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DEMONSTRATION OF INNOVATIVE APPLICATIONS OF TECHNOLOGY FOR THE CT-121 FGD PROCESS

Plant Yates

Environmental Monitoring Program: Final Report

DOE DE-FC22-90PC89650
SCS C-90-00284

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1.0 INTRODUCTION

The purpose of the Innovative Clean Coal Technology demonstration project entitled "Demonstration of Innovative Applications of Technology for the CT-121 FGD Process," conducted at Plant Yates, was to demonstrate the use of the Chiyoda Thoroughbred-121 flue gas desulfurization process as a means of reducing SO_2 and particulate emissions from pulverized-coal utility boilers that use high-sulfur coal. The project was also designed to demonstrate the lower cost and higher reliability of the CT-121 process compared to conventional wet limestone FGD processes.

As the project sponsor, Southern Company Services, Inc., (SCS) was required to develop and implement an approved Environmental Monitoring Plan (EMP). The EMP for this project was prepared by Radian Corporation for SCS and submitted to the U.S. Department of Energy (DOE) on December 18, 1990. The EMP was subsequently revised and resubmitted on January 16, 1995.[1]

The EMP was developed to fulfill the following specific objectives:

- To provide monitoring data to fulfill environmental compliance requirements of local, state, and federal regulatory agencies;
- To define and describe supplemental monitoring activities;
- To ensure that emissions and environmental impacts were consistent with projections provided in documents prepared for this project as required by the National Environmental Policy Act of 1970 (NEPA); and
- To develop an environmental record that can be used for future replication of the subject technology.

This report presents and discusses the data obtained during the CT-121 demonstration project in fulfillment of the EMP objectives.

1.1 CT-121 Demonstration Facility Description

The CT-121 flue gas desulfurization project was conducted at Georgia Power Company's Plant Yates, an existing plant located approximately 40 miles south-southwest of Atlanta, Georgia. Plant Yates consists of seven steam turbine electric generating units providing a total nameplate capacity of 1,250 MW. Units 1through 5, in service since the 1950s, are operated as intermediate load units and are located in one building that features a common 825-foot stack for venting emissions from all five units. Units 6 and 7, in service since 1974, are operated as base load units. A common 800-foot stack is used to vent emissions from these two units, which are housed in a separate building. All of Plant Yates' units are equipped with electrostatic precipitators (ESPs) for particulate control.

The CT-121 flue gas desulfurization project was constructed and operated to treat the entire flue gas stream from Unit 1 (100 MW), approximately 12% of the total flue gas generated at Plant Yates. A new 258-foot stack was constructed to vent emissions from the CT-121 process.

A simplified process flow diagram of the CT-121 process is shown in Figure 1-1. Major process sampling locations are shown in that diagram. The following paragraphs describe key features of the process.

1.1.1 Limestone Feed System

Limestone is transported to Plant Yates by truck and delivered to a 30-day storage pile. From there it is loaded into an above-grade load hopper. A covered inclined conveyor system is used to deliver the limestone to a storage silo, from which it is conveyed to a wet ball mill. The mill product is pumped to hydroclones for size classification. The hydroclone overflow flows into a slurry feed tank, while the underflow is recycled to the ball mill. The limestone slurry is then pumped to the jet bubbling reactor.

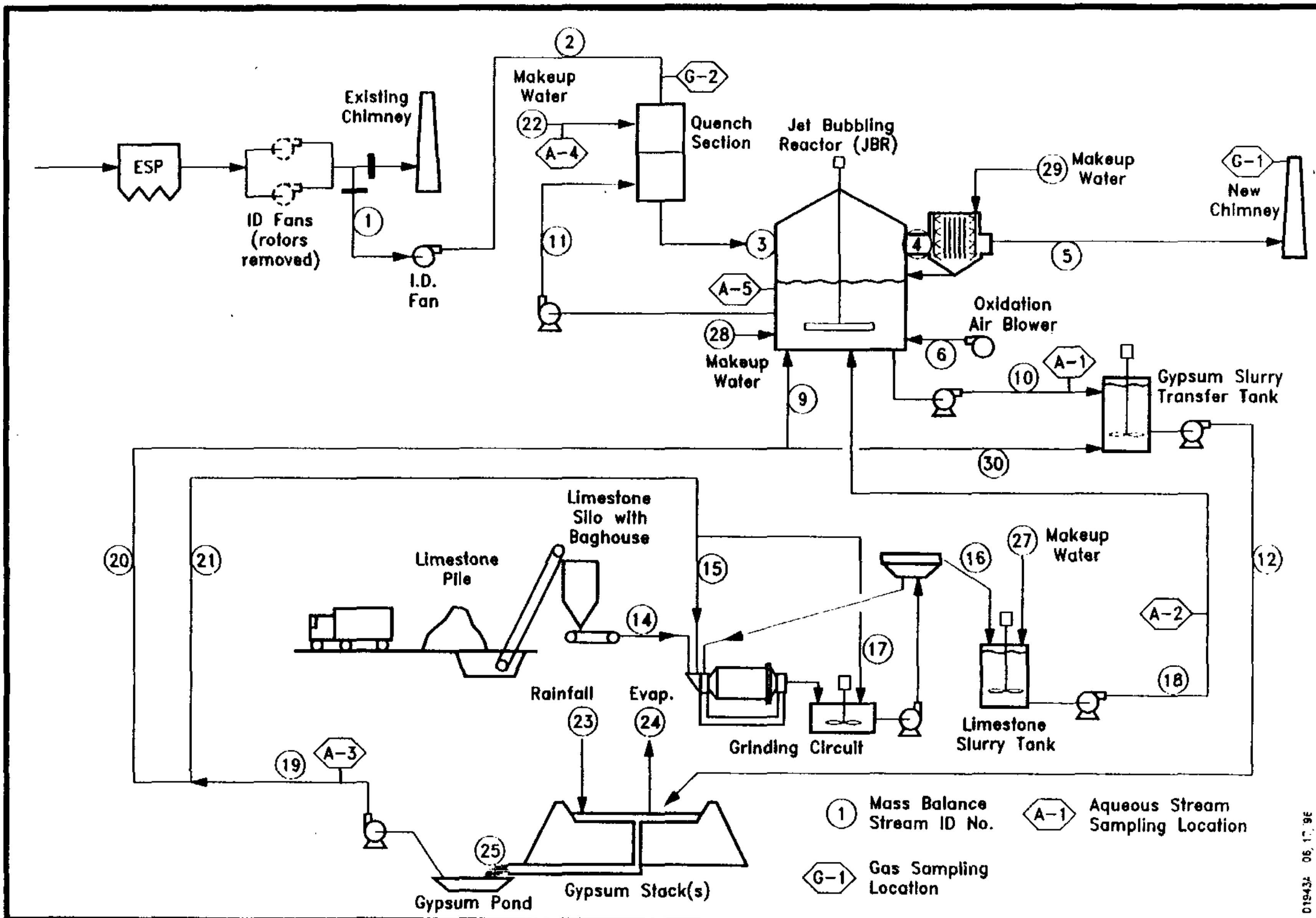


Figure 1-1. Simplified CT-121 Process Flow Diagram

1.1.2 Jet Bubbling Reactor

The jet bubbling reactor (JBR) is the key element of the CT-121 process. The demonstration project's JBR is approximately 40 feet tall by 40 feet in diameter and is constructed of fiberglass reinforced plastic (FRP). The JBR slurry is mixed using a single center-mounted agitator.

Pre-cooled flue gas from Unit 1 enters the JBR in a plenum chamber, from which it is forced into the froth zone of the JBR. Air is injected below the slurry surface to oxidize SO_2 absorbed from the flue gas, which reacts with the limestone slurry to form gypsum. The desulfurized flue gas flows upward through risers and into a second plenum, where most of the entrained liquid in the gas is disengaged, then through a mist eliminator to the dedicated stack.

1.1.3 Flue Gas Handling System

The flue gas handling system was designed to allow for several different modes of operation. Tests with low-particulate loading (with the ESP in service) and high-particulate loading (with the ESP either partially or completely out of service) were conducted as part of the demonstration project.

1.1.4 Solids Disposal

As the JBR slurry exceeds a prescribed density, the underflow is pumped approximately 2,540 feet via a pipeline to an eight-acre gypsum stacking area. The gypsum slurry is pumped to a central location in the stacking area. Supernatant liquor and accumulated rainfall are collected for reuse in the process. As the inner area of the stack is filled with solids, a dragline is used to stack the dewatered material and to raise the level of the perimeter dike.

1.2 Project Description

The CT-121 demonstration project at Plant Yates consists of four distinct test periods including:

- Period 0: Site Preparation, Construction, and Startup of the Demonstration Project;
- Period 1: Baseline Testing at Low-Particulate Loading—with ESP in service;
- Period 2: Testing at High-Particulate Loading—ESP detuned or out of service; and
- Period 3: Post-Demonstration Groundwater Testing and Gypsum By-Product Evaluation.

Additional details about the environmental monitoring conducted during each of these four periods is provided in Section 2.

1.3 Report Organization

The remainder of this report is organized as follows:

- Section 2 discusses the technical approach used in performing environmental monitoring during the CT-121 demonstration project;
- Section 3 summarizes the environmental monitoring results for gaseous, aqueous, solid, and groundwater streams;
- Section 4 presents a summary of conclusions based on the results presented in the previous section;
- Section 5 provides a number of recommendations; and
- Section 6 is a list of references.

Tables and figures containing the detailed results for each of the streams monitored as part of the EMP are provided in the appendices.

2.0 TECHNICAL APPROACH

This section discusses the gaseous-, aqueous-, solid-, and groundwater-stream monitoring conducted under the EMP for the CT-121 demonstration project. It also summarizes the sampling and analytical methods that were used.

2.1 Environmental Monitoring Plan

The objectives of the EMP were addressed through an integrated monitoring approach. Monitoring efforts were divided into discrete areas:

- Gaseous stream monitoring, including internal process streams as well as discharges;
- Aqueous stream monitoring, including effluent streams and internal process streams;
- Solids monitoring, including solid waste and internal streams; and
- Monitoring of key process parameters that may be related to the environmental quality of pertinent streams.

A simplified process flow diagram of the CT-121 demonstration unit was shown earlier (Figure 1-1). EMP sampling and monitoring points are identified in this figure.

The CT-121 demonstration project at Plant Yates consisted of four distinct environmental test periods, including:

- Period 0: Site Preparation, Construction, and Startup of the Demonstration Project;
- Period 1: Baseline Testing at Low-Particulate Loading—with ESP in service;
- Period 2: Testing at High-Particulate Loading–ESP detuned or out of service; and
- Period 3: Post-Demonstration Groundwater Testing and Gypsum By-Product Evaluation.

The Low- and High-Particulate test periods each consisted of a number of short-term parametric and long-term load-following test blocks. These tests were conducted to determine how different operating conditions, such as jet bubbling reactor (JBR) pressure drop, scrubber slurry pH, gas flow (i.e., boiler load), coal sulfur content, limestone source, and ESP operating parameters affect emissions and CT-121 process performance. Tables 2-1 and 2-2 summarize the tests performed during the Low- and High-Particulate test periods, respectively. A more detailed discussion of the tests is provided in Volume 2 of the project's Final Report.[6]

The Low-Particulate loading test period consisted of the following test blocks, all of which were performed with the ESP fully energized:

- Parametric tests while using the baseline program coal (approximately 2.5% sulfur) and main program limestone;
- Long-term load-following tests while using the baseline program coal and limestone; and
- Auxiliary test blocks, consisting of high SO_2 removal, alternate limestone, and alternate coal (4.3% sulfur) tests.

During the High-Particulate loading test period, similar test blocks were performed, but with the ESP either partially or completely de-energized. The original plan called for all of the High-Particulate tests to be conducted with the ESP completely de-energized. However, severe sparger tube fouling was encountered during the High-Particulate Parametric Test block when the ESP was operated in this mode. In subsequent tests, the ESP was operated in a partially energized mode, to simulate operation with a marginally performing particulate collection device.

In addition, a decision was made to continue to operate the scrubber during High-Particulate tests with the limestone used in the Low-Particulate Alternate Limestone test block; a third limestone was used in the High-Particulate Alternate Limestone test block. A number of tests were also conducted using the plant's Phase 1 compliance coal (1.25% sulfur). The coal used in the High-Particulate Alternate Coal test block had a lower sulfur content than that used during the Low-Particulate Alternate Coal test block (3.4% sulfur versus 4.3%). In addition, the 2.5% sulfur

TABLE 2-1
SUMMARY OF LOW-PARTICULATE LOADING TESTS

Test Block	Test Numbers	Dates
Parametric Tests	P1-1 - P1-36	01/17/93 - 03/31/93
Long-Term Load-Following Tests	L1-1 - L1-3	04/01/93 - 09/10/93
Auxiliary Tests		
• High SO_2 Removal		
—Parametric	HR1-1 - HR1-3	09/14/93 - 09/16/93
—Load-Following	HR1-4	09/17/93 - 10/22/93
• Alternate Limestone		
—"Clean" JBR Parametric	P1B-1 - P1B-13	12/03/93 - 12/21/93
—Load-Following	AL1-1 - AL1-2	12/22/93 - 01/25/94
• Alternate Coal		
—Parametric	AC1-1 - AC1-12	01/26/94 - 02/21/94

TABLE 2-2
SUMMARY OF HIGH-PARTICULATE LOADING TESTS

Test Block	Test Numbers	Dates
Parametric Tests	P2-1 - P2-33R	03/14/94 - 03/28/94 04/19/94 - 05/28/94
Long-Term Load-Following Tests	L2-1 - L2-3	06/06/94 - 08/28/94
Auxiliary Tests		
• High SO_2 Removal		
—Parametric	HR2-1 - HR2-3	09/07/94 - 09/12/94
—Load-Following	HR2-4	09/13/94 - 10/03/94
• Alternate Coal		
—Parametric	AC2-1 - AC2-9	10/04/94 - 10/13/94
—Load-Following	AC2-10	10/14/94 - 10/28/94
• Alternate Limestone		
—Parametric	AL2-1 - AL2-14	11/22/94 - 12/28/94

baseline coal was unavailable during the latter part of the High-Particulate test block, resulting in some tests being conducted at lower SO_2 concentrations than were experienced during the Low-Particulate test block.

Another factor leading to a modification of the original test plan was the discovery during the High-Particulate Parametric tests that it was necessary to operate at lower slurry pH levels to avoid the formation of aluminum fluoride complexes that hindered limestone utilization.

For the reasons outlined above, it was not possible to make direct comparisons between many of the Low-Particulate and High-Particulate tests.

2.1.1 Gaseous Stream Monitoring

Gaseous stream monitoring as specified in the EMP is summarized in Table 2-3, and included two streams: the flue gas inlet to the JBR and the stack gas. Monitoring frequencies for each of the parameters included are shown in the table.

The only environmental compliance monitoring requirements were the continuous measurement of the JBR inlet flue gas opacity (for which a variance was obtained for the High-Particulate test blocks), and annual measurement of the particulate matter loading in the stack gas stream. All of the other parameters shown in Table 2-3 represented supplemental monitoring requirements.

SO_2 was monitored continuously in the JBR inlet flue gas and stack gas to determine SO_2 removal efficiency; oxygen was also monitored continuously so that all of the data could be normalized to a consistent basis (i.e., 3% O_2). SO_3 was measured to determine whether the scrubber removed this sulfuric acid mist precursor. Particulate matter loadings and particle size distributions were measured to determine the ability of the scrubber to remove particulate matter present in the flue gas inlet to the JBR.

TABLE 2-3
GASEOUS STREAMS: INTEGRATED MONITORING SCHEDULE
FOR EACH TESTING PERIOD[a]

Parameter	Monitoring Schedule			
	Stack Gas Stream (G-1)		Flue Gas Inlet to JBR (G-2)	
	Parametric	Long-Term	Parametric	Long-Term
Opacity	None	None	C [comp.][b]	C [comp.]
SO_2	C [supp.]	C [supp.]	C [supp.]	C [supp.]
O_2	C [supp.]	C [supp.]	C [supp.]	C [supp.]
Moisture Content	9 [supp.][c]		9 [supp.]	
SO_3	36 [supp.]		36 [supp.]	
Particulate Matter				
Loading	9 [supp.][d] A [comp.]		9 [supp.]	
Particle Size Distribution	9 [supp.]		9 [supp.]	

Abbreviations:

A = Annual monitoring
C = Continuous monitoring
comp. = Compliance monitoring
supp. = Supplemental monitoring

Notes:

[a] Each of the two testing periods (Low-Particulate and High-Particulate) consisted of parametric and long-term tests.

[b] The opacity of the JBR inlet gas stream was measured using a continuous monitor.

[c] The numbers shown refer to the number of samples planned for EMP monitoring.

[d] Particulate loading measurements were to be made in triplicate for each of three load levels at three JBR liquid levels.

Stream identifiers G-1 and G-2 are shown in Figure 1-1.

2.1.2 Aqueous Stream Monitoring

As shown in Table 2-4, aqueous stream monitoring included both compliance and supplemental monitoring. Of Plant Yates' permitted discharge streams, only two could have been affected by operation of the CT-121 scrubber demonstration: ash transport water and final plant discharge. The sampling frequency and parameters monitored were specified in the Georgia Department of Natural Resources, Environmental Protection Division (EPD) NPDES Permit No. GA0001473.

All of the remaining parameters included in the EMP represented supplemental monitoring and included parameters from several internal process streams, including JBR froth zone, JBR draw-off, limestone slurry feed, gypsum stack return, and makeup water. Both solid and liquid phase analyses were conducted for slurry streams. The parameters selected for monitoring were those needed to characterize the performance of the CT-121 process.

2.1.3 Solid Stream Monitoring

The only solid stream included in the scope of the EMP was the coal feed to the boiler supplying flue gas to the CT-121 scrubber. All of the other solids monitoring for process streams and gypsum byproduct were included as part of the aqueous stream monitoring, described in the previous section. As summarized in Table 2-5, the coal feed monitoring included proximate and ultimate analyses and trace elements.

2.1.4 Groundwater Monitoring

Groundwater monitoring was initiated during the preconstruction period (Period 0) and continued through the two-year post-demonstration period (Period 3). During the preconstruction period, five monitoring wells were installed in the vicinity of the proposed gypsum stacking area. Monitoring was conducted every two months from September 1990 through July 1991 for the suite of parameters shown in Table 2-6.

TABLE 2-4

AQUEOUS STREAMS: INTEGRATED MONITORING SCHEDULE FOR EACH TESTING PHASE

Parameter	Ash Transport Water	Final Plant Discharge	JBR Froth Zone (A-5)		JBR Draw-Off (A-1)	
			Parametric	Long-Term	Parametric	Long-Term
Liquid Phase						
pH		2/M [comp.]	7/M [supp.]	4/M [supp.]	7/M [supp.]	4/M [supp.]
Total Suspended Solids	2/M [comp.]					
Oil & Grease	2/M [comp.]					
Chloride			7/M [supp.]	4/M [supp.]		
Sulfite			7/M [supp.]	4/M [supp.]		
Sulfate			7/M [supp.]	4/M [supp.]		
Carbonate			7/M [supp.]	4/M [supp.]		
Trace Elements				1/M [supp.]		
Solid Phase						
Solids Content			7/M [supp.]	4/M [supp.]	7/M [supp.]	4/M [supp.]
Inert Content			7/M [supp.]	4/M [supp.]	7/M [supp.]	4/M [supp.]
Calcium			7/M [supp.]	4/M [supp.]	7/M [supp.]	4/M [supp.]
Magnesium					7/M [supp.]	4/M [supp.]
Sulfite					7/M [supp.]	4/M [supp.]
Sulfate			7/M [supp.]	4/M [supp.]	7/M [supp.]	4/M [supp.]
Carbonate			7/M [supp.]	4/M [supp.]	7/M [supp.]	4/M [supp.]
Trace Elements						1/M [supp.]
TCLP						1/P [supp.]

TABLE 2-4 (CONTINUED)

Parameter	Limestone Slurry Feed (A-2)		Gypsum Stack Return (A-3)		Makeup Water (A-4)	
	Parametric	Long-Term	Parametric	Long-Term	Parametric	Long-Term
Liquid Phase						
pH			7/M [supp.]	4/M [supp.]	1/M [supp.]	1/M [supp.]
Total Suspended Solids						
Oil & Grease						
Chloride			7/M [supp.]	4/M [supp.]	1/M [supp.]	1/M [supp.]
Sulfite					1/M [supp.]	1/M [supp.]
Sulfate			7/M [supp.]	4/M [supp.]	1/M [supp.]	1/M [supp.]
Carbonate			7/M [supp.]	4/M [supp.]	1/M [supp.]	1/M [supp.]
Trace Elements			1/M [supp.]	1/M [supp.]		
Solid Phase						
Solids Content	7/M [supp.]	4/M [supp]				
Inert Content	7/M [supp.]	4/M [supp.]				
Calcium	7/M [supp.]	4/M [supp.]				
Magnesium	7/M [supp.]	4/M [supp.]				
Sulfite						
Sulfate						
Carbonate	7/M [supp.]	4/M [supp.]				
Trace Elements						
TCLP						

TABLE 2-4 (CONTINUED)

Abstract:

Abbreviations:

n/M	=	n times per month
1/P	=	once per test period
comp.	=	compliance monitoring
supp.	=	supplemental monitoring

Notes:

1) Each of the two testing periods (Low-Particulate and High-Particulate) consisted of parametric and long-term tests.

2) Trace elements measured in these tests included the following:

Aluminum	Cadmium	Manganese	Silicon
Antimony	Copper	Mercury	Sodium
Arsenic	Chromium	Molybdenum	Sulfur
Barium	Cobalt	Nickel	Titanium
Beryllium	Iron	Phosphorus	Uranium
Boron	Lead	Potassium	Vanadium
Calcium	Magnesium	Selenium	

3) Stream identifiers A-1, A-2, A-3, A-4, and A-5 are shown in Figure 2-1.

TABLE 2-5
SOLID STREAMS: INTEGRATED MONITORING
SCHEDULE FOR EACH TESTING PERIOD

Parameter			Monitoring Schedule Coal Feed	
			Parametric	Long-Term
Proximate Analysis, Sulfur, and HHV			1/D	1/D
Ultimate Analysis, Chlorine, and Fluorine			1/6M	1/6M
Trace Elements:			1/6M	1/6M
Aluminum	Cobalt	Phosphorus		
Antimony	Copper	Potassium		
Arsenic	Iron	Selenium		
Barium	Lead	Silicon		
Beryllium	Magnesium	Sodium		
Boron	Manganese	Sulfur		
Cadmium	Mercury	Titanium		
Calcium	Molybdenum	Uranium		
Chromium	Nickel	Vanadium		

Abbreviations:

1/D = Once per day
1/6M = Once every six months
HHV = Higher heating value

Notes:

1) All monitoring shown was supplemental.

2) The monitoring shown was in addition to the regulatory compliance requirement for weekly analysis of the coal feed for sulfur, moisture, heating value, and ash.

3) Each testing period consisted of parametric and long-term tests.

4) Gypsum solids were monitored and reported as part of the JBR draw-off (Stream A-1). See Table 2-4.

TABLE 2-6
GROUNDWATER: INTEGRATED MONITORING
SCHEDULE FOR EACH TESTING PERIOD

Parameter	**Groundwater Preconstruction**	**Groundwater Post-Construction**
pH	1/2M [supp]	1/Q [supp.]
Specific Conductance	1/2M [supp.]	1/Q [supp.]
Temperature	1/2M [supp.]	1/Q [supp.]
Eh	1/2M [supp.]	1/Q [supp.]
Alkalinity	1/2M [supp.]	1/Q [supp.]
Total Dissolved Solids	1/2M [supp.]	1/Q [supp.]
Bromide	1/2M [supp.]	1/Q [supp.]
Chloride	1/2M [supp.]	1/Q [supp.]
Total Organic Carbon	1/2M [supp.]	1/Q [supp.]
Fluoride	1/2M [supp.]	1/Q [supp.]
Nitrate	1/2M [supp.]	1/Q [supp.]
Sulfate	1/2M [supp.]	1/Q [supp.]
Radium 226 and 228	1/2M [supp.]	1/Q [supp.]
Gross Alpha	1/2M [supp.]	1/Q [supp.]
Gross Beta	1/2M [supp.]	1/Q [supp.]
Gross Gamma	1/2M [supp.]	1/Q [supp.]
Trace Elements	1/2M [supp.]	1/Q [supp.]

Abbreviations:

1/2M = once every 2 months
1/Q = once per quarter
supp. = supplemental monitoring

Notes:

1) Trace elements that are measured in these tests are the following:

Aluminum	Cadmium	Manganese	Silicon
Antimony	Copper	Mercury	Sodium
Arsenic	Chromium	Molybdenum	Sulfur
Barium	Cobalt	Nickel	Titanium
Beryllium	Iron	Phosphorus	Uranium
Boron	Lead	Potassium	Vanadium
Calcium	Magnesium	Selenium	

Following the preconstruction period, and as a Georgia EPD permit requirement, two additional monitoring wells were installed in 1992. The locations of all seven monitoring wells are shown in Figure 2-1. Beginning in the third quarter of 1994, post-construction monitoring was performed quarterly. Monitoring was performed throughout both scrubber demonstration periods and continued for two additional years.

Groundwater monitoring parameters were selected to demonstrate that the gypsum stacking area can be operated in an environmentally benign and acceptable manner.

2.1.5 Modifications to the EMP

In the course of executing the environmental monitoring for the CT-121 demonstration project, a small number of changes and modifications were made to the EMP. These included the following:

- Several groundwater monitoring parameters were added as part of the permit requirements for the gypsum stacking area, including quarterly monitoring for total organic halides (TOX), and annual monitoring for volatile organic compounds (VOCs).

- Groundwater samples could not be obtained from all seven monitoring wells during each quarterly monitoring campaign. One of the downgradient wells was unproductive since groundwater monitoring began. The upgradient well was also unproductive from the fourth quarter of 1993 through the first quarter of 1995.

- Monitoring of the JBR froth zone solids was discontinued during the early part of the High-Particulate testing period. Previous monitoring demonstrated the similarity of the composition of these solids and the JBR draw-off solids, since the JBR was such a well-mixed vessel. Discontinuing the analysis of the JBR froth zone solids helped alleviate the large work load on the on-site laboratory without eliminating the gathering of unique information on the composition of the JBR solids.

- The EPA's Toxicity Characteristic Leaching Procedure (TCLP), scheduled to be performed on JBR draw-off solids once during each of the two scrubber operating periods, was not performed. A sample was obtained during the Low-Particulate test period but was not analyzed within the maximum allowable holding time; no sample was obtained during the High-Particulate test period due to a scheduling oversight.

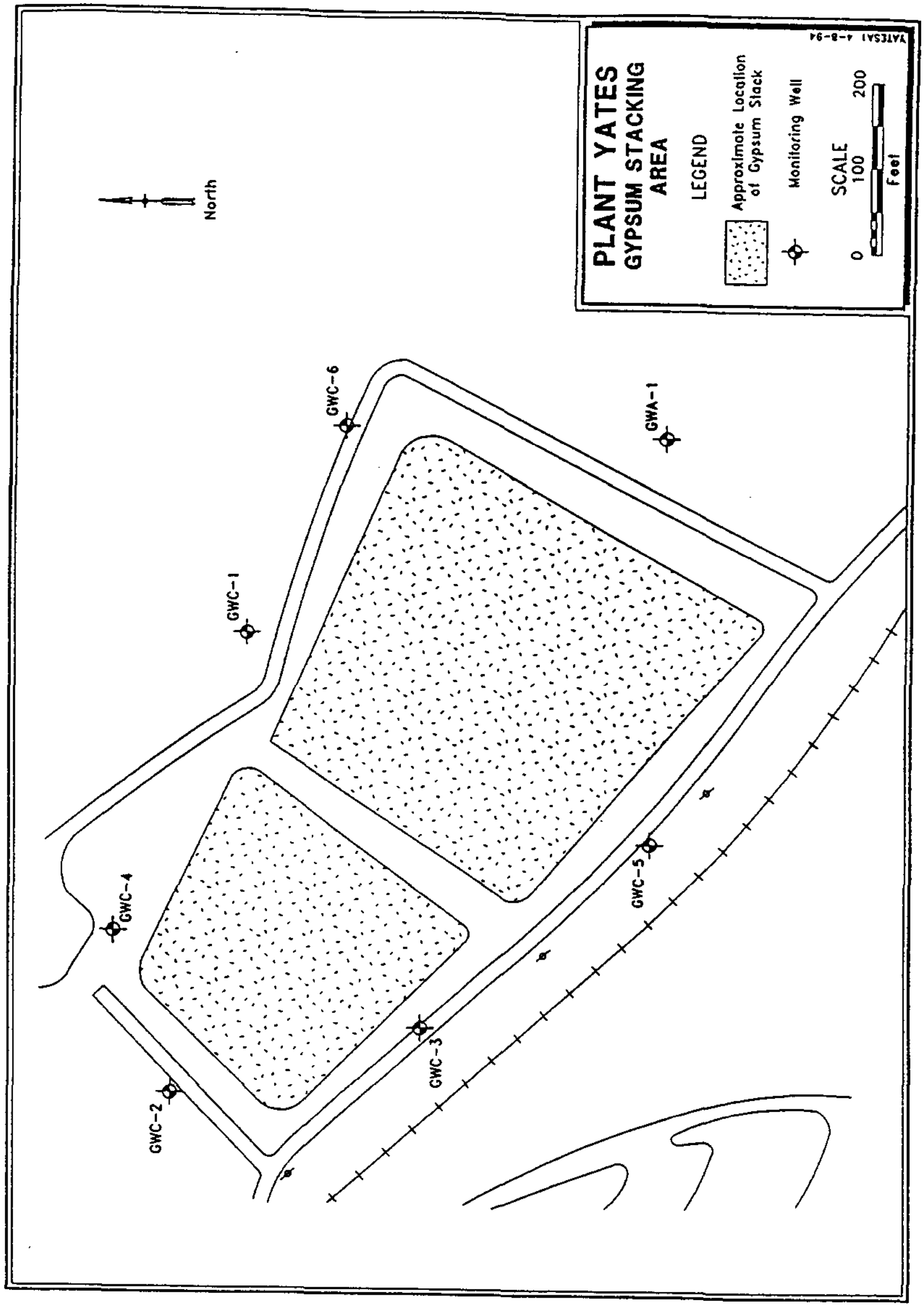


Figure 1. Locations of Monitoring Wells

2.2 Sampling and Analytical Methods

The EMP sampling and analytical methods are briefly summarized in this section. Additional details are provided in the Quality Assurance/Quality Control Plan appended to the project's EMP. Deviations from the EMP-specified methods are also discussed.

2.2.1 Summary of Gaseous Stream Methods

Table 2-7 shows the methods used to collect and analyze gaseous stream samples. Continuous emission monitors were used for opacity, sulfur dioxide, and oxygen measurements. EPA-approved sampling methods were followed to measure moisture (EPA Method 4) and particulate loading (EPA Method 5b). The size distribution of the particulate matter was determined using modified Brink cascade impactors that were operated at the average isokinetic flow rate at a given port.

The controlled condensation method was used for SO_3 sampling. In this method a gas sample is withdrawn from the stream at a temperature above the sulfuric acid dew point (400-600° F). The gas stream passes through a condenser where it is cooled to a temperature that is below the sulfuric acid dew point, but above the moisture dew point.

2.2.2 Summary of Aqueous Stream Methods

Grab samples were obtained from all monitored aqueous streams. Positive pressure filtration was used to remove solids from reactive slurry streams. The liquid phase samples were filtered directly into sample containers containing appropriate preservatives. Vacuum filtration was used for separation of all other aqueous/slurry streams. Approved EPA, EPRI, and ASTM methods were used to analyze the aqueous stream samples, as shown in Table 2-8. Additional details are provided in the listed references.

TABLE 2-7
SAMPLING AND ANALYTICAL METHODS: GASEOUS STREAMS

Parameter	Sampling Method	Analytical Method/Instrument	Streams Included
Opacity	—	Continuous Opacity Monitor	G-2
SO_2	GAS[b]	UV Spectrophotometer	G-1,G-2
O_2	GAS[b]	O_2 Analyzer	G-1,G-2
Moisture	EPA Method 4	Gravimetric	G-1,G-2
SO_3	Controlled Condensation	Titration	G-1,G-2
Particulate Matter:			
Loading	EPA Method 5B	Gravimetric	G-1,G-2
Particle Size Distribution	Isokinetic, Cascade Impactor	Gravimetric	G-1,G-2

[a] Stream identification:

G-1 = treated stack gas stream; and

G-2 = flue gas inlet to JBR.

[b] GAS = Continuous extractive gas analysis system.

TABLE 2-8
SAMPLING AND ANALYTICAL METHODS: AQUEOUS STREAMS

Stream/Type & Parameter	Sampling Method	Analytical Method/Instrument [a,b]	Analytical Reference [c]	Streams Included [d]
Aqueous Discharge	Grab			
Ph		Potentiometric [b]	EPA 150.1	e
Total Suspended Solids		Filtration/Drying/Gravimetric [b]	EPA 160.2	a
Oil and Grease		Freon Extraction/Gravimetric [b]	EPA 413.1	
Process Streams - Liquid Phase	Positive Pressure Filtration [f] & Preservation			
pH [e]		Potentiometric	EPRI C1	A-1,A-3,A-4,A-5
Chloride		Ion Chromatography	EPRI I3	A-3,A-4,A-5
Sulfite		Indirect I_2 Titration	EPRI M2	A-4,A-5
Sulfate		Ion Chromatography	EPRI I3	A-3,A-4,A-5
Carbonate		Nondispersive IR	ASTM 2579	A-3,A-4,A-5
Trace Elements		AA and ICP-AES	EPA 200.2/200.7	A-3, A-5
Process Streams - Solid Phase	Positive Pressure Filtration			
Solids Content		Gravimetric	EPRI F1	A-1,A-2,A-5
Inerts		Acid Dissolution/Gravimetric	--	A-1,A-2,A-5
Calcium		AA	EPRI H1	A-1,A-2,A-5
Magnesium		AA	EPRI H1	A-1,A-2

TABLE 2-8 (CONTINUED)

Stream/Type & Parameter	Sampling Method	Analytical Method/Instrument [a,b]	Analytical Reference [c]	Streams Included [d]
Sulfite		Indirect I_2 Titration	EPRI M2	A-1
Sulfate		Ion Chromatography	EPRI I3	A-1,A-5
Carbonate		Nondispersive IR or Acid-Base Titration	EPRI N2 or N3	A-1,A-2, A-5
Trace Metals		Dissolution/AA and ICP-AES	EPA 200.0/200.7	A-1
TCLP		Leaching/GC,AA	40 CFR 261; Appendices II and III	A-1

[a] Analytical methods: AA = atomic absorption; SIE = specific ion electrode; ICP-AES = inductively coupled plasma argon emission spectroscopy; and IR = infrared.

[b] All analytical methods for NPDES compliance were to follow 40 CFR 136 approved procedures.

[c] EPRI No: EPRI method number specified in "FGD Chemistry and Analytical Methods Handbook" (Ref. 4). EPA No: EPA Methods for Chemical Analysis of Water and Wastes (Ref 7). SW No: Test Methods for Evaluation of Solid Wastes, EPA SW-846, 3rd ed. (November 1986).

[d] Stream identification:

a =	Ash transport water	A-3 =	Gypsum stack return
f =	Final plant discharge	A-4 =	Makeup water
A-1 =	JBR draw-off	A-5 =	JBR froth zone
A-2 =	Limestone slurry feed		

[e] Slurry pH was measured prior to sample filtration.

[f] Positive pressure filtration was to be used to collect samples of all reactive slurry streams. Vacuum filtration was to be used for sampling and separation of all other aqueous/slurry streams. The liquid phase of reactive slurries was to be preserved to prevent loss of reactive compounds.

2.2.3 Summary of Solid Stream Methods

Composited grab samples of coal feed were obtained and stored in plastic bags prior to analysis. The coal analyses followed the approved ASTM methods summarized in Table 2-9.

TABLE 2-9
SAMPLING AND ANALYTICAL METHODS: SOLID STREAM (COAL FEED)

Parameter	Sampling Method	Analytical Method	Analytical Reference[b]
Ultimate Analysis	Grab/Composite	—	ASTM D3176
Proximate Analysis	Grab/Composite	Thermogravimetric	ASTM D3172
Higher Heating Value	Grab/Composite	Calorimetry	ASTM D2015
Total Chlorine	Grab/Composite	Fusion/IC or Titration	ASTM D2361/4208
Total Fluorine	Grab/Composite	Fusion Combustion/SIE	ASTM D3761
Trace Elements	Grab/Composite	Fusion and/or Dissolution/AA	ASTM D3682, D3683, D3684

[a] Analytical methods: AA = atomic absorption; SIE = specific ion electrode; and IC = ion chromatography.

[b] Analytical reference: ASTM Number = American Society for Testing and Materials Method Number.

2.2.4 Summary of Groundwater Methods

Groundwater sampling and analytical methods are summarized in Table 2-10. The QED Well Wizard dedicated sampling system was used to purge the monitoring wells and collect samples. The Well Wizard system utilizes a dedicated Teflon® bladder pump and portable air compressor to extract groundwater samples. To ensure the collection of a representative sample, standing water was removed by purging a minimum of three wetted casing volumes.

TABLE 2-10
SAMPLING AND ANALYTICAL METHODS: GROUNDWATER

Stream/Type & Parameter	Sampling Method	Analytical Method/Instrument[a]	Analytical Reference[b]
Groundwater Wells	Well Pumps		
pH		Potentiometric	EPA 150.1
Specific Conductance		Conductivity Meter	EPA 120.1
Temperature		Temperature Probe	EPA 170.1
Eh		Electrometry	ASTM D1498
Alkalinity		Colorimetry or Titration	EPA 310.1/310.2
Bromide		Ion Chromatography	EPA 300.0
Chloride		Ion Chromatography	EPA 300.0
Total Organic Carbon		Combustion/IR	EPA 415.1
Fluoride		Distillation/SIE	EPA 340.2
Nitrate-Nitrite (as N)		Colorimetry	EPA 353.1
Sulfate		Ion Chromatography	EPA 300.0
Total Dissolved Solids		Filtration/Evaporation Gravimetric	EPA 160.2
Mercury		Cold Vapor AA	SW 7470
Trace Elements		AA and ICP-AES	Note c
Radium 226 and 228		Proportional Counter	ASTM D2460
Gross Alpha		Proportional Counter	ASTM D1943
Gross Beta		Proportional Counter	ASTM D1890
Gross Gamma		Gamma Ray Spectrometer	ASTM D2459

[a] Analytical methods: AA = atomic absorption; ICP-AES = inductively coupled plasma argon emission spectroscopy; and IR = infrared.

[b] EPA No: EPA Methods for Chemical Analysis of Water and Wastes. SW No: Test Methods for Evaluation of Solid Wastes, EPA SW-846, 3rd ed. (November 1986).

[c] Methods for groundwater trace elements include SW 6010 (metals by ICP-AES); SW 7041 (Sb); SW 7060 (As); SW 7421 (Pb); SW 7740 (Se); and SW 7841 (Tl).

Conductivity, pH, redox potential, and temperature were monitored and recorded during purging. Samples were collected after these indicator parameters stabilized. Approved EPA and ASTM methods were used for sample analysis, as summarized in Table 2-10.

2.2.5 Modifications to EMP-Specified Methods

For the most part, the methods specified in the EMP were followed. Deviations from these methods are briefly discussed below:

- For aqueous stream nitrates-nitrites, the colorimetric method (EPA 353.1) was used instead of the specified ion chromatographic method (EPA 300). The alternate method provides an improved detection limit as well as a longer sample holding time.
- Rather than determining coal trace elements using inductively coupled argon plasma emission spectroscopy (ICP-AES; EPA 200.7), Georgia Power Company used ASTM methods based on atomic absorption spectrophotometry, which give improved detection limits (i.e., ASTM D3682, D3683, and D3684).

3.0 MONITORING RESULTS

This section presents a summary of the environmental monitoring program results, primarily in graphical and tabular form. Tables containing the complete results for all EMP parameters are provided in Appendix A. The results for gaseous streams, aqueous streams, solid streams, and groundwater are presented in separate subsections.

3.1 Gaseous Stream Monitoring Results

Two gaseous streams were monitored as specified in the EMP: The flue gas inlet to the JBR and the stack gas. Table 3-1 summarizes the actual and planned gaseous stream monitoring for the Low- and High-Particulate test periods. Essentially all of the planned EMP monitoring was performed during both periods. Monitoring the opacity of the flue gas inlet to the JBR was not conducted during the High-Particulate test period. A variance to Plant Yates' operating permit was obtained for this period because the intentionally high concentrations of particulate matter in this stream led to high opacity values that did not represent the opacity of the stack gas emitted to the atmosphere. Although the results are not presented in this report, continuous monitoring of the oxygen content of the two gas streams was performed as planned. This was done so that the measured SO_2 concentrations could be normalized to a consistent basis (i.e., 3% O_2).

Supplemental and compliance monitoring results are discussed separately below.

3.1.1 Supplemental Monitoring

This section presents a summary of the results of EMP monitoring for sulfur dioxide, particulate matter loading and size distribution, sulfur trioxide, and water vapor.

TABLE 3-1
GASEOUS STREAMS: ACTUAL AND PLANNED MONITORING [a]

Parameter	Stack Gas		Flue Gas Inlet to JBR	
	Low-Particulate	High-Particulate	Low-Particulate	High-Particulate
Opacity	0/0	0/0	C/C[b]	Note c
SO_2	C/C	C/C	C/C	C/C
O_2	C/C	C/C	C/C	C/C
Moisture Content	9/9	9/9	9/9	9/9
SO_3	34/36	34/36	33/36	35/36
Particulate Loading	9/9	9/9	9/9	9/9
Particle Size Distribution	9/9	9/9	9/9	9/9

[a] 9/9 = 9 actual/9 planned.

[b] C = Continuous monitoring.

[c] Opacity monitoring was not conducted during the High-Particulate test period since the particulate loading in this stream led to opacity levels that were not representative of stack gas conditions. A variance to Plant Yates' operating permit was obtained to allow this emission.

3.1.1.1 Sulfur Dioxide

Defining the impacts of CT-121 scrubber operating variables on sulfur dioxide removal efficiency was one of the major areas of emphasis in this demonstration project. SO_2 concentrations in the JBR inlet gas and stack gas streams were monitored continuously during all comparison of results. This section discusses the results from the Low- and High-Particulate Parametric, Long-Term, and Auxiliary test bocks of the Low- and High-Particulate test periods. The measured SO_2 concentrations in both streams were normalized to 3% O_2 to allow direct computation of the scrubber removal efficiency.

Parametric Tests. The purpose of the Parametric Tests was to determine the impact of several scrubber operating variables (including scrubber slurry pH, boiler load, and JBR deck pressure drop) on SO_2 removal efficiency. The results were regressed to develop equations predicting SO_2 removal as a function of scrubber operating parameters. The details of the data regression are beyond the scope of this EMP volume, but they are provided in Volume 2 of the project's Final Report.[6] A full set of Parametric Tests was performed during both the Low- and High-Particulate test periods.

The operating variables and the ranges studied during the Low-Particulate Parametric tests included pH (4.0, 4.5, and 5.0), boiler operating load (50, 75, and 100 MWe), and JBR deck pressure drop (8, 12, and 16 inches of water column - in. WC). The results obtained during this test block are shown graphically in Figures 3-1 through 3-7. In Figures 3-1 through 3-6, the measured SO_2 removal efficiencies were normalized to 2,200 ppmv SO_2 inlet concentration, using the predictive operations described above to facilitate comparisons.

Figures 3-1 through 3-3 present the SO_2 removal efficiency data plotted against pressure drop and pH for loads of 100, 75, and 50 MWe, respectively. These figures show that, in general, SO_2 removal increased with increasing JBR deck pressure drop and slurry pH. However, the incremental increase in SO_2 removal obtained when the slurry pH increased from 4.5 to 5.0 was typically small, indicating that there is little incentive to operate at the higher pH level. Very high pH operation (i.e., pH>5.2) was also found to be undesirable because of operating problems such as scaling and diminished limestone utilization. Achieving SO_2 removal efficiencies above 90% generally required a JBR deck pressure drop of 12 in. WC or more.

Figures 3-4 through 3-6 show the impact of boiler load and JBR deck pressure drop on SO_2 removal efficiency at slurry pH levels of 4.0, 4.5, and 5.0. In general, SO_2 removal tended to decrease with increasing boiler load, although the impact was greatest at low pressure drop and became insignificant at the highest pressure drop of 16 in. WC for pH values of 4.5 and 5.0.

Because of natural variations in the coal sulfur content during these tests, it was possible to determine the impact of this variable on SO_2 removal efficiency at two inlet SO_2 concentrations: 2170 ppmv and 2430 ppmv (corrected to 3% oxygen). As shown in

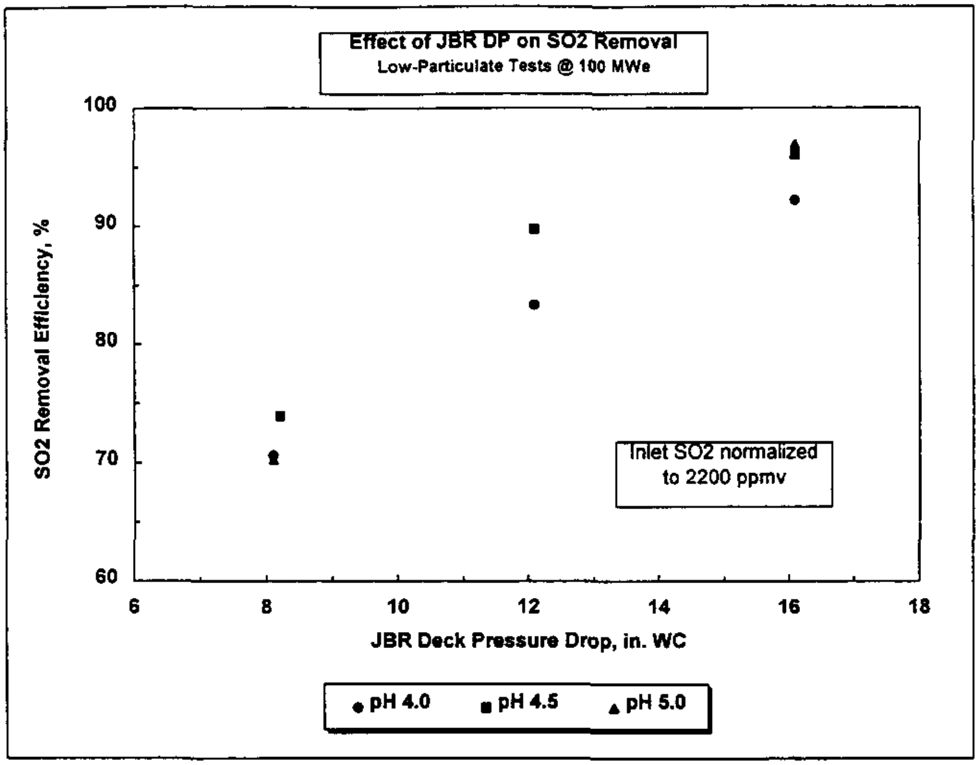


Figure 3-1. Low-Particulate Parametric Test Results at 100 MWe

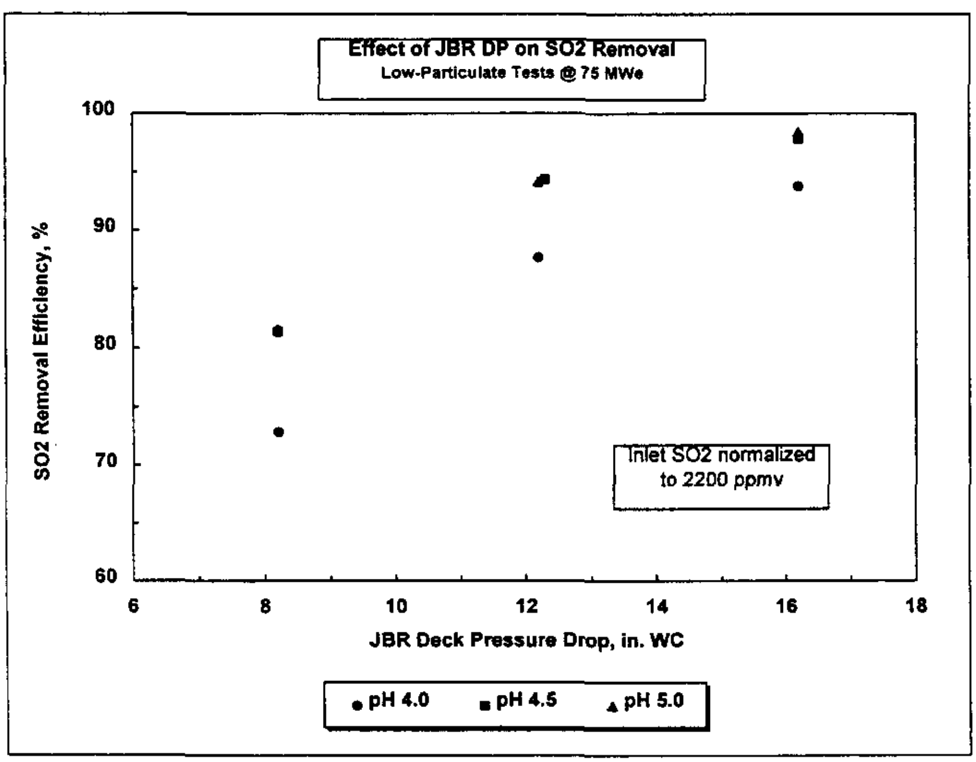


Figure 3-2. Low-Particulate Parametric Test Results at 75 MWe

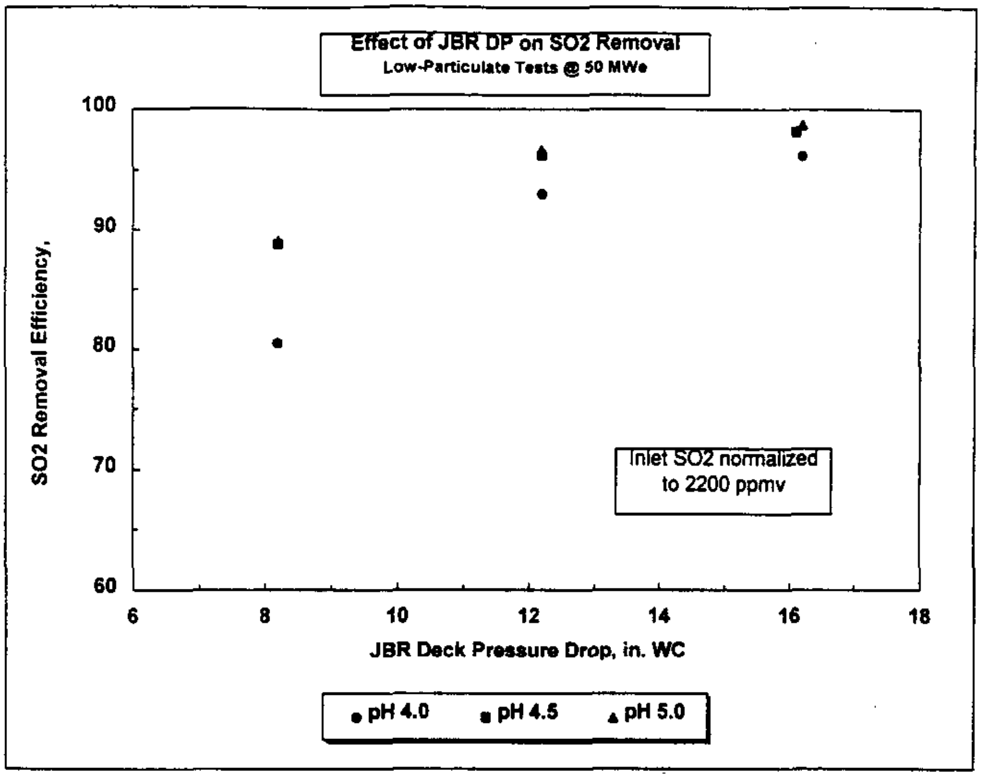


Figure 3-3. Low-Particulate Parametric Test Results at 50 MWe

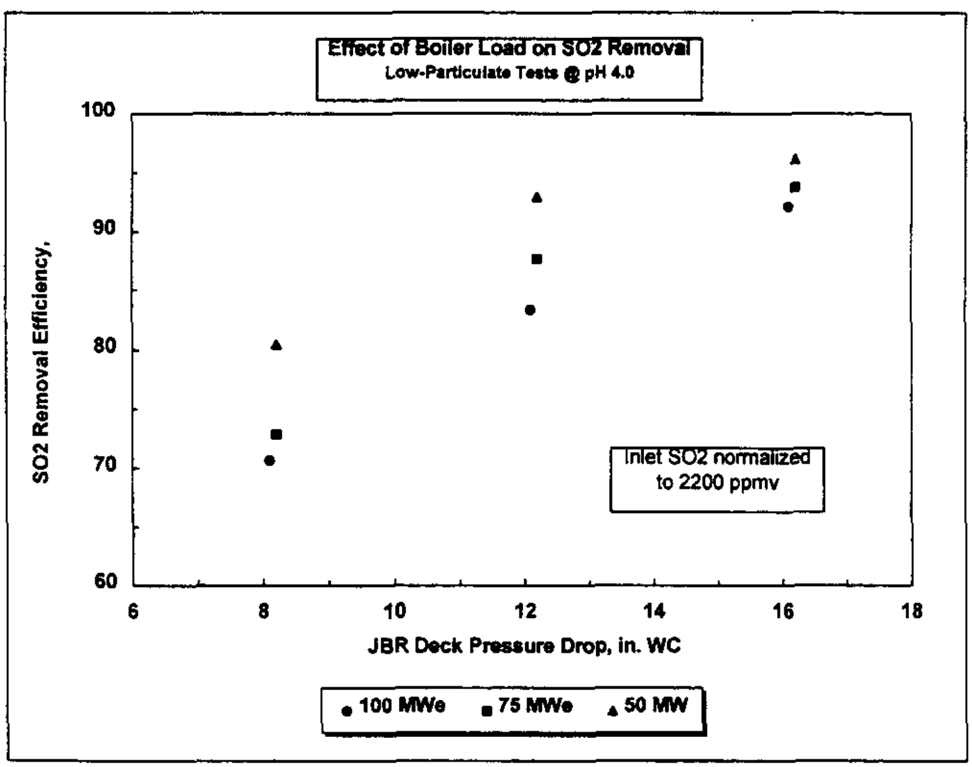


Figure 3-4. Low-Particulate Parametric Tests: Effect of Load and JBR ΔP on SO_2 Removal Efficiency at pH = 4.0

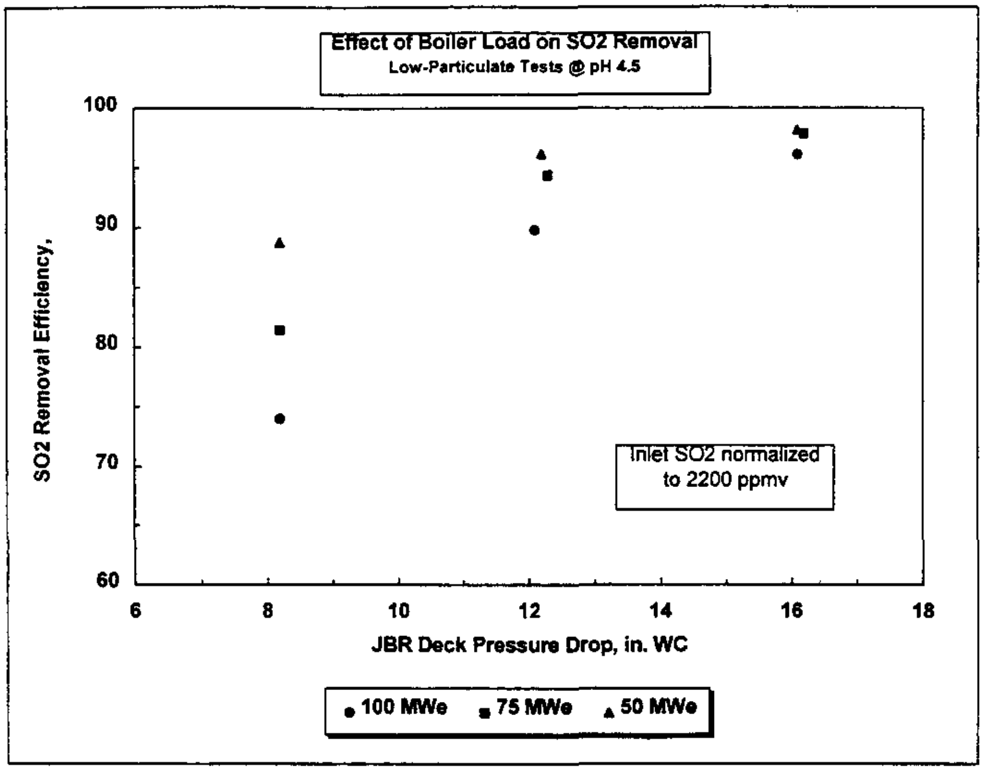


Figure 3-5. Low-Particulate Parametric Tests: Effect of Load and JBR ΔP on SO_2 Removal Efficiency at pH = 4.5

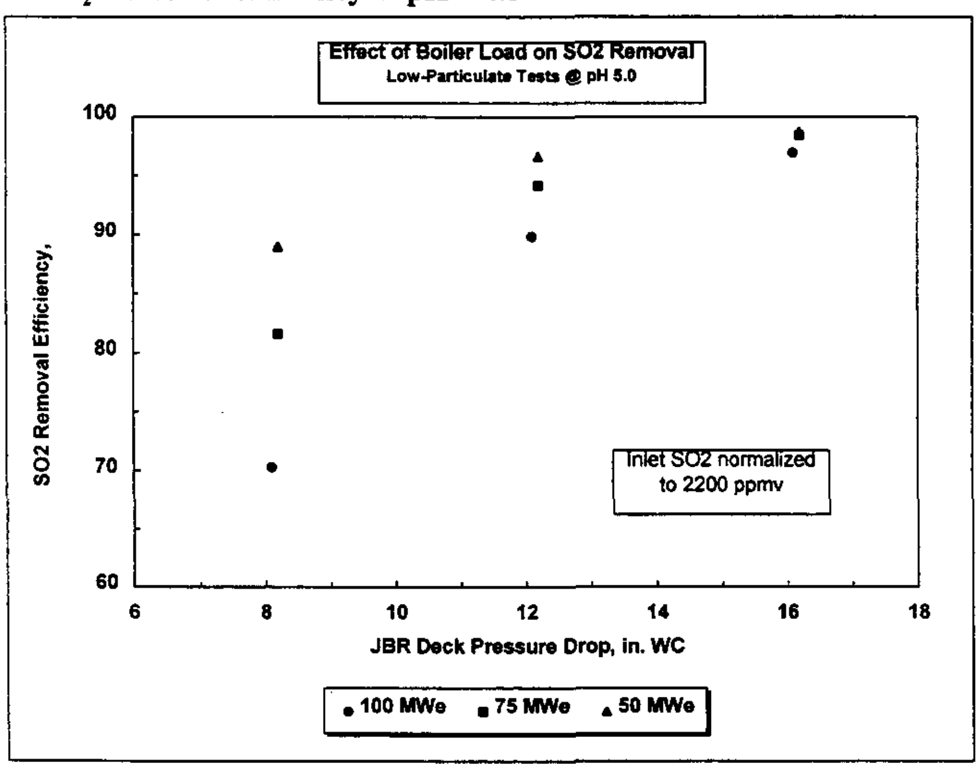


Figure 3-6. Low-Particulate Parametric Tests: Effect of Load and JBR ΔP on SO_2 Removal Efficiency at pH = 5.0

Figure 3-7, an increase in inlet SO_2 concentration led to a decrease in removal efficiency at a given set of scrubber operating conditions.

The test plan for the High-Particulate Parametric Test block did not cover exactly the same ranges of operating parameters as those used during the Low-Particulate Test block.

Although the majority of the tests were conducted with the ESP completely de-energized, a cautious approach was taken to determine the operability of the scrubber at reduced ESP efficiencies (i.e., target particulate removal efficiencies of 90% and 50%) prior to conducting the tests with the ESP completely de-energized. The range of JBR deck pressure drops was altered to evaluate only those in the more typical operating range (10, 13, and 16 in. WC). The pH range was modified (3.5, 3.75, and 4.0) when inhibited limestone dissolution was detected, as a result of the high ash loading. Figures 3-8 through 3-13 present the results from this Parametric Test block. As before, the measured SO_2 removal efficiencies were normalized to an SO_2 inlet concentration of 2,200 ppmv to facilitate direct comparisons between tests.

Figures 3-8 through 3-10 show the impact of JBR deck pressure drop and pH for boiler loads of 100, 75, and 50 MWe, respectively. The increase in SO_2 removal efficiency with increasing JBR deck pressure drop was similar to that seen during the Low-Particulate Parametric Test block. The impact of pH is not clear from these data, primarily because of the scaling in the JBR that occurred over the period of time that this test block was conducted.

Figures 3-11 through 3-13 show the impacts of boiler load and JBR deck pressure drop on SO_2 removal efficiency at slurry pH levels of 3.5, 3.75, and 4.0, respectively. The expected increase in SO_2 removal efficiency with increasing JBR deck pressure drop was observed, but the impact of load was confounded because of progressive scaling in the JBR. Project personnel were able to construct a model to predict the decrease in SO_2 removal efficiency with time due to the buildup of fouling deposits; this is discussed in

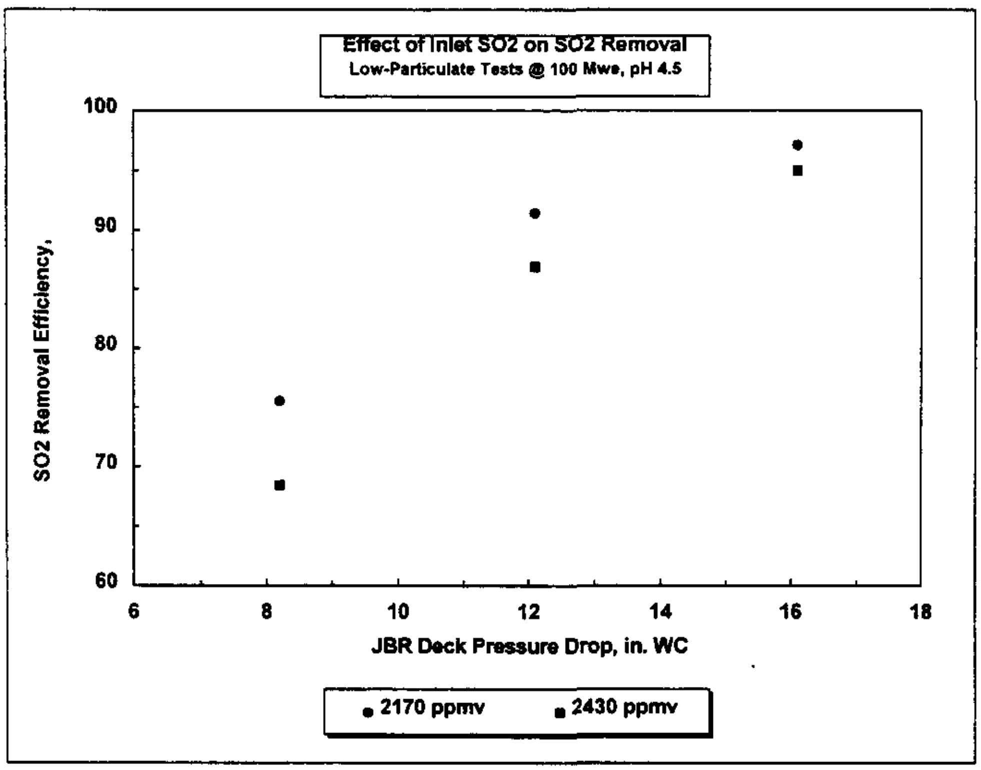


Figure 3-7. Low-Particulate Parametric Tests: Effect of JBR Inlet Gas SO_2 Concentration on SO_2 Removal Efficiency

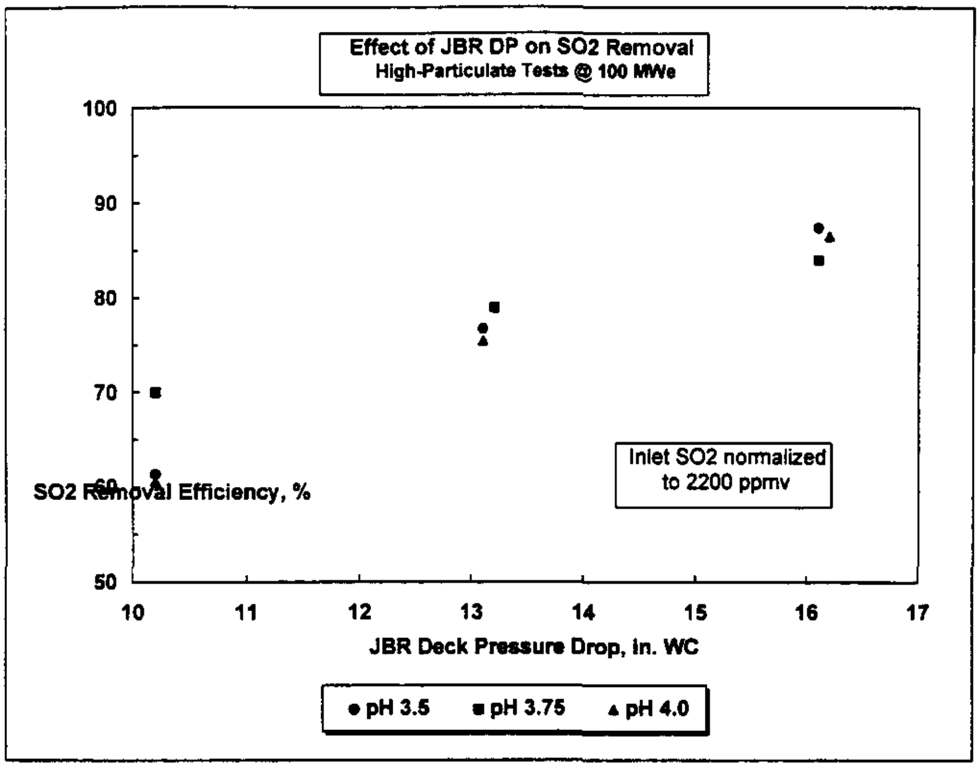


Figure 3-8. High-Particulate Parametric Test Results at 100 MWe

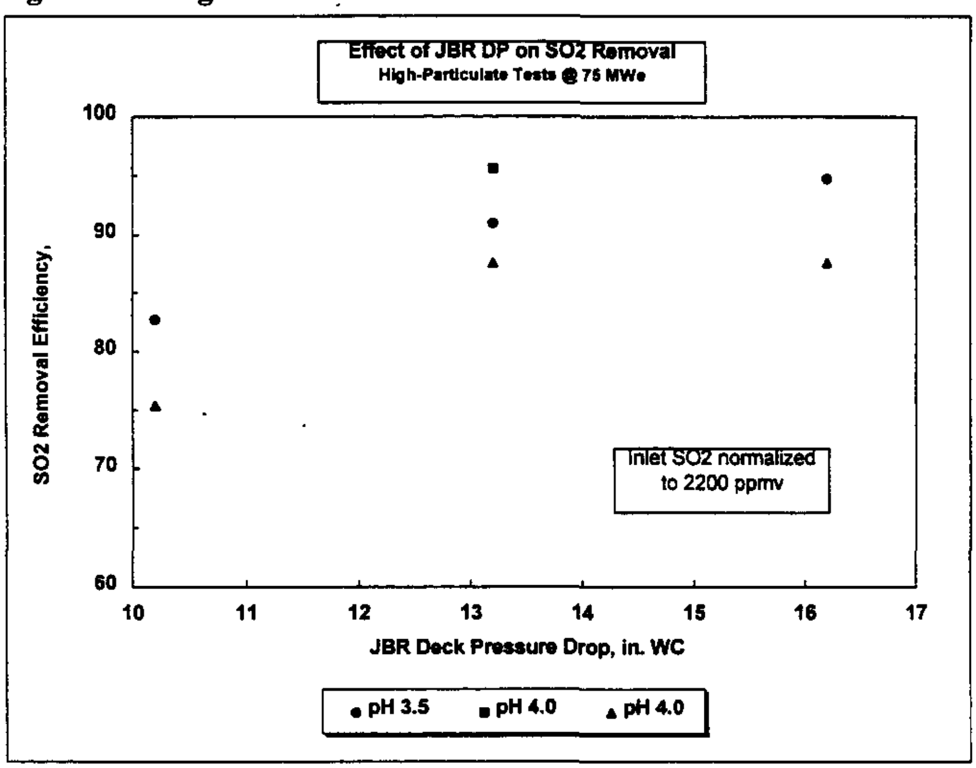


Figure 3-9. High-Particulate Parametric Test Results at 75 MWe

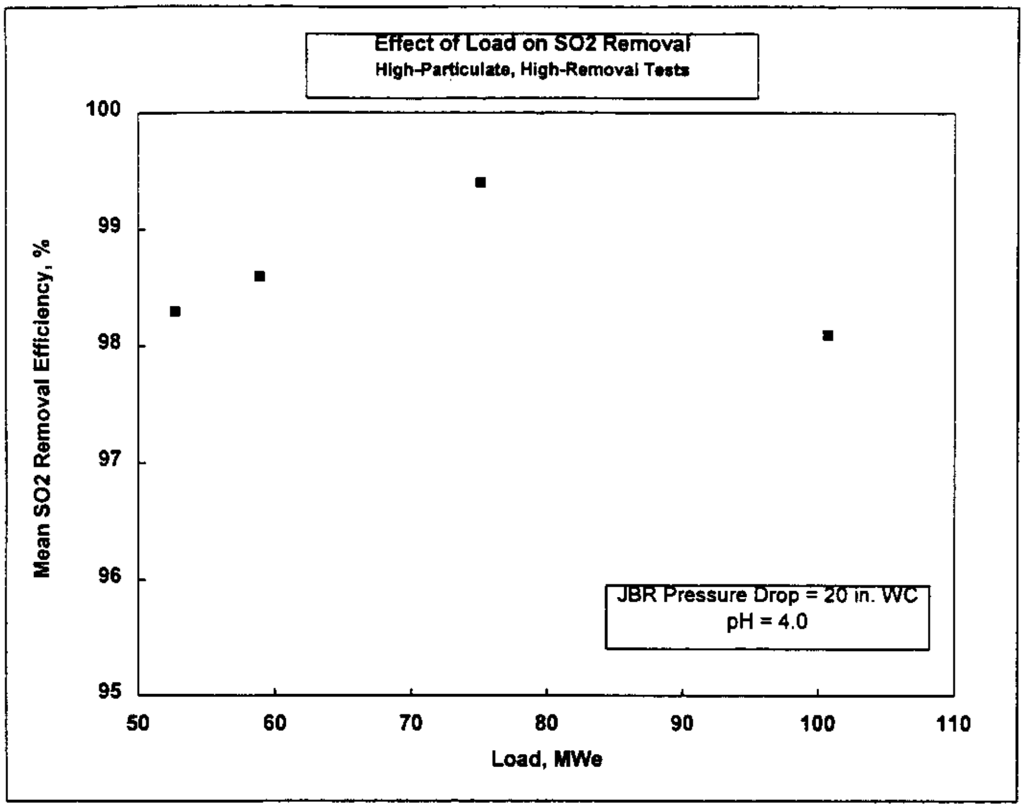


Figure 3-20. SO_2 Removal Efficiency During High-Particulate High Removal Tests

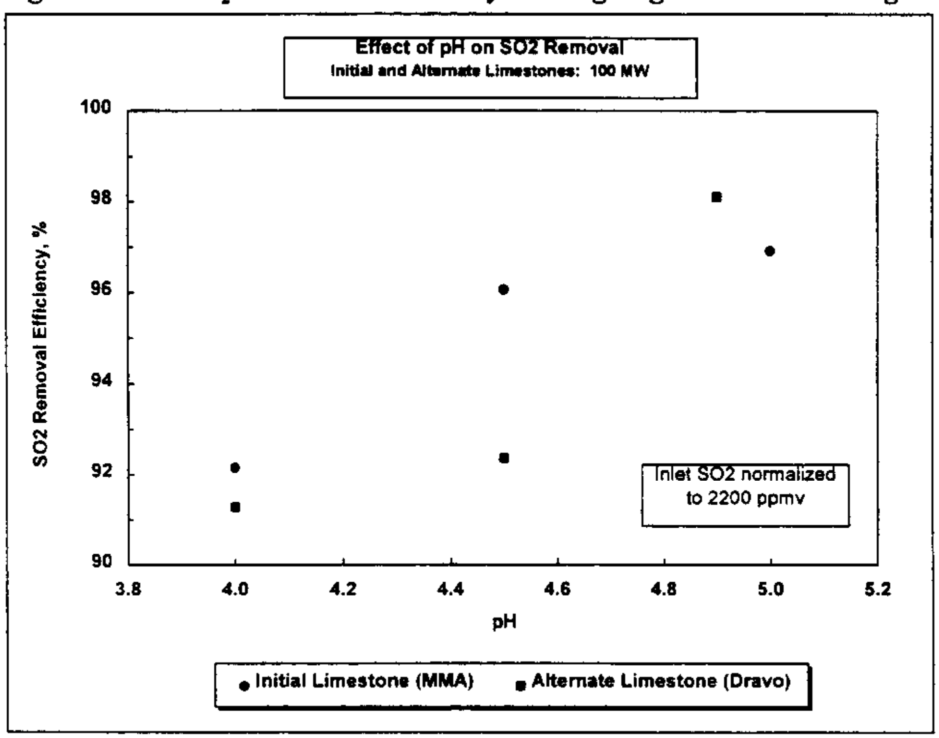


Figure 3-21. Effect of pH and Limestone on SO_2 Removal Efficiency During Low-Particulate Tests at 100 MWe

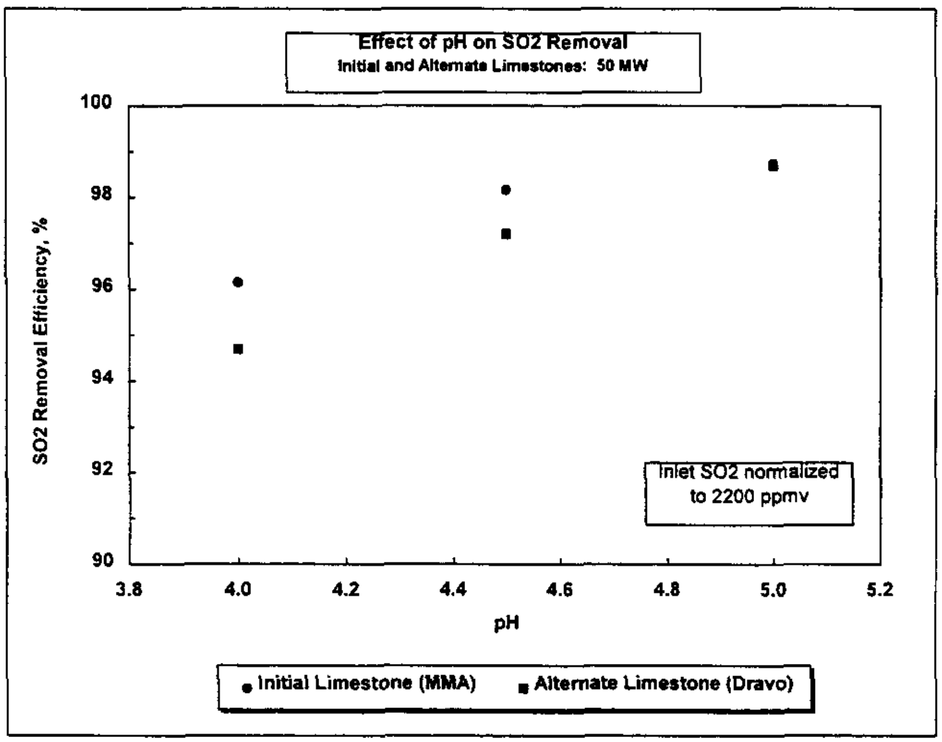


Figure 3-22. Effect of pH and Limestone on SO_2 Removal Efficiency During Low-Particulate Tests at 50 MWe

low-sulfur compliance coal (about 1.25% sulfur), so the original scope of these tests was modified to provide data that could be used to develop a parametric regression model for the prediction of scrubber performance at the low inlet SO_2 concentrations. No direct comparisons to tests conducted with the Dravo limestone could be made because of the differences in flue gas SO_2 concentration resulting from the use of different coals. Tests were conducted at pH levels of 4.0 and 3.75, boiler loads from 50 to 100 MWe, and JBR ΔP levels from 10 to 18 in. WC. The results are shown in Figures 3-23 and 3-24. The results generally followed the expected trend of increasing SO_2 removal efficiency with increasing JBR ΔP. However, during the pH 3.75 tests the effects of load were somewhat uncharacteristic since SO_2 removal efficiency was unaffected by boiler load at the highest JBR ΔP levels.

Alternate Coal tests were conducted to evaluate system performance and flexibility while the boiler burned a coal with a sulfur content significantly higher than that of the baseline coal (2.5% sulfur). During the Low-Particulate Alternate Coal tests, the coal sulfur content was approximately 4.3 percent. Although the same coal was ordered for the High-Particulate Alternate Coal tests, the average sulfur content of the coal fired in these tests was 3.4 percent.

Figures 3-25 and 3-26 present the results for the Low-Particulate tests and include, for comparison, results from comparable Parametric tests (i.e., 50 and 75 MWe, JBR ΔP 16 in. WC) for three pH levels. SO_2 removal efficiencies were lower for the high-sulfur coal at both load levels and all pH levels tested, as expected.

The data from the High-Particulate Alternate Coal tests are shown in Figure 3-27. These results show the expected increases in SO_2 removal efficiency with increasing JBR ΔP and decreasing boiler load. Figure 3-27 also contains data from comparable Low-Particulate Alternate Coal tests conducted at an inlet SO_2 concentration of 3,500 ppmv (at 3% O_2). When these data were normalized to 3,000 ppmv using the regression model developed under this program, the SO_2 removal efficiencies compared well to those

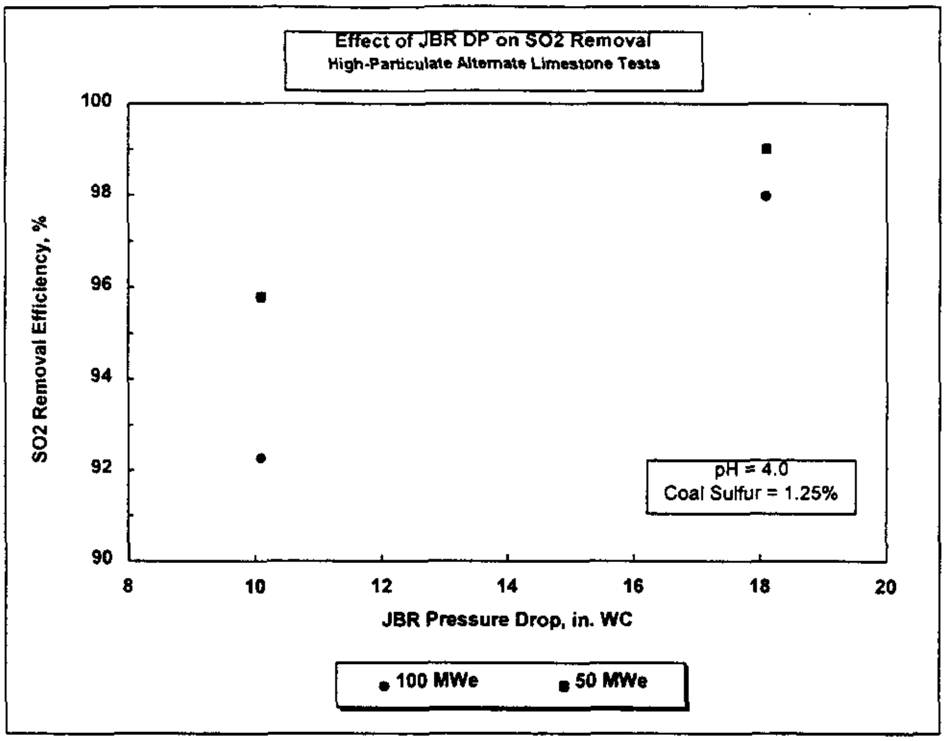


Figure 3-23. Effect of JBR ΔP on SO_2 Removal Efficiency During High-Particulate Alternate Limestone Tests at pH = 4.0

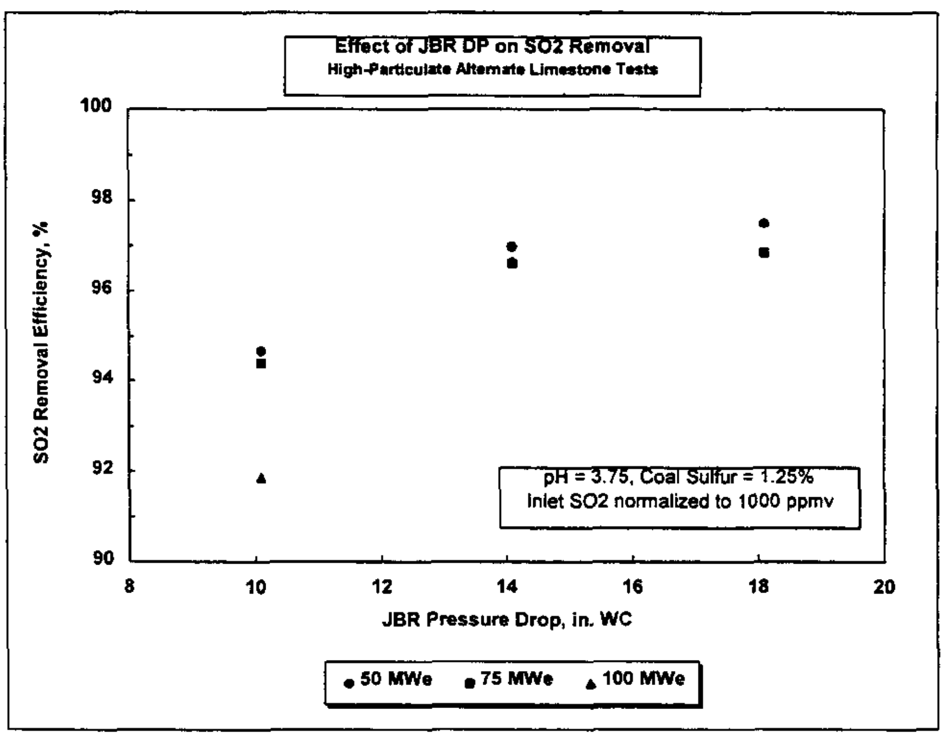


Figure 3-24. Effect of JBR ΔP on SO_2 Removal Efficiency During High-Particulate Alternate Limestone Tests at pH = 3.75

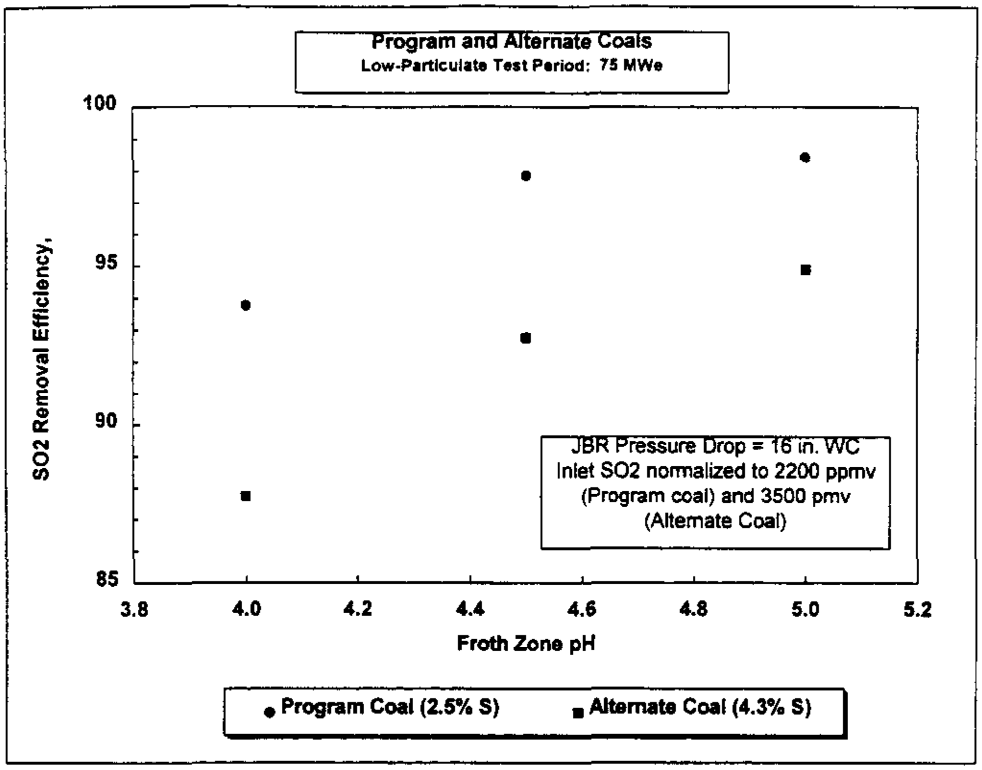


Figure 3-25. Comparison of SO_2 Removal Efficiency for Baseline and Alternate Coals at 75 MWe

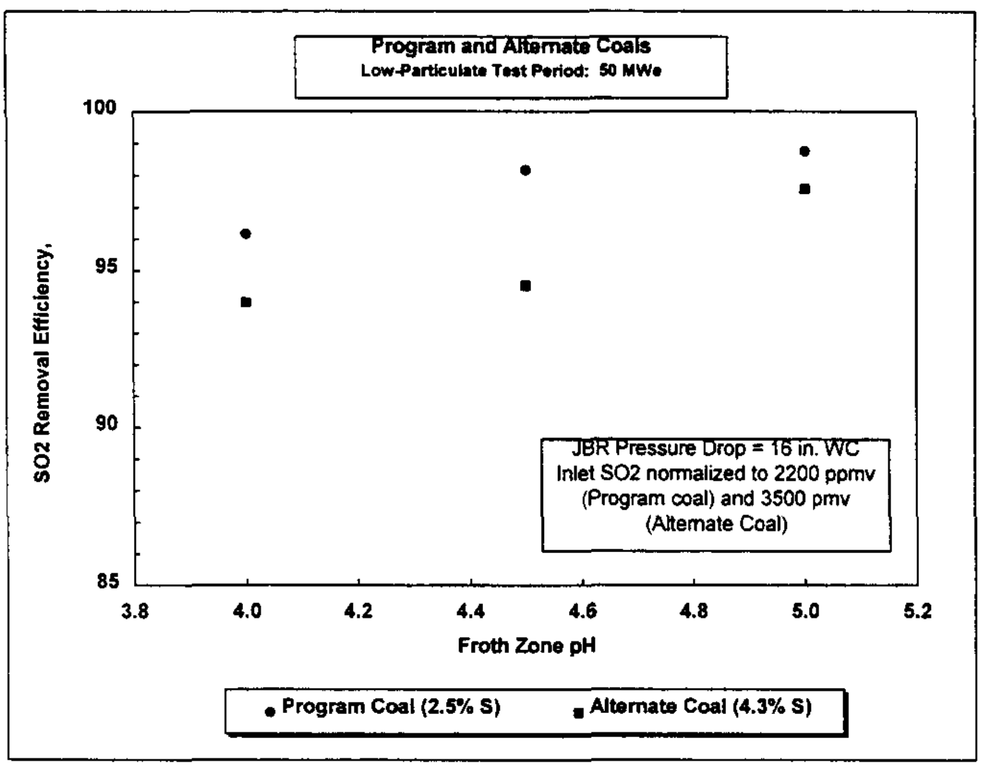


Figure 3-26. Comparison of SO_2 Removal Efficiency for Baseline and Alternate Coals at 50 MWe

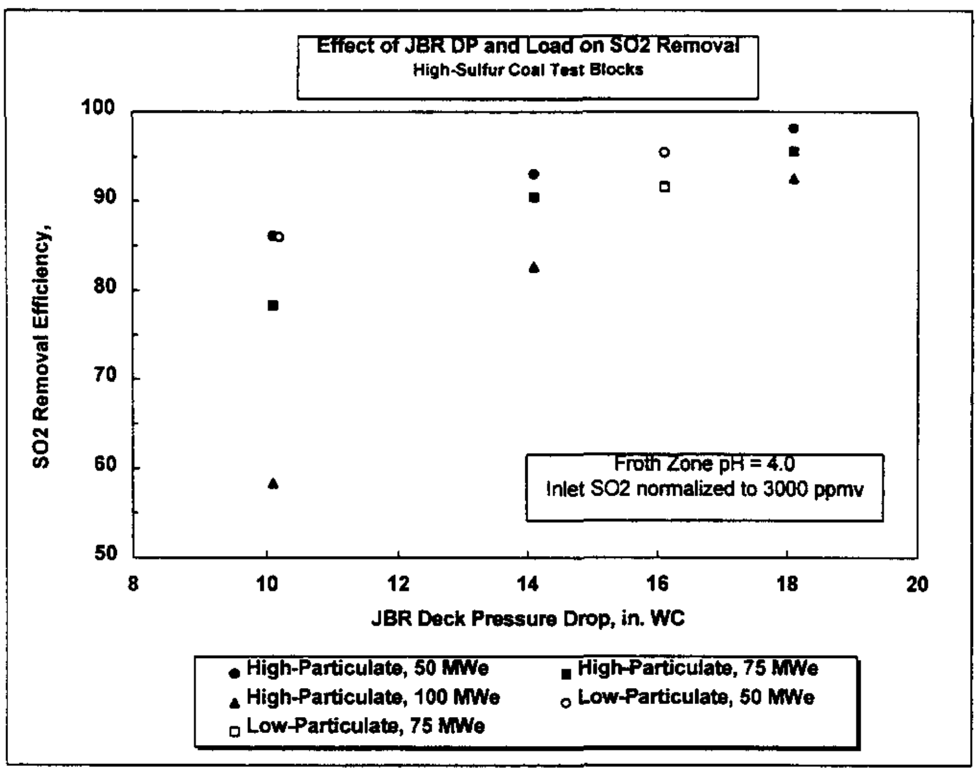


Figure 3-27. Effect of JBR ΔP and Load on SO_2 Removal Efficiency During Low- and High-Particulate High-Sulfur Test Blocks

observed during the High-Particulate Alternate Coal tests. It is significant that the removal efficiency did not decrease at high ash loading conditions.

3.1.1.2 Particulate Matter

Particulate matter (PM) samples were obtained by Southern Research Institute (SRI) from the flue gas inlet to the JBR and stack gas streams during the first nine parametric tests of both the Low- and High-Particulate test periods. During the Low-Particulate tests, the ESP was operated fully energized, while during the High-Particulate tests, target ESP efficiencies from 0 to 95% were achieved by completely de-energizing the ESP or by energizing selected fields. In addition to ESP efficiency, the primary test variables included boiler load (i.e., the quantity of flue gas passing through the JBR) and JBR pressure drop. The nine Low-Particulate tests were all conducted at a scrubber slurry pH of 4.5; the first four High-Particulate tests were conducted at the same pH, but, because of low limestone utilization caused by aluminum fluoride blinding, the scrubber was operated at lower pH levels during the remaining tests.

The ESP and scrubber operating conditions and the average measured PM loading results (in lb/MMBtu) are summarized in Table 3-2. The complete results are tabulated in Appendix A. As shown, the stack gas PM loading was always below the Plant Yates permit limit of 0.24 lb/MMBtu during both test periods. Except when operating with the ESP fully de-energized, the combined ESP and JBR were also able to achieve PM loadings lower than the federal New Source Performance Standard (NSPS) of 0.03 lb/MMBtu.

During the Low-Particulate tests, the JBR inlet gas loadings showed a general decrease as the load decreased, consistent with the fact that ESPs are typically more efficient at lower gas flow rates, all other factors being equal. The particulate removal efficiency across the JBR was about 90% for all of the tests conducted at 75 and 100 MWe and for the 50 MWe test conducted at a pressure drop of 8 in. WC. Lower apparent removals were obtained for the remaining Period 1 tests at 50 MWe, but this was due to decreases in the JBR inlet gas loading, and not to increases in the stack gas loading.

TABLE 3-2
PARTICULATE LOADING IN JBR INLET AND STACK GAS

Test No.	Unit Load, MWe	Approximate ESP Eff., %	JBR ΔP, in. WC	JBR Inlet PM Loading, lb/MMBtu	Stack Gas PM Loading, lb/MMBtu [a,b]
Low-Particulate Parametric Tests					
P1-1	100	99	8	0.081	0.009
P1-2	100	99	12	0.085	0.011
P1-3	100	99	16	0.114	0.010
P1-4	75	99	8	0.095	0.010
P1-5	75	99	12	0.072	0.008
P1-6	75	99	16	0.042	0.006
P1-7	50	99	8	0.087	0.008
P1-8	50	99	12	0.023	0.006
P1-9	50	99	16	0.019	0.006
High-Particulate Parametric Tests					
P2-1	50	95	10	0.196	0.013
P2-2	50	95	16	0.168	0.011
P2-3	100	95	10	0.434	0.017
P2-4	100	95	16	0.525	0.010
P2-5	100	90	16	0.819	0.015
P2-6	100	0	10	5.778	0.049
P2-7	100	0	16	5.293	0.042
P2-8	50	0	10	5.046	0.056
P2-9	50	0	16	4.927	0.049

Notes:

[a] Federal NSPS is 0.03 lb/MMBtu for units for which construction began after 9/18/78.

[b] Plant Yates' permit limit is 0.24 lb/MMBtu as an existing unit.

For the High-Particulate tests, the average stack gas PM loading obtained for the moderate inlet loading associated with the first five tests was about 0.013 lb/MMBtu, which was comparable to the loading in the Low-Particulate tests. For the high inlet mass loadings associated with the tests when the ESP was fully de-energized, the average outlet PM loading was higher, at about 0.049 lb/MMBtu.

Particle size distribution measurements were made at both the scrubber inlet and outlet sampling locations. Details are presented in SRI's test reports.[3,4] Figures showing the cumulative percent versus particle diameter measurements from those reports are reproduced in Appendix B. These measurements showed that the scrubber was more efficient at removing the larger particles.

Over 99.99 wt. % of the particulate larger than 10 μm was removed during both Low- and High-Particulate tests. The removal of particulates between 1 and 10 μm varied from 97.3% to 99.6% during the High-Particulate tests, which was slightly higher than that observed during the Low-Particulate Parametric test block. The removal efficiency for sub-micrometer particulates ranged between 69% and 85% during the High-Particulate Parametric tests.

3.1.1.3 Sulfur Trioxide

SO_3 concentrations in the JBR inlet gas and stack gas were measured by SRI three to four times during each of the first nine parametric tests of both the Low- and High-Particulate test periods. The individual measurements are provided in Appendix A, and mean values are shown in Table 3-3. Low concentrations of SO_3 were found in both streams (approximately 1-4 ppmv, corrected to 3% O_2).

During the Low-Particulate tests apparent SO_3 removal efficiencies between 25-35% were measured, except at the 75 MWe boiler load condition. The reasons for no apparent reduction in SO_3 concentration at this condition are not known, but may be due to errors associated with representative sample collection.

TABLE 3-3
AVERAGE SO_3 CONCENTRATION IN JBR INLET AND STACK GAS

Test No.	Unit Load, MWe	ESP Efficiency, %	pH	JBR ΔP, in. WC	JBR Inlet SO_3, ppmv[a]	Stack Gas SO_3, ppmv[a]	Removal, %[b]
Low-Particulate Parametric Tests							
P1-1	100	99	4.5	8	3.7	2.7	27.0
P1-2	100	99	4.5	12	3.4	2.7	20.6
P1-3	100	99	4.5	16	3.3	2.3	30.3
P1-4	75	99	4.5	8	2.5	2.6	-4.0
P1-5	75	99	4.5	12	2.9	3.4	-17.4
P1-6	75	99	4.5	16	2.8	3.0	-7.1
P1-7	50	99	4.5	8	1.9	1.7	10.5
P1-8	50	99	4.5	12	2.3	1.5	34.8
P1-9	50	99	4.5	16	3.8	2.4	36.8
High-Particulate Parametric Tests							
P2-1	50	95	4.5	10	1.6	2.7	-67
P2-2	50	95	4.5	16	1.4	2.2	-57
P2-3	100	95	4.5	10	1.9	3.0	-53
P2-4	100	95	4.5	16	1.7	1.0	40
P2-5	100	90	4.0	16	1.5	1.3	14
P2-6	100	0	3.5	10	1.4	0.6	61
P2-7	100	0	3.5	16	0.9	<0.3	>70
P2-8	50	0	3.5	10	1.5	<0.2	>87
P2-9	50	0	3.5	16	1.4	0.4	70

[a] All values normalized to 3% O_2.

[b] % Removal = JBR Inlet-Stack Gas/JBR Inlet x 100%.

During the High-Particulate tests apparent SO_3 removal efficiencies from 60 to over 87% were observed when the ESP was de-energized. The measured SO_3 concentration actually increased across the scrubber during the tests when the ESP was partially energized. Again, the reasons for this are not known, but could be due to errors associated with representative sample collection.

3.1.1.4 Water Vapor

Water vapor concentrations in the JBR inlet gas and stack gas were measured during each of the first nine parametric tests for each of the two test periods. The average results for each test are summarized in Table 3-4, together with predicted stack gas concentrations based on the assumption that the stream was saturated at the measured temperature and pressure. As expected, the water vapor content of the stack gas was typically at or above the predicted saturation point.

3.1.2 Compliance Monitoring

As part of the EMP, the opacity of the flue gas inlet to the JBR was monitored using a continuous opacity meter. Georgia Power Company provides quarterly reports to the Georgia Department of Natural Resources detailing the daily excess opacity emissions. Copies of these reports have been attached as appendices to the quarterly EMP progress reports. A summary of the daily excess opacity emissions measured during the Low-Particulate test period is provided in Table 3-5. The applicable emission limit for this source is 40% opacity during any six-minute monitoring period. The table shows the number of minutes during which this limit was exceeded as well as the total number of minutes of operating time for each quarter. The fraction of time the opacity limit was exceeded during the Low-Particulate test period was very small (i.e., 0.42% of the total operating time). The majority of the excess emissions occurred during boiler startup or shutdown periods.

Because the opacity meter for Unit 1 was located upstream of the JBR, the opacity measured by this meter usually exceeded the 40% limit during the High-Particulate tests. Since these

TABLE 3-4
AVERAGE WATER VAPOR CONCENTRATION IN JBR INLET AND STACK GAS

Test No.	Load, MWe	JBR ΔP, in. WC	Average H_2O, Vol. %		Predicted @ Sat'n
			JBR Inlet	Stack Gas	
Low-Particulate Parametric Tests					
P1-1	100	8	6.7	11.8	11.3
P1-2	100	12	8.3	13.0	12.0
P1-3	100	16	7.1	12.0	12.1
P1-4	75	8	7.4	12.1	12.4
P1-5	75	12	6.9	10.9	11.2
P1-6	75	16	6.7	11.4	11.0
P1-7	50	8	6.8	9.3	9.6
P1-8	50	12	7.6	11.0	10.1
P1-9	50	16	6.1	10.7	9.8
High-Particulate Parametric Tests					
P2-1	50	10	7.7	9.5	8.6
P2-2	50	16	6.8	10.8	9.8
P2-3	100	10	7.1	12.5	11.4
P2-4	100	16	7.5	12.0	11.3
P2-5	100	16	6.8	13.0	10.5
P2-6	100	10	7.1	14.5	11.9
P2-7	100	16	7.2	14.0	10.9
P2-8	50	10	6.7	10.5	9.1
P2-9	50	16	6.6	12.3	10.6

TABLE 3-5
JBR INLET GAS EXCESS OPACITY EMISSIONS
SUMMARY: LOW-PARTICULATE TEST PERIOD[a,b]

	1st Quarter 1993	2nd Quarter 1993	3rd Quarter 1993	4th Quarter 1993	1st Quarter 1994
Total operating time	100,421	76,497	112,305	86,603	109,380
Duration of excess opacity emissions due to:					
Startup/shutdown	156	840	174	210	570
Control equipment problems	0	0	0	0	0
Process problems	0	30	0	0	6
Other known causes	0	0	0	0	72
Unknown causes	0	0	0	0	0
Total duration of excess emissions, % of operating time	0.16%	1.14%	0.15%	0.24%	0.59%

Notes:

[a] All times in minutes

[b] A variance was obtained for the High-Particulate test period; opacity was not monitored during this period.

Source: Quarterly Air Emission Reports prepared by Georgia Power for Georgia DNR.

measurements were not representative of the opacity of the flue gas stream at the point of discharge, Georgia Power obtained a variance to the plant's air permit for the duration of High-Particulate testing that exempted the plant from reporting excess opacities from Unit 1. EPA Method 9 visual opacity readings of the flue gas from the CT-121 unit's stack were conducted during the early portion of the High-Particulate Parametric testing with the ESP completely de-energized. The readings obtained during these tests were typically in the range from 5 to 10% opacity. No additional opacity monitoring was conducted during the High-Particulate test period.

3.2 Aqueous Stream Monitoring Results

Aqueous stream monitoring results for the two scrubber test periods are summarized in the paragraphs below. Tables containing the complete set of results for all EMP parameters are provided in Appendix A.

Table 3-6 shows the actual and planned monitoring frequencies for each of the aqueous stream parameters. As shown, the majority of the monitoring specified in the EMP was performed as planned. The few exceptions to this statement have already been discussed in Section 2.

3.2.1 Supplemental Monitoring

Aqueous CT-121 scrubber process streams monitored as part of the scrubber demonstration project's EMP included limestone slurry, makeup water, gypsum stack return, JBR froth zone, and JBR draw-off. Results for each stream are discussed below.

3.2.1.1 Limestone Slurry

Limestone from three different sources was used during portions of the CT-121 scrubber demonstration project. The initial "program limestone" from Martin Marietta Aggregates

TABLE 3-6
AQUEOUS PROCESS STREAMS: ACTUAL AND PLANNED MONITORING[a]

Parameter	Ash Transport Water		Final Plant Discharge		JBR Froth Zone		JBR Draw-Off	
	Period 1	Period 2	Period 1	Period 2	Period 1	Period 2	Period 1	Period 2
Liquid Phase								
pH			29/28[a]	21/20	56/54	40/40	56/54	41/40
Total Suspended Solids	29/28	21/20						
Oil & Grease	29/28	21/20						
Chloride					56/54	40/40		
Sulfite					55/54	40/40		
Sulfate					56/54	40/40		
Carbonate					55/54	39/40		
Trace Elements					4/6	9/9		
Solid Phase								
Solids Content					56/54	40/40	56/54	41/40
Inert Content					17/54	4/40	56/54	41/40
Calcium					50/54	4/40	56/54	41/40
Magnesium							56/54	41/40
Sulfite							55/54	41/40
Sulfate					50/54	4/40	56/54	41/40
Carbonate					49/54	5/40	56/54	41/40
Trace Elements							8/6	9/9
TCLP							1/1[b]	0/1

Parameter	Limestone Slurry		Gypsum Stack Return		Makeup Water	
	Period 1	Period 2	Period 1	Period 2	Period 1	Period 2
Liquid Phase						
pH			57/54	39/40	3/14	4/9
Total Suspended Solids						
Oil & Grease						
Chloride			57/54	41/40	5/14	9/9
Sulfite					2/14	5/9
Sulfate			57/54	41/40	5/14	9/9
Carbonate			56/54	41/40	1/14	4/9
Trace Elements			4/6	7/9		
Solid Phase						
Solids Content	55/54	38/40				
Inert Content	55/54	41/40				
Calcium	55/54	41/40				
Magnesium	55/54	41/40				
Sulfite						
Sulfate						
Carbonate	55/54	41/40				
Trace Elements						
TCLP						

[a] 29/28 = 29 actual/28 planned.

[b] A sample was obtained for TCLP analysis, but maximum allowable holding time was exceeded.

(MMA) was used during the Low-Particulate Parametric and Long-Term tests, and the High Removal tests. Limestone from Dravo Lime's Saginaw, Alabama, quarry was used during the Low-Particulate Alternate Limestone and Alternate Coal tests, and, based on the favorable gypsum characteristics obtained, it was subsequently used during the majority of the High-Particulate test blocks. A third limestone, from Florida Rock's Rome, Georgia, quarry, was used during the High-Particulate Alternate Limestone test period.

The solids content of the limestone slurry during all test periods is plotted against the sample date in Figure 3-28. The mean slurry solids content during the Low-Particulate test period was 30% by weight. The variability as measured by the coefficient of variation (COV—defined as the sample standard deviation divided by the sample mean) was 12 percent. During the High-Particulate tests, the mean slurry solids content was slightly less at 28.7 wt. %, with a COV of 7 percent.

The limestone composition over time is shown in Figure 3-29. As shown, the composition for each limestone was relatively constant. Table 3-7 shows the mean and standard deviation for each constituent for each of the three limestones used. All three limestones consisted primarily of calcium carbonate with a small amount of magnesium carbonate and inert material. Both of the alternate limestones contained slightly more magnesium carbonate than the MMA limestone. The inerts content of the Florida Rock limestone was about twice that of the MMA limestone, whereas the Dravo Lime limestone contained roughly half the inerts of the MMA limestone.

3.2.1.2 Makeup Water

The makeup water monitoring results obtained during both scrubber testing periods are given in Table 3-8. The results are consistent with the fact that the majority of the scrubber makeup water was taken from Plant Yates' ash pond.

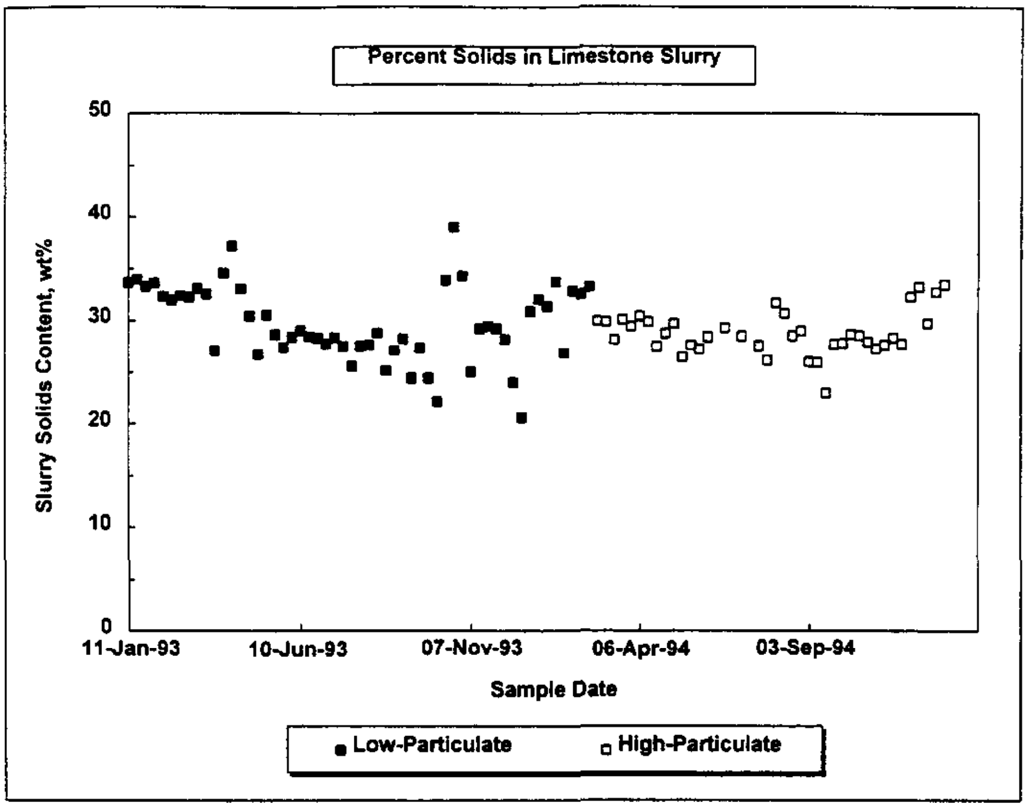


Figure 3-28. Limestone Slurry Solids Content During Low- and High-Particulate Test Periods

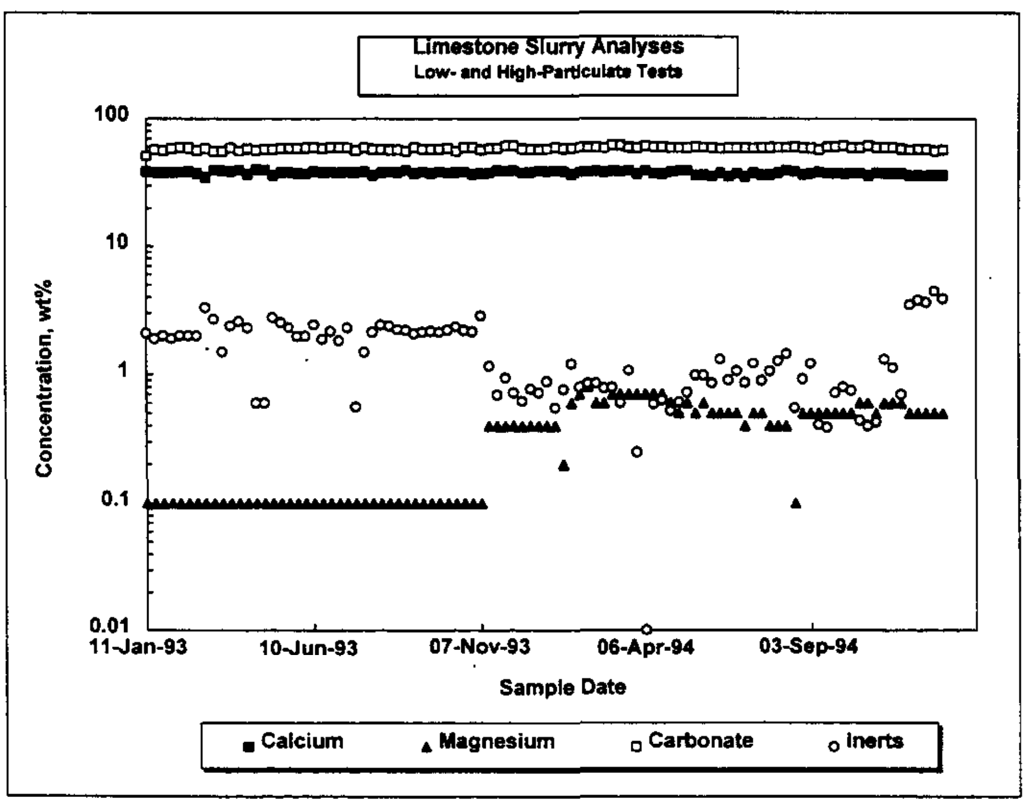


Figure 3-29. Limestone Composition During Low- and High-Particulate Test Periods

TABLE 3-7
SUMMARY OF LIMESTONE COMPOSITION: LOW- AND HIGH-PARTICULATE TESTING PERIODS

Parameter	Initial Limestone (Martin Marietta)		1st Alternate (Dravo Lime)		2nd Alternate (Florida Rock)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Calcium	38.2	1.0	37.8	1.1	36.4	0.2
Magnesium	0.1	0.1	0.5	0.1	0.5	0.0
Carbonate	57.9	1.8	59.6	1.0	57.4	0.7
Inerts	1.9	0.7	0.8	0.3	3.9	0.4

TABLE 3-8
MAKEUP WATER ANALYSES

Date	pH	Liquid Phase, mg/L			
		Carbonate	Sulfite	Sulfate	Chloride
Low-Particulate Tests					
06-Jun-93	6.75	—	0.8	46	42
09-Aug-93	6.08	36	0.8	152	22
04-Oct-93	—	—	—	67	35
10-Jan-94	7.36	—	—	13	37
14-Feb-94	—	—	—	110	138
High-Particulate Tests					
25-Apr-94	5.95	0.0	0.0	114	238
30-May-94	—	—	—	72	257
01-Jun-94	—	—	—	72	257
27-Jun-94	4.95	—	—	125	52
07-Jul-94	—	73.8	0.0	116	113
10-Aug-94	5.65	0.0	0.0	130	151
12-Sep-94	4.61	0.0	0.0	147	1685
24-Oct-94	—	—	—	84	13
06-Dec-94	—	—	0.0	84	53

3.2.1.3 Gypsum Stack Return

The composition of the gypsum stack return liquor is plotted against time in Figure 3-30. The chloride concentration showed considerable variation as the amount of water in the scrubber system fluctuated over time and as coals with different chlorine contents were burned. The sulfate concentration was relatively constant, at around 1,000 mg/L. The results observed were consistent with a typical scrubber system operating with a relatively tightly closed water balance.

Aqueous phase trace element concentrations in the gypsum stack return liquor are provided in Appendix A, Table A-8.

3.2.1.4 JBR Froth Zone

The JBR froth zone slurry solids content is shown in Figure 3-31. The mean solids content during the Low-Particulate tests was nearly 21 wt. %, with a coefficient of variation of 14 percent. During the High-Particulate tests, the mean solids content was 17 wt. %, with a coefficient of variation of 19 percent. The solids set-point chosen for the High-Particulate Alternate Coal and Alternate Limestone test periods was the reason for the lower mean value during the High-Particulate test period.

The composition of the JBR froth zone liquor, shown in Figure 3-32, exhibited the same trends as the gypsum stack return stream, i.e., relatively wide fluctuations in chloride content and steady sulfate concentrations.

The JBR froth zone solids consisted primarily of calcium sulfate, based on the relative concentrations of calcium and sulfate ions and typically low measured sulfite concentrations. The results are presented graphically in Figure 3-33. The data show that the absorbed sulfur dioxide was usually completely converted from sulfite to sulfate in the JBR. A small amount of carbonate was also typically present, due to unconverted limestone. Because of the similarities in the

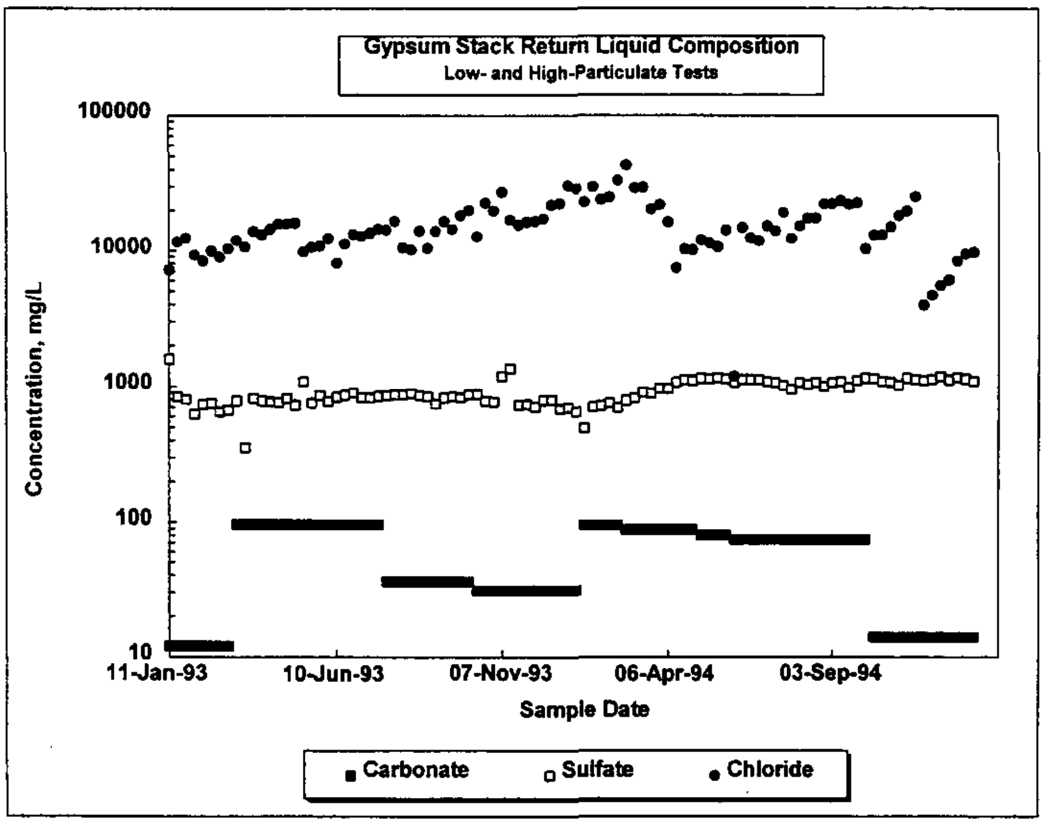


Figure 3-30. Gypsum Stack Return Liquor Composition During Low- and High-Particulate Test Periods

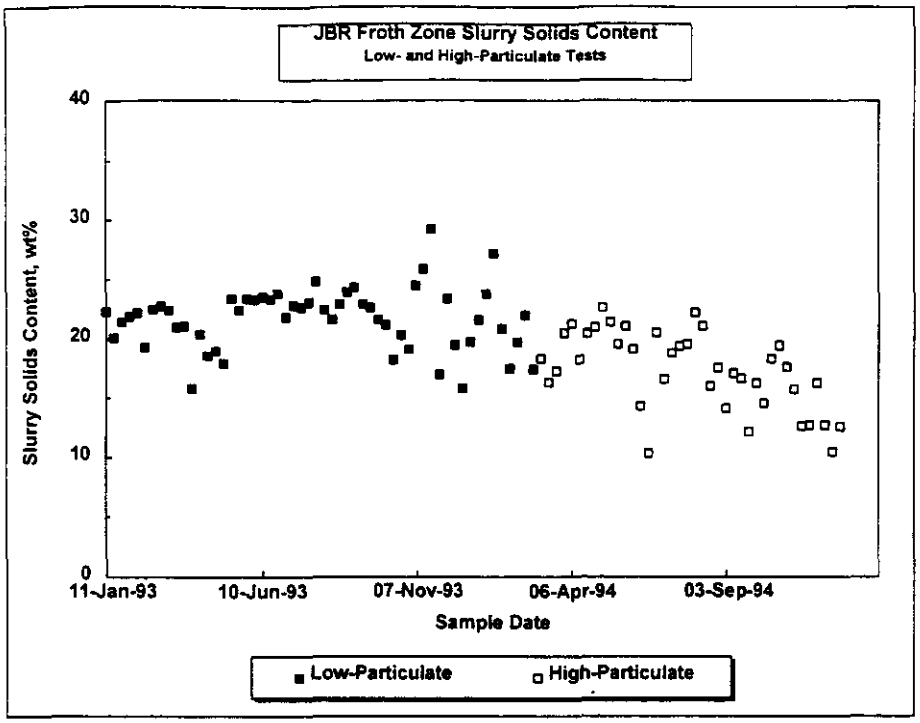


Figure 3-31. JBR Froth Zone Slurry Solids Content During Low- and High-Particulate Test Periods

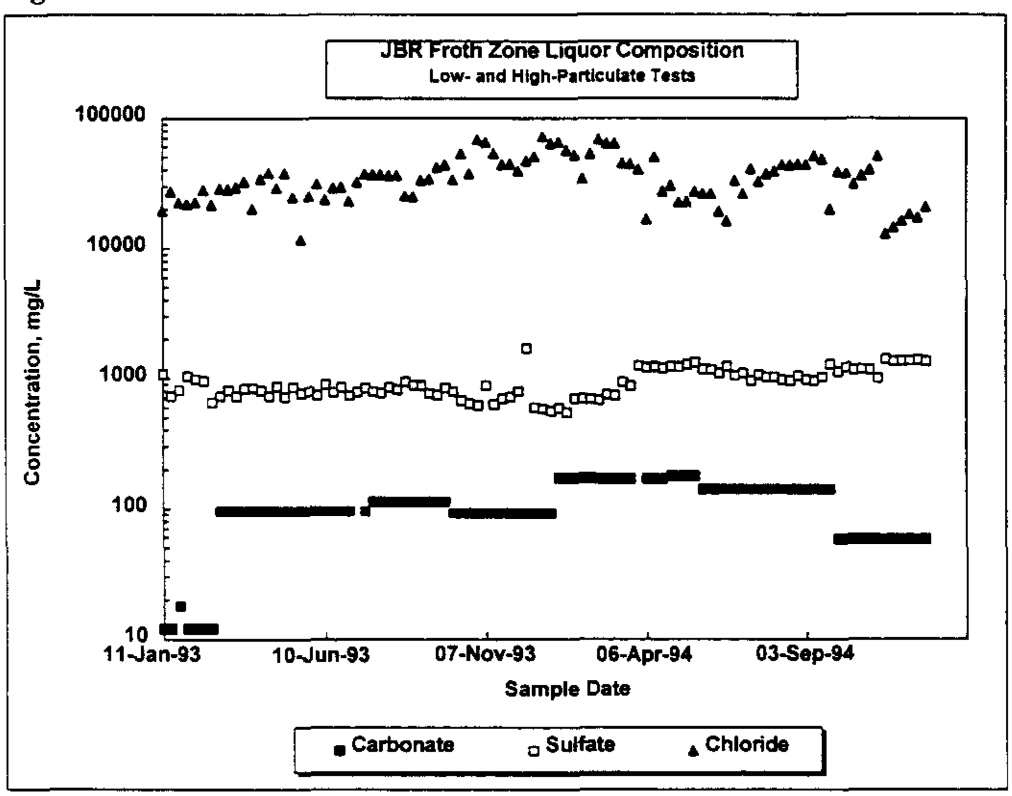


Figure 3-32. JBR Froth Zone Liquor Composition During Low- and High-Particulate Test Periods

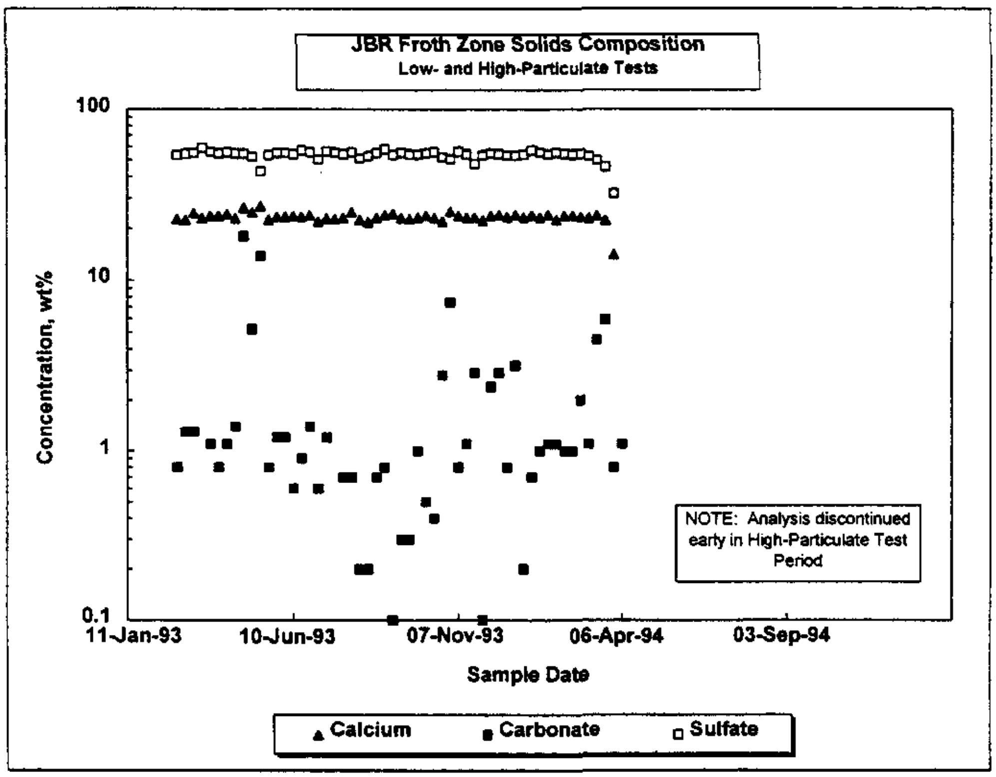


Figure 3-33. JBR Froth Zone Solids Composition Data Only Shown for First (Low-Ash) Period

composition of the JBR froth zone and draw-off solids, the decision was made early in the High-Particulate test period to discontinue analysis of the JBR froth zone solids.

Measured trace element concentrations in the JBR froth zone liquor are provided in the Appendix A, Table A-11.

3.2.1.5 JBR Draw-Off

As shown in Figure 3-34, the solids content of the JBR draw-off slurry was comparable to that measured in the JBR froth zone stream. The mean solids content was 21.0 wt. % during the Low-Particulate tests and 18.8 wt. % during the High-Particulate tests; coefficients of variation were 12% and 18.6%, respectively. As with the JBR froth zone stream, the solids content set-point during High-Particulate Alternate Coal and Alternate Limestone test blocks was the biggest contributor to the lower mean solids content during this period.

As mentioned above, the composition of the JBR draw-off solids was very consistent with the composition measured in the JBR froth zone draw-off solids; the JBR draw-off solids composition data from both test periods are shown in Figure 3-35. The solids consisted primarily of calcium sulfate, with a small amount of unconverted carbonate; the sulfite concentration was typically very low. The JBR draw-off solids were also analyzed periodically for trace elements; the results are presented in Appendix A, Table A-13.

3.2.2 Compliance Monitoring

Compliance monitoring of ash transport water and final plant discharge was performed during both scrubber testing periods. The results presented here were compiled from quarterly compliance reports submitted by Georgia Power Company to the Environmental Protection Division of the Georgia Department of Natural Resources. Copies of these compliance reports were included as appendices to each of the quarterly EMP progress reports submitted to DOE as part of this project.

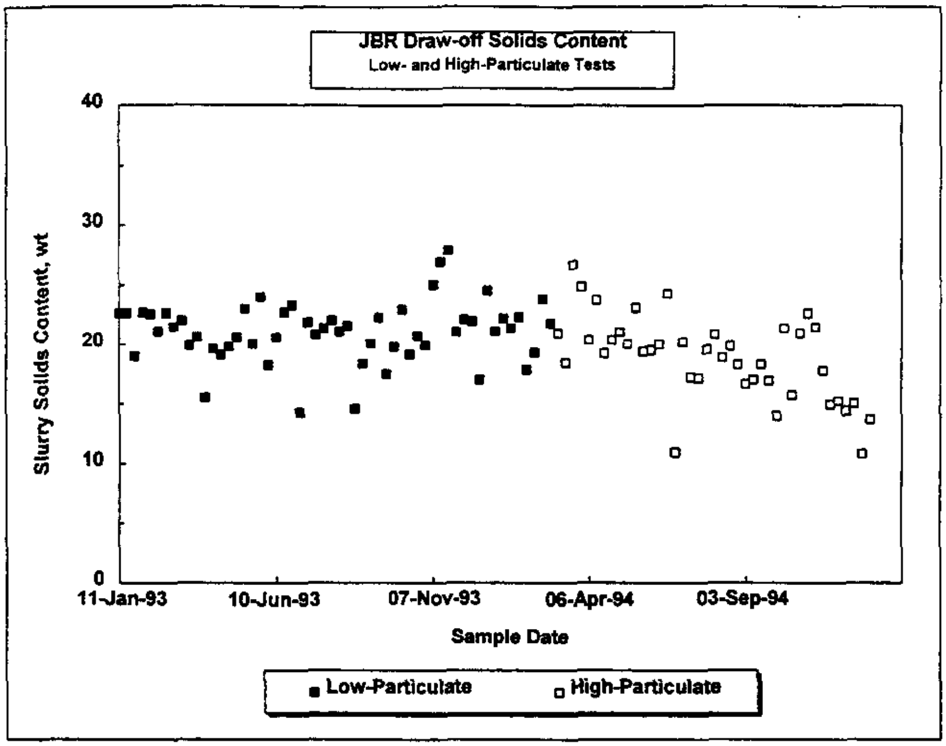


Figure 3-34. JBR Draw-off Slurry Solids Content During Low and High-Particulate Test Periods

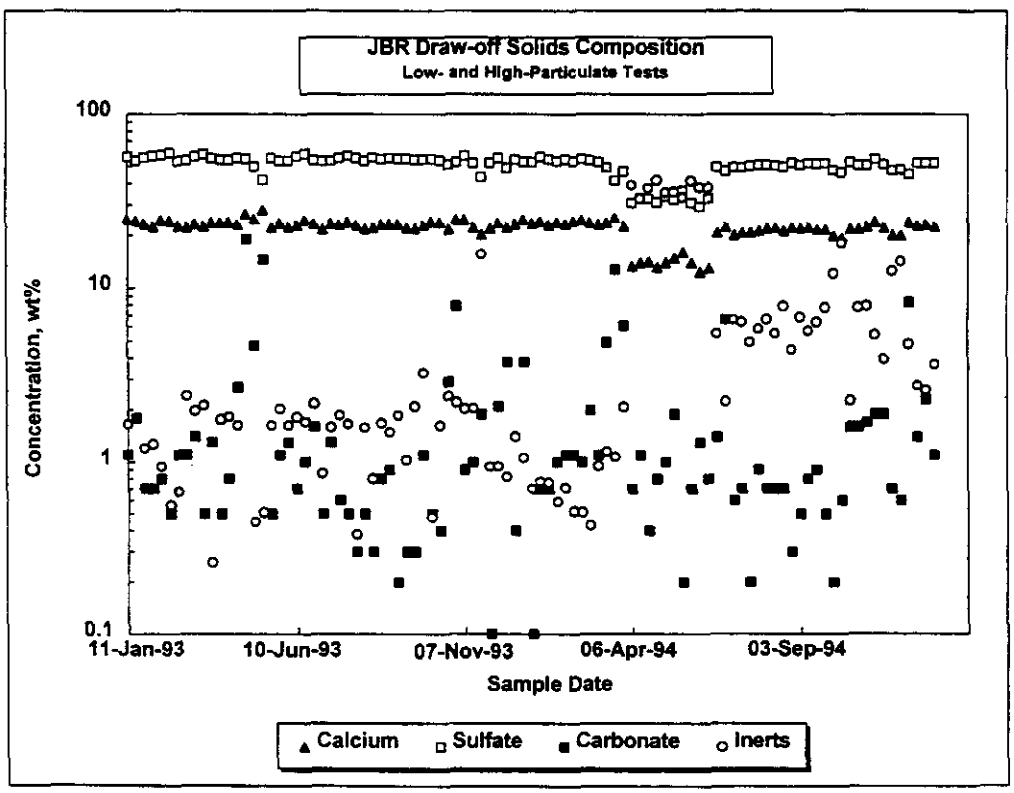


Figure 3-35. JBR Draw-off Solids Composition During Low- and High-Particulate Test Periods

Table 3-9 summarizes the results obtained during each testing period; means, standard deviations, numbers of data points, and ranges are shown for each monitored parameter, together with the corresponding NPDES permit limits. There were no exceedances of the plant's NPDES permit limits for these streams during either testing period.

TABLE 3-9
AQUEOUS STREAMS: COMPLIANCE MONITORING RESULTS

Parameter	Average	Standard Deviation	No. of Data Points	Range	Permit Limits
Ash Transport Water					
TSS (mg/L)					
Low-Particulate Test Period	1.8	0.8	29	1 - 4	30 Ave./100 Max.
High-Particulate Test Period	2.2	2.2	21	0 - 10	30 Ave./100 Max.
Oil & Grease (mg/L)					
Low-Particulate Test Period	<5	0	29	0 - <5	15 Ave./20 Max.
High-Particulate Test Period	0	0	21	0 - 0	15 Ave./20 Max.
Final Plant Discharge					
pH					
Low-Particulate Test Period	6.71	0.24	29	6.14 - 7.22	6.0 Min./9.0 Max.
High-Particulate Test Period	6.89	0.21	21	6.26 - 7.19	6.0 Min./9.0 Max.

3.3 Solid Stream Monitoring Results

Monitoring of the coal feed to the Unit 1 boiler was included in the EMP to provide data on composition changes that could affect the interpretation of the other monitoring results. Table 3-10 shows the actual and planned monitoring frequencies for the coal analyses that were performed as part of the EMP. Monitoring was performed substantially as planned during both testing periods. Detailed tables of coal proximate, ultimate, and trace element analyses are provided in Appendix A.

A statistical summary of the daily coal analyses from both Low- and High-Particulate test periods is provided in Table 3-11. Figure 3-36 presents these results graphically on an as-burned

TABLE 3-10
SOLID STREAMS: ACTUAL AND PLANNED MONITORING [a]

Parameter	Coal Feed	
	Low-Particulate Test Period	High-Particulate Test Period
Proximate Analysis, Sulfur, and HHV	303/303	185/183
Ultimate Analysis, Chlorine and Fluorine	6/3	5/2
Trace Elements	2/3	5/2

[a] 303/303 = 303 actual/303 planned.

TABLE 3-11
STATISTICAL SUMMARY OF DAILY COAL ANALYSES

Parameter	Low-Particulate Parametric Tests			Low-Particulate Long-Term Tests		
	Mean	Std. Dev.	Range	Mean	Std. Dev.	Range
Moisture, wt. %	12.89	1.17	6.66-15.37	11.74	1.01	8.31-14.28
Volatiles, wt. %	33.9	1.1	26.4-35.0	33.9	0.7	31.5-35.3
Fixed C, wt. %	43.5	1.2	41.2-48.6	45.0	0.8	43.3-48.9
Ash, wt. %	9.68	0.74	8.7-11.36	9.41	0.58	8.59-11.27
Sulfur, wt. %	2.42	0.18	1.53-2.70	2.34	0.13	1.76-2.84
HHV, Btu/lb	11,185	269	10,690-12,340	11,431	207	11,024-12,481

Parameter	Low-Particulate Auxiliary Tests[a]			Low-Particulate Alternate Coal Tests		
	Mean	Std. Dev.	Range	Mean	Std. Dev.	Range
Moisture, wt. %	12.49	1.11	8.98-14.98	8.95	1.10	7.19-10.85
Volatiles, wt. %	33.6	0.5	32.2-34.4	37.9	0.6	36.7-38.8
Fixed C, wt. %	44.3	0.8	42.8-48.1	43.2	0.7	41.7-44.5
Ash, wt. %	9.60	0.53	8.47-10.80	9.89	0.25	9.43-10.62
Sulfur, wt. %	2.37	0.16	1.71-2.62	4.30	0.09	4.17-4.49
HHV, Btu/lb	11,272	180	10,847-12,058	11,936	139	11,670-12,141

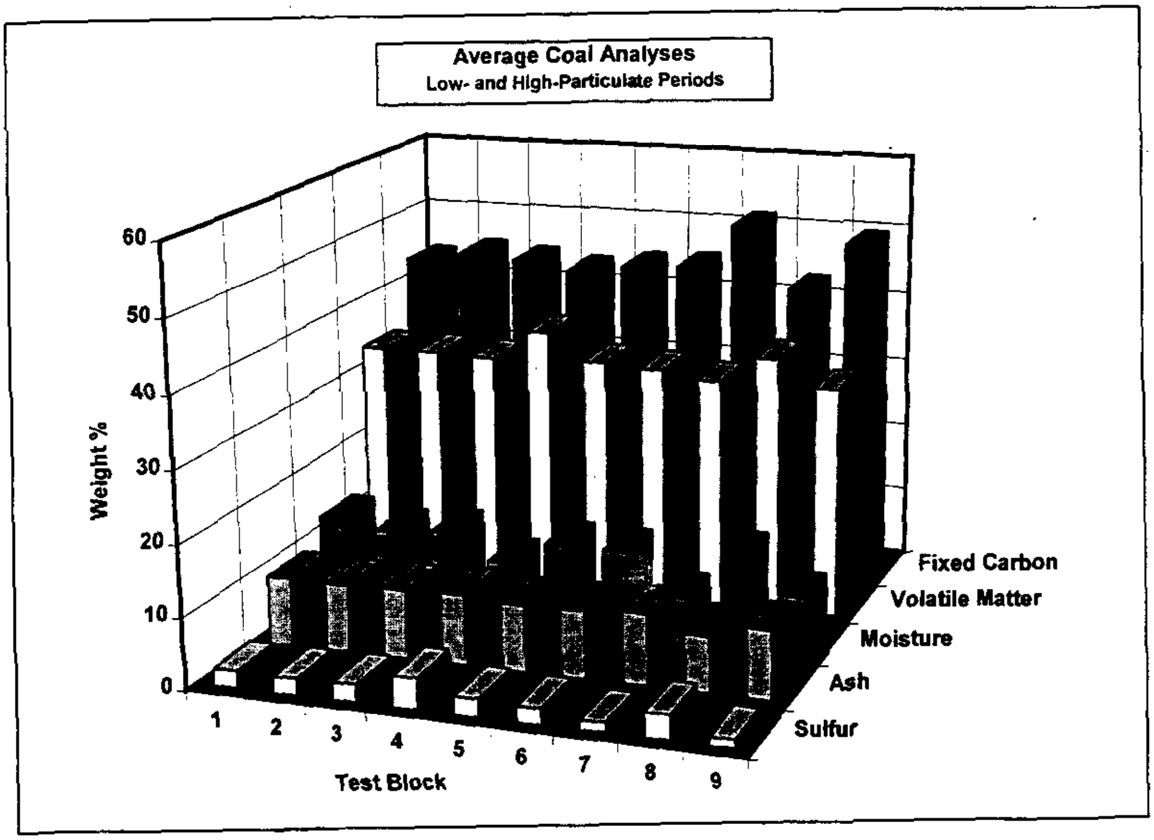
[a] Includes Alternate Limestone and High Removal tests.

All parameters are reported on an as-burned basis.

TABLE 3-11 (CONTINUED)

Parameter	High-Particulate Parametric Tests			High-Particulate Long-Term Tests		
	Mean	Std. Dev.	Range	Mean	Std. Dev.	Range
Moisture, wt. %	12.24	0.81	10.91-14.38	12.10	1.24	8.89 - 15.07
Volatiles, wt. %	34.09	0.58	32.90-34.90	33.71	0.52	32.44-33.71
Fixed C, wt. %	44.30	0.53	42.98-45.33	44.76	0.71	43.33-46.64
Ash, wt. %	9.39	0.18	9.11-9.99	9.47	0.99	8.43-12.56
Sulfur, wt. %	2.53	0.13	2.32-2.80	2.27	0.13	2.03-2.65
HHV, Btu/lb	11,293	113	10,990-11,491	11,356	147	11,009-11,735
Parameter	**High-Particulate High Removal Tests**			**High-Particulate Alternate Coal Tests**		
	Mean	**Std. Dev.**	**Range**	**Mean**	**Std. Dev.**	**Range**
Moisture, wt. %	6.15	1.24	4.55-9.28	13.23	0.81	12.34-14.92
Volatiles, wt. %	32.66	0.51	31.89-33.61	36.50	0.38	35.71-37.19
Fixed C, wt. %	51.28	1.06	49.35-53.05	42.48	0.56	41.43-43.39
Ash, wt. %	9.93	0.48	9.28-10.96	7.77	0.25	7.35-8.16
Sulfur, wt. %	1.26	0.10	1.14-1.43	3.43	0.08	3.23-3.54
HHV, Btu/lb	12,735	253	12,309-13,178	11,482	117	11,260-11,627
Parameter	**High-Particulate Alternate Limestone Tests**					
	Mean	**Std. Dev.**	**Range**			
Moisture, wt. %	8.20	0.65	7.08-9.49			
Volatiles, wt. %	32.86	0.39	31.95-33.36			
Fixed C, wt. %	49.38	0.48	48.49-50.17			
Ash, wt. %	9.55	0.17	9.24-9.80			
Sulfur, wt. %	1.15	0.06	1.02-1.27			
HHV, Btu/lb	12,385	105	12,172-12,534			

All parameters are reported on an as-burned basis



Key:

1 Low-Particulate Parametric Tests
2 Low-Particulate Long-Term Tests
3 Low-Particulate Auxiliary Tests
4 Low-Particulate Alternate Coal Tests
5 High-Particulate Parametric Tests
6 High-Particulate Long-Term Tests
7 High-Particulate High Removal Tests
8 High-Particulate Alternate Coal Tests
9 Period 2 Alternate Limestone Tests

Figure 3-36. Results of Average Coal Proximate Analyses for All Test Blocks

basis. As can be seen, the variation in sulfur, moisture, and ash content accounted for the major differences in coal composition. The SO_2 concentration in the flue gas inlet to the JBR was directly proportional to the coal sulfur content, as shown in Figure 3-37, where average SO_2 concentrations are plotted against average coal sulfur content for each of the Low- and High-Particulate test blocks.

3.4 Groundwater Monitoring Results

Groundwater from monitoring wells located near the perimeter of the gypsum stacking area was monitored once every two months from September 1990 through July 1991, once in September 1992 (following a delay in the initiation of Low-Particulate testing), and quarterly beginning in the fourth quarter of 1992. Monitoring continued for two years following the completion of the CT-121 demonstration (i.e., through the fourth quarter of 1996). Tables containing the complete set of data from the groundwater monitoring through the third quarter of 1996 are provided in Appendix C.

The Shewhart control chart method was used to help determine whether the material in the gypsum stacking area is having an impact on groundwater quality(5). The monitoring data from the period prior to the initiation of the scrubber demonstration (i.e., the preoperational period) were used to determine mean values and ranges for a selected set of representative monitoring parameters. The representative parameters were those present in appreciable concentrations in the JBR draw-off slurry, including the major cations and anions (i.e., calcium, magnesium, chloride, sulfate, sodium, silicon, barium, and nitrate/nitrite), as well as several other indicator parameters including pH, total dissolved solids, specific conductance, and alkalinity.

When the value for any given groundwater monitoring parameter was found to be consistently outside the control chart confidence intervals, it was assumed that a significant change had occurred in the value for that parameter. A single exceedance for a given monitored parameter served as an indicator of possible change, and particular attention was paid to the value obtained during the next quarter's monitoring for that parameter. To minimize the probability of falsely

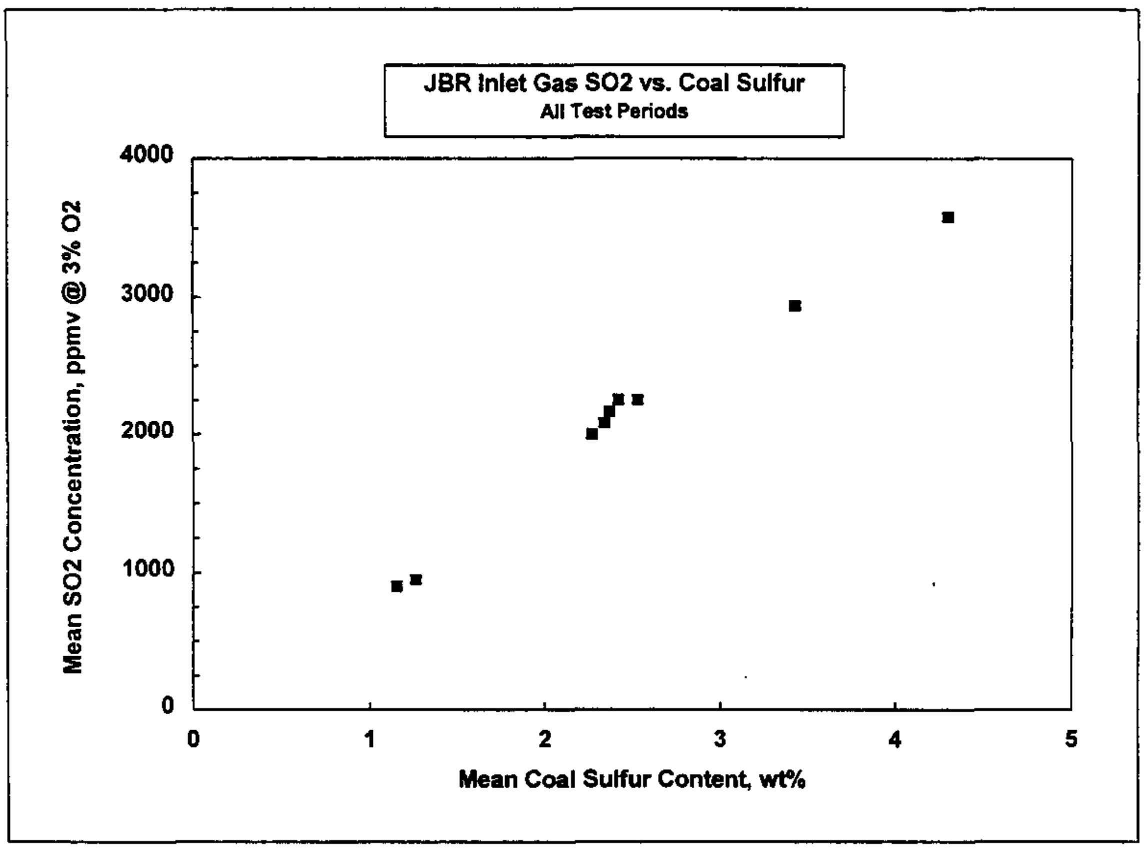


Figure 3-37. Effect of Coal Sulfur Content on JBR Inlet Gas SO_2 Concentration

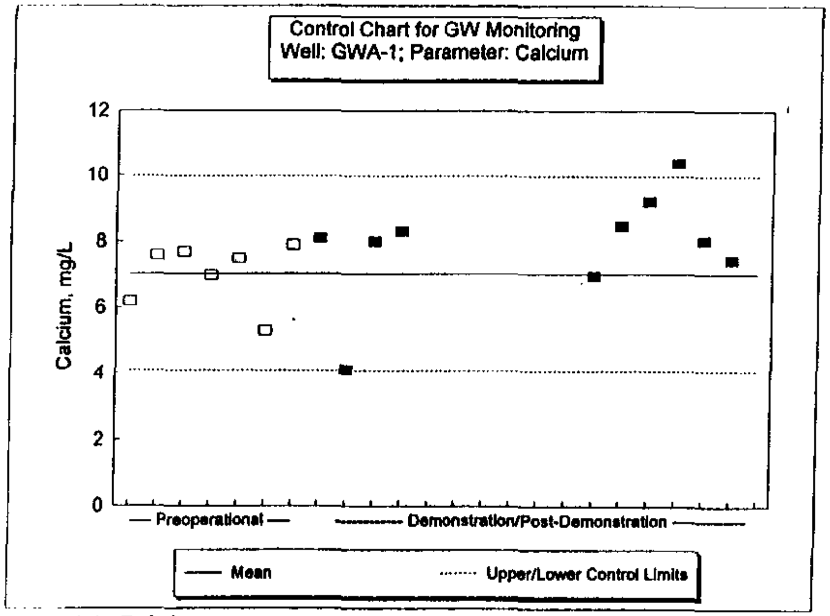
inferring that a change in groundwater composition had occurred, 3-sigma confidence intervals around the mean were computed.

A complete set of control charts for each of the 12 selected parameters for each of groundwater monitoring wells is provided in Appendix D. Example control charts for key species are provided in Figures 3-38 through 3-40. Data are presented for the upgradient well, GWA-1, and two downgradient wells, GWC-2 and GWC-4. The locations of these and other groundwater monitoring wells were shown previously in Figure 2-1.

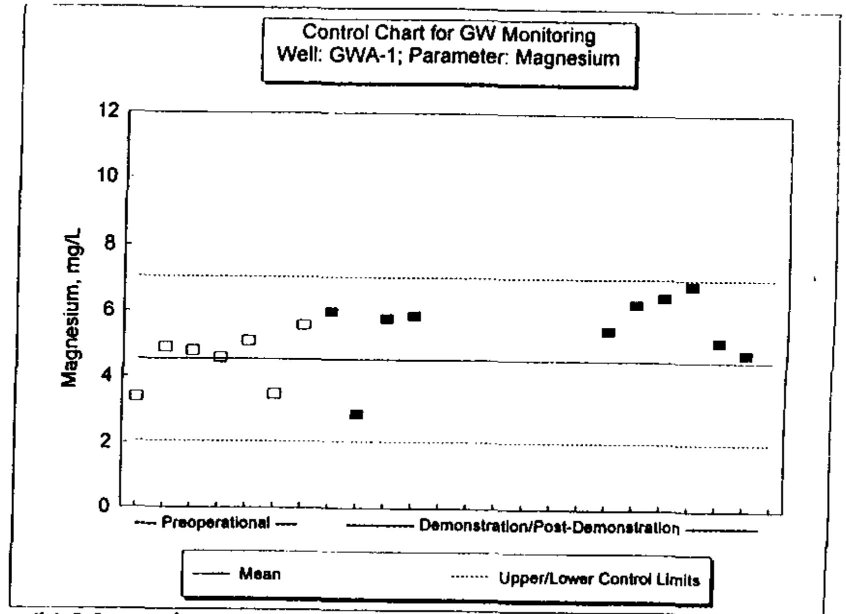
Based on an inspection of the control charts, the concentrations of chloride, magnesium, and calcium in the water from downgradient well GWC-4 have shown significant increases over the concentrations of these species measured during the preoperational period. A generally upward trend in the concentrations of these gypsum constituents was first noticed in the fourth quarter of 1993. There have been no significant increases in the levels of these species in either the upgradient well or the other downgradient wells.

The source(s) of the higher levels of gypsum constituents in well GWC-4 is (are) not clearly apparent. However, there are several potential sources, and three of the more plausible are briefly described below:

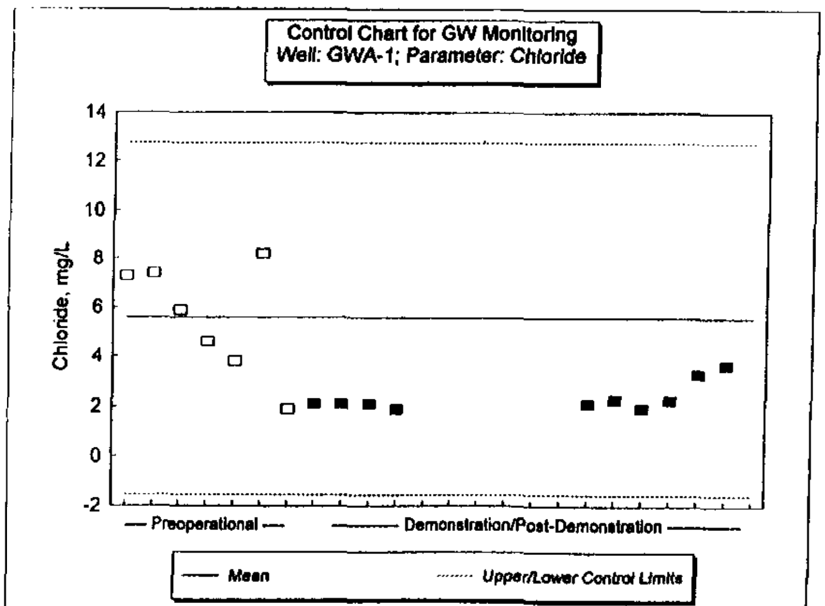
- A breach of the dike surrounding the gypsum pond occurred on July 24, 1993. The breach happened in the vicinity of well GWC-4. Since the increase in the levels of chloride, magnesium, and calcium in GWC-4 was first noticed in the fourth quarter of 1993, it seemed likely that the increase was the result of the dike breach. The validity of this assumption appeared to be reinforced in the first quarter of 1995, when the levels of the three species declined in GWC-4. Such a decline would be expected as the amount of spilled material remaining in the soil diminished due to gradual downward migration in the soil. However, no further decrease in the GWC-4 concentrations occurred over the following three quarters of 1995. In fact, further increases in the levels of chloride, magnesium, and calcium were noted in the first and second quarters of 1996; the concentrations measured during the third quarter of 1996 were similar to those from the second quarter. Although this behavior could still be due to the 1993 breach (e.g., due to changes in rainfall patterns and/or acidity of the rain could cause higher migration rates and/or increased leaching of the soil), other factors could be contributing to



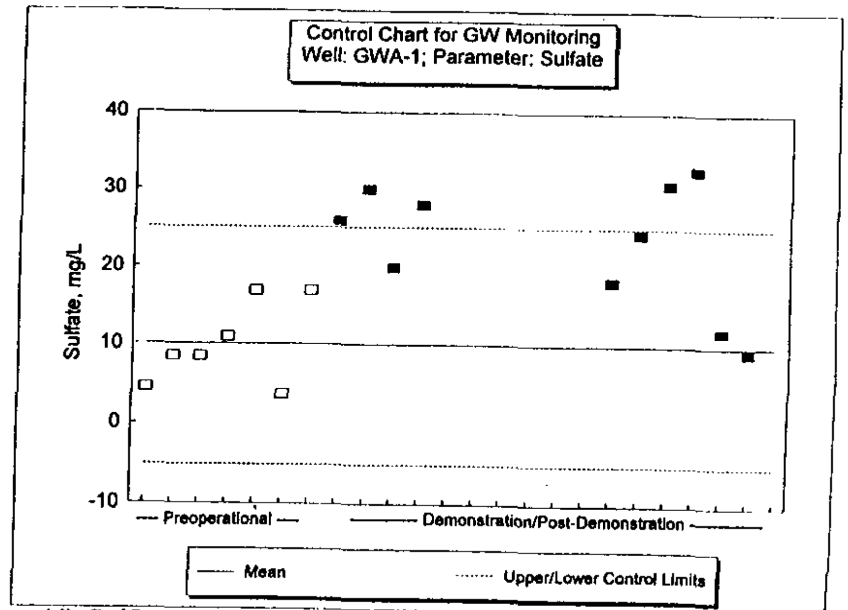
(a) Calcium



(b) Magnesium



(c) Chloride



(d) Sulfate

Figure 3-38. Control Charts for Representative Species from Well GWA-1 (Upgradient)

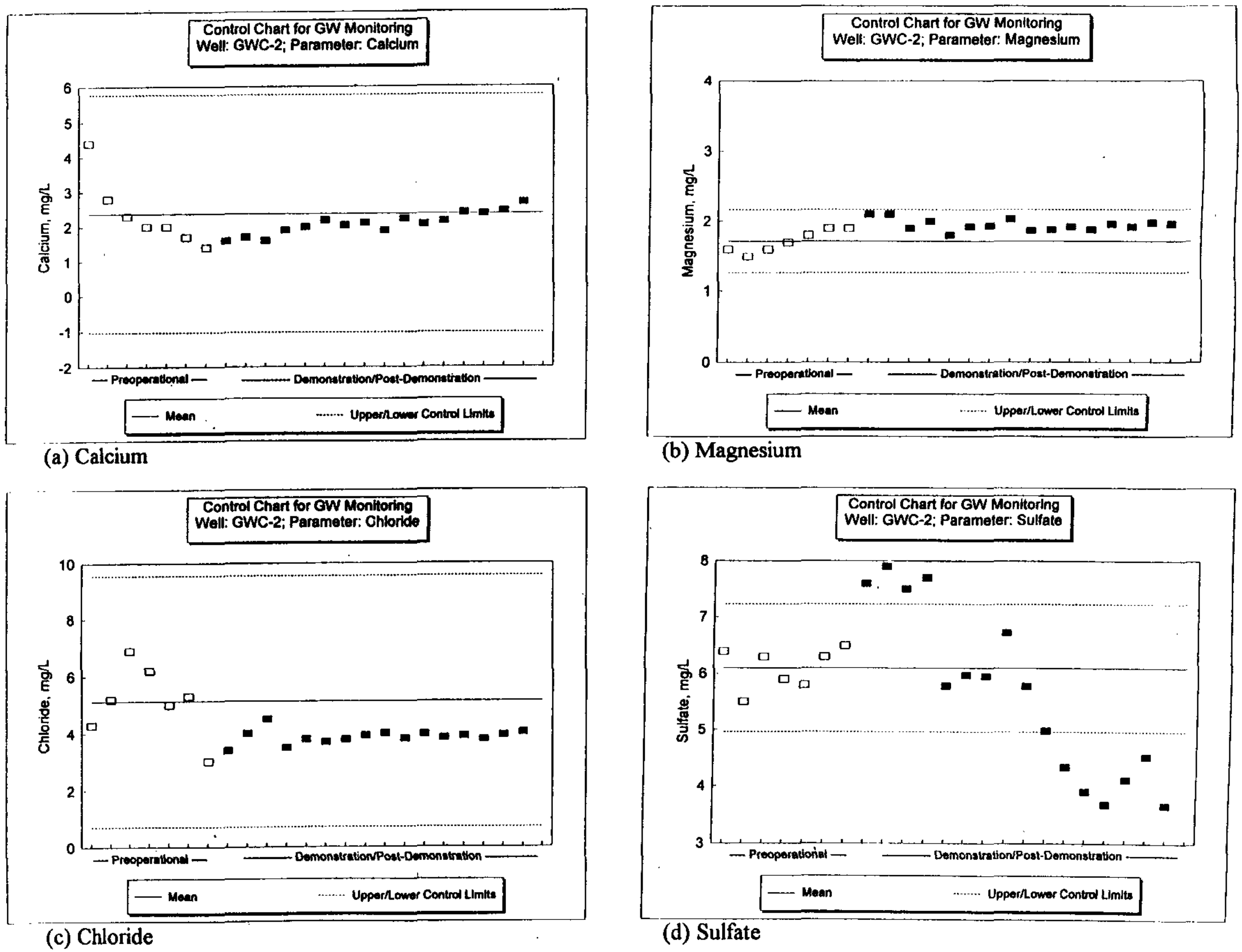
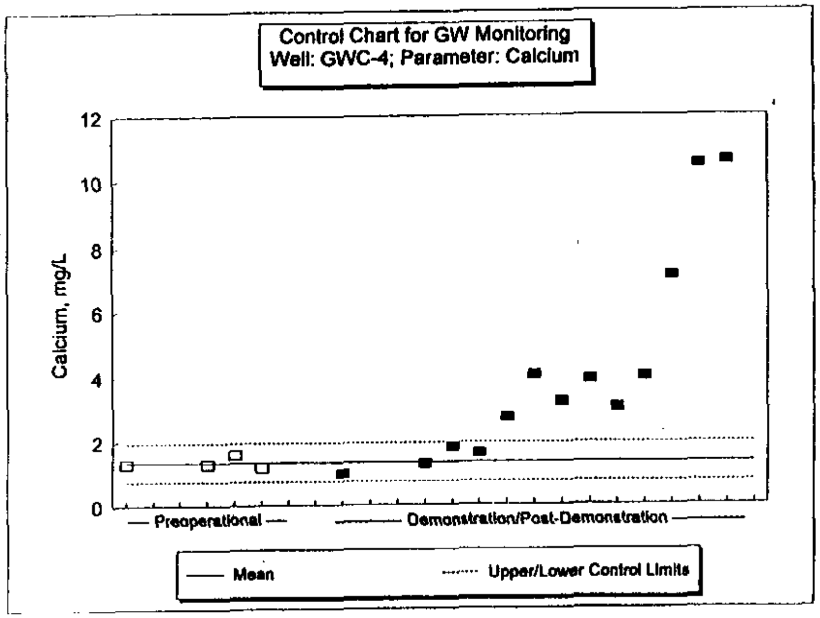
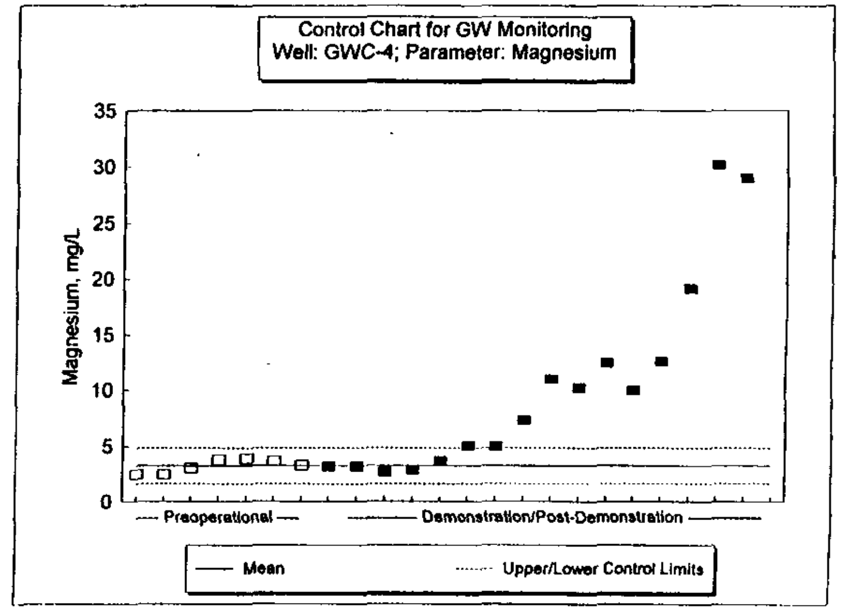


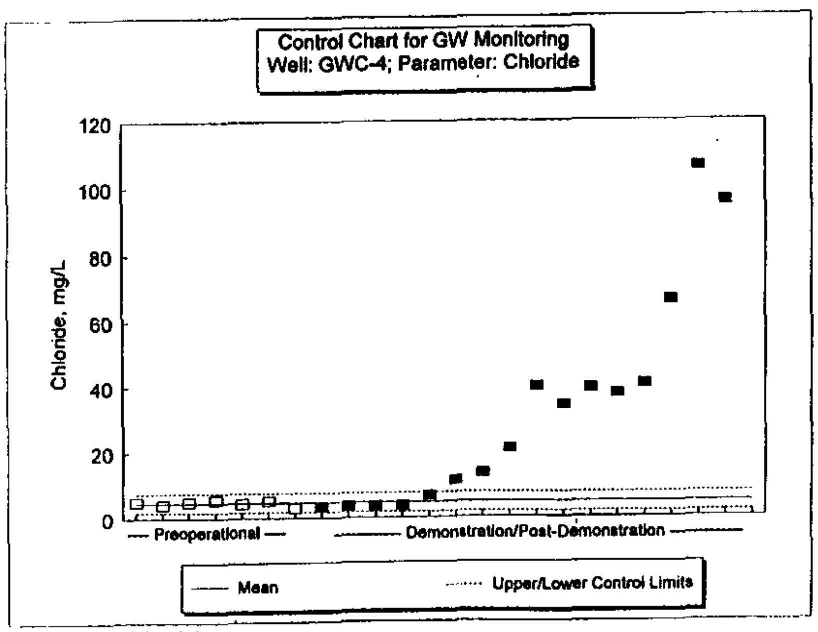
Figure 3-39. Control Charts for Representative Species from Well GWC-2 (Downgradient)



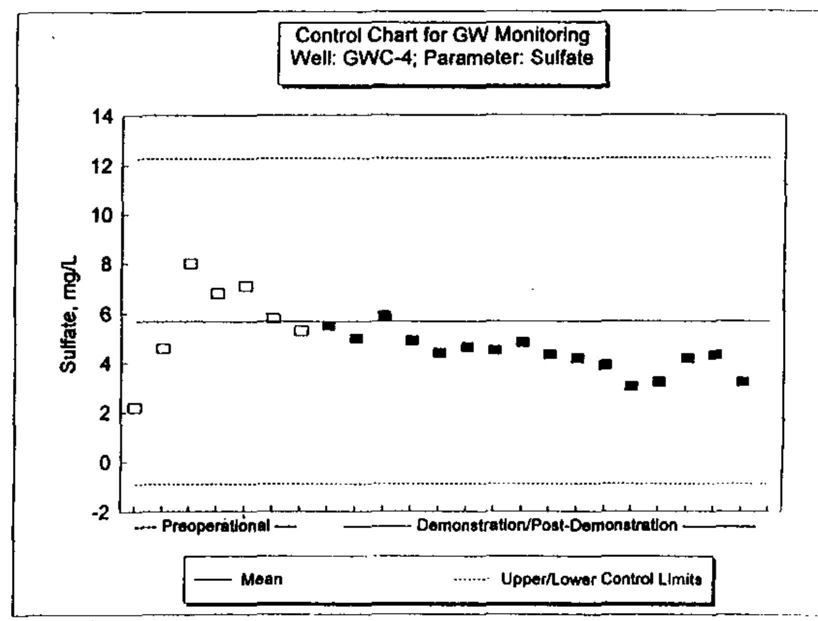
(a) Calcium



(b) Magnesium



(c) Chloride



(d) Sulfate

Figure 3-40. Control Charts for Representative Species from Well GWC-4 (Downgradient)

or causing higher levels of gypsum constituents in the groundwater in the vicinity of GWC-4.

- The groundwater sampling team has noticed that there appear to have been periodic leaks from a slurry pump and associated valves and fittings that are in close proximity (i.e., within 30-40 feet) to GWC-4. Slurry has periodically leaked onto the ground and flowed across the soil surface to form small pools within 10-15 feet of GWC-4. This material could be the source of at least some of the increased levels of chloride, magnesium, and calcium observed during the first three quarters of 1996.

- The possibility that the increased levels of the gypsum slurry constituents in GWC-4 could be caused by a leak in the liner under the gypsum stacking area cannot be discounted. There is no indication of leakage in the monitoring results from the other wells, but this does not preclude the presence of a liner leak at a location immediately upgradient from GWC-4.

At this time, it is not possible to determine which, if any, of the possible causes described above is contributing the bulk of the chloride, etc., being seen in GWC-4. Some clarification may be forthcoming as more results of the continuing groundwater monitoring activities become available.

3.5 Quality Assurance/Quality Control

The environmental monitoring plan for the CT-121 demonstration project at Plant Yates included a quality assurance/quality control plan. That plan described procedures for producing data of acceptable quality, including:

- Adherence to accepted sampling and analytical methods;
- Adequate documentation and sample custody procedures; and
- Quality assurance measures.

This section presents the results from each of these QA/QC procedures that were performed during either Low- or High-Particulate test periods.

3.5.1 Adherence to Accepted Methods

The sampling and analytical methods specified in the EMP were summarized in Section 2 of this report. As noted, the specified procedures were used with only a few exceptions; the alternate methods were used because they offered advantages such as improved detection limits or longer sample holding times.

Compliance with analytical method protocols by personnel conducting groundwater sampling and by the on-site laboratory personnel was assessed as part of technical systems audits conducted by Radian Corporation personnel during the 1st quarter of 1993 and 2nd quarter of 1994. Complete reports of both audits were included as appendices to quarterly EMP progress reports. The 1993 audit found no deficiencies in the groundwater monitoring; sample collection and documentation procedures specified in the Groundwater Monitoring Test Plan had been effectively implemented. Procedures and quality control practices had also been implemented in the on-site laboratory but several recommendations were made, including consistent use of these procedures and additional personnel training. There were no formal recommendations requiring responses.

The purpose of the 1994 audit was to assess compliance of the project's on-site laboratory with quality control procedures and practices that had been established and implemented for the project. The auditing personnel observed the collection and analysis of scrubber process samples. All of the QC procedures established for the laboratory had been implemented and were being complied with, and an appropriate level of quality control was practiced. No major problems were observed, and no formal recommendations requiring responses were made.

3.5.2 Documentation and Sample Custody

For compliance monitoring, the documentation and custody procedures that are part of the state-approved compliance monitoring programs for Plant Yates were followed during EMP activities.

Procedures for documentation and sample custody for supplemental monitoring were reviewed as part of the 1993 technical systems audit, as discussed above. No major problems were found; some minor recommendations were made of improvements to log book formats.

Documentation for instrument calibration checks and related maintenance activities were recorded in five log books that were maintained on site at Plant Yates:

1. CEM flow rates and gas concentrations;
2. pH instrument calibrations;
3. ΔP cells;
4. Density measurements; and
5. Flow meters.

3.5.3 Quality Assessment Measures

Quality assessment measures performed as part of the EMP for the CT-121 demonstration project included 1) duplicate tests; 2) comparison of SO_2 measurements by the CEMs and EPA Method 6; 3) duplicate groundwater samples and duplicate analyses; and 4) analysis of groundwater sample splits by two independent laboratories. The results obtained from each of these measures are summarized below.

3.5.3.1 Duplicate Tests

A measure of the reproducibility of the SO_2 removal test results was obtained by performing duplicate tests. Key operating parameters such as unit load and scrubber operating conditions (i.e., JBR pressure drop and slurry pH) were duplicated to the extent possible for these tests. Because of differences in the JBR inlet gas SO_2 concentrations caused by variations in coal sulfur content, the SO_2 removal efficiency data for a given set of tests were normalized to a common inlet SO_2 concentration using the scrubber performance model. This model was developed by regressing the parametric data obtained during the demonstration project, so that direct comparisons of performance could be made. The results shown in Table 3-12 are from tests conducted during both test periods, and show good agreement between duplicate tests for all but a few of the High-Particulate Parametric tests. The High-Particulate tests were conducted with the ESP partially de-energized, which resulted in progressive increases in JBR fouling over time due to the presence of excess fly ash solids. The impact of this progressive fouling on SO_2 removal can be clearly seen where extended period of time elapsed between duplicate tests, such as tests P2-6 and P2-31, and P2-12 and P2-26.

3.5.3.2 SO_2 Measurements by CEMs and EPA Method 6

A measure of the accuracy of the SO_2 measurements obtained using the CEMs was provided during the first nine Low-Particulate Parametric tests when SO_2 concentrations in the flue gas inlet to the JBR and the stack gas were also measured using EPA Method 6. The average CEM and Method 6 results for each of these tests are shown in Table 3-13. The average percent difference in SO_2 concentration measured by the JBR inlet duct instrument and by Method 6 was 3.8 percent. The average percent difference between the stack concentrations measured by the CEM and those measured by Method 6 was 4.9 percent. At both locations, the CEM concentration measurements were lower than the levels measured by Method 6. Based on these results, the quality of the SO_2 concentration data obtained by the CEMs was judged to be adequate for the purposes of this project.

TABLE 3-12

REPLICATE TEST RESULTS: LOW- AND HIGH-PARTICULATE TEST PERIODS

Test No.	SO_2 Removal, %	Replicate Test No.	SO_2 Removal, %	% RPD[a]	Replicate Test No.	SO_2 Removal, %	% RPD
Low-Particulate Parametric Tests[b]							
P1-1	74.5	P1-22	74.0	0.7			
P1-2	91.3	P1-23	89.7	1.8			
P1-3	97.0	P1-24	96.1	0.9			
P1-19	81.6	P1-19R	78.5	3.9			
P1-20	94.2	P1-20R	93.8	0.4			
P1-21	98.4	P1-21R	98.2	0.2			
P1-35	86.3	P1-36	87.7	1.6			
Low-Particulate Alternate Limestone Tests[b]							
P1B-2	97.5	P1B-2R	96.9	0.6			
P1B-6	98.1	P1B-6R	98.3	0.2			
P1B-9	94.1	P1B-9R2	88.4	6.2	P1B-9R3	95.2	1.2
P1B-10	82.0	P1B-10R	76.5	6.9			
High-Particulate Parametric Tests[b]							
P2-6	64.5	P2-31	52.4	20.7			
P2-7	88.4	P2-33	87.5	1.0	P2-33R	77.5	13.1
P2-8	88.6	P2-16	82.0	7.8			
P2-9	95.9	P2-18	94.5	1.5			
P2-12	88.6	P2-26	70.9	22.2			
High-Particulate High Removal Tests[c]							
HR2-3	98.3	HR2-4	98.6	0.3			
High-Particulate Alternate Coal Tests[d]							
AC2-2	90.4	AC2-10	82.4	9.3			
AC2-5	78.6	AC2-5R	75.2	4.4			
High-Particulate Alternate Limestone Tests[c]							
AL2-1	97.8	AL2-1R	98.0	0.2			
AL2-3	97.7	AL2-3R	99.0	1.3			

[a] %RPD = Relative Percent Difference = $\frac{\text{Larger Value - Smaller Value]}}{\text{[Larger Value + Smaller Value]/2}}$

[b] SO_2 removal efficiencies normalized to 2200 ppmv @ 3% O_2 in the flue gas inlet to the JBR.

[c] SO_2 removal efficiencies normalized to 1000 ppmv @ 3% O_2 in the flue gas inlet to the JBR.

[b] SO_2 removal efficiencies normalized to 3000 ppmv @ 3% O_2 in the flue gas inlet to the JBR.

TABLE 3-13
COMPARISON OF AVERAGE SO_2 MEASUREMENTS BY CEM AND METHOD 6

	JBR Inlet Gas			Stack Gas		
Test No.	CEM	Method 6	% Diff.[a]	CEM	Method 6	% Diff.[a]
P1-1	2158	2286	-5.6	528	538	-1.9
P1-2	2185	2288	-4.5	188	205	-8.3
P1-3	2180	2267	-3.8	63	71	-11.3
P1-4	2156	2279	-5.4	388	385	0.8
P1-5	2166	2188	-1.0	120	128	-6.3
P1-6	2220	2314	-4.1	49	49	0.0
P1-7	2329	2376	-2.0	282	311	-9.3
P1-8	2323	2444	-5.0	95	106	-10.4
P1-9	2355	2421	-2.7	46	45	2.2
Average Difference			-3.8	Average Difference		-4.9

Units: ppmv @ 3% O_2.

[a] % Difference = (CEM - Method 6)/Method 6 x 100 percent.

3.5.3.3 Groundwater Sample and Analytical Duplicates

An assessment of the quality of the groundwater monitoring data was made using duplicate samples and duplicate analyses. The complete results of these replicate analyses were included in the quarterly groundwater monitoring reports. An overall summary for the groundwater monitoring performed from the first-quarter 1993 through the third-quarter 1996 is provided in Appendix E for those analytical parameters that were present above detection limits. In general, acceptable accuracy was obtained for most parameters. When larger differences were observed between sample or analytical replicates, the parameters were typically present at concentrations less than five times the detection limit, where less accurate results can be expected, or the parameters were detected in the method blank.

Specifically, the difference between sample duplicates was less than 20% for nearly three quarters of the duplicate analyses performed. Of those duplicate analyses where the difference was greater than 20%, roughly two-thirds occurred when the parameter concentrations were less than five times the detection limit in both the sample and the field duplicate. Of the duplicate analyses performed on the field duplicate samples, there were only three instances where the relative percent difference exceeded the specified limit; in these cases the analytical parameters (TOX and TDS) were present at concentrations less than five times the method detection limit.

3.5.3.4 Groundwater Analyses by Independent Laboratories

During each groundwater monitoring campaign, sample splits are provided for analysis by both Radian and Savannah Laboratories, an independent laboratory selected by SCS. The results for all groundwater monitoring campaigns through the fourth quarter of 1996 were compared by computing the relative percent differences (RPDs) for species that were analyzed by both laboratories. Overall statistics based on these comparisons are provided in Table 3-14. Note that RPDs were not calculated for those species not measured above method detection limits by either laboratory. The mean RPDs were less than 20% for four of the seven detected analytes, which corresponds to the goal of Radian's laboratory for duplicate sample analyses. A higher average RPD was found for sulfate, nitrate-nitrite, and total dissolved solids. In the majority of cases, the calculated RPDs were less than 20% for all detected parameters. The average RPDs were over 20% for sulfate, nitrate-nitrite, and TDS because of a relatively small number of data points where the calculated RPDs were large. These parameters were typically present at low concentrations, where analytical accuracy can be expected to be lower, and where small absolute differences can translate into large percentage differences. Based on these results, the groundwater monitoring data should be of sufficient quality to meet the purposes of the project.

3.6 Compliance Reporting

During the CT-121 demonstration project's two testing periods, compliance reports were submitted by Georgia Power Company to the Environmental Protection Division of the Georgia Department of Natural Resources (DNR), in accordance with the requirements of Plant Yates' Source 1 (Comprising Units 1-3) air operating permit (No. 4911-038-4838-0), as amended; and of Plant Yates' NPDES permit (Permit No. GA0001473). The air operating permit was amended effective December 28, 1990 to account for the CT-121 system. In addition, as part of the conditions of the DNR-issued permit for the gypsum stacking area, monitoring of the groundwater is required before, during, and for two years after the demonstration.

TABLE 3-14
COMPARISON OF GROUNDWATER MONITORING
BY INDEPENDENT LABORATORIES

Parameters [b]	Relative Percent Difference Statistics [a]		
	% RPD		Percent of Data
	Mean	Range	RPD≤ 20%
Specific Conductance	16.1	0.0 - 97.1	78
Chloride	16.9	0.0 - 158.7	72
Sulfate	29.3	0.0 - 129.7	59
Calcium	11.9	0.0 - 81.6	83
Nitrate-Nitrite	32.1	0.0 - 192.9	63
Strontium	13.0	0.0 - 89.9	78
Total Dissolved Solids	22.4	0.0 - 111.1	63

[a] Relative Percent Difference (RPD) is defined as follows:

$$RPD = \frac{(\text{Larger Value - Smaller Value})}{(\text{Larger Value + Smaller Value})/2} \times 100\%$$

[b] Additional parameters not measured above detection limits by either laboratory included fluoride, arsenic, boron, chromium, lead, mercury, selenium, uranium, and TOC.

Copies of the compliance reports have been included as appendices to the quarterly and annual EMP reports for this project.

3.6.1 Summary of Quarterly Air Emission Reports

Plant Yates' air operating permit requires weekly monitoring of coal feed composition (i.e., sulfur, ash, moisture, and heating value), annual particulate matter emissions (as total particulate loading), and continuous monitoring of the opacity of the flue gas inlet to the JBR. A summary of the opacity exceedance data for the Low-Particulate testing period was presented earlier in this section. As mentioned previously, a variance to the opacity monitoring requirement was obtained for the duration of the High-Particulate testing period.

In addition, semiannual progress reports on the CT-121 project were submitted as required under the amended air operating permit. These reports discussed project activities and plans and contained a table of SO_2 removal efficiency data; all of the information contained in the semiannual reports has been incorporated into this EMP Final Report.

3.6.2 Summary of Quarterly Operational Monitoring Reports

Plant Yates' NPDES permit requires that the pH and concentrations of suspended solids and oil and grease be monitored twice a month for various aqueous discharge streams. Groundwater is monitored quarterly for anions, TOC, and metals; and semiannually for radionuclides. A summary of the data from the operational monitoring reports for those discharge streams that could have been affected by the CT-121 demonstration project was presented earlier in this section.

4.0 CONCLUSIONS

With the few exceptions discussed earlier in this volume, environmental monitoring was performed as described in the CT-121 demonstration project's Environmental Monitoring Plan. The following conclusions can be drawn from this project's environmental monitoring results:

- The CT-121 demonstration scrubber was capable of removing well over 90% of the flue gas SO_2 during parametric tests conducted using the 2.5% sulfur baseline coal. SO_2 removal efficiency was found to increase with increasing scrubber slurry pH and JBR deck pressure drop and to decrease with increasing boiler load and scrubber inlet flue gas SO_2 concentration. Progressive reductions in SO_2 removal efficiency were also observed as a result of JBR fouling over time. Scrubber modifications helped alleviate fouling-related changes in removal efficiency.

- The average SO_2 removal efficiency achieved during the Low-Particulate Long-Term load-following tests was nearly 94%, although it was necessary to operate at somewhat higher pH and pressure drop than originally expected. During the High-Particulate Long-Term test block, the average SO_2 removal efficiency was over 93%, partly due to abnormally low average boiler load demand. As expected, the impact of scrubber fouling due to high ash loading was also more pronounced during this test block. In addition, the scrubber pH set point had to be lowered to minimize the impact of aluminum fluoride blinding on limestone dissolution.

- SO_2 removal efficiencies greater than 97% were achievable during both Low- and High-Particulate tests by operating the scrubber at very high pH and JBR deck pressure drop set points.

- Similar SO_2 removal efficiencies were obtained during tests conducted with limestone from three different sources. Much greater variation in gypsum dewatering properties was found among the limestones used. This was an important factor leading to a change in the main program limestone following the Low-Particulate Alternate Limestone test block.

- Even when a 4.3% sulfur coal was used (well above the scrubber design value of 3.0% sulfur), the CT-121 scrubber achieved over 90% SO_2 removal efficiencies at most test conditions during Low- and High-Particulate operation. As expected, the SO_2 removal efficiency achieved at a given set of operating conditions was lower while burning the 4.3% sulfur than while burning the 2.5% sulfur baseline coal.

- The particulate matter loading in the JBR outlet gas was always well below the Plant Yates permit limit of 0.24 lb/MMBtu, even during High-Particulate tests. Except when operating with the ESP fully de-energized, the combined ESP/JBR was able to achieve particulate matter loadings below the 0.03 lb/MMBtu level specified in the federal New Source Performance Standard.

- The scrubber was found to be relatively inefficient in removing particles with an aerodynamic diameter smaller than 1 micrometer. The particle size distribution measured in the JBR outlet gas was relatively insensitive to changes in boiler load at a given JBR pressure drop.

- Sulfur trioxide (SO_3) concentrations in the JBR inlet and outlet gas streams were typically in the range from 1 to 4 ppmv (@ 3% O_2). There was little or no change in SO_3 concentration across the JBR except during the High-Particulate tests when the ESP was completely de-energized, when apparent SO_3 removals of 70% or greater were achieved.

- As expected, the JBR outlet gas was typically saturated with water vapor.

- The average limestone slurry solids concentrations during both the Low- and High-Particulate test periods were similar: 29-30% by weight. All three limestones used during the demonstration consisted primarily of calcium carbonate. The three limestones differed in their concentrations of magnesium carbonate and inerts.

- The concentrations of chloride and sulfate ions in the gypsum stack return liquor were consistent with those expected of a scrubber system operating with a closed water balance, with changes thought to be due to dilution and/or differences in coal chorine content over time. Chloride ion concentrations showed considerably more variation that did sulfate; the sulfate concentration remained relatively constant at approximately 1,000 mg/L. The composition of the JBR froth zone and draw-off liquor were consistent with the composition of the gypsum stack return liquor.

- The JBR froth zone and draw-off solids concentrations averaged about 21% by weight during the Low-Particulate test period; they were somewhat lower on average (about 17-18% by weight) during the High-Particulate test period, primarily due to a lower scrubber solids set point used during the latter part of the period when low sulfur coal was used. Both solids consisted primarily of calcium sulfate; very low concentrations of sulfite were found, consistent with the high level of scrubber slurry oxidation expected for this scrubber. Low carbonate concentrations were also typically found, indicative of the high limestone utilization achieved at most test conditions.

- There were no exceedances of Plant Yates' NPDES permit limitations in the monitored aqueous discharge streams (i.e., ash transport water and final plant discharge).

- The concentrations of chloride, magnesium, and calcium in the water from downgradient well GWC-4 have shown significant increases over the concentrations of these species measured during the preoperational period. A generally upward trend in the concentrations of these gypsum constituents was first noticed in the fourth quarter of 1993. There have been no significant increases in the levels of these species in either the upgradient well or the other downgradient wells. The source(s) of the higher levels of gypsum constituents in well GWC-4 is (are) not clearly apparent. However, three of the more plausible potential sources include: (1) a breach of the dike surrounding the gypsum pond that occurred on July 24, 1993, in the vicinity of well GWC-4; (2) leaks from a slurry pump and associated valves and fittings that are in close proximity to GWC-4; (3) a leak in the liner under the gypsum stacking area. At this time, it is not possible to determine which, if any, of these possible causes is contributing the bulk of the chloride, etc., being seen in GWC-4. Some clarification may be forthcoming as more results of the continuing groundwater monitoring activities become available.

- The coals used within the two demonstration periods differed primarily in the amount of sulfur, ash, and moisture present; the composition of the coal used during a given test block was found to be relatively constant. As expected, the average JBR inlet gas SO_2 concentration was found to be directly proportional to the average coal sulfur content during each test block.

5.0 RECOMMENDATIONS

Recommendations based on the monitoring performed under the EMP for this demonstration project include the following:

- The use of the colorimetric method for aqueous stream nitrate-nitrite (EPA 353.1) is recommended over the use of ion chromatography, since it provides an improved detection limit as well as a longer sample holding time.
- The measurement of coal trace element concentrations using ASTM methods based on atomic absorption spectrophotometry is recommended over inductively coupled argon plasma emission spectrometry.
- The concentrations of gypsum species (i.e., calcium, magnesium, and chloride) that have increased over the levels observed during the preoperational period in groundwater monitoring well GWC-4 should continue to be monitored, and more definitive reasons for the increases should be determined and corrective action should be taken, if needed.

6.0 REFERENCES

1. Southern Company Services, Inc. "Environmental Monitoring Plan: CT-121 Flue Gas Desulfurization Project at Plant Yates," Birmingham, AL, January 16, 1995.

2. Southern Company Services, Inc. "High-Particulate Auxiliary Test Block Report," Birmingham, AL, April 28, 1995.

3. Southern Research Institute. "Particulate Sampling of CT-121 Wet Scrubber, Georgia Power Company Plant Yates Unit 1: ESP Operational Test Phase, January 21-31, 1993 Tests," Birmingham, AL, March 19, 1993.

4. Southern Research Institute. "Particulate Sampling of Chiyoda CT-121 Jet Bubbling Reactor, Georgia Power Company Plant Yates Unit 1, Increased Mass Loading Test Phase, March 17-24, 1994," Birmingham, AL, July 13, 1994.

5. Gilbert, Richard O., "Statistical Methods for Environmental Pollution Monitoring," Van Nostrand Reinhold Company, New York, 1987, pp. 193-200.

6. Southern Company Services, Inc. "Demonstration of Innovative Applications of Technology for Cost Reductions to the CT-121 FGD Process. Final Report, Volume 2: Process Evaluation," January 1997.

Appendix A
EMP Monitoring Data Summary Tables

TABLE A-1
AVERAGE PROCESS PARAMETER AND SO_2 DATA: LOW-PARTICULATE TESTS

Test No.	Date	Unit Load, MWe	pH	JBR P, in. WC	Inlet SO_2 ppmv @ 3% O_2	Outlet SO2 ppmv @ 3% O2	SO2 Removal, Percent
Parametric Tests							
P1-1	21-Jan-93	100.7	4.5	8.2	2158	528	75.5
P1-2	22-Jan-93	100.3	4.5	12.1	2185	188	91.4
P1-3	23-Jan-93	100.3	4.5	16.1	2180	63	97.1
P1-4	25-Jan-93	75.4	4.5	8.2	2156	388	82.0
P1-5	26-Jan-93	75.3	4.5	12.3	2166	120	94.5
P1-6	27-Jan-93	75.3	4.5	16.2	2220	49	97.8
P1-7	29-Jan-93	49.7	4.5	8.2	2329	282	87.9
P1-8	30-Jan-93	49.2	4.5	12.2	2323	95	95.9
P1-9	31-Jan-93	49.8	4.5	16.1	2355	46	98.0
P1-10		49.7	5.0	8.2	2388	291	87.8
P1-11		50.4	5.0	12.2	2327	83	96.4
P1-12	05-Feb-93	50.4	5.0	16.2	2262	30	98.7
P1-13		50.7	4.0	8.2	2252	453	79.9
P1-14	09-Feb-93	50.0	4.0	12.2	2322	174	92.5
P1-15		50.2	4.0	16.2	2271	90	96.0
P1-16		75.2	4.0	8.2	2323	692	70.2
P1-17		75.2	4.0	12.2	2328	317	86.4
P1-18	15-Feb-93	75.0	4.0	16.2	2235	144	93.6
P1-19		75.1	5.0	8.2	2513	586	76.7
P1-19R		74.9	5.0	8.1	2293	529	76.9
P1-20		76.4	5.0	12.2	2560	198	92.3
P1-20R		74.6	5.0	12.1	2350	161	93.1
P1-21	21-Feb-93	75.0	5.0	16.2	2509	51	98.0
P1-21R	12-Mar-93	74.7	5.0	16.1	2105	36	98.3
P1-22		99.6	4.5	8.2	2399	757	68.4
P1-23		100.0	4.5	12.1	2449	322	86.9
P1-24	26-Feb-93	99.7	4.5	16.1	2446	123	95.0
P1-25		99.6	5.0	8.1	2263	716	68.4
P1-26		99.6	5.0	12.1	2216	230	89.6
P1-27	04-Mar-93	99.5	5.0	16.1	2205	68	96.9
P1-28	08-Mar-93	99.3	4.0	8.1	2282	726	68.2
P1-29		99.9	4.0	12.1	2231	383	82.8
P1-30		99.7	4.0	16.1	2206	175	92.1
P1-31	16-Mar-93	100.9	4.0	12.1	2131	348	83.7
P1-32	18-Mar-93	100.0	4.5	12.1	2129	320	85.0
P1-33	20-Mar-93	100.7	5.0	12.1	2098	210	90.0
P1-34	22-Mar-93	100.8	5.4	12.1	2151	158	92.7
P1-35	28-Mar-93	99.7	5.3	12.1	2097	276	86.8
P1-36	30-Mar-93	100.1	5.4	12.1	2121	251	88.2

TABLE A-1 (CONTINUED)

Test No.	Date	Unit Load, MWe	pH	JBR P, in. WC	Inlet SO_2 ppmv @ 3% O_2	Outlet SO2 ppmv @ 3% O2	SO2 Removal, Percent
Long-Term Tests—24-hour Averages							
L1-1	01-Apr-93	82.9	4.0	12.2	1972	390	80.3
	02-Apr-93	68.0	4.0	12.3	2175	262	87.9
	03-Apr-93	66.7	4.0	12.3	2177	228	89.5
	04-Apr-93	70.1	4.0	12.2	2142	316	85.3
	05-Apr-93	84.0	4.0	12.2	2051	471	76.9
	06-Apr-93	77.0	4.0	12.2	1939	374	80.8
	07-Apr-93	56.0	4.0	12.2	2032	206	89.8
	08-Apr-93	61.8	4.0	12.2	2061	244	88.2
L1-2	15-Apr-93	53.0	5.4	13.8	1613	45	95.0
	16-Apr-93	76.5	5.0	14.1	1970	58	97.0
	17-Apr-93	73.5	5.0	13.8	2028	101	95.1
	18-Apr-93	70.9	4.9	14.3	2038	98	95.2
	19-Apr-93	84.7	5.0	14.0	2061	144	93.0
	20-Apr-93	79.1	5.0	14.0	2078	141	93.2
	21-Apr-93	81.3	5.0	14.0	2081	143	93.1
	22-Apr-93	84.2	5.0	14.0	2080	136	93.5
	23-Apr-93	78.6	5.1	14.2	1978	98	95.1
	24-Apr-93	71.8	5.0	14.1	2005	96	95.2
	25-Apr-93	64.6	5.0	14.1	2063	92	95.6
	26-Apr-93	72.9	5.0	14.0	2157	147	93.2
	27-Apr-93	61.6	5.1	14.0	2102	93	95.6
	28-Apr-93	50.4	5.0	14.0	2069	78	96.2
L1-3	29-May-93	100.2	4.5	14.1	2041	111	94.6
	30-May-93	100.1	4.5	14.0	2005	109	94.6
	31-May-93	99.9	4.5	13.9	1941	107	94.5
	01-Jun-93	70.9	4.5	14.0	2033	86	95.8
	02-Jun-93	56.6	4.5	14.0	2055	73	96.4
	03-Jun-93	79.6	4.5	14.0	2035	112	94.5
	04-Jun-93	78.1	4.5	14.1	2086	116	94.4
	05-Jun-93	81.4	4.5	14.4	2094	122	94.2
	06-Jun-93	71.0	4.5	14.2	2076	94	95.4
	07-Jun-93	79.6	4.5	14.2	2104	93	95.6
	08-Jun-93	84.6	4.5	14.2	2078	95	95.4
	10-Jun-93	65.6	4.5	14.0	2051	42	97.9
	13-Jun-93	72.8	4.6	14.3	1928	52	97.3
	14-Jun-93	78.4	4.5	14.1	1994	70	96.5
	15-Jun-93	80.0	4.5	14.0	2109	93	95.6
	16-Jun-93	91.3	4.5	14.1	2137	157	92.7
	17-Jun-93	81.5	4.5	14.1	2140	138	93.5
	18-Jun-93	81.6	4.5	14.1	2169	160	92.6
	19-Jun-93	78.2	4.5	14.1	2132	145	93.1

TABLE A-1 (CONTINUED)

Test No.	Date	Unit Load, MWe	pH	JBR P, in. WC	Inlet SO_2 ppmv @ 3% O_2	Outlet SO_2 ppmv @ 3% O_2	SO2 Removal, Percent
L1-3	20-Jun-93	74.9	4.5	14.1	2232	153	93.1
(Cont'd)	21-Jun-93	89.9	4.6	14.1	2281	140	93.9
	22-Jun-93	100.9	4.5	14.1	2120	181	91.6
	23-Jun-93	100.9	4.5	14.1	2175	201	90.8
	24-Jun-93	100.3	4.5	14.1	1988	224	88.7
	25-Jun-93	100.2	4.5	14.1	2128	239	88.8
	26-Jun-93	100.4	4.5	14.1	1917	175	90.6
	30-Jun-93	101.8	4.5	14.1	2227	276	87.6
	01-Jul-93	100.8	4.5	14.1	2200	209	90.5
	02-Jul-93	92.3	4.5	14.2	2206	211	90.4
	03-Jul-93	70.3	4.5	14.1	2206	153	93.0
	04-Jul-93	69.0	4.5	14.1	2264	162	92.9
	05-Jul-93	57.9	4.5	14.1	2279	133	94.2
	06-Jul-93	79.5	4.5	14.1	2295	187	91.9
	07-Jul-93	77.6	4.5	14.1	2308	199	91.4
	08-Jul-93	76.2	4.5	14.1	2323	185	92.0
	09-Jul-93	76.3	4.5	14.1	2356	171	92.8
	10-Jul-93	71.5	4.5	14.1	2254	153	93.2
	11-Jul-93	70.0	4.5	14.1	2216	147	93.4
	12-Jul-93	79.0	4.5	14.1	2290	170	92.6
	13-Jul-93	80.6	4.5	14.1	2263	161	92.9
	14-Jul-93	73.4	4.5	14.1	2214	166	92.5
	15-Jul-93	78.1	4.5	14.1	2078	173	91.7
	16-Jul-93	75.8	4.5	14.1	2152	165	92.4
	17-Jul-93	77.0	4.5	14.2	2207	166	92.4
	18-Jul-93	85.8	4.5	14.2	2276	203	91.0
	19-Jul-93	87.3	4.5	14.1	2180	116	94.7
	20-Jul-93	86.2	4.5	14.1	2227	162	92.8
	21-Jul-93	80.3	4.5	14.2	2260	159	92.9
	23-Jul-93	79.5	4.5	14.1	2228	125	94.4
	24-Jul-93	72.1	4.5	14.1	2144	116	94.6
	25-Jul-93	78.6	4.5	14.1	2105	133	93.7
	26-Jul-93	74.3	4.5	14.1	2269	145	93.6
	28-Jul-93	96.1	4.5	14.1	2182	157	92.8
	29-Jul-93	84.4	4.5	14.1	2098	145	93.1
	30-Jul-93	79.9	4.5	14.1	2002	131	93.5
	31-Jul-93	76.9	4.5	14.1	2070	130	93.8
	01-Aug-93	58.2	4.5	14.1	2002	83	95.9
	02-Aug-93	61.0	4.5	14.1	1904	78	95.9
	03-Aug-93	55.8	4.5	14.1	2003	88	95.6
	04-Aug-93	56.9	4.5	14.1	2032	109	94.6
	05-Aug-93	53.1	4.5	14.1	2000	85	95.7

TABLE A-1 (CONTINUED)

Test No.	Date	Unit Load, MWe	pH	JBR P, in. WC	Inlet SO_2 ppmv @ 3% O_2	Outlet SO2 ppmv @ 3% O2	SO2 Removal, Percent
L1-3	08-Aug-93	63.8	4.5	14.0	2098	86	95.9
(Cont'd)	09-Aug-93	68.7	4.5	14.1	1980	83	95.8
	10-Aug-93	60.3	4.5	14.1	1889	58	96.9
	11-Aug-93	70.6	4.5	14.1	2085	90	95.7
	12-Aug-93	66.9	4.5	14.1	2064	82	96.0
	13-Aug-93	58.5	4.5	14.1	1978	70	96.5
	14-Aug-93	58.9	4.5	14.1	1932	70	96.4
	15-Aug-93	65.0	4.5	14.1	2025	81	96.0
	16-Aug-93	50.5	4.5	14.1	2071	64	96.9
	19-Aug-93	75.1	4.5	14.1	1953	133	93.2
	20-Aug-93	72.0	4.5	14.1	1992	137	93.2
	21-Aug-93	65.5	4.5	14.2	2041	129	93.7
	22-Aug-93	54.2	4.5	14.1	1966	78	96.0
	23-Aug-93	74.6	4.5	14.1	2028	115	94.4
	24-Aug-93	61.7	4.5	14.1	2070	93	95.5
	25-Aug-93	67.1	4.5	14.1	1910	104	94.6
	26-Aug-93	67.0	4.5	14.2	2083	108	94.8
	27-Aug-93	64.9	4.5	14.2	2059	100	95.1
	28-Aug-93	60.5	4.5	14.2	2076	103	95.0
	29-Aug-93	58.5	4.5	14.2	2058	103	95.0
	30-Aug-93	67.9	4.5	14.2	2028	132	93.5
	31-Aug-93	72.6	4.5	14.1	2009	138	93.2
	01-Sep-93	73.5	4.5	14.2	2048	137	93.4
	02-Sep-93	73.5	4.5	14.2	2104	141	93.3
	03-Sep-93	62.3	4.5	14.2	2151	124	94.2
	04-Sep-93	53.0	4.5	14.2	2100	96	95.5
	07-Sep-93	50.3	4.5	14.2	2076	66	96.8
	08-Sep-93	52.2	4.5	14.1	2011	71	96.4
High Removal Tests							
HR1-1		88	4.8	18.2	2260	51	97.8
HR1-2		75	4.8	18.2	2290	58	97.5
HR1-3		50	4.8	18.2	2220	50	97.8
HR1-4		91	4.8	18.2	2080	63	97.0
Alternate Limestone—"Clean" Parametric Tests							
P1B-1		101.3	4.4	10.2	2210	391	82.3
P1B-2		51.0	4.5	16.2	2170	61	97.2
P1B-3		52.3	4.5	10.2	2270	166	92.7
P1B-4		100.7	4.5	16.2	2190	165	92.5
P1B-5		49.8	5.0	16.1	2220	29	98.7
P1B-6		100.6	4.9	16.2	2200	40	98.1
P1B-7		48.7	5.0	10.2	2130	91	95.7
P1B-9		50.8	4.0	16.2	2350	114	94.7

TABLE A-1 (CONTINUED)

Test No.	Date	Unit Load, MWe	pH	JBR P, in. WC	Inlet SO_2 ppmv @ 3% O_2	Outlet SO_2 ppmv @ 3% O_2	SO_2 Removal, Percent
P1B-10		101.6	4.0	10.2	2270	572	74.8
P1B-11		100.1	4.0	16.2	2110	156	92.6
P1B-12		49.7	4.0	10.2	2080	216	89.7
P1B-13		80.4	5.1	16.2	2270	63	97.2
Alternate Limestone—Load-Following							
AL1-1		55.5	4.8	14.2	2250	95	95.8
AL1-2		59.7	4.0	10.1	1810	180	90.5
Alternate Coal Parametric Tests							
AC1-1		49.5	4.0	10.2	3560	670	81.1
AC1-2		49.9	4.0	16.1	3700	250	93.3
AC1-3		75.0	4.0	16.1	3580	NA	NA
AC1-4		74.4	4.0	16.1	3390	380	88.7
AC1-5		46.2	4.5	16.1	3610	210	94.2
AC1-6		75.0	4.5	16.1	3510	250	92.9
AC1-7		75.0	4.5	10.1	3660	NA	NA
AC1-8		49.6	4.5	10.1	3700	690	81.4
AC1-9		50.9	5.0	16.2	3760	100	97.2
AC1-10		75.5	5.0	10.2	3820	810	79.0
AC1-11		74.7	5.0	16.2	3590	200	94.5
AC1-12		49.5	5.0	10.2	3490	470	86.4

NA = Not available due to CEM output range limitations.

TABLE A-2
AVERAGE PROCESS PARAMETERS AND SO_2 DATA: HIGH-PARTICULATE TESTS

Test No.	Date	Unit Load, MWe	pH	JBR ΔP, in. WC	Inlet SO_2, ppmv @ 3% O_2	Outlet SO2, ppmv @ 3% O2	ESP Efficiency, %	SO2 Removal, %
Parametric Tests								
P2-1	17 Mar 1994	50.3	4.5	10.2	2173	150	95	93.1
P2-2	18 Mar 1994	50.9	4.5	16.3	2168	28	95	98.7
P2-3	19 Mar 1994	100.0	4.5	10.3	2198	407	95	81.5
P2-4	20 Mar 1994	100.2	4.5	16.3	2134	93	95	95.7
P2-5	22 Mar 1994	100.5	4.0	16.2	2133	205	90	90.4
P2-6	24 Mar 1994	100.6	3.5	10.1	2081	682	0	67.3
P2-7	25 Mar 1994	98.8	3.5	15.9	2117	217	0	89.8
P2-8	26 Mar 1994	47.5	3.5	10.2	2084	219	0	89.5
P2-9	27 Mar 1994	50.3	3.5	16.2	2065	71	0	96.6
P2-10	Apr 1994	50.0	3.8	13.2	2254	110	0	95.1
P2-11	Apr 1994	74.9	3.8	13.2	2369	160	0	93.3
P2-12	Apr 1994	98.5	3.8	13.1	2348	328	0	86.0
P2-13	Apr 1994	52.4	4.1	10.2	2256	212	0	90.6
P2-14	Apr 1994	51.9	4.0	13.2	2187	97	0	95.6
P2-15	Apr 1994	49.8	4.0	16.1	2158	36	0	98.3
P2-16	May 1994	50.4	3.6	10.2	2277	424	0	81.4
P2-17	May 1994	50.3	3.5	13.2	2405	264	0	89.0
P2-18	May 1994	50.3	3.5	16.2	2438	165	0	93.2
P2-19	May 1994	75.6	3.6	10.2	2397	497	0	79.3
P2-20	May 1994	76.1	3.6	13.2	2351	245	0	89.6
P2-21	May 1994	75.7	3.6	16.2	2204	118	0	94.7
P2-22	May 1994	75.2	4.1	10.2	2209	549	0	75.2
P2-23	May 1994	75.4	4.0	13.2	2225	283	0	87.3
P2-24	May 1994	74.2	4.0	16.2	2429	364	0	85.0
P2-25	May 1994	100.6	3.7	10.2	2452	1171	0	52.3
P2-26	May 1994	101.5	3.7	13.2	2448	820	0	66.5
P2-27	May 1994	101.9	3.8	16.1	2352	503	0	78.6
P2-28	May 1994	100.6	4.0	10.2	2270	1019	0	55.1
P2-29	May 1994	99.8	4.0	13.1	2301	678	0	70.5
P2-30	May 1994	100.6	4.0	16.2	2316	389	0	83.2
P2-31	May 1994	100.0	3.5	10.2	2351	1196	0	49.1
P2-32	Apr 1994	100.9	3.5	13.1	2194	505	0	77.0
P2-33	Apr 1994	100.0	3.6	16.1	2169	259	0	88.0
P2-33R	May 1994	100.7	3.5	16.2	2326	571	0	75.4
Long-Term Tests								
L2-2	08-Jun-94	73.0	4.0	14.2	2184	122	90	94.4
	09-Jun-94	59.6	4.1	14.2	2200	101	90	95.4
	10-Jun-94	54.1	4.1	14.2	2221	80	90	96.4
	11-Jun-94	53.6	4.1	14.2	2229	78	90	96.5

TABLE A-2 (CONTINUED)

Test No.	Date	Unit Load, MWe	pH	JBR ΔP, in. WC	Inlet SO_2, ppmv @ 3% O_2	Outlet SO2, ppmv @ 3% O2	ESP Efficiency, %	SO2 Removal, %
L2-2 (Cont'd)	12-Jun-94	56.2	4.1	14.2	2228	87	90	96.1
	13-Jun-94	81.3	4.0	14.2	2216	197	90	91.1
	15-Jun-94	90.2	4.0	14.1	2185	238	90	89.1
	16-Jun-94	60.4	4.1	14.2	2203	117	90	94.7
	17-Jun-94	60.9	4.1	14.2	2135	109	90	94.9
	20-Jun-94	82.7	4.1	14.2	2023	160	90	92.1
	21-Jun-94	78.1	4.0	14.2	1978	158	90	92.0
	22-Jun-94	71.3	4.0	14.2	1982	143	90	92.8
	23-Jun-94	68.0	4.0	14.1	2002	136	90	93.2
	24-Jun-94	53.5	4.0	14.1	2076	98	90	95.3
	25-Jun-94	51.3	4.0	14.1	2066	99	90	95.2
	26-Jun-94	57.4	4.0	14.1	2165	134	90	93.8
	27-Jun-94	51.8	4.0	14.1	2136	105	90	95.1
	28-Jun-94	68.5	4.0	14.1	2164	182	90	91.6
	29-Jun-94	51.2	4.0	14.1	2175	115	90	94.7
	30-Jun-94	52.9	4.0	14.1	2182	111	90	94.9
	01-Jul-94	54.3	4.0	14.1	2205	112	90	94.9
	02-Jul-94	54.2	4.0	14.1	2207	113	90	94.9
	06-Jul-94	52.8	4.0	14.1	1852	52	90	97.2
	07-Jul-94	53.3	4.0	14.1	1972	69	90	96.5
	08-Jul-94	53.5	4.0	14.1	1998	86	90	95.7
	09-Jul-94	51.7	4.0	14.1	2194	108	90	95.1
	10-Jul-94	52.7	4.0	14.1	2077	102	90	95.1
	11-Jul-94	55.4	4.0	14.1	1935	99	90	94.9
	12-Jul-94	51.2	4.0	14.1	1915	86	90	95.5
	13-Jul-94	53.1	4.0	14.1	1968	81	90	95.9
	14-Jul-94	52.6	4.0	14.1	1970	77	90	96.1
	15-Jul-94	56.5	4.0	14.1	1968	83	90	95.8
	16-Jul-94	55.1	4.0	14.1	2111	91	90	95.7
	17-Jul-94	53.8	4.0	14.1	2126	113	90	94.7
	18-Jul-94	66.7	4.0	14.1	2011	171	90	91.5
	19-Jul-94	68.4	4.0	14.1	2075	187	90	91.0
	20-Jul-94	75.7	4.0	14.1	2059	179	90	91.3
	21-Jul-94	64.1	4.0	14.1	1974	152	90	92.3
	22-Jul-94	53.1	4.0	14.1	1971	106	90	94.6
	23-Jul-94	69.9	4.0	14.1	1945	198	90	89.8
	24-Jul-94	58.4	4.0	14.1	1929	133	90	93.1
	25-Jul-94	59.6	4.0	14.1	1870	133	90	92.9
	26-Jul-94	53.8	4.0	14.1	1908	114	90	94.0
	27-Jul-94	53.5	4.0	14.1	1918	96	90	95.0
	28-Jul-94	50.6	4.0	14.1	1985	91	90	95.4
	29-Jul-94	49.0	4.0	14.1	2054	113	90	94.5

TABLE A-2 (CONTINUED)

Test No.	Date	Unit Load, MWe	pH	JBR ΔP, in. WC	Inlet SO_2, ppmv @ 3% O_2	Outlet SO2, ppmv @ 3% O2	ESP Efficiency, %	SO2 Removal, %
L2-2	30-Jul-94	48.7	4.0	14.1	2065	132	90	93.6
(Cont'd)	31-Jul-94	49.1	4.0	14.1	2041	169	90	91.7
	01-Aug-94	49.4	4.0	14.1	2045	172	90	91.6
	02-Aug-94	61.3	4.0	14.1	2106	297	90	85.9
	03-Aug-94	53.4	4.0	14.1	2084	208	90	90.0
	04-Aug-94	64.1	4.0	14.1	1968	307	90	84.4
	05-Aug-94	53.6	4.0	14.1	1962	182	90	90.7
	06-Aug-94	61.3	4.0	14.1	1901	262	90	86.2
	07-Aug-94	53.0	4.0	14.1	1977	200	90	89.9
	10-Aug-94	58.0	4.0	14.1	1833	165	90	91.0
	11-Aug-94	66.3	4.0	14.2	1873	229	90	87.8
	12-Aug-94	55.4	4.0	14.1	1908	139	90	92.7
	15-Aug-94	53.8	4.0	14.1	1853	169	90	90.9
	16-Aug-94	51.7	4.0	14.1	1870	157	90	91.6
L2-3	17-Aug-94	66.7	4.0	14.1	1886	240	90	87.3
	18-Aug-94	60.6	4.0	14.1	1870	174	90	90.7
	19-Aug-94	54.1	4.0	14.1	1897	150	90	92.1
	20-Aug-94	75.0	4.0	14.1	1781	258	90	85.5
	21-Aug-94	47.0	4.0	14.1	1761	114	90	93.5
	22-Aug-94	50.9	4.0	14.1	1764	129	90	92.7
	23-Aug-94	57.7	4.0	14.1	1972	229	90	88.4
	24-Aug-94	56.9	4.0	14.1	1926	191	90	90.1
	25-Aug-94	57.2	4.0	14.1	1990	207	90	89.6
	26-Aug-94	62.6	4.0	14.2	2083	283	90	86.4
High Removal Tests								
HR2-1	Sept 1994	100.7	4.0	20.1	909	17		98.1
HR2-2	Sept 1994	75.1	4.0	20.1	992	6		99.4
HR2-3	Sept 1994	52.7	4.0	20.1	977	17		98.3
HR2-4	Sept 1994	58.9	4.0	20.1	984	14		98.6
Alternate Coal Tests								
AC2-1	Oct 1994	101.1	4.0	14.1	2949	487		83.5
AC2-2	Oct 1994	75.2	4.0	14.1	3016	293		90.3
AC2-3	Oct 1994	51.1	4.0	14.1	2921	196		93.3
AC2-4	Oct 1994	100.2	4.0	10.1	2920	1124		61.5
AC2-5	Oct 1994	75.2	4.0	10.1	3035	677		77.7
AC2-5R	Oct 1994	75.1	4.0	10.1	3011	753		75.0
AC2-6	Oct 1994	50.9	4.0	10.1	3006	421		86.0
AC2-7	Oct 1994	100.5	4.0	18.1	2990	221		92.6
AC2-8	Oct 1994	75.9	4.0	18.1	3036	140		95.4
AC2-9	Oct 1994	49.9	4.0	18.1	3029	58		98.1
AC2-10	Oct 1994	78.0	4.0	14.1	2759	414		85.0

TABLE A-2 (CONTINUED)

Test No.	Date	Unit Load, MWe	pH	JBR ΔP, in. WC	Inlet SO_2, ppmv @ 3% O_2	Outlet SO2, ppmv @ 3% O2	ESP Efficiency, %	SO2 Removal, %
Alternate Limestone Tests								
AL2-1	Dec 1994	100.4	4.0	18.1	1008	22		97.8
AL2-1R	Dec 1994	100.8	4.0	18.1	979	20		98.0
AL2-2	Dec 1994	99.5	4.0	10.1	955	71		92.6
AL2-3	Dec 1994	50.9	4.0	18.1	1022	24		97.7
AL2-3R	Dec 1994	50.4	4.0	18.1	996	10		99.0
AL2-4	Dec 1994	50.7	4.0	10.1	905	36		96.0
AL2-5	Dec 1994	82.2	3.80	14.1	893	25		97.2
AL2-6	Dec 1994	50.0	3.75	14.1	919	27		97.1
AL2-7	Dec 1994	75.4	3.75	14.1	961	32		96.7
AL2-8	Dec 1994	100.1	3.75	14.1	920	29		96.9
AL2-9	Dec 1994	100.5	3.75	10.1	903	67		92.6
AL2-10	Dec 1994	75.3	3.75	10.1	877	45		94.9
AL2-11	Dec 1994	50.1	3.75	10.1	842	41		95.1
AL2-12	Dec 1994	50.0	3.75	18.1	919	22		97.6
AL2-13	Dec 1994	76.9	3.75	18.1	750	20		97.4
AL2-14	Dec 1994	100.4	3.75	18.1	875	19		97.8

TABLE A-3
JBR INLET GAS PM LOADING AND
MOISTURE: LOW-PARTICULATE PARAMETRIC TESTS

Test ID/ Date	Time	Load, MWe	Gas Flow, kacfm	H_2O, vol. %	PM Loading	
					gr/acf	lb/MMBtu
P1-1 21-Jan-93	1119-1237	100	452	6.0	0.0216	0.077
	1325-1410	100	465	7.6	0.0200	0.073
	1631-1744	100	460	6.4	0.0256	0.092
	Mean	100	459	6.7	0.0224	0.081
P1-2 22 -Jan-93	0741-0851	100	452	8.9	0.0216	0.077
	0950-1103	100	454	7.4	0.0250	0.089
	1221-1332	100	465	8.6	0.0251	0.090
	Mean	100	457	8.3	0.0239	0.085
P1-3 23-Jan-93	0731-0845	100	466	6.0	0.0333	0.118
	1004-1124	100	469	7.8	0.0297	0.109
	1235-1350	100	464	7.6	0.0310	0.115
	Mean	100	466	7.1	0.0313	0.114
P1-4 25-Jan-93	0800-0918	75	364	7.2	0.0337	0.128
	1107-1217	75	362	7.0	0.0227	0.087
	1328-1443	75	372	8.0	0.0184	0.070
	Mean	75	366	7.4	0.0249	0.095
P1-5 26-Jan-93	0804-1052	75	452	6.5	0.0216	0.077
	1200-1316	75	386	7.2	0.0167	0.067
	1409-1520	75	374	6.9	0.0181	0.071
	Mean	75	404	6.9	0.0188	0.072
P1-6 27-Jan-93	0706-0820	75	376	6.7	0.0113	0.043
	0916-1026	75	368	6.0	0.0108	0.041
	1208-1319	75	367	7.4	0.0107	0.041
	Mean	75	370	6.7	0.0109	0.042
P1-7 29-Jan-93	0722-0832	50	264	6.9	0.0077	0.033
	0946-1054	50	267	6.9	0.0422	0.173
	1215-1324	50	287	6.6	0.0132	0.054
	Mean	50	273	6.8	0.0210	0.087
P1-8 30-Jan-93	0708-0819	50	262	7.2	0.0054	0.021
	0934-1043	50	259	7.9	0.0079	0.033
	1213-1328	50	264	7.8	0.0036	0.015
	Mean	50	262	7.6	0.0056	0.023
P1-9 31-Jan-93	0658-0808	50	266	5.5	0.0055	0.022
	0900-1009	50	261	6.4	0.0043	0.018
	1107-1217	50	260	6.4	0.0045	0.018
	Mean	50	262	6.1	0.0048	0.019

TABLE A-4
JBR INLET GAS PM LOADING AND
MOISTURE: HIGH-PARTICULATE PARAMETRIC TESTS

Test ID/ Date	Time	Load, MWe	Gas Flow, kacfm	H_2O, vol. %	PM Loading	
					gr/acf	lb/MMBtu
P2-1 17-Mar-94	0957-1113	50	269	7.9	0.0398	0.148
	1251-1406	50	254	8.1	0.0455	0.187
	1538-1653	50	263	7.2	0.0643	0.254
	Mean	50	262	7.7	0.0499	0.196
P2-2 18-Mar-94	0810-0927	50	250	6.4	0.0433	0.163
	1115-1226	50	253	7.4	0.0435	0.167
	1512-1625	50	251	6.6	0.0459	0.175
	Mean	50	251	6.8	0.0442	0.168
P2-3 19-Mar-94	0941-1049	100	401	7.6	0.1466	0.485
	1324-1457	100	401	6.6	0.1300	0.417
	1550-1706	100	407	7.0	0.1183	0.399
	Mean	100	403	7.1	0.1316	0.434
P2-4 20-Mar-94	0840-0949	100	391	7.4	0.1645	0.528
	1104-1216	100	394	7.2	0.1720	0.549
	1333-1504	100	393	7.8	0.1543	0.498
	Mean	100	393	7.5	0.1636	0.525
P2-5 22-Mar-94	1026-1136	100	403	8.2	0.3560	1.159
	1238-1356	100	398	6.4	0.1712	0.548
	1456-1605	100	401	5.8	0.2154	0.749
	Mean	100	401	6.8	0.2475	0.819
P2-6 24-Mar-94	0800-0910	100	399	5.5	1.5680	4.906
	1027-1134	100	400	8.0	1.7197	5.590
	1415-1522	100	396	7.7	2.0841	6.838
	Mean	100	398	7.1	1.7906	5.778
P2-7 25-Mar-94	0809-0933	100	414	7.7	1.8475	6.139
	1134-1242	100	413	6.9	1.4898	5.248
	1339-14047	100	412	7.1	1.3492	4.493
	Mean	100	413	7.2	1.5622	5.293
P2-8 26-Mar-94	0819-0935	50	241	6.4	1.2250	4.047
	1049-1157	50	242	6.0	1.4400	5.728
	1247-1353	50	236	7.7	1.3973	5.364
	Mean	50	240	6.7	1.3541	5.046
P2-9 27-Mar-94	0748-0856	50	241	5.9	1.2939	4.602
	0948-1155	50	244	7.8	1.6893	6.547
	1125-1232	50	243	6.2	0.9785	3.634
	Mean	50	243	6.6	1.3206	4.927

TABLE A-5

JBR INLET GAS SULFUR SPECIES AND MOISTURE: LOW-PARTICULATE TESTS

Test ID/ Date	Time	Load, MWe	Flue Gas Temp, °F	SO_2, ppmv @ 3% O_2	SO3, ppmv @ 3% O_2	H_2O, vol. %
P1-1	1052-1105	100	254	2224	3.4	
21-Jan-93	1128-1142	100	255	2251	4.4	
	1332-1345	100	257	2358	3.8	
	1408-1421	100	257	2311	3.3	
	Mean	100	256	2286	3.7	
	1435	100	260			7.4
P1-2	0825-0838	100	260	2275	4.1	
22-Jan-93	0901-0914	100	261	2335	3.2	
	0934-0947	100	260	2257	3.2	
	1103-1116	100	261	2285	3.2	
	Mean	100	261	2288	3.4	
	1129	100	265			7.8
P1-3	0821-0834	100	256	2307	3.3	
23-Jan-93	0858-0911	100	255	2288	3.2	
	0936-0949	100	258	2244	3.2	
	1106-1119	100	258	2227	3.5	
	Mean	100	257	2267	3.3	
	1134	100	260			6.7
P1-4	0916-0929	75	241	2241	2.3	
25-Jan-93	0952-1005	75	242	2255	2.4	
	1025-1038	75	241	2285	2.6	
	1212-1225	75	244	2335	2.8	
	Mean	75	242	2279	2.5	
	1239	75	244			6.8
P1-5	1049-1102	75	243	2239	2.8	
26-Jan-93	1122-1135	75	243	2162	2.9	
	1154-1207	75	244	2162	2.9	
	Mean	75	243	2188	2.9	
	1220	75	245			6.2
P1-6	0752-0805	75	237	2298	2.6	
27-Jan-93	0829-0842	75	239	2318	2.6	
	0904-0916	75	238	2354	2.8	
	1054-1107	75	242	2286	3.0	
	Mean	75	239	2314	2.8	
	1120	75	244			6.5

TABLE A-5 (CONTINUED)

Test ID/ Date	Time	Load, MWe	Flue Gas Temp, °F	SO_2, ppmv @ 3% O_2	SO3, ppmv @ 3% O_2	H_2O, vol. %
P1-7	0807-0819	50	235	2364	2.2	
29-Jan-93	0839-0852	50	236	2352	1.5	
	0912-0925	50	237	2374	1.9	
	1047-1059	50	239	2414	2.0	
	Mean	50	237	2376	1.9	
	1113	50	240			6.1
P1-8	0756-0809	50	237	2458	2.1	
30-Jan-93	0832-0844	50	237	2429	1.9	
	0906-0919	50	239	2421	2.0	
	1046-1054	50	242	2468	3.3	
	Mean	50	239	2444	2.3	
	1108	50	242			5.6
P1-9	0741-0753	50	239	2423	3.5	
31-Jan-93	0823-0835	50	239	2411	3.8	
	1003-1015	50	241	2428	4.0	
	Mean	50	240	2421	3.8	
	1030	50				5.7

TABLE A-6
JBR INLET GAS SULFUR SPECIES AND MOISTURE: HIGH-PARTICULATE TESTS

Test ID/ Date	Time	Load, MWe	Flue Gas Temp, °F	SO_2, ppmv @ 3% O_2	SO3, ppmv @ 3% O_2	H_2O, vol. %
P2-1	0948-1005	50	224	2153		
17-Mar-94	1057-1111	50	225	2179	1.33	
	1149-1203	50	227	2169	1.74	
	1242-1256	50	228	2138	1.82	5.1
	Mean	50	226	2160	1.63	
P2-2	0919-0935	50	234	2286	1.76	
18-Mar-94	1010-1030	50	230	2159	1.13	
	1112-1125	50	230	2278	1.45	
	1153-1206	50	230	2273	1.20	6.5
	Mean	50	231	2249	1.38	
P2-3	0852-0904	100	248	2356	1.98	
19-Mar-94	0941-0955	100	256	2304	2.11	
	1047-1100	100	256	2340	1.98	
	1134-1147	100	257	2282	1.66	7.2
	Mean	100	254	2321	1.93	
P2-4	0905-0915	100	255	2311	1.53	
20-Mar-94	0945-0958	100	256	2189	1.91	
	1035-1047	100	257	2243	1.78	
	1118-1130	100	258	2224	1.55	7.8
	Mean	100	257	2242	1.69	
P2-5	0827-0844	100	256	2223	1.29	
22-Mar-94	0913-0930	100	256	2220	1.60	
	1016-1033	100	256	2208	1.58	
	1104-1121	100	256	2221	1.70	6.3
	Mean	100	256	2218	1.54	
P2-6	0843-0859	100	259	2194	1.18	
24-Mar-94	0933-0949	100	260	2145	1.40	
	1034-1056	100	261	2177	1.56	
	1125-1143	100	261	2189	1.56	7.8
	Mean	100	260	2176	1.43	
P2-7	0839-0858	100	254	2192	0.67	
25-Mar-94	0934-0951	100	255	2211	0.97	
	1028-1046	100	254	2153	0.78	
	1118-1137	100	254	2174	1.10	
	Mean	100	254	2182	0.88	
P2-8	0833-0850	50	241	2196	1.38	
26-Mar-94	0917-0934	50	242	2205	1.46	
	1014-1031	50	243	2180	1.71	
	1057-1113	50	244	2089	1.62	5.4
	Mean	50	243	2168	1.54	
P2-9	0823-0839	50	252	2270	0.97	
27-Mar-94	0905-0921	50	253	2214	1.14	
	0949-1006	50	253	2267	1.64	
	1053-1109	50	255	2162	1.74	
	Mean	50	253	2228	1.38	

TABLE A-7
STACK GAS PM LOADING AND
MOISTURE: LOW-PARTICULATE PARAMETRIC TESTS

Date	Time	Load, MWe	Gas Flow, kacfm	H_2O, vol. %	PM Loading	
					gr/acf	lb/MMBtu
21-Jan-93	1116-1233	100	377	12.0	0.0034	0.011
	1518-1639	100	383	11.1	0.0025	0.007
	1636-1758	100	383	12.2	0.0025	0.008
	Mean	100	381	11.8	0.0028	0.009
22-Jan-93	0737-0845	100	377	13.2	0.0034	0.011
	0952-1103	100	381	12.8	0.0038	0.012
	1219-1426	100	383	13.1	0.0031	0.009
	Mean	100	380	13.0	0.0034	0.011
23-Jan-93	0730-0838	100	388	12.0	0.0026	0.008
	1022-1128	100	382	12.0	0.0048	0.014
	1238-1343	100	379	12.0	0.0030	0.009
	Mean	100	383	12.0	0.0035	0.010
25-Jan-93	0829-0937	75	315	12.0	0.0031	0.010
	1110-1219	75	311	12.0	0.0030	0.010
	1331-1439	75	312	12.2	0.0036	0.011
	Mean	75	313	12.1	0.0032	0.010
26-Jan-93	0808-1108	75	377	11.0	0.0034	0.011
	1205-1312	75	308	10.6	0.0023	0.007
	1404-1511	75	299	11.2	0.0024	0.007
	Mean	75	328	10.9	0.0027	0.008
27-Jan-93	0704-0811	75	305	10.9	0.0013	0.005
	0917-1027	75	303	11.7	0.0018	0.006
	1132-1250	75	299	11.6	0.0018	0.006
	Mean	75	302	11.4	0.0016	0.006
29-Jan-93	0723-0831	50	226	9.0	0.0030	0.010
	0946-1114	50	221	11.8	0.0017	0.006
	1217-1330	50	224	9.6	0.0027	0.009
	Mean	50	224	10.1	0.0025	0.008
30-Jan-93	0709-0817	50	220	11.3	0.0022	0.007
	0942-1057	50	218	10.9	0.0024	0.008
	1222-1331	50	225	10.9	0.0011	0.004
	Mean	50	221	11.0	0.0019	0.006
31-Jan-93	0657-0805	50	229	10.9	0.0022	0.008
	0902-1011	50	231	10.2	0.0014	0.005
	1144-1252	50	234	10.9	0.0014	0.005
	Mean	50	231	10.7	0.0017	0.006

TABLE A-8
STACK GAS PM LOADING AND
MOISTURE: HIGH-PARTICULATE PARAMETRIC TESTS

Test ID/ Date	Time	Load, MWe	Gas Flow, kacfm	H_2O, vol. %	PM Loading	
					gr/acf	lb/MMBtu
P2-1 17-Mar-94	1007-1121	50	234	8.6	0.0034	0.013
	1256-1415	50	225	9.3	0.0037	0.013
	1542-1822	50	239	10.6	0.0028	0.012
	Mean	50	233	9.5	0.0033	0.013
P2-2 18-Mar-94	0815-0925	50	221	11.0	0.0046	0.017
	1115-1233	50	225	9.3	0.0024	0.008
	1513-1704	50	222	12.2	0.0023	0.008
	Mean	50	223	10.8	0.0031	0.011
P2-3 19-Mar-94	0921-1045	100	343	11.0	0.0066	0.019
	1215-1406	100	332	13.3	0.0076	0.021
	1400-1512	100	339	13.2	0.0043	0.012
	Mean	100	338	12.5	0.0062	0.017
P2-4 20-Mar-94	0830-0941	100	334	10.2	0.0033	0.009
	1125-1238	100	334	13.3	0.0040	0.011
	1310-1416	100	343	12.5	0.0033	0.009
	Mean	100	337	12.0	0.0035	0.010
P2-5 22-Mar-94	0818-0928	100	334	11.6	0.0059	0.017
	1112-1220	100	340	14.0	0.0055	0.015
	1257-1405	100	334	13.5	0.0044	0.012
	Mean	100	336	13.0	0.0053	0.015
P2-6 24-Mar-94	0809-0919	100	340	14.7	0.0168	0.048
	1030-1205	100	343	14.5	0.0171	0.049
	1240-1422	100	345	14.4	0.0178	0.051
	Mean	100	343	14.5	0.0172	0.049
P2-7 25-Mar-94	0807-0917	100	350	14.5	0.0121	0.036
	1022-1132	100	350	13.3	0.0142	0.042
	1202-1312	100	347	14.1	0.0163	0.048
	Mean	100	349	14.0	0.0142	0.042
P2-8 26-Mar-94	0828-0937	50	208	9.1	0.0154	0.050
	1046-1153	50	210	10.6	0.0170	0.058
	1225-1330	50	210	11.9	0.0177	0.061
	Mean	50	209	10.5	0.0167	0.056
P2-9 27-Mar-94	0758-0907	50	213	11.5	0.0140	0.046
	0956-1114	50	221	12.8	0.0166	0.057
	1144-1250	50	216	12.5	0.0126	0.043
	Mean	50	217	12.3	0.0144	0.048

TABLE A-9
STACK GAS SULFUR SPECIES AND
MOISTURE: LOW-PARTICULATE PARAMETRIC TESTS

Date	Time	Load, MWe	Flue Gas Temp, °F	SO_2, ppmv @ 3% O_2	SO_3, ppmv @ 3% O_2	H_2O, vol. %
21-Jan-93	1052-1107	100	122	537	2.8	
	1128-1142	100	121	517	2.7	
	1332-1347	100	120	508	2.7	
	1408-1413	100	121	588	2.7	
	Mean	100	121	538	2.7	
	1435	100	120			12.4
22-Jan-93	0825-0838	100	121	223	2.7	
	0901-0914	100	123	208	2.7	
	0934-0948	100	124	195	2.7	
	1103-1116	100	122	193	2.5	
	Mean	100	123	205	2.7	
	1132	100	122			13.5
23-Jan-93	0821-0840	100	120	91	2.2	
	0859-0919	100	120	67	2.3	
	0936-0954	100	120	67	2.3	
	1106-1123	100	119	60	2.4	
	Mean	100	120	71	2.3	
	1133	100	119			12.3
25-Jan-93	0917-0931	75	117	370	2.6	
	0953-1007	75	117	422	2.6	
	1025-1039	75	116	385	2.8	
	1212-1226	75	117	361	2.1	
	Mean	75	117	385	2.5	
	1103	75	117			10.8
26-Jan-93	1049-1103	75	116	122	3.4	
	1122-1136	75	116	140	3.4	
	1154-1208	75	115	121	3.4	
	Mean	75	116	128	3.4	
	1215	75	116			11
27-Jan-93	0752-0810	75	116	49	3.0	
	0829-0846	75	117	48	3.0	
	0904-0922	75	118	49	3.0	
	1054-1111	75	117	49	2.8	
	Mean	75	117	49	3.0	
	1115	75	117			11.8
29-Jan-93	0807-0821	50	115	303	1.7	
	0840-0854	50	115	312	1.7	
	0913-0926	50	114	314	1.7	
	1048-1100	50	115	314	1.5	
	Mean	50	115	311	1.7	
	1105	50	115			10.1
30-Jan-93	0756-0814	50	114	101	1.6	
	0832-0849	50	114	106	1.6	
	0906-0923	50	115	111	1.2	
	1047-1104	50	115	107	1.8	
	Mean	50	115	106	1.6	
	1108	50	115			9.5

TABLE A-9 (CONTINUED)

Date	Time	Load, MWe	Flue Gas Temp, °F	SO_2, ppmv @ 3% O_2	SO_3, ppmv @ 3% O_2	H_2O, vol. %
31-Jan-93	0742-0804	50	112	47	2.3	
	0824-0845	50	112	43	2.4	
	1004-1025	50	114	45	2.3	
	Mean	50	113	45	2.3	
	1030	50	114			10.5

TABLE A-10
STACK GAS SULFUR SPECIES AND
MOISTURE: HIGH-PARTICULATE PARAMETRIC TESTS

Date	Time	Load, MWe	Flue Gas Temp, °F	SO_2, ppmv @ 3% O_2	SO3, ppmv @ 3% O_2	H_2O, vol. %
P2-1 17-Mar-94	0950-1003	50	112	231		
	1149-1110	50	111	250	2.10	
	1149-1210	50	111	220	2.94	
	1242-1255	50	111	221	3.13	9.8
	Mean	50	111	230	2.72	
P2-2 18-Mar-94	0825-0838	50	113	46		
	0901-0914	50	114	55	2.14	
	0934-0948	50	114	52	2.53	
	1103-1116	50	115	49	1.81	11.1
	Mean	50	114	50	2.16	
P2-3 19-Mar-94	0848-0901	100	117	427		
	0941-0955	100	118	432	2.71	
	1047-1100	100	119	441	2.51	
	1134-1147	100	119	439	3.66	12.0
	Mean	100	118	435	2.96	
P2-4 20-Mar-94	0904-0914	100	120	111	0.94	
	0944-0954	100	119	119	1.27	
	1033-1047	100	119	121	1.02	
	1116-1130	100	122	120	0.83	12.7
	Mean	100	120	118	1.02	
P2-5 22-Mar-94	0826-0842	100	119	117	3.39	
	0912-0928	100	120	131	0.80	
	1015-1031	100	119	122	0.71	
	1103-1118	100	119	136	0.39	12.4
	Mean	100	119	127	1.32	
P2-6 24-Mar-94	0841-0856	100	122	662	0.71	
	0931-0936	100	123	677	0.83	
	1038-1053	100	123	713	0.35	
	1124-1139	100	123	717	0.36	13.4
	Mean	100	123	692	0.56	
P2-7 25-Mar-94	0834-0854	100	121	215	0.59	
	0933-0947	100	123	253	<0.2	
	1027-1042	100	122	258	<0.2	
	1118-1134	100	122	261	<0.2	12.7
	Mean	100	122	247	<0.26	
P2-8 26-Mar-94	0832-0847	50	112	189	<0.2	
	0916-0931	50	113	225	<0.2	
	1013-1028	50	116	234	<0.2	
	1056-1111	50	114	256	<0.2	11.0
	Mean	50	114	226	<0.2	
P2-9 27-Mar-94	0822-0838	50	119	100	<0.2	
	0904-0921	50	120	98	0.36	
	0948-1005	50	120	97	0.67	
	1052-1108	50	119	361	0.60	11.9
	Mean	50	120	164	0.41	

TABLE A-11
MAKEUP WATER ANALYSES: LOW-PARTICULATE TEST PERIOD

Test ID	Date	pH	Liquid Phase, mg/L			
			Carbonate	Sulfite	Sulfate	Chloride
L1-3	06-Jun-93	6.75		0.8	46	42
L1-3	09-Aug-93	6.08	36	0.8	152	22
HR1-4	04-Oct-93				67	35
AL1-1	10-Jan-94	7.36			13	37
AC1-10	14-Feb-94				110	138

TABLE A-12
MAKEUP WATER ANALYSES: HIGH-PARTICULATE TEST PERIOD

Test ID	Date	pH	Liquid Phase, mg/L			
			Carbonate	Sulfite	Sulfate	Chloride
P2-15	25-Apr-94	5.95	0.0	0.0	114	238
L2-1	30-May-94	—	—	—	72	257
	01-Jun-94	—	—	—	72	257
L2-2	27-Jun-94	4.95	—	—	125	52
	07-Jul-94	—	73.8	0.0	116	113
	10-Aug-94	5.65	0.0	0.0	130	151
HR2-2	12-Sep-94	4.61	0.0	0.0	147	1685
AC2-10	24-Oct-94	—	—	—	84	13
AL2-3	06-Dec-94	—	—	0.0	84	53

TABLE A-13
GYPSUM STACK RETURN ANALYSES: LOW-PARTICULATE TEST PERIOD

Test ID	Date	pH	Liquid Phase, mg/L Carbonate	Sulfate	Chloride
Parametric Tests					
P1-2	22-Jan-93	6.5	12	1,593	7,179
P1-6	27-Jan-93	6.0	12	835	11,615
P1-9	01-Feb-93	5.7	12	800	12,382
P1-12	05-Feb-93	6.2	12	624	9,256
P1-14	09-Feb-93	6.5	12	737	8,370
P1-18	15-Feb-93	6.4	12	747	9,883
P1-21	21-Feb-93	6.3	12	649	8,945
P1-24	26-Feb-93	6.9	12	668	10,304
P1-27	04-Mar-93	6.6	96	780	11,912
P1-28	08-Mar-93	6.6	96	354	10,636
P1-21R	12-Mar-93	6.7	96	815	13,898
P1-31	16-Mar-93	6.7	96	778	13,118
P1-32	18-Mar-93	6.6	96	765	14,429
P1-33	20-Mar-93	6.4	96	761	15,777
P1-34	22-Mar-93	6.6	96	811	15,777
P1-35	28-Mar-93	6.5	96	726	15,989
P1-36	30-Mar-93	6.8	96	1,085	9,785
Long-Term Tests					
L1-1	05-Apr-93	6.62	96	755	10,650
L1-2	19-Apr-93	6.60	96	854	10,795
	25-Apr-93	6.70	96	775	12,320
L1-3	28-May-93	7.01	96	834	8,048
	01-Jun-93	6.35	96	863	11,266
	06-Jun-93	6.11	96	897	13,240
	14-Jun-93	6.54	96	823	12,766
	22-Jun-93	6.50		822	13,537
	28-Jun-93	6.73	96	845	14,440
	06-Jul-93	6.35	36	860	14,315
	12-Jul-93	6.23	36	866	16,523
	19-Jul-93	5.91	36	868	10,480
	26-Jul-93	7.05	36	888	10,149
	02-Aug-93	6.51	36	857	14,003
	09-Aug-93	6.51	36	841	10,425
	16-Aug-93	6.60	36	746	13,959
	23-Aug-93	6.17	36	823	16,432
	29-Aug-93	6.34	36	839	14,461
	07-Sep-93	5.08	36	826	18,243
High Removal Tests					
HR1-1	14-Sep-93	6.31	36	873	20,044
	19-Sep-93	6.13	31	878	12,752
	27-Sep-93	6.34	31	778	22,632
HR1-4	05-Oct-93	6.46	31	771	19,809
	11-Oct-93	5.53	31	1,195	27,306
	14-Oct-93	6.51	31	1,361	16,957
	18-Oct-93	6.26	31	727	15,562
	24-Oct-93	6.49	31	736	16,411

TABLE A-13 (CONTINUED)

Test ID	Date	pH	Liquid Phase, mg/L		
			Carbonate	Sulfate	Chloride
Alternate Limestone Tests					
P1A-11	01-Nov-93	5.48	31	708	16,582
P1B-1	02-Dec-93	6.77	31	789	17,281
P1B-5	05-Dec-93	6.81	31	793	21,922
P1B-9R	13-Dec-93	6.58	31	680	22,509
P1B-9R2	19-Dec-93	6.45	31	698	30,493
AL1-1	28-Dec-93	5.97	31	648	29,029
	03-Jan-94	6.88	95	494	22,915
	10-Jan-94	6.43	95	704	29,813
	17-Jan-94	6.47	95	723	24,065
Alternate Coal Tests					
AC1-1	25-Jan-94	6.61	95	753	24,995
	31-Jan-94	6.45	95	698	33,292
AC1-3	07-Feb-94	5.39	88	787	43,221
AC1-10	14-Feb-94	6.31	88	825	29,160

TABLE A-14
GYPSUM STACK RETURN ANALYSES: HIGH-PARTICULATE TEST PERIOD

Test ID	Date	pH	Liquid Phase, mg/L Carbonate	Sulfate	Chloride
Parametric Tests					
P2-0	15-Mar-94	6.54	88	906	29,602
P2-2	18-Mar-94	6.51	88	890	20,417
P2-5	22-Mar-94	5.60	88	969	21,997
P2-6	25-Mar-94		88	965	16,288
P2-11	20-Apr-94	6.24	88	1,076	7,429
P2-15	25-Apr-94	5.97	88	1,118	10,210
P2-31	28-Apr-94	5.58	88	1,106	10,103
P2-19	02-May-94	5.35	80	1,150	11,983
P2-22	06-May-94	5.34	80	1,141	11,382
P2-17	11-May-94	5.42	80	1,159	10,610
P2-27	16-May-94	5.09	80	1,133	14,172
P2-30	20-May-94	5.47	74	1,079	11,899
P2-31	23-May-94	5.00	74	1,126	14,824
Long-Term Tests					
L2-1	01-Jun-94	5.50	74	1,125	12,384
	07-Jun-94	5.52	74	1,122	11,824
L2-2	15-Jun-94	5.87	74	1,086	15,200
	20-Jun-94	5.88	74	1,070	14,013
	27-Jun-94	5.91	74	1,017	19,156
	07-Jul-94	6.23	74	954	12,256
	11-Jul-94	6.19	74	1,073	15,280
	18-Jul-94	6.28	74	1,039	17,432
	25-Jul-94	5.95	74	1,073	17,388
	01-Aug-94	6.11	74	1,001	22,297
	10-Aug-94	5.51	74	1,069	22,401
	15-Aug-94	5.60	74	1,085	23,591
L2-3	22-Aug-94	5.60	74	986	22,166
	28-Aug-94	5.74	74	1,108	22,728
High Removal Tests					
HR2-2	08-Sep-94	6.30	74	1,154	10,285
	12-Sep-94	5.71	14	1,146	13,037
	19-Sep-94	5.96	14	1,089	13,139
Alternate Coal Tests					
AC2-2	05-Oct-94	6.03	14	1,083	15,002
AC2-5	13-Oct-94	5.92	14	1,028	18,208
AC2-8	17-Oct-94	5.25	14	1,157	19,771
AC2-10	24-Oct-94	5.50	14	1,125	25,240
Alternate Limestone Tests					
AL2-1	02-Dec-94	6.76	14	1,109	3,961
	04-Dec-94		14	1,134	4,701
AL2-3	06-Dec-94	6.02	14	1,189	5,538
AL2-4	12-Dec-94	6.2	14	1,119	6,104
AL2-5	15-Dec-94	5.92	14	1,163	8,352
AL2-6	19-Dec-94	6.13	14	1,141	9,461
AL2-14	27-Dec-94	6.08	14	1,094	9,653

TABLE A-15
GYPSUM STACK RETURN LIQUID-PHASE
TRACE METALS: LOW-PARTICULATE TEST PERIOD

Element	Units	14-Jun-93	12-Jul-93	09-Aug-93	14-Sep-93
Aluminum	mg/L	0.5	1.49	0.44	0.26
Antimony	mg/L	0.01	0.008[a]	<0.006	<0.0139
Arsenic	mg/L	<0.008	<0.007	<0.002	<0.001
Barium	mg/L	1.09	0.07	0.91	1.25
Beryllium	mg/L	0.001[b]	<0.004	0.003b	<0.0026
Boron	mg/L	473	29	414	718
Cadmium	mg/L	0.14	0.01	0.14	0.25
Copper	mg/L	0.03	0.02	<0.06	0.03
Chromium	mg/L	0.03	0.005b	0.03	0.04
Cobalt	mg/L	0.09	0.009b	0.13	0.19
Iron	mg/L	0.39	<0.02	<0.09	<0.028
Lead	mg/L	<0.003	<0.003	<0.00008	<0.008
Manganese	mg/L	107	6.8	530	157
Mercury	mg/L			0.0007	0.0023
Molybdenum	mg/L	0.06	0.005b	0.07	0.09
Nickel	mg/L	0.57	0.06	0.47	0.77
Potassium	mg/L	44	2.5	43.5	65.2
Selenium	mg/L	0.08	0.16	0.06	<0.002
Silicon	mg/L	13.8	1.7	14.4	15.1
Sodium	mg/L	90.1	5.3	92.3	139
Vanadium	mg/L	0.08	0.003b	0.09	0.14

[a] Value less than five times detection limit.

[b] Value less than detection limit.

TABLE A-16
GYPSUM STACK RETURN AQUEOUS PHASE TRACE METALS: HIGH-PARTICULATE TEST PERIOD

Element	25-Apr-94	07-Jun-94	27-Jul-94	10-Aug-94	17-Oct-94	06-Dec-94	07-Dec-94
Aluminum	6.86	12.1	1.29	5.74	8.67	6.25	5.71
Antimony	0.01	0.0084	0.00455	0.00544	0.0132	0.00507	0.00462
Arsenic	0.01	<0.00856	0.0062	<0.0107	0.0107	<0.0468	<0.0468
Barium	0.12	0.217	0.165	0.226	0.215	0.137	0.133
Beryllium	0.01	0.0132	0.00083	<0.00086	0.008	0.00336	0.0084
Boron	176	246	197	355	338	107	96.4
Cadmium	0.05	0.104	0.086	0.138	0.13	0.0489	0.0393
Chromium	0.01	0.0664	0.0763	0.0743	0.0602	0.0794	0.0816
Cobalt	0.06	0.112	0.0902	0.158	0.14	0.071	0.0237
Copper	0.02	0.0284	0.0324	0.0443	0.0271	0.0437	0.0379
Iron	<0.0045	<0.00452	<0.00452	1.09	<0.0045	<0.0045	<0.0045
Lead	0.01	<0.00205	0.0046	0.00546	<0.00205	0.0444	<0.0216
Manganese	16.6	22.3	728	25.6	29.2	10.3	10.2
Mercury	<0.00033	<0.000033	0.00051	0.00047	0.00009	—	—
Molybdenum	0.19	0.297	0.0486	0.181	0.144	0.0891	0.0396
Nickel	0.25	0.418	0.348	0.533	0.699	0.196	0.175
Potassium	22.0	45.6	42.7	60.4	65.2	23.6	22.9
Selenium	0.06	0.0982	0.15	0.0803	0.0637	<0.0891	<0.0891
Silicon	10.20	12.8	5.67	10.9	10.1	9.39	8.18
Sodium	4.73	0.0401	67.7	91.9	92.4	37	33.4
Vanadium	0.04	0.254	0.245	<0.0454	<0.045	<0.0227	<0.0227

Note: All concentrations are in units of mg/L.

TABLE A-17
LIMESTONE ANALYSES: LOW-PARTICULATE TEST PERIOD

Test ID	Date	Slurry Solids, wt. %	Solid Phase, wt. % Calcium	Magnesium	Carbonate	Inerts
Parametric Tests						
P1-2	22-Jan-93	33.64	38.9	0.1	51.1	2.1
P1-6	27-Jan-93	33.94	38.1	0.1	57.0	1.9
P1-9	01-Feb-93	33.28	38.1	0.1	56.2	2.0
P1-12	05-Feb-93	33.61	38.2	0.0	58.2	1.9
P1-14	09-Feb-93	32.31	38.3	0.1	59.9	2.0
P1-18	15-Feb-93	31.93	38.9	0.1	58.9	2.0
P1-22	22-Feb-93	32.36	37.4	0.1	56.3	2.0
P1-24	26-Feb-93	32.24	34.9	0.0	58.4	3.3
P1-28	08-Mar-93	33.09	39.8	0.1	55.6	2.7
P1-21R	12-Mar-93	32.54	39.3	0.1	55.7	1.5
P1-31	16-Mar-93	27.07	38.8	0.1	59.2	2.4
P1-32	18-Mar-93	34.54	39.6	0.1	55.8	2.6
P1-33	20-Mar-93	37.13	37.0	0.1	58.0	2.3
P1-35	28-Mar-93	33.02	40.2	0.1	56.5	0.6
P1-36	30-Mar-93	30.40	39.8	0.1	57.5	0.6
Long-Term Tests						
L1-1	05-Apr-93	26.72	36.2	0.1	57.6	2.78
L1-2	19-Apr-93	30.49	38.0	0.1	58.4	2.54
	25-Apr-93	28.58	38.1	0.1	58.7	2.31
L1-3	28-May-93	27.39	37.2	0.1	58.2	1.98
	01-Jun-93	28.34	37.1	0.1	58.9	1.99
	06-Jun-93	28.99	38.9	0.1	59.5	2.43
	14-Jun-93	28.38	38.3	0.1	58.4	1.88
	22-Jun-93	28.27	38.1	0.1	59.9	2.16
	28-Jun-93	27.72	37.8	0.1	59.6	1.83
	06-Jul-93	28.30	38.2	0.1	59.2	2.31
	12-Jul-93	27.46	38.2	0.1	56.3	0.56
	19-Jul-93	25.55	38.6	0.1	58.9	1.49
	26-Jul-93	27.53	36.3	0.1	57.7	2.14
	02-Aug-93	27.66	37.8	0.1	57.5	2.43
	09-Aug-93	28.73	38.4	0.1	57.0	2.39
	16-Aug-93	25.13	38.0	0.1	56.9	2.24
	23-Aug-93	27.12	39.4	0.1	55.6	2.21
	29-Aug-93	28.19	37.4	0.1	59.4	2.08
	05-Sep-93	24.40	38.4	0.1	57.8	2.14
High Removal Tests						
HR1-1	14-Sep-93	27.33	37.5	0.1	57.8	2.18
	19-Sep-93	24.40	38.4	0.1	57.8	2.14
	27-Sep-93	22.15	38.0	0.1	58.8	2.22
HR1-4	05-Oct-93	33.84	38.3	0.1	55.9	2.36
	11-Oct-93	38.93	38.6	0.1	59.6	2.21
	14-Oct-93	34.26	36.8	0.1	59.6	2.16
	18-Oct-93	25.02	37.6	0.0	57.2	2.87
	24-Oct-93	29.16	37.8	0.4	58.6	1.16

TABLE A-17 (CONTINUED)

Test ID	Date	Slurry Solids, wt. %	Solid Phase, wt. %			
			Calcium	**Magnesium**	**Carbonate**	**Inerts**
Alternate Limestone Tests						
P1A-11	01-Nov-93	29.40	39.6	0.4	59.3	0.69
P1B-1	02-Dec-93	29.16	39.3	0.4	61.6	0.94
	10-Dec-93	28.12	39.4	0.4	61.6	0.72
	13-Dec-93	24.00	38.1	0.4	58.4	0.62
P1B-9R2	19-Dec-93	20.58	38.1	0.4	57.8	0.77
	28-Dec-93	30.82	39.1	0.4	57.5	0.72
AL1-1	03-Jan-94	32.00	38.9	0.4	58.0	0.88
	10-Jan-94	31.30	39.2	0.4	59.8	0.55
	17-Jan-94	33.69	38.7	0.2	58.4	0.76
Alternate Coal Tests						
AC1-1	25-Jan-94	26.85	37.0	0.6	59.1	1.21
	31-Jan-94	32.85	38.4	0.7	59.8	0.80
AC1-3	07-Feb-94	32.51	38.6	0.8	59.5	0.85
AC1-10	14-Feb-94	33.22	39.0	0.6	59.6	0.85

TABLE A-18
LIMESTONE ANALYSES: HIGH-PARTICULATE TEST PERIOD

Test ID	Date	Slurry Solids, wt. %	Solid Phase, wt. %			
			Calcium	Magnesium	Carbonate	Inerts
Parametric Tests						
P2-0	15-Mar-94	29.89	38.2	0.6	59.1	0.78
P2-2	18-Mar-94	29.86	39.0	0.7	62.3	0.79
P2-5	22-Mar-94	28.11	38.8	0.7	61.7	0.60
P2-6	25-Mar-94	30.04	39.1	0.7	59.4	1.07
P2-11	20-Apr-94	29.36	37.1	0.7	59.2	0.25
P2-15	25-Apr-94	30.36	39.3	0.7	61.3	0.01
P2-31	28-Apr-94	29.80	37.2	0.7	60.0	0.59
P2-19	02-May-94	27.46	37.1	0.7	60.0	0.63
P2-22	06-May-94	28.70	38.4	0.6	59.1	0.52
P2-17	11-May-94	29.62	39.0	0.5	59.2	0.61
P2-27	16-May-94	26.42	39.1	0.6	59.0	0.72
P2-30	20-May-94	27.58	36.2	0.5	60.1	0.98
P2-31	23-May-94	27.19	36.4	0.6	59.5	0.98
Long-Term Tests						
L2-1	01-Jun-94	28.33	35.4	0.5	59.2	0.85
	01-Jun-94		37.7	0.5	58.6	1.31
	07-Jun-94	29.21	35.4	0.5	59.0	0.90
	07-Jun-94		37.4	0.5	58.9	1.06
L2-2	15-Jun-94	28.39	35.3	0.4	58.9	0.86
	15-Jun-94		37.9	0.5	58.7	1.22
	20-Jun-94	27.50	36.4	0.5	59.4	0.89
	27-Jun-94	26.12	36.6	0.4	59.7	1.06
	07-Jul-94	31.64	37.9	0.4	59.9	1.27
	11-Jul-94	30.60	39.7	0.4	59.9	1.45
	18-Jul-94	28.47	38.8	0.1	60.4	0.55
	25-Jul-94	28.92	37.0	0.5	59.4	0.92
	01-Aug-94	25.97	37.6	0.5	58.9	1.22
	10-Aug-94	25.90	38.6	0.5	57.1	0.41
	15-Aug-94	22.95	38.0	0.5	60.0	0.39
L2-3	22-Aug-94	27.67	37.6	0.5	60.6	0.72
	28-Aug-94	27.74	37.6	0.5	62.0	0.80

TABLE A-18 (CONTINUED)

Test ID	Date	Slurry Solids, wt. %	Solid Phase, wt. %			
			Calcium	Magnesium	Carbonate	Inerts
High Removal Tests						
HR2-2	08-Sep-94	28.60	37.7	0.5	59.4	0.75
	12-Sep-94	28.49	37.7	0.6	59.3	0.44
	19-Sep-94	27.90	36.1	0.6	62.0	0.40
Alternate Coal Tests						
AC2-2	05-Oct-94	27.23	37.9	0.5	59.9	0.43
AC2-5	13-Oct-94	27.61	37.9	0.6	59.6	1.32
AC2-8	17-Oct-94	28.29	37.8	0.6	59.9	1.13
AC2-10	24-Oct-94	27.70	37.7	0.6	58.3	0.70
Alternate Limestone Tests						
AL2-1	02-Dec-94	32.24	36.1	0.5	57.1	3.51
AL2-3	06-Dec-94	33.23	36.4	0.5	58.1	3.81
AL2-4	12-Dec-94	29.66	36.3	0.5	58.1	3.65
AL2-5	15-Dec-94	32.68	36.5	0.5	56.4	4.49
AL2-6	19-Dec-94	33.40	36.6	0.5	57.5	3.91

TABLE A-19
JBR FROTH ZONE ANALYSES: LOW-PARTICULATE TEST PERIOD

Test			Liquid Phase, mg/L				Slurry	Solid Phase, wt. %			
ID	Date	pH	Carbonate	Sulfite	Sulfate	Chloride	Solids, wt. %	Calcium	Carbonate	Sulfate	Inerts
Parametric Tests											
P1-2	22-Jan-93	4.4	12	0.8	1,072	19,499	22.3				
P1-6	27-Jan-93	4.6	12	1.6	729	27,329	20.1				
P1-9	01-Feb-93	4.7	18	0.0	812	22,570	21.4				
P1-12	05-Feb-93	5.2	12	1.6	1,038	21,919	21.9				
P1-14	09-Feb-93	4.5	12	0.8	986	22,746	22.2				
P1-18	15-Feb-93	4.2	12	0.0	958	28,136	19.3				
P1-21	21-Feb-93	5.1	12	0.8	657	21,760	22.5	22.5	0.8	53.4	0.00
P1-24	26-Feb-93	4.6	12	1.6	733	28,801	22.8	22.2	1.3	54.3	1.52
P1-27	04-Mar-93	5.0	96	0.8	812	28,433	22.4	24.4	1.3	54.9	
P1-28	08-Mar-93	4.0	96	0.8	725	29,568	21.0	22.8	0.0	58.7	
P1-21R	12-Mar-93	5.1	96	0.8	838	32,794	21.1	23.6	1.1	55.8	
P1-31	16-Mar-93	4.2	96	0.8	844	20,385	15.8	23.6	0.8	54.5	
P1-32	18-Mar-93	4.5	96	0.8	809	34,283	20.4	24.1	1.1	55.3	
P1-33	20-Mar-93	5.0	96	0.8	732	38,041	18.6	22.8	1.4	54.3	
P1-34	22-Mar-93	5.6	96	1.6	876	29,213	19.0	26.3	18.0	54.3	
P1-35	28-Mar-93	5.4	96	1.6	720	37,935	17.9	24.6	5.2	52.1	0.44
P1-36	30-Mar-93	5.7	96		860	24,853	23.4	26.8	13.8	42.9	

TABLE A-19 (CONTINUED)

Test			Liquid Phase, mg/L				Slurry	Solid Phase, wt. %			
ID	Date	pH	Carbonate	Sulfite	Sulfate	Chloride	Solids, wt. %	Calcium	Carbonate	Sulfate	Inerts
Long-Term Tests											
L1-1	05-Apr-93	4.03	96	0.8	768	11,719	21.80	22.4	0.8	53.2	
L1-2	19-Apr-93	5.18	96	0.8	794	25,119	21.71	23.4	1.2	54.9	
	25-Apr-93	5.03	96	0.8	742	31,270	21.16	23.3	1.2	54.9	
L1-3	28-May-93	4.39	96	0.8	905	23,780	21.17	23.5	0.6	53.8	
	01-Jun-93	4.81	96	1.6	780	29,186	23.67	23.3	0.9	57.0	
	06-Jun-93	4.58	96	0.8	858	29,661	21.86	23.8	1.4	55.3	
	14-Jun-93	4.63	96	1.6	740	23,082	16.09	21.8	0.6	50.0	
	22-Jun-93	4.34		4.8	792	32,316	23.06	22.8	1.2	56.1	
	28-Jun-93	4.07	96	2.4	846	37,054	22.41	22.6		55.1	
	06-Jul-93	4.17	114	0.8	793	36,707	25.39	23.0	0.7	53.9	1.29
	12-Jul-93	4.61	114	0.8	773	36,781	21.13	24.8	0.7	55.3	
	26-Jul-93	4.78	114	1.6	852	36,234	20.63	22.4	0.2	51.0	
	02-Aug-93	4.52	114	0.8	820	36,377	21.11	21.6	- 0.2	52.7	
	09-Aug-93	4.26	114	0.8	945	25,308	12.57	22.9	0.7	54.9	
	16-Aug-93	4.70	114	1.6	894	25,016	18.74	23.9	0.8	57.8	
	23-Aug-93	4.62	114	1.6	880	33,387	17.50	24.3	0.1	53.5	
	29-Aug-93	4.62	114	1.6	768	33,970	21.83	22.9	0.3	55.2	
	07-Sep-93	4.27	114	1.6	744	41,954	15.69	22.6	0.3	53.9	

TABLE A-19 (CONTINUED)

Test			Liquid Phase, mg/L				Slurry	Solid Phase, wt. %			
ID	Date	pH	Carbonate	Sulfite	Sulfate	Chloride	Solids, wt. %	Calcium	Carbonate	Sulfate	Inerts
High Removal Tests											
HR1-1	14-Sep-93	4.42	114	1.6	849	43,785	21.60	23.1	1.0	53.8	
	19-Sep-93	4.72	93	1.6	795	33,758	21.16	23.8	0.5	54.6	
HR1-4	27-Sep-93	4.75	93	0.8	678	53,109	18.20	23.0	0.4	55.5	
	05-Oct-93	4.76	93	1.6	640	37,424	20.33	21.9	2.8	51.9	
	11-Oct-93	4.84	93	11.2	624	68,070	19.12	25.0	7.4	50.6	
	14-Oct-93	4.08	93	19.2	886	64,950	24.49	23.7	0.8	56.0	
	18-Oct-93	4.10	93	22.4	633	53,557	25.88	23.1	1.1	53.9	
	24-Oct-93	4.83	93	0.8	702	44,103	29.23	23.2	2.9	47.4	
Alternate Limestone Tests											
P1A-11	01-Nov-93	4.59	93	0.8	721	44,403	16.98	22.2	0.1	53.2	0.87
P1B-1	02-Dec-93	4.38	93	1.6	801	39,270	23.39	23.8	2.4	54.8	0.81
P1B-5	05-Dec-93	4.62	93	32.0	1,705	47,226	19.52	24.0	2.9	54.2	1.09
P1B-9R	13-Dec-93	4.05	93	1.6	601	50,750	15.82	23.3	0.8	52.9	1.45
P1B-9R2	19-Dec-93	4.87	93	1.6	587	72,432	19.77	24.0	3.2	53.1	1.08
AL1-1	28-Dec-93	4.60	93	1.6	565	63,966	21.58	23.2	0.2	53.8	0.70
	03-Jan-94	4.40	173	0.8	592	65,319	23.77	23.9	0.7	56.9	0.77
	10-Jan-94	4.51	173	0.8	552	56,648	27.13	23.1	1.0	55.3	1.13
	17-Jan-94	4.58	173	1.6	705	52,045	20.86	24.0	1.1	54.0	0.94
Alternate Coal Tests											
AC1-1	25-Jan-94	4.06	173	2.4	703	34,504	17.44	22.4	1.1	55.0	0.71
	31-Jan-94	4.61	173	1.6	701	53,080	19.73	23.8	1.0	54.4	0.59
AC1-3	07-Feb-94	4.10	170	0.0	685	68,770	21.97	23.8	1.0	53.8	0.49
AC1-10	14-Feb-94	5.15	170	0.8	757	63,879	17.40	23.4	2.0	54.3	0.58

TABLE A-20
JBR FROTH ZONE ANALYSES: HIGH-PARTICULATE TEST PERIOD

Test			Liquid Phase, mg/L				Slurry	Solid Phase, wt. %			Inerts,
ID	Date	pH	Carbonate	Sulfite	Sulfate	Chloride	Solids, wt. %	Calcium	Carbonate	Sulfate	wt. %
Parametric Tests											
P2-0	15-Mar-94	4.59	170	1.6	743	63,928	18.29	22.9	1.1	52.6	0.93
P2-2	18-Mar-94	4.43	170	1.6	937	45,151	16.30	23.8	4.5	49.7	1.55
P2-5	22-Mar-94	4.31	170	1.6	879	44,418	17.22	22.3	5.9	45.7	4.00
P2-6	25-Mar-94	3.52	—	1.6	1256	40,130	20.49	14.1	0.8	31.9	35.38
P2-11	20-Apr-94	3.64	170	0.0	1213	16,868	21.24	—	1.1	—	—
P2-15	25-Apr-94	3.94	170	0.0	1231	20,286	18.20	—	—	—	—
P2-31	28-Apr-94	3.80	170	0.8	1204	27,477	20.45	—	—	—	—
P2-19	02-May-94	3.72	179	0.8	1238	30,622	20.95	—	—	—	—
P2-22	06-May-94	3.96	179	0.0	1232	22,674	22.62	—	—	—	—
P2-17	11-May-94	3.21	179	0.0	1279	23,046	21.42	—	—	—	—
P2-27	16-May-94	3.46	179	7.2	1331	27,313	19.56	—	—	—	—
P2-30	20-May-94	3.88	142	1.6	1178	26,477	21.03	—	—	—	—
P2-31	23-May-94	3.40	142	2.4	1175	26,537	19.11	—	—	—	—
Long-Term Tests											
L2-1	01-Jun-94	4.48	142	0.0	1103	19,355	14.30	—	—	—	—
	07-Jun-94	4.44	142	0.0	1234	16,384	10.34	—	—	—	—
L2-2	15-Jun-94	4.19	142	0.8	1057	33,253	20.51	—	—	—	—
	20-Jun-94	4.23	142	1.6	1097	26,389	16.56	—	—	—	—
	27-Jun-94	4.07	142	0.8	967	40,902	18.77	—	—	—	—
	07-Jul-94	4.02	142	0.8	1074	32,801	19.38	—	—	—	—
	11-Jul-94	3.92	142	0.0	1030	37,460	19.57	—	—	—	—

TABLE A-20 (CONTINUED)

Test			Liquid Phase, mg/L				Slurry	Solid Phase, wt. %			Inerts,
ID	Date	pH	Carbonate	Sulfite	Sulfate	Chloride	Solids, wt. %	Calcium	Carbonate	Sulfate	wt. %
L2-2	18-Jul-94	3.81	142	0.0	1030	39,135	22.17	—	—	—	—
(Cont'd)	25-Jul-94	4.07	142	0.8	978	43,988	21.07	—	—	—	—
	01-Aug-94	4.01	142	0.8	966	43,570	15.99	—	—	—	—
	10-Aug-94	4.10	142	5.6	1052	44,591	17.53	—	—	—	—
	15-Aug-94	4.32	142	1.6	986	44,035	14.11	—	—	—	—
L2-3	22-Aug-94	3.97	142	2.4	963	51,480	17.06	—	—	—	—
	28-Aug-94	4.02	142	2.4	1029	48,353	16.63	—	—	—	—
High Removal Tests											
HR2-2	08-Sep-94	3.78	142	0.0	1288	20,176	12.13	—	—	—	—
	12-Sep-94	3.81	58	0.8	1131	38,893	16.20	—	—	—	—
	19-Sep-94	3.98	58	0.0	1227	37,986	14.51	—	—	—	—
Alternate Coal Tests											
AC2-2	05-Oct-94	4.08	58	0.8	1171	31,505	18.28	—	—	—	—
AC2-5	13-Oct-94	4.30	58	0.8	1182	36,176	19.43	—	—	—	—
AC2-8	17-Oct-94	4.07	58	0.8	1176	40,433	17.57	—	—	—	—
AC2-10	24-Oct-94	3.98	58	0.8	1009	51,347	15.74	—	—	—	—
Alternate Limestone Tests											
AL2-1	02-Dec-94	4.03	58	1.6	1408	13,040	12.64	—	—	—	—
AL2-3	06-Dec-94	3.93	58	0.8	1356	14,608	12.72	—	—	—	—
AL2-4	12-Dec-94	4.25	58	2.4	1378	16,437	16.25	—	—	—	—
AL2-5	15-Dec-94	3.73	58	2.4	1377	18,562	12.72	—	—	—	—
AL2-6	19-Dec-94	3.99	58	2.4	1402	17,494	10.47	—	—	—	—
AL2-14	27-Dec-94	3.72	58	4.0	1360	21,136	12.57	—	—	—	—

TABLE A-21
BR FROTH ZONE LIQUID-PHASE TRACE
METALS: LOW-PARTICULATE TEST PERIOD

Element	Units	14-Jun-93	12-Jul-93	09-Aug-93	14-Sep-93
Aluminum	mg/L	4.67	0.45	18.9	7.75
Antimony	mg/L	0.02	0.01[b]	0.07	<0.0139
Arsenic	mg/L	<0.011	<0.008	<0.002	0.01
Barium	mg/L	2.09	0.18	2.12	3.08
Beryllium	mg/L	0.01	<0.004	0.01	<0.0016
Boron	mg/L	894	70	899	1510
Cadmium	mg/L	0.25	0.02	0.31	0.51
Copper	mg/L	0.23	0.03	0.32	0.31
Chromium	mg/L	0.04	<0.007	0.02	0.04
Cobalt	mg/L	0.18	0.02	0.27	0.4
Iron	mg/L	0.162[b]	<0.02	<0.019	<0.0319
Lead	mg/L	<0.004	0.001[b]	0	<0.008
Manganese	mg/L	193	16.4	212	332
Mercury	mg/L	—	—	0.003	0.0056
Molybdenum	mg/L	0.014b	0.014b	<0.014	0.07
Nickel	mg/L	0.98	0.08	1.1	1.6
Potassium	mg/L	78.1	5	94	150
Selenium	mg/L	0.12	0.09	0.16	0.09
Silicon	mg/L	24.6	3.1	35.2	29.1
Sodium	mg/L	153	11.9	194	297
Vanadium	mg/L	0.12	<0.007	0.08	0.17

[a] Value less than five times detection limit.

[b] Value less than detection limit.

TABLE A-22

JBR FROTH ZONE AQUEOUS-PHASE TRACE METALS: HIGH-PARTICULATE TEST PERIOD

Element	21-Mar-94	25-Apr-94	07-Jun-94	27-Jul-94	10-Aug-94	12-Sep-94	17-Oct-94	06-Dec-94	07-Dec-94
Aluminum	<0.0523	62.20	20.2	6.65	24.2	49.3	29.5	35.6	49.9
Antimony	0.01	0.01	0.00658	0.0173	0.0204	0.0296	0.0187	0.00613	0.00809
Arsenic	0.06	0.04	<0.00856	0.018	<0.0107	0.0396	0.00648	0.0071	0.0158
Barium	<0.001	0.29	0.302	0.353	0.395	0.552	0.466	0.278	0.459
Beryllium	<0.0005	0.03	0.00815	0.00972	0.0111	0.025	0.0319	0.034	0.0318
Boron	872.00	394.00	318	482	479	446	624	136	219
Cadmium	<0.004	0.12	0.126	0.175	0.164	0.153	0.221	0.0603	0.0947
Chromium	<0.005	0.02	0.0654	0.0736	0.0716	0.0538	0.0559	0.0822	0.0812
Cobalt	<0.004	0.14	0.128	0.186	0.203	0.219	0.243	0.118	0.158
Copper	<0.009	0.30	0.107	0.176	0.187	0.301	0.125	0.223	0.359
Iron	<0.004	<0.004	<0.00452	<0.00452	1.17	0.0373	<0.0045	0.0515	0.0807
Lead	0.02	0.01	0.00369	0.0332	0.0731	0.0459	0.016	0.00542	0.00494
Manganese	0.18	32.30	25.3	33.6	31.8	32.6	52.4	13	20.4
Mercury	<0.00033	0.01	0.00576	0.00098	0.00164	0.0004	0.00024	0.00017	0.00017
Molybdenum	<0.007	0.17	0.0654	0.145	0.046	0.0845	0.122	0.024	0.0375
Nickel	<0.014	0.62	0.571	0.751	0.693	0.721	1.24	0.354	0.422
Potassium	<0.822	60.70	57.5	87.2	82.8	89.3	120	33.2	52.6
Selenium	0.03	0.26	0.202	0.205	0.088	0.109	0.0938	0.0677	0.124
Silicon	<0.032	41.00	18	18.2	17.7	31.7	20.4	23.3	34.3
Sodium	<0.04	93.30	93.3	135	123	125	164	48.4	76.2
Vanadium	<0.004	0.05	0.25	0.243	<0.0454	<0.0454	<0.045	<0.0227	<0.0227

Note: All concentrations are in units of mg/L

TABLE A-23
JBR DRAW-OFF ANALYSES: LOW-PARTICULATE TEST PERIOD

Test ID	Date	pH	Slurry Solids, wt. %	Solid Phase, wt. %					
				Calcium	Magnesium	Sulfite	Sulfate	Carbonate	Inerts
Parametric Tests									
P1-2	22-Jan-93	4.5	22.6	24.7	0.00	0.00	56.8	1.1	1.66
P1-6	27-Jan-93	4.8	22.6	24.2	0.00	0.08	53.8	1.8	0.00
P1-9	01-Feb-93	4.9	19.0	23.2	0.00	0.00	56.3	0.7	1.20
P1-12	05-Feb-93	5.3	22.7	22.4	0.00	0.00	57.4	0.7	1.27
P1-14	09-Feb-93	4.9	22.5	24.5	0.00	0.00	58.0	0.8	0.94
P1-18	15-Feb-93	4.4	21.1	24.2	0.00	0.00	59.7	0.5	0.56
P1-21	21-Feb-93	5.2	22.6	22.5	0.00	0.00	53.6	1.1	0.67
P1-24	26-Feb-93	4.8	21.5	22.2	0.02	0.00	54.0	1.1	2.41
P1-27	04-Mar-93	5.2	22.0	23.2	0.15	0.08	56.8	1.4	1.98
P1-28	08-Mar-93	4.5	19.9	22.4	0.07	0.00	58.7	0.5	2.12
P1-21R	12-Mar-93	5.4	20.6	23.7	0.02	0.00	55.5	1.3	0.26
P1-31	16-Mar-93	4.9	15.5	23.6	0.00	0.00	54.6	0.5	1.76
P1-32	18-Mar-93	5.2	19.6	23.8	0.00	0.00	54.2	0.8	1.83
P1-33	20-Mar-93	5.2	19.1	23.1	0.02	0.08	55.8	2.7	1.63
P1-34	22-Mar-93	5.5	19.8	26.5	0.05	0.08	55.4	19.0	0.00
P1-35	28-Mar-93	5.3	20.6	24.8	0.02	0.08	50.0	4.7	0.45
P1-36	30-Mar-93	5.7	23.0	28.0	0.05	0.08	41.9	14.5	0.51
Long-Term Tests									
L1-1	05-Apr-93	4.98	20.02	22.2	0.02	0.16	55.8	0.5	1.63
L1-2	19-Apr-93	5.12	23.96	23.5	0.02	0.00	53.7	1.1	2.03
	25-Apr-93	5.27	18.25	22.3	0.02	0.00	53.8	1.3	1.63
L1-3	28-May-93	4.71	20.55	22.9	0.00	0.00	57.1	0.7	1.82
	01-Jun-93	4.74	22.64	24.4	0.00	0.00	59.1	1.0	1.71
	06-Jun-93	4.63	23.24	23.2	0.00	0.00	54.2	1.6	2.17
	14-Jun-93	5.02	14.24	21.7	0.00	0.00	53.7	0.5	0.86
	22-Jun-93	4.86	21.86	23.4	0.00	0.08	53.9	1.3	1.59
	28-Jun-93	4.82	20.77	23.0	0.00	0.00	56.0	0.6	1.86
	06-Jul-93	4.54	21.3	23.8	0.00	0.00	57.6	0.5	1.66
	12-Jul-93	4.81	21.98	22.8	0.00	0.08	55.6	0.3	0.38
	26-Jul-93	5.10	21.04	21.8	0.00	0.00	53.7	0.5	1.58
	02-Aug-93	5.17	21.51	22.1	0.02	0.00	56.2	0.3	0.80
	09-Aug-93	4.54	14.55	23.1	0.02	0.00	54.9	0.8	1.68
	16-Aug-93	5.08	18.31	23.2	0.02	0.00	55.6	0.9	1.49
	23-Aug-93	4.68	20.03	23.2	0.02	0.00	55.3	0.2	1.86
	29-Aug-93	4.55	22.22	22.1	0.00	0.00	55.3	0.3	1.03
	07-Sep-93	3.83	17.45	21.9	0.02	0.00	54.6	0.3	2.10
High Removal Tests									
HR1-1	14-Sep-93	4.81	19.76	22.9	0.02		54.9	1.1	3.27
	19-Sep-93	5.27	22.90	23.9	0.05	0.00	55.0	0.5	0.48
	27-Sep-93	4.28	19.13	23.7	0.02	0.00	54.2	0.4	1.63
HR1-4	05-Oct-93	5.05	20.71	21.6	0.02	0.00	51.0	2.9	2.40
	11-Oct-93	4.35	19.84	24.6	0.07	11.85	53.0	7.9	2.21
	14-Oct-93	4.32	25.01	24.6	0.02	4.88	57.4	0.9	2.03
	18-Oct-93	4.80	26.91	22.2	0.00	0.08	52.4	1.0	2.05
	24-Oct-93	5.10	27.85	20.2	0.12	0.00	43.6	1.9	15.54

TABLE A-23 (CONTINUED)

Test ID	Date	pH	Slurry Solids, wt. %	Solid Phase, wt. %					
				Calcium	Magnesium	Sulfite	Sulfate	Carbonate	Inerts
Alternate Limestone Tests									
P1A-11	01-Nov-93	4.67	21.04	22.0	0.07	0.00	52.7	0.1	0.94
P1B-1	02-Dec-93	5.06	22.10	23.6	0.12	0.08	55.8	2.1	0.94
P1B-5	05-Dec-93	4.70	21.92	22.2	0.10	0.16	48.9	3.8	0.82
P1B-9R	13-Dec-93	4.34	16.99	23.2	0.15	0.16	54.9	0.4	1.41
	19-Dec-93	5.18	24.46	24.7	0.17	0.08	53.2	3.8	1.06
	28-Dec-93	4.84	21.10	23.4	0.07	0.00	53.1	0.1	0.70
AL1-1	03-Jan-94	4.8	22.15	24.0	0.12	0.00	56.7	0.7	0.77
	10-Jan-94	4.65	21.36	22.9	0.15	0.00	55.1	0.7	0.76
	17-Jan-94	4.98	22.26	23.8	0.12	0.00	53.7	1.0	0.59
Alternate Coal Parametric Tests									
AC1-1	25-Jan-94	4.52	17.79	23.2	0.17	0.00	55.0	1.1	0.71
	31-Jan-94	5.17	19.22	24.2	0.12	0.00	53.6	1.1	0.52
AC1-3	07-Feb-94	4.28	23.77	24.4	0.44	0.00	55.2	1.0	0.51
AC1-10	14-Feb-94	5.14	21.74	23.6	0.22	0.00	54.1	2.0	0.43

TABLE A-24
JBR DRAW-OFF ANALYSES: HIGH-PARTICULATE TEST PERIOD

Test ID	Date	pH	Slurry Solids, wt. %	Solid Phase, wt. %					Inerts, wt. %
				Calcium	Magnesium	Sulfite	Sulfate	Carbonate	
Parametric Tests									
P2-0	15-Mar-94	4.81	20.93	23.0	0.2	0.0	52.9	1.1	0.95
P2-2	18-Mar-94	4.55	18.40	23.6	0.3	0.0	49.3	4.9	1.15
P2-5	21-Mar-94	4.65	26.65	25.1	0.4	0.0	41.4	12.7	1.07
	22-Mar-94	4.11	24.80	22.5	0.3	0.0	46.7	6.1	2.08
P2-6	25-Mar-94	3.32	20.32	13.3	0.1	0.0	30.7	0.7	38.99
P2-11	20-Apr-94	4.57	23.68	13.9	0.1	0.0	32.7	1.1	32.51
P2-15	25-Apr-94	4.04	19.19	14.1	0.1	0.0	32.5	0.4	37.42
P2-31	28-Apr-94	3.86	20.32	13.1	0.1	0.0	31.1	0.8	41.65
P2-19	02-May-94	4.28	21.01	14.0	0.1	0.0	33.6	1.0	35.28
P2-22	06-May-94	4.07	19.96	14.8	0.1	0.0	32.0	1.9	35.64
P2-17	11-May-94	3.71	23.04	16.0	0.1	0.0	36.1	0.2	33.06
P2-27	16-May-94	3.89	19.34	13.9	0.1	0.0	30.9	0.7	41.34
P2-30	20-May-94	4.37	19.46	12.3	0.1	0.1	29.3	1.3	37.87
P2-31	23-May-94	4.07	19.94	12.9	0.1	0.0	32.5	0.8	37.53
Long-Term Tests									
L2-1	01-Jun-94	4.88	24.20	20.7	0.1	0.0	49.5	1.4	5.51
	07-Jun-94	4.72	10.92	22.3	0.2	0.2	46.9	6.6	2.24
L2-2	15-Jun-94	4.55	20.12	20.0	0.1	0.0	49.4	0.6	6.61
	20-Jun-94	4.71	17.20	20.7	0.0	0.0	49.2	0.7	6.41
	27-Jun-94	4.61	17.11	20.8	0.0	0.0	50.2	0.2	4.91
	07-Jul-94	4.60	19.47	21.2	0.1	0.0	50.7	0.9	5.85
	11-Jul-94	4.56	20.79	21.9	0.2	0.0	50.7	0.7	6.63
	18-Jul-94	4.59	18.82	22.1	0.0	0.0	50.6	0.7	5.49
	25-Jul-94	4.45	19.81	21.2	0.1	0.0	49.7	0.7	7.87
	01-Aug-94	4.14	18.25	22.2	0.1	0.0	52.3	0.3	4.45
	10-Aug-94	4.34	16.60	21.9	0.2	0.0	50.7	0.5	6.82
	15-Aug-94	4.53	16.96	22.2	0.1	0.0	52.1	0.8	5.69
L2-3	22-Aug-94	4.38	18.23	21.6	0.2	0.0	51.7	0.9	6.41
	28-Aug-94	4.32	16.90	21.6	0.0	0.0	52.2	0.5	7.74
High Removal Test									
HR2-2	08-Sep-94	4.10	13.97	19.9	0.0	0.0	47.8	0.2	12.11
	12-Sep-94	4.21	21.33	19.4	0.0	0.0	46.3	0.6	18.03
	19-Sep-94	4.47	15.68	21.8	0.1	0.0	52.8	1.6	2.26
Alternate Coal Test									
AC2-2	05-Oct-94	4.77	20.92	21.8	0.1	0.0	50.7	1.6	7.76
AC2-5	13-Oct-94	4.62	22.57	22.4	0.2	0.0	50.8	1.7	7.95
AC2-8	17-Oct-94	4.45	21.39	24.0	0.2	0.0	55.2	1.9	5.43
AC2-10	24-Oct-94	3.98	17.73	22.1	0.2	0.0	51.4	1.9	3.94
Alternate Limestone Tests									
AL2-1	02-Dec-94	4.25	14.92	20.1	0.1	0.0	47.6	0.7	12.51
AL2-3	06-Dec-94	4.30	15.20	20.0	0.0	0.0	48.0	0.6	14.23
AL2-4	12-Dec-94	4.62	14.39	23.8	0.1	0.0	45.1	8.3	4.81
AL2-5	15-Dec-94	3.92	15.01	22.7	0.1	0.0	52.4	1.4	2.76
AL2-6	19-Dec-94	4.17	10.79	23.1	0.1	0.0	52.7	2.3	2.60
AL2-14	27-Dec-94	4.12	13.68	22.4	0.1	0.0	52.6	1.1	3.70

TABLE A-25
JBR DRAW-OFF SOLID-PHASE TRACE METALS: LOW-PARTICULATE TEST PERIOD

Element	25-Jun-93	14-Jun-93	28-Jun-93	12-Jul-93	26-Jul-93	09-Aug-93	23-Aug-93	14-Sep-93
Aluminum	848	676	709	621	307	661	909	979
Antimony	0.1	0.09	0.2	0.1	0.09	0.1	0.09	0.09
Arsenic	<0.31	<0.31	0.31	<0.31	<0.31	<0.31	<0.31	<0.30
Barium	1.64	1.84	1.95	1.62	1.37	1.78	3.5	4.05
Beryllium	0.12	0.12	0.18	0.12	0.13	<0.058	<0.056	<0.0535
Boron	105	30	139	99	116	108	93	186
Cadmium	<0.279	<0.27	<0.281	<0.273	<0.266	<0.284	<0.271	<0.261
Copper	2.59	2.42	1.66	1.52	1.19	4.47	4.95	4.41
Chromium	8.85	8.54	7.99	6.89	7.39	8.15	7.3	9.29
Cobalt	1.1	0.52	1.08	1.52	1.19	4.47	4.95	4.41
Iron	1460	1440	1320	1060	1080	1340	1590	1920
Lead	0.69	0.69	1.13	0.79	1.19	0.96	0.99	1.52
Manganese	32	15.4	31.9	24.2	28.6	37.3	31.1	517
Mercury	0.118	0.0875	0.102	0.0325	0.045	0.0575	0.0975	0.0975
Molybdenum	0.72	0.79	0.65	1.23	0.75	1.12	0.6	0.83
Nickel	1.71	1.25	1.82	1.5	1.07	2.13	1.2	2.52
Potassium	179	139	215	222	147	164	113	220
Selenium	2.25	<0.147	4.06	2.57	3.07	1.92	4.55	2.95
Silicon	683	459	399	355	374	442	594	374
Sodium	<25.1	24.1	45.5	36.8	44.2	34.8	31.4	57.6
Vanadium	<4.17	7.05	7.92	7.14	6.32	7.72	7.37	8.73

Note: Units are mg/kg.

TABLE A-26

JBR DRAW-OFF SOLID-PHASE TRACE METALS: HIGH-PARTICULATE TEST PERIOD

Element	25-Apr-94	07-Jun-94	27-Jul-94	10-Aug-94	22-Aug-94	17-Oct-94	02-Dec-94	06-Dec-94	07-Dec-94
Aluminum	5900.00	1150	1930	1610	2520	1610	2600	3370	2800
Antimony	0.82	0.572	0.523	0.52	0.602	0.631	0.568	1.04	0.687
Arsenic	13.00	3.75	6.56	9.6	22.7	6.29	26.2	29	25
Barium	224.00	153	144	124	222	149	85.6	106	88.1
Beryllium	1.20	0.272	0.234	0.0618	0.269	0.327	1.69	1.66	1.71
Boron	82.10	84.3	222	201	477	544	4.33	105	84.6
Cadmium	<0.36	<0.348	<0.298	<0.339	0.62	0.682	<1.57	<1.58	<1.59
Chromium	18.50	11.4	12.6	14.1	13	9.48	12.6	12.1	11.6
Cobalt	<2.59	0.655	0.944	2.23	3.06	1.24	2.41	3.08	<2.30
Copper	12.90	4.42	5.5	4.58	8.49	3950	10.3	15.3	12.8
Iron	9300.00	1480	2540	3640	3530	<1.63	3580	4060	3600
Lead	10.30	—	5.12	5.45	4.88	1.66	5.91	6.41	6.08
Manganese	33.30	45.9	23.5	17.2	59.4	66.8	9.15	22.1	17.3
Mercury	0.15	0.03	0.338	0.174	0.612	0.252	0.766	0.555	0.668
Molybdenum	14.80	7.12	6.25	7.85	8.24	6.4	7.14	7.01	2.92
Nickel	7.48	2.18	4.47	6.4	5.47	10.6	<4.79	10.2	12.9
Potassium	1350.00	361	473	445	826	535	545	638	635
Selenium	4.25	2.86	9.9	7.77	12.00	4.38	18.2	16.3	17
Silicon	499.00	756	345	369	1000	238	538	411	465
Sodium	359.00	113	148	130	265	186	79.9	135	115
Vanadium	44.40	29.6	31.7	17.4	17.7	11.2	18.4	26.1	20.2

Note: All concentrations are in units of mg/kg

TABLE A-27
COAL PROXIMATE ANALYSES
(AS BURNED): LOW-PARTICULATE TEST PERIOD

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
Parametric Tests						
15-Jan-93	12.86	11.12	33.0	43.0	2.38	10,834
16-Jan-93	13.06	10.98	33.4	42.6	2.37	10,922
17-Jan-93	13.90	10.60	33.2	42.3	2.32	10,858
18-Jan-93	13.14	10.74	33.1	43.0	2.42	10,972
19-Jan-93	12.98	10.69	33.3	43.1	2.39	10,981
20-Jan-93	12.79	10.71	33.5	43.0	2.45	10,987
21-Jan-93	14.70	10.54	33.0	41.8	2.42	10,726
22-Jan-93	13.67	10.89	33.3	42.0	2.44	10,777
23-Jan-93	13.39	10.91	33.3	42.4	2.39	10,859
24-Jan-93	15.13	10.82	32.6	41.4	2.34	10,690
25-Jan-93	13.88	10.64	26.4	42.2	2.31	10,869
26-Jan-93	13.56	10.89	32.8	42.7	2.29	10,859
27-Jan-93	13.07	9.38	33.8	43.7	2.48	11,225
28-Jan-93	13.09	9.34	33.9	43.6	2.48	11,098
29-Jan-93	12.84	9.14	34.2	43.8	2.55	11,299
30-Jan-93	12.49	9.13	34.3	44.0	2.50	11,308
31-Jan-93	13.05	9.76	34.9	42.3	2.63	11,093
01-Feb-93	6.66	11.36	33.4	48.6	1.53	12,340
02-Feb-93	12.03	10.61	34.1	43.2	2.57	10,955
03-Feb-93	12.23	10.29	34.3	43.2	2.54	11,045
04-Feb-93	11.93	10.24	34.5	43.2	2.56	11,216
05-Feb-93	12.15	9.81	34.4	43.6	2.50	11,297
06-Feb-93	11.67	9.76	34.7	43.9	2.48	11,331
07-Feb-93	12.52	10.79	34.4	42.3	2.57	11,015
08-Feb-93	13.27	10.91	33.9	41.9	2.57	10,919
09-Feb-93	13.50	9.26	33.7	43.5	2.40	11,159
10-Feb-93	14.27	9.37	33.1	43.3	2.44	11,039
11-Feb-93	14.18	9.49	33.2	43.2	2.43	11,045
12-Feb-93	15.00	9.22	33.3	42.5	2.45	10,932
13-Feb-93	14.35	9.65	33.6	42.5	2.46	10,950
14-Feb-93	13.44	9.93	33.7	42.9	2.41	11,053
15-Feb-93	13.46	10.37	33.7	42.5	2.32	11,009
16-Feb-93	14.20	9.68	34.1	42.0	2.66	10,941
17-Feb-93	13.62	9.84	34.4	42.2	2.69	11,007
18-Feb-93	13.77	9.86	33.6	42.8	2.65	10,990
20-Feb-93	13.63	9.96	33.6	42.8	2.65	11,004
21-Feb-93	15.37	9.91	32.9	41.8	2.56	10,764
22-Feb-93	15.16	9.86	33.8	41.2	2.64	10,804
23-Feb-93	12.63	9.11	34.6	43.7	2.48	11,324
25-Feb-93	12.92	9.35	34.6	43.2	2.52	11,197
26-Feb-93	13.32	9.39	34.3	43.0	2.56	11,163
27-Feb-93	12.81	9.54	34.6	43.1	2.55	11,249
28-Feb-93	12.70	9.52	34.6	43.2	2.59	11,225
01-Mar-93	13.05	9.89	34.3	42.8	2.60	11,102
02-Mar-93	13.92	10.64	33.3	42.1	2.40	10,884
03-Mar-93	12.82	8.89	34.5	43.8	2.38	11,368
04-Mar-93	11.40	9.76	33.7	45.2	2.14	11,494

TABLE A-27 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
05-Mar-93	13.32	9.13	33.5	44.0	2.42	11,196
06-Mar-93	13.23	8.84	34.0	44.0	2.42	11,237
07-Mar-93	12.24	8.95	34.6	44.2	2.39	11,362
08-Mar-93	12.65	8.97	34.6	43.8	2.48	11,374
09-Mar-93	12.65	8.98	34.7	43.7	2.38	11,376
10-Mar-93	12.67	9.11	34.8	43.5	2.70	11,305
11-Mar-93	12.31	8.96	34.8	43.9	2.63	11,379
12-Mar-93	11.90	9.18	34.5	44.5	2.37	11,440
13-Mar-93	10.96	9.96	32.9	46.2	1.90	11,674
14-Mar-93	13.29	8.81	34.3	43.6	2.31	11,296
15-Mar-93	12.65	9.00	34.6	43.8	2.49	11,314
16-Mar-93	12.74	8.99	34.6	43.6	2.45	11,318
17-Mar-93	12.28	8.93	34.5	44.4	2.33	11,414
18-Mar-93	12.67	8.90	34.5	44.0	2.44	11,366
19-Mar-93	12.30	9.02	34.9	43.8	2.42	11,353
20-Mar-93	12.85	8.92	34.6	43.7	2.36	11,308
21-Mar-93	12.46	9.03	34.7	43.9	2.39	11,390
22-Mar-93	12.59	8.84	34.7	43.9	2.39	11,364
23-Mar-93	12.00	8.84	34.3	44.8	2.38	11,401
24-Mar-93	11.61	8.89	34.6	44.8	2.38	11,493
25-Mar-93	11.55	8.81	35.0	44.7	2.37	11,520
26-Mar-93	12.19	9.29	33.1	45.4	2.27	11,443
27-Mar-93	12.27	9.33	33.6	44.8	2.27	11,450
28-Mar-93	12.25	9.35	33.4	44.9	2.21	11,463
29-Mar-93	13.02	8.73	34.3	44.0	2.35	11,329
30-Mar-93	12.71	8.70	34.3	44.3	2.28	11,400
31-Mar-93	11.15	9.58	33.7	45.6	2.02	11,570
Long-Term Tests						
02-Apr-93	12.88	8.69	34.3	44.1	2.41	11,328
03-Apr-93	12.24	9.15	34.4	44.1	2.36	11,365
04-Apr-93	12.22	8.88	34.7	44.2	2.52	11,446
05-Apr-93	12.05	8.86	33.2	45.9	2.15	11,739
06-Apr-93	12.94	8.97	34.6	43.4	2.42	11,300
07-Apr-93	12.60	8.98	34.5	43.9	2.23	11,360
15-Apr-93	12.04	9.00	34.0	44.9	2.23	11,507
16-Apr-93	13.36	8.85	33.5	44.3	2.20	11,328
17-Apr-93	12.08	8.96	34.2	44.8	2.30	11,461
18-Apr-93	11.07	9.30	34.1	45.4	2.27	11,606
19-Apr-93	12.12	8.81	34.5	44.6	2.35	11,448
20-Apr-93	12.59	9.09	34.4	43.9	2.26	11,372
21-Apr-93	12.55	9.27	34.3	44.0	2.26	11,325
22-Apr-93	11.98	9.27	34.3	44.5	2.29	11,415
23-Apr-93	11.33	9.39	34.1	45.1	2.32	11,553
24-Apr-93	11.50	9.20	34.3	45.0	2.34	11,506
25-Apr-93	12.04	9.22	34.0	44.7	2.38	11,457
26-Apr-93	11.75	9.22	34.3	44.7	2.28	11,518
27-Apr-93	11.60	8.99	34.9	44.5	2.32	11,538
28-Apr-93	11.68	9.21	34.4	44.6	2.33	11,497
01-Jun-93	11.81	8.95	34.4	44.9	2.23	11,338
02-Jun-93	10.96	8.86	35.0	45.1	2.29	11,623
03-Jun-93	11.60	8.80	34.5	45.2	2.29	11,556

TABLE A-27 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
04-Jun-93	11.86	8.75	34.7	44.7	2.32	11,491
05-Jun-93	11.27	8.84	35.2	44.7	2.36	11,507
06-Jun-93	10.79	9.03	35.1	45.1	2.35	11,545
07-Jun-93	10.59	9.13	35.3	45.0	2.34	11,572
08-Jun-93	9.77	9.24	35.3	45.7	2.34	11,725
09-Jun-93	12.85	9.50	31.5	46.8	1.84	12,481
10-Jun-93	9.85	9.24	35.2	45.7	2.37	11,696
12-Jun-93	10.22	8.91	34.2	46.6	2.23	11,864
13-Jun-93	11.16	9.02	34.5	45.4	2.24	11,621
14-Jun-93	11.15	9.10	34.1	45.7	2.23	11,601
15-Jun-93	11.34	9.05	34.3	45.3	2.38	11,544
16-Jun-93	10.96	8.93	35.2	45.0	2.38	11,583
17-Jun-93	9.33	9.30	34.5	46.9	2.22	11,896
18-Jun-93	10.50	9.47	34.5	45.6	2.35	11,640
19-Jun-93	12.39	9.43	34.2	44.0	2.54	11,215
20-Jun-93	11.49	10.09	33.8	44.7	2.41	11,309
21-Jun-93	11.89	9.24	34.4	44.5	2.43	11,330
22-Jun-93	11.68	9.62	33.7	45.0	2.43	11,340
23-Jun-93	11.11	9.38	34.8	44.6	2.41	11,464
24-Jun-93	12.76	9.33	33.9	44.0	2.49	11,200
26-Jun-93	11.75	10.26	33.4	44.6	2.36	11,186
27-Jun-93	11.50	10.92	33.5	44.2	2.38	11,196
28-Jun-93	12.58	10.95	33.2	43.3	2.28	11,024
29-Jun-93	13.12	9.80	33.4	43.6	2.41	11,094
30-Jun-93	13.66	9.27	33.4	43.6	2.45	11,103
01-Jul-93	12.90	9.39	33.7	44.0	2.45	11,144
02-Jul-93	12.59	9.50	33.3	44.6	2.45	11,209
03-Jul-93	13.07	9.66	33.2	44.1	2.43	11,174
04-Jul-93	11.85	9.76	33.8	44.6	2.45	11,296
05-Jul-93	12.24	9.70	33.7	44.3	2.44	11,230
06-Jul-93	11.30	9.76	33.9	45.1	2.41	11,355
07-Jul-93	10.07	9.78	33.9	46.3	2.36	11,705
08-Jul-93	11.62	9.90	34.4	44.1	2.54	11,205
09-Jul-93	12.85	9.80	33.9	43.5	2.56	11,149
10-Jul-93	10.38	9.60	33.6	46.4	2.19	11,740
11-Jul-93	11.91	9.85	33.9	44.3	2.44	11,339
12-Jul-93	11.75	10.04	33.8	44.5	2.46	11,319
13-Jul-93	12.93	9.33	33.7	44.1	2.39	11,215
14-Jul-93	12.98	9.18	33.3	44.6	2.31	11,266
15-Jul-93	13.54	8.99	33.4	44.1	2.36	11,176
16-Jul-93	11.66	9.27	33.2	45.8	2.15	11,544
17-Jul-93	13.50	9.06	33.7	43.7	2.41	11,143
18-Jul-93	13.80	8.92	33.4	43.9	2.36	11,106
19-Jul-93	13.47	8.82	33.6	44.1	2.33	11,195
20-Jul-93	11.94	8.88	34.2	45.0	2.51	11,403
21-Jul-93	12.39	8.99	34.0	44.7	2.44	11,339
23-Jul-93	11.32	9.15	34.1	45.4	2.42	11,505
24-Jul-93	11.31	9.14	34.5	45.1	2.40	11,480
25-Jul-93	10.86	9.11	34.2	45.8	2.30	11,613
26-Jul-93	11.34	9.58	34.3	44.8	2.58	11,428
28-Jul-93	9.78	9.87	34.2	46.2	2.19	11,680

TABLE A-27 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
29-Jul-93	12.09	8.92	33.8	45.1	2.25	11,467
30-Jul-93	11.90	8.92	33.8	45.4	2.21	11,498
31-Jul-93	12.15	9.03	34.0	44.8	2.42	11,379
01-Aug-93	12.01	8.77	34.1	45.1	2.29	11,463
02-Aug-93	11.14	9.41	33.6	45.9	2.28	11,540
03-Aug-93	11.76	8.67	33.8	45.8	2.23	11,548
04-Aug-93	11.61	9.01	33.9	45.6	2.34	11,540
05-Aug-93	11.76	9.00	33.8	45.4	2.35	11,499
08-Aug-93	14.28	8.85	33.3	43.5	2.60	11,081
09-Aug-93	12.72	8.91	33.3	45.1	2.37	11,360
10-Aug-93	13.29	9.05	32.4	45.2	2.06	11,282
11-Aug-93	11.82	8.83	33.8	45.6	2.37	11,538
12-Aug-93	12.62	8.59	33.6	45.2	2.38	11,406
13-Aug-93	12.25	8.73	33.4	45.6	2.28	11,535
14-Aug-93	12.36	10.42	32.9	44.3	2.31	11,155
15-Aug-93	12.70	9.87	33.1	44.3	2.84	11,245
16-Aug-93	12.53	8.85	33.2	45.5	2.16	11,474
17-Aug-93	11.14	9.38	33.4	46.0	2.24	11,564
18-Aug-93	12.09	9.93	33.0	45.0	2.23	11,280
19-Aug-93	11.40	9.60	33.5	45.5	2.28	11,449
20-Aug-93	11.47	10.17	33.8	44.5	2.39	11,368
21-Aug-93	10.78	10.44	33.5	45.3	2.26	11,464
23-Aug-93	8.31	11.27	31.5	48.9	1.76	11,971
24-Aug-93	10.72	10.69	33.4	45.2	2.39	11,388
25-Aug-93	10.70	10.77	33.2	45.3	2.30	11,434
26-Aug-93	10.92	10.58	33.1	45.3	2.33	11,412
27-Aug-93	11.06	10.29	33.4	45.3	2.47	11,392
28-Aug-93	11.87	10.66	33.2	44.2	2.36	11,216
29-Aug-93	10.89	10.35	33.7	45.1	2.32	11,405
30-Aug-93	10.10	9.08	34.6	46.2	2.31	11,690
31-Aug-93	10.88	9.38	34.5	45.3	2.46	11,481
01-Sep-93	10.71	10.13	33.8	45.4	2.43	11,460
02-Sep-93	10.92	10.08	33.8	45.3	2.45	11,439
03-Sep-93	10.96	9.99	33.7	45.3	2.42	11,420
04-Sep-93	11.25	9.69	33.8	45.3	2.40	11,394
07-Sep-93	10.64	10.23	33.2	46.0	2.40	11,408
Auxiliary Test Block						
13-Sep-93	11.08	10.30	34.4	44.2	2.59	11,386
14-Sep-93	11.15	10.32	34.3	44.2	2.60	11,345
15-Sep-93	10.38	10.69	33.3	45.5	2.41	11,495
16-Sep-93	9.83	10.50	33.5	46.2	2.31	11,614
17-Sep-93	11.13	10.46	33.6	44.9	2.47	11,364
18-Sep-93	11.06	10.47	33.6	44.9	2.55	11,388
19-Sep-93	11.06	10.30	34.3	44.3	2.47	11,411
20-Sep-93	10.01	9.79	33.2	47.0	1.82	11,760
21-Sep-93	13.30	9.49	33.0	44.2	2.23	11,205
22-Sep-93	12.53	10.45	32.7	44.3	2.22	11,142
23-Sep-93	12.87	9.51	32.7	45.0	2.25	11,273
24-Sep-93	12.32	10.00	33.0	44.7	2.14	11,267
25-Sep-93	12.87	9.69	33.0	44.4	2.33	11,187
26-Sep-93	12.58	9.90	33.5	44.1	2.50	11,174

TABLE A-27 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
27-Sep-93	11.95	9.93	33.4	44.7	2.43	11,314
28-Sep-93	10.53	10.49	34.0	45.0	2.45	11,469
29-Sep-93	12.45	9.39	33.9	44.3	2.52	11,305
04-Oct-93	11.06	9.43	34.2	45.4	2.47	11,494
05-Oct-93	11.10	9.51	34.1	45.3	2.47	11,461
06-Oct-93	12.61	9.63	33.7	44.0	2.52	11,216
07-Oct-93	12.35	9.48	33.9	44.3	2.53	11,267
08-Oct-93	12.46	9.31	33.5	44.6	2.34	11,282
09-Oct-93	11.71	9.23	34.2	44.9	2.37	11,420
10-Oct-93	12.29	8.93	33.9	44.8	2.48	11,409
11-Oct-93	12.89	9.00	33.9	44.3	2.56	11,232
12-Oct-93	11.57	9.59	34.1	44.7	2.41	11,414
13-Oct-93	11.68	9.83	33.7	44.8	2.38	11,403
14-Oct-93	10.64	9.75	34.3	45.3	2.47	11,470
15-Oct-93	11.08	9.60	34.3	45.0	2.42	11,477
16-Oct-93	11.96	9.34	34.2	44.5	2.40	11,322
17-Oct-93	11.51	9.57	34.2	44.7	2.41	11,348
18-Oct-93	11.25	9.47	34.3	44.9	2.43	11,421
19-Oct-93	11.53	9.61	34.3	44.6	2.50	11,393
23-Oct-93	12.71	9.61	33.3	44.3	2.39	11,188
24-Oct-93	12.33	9.04	33.8	44.9	2.30	11,335
25-Oct-93	12.80	8.79	33.7	44.6	2.29	11,377
26-Oct-93	12.90	8.68	33.8	44.6	2.35	11,321
27-Oct-93	12.40	8.76	33.9	44.9	2.26	11,381
28-Oct-93	12.47	8.73	33.9	44.9	2.31	11,375
29-Oct-93	11.85	8.96	33.5	45.7	2.19	11,416
30-Oct-93	14.16	8.47	32.4	44.9	2.15	11,166
31-Oct-93	13.86	8.62	32.9	44.6	2.29	11,157
01-Nov-93	12.71	8.94	33.3	45.0	2.22	11,312
02-Nov-93	13.29	8.79	33.2	44.7	2.29	11,302
03-Nov-93	13.00	8.93	33.3	44.7	2.29	11,285
04-Nov-93	13.56	8.71	33.2	44.5	2.21	11,291
28-Nov-93	13.48	8.76	33.6	44.2	2.26	11,188
29-Nov-93	12.91	9.34	33.4	44.4	2.24	11,280
01-Dec-93	12.95	9.48	34.0	43.5	2.56	11,239
02-Dec-93	13.00	9.66	33.9	43.4	2.60	11,216
03-Dec-93	12.90	9.71	34.0	43.5	2.56	11,172
04-Dec-93	12.41	9.63	34.0	44.0	2.47	11,307
05-Dec-93	13.65	9.53	33.4	43.3	2.38	11,160
06-Dec-93	11.90	9.77	34.4	44.1	2.51	11,352
07-Dec-93	12.23	9.86	34.1	43.9	2.46	11,337
08-Dec-93	12.63	9.92	33.8	43.7	2.43	11,237
09-Dec-93	12.01	9.78	34.1	44.0	2.50	11,367
10-Dec-93	13.67	9.32	33.4	43.6	2.29	11,203
11-Dec-93	13.43	9.48	33.5	43.6	2.31	11,206
12-Dec-93	12.67	9.75	33.5	44.0	2.41	11,279
13-Dec-93	12.43	9.90	33.5	44.1	2.45	11,233
14-Dec-93	12.09	9.13	34.1	44.7	2.47	11,435
15-Dec-93	13.29	9.27	33.6	44.0	2.60	11,217
16-Dec-93	12.50	9.35	34.1	44.0	2.54	11,225
17-Dec-93	12.44	9.30	34.1	44.1	2.53	11,368

TABLE A-27 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
18-Dec-93	12.89	9.02	34.1	43.9	2.54	11,324
19-Dec-93	12.88	9.17	34.2	43.8	2.58	11,340
20-Dec-93	13.12	9.20	34.0	43.7	2.55	11,162
21-Dec-93	13.58	9.06	34.1	43.2	2.62	11,187
22-Dec-93	13.77	9.23	34.1	42.9	2.56	11,175
23-Dec-93	14.25	9.12	33.9	42.8	2.50	10,978
25-Dec-93	13.75	9.33	33.7	43.2	2.52	11,140
26-Dec-93	13.79	9.17	33.9	43.2	2.44	11,145
27-Dec-93	12.26	10.07	33.9	43.9	2.49	11,348
28-Dec-93	12.42	10.12	33.6	43.8	2.50	11,228
29-Dec-93	12.17	10.30	33.7	43.8	2.39	11,287
30-Dec-93	12.02	9.65	34.3	44.1	2.39	11,291
31-Dec-93	12.15	9.67	34.1	44.1	2.38	11,265
02-Jan-94	12.48	9.71	33.5	44.3	2.25	11,252
03-Jan-94	12.83	10.01	33.3	43.8	2.23	11,163
05-Jan-94	14.07	9.43	32.9	43.6	2.28	11,056
06-Jan-94	14.98	9.40	32.6	43.0	2.27	10,919
07-Jan-94	14.04	9.48	33.2	43.3	2.29	10,997
08-Jan-94	14.44	9.47	32.9	43.1	2.26	10,913
09-Jan-94	13.81	9.84	33.0	43.4	2.22	10,847
10-Jan-94	12.75	9.76	33.7	43.9	2.36	11,116
11-Jan-94	12.80	9.47	33.6	44.1	2.37	11,086
12-Jan-94	14.92	9.36	32.2	43.5	2.29	10,869
13-Jan-94	13.23	9.83	32.2	44.7	2.14	11,169
14-Jan-94	13.85	9.91	32.7	43.6	2.26	10,959
15-Jan-94	14.05	9.70	32.7	43.5	2.23	10,968
16-Jan-94	11.94	10.58	32.8	44.6	2.20	11,266
17-Jan-94	12.59	10.70	33.2	43.5	2.31	11,003
18-Jan-94	13.01	10.53	33.5	43.0	2.39	11,056
19-Jan-94	12.67	10.25	33.1	43.9	2.36	11,152
20-Jan-94	9.93	10.69	33.4	45.9	1.95	11,716
21-Jan-94	8.98	10.13	32.7	48.1	1.71	12,058
24-Jan-94	12.22	10.80	32.7	44.3	1.99	11,185
25-Jan-94	8.18	9.89	37.4	44.6	3.59	12,058
Alternate Coal Test Block						
26-Jan-94	7.87	9.99	38.6	43.6	4.49	12,122
27-Jan-94	7.56	10.07	38.8	43.5	4.38	12,141
28-Jan-94	10.85	9.65	37.7	41.7	4.23	11,745
29-Jan-94	9.54	9.74	38.4	42.2	4.22	11,913
30-Jan-94	9.20	9.79	38.6	42.4	4.17	11,941
01-Feb-94	8.14	10.04	38.7	43.2	4.20	12,049
02-Feb-94	8.06	10.08	38.1	43.9	4.20	12,052
03-Feb-94	7.94	9.96	38.4	43.7	4.40	12,045
04-Feb-94	7.70	9.90	38.2	44.2	4.36	12,071
05-Feb-94	10.80	9.77	36.7	42.7	4.19	11,670
06-Feb-94	9.55	9.74	37.4	43.2	4.28	11,843
07-Feb-94	9.01	9.74	37.4	43.6	4.32	11,950
08-Feb-94	9.16	9.86	38.6	42.3	4.28	11,862
09-Feb-94	8.73	9.94	37.7	43.7	4.28	11,953
10-Feb-94	9.28	9.58	37.7	43.4	4.31	11,820
11-Feb-94	10.83	9.43	37.1	42.6	4.21	11,746

TABLE A-27 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
12-Feb-94	9.97	10.05	37.3	42.7	4.40	11,769
13-Feb-94	8.63	10.09	37.9	43.3	4.43	11,981
14-Feb-94	9.01	9.79	37.1	44.0	4.24	11,922
15-Feb-94	7.19	10.62	37.7	44.5	4.38	12,118

TABLE A-28
COAL PROXIMATE ANALYSES: HIGH-PARTICULATE TEST PERIOD

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
Parametric Tests						
15-Mar-94	12.11	9.28	34.9	43.7	2.44	11,361
16-Mar-94	12.10	9.53	34.6	43.8	2.53	11,309
17-Mar-94	11.60	9.75	34.8	43.8	2.52	11,311
18-Mar-94	11.65	9.41	34.9	44.1	2.47	11,409
19-Mar-94	12.00	9.27	34.7	44.1	2.45	11,329
20-Mar-94	11.87	9.23	34.8	44.2	2.37	11,394
21-Mar-94	12.01	9.25	34.8	44.0	2.41	11,387
22-Mar-94	11.79	9.43	34.8	43.9	2.41	11,368
23-Mar-94	11.73	9.52	34.6	44.1	2.33	11,388
12-Apr-94	12.85	8.93	33.7	44.5	2.49	11,307
13-Apr-94	14.59	9.06	32.8	43.6	2.37	11,004
14-Apr-94	8.76	9.94	37.0	44.3	4.20	11,905
18-Apr-94	12.33	9.39	33.7	44.6	2.42	11,260
19-Apr-94	12.31	9.21	33.8	44.7	2.57	11,249
20-Apr-94	12.72	9.24	34.1	43.9	2.67	11,222
21-Apr-94	12.02	9.38	34.0	44.5	2.59	11,291
22-Apr-94	12.21	9.42	33.7	44.7	2.54	11,294
23-Apr-94	11.97	9.63	33.9	44.5	2.50	11,306
24-Apr-94	11.75	9.65	33.5	45.0	2.54	11,367
25-Apr-94	11.61	9.52	33.9	44.9	2.45	11,418
26-Apr-94	11.83	9.65	33.2	45.3	2.41	11,341
27-Apr-94	12.87	9.29	33.5	44.4	2.42	11,228
28-Apr-94	12.61	9.28	33.4	44.7	2.45	11,312
29-Apr-94	12.38	9.37	33.6	44.6	2.40	11,319
30-Apr-94	12.20	9.32	33.9	44.6	2.42	11,267
01-May-94	12.32	9.17	34.8	43.7	2.79	11,282
02-May-94	11.65	9.43	34.5	44.4	2.67	11,334
03-May-94	13.09	9.18	34.0	43.7	2.47	11,201
04-May-94	13.86	9.28	33.2	43.8	2.43	11,091
05-May-94	14.08	9.17	33.0	43.8	2.37	11,101
06-May-94	12.81	9.40	33.7	44.1	2.45	11,211
07-May-94	11.73	9.99	33.8	44.5	2.44	11,285
08-May-94	14.38	9.56	33.1	43.0	2.32	10,996
09-May-94	14.11	9.34	32.9	43.7	2.44	10,990
10-May-94	13.01	9.26	33.8	43.9	2.73	11,174
11-May-94	13.09	9.13	33.9	43.9	2.73	11,119
12-May-94	11.93	9.30	34.0	44.7	2.80	11,267
13-May-94	12.13	9.44	34.6	43.8	2.74	11,229
14-May-94	11.97	9.32	34.7	44.0	2.75	11,292
15-May-94	13.47	9.20	33.9	43.4	2.65	11,131
16-May-94	12.74	9.26	33.3	44.7	2.55	11,313
17-May-94	12.33	9.11	33.6	45.0	2.49	11,381
18-May-94	11.73	9.38	34.2	44.8	2.52	11,376
20-May-94	10.93	9.51	34.7	44.9	2.58	11,491
21-May-94	11.31	9.37	34.4	44.9	2.56	11,407
22-May-94	11.11	9.40	34.1	45.3	2.49	11,457
23-May-94	11.19	9.56	34.8	44.4	2.56	11,428
24-May-94	10.91	9.60	34.4	45.2	2.63	11,439

TABLE A-28 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
25-May-94	11.88	9.23	34.5	44.3	2.68	11,311
26-May-94	11.76	9.53	34.4	44.3	2.61	11,307
31-May-94	12.15	9.37	34.0	44.5	2.42	11,327
Long-Term Tests						
08-Jun-94	13.15	9.03	33.7	44.1	2.41	11,218
09-Jun-94	12.17	9.25	34.2	44.4	2.40	11,339
10-Jun-94	11.69	9.25	34.0	45.0	2.39	11,418
11-Jun-94	11.53	9.33	34.2	44.9	2.37	11,374
12-Jun-94	11.34	9.27	34.1	45.3	2.48	11,384
13-Jun-94	11.23	9.36	34.3	45.1	2.42	11,417
14-Jun-94	11.87	9.34	34.1	44.7	2.42	11,353
15-Jun-94	11.53	9.70	34.1	44.7	2.52	11,360
16-Jun-94	12.23	9.36	34.1	44.4	2.43	11,338
17-Jun-94	12.56	8.43	34.1	44.9	2.26	11,383
20-Jun-94	11.49	8.61	34.1	45.8	2.24	11,534
21-Jun-94	10.62	9.29	34.3	45.8	2.25	11,596
22-Jun-94	12.50	8.93	33.9	44.7	2.43	11,318
23-Jun-94	12.16	8.93	34.3	44.6	2.26	11,314
24-Jun-94	13.11	8.97	33.9	44.0	2.31	11,255
25-Jun-94	12.57	9.10	34.4	44.0	2.43	11,325
26-Jun-94	11.88	9.23	34.5	44.4	2.41	11,272
27-Jun-94	11.83	9.27	34.4	44.5	2.42	11,402
28-Jun-94	11.55	9.49	34.1	44.8	2.45	11,413
29-Jun-94	11.36	9.43	34.0	45.1	2.42	11,449
30-Jun-94	13.59	8.99	33.5	43.9	2.41	11,172
01-Jul-94	11.50	9.26	34.4	44.9	2.50	11,382
02-Jul-94	12.00	9.58	33.8	44.6	2.49	11,315
03-Jul-94	10.62	9.40	34.4	45.6	2.40	11,600
06-Jul-94	10.52	10.17	32.9	46.4	2.04	11,735
07-Jul-94	13.42	8.61	33.3	44.7	2.18	11,264
08-Jul-94	13.37	8.72	33.4	44.6	2.21	11,260
09-Jul-94	12.99	9.14	34.5	43.3	2.65	11,261
10-Jul-94	14.11	8.62	32.9	44.3	2.12	11,205
12-Jul-94	14.05	8.68	32.5	44.8	2.07	11,180
13-Jul-94	14.58	8.65	32.6	44.2	2.03	11,110
14-Jul-94	13.23	8.95	33.2	44.6	2.12	11,249
15-Jul-94	12.25	9.54	34.1	44.1	2.41	11,329
16-Jul-94	13.34	8.98	33.5	44.2	2.26	11,221
17-Jul-94	11.73	9.22	33.9	45.2	2.28	11,438
18-Jul-94	12.00	9.04	34.0	45.1	2.25	11,412
19-Jul-94	13.14	9.05	33.7	44.1	2.33	11,245
20-Jul-94	14.66	9.05	32.7	43.6	2.25	11,058
21-Jul-94	12.66	9.12	33.4	44.8	2.21	11,291
22-Jul-94	12.97	8.92	33.5	44.6	2.15	11,311
23-Jul-94	13.80	8.80	33.3	44.1	2.09	11,204
24-Jul-94	12.38	8.88	33.8	44.9	2.14	11,391
25-Jul-94	12.00	8.78	33.9	45.3	2.14	11,481
26-Jul-94	12.66	8.80	33.7	44.8	2.17	11,359
27-Jul-94	13.55	8.92	33.5	44.0	2.15	11,248
28-Jul-94	15.07	8.70	32.4	43.8	2.23	11,009
30-Jul-94	12.66	9.14	33.8	44.5	2.32	11,322

TABLE A-28 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
31-Jul-94	13.29	9.17	33.3	44.2	2.35	11,155
01-Aug-94	12.82	9.15	33.4	44.6	2.37	11,335
02-Aug-94	12.29	9.31	33.9	44.6	2.37	11,463
03-Aug-94	12.19	9.40	34.1	44.3	2.46	11,357
04-Aug-94	13.52	9.31	33.1	44.0	2.23	11,209
05-Aug-94	12.13	8.81	33.6	45.5	2.23	11,383
06-Aug-94	11.68	9.07	33.6	45.7	2.19	11,435
07-Aug-94	11.47	8.94	33.6	45.9	2.23	11,467
09-Aug-94	10.31	9.15	33.9	46.6	2.19	11,696
10-Aug-94	10.77	9.17	34.0	46.0	2.19	11,634
11-Aug-94	10.98	9.02	34.1	45.9	2.14	11,549
12-Aug-94	11.62	8.94	33.9	45.5	2.20	11,510
13-Aug-94	11.96	9.02	33.6	45.3	2.17	11,450
14-Aug-94	11.61	8.97	34.1	45.3	2.22	11,473
15-Aug-94	11.99	9.12	33.5	45.3	2.21	11,403
16-Aug-94	13.30	8.97	33.0	44.7	2.18	11,235
17-Aug-94	13.07	9.60	—	—	2.12	11,207
18-Aug-94	12.12	9.87	—	—	2.14	11,311
19-Aug-94	12.32	11.14	32.5	44.0	2.16	11,100
20-Aug-94	10.06	11.99	33.1	44.8	2.11	11,375
21-Aug-94	9.93	12.30	32.9	44.9	2.12	11,450
22-Aug-94	10.12	11.13	33.6	45.1	2.12	11,560
23-Aug-94	11.15	11.75	33.6	43.5	2.34	11,308
24-Aug-94	9.95	11.91	33.5	44.7	2.25	11,479
25-Aug-94	10.75	11.96	33.7	43.6	2.39	11,288
26-Aug-94	10.66	12.56	33.2	43.5	2.25	11,152
27-Aug-94	8.89	11.60	34.4	46.0	2.04	11,727
28-Aug-94	9.41	12.00	34.2	45.3	2.20	11,491
High Removal Test Block						
08-Sep-94	11.57	12.28	33.7	42.4	2.43	11,037
09-Sep-94	6.50	10.41	32.1	51.1	1.17	12,570
10-Sep-94	6.38	9.46	32.9	51.3	1.22	12,769
11-Sep-94	5.77	9.89	33.1	51.3	1.14	12,763
12-Sep-94	4.75	9.43	32.8	53.1	1.43	13,178
13-Sep-94	4.69	9.70	33.1	52.6	1.39	13,048
14-Sep-94	4.55	9.61	33.2	52.7	1.35	13,084
15-Sep-94	5.07	9.28	33.6	52.0	1.24	12,915
16-Sep-94	6.54	10.11	32.6	50.7	1.14	12,607
17-Sep-94	9.28	9.44	31.9	49.4	1.15	12,309
18-Sep-94	7.31	10.23	31.9	50.5	1.39	12,575
19-Sep-94	6.53	10.96	32.3	50.2	1.16	12,425
20-Sep-94	6.62	10.22	33.0	50.2	1.30	12,580
21-Sep-94	6.19	10.36	32.4	51.1	1.31	12,665
22-Sep-94	5.94	9.89	32.5	51.7	1.28	12,802
Alternate Coal Test Block						
04-Oct-94	13.05	8.09	36.2	42.7	3.39	11,490
05-Oct-94	12.89	8.13	36.1	42.9	3.46	11,459
06-Oct-94	12.77	7.89	36.6	42.7	3.54	11,543
07-Oct-94	12.94	7.82	36.7	42.5	3.54	11,537
08-Oct-94	12.43	8.09	36.3	43.1	3.40	11,605
09-Oct-94	12.57	7.95	36.8	42.7	3.45	11,569

TABLE A-28 (CONTINUED)

Date	H_2O, wt. %	Ash, wt. %	Volatiles, wt. %	Fixed C, wt. %	Sulfur, wt. %	HHV, Btu/lb
12-Oct-94	14.90	7.50	36.1	41.5	3.36	11,271
13-Oct-94	13.93	7.59	36.3	42.2	3.38	11,410
14-Oct-94	14.92	7.35	36.3	41.4	3.46	11,294
15-Oct-94	14.09	7.53	36.2	42.3	3.47	11,389
16-Oct-94	12.94	7.57	36.9	42.6	3.54	11,524
17-Oct-94	12.71	7.45	37.2	42.7	3.44	11,606
18-Oct-94	12.43	7.65	36.9	43.1	3.39	11,627
19-Oct-94	12.60	7.80	36.6	43.0	3.52	11,508
20-Oct-94	12.34	7.95	36.3	43.4	3.32	11,592
21-Oct-94	12.99	7.63	36.9	42.5	3.47	11,551
22-Oct-94	13.85	7.86	36.4	41.9	3.41	11,374
23-Oct-94	14.15	8.16	35.7	41.5	3.23	11,260
24-Oct-94	12.94	7.58	36.8	42.7	3.38	11,545
Alternate Limestone Test Block						
01-Dec-94	8.41	9.56	32.7	49.3	1.18	12,380
02-Dec-94	7.69	9.45	33.2	49.6	1.16	12,445
03-Dec-94	7.54	9.61	33.1	49.7	1.14	12,483
04-Dec-94	9.02	9.24	33.3	48.5	1.13	12,289
05-Dec-94	9.49	9.62	32.4	48.5	1.18	12,172
06-Dec-94	8.02	9.78	33.0	49.2	1.18	12,408
07-Dec-94	7.90	9.55	33.1	49.5	1.18	12,431
08-Dec-94	7.08	9.80	33.1	50.0	1.18	12,534
09-Dec-94	7.59	9.65	33.4	49.3	1.13	12,478
10-Dec-94	8.35	9.49	32.9	49.2	1.13	12,391
11-Dec-94	8.76	9.26	32.6	49.4	1.09	12,254
12-Dec-94	7.89	9.76	32.7	49.7	1.19	12,436
13-Dec-94	8.60	9.49	32.7	49.2	1.27	12,249
14-Dec-94	8.45	9.42	32.0	50.2	1.02	12,435

Note: As received basis for all parameters

TABLE A-29
COAL ULTIMATE ANALYSES: LOW-PARTICULATE TEST PERIOD

Parameter	22-Jan-93	22-Jun-93	13-Oct-93	09-Jan-94	27-Jan-94	22-Feb-94
Carbon, wt. %	60.72	64.29	64.72	62.53	66.9	67.45
Hydrogen, wt. %	4.01	4.32	4.37	4.15	4.7	4.79
Nitrogen, wt. %	1.19	1.29	1.28	1.25	1.16	1.15
Sulfur, wt. %	2.45	2.53	2.4	2.26	4.28	4.41
Oxygen, wt. %	6.62	5.99	6.58	7.21	5.52	5.87
Moisture, wt. %	13.88	11.64	11.47	13.26	7.67	6.43
Ash, wt. %	11.12	9.94	9.18	9.34	9.76	9.9
Chlorine, ppmw	988	1173	NA	NA	737	961
Fluorine, ppmw	29	15	58	75	92	93

As received basis.

NA = Not analyzed.

TABLE A-30
COAL ULTIMATE ANALYSES: HIGH-PARTICULATE TEST PERIOD

Parameter	Units	14-Mar-94	01-Jun-94	07-Jul-94	15-Sep-94	06-Oct-94
Carbon	wt. %	63.51	64.74	63.79	73.04	63.84
Hydrogen	wt. %	4.31	4.39	4.27	4.71	4.50
Nitrogen	wt. %	1.28	1.31	1.27	1.36	1.33
Sulfur	wt. %	2.42	2.39	2.13	1.28	3.42
Oxygen	wt. %	6.72	6.28	6.38	4.53	6.21
Moisture	wt. %	12.67	11.20	13.61	5.21	12.71
Ash	wt. %	9.09	9.69	8.55	9.87	8.00
Chlorine	ppmw	1,521	1,117	897	573	376
Fluorine	ppmw	45	78	45	76	20

Note: All parameters are reported on "as received" basis.

TABLE A-31
COAL TRACE ELEMENT ANALYSES: LOW-PARTICULATE TEST PERIOD

Element	Units	22-Jun-93	22-Feb-94
Aluminum	ppmw	14,500	11,600
Antimony	ppmw	<1.0	<1.0
Arsenic	ppmw	2	1.3
Barium	ppmw	47	43
Beryllium	ppmw	3	3
Calcium	ppmw	4,500	2,300
Cadmium	ppmw	1.2	<1.0
Copper	ppmw	15	8
Chromium	ppmw	23	18
Cobalt	ppmw	8	7
Iron	ppmw	8,900	20,500
Lead	ppmw	12	2
Magnesium	ppmw	700	500
Manganese	ppmw	40	27
Mercury	ppmw	0.03	0.14
Molybdenum	ppmw	4	2
Nickel	ppmw	19	12
Phosphorus	ppmw	300	200
Potassium	ppmw	2,400	1,300
Selenium	ppmw	<2.0	<2.0
Silicon	ppmw	27,300	23,600
Sodium	ppmw	800	500
Sulfur	ppmw	28,600	47,100
Titanium	ppmw	700	600
Vanadium	ppmw	38	24

TABLE A-32
COAL TRACE ELEMENT ANALYSES: HIGH-PARTICULATE TEST PERIOD

Element	Units	14-Mar-94	01-Jun-94	07-Jul-94	15-Sep-94	06-Oct-94
Aluminum	ppmw	12500	12500 a	12000 a	15800	13500 a
Antimony	ppmw	<1.0	<1.0 a	<1.0 a	1.1	1 a
Arsenic	ppmw	3.1	1.5	1.5	10.5	N/A
Barium	ppmw	43	N/A	N/A	162	N/A
Beryllium	ppmw	3.0	2.5 a	2.4 a	3.0	3.9 a
Boron	ppmw	N/A	N/A	N/A	N/A	N/A
Calcium	ppmw	3500	2600 a	2800 a	1300	520 a
Cadmium	ppmw	<1.0	<1.0 a	<1.0 a	<0.04	<1.0 a
Copper	ppmw	11.0	11.0 a	8.9 a	16.0	9.4 a
Chromium	ppmw	25	26 a	23 a	16	15 a
Cobalt	ppmw	9	9 a	9 a	11	8 a
Iron	ppmw	11700	11200 a	10000 a	8500	3900 a
Lead	ppmw	6.0	4.9 a	9.7 a	5.0	3.3 a
Magnesium	ppmw	700	630 a	620 a	700	670 a
Manganese	ppmw	29.0	28.5 a	27.4 a	17	30 a
Mercury	ppmw	0.04	0.06	0.06	0.08	0.13
Molybdenum	ppmw	1.0	4.4 a	4.4 a	N/A	N/A
Nickel	ppmw	18.0	16.3 a	18.8 a	13.0	14.5 a
Phosphorus	ppmw	100	N/A	N/A	200	N/A
Potassium	ppmw	2600	2800 a	1600 a	3100	1500 a
Selenium	ppmw	2.3	1.6	2.0	2.4	2.3
Silicon	ppmw	24000	29000 a	26000 a	28200	25000 a
Sodium	ppmw	800	810 a	780 a	700	450 a
Sulfur	ppmw	27700	26900	24600	13500	39200
Titanium	ppmw	700	720 a	710 a	900	830 a
Uranium	ppmw	N/A	N/A	N/A	N/A	N/A
Vanadium	ppmw	35.0	36.8 a	30.6 a	31.0	31.5 a

Note: All parameters are presented on a dry basis.
N/A = Not analyzed.
a = Calculated from "ignited basis" data.

Appendix B

Particle Size Distributions—JBR Inlet and Outlet Gas Streams

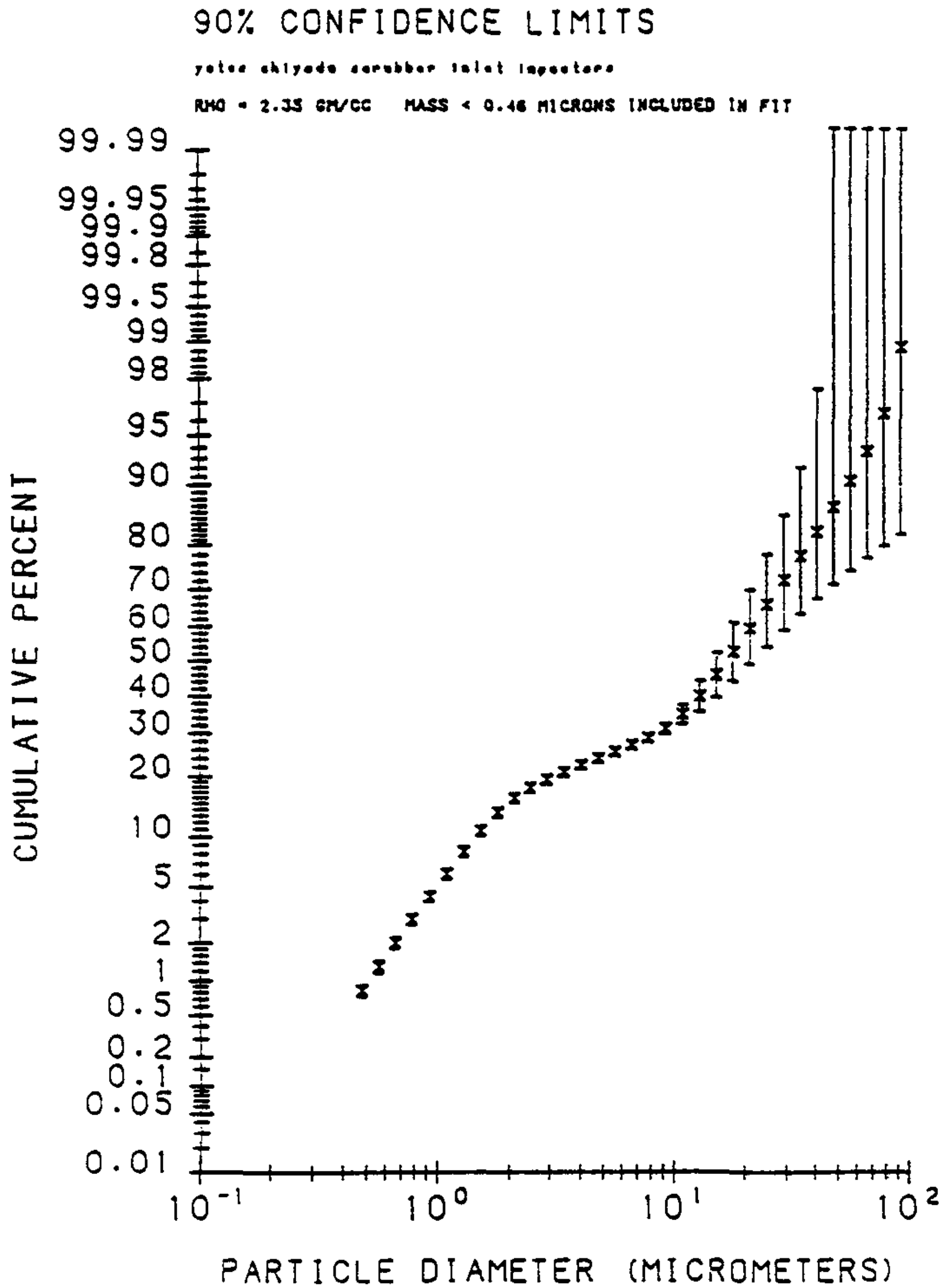


Figure B-1. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, January 21, 1993

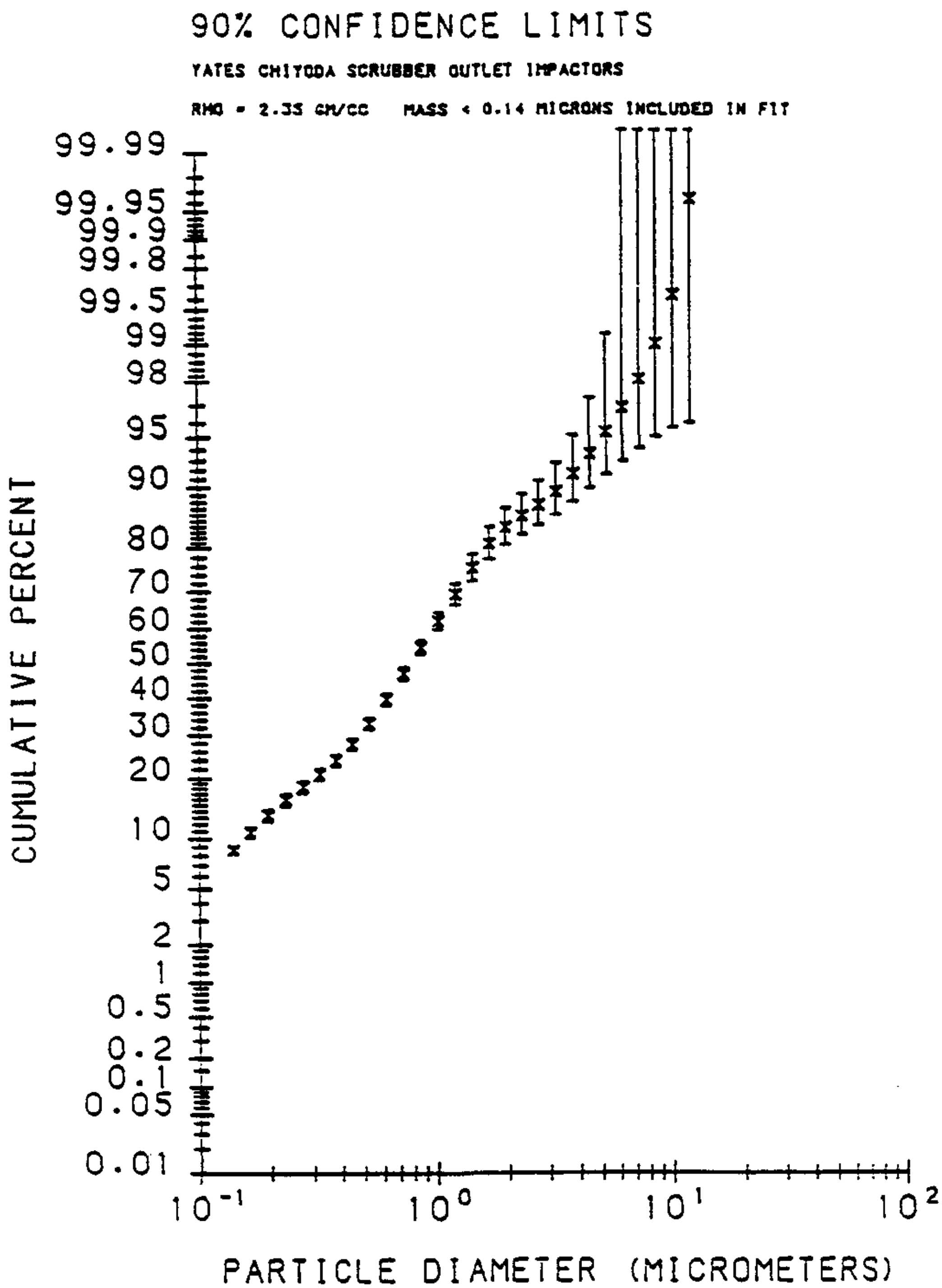


Figure B-2. Period 1 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, 8" ΔP, ESP Energized, January 21, 1993

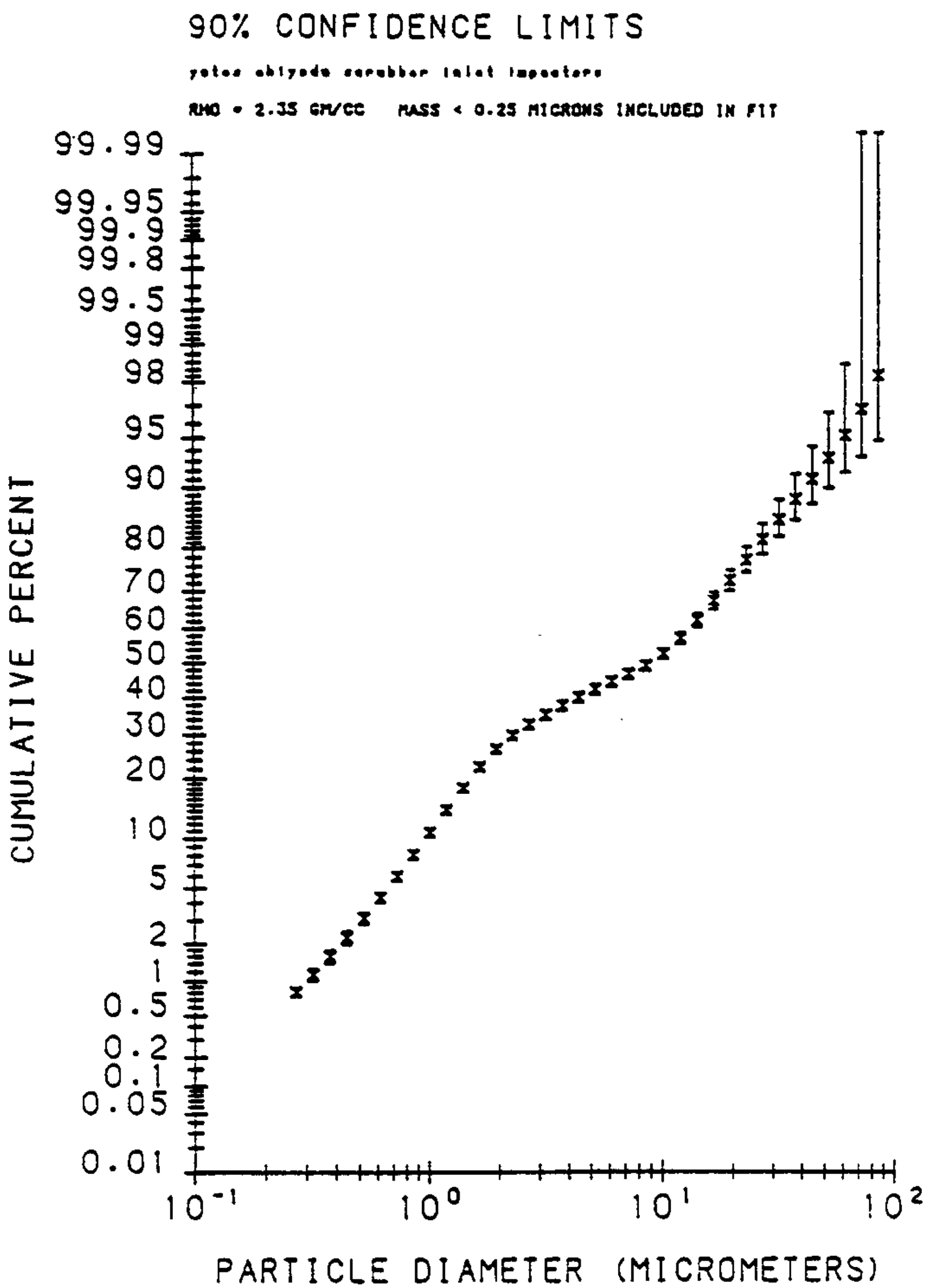


Figure B-3. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, January 22, 1993

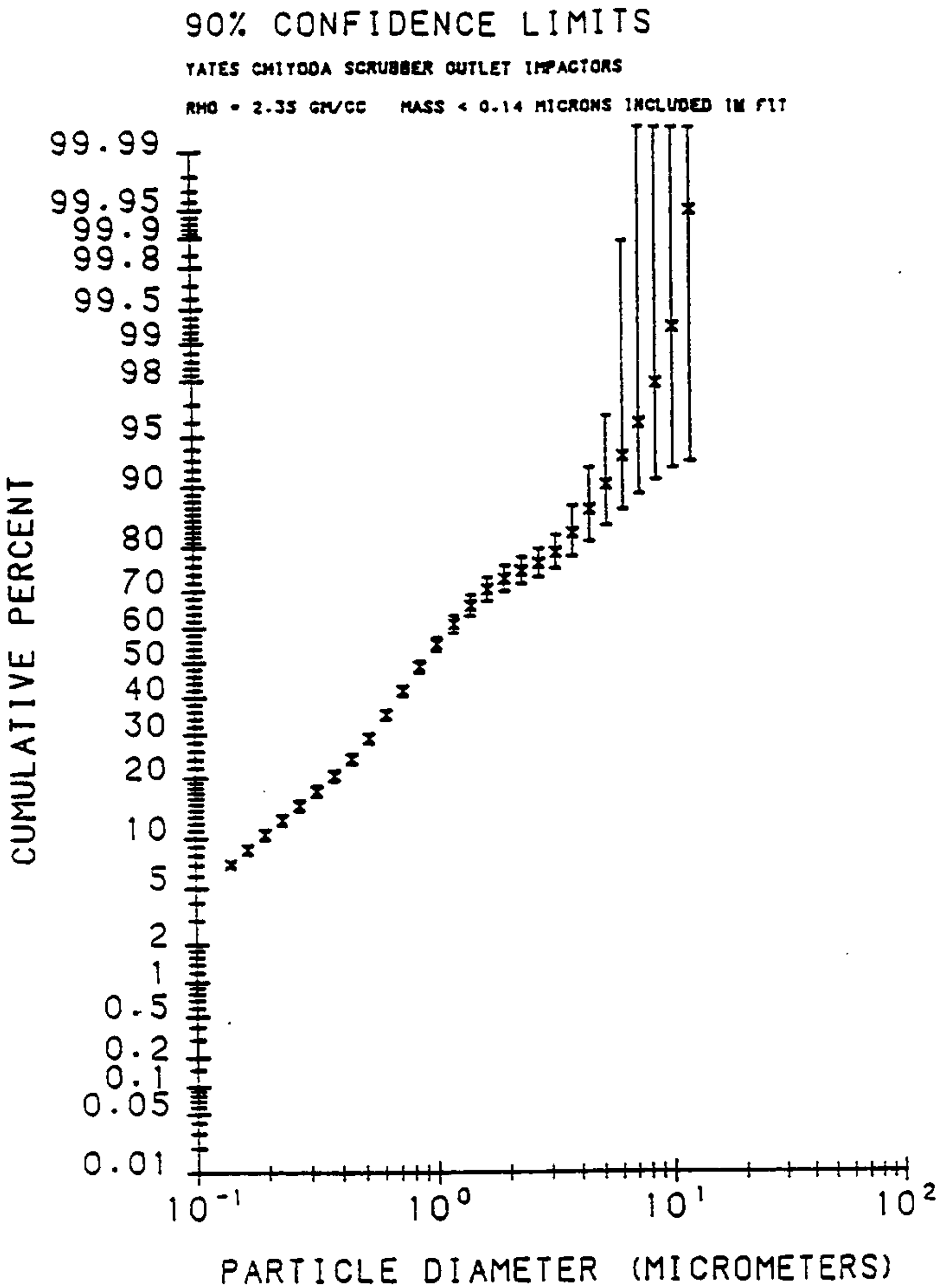


Figure B-4. Period 1 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, 12" ΔP, ESP Energized, January 22, 1993

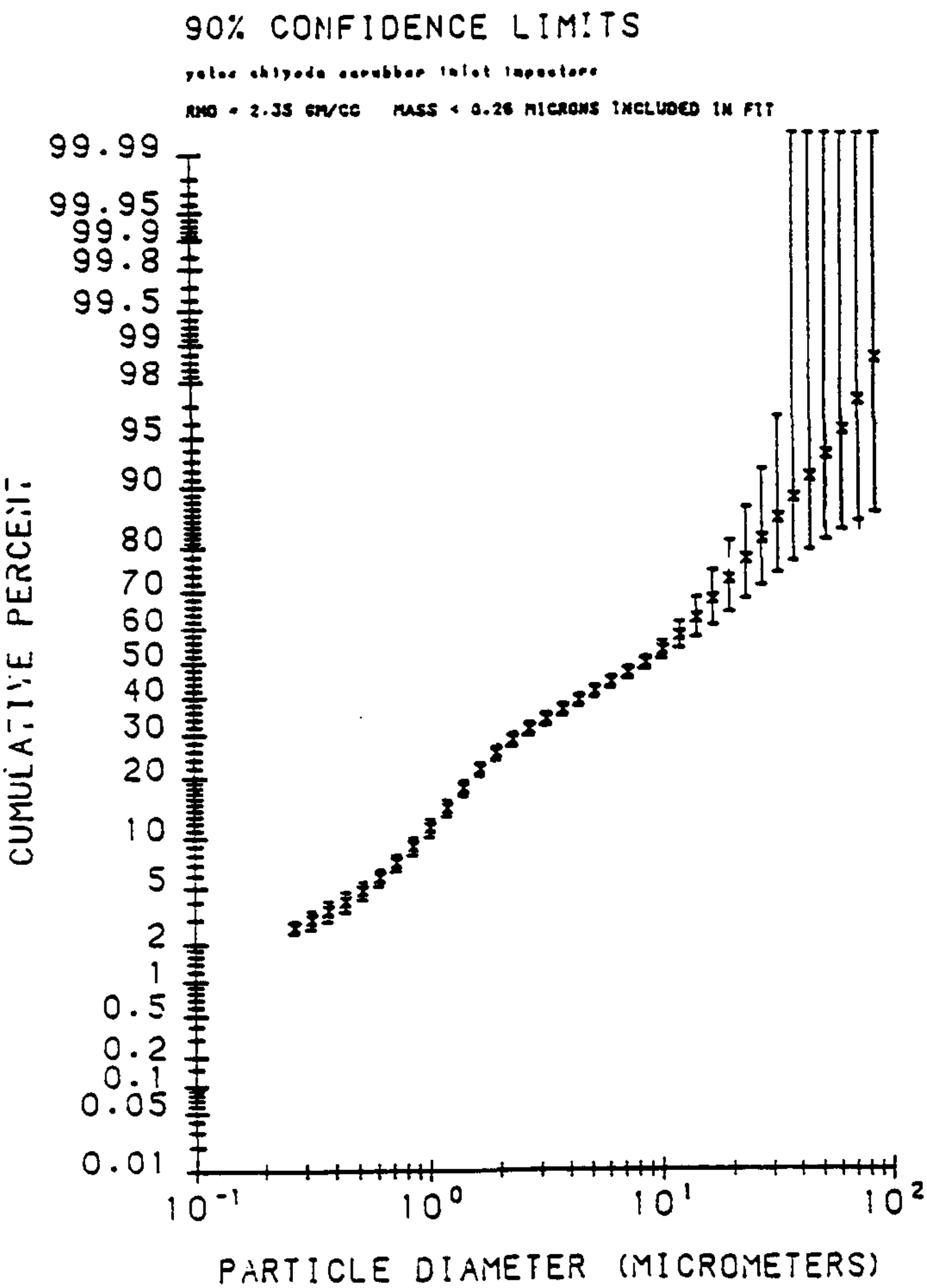


Figure B-5. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, January 23, 1993

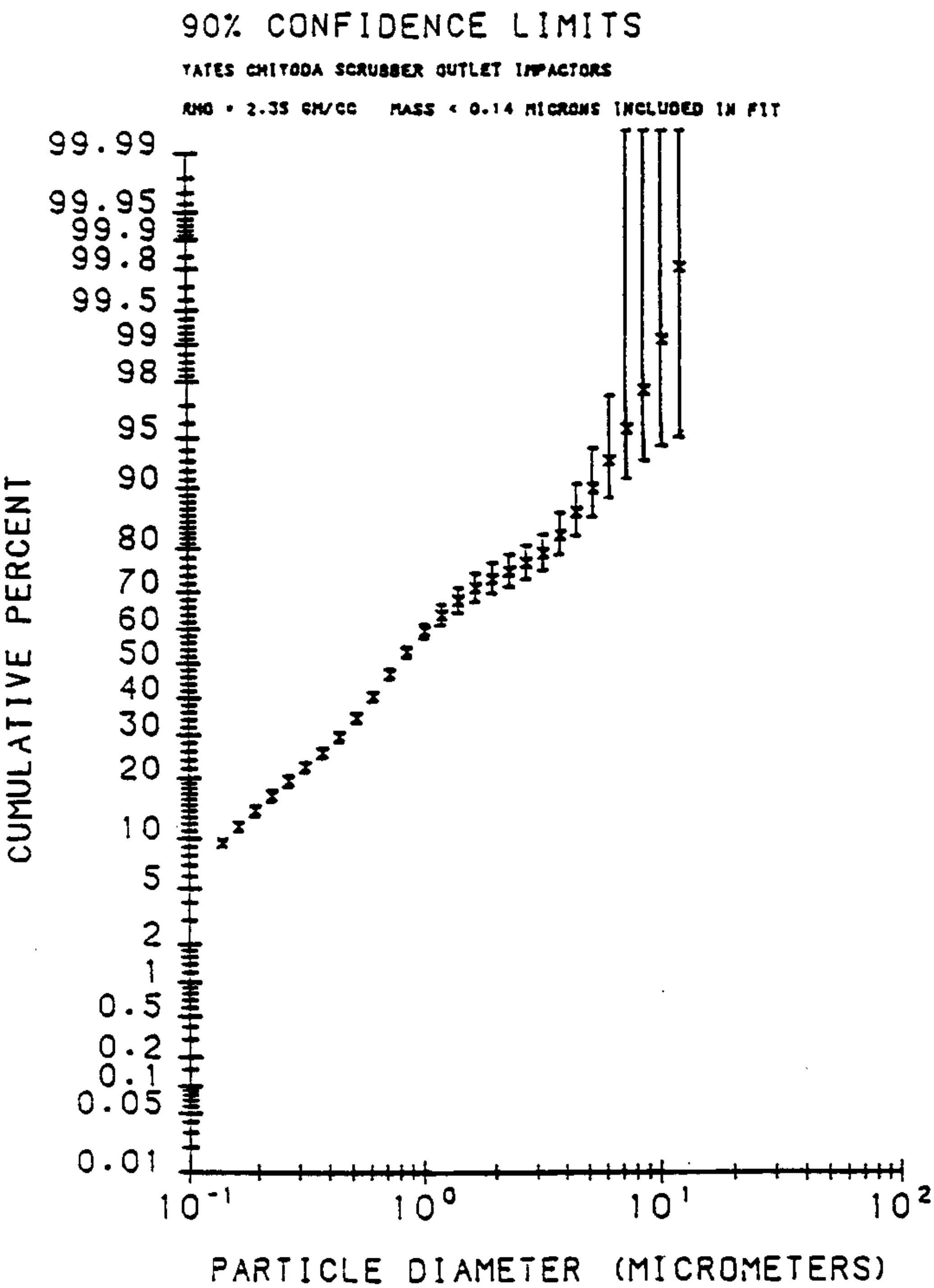


Figure B-6. Period 1 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, 16" ΔP, ESP Energized, January 23, 1993

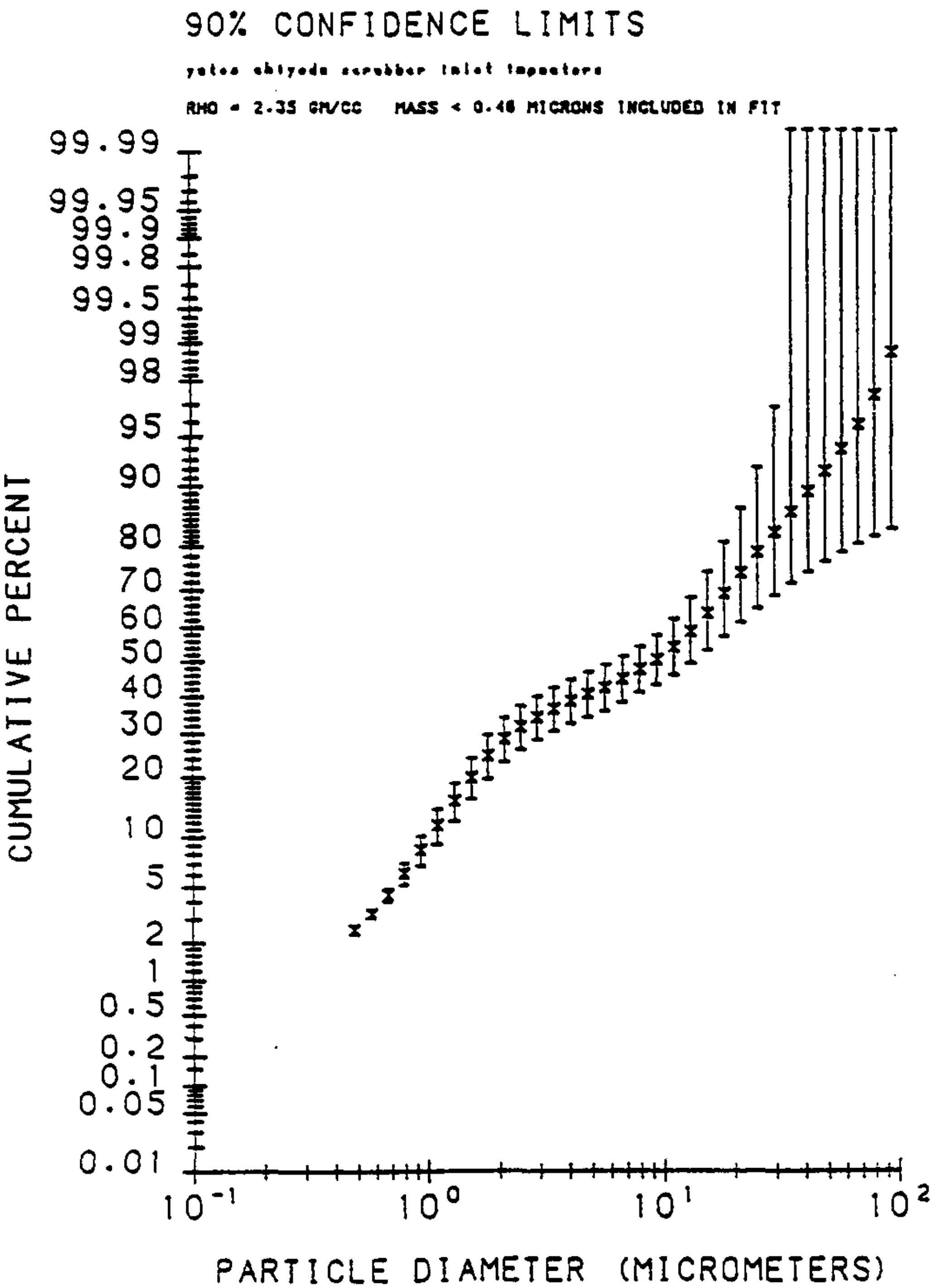


Figure B-7. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 75 MW, January 25, 1993

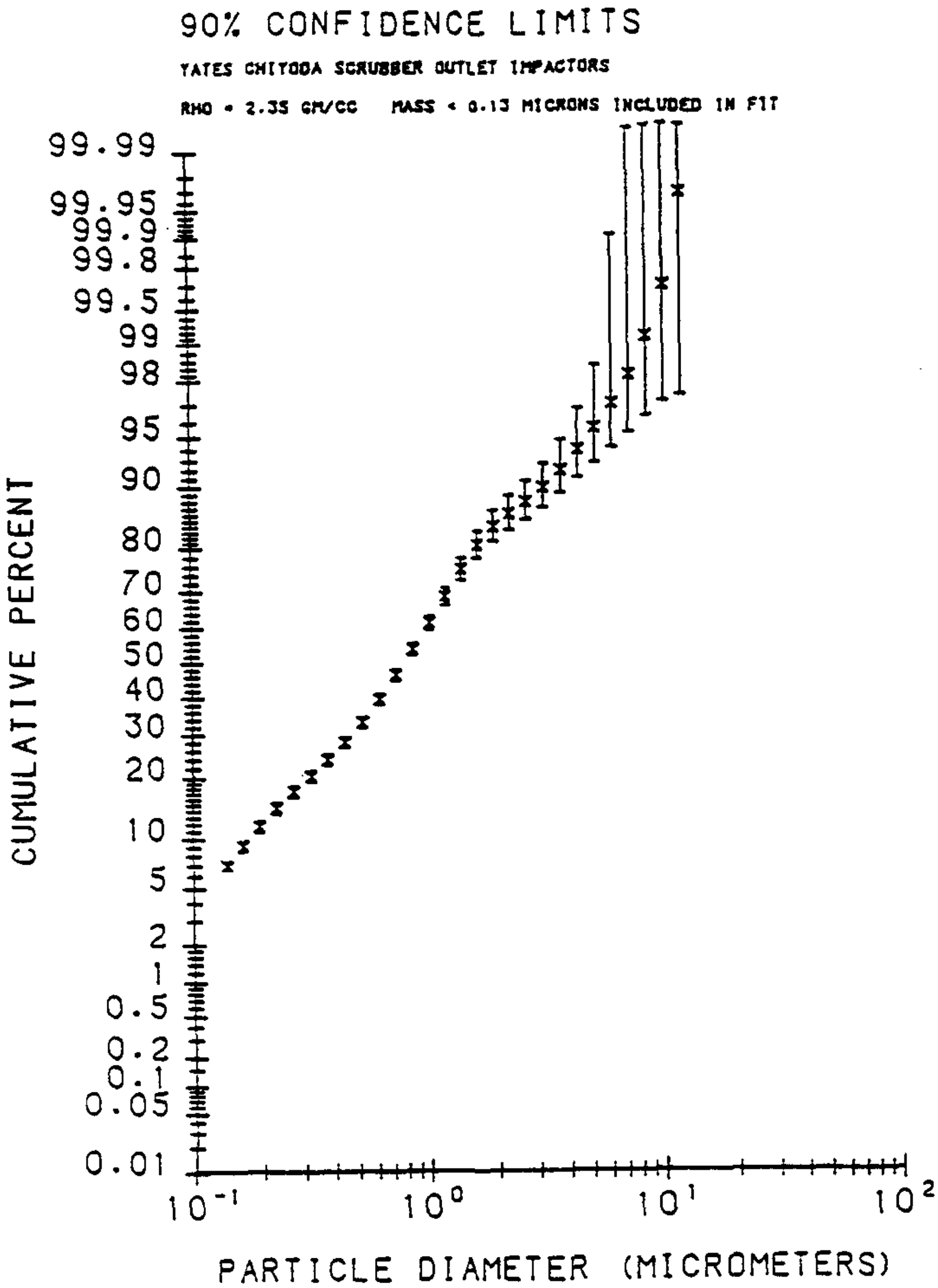


Figure B-8. Period 1 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 75 MW, 8" ΔP, ESP Energized, January 25, 1993

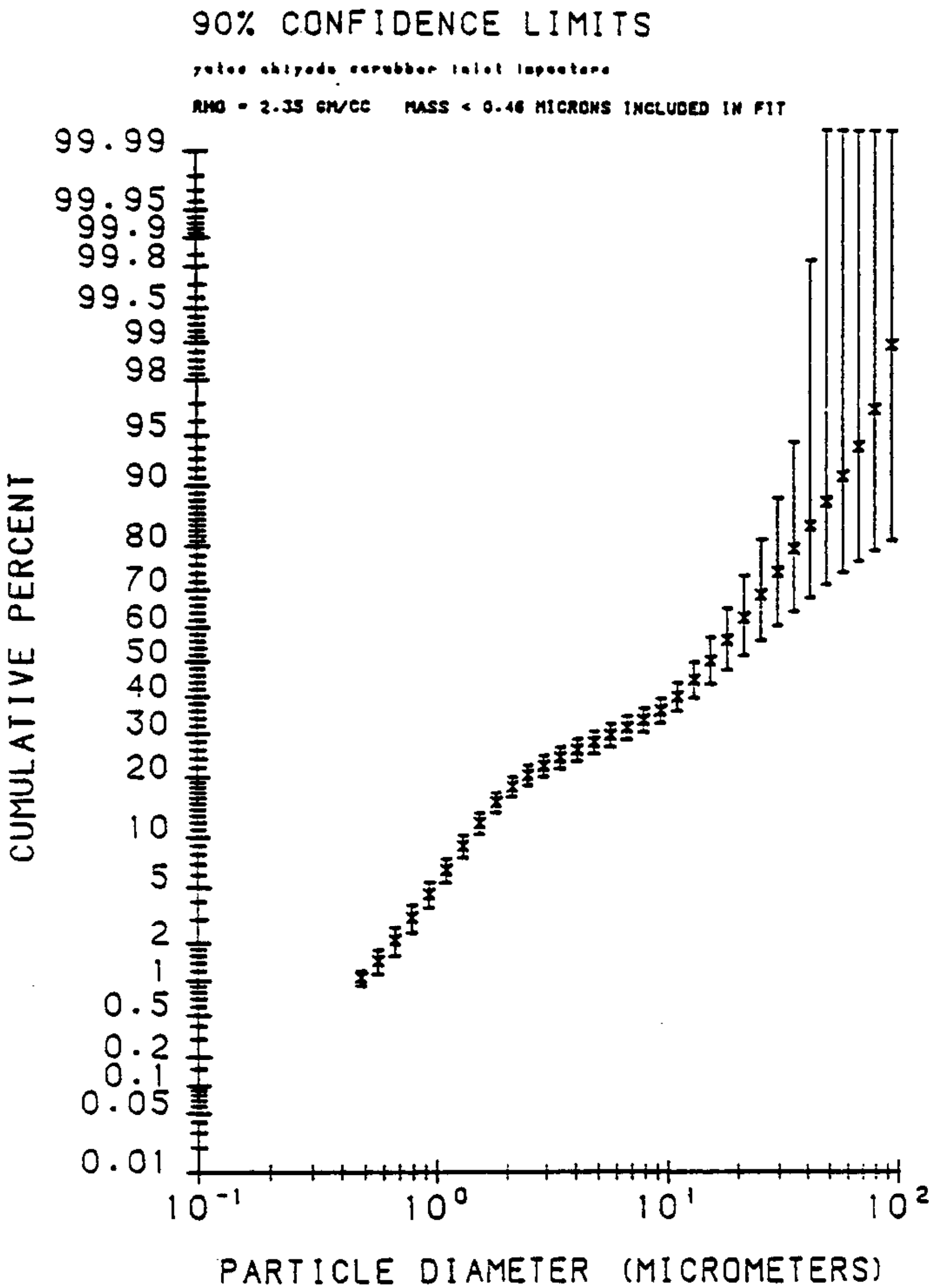


Figure B-9. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 75 MW, January 26, 1993

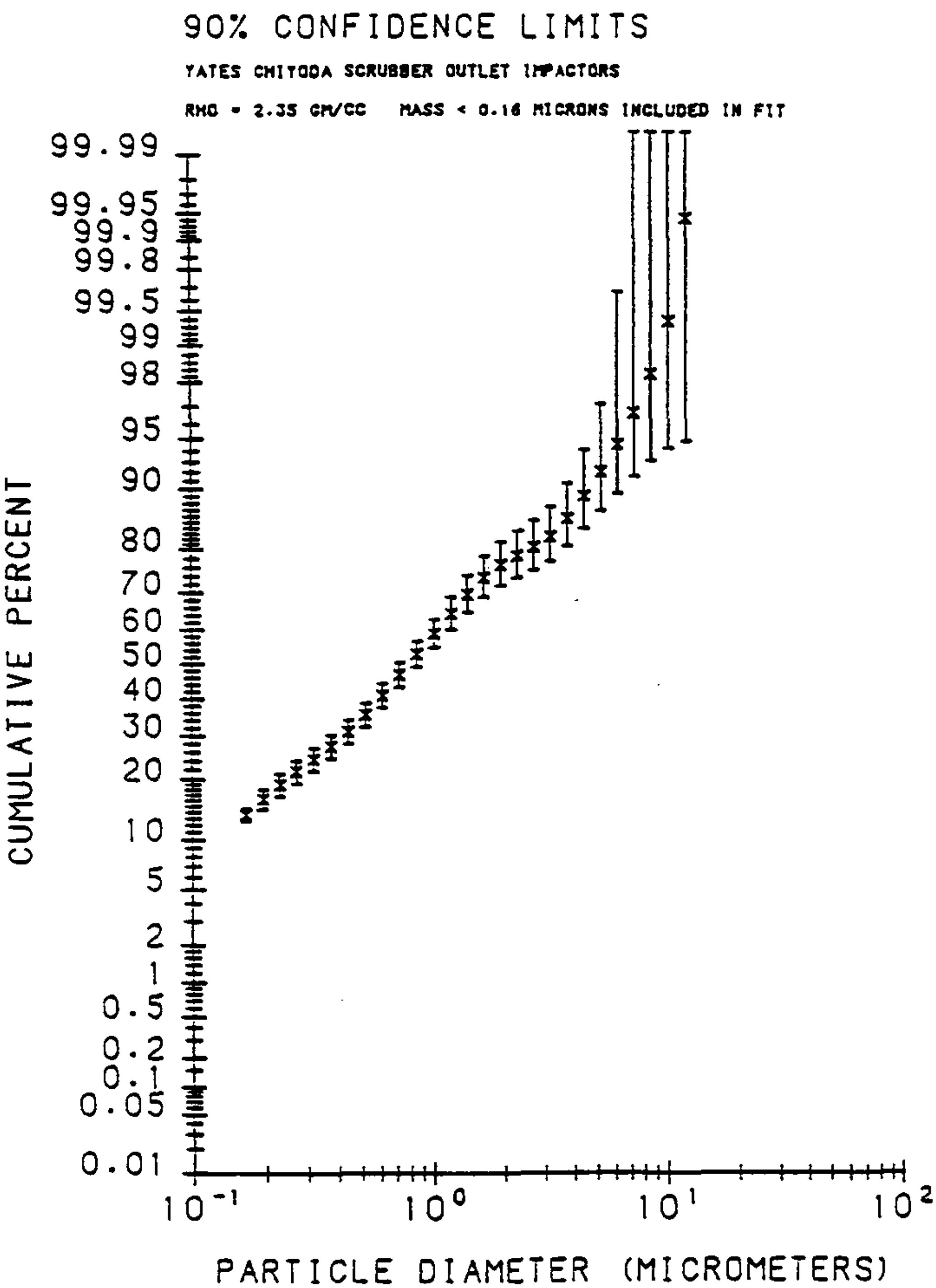


Figure B-10. Period 1 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 75 MW, 12" ΔP, ESP Energized, January 26, 1993

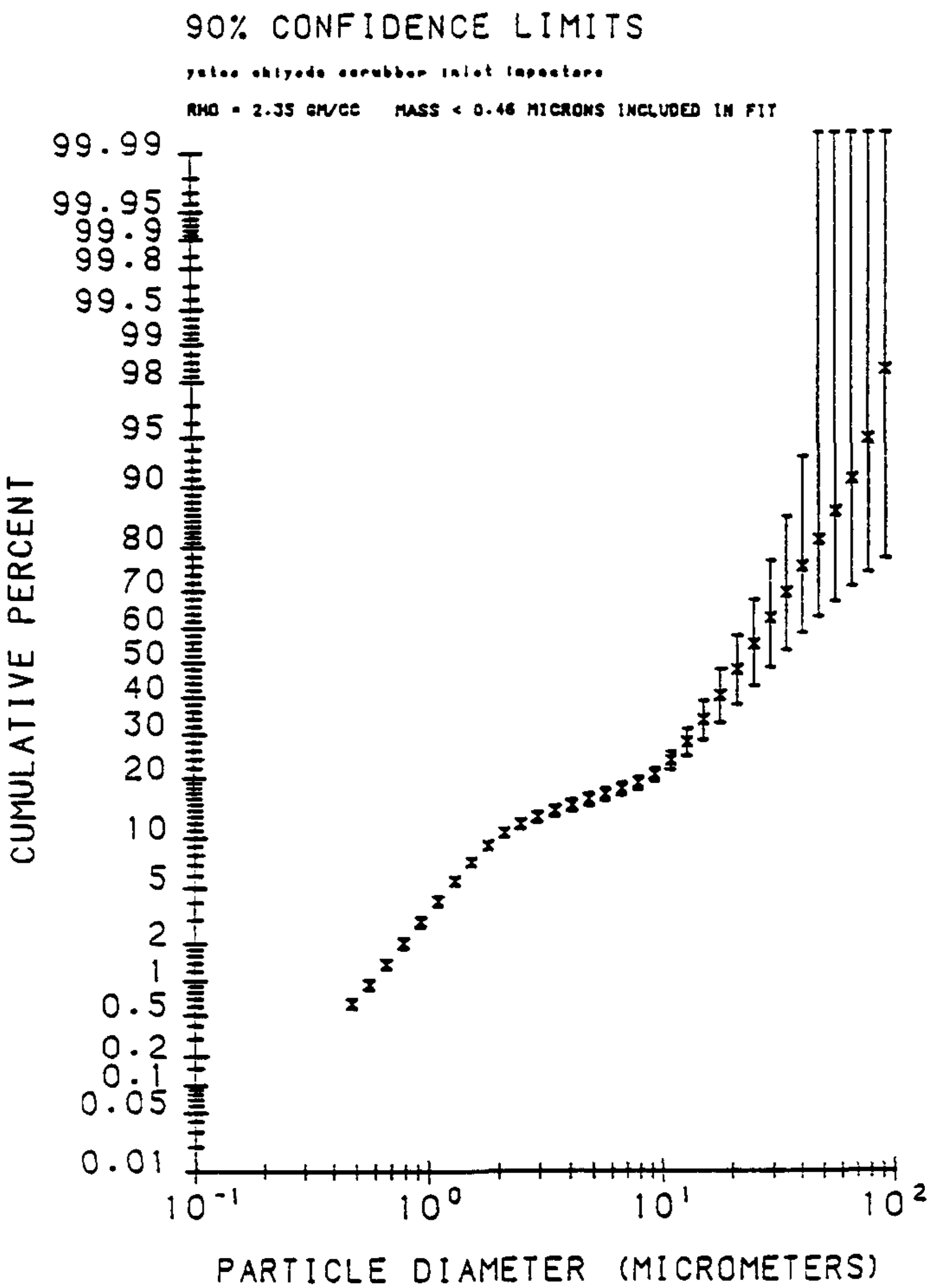


Figure B-11. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 75 MW, January 27, 1993

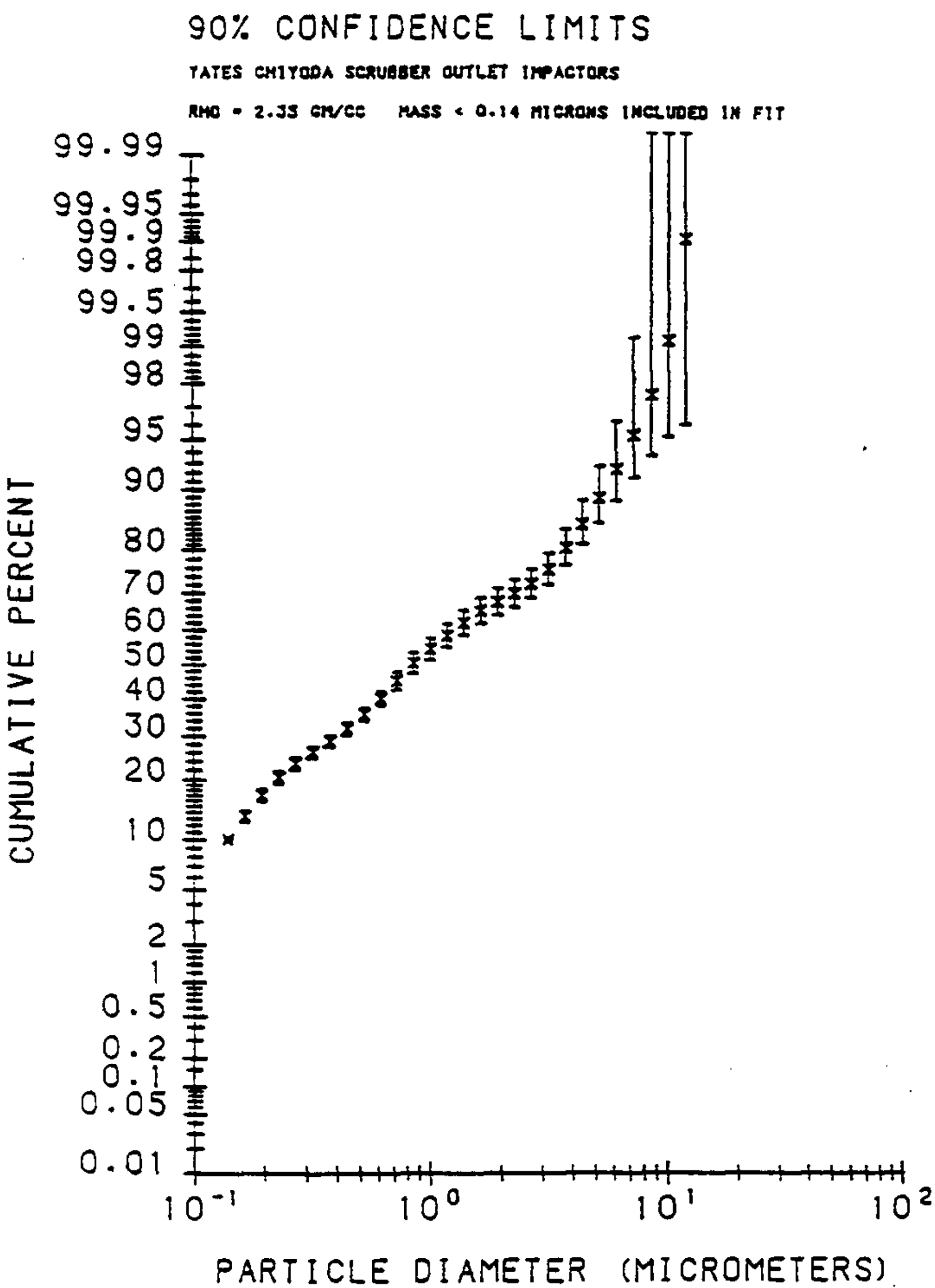


Figure B-12. Period 1 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 75 MW, 16" ΔP, ESP Energized, January 27, 1993

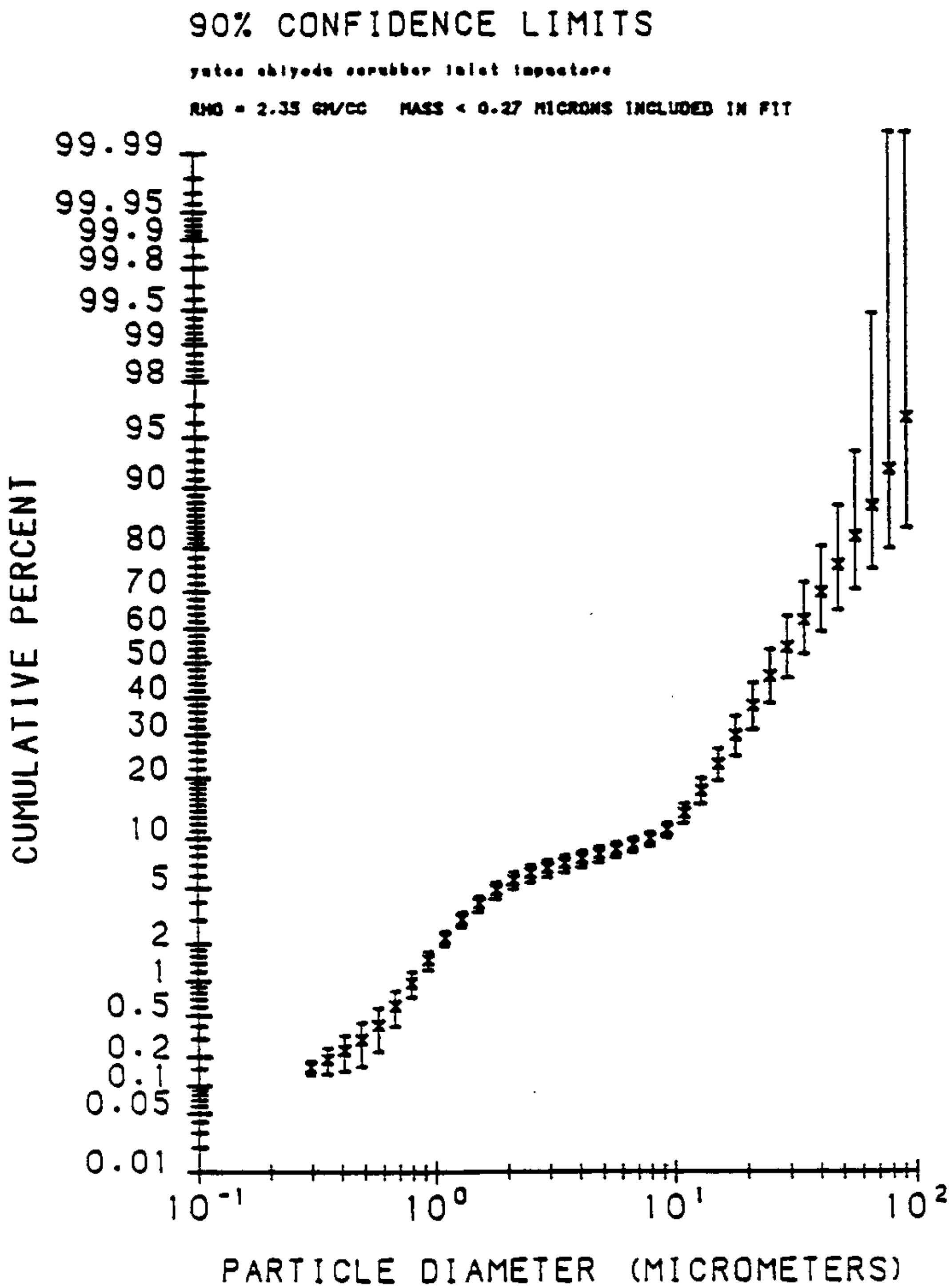


Figure B-13. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, January 29, 1993

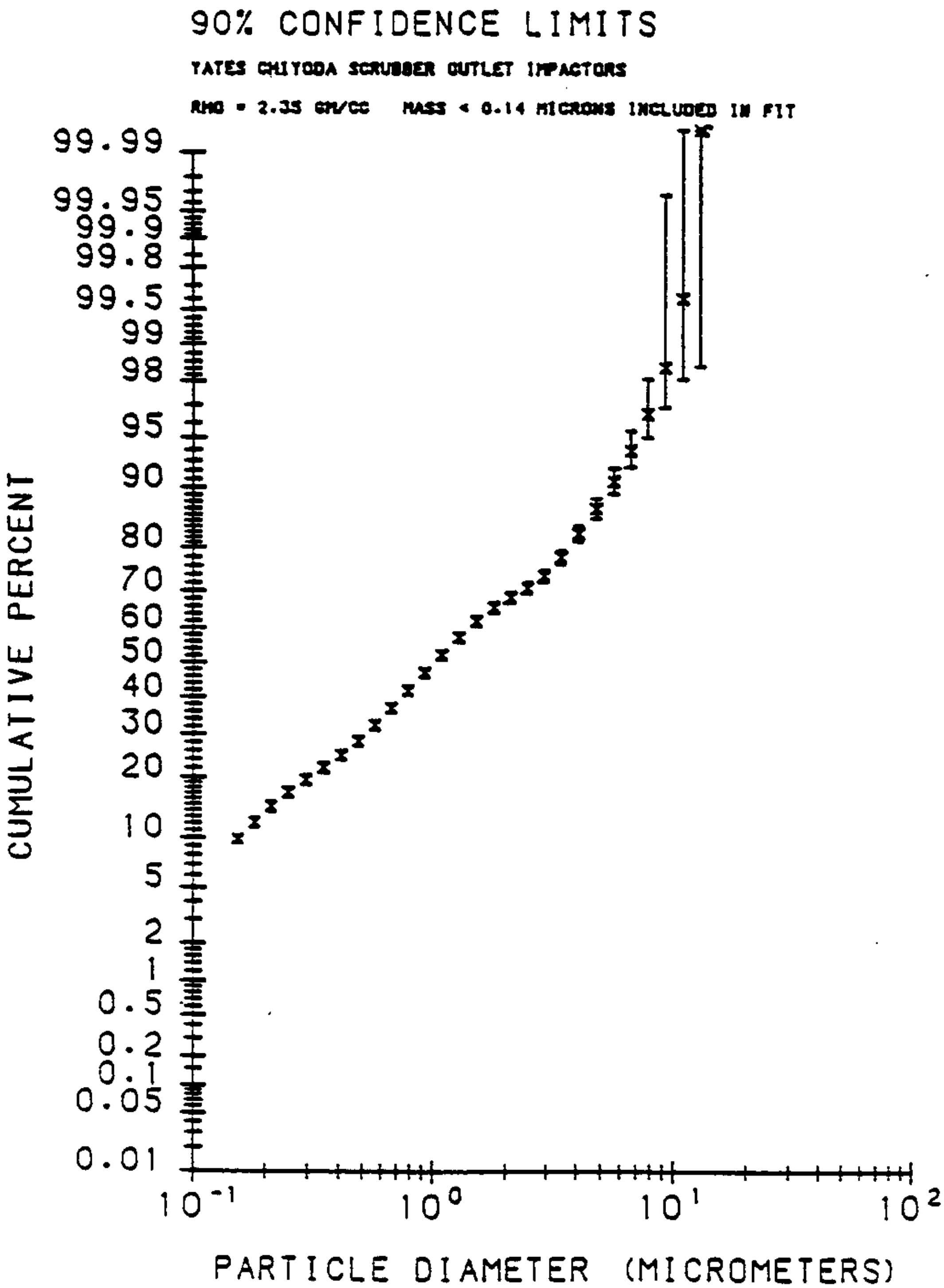


Figure B-14. Period 1 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, 8" ΔP, ESP Energized, January 29, 1993

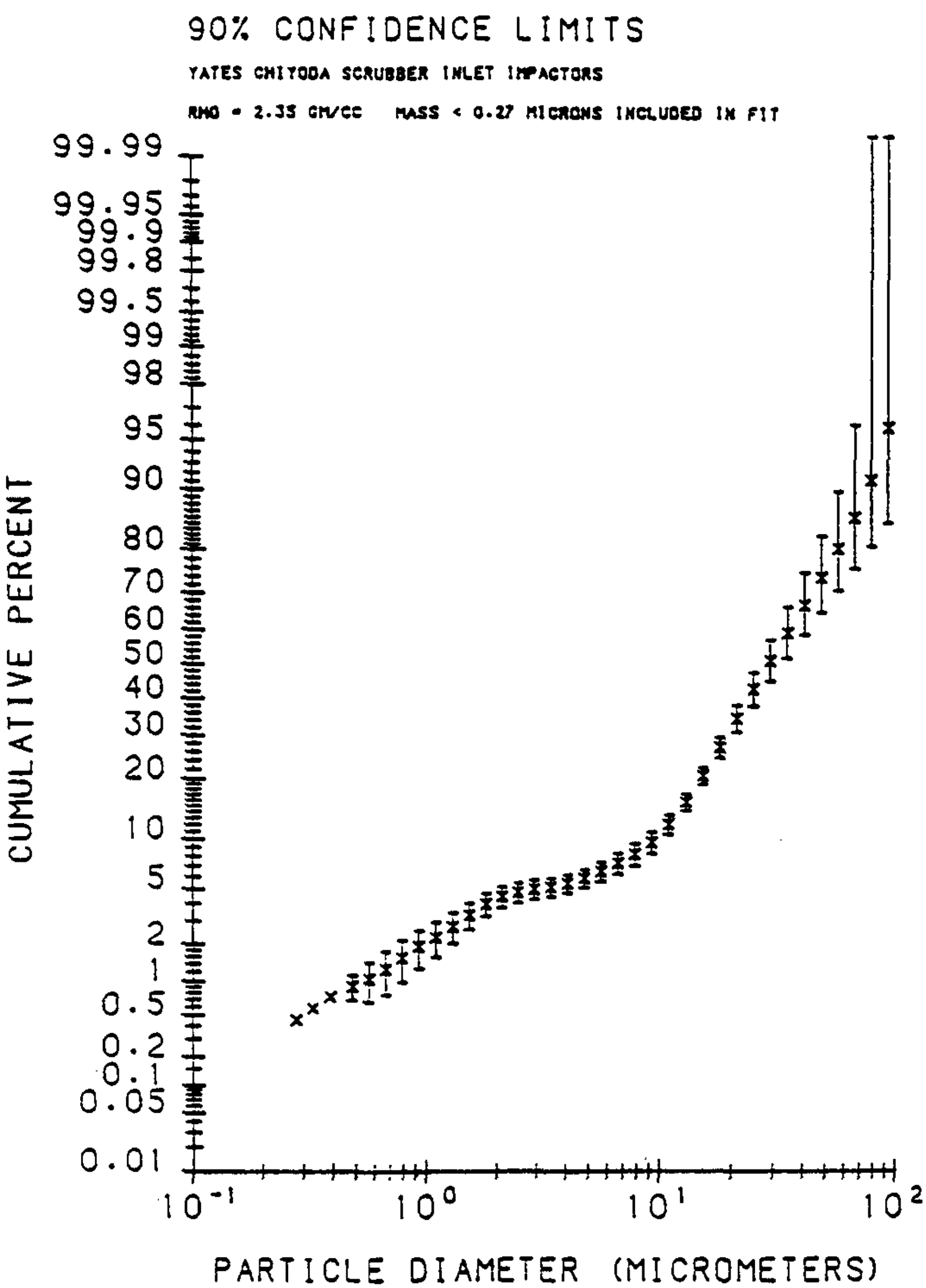


Figure B-15. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, January 30, 1993

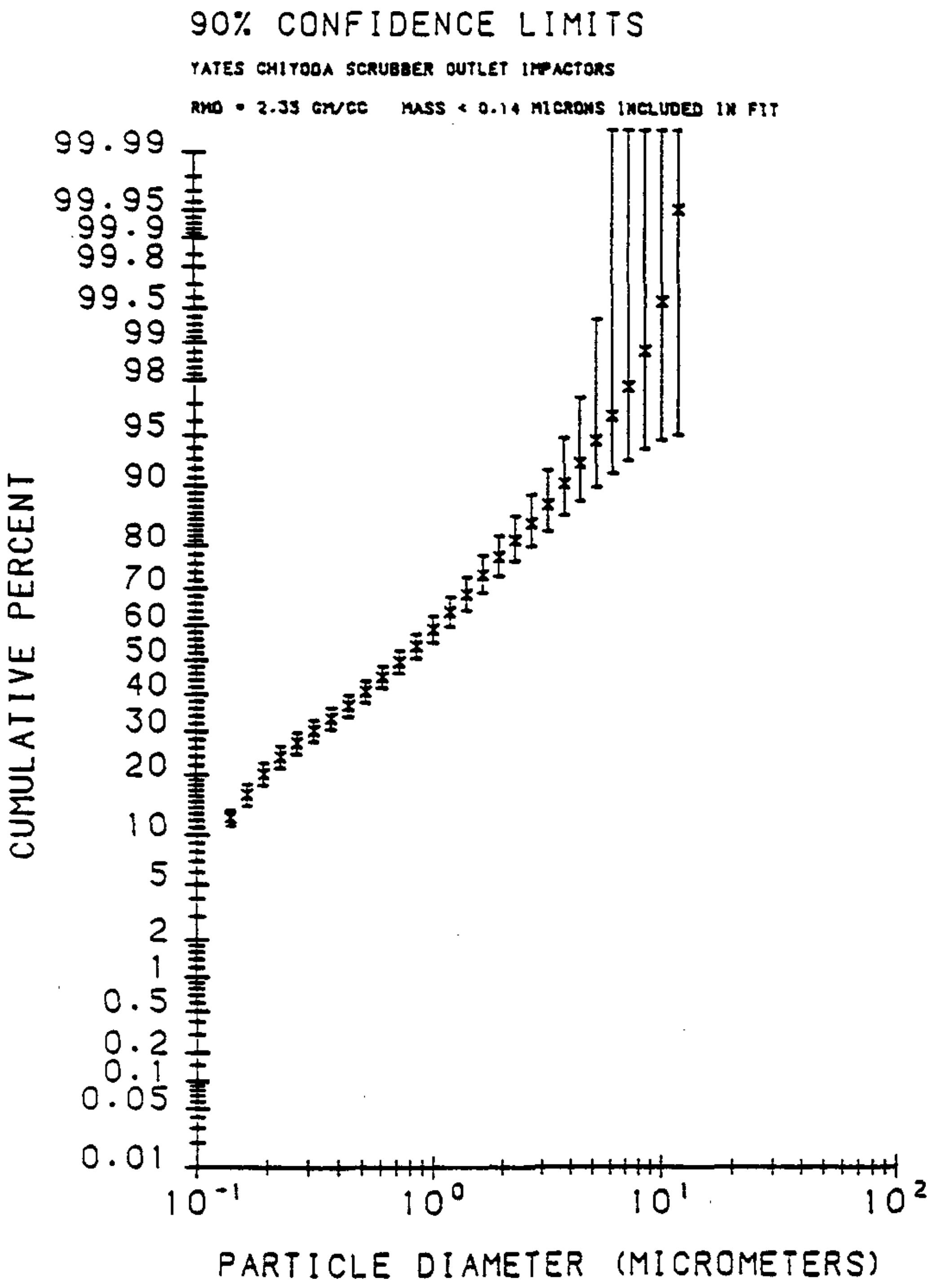


Figure B-16. Period 1 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, 12" ΔP, ESP Energized, January 30, 1993

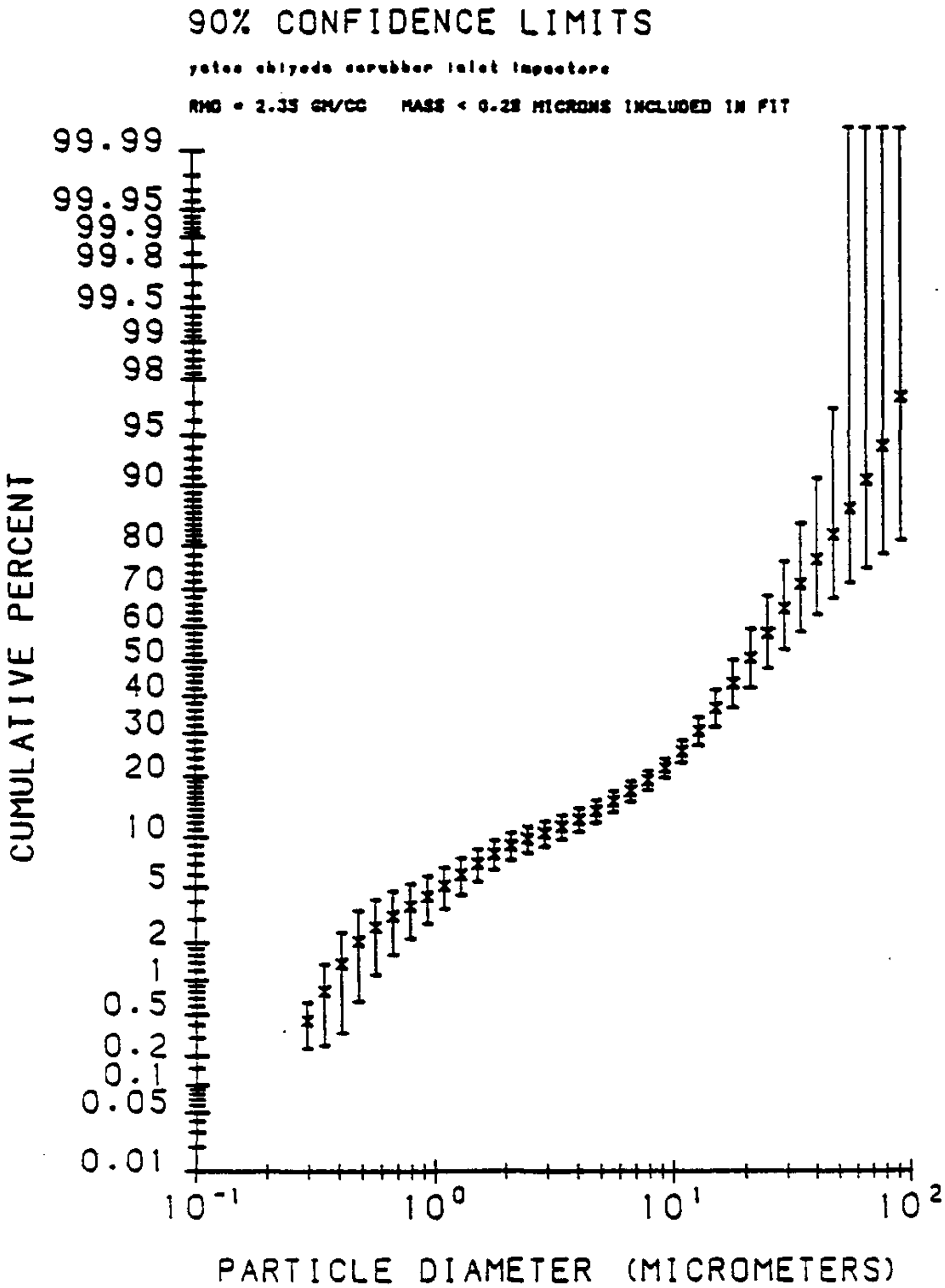


Figure B-17. Period 1 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, January 31, 1993

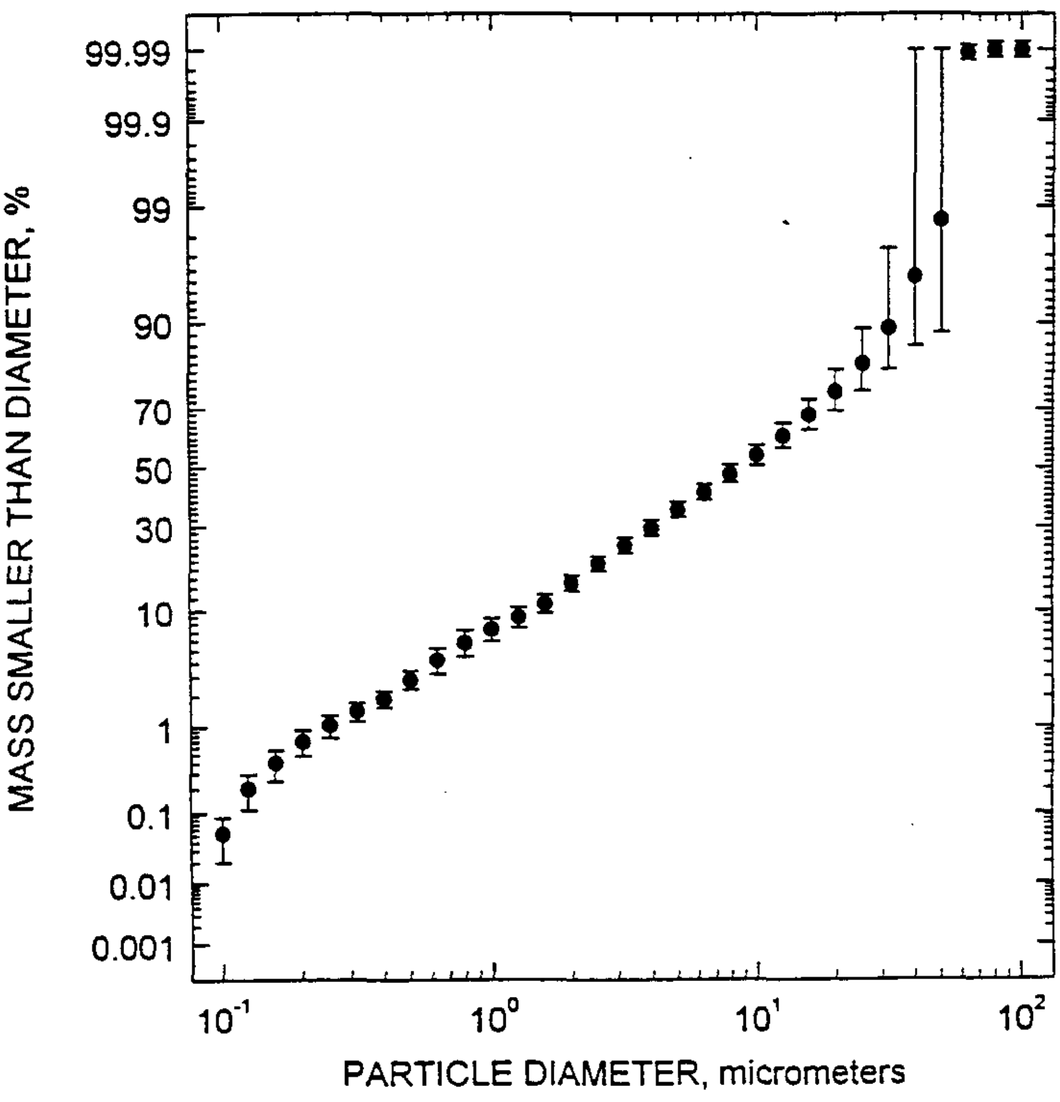


Figure B-18. Period 2 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, ESP First Field On, March 17-18, 1994

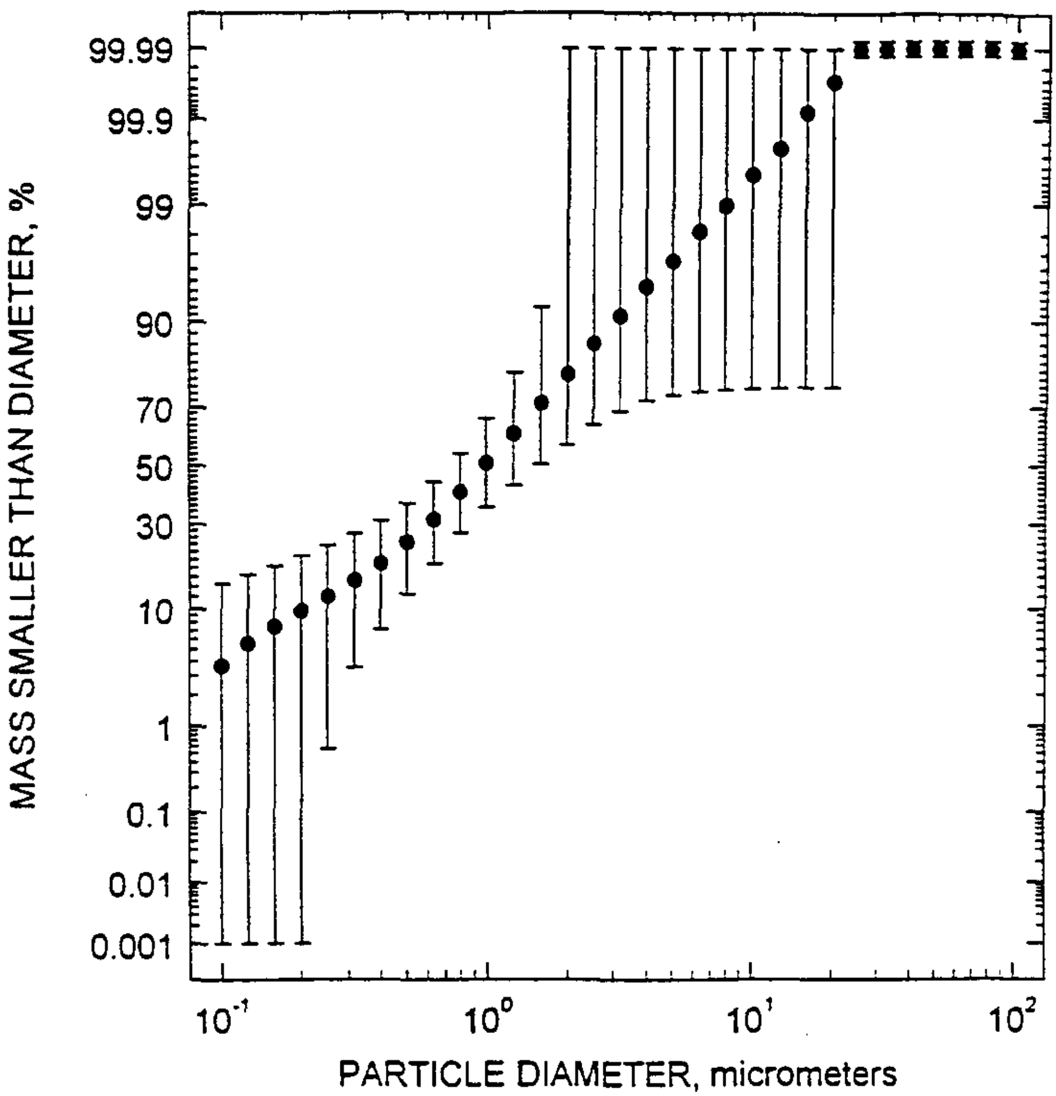


Figure B-19. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, 10" ΔP, ESP First Field On, March 17, 1994

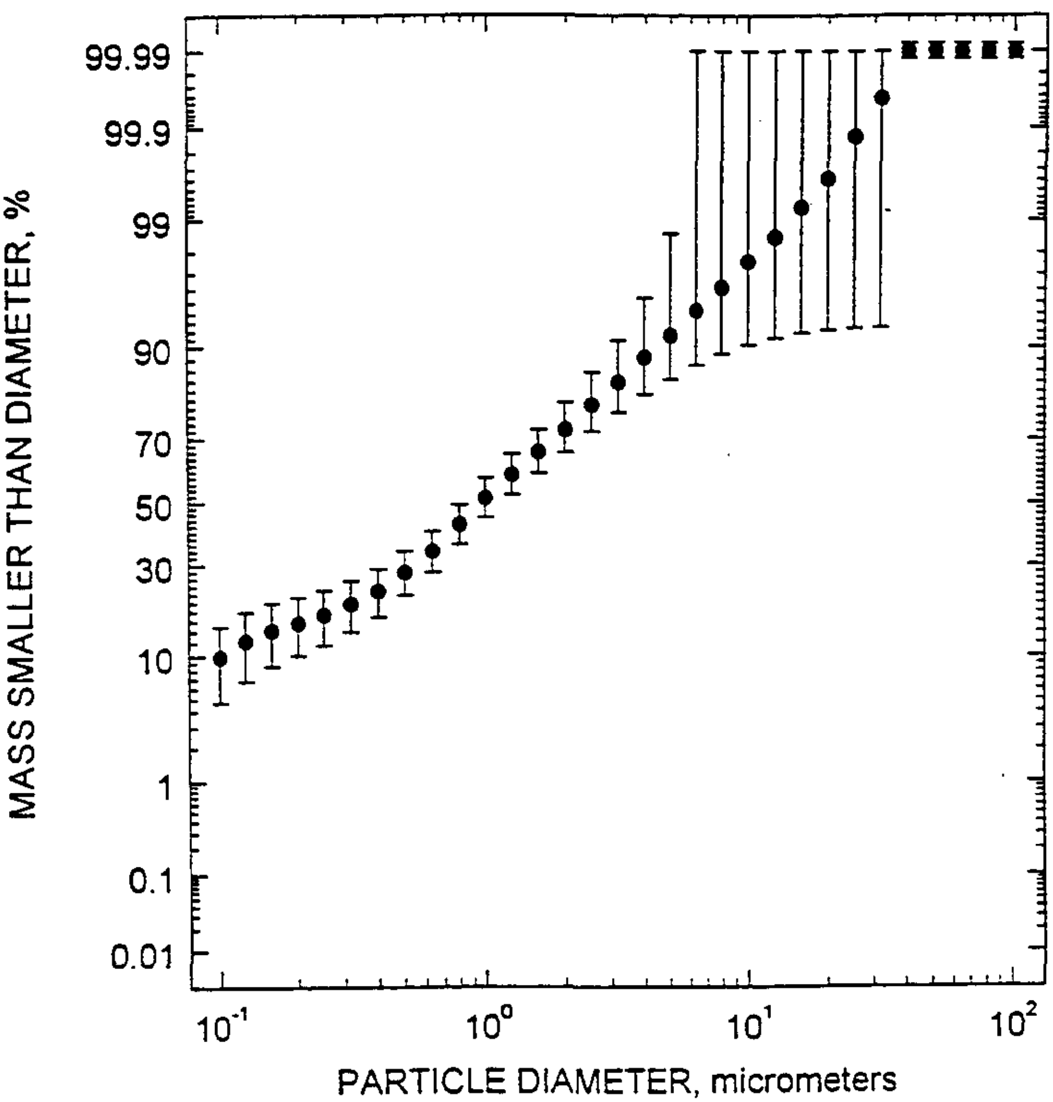


Figure B-20. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, 16" ΔP, ESP First Field On, March 18, 1994

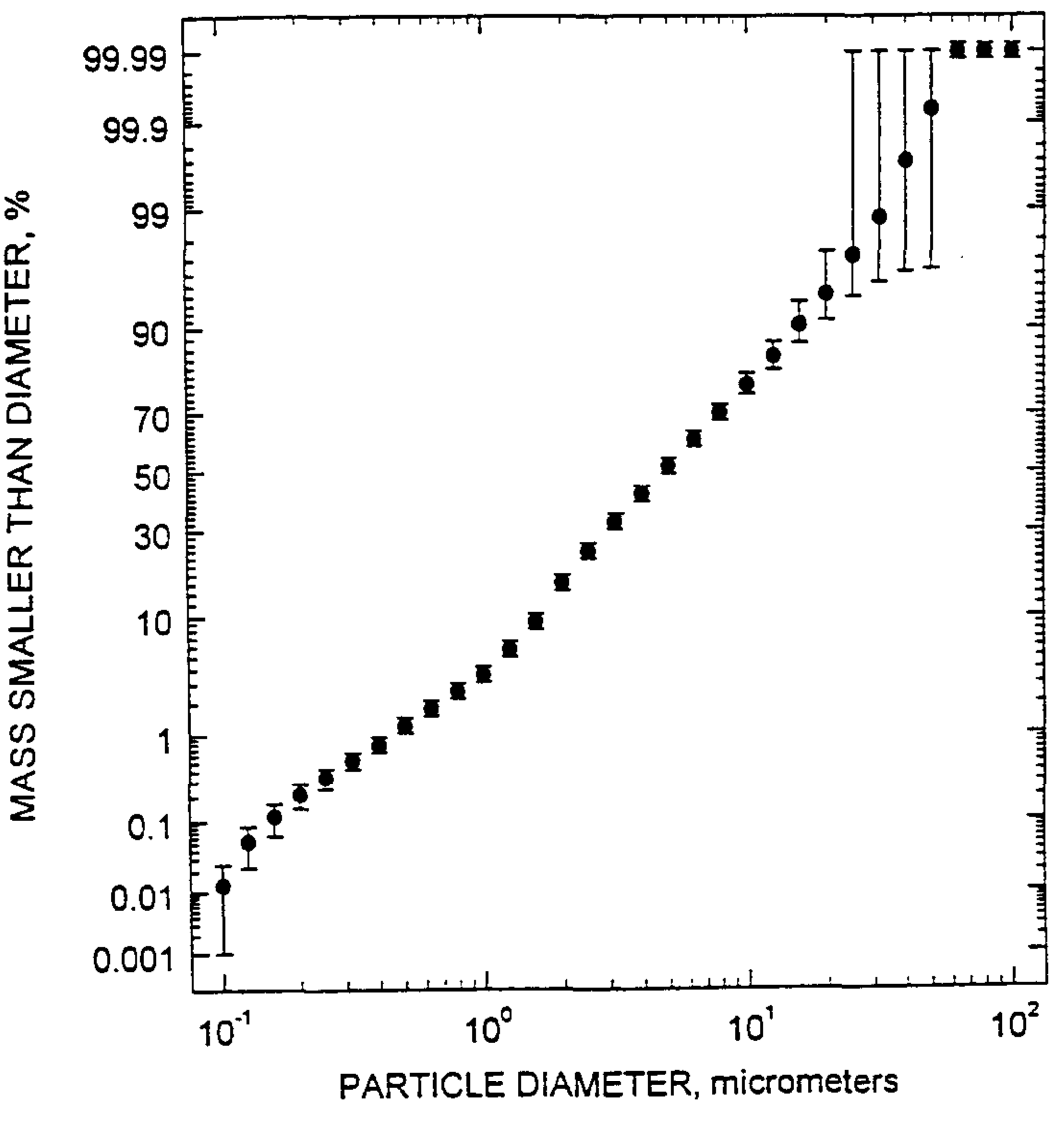


Figure B-21. Period 2 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, ESP First Field On, March 19-20, 1994

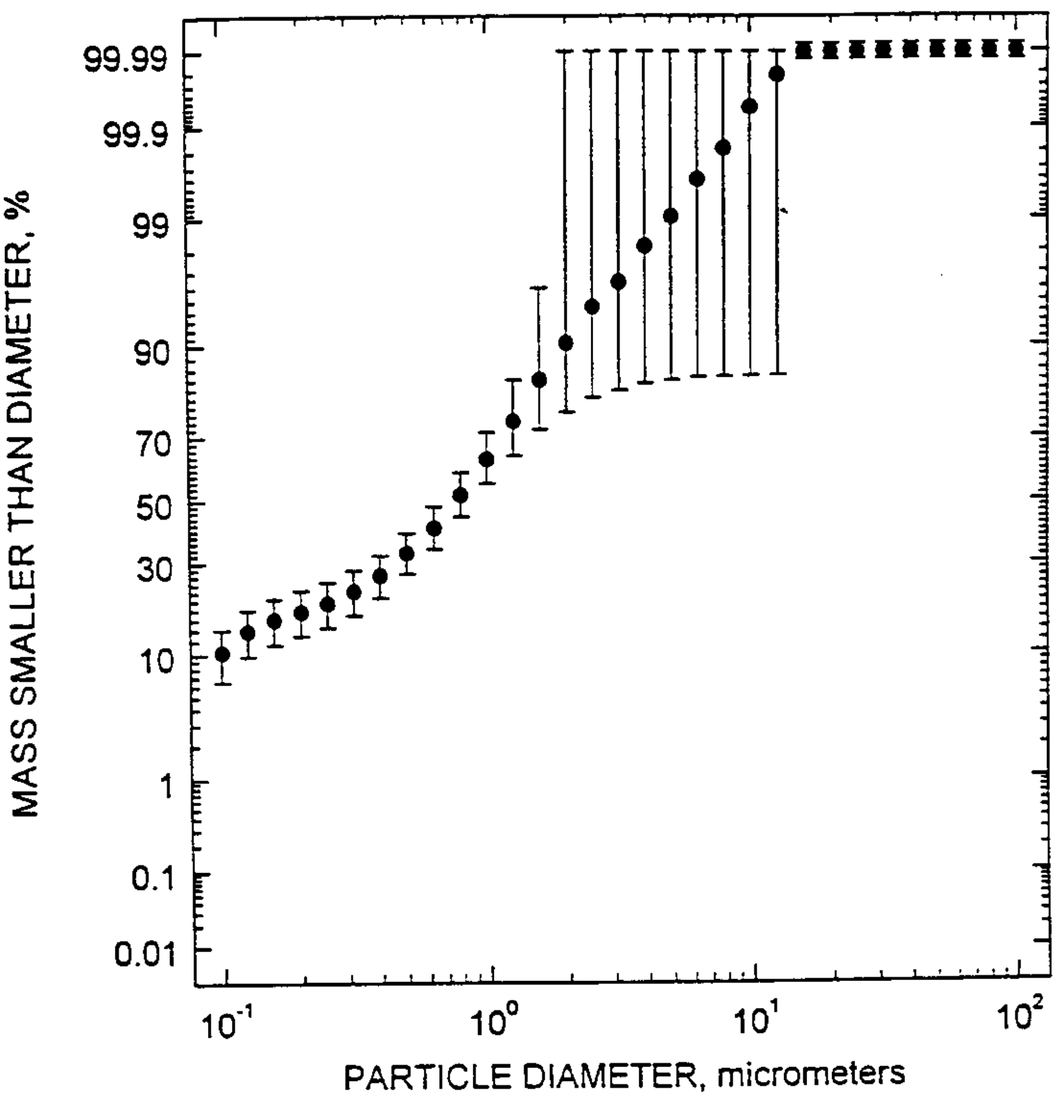


Figure B-22. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, 10" ΔP, ESP First Field On, March 19, 1994

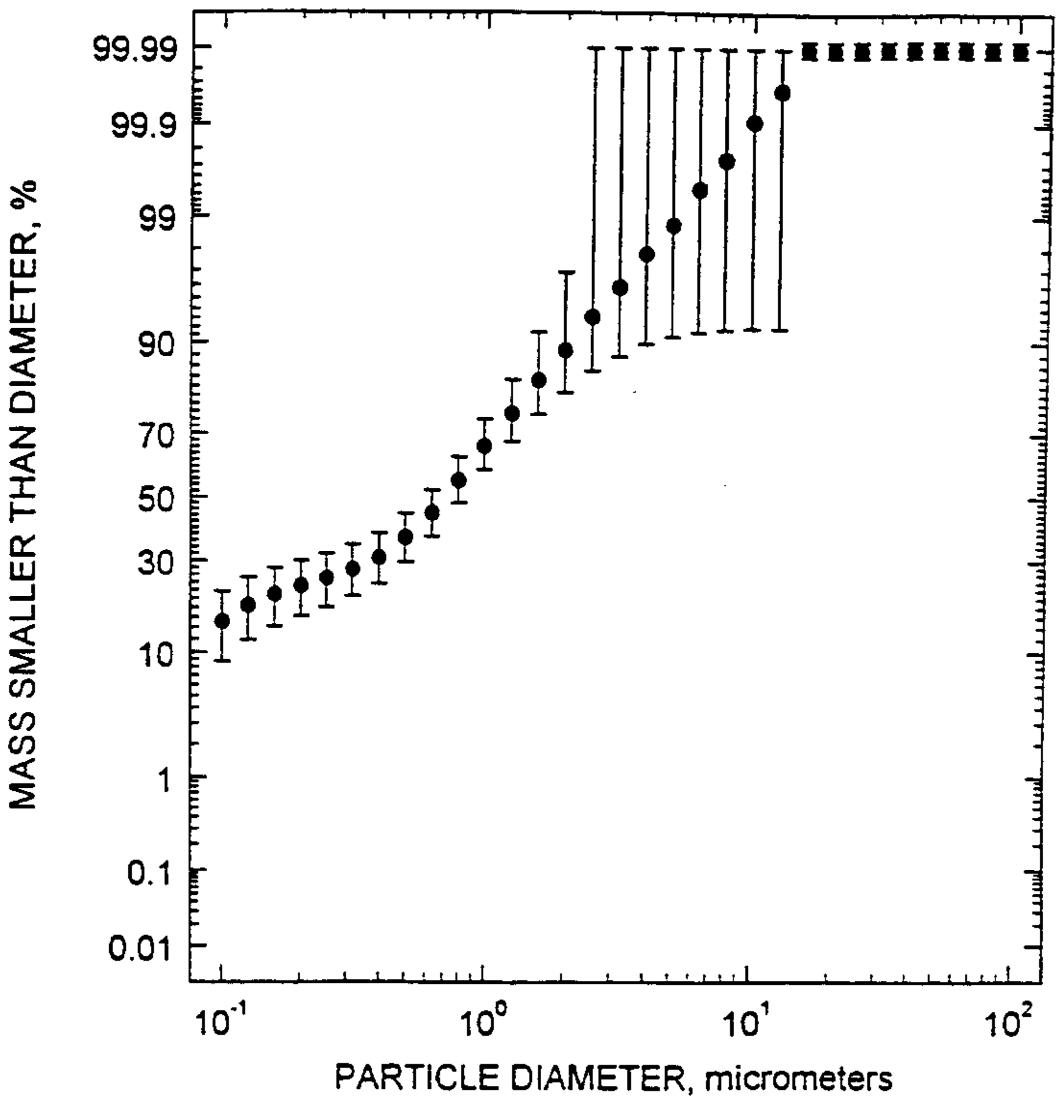


Figure B-23. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, 16" ΔP, ESP First Field On, March 20, 1994

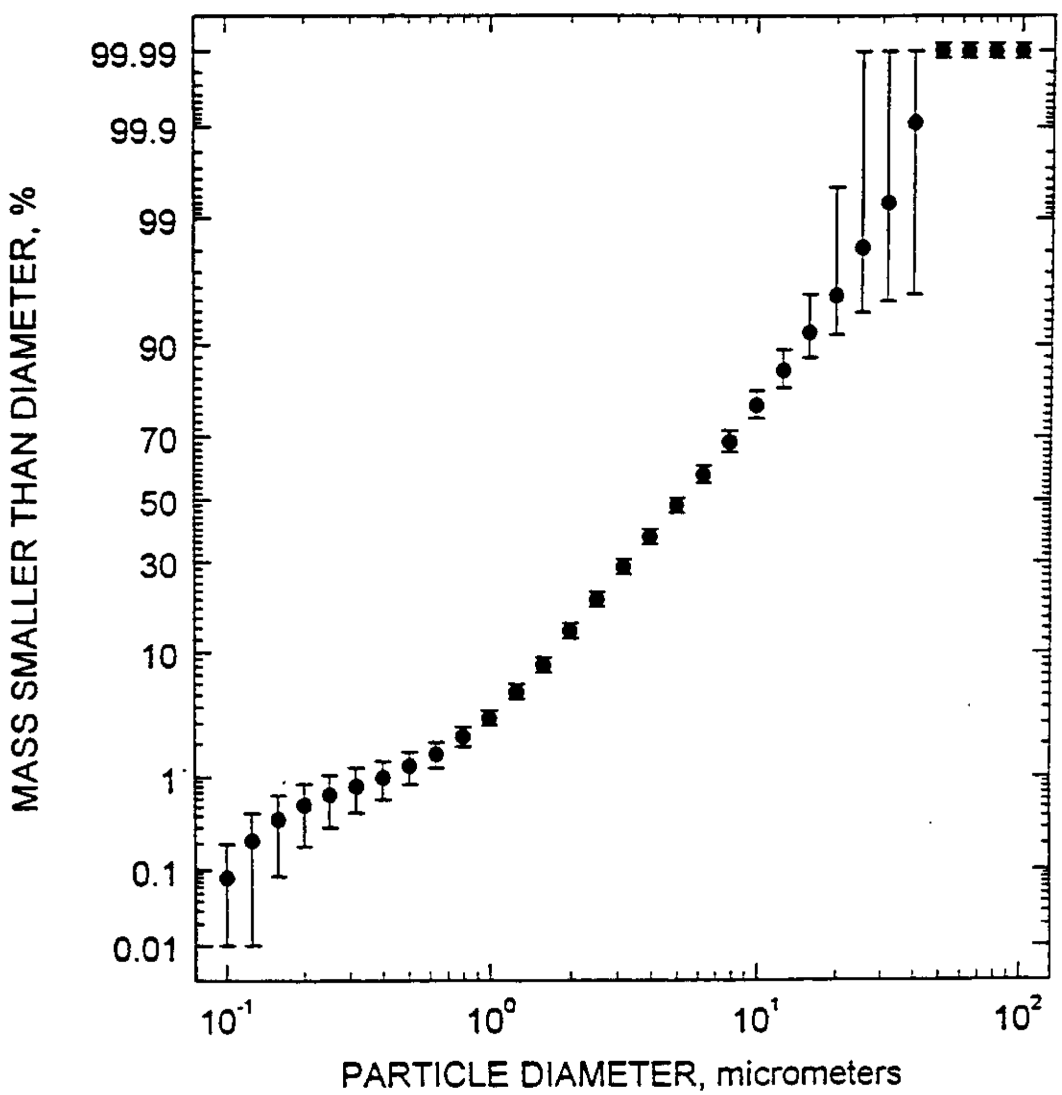


Figure B-24. Period 2 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, ESP First Field Detuned, March 22, 1994

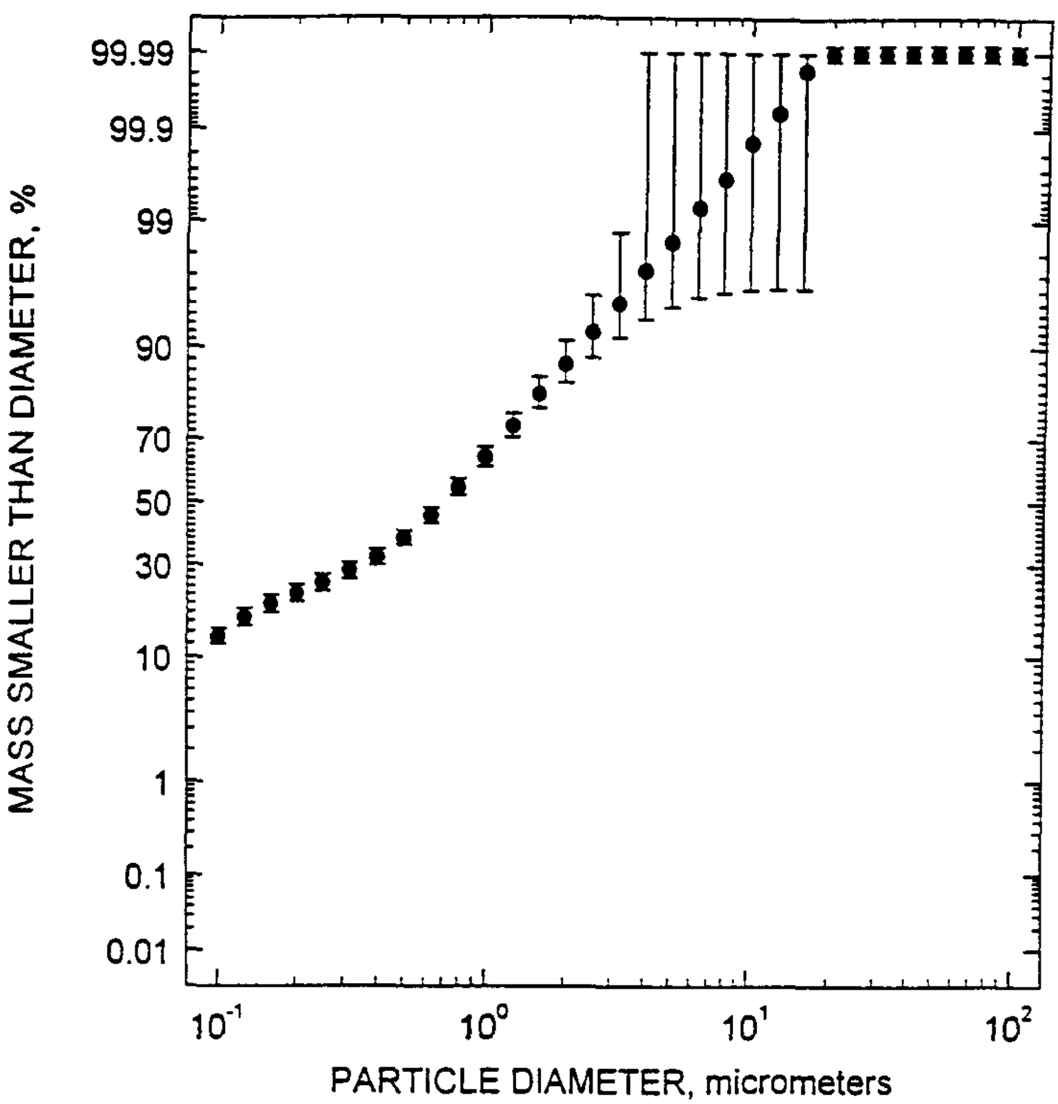


Figure B-25. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, 16" ΔP, ESP First Field Detuned, March 22, 1994

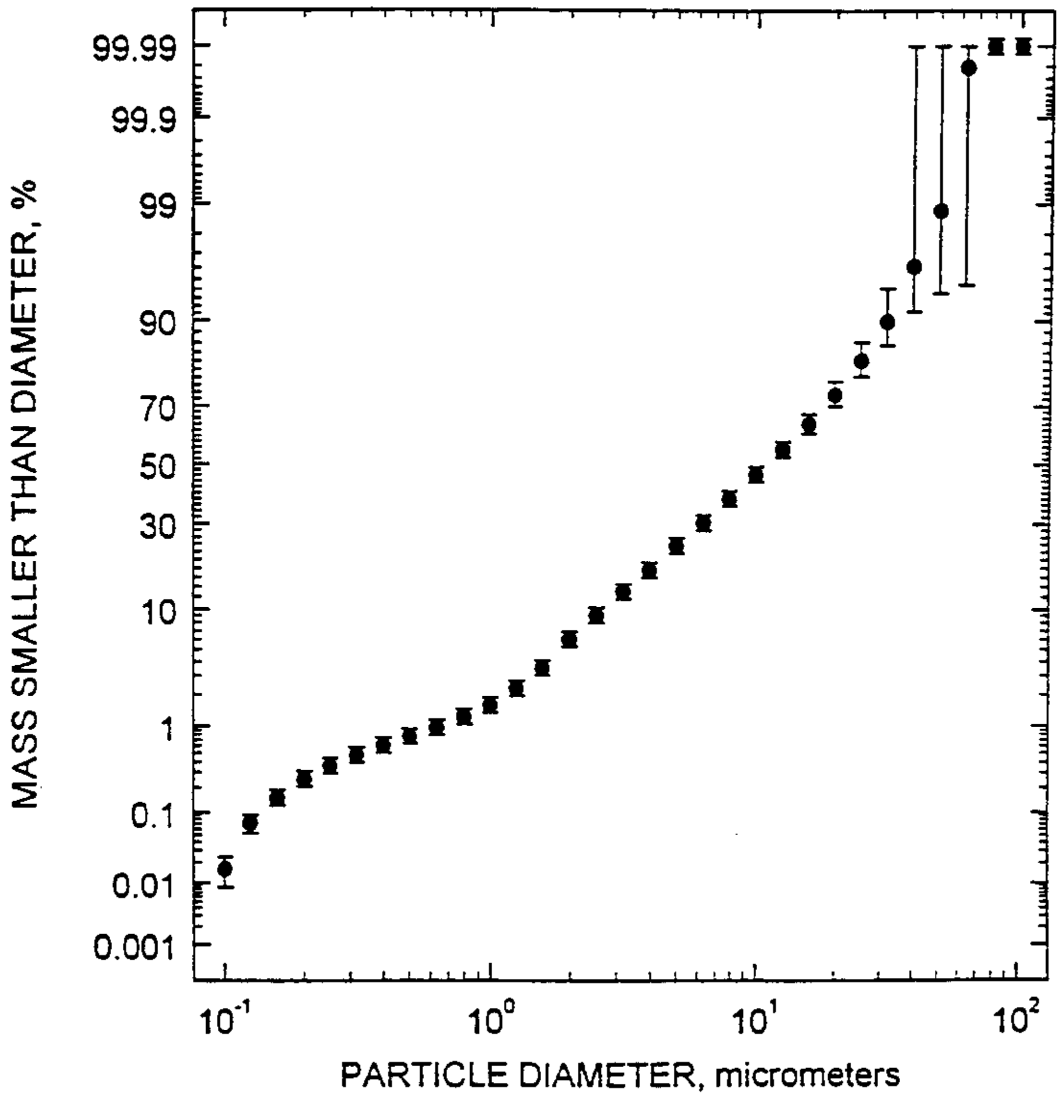


Figure B-26. Period 2 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, ESP First Field Off, March 24-25, 1994

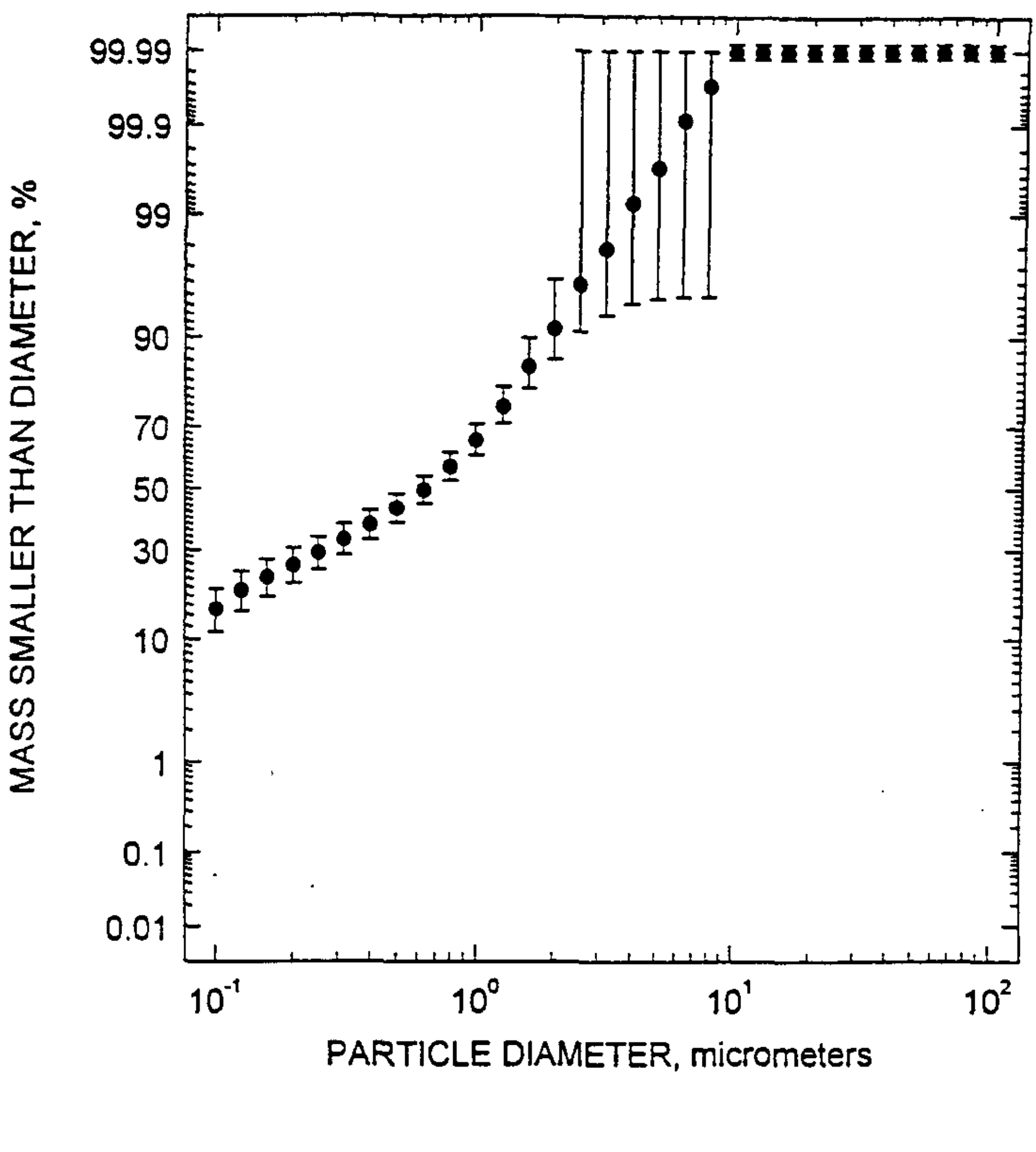


Figure B-27. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, 16" ΔP, ESP First Field Off, March 24, 1994

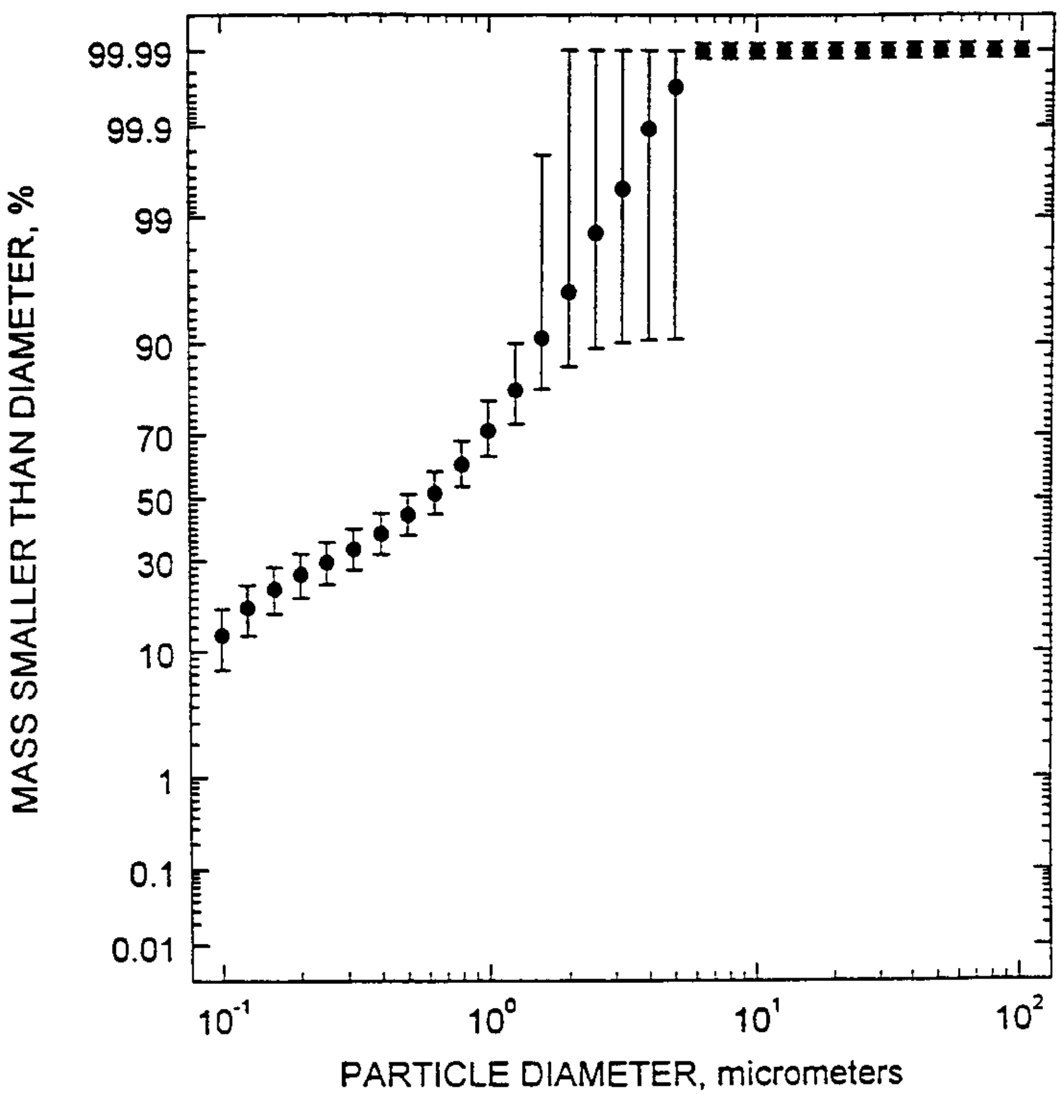


Figure B-28. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 100 MW, 10" ΔP, ESP First Field Off, March 25, 1994

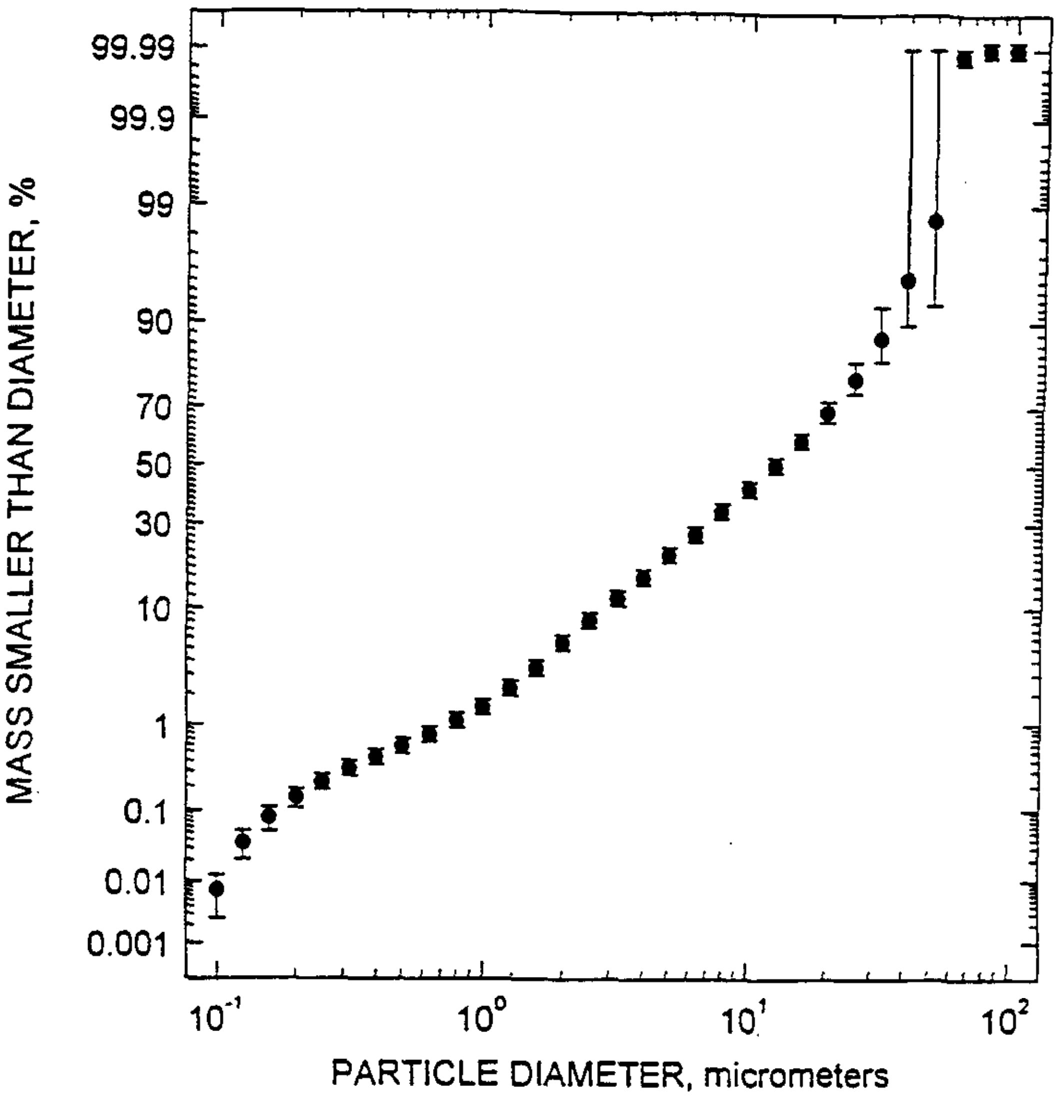


Figure B-29. Period 2 Inlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, *ESP First Field Off, March 26-27, 1994*

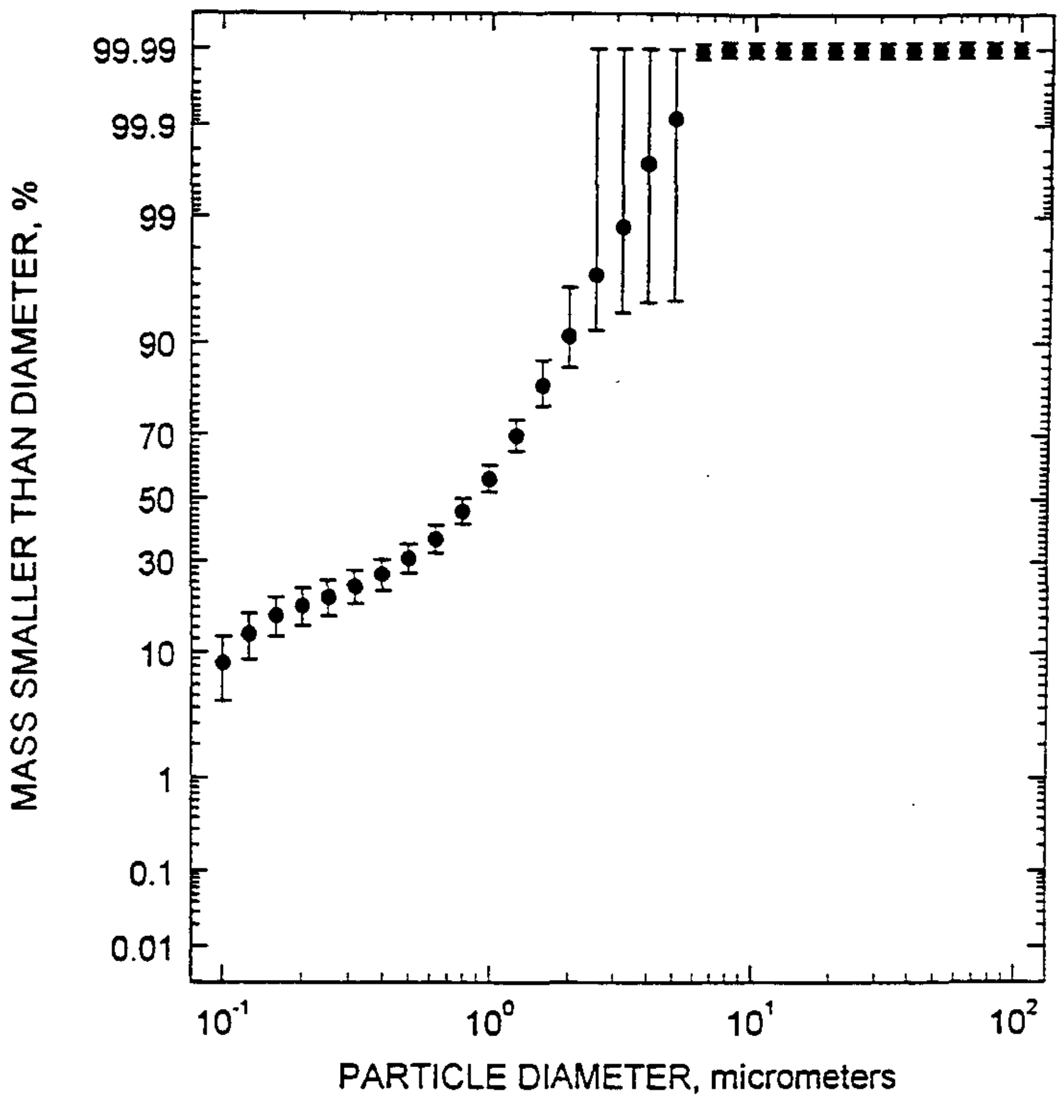


Figure B-30. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, 10" ΔP, ESP First Field Off, March 26, 1994

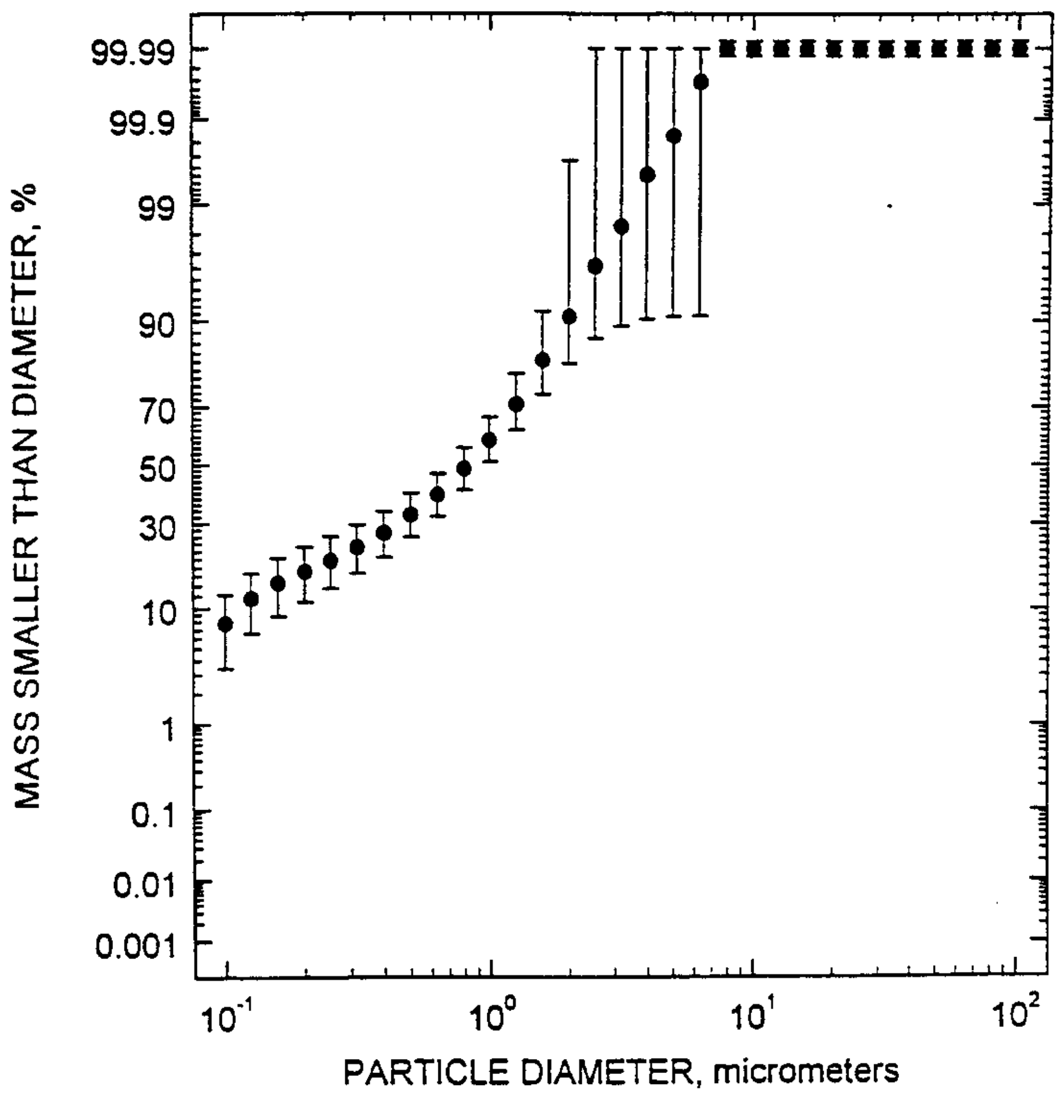


Figure B-31. Period 2 Outlet Cumulative Percent vs. Particle Diameter for Chiyoda Scrubber, 50 MW, 16" ΔP, ESP First Field Off, March 27, 1994

TABLE C-2
CW-2 RESULTS

Parameter	6 Sep 90	2 Nov 90	8-9 Jan 91	11 Mar 91	8 May 91	1-2 Jul 91
pH	6.09	5.79	5.62	5.93	6.04	5.96
Conductivity (μS/cm)	81	70	72	63	63	66
Temperature (°C)	16.3	15.9	15.4	16.1	16.0	16.2
Eh (mv)	169	144	189	190	141	293
Alkalinity (mg/L $CaCO_3$)	21.7	22.9	24.4	22.1	20.5	25.8
Total Dissolved Solids (mg/L)	81	51	59	52	48	64
Bromide (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloride (mg/L)	3.5	2.8	3.1	3.4	2.8	2.5
Total Organic Carbon (mg/L)	<1.0	<1.0	<1.0	<1.0	2.0 [a]	<1.0
Fluoride (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate/Nitrite (mg/L as N)	0.26	0.39	0.53	0.42	0.34	0.36
Sulfate (mg/L)	7.6	5.0	2.8	<0.050	1.2	1.5
Radium 226 and 228 (pCi/L)	0.15; ND	NR	NR	0.14; ND	NR	NR
Gross Alpha (pCi/L)	2.5	NR	NR	ND	NR	NR
Gross Beta (pCi/L)	4.8	NR	NR	2.6	NR	NR
Gross Gamma (pCi/L)						
AC-227	ND	NR	NR	NA	NR	NR
AC-228	ND	NR	NR	ND	NR	NR
Bi-212	ND	NR	NR	ND	NR	NR
Bi-214	140	NR	NR	ND	NR	NR
Co-60	ND	NR	NR	ND	NR	NR
Cs-134	ND	NR	NR	ND	NR	NR
K-40	ND	NR	NR	ND	NR	NR
Pb-211	ND	NR	NR	ND	NR	NR
Pb-212	ND	NR	NR	ND	NR	NR
Pb-214	23	NR	NR	ND	NR	NR
Ra-223	ND	NR	NR	ND	NR	NR
Ra-226	ND	NR	NR	ND	NR	NR
Rn-219	ND	NR	NR	ND	NR	NR
Th-227	ND	NR	NR	ND	NR	NR
Th-228	ND	NR	NR	350	NR	NR
Th-231	ND	NR	NR	NA	NR	NR
Th-234	ND	NR	NR	ND	NR	NR
Tl-208	ND	NR	NR	ND	NR	NR
U-235	ND	NR	NR	ND	NR	NR
U-238	ND	NR	NR	NA	NR	NR
Silver (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminum (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Arsenic (mg/L)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Boron (mg/L)	<0.60	<0.60	<0.050	<0.050	<0.050	<0.050
Barium (mg/L)	0.028 [a]	0.021 [a]	0.019 [a]	0.017 [a]	0.016 [a]	0.012 [a]
Beryllium (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (mg/L)	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Calcium (mg/L)	3.9 [a]	3.6 [a]	3.8 [a]	3.2 a	3.4 [a]	3.6 [a]
Cadmium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt (mg/L)	0.025 [a]	<0.010	<0.010	<0.010	<0.010	<0.010
Copper (mg/L)	0.12 [b]	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (mg/L)	<0.010	<0.0020	<0.010	<0.010	<0.010	<0.010
Mercury (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

TABLE C-2 (CONTINUED)

Parameter	6 Sep 90	2 Nov 90	8-9 Jan 91	11 Mar 91	8 May 91	1-2 Jul 91
Iron (mg/L)	<0.040	0.041 [a]	<0.040	<0.040	<0.040	<0.040
Potassium (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Lithium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	2.3 [a]	2.5 [a]	2.8 [a]	2.2 [a]	2.4 [a]	2.5 [a]
Manganese (mg/L)	0.20	0.068	0.023 [a]	0.064	0.025 [a]	0.014 [a]
Molybdenum (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sodium (mg/L)	5.9	5.2	4.3 [a]	4.1 [a]	4.2 [a]	4.1 [a]
Nickel (mg/L)	0.023 [a]	<0.020	<0.020	<0.020	<0.020	<0.020
Phosphorus (mg/L)	<0.30	0.49 [a]	<0.30	<0.30	<0.30	<0.30
Lead (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Sulfur (mg/L)	<5.0	<5.0	<1.0	<1.0	<1.0	<1.0
Antimony (mg/L)	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070
Selenium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silicon (mg/L)	9.0	9.0	9.2	11	11	11
Tin (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Strontium (mg/L)	0.020	0.014 [a]	0.014 [a]	0.012 [a]	0.013 [a]	0.011 [a]
Tellurium (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Titanium (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Thallium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Tungsten (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

[a]Less than five times the detection limit; results should be viewed accordingly.
[b]Detected in the method blank.

ND = Not detected.
NR = Not required.
NA = Not applicable.

TABLE C-3
CW-3 RESULTS

Parameter	6 Sep 90	2 Nov 90	8-9 Jan 91	11 Mar 91	8 May 91	1-2 Jul 91
pH	5.64	5.6	5.04	5.5	4.97	5.65
Conductivity (μS/cm)	76	69	64	66	33	71
Temperature (°C)	16.2	16.0	15.2	15.9	16.1	16.8
Eh (mv)	210	147	212	250	180	242
Alkalinity (mg/L $CaCO_3$)	23.5	19.3	15.2	16.9	12.2	17.5
Total Dissolved Solids (mg/L)	76	50	55	55	63	65
Bromide (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloride (mg/L)	4.3	5.2	6.9	6.2	5.0	5.3
Total Organic Carbon (mg/L)	1.6 [a]	<1.0	<1.0	<1.0	1.0 [a]	<1.0
Fluoride (mg/L)	<0.10	<0.10	0.37 [a]	<0.10	<0.10	<0.10
Nitrate/Nitrite as N (mg/L)	0.15	0.11	0.81 [a]	0.082 [a]	0.10	0.11
Sulfate (mg/L)	6.4	5.5	6.3	5.9	5.8	6.3
Radium 226 and 228 (pCi/L)	0.17; ND	NR	NR	0.12; ND	NR	NR
Gross Alpha (pCi/L)	3.9	NR	NR	ND	NR	NR
Gross Beta (pCi/L)	3.5	NR	NR	2.1	NR	NR
Gross Gamma (pCi/L)						
AC-227	ND	NR	NR	NA	NR	NR
AC-228	ND	NR	NR	ND	NR	NR
Bi-212	ND	NR	NR	ND	NR	NR
Bi-214	32	NR	NR	ND	NR	NR
Co-60	ND	NR	NR	ND	NR	NR
Cs-134	ND	NR	NR	ND	NR	NR
Cs-137	ND	NR	NR	ND	NR	NR
K-40	ND	NR	NR	170	NR	NR
Pb-211	ND	NR	NR	ND	NR	NR
Pb-212	ND	NR	NR	ND	NR	NR
Pb-214	22	NR	NR	ND	NR	NR
Ra-223	ND	NR	NR	ND	NR	NR
Ra-226	ND	NR	NR	ND	NR	NR
Rn-219	ND	NR	NR	ND	NR	NR
Th-227	ND	NR	NR	ND	NR	NR
Th-228	ND	NR	NR	ND	NR	NR
Th-231	ND	NR	NR	NA	NR	NR
Th-234	ND	NR	NR	ND	NR	NR
Tl-208	ND	NR	NR	ND	NR	NR
U-235	ND	NR	NR	ND	NR	NR
U-238	ND	NR	NR	NA	NR	NR
Silver (mg/L)	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Aluminum (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Arsenic (mg/L)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Boron (mg/L)	<0.60	<0.60	<0.050	<0.050	<0.050	<0.050
Barium (mg/L)	0.028 [a]	0.026 [a]	0.018 [a]	0.015 [a]	0.012 [a]	<0.010
Beryllium (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (mg/L)	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Calcium (mg/L)	4.4 [a]	2.8 [a]	2.3 [a]	2.0 [a]	2.0 [a]	1.7 [a]
Cadmium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper (mg/L)	0.10 [b]	<0.020	<0.020	<0.020	<0.020	<0.020

TABLE C-3 (CONTINUED)

Parameter	6 Sep 90	2 Nov 90	8-9 Jan 91	11 Mar 91	8 May 91	1-2 Jul 91
Chromium (mg/L)	<0.010	0.0024 [a]	0.14 [b]	<0.010	<0.010	<0.010
Mercury (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Iron (mg/L)	<0.040	<0.040	0.54 [b]	<0.040	<0.040	<0.040
Potassium (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Lithium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	1.6 [a]	1.5 [a]	1.6 [a]	1.7 [a]	1.8 [a]	1.9 [a]
Manganese (mg/L)	0.13	0.057	0.32 [a]	<0.010	<0.010	<0.010
Molybdenum (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sodium (mg/L)	7.3	7.4	6.9	7.0	7.5	7.6
Nickel (mg/L)	0.023 [a]	0.034 [a]	0.086 [a]	<0.020	<0.020	<0.020
Phosphorus (mg/L)	<0.30	0.36 [a]	<0.30	<0.30	<0.30	<0.30
Lead (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0033 [a]
Sulfur (mg/L)	<5.0	<5.0	1.2 [a]	1.4 [a]	2.0 [a]	1.8 [a]
Antimony (mg/L)	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070
Selenium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silicon (mg/L)	10	10	9.3	12	11	11
Tin (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Strontium (mg/L)	0.027	0.017	0.014 [a]	0.012 [a]	0.012 [a]	0.0097 [a]
Tellurium (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Titanium (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Thallium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Tungsten (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

[a]Less than five times the detection limit; results should be viewed accordingly.
[b]Detected in the method blank.

ND = Not detected.
NR = Not required.
NA = Not applicable.

TABLE C-4
CW-4 RESULTS

Parameter	6 Sep 90	2 Nov 90	8-9 Jan 91	11 Mar 91	8 May 91	1-2 Jul 91
pH	5.40	5.15	4.8	4.73	6.19	5.08
Conductivity (µS/cm)	40	35	30	34	32	35
Temperature (°C)	16.9	16.9	16.7	16.9	16.8	17.0
Eh (mv)	188	213	228	274	181	319
Alkalinity (mg/L $CaCO_3$)	11.5	15.2	9.9	11.0	7.0	11.1
Total Dissolved Solids (mg/L)	50	35 [a]	31 [a]	34 [a]	39 [a]	41 [a]
Bromide (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloride (mg/L)	3.0	2.8	3.2	3.4	3.1	3.1
Total Organic Carbon (mg/L)	1.3 [a]	1.1 [a]	<1.0	<1.0	<1.0	<1.0
Fluoride (mg/L)	0.040 [a]	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate/Nitrite as N (mg/L)	0.035 [a]	0.027 [a]	<0.020	0.020	0.05 [a]	0.043 [a,b]
Sulfate (mg/L)	2.6	2.1	<0.050	<0.050	0.90	1.5
Radium 226 and 228 (pCi/L)	0.10; ND	NR	NR	0.09; ND	NR	NR
Gross Alpha (pCi/L)	ND	NR	NR	ND	NR	NR
Gross Beta (pCi/L)	ND	NR	NR	ND	NR	NR
Gross Gamma (pCi/L)						
Ac-227	ND	NR	NR	NA	NR	NR
Ac-228	ND	NR	NR	ND	NR	NR
Bi-212	ND	NR	NR	ND	NR	NR
Bi-214	140	NR	NR	ND	NR	NR
Co-60	ND	NR	NR	ND	NR	NR
Cs-134	ND	NR	NR	ND	NR	NR
Cs-137	ND	NR	NR	ND	NR	NR
K-40	ND	NR	NR	ND	NR	NR
Pb-211	ND	NR	NR	ND	NR	NR
Pb-212	190	NR	NR	ND	NR	NR
Pb-214	ND	NR	NR	29	NR	NR
Ra-223	ND	NR	NR	ND	NR	NR
Ra-226	ND	NR	NR	ND	NR	NR
Rn-219	ND	NR	NR	ND	NR	NR
Th-227	ND	NR	NR	ND	NR	NR
Th-228	ND	NR	NR	ND	NR	NR
Th-231	ND	NR	NR	NA	NR	NR
Tl-208	ND	NR	NR	ND	NR	NR
U-235	ND	NR	NR	ND	NR	NR
U-238	ND	NR	NR	NA	NR	NR
Silver (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminum (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Arsenic (mg/L)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Boron (mg/L)	<0.60	<0.60	<0.050	<0.050	<0.050	<0.050
Barium (mg/L)	<0.010	<0.010	<0.010	0.010	0.010	<0.010
Beryllium (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (mg/L)	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Calcium (mg/L)	1.0 [a]	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium (mg/L)	<0.0050	<0.0050	<0.0050	0.0090 [a]	<0.0050	<0.0050
Cobalt (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper (mg/L)	0.094 [a,b]	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (mg/L)	0.011 [a]	<0.0020	0.017 [a,b]	<0.010	<0.010	<0.010
Mercury (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

TABLE C-4 (CONTINUED)

Parameter	6 Sep 90	2 Nov 90	8-9 Jan 91	11 Mar 91	8 May 91	1-2 Jul 91
Iron (mg/L)	<0.040	<0.040	0.046 a,b	<0.040	0.089 [a]	<0.040
Potassium (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Lithium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	1.0 [a]	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese (mg/L)	0.056	0.033 [a]	0.026 [a]	0.012 [a]	<0.010	<0.010
Molybdenum (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sodium (mg/L)	4.4 [a]	4.5 [a]	4.3 [a]	4.1 [a]	4.6 [a]	4.3 [a]
Nickel (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Phosphorus (mg/L)	<0.30	0.37 [a]	<0.30	<0.30	<0.30	<0.30
Lead (mg/L)	0.0038 [a,b]	<0.0030	0.011 [a]	<0.0030	<0.0030	<0.0030
Sulfur (mg/L)	<5.0	<5.0	<1.0	<1.0	<1.0	<1.0
Antimony (mg/L)	0.0078 [a]	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070
Selenium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silicon (mg/L)	8.0	7.8	3.9 [a]	8.5	8.6	8.3
Tin (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Strontium (mg/L)	0.0077 [a]	0.0040 [a]	0.0040 [a]	0.0038 [a]	0.0043 [a]	0.0030 [a]
Tellurium (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Titanium (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Thallium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Tungsten (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (mg/L)	<0.020	<0.020	0.025 [a]	<0.020	<0.020	<0.020

[a] Less than five times the detection limit; results should be viewed accordingly.
[b] Detected in the method blank.

ND = Not detected.
NR = Not required.
NA = Not applicable.

TABLE C-5
CW-5 RESULTS

Parameter	6 Sep 90	2 Nov 90	8-9 Jan 91	11 Mar 91	8 May 91	1-2 Jul 91
pH	5.34	4.97	4.8	4.6	5.03	5.40
Conductivity (µS/cm)	62	62	66	72	54	70
Temperature (°C)	17.5	18.0	16.1	14.6	14.6	16.5
Eh (mv)	188	147	418	439	248	311
Alkalinity (mg/L $CaCO_3$)	12.5	15.3	13.1	15.1	8.6	14.2
Total Dissolved Solids (mg/L)	61	52	60	51	58	64
Bromide (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloride (mg/L)	5.0	4.2	5.0	5.6	4.5	5.2
Total Organic Carbon (mg/L)	2.2 [a]	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate/Nitrite as N (mg/L)	1.4	1.4	1.2	0.66	0.63	0.99 [b]
Sulfate (mg/L)	2.2	4.6	8	6.8	7.1	5.8
Radium 226 and 228 (pCi/L)	0.13; ND	NR	NR	0.09; ND	NR	NR
Gross Alpha (pCi/L)	ND	NR	NR	ND	NR	NR
Gross Beta (pCi/L)	ND	NR	NR	ND	NR	NR
Gross Gamma (pCi/L)						
Ac-227	ND	NR	NR	NA	NR	NR
Ac-228	ND	NR	NR	ND	NR	NR
Bi-212	ND	NR	NR	ND	NR	NR
Bi-214	130	NR	NR	ND	NR	NR
Co-60	ND	NR	NR	ND	NR	NR
Cs-134	ND	NR	NR	ND	NR	NR
Cs-137	ND	NR	NR	ND	NR	NR
K-40	ND	NR	NR	ND	NR	NR
Pb-211	ND	NR	NR	ND	NR	NR
Pb-212	ND	NR	NR	ND	NR	NR
Pb-214	ND	NR	NR	ND	NR	NR
Ra-223	ND	NR	NR	ND	NR	NR
Ra-226	350	NR	NR	ND	NR	NR
Rn-219	ND	NR	NR	ND	NR	NR
Th-227	ND	NR	NR	ND	NR	NR
Th-228	ND	NR	NR	ND	NR	NR
Th-231	ND	NR	NR	NA	NR	NR
Th-234	ND	NR	NR	ND	NR	NR
Tl-208	ND	NR	NR	ND	NR	NR
U-235	ND	NR	NR	ND	NR	NR
U-238	ND	NR	NR	NA	NR	NR
Silver (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminum (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Arsenic (mg/L)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Boron (mg/L)	<0.60	<0.60	<0.050	<0.050	<0.050	<0.050
Barium (mg/L)	0.015 [a]	0.013 [a]	0.011 [a]	0.011 [a]	0.012 [a]	<0.010
Beryllium (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (mg/L)	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Calcium (mg/L)	1.3 [a]	<1.0	<1.0	1.3 [a]	1.6 [a]	1.2 [a]
Cadmium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper (mg/L)	0.077 [a,b]	<0.020	<0.020	<0.020	<0.020	<0.020

TABLE C-5 (CONTINUED)

Parameter	6 Sep 90	2 Nov 90	8-9 Jan 91	11 Mar 91	8 May 91	1-2 Jul 91
Chromium (mg/L)	<0.010	0.0031 [a]	<0.010	<0.010	<0.010	<0.010
Mercury (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Iron (mg/L)	<0.040	<0.040	<0.040	<0.040	0.10 [a]	<0.040
Potassium (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Lithium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	2.5 [a]	2.5 [a]	3.1 [a]	3.8 [a]	3.9 [a]	3.7 [a]
Manganese (mg/L)	0.090	0.043 [a]	0.016 [a]	0.025 [a]	0.052	0.019 [a]
Molybdenum (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sodium (mg/L)	5.4	5.8	5.3	5.1	5.0	5.2
Nickel (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Phosphorus (mg/L)	<0.30	0.36 [a]	<0.30	<0.30	<0.30	<0.30
Lead (mg/L)	<0.0030	0.016 [b]	<0.0030	<0.0030	<0.0030	<0.0030
Sulfur (mg/L)	<5.0	<5.0	1.6 [a]	1.8 [a]	2.3 [a]	1.7 [a]
Antimony (mg/L)	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070
Selenium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silicon (mg/L)	9.9	9.1	4.7 a	9.7	9.2	10
Tin (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Strontium (mg/L)	0.010 [a]	0.0082 a	0.0096 [a]	0.011 [a]	0.014 [a]	0.0089 [a]
Tellurium (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Titanium (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Thallium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Tungsten (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

[a] Less than five times the detection limit; results should be viewed accordingly.
[b] Detected in the method blank.

ND = Not detected.
NR = Not required.
NA = Not applicable.

TABLE C-6
RESULTS FOR SEPTEMBER 3-4 AND
OCTOBER 14, 1992: PARAMETERS OTHER THAN VOCS

Parameter	GWA-1-7-1	GWC-1-7-1	GWC-2-7-1	GWC-3-7-1	GWC-4-7-1	GWC-5-7-1
pH	6.4	6.1	5.5	5.25	5.05	5.6
Conductivity (µS/cm)	116	78	66	32	72	61
Temperature (°C)	18.5	16.5	17.0	17.1	17.8	17.5
Eh (mv)	168	256	321	304	383	232
Alkalinity (mg/L $CaCO_3$)	35.4	27.8	18.2	10.0	11.5	14.8
Total Dissolved Solids (mg/L)	99	64	79	28	61	91
Bromide (mg/L)	<0.030	<0.030	1.7	<0.030	<0.030	<0.030
Chloride (mg/L)	1.9	2.5	3.0	2.0	3.1	1.8
Total Organic Carbon (mg/L)	<1.0	<1.0	6.1	<1.0	<1.0	<1.0
Fluoride (mg/L)	0.091 [a]	0.053 [a]	0.19	0.033 [a]	0.027 [a]	0.037 [a]
Nitrate-Nitrite (mg/L as N)	0.51	0.63	0.14	0.027 [a]	2.4	0.076 [a]
Sulfate (mg/L)	17	3.2	6.5	1.7	5.3	8.8
Radium 226 and 228 (pCi/L)	0.92±0.27 -4.0±5.5	0.63±0.21 3.3±5.6	0.70±0.25 -4.1±6.0	0.57±0.20 -2.5±5.1	0.59±0.19 -1.7±5.2	0.71±0.25 -3.0±6.6
Gross Alpha (pCi/L)	0.89 [a]	<0.60	<0.51	<0.49	<0.50	<0.52
Gross Beta (pCi/L)	1.80 [a]	<1.74	<1.80	<1.80	<1.75	<1.75
Gross Gamma (pCi/L)						
Ac-227	NR	NR	NR	NR	NR	NR
Ac-228	<18.5	<21.6	<16.8	<19.3	<18.4	<18.8
Bi-212	<63.7	<57.0	<57.5	<76.8	<56.1	<61.8
Bi-214	<11.0	<9.77	<11.2	<10.8	<11.5	<10.7
Co-60	<3.09	<3.57	<2.86	<2.45	<4.95	<2.73
Cs-134	<2.58	<2.84	<3.25	<2.10	<2.26	<3.66
Cs-137	<3.23	<2.21	<4.18	<2.20	<3.84	<5.33
K-40	<112	<106	<105	<106	<107	130±170
Pb-211	NR	NR	NR	NR	NR	NR
Pb-212	<10.9	<10.9	<9.31	<9.77	<11.0	<9.49
Pb-214	<9.37	<11.7	<13.0	<13.1	<13.4	<10.9
Ra-223	<33.8	<31.8	<27.9	<30.0	<35.5	<33.4
Ra-226	<116	<123	<112	<119	<121	<112
Rn-219	<37.6	<42	<37.9	<35.9	<46.7	<43.5
Th-227	<46.4	<51.6	<46.2	<42.4	<18.4	<18.9
Th-228	<225	<173	<223	<230	<200	<205
Th-231	<36.2	<42.3	<37.2	<36.3	<54.6	<49.3
Th-234	<59.6	86±84	<75.6	<71.5	<75.7	<67.7
Tl-208	<6.05	<4.37	7.0±4.3	<5.54	13.0±8.1	<4.56
U-235	<7.43	<7.67	<7.50	<7.81	<6.78	<6.90
U-238	NR	NR	NR	NR	NR	NR
Silver (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminum (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Arsenic (mg/L)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Boron (mg/L)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Barium (mg/L)	0.025 [a]	0.012 [a]	0.010 [a]	<0.010	<0.010	<0.010
Beryllium (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (mg/L)	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Calcium (mg/L)	7.9	4.3 [a]	1.4 [a]	<1.0	<1.0	2.1
Cadmium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0054 [a]	<0.0050
Cobalt (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

TABLE C-6 (CONTINUED)

Parameter	GWA-1-7-1	GWC-1-7-1	GWC-2-7-1	GWC-3-7-1	GWC-4-7-1	GWC-5-7-1
Copper (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury (mg/L)	0.00036 [a]	0.00036 [a]	0.00036 [a]	0.00034 [a]	0.00036 [a]	0.00036 [a]
Iron (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Lithium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	5.6	3.2 [a]	1.9 [a]	<1.0	3.3 [a]	1.9
Manganese (mg/L)	<0.010	<0.010	<0.010	<0.010	0.014 [a]	0.12
Molybdenum (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sodium (mg/L)	4.1 [a]	4.0 [a]	7.5	4.1 [a]	4.8 [a]	6.0
Nickel (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Phosphorus (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Lead (mg/L)	0.0030 [a]	<0.0030	0.0031 [a]	0.0064 [a]	0.0065 [a]	0.012 [a]
Sulfur (mg/L)	8.7 [a]	<5.0	<5.0	<5.0	<5.0	<5.0
Antimony (mg/L)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Selenium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silicon (mg/L)	15	11	11	8.3	8.6	12
Tin (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Strontium (mg/L)	0.023	0.014 [a]	0.011 [a]	0.0038 [a]	0.0081 [a]	0.013 [a]
Tellurium (mg/L)	<0.02	<0.20	<0.20	<0.20	<0.20	<0.20
Titanium (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Thallium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (mg/L)	0.039 [a]	<0.031	0.014 [a]	<0.031	<0.031	<0.031
Vanadium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Tungsten (mg/L)	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

[a] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.
[b] Detected in the method blank.

NR = Not reported.

Well No. GWA-1 was previously named CW-1.
Well No. GWC-1 was previously named CW-2.
Well No. GWC-2 was previously named CW-3.
Well No. GWC-3 was previously named CW-4.
Well No. GWC-4 was previously named CW-5.

Metal concentrations shown are total.

TABLE C-7
RESULTS FOR SEPTEMBER 3-4 AND OCTOBER 14, 1992: VOCS

Parameter	GWC-5-7-1 (µg/L)
Acetone	<100
Acrolein	<75
Acrylonitrile	<50
Benzene	<5.0
Bromodichloromethane	<5.0
Bromomethane	<10
Carbon disulfide	<5.0
Carbon tetrachloride	<5.0
Chlorobenzene	<5.0
Chloroethane	<10
2-Chloroethyl vinyl ether	<10
Chloroform	<5.0
Chloromethane	6.2 [a]
Dibromochloromethane	<5.0
Dibromomethane	<5.0
trans-1,4-Dichloro-2-butene	<10
Dichlorodifluoromethane	<20
1,1-Dichloroethane	<5.0
1,2-Dichloroethane	9.3 [b]
1,1-Dichloroethene	<5.0
trans-1,2-Dichloroethene	<5.0
1,2-Dichloropropane	<5.0
cis-1,3-Dichloropropene	<5.0
trans-1,3-Dichloropropene	<5.0
Ethyl benzene	<5.0
Ethyl methacrylate	<15
2-Hexanone	<50
Iodomethane	<5.0
Methyl ethyl ketone	<100
4-Methyl-2-pentanone(MIBK)	<50
Methylene chloride	<5.0
Styrene	<5.0
1,1,2,2-Tetrachloroethane	<50
Tetrachloroethene	<5.0
Toluene	<5.0
Tribromomethane(Bromoform)	<5.0
1,1,1-Trichloroethane	<5.0
1,1,2-Trichloroethane	<5.0
Trichloroethene	<5.0
Trichlorofluoromethane	<10
1,2,3-Trichloropropane	<5.0
Vinyl acetate	<5.0
Vinyl chloride	<10
Xylenes	<5.0

[a] Detected at less than the detection limit.
[b] Less than five times the detection limit; results should be viewed accordingly.

TABLE C-8

RESULTS OF GROUNDWATER MONITORING CONDUCTED

DECEMBER 29-30, 1992 (FOURTH QUARTER 1992)

Parameter	GWA-1-8-1	GWC-1-8-1	GWC-2-8-1	GWC-3-8-1	GWC-4-8-1	GWC-5-8-1
pH	5.7	4.5	4.6	3.8	3.9	4.4
Conductivity (µS/cm)	101	57	56	27	58	60
Temperature (°C)	15.9	16.0	17.0	17.1	17.3	17.1
Eh (mv)	165	237	251	275	301	276
Alkalinity (mg/L $CaCO_3$)	22.7	23.3	17.3	8.9	8.0	13.5
Total Dissolved Solids (mg/L)	110	68	71	37 [a]	65	86
Bromide (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Chloride (mg/L)	2.1	2.6	3.4	2.3	3.4	2.6
Total Organic Carbon (mg/L)	2.2 [a]	3.1 [a]	4.6 [a]	9.3	2.0 [a]	2.9 [a]
Fluoride (mg/L)	0.089 [a]	0.057 [a]	0.030 [a]	0.040 [a]	0.028 a	0.031 [a]
Nitrate-Nitrite (mg/L as N)	0.17 [b]	0.53 [b]	0.15 [b]	0.022 [a]	2.5 [b]	0.090 [b]
Sulfate (mg/L)	26	3.3	7.6	2.6	5.5	10
Silver (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminum (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Arsenic (mg/L)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Boron (mg/L)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Barium (mg/L)	0.033 [a]	0.012 [a]	0.010 [a]	<0.010	<0.010	0.012 [a]
Beryllium (mg/L)	<0.0033	<0.0033	<0.0033	<0.0033	<0.0033	<0.0033
Bismuth (mg/L)	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Calcium (mg/L)	8.1	4.0 [a]	1.6 [a]	<1.0	<1.0	2.7 [a]
Cadmium (mg/L)	<0.0015	<0.015	<0.0015	<0.0015	<0.0015	<0.0015
Cobalt (mg/L)	<0.029	<0.029	<0.029	<0.029	<0.029	<0.029
Copper (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury (mg/L)	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Iron (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Lithium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	6.0	3.0 [a]	2.1 [a]	<1.0	3.2 [a]	2.3 [a]
Manganese (mg/L)	<0.010	0.011 [a]	<0.010	<0.010	0.022 [a]	0.084
Molybdenum (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sodium (mg/L)	4.2 [a]	4.0 [a]	7.4	4.0 [a]	4.9 [a]	6.2
Nickel (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Phosphorus (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Lead (mg/L)	0.016	0.0035 [a]	0.0049 [a]	0.0058 [a]	0.0086 [a]	<0.0030
Sulfur (mg/L)	10 [a]	<5.0	<5.0	<5.0	<5.0	<5.0
Antimony (mg/L)	0.0095 [a]	<0.0060	<0.0060	0.0065 [a]	<0.0060	<0.0060
Selenium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silicon (mg/L)	17	12	13	9.3	9.5	14
Tin (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Strontium (mg/L)	0.024	0.013 [a]	0.012 [a]	0.0030 [a]	0.0093 [a]	0.016

TABLE C-8 (CONTINUED)

Parameter	GWA-1-8-1	GWC-1-8-1	GWC-2-8-1	GWC-3-8-1	GWC-4-8-1	GWC-5-8-1
Tellurium (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Titanium (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Thallium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (mg/L)	<0.050	<0.50	<0.50	<0.50	<0.50	<0.050
Vanadium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Tungsten (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

[a] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

[b] Detected in the method blank.

TABLE C-9
RESULTS OF GROUNDWATER MONITORING CONDUCTED
MARCH 30 AND APRIL 1, 1993 (FIRST QUARTER OF 1993)

Parameter	GWA-1-9-1	GWC-1-9-1	GWC-2-9-1	GWC-3-9-1	GWC-4-9-1	GWC-5-9-1
pH	6.82	5.83	5.29	5.23	5.04	6.13
Conductivity (µS/cm)	128	67	67	33	64	54
Temperature (°C)	19.7	16.4	17.0	17.4	15.7	17.7
Eh (mv)	234	184	194	205	189	224
Alkalinity (mg/L $CaCO_3$)	28.0	22.5	12.5	7.0	6.0	12.5
Total Dissolved Solids (mg/L)	110	43 [a]	68	44 [a]	63	67
Bromide (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Chloride (mg/L)	2.1	2.6	4.0	2.7	3.6	2.7
Total Organic Carbon (mg/L)	3.1 [a]	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride (mg/L)	0.097 [a]	0.062 [a]	<0.050	<0.050	<0.050	<0.050
Nitrate-Nitrite (mg/L as N)	0.19	0.42	0.17	<0.030	2.5	0.062 [a]
Sulfate (mg/L)	30	2.2	7.9	1.6	5.0	7.4
Radium 226 and 228 (pCi/L)	0.31 ± 0.33 2.16 ± 0.62	0.13 ± 0.34 1.03 ± 0.58	0.25 ± 0.33 1.57 ± 0.59	-0.12 ± 0.35 1.73 ± 0.60	0.0 ± 0.40 1.00 ± 0.67	0.01 ± 0.31 0.21 ± 0.48
Gross Alpha (pCi/L)	11.6 ± 3.9	40.2 ± 6.4	0.0 ±1.6	15.2 ± 4.2	21.4 ± 5.0	19.1 ± 4.8
Gross Beta (pCi/L)	232 ± 7.5	436 ± 11	-1.2 ± 3.9	179.4 ± 7.8	271.9 ± 9.0	279.8 ± 8.9
Gross Gamma (pCi/L)						
Ac-227	NR	NR	NR	NR	NR	NR
Ac-228	NR	NR	NR	NR	NR	NR
Bi-212	<78.8	<74.5	<69.3	<68.2	<84.5	<94.3
Bi-214	<14.2	<13.9	<13.6	<13.4	<14.3	<14.1
Co-60	<5.68	<5.30	<5.22	<4.93	<5.96	<5.52
Cs-134	<5.75	<3.52	<2.51	<5.36	<2.90	<3.06
Cs-137	<5.80	<4.10	<5.11	<4.65	<5.22	<2.49
K-40	<172	<173	<158	<172	<169	<172
Pb-211	NR	NR	NR	NR	NR	NR
Pb-212	<11.0	<11.7	<12.0	<11.6	<10.8	<10.6
Pb-214	<12.8	<13.8	<14.0	<15.6	<14.3	<14.2
Ra-223	<36.4	<43.3	<18.0	<45.1	<33.8	<36.1
Ra-226	<128	<128	<122	<131	<141	<132
Rn-219	<46.2	<48.9	<41.1	<52.1	<41.7	<41.7
Th-227	<28.8	<55.5	<56.8	<51.8	<55.2	<53.4
Th-228	<289	<264	<271	<230	<267	<244
Th-231	<45.4	<44.3	<38.7	<65.8	<43.5	<46.4
Th-234	<89.7	<92.3	<90.2	<90.8	<96.3	<90.3
Tl-208	<7.42	<7.17	<6.41	<7.35	<7.16	<6.55
U-235	<8.39	<8.02	<8.00	<8.51	<9.63	<8.46
U-238	NR	NR	NR	NR	NR	NR
Silver (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminum (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Arsenic (mg/L)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Boron (mg/L)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Barium (mg/L)	0.010 a	0.033 [a]	0.011 [a]	<0.010	<0.010	<0.010
Beryllium(mg/L)	<0.0033	<0.0033	<0.0033	<0.0033	<0.0033	<0.0033
Bismuth (mg/L)	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Calcium (mg/L)	4.1 [a]	8.8	1.7 [a]	<1.0	1.0 [a]	2.2 [a]
Cadmium (mg/L)	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Cobalt (mg/L)	<0.029	<0.029	<0.029	<0.029	<0.029	<0.029

TABLE C-9 (CONTINUED)

Parameter	GWA-1-9-1	GWC-1-9-1	GWC-2-9-1	GWC-3-9-1	GWC-4-9-1	GWC-5-9-1
Copper (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury (mg/L)	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Iron (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (mg/L)	<3.0	3.2 [a]	<3.0	<3.0	<3.0	<3.0
Lithium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	2.9 [a]	6.2	2.1 [a]	<1.0	3.2 [a]	1.8 [a]
Manganese (mg/L)	<0.010	<0.010	0.012 [a]	<0.010	0.017 [a]	0.041 [a]
Molybdenum (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sodium (mg/L)	4.0 [a]	4.2 [a]	7.5	4.1 [a]	4.7 [a]	5.7
Nickel (mg/L)	<0.020	<0.020	0.052 [a]	<0.020	<0.020	<0.020
Phosphorus (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Lead (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	0.021	<0.0030
Sulfur (mg/L)	<5.0 [a]	11 [a]	<5.0	<5.0	<5.0 [a]	<5.0
Antimony (mg/L)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Selenium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silicon (mg/L)	11	16	12	9.0	8.7	13
Tin (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Strontium (mg/L)	0.013 [a]	0.025	0.012 [a]	0.0038 [a]	0.010 [a]	0.013 a
Tellurium (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Titanium (mg/L)	<0.050	<0.050	<0.050	<0.050	<0050	<0.050
Thallium (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Tungsten (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

[a] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

[b] Detected in the method blank.

NR = Not reported.

TABLE C-10
RESULTS OF GROUNDWATER MONITORING CONDUCTED
JUNE 21, 1993 (SECOND QUARTER 1993)

Parameter	GWA-1-10-1	GWC-1-10-1	GWC-2-10-1	GWC-3-10-1	GWC-4-10-1	GWC-5-10-1
pH	6.1	6.0	5.4	5.2	5.2	5.4
Conductivity (µS/cm)	100	57	56	27	52	41
Temperature (°C)	18.1	16.3	16.8	17.0	15.9	17.3
Eh (mv)	145	110	71	50	77	40
Alkalinity (mg/L $CaCO_3$)	27.0	24.1	14.1	8.5	6.9	10.2
Total Dissolved Solids (mg/L)	116	74	77	52	55	56
Bromide (mg/L)	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028
Chloride (mg/L)	2.1	2.6	4.5	2.9	3.6	2.9
Total Organic Carbon (mg/L)	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45
Fluoride (mg/L)	0.073 [a]	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate-Nitrite (mg/L as N)	0.57	0.41	0.15	0.039 [a]	2.2	0.041 [a]
Sulfate (mg/L)	20	<2.5	7.5	<2.5	5.9	6.7
Silver (mg/L)	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049
Aluminum (mg/L)	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028
Arsenic (mg/L)	<0.00066	<0.00066	<0.00066	<0.00066	<0.00066	<0.00066
Boron (mg/L)	<0.025	<0.025	<0.025	<0.015	<0.015	<0.025
Barium (mg/L)	0.030	0.011	<0.010	<0.010	<0.010	<0.010
Beryllium (mg/L)	<0.0033	<0.00055	<0.00055	<0.00055	<0.00055	<0.00055
Bismuth (mg/L)	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013
Calcium (mg/L)	8.0	4.1	1.6	<1.0	<1.0	1.6
Cadmium (mg/L)	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
Cobalt (mg/L)	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034
Copper (mg/L)	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038
Chromium (mg/L)	<0.010	<0.0025	<0.010	<0.010	<0.0025	<0.0025
Mercury (mg/L)	<0.000048	<0.000048	<0.000048	<0.000048	<0.000048	<0.000048
Iron (mg/L)	<0.050	<0.050	<0.0060	<0.0060	<0.0060	<0.050
Potassium (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0	<0.0029
Lithium (mg/L)	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029
Magnesium (mg/L)	5.8	2.9	1.9	<1.0	2.7	1.5
Manganese (mg/L)	<0.010	<0.010	0.010	<0.010	0.013	0.021
Molybdenum (mg/L)	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046
Sodium (mg/L)	4.4	4.0	6.7	3.9	4.4	5.5
Nickel (mg/L)	<0.0099	<0.0099	0.053	<0.0099	<0.0099	<0.0099
Phosphorus (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Lead (mg/L)	0.0037 [a]	<0.0011	0.0078	0.0033 [a]	0.0049 [a]	0.0067
Sulfur (mg/L)	7.4	<5.0	<5.0	<5.0	<5.0	<5.0
Antimony (mg/L)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Selenium (mg/L)	<0.00084	<0.00084	<0.0050	<0.00084	<0.00084	<0.00084
Silicon (mg/L)	18	12	11	8.7	8.3	12
Tin (mg/L)	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014
Strontium (mg/L)	0.025	0.013	0.011	<0.0030	0.0077	0.011

TABLE C-10 (CONTINUED)

Parameter	GWA-1-10-1	GWC-1-10-1	GWC-2-10-1	GWC-3-10-1	GWC-4-10-1	GWC-5-10-1
Tellurium (mg/L)	<0.032	<0.032	<0.032	<0.032	<0.032	<0.032
Titanium (mg/L)	<0.050	<0.0010	<0.0010	<0.050	<0.0010	<0.0010
Thallium (mg/L)	<0.0020	<0.00087	<0.00087	<0.0020	<0.00087	<0.00087
Uranium (mg/L)	<0.083	<0.083	<0.083	<0.50	<0.083	<0.083
Vanadium (mg/L)	<0.020	<0.0024	<0.0024	<0.0024	<0.020	<0.0024
Tungsten (mg/L)	<0.046	<0.046	<0.046	<0.046	<0.046	<0.046
Zinc (mg/L)	<0.020	<0.0015	<0.020	<0.0015	<0.020	<0.020

[a] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

TABLE C-11
RESULTS OF GROUNDWATER MONITORING CONDUCTED
SEPTEMBER 23-24, 1993 (THIRD QUARTER 1993)

Parameter	GWA-1-11-1	GWC-1-11-1	GWC-2-11-1	GWC-3-11-1	GWC-4-11-1	GWC-5-11-1
pH	5.9	6.0	5.6	5.3	5.2	5.6
Conductivity (µS/cm)	110	61	49	27	54	40
Temperature (°C)	19.2	17.1	17.6	17.5	18.0	17.5
Eh (mv)	210	161	171	194	205	198
Alkalinity (mg/L $CaCO_3$)	24.8	27.3	15.9	9.1	7.0	11.5
Total Dissolved Solids (mg/L)	99	70	60	21 [a]	44	50
Bromide (mg/L)	0.46	0.76	0.58	0.34	1.9	0.33
Chloride (mg/L)	1.9	2.5	3.5	2.8	3.8	2.5
Total Organic Carbon (mg/L)	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45
Fluoride (mg/L)	0.071 [a]	<0.05	<0.05	<0.05	<0.05	<0.024
Nitrate-Nitrite (mg/L as N)	0.19	0.51	0.30	0.048 [a]	1.8	0.038 [a]
Sulfate (mg/L)	28	2.6	7.7	<2.5	4.9	5.5
Radium 226 and 228 (pCi/L)	0.27 ± 0.13 0.32 ± 0.48	0.16 ± 0.13 0.64 ± 0.54	0.05 ± 0.12 0.69 ± 0.54	0.10 ± 0.13 0.31 ± 0.50	0.11 ± 0.11 0.52 ± 0.52	0.18 ± 0.13 0.0 ± 0.53
Gross Alpha (pCi/L)	0.88 ± 0.92	-0.29 ± 0.74	0.73 ± 0.85	0.20 ± 0.79	0.51 ± 0.83	0.04 ± 0.72
Gross Beta (pCi/L)	2.0 ± 1.9	0.7 ± 1.8	0.1 ± 1.8	-0.1 ± 1.8	0.3 ± 1.9	0.2 ± 1.8
Gross Gamma (pCi/L)						
Ac-227	NR	NR	NR	NR	NR	NR
Ac-228	NR	NR	NR	NR	NR	NR
Bi-212	<75.7	<79.5	<115	<138	<81.4	<103
Bi-214	<24.2	<19.6	<24.5	<21.5	<25.9	<23.5
Co-60	<8.15	<3.67	<6.46	<6.03	<7.01	<3.87
Cs-134	<8.03	<7.55	<5.95	<4.05	<8.27	<9.99
Cs-137	<7.53	<7.26	<11.1	<10.2	<9.43	<8.30
K-40	<240	<252	380 ± 230	320 ± 220	<239	<230
Pb-211	NR	NR	NR	NR	NR	NR
Pb-212	<17.0	<18.4	<21.0	<19.7	<18.8	<19.6
Pb-214	<21.0	<24.9	<23.4	<24.4	<26.4	<23.1
Ra-223	<50.5	<63.1	<72.0	<78.2	<71.9	<58.8
Ra-226	<241	<247	<255	<212	<235	<202
Rn-219	<66.5	<80.0	<80.9	<89.7	<81.1	<68.8
Th-227	<88.1	<81.8	<102	<91.6	<88.1	<41.9
Th-228	<418	<391	<389	<406	<388	<420
Th-231	<54.5	<99.1	<69.7	<78.1	<72.0	<67.0
Th-234	<124	<136	<150	<158	<138	<132
Tl-208	<10.2	<10.1	<62.3	<11.8	<11.9	<11.6
U-235	<63.7	<57.8	<68.2	<64.9	<62.0	<50.9
U-238	NR	NR	NR	NR	NR	NR
Silver (mg/L)	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049
Aluminum (mg/L)	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028
Arsenic (mg/L)	<0.00098	<0.00098	<0.00098	<0.00098	<0.00098	<0.00098
Boron (mg/L)	<0.015	<0.025	<0.025	<0.025	<0.025	<0.015
Barium (mg/L)	0.034	0.011	0.011	<0.010	<0.010	<0.010
Beryllium (mg/L)	<0.00055	<0.00055	<0.00055	<0.0033	<0.0033	<0.00055
Bismuth (mg/L)	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Calcium (mg/L)	8.3	4.1	1.9	<1.0	<1.0	1.4
Cadmium (mg/L)	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
Cobalt (mg/L)	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034

TABLE C-1.1 (CONTINUED)

Parameter	GWA-1-11-1	GWC-1-11-1	GWC-2-11-1	GWC-3-11-1	GWC-4-11-1	GWC-5-11-1
Copper (mg/L)	<0.020	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038
Chromium (mg/L)	<0.010	<0.0025	<0.010	<0.0025	<0.0025	<0.010
Mercury (mg/L)	<0.00036	<0.00020 [a]	<0.00020	<0.00020	<0.00020	<0.000048
Iron (mg/L)	<0.050	0.074	<0.050	<0.050	<0.050	<0.050
Potassium (mg/L)	<3.0	<3.0	<0.37	<0.37	<0.37	<3.0
Lithium (mg/L)	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029
Magnesium (mg/L)	5.9	3.0	2.0	<1.0	2.9	1.4
Manganese (mg/L)	<0.010	<0.010	<0.010	<0.010	0.021	0.013
Molybdenum (mg/L)	<0.0046	<0.0046	<0.050	<0.0046	<0.0046	<0.0046
Sodium (mg/L)	4.3	3.8	6.8	3.8	4.4	5.2
Nickel (mg/L)	<0.0099	<0.0099	0.048	<0.0099	<0.0099	<0.0099
Phosphorus (mg/L)	<0.061	<0.061	<0.061	<0.061	<0.061	<0.061
Lead (mg/L)	<0.0030	0.010	0.003 [a]	0.006	0.005	0.004 [a]
Sulfur (mg/L)	9.5	<5.0	<5.0	<0.025	<5.0	<5.0
Antimony (mg/L)	<0.0030	<0.0014	<0.0014	<0.0014	<0.0014	0.0034 [a]
Selenium (mg/L)	<0.00084	<0.00084	<0.00084	<0.00084	<0.00084	<0.00084
Silicon (mg/L)	17	12	13	9.2	9.3	12
Tin (mg/L)	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014
Strontium (mg/L)	0.025	0.013	0.013	0.0031	0.0089	0.011
Tellurium (mg/L)	<0.20 [b]	<0.20 [b]	0.48 [b]	<0.032 [b]	<0.032 [b]	<0.032 [b]
Titanium (mg/L)	<0.050	<0.0010	<0.0010	<0.0010	<0.0010	<0.050
Thallium (mg/L)	<0.00087	<0.00087	<0.00087	<0.00087	<0.00087	<0.00087
Uranium (mg/L)	<0.083	<0.083	<0.083	<0.083	<0.083	<0.50
Vanadium (mg/L)	<0.0024	<0.020	<0.0024	<0.0024	<0.0024	<0.020
Tungsten (mg/L)	<0.046	<0.046	<0.046	<0.046	<0.046	<0.046
Zinc (mg/L)	<0.020	<0.020	<0.020	<0.0015	<0.0015	<0.0015

[a] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.
[b] Detected in the method blank.

NR = Not reported.

TABLE C-12
RESULTS OF GROUNDWATER MONITORING CONDUCTED
JANUARY 5, 1994 (FOURTH QUARTER 1993)

Parameter	GWA-1-12-1 [a]	GWC-1-12-1	GWC-2-12-1	GWC-3-12-1	GWC-4-12-1	GWC-5-12-1
pH		6.12	5.75	5.51	5.21	6.95
Conductivity (µS/cm)		74	53	22	63	39
Temperature (°C)		15.2	16.4	16.9	17.2	17.1
Eh (mv)		NR	NR	NR	NR	NR
Alkalinity (mg/L $CaCO_3$)		29.9	15.7	9.3	9.2	10.8
Total Dissolved Solids (mg/L)		22	27	<8.7	20	29
Bromide (mg/L)		<0.0277	<0.0277	<0.0277	0.167	<0.0277
Chloride (mg/L)		3.45	3.80	2.79	6.72	2.55
Total Organic Carbon (mg/L)		<0.453	<0.453	<0.453	<0.453	<0.453
Fluoride (mg/L)		<0.050	<0.050	<0.050	<0.050	<0.050
Nitrate-Nitrite (mg/L as N)		0.69	0.414	0.0594	1.27	<0.030
Sulfate (mg/L)		3.26	5.78	<0.060	4.37	5.28
Silver (mg/L)		<0.0049	<0.0049	<0.0049	<0.0049	<0.0049
Aluminum (mg/L)		<0.028	<0.028	<0.028	<0.028	<0.028
Arsenic (mg/L)		<0.000984	<0.000984	<0.000984	<0.000984	<0.000984
Boron (mg/L)		<0.015	<0.015	<0.015	<0.015	<0.015
Barium (mg/L)		0.013	0.010	<0.010	0.010	<0.010
Beryllium (mg/L)		<0.00055	<0.00055	<0.00055	<0.00055	<0.00055
Bismuth (mg/L)		0.103 [b]	0.142 [b]	0.0985 [b]	0.115 [b]	0.0973 [b]
Calcium (mg/L)		5.06	1.98	<1.0	1.3	1.3
Cadmium (mg/L)		<0.0050	<0.0017	<0.0017	<0.0017	<0.0017
Cobalt (mg/L)		<0.0034	<0.0034	<0.0034	<0.0034	<0.0034
Copper (mg/L)		<0.0038	<0.0038	<0.0038	<0.0038	<0.0038
Chromium (mg/L)		<0.010	0.011 [c]	<0.010	<0.010	<0.010
Mercury (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron (mg/L)		0.097	<0.050	<0.050	<0.050	<0.050
Potassium (mg/L)		<3.0	<3.0	<0.37	<3.0	<3.0
Lithium (mg/L)		<0.0029	<0.0029	<0.0029	<0.0029	<0.020
Magnesium (mg/L)		3.7	1.8	<1.0	3.7	1.3
Manganese (mg/L)		<0.010	<0.010	<0.010	0.041	<0.010
Molybdenum (mg/L)		<0.0046	<0.0046	<0.0046	<0.0046	<0.0046
Sodium (mg/L)		4.3	7.0	4.1	5.0	5.5
Nickel (mg/L)		<0.0099	0.037 [c]	<0.0099	<0.0099	<0.0099
Phosphorus (mg/L)		<0.061	<0.061	<0.061	<0.061	<0.061
Lead (mg/L)		<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
Sulfur (mg/L)		<5.0	<5.0	<5.0	<5.0	<5.0
Antimony (mg/L)		0.0030 [c]	<0.00104	<0.00104	<0.00104	<0.00104
Selenium (mg/L)		<0.000843	<0.000843	<0.000843	<0.000843	<0.000843

TABLE C-12 (CONTINUED)

Parameter	GWA-1-12-1 [a]	GWC-1-12-1	GWC-2-12-1	GWC-3-12-1	GWC-4-12-1	GWC-5-12-1
Silicon (mg/L)		12.7	12.9	9.7	9.8	11.4
Tin (mg/L)		<0.014	<0.014	<0.014	<0.014	<0.014
Strontium (mg/L)		0.015	0.012	<0.0030	0.011	0.0096
Tellurium (mg/L)		<0.0317	<0.0317	<0.0317	<0.0317	<0.0317
Titanium (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Thallium (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (mg/L)		<0.083	<0.083	<0.083	<0.083	<0.083
Vanadium (mg/L)		<0.020	<0.0024	<0.0024	<0.0024	<0.0024
Tungsten (mg/L)		<0.046	<0.046	<0.046	<0.046	<0.046
Zinc (mg/L)		<0.020	<0.020	<0.020	<0.0015	<0.020

[a] Well was dry; no samples collected.
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

NR = Not reported.

TABLE C-13
RESULTS OF GROUNDWATER MONITORING CONDUCTED
MARCH 22-23, 1994 (FIRST QUARTER 1994)

Parameter	GWA-1-13-1 [a]	GWC-1-13-1	GWC-2-13-1	GWC-3-13-1	GWC-4-13-1	GWC-5-13-1
pH		5.89	5.50	5.18	4.98	5.38
Conductivity (µS/cm)		61	57	28	72	43
Temperature (°C)		16.5	17.4	17.2	16	17.8
Eh (mv)		126	149	161	299	206
Alkalinity (mg/L $CaCO_3$)		25	14	7.5	5.0	8.6
Total Dissolved Solids (mg/L)		66	76	42 [c]	64	53
Bromide (mg/L)		<0.0277	<0.0277	<0.0277	0.133 [c]	<0.0277
Chloride (mg/L)		2.43	3.70	2.77	11.3	2.34
Total Organic Carbon (mg/L)		<0.357	<0.357	<0.357	<0.357	<0.357
Fluoride (mg/L)		0.0557 [b]	0.0390 [b]	0.0372 [b]	0.0357 [b]	0.0320 [b]
Nitrate-Nitrite (mg/L as N)		0.414	0.443	0.0827	0.943	0.0433 [c]
Sulfate (mg/L)		1.75	5.97	1.38	4.64	6.56
Radium 226 and 228 (pCi/L)		-0.06 ± 0.13 1.14 ± 0.57	0.06 ± 0.13 0.77 ± 0.51	-0.03 ± 0.14 0.97 ± 0.52	-0.14 ± 0.16 0.79 ± 0.49	-0.09 ± 0.17 0.89 ± 0.51
Gross Alpha (pCi/L)		0.92 ± 0.42	1.44 ± 0.5	1.00 ± 0.40	1.16 ± 0.43	0.94 ± 0.41
Gross Beta (pCi/L)		2.05 ± 0.73	1.58 ± 0.73	1.53 ± 0.71	0.99 ± 0.69	0.75 ± 0.68
Gross Gamma (pCi/L)						
Ac-227		NR	NR	NR	NR	NR
Ac-228		NR	NR	NR	NR	NR
Bi-212		<109	<100	<136	<89.7	<93.7
Bi-214		157 ± 26	60 ± 19	43 ± 19	45 ± 21	37 ± 19
Co-60		<9.13	<8.8	<11.1	<6.76	<11.0
Cs-134		<23.9	<18.4	<17.7	<19.0	<18.0
Cs-137		<6.33	<7.75	<10.9	<6.73	<10.1
K-40		<148	<146	<132	<163	<146
Pb-211		NR	NR	NR	NR	NR
Pb-212		<28.1	<20.5	<21.3	<22.3	<22.1
Pb-214		200 ± 27	89 ± 25	41 ± 22	66 ± 24	46 ± 23
Ra-223		<62.2	<37.7	<53.7	<50.9	<47.5
Ra-226		<195	<120	<180	<83.3	<165
Rn-219		<77.9	<65.1	<73.9	<72.9	<63.3
Th-227		<45.5	<90.1	<95.3	<55.9	<91.3
Th-228		<423	<623	<637	<592	<522
Th-231		<186	<187	<367	<323	<323
Th-234		<159	<202	<211	<247	<180
Tl-208		<11.6	<9.50	<11.1	<10.8	<9.80
U-235		<46.6	<38.6	<39.8	<53.7	<53.8
U-238		NR	NR	NR	NR	NR
Silver (mg/L)		<0.00492	<0.00492	<0.00492	0.0171 [c]	<0.00492
Aluminum (mg/L)		<0.0284 [b]	<0.0284 [b]	<0.0284 [b]	<0.0284 [b]	<0.0284 [b]
Arsenic (mg/L)		<0.000647	<0.000647	<0.000647	<0.000647	<0.000647
Boron (mg/L)		<0.0151	<0.0151	<0.0151	0.023	<0.0151
Barium (mg/L)		0.0142 [b]	0.0119 [b]	0.00783 [b]	0.0286 [b]	0.0375 [b]
Beryllium (mg/L)		0.00268 [c]	0.00075 [c]	<0.000554	0.0165	0.00563
Bismuth (mg/L)		<0.132	<0.132	<0.132	<0.132	<0.132

TABLE C-13 (CONTINUED)

Parameter	GWA-1-13-1 [a]	GWC-1-13-1	GWC-2-13-1	GWC-3-13-1	GWC-4-13-1	GWC-5-13-1
Calcium (mg/L)		4.72	2.19	0.392 [c]	1.81	1.65
Cadmium (mg/L)		<0.00172	<0.00172	<0.00172	0.0159	0.00381 [c]
Cobalt (mg/L)		0.0041 [c]	<0.00340	<0.00340	0.0183	0.00693 [c]
Copper (mg/L)		<0.00381	<0.00381	<0.00381	<0.00381	<0.00381
Chromium (mg/L)		0.00466 [c]	0.00695 [c]	<0.00249	0.0187	0.00937 [c]
Mercury (mg/L)		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Iron (mg/L)		0.0502 [b]	0.0282 [b]	0.0142 [b]	0.188 [b]	0.179 [b]
Potassium (mg/L)		0.708 [c]	<0.370	<0.370	0.569 [c]	0.402 [c]
Lithium (mg/L)		2,202	2,159	2,351	2,391	2,187
Magnesium (mg/L)		3.14	1.92	0.962	5.05	1.60
Manganese (mg/L)		0.00298	0.00980	0.00206	0.0760	0.0134
Molybdenum (mg/L)		<0.00463	<0.00463	<0.00463	0.0179 [c]	<0.00463
Sodium (mg/L)		4.12	7.15	4.35	5.33	5.74
Nickel (mg/L)		0.0119 [c]	0.0767	<0.00986	0.0319 [c]	0.0121 [c]
Phosphorus (mg/L)		<0.0610	<0.0610	<0.0610	<0.0610	<0.0610
Lead (mg/L)		<0.00106	<0.00106	<0.00106	<0.00106	<0.00106
Sulfur (mg/L)		0.682	1.59	0.227	1.02	2.39
Antimony (mg/L)		<0.00156	<0.00156	<0.00156	<0.00156	<0.00156
Selenium (mg/L)		0.00120 [b,c]	0.00151 [b,c]	0.000730 [b,c]	0.000830 [b,c]	<0.000592
Silicon (mg/L)		11.9	13.3	10.1	9.91	11.8
Tin (mg/L)		<0.0145	<0.0145	<0.0145	<0.0145	0.0213 [c]
Strontium (mg/L)		0.0117	0.0112	0.00513 [c]	0.0112	0.0121
Tellurium (mg/L)		<0.0317	<0.0317	<0.0317	<0.0317	<0.0317
Titanium (mg/L)		<0.00159	<0.00159	<0.00159	<0.00159	<0.00159
Thallium (mg/L)		<0.00103	<0.00103	<0.00103	<0.00103	<0.00103
Uranium (mg/L)		<0.199	<0.199	<0.199	<0.199	<0.199
Vanadium (mg/L)		0.00561 [c]	<0.00236	<0.00236	0.0168	0.00586 [c]
Tungsten (mg/L)		<0.0408	<0.0408	<0.0408	<0.0408	<0.0408
Zinc (mg/L)		0.00623 [c]	0.00669 [c]	0.00239 [c]	0.0169	0.00771

[a] Well was dry; no samples collected.

[b] Detected in the method blank.

[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

NR = Not reported.

TABLE C-14
RESULTS OF GROUNDWATER MONITORING
CONDUCTED JUNE 21-22, 1994 (SECOND QUARTER 1994)

Parameter	GWA-1-14-1[a]	GWC-1-14-1	GWC-2-14-1	GWC-3-14-1	GWC-4-14-1	GWC-5-14-1
pH		5.91	5.72	5.43	5.20	5.42
Conductivity (µS/cm)		60	59	29	81	45
Temperature (°C)		17.1	18.0	17.9	16.6	17.7
Eh (mv)		375	404	350	488	398
Alkalinity (mg/L $CaCO_3$)		30.1	16.2	8.5	10.3	10.8
Total Dissolved Solids (mg/L)		56	58	36 [b]	75	61
Bromide (mg/L)		<0.0226	<0.0226	<0.0226	0.193	<0.0226
Chloride (mg/L)		2.77	3.79	2.76	13.5	2.48
Total Organic Carbon (mg/L)		<0.357	<0.357	<0.357	0.386 [c]	<0.357
Fluoride (mg/L)		0.0515 [b]	NR	NR	NR	NR
Nitrate-Nitrite (mg/L as N)		0.287	0.450	0.0136	1.31	0.0492
Sulfate (mg/L)		1.77	5.95	1.52	4.50	7.65
Silver (mg/L)		<0.00519	<0.00519	<0.00519	<0.00519	<0.00519
Aluminum (mg/L)		<0.0523	<0.0523	<0.0523	<0.0523	<0.0523
Arsenic (mg/L)		<0.000647	<0.000647	<0.000647	<0.000647	<0.000647
Boron (mg/L)		0.214 [b]	0.190 [b]	0.158 [b]	0.121 [b]	0.116 [b]
Barium (mg/L)		0.0105 b	0.0105 [b]	0.0206 [b]	0.0105 [b]	0.0105 [b]
Beryllium (mg/L)		<0.000510	<0.000510	<0.000510	<0.000510	<0.000510
Bismuth (mg/L)		<0.0132	<0.0132	<0.0132	<0.0132	<0.0132
Calcium (mg/L)		4.65 [b]	2.05 [b]	0.321 [b]	1.62 [b]	1.38 [b]
Cadmium (mg/L)		<0.00386	<0.00513 [c]	<0.00386	<0.00386	<0.00386
Cobalt (mg/L)		<0.00407	<0.00407	<0.00407	<0.00407	<0.00407
Copper (mg/L)		<0.00916	<0.00916	<0.00916	<0.00916	<0.00916
Chromium (mg/L)		<0.00524	<0.00524	<0.00524	<0.00524	<0.00524
Mercury (mg/L)		0.000040 [c]	<0.000033	<0.000033	<0.000033	<0.000033
Iron (mg/L)		0.0136 [c]	0.00698 [c]	0.0103	0.0135 [c]	0.0153 [c]
Potassium (mg/L)		<0.822	<0.822	<0.822	<0.822	<0.822
Lithium (mg/L)		<0.00543	<0.00543	<0.00543	<0.00543	<0.00543
Magnesium (mg/L)		3.39	1.93	0.935	4.98	1.55
Manganese (mg/L)		<0.00155	0.00430 [b,c]	0.00348 [b,c]	0.0884 [b]	0.00170 [b,c]
Molybdenum (mg/L)		<0.00739	<0.00739	<0.00739	<0.00739	<0.00739
Sodium (mg/L)		4.16	7.09	4.14	4.87	5.77
Nickel (mg/L)		<0.0141	0.0384 [c]	<0.0141	<0.0141	<0.0141
Phosphorus (mg/L)		<0.0610	<0.0610	<0.0610	<0.0610	<0.0610
Lead (mg/L)		<0.00205	<0.00205	<0.00205	<0.00205	<0.00205
Sulfur (mg/L)		0.454 [c]	2.50	0.341 [c]	1.48	2.84
Antimony (mg/L)		0.00249 [c]	0.00210 [c]	<0.00146	<0.00146	<0.00146
Selenium (mg/L)		<0.000592	0.00090 c	<0.000592	<0.000592	0.00101 [c]

TABLE C-14 (CONTINUED)

Parameter	GWA-1-14-1[a]	GWC-1-14-1	GWC-2-14-1	GWC-3-14-1	GWC-4-14-1	GWC-5-14-1
Silicon (mg/L)		11.9	13.0	9.16	9.18	11.3
Tin (mg/L)		<0.0145	<0.0145	<0.0145	<0.0145	<0.0145
Strontium (mg/L)		0.0168	0.0112	0.00467 [c]	0.0126	0.0112
Tellurium (mg/L)		0.0689 [b,c]	<0.0317 [b]	0.0708 [b,c]	0.0469 [b,c]	<0.0317
Titanium (mg/L)		<0.00159	<0.00159	<0.00159	<0.00159	<0.00159
Thallium (mg/L)		<0.00185	<0.00185	<0.00185	<0.00185	<0.00185
Uranium (mg/L)		<0.199	<0.199	<0.199	<0.199	<0.199
Vanadium (mg/L)		<0.00454	<0.00454	<0.00454	<0.00454	<0.00454
Tungsten (mg/L)		<0.0408	<0.0408	<0.0408	<0.0408	<0.0408
Zinc (mg/L)		0.00649 [c]	0.00964 [c]	0.0130 [c]	0.0131 [c]	<0.00402
TOX (µg/L)		018.1 [c]	<10.0	<10.0	<10.0	<10.0
VOCs (µg/L)						
Acetone		2.21 [b,c]	<2.09 [b]	2.19 [b,c]	2.23 [b,c]	<2.09 [b]
Acrolein		<1.78	<1.78	<1.78	<1.78	<1.78
Acrylonitrile		<0.286	<0.286	<0.286	<0.286	<0.286
Benzene		<0.0307	<0.0307	<0.0307	<0.0307	<0.0307
Bromodichloromethane		<0.0536	<0.0536	<0.0536	<0.0536	<0.0536
Bromoform		<0.108	<0.108	<0.108	<0.108	<0.108
Bromomethane		<0.0968	<0.0968	<0.0968	<0.0968	<0.0968
2-Butanone (MEK)		<0.890	<0.890	<0.890	<0.890	<0.890
Carbon disulfide		<0.161	<0.161	<0.161	<0.161	<0.161
Carbon tetrachloride		<0.117	<0.117	<0.117	<0.117	<0.117
Chlorobenzene		<0.112	<0.112	<0.112	<0.112	<0.112
Chloroethane		<0.0972	<0.0972	<0.0972	<0.0972	<0.0972
2-Chloroethyl vinyl ether		<0.124	<0.124	<0.124	<0.124	<0.124
Chloroform		<0.0363	<0.0363	<0.0363	<0.0363	<0.0363
Chloromethane		<0.155	<0.155	<0.155	<0.155	<0.155
Dibromochloromethane		<.0283	<.0283	<.0283	<.0283	<.0283
Dibromomethane		<0.0598	<0.0598	<0.0598	<0.0598	<0.0598
trans-1,4-Dichloro-2-butene		<0.0672	<0.0672	<0.0672	<0.0672	<0.0672
Dichlorodifluoromethane		<0.107	<0.107	<0.107	<0.107	<0.107
1,1-Dichloroethane		<0.0886	<0.0886	<0.0886	<0.0886	<0.0886
1,2-Dichloroethane		<0.0791	<0.0791	<0.0791	<0.0791	<0.0791
1,1-Dichloroethene		<0.0806	<0.0806	<0.0806	<0.0806	<0.0806
trans-1,2-Dichloroethene		<0.131	<0.131	<0.131	<0.131	<0.131
1,2-Dichloropropane		<0.0742	<0.0742	<0.0742	<0.0742	<0.0742
cis-1,3-Dichloropropene		<0.0758	<0.0758	<0.0758	<0.0758	<0.0758
trans-1,3-Dichloropropene		<0.0829	<0.0829	<0.0829	<0.0829	<0.0829
Ethyl methacrylate		<0.127	<0.127	<0.127	<0.127	<0.127
Ethylbenzene		<0.110	<0.110	<0.110	<0.110	<0.110
2-Hexanone		<0.766	<0.766	<0.766	<0.766	<0.766

TABLE C-14 (CONTINUED)

Parameter	GWA-1-14-1[a]	GWC-1-14-1	GWC-2-14-1	GWC-3-14-1	GWC-4-14-1	GWC-5-14-1
Iodomethane		<0.0350	<0.0350	<0.0350	<0.0350	<0.0350
4-Methyl-2-pentanone (MIBK)		<0.501	<0.501	<0.501	<0.501	<0.501
Methylene chloride		0.200 [b,c]	<0.151 [b]	0.260 [b,c]	0.280 [b,c]	0.390 [b,c]
Styrene		<0.113	<0.113	<0.113	<0.113	<0.113
1,1,2,2-Tetrachloroethane		<0.170	<0.170	<0.170	<0.170	<0.170
Tetrachloroethene		<0.209	<0.209	<0.209	<0.209	<0.209
Toluene		0.060 [c]	<0.0336	0.110 [c]	0.050 [c]	<0.0336
1,1,1-Trichloroethane		<0.0992	<0.0992	<0.0992	<0.0992	<0.0992
1,1,2-Trichloroethane		<0.0920	<0.0920	<0.0920	<0.0920	<0.0920
Trichloroethene		<0.0429	<0.0429	<0.0429	<0.0429	<0.0429
Trichlorofluoromethane		<0.0943	<0.0943	<0.0943	<0.0943	<0.0943
1,2,3-Trichloropropane		<0.233	<0.233	<0.233	<0.233	<0.233
Vinyl acetate		<0.127	<0.127	<0.127	<0.127	<0.127
Vinyl chloride		<0.0992	<0.0992	<0.0992	<0.0992	<0.0992

[a] Well was dry; no samples collected.
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

NR = Not reported.

TABLE C-15
RESULTS OF GROUNDWATER MONITORING CONDUCTED
AUGUST 31, 1994 (THIRD QUARTER 1994)

Parameter	GWA-1-15-1 [a]	GWC-1-15-1	GWC-2-15-1	GWC-3-15-1	GWC-4-15-1	GWC-5-15-1
pH		6.09	5.63	5.41	5.10	5.53
Conductivity (μS/cm)		68	60	30	108	43
Temperature (°C)		18.0	18.4	19.0	18.1	18.4
Eh (mv)		365	350	305	440	372
Alkalinity (mg/L $CaCO_3$)		25	7	77 [d]	5	13
Total Dissolved Solids (mg/L)		64	60	39 [c]	93	61
Bromide (mg/L)		<0.0226	<0.0226	<0.0226	<0.0226	<0.0226
Chloride (mg/L)		2.71	3.92	2.91	20.8	2.67
Total Organic Carbon (mg/L)		<0.357	<0.357	<0.357	1.42 [c]	<0.357
Total Organic Halogens (μg/L)		<11.7	<11.7	<11.7	12.7 [c]	11.9 [c]
Fluoride (mg/L)		0.0596 [b]	0.0402 [b]	0.0424 [b]	0.0334 [b]	0.0284 [b]
Nitrate-Nitrite (mg/L as N)		0.459 [b]	0.810 [b]	0.366 [b]	1.80 [b]	0.167 [b]
Sulfate (mg/L)		1.64	6.73	<0.0471	4.83	6.68
Radium 226 and 228 (pCi/L)		0.12 ± 0.048 -0.56 ± 0.68	0.14 ± 0.052 -0.83 ± 0.72	0.10 ± 0.046 -0.091 ± 0.70	0.12 ± 0.055 0.92 ± 0.89	0.10 ± 0.046 0.23 ± 0.72
Gross Alpha (pCi/L)		0.64 ± 0.51	-0.13 ± 0.33	0.08 ± 0.30	0.14 ± 0.36	1.9 ± 0.7
Gross Beta (pCi/L)		1.8 ± 0.8	1.5 ±0.7	1.2 ± 0.7	0.67 ± 0.72	3.6 ± 0.9
Gross Gamma (pCi/L)						
Ac-227		NR	NR	NR	NR	NR
Ac-228		NR	NR	NR	NR	NR
Bi-212		<110	<90	<92	<100	<110
Bi-214		57 ± 32	52 ± 28	50 ± 34	77 ± 32	<37
Co-60		<10	<12	<16	<13	<15
Cs-134		<14	<11	<15	<12	<16
Cs-137		<13	<12	<13	<14	<13
K-40		<170	<120	<220	<210	<210
Pb-211		NR	NR	NR	NR	NR
Pb-212		<20	<15	<19	<21	<19
Pb-214		86 ± 27	57 ± 23	33 ± 27	68 ± 30	<33
Ra-223		<62	<54	<61	<67	<64
Ra-226		<290	<230	<280	<270	<290
Rn-219		<81	<63	<87	<83	<77
Th-227		<78	<61	<74	<77	<78
Th-228		<560	<840	<940	<1100	<940
Th-231		<100	<160	<170	<200	<180
Th-234		<390	<400	<480	<460	<430
Tl-208		<35	<38	<35	<47	<44
U-235		<9.9	<13	<16	<16	<18
U-238		NR	NR	NR	NR	NR
Silver (mg/L)		<0.00519	<0.00519	<0.00519	<0.00519	<0.00519
Aluminum (mg/L)		<0.0523	<0.0523	<0.0523	<0.0523	<0.0523
Arsenic (mg/L)		<0.00214	<0.00214	<0.00214	<0.00214	<0.00214
Boron (mg/L)		<0.0176	<0.0176	<0.0176	0.0361 [c]	<0.0176
Barium (mg/L)		0.00909	0.00952	0.00693	0.0178	0.00693
Beryllium (mg/L)		<0.00051	<0.00051	<0.00051	<0.00051	<0.00051
Bismuth (mg/L)		<0.0132	<0.0132	<0.0132	<0.0132	<0.0132
Calcium (mg/L)		5.00 [b]	2.11 [b]	0.328 [b]	2.73 [b]	1.26 [b]
Cadmium (mg/L)		0.00533 [c]	<0.00386	<0.00386	<0.00386	<0.00386
Cobalt (mg/L)		<0.00407	<0.00407	<0.00407	<0.00407	<0.00407
Copper (mg/L)		<0.00916	<0.00916	<0.00916	<0.00916	<0.00916

TABLE C-15 (CONTINUED)

Parameter	GWA-1-15-1 [a]	GWC-1-15-1	GWC-2-15-1	GWC-3-15-1	GWC-4-15-1	GWC-5-15-1
Chromium (mg/L)		<0.00524	0.0102 [c]	0.00653 [c]	<0.00524	0.00562 [c]
Mercury (mg/L)		<0.000033	<0.000033	<0.000033	<0.000033	<0.000033
Iron (mg/L)		0.0203 [c]	0.0125 [c]	<0.00452	0.0126 [c]	0.0419
Potassium (mg/L)		<0.822	<0.822	<0.822	<0.822	<0.822
Lithium (mg/L)		<0.00543	<0.00543	<0.00543	<0.00543	<0.00543
Magnesium (mg/L)		3.70	2.03	1.00	7.32	1.46
Manganese (mg/L)		<0.00155	0.0102	0.00289 [c]	0.194	0.00436 [c]
Molybdenum (mg/L)		<0.00739	<0.00739	<0.00739	<0.00739	<0.00739
Sodium (mg/L)		4.32	7.17	4.17	5.80	5.38
Nickel (mg/L)		<0.0141	0.0455 [c]	<0.0141	<0.0141	<0.0141
Phosphorus (mg/L)		<0.0610	<0.0610	<0.0610	<0.0610	<0.0610
Lead (mg/L)		<0.00205	<0.00205	0.0140	<0.00205	<0.00205
Sulfur (mg/L)		0.344 [c]	2.18	<0.175	1.38	2.29
Antimony (mg/L)		<0.00146	<0.00146	<0.00146	<0.00146	<0.00146
Selenium (mg/L)		<0.000592	0.00242 [c]	<0.000592	0.000930 [c]	0.000650 [c]
Silicon (mg/L)		11.8	12.9	9.15	9.91	10.5
Tin (mg/L)		<0.0145	0.0146 [c]	<0.0145	<0.0145	0.0146 [c]
Strontium (mg/L)		0.0157	0.0124	0.00286 c	0.0210	0.0114
Tellurium (mg/L)		<0.0317	<0.0317	0.0405 [c]	<0.0317	<0.0317
Titanium (mg/L)		<0.00159	<0.00159	0.00164 [c]	0.00188 [c]	<0.00159
Thallium (mg/L)		<0.00185	<0.00185	<0.00185	<0.00185	<0.00185
Uranium (mg/L)		<0.199	<0.199	<0.199	<0.199	<0.199
Vanadium (mg/L)		<0.00454	<0.00454	<0.00454	<0.00454	<0.00454
Tungsten (mg/L)		<0.0408	<0.0408	<0.0408	<0.0408	<0.0408
Zinc (mg/L)		0.0111 [c]	0.0137 [c]	0.00569 [c]	0.0134 [c]	0.0138 [c]

[a] Well was dry; no samples collected.
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.
[d] Result is questionable; concentration of reagent used in titration is unclear.

NR = Not reported.

TABLE C-16
RESULTS OF GROUNDWATER MONITORING CONDUCTED
DECEMBER 20-21, 1994 (FOURTH QUARTER 1994)

Parameter	GWA-1-16-1[a]	GWC-1-16-1	GWC-2-16-1	GWC-3-16-1	GWC-4-16-1	GWC-5-16-1
pH		6.09	5.34	5.06	4.92	5.57
Conductivity (µS/cm)		76	66	36	188	47
Temperature (°C)		15.8	16.6	17.4	18.0	16.9
Eh (mv)		305	267	309	280	53
Alkalinity (mg/L $CaCO_3$)		21.9	6.9	4.8	3.8	11.2
Total Dissolved Solids (mg/L)		46	65	30	110	45
Bromide (mg/L)		<0.00226	<0.0226	<0.0226	0.118	<0.0226
Chloride (mg/L)		2.68	4.00	3.02	39.7	2.7
Total Organic Carbon (mg/L)		<0.357	<0.357	<0.357	<0.357	<0.357
Total Organic Halogens (µg/L)		<11.7	<11.7	<11.7	<11.7	<11.7
Fluoride (mg/L)		0.0476 [b]	0.0340 [b]	0.0340 [b]	0.0300 [b]	0.0232 [b,c]
Nitrate-Nitrite (mg/L as N)		0.322	1.19	0.246	1.90	0.049
Sulfate (mg/L)		1.19	5.78	1.01	4.34	5.75
Silver (mg/L)		<0.00519	<0.00519	<0.00519	<0.00519	<0.00519
Aluminum (mg/L)		<0.0523	<0.0523	<0.0523	<0.0523	<0.0523
Arsenic (mg/L)		<0.00214	<0.00214	<0.00214	<0.00214	<0.00214
Boron (mg/L)		0.0298 [c]	0.0297 [c]	<0.0176	0.0527 [c]	0.030 [c]
Barium (mg/L)		0.00944	0.00944	0.00742	0.0283	0.00742
Beryllium (mg/L)		<0.00051	<0.00051	<0.00051	<0.00051	<0.00051
Bismuth (mg/L)		<0.0275	<0.0275	0.0336 [c]	<0.0275	0.0369 [b,c]
Calcium (mg/L)		4.50 [b]	1.89 [b]	0.335 [b]	4.04 [b]	1.20 [b]
Cadmium (mg/L)		<0.00386	<0.00386	<0.00386	<0.00386	<0.00386 [b]
Cobalt (mg/L)		<0.00407	<0.00407	<0.00407	<0.00407	<0.00407
Copper (mg/L)		<0.00916	<0.00916	<0.00916	<0.00916	<0.00916
Chromium (mg/L)		<0.00524	0.00654 [c]	<0.00524	<0.00524	<0.00524
Mercury (mg/L)		0.000040 [c]	<0.000033	<0.000033	0.00016 [c]	<0.000033
Iron (mg/L)		0.033 [b]	0.0122 [b,c]	0.0203 [b,c]	0.0661 [b]	0.0246
Potassium (mg/L)		<0.822	<0.822	<0.822	<0.822	<0.822
Lithium (mg/L)		0.011 [b,c]	0.0118 [b,c]	0.0103 [b,c]	0.0118 [b,c]	0.0108 [b,c]
Magnesium (mg/L)		3.33	1.87	1.02	11.0	1.32
Manganese (mg/L)		<0.00155	0.00696 [c]	<0.00155	0.282	0.00697 [c]
Molybdenum (mg/L)		<0.00739	<0.00739	<0.00739	<0.00739	<0.00739
Sodium (mg/L)		4.10	6.96	4.34	7.86	5.43
Nickel (mg/L)		<0.0141	0.0393 [c]	<0.0141	<0.0141	<0.0141
Phosphorus (mg/L)		<0.109	<0.109	<0.109	<0.109	<0.109
Lead (mg/L)		<0.0022	<0.0022	<0.0022	<0.0022	<0.0022
Sulfur (mg/L)		<0.175	1.65	<0.175	1.22	1.73
Antimony (mg/L)		<0.00146	0.00235 [c]	<0.00146	<0.00146	0.0035 [c]

TABLE C-16 (CONTINUED)

Parameter	GWA-1-16-1[a]	GWC-1-16-1	GWC-2-16-1	GWC-3-16-1	GWC-4-16-1	GWC-5-16-1
Selenium (mg/L)		<0.000592	0.0011 [c]	<0.000592	<0.000592	0.00070 [c]
Silicon (mg/L)		10.9	12.2	8.94	10.1	10.3 [b]
Tin (mg/L)		<0.0145	<0.0145	0.0162 [c]	0.0195 [c]	0.0162 [c]
Strontium (mg/L)		0.0146	0.0109	0.00202 [c]	0.0315	0.0097
Tellurium (mg/L)		<0.177	<0.177	<0.177	<0.177	<0.177 [b]
Titanium (mg/L)		<0.00159	<0.00159	<0.00159	<0.00159	<0.00159 [b]
Thallium (mg/L)		<0.000536	<0.000536	<0.000536	<0.000536	<0.000536
Uranium (mg/L)		<0.199	<0.199	<0.199	<0.199	<0.199
Vanadium (mg/L)		<0.00454	<0.00454	<0.00454	<0.00454	<0.00454
Tungsten (mg/L)		<0.0408	<0.0408	<0.0408	<0.0408	<0.0408
Zinc (mg/L)		0.0067 [b,c]	0.00662 [b,c]	<0.00402 [b]	0.00633 [b,c]	<0.00402

[a] Well was dry; no samples collected.
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.
[d] Result is questionable; concentration of reagent used in titration is unclear.

NR = Not reported.

TABLE C-17
RESULTS OF GROUNDWATER MONITORING CONDUCTED
MARCH 28-29, 1995 (FIRST QUARTER 1995)

Parameter	GWA-1-17-1 [a]	GWC-1-17-1	GWC-2-17-1	GWC-3-17-1	GWC-4-17-1	GWC-5-17-1
pH		6.05	5.53	5.10	5.10	5.52
Conductivity (µS/cm)		77	65	36	163	50
Temperature (°C)		16.8	17.8	17.7	17.0	17.9
Eh (mv)		200	195	180	210	235
Alkalinity (mg/L $CaCO_3$)		29.1	13.3	8.6	9.0	9.5
Total Dissolved Solids (mg/L)		63	63	44	113	50
Bromide (mg/L)		1.13	3.18	1.31	6.80	0.322
Chloride (mg/L)		2.64	3.81	3.15	34.1	2.54
Total Organic Carbon (mg/L)		<0.137	<0.137	<0.137	<0.137	<0.137
Total Organic Halogens (g/L)		<11.7	<11.7	12.3 [c]	17.2 [c]	<11.7
Fluoride (mg/L)		*0.0413* [b]	*0.0273* [b]	*0.0296* [b]	*0.0231* [b]	*0.0191* [b, c]
Nitrate-Nitrite (mg/L as N)		0.254	0.693	0.289	1.58	0.0725
Sulfate (mg/L)		1.23	4.98	0.0471	4.18	6.45
Radium 226 and 228 (pCi/L)		0.296 ± 1.21 0.003 ± 1.63	0.056 ± 0.738 0.210 ± 0.541	0.440 ± 0.731 0.550 ± 0.862	0.800 ± 0.339 -0.393 ± 1.52	-0.632 ± 0.944 0.696 ± 1.49
Gross Alpha (pCi/L)		0.87 ± 0.50	-0.27 ± 0.27	-0.12 ± 0.23	-0.06 ± 0.51	0.39 ± 0.35
Gross Beta (pCi/L)		1.11 ± 0.48	0.21 ± 0.42	0.64 ± 0.43	0.97 ± 0.49	0.24 ± 0.42
Gross Gamma (pCi/L)						
Ac-228		-0.620 ± 18.7	13.2 ± 9.03	-3.474 ± 21.8	-2.693 ± 10.9	6.30 ± 6.98
Bi-214		-2.915 ± 12.0	-16.151 ± 15.4	-15.165 ± 15.4	-8.412 ± 7.75	-8.606 ± 12.2
K-40		74.8 ± 72.6	40.4 ± 101	56.2 ± 93.1	22.2 ± 41.2	6.69 ± 72.8
Pb-214		-2.536 ± 9.98	-12.851 ± 14.3	-7.159 ± 11.0	-11.272 ± 6.63	-19.227 ± 10.9
Silver (mg/L)		<0.00519	<0.00519	<0.00519	<0.00519	<0.00519
Aluminum (mg/L)		0.0560 [c]	0.0538 [c]	0.0657 [c]	<0.0523	0.0532 [c]
Arsenic (mg/L)		<0.00102	<0.00102	<0.00102	<0.00102	<0.00102
Boron (mg/L)		<0.0176	<0.0176	<0.0176	0.0856 [c]	0.0234 [c]
Barium (mg/L)		0.0109 [b]	0.0116 [b]	0.00784 [b]	0.0273 [b]	0.00784 [b]
Beryllium (mg/L)		<0.000510	<0.000510	<0.000510	<0.000510	<0.000510
Bismuth (mg/L)		<0.00504	<0.00504	<0.00504	<0.00504	<0.00504
Calcium (mg/L)		5.30 [b]	2.23 [b]	0.441 [b]	3.21 [b]	1.51 [b]
Cadmium (mg/L)		<0.00386	<0.00386	<0.00386	<0.00386	<0.00386
Cobalt (mg/L)		<0.00407	<0.00407	<0.00407	<0.00407	<0.00407
Copper (mg/L)		<0.00916	<0.00916	<0.00916	<0.00916	<0.00916
Chromium (mg/L)		0.00582 [c]	0.0130 [c]	0.00715 [c]	<0.00524	<0.00524
Mercury (mg/L)		<0.000028	<0.000028	<0.000028	<0.000028	<0.000028
Iron (mg/L)		0.195 [b]	0.155 [b]	0.0925 [b]	0.0937 [b]	0.0767 [b]
Potassium (mg/L)		0.919 [c]	<0.822	<0.822	<0.822	<0.822
Lithium (mg/L)		<0.00543	<0.00543	<0.00543	<0.00543	<0.00543
Magnesium (mg/L)		3.65	1.88	1.10	10.2	1.59

TABLE C-17 (CONTINUED)

Parameter	GWA-1-17-1 [a]	GWC-1-17-1	GWC-2-17-1	GWC-3-17-1	GWC-4-17-1	GWC-5-17-1
Manganese (mg/L)		<0.00155	0.0132	0.00242 [c]	0.129	0.00360 [c]
Molybdenum (mg/L)		0.00755 [b, c]	<0.00739 [b]	<0.00739 [b]	<0.00739 [b]	<0.00739 [b]
Sodium (mg/L)		4.21	6.79	4.39	7.63	5.34
Nickel (mg/L)		0.0886	0.0467 [c]	<0.0141	<0.0141	0.0162 [c]
Phosphorus (mg/L)		<0.109	<0.109	<0.109	0.524 [c]	<0.109
Lead (mg/L)		<0.000966	<0.000966	<0.000966	<0.000966	<0.000966
Sulfur (mg/L)		0.357 [c]	1.79	<0.175	1.31	2.50
Antimony (mg/L)		0.00240 [c]	0.00494 [c]	0.00121 [c]	0.00116 [c]	<0.00104
Selenium (mg/L)		<0.00124	<0.00124	<0.00124	<0.00124	<0.00124
Silicon (mg/L)		10.9 [b]	12.2 [b]	8.97 [b]	9.36 [b]	10.3 [b]
Tin (mg/L)		<0.0145 [b]	<0.0145 [b]	<0.0145 [b]	<0.0145	0.0512 [b, c]
Strontium (mg/L)		0.0148	0.00922	0.00320 [c]	0.0261	0.00882
Tellurium (mg/L)		<0.00449	<0.00449	<0.00449	<0.00449	<0.00449
Titanium (mg/L)		0.00339 [c]	0.00165 [c]	0.00218 [c]	<0.00159	<0.00159
Thallium (mg/L)		<0.00119	<0.00119	<0.00119	<0.00119	<0.00119
Uranium (mg/L)		<0.199	<0.199	<0.199	<0.199	<0.199
Vanadium (mg/L)		<0.00454	<0.00454	<0.00454	<0.00454	<0.00454
Tungsten (mg/L)		<0.0408	<0.0408	<0.0408	<0.0408	<0.0408
Zinc (mg/L)		<0.00402	<0.00402	<0.00402	<0.00402	<0.00402

[a] Well was dry; no samples collected.
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

NR = Not reported.

TABLE C-18
RESULTS OF GROUNDWATER MONITORING CONDUCTED
JUNE 13-14, 1995 (SECOND QUARTER 1995)

Parameter	GWA-1-18-1	GWC-1-18-1	GWC-2-18-1	GWC-3-18-1	GWC-4-18-1	GWC-5-18-1
pH	6.31	5.70	5.39	5.10	4.98	5.60
Conductivity (μS/cm)	116	66	65	37	148	52
Temperature (°C)	19.2	16.7	17.6	17.8	21.0	17.4
Eh (mv)	176	212	139	105	213	96
Alkalinity (mg/L $CaCO_3$)	28.6	31.0	14.5	8.5	4.6	8.5
Total Dissolved Solids (mg/L)	108	72	64	52	132	64
Bromide (mg/L)	<0.0226	<0.0226	<0.0226	<0.0226	<0.0226	<0.0226
Chloride (mg/L)	2.10	2.76	3.97	3.13	39.1	2.62
Total Organic Carbon (mg/L)	<0.137	0.759	<0.137	0.334 [c]	<0.137	0.137
Fluoride (mg/L)	0.0900 [b]	0.0461 [b]	0.0289 [b]	0.318 [b]	0.0268 [b]	0.0216 [b]
Nitrate-Nitrite (mg/L as N)	0.437	0.308	0.795	0.311	1.79	0.0543
Sulfate (mg/L)	18.3	1.10	4.33	0.968	3.91	6.64
Silver (mg/L)	<0.00519	<0.00519	<0.00519	<0.00519	<0.00519	<0.00519
Aluminum (mg/L)	<0.0523	0.106	<0.0523	<0.0523	<0.0523	0.0949 [c]
Arsenic (mg/L)	<0.00201	<0.00201	<0.00201	<0.00201	<0.00201	<0.00201
Boron (mg/L)	0.0327 [c]	<0.0176	<0.0176	0.0392 [c]	0.214	<0.0176
Barium (mg/L)	0.0263 [b]	0.0094 [b]	0.0094 [b]	0.00725 [b]	0.0296 [b]	0.00698 [b]
Beryllium (mg/L)	0.00052 [c]	<0.00051	<0.00051	<0.00051	<0.00051	<0.00051
Bismuth (mg/L)	<0.00504	<0.00504	<0.00504	<0.00504	<0.00504	<0.00504
Calcium (mg/L)	6.98 [b]	5.12 [b]	2.08 [b]	0.314 [b]	3.89 [b]	1.31 [b]
Cadmium (mg/L)	<0.00386	<0.00386	<0.00386	<0.00386	<0.00386	<0.00386
Cobalt (mg/L)	<0.00407	0.0083 [c]	<0.00407	<0.00407	<0.00407	<0.00407
Copper (mg/L)	<0.00916	<0.00916	<0.00916	<0.00916	<0.00916	<0.00916
Chromium (mg/L)	<0.00524	<0.00524	<0.00524	<0.00524	<0.00524	<0.00524
Mercury (mg/L)	<0.000028	<0.000028	<0.000028	<0.000028	<0.000028	<0.000028
Iron (mg/L)	0.0200 [b,c]	0.145 [b]	0.00697 [b,c]	0.00944 [b,c]	0.0398 [b]	0.127 [b]
Potassium (mg/L)	1.81 [c]	0.952 [c]	<0.822	<0.822	<0.822	<0.822
Lithium (mg/L)	<0.00543	<0.00543	<0.00543	<0.00543	<0.00543	<0.00543
Magnesium (mg/L)	5.47	3.83	1.92	1.08	12.5	1.73
Manganese (mg/L)	0.00403 [b,c]	0.00203 [b,c]	0.00813 [b]	0.0061 [b,c]	0.190 [b]	<0.00155 [b]
Molybdenum (mg/L)	<0.00739	<0.00739	<0.00739	<0.00739	0.00857 [c]	<0.00739
Sodium (mg/L)	4.29	4.15	6.85	4.47	8.61	5.54
Nickel (mg/L)	0.0165 [c]	<0.0141	0.0165 [c]	<0.0141	<0.0141	<0.0141
Phosphorus (mg/L)	0.222 [c]	<0.109	<0.109	<0.109	0.331 [c]	<0.109
Lead (mg/L)	<0.00069	<0.00069	0.00097 [c]	<0.00069	<0.00069	<0.00069
Sulfur (mg/L)	6.61	0.385 [c]	1.41	<0.175	1.28	2.69
Antimony (mg/L)	<0.00104	<0.00104	<0.00104	<0.00104	<0.00104	<0.00104
Selenium (mg/L)	<0.00186	<0.00186	<0.00186	<0.00186	<0.00186	0.00307 [b,c]

TABLE C-18 (CONTINUED)

Parameter	GWA-1-18-1	GWC-1-18-1	GWC-2-18-1	GWC-3-18-1	GWC-4-18-1	GWC-5-18-1
Silicon (mg/L)	16.6[b]	11.8[b]	13.4[b]	8.90[b]	10.0[b]	11.1[b]
Tin (mg/L)	0.0524[c]	0.0524[c]	0.0150[c]	<0.0145	<0.0145	0.0449[b,c]
Strontium (mg/L)	0.0209	0.0152	0.0114	0.0038[c]	0.0352	0.0117
Tellurium (mg/L)	<0.00449	<0.00449	<0.00449	<0.00449	<0.00449	<0.00449
Titanium (mg/L)	0.00184[b,c]	0.00165[b,c]	<0.00159[b]	<0.00159[b]	<0.00159	0.00182[b,c]
Thallium (mg/L)	<0.00116	<0.00116	<0.00116	<0.00116	<0.00116	<0.00116
Uranium (mg/L)	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199
Vanadium (mg/L)	<0.00454	<0.00454	<0.00454	<0.00454	<0.00454	<0.00454
Tungsten (mg/L)	<0.0408	<0.0408	<0.0408	<0.0408	<0.0408	<0.0408
Zinc (mg/L)	<0.00402	<0.00402	<0.00402	<0.00402	<0.00402	<0.00402
TOX (µg/L)	<11.7	15.5[c]	<11.7	<11.7	24.1[c]	<11.7
VOCs (µg/L)						
Acetone	5.57[c]	4.24[c]	<2.30	<2.30	<2.30	<2.30
Acrolein	<0.662	<0.662	<0.662	<0.662	<0.662	<0.662
Acrylonitrile	<0.132	<0.132	<0.132	<0.132	<0.132	<0.132
Benzene	<0.122	<0.122	<0.122	<0.122	<0.122	<0.122
Bromodichloromethane	<0.0462	<0.0462	<0.0462	<0.0462	<0.0462	<0.0462
Bromoform	<0.136	<0.136	<0.136	<0.136	<0.136	<0.136
Bromomethane	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
2-Butanone (MEK)	<1.29	<1.29	<1.29	<1.29	<1.29	<1.29
Carbon disulfide	<0.190	<0.190	<0.190	<0.190	<0.190	<0.190
Carbon tetrachloride	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131
Chlorobenzene	<0.205	<0.205	<0.205	<0.205	<0.205	<0.205
Chloroethane	<0.0898	<0.0898	<0.0898	<0.0898	<0.0898	<0.0898
2-Chloroethyl vinyl ether	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131
Chloroform	<0.0985	<0.0985	<0.0985	<0.0985	<0.0985	<0.0985
Chloromethane	<0.0893	<0.0893	<0.0893	<0.0893	<0.0893	<0.0893
Dibromochloromethane	<0.0870	<0.0870	<0.0870	<0.0870	<0.0870	<0.0870
Dibromomethane	<0.107	0.217[b,c]	0.209[b,c]	0.225[b,c]	0.252[b,c]	0.222[b,c]
trans-1,4-Dichloro-2-butene	<0.359	<0.359	<0.359	<0.359	<0.359	<0.359
Dichlorodifluoromethane	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131
1,1-Dichloroethane	<0.0646	<0.0646	<0.0646	<0.0646	<0.0646	<0.0646
1,2-Dichloroethane	0.314	0.199	<0.0481	<0.0481	<0.0481	<0.0481
1,1-Dichloroethene	<0.212	<0.212	<0.212	<0.212	<0.212	<0.212
trans-1,2-Dichloroethene	<0.212	<0.212	<0.212	<0.212	<0.212	<0.212
1,2-Dichloropropane	<0.0440	<0.0440	<0.0440	<0.0440	<0.0440	<0.0440
cis-1,3-Dichloropropene	<0.116	<0.116	<0.116	<0.116	<0.116	<0.116
trans-1,3-Dichloropropene	<0.0724	<0.0724	<0.0724	<0.0724	<0.0724	<0.0724
Ethyl methacrylate	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Ethylbenzene	<0.246	<0.246	<0.246	<0.246	<0.246	<0.246
2-Hexanone	<0.347	<0.347	<0.347	<0.347	<0.347	<0.347

TABLE C-18 (CONTINUED)

Parameter	GWA-1-18-1	GWC-1-18-1	GWC-2-18-1	GWC-3-18-1	GWC-4-18-1	GWC-5-18-1
Iodomethane	<0.0896	<0.0896	<0.0896	<0.0896	<0.0896	<0.0896
4-Methyl-2-pentanone (MIBK)	<0.316	<0.316	<0.316	<0.316	<0.316	<0.316
Methylene chloride	<0.423 [b]	<0.423 [b]	<0.423 [b]	<0.423 [b]	<0.423 [b]	<0.423 [b]
Styrene	<0.184	0.639[c]	<0.184	<0.184	<0.184	<0.184
1,1,2,2-Tetrachloroethane	<0.0708	<0.0708	<0.0708	<0.0708	<0.0708	<0.0708
Tetrachloroethene	<0.420	<0.420	<0.420	<0.420	<0.420	<0.420
Toluene	<0.163	0.197[c]	<0.163	<0.163	<0.163	<0.163
1,1,1-Trichloroethane	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120
1,1,2-Trichloroethane	<0.0678	<0.0678	<0.0678	<0.0678	<0.0678	<0.0678
Trichloroethene	<0.197	<0.197	<0.197	<0.197	<0.197	<0.197
Trichlorofluoromethane	<0.0999	<0.0999	<0.0999	<0.0999	<0.0999	<0.0999
1,2,3-Trichloropropane	<0.0902	<0.0902	<0.0902	<0.0902	<0.0902	<0.0902
Vinyl acetate	<0.381	<0.381	<0.381	<0.381	<0.381	<0.381
Vinyl chloride	<0.0697	<0.0697	<0.0697	<0.0697	<0.0697	<0.0697
m & p-Xylene	<0.554	<0.554	<0.554	<0.554	<0.554	<0.554
o-Xylene	<0.207	<0.207	<0.207	<0.207	<0.207	<0.207

[a] Well was dry; no samples collected.

[b] Detected in the method blank.

[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

TABLE C-19
RESULTS OF GROUNDWATER MONITORING CONDUCTED
SEPTEMBER 11-12, 1995 (THIRD QUARTER 1995)

Parameter	GWA-1-19-1	GWC-1-19-1	GWC-2-19-1	GWC-3-19-1	GWC-4-19-1	GWC-5-19-1
pH	6.38	6.00	5.41	5.02	4.79	5.20
Conductivity (µS/cm)	165	79	67.5	45	180	60
Temperature (°C)	20.2	18.0	18.8	18.2	18.7	18.4
Eh (mv)	231	127	141	156	219	148
Alkalinity (mg/L $CaCO_3$)	23	31	13.5	9.0	4.5	11.0
Total Dissolved Solids (mg/L)	114	58	54	37	123	64
Bromide (mg/L)	<0.0181	<0.0181	<0.0181	<0.0181	<0.0181	<0.0181
Chloride (mg/L)	2.27	2.77	3.83	3.64	37.5	2.70
Total Organic Carbon (mg/L)	<0.117	<0.117	0.571 [c]	<0.117	1.86	<0.117
Fluoride (mg/L)	0.0904 [b]	0.0582 [b]	0.0402 [b]	0.0370 [b]	0.0325 [b]	0.0304 [b]
Nitrate-Nitrite (mg/L as N)	0.0999	0.287	0.888	0.298	1.74	0.0298
Sulfate (mg/L)	24.4	1.06	3.90	0.595	3.03	6.80
Radium-226 and -228 (pCi/L)	NA	0.310 ± 1.33	0.120 ± 0.770	0.230 ± 0.890	0.190 ± 0.840	-0.530 ± 0.892
	NA	-0.490 ± 1.68	-0.680 ± 1.67	-0.230 ± 1.39	-0.430 ± 1.59	-0.980 ± 1.70
Gross Alpha (pCi/L)	NA	0.71 ± 0.25	<0.44	<0.37	<0.67	0.53 ± 0.20
Gross Beta (pCi/L)	NA	<1.4	<1.4	<1.3	<1.6	1.47 ± 0.49
Gross Gamma (pCi/L)						
Ac-228	NA	18.3 ± 8.35	14.7 ± 9.34	7.36 ± 7.36	16.1 ± 7.71	5.14 ± 9.33
Bi-214	NA	5.06 ± 13.2	-6.50 ± 17.0	12.2 ± 13.7	-1.93 ± 13.5	-3.19 ± 17.1
K-40	NA	10.9 ± 94.6	-90.4 ± 108	-128 ± 85.3	-67.3 ± 84.5	0.000 ± 108
Pb-214	NA	4.31 ± 12.1	-8.63 ± 14.8	26.8 ± 4.96	9.62 ± 4.23	-7.13 ± 14.8
Silver (mg/L)	<0.00519	<0.00519	<0.00519	<0.00519	<0.00519	<0.00519
Aluminum (mg/L)	<0.0523	<0.0523	<0.0523	0.0716 [c]	<0.0523	<0.0523
Arsenic (mg/L)	<0.00102	<0.00102 [b]	<0.00102 [b]	<0.00102 [b]	<0.00102 [b]	<0.00102 [b]
Boron (mg/L)	<0.0176	<0.0176	<0.0176	<0.0176	0.234	<0.0176
Barium (mg/L)	0.0289	0.0111	0.00888	0.00933	0.0262	0.00799
Beryllium (mg/L)	<0.00051	<0.00051	<0.00051	<0.00051	<0.00051	<0.00051
Bismuth (mg/L)	<0.00504	<0.00504	<0.00504	<0.00504	<0.00504	<0.00504
Calcium (mg/L)	8.47	5.12	2.16	0.389	3.03	1.48
Cadmium (mg/L)	<0.00386	<0.00386	<0.00386	<0.00386	<0.00386	<0.00386
Cobalt (mg/L)	0.0101 [b,c]	0.0101 [b,c]	0.00757 [b,c]	0.00756 [b,c]	0.0126 [b,c]	0.0108 [b,c]
Copper (mg/L)	<0.00916	<0.00916	<0.00916	<0.00916	<0.00916	<0.00916
Chromium (mg/L)	0.0180 [c]	<0.00524	<0.00524	<0.00524	0.0113 [c]	0.0108 [c]
Mercury (mg/L)	<0.000028	<0.000028	<0.000028	<0.000028	<0.000028	<0.000028
Iron (mg/L)	<0.00452 [b]	0.0410 [b]	0.0336 [b]	0.0772 [b]	0.0217 [b]	0.0681 [b]
Potassium (mg/L)	1.65 [c]	<0.822	<0.822	<0.822	<0.822	<0.822
Lithium (mg/L)	<0.00543	<0.00543	<0.00543	<0.00543	<0.00543	<0.00543
Magnesium (mg/L)	6.30	3.80	1.88	1.21	10.0	1.78
Manganese (mg/L)	<0.00155	<0.00155	<0.00155	0.00296 [b,c]	0.124 [b]	0.00884 [b]
Molybdenum (mg/L)	<0.00739	<0.00739	<0.00739	<0.00739	<0.00739	<0.00739
Sodium (mg/L)	4.53	4.28	6.94	4.83	8.42	6.12
Nickel (mg/L)	<0.0141	<0.0141	0.0190 [c]	<0.0141	<0.0141	<0.0141
Phosphorus (mg/L)	<0.109	<0.109	<0.109	<0.109	0.462	<0.109
Lead (mg/L)	<0.00120	<0.00120	<0.00120	<0.00120	<0.00120	<0.00120
Sulfur (mg/L)	8.57	<0.175	1.03	<0.175	0.826	2.48

TABLE C-19 (CONTINUED)

Parameter	GWA-1-19-1	GWC-1-19-1	GWC-2-19-1	GWC-3-19-1	GWC-4-19-1	GWC-5-19-1
Antimony (mg/L)	0.00167 [b,c]	0.00196 [b,c]	0.00183 [b,c]	0.00151 [b,c]	0.00194 [b,c]	0.00156 [b,c]
Selenium (mg/L)	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124
Silicon (mg/L)	17.6	12.3	13.5	9.94	10.4	11.5
Tin (mg/L)	<0.0145	<0.0145	<0.0145	<0.0145	<0.0145	<0.0145
Strontium (mg/L)	0.0242	0.0171	0.0128	0.00617	0.0290	0.0147
Tellurium (mg/L)	<0.00449	<0.00449	<0.00449	<0.00449	<0.00449	<0.00449
Titanium (mg/L)	<0.00159	0.00455 [c]	0.00264 [c]	0.00892	<0.00159	<0.00159
Thallium (mg/L)	<0.00119	<0.00119	<0.00119	<0.00119	<0.00119	<0.00119
Uranium (mg/L)	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199
Vanadium (mg/L)	<0.00454	<0.00454	<0.00454	<0.00454	<0.00454	<0.00454
Tungsten (mg/L)	0.0524 [c]	<0.0408	<0.0408	<0.0408	<0.0408	<0.0408
Zinc (mg/L)	<0.00402	<0.00402	<0.00402	<0.00402	<0.00402	<0.00402
TOX (µg/L)	42.3 [c]	14.6 [c]	12.2 [c]	17.9 [c]	25.0 [c]	20.6 [c]

[a] Well was dry; no samples collected.
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

NA = Not analyzed; insufficient sample was obtained.

TABLE C-20

RESULTS OF GROUNDWATER MONITORING CONDUCTED DECEMBER 12-13, 1995

(FOURTH QUARTER 1995)

Parameter	GWA-1-20-1	GWC-1-20-1	GWC-2-20-1	GWC-3-20-1[A]	GWC-4-20-1	GWC-5-20-1
pH	6.08	5.92	5.45	5.27	4.89	5.28
Conductivity (µS/cm)	118	82	67	39	196	53
Temperature (C)	16.4	16.7	17.6	17.5	18.6	17.4
Eh (mV)	176	211	223	222	325	235
Alkalinity (mg/L $CaCO_3$)	NM	31.2	13.0	9.1	4.2	9.1
Total Dissolved Solids (mg/L)	93	49	53	36	107	45
Bromide (mg/L)	<0.0181	<0.0181	<0.0181	<0.0181	<0.0181	<0.0181
Chloride (mg/L)	1.94	2.45	3.91	3.52	40.5	2.93
Total Organic Carbon (mg/L)	NM	<0.117	<0.117	<0.117	<0.117	<0.117
Fluoride (mg/L)	0.0672[b]	0.0412[b]	0.0274[b]	0.0307[b]	0.0247[b]	0.0196[b,c]
Nitrate-Nitrite (mg/L as N)	NM	1.39	0.941	0.328	0.313	0.0648
Sulfate (mg/L)	30.8	<0.0491	3.68	0.233[c]	3.21	7.20
Silver (mg/L)	<0.00600	<0.00600	<0.00600	<0.00600	<0.00600	<0.00600
Aluminum (mg/L)	<0.0270	<0.0270	<0.0270	0.0348[c]	0.0988[c]	1.44
Arsenic (mg/L)	0.00102[c]	0.00134[c]	0.00128[c]	0.00120[c]	0.00200[c]	0.00167[c]
Boron (mg/L)	0.0334[c]	0.0332[c]	0.0463[c]	0.0330[c]	0.225	0.0338[c]
Barium (mg/L)	0.0303	0.00973	0.00901	0.00973	0.0303	0.0274
Beryllium (mg/L)	<0.00180	<0.00180	<0.00180	<0.00180	<0.00180	<0.00180
Bismuth (mg/L)	<0.00504	<0.00504	<0.00504	<0.00504	<0.00504	<0.00504
Calcium (mg/L)	9.21	5.86	2.41	0.436	3.99	1.97
Cadmium	<0.00262	<0.00262	<0.00262	<0.00262	<0.00262	<0.00262
Cobalt (mg/L)	<0.00987	<0.00987	<0.00987	0.0103[c]	<0.00987	<0.00987
Copper (mg/L)	<0.00302	<0.00302	0.00512[c]	<0.00302	<0.00302	<0.00302
Chromium (mg/L)	0.0233[c]	<0.00558	<0.00558	<0.00558	<0.00558	0.0106[c]
Mercury (mg/L)	<0.000039	<0.000039	<0.000039	<0.000039	<0.000039	<0.000039
Iron (mg/L)	0.0556[c]	0.0600[c]	0.0372[c]	0.0511[c]	0.139	1.55
Potassium (mg/L)	1.93[c]	<0.883	<0.883	<0.883	<0.883	1.23[c]
Lithium (mg/L)	<0.00297	<0.00297	<0.00297	<0.00297	<0.00297	<0.00297
Magnesium (mg/L)	6.51	4.23	1.96	1.26	12.6	6.02
Manganese (mg/L)	<0.00365	<0.00365	<0.00365	<0.00365	<0.00365	<0.00365
Molybdenum (mg/L)	<0.0192	<0.0192	<0.0192	<0.0192	<0.0192	<0.0192
Sodium (mg/L)	3.50	4.44	7.11	5.14	8.00	5.82
Nickel (mg/L)	0.0286[c]	<0.0218	0.0286[c]	<0.0218	<0.0218	0.0286[c]
Phosphorus (mg/L)	<0.141	<0.141	<0.141	<0.141	0.408[c]	<0.141
Lead (mg/L)	<0.00126	<0.00126	<0.00126	<0.00126	<0.00126	<0.00126
Sulfur (mg/L)	11.1	0.218[c]	1.53	0.125	1.12	2.77
Antimony (mg/L)	0.00247[b,c]	0.00128[b,c]	0.00147[b,c]	<0.000919[b]	0.00124[b,c]	<0.000919[b]
Selenium (mg/L)	<0.000821	<0.000821	0.00166[c]	0.000840[c]	0.00120[c]	0.00121[c]

TABLE C-20 (CONTINUED)

Parameter	GWA-1-20-1	GWC-1-20-1	GWC-2-20-1	GWC-3-20-1[A]	GWC-4-20-1	GWC-5-20-1
Silicon (mg/L)	13.2	10.0	12.9	5.18	11.4	16.2
Tin (mg/L)	<0.0350	<0.0350	<0.0350	<0.0350	<0.0350	<0.0350
Strontium (mg/L)	0.0242	0.0156	0.0115[c]	0.00369[c]	0.0332	0.0160
Tellurium (mg/L)	<0.00449	<0.00449	<0.00449	<0.00449	<0.00449	<0.00449
Titanium (mg/L)	0.00289[b,c]	0.00711,[bc]	0.00219[b,c]	0.00265[b,c]	0.0115[b]	0.0160[b]
Thallium (mg/L)	<0.00232	<0.00232	<0.00232	<0.00232	<0.00232	<0.00232
Uranium (mg/L)	<0.0676	<0.0676	<0.0676	<0.0676	<0.0676	<0.0676
Vanadium (mg/L)	<0.00679	<0.00679	<0.00679	<0.00679	<0.00679	<0.00679
Tungsten (mg/L)	<0.0759	<0.0759	<0.0759	<0.0759	<0.0759	<0.0759
Zinc (mg/L)	0.0131[b,c]	0.00664[b,c]	<0.00362[b]	0.0160[b,c]	0.0130[b,c]	0.0184[b]
TOX (µg/L)	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7

[a] A duplicate sample (GWC-3-20-2) was collected from this well.
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

NM = Not measured due to insufficient sample.

TABLE C-21
RESULTS OF GROUNDWATER MONITORING CONDUCTED
MARCH 18-19, 1996 (1ST QUARTER 1996)

Parameter	GWA-1-21-1	GWC-1-21-1	GWC-2-21-1	GWC-3-21-1[a]	GWC-4-21-1	GWC-5-21-1
pH	NM	6.04	5.79	5.25	4.98	5.54
Conductivity (µS/cm)	NM	86	66	42	288	67
Temperature (°C)	NM	15.7	16.5	17.9	16.5	17.5
Eh (mV)	NM	153	167	177	189	196
Alkalinity (mg/L $CaCO_3$)	NM	24.2	NM	7.4	5.6	4.7
Total Dissolved Solids (mg/L)	113	71.0	69.0	49.0	175	72.0
Bromide (mg/L)	<0.0181	<0.0181	<0.0181	<0.0181	0.616	<0.0181
Chloride (mg/L)	2.26	2.20	3.79	3.46	66.0	2.78
Total Organic Carbon (mg/L)	NM	<0.117 [b]	1.12 [b]	0.176 [b,c]	0.118 [b,c]	<0.117 [b]
Total Organic Halogens (g/L)	NM	<20.9	<20.9	<20.9	<20.9	<20.9
Fluoride (mg/L)	0.0767 [b]	0.0517 [b]	0.0339 [b]	0.0365 [b]	0.0368 [b]	0.0311 [b]
Nitrate-Nitrite (mg/L as N)	NM	0.226 [b]	0.922 [b]	0.259 [b]	16.7 [b]	0.126 [b]
Sulfate (mg/L)	32.7	1.06	4.11	<0.0491	4.18	13.3
Radium 226 (pCi/L)	NM	1.23 ± 0.409	1.00 ± 0.354	0.840 ± 0.409	-0.290 ± 0.701	-0.180 ± 0.690
Radium 228 (pCi/L)	NM	0.470 ± 0.572	0.680 ± 0.495	0.780 ± 0.526	0.240 ±1.40	-0.320 ± 1.40
Gross Alpha (pCi/L)	NM	<0.63	<0.59	<0.46	<0.73	<0.53
Gross Beta (pCi/L)	NM	<1.4	<1.4	<1.3	<1.5	<1.4
Gamma Scan (pCi/L)						
Ac-228	NM	3.64 ± 25.2	2.13 ± 14.8	-6.56 ± 21.8	0.294 ± 24.4	-0.770 ± 20.5
Bi-214	NM	38.4 ± 15.9	16.0 ± 13.9	11.8 ± 12.9	14.4 ± 5.36	12.0 ± 12.6
Pb-214	NM	54.0 ± 7.37	12.9 ± 11.6	9.66 ± 10.1	13.0 ± 4.32	16.7 ± 10.2
K-40	NM	39.1 ± 100	-44.3 ± 80.6	-71.1 ± 85.1	-67.9 ± 99.1	21.0 ± 70.3
Silver (mg/L)	0.000700 [c]	<0.000501	<0.000501	<0.000501	<0.000501	<0.000501
Aluminum (mg/L)	0.0402 [b,c]	0.0574 [b,c]	0.0510 [b,c]	0.0228 [b,c]	0.160 [b]	0.105 [b]
Arsenic (mg/L)	<0.00392	<0.00392	<0.00392	<0.00392	<0.00392	<0.00392
Boron (mg/L)	<0.0479	<0.0479	<0.0479	<0.0479	0.608	<0.0479
Barium (mg/L)	0.0469 [b]	0.0134 [b]	0.0117 [b]	0.0102 [b]	0.0448 [b]	0.0495 [b]
Beryllium (mg/L)	0.00150 [b]	0.00026 [b,c]	0.00020 [b,c]	<0.000162 [b]	0.00379 [b]	0.00048 [b,c]
Bismuth (mg/L)	0.00320 [c]	<0.00271	<0.00271	<0.00271	<0.00271	<0.00271
Calcium (mg/L)	10.4	5.91	2.37	0.361	7.10	2.28
Cadmium (mg/L)	0.000200 [c]	<0.000156	<0.000156	<0.000156	<0.000156	<0.000156
Cobalt (mg/L)	0.00180 [c]	<0.000580	<0.000580	<0.000580	0.00585	<0.000580
Copper (mg/L)	0.00400 [b,c]	<0.00136 [b]	<0.00136 [b]	<0.00136 [b]	<0.00136 [b]	0.00226 [b,c]
Chromium (mg/L)	0.0186	0.000630 [c]	0.00274	0.00188	0.00155 [c]	0.00587
Mercury (mg/L)	<0.000039	<0.000039	<0.000039	<0.000039	<0.000039	<0.000039
Iron (mg/L)	0.0560 [b,c]	0.0510 [b,c]	0.0501 [b,c]	0.0150 [b,c]	0.158 [b]	0.261 [b]
Potassium (mg/L)	2.72	0.730	0.372	0.128	0.659	0.361
Lithium (mg/L)	NM	NM	NM	NM	NM	NM
Magnesium (mg/L)	6.87	4.11	1.92	1.11	19.1	2.65
Manganese (mg/L)	0.00650	0.00121 [c]	0.00181 [c]	0.00274	0.0371	0.00745
Molybdenum (mg/L)	0.00270 [c]	<0.000705	<0.000705	<0.000705	0.00358	<0.000705
Sodium (mg/L)	4.65	4.38	7.04	5.14	9.36	6.43
Nickel (mg/L)	0.0147 [b]	0.00110 [b,c]	0.0129 [b]	0.00292 [b,c]	0.0217 [b,c]	0.00873 [b]
Phosphorus (mg/L)	0.0215 [c]	0.0224 [c]	<0.00471	<0.00471	0.188	0.00854 [c]
Lead (mg/L)	<0.00126	<0.00126	<0.00126	<0.00126	<0.00126	<0.00126

TABLE C-21 (CONTINUED)

Parameter	GWA-1-21-1	GWC-1-21-1	GWC-2-21-1	GWC-3-21-1[a]	GWC-4-21-1	GWC-5-21-1
Sulfur (mg/L)	12.4	0.104	1.37	0.0569	1.42	4.96
Antimony (mg/L)	0.00398 c	<0.000919	<0.000919	<0.000919	<0.000919	<0.000919
Selenium (mg/L)	0.00148 b,c	<0.00821 b	0.00119 b,c	0.00104 b,c	<0.00821 b	<0.00821 b
Silicon (mg/L)	14.3	11.6	13.7	9.48	10.8	11.3
Tin (mg/L)	0.00230 c	<0.00111	<0.00111	<0.00111	0.00346 c	<0.00111
Strontium (mg/L)	0.0315 b	0.0183 b	0.0126 b	0.00387 b	0.0580 b	0.0197 b
Tellurium (mg/L)	0.00220 c	<0.00170	<0.00170	<0.00170	0.00300 c	<0.00170
Titanium (mg/L)	0.00230 b	0.00541 b	0.00432 b	0.000420 b	0.0140 b	0.00742 b
Thallium (mg/L)	<0.00125	<0.00125	<0.00125	<0.00125	<0.00125	<0.00125
Uranium (mg/L)	<0.0132	<0.0132	<0.0132	<0.0132	0.0377 c	0.0956
Vanadium (mg/L)	0.00100 c	0.00100 c	<0.000681	<0.000681	<0.000681	<0.000681
Tungsten (mg/L)	0.00510 c	<0.00183	<0.00183	<0.00183	0.00570 c	<0.00183
Zinc (mg/L)	0.00189 b	<0.00309 b	<0.00309 b	<0.00309 b	0.00462 b	0.685 b

a A duplicate sample (GWC-3-21-2) was collected from this well.
b Detected in the method blank.
c Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

NM = Not measured due to insufficient sample.

TABLE C-22
RESULTS OF GROUNDWATER MONITORING CONDUCTED
JUNE 20-21, 1996 (SECOND QUARTER 1996)

Parameter	GWA-1-22-1	GWC-1-22-1	GWC-2-22-1	GWC-3-22-1	GWC-4-22-1[a]	GWC-5-22-1
pH	6.14	5.84	5.48	5.08	4.71	5.24
Conductivity (µS/cm)	116	83	59	41	412	64
Temperature (°C)	19.3	17.0	18.3	18.3	16.8	17.6
Eh (mV)	103	178	237	262	390	193
Alkalinity (mg/L $CaCO_3$)	NM	35	15.0	9.2	6.9	10.6
Total Dissolved Solids (mg/L)	105	63	75	49	266	76
Bromide (mg/L)	<0.0493	<0.0493	<0.0493	<0.0493	1.08	<0.0493
Chloride (mg/L)	3.30	2.47	3.93	3.83	106	2.98
Total Organic Carbon (mg/L)	<0.117	<0.117	<0.117	<0.117	<0.117	<0.117
Fluoride (mg/L)	0.0789 [b]	0.0442 [b]	0.0376 [b]	0.0344 [b]	0.0305 [b]	0.0384 [b]
Nitrate-Nitrite (mg/L as N)	0.742	0.233	0.915	0.192	2.10	0.0870
Sulfate (mg/L)	12.0	<0.154	4.52	1.91	4.33	9.87
Silver (mg/L)	<0.000501	<0.000501	<0.000501	<0.000501	<0.000501	<0.000501
Aluminum (mg/L)	0.0155 [b,c]	0.0224 [b,c]	0.168 [b]	0.168 [b]	0.179 [b]	0.291 [b]
Arsenic (mg/L)	<0.00392	<0.00392	<0.00392	<0.00392	<0.00392	<0.00392
Boron (mg/L)	<0.0479	<0.0479	<0.0479	<0.0479	1.98	<0.0479
Barium (mg/L)	0.0156	0.00838	0.0134	0.0142	0.0634	0.0142
Beryllium (mg/L)	0.000490 [b,c]	0.000460 [b,c]	0.000480 [b,c]	0.000590 [b,c]	0.00135 [b]	0.000730 [b,c]
Bismuth (mg/L)	<0.0271	<0.0271	<0.0271	<0.0271	<0.0271	<0.0271
Calcium (mg/L)	8.03	5.62	2.46	0.433	10.5	1.96
Cadmium (mg/L)	<0.000156	<0.000156	<0.000156	<0.000156	<0.000156	<0.000156
Cobalt (mg/L)	<0.000580	<0.000580	<0.000580	<0.000580	0.00406	<0.000580
Copper (mg/L)	<0.00136	<0.00136	<0.00136	<0.00136	<0.00136	<0.00136
Chromium (mg/L)	0.000440 [c]	0.000450 [c]	0.000408 [c]	0.00325	0.00275	0.00465
Mercury (mg/L)	<0.000039	<0.000039	<0.000039	<0.000039	0.000230	<0.000039
Iron (mg/L)	<0.0135	<0.0135	0.208	0.217	0.245	0.488
Potassium (mg/L)	1.40	0.611	0.429	0.273	0.523	0.284
Lithium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Magnesium (mg/L)	5.16	3.68	1.98	1.32	30.2	2.36
Manganese (mg/L)	0.00151 [c]	0.00052 [c]	0.00529	0.00597	0.424	0.0113
Molybdenum (mg/L)	0.000840 [c]	<0.000705	<0.000705	<0.000705	<0.000705	0.000720 [c]
Sodium (mg/L)	4.34	3.88	6.60	4.89	9.95	5.82
Nickel (mg/L)	0.00184 [c]	<0.000721	0.0114	0.000920 [c]	0.00133 [c]	0.00621
Phosphorus (mg/L)	0.0127 [b,c]	0.0199 [b,c]	0.0132 [b,c]	0.0150 [b,c]	0.0370 [b]	0.0446 [b]
Lead (mg/L)	<0.00126	<0.00126	<0.00126	<0.00126	<0.00126	<0.00126
Sulfur (mg/L)	4.63	0.0898	1.44	0.212	1.44	3.91
Antimony (mg/L)	<0.000919	<0.000919	<0.000919	<0.000919	<0.000919	<0.000919
Selenium (mg/L)	0.00309 [c]	<0.00258	0.00295 [c]	0.0421	0.00399 [c]	0.00356 [c]
Silicon (mg/L)	16.8	11.0	13.4	9.63	10.3	11.3
Tin (mg/L)	<0.00111	<0.00111	<0.00111	<0.00111	<0.00111	<0.00111
Strontium (mg/L)	0.0252 [b]	0.0173 [b]	0.0130 [b]	0.00465 [b]	0.0858 [b]	0.0175 [b]
Tellurium (mg/L)	<0.00170	<0.00170	<0.00170	<0.00170	<0.00170	<0.00170
Titanium (mg/L)	0.000660 [c]	0.00149	0.0307	0.0295	0.0241	0.0461

TABLE C-22 (CONTINUED)

Parameter	GWA-1-22-1	GWC-1-22-1	GWC-2-22-1	GWC-3-22-1	GWC-4-22-1[a]	GWC-5-22-1
Thallium (mg/L)	<0.00125	<0.00125	<0.00125	<0.00125	<0.00125	<0.00125
Uranium (mg/L)	0.0867	<0.0132	<0.0132	<0.0132	<0.0132	<0.0132
Vanadium (mg/L)	0.000860 [c]	0.000930 [c]	0.00104 [c]	0.000900 [c]	<0.000681	0.00150 [c]
Tungsten (mg/L)	<0.00183	<0.00183	<0.00183	<0.00183	<0.00183	<0.00183
Zinc (mg/L)	<0.00309 [b]	<0.00309 [b]	0.00789 [b,c]	<0.00309 [b]	<0.00309 [b]	<0.00309 [b]
TOX (μg/L)	<20.9	<20.9	<20.9	24.6 [c]	27.0 [c]	<20.9
VOCs (μg/L):						
Acetone	<1.26	<1.26	41.0	<0.274	<0.274	<0.274
Acrolein	<1.21	<1.21	<0.525	<0.525	<0.525	<0.525
Acrylonitrile	<0.435	<0.435	<0.254	<0.254	<0.254	<0.254
Benzene	<0.0470	<0.0470	0.882	<0.0633	<0.0633	<0.0633
Bromodichloromethane	<0.0698	<0.0698	<0.0629	<0.0629	<0.0629	<0.0629
Bromoform	<0.160	<0.160	<0.0854	<0.0854	<0.0854	<0.0854
Bromomethane	<0.190	<0.190	<0.101	<0.101	<0.101	<0.101
2-Butanone (MEK)	<0.289	<0.289	<0.819	<0.819	<0.819	<0.819
Carbon disulfide	<0.0786	<0.0786	<0.0780	<0.0780	<0.0780	<0.0780
Carbon tetrachloride	<0.113	<0.113	<0.0527	<0.0527	<0.0527	<0.0527
Chlorobenzene	<0.0688	<0.0688	<0.0665	<0.0665	<0.0665	<0.0665
Chloroethane	<0.114	<0.114	<0.0693	<0.0693	<0.0693	<0.0693
Chloroform	<0.122	<0.122	<0.0773	<0.0773	<0.0773	<0.0773
Chloromethane	<0.141	<0.141	<0.0454	<0.0454	<0.0454	<0.0454
3-Chloropropene	<0.0951	<0.0951	<0.0735	<0.0735	<0.0735	<0.0735
Dibromochloromethane	<0.166	<0.166	<0.0454	<0.0454	<0.0454	<0.0454
Dibromomethane	<0.169	<0.169	<0.0692	<0.0692	<0.0692	<0.0692
trans-1,4-Dichloro-2-butene	<0.512	<0.512	<0.155	<0.155	<0.155	<0.155
Dichlorodifluoromethane	<0.235	<0.235	<0.0853	<0.0853	<0.0853	<0.0853
1,1-Dichloroethane	<0.0864	<0.0864	<0.0559	<0.0559	<0.0559	<0.0559
1,2-Dichloroethane	<0.125	<0.125	<0.0865	<0.0865	<0.0865	<0.0865
1,1-Dichloroethene	<0.0767	<0.0767	<0.608	<0.608	<0.608	<0.608
cis-1,2-Dichloroethene	<0.0831	<0.0831	<0.0541	<0.0541	<0.0541	<0.0541
trans-1,2-Dichloroethene	<0.103	<0.103	<0.0567	<0.0567	<0.0567	<0.0567
1,2-Dichloropropane	<0.0853	<0.0853	<0.0566	<0.0566	<0.0566	<0.0566
cis-1,3-Dichloropropene	<0.0545	<0.0545	<0.0614	<0.0614	<0.0614	<0.0614
trans-1,3-Dichloropropene	<0.0732	<0.0732	<0.0657	<0.0657	<0.0657	<0.0657
Ethyl methacrylate	<0.0914	<0.0914	<0.0788	<0.0788	<0.0788	<0.0788
Ethylbenzene	<0.107	<0.107	0.393	<0.0655	<0.0655	<0.0655
2-Hexanone	<0.193	<0.193	<0.211	<0.211	<0.211	<0.211
Iodomethane	<0.0553	<0.0553	<0.0342	<0.0342	<0.0342	<0.0342
4-Methyl-2-pentanone (MIBK)	<0.172	<0.172	<0.146	<0.146	<0.146	<0.146
Methylene chloride	<0.159	<0.159	0.879 [b]	0.796 [b]	1.02 [b]	0.626 [b]
Styrene	<0.0981	<0.0981	<0.0596	0.0697 [c]	<0.0596	0.141 [c]
1,1,1,2-Tetrachloroethane	<0.141	<0.141	<0.0590	<0.0590	<0.0590	<0.0590
1,1,2,2-Tetrachloroethane	<0.227	<0.227	<0.0729	<0.0729	<0.0729	<0.0729
Tetrachloroethene	<0.0959	<0.0959	<0.118	<0.118	<0.118	<0.118
Toluene	<0.0619	<0.0619	2.58	<0.0537	<0.0537	<0.0537
1,1,1-Trichloroethane	<0.0927	<0.0927	<0.0388	<0.0388	<0.0388	<0.0388
1,1,2-Trichloroethane	<0.179	<0.179	<0.0714	<0.0714	<0.0714	<0.0714

TABLE C-22 (CONTINUED)

Parameter	GWA-1-22-1	GWC-1-22-1	GWC-2-22-1	GWC-3-22-1	GWC-4-22-1[a]	GWC-5-22-1
Trichloroethene	<0.0931	<0.0931	<0.127	<0.127	<0.127	<0.127
Trichlorofluoromethane	<0.336	<0.336	<0.0681	<0.0681	<0.0681	<0.0681
1,2,3-Trichloropropane	<0.256	<0.256	<0.125	<0.125	<0.125	<0.125
Vinyl acetate	<0.0525	<0.0525	<0.0639	<0.0639	<0.0639	<0.0639
Vinyl chloride	<0.232	<0.232	<0.0307	<0.0307	<0.0307	<0.0307
m & p-Xylene	<0.131	<0.131	0.882 [c]	<0.184	<0.184	<0.184
o-Xylene	<0.789	<0.789	0.474	<0.0627	<0.0627	<0.0627

[a] A duplicate sample (GWC-4-22-2) was collected from this well.
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

TABLE 23
RESULTS OF GROUNDWATER MONITORING CONDUCTED SEPTEMBER 13-14, 1996 (THIRD QUARTER 1996)

Parameter	GWA-1-23-1	GWC-1-23-1	GWC-2-23-1	GWC-3-23-1[a]	GWC-4-23-1[a]	GWC-5-23-1
pH	6.54	5.96	5.50	5.19	4.94	5.39
Conductivity (μS/cm)	58	75	62	38	330	64
Temperature (°C)	23	18	18	17	18	17
Eh (mV)	218	264	348	177	415	200
Alkalinity (mg/L $CaCO_3$)	27.8	32.2	17.4	9.7	6.8	10.1
Total Dissolved Solids (mg/L)	88 [b]	81 [b]	82 [b]	56 [b]	229 [b]	66 [b]
Bromide (mg/L)	<0.0493	<0.0493	<0.0493	<0.0493	0.737	<0.0493
Chloride (mg/L)	3.65	2.57	4.04	4.31	95.5	3.00
Total Organic Carbon (mg/L)	<0.117	0.379 [c]	0.217 [c]	0.159 [c]	1.25	0.672
Fluoride (mg/L)	0.0800 [b]	0.0495 [b]	0.0349 [b]	0.0320 [b]	0.0352 [b]	0.0224 [b]
Nitrate-Nitrite (mg/L as N)	0.774	0.310	1.01	0.212	2.02	0.127
Sulfate (mg/L)	9.34	0.694	3.66	1.49	3.21	7.82
Radium 226 (pCi/L)	N/M	0.330 ± 0.481	<0.390	0.480 ± 0.542	<0.210	<0.190
Radium 228 (pCi/L)	N/M	<0.590	<0.850	<0.470	<0.460	<0.450
Gross Alpha (pCi/L)	N/M	<0.20	<0.33	<1.2	<0.58	<1.5
Gross Beta (pCi/L)	N/M	<0.78	<0.93	<4.0	<1.8	<4.9
Gamma Scan (pCi/L):						
Ac-228	N/M	-5.45 ± 10.6	0.00 ± 13.7	4.93 ± 11.8	-7.78 ± 14.6	1.21 ± 13.4
Bi-214	N/M	14.4 ± 7.83	10.1 ± 9.43	8.65 ± 7.56	11.1 ± 11.6	7.96 ± 9.06
Pb-214	N/M	12.0 ± 7.21	6.55 ± 7.28	9.47 ± 7.27	7.99 ± 7.85	15.3 ± 7.66
K-40	N/M	-21.0 ± 48.3	8.82 ± 59.0	-48.5 ± 45.2	3.24 ± 63.7	-7.66 ± 55.5
Silver (mg/L)	<0.000501	<0.000501	0.000920 [c]	<0.000501	0.000880 [c]	<0.000501
Aluminum (mg/L)	0.0348 [b,c]	0.0385 [b,c]	0.0429 [b,c]	0.0388 [b,c]	0.0708 [b]	0.0368 [b,c]
Arsenic (mg/L)	<0.000887	<0.000887	<0.000887	<0.000887	<0.000887	<0.000887
Boron (mg/L)	<0.0479	<0.0479	<0.0479	<0.0479	1.98	<0.0479
Barium (mg/L)	0.0143	0.00818	0.0102	0.0109	0.0626	0.00805
Beryllium (mg/L)	0.000670 [b,c]	0.000240 [b,c]	<0.000162	0.000330 [b,c]	0.00107 [b]	0.000300 [b,c]
Bismuth (mg/L)	<0.00271	<0.00271	<0.00271	<0.00271	<0.00271	0.00376 [c]
Calcium (mg/L)	7.46 [b]	5.85 [b]	2.70 [b]	0.505 [b]	10.6 [b]	1.90 [b]
Cadmium (mg/L)	0.000180 [c]	<0.000156	<0.000156	<0.000156	<0.000156	<0.000156
Cobalt (mg/L)	<0.000580	<0.000580	<0.000580	<0.000580	0.00381	<0.000580
Copper (mg/L)	<0.00136	<0.00136	<0.00136	<0.00136	<0.00136	<0.00136
Chromium (mg/L)	0.00177 [c]	0.00109 [c]	0.00312	0.00158 [c]	0.00044 [c]	0.00143 [c]
Mercury (mg/L)	<0.000039	<0.000039	<0.000039	<0.000039	<0.000039	<0.000039
Iron (mg/L)	0.0157 [c]	<0.0135	<0.0135	<0.0135	<0.0135	<0.0135
Potassium (mg/L)	1.47 [b]	0.922 [b]	0.507 [b]	0.337 [b]	0.716 [b]	0.278 [b]
Lithium (mg/L)	NM	NM	NM	NM	NM	NM
Magnesium (mg/L)	4.80	3.80	1.96	1.41	29.0	2.06
Manganese (mg/L)	0.00164 [c]	0.000740 [c]	0.00281	0.00336	0.475	0.00364
Molybdenum (mg/L)	0.00104 [c]	<0.000705	<0.000705	<0.000705	<0.000705	<0.000705
Sodium (mg/L)	4.16	4.04	7.16	5.36	9.64	5.96
Nickel (mg/L)	0.00326 [c]	0.000810 [c]	0.0177	0.00342 [c]	0.00131 [c]	0.00476
Phosphorus (mg/L)	0.00743 [c]	0.0152 [c]	<0.00471	<0.00471	0.00854 [c]	<0.00471

TABLE C-23 (CONTINUED)

Parameter	GWA-1-23-1	GWC-1-23-1	GWC-2-23-1	GWC-3-23-1[a]	GWC-4-23-1[a]	GWC-5-23-1
Lead (mg/L)	<0.00126	<0.00126	<0.00126	<0.00126	0.00410 [c]	<0.00126
Sulfur (mg/L)	4.11	0.176	1.40	0.504	1.38	3.29
Antimony (mg/L)	0.00135 [c]	0.00273 [c]	<0.000919	0.00145 [c]	<0.000919	0.00405 [c]
Selenium (mg/L)	0.00174 [c]	0.00132 [c]	0.00169 [c]	0.00112 [c]	0.00183 [c]	0.00164 [c]
Silicon (mg/L)	16.2	11.8	13.8	10.1	11.1	11.1
Tin (mg/L)	0.00169 [b,c]	0.00151 [b,c]	0.00164 [b,c]	<0.00111	0.00213 [b,c]	<0.00111
Strontium (mg/L)	0.0214	0.0171	0.0133	0.00484	0.0809	0.0155
Tellurium (mg/L)	<0.00170	<0.00170	<0.00170	<0.00170	<0.00170	<0.00170
Titanium (mg/L)	0.00037 [c]	0.00032 [c]	0.00061 [c]	<0.000200	0.00036 [c]	<0.000200
Thallium (mg/L)	<0.00168	<0.00168	<0.00168	<0.00168	<0.00168	<0.00168
Uranium (mg/L)	0.0958 [b]	0.0885 [b]	0.0664 [b]	0.101 [b]	0.105 [b]	0.0981 [b]
Vanadium (mg/L)	<0.000681	<0.000681	0.000770 [c]	<0.000681	<0.000681	<0.000681
Tungsten (mg/L)	0.00713 [c]	0.0107	0.00660 [c]	<0.00183	0.00334 [c]	0.00289 [c]
Zinc (mg/L)	<0.00309	0.00318 [c]	<0.00309	<0.00309	<0.00309	<0.00309
TOX (µg/L)	<20.9	<20.9	<20.9	<20.9	50.8 [c]	<20.9
VOCs (µg/L):						
Acetone	NM	NM	<1.26	<0.489	NM	NM
Acrolein	NM	NM	<1.21	<0.707	NM	NM
Acrylonitrile	NM	NM	<0.364	<0.712	NM	NM
Benzene	NM	NM	<0.0470	<0.0378	NM	NM
Bromodichloromethane	NM	NM	<0.0698	<0.0393	NM	NM
Bromoform	NM	NM	<0.0849	<0.174	NM	NM
Bromomethane	NM	NM	<0.190	<0.0632	NM	NM
2-Butanone (MEK)	NM	NM	<0.289	<0.260	NM	NM
Carbon disulfide	NM	NM	<0.0786	<0.0485	NM	NM
Carbon tetrachloride	NM	NM	<0.113	<0.0474	NM	NM
Chlorobenzene	NM	NM	<0.0688	<0.0258	NM	NM
Chloroethane	NM	NM	<0.114	<0.0741	NM	NM
Chloroform	NM	NM	<0.122	<0.0409	NM	NM
Chloromethane	NM	NM	<0.141	<0.0454	NM	NM
3-Chloropropene	NM	NM	<0.0951	<0.0340	NM	NM
Dibromochloromethane	NM	NM	<0.166	<0.141	NM	NM
Dibromomethane	NM	NM	<0.169	<0.0621	NM	NM
trans-1,4-Dichloro-2-butene	NM	NM	<0.181	<0.389	NM	NM
Dichlorodifluoromethane	NM	NM	<0.153	<0.0651	NM	NM
1,1-Dichloroethane	NM	NM	<0.0864	<0.0919	NM	NM
1,2-Dichloroethane	NM	NM	<0.125	<0.105	NM	NM
1,1-Dichloroethene	NM	NM	<0.0767	<0.0802	NM	NM
cis-1,2-Dichloroethene	NM	NM	<0.0831	<0.0770	NM	NM
trans-1,2-Dichloroethene	NM	NM	<0.103	<0.0641	NM	NM
1,2-Dichloropropane	NM	NM	<0.0853	<0.0541	NM	NM
cis-1,3-Dichloropropene	NM	NM	<0.0545	<0.0538	NM	NM
trans-1,3-Dichloropropene	NM	NM	<0.0732	<0.0667	NM	NM
Ethyl methacrylate	NM	NM	<0.0914	<0.121	NM	NM
Ethylbenzene	NM	NM	<0.107	<0.0649	NM	NM
2-Hexanone	NM	NM	<0.193	<0.208	NM	NM
Iodomethane	NM	NM	<0.0553	<0.0652	NM	NM

TABLE C-23 (CONTINUED)

Parameter	GWA-1-23-1	GWC-1-23-1	GWC-2-23-1	GWC-3-23-1[a]	GWC-4-23-1[a]	GWC-5-23-1
4-Methyl-2-pentanone (MIBK)	NM	NM	<0.172	<0.0809	NM	NM
Methylene chloride	NM	NM	<0.159	<0.177	NM	NM
Styrene	NM	NM	<0.0981	<0.0406	NM	NM
1,1,1,2-Tetrachloroethane	NM	NM	<0.141	<0.0612	NM	NM
1,1,2,2-Tetrachloroethane	NM	NM	<0.227	<0.0412	NM	NM
Tetrachloroethene	NM	NM	<0.167	<0.0487	NM	NM
Toluene	NM	NM	<0.0619	<0.0492	NM	NM
1,1,1-Trichloroethane	NM	NM	<0.0927	<0.0993	NM	NM
1,1,2-Trichloroethane	NM	NM	<0.179	<0.119	NM	NM
Trichloroethene	NM	NM	<0.0931	<0.0854	NM	NM
Trichlorofluoromethane	NM	NM	<0.336	<0.0640	NM	NM
1,2,3-Trichloropropane	NM	NM	<0.256	<0.101	NM	NM
Vinyl acetate	NM	NM	<0.0525	<0.0612	NM	NM
Vinyl chloride	NM	NM	<0.232	<0.0767	NM	NM
m & p-Xylene	NM	NM	<0.131	<0.0688	NM	NM
o-Xylene	NM	NM	<0.0789	<0.0490	NM	NM

[a] Duplicate samples were collected for radionuclide analysis (GWC-3-2) and for the remaining parameters (GWC-4-2).
[b] Detected in the method blank.
[c] Less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

Appendix D

Control Charts for Groundwater Monitoring

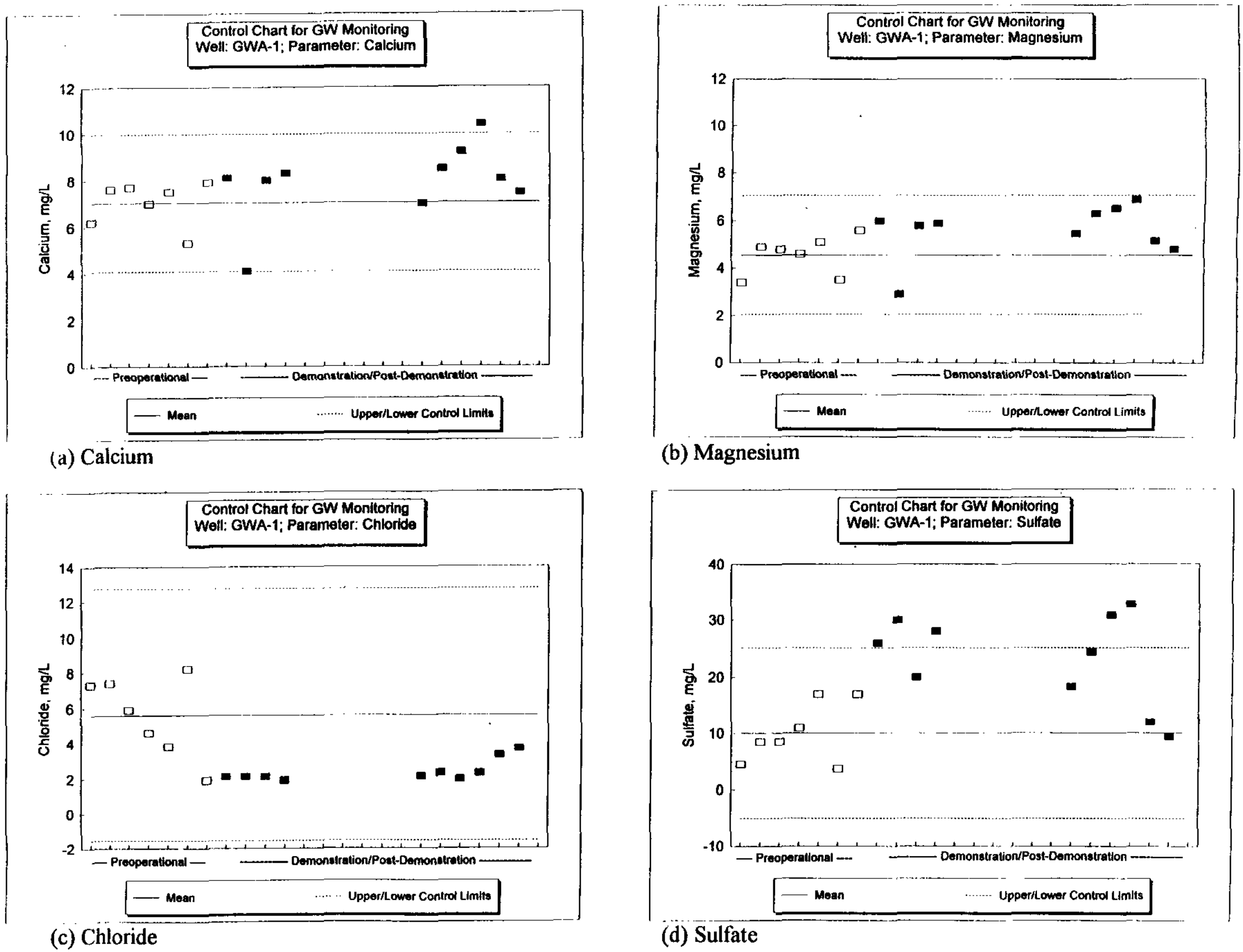
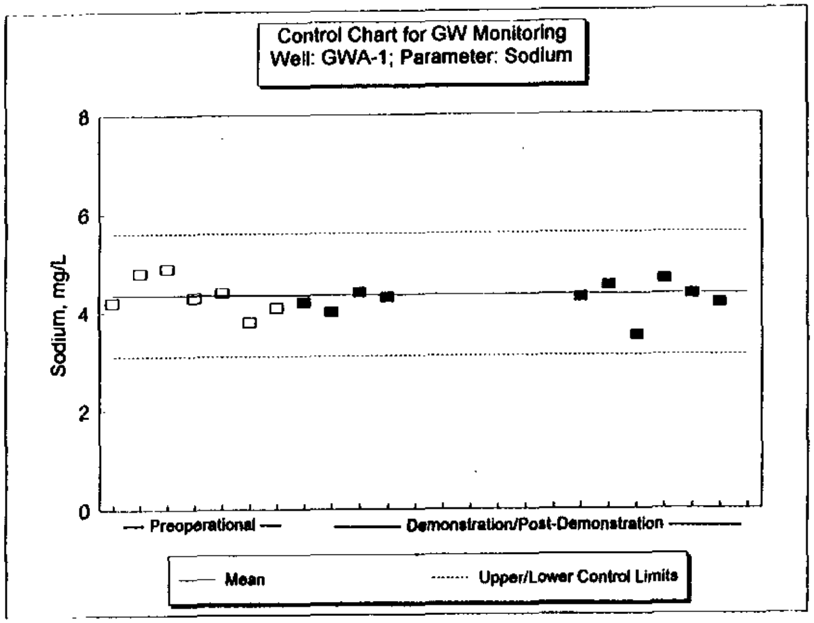
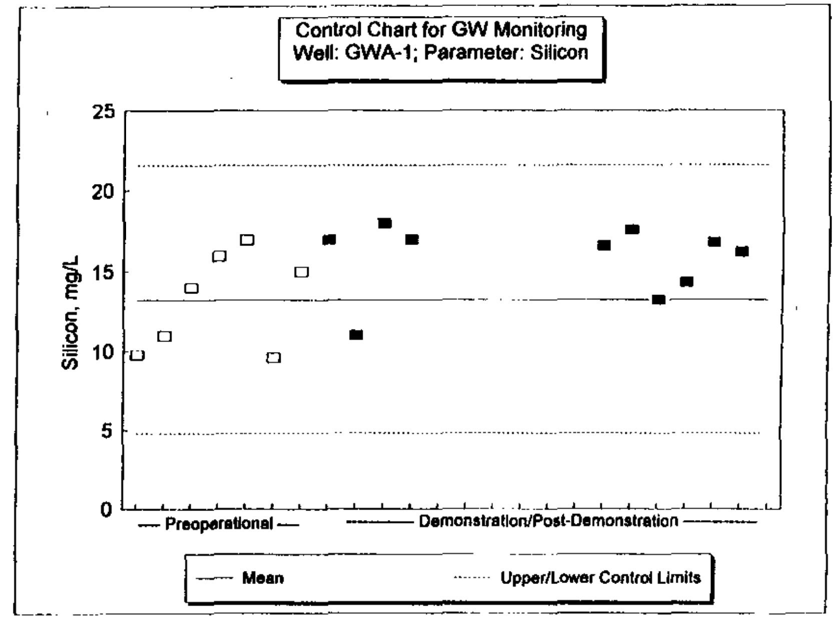


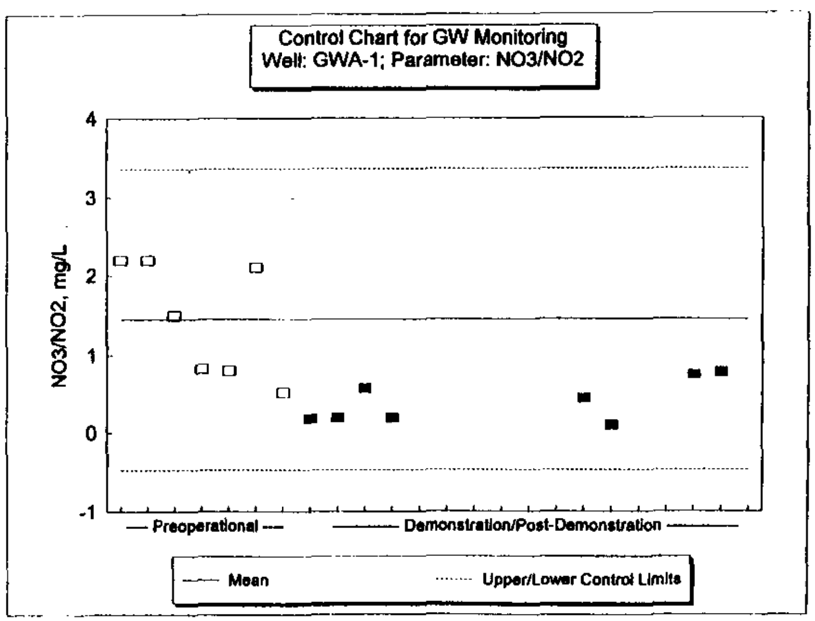
Figure D-1. Control Charts for Groundwater Monitoring: Well GWA-1 (Upgradient)



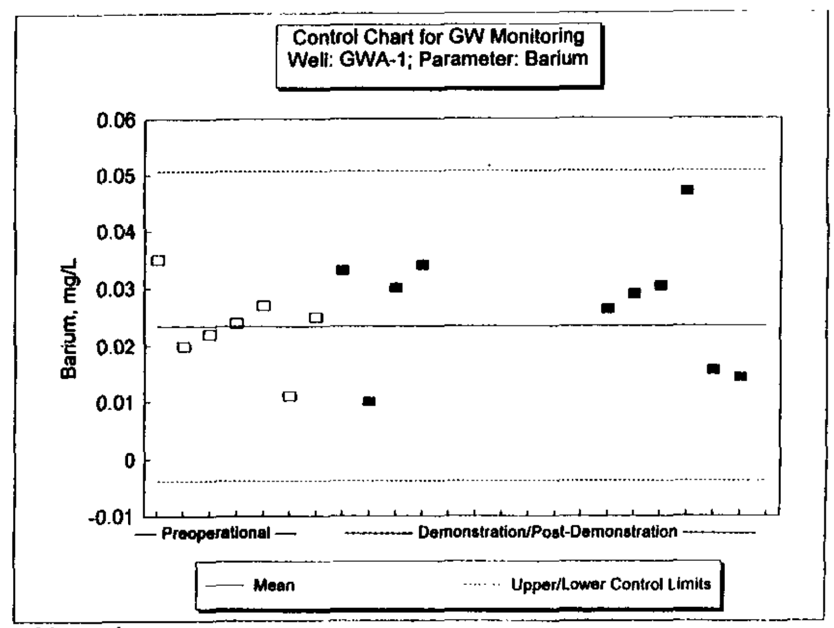
(e) Sodium



(f) Silicon

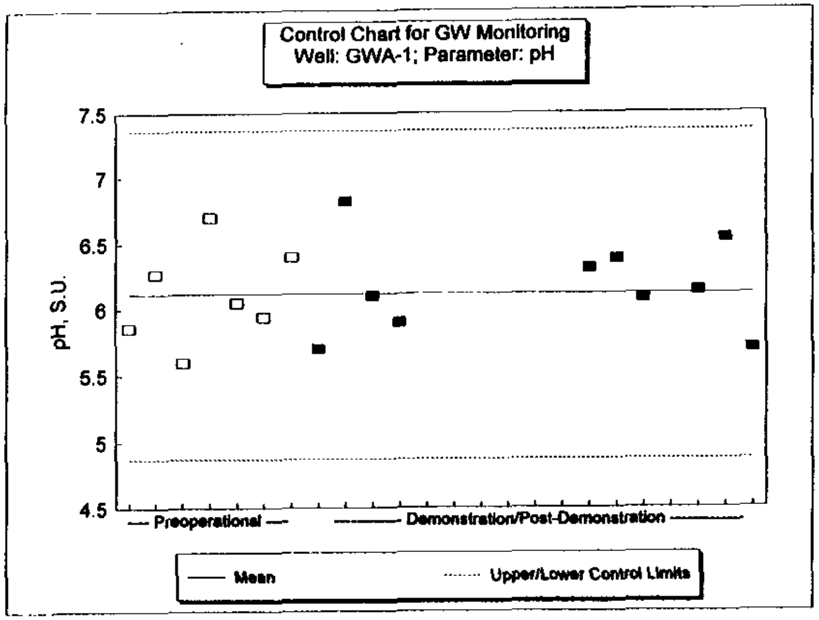


(g) Nitrate/Nitrite

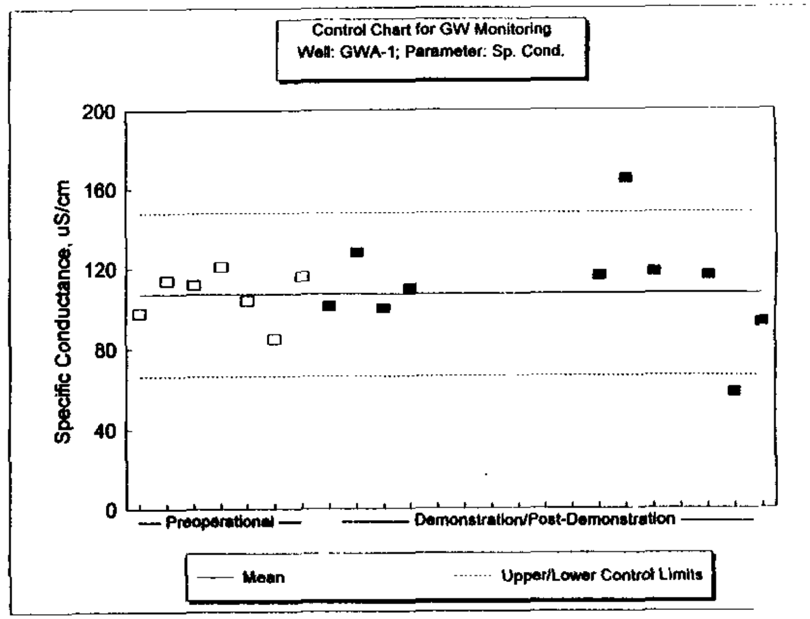


(h) Barium

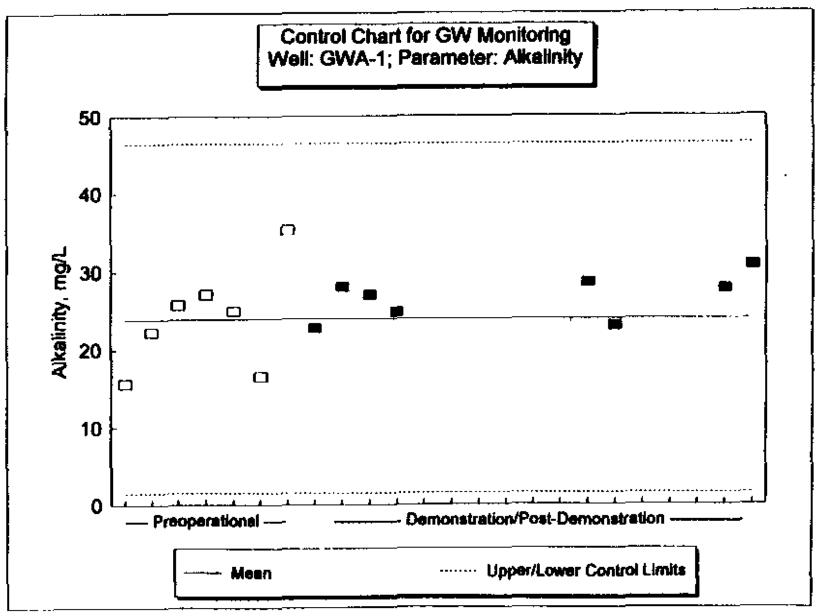
Figure D-1 (Continued)



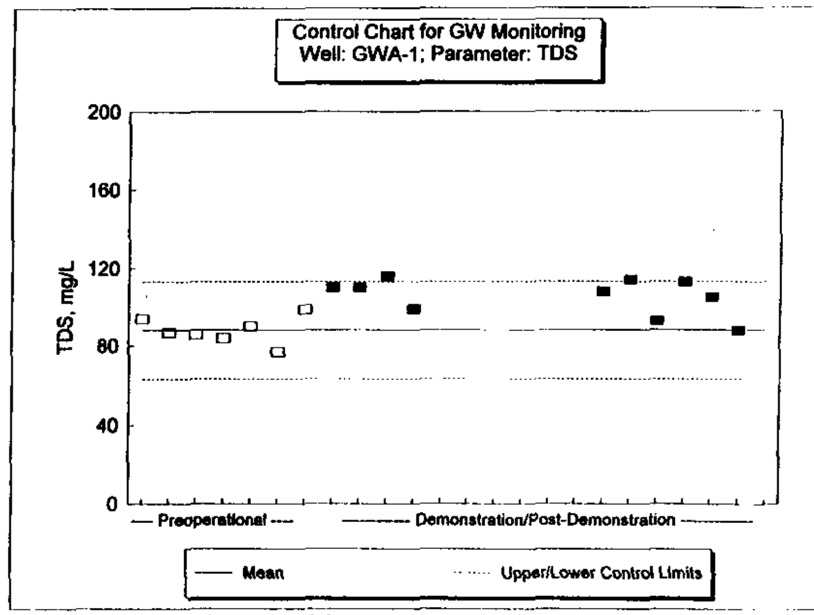
(i) pH



(j) Specific Conductivity

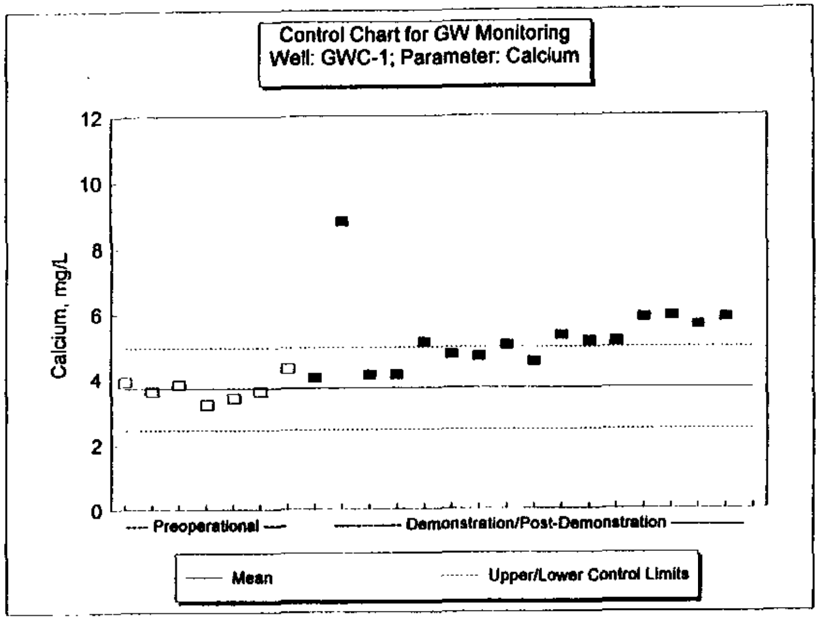


(k) Alkalinity

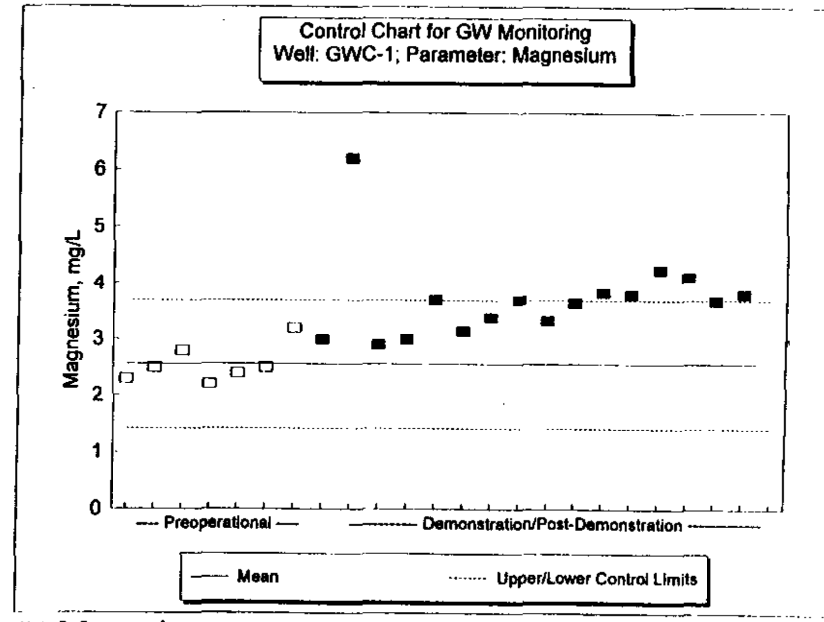


(l) Total Dissolved Solids

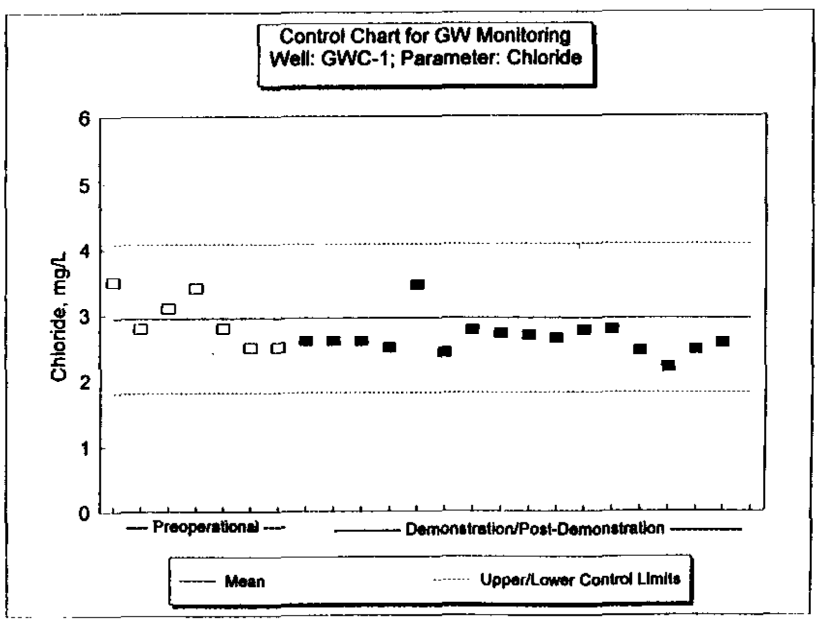
Figure D-1 (Continued)



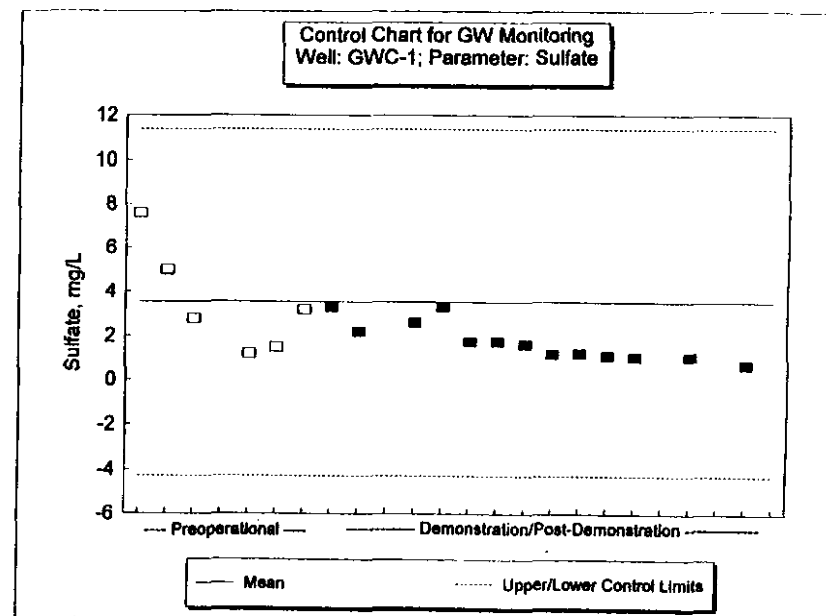
(a) Calcium



(b) Magnesium

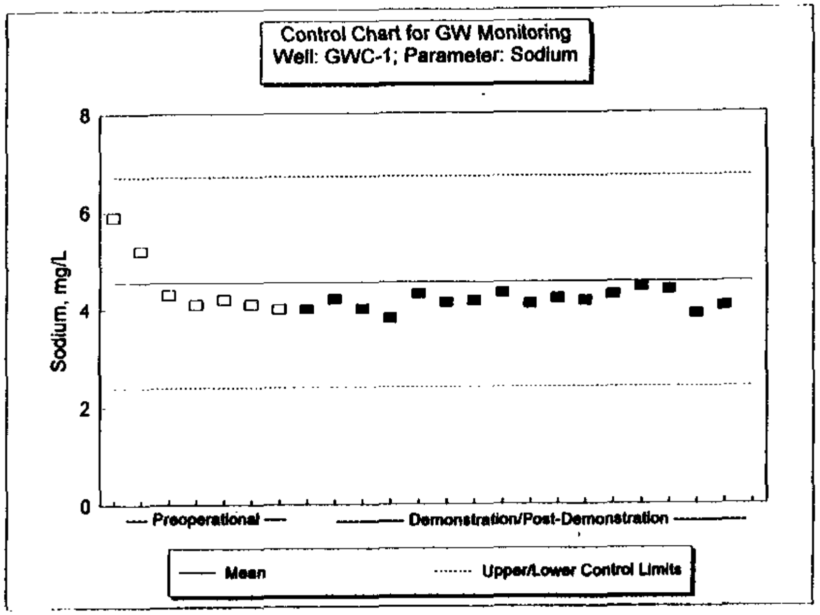


(c) Chloride

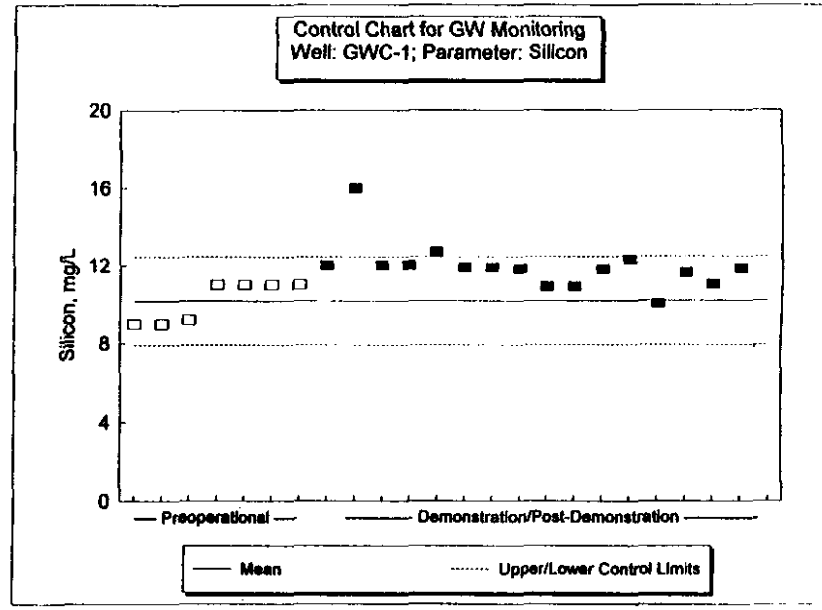


(d) Sulfate

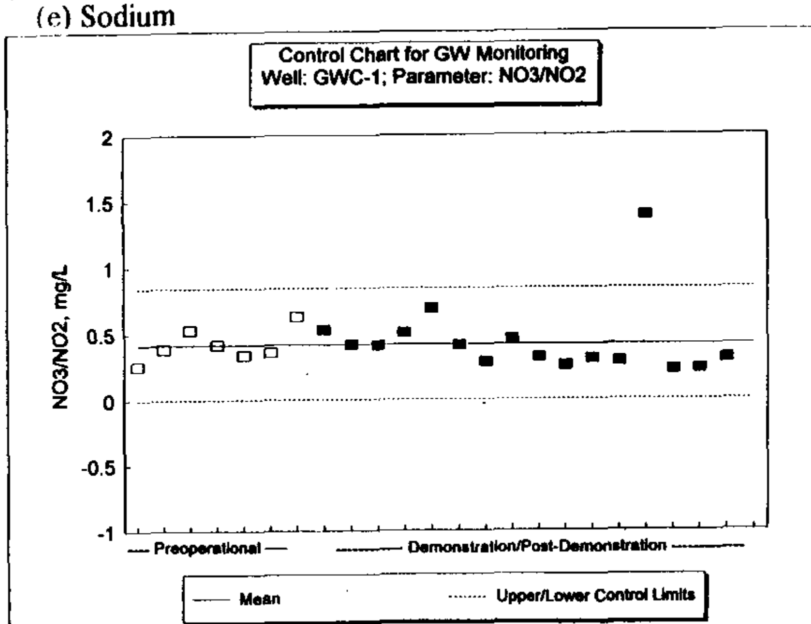
Figure D-2. Control Charts for Groundwater Monitoring: Well GWC-1 (Downgradient)



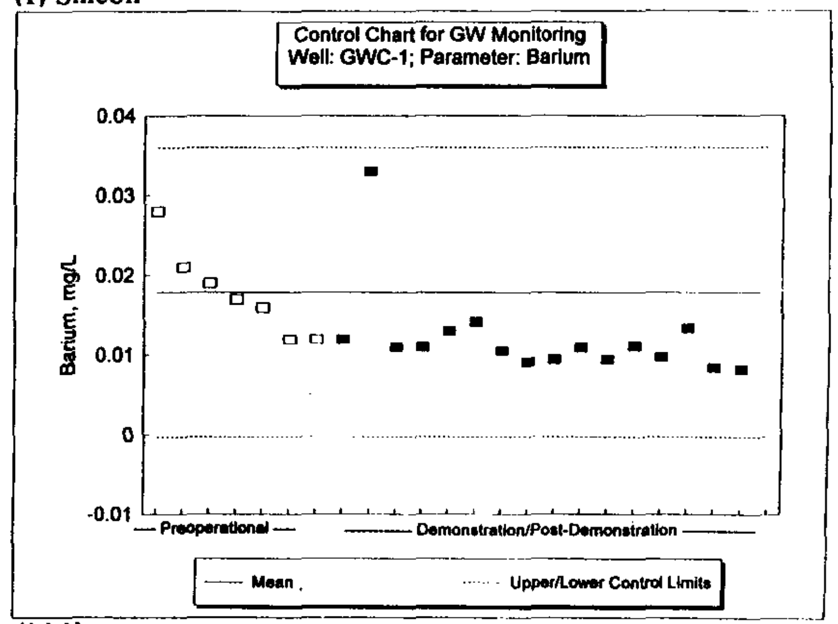
(e) Sodium



(f) Silicon

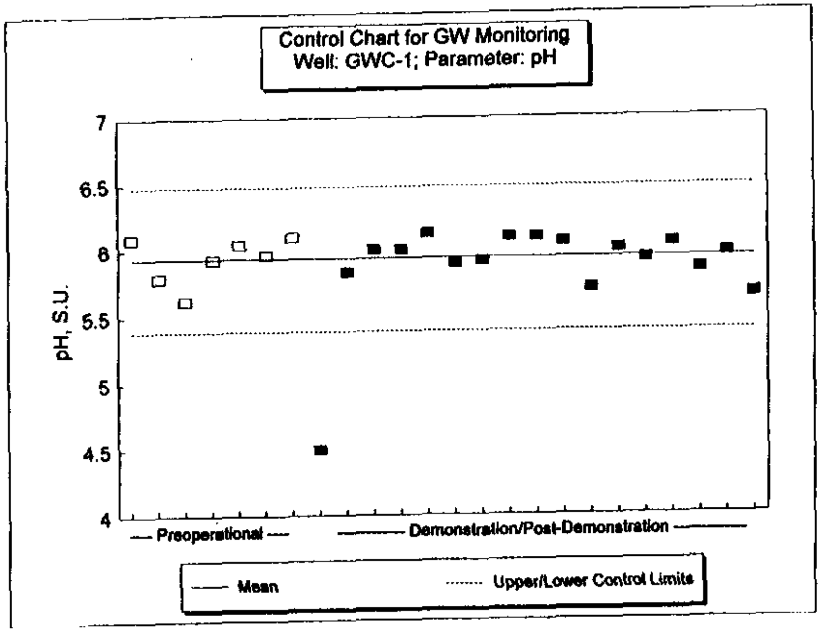


(g) Nitrate/Nitrite

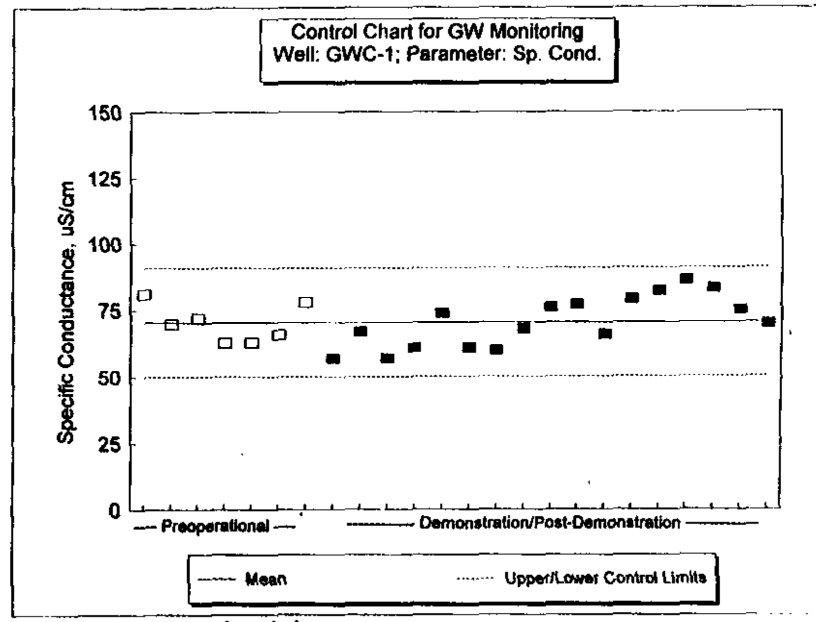


(h) Barium

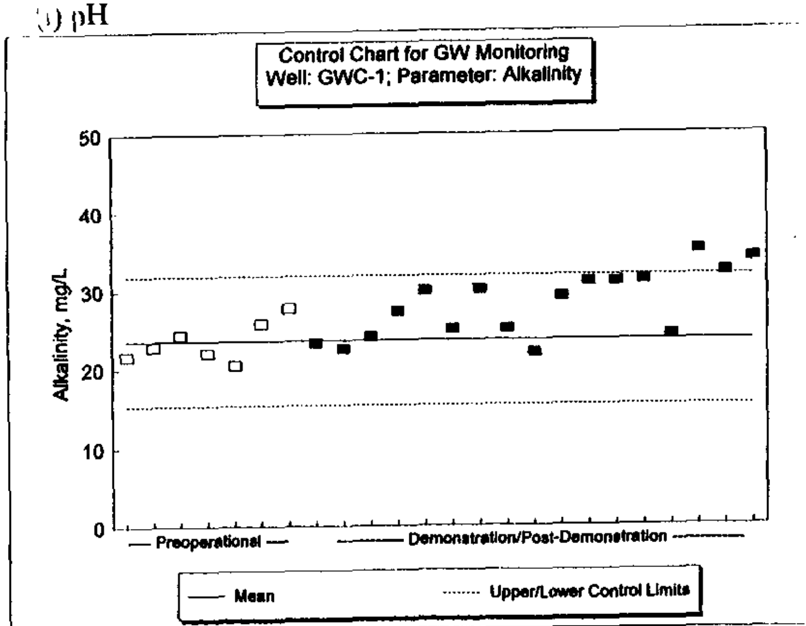
Figure D-2 (Continued)



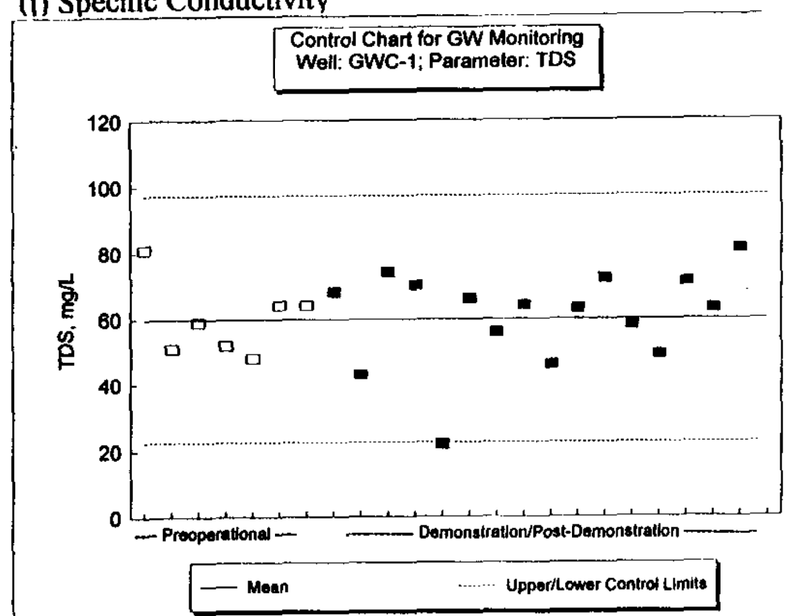
(j) pH



(i) Specific Conductivity

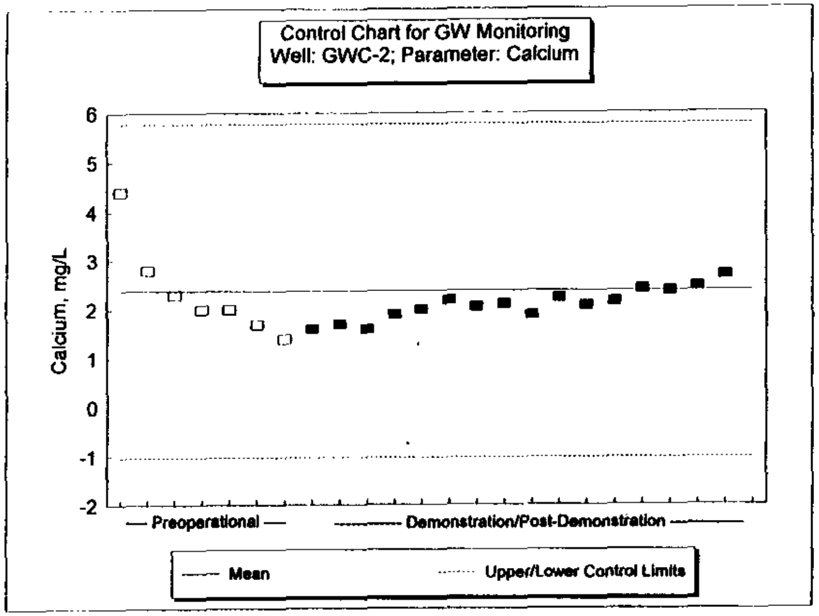


(k) Alkalinity

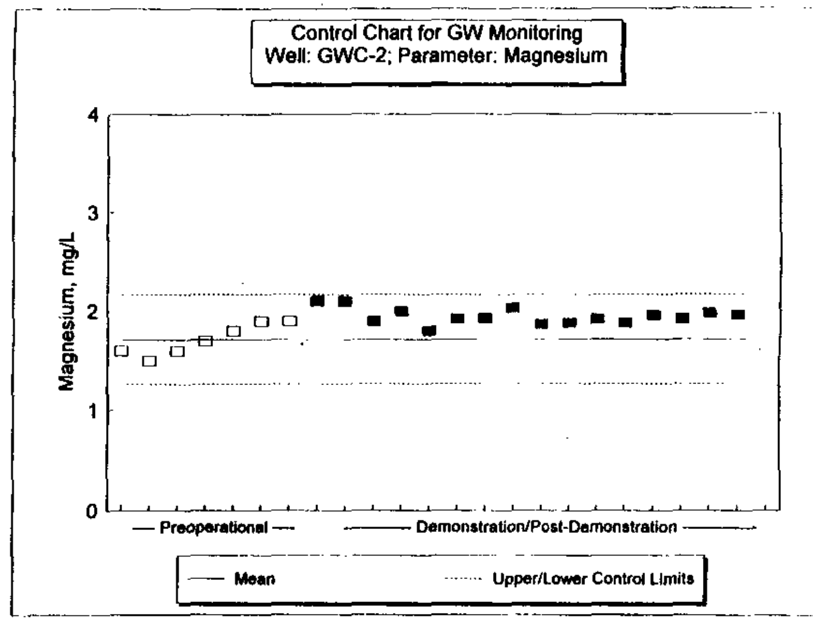


(l) Total Dissolved Solids

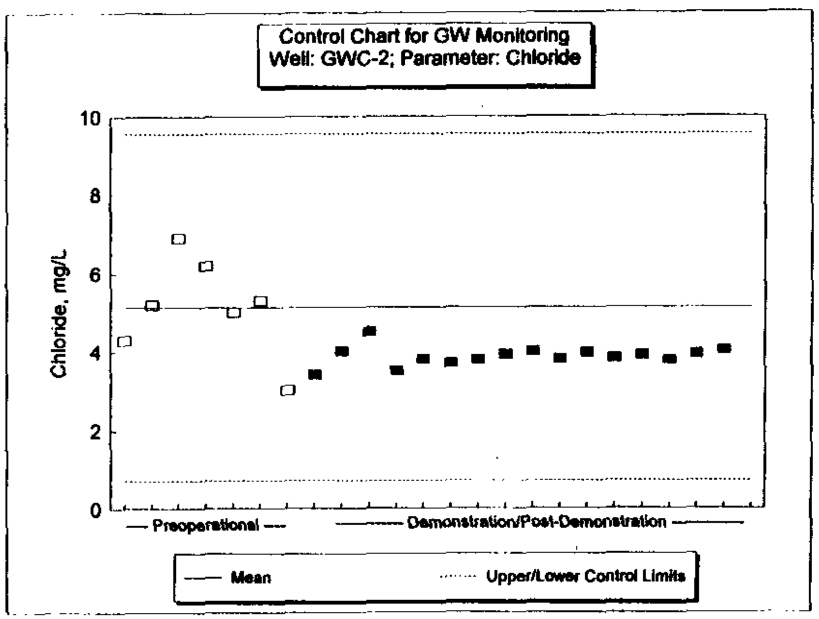
Figure D-2 (Continued)



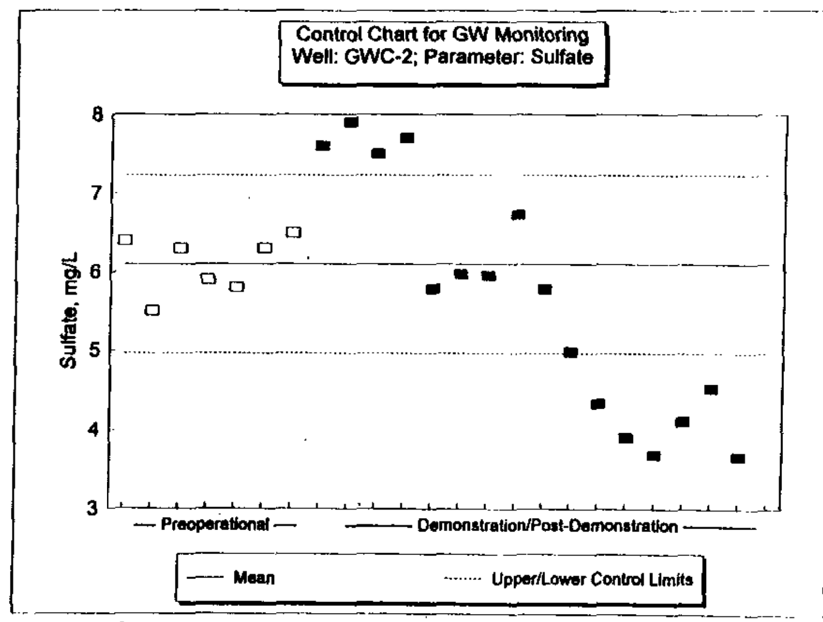
(a) Calcium



(b) Magnesium

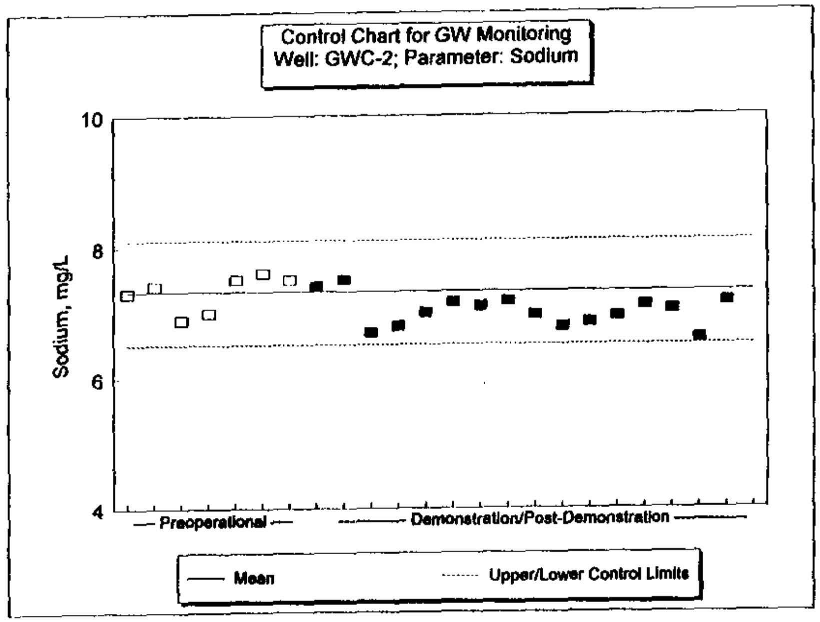


(c) Chloride

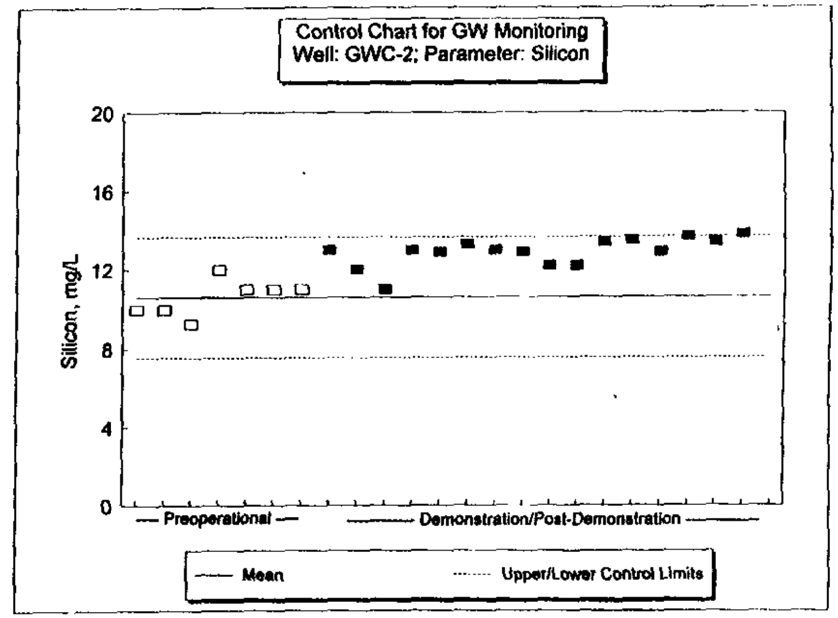


(d) Sulfate

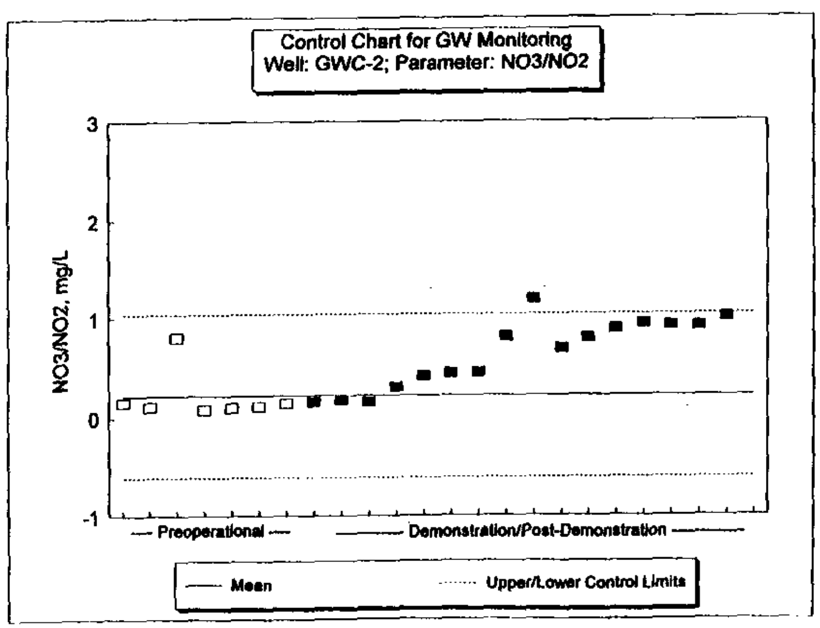
Figure D-3. Control Charts for Groundwater Monitoring: Well GWC-2 (Downgradient)



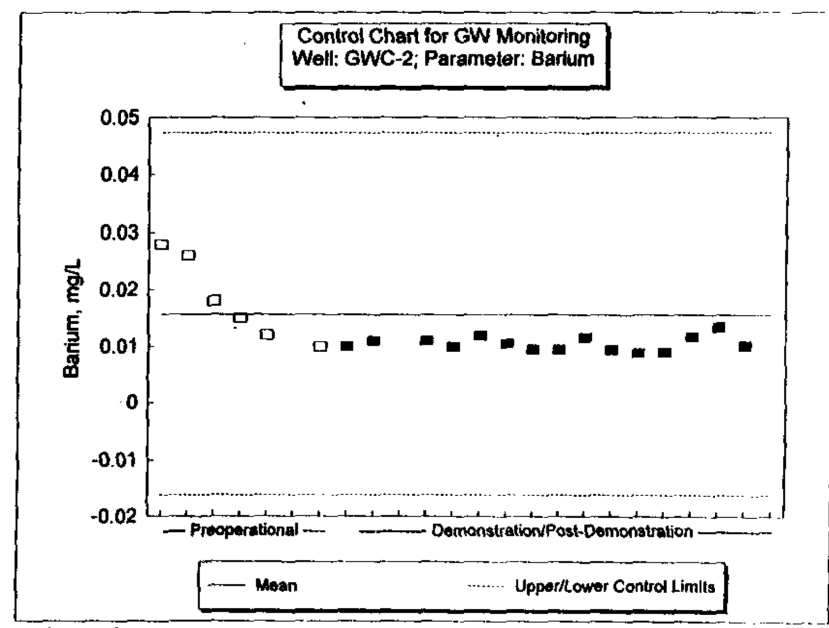
(e) Sodium



(f) Silicon

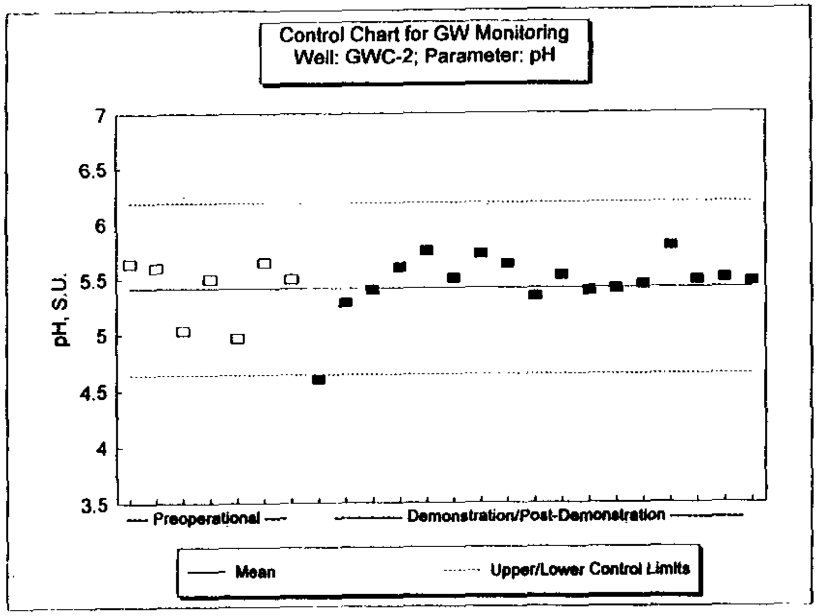


(g) Nitrate/Nitrite

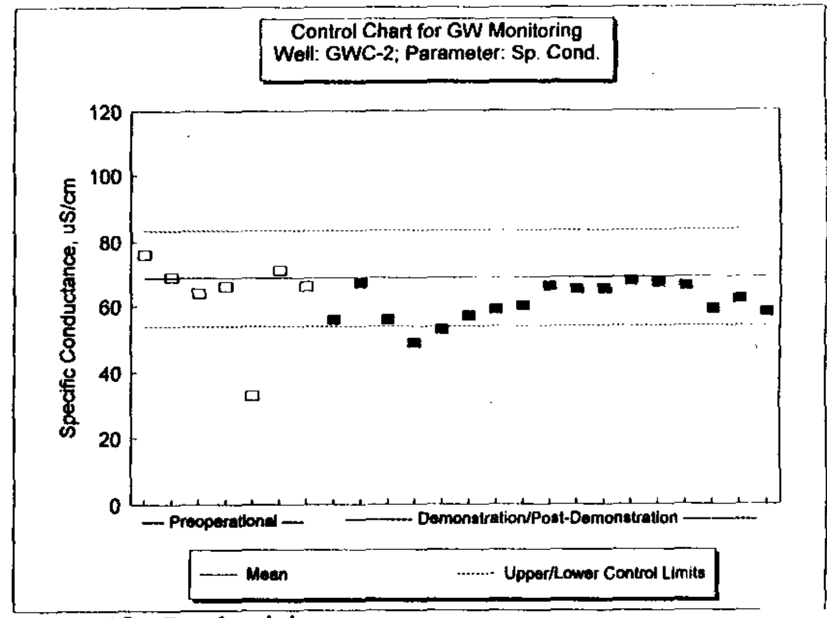


(h) Barium

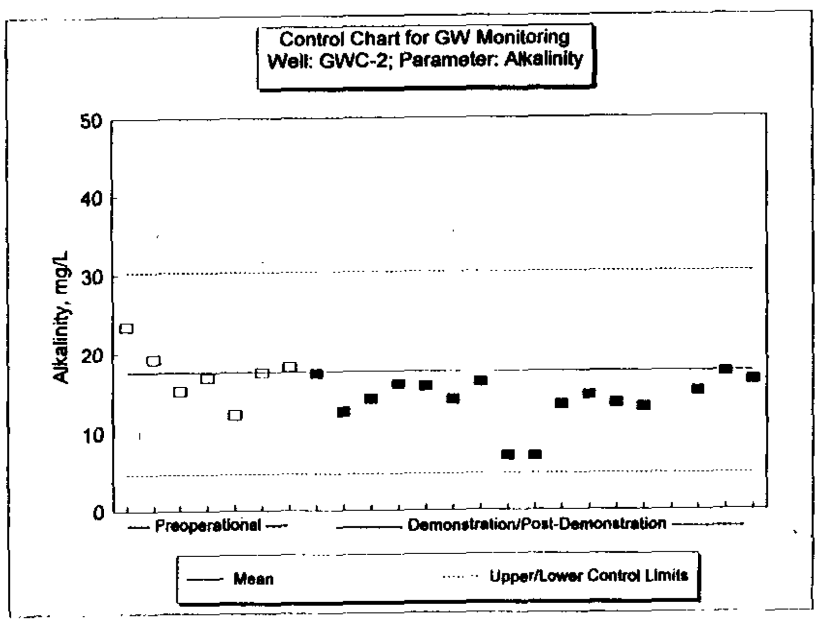
Figure D-3 (Continued)



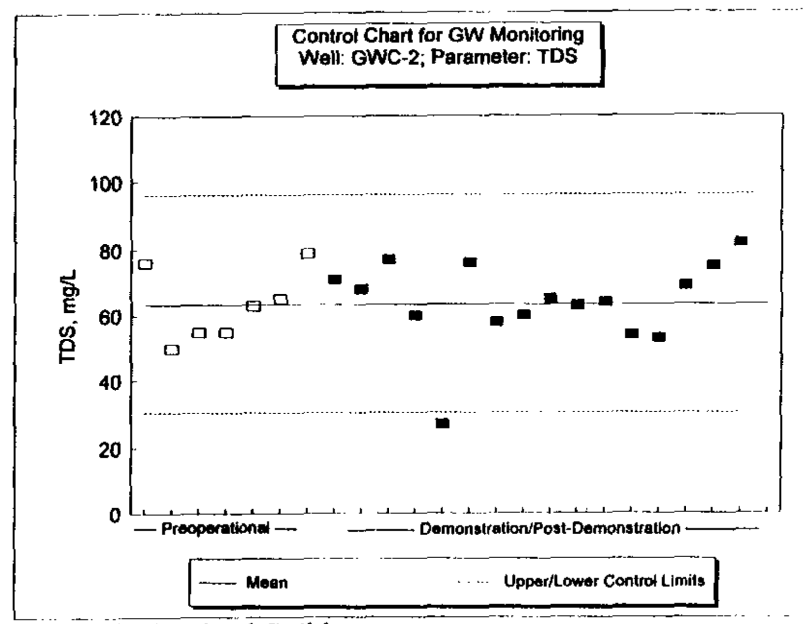
(i) pH



(j) Specific Conductivity

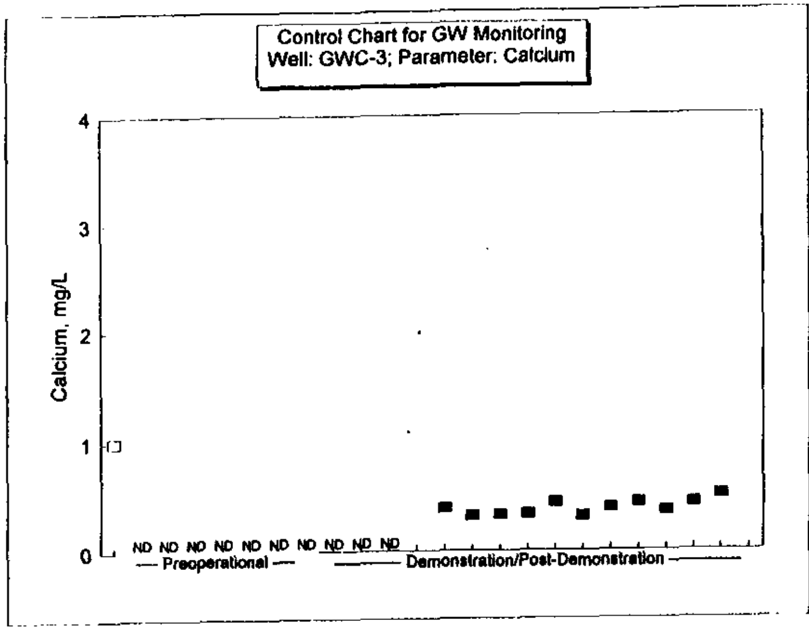


(k) Alkalinity

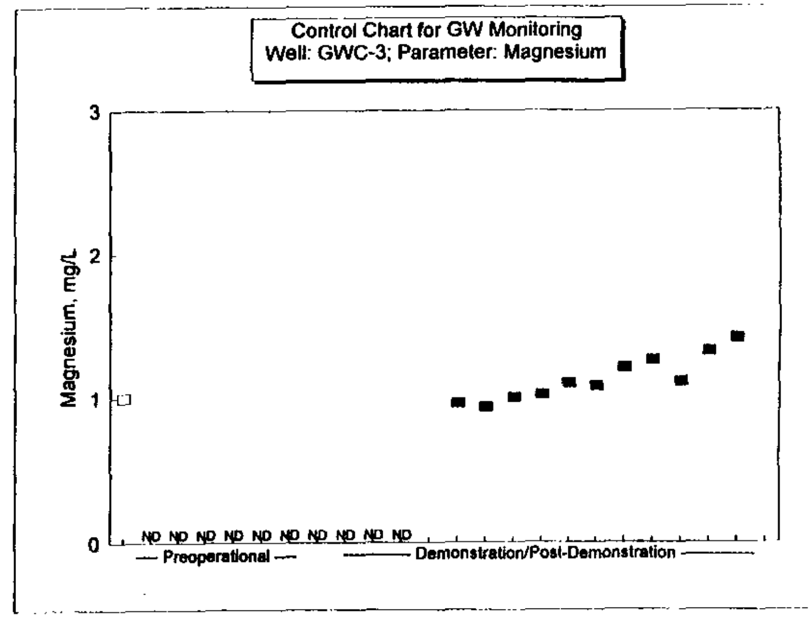


(l) Total Dissolved Solids

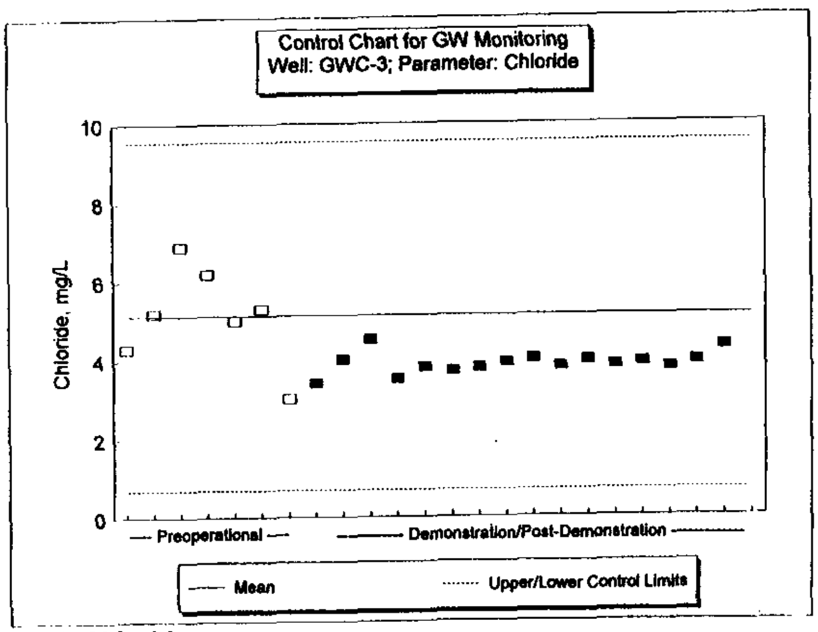
Figure D-3 (Continued)



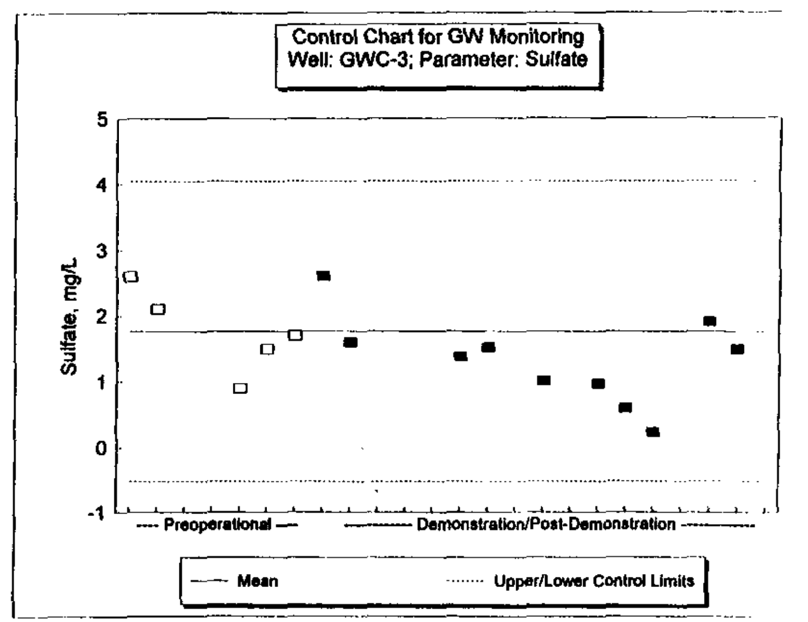
(a) Calcium



(b) Magnesium

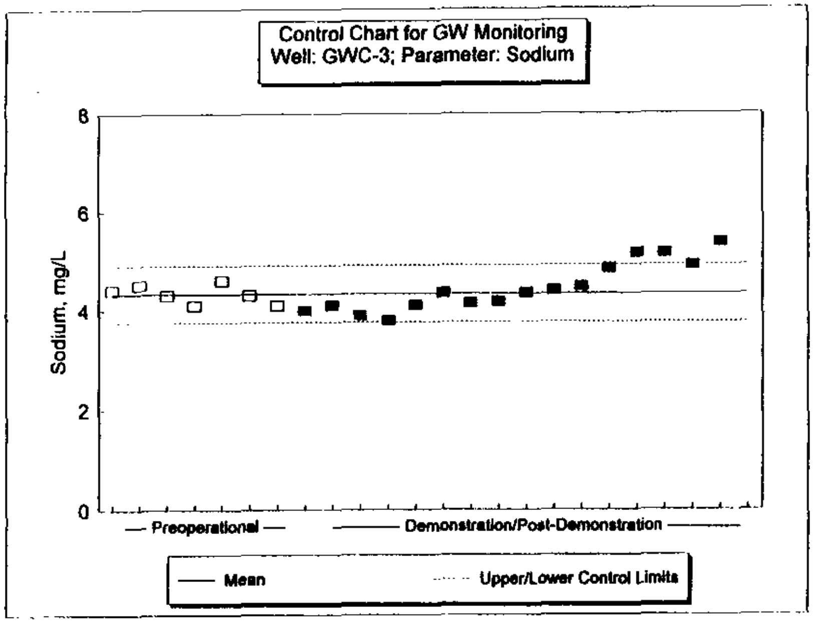


(c) Chloride

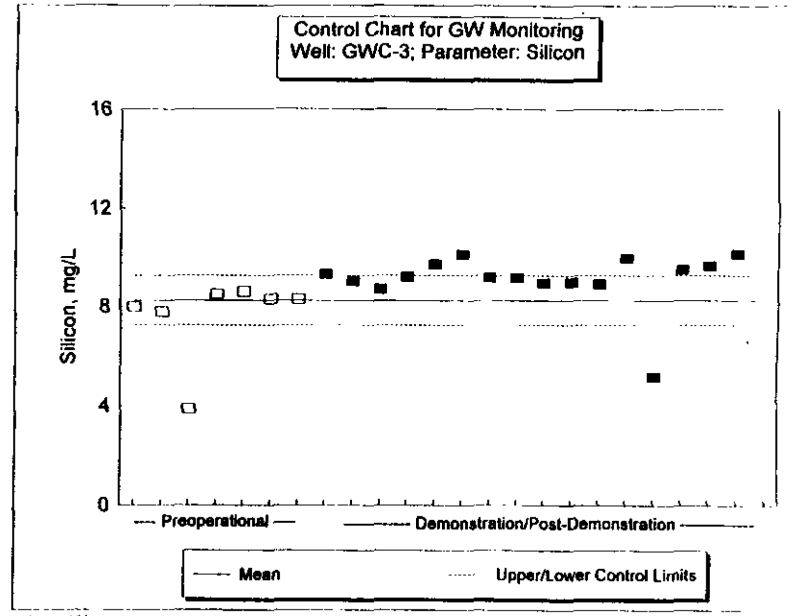


(d) Sulfate

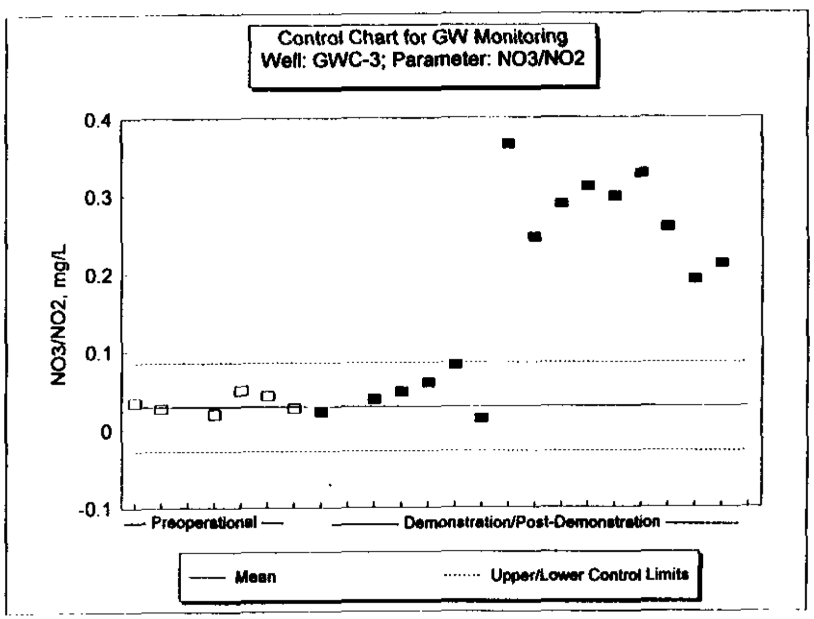
Figure D-4. Control Charts for Groundwater Monitoring: Well GWC-3 (Upgradient)



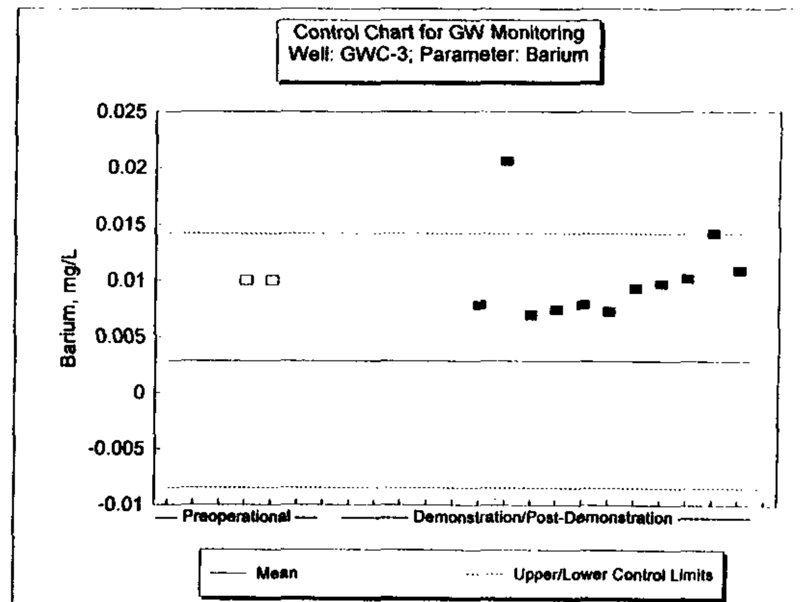
(e) Sodium



(f) Silicon

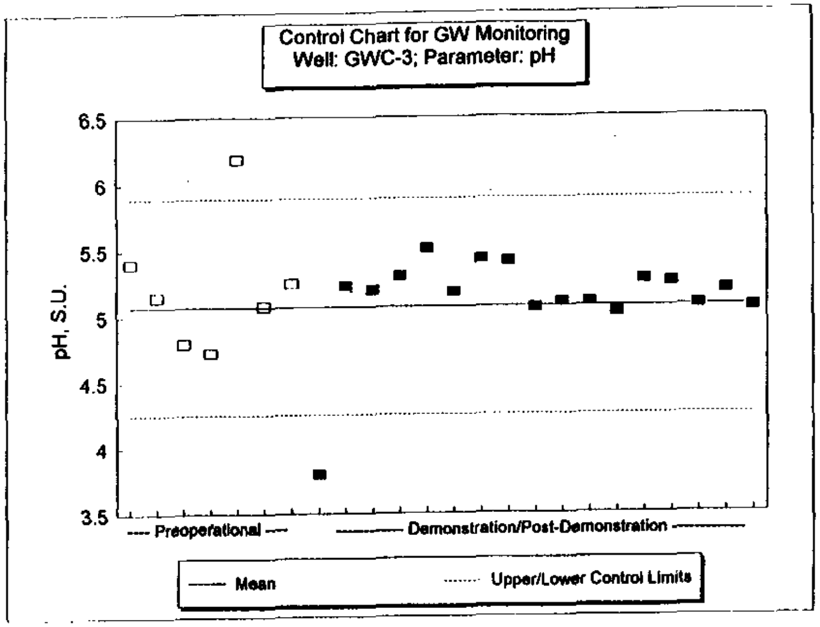


(g) Nitrate/Nitrite

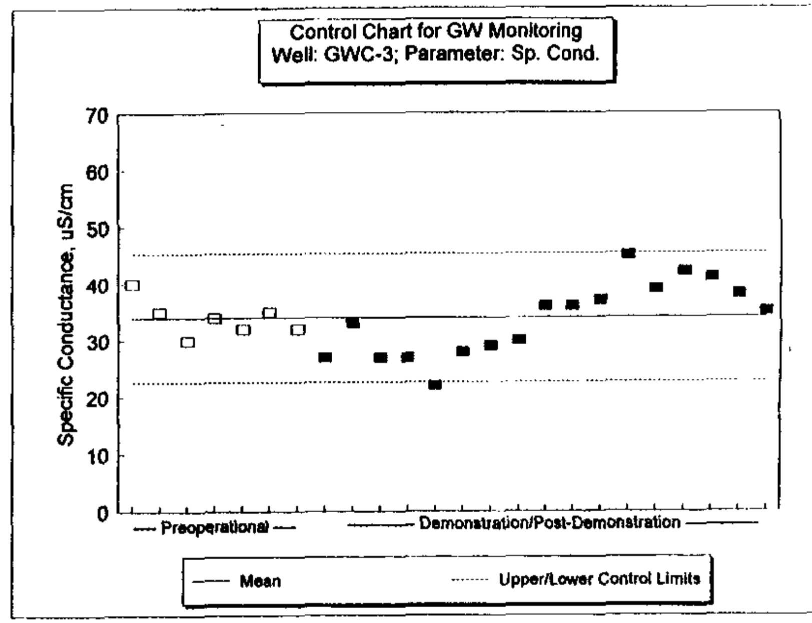


(h) Barium

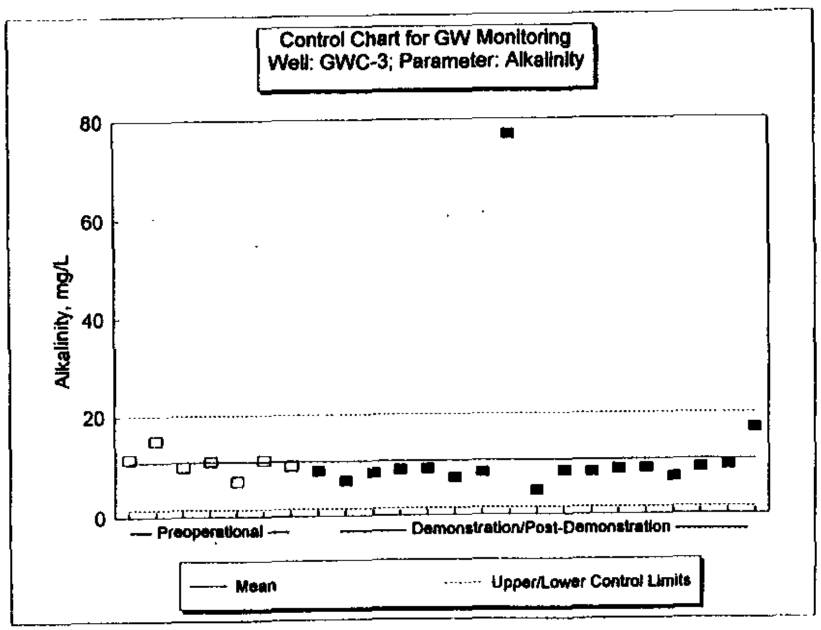
Figure D-4 (Continued)



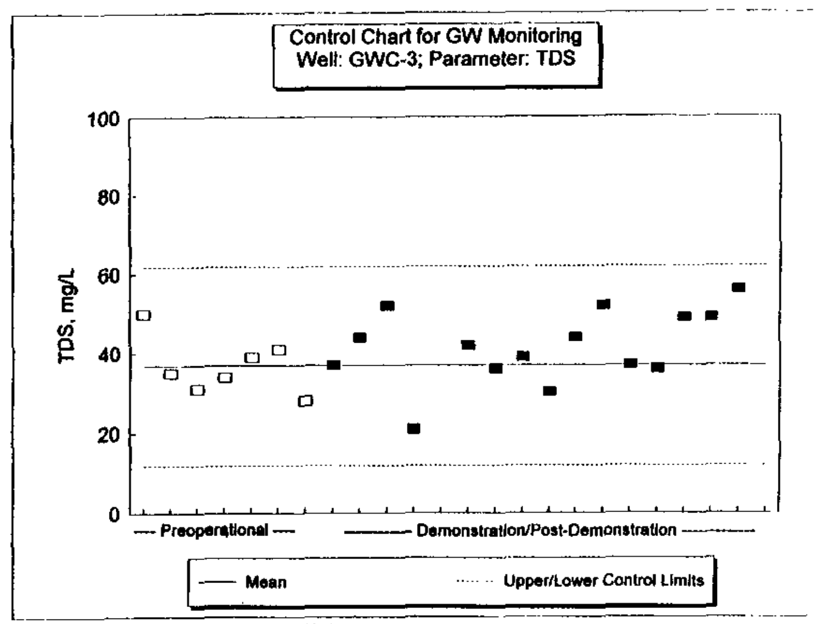
(i) pH



(j) Specific Conductivity

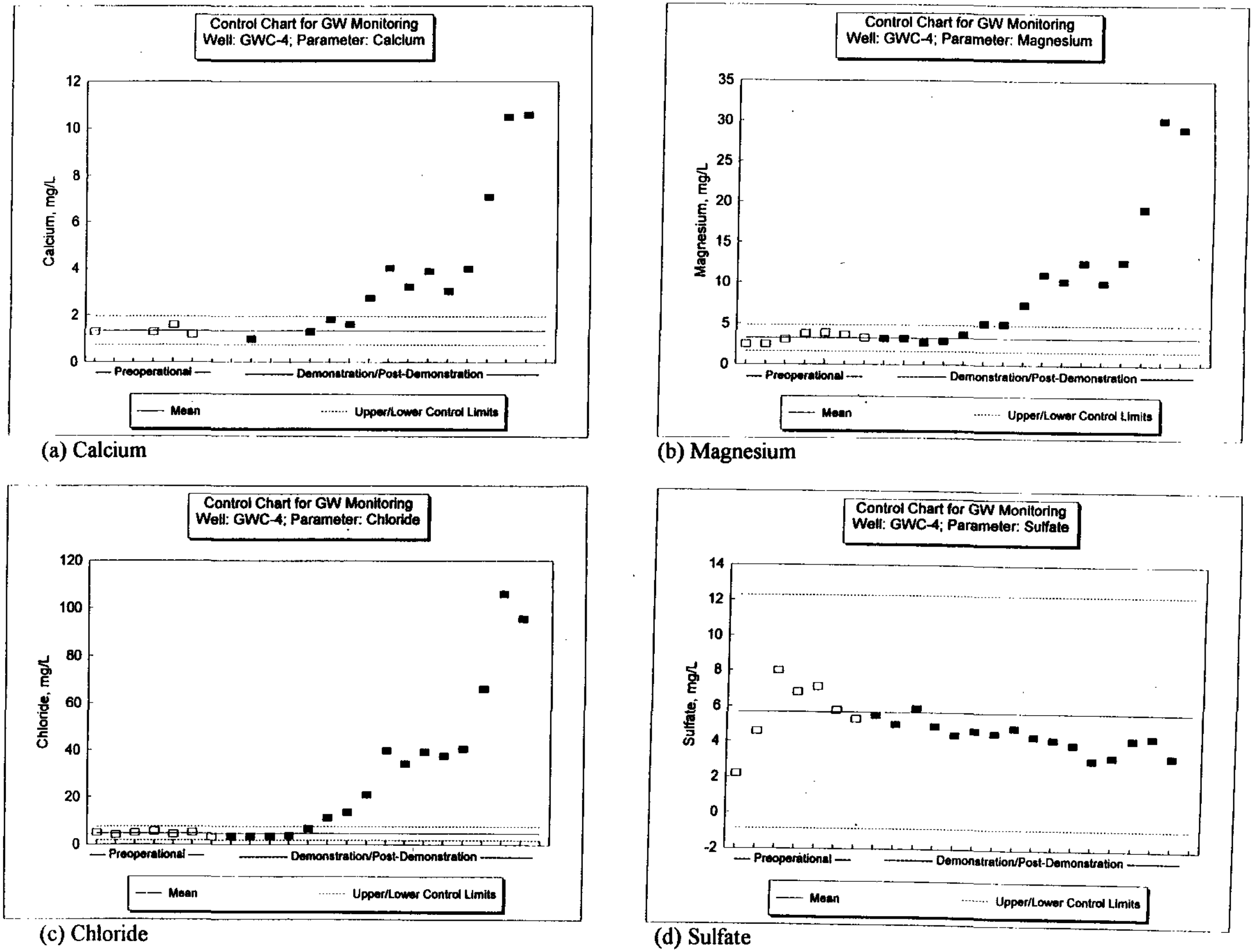


(k) Alkalinity



(l) Total Dissolved Solids

Figure D-4 (Continued)



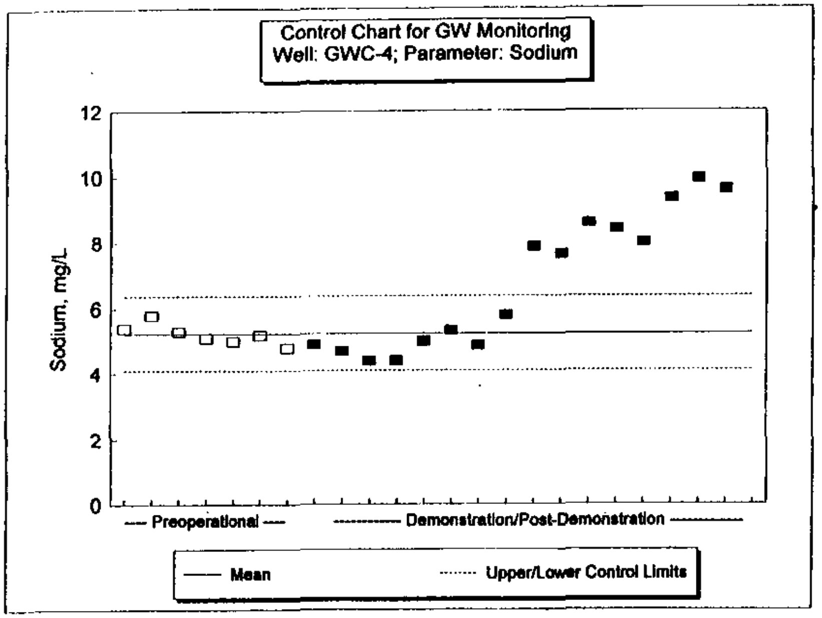
(a) Calcium

(b) Magnesium

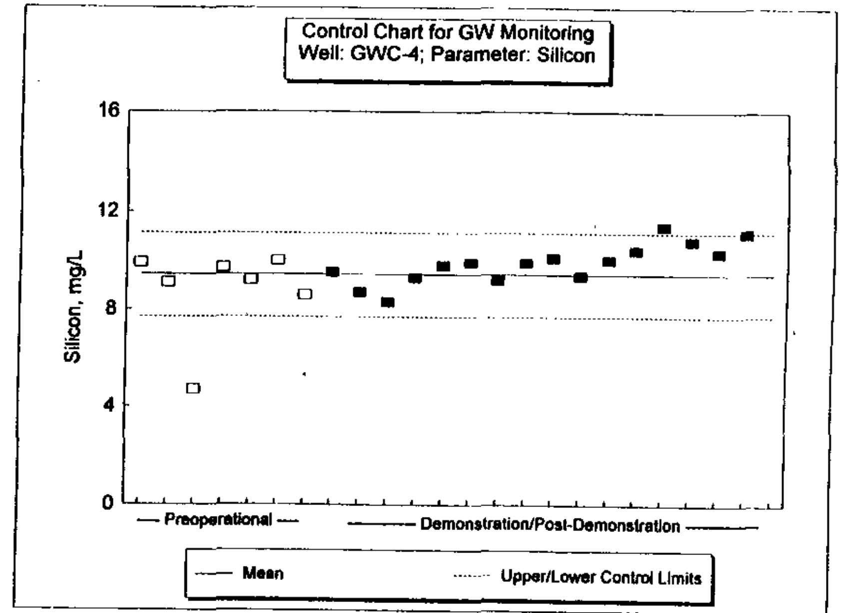
(c) Chloride

(d) Sulfate

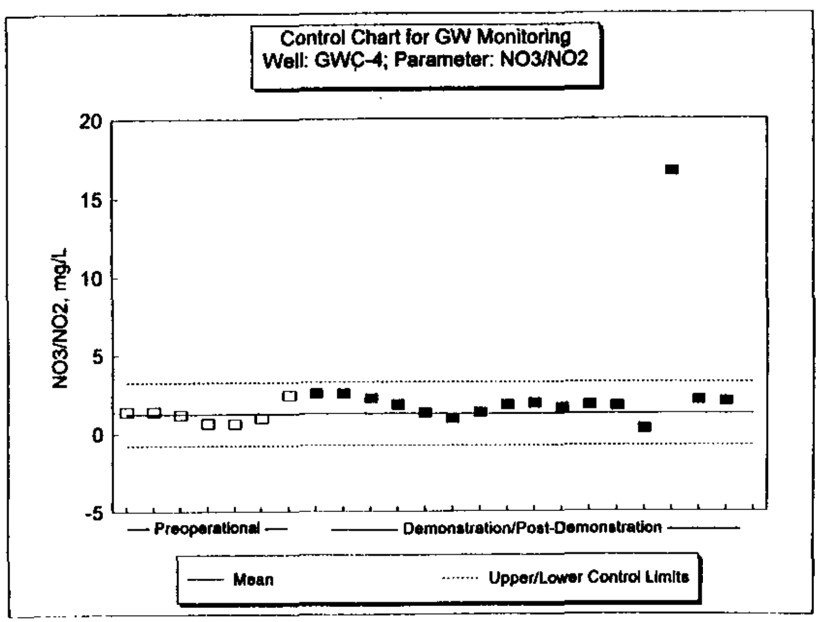
Figure D-5. Control Charts for Groundwater Monitoring: Well GWC-4 (Downgradient)



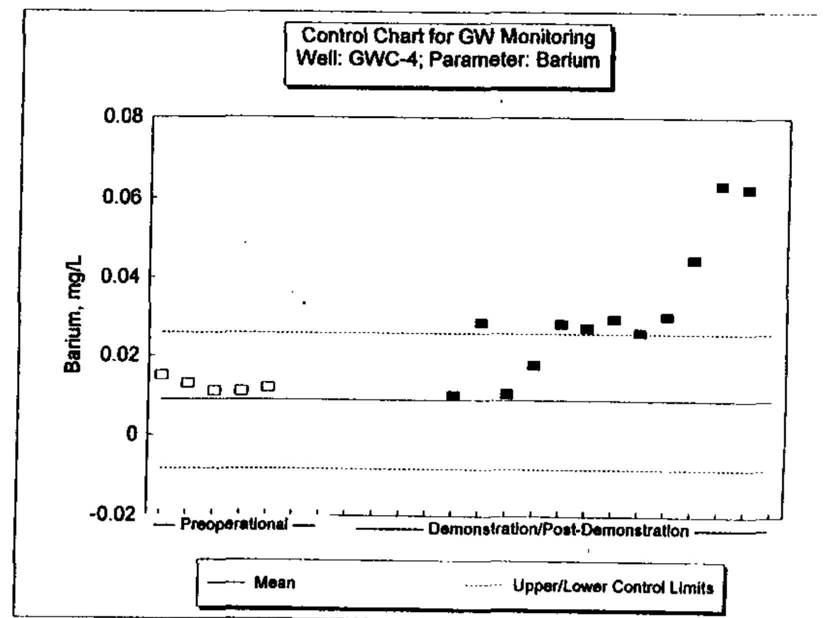
(e) Sodium



(f) Silicon

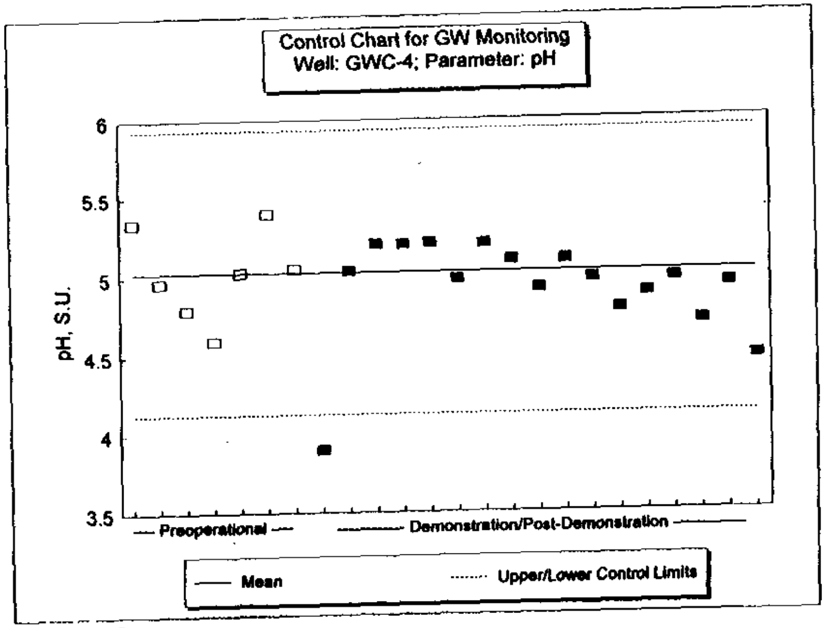


(g) Nitrate/Nitrite

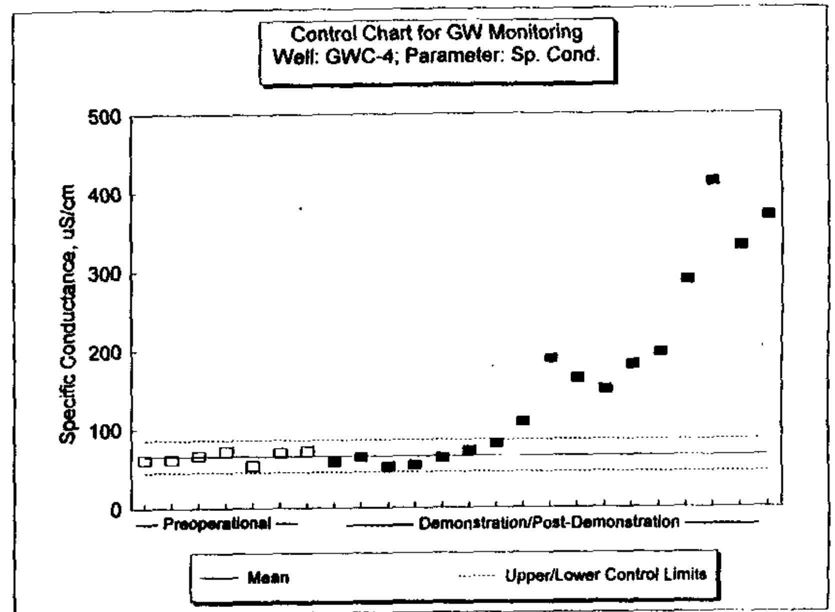


(h) Barium

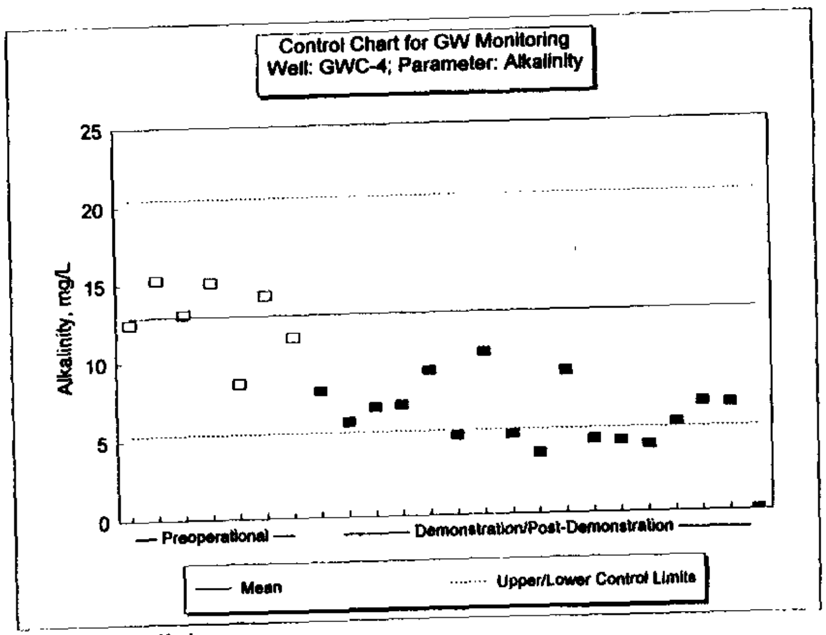
Figure D-5 (Continued)



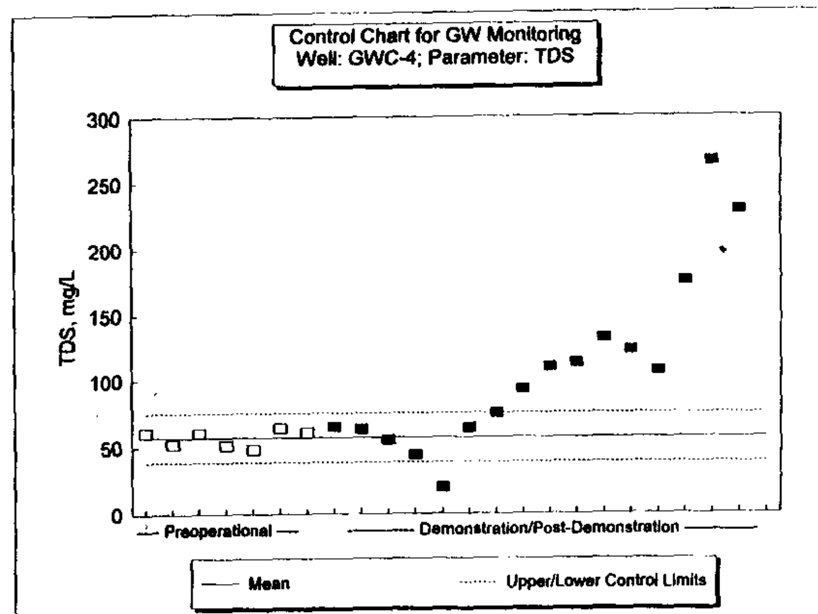
(i) pH



(j) Specific Conductivity

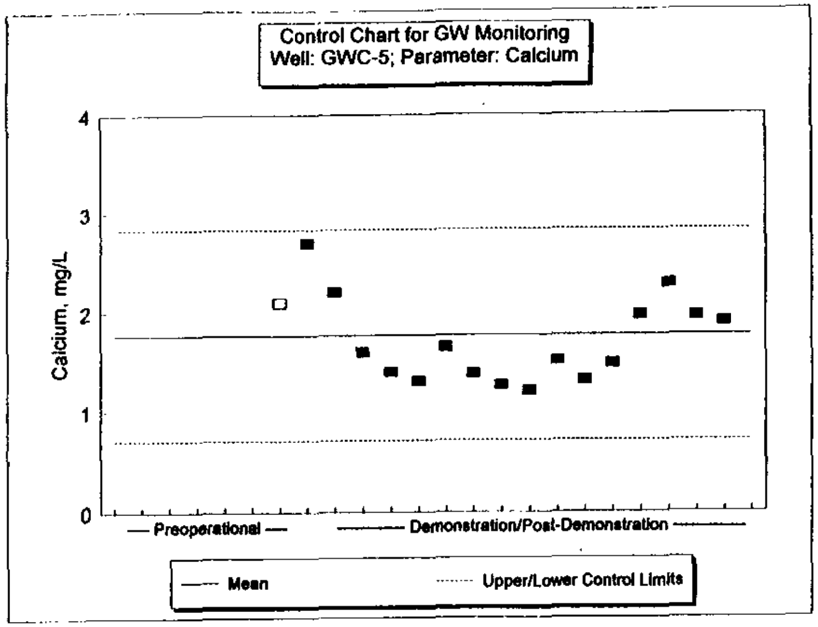


(k) Alkalinity

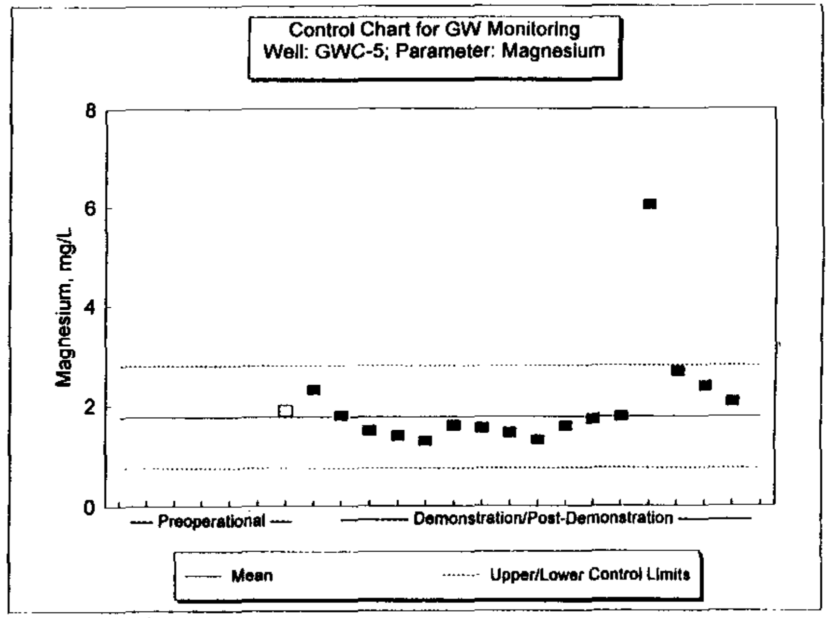


(l) Total Dissolved Solids

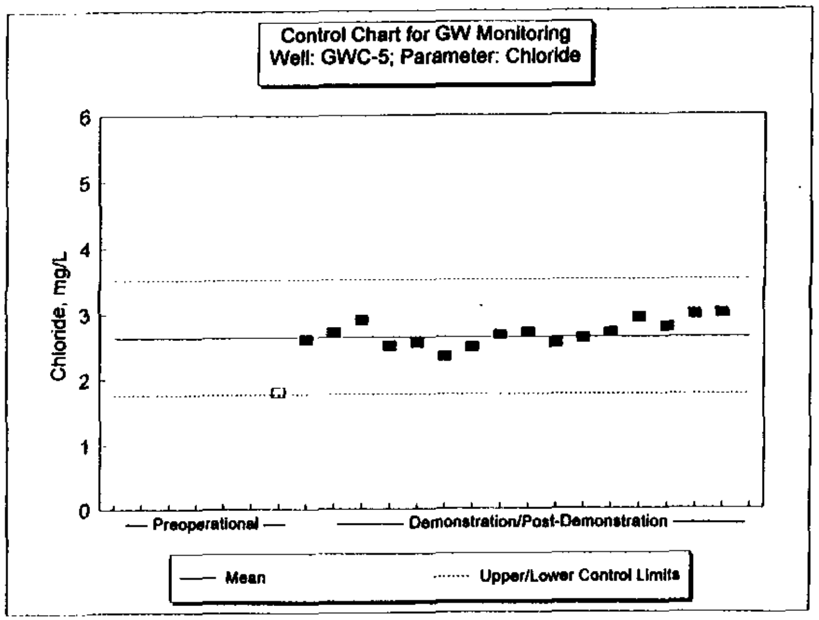
Figure D-5 (Continued)



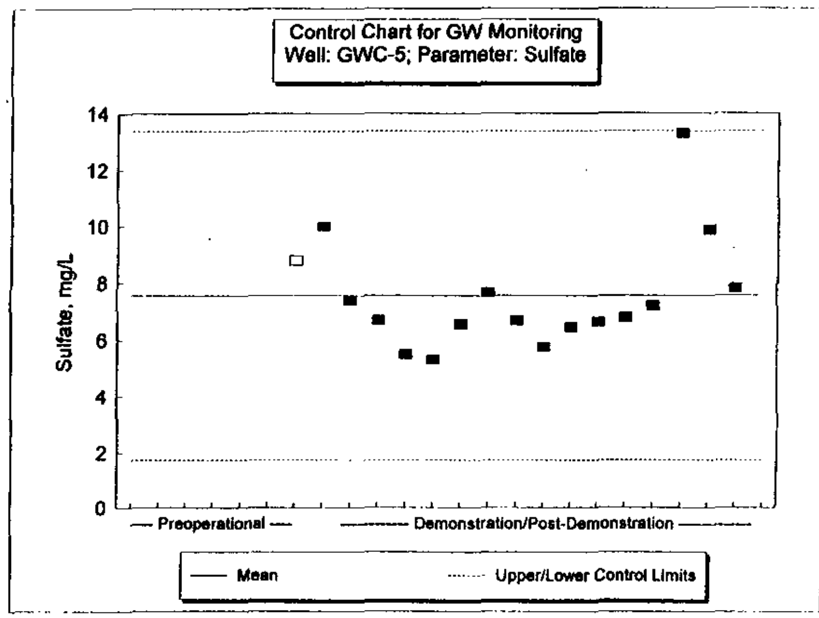
(a) Calcium



(b) Magnesium

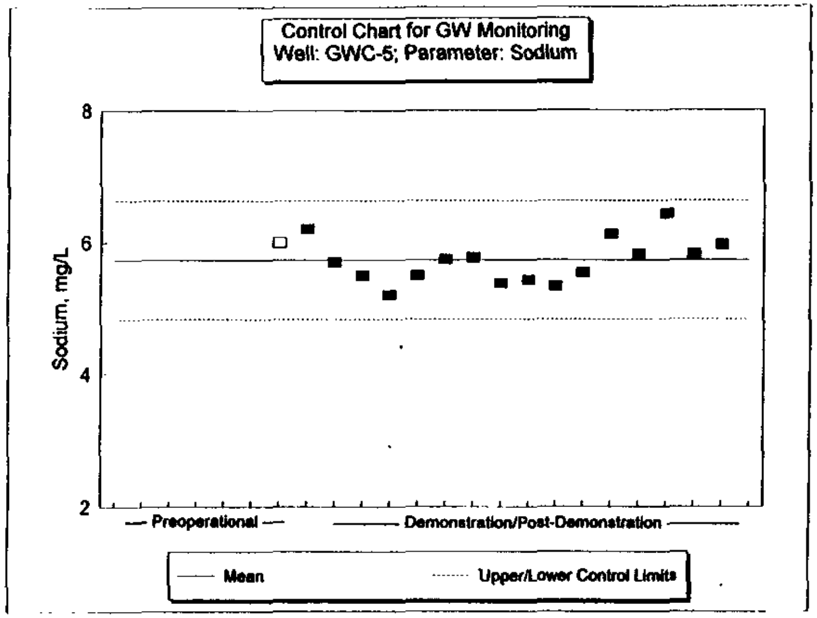


(c) Chloride

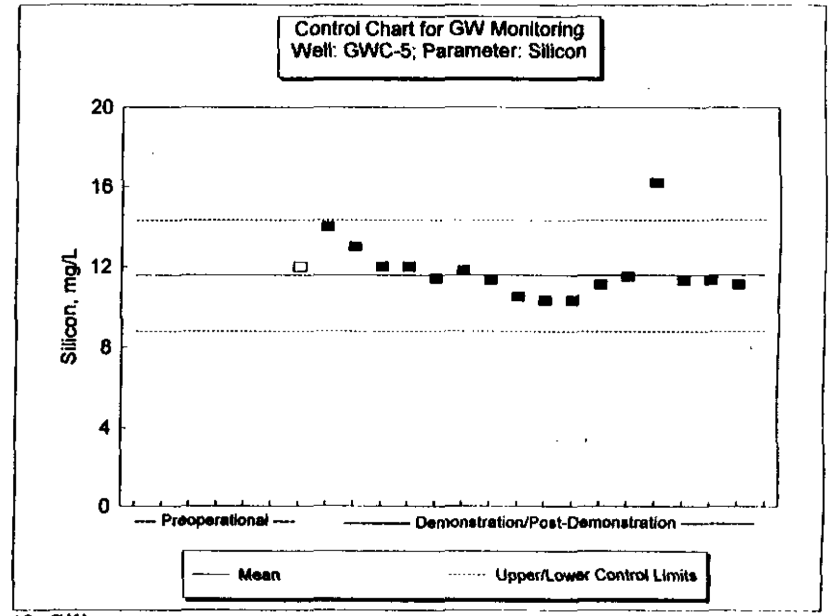


(d) Sulfate

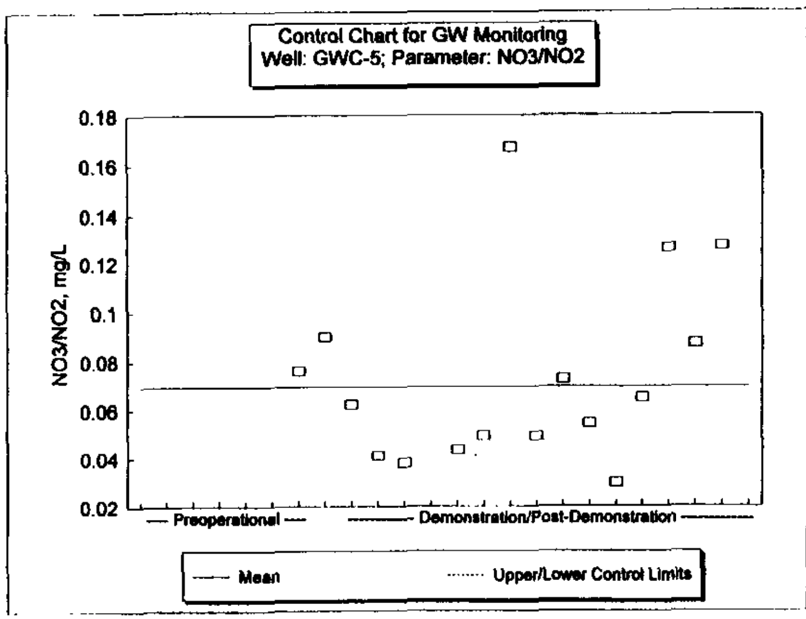
Figure D-6. Control Charts for Groundwater Monitoring: Well GWC-5 (Downgradient)



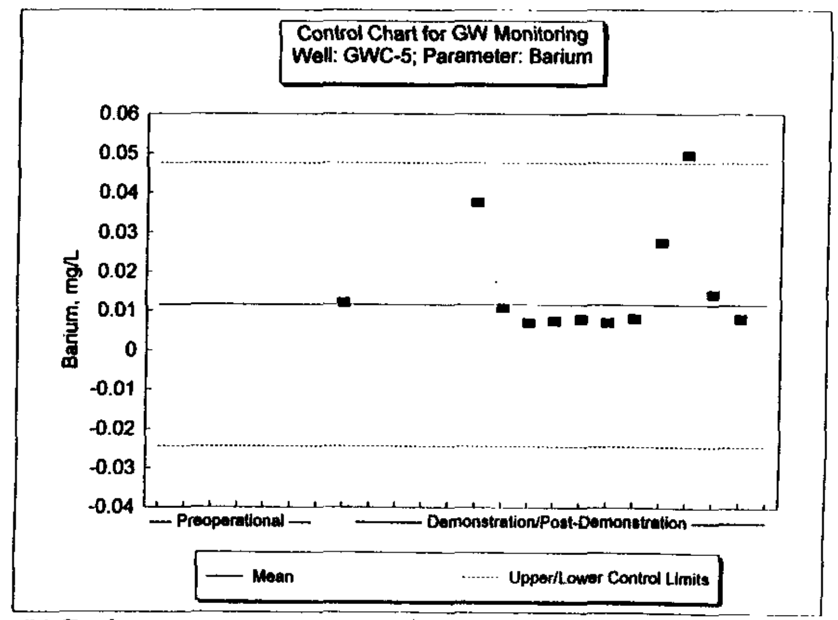
(e) Sodium



(f) Silicon

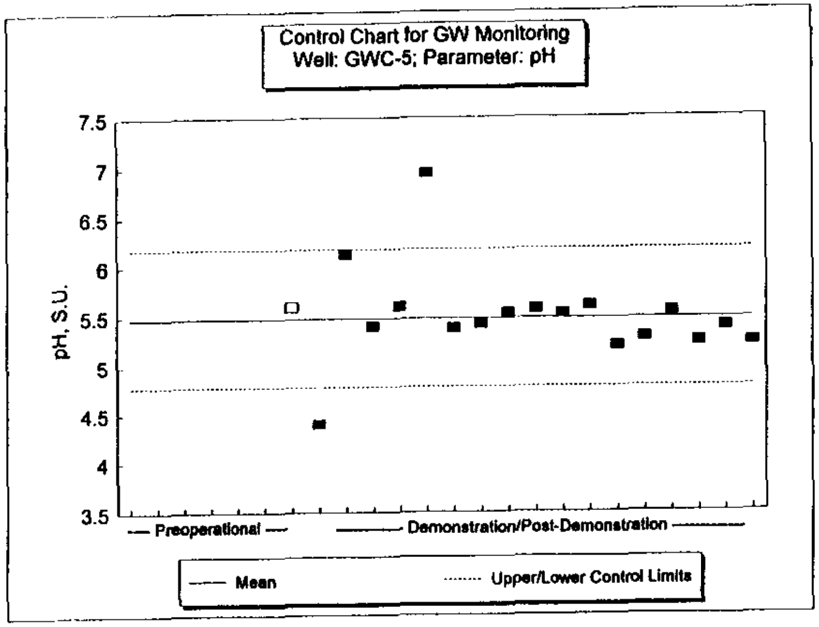


(g) Nitrate/Nitrite

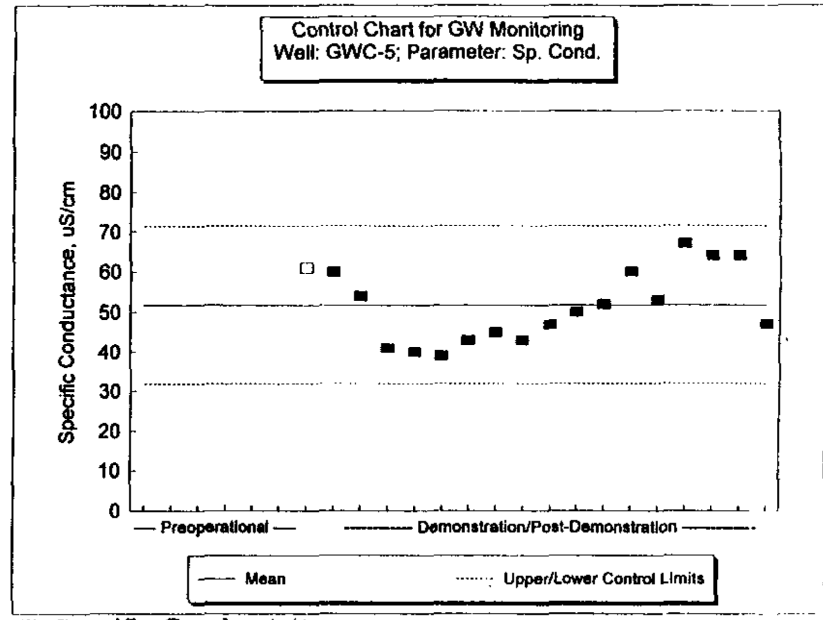


(h) Barium

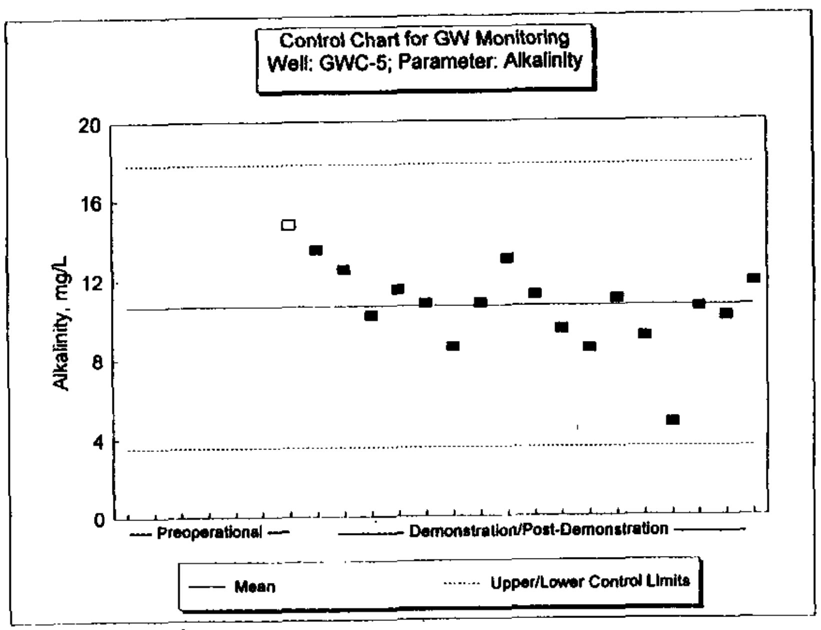
Figure D-6 (Continued)



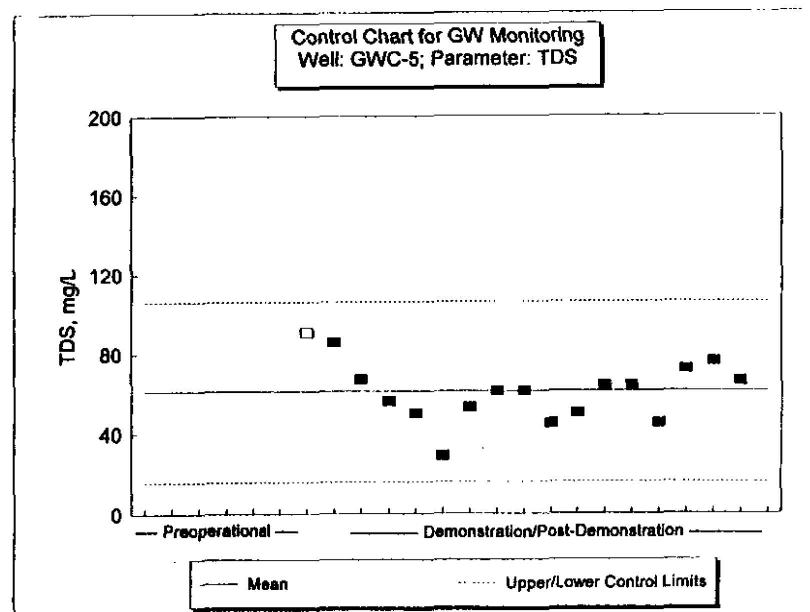
(i) pH



(j) Specific Conductivity



(k) Alkalinity



(l) Total Dissolved Solids

Figure D-6 (Continued)

Appendix E

Results of Duplicate Groundwater Analyses

TABLE E-1
RESULTS OF DUPLICATE GROUNDWATER ANALYSES

Parameter	Sample	Field Duplicate	% Diff.[a]	Duplicate Analysis of Field Dup.	% RPD[b]	Spec. Limit
1st Quarter 1993						
Total Organic Carbon	<1.0	3.0[d]	NC			
Total Dissolved Solids	44[d]	42[d]	-4.5			
Chloride	2.7	2.7	0.0			
Sulfate	1.6	1.6	0.0			
Calcium	2.2[d]	<1.0	NC			
Magnesium	1.8[d]	<1.0	NC			
Manganese	0.041[d]	<0.010	NC			
Silicon	13	8.8	-32.3			
Sodium	5.7	4.0[d]	-29.8			
Strontium	0.013[d]	0.0036[d]	-72.3			
2nd Quarter 1993						
Total Dissolved Solids	52	50	-3.8	49	2.0	15
Chloride	2.91	2.96	1.7			
Nitrate-nitrite	0.0387[d]	0.0309[d]	-20.2	0.0336	8.4	20
Lead	0.0033[d]	<0.0030	NC			
Silicon	8.73	9.10	4.2			
Sodium	3.88	4.03	3.9			
3rd Quarter 1993						
Total Dissolved Solids	21.0[d]	30.0[d]	42.9	31.0 [c]	3.3	15
Bromide	0.342	0.342	0.0	0.343	0.3	
Chloride	2.82	2.77	-1.8			
Nitrate-Nitrite (as N)	0.0475[d]	0.0523[d]	10.1	0.0556 [c]	6.1	20
Sodium	3.8	3.94	3.7			
Lead	0.006	0.005	-16.7			
Silicon	9.15	9.42	3.0			
Strontium	0.00307	0.00307	0.0			
4th Quarter 1993						
Chloride	2.79	3.15	12.9	2.78	12.5	20
Nitrate-Nitrite (as N)	0.059	0.056	-5.1	0.058	3.7	20
Bismuth	0.099 [d]	0.074 [d]	-25.3			
Sodium	4.1	4.0	-2.4			
Silicon	9.7	9.6	-1.0			
1st Quarter 1994						
Total Dissolved Solids	42.0 [d]	41.0 [d]	-2.4	41.0 [d]	0.0	15
Chloride	2.77	2.70	-2.5	2.71	0.37	20
Fluoride	0.0372 [c]	0.0345 [c]	-7.3			
Nitrate-Nitrite as N	0.0827	0.0835	1.0	0.0817	2.2	20
Sulfate	1.38	<0.0471	NC	<0.0471	NC	20
Radium 228	0.97 ± 0.52	0.96 ± 0.52	-1.0			
Gross Alpha	1.00 ± 0.40	0.98 ± 0.44	-2.0			
Gross Beta	1.53 ± 0.71	1.80 ± 0.72	17.6			
Bi-214	43 ± 19	34 ± 18	-21			

TABLE E-1 (CONTINUED)

Parameter	Sample	Field Duplicate	% Diff.[a]	Duplicate Analysis of Field Dup.	% RPD[b]	Spec. Limit
Pb-214	41 ± 22	41 ± 24	0			
Barium	0.00783 [c]	0.00747 [c]	-4.6			
Calcium	0.392 [d]	0.361 [d]	-7.9			
Iron	0.0142 [c]	0.00816 [c,d]	-42.5			
Magnesium	0.962	0.964	0.2			
Manganese	0.00206	0.00187	-9.2			
Sodium	4.35	4.43	1.8			
Sulfur	0.227	0.227	0.0			
Selenium	0.000730 [c,d]	0.000870 [c,d]	19.2	<0.000592[d]		
Silicon	10.1	10.3	2.0			
Strontium	0.00513	0.00467 [d]	-9.0			
2nd Quarter 1994						
Total Dissolved Solids	36.0 [d]	33.0 [d]	-8.3	36.0	8.7	15
Chloride	2.76	2.77	0.4	2.77	0.0	20
Nitrate-Nitrite (as N)	0.136	0.129	-5.1	0.127	1.6	20
Sulfate	1.52	1.45	-4.6	1.48	2.0	20
Boron	0.158 [c]	0.149 [c]	-5.7			
Barium	0.0206 [c]	0.008 [c]	-61.2			
Calcium	0.321 [c]	0.325 [c]	1.2			
Iron	0.103	0.267	159			
Magnesium	0.935	0.944	1.0			
Sodium	4.14	4.13	-0.2			
Silicon	9.16	9.19	0.3			
Strontium	0.00467 [d]	0.0056	19.9			
Zinc	0.013 [d]	0.00816 [d]	-37.2			
3rd Quarter 1994						
Total Dissolved Solids	39.0	42.0	7.7	40.0	4.9	15
Chloride	2.91	2.82	-3.1	2.82	0.0	20
Fluoride	0.0424 [c]	0.0390 [c]	-8.0			
Nitrate-Nitrite as N	0.366 [c]	0.249 [c]	-32	0.256 [c]	2.6	20
Total Organic Halides	<11.7	15.1 [d]	NC	12.0 [d]	23	20
Aluminum	<0.0523	0.147 [d]	NC			
Barium	0.00693	0.0715	930			
Calcium	0.328 [c]	0.539 [c]	64			
Iron	<0.00452	0.227	NC			
Magnesium	1.00	1.07	7.0			
Manganese	0.00289 [d]	0.00300 [d]	3.8			
Sodium	4.17	4.61	11			
Lead	0.0140	<0.00205	NC			
Silicon	9.15	9.53	4.2			
Strontium	0.00286 [d]	0.00429 [d]	50			
Tellurium	0.0405 [d]	<0.0317	NC			
Titanium	0.00164 [d]	0.00166 [d]	1.2			
Zinc	0.00569 [d]	0.0166 [d]	190			

TABLE E-1 (CONTINUED)

Parameter	Sample	Field Duplicate	% Diff.[a]	Duplicate Analysis of Field Dup.	% RPD[b]	Spec. Limit
4th Quarter 1994						
Total Dissolved Solids	30	28	-6.7	31	10	15
Chloride	3.02	3.00	-0.7	2.89	3.7	20
Fluoride	0.0340 [c]	0.0325 [c]	-4.4			
Sulfate	1.01	<0.0471	NC	1.03	NC	20
Nitrate-Nitrite as N	0.246	0.232	-5.7	0.234	0.9	20
Barium	0.00742	0.00742	0.0			
Bismuth	0.0336 [d]	<0.0275	NC			
Calcium	0.335 [c]	0.338 [c]	0.9			
Mercury	<0.000033	0.00007 [d]	NC			
Iron	0.0203 [c,d]	0.0133 [c,d]	-34.5			
Lithium	0.0103 [c,d]	0.00948 [c,d]	-8.0			
Magnesium	1.02	0.999	-2.1			
Sodium	4.34	4.34	0.0			
Antimony	<0.00146	0.00182 [d]	NC			
Silicon	8.94	8.92	-0.2			
Tin	0.0162 [d]	<0.0145	NC			
Strontium	0.00202 [d]	0.00161 [d]	-20.3			
Zinc	<0.00402 [c]	0.00675 [c,d]	NC			
1st Quarter 1995						
Total Dissolved Solids	113	109	-3.5	104	4.7	15
Bromide	6.80	7.01	3.1	7.06	0.7	20
Chloride	34.1	34.6	1.5	32.9	5.0	20
Fluoride	0.0231[c]	0.0225 [c]	-2.6	0.0224 [c]	0.4	20
Sulfate	4.18	4.25	1.7	4.19	1.4	20
Nitrate-Nitrite as N	1.58	1.58	0.0	1.55	1.9	20
Total Organic Halides	17.2[d]	12.2 [d]	-29.1	19.6 [d]	46.5	20
Aluminum	<0.0523	0.0999 [d]	NC			
Boron	0.0856	0.0779	-9.0			
Barium	0.0273[c]	0.0293 [c]	7.3			
Calcium	3.21[c]	3.32 [c]	3.4			
Chromium	<0.00524	0.00589 [d]	NC			
Iron	0.0937[c]	0.139 [c]	48.3			
Magnesium	10.2	10.5	2.9			
Manganese	0.129	0.134	3.9			
Molybdenum	<0.00739[c]	0.0173 [c,d]	NC			
Sodium	7.63	7.84	2.8			
Phosphorus	0.524[d]	0.671	28.1			
Sulfur	1.31	1.43	9.2			
Antimony	0.00116[d]	0.00224 [d]	93			
Silicon	9.36[c]	8.76 [c]	-6.4			
Strontium	0.0261	0.0265	1.5			
Titanium	<0.00159	0.0039 [d]	NC			

TABLE E-1 (CONTINUED)

Parameter	Sample	Field Duplicate	% Diff.[a]	Duplicate Analysis of Field Dup.	% RPD[b]	Spec. Limit
2nd Quarter 1995						
Total Dissolved Solids	156	127	-18.6	132	3.9	15
Chloride	39.1	38.5	-1.5	38.8	0.8	20
Fluoride	0.0268[c]	0.0311[c]	16.0	0.0258[c]	18.6	20
Sulfate	3.91	3.91	0.0	3.87	1.0	20
Nitrate-Nitrite as N	1.79	1.80	0.6	1.78	1.1	20
Total Organic Halides	24.1[d]	16.2[d]	-32.8	18.8[d]	14.9	20
Boron	0.214	0.208	-2.8			
Barium	0.0296[c]	0.0293[c]	-1.0			
Calcium	3.89[c]	3.71[c]	-4.6			
Iron	0.0398[c]	0.0394[c]	-1.0			
Magnesium	12.5	11.8	-5.6			
Manganese	0.190[c]	0.192[c]	1.1			
Molybdenum	0.00857[d]	<0.00739	NC			
Sodium	8.61	8.61	0.0			
Phosphorus	0.331[d]	0.684	106.6			
Sulfur	1.28	1.16	-9.4			
Silicon	10.0	10.1	1.0			
Tin	<0.0145	0.0224[d]	NC			
Strontium	0.0352	0.0323	-8.2			
Dibromomethane	0.225[c,d]	0.228[b,c]	1.3			
3rd Quarter 1995						
Total Dissolved Solids	123	125	1.6			
Chloride	37.5	37.9	1.1	37.1	2.1	20
Fluoride	0.0325[c]	0.0314[c]	-3.4	0.0317[c]	1.0	20
Sulfate	3.03	3.19	5.3	3.18	0.3	20
Nitrate-Nitrite as N	1.74	1.52	-12.6	1.48	2.7	20
Total Organic Halides	25[d]	29.8[d]	19.2			20
Boron	0.234	0.225	-3.8			
Barium	0.0262	0.0293	11.8			
Calcium	3.03	3.20	5.6			
Cobalt	0.0126[c]	0.0227[c]	80.2			
Chromium	0.0113[d]	0.00834[d]	-26.2			
Mercury	0.00016	0.000070[d]	-56.3			
Iron	0.0217[c]	0.0769[c]	254.4			
Magnesium	10.0	10.5	5.0			
Manganese	0.124[c]	0.127[c]	2.4			
Sodium	8.42	8.65	2.7			
Phosphorus	0.462	0.461	-0.2			
Sulfur	0.826[d]	0.620[d]	-24.9			
Antimony	0.00194[c,d]	0.00266[c,d]	37.1			
Silicon	10.4	10.6	1.9			
Strontium	0.0290	0.0299	3.1			

TABLE E-1 (CONTINUED)

Parameter	Sample	Field Duplicate	% Diff.[a]	Duplicate Analysis of Field Dup.	% RPD[b]	Spec. Limit
4th Quarter 1995						
Total Dissolved Solids	36.0	42.0	17	34.0	21	15
Chloride	3.52	3.45	-2	3.50	1	20
Fluoride	0.0307[c]	0.0302[c]	-2	0.0281[c]	7	20
Sulfate	0.233	<0.0491	NC	<0.0491	NC	20
Nitrate-Nitrite as N	0.328	0.406	24	0.414	2	20
Aluminum	0.0338[d]	<0.0270	NC			
Arsenic	0.0012[d]	<0.000887	NC			
Boron	0.0330[d]	<0.0105	NC			
Barium	0.00973	0.00865[c]	-11			
Calcium	0.436	0.390	-11			
Cobalt	0.0103[d]	<0.00987	NC			
Iron	0.0511[d]	0.238	366			
Magnesium	1.26	1.14	-10			
Sodium	5.14	5.03	-2			
Sulfur	0.125[d]	<0.118	NC			
Selenium	0.000840[d]	<0.000821	NC			
Silicon	5.18	0.242	-95			
Strontium	0.00369[d]	0.00369[d]	0			
Titanium	0.00265[c,d]	0.00199[c,d]	-25			
Zinc	0.0160[c,d]	0.0106[c,d]	-34			
1st Quarter 1996						
Total Dissolved Solids	49.0	44.0	-10	51.0	15	15
Chloride	3.46	3.49	1			
Fluoride	0.0365[c]	0.0361[c]	-1			
Sulfate	<0.0491	1.17	NC			
Total Organic Carbon	0.176[c,d]	1.41[c]	700			
Nitrate-Nitrite as N	0.259[c]	0.291[c]	12			
Aluminum	0.0228[c,d]	0.0392[c,d]	72			
Barium	0.0102[c]	0.0122[c]	20			
Calcium	0.361	0.378	5			
Chromium	0.00188	0.00268	43			
Iron	0.0150[c,d]	0.0335[c,d]	123			
Magnesium	1.11	1.18	6			
Manganese	0.00274	0.00303	11			
Nickel	0.00292[c]	0.00321[c]	10			
Potassium	0.128	0.136	6			
Sodium	5.14	5.30	3			
Sulfur	0.0569	0.0627	10			
Selenium	0.001040[c,d]	0.00112[c,d]	8			
Silicon	9.48	9.88	4			
Strontium	0.00387[c]	0.00408[c]	5			
Titanium	0.00042[c,d]	0.00174[c]	314			

TABLE E-1 (CONTINUED)

Parameter	Sample	Field Duplicate	% Diff.[a]	Duplicate Analysis of Field Dup.	% RPD[b]	Spec. Limit
2nd Quarter 1996						
Total Dissolved Solids	266	262	-1.5	274	4.5	15
Bromide	1.08	1.06	-1.9			
Chloride	106	99.5	-6.5			
Fluoride	0.0305[c]	0.0379[c]	19.5			
Sulfate	4.33	4.29	-0.9			
Nitrate-Nitrite as N	2.10	2.11	0.5			
Total Organic Halides	24.6[d]	32.2[d]	30.9	27.0[d]	17.6	20
Aluminum	0.179[c]	1.62[c]	805			
Boron	1.98	2.37	19.7			
Barium	0.0634	0.11	73.5			
Beryllium	0.00135[c]	0.00156[c]	15.6			
Calcium	10.5	12.8	21.9			
Cadmium	<0.000156	0.00038[d]	NC			
Cobalt	0.00406	0.00632	55.7			
Copper	<0.00136	0.00278[d]	NC			
Chromium	0.00275	0.025	809			
Mercury	0.00023	0.00024	4.2			
Iron	0.245	2.23	810			
Potassium	0.523	1.33	154			
Magnesium	30.2	37.6	24.5			
Manganese	0.424	0.534	25.9			
Sodium	9.95	11.1	11.6			
Nickel	0.00133[d]	0.00577	334			
Phosphorus	0.037[c]	0.158[c]	327			
Sulfur	1.44	1.59	10.4			
Selenium	0.00399[d]	<0.00258	NC			
Silicon	10.3	14.7	42.7			
Strontium	0.0858[c]	0.104[c]	21.2			
Titanium	0.0241	0.306	1170			
Vanadium	<0.000681	0.00567	NC			
Zinc	<0.00309[c]	0.00602[c,d]	NC			
Acetone	<0.274	19.8	NC			
Benzene	<0.0633	0.174[d]	NC			
Ethylbenzene	<0.0655	0.0724[d]	NC			
Methylene chloride	1.02[c]	1.17[c]	14.7			
Toluene	<0.0537	0.55	NC			
m&p-Xylene	<0.184	0.196[d]	NC			
3rd Quarter 1996						
Total Dissolved Solids	229[c]	261[c]	14.0	271[c]	3.8	15
Bromide	0.737	0.808	9.6			
Chloride	95.5	107	12.0			
Fluoride	0.0352[c]	0.035[c]	-0.6			
Sulfate	3.21	3.25	1.2			
Total Organic Carbon	1.25	1.03	-17.6			

TABLE E-1 (CONTINUED)

Parameter	Sample	Field Duplicate	% Diff.[a]	Duplicate Analysis of Field Dup.	% RPD[b]	Spec. Limit
Nitrate-Nirite as N	2.02	2.2	8.9			
Total Organic Halides	50.8[d]	60.6[d]	19.3	54[d]	11.5	20
Silver	0.000880[d]	<0.000501	NC			
Aluminum	0.0708[c]	0.072	1.7			
Boron	1.98	2.03	2.5			
Barium	0.0626	0.0639	2.1			
Beryllium	0.00107[c]	0.00115[c]	7.5			
Calcium	10.6[c]	11.0[c]	3.8			
Cobalt	0.00381	0.00411	7.9			
Chromium	0.00044[d]	0.00078[d]	77.3			
Potassium	0.716[c]	0.730[c]	2.0			
Magnesium	29	30	3.4			
Manganese	0.475	0.486	2.3			
Sodium	9.64	9.85	2.2			
Nickel	0.00131[d]	0.00173[d]	32.1			
Phosphorus	0.00854[d]	0.0070[d]	-18.0			
Lead	0.0041[d]	0.00248[d]	-39.5			
Sulfur	1.38	1.40	1.4			
Antimony	<0.000919	0.00263[d]	NC			
Selenium	0.00183[d]	0.00181[d]	-1.1			
Silicon	11.1	11.3	1.8			
Tin	0.00213[c,d]	0.00145[c,d]	-31.9			
Strontium	0.0809	0.0828	2.3			
Titanium	0.00036[d]	0.00028[d]	-22.2			
Uranium	0.105[c]	0.128[c]	21.9			
Tungsten	0.00334[d]	<0.00183	NC			

[a] % Difference = (Field Duplicate - Sample) x 100/sample.

[b] RPD = Relative Percent Difference, defined as follows:

$$RPD = \frac{(\text{Larger Value} - \text{Smaller Value})}{(\text{Larger Value} + \text{Smaller Value})/2} \times 100\%$$

[c] Detected in the method blank.

[d] Measured concentration is less than five times the detection limit; results are expected to be less accurate as concentrations approach the detection limit.

NC = Not computed.