary drinking water standard.

WELL FAC 5 collected on 05/27/92, laboratory analyses (cont.)

H	D	Analyte	Result	Unit	Flag	Lab
		Benzene	<5.0	µg/L	0	WA
		Bromodichloromethane	<5.0	µg/L	0	WA
		Bromoform	<5.0	µg/L	0	WA
		Bromomethane (Methyl bromide)	<10	µg/L	0	WA
		Cadmium	<0.36	µg/L	0	WA
		Calcium	6,300	µg/L	0	WA
		Carbon tetrachloride	<5.0	µg/L	0	WA
		Chloride	4,160	µg/L	0	WA
		Chloride	4,090	µg/L	0	WA
		Chlorobenzene	<5.0	µg/L	0	WA
		Chloroethane	<10	µg/L	0	WA
		Chloroethene (Vinyl chloride)	<10	µg/L	0	WA
		2-Chloroethyl vinyl ether	<10	µg/L	0	WA
		Chloroform	<5.0	µg/L	0	WA
		Chloromethane (Methyl chloride)	<10	µg/L	0	WA
		Chromium	2.3	µg/L	0	WA
		Dibromochloromethane	<5.0	µg/L	0	WA
		1,1-Dichloroethane	<5.0	µg/L	0	WA
		1,2-Dichloroethane	<5.0	µg/L	0	WA
		cis-1,2-Dichloroethene	<5.0	µg/L	0	WA
		1,1-Dichloroethylene	<5.0	µg/L	0	WA
		Dichloromethane (Methylene chloride)	5.1	µg/L	0	WA
		2,4-Dichlorophenoxyacetic acid	<1.1	µg/L	0	WA
		1,2-Dichloropropane	<5.0	µg/L	0	WA
		cis-1,3-Dichloropropene	<5.0	µg/L	0	WA
		trans-1,3-Dichloropropene	<5.0	µg/L	0	WA
		Endrin	<0.11	µg/L	0	WA
		Ethylbenzene	<5.0	µg/L	0	WA
		Fluoride	<100	µg/L	0	WA
		Iron	10	µg/L	0	WA
		Lead	<2.0	µg/L	0	WA
		Lindane	<0.056	µg/L	0	WA
		Magnesium	2,130	µg/L	0	WA
		Manganese	41	µg/L	1	WA
		Mercury	<0.20	µg/L	0	WA
		Methoxychlor	<0.56	µg/L	0	WA
		Nitrate as nitrogen	227	µg/L	0	WA
		Phenols	<5.0	µg/L	0	WA
		Potassium	3,030	µg/L	0	WA
		Selenium	<2.0	µg/L	0	WA
		Silica	6,730	µg/L	0	WA
		Silver	1.0	µg/L	0	WA
		Sodium	3,700	µg/L	0	WA
		Sulfate	26,800	µg/L	0	WA
		1,1,2,2-Tetrachloroethane	<5.0	µg/L	0	WA
		Tetrachloroethylene	<5.0	µg/L	0	WA
		Toluene	<5.0	µg/L	0	WA
		Total dissolved solids	68,000	µg/L	0	WA
		Total organic carbon	5,980	µg/L	1	WA
		Total organic halogens	93	µg/L	2	WA
		Total phosphates (as P)	62	µg/L	0	WA
		Toxaphene	<1.1	µg/L	0	WA
		2,4,5-TP (Silvex)	<0.55	µg/L	0	WA
		1,1,1-Trichloroethane	<5.0	µg/L	0	WA
		1,1,2-Trichloroethane	<5.0	µg/L	0	WA
		Trichloroethylene	<5.0	µg/L	0	WA

● = exceeded holding time. ■ = exceeded primary drinking water standard.

WELL FAC 5 collected on 05/27/92, laboratory analyses (cont.)

H	D	Analyte	Result	Unit	Flag	Lab
		Trichlorofluoromethane	4.6	µg/L	0	WA
		Gross alpha	<3.0E+00	pCi/L	0	CN
		Nonvolatile beta	<5.0E+00	pCi/L	0	CN
		Radium-226	1.2E+00 ± 2.6E-01	pCi/L	0	CN
		Tritium	<2.0E+00	pCi/mL	0	CN

WELL FAC 6

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Formation
N78129.0 E55335.5	33.288858 °N 81.672855 °W	236.2-216.2 ft msl	312.5 ft msl	4" PVC	Water table

FIELD MEASUREMENTS

Sample date: 05/27/92
Depth to water: 89.21 ft (27.19 m) below TOC
Water elevation: 223.29 ft (68.06 m) msl
Sp. conductance: 83 µS/cm
Water evacuated before sampling: 10 gal
The well went dry during purging.
Time: 10:15
pH: 5.9
Alkalinity: 22 mg/L
Water temperature: 21.0°C

LABORATORY ANALYSES

H	D	Analyte	Result	Unit	Flag	Lab
•		pH	6.2	pH	0	WA
•		Specific conductance	80	µS/cm	0	WA
		Turbidity	25	NTU	0	WA
		Arsenic	<2.0	µg/L	0	WA
		Barium	4.8	µg/L	0	WA
		Benzene	<5.0	µg/L	0	WA
		Bromodichloromethane	<5.0	µg/L	0	WA
		Bromoform	<5.0	µg/L	0	WA
		Bromomethane (Methyl bromide)	<10	µg/L	0	WA
		Cadmium	0.92	µg/L	0	WA
		Calcium	6,890	µg/L	0	WA
		Carbon tetrachloride	<5.0	µg/L	0	WA
		Chloride	4,700	µg/L	0	WA
		Chlorobenzene	<5.0	µg/L	0	WA
		Chloroethane	<10	µg/L	0	WA
		Chloroethene (Vinyl chloride)	<10	µg/L	0	WA
		2-Chloroethyl vinyl ether	<10	µg/L	0	WA
		Chloroform	<5.0	µg/L	0	WA
		Chloromethane (Methyl chloride)	<10	µg/L	0	WA
		Chromium	1.3	µg/L	0	WA
		Dibromochloromethane	<5.0	µg/L	0	WA
		1,1-Dichloroethane	<5.0	µg/L	0	WA
		1,2-Dichloroethane	<5.0	µg/L	0	WA
		cis-1,2-Dichloroethene	<5.0	µg/L	0	WA
		1,1-Dichloroethylene	<5.0	µg/L	0	WA
		Dichloromethane (Methylene chloride)	6.8	µg/L	0	WA
		2,4-Dichlorophenoxyacetic acid	<1.1	µg/L	0	WA
		1,2-Dichloropropane	<5.0	µg/L	0	WA
		cis-1,3-Dichloropropene	<5.0	µg/L	0	WA

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WELL FAC 6 collected on 05/27/92, laboratory analyses (cont.)

H	D	Analyte	Result	Unit	Flag	Lab
		trans-1,3-Dichloropropene	<5.0	µg/L	0	WA
		Endrin	<0.11	µg/L	0	WA
		Ethylbenzene	<5.0	µg/L	0	WA
		Fluoride	<100	µg/L	0	WA
		Iron	8.1	µg/L	0	WA
		Lead	<2.0	µg/L	0	WA
		Lindane	<0.056	µg/L	0	WA
		Magnesium	769	µg/L	0	WA
		Manganese	21	µg/L	0	WA
		Mercury	<0.20	µg/L	0	WA
		Methoxychlor	<0.56	µg/L	0	WA
		Nitrate as nitrogen	219	µg/L	0	WA
		Phenols	<5.0	µg/L	0	WA
		Potassium	1,610	µg/L	0	WA
		Selenium	<2.0	µg/L	0	WA
		Silica	9,200	µg/L	0	WA
		Silver	3.1	µg/L	0	WA
		Sodium	4,940	µg/L	0	WA
		Sulfate	9,190	µg/L	0	WA
		1,1,2,2-Tetrachloroethane	<5.0	µg/L	0	WA
		Tetrachloroethylene	<5.0	µg/L	0	WA
		Toluene	<5.0	µg/L	0	WA
		Total dissolved solids	69,000	µg/L	0	WA
		Total organic carbon	18,000	µg/L	2	WA
		Total organic halogens	235	µg/L	2	WA
		Total phosphates (as P)	42	µg/L	0	WA
		Toxaphene	<1.1	µg/L	0	WA
		2,4,5-TP (Silvex)	<0.56	µg/L	0	WA
		1,1,1-Trichloroethane	<5.0	µg/L	0	WA
		1,1,2-Trichloroethane	<5.0	µg/L	0	WA
		Trichloroethylene	<5.0	µg/L	0	WA
		Trichlorofluoromethane	<5.0	µg/L	0	WA
		Gross alpha	<3.0E+00	pCi/L	0	CN
		Nonvolatile beta	<5.0E+00	pCi/L	0	CN
		Radium-226	9.2E-01 ± 2.4E-01	pCi/L	0	CN
		Tritium	<2.0E+00	pCi/mL	0	CN

• = exceeded holding time. ■ = exceeded primary drinking water standard.

WELL FAC 7

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Formation
N78123.4 E55356.2	33.288879 °N 81.672790 °W	235.7-215.7 ft msl	312.0 ft msl	4" PVC	Water table

FIELD MEASUREMENTS

Sample date: 05/28/92
Depth to water: 83.19 ft (25.36 m) below TOC
Water elevation: 228.81 ft (69.74 m) msl
Sp. conductance: 59 µS/cm
Water evacuated before sampling: 20 gal
The well went dry during purging.

Time: 9:15
pH: 5.4
Alkalinity: 13 mg/L
Water temperature: 20.2°C

LABORATORY ANALYSES

H	D	Analyte	Result	Unit	Flag	Lab
•		pH	6.5	pH	0	WA
•		pH	6.5	pH	0	WA
•		Specific conductance	63	µS/cm	0	WA
•		Specific conductance	63	µS/cm	0	WA
		Turbidity	16	NTU	0	WA
		Turbidity	16	NTU	0	WA
		Arsenic	<2.0	µg/L	0	WA
		Barium	<4.0	µg/L	0	WA
		Benzene	<5.0	µg/L	0	WA
		Bromodichloromethane	<5.0	µg/L	0	WA
		Bromoform	<5.0	µg/L	0	WA
		Bromomethane (Methyl bromide)	<10	µg/L	0	WA
		Cadmium	<0.35	µg/L	0	WA
		Calcium	6,030	µg/L	0	WA
		Carbon tetrachloride	<5.0	µg/L	0	WA
		Chloride	4,180	µg/L	0	WA
		Chlorobenzene	<5.0	µg/L	0	WA
		Chloroethane	<10	µg/L	0	WA
		Chloroethene (Vinyl chloride)	<10	µg/L	0	WA
		2-Chloroethyl vinyl ether	<10	µg/L	0	WA
		Chloroform	<5.0	µg/L	0	WA
		Chloromethane (Methyl chloride)	<10	µg/L	0	WA
		Chromium	<1.1	µg/L	0	WA
		Dibromochloromethane	<5.0	µg/L	0	WA
		1,1-Dichloroethane	<5.0	µg/L	0	WA
		1,2-Dichloroethane	<5.0	µg/L	0	WA
		cis-1,2-Dichloroethene	<5.0	µg/L	0	WA
		1,1-Dichloroethylene	<5.0	µg/L	0	WA
		Dichloromethane (Methylene chloride)	8.7	µg/L	0	WA
		2,4-Dichlorophenoxyacetic acid	<1.1	µg/L	0	WA
		1,2-Dichloropropane	<5.0	µg/L	0	WA
		cis-1,3-Dichloropropene	<5.0	µg/L	0	WA
		trans-1,3-Dichloropropene	<5.0	µg/L	0	WA
		Endrin	<0.11	µg/L	0	WA
		Ethylbenzene	<5.0	µg/L	0	WA
		Fluoride	<100	µg/L	0	WA
		Fluoride	<100	µg/L	0	WA
		Iron	12	µg/L	0	WA
		Lead	<2.0	µg/L	0	WA

• = exceeded holding time. ■ = exceeded primary drinking water standard.

WELL FAC 7 collected on 05/28/92, laboratory analyses (cont.)

H	D	Analyte	Result	Unit	Flag	Lab
		Lindane	<0.056	µg/L	0	WA
		Magnesium	428	µg/L	0	WA
		Manganese	13	µg/L	0	WA
		Mercury	<0.20	µg/L	0	WA
		Methoxychlor	<0.56	µg/L	0	WA
		Nitrate as nitrogen	181	µg/L	0	WA
		Phenols	<5.0	µg/L	0	WA
		Potassium	1,010	µg/L	0	WA
		Selenium	<2.0	µg/L	0	WA
		Silica	7,170	µg/L	0	WA
		Silver	<0.70	µg/L	0	WA
		Sodium	4,330	µg/L	0	WA
		Sulfate	5,560	µg/L	0	WA
		1,1,2,2-Tetrachloroethane	<5.0	µg/L	0	WA
		Tetrachloroethylene	<5.0	µg/L	0	WA
		Toluene	1.1	µg/L	0	WA
		Total dissolved solids	47,000	µg/L	0	WA
		Total organic carbon	19,500	µg/L	2	WA
		Total organic halogens	152	µg/L	2	WA
		Total phosphates (as P)	<80	µg/L	0	WA
		Toxaphene	<1.1	µg/L	0	WA
		2,4,5-TP (Silvex)	<0.55	µg/L	0	WA
		1,1,1-Trichloroethane	<5.0	µg/L	0	WA
		1,1,2-Trichloroethane	<5.0	µg/L	0	WA
		Trichloroethylene	<5.0	µg/L	0	WA
		Trichlorofluoromethane	<5.0	µg/L	0	WA
		Gross alpha	<3.0E+00	pCi/L	0	CN
		Nonvolatile beta	<5.0E+00	pCi/L	0	CN
		Radium-226	5.5E+00 ± 6.5E-01	pCi/L	0	CN
		Tritium	2.8E+00 ± 4.3E-01	pCi/mL	0	CN

WELL FAC 8

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Formation
N78090.9 E55366.0	33.288823 °N 81.672701 °W	236.0-216.0 ft msl	311.0 ft msl	4" PVC	Water table

FIELD MEASUREMENTS

Sample date: 05/27/92
Depth to water: 80.17 ft (24.44 m) below TOC
Water elevation: 230.83 ft (70.36 m) msl
Sp. conductance: 83 µS/cm
Water evacuated before sampling: 32 gal
The well went dry during purging.

Time: 9:00
pH: 5.8
Alkalinity: 26 mg/L
Water temperature: 19.1°C

LABORATORY ANALYSES

H	D	Analyte	Result	Unit	Flag	Lab
•		pH	6.2	pH	0	WA
•		Specific conductance	76	µS/cm	0	WA
		Turbidity	6.9	NTU	0	WA
		Arsenic	<2.0	µg/L	0	WA

• = exceeded holding time. ● = exceeded primary drinking water standard.

WELL FAC 8 collected on 05/27/92, laboratory analyses (cont.)

H	D	Analyte	Result	Unit	Flag	Lab
		Barium	5.4	µg/L	0	WA
		Benzene	<5.0	µg/L	0	WA
		Bromodichloromethane	<5.0	µg/L	0	WA
		Bromoform	<5.0	µg/L	0	WA
		Bromomethane (Methyl bromide)	<10	µg/L	0	WA
		Cadmium	0.92	µg/L	0	WA
		Calcium	13,800	µg/L	0	WA
		Carbon tetrachloride	<5.0	µg/L	0	WA
		Chloride	3,980	µg/L	0	WA
		Chlorobenzene	<5.0	µg/L	0	WA
		Chloroethane	<10	µg/L	0	WA
		Chloroethene (Vinyl chloride)	<10	µg/L	0	WA
		2-Chloroethyl vinyl ether	<10	µg/L	0	WA
		Chloroform	<5.0	µg/L	0	WA
		Chloromethane (Methyl chloride)	<10	µg/L	0	WA
		Chromium	1.6	µg/L	0	WA
		Dibromochloromethane	<5.0	µg/L	0	WA
		1,1-Dichloroethane	<5.0	µg/L	0	WA
		1,2-Dichloroethane	<5.0	µg/L	0	WA
		cis-1,2-Dichloroethene	<5.0	µg/L	0	WA
		1,1-Dichloroethylene	<5.0	µg/L	0	WA
		Dichloromethane (Methylene chloride)	<5.0	µg/L	0	WA
		2,4-Dichlorophenoxyacetic acid	<1.1	µg/L	0	WA
		1,2-Dichloropropane	<5.0	µg/L	0	WA
		cis-1,3-Dichloropropene	<5.0	µg/L	0	WA
		trans-1,3-Dichloropropene	<5.0	µg/L	0	WA
		Endrin	<0.11	µg/L	0	WA
		Ethylbenzene	<5.0	µg/L	0	WA
		Fluoride	<100	µg/L	0	WA
		Iron	<1.9	µg/L	0	WA
		Lead	<2.0	µg/L	0	WA
		Lindane	<0.055	µg/L	0	WA
		Magnesium	379	µg/L	0	WA
		Manganese	16	µg/L	0	WA
		Mercury	<0.20	µg/L	0	WA
		Methoxychlor	<0.55	µg/L	0	WA
		Nitrate as nitrogen	313	µg/L	0	WA
		Phenols	<5.0	µg/L	0	WA
		Potassium	1,640	µg/L	0	WA
		Selenium	<2.0	µg/L	0	WA
		Silica	7,680	µg/L	0	WA
		Silver	0.88	µg/L	0	WA
		Sodium	12,000	µg/L	0	WA
		Sulfate	5,330	µg/L	0	WA
		1,1,2,2-Tetrachloroethane	<5.0	µg/L	0	WA
		Tetrachloroethylene	<5.0	µg/L	0	WA
		Toluene	<5.0	µg/L	0	WA
		Total dissolved solids	64,000	µg/L	0	WA
		Total organic carbon	2,470	µg/L	0	WA
		Total organic halogens	53	µg/L	2	WA
		Total phosphates (as P)	<20	µg/L	0	WA
		Toxaphene	<1.1	µg/L	0	WA
		2,4,5-TP (Silvex)	<0.57	µg/L	0	WA
		1,1,1-Trichloroethane	<5.0	µg/L	0	WA
		1,1,2-Trichloroethane	<5.0	µg/L	0	WA
		Trichloroethylene	<5.0	µg/L	0	WA

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WELL FAC 8 collected on 05/27/92, laboratory analyses (cont.)

H	D	Analyte	Result	Unit	Flag	Lab
		Trichlorofluoromethane	<5.0	µg/L	0	WA
		Gross alpha	<3.0E+00	pCi/L	0	CN
		Nonvolatile beta	<5.0E+00	pCi/L	0	CN
		Radium-226	2.1E+00 ± 3.6E-01	pCi/L	0	CN
		Tritium	2.5E+00 ± 4.1E-01	pCi/mL	0	CN

● = exceeded holding time. ■ = exceeded primary drinking water standard.

END

DATE FILMED

5/4/93