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RE-INJECTION DEMONSTRATION TEST REPORT FOR THE AQUIFER RESTORATION AND WASTEWATER PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

MAY 2000

U.S. DEPARTMENT OF ENERGY

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EXECUTIVE SUMMARY

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September 2, 1999 marked the completion of a successful one-year re-injection demonstration at Fernald. Information collected during the demonstration indicates that the current groundwater remedy should be modified to include the use of re-injection. The following conclusions and recommendations are the most important ones to be drawn from the data and discussions in this report.

Conclusions:

- Continued use of re-injection could result in a predicted (net present value) cost savings of $14.3 million dollars. This assumes that the use of re-injection will reduce the OU5 ROD approved aquifer remediation by seven years.
- Fernald can provide a reliable source of injection water that is protective of the aquifer.
- The costs for maintaining the re-injection wells appear reasonable.
- Treatments used to address plugging in the re-injection wells appear adequate under conditions experienced in the demonstration.
- Capture of the 20 μg/L uranium plume was maintained during the demonstration.
- Re-Injection did not displace the base of the 20 μg/L uranium plume into deeper regions of the aquifer. Re-injection effectively flushed contamination south of the re-injection wells, but was ineffective in flushing uranium contamination from between the re-injection wells.
- A stagnation zone was created at the southern Fernald property boundary, which provided a hydraulic barrier to prevent further southward migration of on-property contamination.
- Re-Injection had a very minor impact on the chemistry of the groundwater in the Great Miami Aquifer.

Future recommendations/concerns for use of re-injection include:

- Sampling of the injectate, in addition to the monthly FRL sampling, should continue for pH, Eh total suspended solids (TSS). The TSS samples should be composite samples.
- Monitoring for Eh and pH in the aquifer, in the area of re-injection, should continue.
- A direct-push sampling program along the southern Fernald property boundary should continue.
- The injection well treatment strategy should continue to be followed to watch for signs of future residual plugging development within the re-injection wells.
- The monthly injectable grab sample, should be changed to a 1-day, daily composite sample.

1.0 INTRODUCTION

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This report presents the results of a year long groundwater re-injection demonstration conducted at the U.S. Department of Energy (DOE) Fernald Site, near Cincinnati, Ohio, from September 2, 1998 to September 2, 1999.

During the Re-Injection Demonstration groundwater was extracted from the Great Miami Aquifer, treated for uranium in the Fernald Advanced Waste Water Treatment (AWWT) Expansion Facility, and re-injected back into the Great Miami Aquifer through five re-injection wells at a target rate of 200 gallons per minute (gpm) per well. The five re-injection wells (IW-8, IW-9, IW-10, IW-11 and IW-12) were located along the southern property boundary of the Fernald Site as shown in Figure 1-1. Over the course of the Re-Injection Demonstration approximately 455 million gallons of treated groundwater were re-injected back into the Great Miami Aquifer. The controlling document for the Re-Injection Demonstration was the Re-Injection Demonstration Test Plan (DOE 1998). The test plan is provided as Appendix A.

Conducting a successful Re-Injection Demonstration was deemed the final step in determining the feasibility of applying treated groundwater re-injection as an enhancement to the approved aquifer remedy. The Record of Decision (ROD) for Operable Unit 5 (OU5) presents groundwater extraction and treatment as the selected remedy for restoring the Great Miami Aquifer. The ROD presents a 28 well extraction system, which operates at a maximum rate of 4000 gallons per minute (gpm) to restore the aquifer in an estimated 27 years (Figure 1-2). In the OU5 ROD, the DOE agreed to continue evaluating innovative technologies which might enhance the approved aquifer remedy. Re-Injection of treated groundwater is considered to be one of these innovative technologies.

The evaluation of re-injection technology at Fernald was sponsored by the DOE's Office of Science and Technology Subsurface Contaminants Focus Area, at the request of Fernald. Figure 1-3 illustrates the evaluation strategy that was followed and illustrates how the re-injection demonstration fits into this strategy. The shaded box in Figure 1-3 identifies the outcome of the evaluation process; the outcome being: modify the aquifer remedy by incorporating re-injection technology.

1.1 THE DESIRED ROLE OF RE-INJECTION IN ENHANCING THE AQUIFER REMEDIATION SCHEDULE

The desired role for using groundwater re-injection is to accelerate the aquifer remedy. Shortly after the OU5 ROD was issued, an effort began at Fernald to determine if site cleanup could be accomplished within an accelerated time frame (DOE, 1996b). Restoration of the aquifer was included in this planning effort. The evaluation of using an innovative technology as a means of speeding up the remediation began with re-modeling the planned clean-up for the aquifer with the addition of various re-injection scenarios. The modeling used the SWIFT/486 computer code (version 2.54) marketed by HSI GeoTrans. Using the OU5 ROD approved remedy as a starting point for additional modeling, a new remedy design was developed that indicated aquifer restoration could be accomplished in ten years. This new modeling effort is presented in the Baseline Remedial Strategy Report (BRSR) Remedial Design for Aquifer Restoration (DOE 1997).

Several different modeling scenarios were conducted in the BRSR by varying the number and location of extraction wells and adding re-injection wells. The final selected modeling scenario that predicts groundwater remediation in 10 years is presented in Section 5 of the BRSR. Figure 1-4 shows the location of extraction and injection wells for this modeling scenario. The decision was made to work toward the 10-year aquifer remedy using the design presented in Chapter 5 of the BRSR. Unknowns involving the use of re-injection at Fernald would be addressed through single well tests and a field-scale demonstration.

The BRSR predicted reduction in remediation time, from 27 years to 10 years, is not solely attributable to the use of re-injection. As presented in Appendix F of the BRSR, the use of re-injection is projected to shorten the aquifer remedy by approximately 7 years. It is anticipated that re-injection will shorten the remedy by increasing the rate of aquifer flushing in the more highly contaminated areas, thereby reducing the time required to achieve cleanup.

The selected modeling scenario also predicted how the re-injection wells might interact with the extraction wells during the active remediation. The predicted interaction would:

- Help to minimize pumping related drawdown impacts at neighboring properties beyond the Fernald property by returning water back to the aquifer after extraction and treatment,
- Provide a hydraulic barrier at Fernald's southern property boundary to minimize the potential for further off-property contaminant migration, and
- Help minimize excessive drawdown of water levels in the target cleanup zones by maintaining high water levels in the areas where re-injection is occurring.

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1.2 OBJECTIVES OF THE RE-INJECTION DEMONSTRATION

Although groundwater modeling predictions were favorable for the use of re-injection, several uncertainties still existed for applying re-injection at Fernald. Industry lessons had shown that the successful use of re-injection depended on site-specific aquifer conditions and groundwater chemistry. The hydraulic conductivity of some aquifers is too low to effectively support re-injection, and chemistry changes around the re-injection wells can cause the re-injection wells and surrounding aquifer to plug, making re-injection ineffective. Consequently, two single well injection tests were conducted at Fernald to obtain preliminary operational information. At that time, the infrastructure (piping, wells, etc.) needed to conduct larger-scale tests was not available. The single well tests provided valuable information on water chemistry and plugging issues that would impact re-injection operations at Fernald (DOE 1995, and DOE 1996a).

However, site specific field scale information needed to be obtained before a commitment to add re-injection to the aquifer remedy at Fernald could be made. The problem with obtaining field-scale information was the lack of required infrastructure.

Rather than fund and conduct a field-scale demonstration separate from the groundwater remedy, only to have wasted infrastructure following the demonstration that might not be able to be used in the remedy, the decision was made to incorporate the field-scale demonstration into the ongoing aquifer remedial design effort. This cost-conscious measure would allow for the immediate incorporation of re-injection technology into the aquifer remedy, should the field scale demonstration show that re-injection is a viable alternative at Fernald. If not viable, the remedy strategy would revert back to the approved ROD remedy (28 wells, 27 years) and other efforts to shorten the time frame would be pursued.

A major concern with the field scale use of re-injection at Fernald was how much, and how often the re-injection wells would be inoperative due to plugging problems and the resulting costs needed to keep the wells operating. Also, data were needed to document the accuracy of model predictions concerning the benefit of using re-injection to shorten the remedy.

The following specific objectives were listed for the Re-Injection Demonstration hereinafter referred to as (Demonstration) in the Re-Injection Demonstration Test Plan.

- Determine if a re-injection rate of 200 gpm per well could be sustained at the field scale for a time period of one year,
- Determine the operational and maintenance costs required for maintaining re-injection rates of 200 gpm per well at the field scale,
- Determine if the extraction and re-injection wells would work together as modeled to maintain capture of the 20 µg/L uranium plume,
- Determine if a hydraulic barrier could be produced and maintained at the southern boundary of Fernald at the 200 gpm per well injection rate, and
- Determine if actual hydraulic patterns and profiles would indicate increased flushing in the aquifer, and minimized pumping-related drawdown as predicted by the groundwater model.

1.3 DECISION CRITERIA FOR THE USE OF RE-INJECTION AT FERNALD

Data collected during the Demonstration would be used to determine what role if any re-injection technology would play in the FEMP aquifer restoration. The decision criteria for continued use of re-injection as an integral part of the aquifer remedy were:

- Maintenance and operational costs,
- Effectiveness in shortening the remedy as predicted through modeling scenarios,
- Vertical and horizontal expansion of the 20 µg/L uranium plume, and
- Creation of a hydraulic barrier at the Southern Fernald property boundary.

1.4 OVERVIEW OF THE REST OF THIS REPORT

Chapters 2 through 6 of this report focus on key issues, which were evaluated during the demonstration, for the purpose of addressing the objectives and decision criteria presented above. The key issues are:

- The quality and source of the injectate water (Section 2),
- Plugging in the re-injection wells (Section 3),
- The impact re-injection had on the aquifer remedy (Section 4),
- Impact on the water chemistry of the aquifer (Section 5), and
- Costs associated with re-injection (Section 6).

Chapter 7 summarizes the conclusions reached concerning the use of re-injection. Data collected during the demonstration are presented in Appendices B through G. The data from the Appendices are summarized and presented in the chapters of this report in tabular form or placed in figures to focus the reader on the key observations.

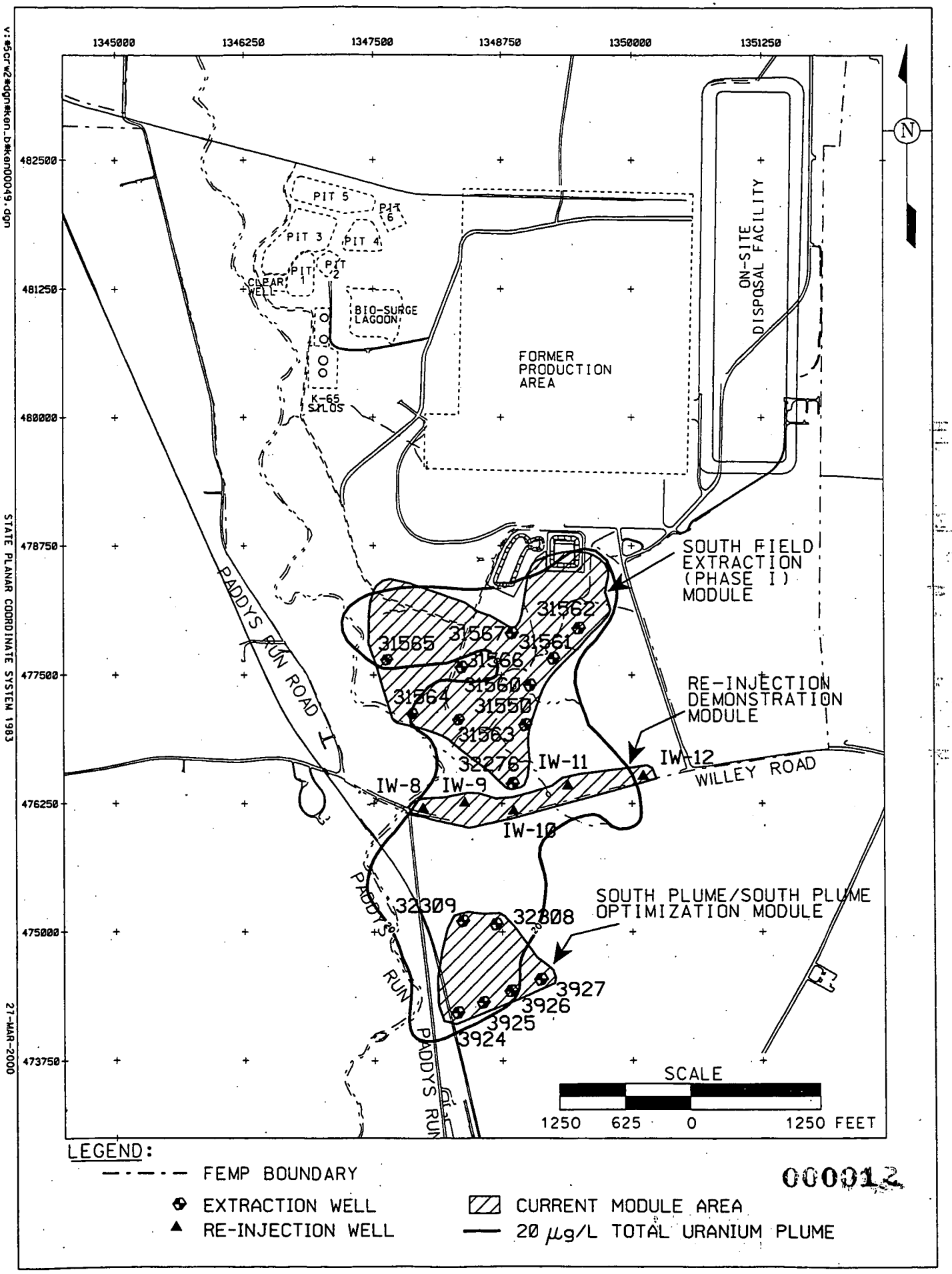

FIGURE 1-1. RE-INJECTION DEMONSTRATION SETUP

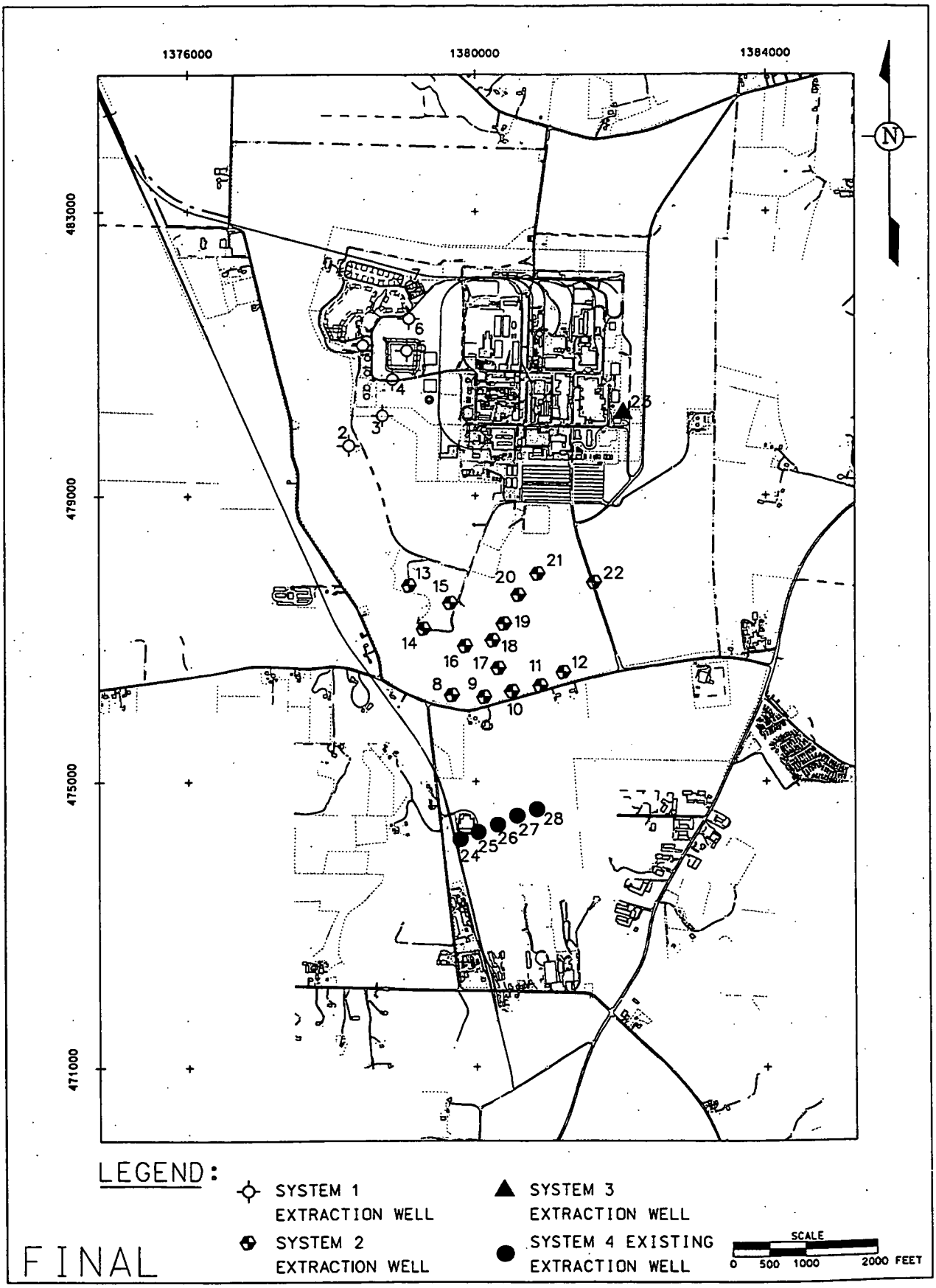

FIGURE 1-2. WELL LOCATIONS FOR THE OU5 ROD GROUNDWATER REMEDIAL STRATEGY

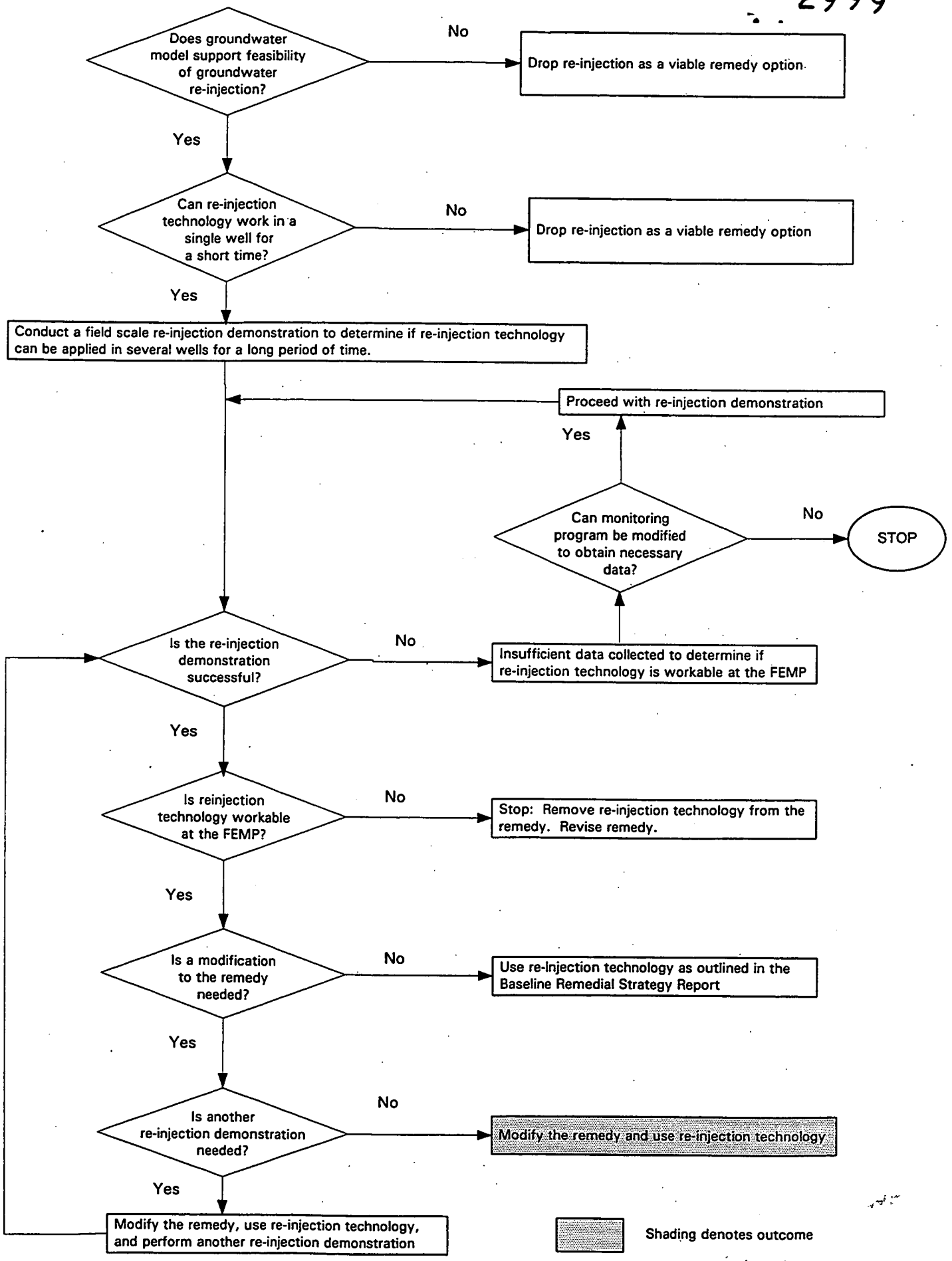

Figure 1-3 Re-injection Technology Evaluation Flowchart

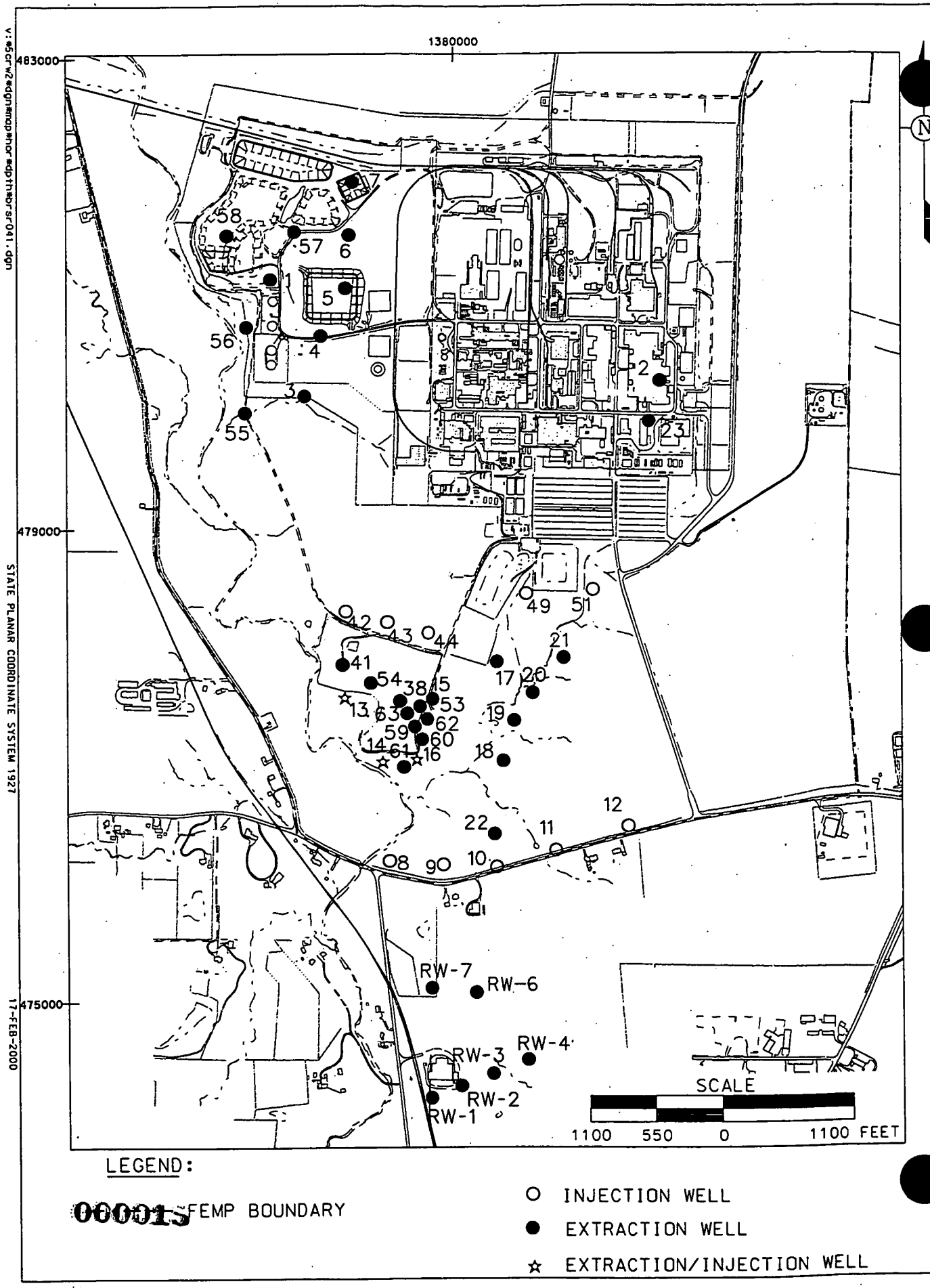

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FIGURE 1-4. WELL LOCATIONS FOR THE BASELINE GROUNDWATER REMEDIAL STRATEGY

2.0 QUALITY AND SOURCE OF THE INJECTATE WATER

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A reliable source of re-injection water that does not contaminate or alter the water quality of the Great Miami Aquifer, can be maintained at Fernald. During the Demonstration, a re-injection rate of 1000 gallons per minute (GPM) (200 GPM in five separate wells) was generally maintained. The goal of needing to maintain the quality of the injected water at no more than 10 μg/L uranium concentration resulted in: 1) the development of a strategy for the regeneration of the ion exchange resins used in the treatment process, and 2) the necessity to demonstrate the viability of the regeneration strategy.

2.1 BACKGROUND

During the Demonstration, groundwater was extracted from the Great Miami Aquifer through wells pumping in the South Plume and South Field Extraction (Phase 1) Aquifer Remediation Modules (Figure 1-1). The groundwater was treated for uranium and iron in the Fernald Advanced Wastewater Treatment (AWWT) Expansion Facility in an ion-exchange process. Treated groundwater was subsequently re-injected back into the aquifer through five re-injection wells located along the southern Fernald property boundary as shown in Figure 1-1.

The rate specified in the Baseline Remedial Strategy Report (BRSR) called for the injection of 1000 gpm of treated water. Over the course of the one-year demonstration this equates to approximately 526 million gallons of treated groundwater. Actual operation of the wells during the demonstration resulted in the re-injection of approximately 455 million gallons of treated water, 86.5 percent of the BRSR suggested rate.

In accordance with Ohio EPA re-injection guideline "5X26 Aquifer Remediation Projects" (OEPA 1997), this treated groundwater was analyzed monthly via a single grab sample, both prior to and during the Demonstration. The sampling results were furnished in monthly reports to: Ohio EPA's Division of Drinking and Ground Waters (DDAGW) Underground Injection Control (UIC) Unit, Ohio EPA's Office of Federal Facilities Oversight, and the United States Environmental Protection Agency.

A monthly grab sample of the AWWT Expansion Facility discharge was collected at the Re-Injection Surge Tank and analyzed for the parameters listed in Table 2.1 of the Re-Injection Demonstration Test Plan, Rev. 0 (Appendix A of this report). The re-injection surge Tank is a 50,000-gallon tank which receives treated waters from the AWWT Expansion. The tank is maintained at a minimal half full level to provide a reservoir which will effectively alleviate minor stops in treatment from affecting the injection

system. Injection pumps draw water from the tank and distribute to the injection wells. The first monthly grab sample was collected on May 28, 1998. The last monthly grab sample presented in this report was collected on September 13, 1999. The purpose of the monthly grab sampling was to document that the injectate water quality was protective of the aquifer, and to take corrective measures should the quality be judged as non-protective.

The monthly grab samples were analyzed for the constituents that had a recorded Final Remediation Level (FRL) exceedance in the area of the aquifer from which the groundwater was being pumped. The monthly grab samples were sent to an off-site laboratory for analysis, and the analytical results of 17 months of sampling are presented in Table 2-1. Further information on the sampling strategy used during the Demonstration is provided in Appendix A. Information regarding FRLs can be found in the Integrated Environmental Monitoring Plan (DOE 1999).

2.2 RESULTS

Only four FRL exceedances were measured in the grab samples during the 17 months of sampling. The four exceedances are listed below.

Date	Constituent	FRL Value	Sample Concentration
10/23/98	Zinc	0.021 mg/l	0.0213 mg/l
4/8/99	Lead	0.015 mg/l	0.0191 mg/l
6/14/99	Bis(2-ethylhexyl)Phthalate	6 µg/l	8 µg/l
7/14/99	Uranium	20 µg/l	26.8 µg/l

All four exceedances were one time occurrences, meaning the subsequent monthly grab sample collected immediately following each exceedance once again had FRL constituent concentrations which did not exceed the FRL value. Each individual one-time exceedance is discussed below.

Lead and Zinc: Both of these exceedances were only slightly over their FRL values respectively and they do not appear to indicate that a long-term water quality issue was present. The concentrations were reported correctly by the lab, so the values are considered to be representative of the grab samples from which they came.

Bis(2-ethylhexyl)phthalate: The one-time exceedance of the bis(2-ethylhexyl)phthalate FRL was attributed to laboratory contamination, as reported in the July 1999 Re-Injection Operating Report (DOE 1999a).

Uranium: Figure 2-1 is a graph of the monthly grab samples of uranium concentration versus time. The graph shows a uranium spike (July 1999 exceedance) superimposed upon an increasing concentration trend (DOE 1999a).

Details surrounding the July uranium concentration were reported to the U.S. and Ohio EPAs during weekly site conference calls and in the July 1999 Operating Report for the Re-Injection Demonstration. As noted above, the graph of uranium concentration versus time for the monthly grab samples (Figure 2-1) shows a spike in July 1999 superimposed upon an increasing concentration trend. To provide a better perspective on Figure 2-1, Figure 2-2 is a plot of uranium concentration in the treated effluent of the AWWT Expansion Facility from January 1, 1999 to January 25, 2000. The samples analyzed are daily composite samples.

Figure 2-2 shows a steadily increasing uranium concentration trend from about 0.1 μg/L on January 1, 1999 to about 13 μg/L on August 23, 1999. Subsequently, the uranium trending decreases from August 23, 1999 to a low of 0.1 μg/L on November 13, 1999. After November 13, 1999 the uranium concentration again gradually increases to about 2.0 μg/L. The increasing uranium concentrations represent the increasing degree of uranium saturation of the ion exchange resin and its concomitant loss in capability to efficiently remove uranium from water. The decrease in uranium concentration in the AWWT expansion facility results from the three vessels in lag position (1800-1A, 2A, 3A) having been successfully regenerated between August 13, 1999 and November 13, 1999 so that their uranium extraction efficiency was restored.

Superimposed upon the increasing and decreasing trends represented by resin saturation and regeneration discussed above are a series of random "spikes" or "peaks" of increased uranium concentration; some of these exceed 20 μg/L. These higher uranium concentrations were believed to have resulted from one of three factors:

- Contamination resulting from a dirty line in the composite sampler
- Inadvertent valve leakage which resulted in untreated or partially treated water bypassing one or more ion exchange vessels and going directly to discharge, or
- Inadvertent erroneous labeling of sample bottles.

Of the three factors, inadvertent valve leakage has been the most common cause of high uranium concentrations in the AWWT Expansion Facility and is believed to be the cause of the July 1999 FRL exceedance as represented by the 26.8 µg/L uranium concentration in the July 1999 grab sample collected on July 14, 1999.

As a result of the July 1999 exceedance, a series of additional operational measures have been taken to stay below the 10 µg/L uranium concentration goal. These additional measures include:

- New procedures to successfully regenerate AWWT Expansion Facility ion exchange vessels
- Routine monitoring of ion exchange resin loading with projections as to when a given vessel must be regenerated
- Implementation of a routine regeneration schedule
- Changes to valving lineups to provide redundant isolation of regeneration water (eluate) containing high concentrations of uranium from the treated water routed to the re-injection system, and
- Improvements in Operational Work Instructions to reduce the possibility of unintended valve actuation which results in non-treated groundwater inadvertently bypassing full treatment and going directly to discharge.
- Despite such measures, occasional isolated random exceedances of the uranium FRL may occur. However, the above measures, combined with an operational goal of no more than 10 µg/L uranium in the injectate, should prevent persistent recurrences of injectate containing uranium above 20 µg/L into the Great Miami Aquifer.

Iron Concentration of the Injectate

Although not a requirement of the Re-Injection Test Plan, monthly grab samples of the treated effluent collected during the demonstration were also analyzed for iron to track the iron-concentration of the effluent. Iron concentration data were collected from the treated groundwater from September 1998 through September 1999. The data are presented in Table 2-2.

Table 2-2 shows that the iron concentrations during this time period ranged from 34.2 µg/L to 2670 µg/L. Because Eh is elevated above 200 mV at a pH of 7 it is believed that the high variation in iron concentration is attributed to the digestion of ferric iron (Fe^{3+}) particulates in the unfiltered sample during the analysis process. Therefore, to the degree that variability exists with particulate concentrations in unfiltered water, a similar variability exists with the reported iron concentrations. The injection of these particulates should not promote the growth of iron bacteria in the aquifer, as the iron is already in the form of Fe^{3+}. However, in the long term injection of particulate matter could lead to plugging within the aquifer. Monitoring for total suspended solids is discussed in Section 3.

TABLE 2-1

INJECTATE WATER QUALITY
MAY 28, 1998 TO SEPTEMBER 13, 1999

Constituents[b]	Constituent Type[c]	Basis for FRL[g]	Groundwater FRL[a]	5/28/98	6/28/98	7/28/98	8/19/98	9/21/98	10/23/98	11/24/98	12/17/98
General Chemistry			mg/L								
Nitrate	MP	B	11.0	0.31[d]	0.30	1.50	0.740	1.1	0.487	0.454	0.377
Inorganics			mg/L								
Antimony	N	A	0.006	0.0012	U 0.00075	U 0.00090	U 0.000432	U 0.00088	U 0.003	U 0.003	U 0.0039
Arsenic	N	A	0.05	0.001	U 0.00082	U 0.00065	U 0.0018	U 0.0007	U 0.0018	U 0.0018	U 0.0025
Barium	N	A	2.0	0.0527	0.0513	0.0562	0.0505	0.0431	0.0467B	0.0502 B	0.0542 B
Beryllium	N	A	0.004	U 0.00005	U 0.00005	U 0.00002	U 0.000072	U 0.00002	U 0.0004	U 0.0004	U 0.0003
Cadmium	N	B	0.014	U 0.00012	U 0.00012	U 0.00010	U 0.000294	U 0.0001	U 0.0004	U 0.0004	U 0.0005
Total Chromium	MP	R	0.022[d]	0.002	0.00035	0.00021	U 0.000598	0.00032 B	U 0.0027	0.0012 B	U 0.0018
Cobalt	N	R	0.17	U 0.00038	U 0.00038	U 0.00015	U 0.000291	U 0.00018	U 0.0024	0.0042 B	U 0.0034
Lead	N	A	0.015	U 0.00062	U 0.00062	U 0.00048	0.000603	U 0.00042	0.0014B	U 0.0009	U 0.0016
Manganese	N	B	0.9	.175	U 0.00005	0.0019	0.0339	0.0035	0.0053B	0.0053 B	0.0072 B
Mercury	MP	A	0.002	U 0.0001	U 0.0001	U .0001	U 0.000104	U 0.001	U 0.0001	U 0.0001	U 0.00010
Nickel	N	A	0.1	.0021	0.00091	0.007	0.0173 J	0.0066	U 0.0108	U 0.0108	U 0.0158
Selenium	N	A	0.05	U 0.001	0.0018	0.00099	U .0023	0.00097 J	U 0.0022	U 0.0022	0.0045 B
Silver	N	R	0.05	U 0.00028	U 0.00028	U 0.00025	U 0.0005	U 0.00012	U 0.0013	U 0.0013	U 0.0025
Vanadium	N	R	0.038	U 0.00032	U 0.00032	U 0.0020	U 0.0015	U 0.00015	U 0.0013	0.0161 B	0.0128 B
Zinc	N	B	0.021	.0026	0.00098	U .0015	U 0.0076	0.0051 B	0.0213	0.0105	0.0179
Radionuclides			pCi/L								
Neptunium-237	MP	R*	1.0	U 0.035	0.028	U 0.07	0.115	U 0.024	U 0.160	U 0.017	U 0.0
Radium-226	N	A	20.0	U 0.055	1.71	<1[g]	0.196	U -0.067	U 0.081	U 0.12	U -0.310
Strontium-90	MP	A	8.0	U 1.4	0.751	U 1	0.337	U 0.503	U 0.468	U 0.54	U 0.121
Thorium-228	N	R*	4.0	U 0.11	0.257	0.273	U 0.021	U 0.097	U 0.132	U 0.16	U 0.003
Thorium-232	N	R*	1.2	U 0.11	U 0.11	0.17	U 0.004	U 0.003	U 0.014	U 0.16	U 0.003
			µg/L								
Total Uranium	MP	A	20.0		U 0.016	0.619	0.349	U 0.020	U 0.053	0.018 J	0.058 J
Organics			µg/L								
Bis(2-ethylhexyl)phthalate	N	A	6.0	U 5	U 5	U5	U 5	U 5	U 5	2 J B	U 5
Carbon disulfide	N	A	5.5	U 1	U 1	0.0001 J	U 5	U 1	U 1	U 1	U 1
1, 1-Dichloroethene	N	A	7.0	U 1	U 1	U 1	U 1	U 1	U 1	U 1	U 1
1, 2-Dichloroethane	MP	A	5.0	U 1	1	U 1	U 1	U 1	U 1	U 1	U 1
Trichloroethene	N	A	5.0	U 1	0.4 J	U 1	U 1	U 1	U 1	U 1	U 1

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TABLE 2-1
(Continued)

Constituents[b]	Constituent Type[c]	Basis for FRL[g]	Groundwater FRL[a]	1/27/99	2/17/99	3/10/99	4/8/99	5/13/99	6/14/99	7/14/99	8/30/99	9/13/99
General Chemistry			**mg/L**									
Nitrate	MP	B	11.0	0.47	0.750 J	0.69	2.38	0.560 J	0.67	0.360 J	0.440 J	0.6
Inorganics			**mg/L**									
Antimony	N	A	0.006	0.0031 B	0.0002 B	0.001 B	U 0.00053	U 0.00010	U 0.005	U 0.0031	0.00015 B	U 0.00062
Arsenic	N	A	0.05	U 0.0029	0.0024 B	0.00085 B	U 0.0042	0.0026 B	U 0.0033	U 0.0022	0.0012 B	0.0012 B
Barium	N	A	2.0	0.0511	0.0609	0.0514	0.0535	0.0529	0.054	0.0503	0.051	0.0486
Beryllium	N	A	0.004	U 0.0001	0.00001 B	U 0.00002	U 0.0017	U 0.00001	U 0.003	U 0.00022	0.00001 B	U 0.00002
Cadmium	N	B	0.014	U 0.0003	0.00019 B	U 0.00010	U 0.0031	U 0.00031	U 0.003	U 0.00031	U 0.00013	U 0.00008
Total Chromium	MP	R	0.022[d]	U 0.0007	0.00074 B	0.00071B	U 0.00014	0.00066 B	U 0.0005	U 0.0011	0.00094 B	0.0015 B
Cobalt	N	R	0.17	U 0.001	0.00029 B	U 0.00015	U 0.00001	U 0.00001	U 0.0017	U 0.00016	U 0.0000016	U 0.00012
Lead	N	A	0.015	U 0.0015	0.00076 B	U 0.00045	**0.0191**	0.00008 B	U 0.0021	0.00042	0.00026 B	U 0.00052
Manganese	N	B	0.9	0.00087 B	0.293	0.0045 B	0.0061	0.0023 BE	0.0031	0.0038	0.0023 B	0.0008 B
Mercury	MP	A	0.002	U 0.0001	U 0.00012	U 0.00010	U 0.00012	U 0.00012	U 0.0001	U 0.00012	U 0.00004	U 0.0001
Nickel	N	A	0.1	U 0.001	0.0022 B	0.00050 B	0.00081	0.0040 BE	U 0.0008	0.002	0.0049 B	0.00037 B
Selenium	N	A	0.05	U 0.0031	U 0.0013	U 0.00090	0.0025	0.0011 B	U 0.0029	0.0008	U 0.0011	U 0.00092
Silver	N	R	0.05	U 0.0001	U 0.001	U 0.00022	U 0.00037	U 0.00002	U 0.002	U 0.00015	0.00023 B	U 0.00025
Vanadium	N	R	0.038	U 0.0008	U 0.0022	U 0.00015	U 0.00073	U 0.0073	U 0.0009	U 0.0011	0.00062 B	U 0.00015
Zinc	N	B	0.021	U 0.0027	0.0083 BE	0.0029 B	0.0124	0.0033 B	0.0079 B	U 0.0089	0.0034 B	U 0.0002
Radionuclides			**PCi/L**									
Neptunium-237	MP	R*	1.0	U 0.0461	U 0.159	U 0.0164	U 0.0722	U 0.0581	U -0.0406	U 0.008	U -0.001	U -0.027
Radium-226	N	A	20.0	0.569	0.335	0.419	0.458	0.408	U 0.504	U -0.187	U 0.072	0.087
Strontium-90	MP	A	8.0	U 0.273	U 0.362	U 0.400	1.10	U 0.447	U 0.277	U 0.287	U 0.410	U 0.101
Thorium-228	N	R*	4.0	U 0.176	U 0.124	U 0.127	U 0.193	U 0.103	U -0.0681	U -0.006	U 0.67	U 0.085
Thorium-232	N	R*	1.2	U 0.0725	U 0.0237	U 0.0513	U 0.095	U 0.0398	U -0.00764	U 0	0.014	U 0
			µg/L									
Total Uranium	**MP**	**A**	**20.0**	2.53	2.62	2.44	4.69	5.41	10.3	**26.8**	9.25	9.56
Organics			**µg/L**									
Bis(2-ethylhexyl)phthalate	N	A	6.0	U 10	U 5	0.6 J	U 5	U 5	8 B	U 5	U 5	U 5
Carbon disulfide	N	A	5.5	U 1	U 5	U 1	U 5	U 5	U 1	U 5	U 5	U 1
1, 1-Dichloroethene	N	A	7.0	U 1	U 1	U 1	U 1	U 5	U 1	U 5	U 5	U 1
1, 2-Dichloroethane	MP	A	5.0	U 1	U 1	U 1	U 1	U 1	U 1	U 1	U 1	U 1
Trichloroethene	N	A	5.0	U 1	U 3	U 1	U 3	U 3	U 1	U 3	U 3	U 1

Note: Bold concentration result and shading indicates an FRL exceedance.

[a]Constituents taken from Table 2-1 of Re-Injection Demonstration Test Plan. Constituents are those previously detected in aquifer zones 2 and 4 at concentrations above their FRL.
[b]If a duplicate sample was analyzed the highest concentration between the regular sample and duplicate sample is reported.
B = Lab qualifier(inorganic). Reported value was obtained from a reading that was less than the contract required detection limit but greater than or equal to the instrument detection limit.
J = Lab Qualifier, means data is estimated.
U = Nondetect
[c]From Table 9-4 in OU5 ROD.
[d]FRL is for hexavalent chromium.
[e]Constituent types from Appendix A of IEMP. MP indicates that the constituent has been identified as being able to migrate to the aquifer. N indicates that the constituent has been identified as not being able to migrate to the aquifer.
[f]A - Applicable or relevant and appropriate requirement based (MCL, PMCL, etc.).
B - Based on 95th percentile background concentrations.
R - Risk-base[illegible]
R* - Risk-ba[illegible]onuclide cleanup levels include constituent specific 95th percentile background co[illegible]ation.

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TABLE 2-2

IRON CONCENTRATION IN INJECTATE

Sampling Date	Concentration (µg/L)
9/21/98	89.6
10/23/98	110
11/24/98	55.2
12/17/98	113
1/21/99	121
2/17/99	2670
3/10/99	585
4/8/99	747
5/13/99	114
6/14/99	139
7/14/99	160
8/30/99	283
9/13/99	34.2

FIGURE 2-1
Uranium Concentration versus Time for the Injectate Water

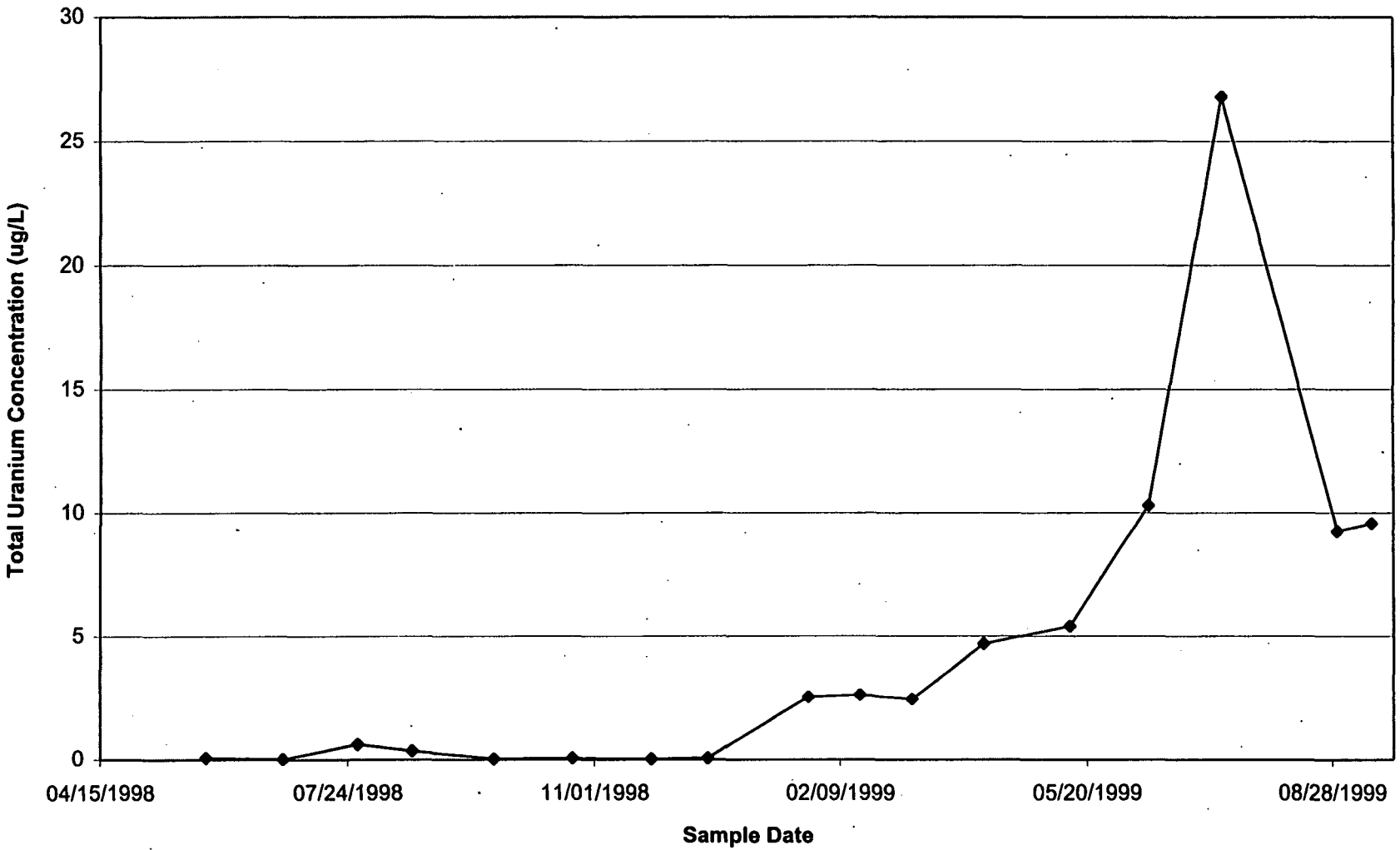

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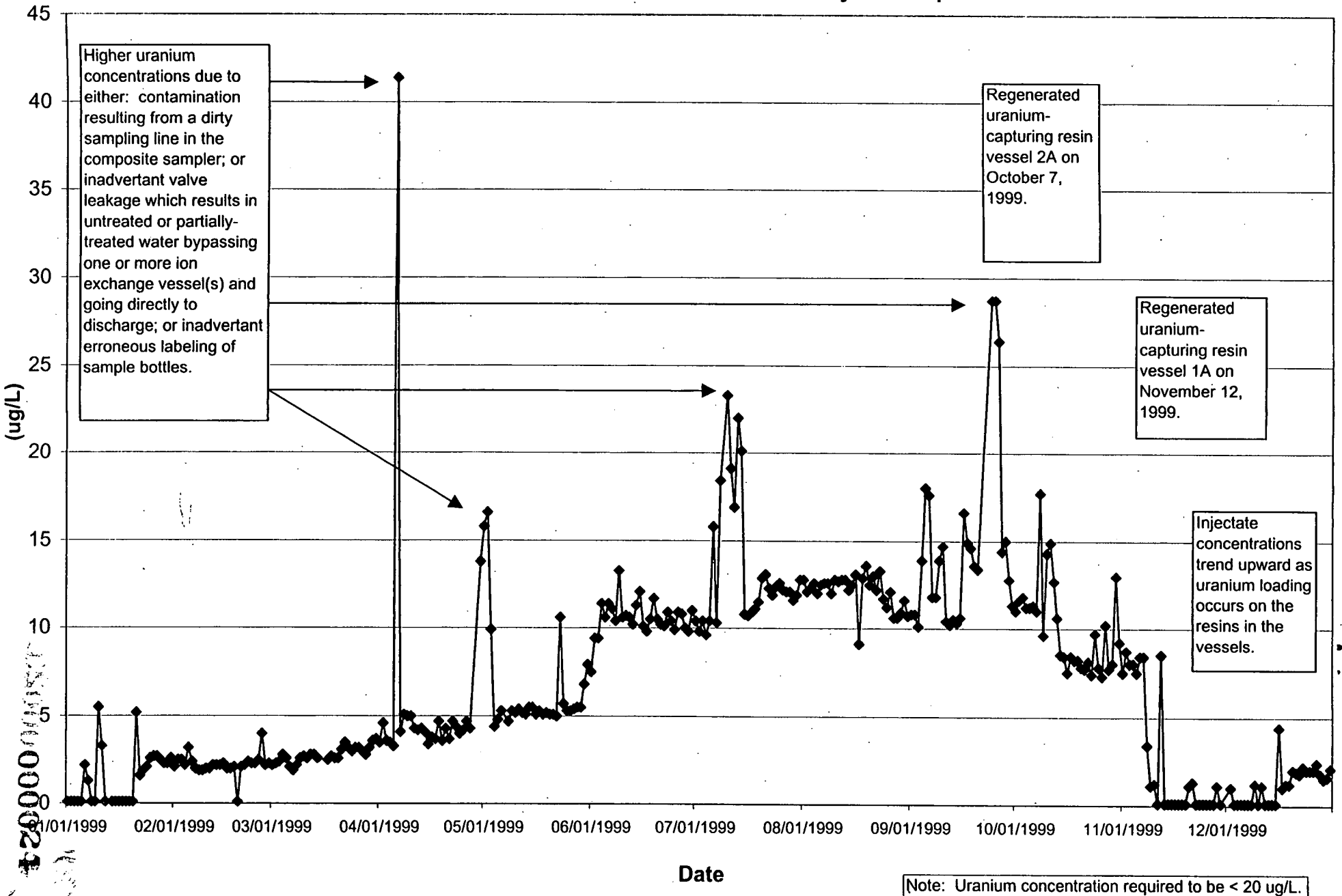
Figure 2-2
Uranium Concentration from the AWWT 1800 System Expansion



Note: Uranium concentration required to be < 20 ug/L.

Fig2-2 Graph 04/12/2000 8:44 AM

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3.0 PLUGGING IN THE RE-INJECTION WELLS

Plugging in the re-injection wells turned out to be a lesser issue than was anticipated at the start of the Demonstration. Twenty treatments were planned to address plugging for the demonstration (DOE 1998). Only six were required during the demonstration. This success is attributed to the design of the Demonstration including modifications made to the AWWT Expansion Facility treatment scheme and the incorporation of information learned from two single well injection tests conducted prior to the Demonstration (DOE 1995, DOE 1996a).

Camera surveys conducted during the Demonstration revealed no bacterial-plugging within the well screens; therefore bacteria growing outside and beyond the confines of the well screen, in either the filter pack or surrounding aquifer formation, appeared to have caused the plugging. The modified AWWT Expansion treatment used during the Demonstration to address the plugging was effective. No indication of residual plugging was noticed during the year long Demonstration. However, some degree of residual plugging is anticipated in the future. The impact that residual plugging might have on future operational cost remains uncertain, but is expected to be manageable.

3.1 BACKGROUND

Plugging within the re-injection wells was a major concern at the start of the Demonstration. Plugging is defined as "the increasing resistance to flow" (Pyne 1995, pg. 111). Plugging is the result of a decrease in porosity within the gravel pack and/or the formation surrounding the well screen, and/or a decrease in the openings of the well screen itself. As a well becomes plugged, the openings through which the injected water can move through become smaller. Given a constant injection rate, the water level in the re-injection well will rise to compensate for the greater pressure needed to move the same volume of water through a smaller opening. Unless the effects of the plugging are addressed, the water level within the re-injection well could eventually rise to the top of the well. When plugging occurs within a well, the well needs to be treated to reduce the effects of the plugging to restore the efficiency of the well. If numerous treatments are needed for maintaining the operational efficiency of the well, then the treatment costs involved could negate the benefits realized by the use of re-injection.

The primary sites for plugging during re-injection are the screens, gravel pack, and the formation immediately surrounding the screens. Plugging processes include: 1) entrained air and gas binding, 2) deposition of total suspended solids (TSS) from the injectate, 3) biological growth, 4) particle rearrangement in the aquifer material adjacent to the injection well, and 5) geochemical reactions. The first two single well injection tests showed that plugging due to iron bacteria would occur during the

Demonstration (DOE 1995, DOE 1996a). However, the other possible plugging mechanisms were also considered during the Demonstration.

3.2 WATER LEVEL MEASUREMENTS (AN INDICATOR OF PLUGGING)

As explained above, an effect of plugging will be an increase in resistance to flow within the re-injection well. This resistance to flow can be measured as a rise in water level within the re-injection well. The trend of the water level rise offers insight into what might be causing the plugging (Pyne 1995). Figure 3-1 illustrates the relationship between the trend in water level rise versus typical plugging processes.

Water level monitoring within the re-injection wells was conducted continuously during the Demonstration using down-hole pressure transducers. The transducers were installed inside stilling pipes and were connected to water level sensors and recorders. The water level sensors operate continuously and are monitored by operators in the AWWT control room. Flow to a re-injection well is programmed to automatically shut off should the water level within that well rise to a predetermined level. Thus an engineering control is provided for safeguarding against the overflow of injection water onto the ground surface should the well plug rapidly. Note that an overflow would not harm the environment as the re-injection water has been treated.

Operators recorded the water level reading from the AWWT control room monitor screen at the start of each work shift onto a water level tracking sheet. Each workday is divided into three work shifts. Therefore, three water level readings were documented on the tracking sheet each day of the Demonstration. A tabulation of operational shift readings is provided in Appendix B for reference purposes. The water level data obtained from the re-injection wells were graphed and tracked to determine when the water level rise within a well was such that the well required a treatment for plugging. Figures 3-2 and 3-3 are water level rise versus time graphs for water level data collected over the course of the Demonstration for the five re-injection wells. The behavior of the data can be used to indicate what type of plugging may be occurring (i.e., bacterial growth, suspended solids, gas bubbles, etc.) when compared to Figure 3-1.

The water level rises needed in Re-injection Wells IW-8, IW-9, IW-10, IW-11, and IW-12 to reach the automatic cut-off point were 16.35 feet, 52.16 feet, 53.24 feet, 53.19 feet, and 57.55 feet, respectively. Water level rises of these heights would allow the water level to come within approximately 3.4 feet of the ground surface. When the water level reached an elevation that was approximately 3.0 feet below (IW-8) to 6.0 feet below (IW-9, IW-10, IW-11, and IW-12) these automatic cut-off points preparation for

a treatment was initiated. The allowable water level rise in IW-8 is much smaller than the other four wells. The water table in Re-Injection Well IW-8 is much shallower than the other four wells, approximately 20 feet deep below ground surface (bgs) compared to approximately 60 feet bgs for the other four wells. The other four wells are located on top of approximately 40 feet of glacial overburden deposits, whereas IW-8 is at a location where the glacial overburden is very thin to absent next to the bank of Paddys Run.

Figure 3-2 shows the water level rise over time in Re-Injection Wells IW-9, IW-10, IW-11, and IW-12, during the Demonstration. As shown in Figure 3-2, the water level rise in Re-Injection Well IW-10 rose high enough to require a treatment for plugging twice during the demonstration. Figure 3-3 shows the water level rise over time for Re-Injection Well IW-8. As shown in Figure 3-3, the water level rise in Re-Injection Well IW-8 rose high enough to require a treatment for plugging four times during the Demonstration. None of the other three wells (IW-9, IW-11 and IW-12) required a treatment for plugging during the Demonstration.

3.3 DETERMINING THE CAUSE OF THE PLUGGING

As discussed above, water level changes within the re-injection wells is a good indicator for determining whether or not plugging is taking place; as illustrated in Figure 3-1, the trend of the water level data can be used to indicate what the cause of the plugging might be (Pyne 1995). A water level rise curve constructed from data collected during the first of the two single well injection tests, indicated that plugging was the result of bacterial growth with an abundant food supply of carbon dioxide (CO_2) and nutrients (DOE 1995). The water level rise patterns observed for IW-8 and IW-10 (Figures 3-2 and 3-3) also indicate bacterial growth. However, in the case of the Demonstration, the food supply is not as abundant as it was during the first single-well injection test. This is attributed to the injection of treated water during the Demonstration, versus the injection of untreated water during the first single-well test.

In addition to the monitoring of water levels within the re-injection wells, the following data were also employed during the demonstration to help determine the cause of the plugging.

- Down hole camera surveys from within the re-injection wells,
- Biological sampling within and surrounding the re-injection wells, and
- Monitoring the TSS concentration of the water being injected.

Results of these efforts are provided below.

3.3.1 Down Hole Camera Surveys

During the first single well re-injection test, rapid biological growth of iron bacteria across the well screen led to well plugging after the first 600 minutes of injection. Camera surveys of the well following the test revealed that portions of the annulus were stained orange-red and that a good deal of the surface area of the screen appeared to be covered by a orange-red flocculent substance (DOE 1995).

Camera surveys were conducted during the demonstration to determine if any visible evidence of plugging could be seen. The camera surveys were conducted in each re-injection well prior to the start of re-injection, and also conducted each time that the down-comers (injection tubes) were pulled from the well to address well plugging. In addition to the surveys conducted before re-injection began, four surveys were conducted in IW-8 and two surveys were conducted in IW-10. None of the camera surveys conducted during the Demonstration revealed any visual evidence of iron bacteria within the well, including the inner surface of the well screens. This observation led to the conclusion that plugging was taking place outside the well screen, and out of the view of the camera, perhaps at the interface between the filter pack and the natural formation.

3.3.2 Iron Bacteria Data

Lessons learned from the two single-well well injection tests indicated that plugging due to iron bacteria growth would be an issue for re-injection at Fernald (DOE 1995 and DOE 1996a). The two single well injection tests revealed that the oxidation of ferrous (Fe^{2+}) iron to ferric (Fe^{3+}) iron was an issue. The iron oxidation synergistically promotes the growth of iron bacteria within and surrounding the well screen, resulting in a plugged well screen and poor well-performance (DOE 1995, DOE 1996a). Sampling for bacteria in the aquifer in the Demonstration area prior to the Demonstration, revealed that both aerobic and sulfate-reducing bacteria are naturally present (DOE, 1998). Biological sampling was conducted in the re-injection wells and nearby shallow observation wells (22299, 22300, 22301, 22302, and 22303) during the Demonstration. The locations of these wells are discussed in Section 4. Prepared Biological Activity Reaction Test (BART) culture kits were utilized. These sampling kits are recognized in the industry as being a promising approach for routine biological sampling purposes (Smith, 1995, pg. 85). Each sample event tested for iron-related bacteria, slime-forming bacteria, and total aerobic bacteria. BART sampling was conducted during the Demonstration in an attempt to see if any bacterial changes could be detected which could aid in understanding why the wells were plugging, and how effective rehabilitation efforts were at attacking the bacteria. Data are tabulated and presented in Appendix C.

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The sampling frequency chosen took into consideration the way in which biofilms move through the sub-surface. Portions of biofilms intermittently slough off. The intermittent shedding events can provide transient increases in microbial counts. Biofilm sloughing occurs preferentially on start-up, after a period of rest or "quiescence". Analysis of samples collected after prolonged re-injection may fail to detect the presence of microbiological parameters that would indicate the presence of biofilms near wells, but samples collected immediately following start-up of re-injection provide better indicators of the biological environment surrounding the re-injection wells (Cullmore 1993). Therefore, sampling during the Demonstration focused on start-up events. Samples were collected: 1) just prior to the shut down of a re-injection well, 2) immediately after restart, 3) a few hours after restart, and 4) a few days after restart to provide the best potential for detecting biological activity.

As the data tabulated in Appendix C reveal, the samples collected indicated aggressive growth of all three types of bacteria being tested for, regardless of when the samples were collected. Samples collected prior to the start of re-injection yielded the same results as samples collected both before and following each well plugging rehabilitation event. As a result of this sampling methodology, no evident pattern was observed that indicated a decrease in biological activity following well rehabilitation activities, just as no evident pattern was observed that indicated an increase of biological activity due to injection.

3.3.3 TSS Concentration of the Injectate

As mentioned earlier, suspended solids entrained in the water being injected into the aquifer can also contribute to plugging. The suspended solids become lodged in the pore spaces of the aquifer material, causing a decrease in effective porosity around the re-injection well. It is reported that injecting water with a total suspended solids (TSS) concentration as low as 1 mg/L can clog injection wells within a short time (Driscoll 1986). Operation during the demonstration though showed that it was not a short-term problem at Fernald.

Although not a requirement of the test plan, monthly grab samples from the treated groundwater being used for re-injection were also sampled for TSS. The monthly grab samples all had a measured TSS concentration of less than 1 mg/L. However, it should be acknowledged that suspended solids in the injection water, even at these low concentrations, could contribute to long term plugging problems.

3.4 TREATMENT OF INJECTION WELLS (IW-8 AND IW-10) TO ADDRESS PLUGGING

The procedure used at Fernald to rehabilitate a plugged re-injection well consists of three main steps:

1) Add sodium hypochlorite solution to the well, surge the well briefly to get the chemical out into the gravel pack and surrounding formation, then let the chemical work for 12 - 24 hours.

2) Swab and airlift the well for approximately 90 minutes to remove the residual sodium hypochlorite reaction by-products and dead bacteria.

3) Pump out a minimum of five times the volume of standing water in the well or five times the volume of sodium hypochlorite solution added to the well, whichever is more.

The sodium hypochlorite solution used is 12.5 percent chlorine. The concentration of chlorine targeted for the chemical treatment is between 2000 to 3000 ppm. The area targeted for treatment is the well screen and surrounding filter pack. As discussed below, this treatment strategy appears to be adequate. That is, no apparent decrease in well efficiency over the course of the demonstration was observed, indicating that residual plugging was not yet occurring.

3.4.1 Rehabilitation of IW-8

Re-Injection Well IW-8 required chemical treatments four times during the course of the Demonstration to address plugging in the well. Figure 3-3 illustrates the water level rise versus time for this well. Information concerning the treatments can be found in Table 3-1. Table 3-1 presents the water level rise that was recorded at the start of the Demonstration (5.34 feet) and following each chemical treatment. Again, the data does not indicate any decreasing pattern of well efficiency over the course of the demonstration. As shown in Table 3-1, in both October 1998 and September 1999 the initial water level rise following chemical treatment was approximately 4 - 5 feet. In both early March 1999 and May 1999 the initial water level rise following chemical treatment was approximately 7.5 feet. This change in the initial water level rise following each treatment is believed to be due to regional aquifer water table fluctuations being referenced to a fixed elevation datum (water level rise at start-up on September 2, 1998), not well efficiency.

Table 3-2 compares the change in water level during each operating period, the days operating between treatments, the volume re-injected between treatments, and the volume re-injected per foot of water level rise between treatments. As the Table shows, the data does not show any decreasing pattern of well efficiency over the course of the Demonstration. In fact, the volume of water injected per foot of water level rise recorded within the re-injection well between treatments appears to be steadily improving. The surging and airlift process conducted during each treatment could act to further develop the well. At

some point in time, the volume of water injected per foot of water level rise should level off and begin to decrease as a result of residual plugging.

3.4.2 Rehabilitation of IW-10

Re-Injection Well IW-10 required chemical treatments two times during the course of the Demonstration to address plugging in the well. Information concerning the treatments can be found in Table 3-3. The water level rises recorded on the table follow the same pattern seen in IW-8. The rise in September 1999 is approximately 5 feet, and the rise in April 1999 is approximately 8.5 feet. This change in water level at start-up is believed to have been due to regional aquifer water table fluctuations being referenced to a fixed elevation datum (water level rise on September 2, 1998), not well efficiency.

3.5 CONCLUSIONS

Based on the above data and because treatment for bacteria was successful, it appears that IW-8 and IW-10 plugged due to the growth of bacteria in the gravel pack or aquifer formation immediately surrounding the well screens. Camera surveys in the wells prior to treatment did not reveal any visual evidence of plugging. Testing for bacteria identified a prevalence of bacteria in the area of the re-injection wells. However, bacteria testing was not useful as an indicator of how effective a well treatment was in reducing the bacteria, or as a tool for predicting when treatment might be needed.

The TSS content of the injectate does not appear to be causing the wells to plug and is therefore not an operational concern at this time. Well plugging due to TSS may not be significant after only one year of operation. Continued operation of the well field may result in the realization that a longer operating period is needed in order to observe the effects. Of importance to the demonstration though, is the realization that plugging due to suspended solids is not occurring on a frequency that would have a significant negative impact on re-injection operations. Future monitoring for TSS should switch from a grab sample to a longer-term composite sample. A composite sample would be more representative of the quality of the injection water.

The cause of plugging during the demonstration has been attributed to bacteria, based on the success of the treatment program used during the Demonstration. Chemical treatments using sodium hypochlorite solution appear to adequately reduce the plugging. Evidence for residual plugging, in the wells following treatment was not observed.

TABLE 3-1

TREATMENT SUMMARY FOR INJECTION WELL 8 RE-HABILITATION WORK TO ADDRESS PLUGGING

	Sept 98[a]	Oct 98	Feb/Mar 99	May 99	Sept 99
Water level rise prior to treatment	NA	15.80 ft	15.32 ft	13.44 ft	15.80 ft
Sand/Silt removal from the bottom of the sump	NA	12 in	2 in	½ in	1½ in
Volume of sodium hypochlorite used	NA	1.75 gal	2.0 gal	2.0 gal	2.0 gal
Volume of spent acid/water pumped from well	NA	4,300 gal	4,500 gal	7,790 gal	9,250 gal
Water level rise at start-up or following treatment	5.34 ft	4.02 ft	7.48 ft	7.62 ft	4.92 ft

[a]Start-up date was September 2, 1998

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TABLE 3-2

OPERATIONAL SUMMARY FOR IW-8

Operation Dates	Feet of water level rise	Days operating between treatments	Volume re-injected between treatments	MG of water injected per foot of rise
Operated from 9/2/98 to 10/22/98	10.46	51	13.161 MG	1.26
Operated from 10/29/98 to 2/26/99	11.30	120	27.701 MG	2.45
Operated from 3/4/99 to 5/3/99	5.96	60	15.374 MG	2.58
Operated from 5/6/99 to 9/7/99	8.18	124	34.728 MG	4.24

TABLE 3-3

TREATMENT SUMMARY FOR INJECTION WELL 10 RE-HABILITATION WORK TO ADDRESS PLUGGING

	Sept 98[a]	April 99	Sept 99
Water level rise prior to treatment	NA	51.79 feet	51.23 feet
Sand/Silt removed from the bottom of the sump	NA	2 in	4.68 in
Volume of Sodium hypochlorite used	NA	6 gal	5 gal
Volume of spent acid/water pumped from well	NA	11,750 gal	14,450 gal
Water level rise at start-up or following treatment	4.92 ft	8.54 feet	4.94 feet

[a]Start-up date was September 2, 1998

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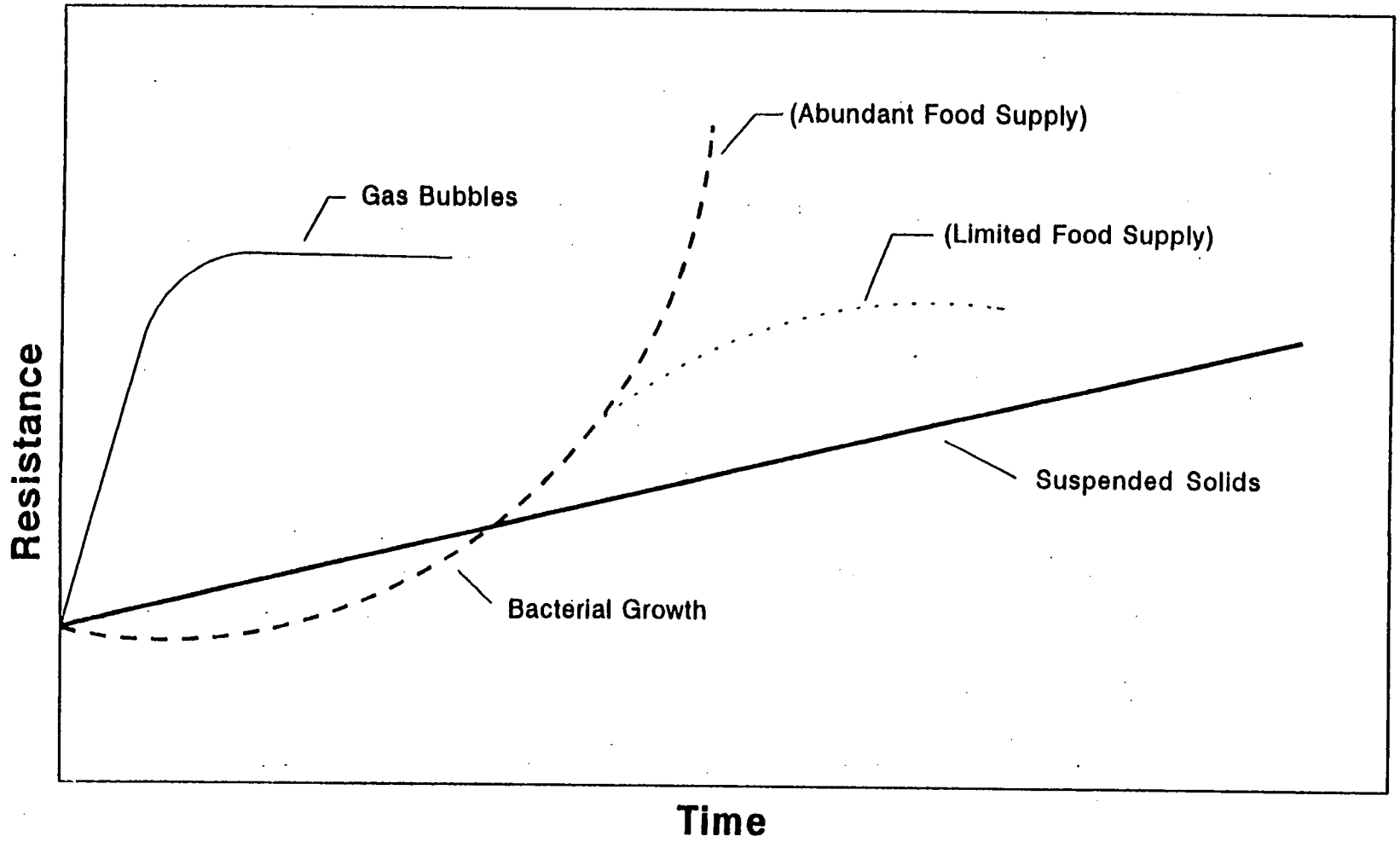

Note: From Pyne, R. D. G. (1995)

FIGURE 3-1 TYPICAL PLUGGING PROCESSES

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FIGURE 3-2
Water Level Rise in IW-9, IW-10, IW-11, and IW-12
September 2, 1998 to September 2, 1999
(Data used to construct graph is provided in Appendix B.)

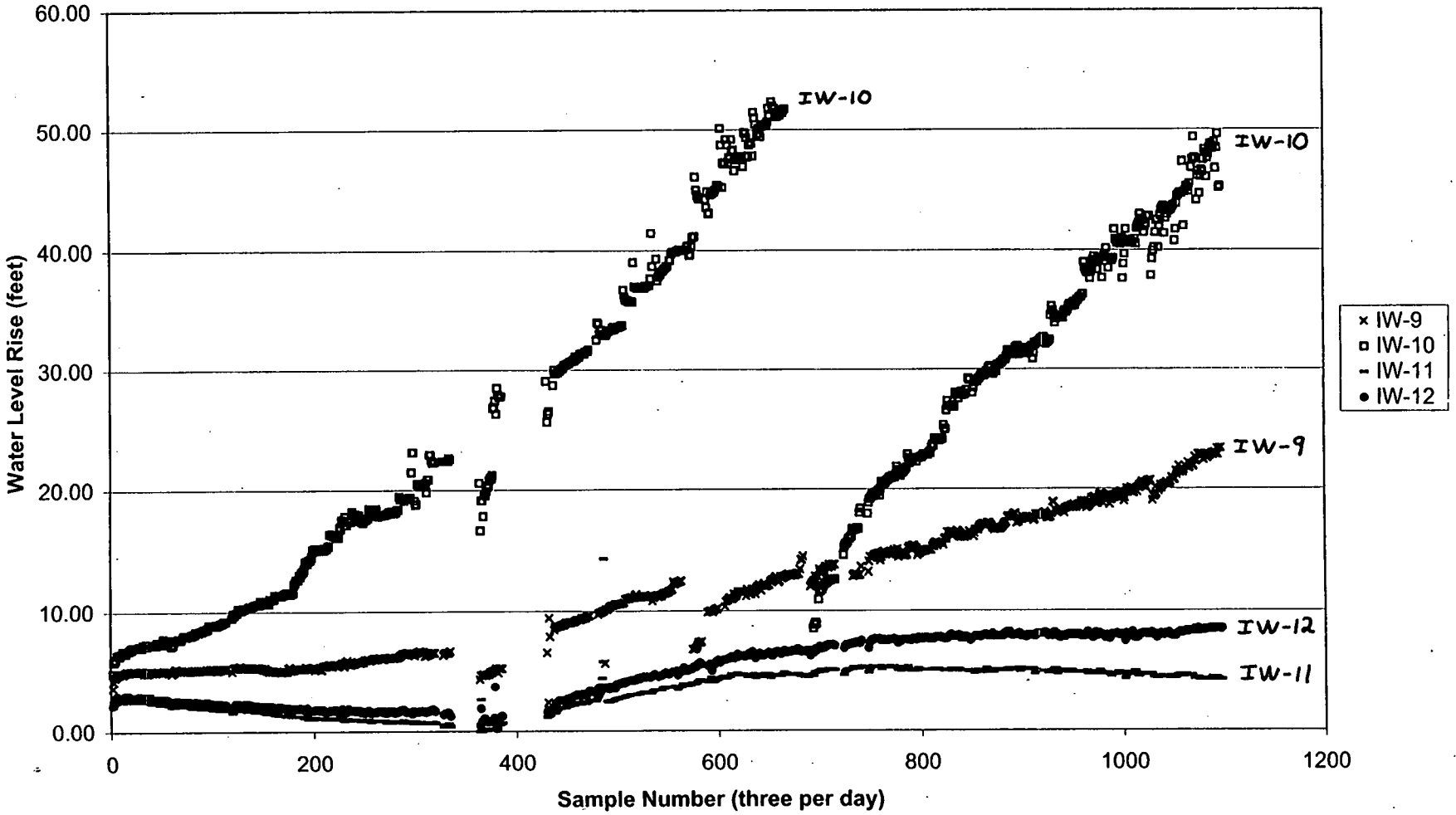
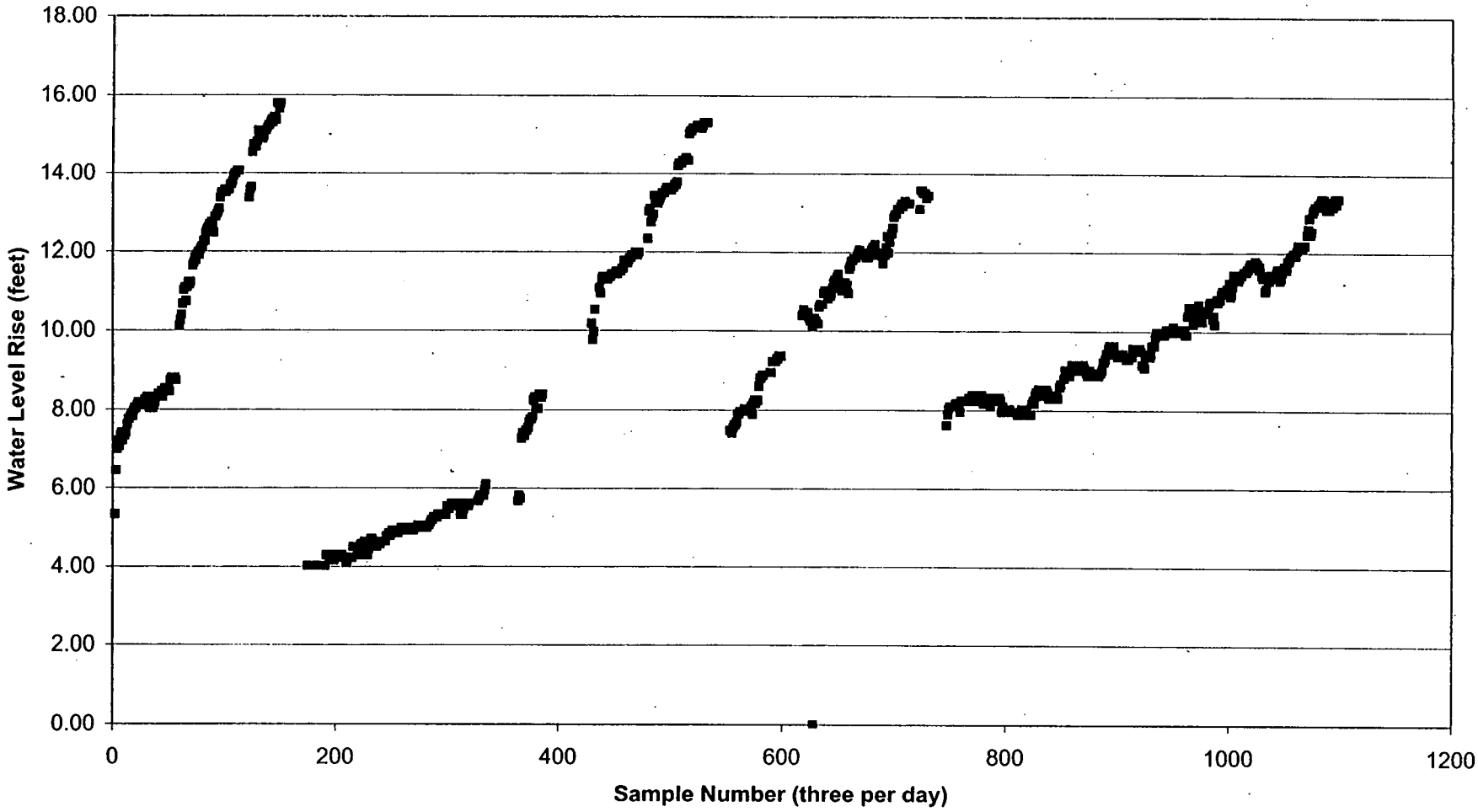


FIGURE 3-3
Water Level Rise in IW-8
September 2, 1998 to September 2, 1999
(Data used to construct graph is provided in Appendix B.)



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4.0 IMPACT ON THE AQUIFER REMEDIATION

Water level and uranium concentration data collected during the Demonstration indicate that:

- Capture of the 20 µg/L uranium-plume was maintained during the Demonstration.
- The base of the 20 µg/L uranium plume was not displaced into deeper regions of the aquifer due to re-injection.
- The combined effect of pumping in the South Plume and South Field created a stagnation zone between the two pumping systems. This stagnation zone held the uranium contamination in place and served as a hydraulic barrier to the southern flow of groundwater across the southern Fernald property boundary.
- Re-Injection effectively flushed contamination south of the re-injection wells, but was ineffective in flushing uranium contamination from between the re-injection wells.
- The water level increases produced by the re-injection wells were limited to the areas immediately surrounding the wells and were not evenly distributed. They were lower around Re-Injection Wells IW-10, IW-11, and IW-12 than expected. Only two wells (IW-8 and IW-9) produced a water level rise in the aquifer of greater than 0.5 feet.
- Drawdown of the water table was not as great as predicted.
- The measured average gradients for the water table surface north and south of the re-injection wells were very close to model predictions.

4.1 BACKGROUND

Information was collected during the demonstration to assess how effective re-injection would be in shortening the aquifer remedy. Specifically, would extraction and re-injection wells work together as modeled to reduce the time needed to remediate the aquifer?

The data assessment was performed to determine if re-injection was producing the benefits indicated by the groundwater model and focused on the following model predictions:

- Extraction and re-injection wells will work together to maintain capture of the 20 µg/L uranium plume.
- Re-injection will not displace the base of the 20 µg/L uranium plume into deeper regions of the aquifer.
- A hydraulic barrier will be produced in the area of re-injection.

- Re-injection will effectively flush uranium contamination from the aquifer.
- Hydraulic patterns and profiles produced will indicate increased flushing in the aquifer, and minimize pumping related draw down.

4.2 EXPECTATIONS CONCERNING THE USE OF RE-INJECTION

Figure 4-1 is a model prediction of flow for the 10-year aquifer cleanup strategy, taken from the BRSR (DOE 1997). The figure illustrates the interpreted capture zone and anticipated flow patterns within the expected capture zone over the life of the 10-year aquifer remedy under steady state conditions. Under steady state conditions the magnitude and direction of flow are constant with time. This modeling scenario includes not only the five Demonstration Wells, but also future re-injection wells planned for the South Field Area should the outcome of the demonstration support the continued use of re-injection.

To create Figure 4-1, particles were seeded in the model blocks containing the pumping wells used in the modeling scenario. The model was then run backwards in time and the particles were allowed to track backwards, as dictated by the forces of flow exerted within the model, to determine where the particles came from. This resulted in defining a time-dependent capture zone for each pumping well. Figure 4-1 also illustrates the flushing pattern predicted by the model for each Groundwater Demonstration Well (IW-8, IW-9, IW-10, IW-11, and IW-12) located along the southern property boundary.

The particle tracks shown in Figure 4-1 illustrate that pumping in the South Field coupled with pumping in the South Plume would create a stagnation zone between the two pumping systems. Contamination within this stagnation zone will essentially be held in place. This stagnation zone was predicted to be located in the vicinity of the southern Fernald property boundary. This stagnation zone would also serve as a hydraulic barrier to prevent further contaminant flow across the property boundary.

The Demonstration Wells are positioned within the stagnation zone created between the South Field and South Plume pumping systems. The groundwater model predicted that re-injection in this stagnation zone would:

- Help flush uranium contamination out of the stagnation zone, and toward the pumping wells in the South Plume.
- Slightly raise water levels within the stagnation zone.

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Figure 4-2 depicts three north-south water table profiles across the re-injection area. Figure 4-3 illustrates where the wells used to construct the profiles are located. When looking at Figure 4-2, the South Field Area is on the left side of the figure (EW-15, EW-22), the South Plume Area (RW-6, RW-3) is on the right. The Demonstration Area is located in the middle (IW-10).

The "pre-pumping water table – (pre 1993)" profile shown in Figure 4-2 represents actual average elevation measurement data collected prior to the start of pumping in the South Plume. This surface indicates that under no-pumping conditions flow is normally to the south. The surface labeled "water table-pumping (1993 to 1998)" is an average of actual field data collected during this time period when only the South Plume extraction wells were operating. The surface labeled "predicted water table for demonstration", is the modeled steady-state water table profile predicted for the Demonstration time period when injection in the Demonstration Wells and pumping in the South Field Extraction Wells is superimposed with the South Plume Extraction Wells.

As Figure 4-2 illustrates the combined effect of both pumping and re-injection is a predicted overall lowering of the water table. North of the Demonstration, the predicted drop in water level was 4 to 6 feet below the 1993 pre-pumping levels. South of the Re-Injection test area the predicted drop was 4 to 4.5 feet below the 1993 pre-pumping levels. In the area of re-injection itself, a drop of approximately 3 feet was predicted. As illustrated in Figure 4-2, re-injection was expected to cause water levels in the Demonstration area to rise approximately 0.5 feet. The combined effect of lowering the water table north and south of the Demonstration Area was expected to result in a stagnation zone in the area of the re-injection wells. Raising the water level in the re-injection area through re-injection was expected to result in increased flushing and a reduction in the size of the stagnation zone.

It was also anticipated that re-injecting groundwater north of the South Plume Extraction Wells would supply water to the South Plume Extraction Wells and help alleviate the drawdown of the water table surface in the area of the South Plume wells. Reducing the amount of drawdown in this area would reduce the impact that pumping in the South Plume Wells has on the Paddy's Run Roadsite Plume, which is located just south of the South Plume Recovery Wells. Further information can be found in the Re-Injection Demonstration Test Plan, which is Appendix A of this report.

4.3 OVERVIEW OF MONITORING/SAMPLING ACTIVITIES

The following is a brief overview of the monitoring and sampling activities that took place during the Demonstration to assess what impact re-injection was having on the aquifer remedy.

4.3.1 Water Levels

Figure 4-4 shows the location of the 55 groundwater-monitoring wells used to measure water levels during the demonstration. Water levels were collected:

- The week prior to the start of re-injection,
- The day following the start of re-injection,
- Weekly following the start of re-injection, through September 1998, and
- Monthly from October 1998 through August 1999.

Monthly water table elevation data are provided for reference purposes in Appendix D. The monthly monitoring effort was integrated with the quarterly routine IEMP groundwater level monitoring activity. During the months when IEMP water level monitoring was taking place, water levels were measured at 159 groundwater-monitoring wells in order to get a more regional look at the water table.

4.3.2 Flow Direction Measurement Data

Flow direction measurements were conducted at four deep observation wells (32304, 32305, 32306, and 32307) using a colloidal borescope. Figure 4-4 shows the location of these wells. The four deep observation wells were specifically installed to monitor each re-injection well location as described in the Re-Injection Demonstration Test Plan. The objective of the measurements was to assess flow conditions beneath the base of the 20 μg/L uranium plume. Flow measurements were collected:

- Prior to the start-up of the South Field (Phase I) Extraction System,
- Following start-up of the South Field System (after the aquifer had stabilized to the new pumping conditions), and
- During the demonstration on a quarterly schedule.

Flow data collected during the demonstration using the colloidal borescope are provided in Appendix E for reference purposes. However as discussed below these data were not used to evaluate the demonstration. Approximately half way through the Demonstration, a conclusion was reached at Fernald regarding flow direction data collected with the colloidal borescope. The borescope appears to be a useful tool only for observing real-time flow direction changes. Real-time means that stress changes are being applied to the aquifer during the time that measurements are being collected. An example of a stress change would be a change to pumping rates in nearby extraction wells. Unless a stress change is being applied at the same time that measurements are being made, it is very hard to interpret the flow direction results.

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Flow directions measured with a colloidal borescope should correlate with flow directions interpreted from the slope of the water table, but often they did not. Flow directions recorded by the borescope reflect flow on a very local scale. A down hole camera monitors the movement of very small particles within a single plane of focus in front of the camera lens. Flow directions recorded by the camera represent a snapshot of a very small segment of a very long and tortuous flow path that the particle is progressing along. All of the repeated twists and turns that a particle takes, as it migrates through the aquifer, eventually average out into a general flow direction, as indicated by the slope of the water table. It cannot be determined if an observed flow direction is actually due to nearby pumping, or just a localized bend in the migration pathway as the particles pass in front of the camera lens. If a stress is simultaneously applied as a flow direction is being observed, and the flow direction is observed to change shortly after the stress change was applied, then the shift in direction can be attributed to the pumping change. This is not how the data collection activity was designed for the Demonstration. This strategy can be used in the future on a small, localized scale, though, to help answer questions concerning the progress and effects of the active remediation.

4.3.3 Uranium Concentration Data

Groundwater samples were collected from twenty-three monitoring wells during the demonstration and analyzed for uranium. The locations of these 23 monitoring wells are shown in Figure 4-5. Sampling of the monitoring wells was conducted quarterly and coordinated with IEMP quarterly sampling events. Sampling at these 23 wells for uranium provided for the collection of samples from fixed depths within the aquifer. The uranium data are provided in Appendix F for reference purposes.

Groundwater samples were also collected from seven direct-push sampling locations during the Demonstration. The locations of the seven direct-push sampling locations are shown in Figure 4-6. Sampling using a direct-push technique allows groundwater samples to be collected within the aquifer from several different depths, at the same location, without installing a monitoring well. A sampling tool is pushed into the ground to facilitate the collection of a groundwater sample. By pushing the tool to different depths, samples from different discrete depths can be collected and analyzed. This strategy provides data that can be used to construct a complete vertical profile through a contaminant plume. After samples from all of the targeted depths have been collected, the rod is pulled from the ground, and the hole is filled with grout.

Direct-push sampling during the Demonstration consisted of the collection of water samples at the water table and ten-foot depth intervals beneath the water table. Sufficient samples were collected to define the

vertical thickness of the 20 µg/L total uranium plume. Figure 4-6 shows the seven direct-push locations (12367, 12368, 12369, 12370, 12371, 12372, and 12373). Locations 12367, 12368, 12369, 12370, and 12373 are situated just south of their respective re-injection wells. Locations 12372 and 12373 are located east and west of Re-Injection Well IW-10.

Six rounds of sampling (designated by letter) were conducted during the demonstration.

- Round A: May to June 1998.
- Round B: July 1998.
- Round C: December 1998 to January 1999.
- Round D: March 1999.
- Round E: June to July 1999.
- Found F: September to November 1999.

Uranium concentration data collected during each sampling round are provided in Appendix F for reference purposes. Cross sections incorporating the results of the sampling are also provided in Appendix F. (Note, these cross sections have been previously reported in quarterly Integrated Environmental Monitoring Reports.) As prescribed in the Re-Injection Demonstration Test Plan (DOE 1998), all seven locations were sampled during Rounds A and F. Only three of the seven locations (12369, 12372, and 12373) were sampled during Rounds B, C, D and E.

4.4 DEMONSTRATION RESULTS

4.4.1 Capture of the 20 µg/L Uranium Plume

Capture of the 20 µg/L uranium plume was assessed during the Demonstration by collecting water level data, preparing water table maps, interpreting hydraulic capture zones, and then correlating the capture interpretations to the location of the uranium plume. Quarterly water table maps for the Demonstration time period are shown in Figures 4-7 through 4-10. (Note, these water table maps were previously reported in quarterly Integrated Environmental Monitoring Status Reports.) The October 1998 map shown in Figure 4-7 has been revised from what was previously reported in the Integrated Environmental Monitoring Status Report for Fourth Quarter 1998 by removing water elevation data from the extraction and re-injection wells from the map. The pumping and re-injection well data were removed because they skewed regional aquifer water table interpretations with well efficiency effects. The quarterly water table maps (Figure 4-7 through 4-10) show that the interpreted capture zones and flow divides that existed

during the Demonstration as a result of the combination of pumping in the South Plume, and South Field, and re-injection. These interpreted capture zones and flow divides are generally in good agreement with modeled flow path predictions illustrated in Figure 4-1. The interpreted capture zones shown in

Figures 4-7 thru 4-10, indicate that capture of the 20 μg/L uranium plume was maintained during the Demonstration.

Figure 4-11 is the model-predicted, steady state, water table map for 1999. This model prediction comes from the 10-year aquifer remediation-modeling scenario presented in the BRSR (DOE 1997). It represents an average water table surface. Comparison of the modeled steady state surface with each of the four quarterly water table maps constructed during the Demonstration indicates that there is generally a good correlation, with the exception of the eastern portion of the map area (east of Re-Injection Well IW-12). Achievement of better correlation in the eastern portion of the map area is an objective of an ongoing modeling improvement project that has been discussed in quarterly IEMP reports.

4.4.2 Displacement of the Base of the 20 μg/L Uranium Plume into Deeper Regions of the Aquifer

Monitoring to determine if re-injection caused displacement of the base of the 20 μg/L uranium plume into deeper regions of the aquifer was accomplished through the collection of groundwater samples using a direct-push sampling tool at seven locations, as discussed in Section 4.3.

Figure 4-12 is a composite of cross sections constructed using uranium concentration data collected during six rounds of direct push uranium sampling from Locations 12369, 12372, and 12373. Figure 4-13 is a composite of two cross sections constructed using uranium concentration data collected during Sampling Rounds A and F from Locations 12367, 12368, 12369, 12370, and 12371. The individual cross sections shown in Figures 4-12 and 4-13 are provided at a larger scale in Appendix F for reference purposes. Both Figures 4-12 and 4-13 illustrate that the base of the uranium plume was not displaced into deeper regions of the aquifer because the uranium plume did not expand vertically during the Demonstration. At sampling points 12371, 12369, and 12372 in Round A, (Figure 4-12) the 20 μg/L uranium plume was interpreted as being 37 feet, 26 feet, and 65 feet thick, respectively, with the top of the plume situated at the water table. At the same three sampling points in Round F, the thickness of the 20 μg/L uranium plume was interpreted as being approximately 33 feet, 10 feet, and 58 feet, respectively with the top of the plume situated at the water table.

During Round C, a uranium concentration of 21 μg/L was detected at Location 12369 at 470 feet above mean sea level, approximately 20 feet beneath the interpreted base of the 20 μg/L uranium plume, as shown in Figure 4-12. If the plume was being displaced deeper into the aquifer as a result of re-injection, it was expected that the base of the plume would move. These data show that the base of the plume did

not move, which implies that a separate lobe of the plume was present. However, subsequent rounds of sampling confirmed that a uranium concentration above 20 μg/L at 470 feet above mean sea level did not exist at that depth.

During Sampling Round D, a uranium concentration of 21 μg/L was detected at Location 12373 (Figure 4-12) at an elevation of approximately 450 feet amsl, approximately 10 feet beneath the interpreted base of the 20 μg/L uranium plume. Again, the data indicate that the base of the uranium plume did not move, and that a separate, deeper lobe of the plume could exist. In order to verify whether or not this deeper contamination actually existed, sampling during Round E at Location 12449 went to an elevation of 400 feet amsl, or 120 feet below the water table. The first attempt to go this deep encountered sampling problems, which resulted in cross contamination of the deeper samples. However, a confirmatory sampling (identified as 12449) was successful in collecting representative samples down to an elevation of 400 feet amsl. These samples showed that the uranium concentration at an elevation of 450 feet amsl was not above 20 μg/L. The last sampling round (Round F) went to an elevation of 430 feet amsl (forty feet beneath the interpreted base of the 20 μg/L uranium plume) at location 12373. Round F results confirmed that the uranium concentration below an elevation of approximately 462 feet amsl (58 feet below the water table) is below 20 μg/L.

4.4.3 Hydraulic Barrier

As explained below, water level data collected during the Demonstration indicate that the combined effect of re-injection and pumping in the South Plume and South Field did create a stagnation zone between the two pumping systems. However, the influence re-injection had in raising water levels in the stagnation zone to enhance this hydraulic barrier was not as great as was predicted by the groundwater model also, the water level rise produced in the aquifer by the re-injection wells was not evenly distributed across the re-injection area.

The groundwater modeling scenario for the 10-year aquifer remedy predicted a water level rise around each re-injection well of approximately 0.5 feet, as shown in Figure 4-2. The water level rise around only two of the re-injection wells (IW-8 and IW-9) was 0.5 feet or greater. Both of these wells are in the western portion of the demonstration area indicating that the rise was greater in the west than in the east.

Figure 4-4 is a map that shows the location of the monitoring wells which were used for the collection of water level measurements during the Demonstration. Water levels measured after startup of the additional South Plume Extraction wells and the South Field Extraction Wells but prior to the start of re-injection compared to the water levels measured just after the start of re-injection offer the best comparison for determining the net actual water level rise added by re-injection. Of the wells monitored

in the Demonstration just after the start of re-injection, only seven of the monitoring wells recorded an increase in water level as a result of re-injection. These seven wells are 22299, 22300, 22301, 22302, 32304, 32305, and 3015 (Figure 4-4). With the exception of Monitoring Well 3015, all of these wells are within approximately 25 feet of the re-injection wells, indicating that the water level rise due to re-injection was limited to the area immediately surrounding the wells.

Table 4-1 presents the water level rises recorded in each of these seven wells immediately following start-up of the Demonstration. Of the seven wells listed, the data indicate that four had a rise of 0.50 feet or greater (22299, 22300, 22301, and 32304). These four wells monitor the three western most re-injection wells (IW-8, IW-9, and IW-10.

An erroneous water level reading on September 3, 1998 in Well 2096 gives the appearance of a water level rise. However, the water level rise recorded for Monitoring Well 2096 on September 3, 1998 is inconsistent with water levels measured both prior and subsequent to September 3, 1998. A graph of the water level versus time for Monitoring Well 2096 is provided in Figure 4-14. The figure indicates that the water elevation recorded on September 3, 1998 appears to be an error and that re-injection did not cause the water level to rise at this location. Monitoring Well 2096 is also located over 2000 feet west of the closest Re-Injection Well (IW-8); further support that the reading on September 3, 1998 was an error.

4.4.4 Flushing of Uranium Contamination

It was determined that water level and uranium concentration data provide evidence for the effectiveness of re-injection in flushing uranium contamination in the aquifer. This evidence is discussed below. Figure 4-15 illustrates the actual versus modeled north-south oriented water table profile during the Demonstration. Since the model prediction shown in Figure 4-15 is based on steady-state conditions, water levels measured at Wells EW-15, 22301, 2880, and 2899 were averaged from October of 1998 through August of 1999 to determine the average water table profile produced during the demonstration. The actual water levels for each individual month are reported in Appendix D.

As Figure 4-15 illustrates, the actual overall lowering of the water table in the area of the selected wells was not as much as was predicted by the groundwater model. The gradient between IW-10 (Re-Injection Area) and EW-15 (South Field) appears to be very close to modeled predictions. The model predicted that the gradient north of the re-injection wells, between IW-10 and EW-22, would be 0.25 feet (516.5 feet amsl – 516.25 feet amsl. The measured average of the gradients during the demonstration (between monitoring wells 22301 and EW-15) was 0.16 feet (518.04 feet amsl – 518.20 feet amsl). The

gradient between IW-10 (re-injection area) and RW-6 (south plume) appears to be very close to model predictions. The model predicted that the gradient south of the re-injection wells, between IW-10 and RW-3, would be 5 feet (516.5 feet amsl - 511.5 feet amsl). The measured average of the gradients during the demonstration (between 22301 and 2899) was 4.01 feet (518.04 feet amsl - 514.03 feet amsl).

To conclude, the overall lowering of the water table over the course of the demonstration was not as great as what it was predicted to be, indicating that the aquifer yield is greater than predicted. Measured average gradients north and south of the re-injection wells were very close to model predictions indicating that water is being flushed at about the same rate as the model predicted it would be. Because drawdown was less than predicted, the water level impact in the Paddys Run Roadsite area which is located to the south of the South Plume extraction wells, was less than anticipated.

Uranium concentration data from direct-push sampling indicate that re-injection was effective in flushing uranium contamination immediately south of the re-injection wells, but not between the re-injection wells. No geoprobe sampling was done north of the re-injection wells. The three direct-push locations, which were sampled quarterly (Figure 4-12), are located in a region of the uranium plume where uranium concentrations are larger than 400 μg/L. Figure 4-6 is a map showing the locations. Monitoring of these three locations quarterly was conducted to determine how effectively uranium contamination was being flushed from the aquifer between Re-injection Wells. Locations 12372 and 12373 are located between re-injection wells IW-9 and IW-10, and IW-10 and IW-11 respectively. Location 12369 provided data concerning how effectively uranium contamination was being flushed south of IW-10.

The decrease in uranium concentrations immediately south of the re-injection wells was much greater than the uranium decrease recorded between the re-injection wells. Figure 4-12 illustrates that, between sampling Rounds A and F, the uranium concentration just west of Re-Injection Well IW-10 (Location 12372) increased by 14.9 μg/L. The uranium concentration east of Re-Injection Well IW-10

(Location 12373) decreased by 40 μg/L. The uranium concentration south of Re-Injection Well IW-10 (down gradient at Location 12369) decreased by 82 μg/L. The thickness of the uranium plume between re-injection wells is relatively unchanged after one year of re-injection.

Figure 4-13 illustrates that after one year of re-injection, the concentration of uranium contamination immediately south of the re-injection wells has been decreased dramatically. Flow paths predicted by the model, shown in Figure 4-1, as well as direct-push data shown in Figure 4-12 were incorporated into the

Round F plume interpretation shown in Figure 4-13 (for Round F). The direct-push data shown in Figure 4-12 indicate that flushing of uranium contamination between the re-injection wells is not taking place. The plume interpretation shown in Figure 4-13 therefore assumes that flushing south of the re-injection wells also did not take place between the direct-push sampling locations. Eventually the flushing patterns should coalesce as they approach the South Plume Extraction Wells. The point of coalescence, though, is not known as this time. The plume interpretation shown in Figure 4-13 is in agreement with modeled flow path predictions shown in Figure 4-1 that indicate a narrow flow path south of each re-injection well at the direct-push sampling locations.

The decrease in uranium concentrations at these five sampling locations in just one year is very encouraging. Using the highest recorded uranium concentration measured in Round A and Round F, regardless of depth, the largest decrease in uranium concentrations took place at Locations 12369 and 12370 where uranium concentrations dropped by 82 μg/L and 118 μg/L, respectively, in just one year.

TABLE 4-1

WATER LEVEL RISE DATA (MONITORING WELLS)

Well	Pre-Inject Week of 8/24/98[a]	Post-Inject 9/3/98	Water Level Rise
22299	519.47	520.39	0.92
22300	519.56	520.20	0.64
22301	518.71	519.21	0.50
22302	519.17	519.28	0.11
32304	516.61	517.62	1.01
32305	519.54	519.55	0.01
3015	518.54	518.72	0.18

[a]South Field and South Plume Optimization Wells were placed into operation prior to this date on July 13, 1998 and August 9, 1998 respectively.

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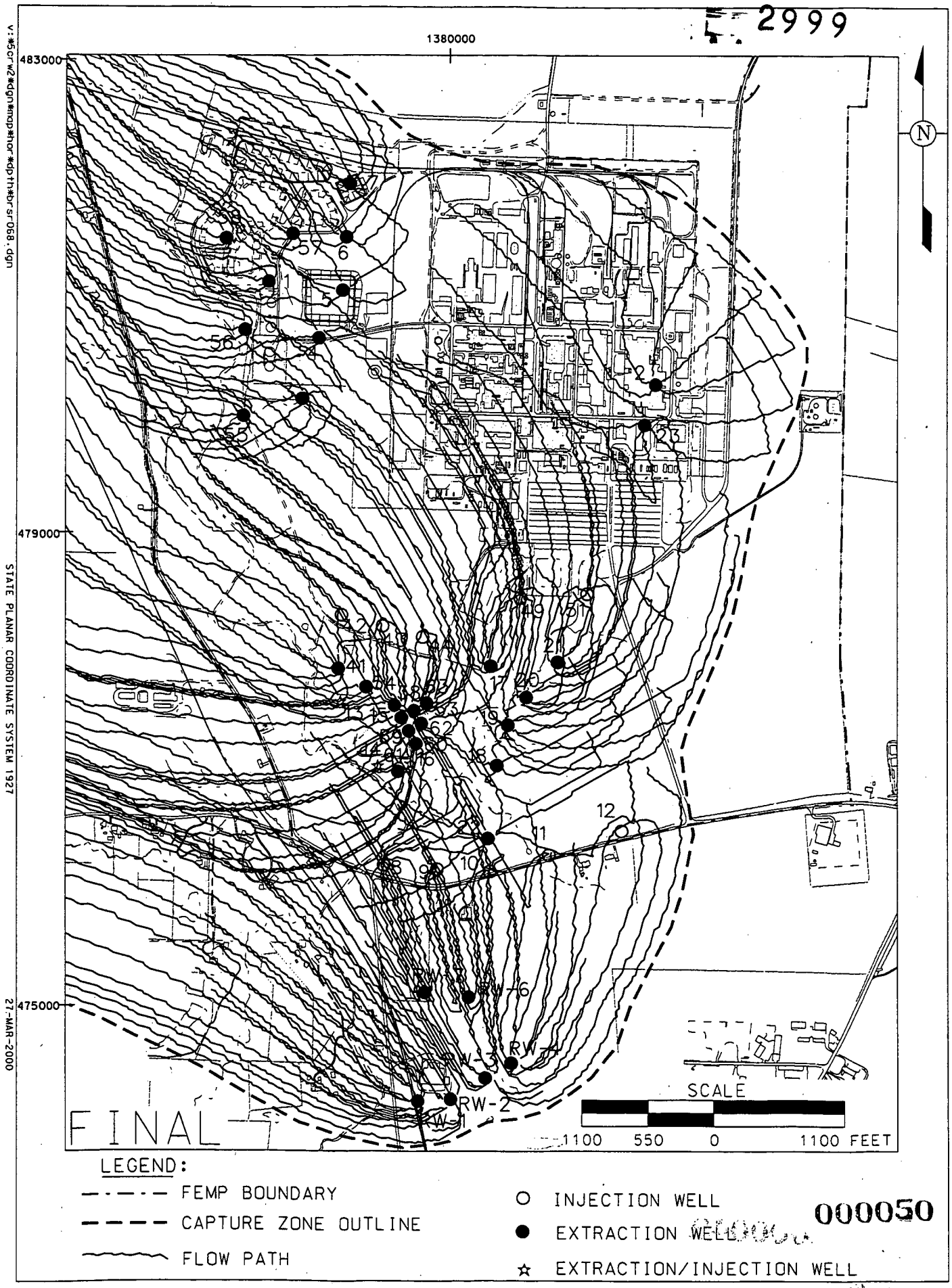

FIGURE 4-1. MODELED CAPTURE ZONE AND FLOW FOR THE 10-YEAR REMEDIATION STRATEGY

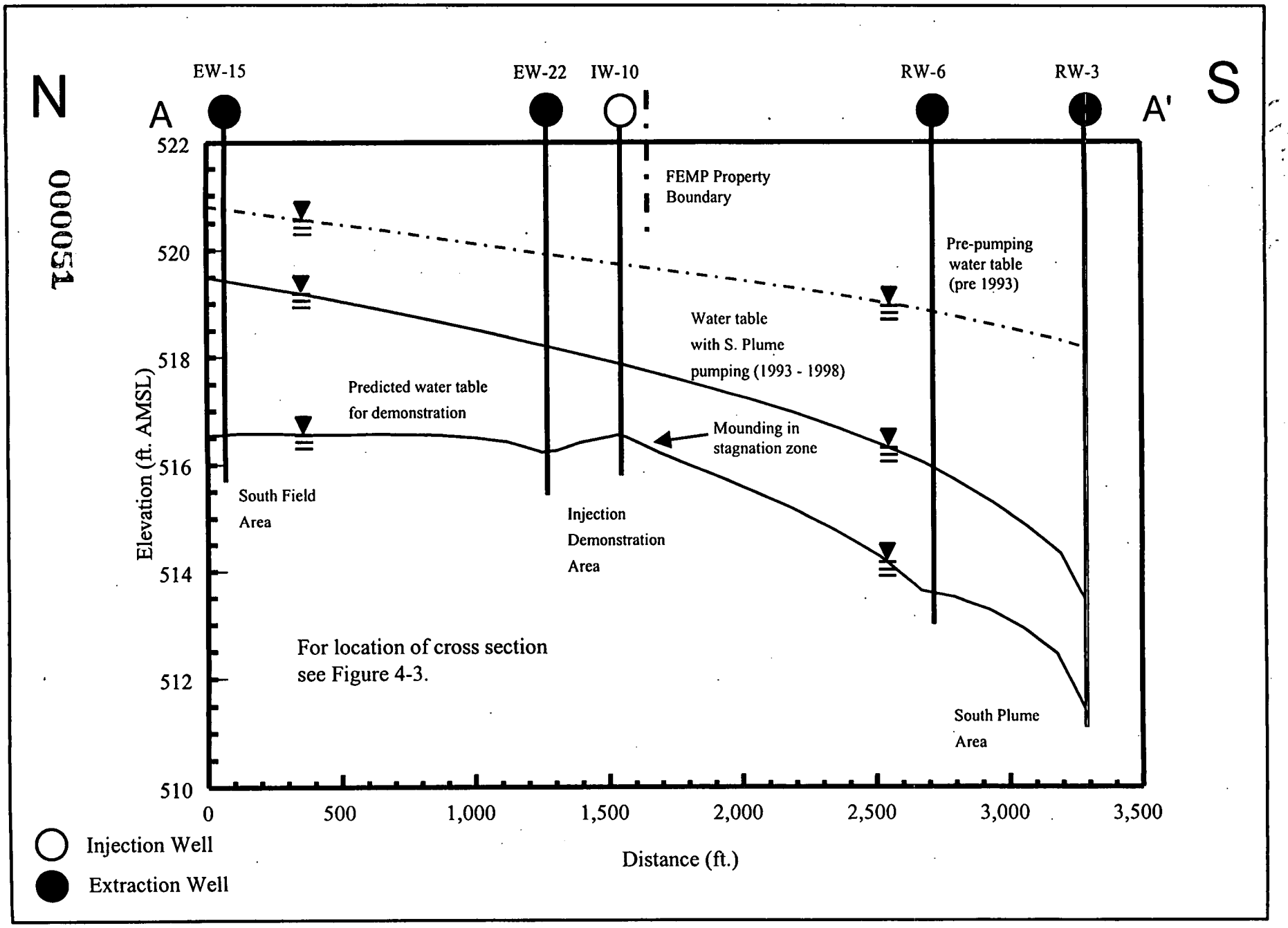

Figure 4-2. Water Table Elevation Profile

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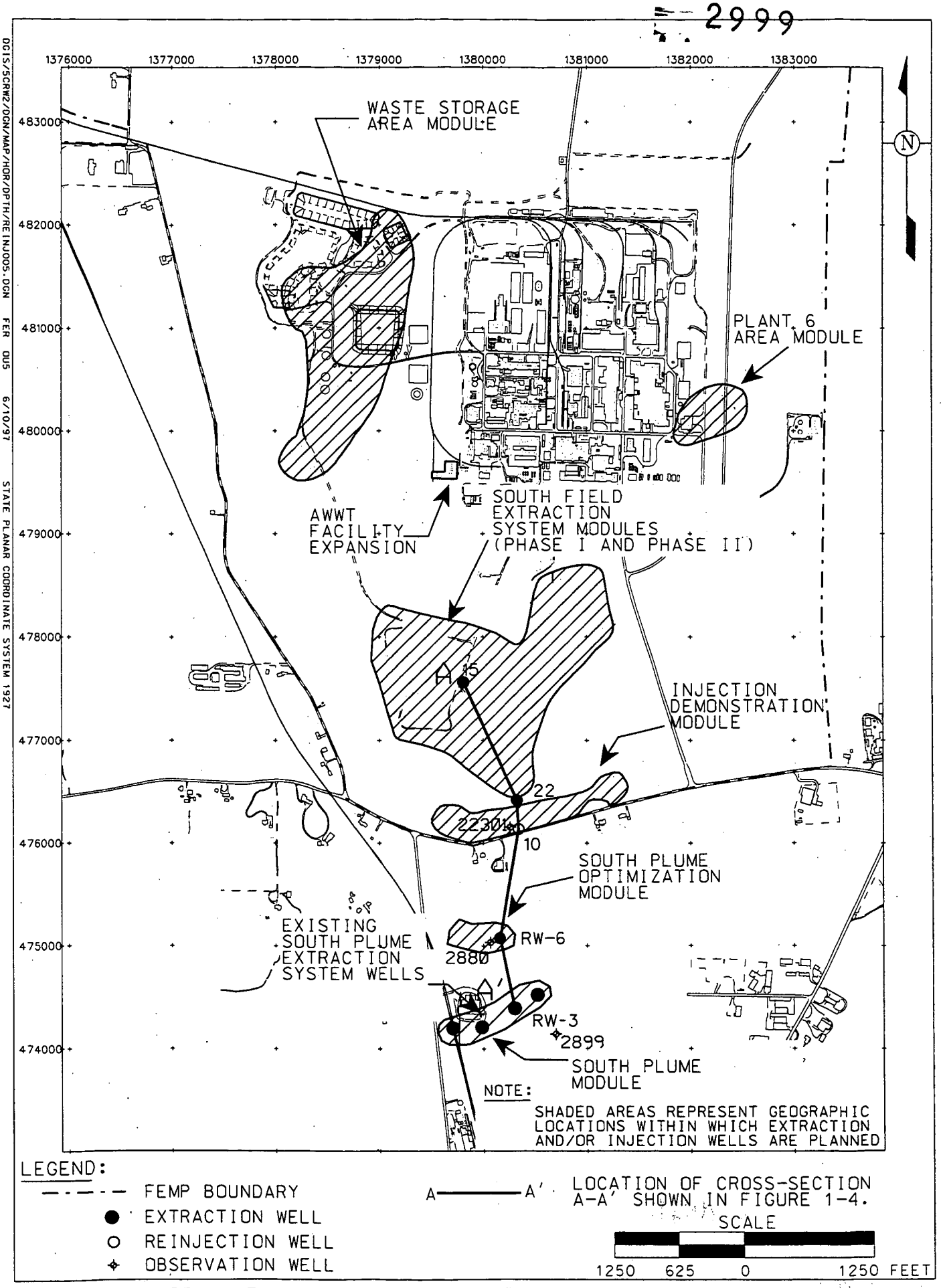
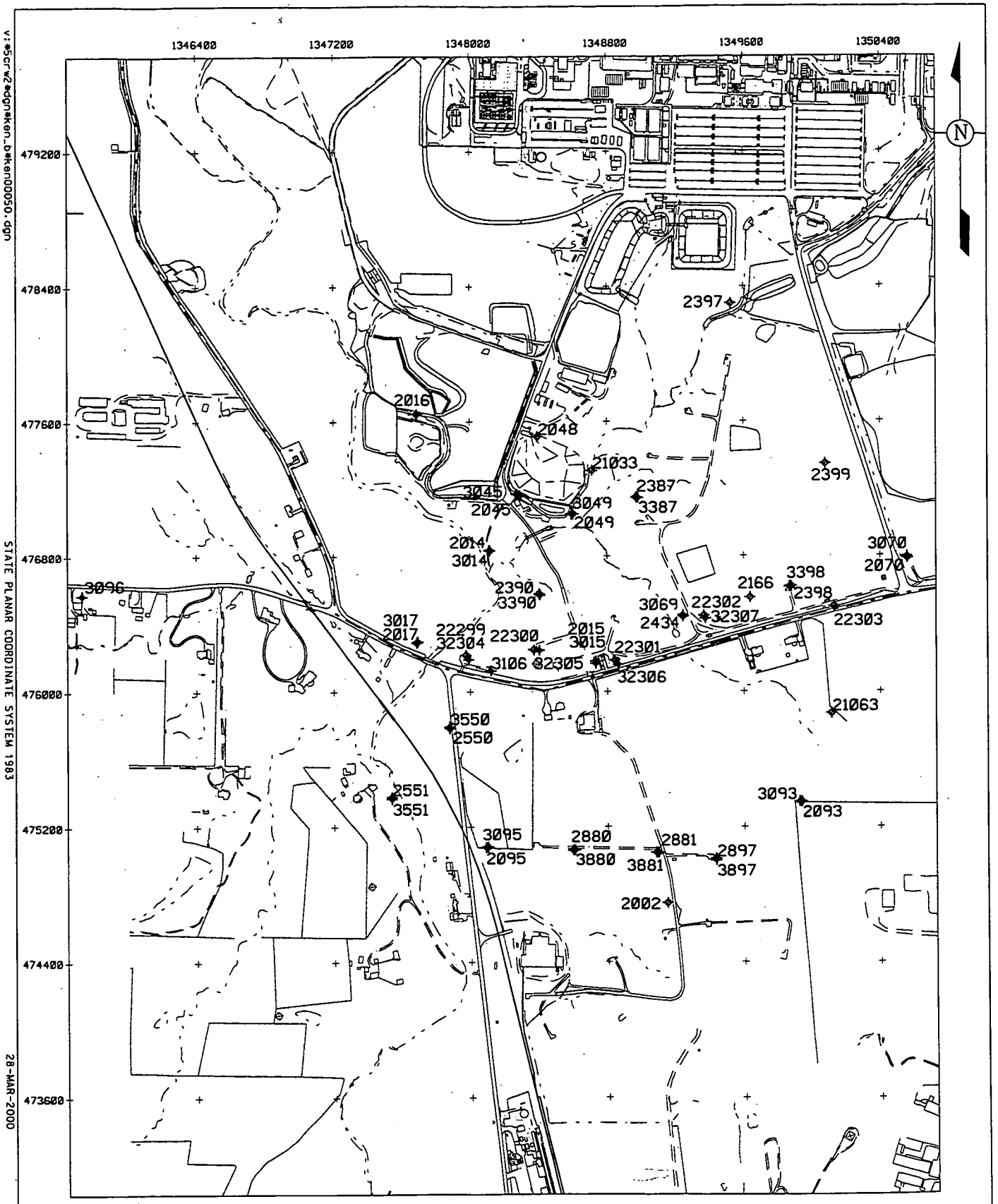


FIGURE 4-3. LOCATION OF WATER TABLE ELEVATION PROFILES



LEGEND:

— · — · — FEMP BOUNDARY

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✧ TYPE 2 MONITORING WELL

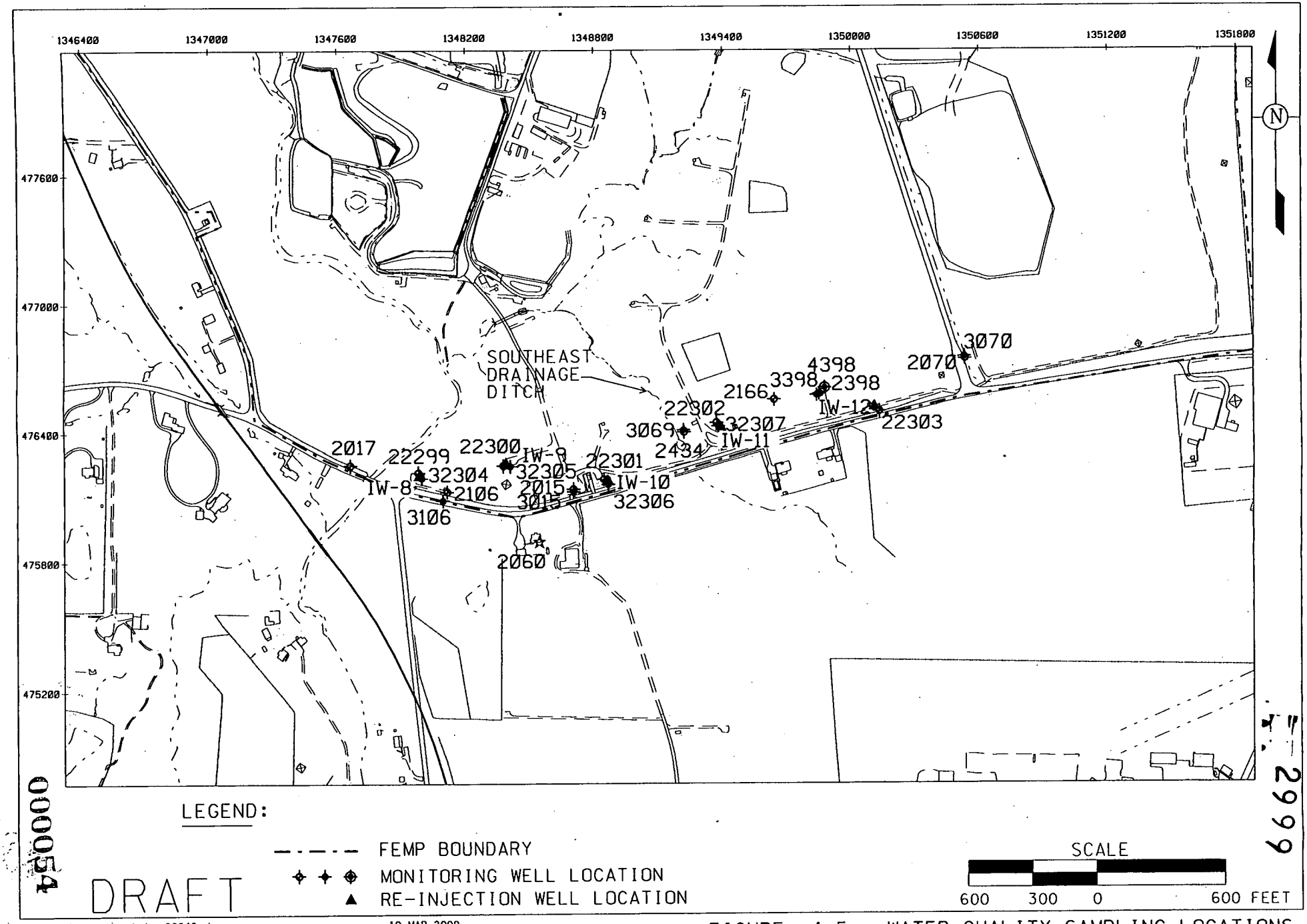
✦ TYPE 3 MONITORING WELL

SCALE

800 400 0 800 FEET

DRAFT

FIGURE 4-4. GROUNDWATER ELEVATION MONITORING WELLS



v:\5crw2\dgn\ken_b\ken00046.dgn
STATE PLANAR COORDINATE SYSTEM 1983

10-MAR-2000

FIGURE 4-5. WATER QUALITY SAMPLING LOCATIONS

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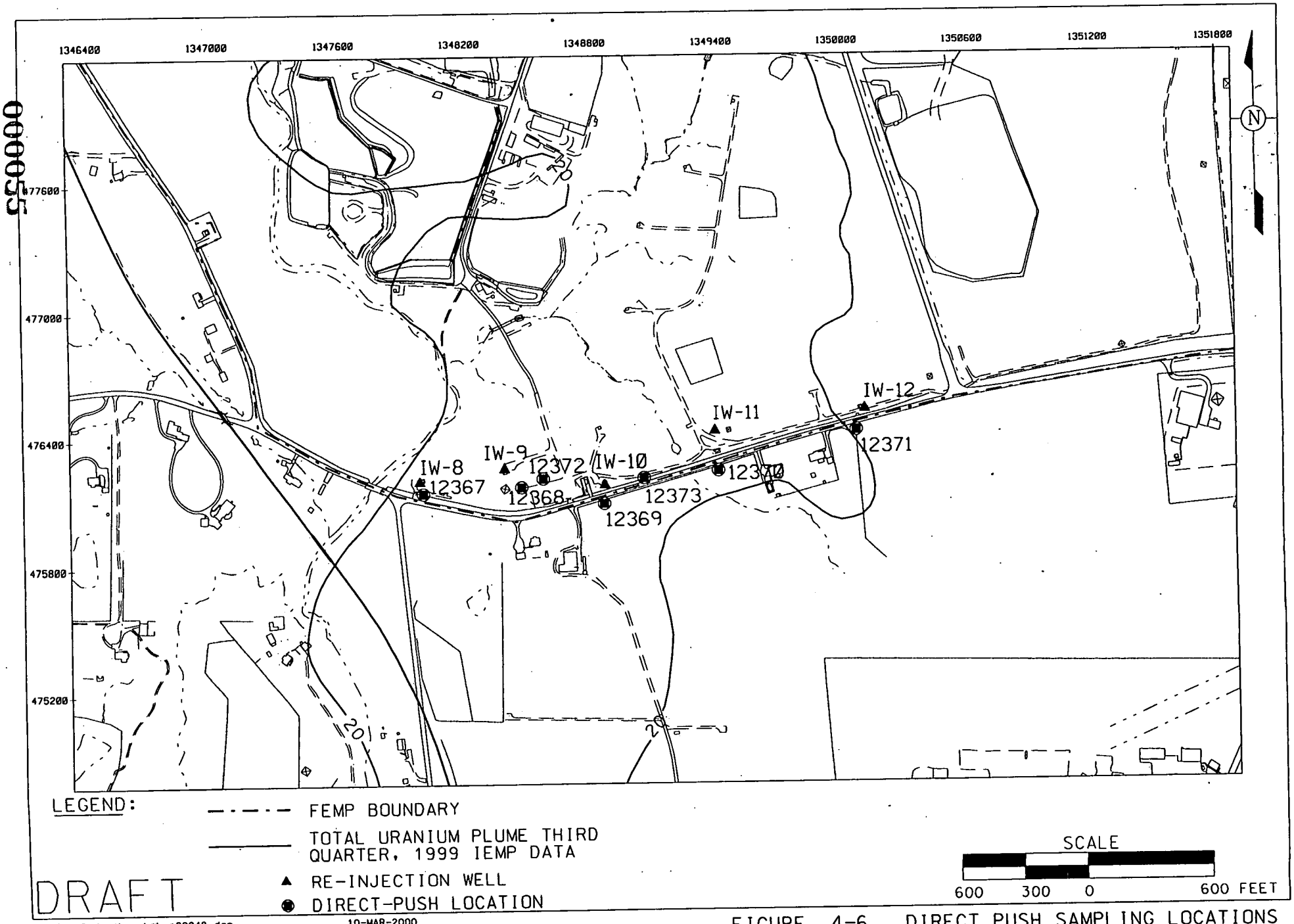

v:\5crw2\dgn\ken_b\ken00048.dgn
STATE PLANAR COORDINATE SYSTEM 1983

10-MAR-2000

FIGURE 4-6. DIRECT PUSH SAMPLING LOCATIONS

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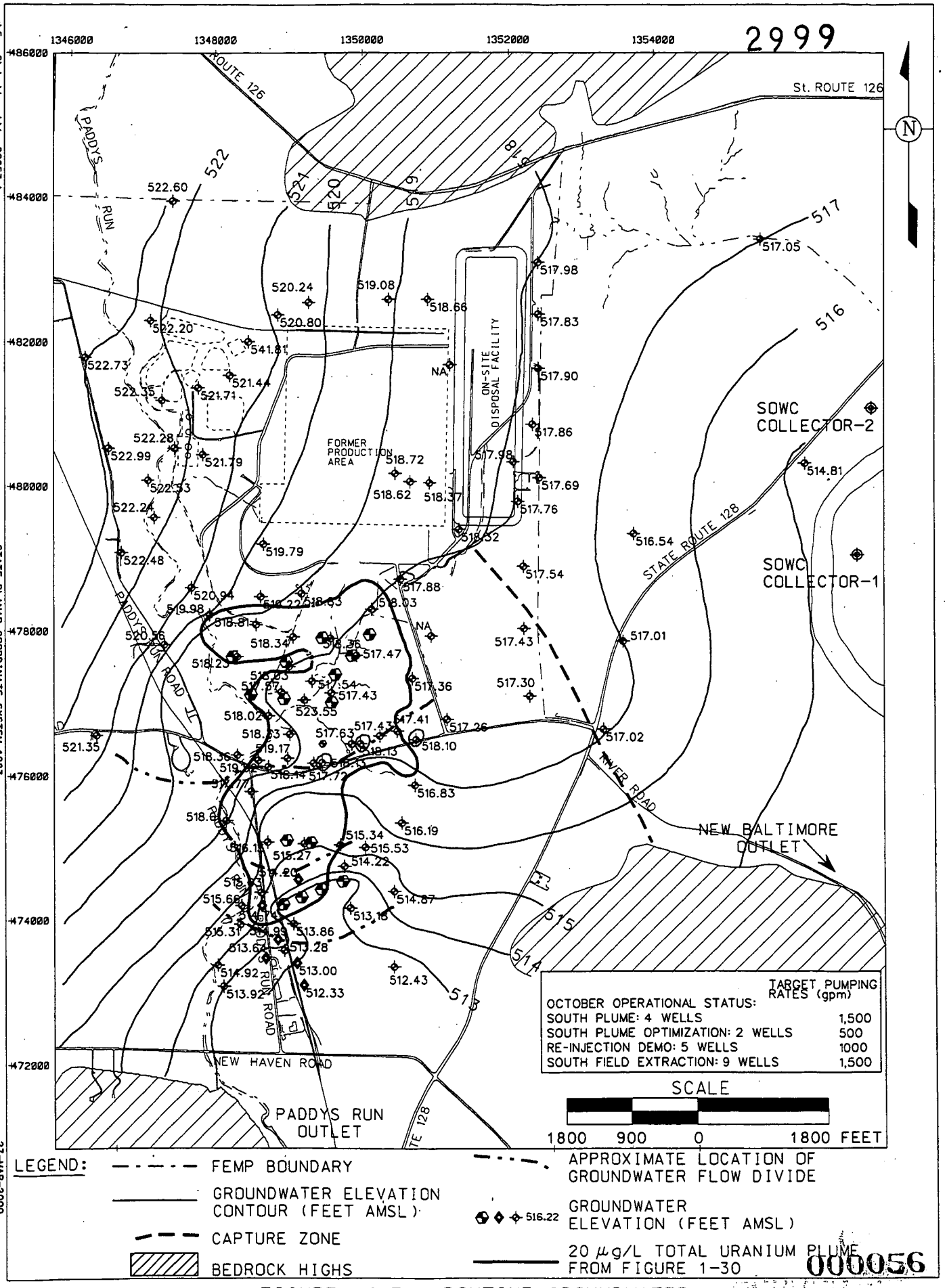

v:\Scrw2\dgn\ken_b\ken00053.dgn

STATE PLANAR COORDINATE SYSTEM 1983

27-MAR-2000

FIGURE 4-7. ROUTINE GROUNDWATER ELEVATIONS FOR TYPE 2 WELLS, OCTOBER 1998

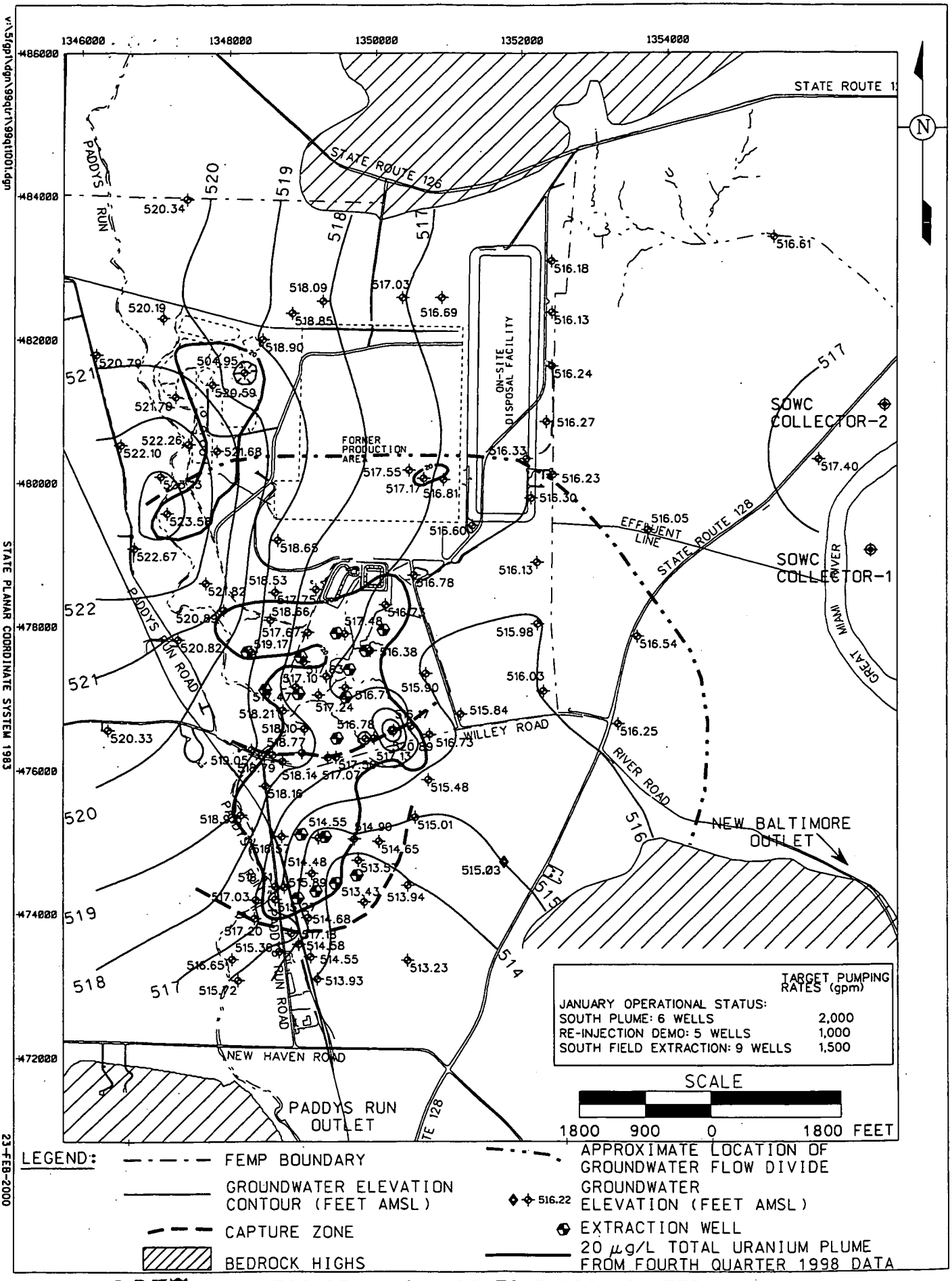

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FIGURE 4-8. ROUTINE GROUNDWATER ELEVATIONS FOR TYPE 2 WELLS, JANUARY 1999

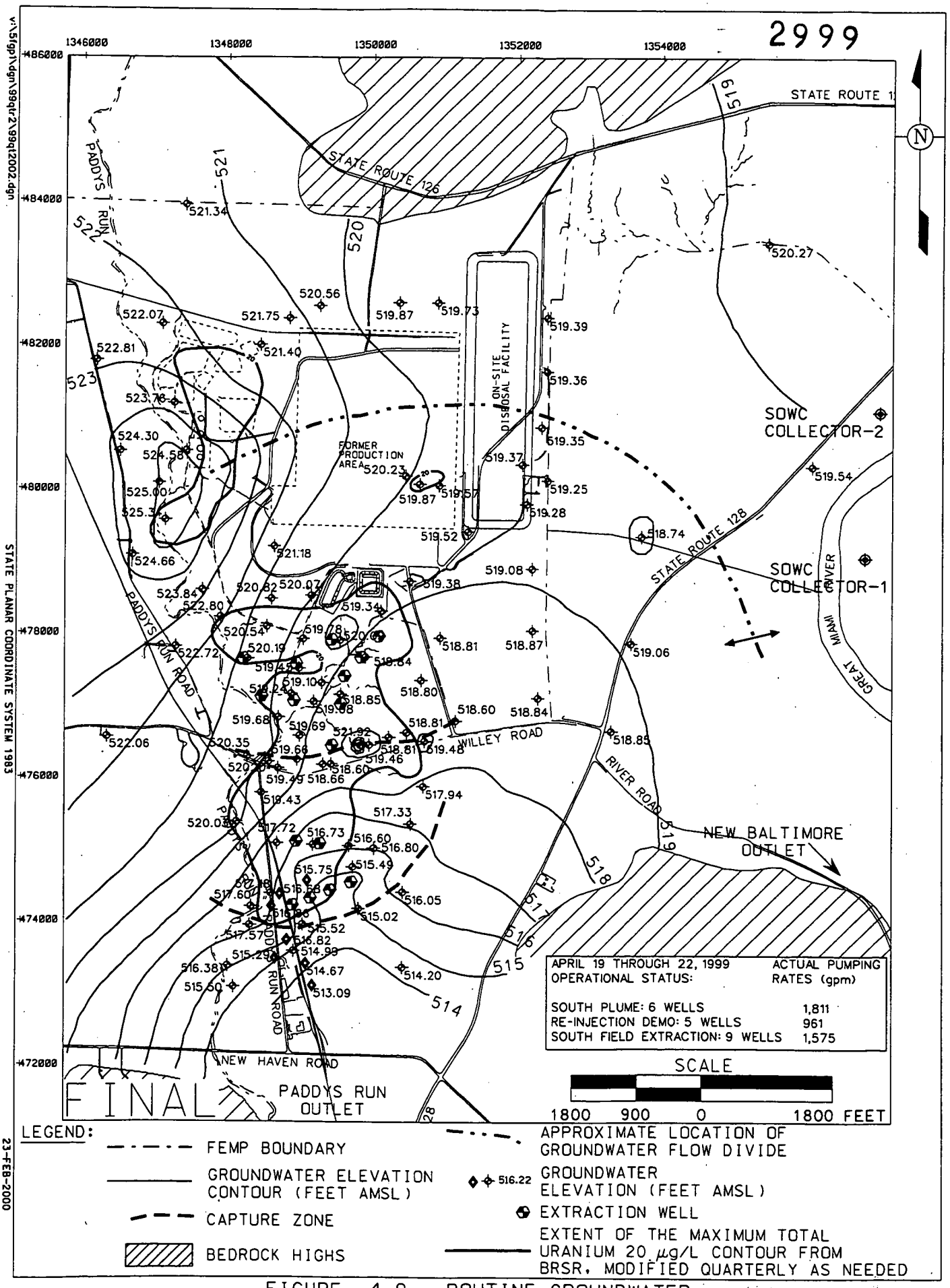


FIGURE 4-9. ROUTINE GROUNDWATER ELEVATIONS FOR TYPE 2 WELLS, APRIL 1999

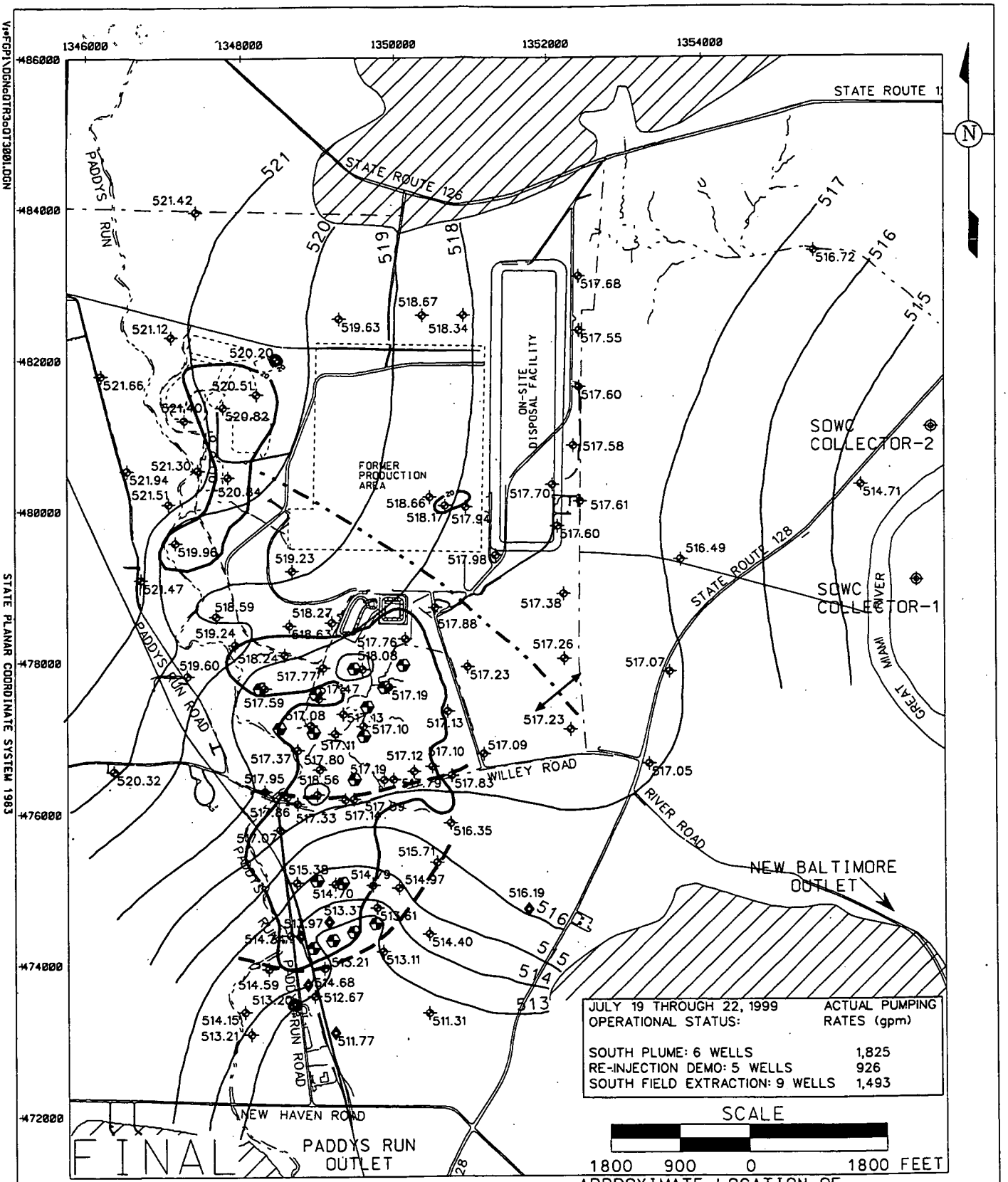


FIGURE 4-10. ROUTINE GROUNDWATER ELEVATIONS FOR TYPE 2 WELLS, JULY 1999

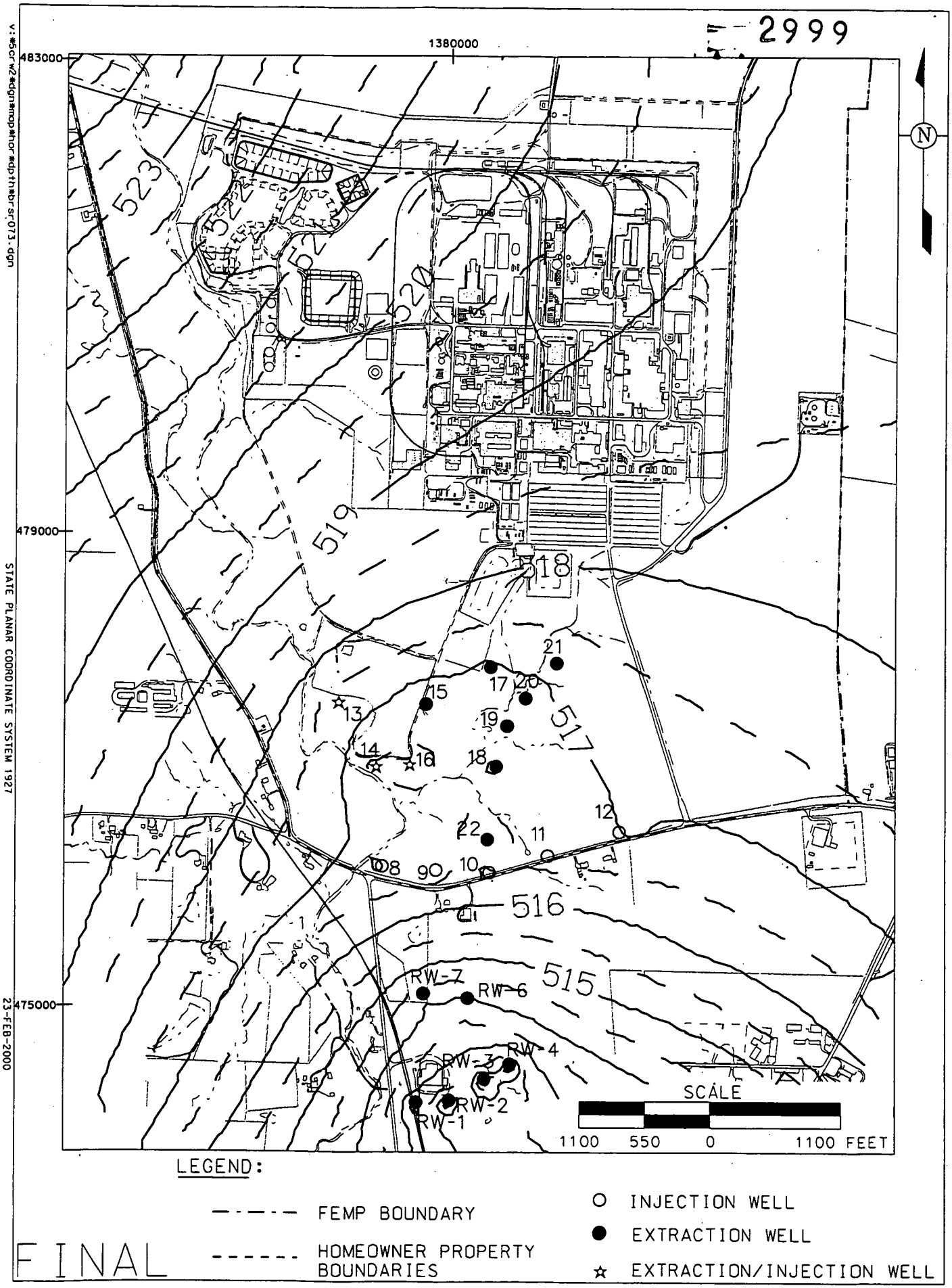
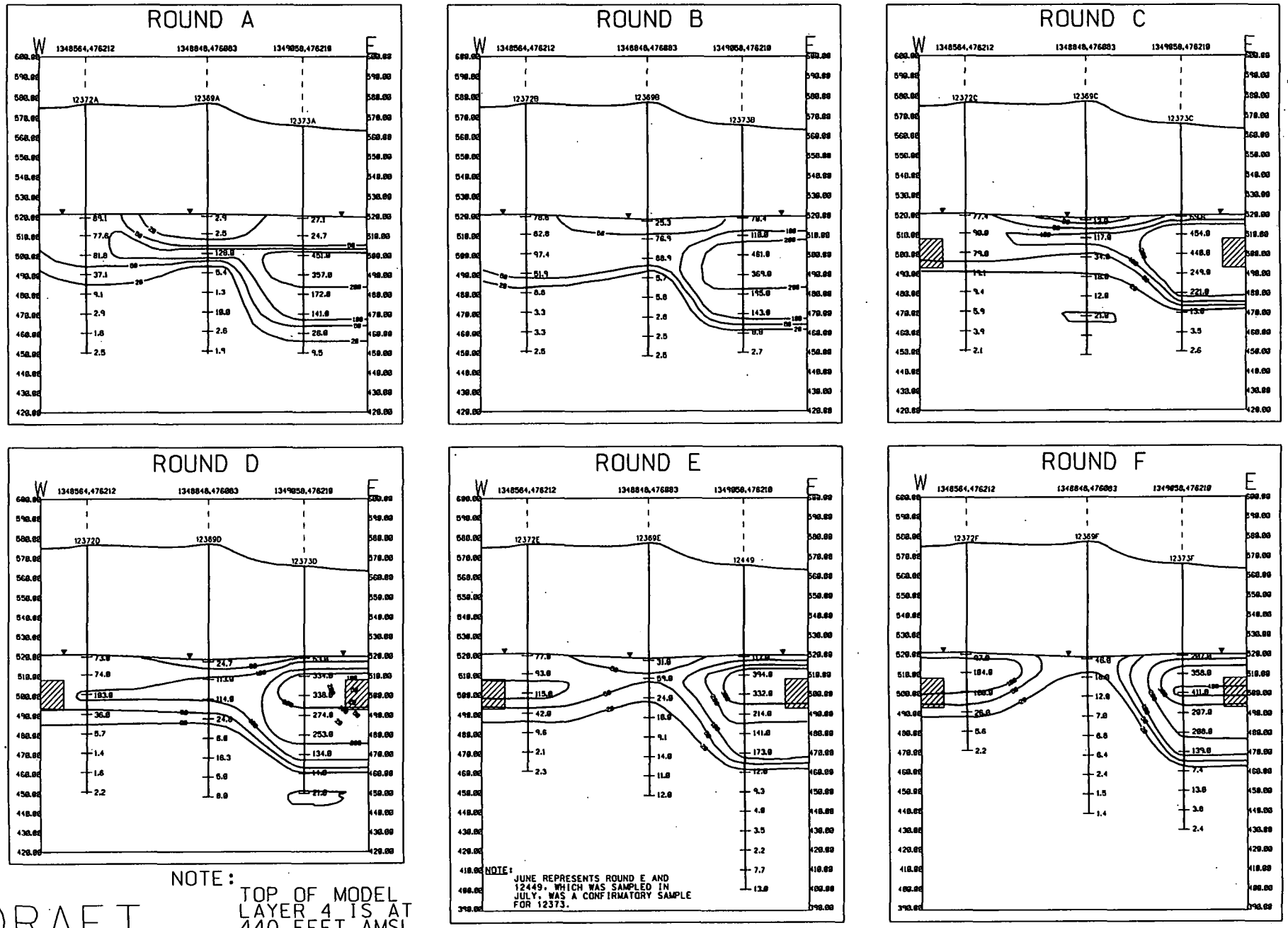


FIGURE 4-11. MODELED GROUNDWATER ELEVATIONS FOR 1999 THROUGH 2003



NOTE: TOP OF MODEL LAYER 4 IS AT 440 FEET AMSL

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STATE PLANAR COORDINATE SYSTEM 1983

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FIGURE 4-12. URANIUM PLUME PROFILES (ROUNDS A THRU F)

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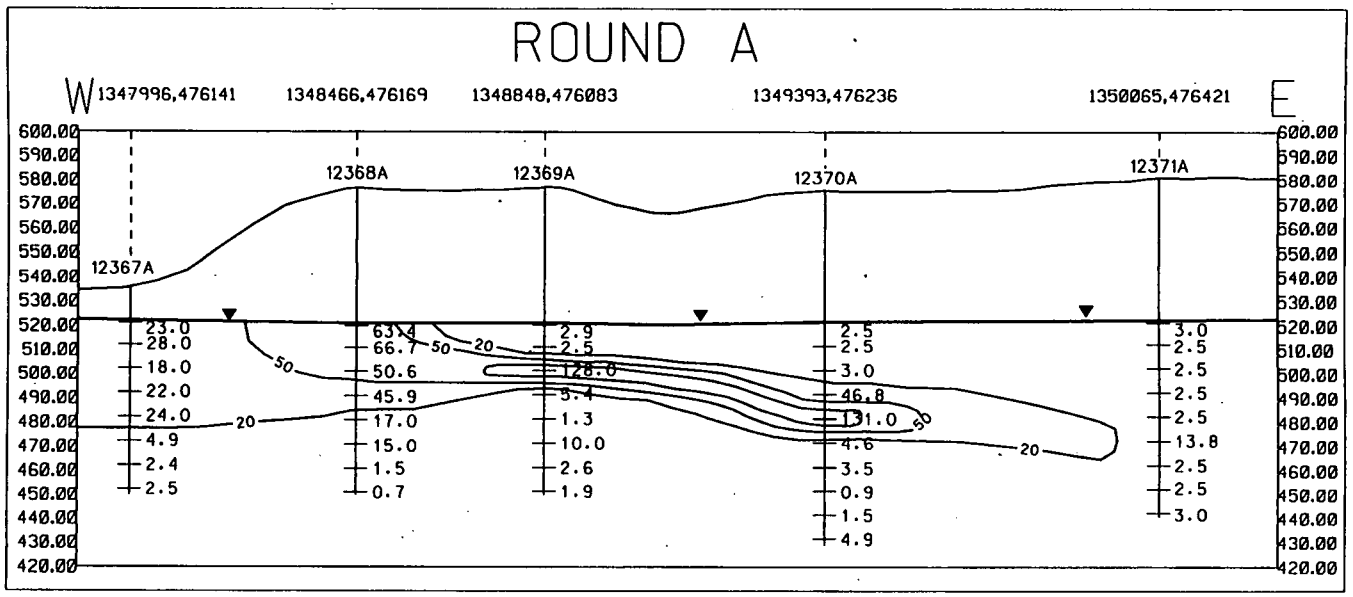

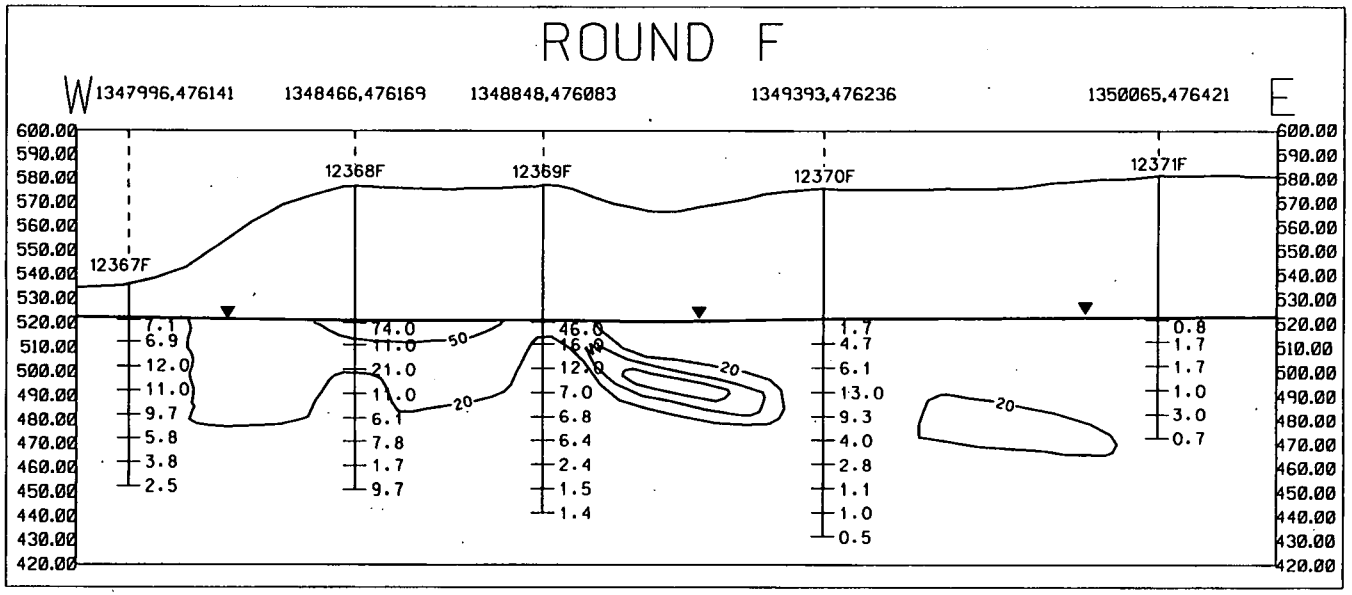

LEGEND:

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FIGURE 4-13. URANIUM PLUME PROFILE (ROUND A AND F)

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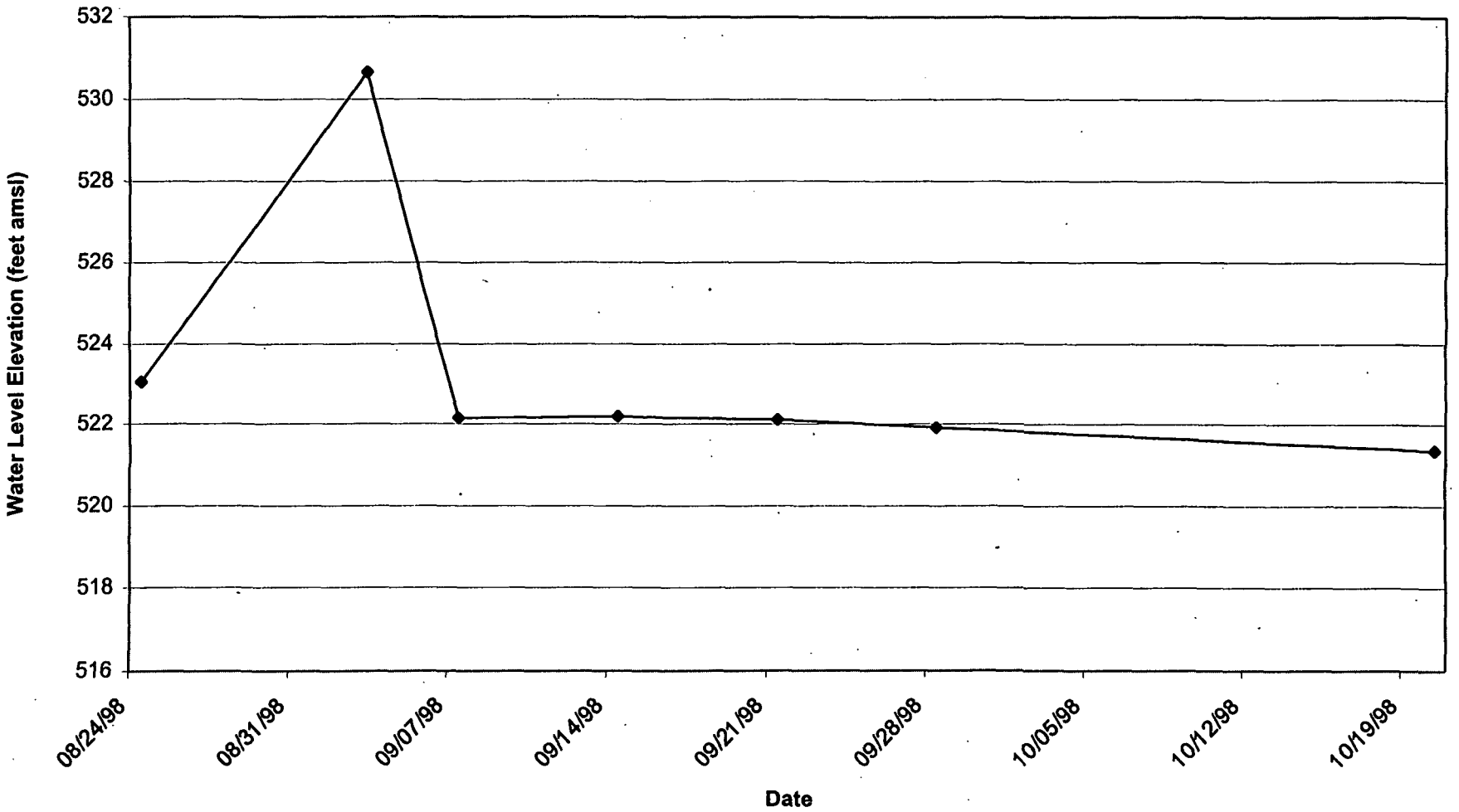
FIGURE 4-14
Water Level in Well 2096
Week of Aug 24, 1998 through October 20, 1998



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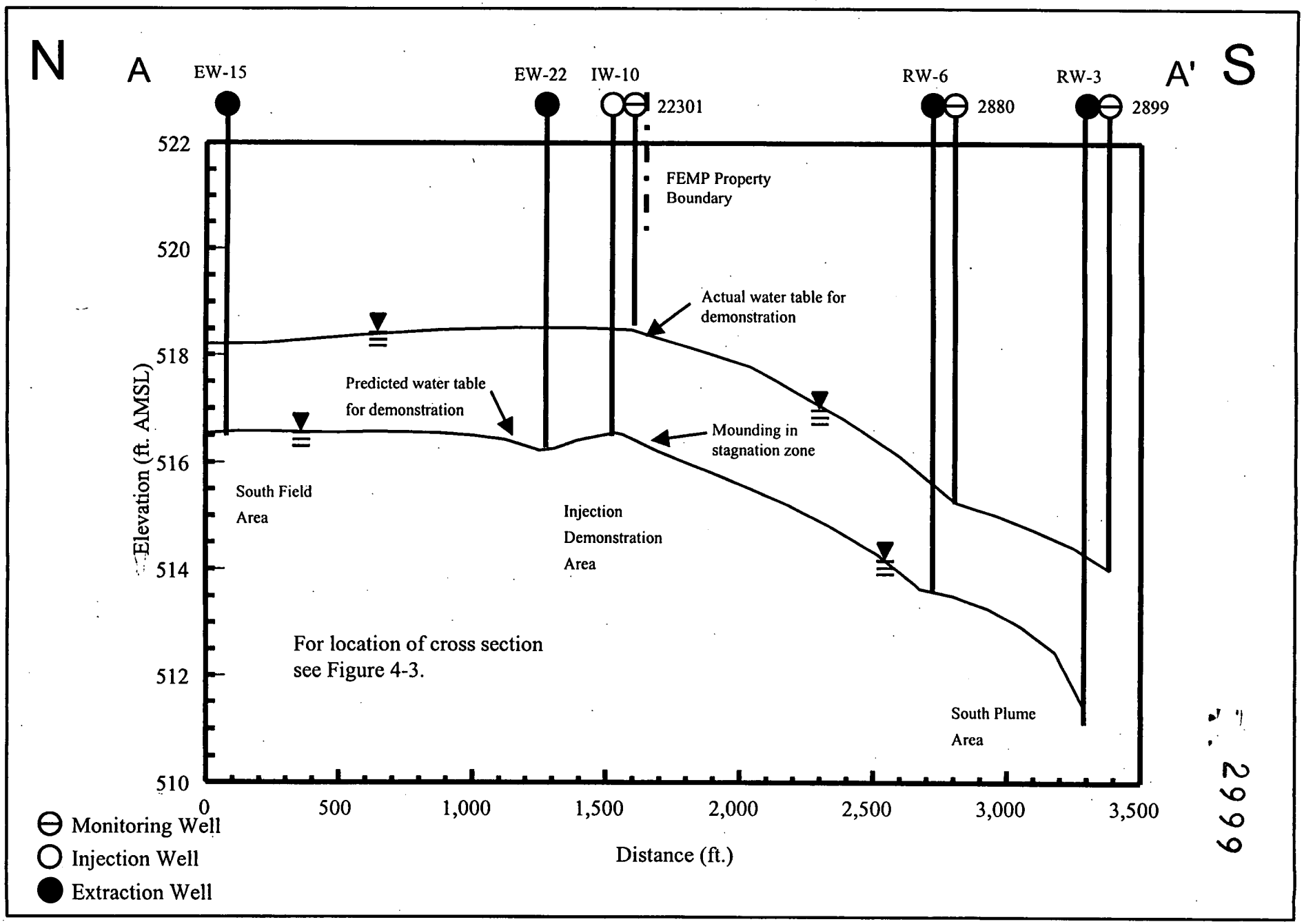

Figure 4-15. Actual Water Table Elevation Profile for Demonstration Time Period

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5.0 IMPACT ON THE CHEMISTRY OF THE AQUIFER

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As expected, major anion and cation concentration data collected during the Demonstration document that the injection of treated groundwater had a very minor impact on the chemistry of the groundwater in the Great Miami Aquifer. The minor changes, which were observed near the re-injection wells (dissolved oxygen, sulfates, and chloride concentrations) are not expected to have a negative impact on contaminant migration, remedy performance, or water chemistry of the aquifer. One change in Eh conditions was observed during the demonstration. Relative to the Fe^{2+} - Fe^{3+} system, Eh went from relatively reducing to relatively oxidizing in Observation Well 32304. This well is screened next to Re-Injection Well IW-8 but its screen is located beneath the screen in IW-8. This change in Eh conditions indicates that any Fe^{2+} present in the aquifer at this location would undergo oxidation into Fe^{3+}. Energy from this reaction would fuel the growth of iron bacteria, if the reaction takes place within the bacterial cell. This observation is consistent with the fact that IW-8 required more treatments to address plugging during the demonstration than any of the other re-injection wells did. IW-8 is very close to Paddys Run, which is a recharge point to the Great Miami Aquifer in this area. It is possible that during recharge periods, the added effect of re-injection coupled, with seasonal recharge to the aquifer through Paddys Run, caused the natural redox front within the aquifer to shift to a lower depth at this location.

5.1 BACKGROUND

Information learned from two single well injection tests, conducted prior to the Demonstration (DOE 1995 and DOE 1996a), revealed that water with a similar chemistry to that of the aquifer needed to be injected during the demonstration to minimize plugging due to iron and bacterial growth.

In the Great Miami Aquifer, re-injection of treated groundwater can create conditions favorable for the precipitation of iron hydroxide which can plug well screens and decrease porosity and permeability in the Great Miami Aquifer, in the vicinity of the re-injection wells. This reaction is driven by the pH, Eh, and iron concentration of the aquifer system. The pH of the Great Miami Aquifer lies between 6.8 and 7.8 in the majority of monitoring wells sampled. Reported Eh values for the aquifer imply that iron will be mobile as Fe^{2+} in the Eh range of 75 to 200 mV and immobile as Fe^{3+} in the relatively oxidizing range of 300 to 450 mV. Dissolved iron concentrations in the aquifer are relatively high (e.g. > 0.5 mg/L) in the transitional Eh range and low (< 0.05 mg/L) in the oxidizing Eh range. As Fe^{2+} oxidizes to Fe^{3+}, iron precipitates (e.g., $Fe(OH)_3$) and the aqueous iron concentration is lowered.

Analysis of water samples collected from the AWWT Expansion Facility prior to the start of re-injection indicates that the chemistry of the treated water was similar to the chemistry of the aquifer water in the zone of re-injection (DOE 1998). Therefore, changes to the water chemistry of the aquifer were not expected to take place. The Re-Injection Demonstration Test Plan prescribed three monitoring activities that focused on documenting water chemistry changes in the aquifer:

1) The collection of groundwater samples from twenty-three groundwater monitoring wells within the Demonstration area. The samples were analyzed for major anions and cations, along with uranium.

2) The collection of groundwater samples from direct-push sampling locations. The samples were analyzed for major anions and cations, along with uranium.

3) The monitoring of water temperature, pH, specific conductivity, dissolved oxygen, and Eh in nine observation wells utilizing a down-hole water quality probe. These are referred to in this report as "*in situ*" parameters.

The water chemistry data collected during the Demonstration is presented in Appendix G for reference purposes.

Results of the analysis of a grab sample of water from the Southeast Drainage Ditch, as prescribed in the Re-Injection Demonstration Test Plan, are also presented in Appendix G. Data presented in Appendix G show that the water chemistry of the surface water sample collected from the Southeast Drainage Ditch, (see Figure 4-5 for ditch location) is chemically similar to the groundwater found in the aquifer directly beneath the ditch. Based on the similarities of the waters sampled, the Southeast Drainage Ditch is a likely source of recharge to the Great Miami Aquifer.

5.2 WATER CHEMISTRY CHANGES IN THE AQUIFER (MAJOR ANIONS AND CATIONS)

During the Demonstration, groundwater samples were collected from both monitoring wells and direct-push sampling locations and analyzed for the major anions and cations listed in Table 4-2 of the Re-Injection Demonstration Test Plan (DOE 1998).

Twenty-three monitoring wells were sampled quarterly. Figure 4-5 of this report shows the locations of the monitoring wells. Sampling took place on the following dates.

- Prior to the Start of Re-Injection - August 18, 1998 to August 19, 1998.
- December 29, 1998 to December 31, 1998.
- March 22, 1999 to March 25, 1999.
- June 7, 1999 to August 11,1999.

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The last sampling round from June 7, 1999 to August 11, 1999, was integrated with IEMP sampling activities to improve efficiency and lower costs.

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Preliminary results for the samples collected from these monitoring wells were presented to the U.S. EPA and Ohio EPA via monthly re-injection operation reports. Final results are presented in Appendix G. Due to data validation and QA/QC, a few of the final values are different than the preliminary values reported earlier. The biggest change involves bicarbonate. The preliminary bicarbonate values were reported incorrectly by the lab. The preliminary bicarbonate values were often the same as the preliminary alkalinity values. The correct bicarbonate values are 1.22 times the value of the alkalinity. This conversion factor takes into account the mass ratio between bicarbonate and calcium (0.61), and that it takes two moles of bicarbonate to balance one mole of calcium carbonate (0.61 x 2 = 1.22).

Piper-Trilinear Diagrams of the water chemistry data were prepared to illustrate the water chemistry of the waters sampled from these wells over time. Two of the diagrams are presented in this chapter as examples. Additional diagrams can be found in Appendix G. Figure 5-1 is the Piper Diagram for Monitoring Well 2015. All of the data collected at the monitoring wells during the Demonstration are in the same region of the Piper-Trilinear Diagram as the data in Figure 5-1 are plotted in. Each Piper-Trilinear diagram shows all four rounds of sampling for each monitoring well location. The diagrams illustrate that re-injection did not change the major anion and cation composition of the aquifer water. That is, the constituent concentrations plotted over time at each monitoring location are located in the same region of each diagram, indicating little change in the major anion and cation composition of the samples over time. Only the sulfate-chloride concentration appears to have shifted slightly over the course of the demonstration, possibly due to the addition of chloride ion to the injectate water from the ion exchange resin (the uranium ion when captured on the resin displaces a chloride ion).

During the demonstration, groundwater samples were also collected from seven direct push locations. Figure 4-6 illustrates the locations where the direct push samples were collected. Groundwater samples collected from each location were analyzed for major anions and cations, along with uranium. Further information concerning the direct-push activity, and a discussion of the uranium results, can be found in Section 4. This discussion focuses on water chemistry (major anion and cation data only).

Six rounds (Rounds A through F) of direct push sampling were conducted. Three locations were sampled during each of the six rounds; four additional locations were only sampled during two of the rounds (Round A before the demonstration began and Round F after one year of re-injection). The data are

presented in Appendix G. Piper-Trilinear Diagrams of the water chemistry data were prepared to illustrate the water chemistry for the locations that were sampled. These Piper diagrams can also be found in Appendix G. Figure 5-2 is the Piper Diagram for Direct Push Location 12369. All of the data collected at the direct-push sampling location are in the same region of the Piper-Trilinear Diagram as the data in Figure 5-2 are plotted in. Data used to construct these diagrams were selected from the depth at each sampling location that corresponded to the highest measured uranium concentration. This depth corresponds best to the depth at which re-injection was taking place; therefore, the groundwater chemistry there would be most likely to exhibit a change if a change would occur.

The direct push data are similar to the monitoring well data in that they indicate no major change in the water chemistry of the Great Miami Aquifer near the injection wells over the course of the demonstration. The constituent concentrations plotted over time are located in the same region of the diagrams. As with the monitoring well data, the sulfate-chloride concentration appears to have shifted slightly over the course of the demonstration, possibly due to the addition of chloride ion from the ion-exchange resin.

5.3 *IN SITU* MONITORING (TEMPERATURE, pH, SPECIFIC CONDUCTIVITY, DISSOLVED OXYGEN, Eh)

Two Hydrolab™ down-hole water quality probes and data loggers were used during the Demonstration to monitor the temperature, pH, specific conductivity, dissolved oxygen concentration, and Eh of the groundwater in the immediate vicinity of the re-injection wells.

The probes were used to monitor water quality in the five shallow observation wells (22299, 22300, 22301, 22302, and 22303) and in four deep observation wells (32304, 32305, 32306, and 32307). Figure 4-5 shows the nine well locations. The top of the screens in Wells 22299, 22300, 22301, 22302, and 22303 are installed at the same depths as the top of the screens in the closest corresponding re-injection well. The top of the screens in Wells 32304, 32305, 32306, and 32307 are set deeper in the aquifer, at a depth that corresponds to the top of Model Layer 4. The screens were set at the top of model layer 4 to verify model predictions which indicated that cleanup would be accomplished without displacing contamination down into model layer 4.

Monitoring was conducted:

- Prior to the start of re-injection in all nine wells.
- During startup of the Demonstration at observation wells 22300 and 32306.
- Monthly during the Demonstration in all nine observation wells.

Two water quality probes were rotated among the five shallow and four deep observation wells during the Demonstration. Hourly readings were recorded over a 24-hour time period at each well each month. *In situ* water quality data are provided in Appendix G for reference purposes.

The monitoring objective was to document whether water chemistry conditions were changed due to re-injection. An increase in pH and/or Eh conditions could result in iron precipitation and promote the growth of new bacteria. Either change could result in plugging within the re-injection wells or surrounding aquifer. Plugging is discussed in Section 3 of this report.

The sensors in the probe require a certain period of time to stabilize once they are lowered into the aquifer. A review of the data indicates that, for the most part sensors stabilized after approximately one hour, with the exception of Eh. Eh readings appear to have drifted throughout the entire 24-hour measurement period. The drift was never large enough to interfere with the objective of the sampling activity, which was to determine if conditions were oxidizing or reducing relative to the standard hydrogen electrode. For the ferrous-ferric iron couple, a reading above 200 mV is considered oxidizing. A negative reading is considered reducing. A reading between the two is considered a transition-state: neither strongly oxidizing, nor strongly reducing. It is reported by the manufacturer that the Eh sensor usually takes longer than the other sensors to stabilize completely. The manufacturer suggests that the operator decide based on field measurements how long to wait for an acceptable-stable Eh reading (Hydrolab, 1993). To obtain an exact reading of Eh was not the objective of the demonstration. The objective was to determine whether or not Eh conditions would change between reducing and oxidizing in response to re-injection. If Eh readings indicated strongly reducing conditions and ferrous iron is present, changing Eh conditions from a reducing to an oxidizing environment could promote iron bacteria growth and subsequently contribute to plugging in the Demonstration region of the Great Miami Aquifer. The data collected during the Demonstration were adequate for achieving this objective, as discussed in the results section below.

5.3.1 Start-up Results

Monitoring during the start-up of the re-injection system was conducted to document whether or not the re-injection of treated groundwater was causing any drastic changes to the chemistry of the groundwater. Monitoring during start-up revealed that, of the parameters monitored during the first 12-hours of operation, only dissolved oxygen exhibited a change. This change is discussed below.

An *in situ* water quality probe was installed in Observation Wells 22300 and 32306 during the time period that re-injection commenced. Well 22300 is located next to Re-Injection Well IW-9 and screened at the same elevation as the screen in Re-Injection Well IW-9. Well 32306 is located next to, and screened lower than Re-Injection Well IW-10.

Data were collected from Observation Well 22300 for the time period extending from 09:30 hours on August 31, 1998 to 09:30 hours on September 3, 1998. Data were collected from Observation Well 32306 for the time period extending from 09:40 hours on August 31, 1998 to 09:40 hours on September 3, 1998. The loggers recorded readings every hour; the data logger printouts can be found in Appendix G. Re-Injection began at approximately 09:30 hours on September 2, 1998. The objective was to monitor any changes until stabilization of the changes had been documented.

The data collected indicates that only the dissolved oxygen concentration in Observation Well 22300 exhibited a change. No changes were recorded for Observation Well 32306. Up until the start of re-injection, the dissolved oxygen concentration in Observation Well 22300 was approximately 4 mg/L. Within a few hours following the start of re-injection, the dissolved oxygen concentration began to steadily increase from approximately 4 mg/L to approximately 8.4 mg/L, where it appeared to stabilize. If ferrous iron is present, an influx of dissolved oxygen could promote the growth of iron bacteria. However, given the lack of plugging problems encountered in Re-Injection Well IW-9 during the demonstration, this change in dissolved oxygen does not appear to have had this effect.

5.3.2 Monthly *In situ* Monitoring

As explained above, nine monitoring wells were monitored monthly during the Demonstration for a duration of 24-hours each month. To simplify the analysis, the twelve hour reading of each 24-hour reading event was tabulated and is presented in Table 5-1. As explained above, most of the sensors stabilized within the first hour. In addition, the drift on the Eh sensor past the first hour was small enough so that it did not interfere with the monitoring objective. Most of the 24-hour monitoring runs began early in the day, so the twelve hour reading was usually recorded close to midnight. This provision minimized the likelihood of some interfering activity occurring (nearby well sampling, pumping changes, etc.), which might affect the reading.

The data indicate that, similar to start-up monitoring, dissolved oxygen again showed the greatest amount of fluctuation. As expected, dissolved oxygen concentrations were higher in the shallow wells than in the deeper wells because the shallow wells are closer to both the aquifer recharge points and the re-injection well screens. In the shallow observation wells, the twelve hour dissolved oxygen readings

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ranged from a high of 13.18 mg/L to a low of 3.22 mg/L. In the deeper observation wells the twelve hour dissolved oxygen readings ranged from a high of 12.09 mg/L to a low of 0.01 mg/L. The 12.09 mg/L was recorded in Well 32305 on December 14, 1998. The dissolved oxygen reading on December 14th in this well is unusually high when compared to prior and subsequent months suggesting that the sensor was not functioning properly. If the 12.09 mg/L is not considered representative, then the next highest result for dissolved oxygen in the lower monitoring wells is 7.29 mg/L, measured in well 32305 on July 8, 1999.

One Eh shift was recorded during the demonstration. This shift occurred in Observation Well 32304, which is screened beneath Re-Injection Well IW-8. The September and October Eh data from this well was in the negative range indicating reducing conditions. In December 1998, there was a dramatic shift, with the Eh reading increasing up to 487 mV, indicating oxidizing conditions (Table 5-1). With the exception of the January measurement, the Eh remained strongly positive for the remainder of the demonstration, indicating oxidizing conditions relative to the Fe^{2+}-Fe^{3+} system. No changing trend in temperature, pH, specific conductivity, or dissolved oxygen was recorded. The screen in this monitoring well is situated at an elevation that is below the screen in Re-Injection Well IW-8.

This shift in Eh from relatively reduced to relatively oxidized, with respect to the Fe^{2+} - Fe^{3+} system, indicates that iron hydroxide [$Fe(OH)_3$]is most likely precipitating out of solution at this depth as a result of re-injection. Any iron bacteria in the aquifer at this depth could utilize energy derived through the bacterial catalyst of the oxidation reaction for Fe^{2+} to Fe^{3+}. This might explain why Re-Injection Well IW-8 required more anti-plugging treatments during the demonstration than any of the other re-injection wells.

Data collected in August 1999 at Wells 32306 and 32307 also indicated an Eh shift from negative to positive. Although the Demonstration had ended, it was decided to wait a few months and then re-measure conditions in both wells to determine if positive Eh readings would still be present. Both locations were re-monitored in December 1999. The results showed that the Eh was again back in the negative range. The August 1999 results at these two wells are therefore considered suspect. The data are presented in Appendix G, tables G-21 through G-23.

TABLE 5-1

MONTHLY *IN SITU* MONITORING

Well:	22299					
Date	Time	Temperature Celsius	PH pH units	Sp. Cond. mS/cm	DO mg/L	Redox mV
9-21-98	2310	12.33	7.45	0.0695	12.17	370
10-13-98	0145	11.80	7.64	0.7380	12.70	331
12-01-98	0250	11.61	7.52	0.0622	10.70	323
12-02-98	2200	11.57	7.55	0.0620	8.47	360
1-18-99	2215	11.15	7.02	0.0701	11.41	385
2-10-99	2250	11.38	7.34	0.0704	7.46	384
4-13-99	2130	11.67	8.01	0.0694	5.06	473
5-19-99	2100	11.69	7.47	0.0689	8.40	482
6-02-99	2130	11.90	7.68	0.0703	5.47	534
7-14-99	2235	11.99	7.32	0.0717	7.06	555
8-03-99	2107	12.01	7.66	0.0727	4.35	441

Well:	22300					
Date	Time	Temperature Celsius	PH pH units	Sp. Cond. mS/cm	DO mg/L	Redox mV
8-31-98	2130	11.14	7.07	0.6730	4.03	553
9-03-98	2205	12.31	7.23	0.7440	12.10	576
10-02-98	2300	11.83	7.60	0.7410	12.48	512
11-24-98	0345	11.65	7.64	0.0710	12.73	269
12-16-98	2335	11.43	7.77	0.0689	13.18	504
1-11-99	2235	11.13	7.10	0.0686	10.75	339
2-04-99	2315	11.31	7.38	0.0676	6.80	307
4-01-99	2315	11.61	7.76	0.0766	4.43	306
5-14-99	0000	11.67	7.23	0.0687	6.59	373
6-16-99	2315	11.83	7.34	0.0694	6.68	353
7-01-99	2215	12.09	7.28	0.0721	5.22	554
8-03-99	2140	11.93	7.18	0.0742	4.48	376

Well:	22301					
Date	Time	Temperature Celsius	pH pH units	Sp. Cond. mS/cm	DO mg/L	Redox mV
9-09-98	2305	12.05	7.81	0.0675	11.84	266
10-08-98	2200	11.72	7.53	0.0543	3.22	342
11-06-98	1100	11.55	7.55	0.0693	12.69	351
12-07-98	2300	11.53	7.73	0.0689	8.6	499
1-13-99	2200	11.20	7.33	0.0743	11.21	251
2-06-99	0015	11.33	7.34	0.0645	8.11	309
4-01-99	2250	11.60	7.55	0.7470	5.30	342
5-19-99	0135	11.70	7.44	0.0730	3.69	267
6-16-99	2340	11.87	7.66	0.0692	9.57	304
7-07-99	2030	11.93	7.59	0.0710	8.09	549
8-06-99	0315	11.90	7.23	0.0692	6.52	397

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TABLE 5-1

MONTHLY *IN SITU* MONITORING
(Continued)

Well:	22302					
Date	Time	Temperature Celsius	pH pH units	Sp. Cond. mS/cm	DO mg/L	Redox mV
9-25-98	0145	12.08	7.43	0.0760	10.19	249
10-21-98	2245	11.76	7.54	0.7380	7.46	259
11-10-98	2310	11.61	7.38	0.0631	5.89	252
12-11-98	0220	11.43	7.56	0.0619	10.93	497
1-8-99	0320	11.41	7.07	0.0569	8.02	304
2-10-99	2210	11.31	7.45	0.0593	4.54	291
4-12-99	2145	11.50	7.77	0.6980	4.77	492
5-20-99	2315	11.68	7.57	0.0719	4.97	288
6-03-99	2245	11.60	7.71	0.0706	4.05	401
7-15-99	2350	11.93	7.77	0.0699	5.08	344
8-19-99	2330	11.93	7.99	0.0690	4.07	432

Well:	22303					
Date	Time	Temperature Celsius	pH pH units	Sp. Cond. mS/cm	DO mg/L	Redox mV
9-23-98	0210	12.23	7.33	0.7390	4.79	347
10-21-98	2130	11.67	7.47	0.0702	7.49	292
12-04-98	0030	11.56	7.48	0.0624	8.32	401
1-05-99	2335	11.19	7.35	0.0733	9.93	426
2-11-99	2240	11.29	7.45	0.0740	6.43	343
4-13-99	2340	11.52	7.73	0.7230	3.49	407
5-27-99	2105	11.65	7.60	0.0709	4.40	297
6-02-99	2140	11.80	7.67	0.0701	4.56	510
7-21-99	0215	11.97	7.65	0.0709	4.33	538
8-06-99	0200	11.98	7.69	0.0719	3.85	439

Well:	32304					
Date	Time	Temperature Celsius	pH pH units	Sp. Cond. mS/cm	DO mg/L	Redox mV
9-29-98	2130	11.02	7.23	0.0759	0.60	-81
10-14-98	2345	11.25	7.44	0.7400	0.86	-95
12-01-98	0105	11.68	7.41	0.0707	1.67	232
12-02-98	2205	11.68	7.43	0.0707	1.57	487
1-18-99	2235	11.58	7.05	0.0745	0.90	69
2-09-99	2110	11.54	7.07	0.0703	2.92	246
4-07-99	2325	11.44	7.59	0.0752	0.76	305
5-20-99	2230	11.39	7.32	0.0733	3.24	490
6-01-99	1800	11.44	7.43	0.0706	3.29	535
7-27-99	0030	11.73	7.23	0.0740	1.11	386
8-01-99	1800	11.75	7.53	0.0692	0.83	442

TABLE 5-1

MONTHLY *IN SITU* MONITORING
(Continued)

Well:	32305					
Date	Time	Temperature Celsius	pH pH units	Sp. Cond. mS/cm	DO mg/L	Redox mV
9-09-98	2240	9.82	7.10	0.6170	0.30	253
10-02-98	2130	9.85	7.26	0.0672	3.42	330
11-25-98	0415	11.57	7.49	0.0666	6.61	299
12-14-98	2300	11.57	7.61	0.0675	12.09	426
1-13-99	2235	11.00	7.02	0.0639	4.30	334
2-06-98	0045	11.42	7.33	0.0655	2.27	312
4-05-99	2135	11.27	7.67	0.0692	3.95	326
5-17-99	2300	11.31	7.27	0.0764	5.30	452
6-15-99	2145	11.42	7.15	0.0689	7.17	361
7-08-99	2200	11.53	7.34	0.0691	7.29	552
8-01-99	1600	11.65	7.15	0.0683	5.69	389

Well:	32306					
Date	Time	Temperature Celsius	pH pH units	Sp. Cond. mS/cm	DO mg/L	Redox mV
8-31-98	2140	8.95	7.58	0.0658	0.31	-205
9-03-98	2210	8.93	7.64	0.0617	0.88	-200
10-08-98	2230	9.00	7.54	0.6380	0.93	-15
11-10-98	2330	9.91	7.50	0.0711	1.05	-9
12-10-98	2215	10.84	7.55	0.0710	0.99	-50
1-11-99	2300	10.73	7.21	0.0746	0.90	-10
2-04-99	2335	10.95	7.17	0.0708	0.26	65
4-05-99	2155	10.96	7.41	0.7440	0.08	-56
5-17-99	2330	10.99	7.27	0.0760	0.06	-113
6-15-99	2210	11.11	7.35	0.0720	0.12	-53
7-08-99	2225	11.26	7.51	0.0715	0.01	24
8-12-99	2200	11.53	7.17	0.0740	0.14	250
1-24-00	2310	11.62	7.46	0.7391		-102

Well:	32307					
Date	Time	Temperature Celsius	pH pH units	Sp. Cond. MS/cm	DO mg/L	Redox MV
9-29-98	0215	11.27	7.33	0.7440	0.88	-133
10-27-98	0030	11.79	7.07	0.0632	0.61	-37
11-05-98	2300	11.67	7.19	0.0641	0.19	-131
12-08-98	0230	11.53	7.33	0.0624	0.40	78
1-05-99	2310	11.48	6.92	0.0718	0.62	11
2-09-99	2135	11.40	7.23	0.0716	0.29	76
4-07-99	2300	11.34	7.41	0.7180	0.09	64
5-25-99	2235	11.63	7.34	0.0704	0.14	23
6-03-99	2315	11.69	7.40	0.0700	0.17	-11
7-14-99	2215	11.87	7.45	0.0724	0.06	43
8-12-99	2235	11.98	7.64	0.0699	0.05	368
1-24-00	2300	11.46	8.96	0.7419		-135

Note: No measurements were collected on March of 1999 and no measurements were taken at 22303 in November of 1998.

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Figure 5-1, Piper Diagram

Monitoring Well 2015

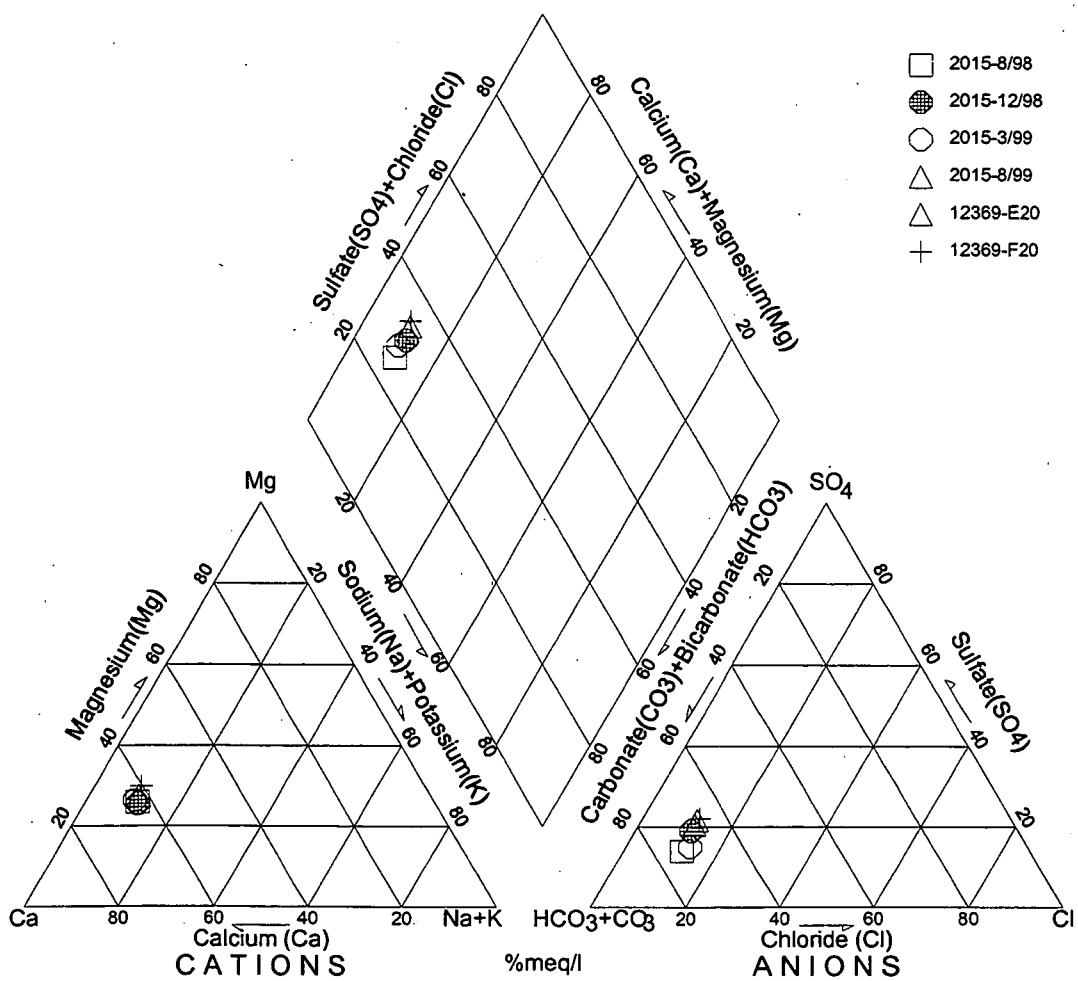
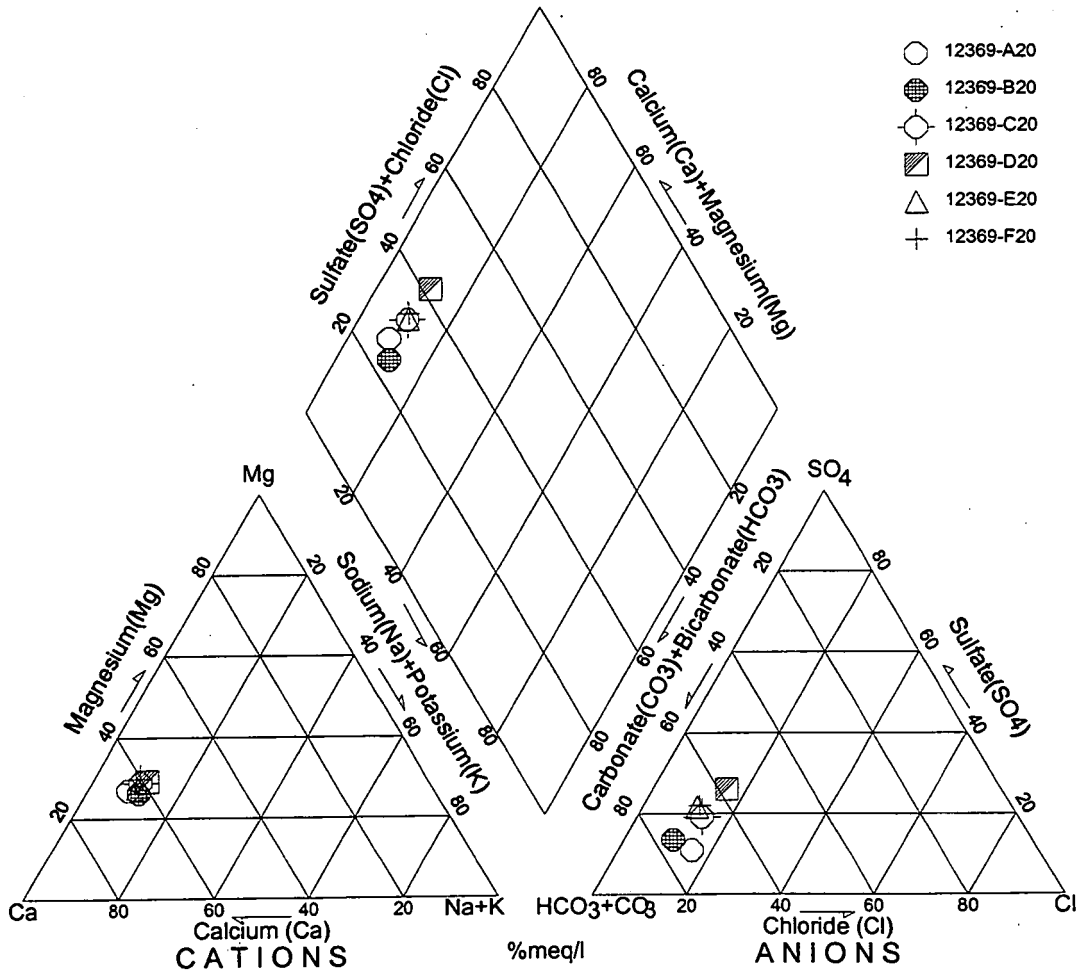


Figure 5-2, Piper Diagram

Geoprobe Location 12369, at 20 feet BWT



6.0 COSTS

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Assuming that groundwater re-injection is successful in reducing the time needed for the active remediation of the aquifer by 7 years, the aquifer remediation project could realize a potential (net present value) cost savings of approximately $14.3 million dollars. The estimated total project cost (net present value) for using groundwater re-injection and completing active remediation in the year 2008 is $67.3 million dollars. The estimated total project cost (net present value) for not using groundwater re-injection and completing active remediation in the year 2015 is $81.6 million dollars. Details are provided below.

6.1 BACKGROUND

One of the objectives for conducting the Demonstration was to obtain one year's worth of information on the cost to operate the re-injection wells. Of concern was the possibility that the wells would undergo frequent and severe plugging, leading to excessive maintenance costs. As presented in Section 2, the first year of operation went better than expected concerning plugging within the re-injection wells. Cost information collected during the one-year demonstration was used to conduct a life cycle cost analysis on the use of re-injection.

Two remediation scenarios were considered for costing purposes.

- Scenario-1 includes re-injection. Active remediation in this scenario would end in the year 2008.
- Scenario-2 does not include re-injection. Active remediation in this scenario would end in the year 2015.

6.2 COST ANALYSIS

The aquifer remediation that is currently underway at Fernald is targeted toward a 10-year remediation schedule. The groundwater model predicts that if the aquifer is pumped as modeled and re-injection used, then uranium concentrations in the aquifer will be lowered to a concentration that is below 20 μg/L in 10 years.

The design of the 10-year remediation is based on the modeling scenario presented in Section 5 of the Operable Unit 5, Baseline Remedial Strategy Report (BRSR) Remedial Design for Aquifer Restoration (DOE 1997). This modeling scenario includes the Demonstration Wells, assumes that re-injection on a field scale will prove to be successful, and assumes that additional re-injection wells will be installed. As

previously explained, incorporating the Demonstration into the 10-year aquifer remedy was conducted as a cost-conscious measure to decrease costs. If the demonstration supported the continued use of groundwater re-injection, then the benefit to the aquifer remedy could begin to be realized immediately. The cost analysis presented in this section refers to this 10-year remediation strategy as Scenario-1. Costing under Scenario-1 includes operation and maintenance of the re-injection wells, monthly sampling of the treated groundwater being used for re-injection, and construction costs for additional re-injection wells planned for the South Field.

Because the current design and operation of the well field is based on Scenario-1, costing for this scenario is reflected in the current budgeted baseline for the project. Table 6-1 presents the annual costs for Remediation Scenario-1. As Table 6-1 indicates, active remediation under this 10-year strategy is scheduled for completion in the year 2008. The total cost for this scenario (in FY00 dollars) is estimated to be $67,309,890.00.

A comparison showed that the annual baseline costs, which were budgeted for the individual well treatments to address plugging, were very close to the actual first year costs even though a much smaller number of treatments were required. At the start of the demonstration it was anticipated that the re-injection wells would require quarterly maintenance to address plugging: five wells, four times a year, or twenty maintenance activities per year. During the first year of operation, only six maintenance activities were actually required. Each maintenance activity included a camera survey of the well and a chemical treatment. The subcontractor costs for each individual treatment turned out to be higher than was budgeted for.

Scenario-2 looks at remediation costs for a remedy that does not include re-injection. If the decision is made not to continue using groundwater re-injection, then the 10-year aquifer remedy currently being pursued would need to be modified and extended out an additional 7 years. The addition of 7 years to the remedy is a model prediction made in the Operable Unit 5 Baseline Remedial Strategy Report (BRSR) Remedial Design for Aquifer Restoration (DOE 1997).

Annual costs for Scenario-2 are presented in Table 6-2. Costs presented in Table 6-2, up until the year 2008, are currently budgeted for baseline costs, minus the costs associated with the use of re-injection. As Table 6-2 indicates, it has been predicted that without the use of re-injection, active remediation would be completed by the year 2015. The total cost (in FY00 dollars) for this scenario is estimated to be $81,616,208.00. Subtracting the costs (in FY00 dollars) for Scenario 1 ($67,309,890.00) from the

costs (in FY00 dollars) for Scenario 2 ($81,616,208.00) results in a difference of $14,306,318.00. This is the predicted cost saving (in FY00 dollars) that should be realized through the use of re-injection to help accelerate the aquifer remedy.

The costs presented in Tables 6-1 and 6-2 are given in FY00 dollars. Costs were discounted using a rate of 5.02 percent. This is the U.S. Federal Reserve Discount Rate Forecast Rate found at the Financial Forecast Center (http://www.forecast.org/disc.htm) in January 2000. Cost values were entered into an Excel Spreadsheet, and the Excel Spreadsheet Net Present Value (NPV) function was used to calculate the net present value.

6.2.1 TOTAL RE-INJECTION PROJECT COSTS

A total re-injection project cost was also calculated using sunk costs (costs through completion of the Demonstration) and FY00 dollar costs for Scenario-1. Sunk costs include, design of the system, installation of the Demonstration wells, construction of the Demonstration system, monitoring and well maintenance during the Demonstration. Table 6-3 lists the total project cost. The total project cost (in FY00 dollars) was calculated to be $87,458,234.00.

6.2.2 COMPARISON OF WELL INSTALLATION VERSUS TREATMENT COSTS

Three different well casing diameters were used for the re-injection well installations to evaluate an optimal diameter for use at the FEMP. IW-8 has an 8-inch diameter, IW-9 has a 12-inch diameter, and the IW-10, IW-11, and IW-12 each have a 16-inch diameter.

Assuming similar slot size and screen length, a larger diameter well provides more open surface area in the screen than a smaller diameter well. Assuming similar bio-geochemical conditions, larger diameter well should operate longer before becoming completely plugged. However, the larger diameter well is also more expensive to install than a smaller diameter well.

Table 6-4 provides the costs for installing wells with diameters of 8, 12, and 16 inches at Fernald. As the table shows, it costs approximately twice as much money to install a 16-inch diameter well as it does to install an 8-inch diameter well. The difference in cost is approximately $30,381.00. Cost information collected during the demonstration shows that, on average, it cost approximately $14,000.00 per treatment to address plugging in re-injection wells regardless of well diameter.

Using $14,000.00 as a unit cost for treatment, the difference in installation cost between an 8-inch diameter and a 16-inch diameter injection well is approximately equal to the cost of 2.2 treatments to address plugging. The cost difference between the installation of a 12-inch diameter well and a 16-inch diameter well is approximately $10,492.00 or roughly the cost of performing 0.75 treatments to address plugging.

As discussed in Chapter 3, Re-Injection Well IW-8 required four treatments during the demonstration to address plugging. The reasons that IW-8 plugged more often than the other four re-injection wells could be:

- Its close proximity to Paddy's Run. Perhaps recharge from the creek supplies nutrients for biological growth of well fouling bacteria.
- Its shallow depth. The water table is closer to the ground surface than the other re-injection wells; therefore, the allowable water level rise between treatments is much less than the other re-injection wells.
- Its smaller diameter. As stated above, an 8-inch diameter well has less surface area than a 12-inch or 16-inch diameter well.
- An Eh change beneath the well, (as monitored during the demonstration, see Chapter 5). An Eh change would result in the oxidation of Fe^{2+} to Fe^{3+}. This change would provide energy needed for increased bacterial growth.

Assuming that well diameter is the primary function for how much maintenance is required to control plugging, the cost information collected during the demonstration indicates that it is more cost effective to install a 16-inch diameter rather than an 8-inch or 12-inch diameter well given that the installation cost difference only amounts to the cost of 2.2 or 0.75 well treatments respectively.

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TABLE 6-1

ANNUAL COSTS FOR REMEDIATION COST SCENARIO 1
Re-Injection with Pump & Treat

Year		Fiscal Year 00 Dollars
FY2000	Initial Period	8,715,784
FY2001	Period 1	9,046,878
FY2002	Period 2	10,167,257
FY2003	Period 3	13,503,757
FY2004	Period 4	9,289,452
FY2005	Period 5	15,146,449
FY2006	Period 6	8,820,100
FY2007	Period 7	4,868,906
FY2008	Period 8	4,378,406
	Discount Rate	5.02%
	Net Present Value	67,309,890

TABLE 6-2

ANNUAL COSTS FOR REMEDIATION COST SCENARIO 2
Pump & Treat, No Re-injection

Year		Fiscal Year 00 Dollars
FY2000	Initial Period	7,756,759
FY2001	Period 1	8,671,268
FY2002	Period 2	9,728,911
FY2003	Period 3	11,252,735
FY2004	Period 4	8,884,210
FY2005	Period 5	14,841,208
FY2006	Period 6	8,597,293
FY2007	Period 7	4,868,905
FY2008	Period 8	4,864,652
FY2009	Period 9	4,864,652
FY2010	Period 10	4,864,652
FY2011	Period 11	4,864,652
FY2012	Period 12	4,864,652
FY2013	Period 13	4,864,652
FY2014	Period 14	4,864,652
FY2015	Period 15	4,864,652
	Discount Rate	5.02%
	Net Present Value	$81,616,208

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TABLE 6-3

TOTAL PROJECT COSTS FOR RE-INJECTION (FY00 DOLLARS)

Sunk Costs	$3,521,248.00
FY2000	8,715,784.00
FY2001	9,046,875.00
FY2002	10,167,257.00
FY2003	13,503,757.00
FY2004	9,289,452.00
FY2005	15,146,449.00
FY2006	8,820,100.00
FY2007	4,868,906.00
FY2008	4,378,406.00
	$87,458,234.00

TABLE 6-4

WELL INSTALLATION COSTS

Diameter of Well	8 inches	12 inches	16 inches
Diameter of Boring	12-inches	20-inches	24 inches
Length (feet)	100	100	100
Cost/Foot	285.00	450.00	533.00
Stainless steel screen/sump/riser/flange	1,400.00	4,789.00	6,981.00
Installation Costs	29,900.00	49,789.00	60,281.00

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7.0 CONCLUSIONS/RECOMMENDATIONS

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7.1 CONCLUSIONS

The one-year Demonstration has successfully provided the information needed to determine if re-injection technology is workable at the FEMP. The biggest questions answered being:

- Can a reliable source of injection water be maintained?
- Could the wells be maintained such that the modeled injection rates and volumes were maintained and achieved (i.e., how much, and how often would the re-injection wells be inoperative due to plugging problems and what the resulting costs would be to keep the wells operating)?
- Would re-injection and extraction wells work together as modeled thereby validating model predictions that re-injection would shorten the time needed to remediate the Great Miami Aquifer?
- What if any, would the cost savings for using re-injection be?

A reliable source of re-injection water, that is protective of the Great Miami Aquifer, can be maintained at Fernald. An outcome of the need to maintain the quality of the injected water (goal of no more than 10 μg/L) was the development of a strategy for operation of the AWWT Expansion Facility.

The rate specified in the Baseline Remedial Strategy Report (BRSR) called for the injection of 1000 gpm of treated water. Over the course of the one-year demonstration this equates to approximately 526 million gallons of treated groundwater. Actual operation of the wells during the demonstration resulted in the re-injection of approximately 455 million gallons of treated water, 86.5 percent of the BRSR suggested rate. The BRSR rate assumes 0 percent downtime for maintenance. The 86.5 percent uptime is considered very good for the first year of operation. Future re-injection should be increased to 1112 gpm (222 gpm/well) assuming a 90 percent uptime rate.

Plugging in the re-injection wells turned out to be a much smaller issue than was anticipated. Of twenty planned plugging treatments, only six were performed. The plugging that occurred took place behind the well screen in the gravel pack or surrounding aquifer formation. The treatment procedure used during the demonstration to address the plugging was effective. No indication of residual plugging was detected, although some degree of residual plugging is expected in the future. The impact that this future residual plugging will have on the operational costs remains uncertain but is expected to be manageable.

Analysis of the water level and uranium data collected during the demonstration indicates that:

- Capture the 20 μg/L uranium-plume was maintained during the Demonstration.
- The base of the 20 μg/L uranium plume was not displaced into deeper regions of the aquifer due to re-injection.
- The combined effect of pumping in the South Plume and South Field created a stagnation zone between the two pumping systems. This stagnation zone held the uranium contamination in place and served as a hydraulic barrier to the southern flow of groundwater across the southern Fernald property boundary. Conditions within this stagnation zone, as well as others created by the remedy, will need to be changed periodically during the remedy to affect movement of uranium out of the stagnant area.
- Re-Injection effectively flushed contamination immediately south of the re-injection wells, but was ineffective in flushing uranium contamination from between the re-injection wells.
- Lowering of the water table in the aquifer due to the remediation was similar to, although not as great as predicted.
- The measured average gradients for the water table surface north and south of the re-injection wells were very close to model predictions.
- No major change in the water chemistry of the Great Miami Aquifer was detected during the demonstration.

Major anion and cation concentration data collected during the Demonstration indicates that the re-injection of treated groundwater had a very minor impact on the chemistry of the groundwater in the Great Miami Aquifer. Re-Injection does appear to have contributed to a Eh shift beneath Re-Injection Well IW-8. This Eh shift may be contributing to the plugging of Re-Injection Well IW-8.

Assuming that groundwater re-injection is successful in reducing the time needed for the active remediation of the aquifer by 7-years, the aquifer remediation project will realize a potential (net present value) cost savings of approximately $14.3 million dollars. The estimated total project cost (net present value) for using groundwater re-injection and completing the active remediation in the year 2008 is $67.3 million dollars. The estimated total project cost (net present value) for not using groundwater re-injection and completing the active remediation in the year 2015 is $81.6 million dollars.

7.2 RECOMMENDATIONS

Information collected during the demonstration indicates that the current groundwater remedy should be modified to include the use of re-injection. The dramatic flushing effect that re-injection has on the

uranium contamination (as evidenced in Figure 4-13) indicates that re-injection will be a successful tool for flushing out high concentration areas of the uranium plume.

To provide ongoing feedback on the impacts of re-injection, future monitoring in the aquifer will need to be conducted above and beyond what is already prescribed by the Integrated Environmental Monitoring Plan (IEMP), and periodic chemistry checks of the injectable should be made. The demonstration showed that the GMA readily accepts injected water with very little mounding. The front of contamination in a plume or body of injected water will finger its way through the sand and gravel of the Great Miami Aquifer toward an extraction well. Maximizing operational conditions so that the most effective flushing pattern is obtained should be a focus for future monitoring efforts. The exact number and types of monitoring points will be situation dependent, but a few monitoring suggestions, specific to the five existing re-injection wells are presented below. Also presented below are recommendations for monitoring of the injectate.

7.3 MONITORING THE AQUIFER

Future monitoring efforts within the aquifer, above and beyond what are already defined in the IEMP, should focus on:

- Changes in the chemistry of the groundwater in the aquifer, near the re-injection wells, that indicate that conditions within the aquifer are becoming favorable for plugging to take place,
- Flushing patterns within the aquifer, and
- The position of the base of the uranium plume.

Data indicates that in regards to plugging in the remediation area if Fe^{2+} oxidizes to Fe^{3+}, the energy of the reaction feeds bacteria which are already present in the aquifer. The bacteria will multiply and plug the re-injection well screens and surrounding aquifer.

The reaction is dependent on Eh, and pH conditions. Continuing the in-situ monitoring activity defined in the Re-Injection Demonstration Test Plan on a quarterly schedule should provide the needed data to monitor this situation.

Supplementing monitoring well data with direct push data is the current best strategy for determining flushing patterns and monitoring the base of the uranium plume. Direct push sampling at the seven

locations sampled during the demonstration should continue on an annual basis. Efforts should also be made to expand the number of locations to provide additional information on sweeping patterns, this would include the area north of the re-injection wells.

7.4 MONITORING THE INJECTATE

If re-injection continues, sampling of the treated groundwater being used for re-injection will need to continue in accordance with Ohio EPA re-injection guideline 5X26 Aquifer Remediation Projects. Monthly reports will need to be sent to the U.S. EPA, Ohio EPA Office of Federal Facilities Oversight and the Division of Ohio EPA Drinking and Ground Waters - UIC Unit. This sampling will consist of one time monthly grab samples, and daily composite samples.

Monthly grab samples should be analyzed for the FRL constituents listed in Table 2-1 of the Re-Injection Demonstration Test Plan. This plan is attached to this report in Appendix A. This sampling will serve to document how protective the water was of the aquifer. Any water quality problems will need to be addressed so that all re-injected concentrations are below their respective FRLs.

Daily composite sampling for uranium in AWWT expansion discharge should also be reported in the monthly reports. Should the daily composite sampling results indicate that the concentration of the treated groundwater is at or above 10 μg/L, then action will be taken to lower the uranium concentration as specified in Figure 5-2 of the Operations and Maintenance Master Plan for the Aquifer Restoration and Wastewater Project (DOE 1999c) and the EPAs will be notified of the situation.

The treated groundwater should also be monitored monthly for total suspended solids, Eh, and pH. The TSS sample should be a 24-hour composite. Monitoring TSS will provide insight into the potential for plugging due to the injection of solids. Eh and pH will provide insight into changing conditions that might effect the chemistry of the aquifer.

7.5 THE DIAMETER OF AND COMPLETION METHOD FOR FUTURE RE-INJECTION WELLS

Cost information collected during the Demonstration indicates that it is more cost effective to install and operate a 16-inch diameter re-injection well than an 8-inch or 12-inch diameter Re-Injection well given that the installation cost difference only amounts to the cost of 2.2 or 0.75 well treatments respectively. Cost information collected during the demonstration shows that on average, it cost approximately $14,000 per treatment to address plugging in re-injection wells irregardless of the well diameter.

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Operational experience for the three 16-inch diameter re-injection wells (IW-10, IW-11, and IW-12) indicates that the wells completed using an artificial filter pack (IW-11, IW-12) performed better than the well completed using a natural filter pack (IW-10). Re-Injection Well IW-10 required two treatments to address iron plugging during the demonstration. The other two 16-inch diameter wells did not require any well treatments for iron plugging. Assuming that the artificial filter pack served to expand the effective surface area of the well screens, and was responsible for the lack of plugging in Re-Injection Wells IW-11 and IW-12, it appears that future re-injection wells should be completed using an artificial filter pack.

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APPENDIX A

RE-INJECTION DEMONSTRATION TEST PLAN

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RE-INJECTION DEMONSTRATION TEST PLAN

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

FEBRUARY 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

ORIGINAL

53100-PL-0001
REV. 0
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RE-INJECTION DEMONSTRATION TEST PLAN

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

FEBRUARY 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

FINAL

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1.0 INTRODUCTION

This test plan is the controlling document (Project Specific Plan) for a one-year field scale groundwater re-injection demonstration in the Great Miami Aquifer (GMA) at the Fernald Environmental Management Project (FEMP). The demonstration will involve the re-injection of groundwater (which has been extracted from the Great Miami Aquifer and treated in the FEMP Advanced Waste Water Treatment (AWWT) Expansion Facility to remove uranium contamination) into five Great Miami Aquifer re-injection wells located along the southern property boundary of the FEMP, Figure 1-1.

Data from the demonstration will be used to determine what role, if any, re-injection technology will play in the FEMP aquifer restoration. As a cost conscious measure, the re-injection demonstration presented in this test plan has been incorporated into the final aquifer remedy for the FEMP so that if field scale re-injection proves successful the application to the remedy will be immediate.

6 Groundwater re-injection was determined to be a potentially viable strategy for shortening the duration required to achieve aquifer restoration. This strategy was presented in the Baseline Remedial Strategy Report Remedial Design for Aquifer Restoration (DOE 1997a). In addition to shortening the remediation time frame, the following benefits are anticipated:

- Re-injection will increase the rate of aquifer flushing in the more highly contaminated areas thereby reducing the time required to achieve clean-up.
- Re-Injection will help minimize pumping related drawdown impacts at neighboring properties beyond the FEMP property by returning pumped water back into the aquifer following extraction and treatment.
- Re-Injection is expected to provide a hydraulic barrier at the southern boundary of the FEMP to minimize the potential for further off-property contaminant migration.
- 4 Re-injection will help minimize excessive drawdown of water levels in the target cleanup zones by maintaining high water levels in the areas where re-injection is occurring. This will help reduce the amount of residual contamination left in the unsaturated portion of the aquifer.

54 Uncertainties exist with the field-scale application of re-injection technology at the FEMP based on two short-term injection tests conducted in individual wells (DOE 1995b, DOE 1996a). These uncertainties need to be addressed before a commitment can be made to continue re-injection as a part of the aquifer remedy. The Re-Injection Demonstration presented in this Test Plan will critically examine these

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field-scale uncertainties and resolve the remaining questions regarding the long-term viability of the technology at the FEMP. This test plan follows guidelines issued by the Ohio EPA Division of Drinking and Ground Waters (DDAGW) unit of Underground Injection Control (UIC) in a document titled 5X26 Aquifer Remediation Projects (OEPA 1997).

1.1 DEMONSTRATION OBJECTIVES

The long term viability of re-injection at the FEMP is uncertain due to field-scale uncertainties in the re-injection process; specifically, the cost of maintaining and operating re-injection wells for extended periods of time and the effect that re-injection could have on the 20 μg/L total uranium plume. The objective of the Re-injection Demonstration is to address these field-scale uncertainties. The re-injection demonstration will:

- Determine if a re-injection rate of 200 gpm per well can be sustained at the field scale for a time period of one year
- Determine the operational and maintenance costs required to sustain re-injection rates of 200 gpm at the field scale
- Determine if extraction and re-injection wells are working together as modeled to maintain capture of the 20 μg/L total uranium plume
- Determine if a hydraulic barrier has been produced at the southern boundary of the FEMP
- Determine if hydraulic patterns and profiles that indicate increased flushing in the aquifer, and minimized pumping related drawdown are being achieved as predicted by the groundwater model.

1.2 RE-INJECTION EVALUATION STRATEGY

The final Record of Decision (ROD) for Operable Unit 5 presents groundwater extraction and treatment as the selected remedy for restoring the Great Miami Aquifer. The ROD presents a 28 well extraction system pumping at a maximum rate of 4000 gallons per minute (gpm) to restore the aquifer in an estimated 27 years. In the Operable Unit 5 ROD, the U.S. Department of Energy (DOE) agreed to continue evaluating emerging or innovative technologies which might enhance the aquifer restoration. Examination of the feasibility of applying re-injection of groundwater into the aquifer as a remedy enhancement fulfills this ROD commitment. Figure 1-2 illustrates the strategy that is being followed for evaluating groundwater re-injection at the FEMP, and illustrates how the re-injection demonstration fits into this strategy. The shaded upper portion of Figure 1-2, identifies steps in the

evaluation process that have already been completed (groundwater modeling and single well injection tests).

55 The first step in the evaluation process was to predict if and how the aquifer remedy could be improved by using re-injection. Groundwater re-injection was modeled to determine if the modeling results would support the feasibility of using groundwater re-injection as part of the aquifer remedy. The FEMP groundwater model uses the SWIFT/486 computer code (version 2.54) marketed by HSI GeoTrans. Groundwater model construction, calibration, and validation is documented in the SWIFT Great Miami Aquifer Model, Summary of Improvements Report (DOE 1994).

56 Re-injection was added to the model of the remediation strategy presented in the Operable Unit 5 ROD (i.e., a 27-year remediation involving 28 extraction wells). The modeling results are presented in the Baseline Remedial Strategy Report (BRSR) Remedial Design for Aquifer Restoration (DOE 1997a). Modeling re-injection as part of the remediation strategy predicted a shorter duration for the aquifer remedy. The use of re-injection allows for additional extraction wells without increasing the net overall rate at which groundwater would be removed from the aquifer. This is important because without re-injection it is predicted that additional extraction wells with the associated increase in the extraction rate would lower the water level in the Great Miami Aquifer to unacceptable levels during the restoration. The current aquifer remediation for the FEMP, as detailed in the BRSR, is predicted to be completed in approximately 10 years. Achievement of the 10-year clean-up of the aquifer is also based upon:

- Other operable units completing their accelerated clean-up objectives so that surface access is available for aquifer remediation wells
- The accelerated removal of source terms which will allow recovery wells to be located closer to the center of uranium plumes
- Refinements in the understanding of the uranium desorption process.

Since post-ROD groundwater modeling for the BRSR supported the feasibility of using re-injection technology as part of an enhanced remedy, a single well injection test was conducted to further assess the implementability of re-injection at the FEMP. Limitations in water treatment capacity (i.e., only 200 gpm of treated groundwater was available for re-injection) and in delivery of injection water to a well (i.e., a temporary piping system had to be used) constrained the field test to a single well for a

short time period. Two single well injection tests were conducted, the first in October 1995, and the second in March and April of 1996.

In October 1995, a single well injection test was conducted in which groundwater was extracted from the South Plume Area and injected into a South Field Extraction Well without undergoing any treatment process (DOE 1995b). The groundwater which was injected into the aquifer had a total uranium concentration below 20 μg/L. The test was conducted over 72-hours at a constant injection rate of 300 gallons per minute (gpm). After approximately 600 minutes, water levels in the injection well began to rise which indicated plugging of the formation and/or the well screen was occurring. Test results confirmed iron precipitation and iron bacteria worked synergistically to plug the screen of the injection well. Sampling and geochemical modeling conducted after the test indicated that injecting treated effluent would not result in well screen plugging from iron precipitation and iron bacteria (DOE 1996a). A second single well injection test was conducted in March and April of 1996 in which groundwater treated in the South Plume Interim Treatment (SPIT) system was injected into a South Field Well (DOE 1996a). The test was conducted for approximately 114 hours at a constant injection rate of 200 gpm. The results of the second test indicated that groundwater which had been treated for uranium could be injected into the aquifer without plugging the well screens. During the treatment for uranium, aeration reduces the iron concentration.

As mentioned earlier, the treatment and delivery of groundwater to the re-injection test wells limited field testing of re-injection to single well, short duration tests. Results of the single well tests indicate that re-injection should work at the FEMP. However, the long term dependability and costs associated with a field scale re-injection program (i.e., the cost required to keep the screen unplugged) need to be better understood before a commitment is made to continue full-scale re-injection as part of the aquifer remedy.

As Figure 1-2 illustrates, the re-injection demonstration presented in this test plan is the next step to determine if re-injection technology is workable at the FEMP. The demonstration needs to determine if re-injection technology can be applied in several wells over an extended period of time. One year of cost data and data on the vertical and horizontal expansion of the total uranium plume will be collected. If the cost data is favorable, and the plume expansion data is consistent with modeled predictions, then a decision will be made to continue using re-injection technology as part of the aquifer remedy. It is possible that the demonstration can be a success, but that re-injection technology be dropped from the

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aquifer remedy. The decision criteria for continuing with re-injection technology as a part of the FEMP aquifer remedy is presented in Section 1.3 of this test plan.

1.3 DECISION CRITERIA

As Figure 1-2 illustrates, a question being evaluated at the FEMP is whether or not re-injection technology is workable at the FEMP on a field scale. The decision criteria for evaluating workability focuses on:

- Maintenance and operational costs of re-injection
- Vertical and horizontal expansion of the 20 μg/L total uranium plume
- Effectiveness in shortening the remedy
- Creation of a hydraulic barrier at the Southern FEMP property boundary.

As presented above, it is predicted that the aquifer can be remediated in a much shorter time period if re-injection is used and assumptions about uranium desorption and surface access are realized. Significant cost savings could be realized by shortening the time required to operate extraction and/or re-injection wells and to treat groundwater.

The re-injection demonstration will provide cost data for one year of actual operation for the re-injection wells. Following the re-injection demonstration, this cost data will be used to conduct a life cycle cost analysis on the use of re-injection at the field scale. This life cycle cost analysis will be compared to the estimated life cycle cost analysis for completing the aquifer remediation without using re-injection. A positive benefit/cost ratio would support a decision to continue using re-injection.

Re-injection will affect the total uranium plume, and could lead to vertical and/or horizontal expansion of the plume. Although expansion is not desirable, the added benefit from a remedy which is shorter in duration would out weigh the negative impact of plume expansion as long as the expansion was limited to inside the plume capture zone and therefore would ultimately be remediated. If expansion of the plume occurs such that the overall capture zone of the remediation system is no longer maintaining effective capture of the 20 μg/L total uranium plume, then pumping and injection rate adjustments will be implemented to determine if capture of the plume can be maintained. Operational philosophy for the aquifer remediation system is presented in the Operations and Maintenance Master Plan for the Aquifer Restoration and Wastewater Treatment Project (DOE 1997d). A determination that capture can be maintained with re-injection would support a decision to continue using re-injection.

60 In addition, decision criteria will also focus on two other effects that re-injection is predicted to have on the aquifer and the plume. As described in the BRSR, groundwater modeling predicts that re-injection helps to shorten the time needed to clean up the aquifer because it helps to create hydraulic patterns and profiles within the aquifer that result in increased flushing and removal of the uranium plume. The hydraulic barrier is further explained in Section 1.4. Data that indicates that both these effects are occurring as predicted would support a decision to continue using re-injection.

1.4 START-UP SEQUENCE FOR THE DEMONSTRATION

The start-up of the re-injection demonstration will be coordinated with the continued pumping of the South Plume Module and the start-up of the:

- AWWT Expansion Water Treatment Facility
- Phase I South Field Extraction System Module
- South Plume Optimization Module.

A summary description of the site aquifer remedy, as specified in the BRSR and the Remedial Action Work Plan for Aquifer Restoration at Operable Unit 5 (RAWP) for Aquifer Restoration, is presented in Section 2.2.

Figure 1-3 shows the location of each of these facilities and modules. The Phase I South Field Extraction System Module consists of 10 extraction wells located up gradient of the Re-injection Demonstration Module. The South Plume Optimization Module consists of 2 extraction wells, and the existing South Plume Module consists of 4 operating extraction wells; both are located down gradient of the Re-injection Demonstration Module. The re-injection module itself consists of 5 re-injection wells. Start-up dates for the AWWT Expansion Facility, Phase I South Field Extraction Module, South Plume Optimization Module, and the Re-Injection Demonstration Module are provided in the Remedial Action Work Plan for Aquifer Restoration at Operable Unit 5 (DOE 1997c).

The start-up sequence outlined below is preferred as it will provide data to assess how the addition of each module affects water levels and capture of the total uranium plume. This information will be useful in the future if operational adjustments to the pumping or injection rates are required.

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1. Begin operation of the AWWT Expansion Water Treatment Facility. Sample effluent to confirm acceptability of treated groundwater supply for the re-injection demonstration. The sampling program is presented in Section 4.1.

2. Begin operation of the Phase I South Field Extraction Module. Do not start-up any other modules until water levels in the aquifer have stabilized. Pumping from the South Field will establish a new hydraulic gradient and slow the migration of uranium contamination into the re-injection demonstration area. It is planned that this module will later work with the re-injection wells to produce a hydraulic barrier across the re-injection demonstration area.

3. When water levels in the aquifer have stabilized, begin pumping from the South Plume Optimization Wells. Do not start-up any other modules until water levels in the aquifer have stabilized.

61 4. Begin re-injection and observe aquifer water levels to assess and verify that they have reached stabilization.

62 It is anticipated that operating the re-injection wells along with the other extraction and re-injection wells will create a hydraulic barrier along the southern FEMP property boundary, as shown by the water table elevation profile in Figure 1-4. The water table elevation profile is oriented north to south as identified in Figure 1-3. As Figure 1-4 illustrates, prior to any pumping in this area, the groundwater gradient was to the south at about 0.56 feet of elevation per 1000 feet of lateral distance. When pumping in the South Plume began in 1993, the water table was lowered by approximately 1.5 feet to 3.5 feet by the pumping and the gradient to the south was increased to about 1.1 feet elevation per 1000 feet lateral distance. When more pumping and injection begin in 1998, it is predicted that the water table will be lowered by an additional 1.5 feet to almost 3 feet. In addition, the re-injection wells will create a small mound of water in the re-injection demonstration area (Re-injection Well #10). This mound in conjunction with the south field extraction system wells will cause the hydraulic gradient north of the re-injection wells to reverse creating the desired hydraulic barrier along the southern FEMP property boundary.

8 Re-injection will begin sequentially starting with the western most Well 22107, and proceeding to 22108, 22109, 22240, and finally 22111, see Figure 1-1. A start-up goal will be to get re-injection, at a rate of 200 gpm per well, going in all five wells as quickly as possible (1 day) to achieve the net system re-injection rate of 1000 gpm. Water levels and flow rates in the re-injection wells will be closely monitored for stability, using pressure transducers and flow meters, for approximately two hours following startup before a decision will be made to move to the next re-injection well to begin operations there.

The re-injection wells are scheduled for maintenance checks every three months during the demonstration. Maintenance checks involve the evaluation of each re-injection well screen for plugging and possible screen rehabilitation using physical and/or chemical methods. Corrective maintenance will be implemented as needed.

If the demonstration substantiates the viability of re-injection and the decision is made to continue re-injection, the re-injection wells will continue operation and preventive maintenance schedules will be implemented. If at the conclusion of the demonstration the decision is made not to continue re-injection, then operation of the re-injection wells will cease.

1.5 DEMONSTRATION PARTICIPANTS

The evaluation of re-injection technology at the FEMP is being sponsored by the Department of Energy's Office of Science and Technology Subsurface Contaminants Focus Area, at the request of the FEMP. The FEMP is an ideal place for evaluation of this technology because:

- A commitment was made by the DOE to the EPA in the OU5 ROD to evaluate the incorporation of innovative technologies into the aquifer remedy to try to shorten the duration of the aquifer remedy.
- As a result of the FEMP's intensive CERCLA site characterization efforts, in conjunction with previous regional studies, the contaminated Great Miami Aquifer at the FEMP is one of the most well studied aquifers in the world.
- The presence of educated, informed and supportive stakeholders.
- Cooperative regulatory agencies involved with the restoration project.
- A groundwater model has been developed that simulates flow and transport in the aquifer beneath the FEMP site.

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- The opportunity existed to integrate the demonstration into an actual Site remedy (i.e., the timing was right).

The evaluation is being conducted with a group of industry partners:

- MSE-Western Energy Technology Office (WETO)
  P.O. Box 4078
  Butte, Montana 59702

- Rio-Algom Environmental Services Inc.
  6305 Waterford Blvd.
  Oklahoma City, Oklahoma 73118

- In-Situ Inc.
  210 South 3rd. Street
  P.O. Box 1
  Laramie, Wyoming 82070-0920

MSE-WETO brings additional general groundwater hydrology expertise to the evaluation, and is the coordinator of the industry partnership with Rio-Algom and In-Situ Inc. Rio-Algom has conducted "in situ uranium leaching" (ISL) demonstrations in the western US and has experience pertaining to aquifer geochemistry, re-injection well maintenance, and re-injection system operations. In-Situ Inc. is a recognized industry leader in groundwater monitoring instrumentation. They bring expertise in velocity profile measurements in re-injection wells.

As part of the re-injection demonstration, DOE EM-50 and the three industry partners mentioned will review this test plan and be available for technical support upon request throughout the duration of the demonstration.

1.6 RELATIONSHIP TO OTHER DOCUMENTS

This test plan provides for the monitoring which will be conducted to support the Re-Injection Demonstration, above and beyond the monitoring that is already prescribed in the Draft Integrated Environmental Monitoring Plan (IEMP) and the Draft Operations and Maintenance Master Plan for the Aquifer Restoration and Wastewater Treatment Project (OMMP, DOE 1997d). Monitoring activities outlined in this test plan are not considered long term "routine" activities, therefore they have been separated from the long term monitoring programs presented in the IEMP and the OMMP. If re-injection is continued after the demonstration, long term routine monitoring requirements for re-injection will be identified and incorporated into the IEMP and OMMP.

Maintenance of the re-injection wells will begin by incorporating lessons learned from operating the South Plume Extraction Wells and from the two single well injection tests conducted at the FEMP. Corrective maintenance activities for the South Plume Module Wells are presented in Appendix A of the OMMP. Some of the activities carried out for the South Plume Wells will also be conducted for the re-injection demonstration wells. It is anticipated that the re-injection maintenance program will evolve as the re-injection demonstration proceeds.

1.7 TEST PLAN ORGANIZATION

The Re-Injection Test Plan is comprised of nine sections and one appendix. The first seven sections focus on conducting the demonstration. The last two sections present the management structure and safety and quality assurance. The sections and their contents are as follows:

Section 1.0 Provides an overview of the re-injection demonstration. The overview gives general background information concerning demonstration objectives, re-injection evaluation strategy, decision criteria for the demonstration, a startup sequence for the demonstration, participants, and the relationship of the test plan to other documents.

Section 2.0 Considerations for the design of the re-injection demonstration are presented in this section.

Section 3.0 The set-up of the re-injection demonstration is presented in this section. The general design used for the re-injection wells is presented along with actual installation information for the five re-injection wells installed to support the demonstration. The section also outlines the need for additional observation wells to support monitoring of the demonstration.

Section 4.0 This section presents testing activities that will be conducted during the demonstration. Testing activities include: analysis of the injectate, downhole camera surveys, biological sampling, ground water quality sampling, water level monitoring, maintenance checks, and surface water quality sampling.

Section 5.0 This section outlines the data evaluation strategy for the data collected during the re-injection demonstration.

Section 6.0 Schedules, deliverables, and reporting are discussed in this section.

Section 7.0 This section discusses the plugging and abandonment of re-injection demonstration wells following completion of the aquifer remedy.

Section 8.0 This section presents an overview of the management structure for the demonstration and outlines responsibilities for demonstration activities.

Section 9.0 This section presents activities which will be conducted to support the test (i.e., data management, health and safety, quality assurance/quality control, waste disposition, and decontamination).

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References Cited

Appendix A Presents previously collected water quality data for the re-injection demonstration area.

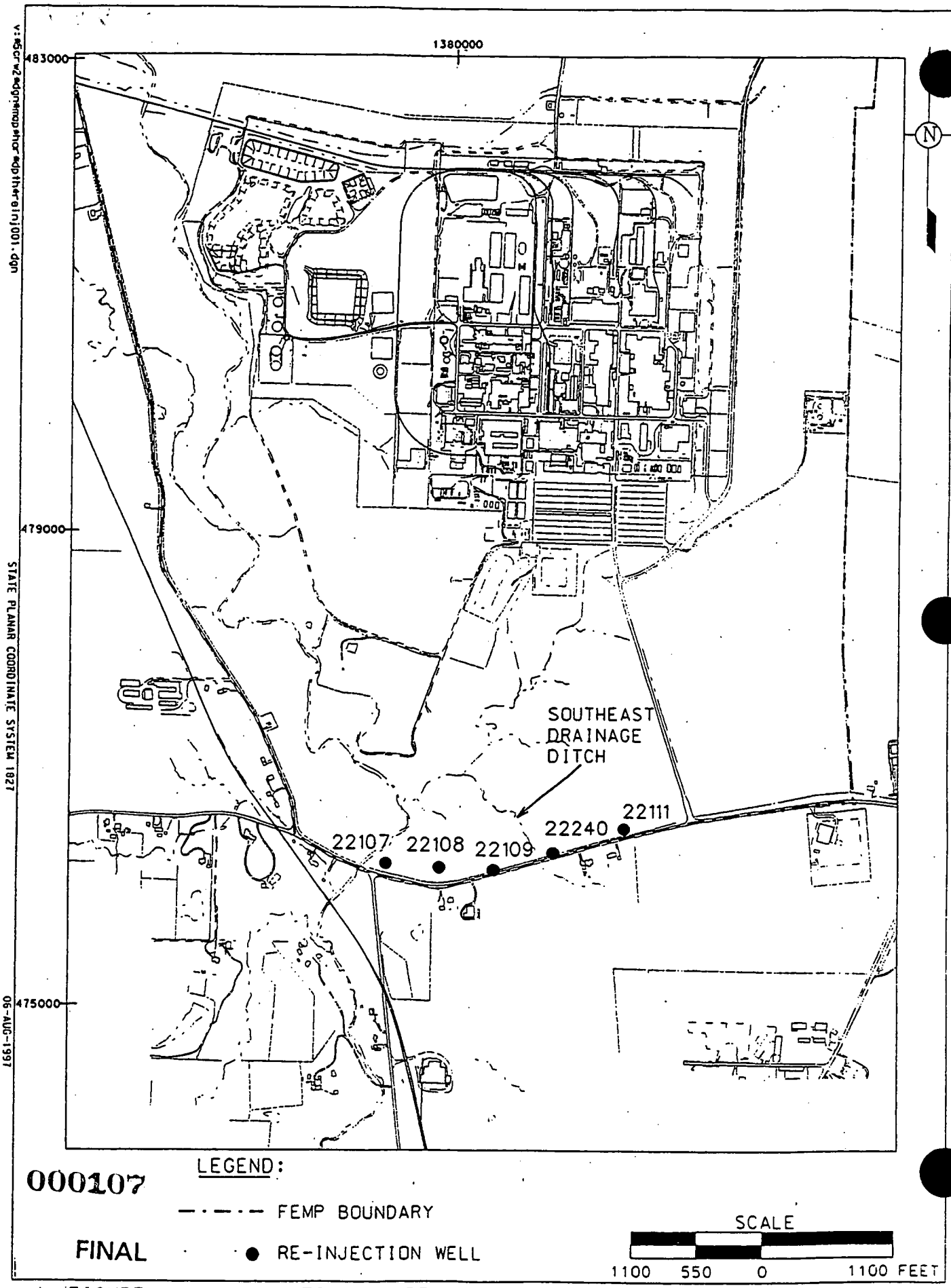

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FIGURE 1-1. LOCATION OF RE-INJECTION DEMONSTRATION TEST WELLS

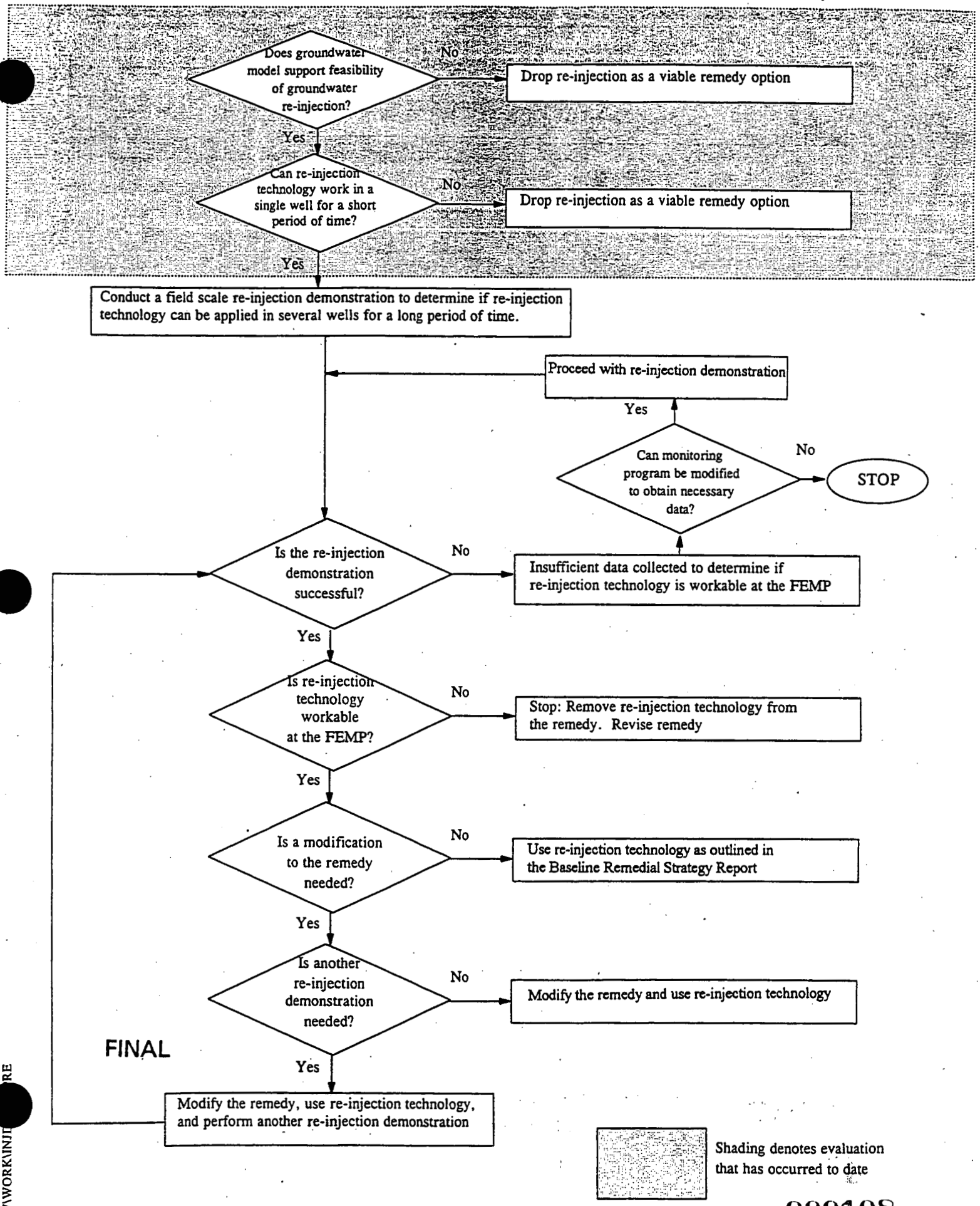

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Figure 1-2. Re-injection Technology Evaluation Flowchart

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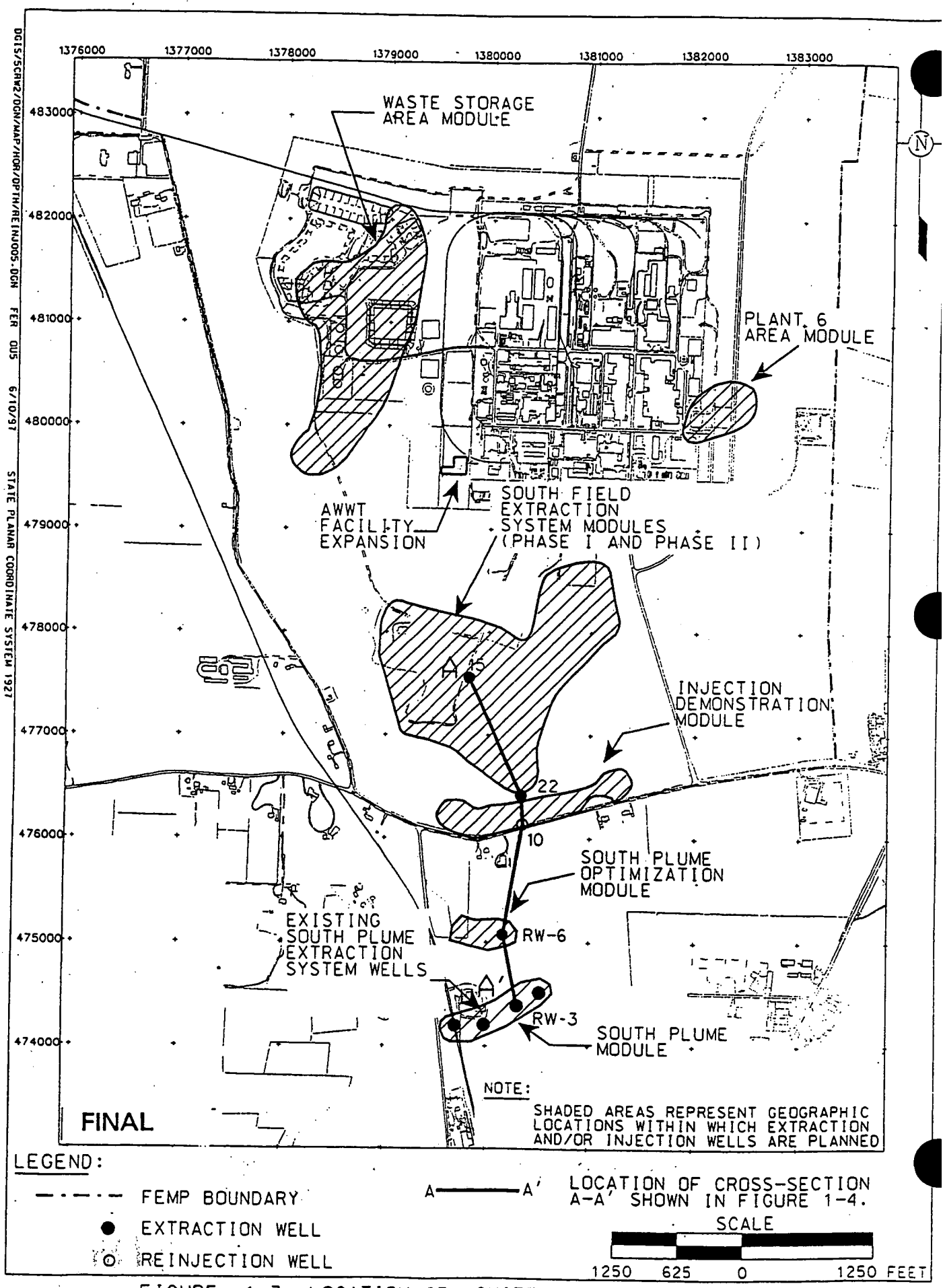

000109 FIGURE 1-3. LOCATION OF AQUIFER RESTORATION MODULES

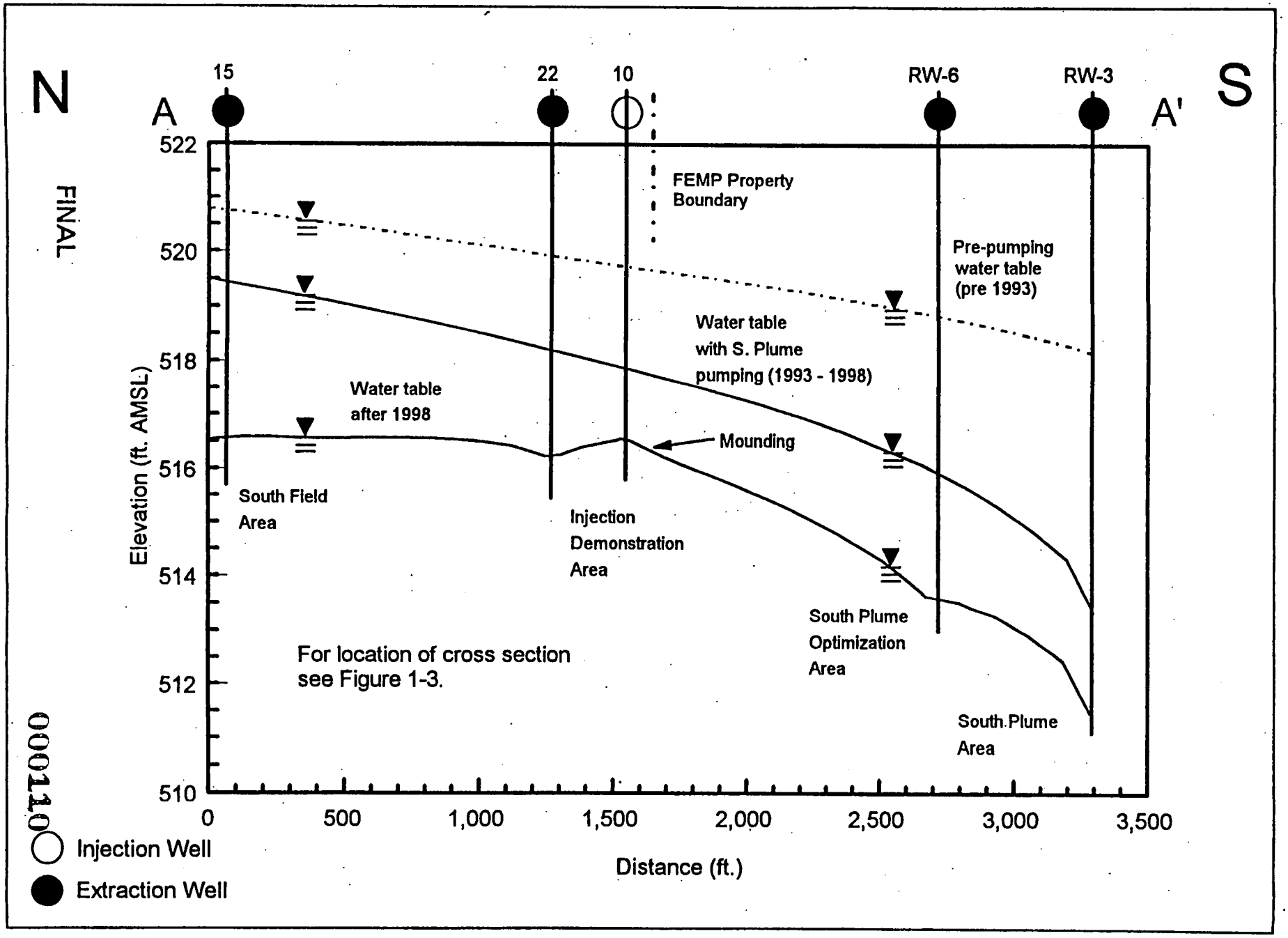

Figure 1-4. Water Table Elevation Profile

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2.0 DESIGN CONSIDERATIONS

The design considerations for the re-injection demonstration project are:

- Ohio EPA re-injection guidelines
- Aquifer characteristics
  - Hydrogeology
  - Groundwater quality
- The aquifer remedy
  - Aquifer restoration modules and facilities
  - Source and quality of injectate
  - Volume and rate of re-injection
  - The effect that re-injection will have on the 20 μg/L total uranium plume
- Industry knowledge on the design of re-injection wells
- Previous site experience
  - Single well injection tests
  - Water quality sampling in the re-injection demonstration area
  - Operation of the South Plume Extraction System
- Previous commitments made in other plans for work to be conducted as part of the re-injection demonstration

These considerations are discussed in each of the following subsections.

2.1 OHIO EPA RE-INJECTION GUIDELINES

The Ohio EPA Division of Drinking and Ground Waters (DDAGW) Underground Injection Control (UIC) has regulatory authority for re-injection in the State of Ohio. The re-injection demonstration will follow Ohio EPA Guidance (OEPA 1997). This guidance allows underground injection wells, used for the purpose of remediation, to operate without a permit provided that the injectate does not exceed any Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) or Health Advisory Limits (HAs).

65 The Re-Injection Demonstration is already exempted (under 40 CFR 300.400(e)(1)) from requiring a permit as it is a CERCLA action. However, the injectate will need to be evaluated with respect to the Operable Unit 5 Record of Decision established final remediation levels (FRLs) for affected groundwater at the FEMP. The injectate sampling strategy is provided in Section 4.1.

Ohio EPA guidance requires the following elements to be included in this test plan:

- A hydrogeologic site description (Section 2.2) including groundwater flow direction
- 66 A detailed description of the aquifer remedy that explains the method of restoration and number of wells (Section 2.3)
- A complete analysis of fluids to be re-injected (Section 4.1)
- The volume and rate of fluid to be re-injected (Section 2.3)
- The results of ground water monitoring in the test area (Section 2.2)
- The name of the Ohio EPA staff member overseeing any related site activities (Section 6.0)
- Plugging and abandonment of the re-injection wells (Section 7.0).

The Ohio EPA guidelines also request that monthly operating reports be prepared and submitted that include:

- Analysis of the injectate
- Volume and rate of re-injected fluid
- A description of any well maintenance and rehabilitation procedures
- The results of groundwater monitoring at the re-injection site.

A copy of the monthly reports and the test plan will be submitted to the Ohio Division of Drinking and Ground Waters - UIC Unit, P.O. Box 1049, 1800 Watermark Drive, Columbus, Ohio 43216-1049.

2.2 AQUIFER CHARACTERISTICS

This section presents the hydrogeology and groundwater quality of the re-injection demonstration area.

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Hydrogeology

As a result of the FEMP's intensive CERCLA site characterization efforts, in conjunction with other previous studies, the Great Miami Aquifer at the FEMP is one of the most well studied aquifers in the world. A detailed hydrogeologic site description of the FEMP can be found in Chapter 3 of the OU5 Remedial Investigation Report (DOE 1995a). A brief overview is provided below.

The re-injection demonstration is situated over the New Haven Trough, a large buried valley filled with glacial sand and gravel outwash deposits with an axis running northeast-southwest. Figure 2-1 is a bedrock topographic map that defines the base of the valley floor. The floor and walls of the New Haven Trough consist of Ordovician age shale and limestone. During the Pleistocene the New Haven Trough was carved into the shale and limestone bedrock, filled with sand and gravel, and capped by a layer of Wisconsin age clay-rich glacial overburden. The sand and gravel forms the matrix of the regionally extensive Great Miami Aquifer.

12 The Great Miami Aquifer is unconfined, anisotropic, and heterogeneous and has been federally designated a sole-source aquifer by the U.S. EPA. As recorded during the drilling of Monitoring Well 4398, the lithology in the area of the Re-Injection Demonstration, in descending order, consists of approximately 24 feet of silty clay and approximately 167 feet of sand and gravel. Bedrock is approximately 191 feet below ground surface (bgs).

13 As explained in Section 2.3, four extraction wells have been pumping south of the re-injection demonstration area since August of 1993. Figure 2-2 is a water table map from 1996 that illustrates groundwater levels in the re-injection demonstration area with the four existing extraction wells pumping.

Groundwater Quality

To facilitate monitoring and remediation the Great Miami Aquifer, the area of the FEMP site has been subdivided into five zones, Figure 2-3. Re-injection will take place in aquifer zone two but very close to aquifer zone four. The groundwater which will be treated for re-injection will be pumped from wells located in both aquifer zones two and four. Therefore, the groundwater quality in aquifer zones two and four will impact, and be impacted by, the re-injection demonstration.

A CERCLA Remedial Investigation/Feasibility Study (RI/FS) has been completed at the FEMP. During the RI/FS a very rigorous groundwater monitoring program was conducted to characterize the nature and extent of contamination in the Great Miami Aquifer at the FEMP. Over 200 groundwater monitoring wells were installed in the aquifer. Groundwater analyses included radiological constituents, full Hazardous Substance List (HSL) constituents, Appendix IX constituents, and general groundwater quality parameters. Process knowledge at the FEMP was used to guide the monitoring program and keep the program focused on those contaminants which were used at the FEMP. A detailed summary of the groundwater quality of the Great Miami Aquifer beneath the FEMP can be found in Chapter 4 of the Remedial Investigation (RI) Report for Operable Unit 5 (DOE 1995a). The study resulted in a list of Contaminants of Potential Concern (CPCs) for the FEMP site.

A detailed risk assessment, which focused on the FEMP CPCs, was conducted to determine which constituents posed an unacceptable risk to target receptors via the groundwater pathway. The result of the risk assessment was the identification of 50 site-specific groundwater constituents of concern (COCs) that were carried forward into the Operable Unit 5 Feasibility Study where preliminary remediation goals were developed. Remediation goals for the selected remedy were then carried forward and established as final remediation levels (FRLs) in the Operable Unit 5 Record of Decision (DOE 1996b). Remediation of the Great Miami Aquifer is based on achieving Final Remediation Level (FRL) concentrations for the 50 identified FRL constituents. The FRLs for these constituents are set at the MCL, proposed MCL, a risk-based level, analytical detection limit, or background.

A full assessment of the groundwater quality (against FRL concentrations) in all five aquifer zones is presented in Appendix A of the Integrated Environmental Monitoring Plan. FRL constituents that have had at least one validated FRL exceedance in either aquifer zone two or four are listed in Table 2-1. The first column of Table 2-1 lists the FRL parameter for which an FRL exceedance has been recorded. The second column lists the FRL concentration for the parameter. The third column gives the range of concentration that has been detected in the aquifer zones two and four combined. The fourth column lists the number of detections above the FRL, and the fifth column lists the total number of samples considered. The sixth column of Table 2-1 identifies whether or not the constituent is considered mobile and persistent "MP" or *not* mobile and persistent "N." The terms mobile and persistent are used to describe those constituents that are predicted to be able to migrate vertically through the glacial overburden reach the aquifer, and create an unacceptable risk in the absence of source control actions (i.e., identified as failing the Operable Unit 5 model screening in Table F.2-2,

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Operable Unit 5 Feasibility Study, DOE 1995c). Those FRL constituents that do not have the ability to migrate through the glacial overburden to the aquifer and create an unacceptable risk (not mobile and persistent) are identified with an N. If an N constituent has been detected in the aquifer above its FRL it must have short circuited the pathway through the overlying glacial overburden and into the aquifer. These "short circuits" are present where the glacial overburden has been removed by erosion such as in Paddys Run and in the Storm Sewer Outfall Ditch. The last column in Table 2-1 identifies the basis for the FRL.

The principal contaminant of concern in aquifer zones two and four is total uranium. In the immediate area of the re-injection demonstration wells, total uranium concentrations have been recorded as high as 490 μg/L, see BRSR, Figure G-22, (DOE 1997a).

2.3 AQUIFER REMEDY

64 A detailed description of the planned aquifer remedy, the groundwater modeling which was conducted to design the remedy, and the proposed system that will implement the remedy can be found in the BRSR (DOE 1997a).

17 The aquifer at the FEMP will be remediated with a pump-and-treat remedy supplemented by groundwater re-injection. The remedy consists of 37 pumping wells and 10 re-injection wells (Figure 2-4) which will be installed as phased modules as described below. Figure 1-3 shows the locations of the modules. The continued use of re-injection as part of the aquifer remedy is contingent upon the outcome of the re-injection demonstration.

The extraction and re-injection wells are grouped into seven modules located in four distinct areas of aquifer contamination, Figure 1-3. Each module is designed to remediate a specific portion of the aquifer. The modules are scheduled to be installed and operational at different times during the life of the remedy as surface remediation activities are completed and as access becomes available for well installation.

Four existing recovery wells located off property in the South Plume Area have been pumping contaminated groundwater since August of 1993 as part of a removal action. These wells will continue to operate during the aquifer remedy. In 1998, two additional South Plume Optimization Wells located off property and north of the existing recovery wells are scheduled to become operational. The South

Plume, and South Plume Optimization wells are scheduled to operate through the year 2003 or until groundwater monitoring in the South Plume Area indicates that COC concentrations are below the FRLs established in the Operable Unit 5 Record of Decision (DOE 1996b) or a technical impracticability waiver is approved. Also in 1998, ten wells located on property in the South Field Area are scheduled to begin pumping groundwater. The South Field Phase I wells are scheduled to be operational until 2005 or until the remedy is completed.

Five re-injection wells have been installed along the southern FEMP boundary as part of the re-injection demonstration. These wells are scheduled to begin to operate in 1998 and continue through the year 2003 if the demonstration concludes that it is feasible and beneficial.

In 2004, ten extraction wells are scheduled to become operational in the Waste Storage Area if surface remediation activities are complete. These wells will pump contaminated groundwater from beneath the former Waste Pit Area of the site. At the same time, two extraction wells are scheduled to be installed in the former process area to remediate a small uranium plume at the Plant-6 area. These wells will pump contaminated groundwater for two years or until groundwater monitoring in the area indicates COC concentrations are below the FRLs.

Also in 2004, the South Field Phase II system is scheduled to become operational to provide additional pumping capacity in the South Field Area and to complement the South Field Phase I wells discussed above. If the demonstration proves that re-injection technology is viable at the FEMP, then an additional line of re-injection wells immediately north of the South Field Area will be installed and begin operating in 2004. The aquifer remedy is scheduled for completion in 2005.

Source and Quality of Injectate

For the purpose of this test plan, the treated groundwater that will be re-injected into the Great Miami Aquifer will be called "injectate." The source of injectate for the re-injection demonstration will be treated groundwater from the AWWT Expansion Facility. Groundwater from aquifer zones two and four will be pumped from the aquifer and conveyed to the AWWT Expansion Facility for treatment prior to re-injection into aquifer zones two and four. See Section 2.2 for a discussion of the quality of groundwater in aquifer zones two and four.

Since the AWWT Expansion Facility is not yet operational it is not possible to analyze the effluent. However, prior to re-injection, in accordance with OEPA guidelines, effluent from the AWWT Expansion Facility will be sampled. As presented in the RA Work Plan, the AWWT Expansion Facility is scheduled to begin operation in April of 1998. A sampling strategy for the injectate that begins before re-injection is scheduled to take place is presented in Section 4.1.

Volume and Rate of Re-Injection

The aquifer remedy will be operating during the re-injection demonstration. As shown in Table 5-2 of the BRSR (DOE 1997a) it is planned that:

- Groundwater will be pumped from the aquifer at a net rate of 3400 gpm.
- 2000 gpm of groundwater will be sent to treatment, 1400 gpm will go to the AWWT Expansion facility.
- 1000 gpm of treated-groundwater will be re-injected back into the aquifer for the re-injection demonstration.
- 2400 gpm of groundwater (mixture of treated and untreated) will be discharged to the Great Miami River.

Given a re-injection rate of 1000 gpm, and a re-injection duration of 1 year, it is estimated that up to approximately 5.26×10^8 gallons of water could be injected into the aquifer during the demonstration. This estimate assumes re-injection will take place through 5 wells at an individual rate of 200 gpm and each well operate continuously during the demonstration. However, some downtime is expected. At a minimum the re-injection wells will be shut down quarterly for a short period of time for maintenance checks.

The Affect That Re-injection Will Have on the 20 μg/L Total Uranium Plume

If re-injection takes place above the top of the plume, the injectate might push the plume deeper into the aquifer. If re-injection occurs below the plume the injectate might not effectively flush contamination to the extraction wells. Re-injection within the plume itself would flush contamination to the extraction wells, but depending upon the thickness of the plume in relation to the length of the zone of active injection, the injectate might serve to split the plume and push some of the plume deeper into the aquifer. Data collected from the spinner tool (discussed below) indicates that the active zone of re-injection is much smaller than the total length of the well screen, so it is quite likely that if

re-injection occurs in an area where the plume is very thick, relative to the length of the re-injection well screen, that some of the total uranium plume might be pushed deeper into the aquifer. The concern, should this occur, is whether or not capture of the entire plume would still be maintained. A strategy to monitor the effect that re-injection has on the 20 μg/L total uranium plume is presented in Section 4.

2.4 INDUSTRY KNOWLEDGE ON THE DESIGN OF RE-INJECTION WELLS

Based on industry reports, re-injection wells are much more likely to fail than typical water producing wells because of plugging due to water-chemistry problems. As recommended in Driscoll 1986, the design criteria commonly used for extraction wells should be used to design re-injection wells, with the exception of entrance velocity and screen length. For the purpose of this test plan, "entrance velocity" for an extraction well will be referred to as "exit velocity" for a re-injection well. The screens of re-injection wells should be designed for an average exit velocity that does not exceed 0.05 feet/second. Since clogging of the well screen is the most serious problem expected in re-injection wells, an effort should be made to maximize the length of the well screen.

2.5 PREVIOUS SITE EXPERIENCE

Previous site experience consists of the two single-well injection tests (conducted in 1995 and 1996), water quality sampling results in the area of the re-injection demonstration, and operation of the South Plume Extraction System. Test results are presented in two separate reports (DOE 1995b) and (DOE 1996a).

Single Well Injection Tests

During the first single well injection test (DOE 1995b) it was learned that in order for the re-injection process to work at the FEMP, only waters with similar pH, Eh, and low iron content should be mixed. If the waters are not similar and high concentrations of ferrous iron are present, the ferrous iron can oxidize to ferric iron and form an iron-hydroxide precipitate which in turn promotes the growth of iron bacteria and leads to rapid screen plugging.

During the second single well injection test (DOE 1996a) a spinner tool was used in the re-injection well to determine a vertical flow profile over the length of the well screen. The spinner tool indicated that 80 percent of the injectate flowed out of the upper three feet of a 15 foot well screen. This indicates that the injectate will move out of the upper portion of the well screen unless it is physically

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forced down into the lower levels of the screen. This can be accomplished by grading the size of the exit holes in the base of the downcomers so that they are larger at the bottom and smaller at the top. A downcomer is the piping within the re-injection well that carries the injectate down the well. The holes in the downcomers used for the re-injection demonstration will be graded as described above.

Sampling Results

Water quality sampling conducted in the area of the re-injection demonstration indicates that:

- Iron concentrations vary vertically and horizontally in the Great Miami Aquifer, increasing with depth
- Both aerobic and sulfate-reducing bacteria are naturally present in the aquifer at the re-injection demonstration area
- Dissolved oxygen concentrations decrease with depth
- The redox potential decreases with depth.

Results of the water quality sampling for major anions and cations, in situ water quality parameters (i.e., temperature, pH, specific conductance, dissolved oxygen, and redox potential) and bacterial analyses are presented in Appendix A.

19 Sampling data indicates that the potential exists for iron plugging of the re-injection well screens and that the potential increases with depth in the aquifer. Geochemical modeling using geochemical data collected from Well 31567 (a well used in earlier injection tests), which is located in the Southfield, indicated that a total iron concentration in the aquifer above 0.15 ppm may result in precipitation of ferric iron. Sampling results presented in Table A-1 indicate that the iron concentration in the re-injection demonstration area, in the shallow zone being targeted for re-injection (2000 series results) is below this concentration. The precipitation of ferric iron plugs the well screen and promotes the growth of iron bacteria which leads to further plugging. The two single-well injection test reports both discuss the process of iron precipitation and iron-bacteria plugging (DOE 1995b, DOE 1996a).

Operation of the South Plume Extraction System

The South Plume Extraction System has been pumping groundwater from the Great Miami Aquifer since August 1993. Various problems have been encountered during the operational life of the South

Plume Module. Lessons learned from operation of the South Plume system will be incorporated into the maintenance and operation of the Re-Injection Demonstration Wells.

In particular, iron fouling of system components, including well screens, control valves, flow meters and check valves has occurred in the South Plume wells. The South Plume wells have been placed on a quarterly preventive maintenance program to address the iron fouling. The preventive maintenance program for the South Plume Wells is presented in the OMMP (DOE 1997d). The maintenance program for the Re-Injection Demonstration Wells will be based off of the South Plume program. It is expected that the program for the Re-Injection Wells will evolve as the demonstration progresses and information on the operation of the re-injection wells is collected and evaluated. The maintenance program for the re-injection wells is presented in Section 4.

2.6 PREVIOUS COMMITMENTS

The top of the 20 μg/L total uranium plume in the area of Monitoring Well 3069, which is next to a ponding feature in the South East Drainage Ditch, is located approximately 30 feet beneath the water table. Recharge from the drainage ditch could be diluting the plume at the water table. A comparison of the chemistry of the surface water found in the ditch to groundwater found in the aquifer directly beneath the ditch will be used to indicate how similar the waters are. Similar chemistries will support the recharge theory. Page seven of the Restoration Area Verification Sampling Program Project Specific Plan (DOE 1997e) states that the surface water chemistry in the Southeast Drainage Ditch will be measured and compared to the groundwater chemistry of the underlying aquifer in an effort to verify that the ditch recharges the aquifer. The location of the Southeast Drainage Ditch is shown on Figure 1-1. This work will be conducted as part of the Re-Injection Demonstration.

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TABLE 2-1

16 **CONSTITUENTS IDENTIFIED IN AQUIFER ZONES 2 AND 4 AT CONCENTRATIONS ABOVE THEIR FRL**

Constituents	Groundwater FRL[a]	Range Detected in Aquifer in Zones 2 & 4	No. Samples > FRL	Total Number of Samples	Constituent Type	Basis for FRL
General Chemistry	**mg/L**					
Nitrate	11.0	0.01- 43.2	3	296	MP	B
Inorganics	**mg/L**					
Antimony	0.006	0.0012 - 0.0958	8	476	N	A
Arsenic	0.05	0.00084 - 0.35	40	1121	N	A
Barium	2.0	0.0081 - 8.69	2	713	N	A
Beryllium	0.004	0.001 - 0.178	1	469	N	A
Cadmium	0.014	0.001 - 0.211	4	746	N	B
Chromium	0.022	0.0021 - 2.017	154	745	MP	R
Cobalt	0.17	0.002 - 0.528	2	469	N	R
Lead	0.015	0.001 - 0.3	18	730	N	A
Manganese	0.9	0.001 - 139.0	12	746	N	B
Mercury	0.002	0.00015 - 0.0123	6	744	MP	A
Nickel	0.1	0.0042 - 0.791	13	748	N	A
Selenium	0.05	0.0009 - 0.246	4	741	N	A
Silver	0.05	0.0011 - 0.12	3	743	N	A
Vanadium	0.038	0.0038 - 0.29	7	609	N	R
Zinc	0.021	0.0019 - 1.12	37	467	N	B
Radionuclides	**pCi/L**					
Neptunium-237	1.0	0.036 - 3.25	2	371	MP	R*
Radium-226	20.0	0.181 - 39.8	1	699	N	A
Strontium-90	8.0	0.723 - 17.4	1	486	MP	A
Thorium-228	4.0	0.01- 14.2	25	757	N	R*
Thorium-232	1.2	0.008 - 2.7	6	756	N	R*
	µg/L					
Total Uranium	20.0	0.063 - 2070	246	808	MP	A
Organics	**µg/L**					
Bis(2-ethylhexyl)phthalate	6.0	0.4 - 13.0	1	71	N	A
Carbon disulfide	5.5	1.0 - 26	1	342	N	A
1,1-Dichloroethene	7.0	ND - 110	1	317	N	A
1,2-Dichloroethane	5.0	0.2 - 310	1	317	MP	A
Trichloroethene	5.0	1.0 - 34	2	343	N	A

[a]From Table 9-3 in OU5 ROD. Fluoride and lead FRLs reflect values presented in the Remedial Design Fact Sheet for Operable Unit 5 Aquifer Restoration - Groundwater FRLs for Fluoride and Lead.
A - Applicable or relevant and appropriate requirement based (MCL, PMCL, etc.).
B - Based on 95th percentile background concentrations.
R - Risk Based Preliminary Remediation Goal (CPRG)
R* - Risk Based Preliminary Remediation Level includes the radionuclide risk-based PRG plus its 95th percentile background concentration.

NOTES:
- Unfiltered and filtered validated data was used to prepare table. Any data qualified as "R" or "Z" was not used.
- Data was pulled from Site Environmental Database (SED) (which contains sampling results from 1-1-94 to 7-31-97) and the Operable Unit 5 remedial investigation groundwater data set (which contains data prior to 1-1-94).
- If duplicate data was available, the highest value was used.

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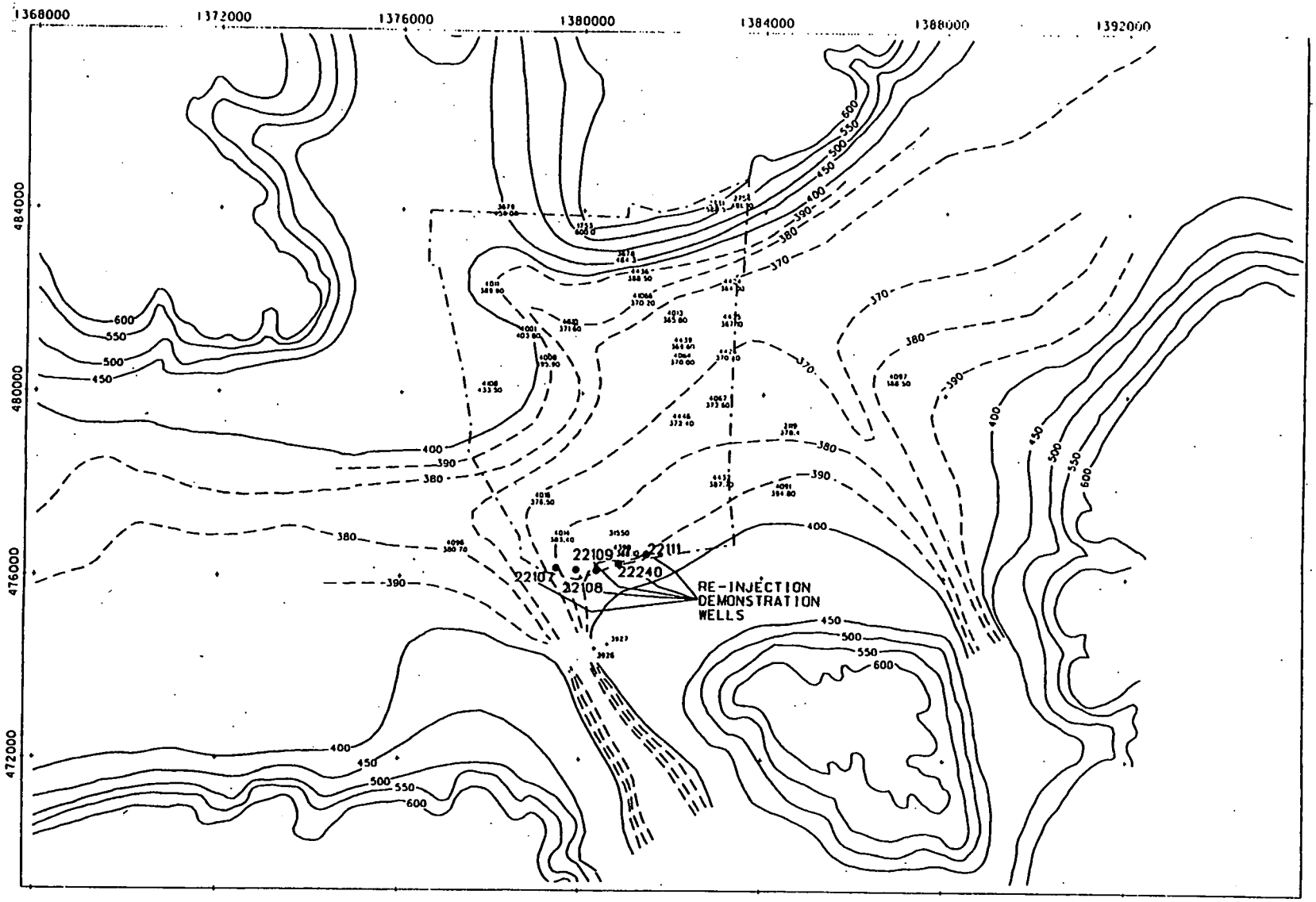


LEGEND:

- FEMP BOUNDARY
- 10 FOOT BEDROCK CONTOUR (RI/FS WELL DATA)
- 50 FOOT BEDROCK CONTOUR (WATKINS & SPIEKER, 1971)
- WELL/BORING NUMBER
- BEDROCK ELEVATION

SCALE

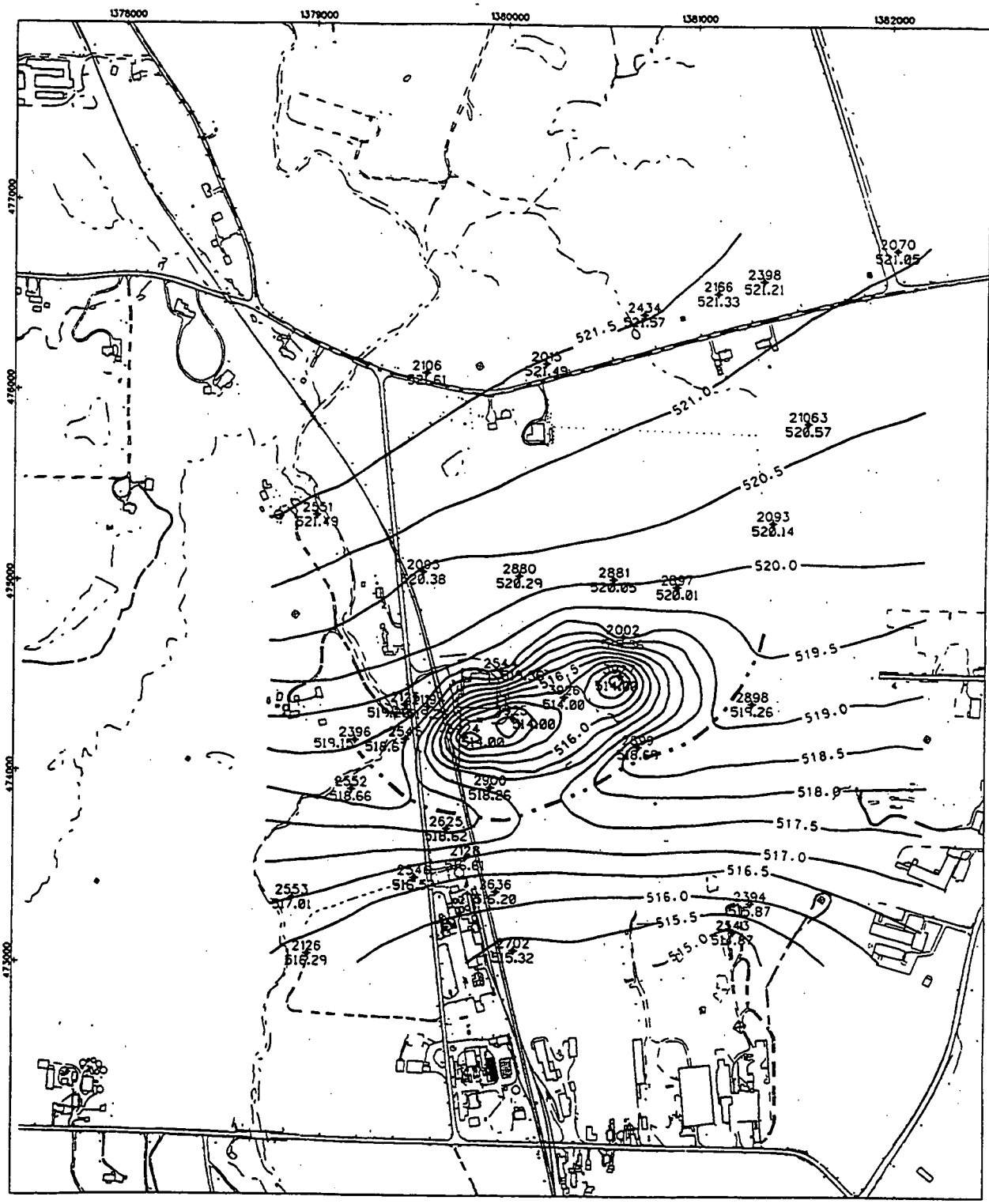
2500 1250 0 2500 FEET

FINAL

FIGURE 2-1. BEDROCK TOPOGRAPHIC SURFACE

USR/ERMA5/SCRW2/DGN/MAP/HOR/DPTH/REINJ003.DGN STATE PLANAR COORDINATE SYSTEM 1927

/USR/ERMAS/SCRW2/DGN/MAP/HOR/DPTH/REINJ004.DGN FER OU5 1/28/97 STATE PLANAR COORDINATE SYSTEM 1927



LEGEND:

— · — · — FEMP BOUNDARY

— · · — · · FLOW DIVIDE

—515.0— GROUNDWATER ELEVATION CONTOUR (AMSL)

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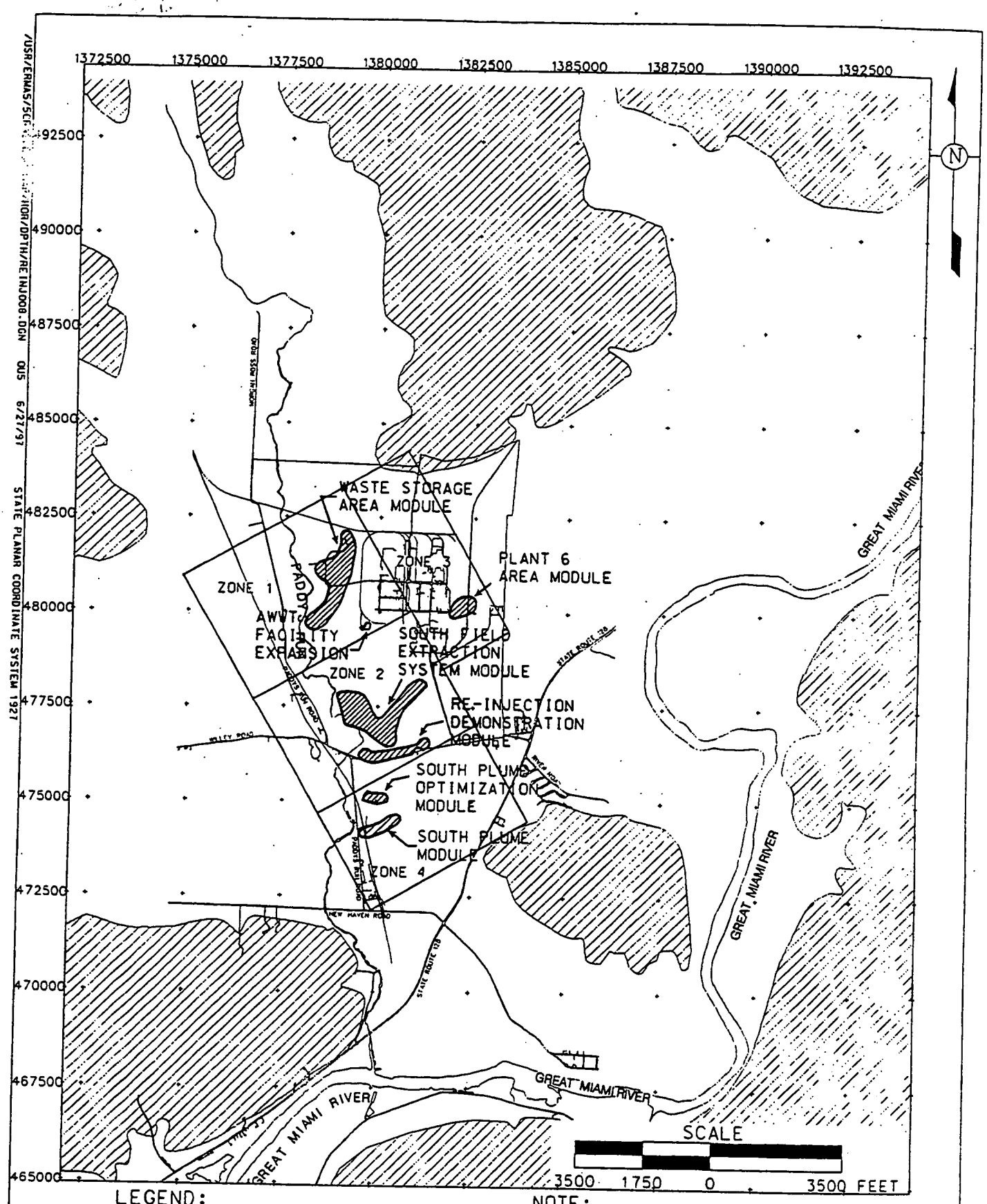
SCALE

800 400 0 800 FEET

FINAL

FIGURE 2-2. GROUNDWATER ELEVATIONS AUGUST 1996



LEGEND:

— · — · — FEMP BOUNDARY

NOTE:
SHADED AREAS REPRESENT GEOGRAPHIC LOCATIONS WITHIN WHICH EXTRACTION AND/OR INJECTION WELLS ARE PLANNED
ZONE 0 CONSISTS OF ALL AREAS OUTSIDE ZONES 1, 2, 3, AND 4.

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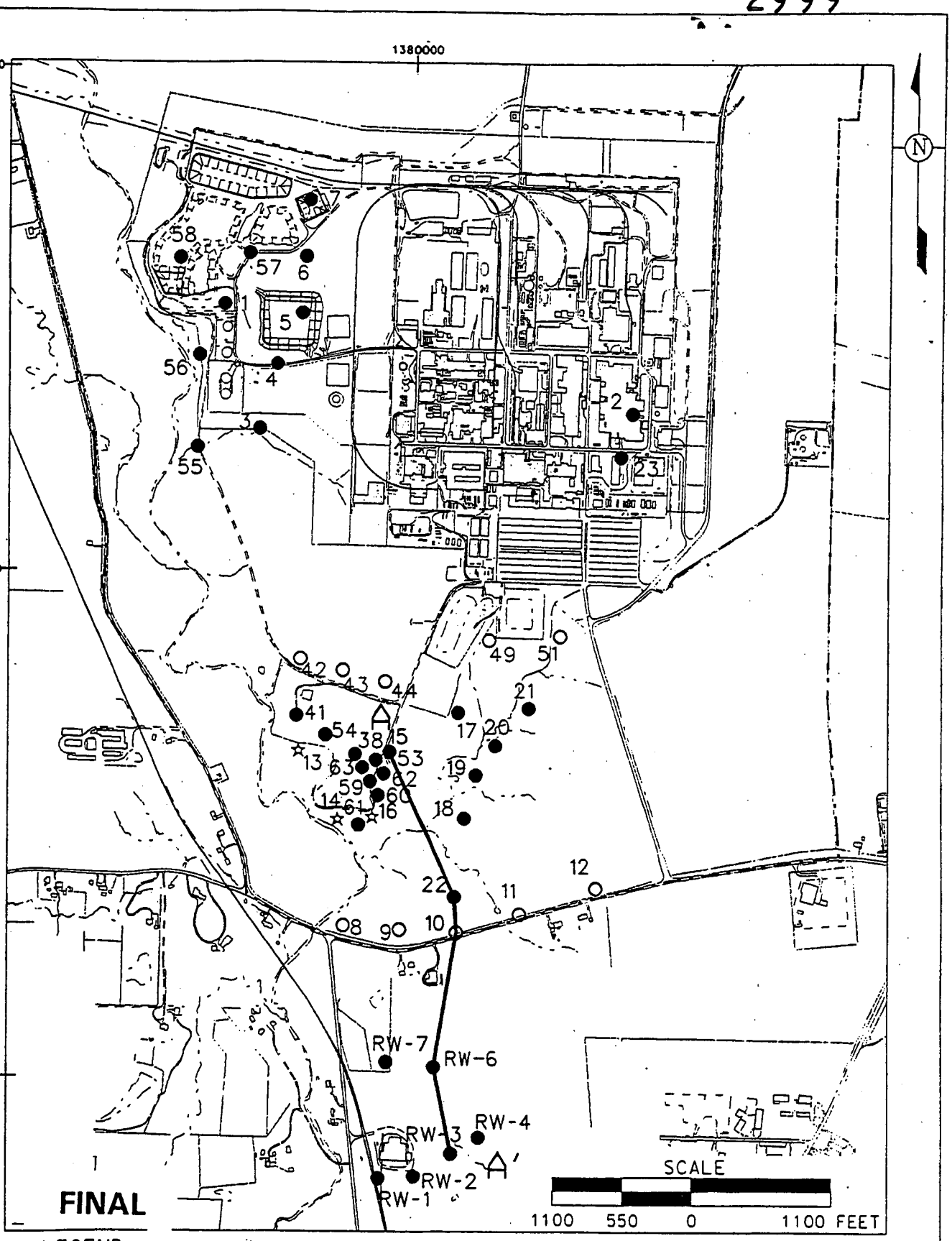
FINAL

FIGURE 2-3. GROUNDWATER AQUIFER ZONES



LEGEND:

- — · — · — FEMP BOUNDARY
- - - - - - HOMEOWNER PROPERTY BOUNDARIES
- ○ INJECTION WELL
- ● EXTRACTION WELL
- ☆ EXTRACTION/INJECTION WELL

FIGURE 2-4. WELL LOCATIONS FOR THE BASELINE GROUNDWATER REMEDIAL STRATEGY

3.0 DEMONSTRATION SET-UP

The Re-Injection Demonstration System will consist of five re-injection wells (already installed) located along the southern FEMP property line. With the exception of re-injection Well 22111, each re-injection well will have a shallow and deep observation well (located within approximately 25 feet of the re-injection well). Well 22111 will only have a shallow observation well. The re-injection wells have all been installed. The nine observation wells will be installed before the South Field Extraction System begins operation in 1998.

During the demonstration 1000 gpm of treated groundwater called "injectate," coming from the AWWT Expansion Facility, will be re-injected into the 5 re-injection wells at a rate of 200 gpm per well. The injectate will contain less than 20 μg/L total uranium and less than 0.1 ppm total iron. The uranium concentration limit is the OU5 ROD established FRL. The iron concentration limit is deemed necessary to prevent the buildup of iron precipitate and bacteria in the wells and is based on geochemical modeling conducted to support the second single well injection test at the FEMP (DOE 1996a, Appendix F). The injectate will flow from the AWWT Expansion Facility to a 50,000 gallon surge tank to the injection wells via a pipe network. The injection flow rate will be controlled remotely from the AWWT Control Room. It will be possible to control the flow rate locally at each well head, but any change made locally will be detected in the AWWT Control Room. The design of the re-injection demonstration system is contained in the Certified for Construction Design Package for Task 4: Injection Demonstration (DOE 1997b).

3.1 GENERAL DESIGN OF THE RE-INJECTION WELLS

As discussed in Section 2.4, re-injection wells are much more likely to fail than typical water production wells. Problems associated with water-chemistry, air entrainment, and sand pumping are considerably more serious and common for re-injection wells. Given the increased chance for maintenance problems, several factors were considered in the general design of the re-injection wells:

- The design needs to be simple and flexible to facilitate later modifications if necessary.
- The design needs to facilitate routine maintenance and work-over of the screen area for iron encrustation and plugging.
- The design needs to reduce the possibility that air bubbles will be injected into the well and pushed out into the aquifer material. This happens if the injectate is allowed to cascade

down the well. The air bubbles will displace groundwater around the well, reducing effective porosity for the injectate.

- The design needs to allow for the monitoring of sand content in the injectate. Injectate with a sand concentration as low as 1 mg/L can clog re-injection wells over time. If sand concentration in the re-injection well becomes a problem, an in-line filter can be installed.

- The demonstration will determine if a larger diameter re-injection well will incur less maintenance costs than a smaller diameter re-injection well. In theory, given the same injection rate and slot opening size, the screen of a larger diameter well should have a lower average entrance velocity than the screen of a smaller diameter re-injection well. The lower entrance velocity should lower the probability of the screen plugging and decrease maintenance costs. Another advantage of a larger diameter well is that it is easier to work in during maintenance operations.

71 The general design of each re-injection well is illustrated in Figure 3-1. Each re-injection well has protective casing constructed of Schedule 40 PVC with a 304 stainless steel wire wrapped screen. It is anticipated that the stainless steel screen will hold up better than other materials if numerous screen work-overs are needed due to well plugging. The use of a telescoped protective casing was considered but not used. The thought was that the screen of the re-injection well might become so clogged that it would need to be replaced. A larger fixed casing could be installed through which a smaller retrievable screen could extend. It was decided though, that if the screen was so badly plugged that it needed to be replaced, then chances would be good that the porosity of the surrounding aquifer would also be reduced. It would be more cost effective in these circumstances to re-drill at a new location rather than install a new screen at the old location.

A flow controller will operate at each re-injection well with a flow meter and control valve to maintain a preset nominal 200 gpm (± 10%) flow rate into the well. This flow will be directed down one of two injection tubes called "downcomers." One downcomer is designed for a nominal flow of 200 gpm, the other is slightly smaller and designed for a nominal flow of 150 gpm. The smaller downcomer can be used temporarily to maintain needed back pressure should the re-injection rate temporarily fall to 150 gpm or less. The base of the downcomer will be sized to maintain a 1 psi pressure at the downcomer inlet so that injectate will not cascade down the downcomer and create air entrainment. Downcomer perforations increasing in size with depth will help distribute flow across the well screen. The downcomers are essentially a passive delivery system. The use of a downhole packer was also considered for controlling the delivery of the injectate. An inflatable packer would restrict flow within the well creating the positive pressure needed to prevent cascading of the injectate. It was decided

though, that the maintenance and operation of a packer was more complicated than using a passive downcomer. To keep the design simple downcomers were selected. The wells could be modified with a packer at a later date if the use of a packer is found to be beneficial.

The design also includes the following features:

- A chemical injection port at each well head which can be used for possible maintenance activities during the demonstration
- A downhole pressure transducer installed in a stilling pipe within each re-injection well. The transducer will measure water levels and signal operators if the water level in a re-injection well is getting too high
- A sampling port at each re-injection well head for installing a centrifugal sand sampler which can be used to measure the sand content of the injectate.

General Design of the Well Screen

The general design of the re-injection well screens was based upon the following:

72 - Used a continuous wire wrapped well screen and conducted a sieve analysis to select a screen slot size to maximize the open area of the screen
- Set the top of the well screen so that it would remain below the surrounding water table during the aquifer remedy

21 - Restricted re-injection to areas of the aquifer where total iron concentration is below 0.15 ppm
- Designed for an average screen exit velocity of 0.05 feet/second or less
- Designed for a natural completion, but if velocity calculations indicated a screen exit velocity that was greater than 0.05 feet/second, then used a filter pack
- Based screen length on the thickness and depth of the total uranium plume, spinner tool data collected from the second single-well re-injection test (DOE 1996), and total iron concentration of the groundwater in the re-injection demonstration area

18 - Maximized the length of the screen within the constraints imposed by the location and thickness of the 20 μg/L total uranium plume.

3.2 INSTALLATION OF THE RE-INJECTION WELLS

The five re-injection wells were installed during late 1996 and early 1997. From west to east they are numbered as follows: 22107, 22108, 22109, 22240, and 22111. Figure 3-2 illustrates the completion method, diameter, and screen position of each well.

- Well 22107 is an 8-inch diameter well completed with a Global #4 sand filter pack. The screen is wire wrapped, 15 feet in length, and has a slot size of .060 inches.
- Well 22108 is a 12-inch diameter well completed with a Global #4 sand filter pack. The screen is wire wrapped, 15 feet in length, and has a slot size of .060 inches.
- 23 Well 22109 is a 16-inch diameter well completed with a natural filter pack. The screen is wire wrapped, 15 feet in length, and has a slot size of .040 inches.
- Well 22240 is a 16-inch diameter well completed with a Global #4 sand filter pack. The screen is wire wrapped, 15 feet in length, and has a slot size of .060 inches.
- Well 22111 is a 16-inch diameter well completed with a Global #4 sand filter pack. The screen is wire wrapped, 15 feet in length, and has a slot size of .060 inches.

The re-injection wells were designed so that the top of the well screen would remain submerged during the aquifer restoration. Submergence of the well screen helps to limit screen corrosion and plugging. Water level data collected from surrounding monitoring wells over the past decade were used to define high and low water levels. In this area the recorded water table elevation range was 514 feet amsl to 517 feet amsl. Groundwater modeling in the BRSR (DOE 1997a) indicates that operation of the planned extraction wells during the remedy will lower the water table in the re-injection demonstration area as much as 3.5 feet. This estimation includes the expected rise in water levels due to re-injection. Providing for approximately 5 feet of uncertainty (or insurance), the top of the screen in each re-injection well was positioned 8.5 feet below the lowest recorded water table elevation for the immediate area.

Screen slot sizes were determined from grain size data collected from sieve analyses. The screen length was set at 15 feet so as to maximize the length of the screen but limit the depth of reinjection to the upper regions of the aquifer where the total uranium plume is situated and the iron concentrations are lower. The positioning of the screen in relation to the total uranium plume is explained further below.

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3.3 SCREEN LOCATIONS IN RELATION TO THE 20 μg/L TOTAL URANIUM PLUME

Of the five re-injection wells, four screens are located within the 20 μg/L total uranium plume, and one screen is located outside of the 20 μg/L total uranium plume. Figures 3-3 and 3-4 illustrate the vertical position of the re-injection well screens in relation to the vertical thickness and location of the 20 μg/L total uranium plume.

The dimension and location of the edge of the 20 μg/L total uranium plume has been well characterized in the re-injection demonstration area. From the late Fall of 1996 through Spring of 1997 additional characterization work was conducted in the re-injection demonstration area to support remedy design and the installation of the re-injection wells. The controlling document for the work was the Restoration Area Verification Sampling Program Project Specific Plan (DOE 1997e). The additional characterization of the uranium plume was conducted using a Geoprobe™ mill slot sampling tool to complete vertical plume profiles. The results of the work can be found in Appendix G of the BRSR (DOE 1997a).

The Geoprobe™ work indicates that, with the exception of the area around re-injection Well 22240, the top of the 20 μg/L total uranium plume is located at the water table. In the area of re-injection Well 22240, the top of the 20 μg/L total uranium plume is located approximately 30 feet below the water table. With the exception of re-injection Well 22240, the screens in the re-injection wells are positioned as shallow as possible to maintain submergence (i.e., 8.5 feet below the lowest recorded water level for the area of the well). A shallow screen depth is preferred because iron concentrations increase with depth increasing the possibility for iron encrustation and plugging of the well screen and surrounding formation.

In re-injection Well 22111, the screen is positioned to intercept the leading edge of the 20 μg/L total uranium plume Figure 3-3. Re-injection at this location should help to confine the plume to its present geometry. Monitoring of water level and water quality during the demonstration will be conducted to document how the plume is behaving in response to re-injection. Details of the monitoring are presented in Section 4 of this test plan.

The well screens in re-injection Wells 22107, 22108 and 22109 are positioned within the 20 μg/L total uranium plume, Figure 3-3. Re-injection at these locations could cause the total uranium plume to migrate deeper into the aquifer. This possibility will be monitored during the demonstration through

deep observation wells installed at the a depth that corresponds to the top of groundwater model layer four. The top of groundwater model layer four corresponds to the top of a clay interbed layer that is found to the north of the re-injection demonstration area (DOE 1994). Groundwater modeling shows that during the remediation particles seeded at the depth of re-injection travel no deeper than the top of model layer four as a result of re-injection (Figure E-20 of the BRSR, DOE 1997a). Monitoring at this depth will confirm model predictions concerning vertical movement. Details of the monitoring are presented in Section 4 of this test plan.

Pumping in the upgradient South Field Phase I wells prior to re-injection in the demonstration area will serve to hold back the source of uranium contamination migrating into the demonstration area. Finally the screen in re-injection Well 22240 is positioned within the leading edge of the 20 μg/L total uranium plume whose top surface is approximately 30 feet below the water table (Figure 3-4).

3.4 RE-INJECTION OBSERVATION WELLS

In order to monitor the effect that re-injection is having on the aquifer, five new shallow groundwater observation wells and four new deep groundwater observation wells will be installed and monitored during the re-injection demonstration. The observation wells will be installed prior to the start of pumping in the South Field Extraction System, which is scheduled before re-injection begins.

A shallow observation well will be located within approximately 25 feet of each re-injection well. The screens of the shallow observation wells will be 5 feet in length and the top of each screen will be set at the same depth as the top of the screen in the closest re-injection well. Monitoring of the shallow observation wells will provide data on the changing geochemistry within the aquifer due to the re-injection within close proximity to the re-injection wells. As discussed in Section 4, biological monitoring will be conducted in the shallow observation wells in an attempt to monitor for bacteria changes within the aquifer due to re-injection without having to stop re-injection and sample the re-injection well itself.

A new deep re-injection observation well will also be installed within 25 feet of re-injection Wells 22107, 22108, 22109, and 22240 (Figure 3-3). The screens of the four deep observation wells will be five feet in length, and set at the top of model layer 4. Monitoring in these four observation wells will be used to determine if re-injection is pushing the uranium plume deeper into the aquifer than predicted by the groundwater model. If the plume were to be pushed deeper it would most likely be

pushed deeper beneath the point of re-injection. Since re-injection Well 22111 is located outside of the plume there is no need for deep monitoring at that location.

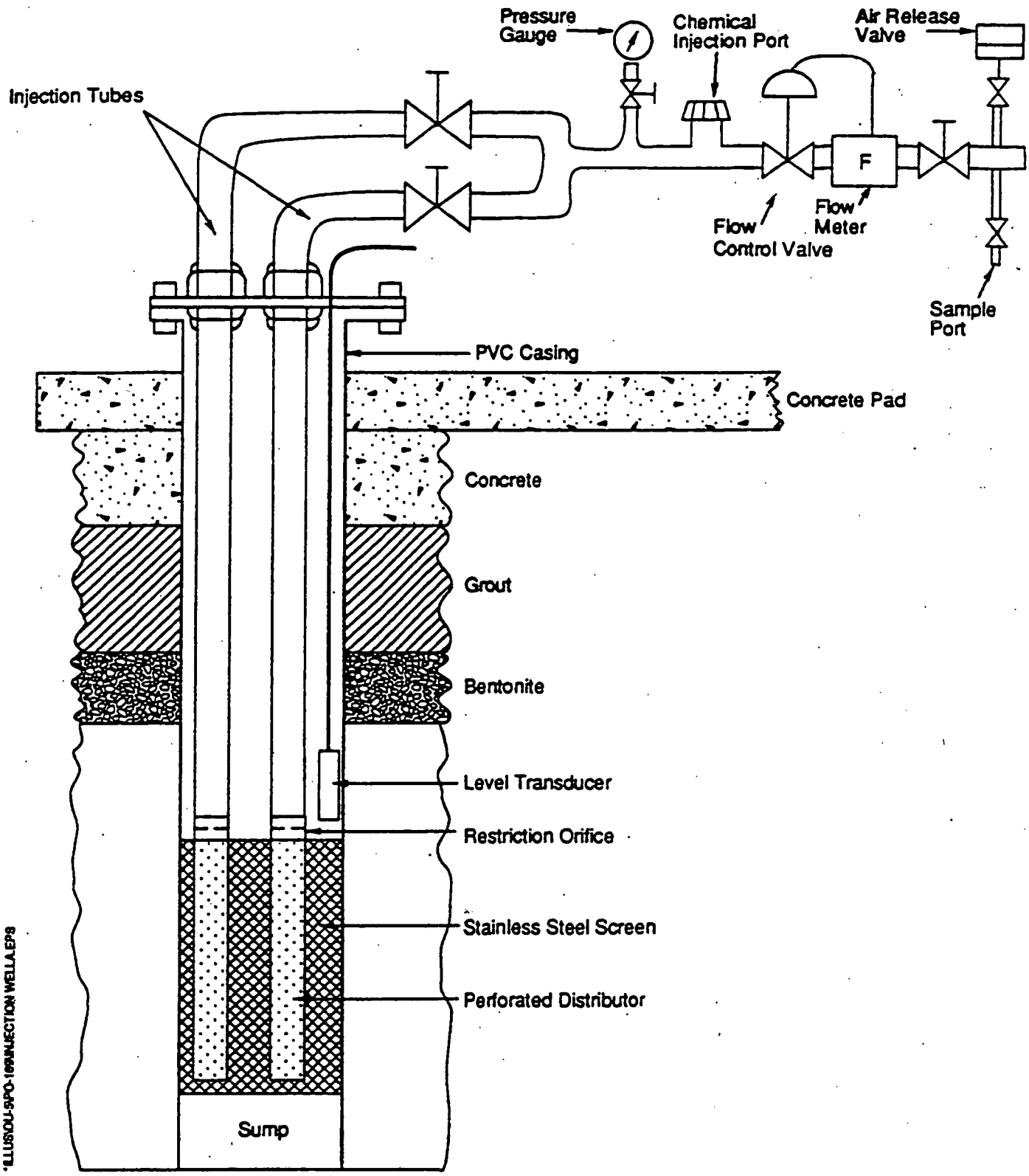

FIGURE 3-1. GENERAL DESIGN OF RE-INJECTION WELLS

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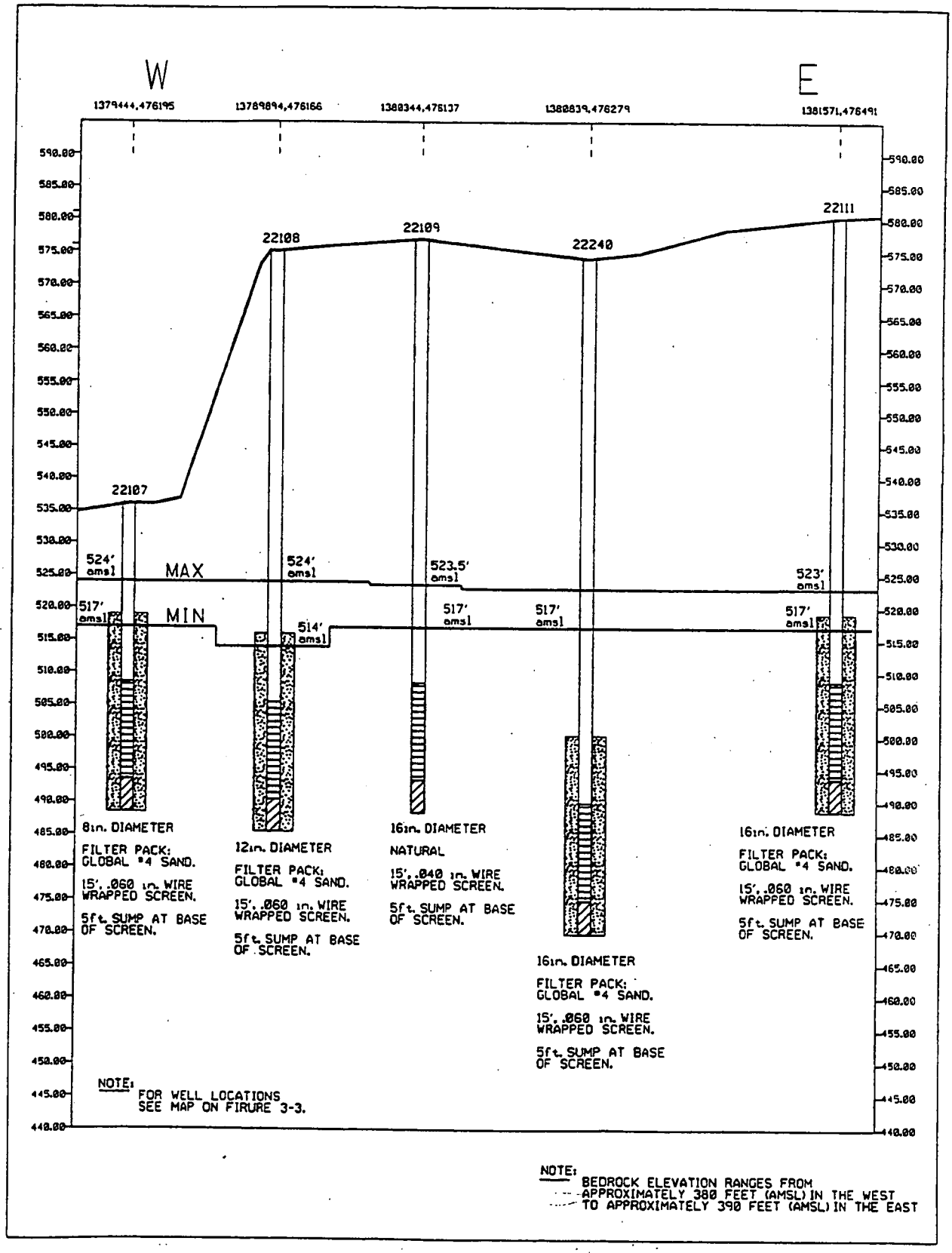

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STATE PLANAR COORDINATE SYSTEM 1927

25-FEB-1998

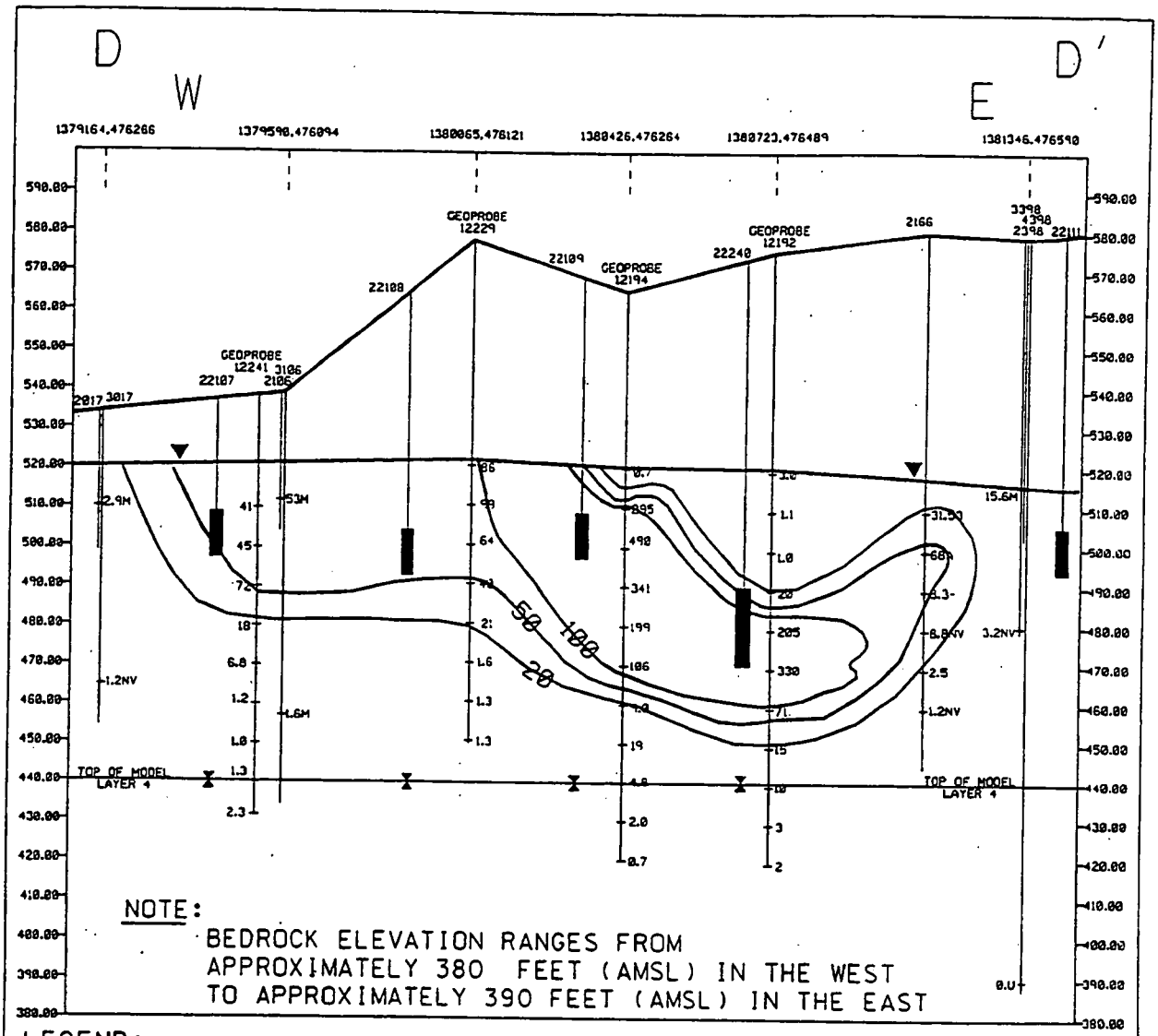
000134

SCALE

450 225 0 450 FEET

FINAL

FIGURE 3-2. COMPLETION ILLUSTRATION OF THE 5 RE-INJECTION WELLS

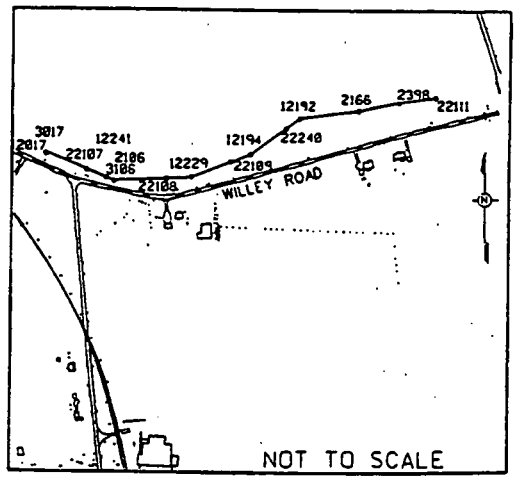


LEGEND:

- TOTAL URANIUM IN GROUNDWATER (ppb)
- RE-INJECTION WELL SCREEN
- DEEP RE-INJECTION OBSERVATION WELL

DATA QUALIFIERS:

- U = UNDETECTED
- NV = NONVALIDATED
- – = VALIDTED, NOT QUALIFIED
- J = VALIDATED, ESTIMATED
- M = MAXIMUM OF 1996 3rd. AND 4th. QUARTER DATA



NOTE:

NON-GEOPROBE VALUES ARE FROM 1993 SNAPSHOT DATA UNLESS QUALIFIED WITH AN "M". THE WATER ELEVATION SHOWN IS ESTIMATED.

SCALE

450 225 0 450 FEET

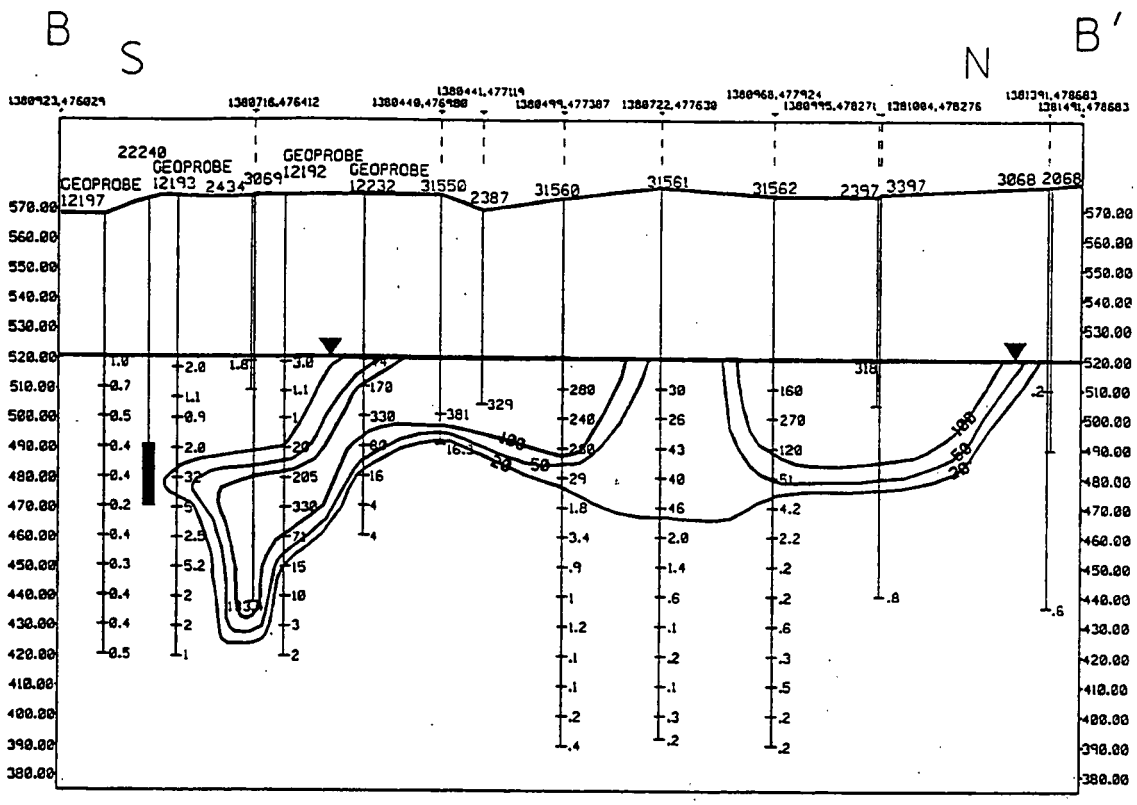
FINAL 000135

FIGURE 3-3. LOCATION OF RE-INJECTION WELL SCREENS IN RELATION TO THE 20 μg/L TOTAL URANIUM PLUME

/dgis/5cr2/dgn/map/hor/dpth/reinj014.dgn

STATE PLANAR COORDINATE SYSTEM 1927

25-FEB-1998



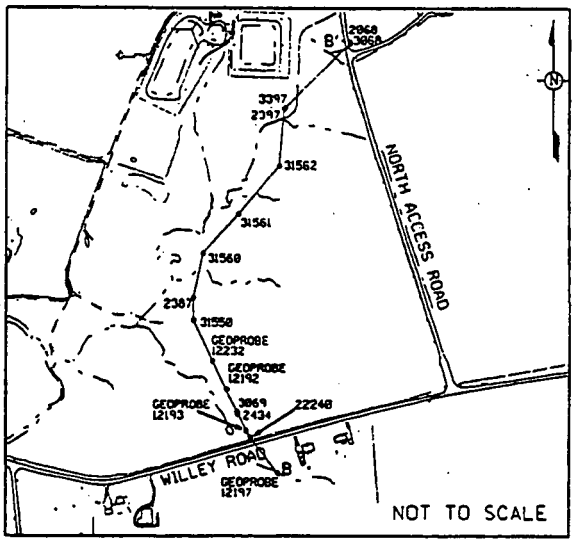
NOTE:

BEDROCK ELEVATION RANGES FROM APPROXIMATELY 370 FEET (AMSL) IN THE NORTH TO APPROXIMATELY 395 FEET (AMSL) IN THE SOUTH

LEGEND:

+.1 TOTAL URANIUM IN GROUNDWATER (ug/L)

▌ RE-INJECTION WELL



NOTE:

NON-GEOPROBE VALUES ARE FROM 1993 SNAPSHOT DATA. VALUES FOR EXTRACTION WELLS 31550, 31560, 31561 AND 31562 WERE COLLECTED WHEN THE WELLS WERE INSTALLED BY HYDROPUNCH

SCALE 000136

650 325 0 650 FEET

FINAL

FIGURE 3-4. LOCATION OF RE-INJECTION WELL SCREEN IN 22240 IN RELATION TO THE 20 μg/L TOTAL URANIUM PLUME

/dgis/5crw2/dgn/map/hor/dpth/reinj007.dgn
STATE PLANAR COORDINATE SYSTEM 1927
25-FEB-1998

4.0 TESTING PROGRAM

The testing program for the one-year re-injection demonstration focuses on determining maintenance and operation costs for the re-injection wells and determining the effects that re-injection has on the chemistry of the aquifer and the dimension of the 20 μg/L total uranium plume.

Testing activities will include:

- Monthly sampling of the injectate.
- Quarterly downhole camera surveys of the re-injection wells. The surveys will be used to look for evidence of screen plugging or iron precipitation.
- Quarterly biological sampling of the re-injection wells and the aquifer immediately around the re-injection wells. Data will be used to determine if such sampling can reveal the on-set of plugging conditions prior to actual screen plugging taking place.
- Groundwater Quality Sampling. Uranium and major cations and anions will be collected to determine the morphology of the 20 μg/L total uranium plume and changing water chemistry.
- Geoprobe™ sampling to determine if the 20 μg/L total uranium plume is migrating either between or beneath the re-injection wells. Samples will provide a vertical profile of the plume geometry at selected sampling locations.
- In-situ monitoring of water quality parameters to determine how water chemistry of the aquifer immediately around the re-injection wells is affected by the re-injection process.
- Monthly water level monitoring. The collection of water levels will be integrated with the IEMP Water Level Monitoring Program. Water levels will be used to monitor plugging within the re-injection wells and to construct water table maps of the aquifer and to interpret capture zones in the aquifer.
- 73 Collection of borescope data. Borescope data will be used to document flow direction at selected locations within the aquifer during the demonstration.
- Quarterly maintenance checks. Maintenance checks will be conducted to assess screen plugging conditions and to develop a long term preventive maintenance program for the wells should the decision be made following the demonstration to continue re-injection.
- Surface water sampling. A one time grab sample will be collected from the Southeast Drainage Ditch so that the water chemistry can be compared to the water chemistry of

the groundwater found beneath the ditch to lend support to the interpretation that water from the ditch is recharging the aquifer in the area of Monitoring Well 3069.

Each of these activities is discussed in detail below.

4.1 ANALYSIS OF INJECTATE

In accordance with the Ohio EPA re-injection guidelines 5X26 Aquifer Remediation Projects (OEPA 1997), injectate will be analyzed monthly both prior to and during the re-injection demonstration. This information will be furnished to the Ohio EPA Division of Drinking and Ground Waters (DDAGW) Underground Injection Control (UIC) Unit. Analysis of the injectate will begin as soon as the AWWT Expansion Facility begins operating, and monthly during the re-injection demonstration. If the decision is made to continue re-injection technology after the completion of this demonstration, monthly injectate sampling will continue.

As explained in Section 2, the FEMP has completed a CERCLA characterization that has identified what contamination is present and the OU5 ROD (DOE 1996b) has established levels for the 50 constituents of concern for groundwater. It is appropriate that the FRL list serve to guide the injectate sampling program during the re-injection demonstration. FRLs are set at MCLs, proposed MCLs, risk-based levels, analytical detection limits, or background. The FRL constituents and limits are therefore appropriate for determining the protectiveness of the injectate.

Monthly injectate sampling will begin by focusing on those FRL constituents that have had a validated exceedance of their FRL in either aquifer zones two or four (Table 2-1). The basis for the FRL for Nitrate and Cadmium is the 95th percentile background concentration. This places the FRL at a higher concentration than the MCL for these two constituents only. After an initial testing of the injectate has been completed and the quality of the injectate has been documented, it is proposed that FRL constituents listed in Table 2-1 as mobile and persistent (MP) be sampled monthly, and those listed as *not* mobile and persistent (N) be sampled quarterly. The MP and N designations are explained in more detail in Section 2.2.

Table 4-1 presents the sampling protocols that are used at the FEMP for monitoring groundwater. These same protocols will be used to sample the injectate. Injectate samples will be collected as they leave the AWWT Expansion facility but before flow is diverted to individual re-injection wells.

4.2 DOWNHOLE CAMERA SURVEYS

Each re-injection well will be surveyed with a downhole camera (according to site procedure EQT-08 Down-Hole Camera Operation) five times during the demonstration; once at the start, and after every three months of operation (corresponding to maintenance checks of the wells). Camera surveys performed just prior to the start of re-injection will serve as baselines for comparisons. The camera surveys will be helpful in establishing a preventive maintenance program for the re-injection wells should the decision be made at the conclusion of the demonstration to continue with re-injection as part of the aquifer remedy.

4.3 BIOLOGICAL SAMPLING

Biological sampling will be conducted in the re-injection wells and the shallow observation wells during the re-injection demonstration. Plugging of the well screen, gravel pack, and formation immediately surrounding the re-injection well screen can occur due to bacterial growth. Single well injection tests conducted at the FEMP revealed that the oxidation of ferrous iron to ferric iron synergistically promotes the growth of iron bacteria within and surrounding the well screen, resulting in a plugged well screen and poor well performance (DOE 1995b, DOE 1996a). Sampling for bacteria in the area of the re-injection demonstration has revealed that both aerobic and sulfate-reducing bacteria are naturally present in the aquifer (Appendix A). Therefore biological monitoring will be conducted as part of the re-injection demonstration in an attempt to detect and control bacterial growth before well plugging becomes a problem. Monitoring will take place within the re-injection wells (when re-injection is not taking place) and within the five shallow observation wells (while re-injection is taking place).

If bio-fouling conditions, due to bacteria, are present in the re-injection well then a grab sample collected from the well, when re-injection is not taking place, should detect the presence of bacteria. The results interpreted along with the visual results of down hole camera surveys will be useful in determining if biofouling conditions are developing that could, if untreated, lead to well plugging problems.

In an effort to detect biofouling conditions around the re-injection wells, biological sampling will also take place in the five shallow observation wells. The attempt to detect biofouling conditions developing around the re-injection wells by monitoring the nearby observation wells is based on the assumption that if biofilm bacteria and their characteristic structures are present around the re-injection wells then

they will be present in the water (planktonic phase) moving out of the re-injection wells and past the observation wells. The movement of injectate away from the re-injection wells should carry the bacteria (if present) to the nearby observation wells.

The sampling methodology which will be used considers the way in which biofilms move through the sub-surface. Because portions of biofilms intermittently slough off, a one time sampling event in an observation well might not detect adverse concentrations of bacteria. Biological shedding events can provide transient increases in microbial counts. Analysis of samples taken after prolonged re-injection may fail to detect the presence of chemical and microbiological parameters that would indicate the presence of biofilms near wells, but samples collected immediately following start-up of re-injection may provide better indicators of the biological environment surrounding the re-injection wells.

Biofilm sloughing occurs preferentially on start-up after a period of rest or "quiescence," (two hours to several days). Samples taken: 1) just prior to shut-down, 2) immediately after restart, 3) a few hours after restart, and 4) a few days after restart provide the best potential for detecting biological activity (Smith 1995, pg. 89).

A comprehensive sampling program will therefore be used in the five shallow observation wells during the re-injection demonstration to attempt to detect the transient biofilm sloughing if it is occurring. Groundwater samples will be collected from the observation wells just prior to the start of re-injection, immediately after re-injection is started, a few hours after the start of re-injection and after one day of re-injection. In instances where a re-injection well is scheduled to be shutdown, the closest observation wells will be sampled for evidence of biofouling just prior to the shutdown. Upon the re-start of re-injection the same sampling program outlined above would be followed in the closest observation wells. Duplicate samples may be taken periodically to further help overcome the limitation of grab sampling.

29 Prepared Biological Activity Reaction Test culture methods are the most promising approach for routine biological monitoring purposes (Smith 1995, pg. 85) and will be used during the re-injection demonstration. Each sample event will test for iron-related bacteria, slime-forming bacteria, and total aerobic bacteria. If biological sampling and groundwater quality sampling, (discussed in the next section) coincide at a particular location, the biological sample will be collected first.

000140

4.4 GROUNDWATER QUALITY SAMPLING

Groundwater quality sampling will take place during the re-injection demonstration to monitor the morphology of the 20 μg/L total uranium plume and to monitor the water chemistry of the aquifer in the area around the re-injection wells. The sampling effort will be coordinated with quarterly IEMP sampling. Groundwater quality sampling to support the re-injection demonstration will be conducted within the nine new re-injection observation wells, 14 existing FEMP groundwater monitoring wells, and at select locations in the re-injection demonstration area using a Geoprobe™ sampling tool, Figure 4-1.

Monitoring the Morphology of the 20 μg/L Total Uranium Plume

During the re-injection demonstration, groundwater quality data will be collected to monitor the morphology of the 20 μg/L total uranium plume. Specifically, monitoring will determine:

- If breakthrough of the 20 μg/L total uranium plume is occurring beneath the re-injection wells
- If breakthrough of the 20 μg/L total uranium plume is occurring between the re-injection wells.

The groundwater model predicts that re-injection in 5 wells, at a rate of 200 gpm in each well, along the southern FEMP property boundary, in concert with pumping in extraction wells upgradient and downgradient of the re-injection wells, will create a hydraulic barrier within the aquifer that should effectively stop the further southern migration of the 20 μg/L total uranium plume across the FEMP property boundary, Figure 1-4. The plume downgradient of the re-injection wells will be flushed into downgradient extraction wells. The plume upgradient of the re-injection wells will be recovered by upgradient extraction wells.

The four deep observation wells, five shallow observation wells, and 14 existing monitoring wells (2106, 3106, 2434, 3069, 2398, 3398, 4398, 2070, 3070, 2017, 2015, 3015, 2060, and 2166) will be sampled for total uranium and the major anions and cations listed in Table 4-2 prior to the start of re-injection and quarterly during the re-injection demonstration.

Table 4-1 presents the sampling protocols that are used at the FEMP for monitoring groundwater. Each sampling event will be evaluated to determine the size of the total uranium plume and changing water chemistry within the plume. The sampling will be coordinated with other IEMP groundwater

sampling to maximize the amount of data available for interpretation. Quarterly sampling of the 14 existing groundwater monitoring wells for total uranium is part of the current IEMP program. Nine of these wells are currently sampled under the IEMP as property boundary wells and five are currently sampled under the IEMP as part of the South Plume Module.

All monitoring and observation wells will be purged and sampled using guidelines specified in SCQ Section 6.2. All analyses will be conducted by the appropriate FEMP or contract laboratory using procedures which meet ASL B as established in the SCQ as referenced in Table 4-1. ASL B is specified for this program since the data will be used for surveillance monitoring purposes. Sample collection protocols are identified in the SCQ and in specific procedures referenced in the SCQ. The following procedures and guidance sections of the SCQ are used to conduct groundwater monitoring:

Standard Operating Procedures	
ADM-02	Field Project Prerequisites
SC-GWM-FO-201	Groundwater Sampling Activities
EP-GWM-202	Groundwater Sample Shipment

Sitewide CERCLA Quality (SCQ) Assurance Project Plan	
Section 5	Field Activities
Section 6	Sampling Requirements
Section 7	Sample Custody
Section 9	Analytical Procedures
Appendix I	Field Calibration Requirements
Appendix J	Field Activity Methods
Appendix K	Sampling Methods

Samples will be sent to either an on-site or "acceptable" off-site laboratory. Samples will be sent to the FEMP on-site laboratory if capacity is available and if the analysis can be performed, and if required detection limits can be achieved.

000142

Geoprobe™ Sampling

32 Analysis of groundwater samples obtained with a Geoprobe™ sampling tool will be used to determine if the 20 μg/L total uranium plume is migrating either between or beneath the re-injection wells. As was done for the Restoration Area Verification Sampling (RAVS) project (DOE 1997e), the Geoprobe™ tool will be used to collect groundwater samples from different vertical locations within the aquifer, rather than at a fixed monitoring point. Collection of groundwater samples at several vertical locations in the aquifer, throughout the re-injection demonstration, is the best way to detect if the uranium plume is moving past the re-injection wells. A groundwater sample will be collected at the water table and at ten foot intervals beneath the water table until it can be verified that the entire vertical thickness of the 20 μg/L total uranium plume has been sampled. Samples collected will be analyzed for total uranium. An attempt will also be made to analyze for the major anions and cations listed in Table 4-2. It is uncertain if results, especially iron, will be representative. Iron from the sampling tool could bias the analysis. Data will be assessed and if it is determined that the data is representative then the analysis for major anions and cations will continue. If the results do appear to be compromised due to the sampling tool and method, then sampling will only continue for uranium.

Prior to the start up of the South Field Extraction System Wells, Geoprobe™ sampling will take place at seven locations, one location downgradient of each re-injection well, one location between Re-injection Wells 22108 and 22109 and one location between re-injection Wells 22109 and 22240, Figure 4-1. The samples will be analyzed for the constituents listed in Table 4-2. The results of the analysis will be used to establish a baseline of plume dimensions and groundwater geochemistry prior to re-injection.

33 During the re-injection demonstration, Geoprobe™ sampling will take place at three locations. The area of re-injection that corresponds to the highest total uranium concentrations in the aquifer was targeted for this monitoring activity. This area is located around re-injection Well 22109 Figure 4-1. Geoprobe™ locations 1 and 2 are between re-injection Wells 22108 and 22109, and 22109 and 22240 respectively. Monitoring here will provide data to determine if the plume is moving between either of these three re-injection wells. Geoprobe™ location 3 is located downgradient of re-injection Well 22109 and will provide data to determine if the uranium plume is migrating beneath re-injection Well 22109.

1 All three Geoprobe™ locations will be sampled prior to the start of pumping in the South Field Extraction Wells. The next round of Geoprobe™ sampling at these three locations will take place just prior to the start of re-injection. Geoprobe™ sampling will then take place after 3, 6, 9, and 12 months of re-injection. The data collected will be used to construct cross sections that illustrate the vertical dimension of the total uranium plume through time.

During the last round of Geoprobe™ sampling, all 7 locations sampled prior to the start of pumping in the South Field Extraction System will be sampled again to determine how the vertical dimension of the total uranium plume and aquifer geochemistry has changed in response to one year of pumping and injection operations.

In-situ Monitoring of the Water Chemistry Around the Re-Injection Wells

Two Hydrolab™ downhole water quality probes and data loggers will be used to monitor specific conductivity, temperature, pH, Eh, and dissolved oxygen in the re-injection demonstration area. The probes will be used to:

- Collect pre re-injection baseline conditions at all five re-injection locations
- Monitor how quickly the slug of injectate affects the geochemistry of the aquifer next to and beneath a re-injection well
- Provide routine monitoring checks of how the water chemistry has changed at each re-injection location compared to baseline conditions throughout the re-injection demonstration.

Baseline conditions prior to re-injection will be established by monitoring each re-injection location once every hour for 48 hours with the data logger. Deep and shallow re-injection observation wells will be monitored at re-injection Wells 22107, 22108, 22109, and 22240. The shallow re-injection observation well will be monitored at re-injection Well 22111.

The re-injection well that is installed in the highest concentration of uranium (22109) will be used to monitor how quickly the re-injected groundwater effects the geochemistry of the aquifer next to and beneath a re-injection well. At the start of re-injection, the two probes will be used to monitor

changing conditions in the shallow observation well next to Well 22109 and the deep observation well beneath 22109. The data loggers will collect a reading every hour until values appear to have stabilized.

34 Following parameter stabilization next to and beneath re-injection Well 22109, the water quality probes will be rotated among the five shallow and four deep re-injection observation wells. Hourly monitoring for 24 hours at each observation well will take place monthly during the re-injection demonstration. Data collected while re-injection is taking place will be compared to data collected prior to re-injection to document changing conditions. Monitoring results from both the deep and shallow observation wells will be used to assess depth variations.

4.5 WATER LEVEL MONITORING

Water levels will be collected both within the re-injection wells (to control the re-injection process and to monitor for the effects of plugging within the re-injection well screen) and in a network of new observation and existing monitoring wells surrounding the re-injection wells to determine capture of the total uranium plume. Water level monitoring activities for the re-injection demonstration will be coordinated with IEMP water level monitoring activities.

Monitoring within the Re-Injection Wells

Plugging is defined as "the increasing resistance to flow" (Pyne 1995, pg. 111). The primary sites for plugging during re-injection are the screen, gravel pack, and the formation immediately surrounding the screen. Plugging processes include: 1) entrained air and gas binding, 2) deposition of total suspended solids (TSS) from the injectate, 3) biological growth, 4) particle rearrangement in the aquifer material adjacent to the injection well, and 5) geochemical reactions.

35 An effect of plugging will be an increase in resistance to flow within the re-injection well, Figure 4-2. This resistance to flow can be measured as a rise in water level within the re-injection well. Water level monitoring within the re-injection wells will be conducted continuously using down hole pressure transducers which will be installed in stilling pipes. The transducers will be connected to water level sensors and recorders. The sensors will automatically shut off flow to the well should the water level within the re-injection well rise to a specific level. The water level sensor will operate continuously and it will be possible to monitor the sensor from the AWWT control room. As operational experience

with the wells is collected the water level in the re-injection well will be used to indicate when maintenance of the well screen is required.

Monitoring in the Aquifer

Water levels will be monitored in the aquifer during the re-injection demonstration. The activity will consist of two phases: start-up monitoring and routine monitoring.

Just prior to the start of re-injection, water levels will be collected from 50 monitoring wells (both Type 2 and Type 3) located around the immediate area of the re-injection demonstration. Table 4-3 lists the 50 monitoring wells that will be monitored and Figure 4-3 illustrates where the wells are located. Water level measurements will be collected again immediately following start-up of re-injection and will continue on a weekly schedule until water levels in the aquifer have stabilized to the new stresses induced by the re-injection.

After water levels in the aquifer have stabilized to the re-injection, water level monitoring will be cut back to a monthly schedule. The same 50 wells will be monitored. The monthly monitoring effort will be integrated with the quarterly water level monitoring program outlined in the IEMP. In the IEMP, water levels are monitored quarterly in 159 monitoring wells (both Type 2 and Type 3). Figure 4-4 illustrates the location of the 159 monitoring wells.

4.6 COLLECTION OF BORESCOPE DATA

The colloidal borescope has been used at the FEMP for over a year to evaluate flow directions in the South Plume Area. Data and results have been reported in the South Plume Removal Action Design Monitoring Evaluation Program Plan System Evaluation Reports. The instrument gives reliable flow directions in the vicinity of pumping wells.

The colloidal borescope will be used to help determine what influence pumping and re-injection is having on the groundwater flow direction at discrete locations within the aquifer. Prior to start up of the South Field Extraction System, the colloid flow direction in the four new deep re-injection observation wells will be recorded. Following start-up of the South Field Extraction System and after the aquifer has stabilized, the colloid flow direction will be recorded in the same wells. Results will be compared to pre-pumping results to determine what effect the South Field System is having on the base of the 20 μg/L total uranium plume.

After re-injection has begun and water levels have equilibrated to the new influx of water, colloid flow directions will be measured in the same four deep re-injection observation wells. Data will be compared to baseline data to determine what effect re-injection has had on the flow at these locations. The data collected from the colloidal borescope should be useful in determining if the base of the 20 μg/L total uranium plume is being captured. Colloidal borescope measurements will be completed every three months in the same wells during the demonstration. Colloidal borescope measurements will be qualified with the operating conditions that were taking place during the collection of the measurements. The colloidal borescope will be used periodically at other wells in the re-injection demonstration area to help determine if the 20 μg/L total uranium plume is being captured.

4.7 MAINTENANCE CHECKS

Lessons learned from operation of the South Plume Extraction Wells will be used to establish a maintenance program for the re-injection wells. During the demonstration the re-injection wells will undergo quarterly maintenance checks. If indications of screen plugging are found then the screen will be scrubbed and chlorinated prior to resuming re-injection in a manner similar to procedures outlined in the OMMP (DOE 1997d). Maintenance checks at the re-injection wells will include:

- Visual inspection of the well screen, possible cleaning and chlorination
- Flow controller calibration
- Flow totalizer calibration
- Flow meter cleaning and calibration
- Flow control valve maintenance (i.e., inspection, cleaning, re-building)
- Biological sampling

4.8 SURFACE WATER QUALITY SAMPLING

The top of the 20 μg/L total uranium plume in the area of Monitoring Well 3069, which is next to a ponding feature in the South East Drainage Ditch, is located approximately 30 feet beneath the water table. Recharge from the drainage ditch could be diluting the plume at the water table. A comparison of the chemistry of the surface water found in the ditch to groundwater found in the aquifer directly beneath the ditch will be used to indicate how similar the waters are. Similar chemistries will support the recharge theory.

Surface water sampling in the South East Drainage Ditch will be conducted to verify that surface water from the ditch is recharging the aquifer in the area around Monitoring Well 3069. Water samples will be analyzed for the major anions and cations listed in Table 4-2.

TABLE 4-1
SAMPLING PROTOCOLS

Constituent	Method	Sample Type	ASL	Holding Time[a]	Preservation[a]	Container[a,b]
General Chemistry:						
Alkalinity	310.1[d] or 2320B[e]	Grab	B	14 Days	Cool to 4°C	Plastic or glass
Ammonia	350.1[d], 350.3[d], 4500C[e], or 4500F[e]	Grab	B	28 Days	Cool to 4°C, H_2SO_4 to pH < 2	Plastic or glass
Bicarbonate	33.076[h]	Grab	B	14 Days	Cool to 4°C	Plastic or glass
Carbonate	33.076[h]	Grab	B	14 Days	Cool to 4°C	Plastic or glass
Chloride	352.2[d], 300.(all)[d] or 4500B[e]	Grab	B	28 Days	None	Plastic or glass
Fluoride	340.2[d] or 4500C[e]	Grab	B	28 days	None	Plastic
Nitrate/Nitrite	353.1[d], 353.2[d], 4500D[e], or 4500E[e]	Grab	B	28 days	Cool to 4°C, H_2SO_4 to pH < 2	Plastic or glass
Phosphorus	365.(all)[d] or 4500E[e]	Grab	B	28 days	Cool to 4°C, H_2SO_4 to pH < 2	Plastic or glass
Sulfate	375.2[d], 300.0[d], or 4500E[e]	Grab	B	28 days	Cool to 4°C	Plastic or glass
Total Dissolved Solids	160.1[d] or 2540C[e]	Grab	B	7 Days	Cool to 4°C	Plastic or glass
Total Suspended Solids	160.2[d] or 2540D[e]	Grab	B	7 Days	Cool to 4°C	Plastic or glass
Inorganics:						
Metals Excluding Mercury	7000[c] or 6010[c]	Grab	B	6 months	HNO_3 to pH < 2	Plastic or glass
Mercury	7470A[c]	Grab	B	28 days	HNO_3 to pH < 2	Plastic or glass
Radionuclides: (All Radiological)	SCQ[f]	Grab	B[g]	Six months or 5 x half-life, whichever is less	HNO_3 to pH < 2	Plastic or glass
Volatile Organics:	8260[c]	Grab	B	7 days	Cool to 4°C	Glass vial with Teflon lined septum cap
		Grab	B	14 days	Cool to 4°C H_2SO_4, HCl, or solid $NaHSO_4$ to pH < 2	Glass vial with Teflon lined septum cap
Field Parameters[i]:		Grab	A	NA[j]	NA[j]	NA[j]

[a]Appropriate preservative, holding time, and container requirements will be used for the corresponding method.
[b]Container size is left to the discretion of the individual laboratory.
[c]"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846.
[d]"Methods for Chemical analysis of Water and Wastes, EPA 600/4-79-020.
[e]"Standard Methods for the Analysis of Water and Wastewater," 17th edition.
[f]Radionuclide analyses do not have standard methods; however, the analytical specifications for these parameters are provided in Appendix G of the SCQ.
[g]The ASL may become more conservative, if it is necessary to meet detection limits.
[h]"Official Methods of Analysis of the Association of Official Analytical Chemist"
[i]Field parameters include dissolved oxygen, pH, specific conductance, temperature and turbidity.
[j]NA = Not applicable.

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TABLE 4-2

ANALYTE LIST FOR MONITORING WELLS FOR GEOPROBE™ SAMPLES

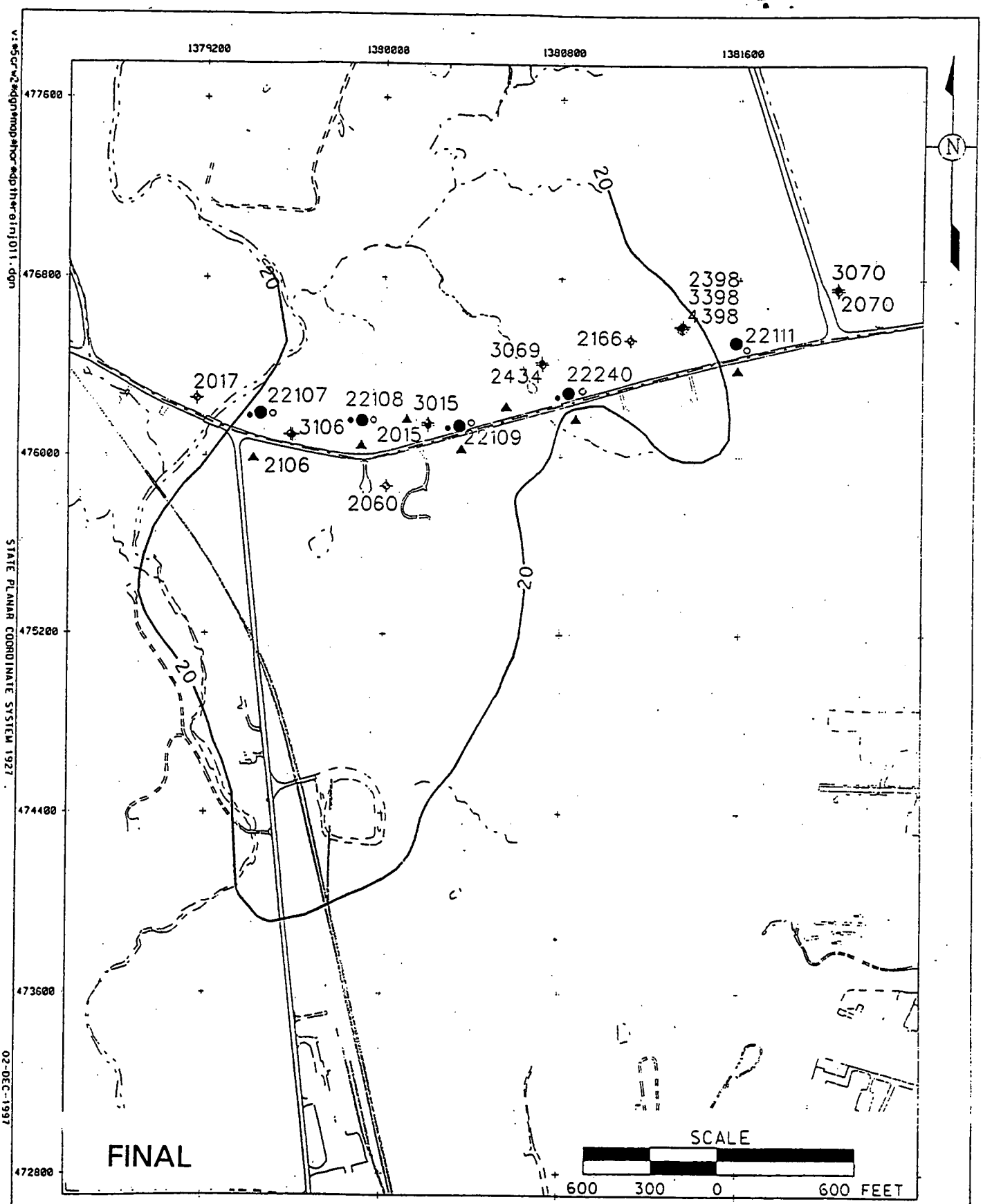
List of Analytes		
aluminum	fluoride	potassium
alkalinity	iron	silicon
ammonia	magnesium	sodium
bi-carbonate	manganese	solids
calcium	NO_3-N	sulfate
carbonate	phosphate	TDS
chloride	total uranium	

TABLE 4-3

MONTHLY WATER LEVEL MONITORING WELLS

List of Wells			
2002	2166	3015	3881
2014	2387	3017	3897
2015	2390	3049	Observation Well 1
2016	2397	3069	Observation Well 2
2017	2398	3070	Observation Well 3
2045	2399	3093	Observation Well 4
2048	2434	3095	Observation Well 5
2049	2550	3096	Observation Well 6
2070	2551	3106	Observation Well 7
2093	2880	3390	Observation Well 8
2095	2881	3398	Observation Well 9
2096	2897	3551	
2107	3014	3880	

000150



LEGEND:

- FEMP BOUNDARY
- EXISTING MONITORING WELL
- RE-INJECTION WELL
- GEOPROBE™ SAMPLING LOCATIONS
- DEEP OBSERVATION WELL
- SHALLOW OBSERVATION WELL
- 20 TOTAL URANIUM PLUME AS OF SPRING, 1997

FIGURE 4-1. GROUNDWATER QUALITY SAMPLING LOCATIONS

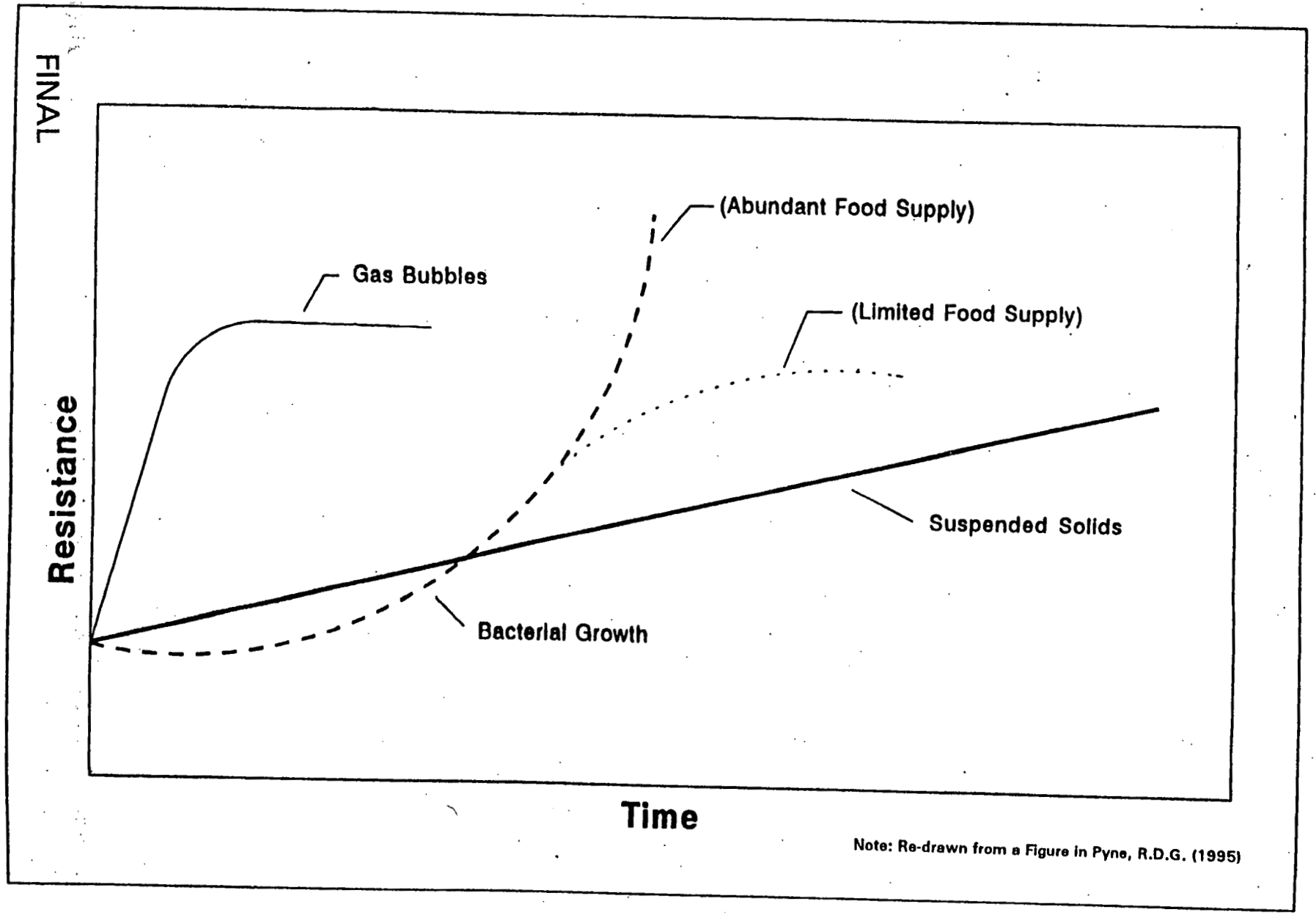
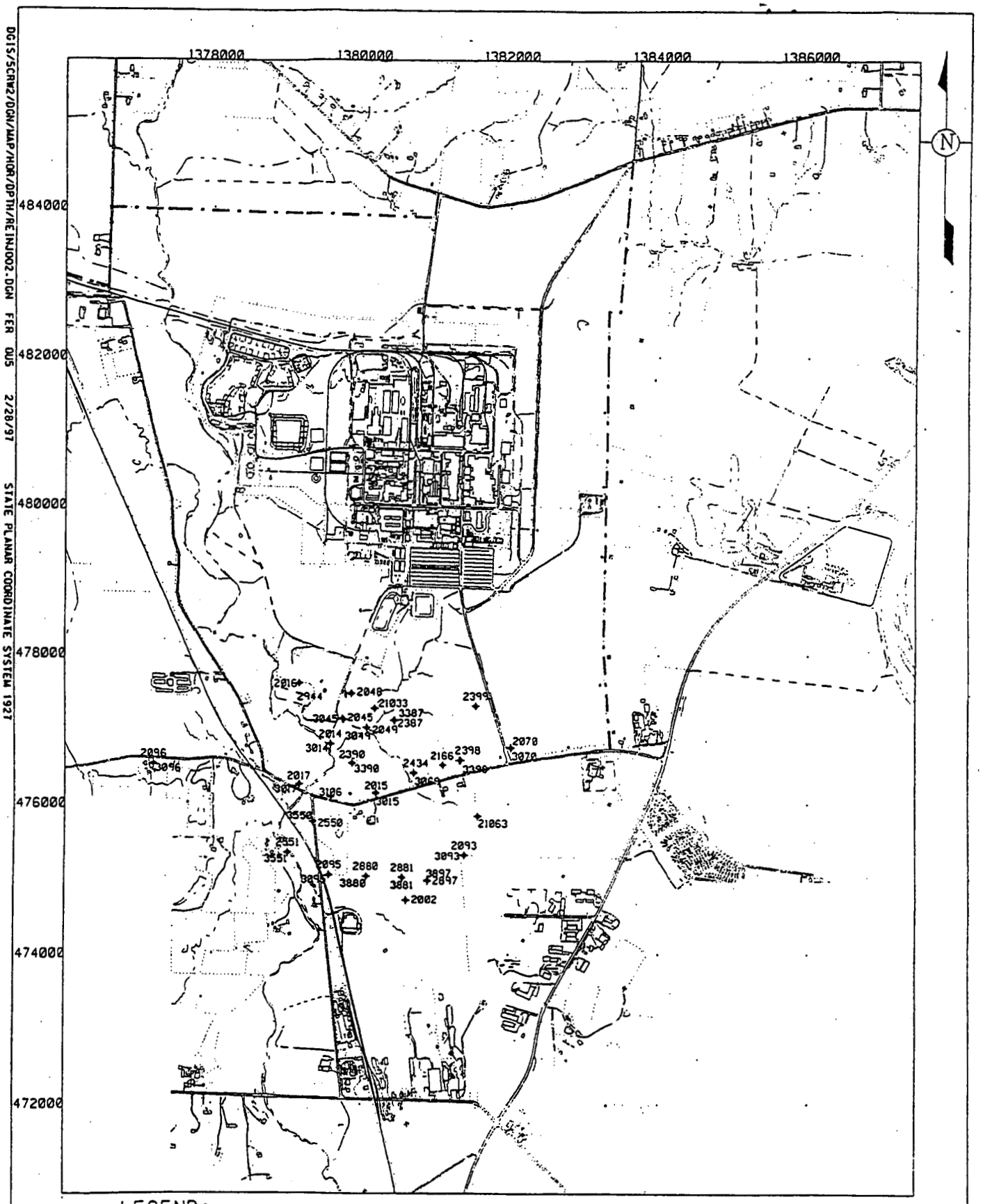


FIGURE 4-2. TYPICAL PLUGGING PROCESSES



LEGEND:

FEMP BOUNDARY

+ 2046 TYPE 2 MONITORING WELL

+ 3046 TYPE 3 MONITORING WELL

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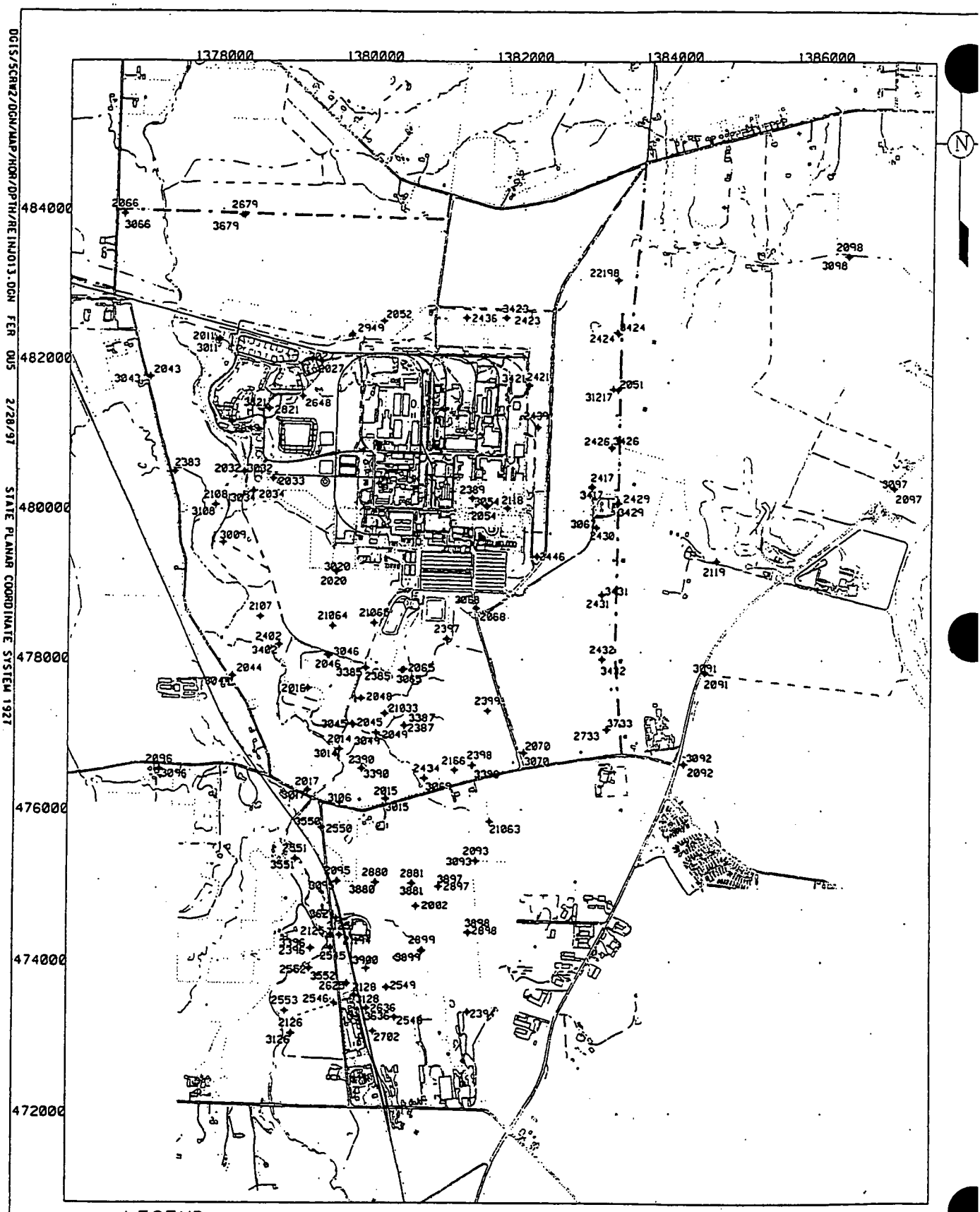
SCALE

1800 900 0 1800 FEET

FINAL

FIGURE 4-3. GROUNDWATER ELEVATION MONITORING WELLS



LEGEND:

FEMP BOUNDARY

+ 2046 TYPE 2 MONITORING WELL

+ 3046 TYPE 3 MONITORING WELL

SCALE

1800 900 0 1800 FEET

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FIGURE 4-4. IEMP GROUNDWATER ELEVATION MONITORING WELLS

5.0 DATA EVALUATION

During the re-injection demonstration, large quantities of data will be collected and evaluated to answer the following questions regarding the viability of re-injection at the FEMP:

- What is the quality of the injectate?
- Are the screens in the re-injection wells becoming plugged?
- What are the biological conditions around the re-injection wells?
- What are the resultant hydraulic patterns and capture zone for the system?
- Is the water quality of the area around the re-injection wells changing?
- Has a hydraulic barrier been created at the southern boundary of the FEMP?
- Is the South East Drainage Ditch recharging the aquifer in the area of Well 3069?
- Does re-injection cause the uranium plume to go deeper in the Great Miami Aquifer?

These questions are explained in more detail below.

What is the quality of the injectate?

The quality of the injectate will be evaluated monthly. Sampling data will be tabulated and compared against FRL values to identify if any FRL exceedances occur.

Are the screens in the re-injection wells becoming plugged?

Plugging within the re-injection wells will be evaluated continuously by monitoring water levels within the re-injection well, and quarterly by conducting maintenance checks which include downhole camera surveys, and biological sampling.

Water levels collected from within the re-injection wells will be tabulated and graphed so that trends can be visually observed. Data collected during routine maintenance checks will also be tabulated. Downhole camera survey tapes will be viewed and archived for later reference. A brief write-up of the results of the survey will be prepared that will state when the survey was conducted, the well being surveyed, whether or not any indications of screen plugging were observed and if conditions have changed since the last survey was conducted. Biological sampling data will be tabulated and selected data may be graphed to illustrate trends.

What are the biological conditions around the re-injection wells?

Biological sampling data will be evaluated quarterly and tabulated by well. Tables will list the well being sampled, the date and time that the sample was collected, and the results of each sample collected. Results for different sampling events will be compared so that changes or trends can be noted.

What are the resultant hydraulic patterns and capture zone for the system?

Hydraulic patterns, profiles and capture zones will be evaluated monthly. Capture of the 20 μg/L total uranium plume will be evaluated quarterly.

Water level data will be tabulated and used to create monthly water level maps. Capture zones will be etermined for the monthly water table maps. Actual data will be compared to modeled predictions to assess whether or not the modeled predictions (i.e., pumping related drawdown in the aquifer both on and off-property) are being realized. The strategy which will be used for verifying groundwater model predictions of remedy performance is presented in Section 3.7.1 of the IEMP.

Total uranium sampling of the plume is conducted quarterly as part of the IEMP. Quarterly determinations will be made on whether or not the 20 μg/L total uranium plume is being captured by overlaying quarterly capture zone maps on top of the quarterly plume maps. Major anion and cation data collected during the re-injection demonstration will be tabulated. Select parameters may be graphed to illustrate concentration changes.

Is the water quality of the area around the re-injection wells changing?

Water quality data will be tabulated. Select data may be graphed. Data collected at different times during the demonstration will be compared to determine if changes or trends are occurring.

Has a hydraulic barrier been created at the southern boundary of the FEMP?

Evaluating whether or not the total uranium plume is migrating between or beneath the re-injection wells will be based on water quality data collected using the Geoprobe™ sampling tool, water level data, and groundwater flow data collected using the colloidal borescope.

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Water quality data obtained with a Geoprobe™ sampling tool will be used to construct vertical profiles of the uranium plume. Cross sections of the uranium plume will be prepared and compared through

time to determine if the plume is migrating between or beneath the re-injection wells. Water level data will be used to prepare water level maps to interpret capture zones and groundwater flow divides.

Velocity and flow data will be collected at select monitoring locations using the colloidal borescope to provide additional data concerning fluid movement in response to the re-injection.

Is the South East Drainage Ditch recharging the aquifer in the area of Well 3069?

Major anion and cation data collected from the drainage ditch will be tabulated and compared to major anion and cation data collected from the aquifer beneath the South East Drainage Ditch to determine if the two waters have similar chemistries. Similar chemistries would support the recharge interpretation.

41 Does re-injection cause the uranium plume to go deeper in the Great Miami Aquifer?

Water quality sampling results from the deep observation wells as well as vertical profile samples will be used to asses whether or not re-injection is causing the uranium plume to migrate deeper in the Great Miami Aquifer. As was discussed in Section 1.3, the concern, should this occur, is whether or not capture of the entire plume can still be maintained.

Potential Decisions

As presented in Section 1.2, the final decision which will be made using data collected during this re-injection demonstration will be one of the following:

1) Do not continue groundwater re-injection as part of the aquifer remedy. The long term application of the technology at the FEMP is just too costly or capture of the 20 μg/L total uranium plume cannot be maintained and still achieve the benefits of re-injection.

2) Continue groundwater re-injection technology as part of the aquifer remedy with no modification to the strategy presented in the BRSR. The long term application of the technology at the FEMP is not too costly and capture of the 20 μg/L total uranium plume can be maintained while still achieving the benefits of re-injection predicted in the BRSR.

3) Continue groundwater re-injection technology as part of the aquifer remedy but revise the remediation strategy presented in the BRSR. The long term application of the technology at the FEMP is not too costly and with a change to pumping and or re-injection rates capture of the 20 μg/L total uranium plume can be achieved.

During the re-injection demonstration, potential actions may be taken in response to monitoring results. The main monitoring observations and resulting potential actions are presented in Figure 5-1.

Figure 5-1

DEMONSTRATION MONITORING AND POTENTIAL ACTIONS

Monitor:
- Quality of Injectate
- Injection Rate
- Capture of the 20μg/l total Uranium Plume
- Hydraulic Barrier at FEMP Property Line
- Chemistry of Aquifer

If injectate exceeds FRLs:
- The Ohio EPA UIC unit will be notified
- A determination will be made as to why the exceedance is occurring
- A change to the treatment process for the injectate will be considered
- Depending on the magnitude and persistence of the exceedance, a decision to stop re-injection may be made

If re- injection wells do not operate at an injection rate of 200 gpm without becoming plugged:
- Well maintenance will be performed to clean out plugging material
- A determination will be made as to why plugging is occurring
- More frequent routine maintenance checks will be initiated to determine the best method to control the plugging problem
- Depending on the magnitude and persistence of the plugging , a decision to stop re-injection may be made at a specific well or select number of wells

If capture of the 20 μg/l total uranium plume is not maintained:
- A determination will be made as to why the plume is not being captured
- Pumping/injection rates may be adjusted in an attempt to maintain capture
- A decision to stop re-injection may be made if the magnitude of the excursion is unacceptable

If a hydraulic barrier is not produced along the FEMP property boundary line:
- A determination will be made as to why the barrier is not present
- Pumping/injection rates may be adjusted in an attempt to create/maintain the barrier
- Additional extraction wells may be considered

If re-injection causes adverse impact to the chemistry of the aquifer:
- A determination as to why adverse impact is occurring will be made
- A change to the injectate treatment process may be considered
- Depending on the magnitude and extent of the impact, a decision to stop re-injection may be made

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6.0 SCHEDULES, DELIVERABLES AND REPORTING

Enforceable schedules for the aquifer remedy can be found in the Remedial Action Work Plan for Aquifer Restoration at Operable Unit 5 (DOE 1997c). The RA Work Plan lists start up dates for the AWWT Expansion Facility, the South Field Phase I Module, the Re-Injection Demonstration Module, and the South Plume Optimization Module.

Per Ohio EPA guidelines (OEPA 1997) a copy of this test plan and all monthly and final data reports will be submitted to the U.S. EPA and Ohio EPA Office of Federal Facilities Oversight, and the Division of Ohio EPA Drinking and Ground Waters-UIC Unit. The Ohio EPA contact for the FEMP aquifer remedy is Mr. Tom Schneider. Mr. Schneider is the Fernald Project Manager within the Office of Federal Facilities Oversight Unit, Southwest District Office, in Dayton Ohio. Monthly operating reports will include the following information:

- Analysis of the injectate
- The volume and rate of the injection
- A description of any well maintenance and rehabilitation procedures which were conducted
- Results of groundwater monitoring at the re-injection test site.

If the decision is made to continue using re-injection as part of the aquifer remedy, then the monthly reporting will continue. Monitoring updates for the re-injection demonstration will be provided quarterly as part of the IEMP quarterly reporting program. The quarterly monitoring updates will supplement the monthly reports by including:

- An assessment of how the demonstration is proceeding, and
- The latest water table map and capture zone interpretation.

Following completion of the re-injection demonstration a recommendation will be made concerning whether or not re-injection should continue. The recommendation to continue or discontinue re-injection will likely be made ahead of issuance of a final report. In the interim time period following the demonstration but before the recommendation, re-injection will continue unless data has already been collected indicating that the continuation of re-injection would adversely impact the aquifer remedy.

If the decision is made not to continue the use of re-injection, the baseline remedy presented in the BRSR (DOE 1997a) will need to be modified. The final re-injection demonstration report will include tabulations of all the data used to decide whether or not re-injection will continue as part of the site aquifer remedy. The final report will be issued within 90 days following the compilation of the data collected in support of the demonstration. Table 6-1 lists the monitoring and reporting commitments for the re-injection demonstration.

The final test report will be sent to the EPA, the Ohio EPA Office of Federal Facility Oversight, and the Ohio EPA Division of Drinking and Ground Waters - UIC Unit for review and approval.

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TABLE 6-1

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RE-INJECTION DEMONSTRATION TEST MONITORING AND REPORTING COMMITMENTS

Activity	Schedule	Commitment/Requirement
Analyze Injectate	Monthly	Collect one grab sample each month. Begin in April, prior to re-injection, when AWWT expansion facility is operational. Analyze for all constituents that have had a recorded FRL exceedance in Aquifer Zones 2 and 4. A list of those constituents is found in Table 2-1.
Downhole Camera Surveys	Quarterly	Survey the five re-injection wells (22107, 22108, 22109, 22240, and 22111) at the start of the re-injection demonstration, at every quarterly scheduled well maintenance, and at the end of the re-injection demonstration.
Biological Sampling	Quarterly	Sample five re-injection wells (22107, 22108, 22109, 22240, and 22111) and five shallow observation wells (not yet installed) at the start of the re-injection demonstration, at every quarterly scheduled well maintenance, and at the end of the re-injection demonstration. Sample for iron-related bacteria, slime-forming bacteria, and total aerobic bacteria using prepared biological activity reaction test kits.
Groundwater Quality Sampling	Quarterly	Integrate with quarterly IEMP sampling. Collect samples from nine new observation wells (not yet installed), and 14 existing wells (2106, 3106, 2434, 3069, 2398, 3398, 4398, 2070, 3070, 2017, 2015, 3015, 2060, and 2166). Analytes are defined in Table 4-2. Sampling protocols are defined in Table 4-1.
Geoprobe™ Sampling	Variable	Seven locations prior to re-injection. Three locations every three months during demonstration. Seven locations at the end of the demonstration. Analytes are defined in Table 4-2.
In-situ Water Quality Monitoring	Monthly	Monitor each re-injection well (22107, 22108, 22109, 22240, and 22111) for 48 hours prior to the start of re-injection. Record measurements for specific conductivity, temperature, pH, Eh, and dissolved oxygen every hour. Monitor the deep and shallow observation wells next to Re-Injection Well 22109 continuously at the start of re-injection. Record measurements for specific conductivity, temperature, pH, Eh, and dissolved oxygen every hour until parameters have stabilized. Rotate the two water quality probes between the nine observation wells monthly during the demonstration. Collect hourly measurements for specific conductivity, temperature, pH, Eh, and dissolved oxygen for 24 hours at each well.
Water Level Measurements	Weekly at startup, then monthly	Integrate with quarterly IEMP water level monitoring. At the start of re-injection monitor fifty wells weekly until water levels have stabilized. A list of the 50 wells can be found in Table 4-3. Collect water levels from the same 50 wells monthly during the demonstration except for those months that coincide with quarterly IEMP water level monitoring. On months that coincide with IEMP monitoring just use the IEMP data.

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TABLE 6-1
(Continued)

Activity	Schedule	Commitment/Requirement
Identify Well-Specific Groundwater Flow Directions.	Quarterly	Use the colloidal borescope to measure colloidal flow directions in four deep wells prior to start-up of South Field Module, four deep wells prior to start of re-injection, and four deep wells quarterly during the demonstration
Surface Water Sampling	One time event	Collect a grab sample from the Southeast Drainage Ditch. Sample for analytes listed in Table 4-1.
Operating Reports	Monthly	Monthly reports will provide an analysis of quality of the injectate, volume and rate of injection, description of any well maintenance and rehabilitation procedures which were conducted, results of groundwater monitoring at the re-injection test site. Reports will be sent to the U.S. EPA, and Ohio EPA Office of Federal Facilities Oversight and the Division of Drinking and Ground Waters (DDAGW) Underground Injection Control (UIC) Unit.
Up-date Reports	Quarterly	Quarterly reports will supplement the monthly reports by providing an assessment of how the demonstration is proceeding, latest water table map and captive zone interpretation. Reports will be sent to the U.S. EPA, and Ohio EPA Office of Federal Facilities Oversight and the Division of Drinking and Ground Waters (DDAGW) Underground Injection Control (UIC) Unit.
Life Cycle Cost Analysis of Re-injection Costs	Following completion of the demonstration	Results will be incorporated into the Final Re-Injection Demonstration Test Report
Final Re-Injection Demonstration Report	Following completion of the demonstration	Issue to EPA approximately nine months following completion of the Re-Injection Demonstration

7.0 PLUGGING AND ABANDONMENT OF THE RE-INJECTION WELLS

As recommended in Ohio EPA guidance document titled 5X26 Aquifer Remediation Projects (EPA 1997) upon completion of remedial activities at the FEMP, all re-injection wells will be permanently plugged and abandoned in a manner that will limit migration of fluids into an underground source of drinking water. The plugging and abandonment will begin within 120 days of the DOE, EPA and Ohio EPA reaching agreement and declaring that the aquifer remedy objectives for the FEMP have been achieved. Wells will be plugged and abandoned following guidelines presented in Appendix J of the SCQ, and following site procedure DRL-01 Well Plugging and Abandonment.

8.0 MANAGEMENT AND RESPONSIBILITIES

This section defines the roles and responsibilities of key management and technical personnel associated with the completion of the work defined in this test plan. Sampling activities defined in this test plan will be performed by Fluor Daniel Fernald. Descriptions of some of the key technical responsibilities of project personnel or organizations are provided below.

The DOE Operable Unit 5 Team Leader is responsible for:

- Providing direction and oversight to the completion of test plan activities
- Acting as the point of contact within DOE and for the regulators and stakeholders for all communications concerning work carried out under this test plan.

The Fluor Daniel Fernald Aquifer Restoration Project Director is responsible for:

- Providing overall project management and technical guidance to the Fluor Daniel Fernald team
- Ensuring the necessary resources are allocated to the project for the efficient and safe completion of test plan activities
- Overseeing and auditing test plan activities to ensure that the work is being performed efficiently and in accordance with all regulatory requirements and commitments, DOE Orders, site policies and procedures, and safe working practices.

The Fluor Daniel Fernald Project Manager is responsible for:

51 - The safe, prompt, and correct completion of work outlined in the test plan
- Oversight and programmatic direction of sampling activities
- Providing a technical lead for the collection and interpretation of sampling data
- Establishing and maintaining the scope, schedule, and cost baseline
- Reporting to the DOE Operable Unit 5 Team Leader and Fluor Daniel Fernald Aquifer Restoration Project Director on the status of test plan activities and on the identification of any problems encountered in the accomplishment of the test plan
- Managing the funding to complete the sampling and data analysis activities.

The Fluor Daniel Fernald Technical Lead is responsible for:

- Reporting to the Fluor Daniel Fernald Project Manager on the progress of test plan activities
- Collection, interpretation, and reporting of sampling data.

Groundwater Monitoring Team will be responsible for:

- Down hole camera surveys
- Biological monitoring in re-injection wells and observation wells
53 - Collection of water level data in monitoring wells
- Collection of water quality data from re-injection wells and monitoring wells
- Collection of water quality data from the South East Drainage Ditch
- Data management.

Waste Water Treatment Operations Team will be responsible for:

- Analysis of the injectate
- Conducting Predictive and Preventive Maintenance
- Operation of the re-injection system.

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9.0 SUPPORTING ACTIVITIES

9.1 DATA MANAGEMENT

Field and analytical data will be managed to meet test criteria evaluation needs. Field documentation and analytical data results will be verified to ensure conformance to the appropriate SCQ sections and appendices. The process for management of the field and analytical data is described in the Environmental Data Management Plan (EDMP) (FDF 1996).

Field documentation will be verified for accuracy and completeness by the sampling team followed by an independent field data validation in accordance with SCQ requirements for the corresponding ASL. The project team leader must have processes in place to verify that chemical and radiological data results meet all applicable quality requirements specified in the SCQ for the respective ASL (SCQ Section 11.0 and Appendix F). The quality of analytical data will be evaluated by independent project personnel qualified to determine accuracy, completeness and applicable statistical data necessary to evaluate data useability and data quality required for environmental monitoring reporting.

Both the field and analytical data will be entered into a controlled database using a double key or equivalent method to ensure accuracy. The hard copy data will be managed in the project files in accordance with FEMP record keeping procedures and DOE orders.

9.2 HEALTH AND SAFETY

The Fluor Daniel Fernald (FDF) Health and Safety Department is responsible for the development and implementation of health and safety requirements for this test plan. Hazards (physical, radiological, chemical, and biological) typically encountered by personnel when performing the specified field work will be addressed.

All involved personnel will receive adequate training to the health and safety requirements prior to implementation of the field work required by this test plan. Daily safety meetings will be conducted prior to beginning field work to address specific health and safety issues.

All FDF employees and subcontractor personnel who will be performing field work required by this test plan are required to have completed all site required training. For areas subject to more restrictive radiological controls where the potential for exposure is greater, Radiation Work Permits (RWPs) are necessary and will be obtained prior to the field work being performed in those areas. A radiological control technician will be assigned to each field crew performing any activities in an area requiring an RWP.

9.3 QUALITY ASSURANCE/QUALITY CONTROL

Groundwater Monitoring Sampling events will follow Quality Assurance/Quality Control (QA/QC) protocol established in Section 4 and Appendix K of the SCQ.

9.3.1 Project Requirements for Surveillances

Self-assessment of work processes and operations will be undertaken to assure quality of performance. Self-assessment will be performed by the Project Manager, and will encompass technical and procedure requirements. Such self-assessment may be conducted at any point in the project.

Independent assessment will be performed by the FEMP QA organization by conducting surveillances. At a minimum, one surveillance will be conducted, consisting of monitoring/observing ongoing project activity and work areas to verify conformance to specified requirements. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

9.3.2 Field Changes to the Test Plan

Prior to the implementation of field changes, the Project Manager will be informed of the proposed field changes. Once approval has been obtained (verbal or written) from the Project Manager and QA representative for the field changes to the test plan, the field changes may be implemented. Field changes to the test plan will be noted on a Variance Request form. QA must receive the completed Variance Request form, which includes the signatures of the Project Manager, and the QA/QC Representative, within one week of the granting of the verbal approval.

9.3.3 Quality Assurance Samples

Field quality control samples will be taken according to the frequency recommended in the SCQ. These samples will be collected and analyzed in order to evaluate the possibility that some controllable practice, such as decontamination or sampling technique, may be responsible for introducing bias in the projects analytical results. The following types of quality control samples will be collected: sampling equipment rinsates, trip blanks, field blanks, and duplicate samples as outlined in Section 6 and Appendix K of the SCQ. Each QC sample is preserved using the same method for groundwater samples. The QC sample frequencies will be tracked to ensure the proper frequency requirements are met as follows:

- Trip Blanks: Prepared for each sampling team on each day of sampling when volatile organic compounds are included in the respective analytical program.
- Equipment Blanks: Collect one rinsate sample every 20 groundwater samples that are collected using reusable sampling equipment. If less than 20 samples are collected a rinsate is still required. Rinsates are not required when dedicated well equipment or disposable sampling equipment is utilized.
- Field Blanks: Collect one field blank for each day of groundwater sampling.
- Field Duplicates (blind): One duplicate sample will be collected for every 20 groundwater samples or fraction thereof if less than 20 samples are collected.

The field samples associated with each QC sample will also be tracked to ensure traceability in the event that contaminants are detected in the QC sample.

9.4 WASTE DISPOSITION

The following wastes will be generated during sampling activities:

- Purge water
- Contact Wastes
- Equipment decontamination solutions

The following subsections provide the proposed disposition methodology for each type of water generated.

Purge Water and Decontamination Solutions

Groundwater purged from the wells and solutions used to decontaminate equipment used during sampling will be contained and transported to the FEMP wastewater system for proper disposal. If historic data for a well indicate the purge water is potentially a RCRA waste, the purge water will be drummed at the well and moved to the FEMP's controlled holding area until analytical results are returned and appropriate disposition can be made.

Contact Wastes

Contact wastes such as personal protective equipment (PPE), paper towels, and other solid investigation-derived waste will be placed in plastic bags or 55-gallon drums and transported to the FEMP for appropriate disposition.

9.5 DECONTAMINATION

Sampling equipment will be decontaminated following sample collection from each well to prevent cross-contamination of samples. The decontamination of equipment will be performed in accordance with the Level II method referenced in Appendix K.11 and described in Section 6.4.1 of the SCQ.

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APPENDIX A

WATER QUALITY IN THE RE-INJECTION DEMONSTRATION AREA

APPENDIX A

A.1 WATER QUALITY SAMPLING IN THE RE-INJECTION DEMONSTRATION AREA

Following the second single well injection test, conducted in Extraction Well 31567 in April of 1996 (see Figure A-1), groundwater samples were collected from 12 existing groundwater monitoring wells in the re-injection demonstration area (2017, 3017, 2106, 3106, 2015, 3015, 2434, 3069, 2398, 3398, 2070, and 3070), Figure A-1. The groundwater samples were analyzed for:

- Major anions and cations
- Iron bacteria (wells 2106, 2434, and 2398 only).

The collection of iron bacteria samples was limited to three wells due to the expense of the analysis used. During the re-injection demonstration, prepared BART kits will be used at a fraction of the cost, see Section 4.3.

In addition to the lab analyses, a Hydrolab™ Model H2OG downhole probe was used to measure in situ readings of temperature, pH, specific conductance, dissolved oxygen, and redox potential.

The objective of the sampling effort was to document geochemical conditions in the re-injection demonstration area. Results of the sampling effort are presented below.

A.2 RESULTS

Major anion and cation analytical results, in-situ water chemistry measurements, and iron bacteria analytical results are presented in Tables 1, 2, and 3, respectively. The data indicate that:

- Iron concentrations vary vertically and horizontally in the Great Miami Aquifer, increasing with depth
- Dissolved oxygen concentrations decrease with depth
- The redox potential decreases with depth
- Both aerobic and sulfate-reducing bacteria are naturally present in the aquifer in the re-injection demonstration area.

Iron Concentrations

In the re-injection demonstration area, groundwater collected from five Type-2 monitoring wells (2106, 2017, 2015, 2434, and 2398) had iron concentrations which were at or below 100 μg/L, Table A-1. The iron concentration measured in a sixth Type-2 monitoring well (2070) was 1363 μg/L, Type-2 monitoring wells have a fifteen foot screen that is completed across the water table.

Iron concentrations were also measured in groundwater collected from six Type-3 monitoring wells (3106, 3017, 3015, 3070, 3398 and 3069). Three of the six locations (3017, 3070, and 3398) had iron concentrations which were relatively high, ranging from 1363 μg/L to 3994 μg/L. Two of the six wells (3106, and 3069) had iron concentrations below 100 μg/L. Monitoring Well 3015 had an iron concentration of 169.9 μg/L. Type-3 monitoring wells have a ten foot screen positioned approximately 60 feet below the water table.

The data indicates that in the re-injection demonstration area the aquifer is zoned vertically with respect to iron. Shallow depths are relatively low in iron and deeper intervals are relatively high in iron.

It is common for iron concentrations in some aquifer systems to be relatively low near recharge areas, increasing as the groundwater migrates away from the source of the recharge. Precipitation and surface water runoff are usually low in iron, making the concentration in groundwater near aquifer recharge points relatively low. As groundwater migrates through the aquifer, iron leaches from the sediment through which the water is passing, raising the dissolved concentration of iron in the groundwater. Iron is a constituent of shale and is found as impurities in carbonate rocks. Both shale and carbonate rocks are in contact with the Great Miami Aquifer. Because iron plugging of the re-injection well is a concern it is important to understand what iron concentrations can be expected in the area of the re-injection demonstration and if the concentration is uniform across the area.

The apparent zonation of iron observed in the re-injection demonstration area should be favorable for the planned re-injection program. Re-injection is being targeted to the shallow portion of the aquifer where iron concentrations are low. Because treated water which is low in iron will be re-injected into groundwater which is low in iron, the precipitation of iron hydroxide should be minimized. Therefore the growth of iron bacteria that thrives on the precipitation reaction should be minimized.

In-Situ Groundwater Chemistry Measurements

In situ measurements of temperature, pH, specific conductance, dissolved oxygen, and redox potential collected from monitoring Wells 2017, 3017, 2106, 3106, 2015, 3015, 2434, 3069, 2398, 3398, 2070, and 3070) are listed in Table A-2.

In-Situ measurements were collected hourly over a time period of approximately 24 hours. The data listed in Table A-2 contains the range of representative data recorded.

The data indicates that the aquifer in the area of the re-injection demonstration is zoned with respect to dissolved oxygen and redox potential. Dissolved oxygen concentrations generally decrease with depth, and lateral distance from an aquifer recharge location. In the Type-2 monitoring wells (with the exception of Well 2070) the dissolved oxygen ranged from 5.91 mg/L to 10.13 mg/L and in the 3000-series wells the dissolved oxygen concentration ranged from 0 mg/L to 1.03 mg/L. In the Type-2 monitoring wells (with the exception of 2070) the redox potential ranged from 288 mV to 392 mV, and in the Type-3 monitoring wells the redox potential ranged from 58 mV to 303 mV.

Iron Bacteria Results

Iron bacteria results for the re-injection demonstration area are presented in Table A-3. Three monitoring wells were sampled, 2106, 2398, and 2434. The data indicated that monitoring Well 2106 had very low counts of bacteria in general. The aerobic heterotroph count was below 10,000 CFU/dl and therefore not considered significant in regard to biofouling potential. Yeast and fungi are commonly associated with aerobic heterotrophs so the high count is considered normal.

The results for the other two wells though did indicate biofouling problems. Well 2398 had an aerobic heterotroph count of 162,000 CFU/dl. Anything over 10,000 CFU/dl is reported to be a concern. The water sample also exhibited a very prominent population of iron-oxidizing bacteria as well as sulfur-oxidizing bacteria, indicative of a iron biofouling problem.

The water sample collected from Well 2434 had a sphaerotilus/Leptothrix count of 2,700 CFU/dl. It was reported by the lab that counts of Sphaerotilus/Leptothrix exceeding 2000 to 3000 CFU/dl typically indicate the beginning of an iron bacteria biofouling problem. The sample also had a population of sulfate-reducing bacteria and a high count of anaerobic heterotrophs, indicative of a more reduced environment compared to the other two samples.

Judging by these results, bacteria conditions vary across the re-injection demonstration area from no observable problem in Well 2106, to observable problems with both oxidized and reduced forms of bacteria in Wells 2398 and 2434 respectively.

A.3 CONCLUSIONS

The water quality data collected in the re-injection demonstration area indicate that favorable conditions are present in the aquifer for the re-injection demonstration. The aquifer in the re-injection demonstration area is relatively oxidized and has a low iron concentration. Water treated through the FEMP groundwater treatment system is also relatively oxidized and has a low iron concentration. Re-injection of treated groundwater into the aquifer should not promote the oxidation of ferrous iron to ferric iron or promote the growth of iron bacteria.

Iron bacteria data collected in the area of the re-injection demonstration indicates that different bacteria conditions are present across the area. The three monitoring wells which were sampled all exhibited different iron bacteria results.

The presence of iron bacteria in the aquifer, prior to re-injection, should not be a problem for the re-injection demonstration unless the re-injection process alters the chemistry of the groundwater such that reactions favorable for the growth of the iron bacteria occur.

2999

TABLE A-1

INJECTION DEMO AREA, WATER QUALITY DATA
MAJOR ANIONS AND CATIONS

Parameter	Units	2106	3106	2017	3017	2015	3015	2434	2070	3070	2398	3398	3069	Detection Limit[b]
Aluminum	μg/L	U	U	U	U	U	U	U	U	U	U	U	U	200
Calcium	μg/L	90,610	94,670	122,220	136,700	82,960	86,400	102,800	83,710	75,230	84,930	111,190	85,180	NA
Iron	μg/L	100	U	U	2838	U	169.9	U	3898.1	3994	U	1363	U	100
Magnesium	μg/L	22,210	24,620	30,280	28,930	20,390	20,700	27,720	22,890	17,920	21,960	26,940	21,110	NA
Manganese	μg/L	U	U	U	385.7	U	261.5	U	352.6	262.5	U	340.7	26.7	15
Potassium	μg/L	U	U	U	U	U	U	U	U	U	U	U	U	5000
Silicon	μg/L	3192	4083	5286	4818	3190	3568	4584	3623	3928	4125	4248	3813	NA
Sodium	μg/L	16,870	14,890	8,322	12,820	12,910	9803	23,060	10,030	6967	19,780	9718	10,560	NA
Alkalinity	N	U	U	U	U	U	U	U	U	U	U	U	U	0.01
Fluoride	mg/L	0.3	0.2	0.2	0.1	0.44	0.18	0.23	0.18	0.18	0.16	0.15	.18	NA
NO_3-N	mg/L	2.6	0.2	2.0	U	2.1	0.1	3.9	0.24	U	0.70	U	1.05	0.2
Solids	mg/L	U	U	U	4	U	8	4	3	8	15	3	U	2
Chloride	mg/L	43	33.8	7.2	32.6	36.6	33	63.4	36.6	28.6	58.8	32.4	38.4	NA
Sulfate	mg/L	66.5	88.5	58	205	81	98.5	82.5	85	75.5	76.5	157.5	93	NA
TDS	mg/L	399	450	446	578	348	350	475	397	504	422	525	392	NA
Ammonia	mg/L	U	U	U	U	U	U	U	U	0.14	U	U	U	0.10
Phosphate	mg/L	0.52	.08	.08	0.15	0.18	0.15	0.23	0.23	0.45	0.20	0.15	0.7	NA
Uranium	μg/L	42	1.8	3.5	0.9	140	1.2	1.2	0.8	0.2	11	1.0	110	NA
Carbonate	μg/L	U	U	U	U	U	U	U	U	U	U	U	U	0
Bi-carbonate	μg/L	246,000	266,000	346,000	300,000	228,000	230,000	271,000	276,000	270,000	246,000	264,000	250,000	NA

[a] U = Undetected
[b] NA = Not applicable

TABLE A-2

INJECTION DEMO AREA, WATER QUALITY DATA
IN-SITU WATER QUALITY PARAMETERS

Wells	Temp (°C)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Redox (mV)
2017	10.61-10.94	7.0-7.18	0.592-0.628	9.13-10.13	316-329
3017	11.83-11.96	6.84-6.99	0.784-0.794	0.72-1.03	197-239
2106	13.59-13.68	7.07-7.20	0.665-0.716	6.40-7.12	329-392
3106	10.78-10.94	7.02-7.22	0.881-0.791	0.05-0.10	259-285
2015	9.63-9.97	7.15-7.40	0.642-0.720	6.04-4.48	304-314
3015	9.29-9.31	7.36-7.38	0.680-0.682	0.6-0.8	120-147
2434	9.27-9.42	6.89-7.1	0.787-0.819	9.33-10.29	316-332
3069	9.38-9.48	7.15-7.32	0.711-0.756	0.38-0.45	270-303
2398	10.86-11.14	7.03-7.24	0.773-0.796	5.91-6.24	288-365
3398	10.53-10.65	7.06-7.23	0.787-0.812	0-0.39	117-215
2070	10.99-11.50	6.99-7.31	0.663-0.741	0.03-0.52	82-155
3070	10.67-10.80	6.99-7.39	0.694-0.723	0.07-0.76	58-76

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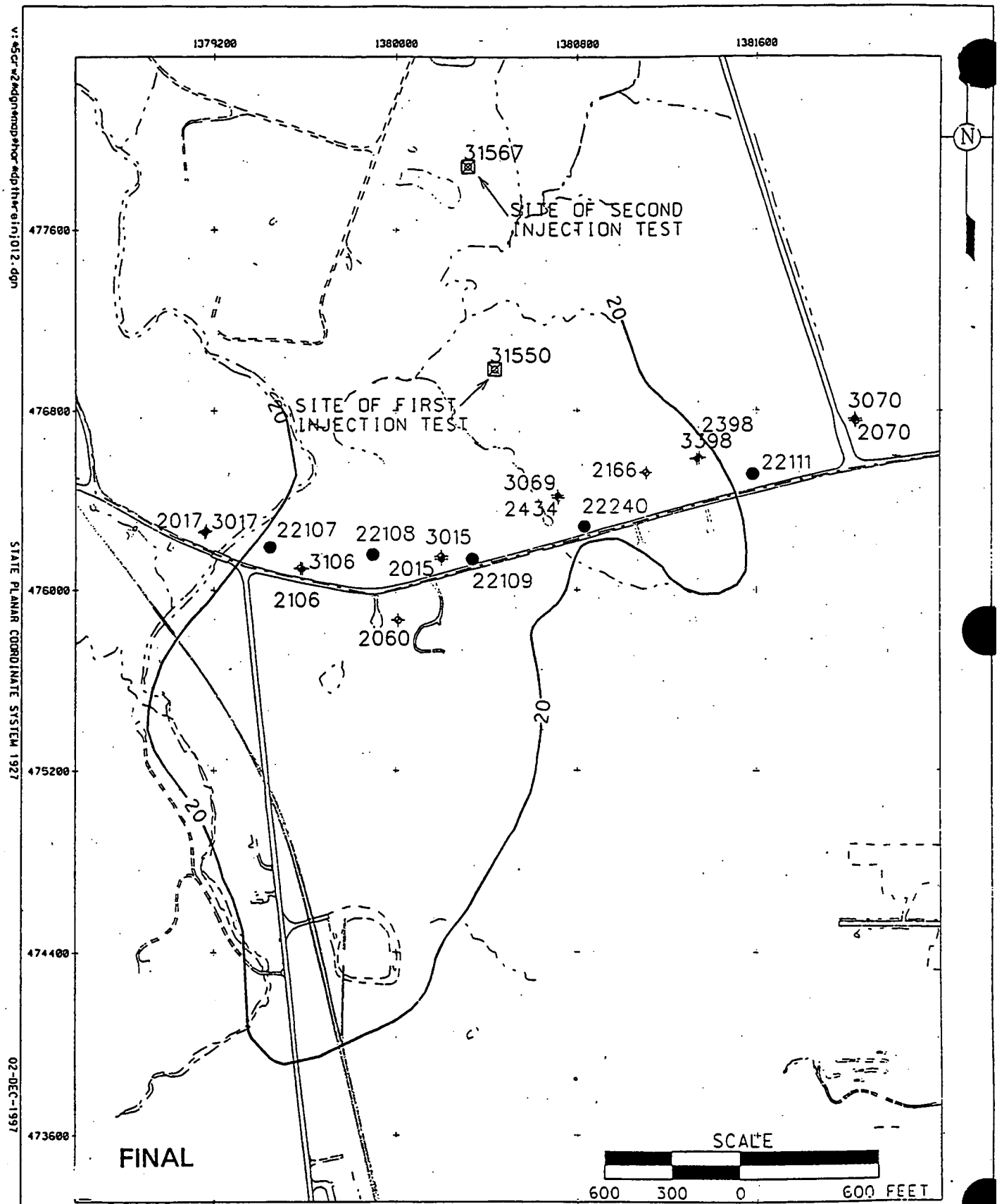
TABLE A-3

INJECTION DEMO AREA, WATER QUALITY DATA BACTERIAL ANALYSIS

Parameter	Units[a]	2106	2434	2398
Aerobic Heterotrophs, Total	CFU/dL	7200	5400	162,000
Anaerobic Heterotrophs, Total	CFU/dL	40	2700	320
Fungi and Yeast, Total	CFU/dL	4800	7200	27,000
Gallionella	CFU/dL	2.0	66.0	8100
Sphaerotilus/Leptothrix	CFU/dL	720	2700	9000
Thiobacillus	CFU/dL	10	1400	27,000
Sulfate-Reducing Bacteria	CFU/dL	<1	800	<1
Sulfide/Sulfer-Oxidizing Bacteria	CFU/dL	<1	<1	1800
Geobacter	CFU/dL	<1	<1	<1

[a]Colony forming unit per deciliter



LEGEND:

- FEMP BOUNDARY
- EXISTING MONITORING WELL
- RE-INJECTION WELL
- EXTRACTION WELL
- 20 TOTAL URANIUM PLUME AS OF SPRING, 1997

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FIGURE A-1. GROUNDWATER QUALITY SAMPLING LOCATIONS

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VARIANCE / FIELD CHANGE NOTICE	V/F No. 1
WBS NO.: 53100-PL-001	Page 1 of 1
PROJECT TITLE: Re-Injection Demonstration Test Plan	Date: 02-15-00

VARIANCE / FIELD CHANGE NOTICE (Include justification):

Requirement

A monthly grab sample of the treated groundwater that is being used for re-injection will be collected and analyzed for the constituents listed in Table 2-1 of the test plan. According to procedure EW-0002 "Chain of Custody/Request for Analysis Record for Sample Control" the injectate samples should have been tracked in the FACTS and SED using the following project number 53100-PI-001.

Variance:
The injectate water quality samples collected under this test plan will be tracked in the FACTS and SED using project number 50.03.77 "Re-Injection Demo (Injectate)".

Justification:
Several injectate water quality samples have already been incorrectly tracked to Project Number 50.03.77. An analysis of the situation indicates that it is more cost effective to draft a variance to the test plan to track the samples under Project Number 50.03.77 then it is to go back and revise all of the effected paperwork. Linking of these samples to Project Number 50.03.77 will only impact future data- base searches for the sampling results.

ORIGINAL

REQUESTED BY: Ken Broberg Date: 02-15-00

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE For F. Thompson	2/25/00		Water Monitoring Team Coach	2-15-00
X	DATA QUALITY MANAGEMENT	2/25/00		Soils and Misc. Media Sampling Team Coach	
	ANALYTICAL CUSTOMER SUPPORT		X	Hydrogeology Team Coach:	2/15/00
	ARWWP Project Manager			Waste Water Treatment Operations Team Coach:	

VARIANCE/FCN APPROVED [X]YES [ ]NO REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

PROJECT MANAGER:	DOCUMENT CONTROL:	OTHER:
QUALITY ASSURANCE:	OTHER:	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

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VARIANCE / FIELD CHANGE NOTICE

V/F No. 2

WBS NO.: 53100-PL-001

Page 1 of 1

PROJECT TITLE: Re-Injection Demonstration Test Plan

Date: 02-09-00

VARIANCE / FIELD CHANGE NOTICE (Include justification):

Requirement

A monthly grab sample of the treated groundwater that is being used for re-injection will be collected and analyzed for the constituents listed in Table 2-1 of the test plan.

Variance:
An archive sample will also be collected.

Justification:
The archived sample will be saved until laboratory results have been received. This will facilitate re-analysis of the sample if deemed necessary.

ORIGINAL

REQUESTED BY: Ken Broberg KAB Date: 02-09-00

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE For F. Thompson	2/25/00		Water Monitoring Team Coach	
	DATA QUALITY MANAGEMENT			Soils and Misc. Media Sampling Team Coach	
	ANALYTICAL CUSTOMER SUPPORT		X	Hydrogeology Team Coach:	2/15/00
	ARWWP Project Manager		X	Waste Water Treatment Operations Team Coach	02/23/00

VARIANCE/FCN APPROVED [X]YES [ ]NO

REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

PROJECT MANAGER:	DOCUMENT CONTROL:	OTHER:
QUALITY ASSURANCE:	OTHER:	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

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VARIANCE / FIELD CHANGE NOTICE	V/F No. 3
WBS NO.: 53100-PL-001	Page 1 of 1
PROJECT TITLE: Re-Injection Demonstration Test Plan	Date: 02-28-00

VARIANCE / FIELD CHANGE NOTICE (Include justification):

Variance:
The monthly injectate grab sample is considered to be a "process control sample". It is collected from a valve. A properly filled out Chain of Custody form will accompany each process control sample.

Justification:
Need to distinguish between the field paperwork generated during the collection of the monthly injectate grab sample versus the field paperwork that is generated during the collection of a groundwater sample from the aquifer. The field paperwork generated for the monthly injectate grab sample only consists of a Chain of Custody Form. The sample is collected from a valve that is plumbed into the effluent line. The procedure, essentially turn on the valve, is simpler than the procedure required to collect a groundwater sample from the aquifer. Therefore much less field paperwork is needed.

ORIGINAL

KAB

REQUESTED BY: Ken Broberg Date: 02-28-00

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE	2-28-00		Water Monitoring Team Coach	
	DATA QUALITY MANAGEMENT			Soils and Misc. Media Sampling Team Coach	
	ANALYTICAL CUSTOMER SUPPORT		X	Hydrogeology Team Coach:	02/28/00
	ARWWP Project Manager		X	Waste Water Treatment Operations Team Coach:	02/28/00

VARIANCE/FCN APPROVED [X]YES [ ]NO

REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

PROJECT MANAGER:	DOCUMENT CONTROL:	OTHER:
QUALITY ASSURANCE:	OTHER:	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

APPENDIX B

WATER LEVEL DATA (FROM RE-INJECTION WELLS)

APPENDIX B

This appendix contains a tabulation of water level data collected from within the Re-Injection Wells over the duration of the Demonstration. Well field operators recorded a water level reading for each re-injection well from the AWWT control room at the start of each work shift onto a water level tracking sheet. Each workday is divided into three work shifts. Therefore three water level readings were documented on the tracking sheet each day of the demonstration. As discussed in Section 2, this data was monitored as an indicator of plugging within the re-injection wells.

Each transducer installed in the re-injection wells was set to give a percentage reading. The set points for each transducer, and the installation depths, are presented at the top of each page of the table. As an example, in Re-Injection Well IW-8, a reading of 57 percent on the transducer corresponds to a depth of 6.1 feet below the top of the well (BTOW). A reading of 62 percent on the transducer corresponds to a depth of 3.5 feet BTOW. Set points are further discussed in Section 2. The transducer in Well IW-8 was set at a depth of 45.6 feet (BTOW).

Using information learned during the first few months of operation, transducer settings were adjusted on February 10, 1999 as indicated in the table, to establish a more uniform operation. Below is an explanation of what is presented in each column of the table.

Column 1:	The date that the measurements were collected on.
Column 2:	The starting time of each of the three shifts.
Column 3:	The sample number. Ordered sequentially from 1 to 1097.
Columns 4-6:	Water level data specific to Re-Injection Well IW-8. Column 4 lists the percentage reading recorded on the water level transmitter. Column 5 lists the corresponding depth calculation. Column 6 lists the water level rise.
Columns 7-9:	Water level data specific to Re-Injection Well IW-9. Data is presented in the same order as for Re-Injection Well IW-8.
Columns 10-12:	Water level data specific to Re-Injection Well IW-10. Data is presented in the same order as for Re-Injection Well IW-8.
Columns 13-15:	Water level data specific to Re-Injection Well IW-11. Data is presented in the same order as for Re-Injection Well IW-8.
Columns 16-18:	Water level data specific to Re-Injection Well IW-12. Data is presented in the same order as for Re-Injection Well IW-8.
Column 19:	Operational notes.

TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
9/2/98	initial	1	38.4	18.99		40.8	58.33		35.2	59.41		34.7	59.35		36.2	63.71		
	at start	2	46.1	13.65	5.34	46.1	54.65	3.67	42.3	54.49	4.92	37.7	57.27	2.08	39.4	61.50	2.22	
	1400	3	47.7	12.54	6.44	46.9	54.10	4.23	43.7	53.52	5.89	38	57.07	2.29	40	61.08	2.63	
	2200	4	48.5	11.99	7.00	47.4	53.75	4.57	43.8	53.45	5.96	38.3	56.86	2.49	40.3	60.87	2.84	
9/3/98	600	5	48.8	11.78	7.21	47.5	53.68	4.64	44	53.31	6.10	38.2	56.93	2.43	40.3	60.87	2.84	
	1400	6	48.6	11.92	7.07	47.7	53.54	4.78	44.5	52.96	6.44	38.3	56.86	2.49	40.5	60.73	2.98	
	2200	7	49	11.64	7.35	47.7	53.54	4.78	44.5	52.96	6.44	38.3	56.86	2.49	40.3	60.87	2.84	
9/4/98	600	8	49.1	11.57	7.42	47.8	53.47	4.85	44.6	52.89	6.51	38.3	56.86	2.49	40.3	60.87	2.84	
	1400	9	48.8	11.78	7.21	47.8	53.47	4.85	44.4	53.03	6.38	38.3	56.86	2.49	40.3	60.87	2.84	
	2200	10	49	11.64	7.35	47.9	53.41	4.92	44.6	52.89	6.51	38.3	56.86	2.49	40.2	60.94	2.77	
9/5/98	600	11	49	11.64	7.35	47.9	53.41	4.92	44.7	52.82	6.58	38.3	56.86	2.49	40.2	60.94	2.77	
	1400	12	49.1	11.57	7.42	47.8	53.47	4.85	45	52.62	6.79	38.3	56.86	2.49	40.4	60.80	2.91	
	2200	13	49.4	11.37	7.62	47.9	53.41	4.92	45	52.62	6.79	38.4	56.79	2.56	40.3	60.87	2.84	
9/6/98	600	14	49.6	11.23	7.76	48	53.34	4.99	44.7	52.82	6.58	38.5	56.72	2.63	40.5	60.73	2.98	
	1400	15	49.6	11.23	7.76	48	53.34	4.99	44.7	52.82	6.58	38.5	56.72	2.63	40.5	60.73	2.98	
	2200	16	49.7	11.16	7.83	48.1	53.27	5.06	45	52.62	6.79	38.5	56.72	2.63	40.4	60.80	2.91	
9/7/98	600	17	49.8	11.09	7.90	48.1	53.27	5.06	45	52.62	6.79	38.4	56.79	2.56	40.4	60.80	2.91	
	1400	18	49.7	11.16	7.83	48	53.34	4.99	45	52.62	6.79	38.5	56.72	2.63	40.5	60.73	2.98	
	2200	19	49.9	11.02	7.97	48.1	53.27	5.06	45.2	52.48	6.93	38.4	56.79	2.56	40.3	60.87	2.84	
9/8/98	600	20	50	10.95	8.04	48.1	53.27	5.06	45.3	52.41	7.00	38.4	56.79	2.56	40.3	60.87	2.84	
	1400	21	50	10.95	8.04	48.1	53.27	5.06	45.2	52.48	6.93	38.4	56.79	2.56	40.3	60.87	2.84	
	2200	22	50.1	10.88	8.11	48.1	53.27	5.06	45.4	52.34	7.07	38.3	56.86	2.49	40.3	60.87	2.84	
9/9/98	600	23	50.2	10.81	8.18	48.2	53.20	5.13	45.4	52.34	7.07	38.3	56.86	2.49	40.3	60.87	2.84	
	1400	24	50.1	10.88	8.11	48.1	53.27	5.06	45.4	52.34	7.07	38.3	56.86	2.49	40.3	60.87	2.84	
	2200	25	50.2	10.81	8.18	48.1	53.27	5.06	45.4	52.34	7.07	38.3	56.86	2.49	40.3	60.87	2.84	
9/10/98	600	26	50.2	10.81	8.18	48.1	53.27	5.06	45.4	52.34	7.07	38.3	56.86	2.49	40.3	60.87	2.84	
	1400	27	50.1	10.88	8.11	48.1	53.27	5.06	45.4	52.34	7.07	38.3	56.86	2.49	40.4	60.80	2.91	
	2200	28	50.2	10.81	8.18	48.1	53.27	5.06	45.5	52.27	7.14	38.3	56.86	2.49	40.3	60.87	2.84	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
9/11/98	600	29	50.3	10.74	8.25	48.2	53.20	5.13	45.5	52.27	7.14	38.3	56.86	2.49	40.3	60.87	2.84	
	1400	30	50.2	10.81	8.18	48.1	53.27	5.06	45.5	52.27	7.14	38.3	56.86	2.49	40.4	60.80	2.91	
	2200	31	50.4	10.67	8.32	48.2	53.20	5.13	45.4	52.34	7.07	38.3	56.86	2.49	40.3	60.87	2.84	
9/12/98	600	32	50.4	10.67	8.32	48.2	53.20	5.13	45.7	52.13	7.28	38.3	56.86	2.49	40.3	60.87	2.84	
	1400	33	50	10.95	8.04	47.9	53.41	4.92	45.6	52.20	7.21	39.2	56.23	3.12	40.3	60.87	2.84	
	2200	34	50.1	10.88	8.11	48	53.34	4.99	45.7	52.13	7.28	39.1	56.30	3.05	40.2	60.94	2.77	
9/13/98	600	35	50.2	10.81	8.18	48	53.34	4.99	45.8	52.06	7.35	39.2	56.23	3.12	40.2	60.94	2.77	
	1400	36	50	10.95	8.04	47.9	53.41	4.92	45.6	52.20	7.21	39.1	56.30	3.05	40.2	60.94	2.77	
	2200	37	50.1	10.88	8.11	47.9	53.41	4.92	45.7	52.13	7.28	39.1	56.30	3.05	40.2	60.94	2.77	
9/14/98	600	38	50.2	10.81	8.18	48	53.34	4.99	45.8	52.06	7.35	39.2	56.23	3.12	40.2	60.94	2.77	
	1400	39	50.4	10.67	8.32	48.1	53.27	5.06	45.8	52.06	7.35	38.2	56.93	2.43	40.2	60.94	2.77	
	2200	40	50.4	10.67	8.32	48.1	53.27	5.06	45.8	52.06	7.35	38.2	56.93	2.43	40.1	61.01	2.70	
9/15/98	600	41	50.5	10.60	8.39	48.1	53.27	5.06	45.8	52.06	7.35	38.1	57.00	2.36	40.1	61.01	2.70	
	1400	42	50.4	10.67	8.32	48	53.34	4.99	45.8	52.06	7.35	38.1	57.00	2.36	40.1	61.01	2.70	
	2200	43	50.5	10.60	8.39	48.1	53.27	5.06	45.8	52.06	7.35	38.1	57.00	2.36	40.1	61.01	2.70	
9/16/98	600	44	50.6	10.53	8.45	48.1	53.27	5.06	45.8	52.06	7.35	38.1	57.00	2.36	40.1	61.01	2.70	
	1400	45	50.4	10.67	8.32	48	53.34	4.99	45.7	52.13	7.28	38.1	57.00	2.36	40.1	61.01	2.70	
	2200	46	50.6	10.53	8.45	48.1	53.27	5.06	46	51.92	7.48	38.1	57.00	2.36	40.1	61.01	2.70	
9/17/98	600	47	50.7	10.46	8.52	48.2	53.20	5.13	46	51.92	7.48	38.1	57.00	2.36	40.1	61.01	2.70	
	1400	48	50.6	10.53	8.45	48.1	53.27	5.06	45.9	51.99	7.42	38	57.07	2.29	40.1	61.01	2.70	
	2200	49	50.7	10.46	8.52	48.1	53.27	5.06	45.9	51.99	7.42	38	57.07	2.29	40.1	61.01	2.70	
9/18/98	600	50	50.7	10.46	8.52	48.1	53.27	5.06	45.9	51.99	7.42	38	57.07	2.29	40.1	61.01	2.70	
	1400	51	50.6	10.53	8.45	48	53.34	4.99	45.8	52.06	7.35	38	57.07	2.29	40.1	61.01	2.70	
	2200	52	51	10.26	8.73	48.2	53.20	5.13	46.4	51.64	7.76	38.1	57.00	2.36	40.1	61.01	2.70	
9/19/98	600	53	51.1	10.19	8.80	48.2	53.20	5.13	46.3	51.71	7.69	38.1	57.00	2.36	40.1	61.01	2.70	
	1400	54	51	10.26	8.73	48.1	53.27	5.06	46.2	51.78	7.62	38.1	57.00	2.36	40.1	61.01	2.70	
	2200	55	51.1	10.19	8.80	48.1	53.27	5.06	46.3	51.71	7.69	38.1	57.00	2.36	40.1	61.01	2.70	
9/20/98	600	56	51.1	10.19	8.80	48.2	53.20	5.13	46.2	51.78	7.62	38	57.07	2.29	40	61.08	2.63	
	1400	57	51	10.26	8.73	48.1	53.27	5.06	46	51.92	7.48	37.9	57.14	2.22	40	61.08	2.63	
	2200	58																LIGHTENING STRIKE
																		NO INJECTION
																		TAKING PLACE

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
9/21/98	600	59																
	1400	60	53	8.87	10.12	47.9	53.41	4.92	45.6	52.20	7.21	37.7	57.27	2.08	39.8	61.22	2.49	
	2200	61	53.2	8.73	10.26	47.9	53.41	4.92	45.7	52.13	7.28	37.7	57.27	2.08	39.8	61.22	2.49	
9/22/98	600	62	53.4	8.59	10.40	48	53.34	4.99	45.8	52.06	7.35	37.7	57.27	2.08	39.8	61.22	2.49	
	1400	63	53.8	8.32	10.67	48.1	53.27	5.06	46.2	51.78	7.62	37.7	57.27	2.08	39.8	61.22	2.49	
	2200	64	54.3	7.97	11.02	48.4	53.06	5.27	46.3	51.71	7.69	37.8	57.20	2.15	39.8	61.22	2.49	
9/23/98	600	65	54.4	7.90	11.09	48.4	53.06	5.27	46.3	51.71	7.69	37.8	57.20	2.15	39.9	61.15	2.56	
	1400	66	53.9	8.25	10.74	48.3	53.13	5.20	46.3	51.71	7.69	37.8	57.20	2.15	39.9	61.15	2.56	
	2200	67	54.4	7.90	11.09	48.3	53.13	5.20	46.4	51.64	7.76	37.9	57.14	2.22	39.8	61.22	2.49	
9/24/98	600	68	54.6	7.76	11.23	48.3	53.13	5.20	46.4	51.64	7.76	37.9	57.14	2.22	39.8	61.22	2.49	
	1400	69	54.5	7.83	11.16	48.2	53.20	5.13	46.3	51.71	7.69	37.9	57.14	2.22	39.8	61.22	2.49	
	2200	70	54.6	7.76	11.23	48.3	53.13	5.20	46.4	51.64	7.76	37.9	57.14	2.22	39.8	61.22	2.49	
9/25/98	600	71																MISSED READING AT DCS
	1400	72	55.2	7.35	11.64	48.2	53.20	5.13	46.7	51.44	7.97	37.8	57.20	2.15	39.8	61.22	2.49	
	2200	73	55.3	7.28	11.71	48.2	53.20	5.13	46.8	51.37	8.04	37.8	57.20	2.15	39.8	61.22	2.49	
9/26/98	600	74	55.5	7.14	11.85	48.3	53.13	5.20	46.8	51.37	8.04	37.8	57.20	2.15	39.8	61.22	2.49	
	1400	75	55.4	7.21	11.78	48.2	53.20	5.13	46.7	51.44	7.97	37.8	57.20	2.15	39.8	61.22	2.49	
	2200	76	55.6	7.07	11.92	48.2	53.20	5.13	46.8	51.37	8.04	37.8	57.20	2.15	39.8	61.22	2.49	
9/27/98	600	77	55.7	7.00	11.99	48.3	53.13	5.20	46.8	51.37	8.04	37.8	57.20	2.15	39.8	61.22	2.49	
	1400	78	55.6	7.07	11.92	48.2	53.20	5.13	46.8	51.37	8.04	37.7	57.27	2.08	39.8	61.22	2.49	
	2200	79	55.8	6.93	12.06	48.2	53.20	5.13	46.8	51.37	8.04	37.7	57.27	2.08	39.7	61.29	2.43	
9/28/98	600	80	55.9	6.86	12.13	48.3	53.13	5.20	46.9	51.30	8.11	37.6	57.34	2.01	39.6	61.36	2.36	
	1400	81	55.9	6.86	12.13	48.2	53.20	5.13	46.9	51.30	8.11	37.7	57.27	2.08	39.7	61.29	2.43	
	2200	82	56.1	6.72	12.27	48.3	53.13	5.20	47	51.23	8.18	37.7	57.27	2.08	39.7	61.29	2.43	
9/29/98	600	83	56.1	6.72	12.27	48.3	53.13	5.20	47	51.23	8.18	37.7	57.27	2.08	39.7	61.29	2.43	
	1400	84	56.4	6.51	12.47	48.2	53.20	5.13	47.2	51.09	8.32	37.7	57.27	2.08	39.8	61.22	2.49	
	2200	85	56.5	6.45	12.54	48.3	53.13	5.20	47.2	51.09	8.32	37.6	57.34	2.01	39.7	61.29	2.43	
9/30/98	600	86	56.6	6.38	12.61	48.3	53.13	5.20	47.2	51.09	8.32	37.6	57.34	2.01	39.6	61.36	2.36	
	1400	87	56.7	6.31	12.68	48.2	53.20	5.13	47.2	51.09	8.32	37.6	57.34	2.01	39.7	61.29	2.43	
	2200	88	56.7	6.31	12.68	48.3	53.13	5.20	47.3	51.02	8.39	37.6	57.34	2.01	39.7	61.29	2.43	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
	1400	90	56.7	6.31	12.68	48.3	53.13	5.20	47.3	51.02	8.39	37.5	57.41	1.94	39.6	61.36	2.36	
	2200	91	56.4	6.51	12.47	48.3	53.13	5.20	47.4	50.95	8.45	37.5	57.41	1.94	39.6	61.36	2.36	
10/2/98	600	92	57	6.10	12.89	48.3	53.13	5.20	47.5	50.88	8.52	37.6	57.34	2.01	39.6	61.36	2.36	
	1400	93	57	6.10	12.89	48.3	53.13	5.20	47.5	50.88	8.52	37.6	57.34	2.01	39.7	61.29	2.43	
	2200	94	57.1	6.03	12.96	48.3	53.13	5.20	47.5	50.88	8.52	37.6	57.34	2.01	39.6	61.36	2.36	
10/3/98	600	95	57.2	5.96	13.03	48.4	53.06	5.27	47.6	50.81	8.59	37.6	57.34	2.01	39.7	61.29	2.43	
	1400	96	57.3	5.89	13.10	48.3	53.13	5.20	47.6	50.81	8.59	37.5	57.41	1.94	39.7	61.29	2.43	
	2200	97	57.7	5.61	13.37	48.3	53.13	5.20	48	50.54	8.87	37.5	57.41	1.94	39.5	61.43	2.29	
10/4/98	600	98	57.9	5.48	13.51	48.4	53.06	5.27	48	50.54	8.87	37.5	57.41	1.94	39.5	61.43	2.29	
	1400	99	57.9	5.48	13.51	48.4	53.06	5.27	48	50.54	8.87	37.5	57.41	1.94	39.6	61.36	2.36	
	2200	100	57.9	5.48	13.51	48.4	53.06	5.27	48	50.54	8.87	37.4	57.48	1.87	39.5	61.43	2.29	
10/5/98	600	101	58	5.41	13.58	48.4	53.06	5.27	48	50.54	8.87	37.4	57.48	1.87	39.5	61.43	2.29	
	1400	102	57.9	5.48	13.51	48.3	53.13	5.20	48	50.54	8.87	37.4	57.48	1.87	39.5	61.43	2.29	
	2200	103	58	5.41	13.58	48.3	53.13	5.20	48	50.54	8.87	37.4	57.48	1.87	39.5	61.43	2.29	
10/6/98	600	104	58	5.41	13.58	48.3	53.13	5.20	48.1	50.47	8.94	37.4	57.48	1.87	39.5	61.43	2.29	
	1400	105	58	5.41	13.58	48.2	53.20	5.13	48	50.54	8.87	37.4	57.48	1.87	39.5	61.43	2.29	
	2200	106	58.2	5.27	13.72	48.3	53.13	5.20	48.1	50.47	8.94	37.4	57.48	1.87	39.5	61.43	2.29	
10/7/98	600	107	58.2	5.27	13.72	48.3	53.13	5.20	48.1	50.47	8.94	37.3	57.55	1.80	39.5	61.43	2.29	
	1400	108	58.3	5.20	13.79	48.3	53.13	5.20	48.2	50.40	9.01	37.3	57.55	1.80	39.5	61.43	2.29	
	2200	109	58.5	5.06	13.93	48.4	53.06	5.27	48.2	50.40	9.01	37.3	57.55	1.80	39.4	61.50	2.22	
10/8/98	600	110	58.6	4.99	14.00	48.4	53.06	5.27	48.3	50.33	9.08	37.3	57.55	1.80	39.4	61.50	2.22	
	1400	111	58.6	4.99	14.00	48.4	53.06	5.27	48.3	50.33	9.08	37.3	57.55	1.80	39.4	61.50	2.22	
	2200	112	58.7	4.92	14.07	48.4	53.06	5.27	48.4	50.26	9.15	37.3	57.55	1.80	39.4	61.50	2.22	
10/9/98	600	113	58.7	4.92	14.07	48.4	53.06	5.27	48.5	50.19	9.22	37.3	57.55	1.80	39.4	61.50	2.22	
	1400	114	58.7	4.92	14.07	48.4	53.06	5.27	48.5	50.19	9.22	37.3	57.55	1.80	39.4	61.50	2.22	
	2200	115																PLANNED POWER OUTAGE
10/10/98	600	116																NO INJECTION
	1400	117																TAKING PLACE
	2200	118																

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
10/11/98	600	119																
	1400	120				48.1	53.27	5.06	48.9	49.91	9.49	37	57.76	1.59	39	61.77	1.94	
	2200	121				48.5	52.99	5.34	49.4	49.57	9.84	37.2	57.62	1.73	39.2	61.63	2.08	
10/12/98	600	122				48.6	52.92	5.41	49.2	49.70	9.70	37.4	57.48	1.87	39.3	61.57	2.15	
	1400	123	57.7	5.61	13.37	48.5	52.99	5.34	49.4	49.57	9.84	37.4	57.48	1.87	39.5	61.43	2.29	
	2200	124	58	5.41	13.58	48.6	52.92	5.41	49.5	49.50	9.91	37.4	57.48	1.87	39.4	61.50	2.22	
10/13/98	600	125	58.1	5.34	13.65	48.6	52.92	5.41	49.5	49.50	9.91	37.3	57.55	1.80	39.4	61.50	2.22	
	1400	126	59.4	4.44	14.55	48.6	52.92	5.41	50	49.15	10.26	37.4	57.48	1.87	39.5	61.43	2.29	
	2200	127	59.7	4.23	14.76	48.7	52.85	5.47	49.9	49.22	10.19	37.3	57.55	1.80	39.4	61.50	2.22	
10/14/98	600	128	59.7	4.23	14.76	48.7	52.85	5.47	49.9	49.22	10.19	37.3	57.55	1.80	39.4	61.50	2.22	
	1400	129	59.6	4.30	14.69	48.6	52.92	5.41	49.8	49.29	10.12	37.3	57.55	1.80	39.4	61.50	2.22	
	2200	130	59.8	4.16	14.83	48.5	52.99	5.34	49.9	49.22	10.19	37.3	57.55	1.80	39.4	61.50	2.22	
10/15/98	600	131	60.2	3.88	15.11	48.6	52.92	5.41	50.1	49.08	10.33	37.3	57.55	1.80	39.4	61.50	2.22	
	1400	132	60.1	3.95	15.04	48.5	52.99	5.34	50	49.15	10.26	37.3	57.55	1.80	39.5	61.43	2.29	
	2200	133	60	4.02	14.97	48.6	52.92	5.41	50.1	49.08	10.33	37.3	57.55	1.80	39.4	61.50	2.22	
10/16/98	600	134	60	4.02	14.97	48.6	52.92	5.41	50.1	49.08	10.33	37.2	57.62	1.73	39.4	61.50	2.22	
	1400	135	59.9	4.09	14.90	48.5	52.99	5.34	50.1	49.08	10.33	37.3	57.55	1.80	39.5	61.43	2.29	
	2200	136	60	4.02	14.97	48.6	52.92	5.41	50.2	49.01	10.40	37.2	57.62	1.73	39.4	61.50	2.22	
10/17/98	600	137	60.2	3.88	15.11	48.6	52.92	5.41	50.3	48.94	10.46	37.2	57.62	1.73	39.4	61.50	2.22	
	1400	138	60.2	3.88	15.11	48.5	52.99	5.34	50.2	49.01	10.40	37.2	57.62	1.73	39.4	61.50	2.22	
	2200	139	60.3	3.81	15.18	48.5	52.99	5.34	50.3	48.94	10.46	37.2	57.62	1.73	39.3	61.57	2.15	
10/18/98	600	140	60.4	3.74	15.25	48.5	52.99	5.34	50.3	48.94	10.46	37.2	57.62	1.73	39.3	61.57	2.15	
	1400	141	60.4	3.74	15.25	48.5	52.99	5.34	50.4	48.87	10.53	37.2	57.62	1.73	39.3	61.57	2.15	
	2200	142	60.5	3.67	15.32	48.5	52.99	5.34	50.5	48.80	10.60	37.1	57.69	1.66	39.2	61.63	2.08	
10/19/98	600	143	60.6	3.60	15.38	48.6	52.92	5.41	50.5	48.80	10.60	37.1	57.69	1.66	39.2	61.63	2.08	
	1400	144	60.5	3.67	15.32	48.5	52.99	5.34	50.5	48.80	10.60	37.1	57.69	1.66	39.3	61.57	2.15	
	2200	145	60.7	3.53	15.45	48.6	52.92	5.41	50.6	48.73	10.67	37.1	57.69	1.66	39.2	61.63	2.08	
10/20/98	600	146	60.7	3.53	15.45	48.6	52.92	5.41	50.6	48.73	10.67	37.1	57.69	1.66	39.2	61.63	2.08	
	1400	147	60.6	3.60	15.38	48.5	52.99	5.34	50.5	48.80	10.60	37.1	57.69	1.66	39.2	61.63	2.08	
	2200	148	61.2	3.19	15.80	48.5	52.99	5.34	51	48.46	10.95	37.1	57.69	1.66	39.2	61.63	2.08	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
10/21/98	600	149	61.2	3.19	15.80	48.5	52.99	5.34	51	48.46	10.95	37.1	57.69	1.66	39.2	61.63	2.08	
	1400	150	61	3.33	15.66	48.4	53.06	5.27	50.9	48.53	10.88	37.1	57.69	1.66	39.2	61.63	2.08	
	2200	151	61.2	3.19	15.80	48.4	53.06	5.27	50.9	48.53	10.88	37	57.76	1.59	39.1	61.70	2.01	
10/22/98	600	152				48.5	52.99	5.34	51	48.46	10.95	37.1	57.69	1.66	39.1	61.70	2.01	First Re-hab IW-8 for plugging
	1400	153				48.3	53.13	5.20	51	48.46	10.95	36.9	57.83	1.52	39.2	61.63	2.08	
	2200	154				48.3	53.13	5.20	50.7	48.66	10.74	37	57.76	1.59	39.2	61.63	2.08	
10/23/98	600	155				48.3	53.13	5.20	50.7	48.66	10.74	36.9	57.83	1.52	39.2	61.63	2.08	
	1400	156				48.1	53.27	5.06	50.6	48.73	10.67	36.9	57.83	1.52	39.2	61.63	2.08	
	2200	157				48.2	53.20	5.13	51.2	48.32	11.09	36.9	57.83	1.52	39.1	61.70	2.01	
10/24/98	600	158				48.2	53.20	5.13	51.2	48.32	11.09	36.9	57.83	1.52	39.1	61.70	2.01	
	1400	159				48.1	53.27	5.06	51.1	48.39	11.02	36.9	57.83	1.52	39.2	61.63	2.08	
	2200	160				48.2	53.20	5.13	51.2	48.32	11.09	36.9	57.83	1.52	39.1	61.70	2.01	
10/25/98	600	161				48.2	53.20	5.13	51.2	48.32	11.09	36.8	57.90	1.46	39.1	61.70	2.01	
	1400	162				48.1	53.27	5.06	51.7	47.97	11.43	36.8	57.90	1.46	39.1	61.70	2.01	
	2200	163				48.1	53.27	5.06	51.7	47.97	11.43	36.8	57.90	1.46	39.1	61.70	2.01	
10/26/98	600	164				48.2	53.20	5.13	51.7	47.97	11.43	36.8	57.90	1.46	39	61.77	1.94	
	1400	165				48.1	53.27	5.06	51.6	48.04	11.37	36.7	57.97	1.39	39.1	61.70	2.01	
	2200	166				48.1	53.27	5.06	51.6	48.04	11.37	36.7	57.97	1.39	39	61.77	1.94	
10/27/98	600	167				48.1	53.27	5.06	51.6	48.04	11.37	36.7	57.97	1.39	39	61.77	1.94	
	1400	168				48	53.34	4.99	51.6	48.04	11.37	36.7	57.97	1.39	39.1	61.70	2.01	
	2200	169				48.1	53.27	5.06	51.7	47.97	11.43	36.7	57.97	1.39	39	61.77	1.94	
10/28/98	600	170				48.1	53.27	5.06	51.7	47.97	11.43	36.7	57.97	1.39	39	61.77	1.94	
	1400	171				48.1	53.27	5.06	51.8	47.90	11.50	36.7	57.97	1.39	39	61.77	1.94	
	2200	172				48.1	53.27	5.06	51.9	47.83	11.57	36.6	58.04	1.32	38.9	61.84	1.87	
10/29/98	600	173				48.1	53.27	5.06	51.9	47.83	11.57	36.6	58.04	1.32	38.9	61.84	1.87	
	1400	174				48.1	53.27	5.06	52	47.76	11.64	36.7	57.97	1.39	39	61.77	1.94	
	2200	175	44.2	14.97	4.02	48.5	52.99	5.34	51.9	47.83	11.57	36.6	58.04	1.32	39	61.77	1.94	
10/30/98	600	176	44.2	14.97	4.02	48.6	52.92	5.41	51.9	47.83	11.57	36.6	58.04	1.32	38.9	61.84	1.87	
	1400	177	44.2	14.97	4.02	48.2	53.20	5.13	51.8	47.90	11.50	36.6	58.04	1.32	38.9	61.84	1.87	
	2200	178	44.2	14.97	4.02	48.3	53.13	5.20	51.9	47.83	11.57	36.5	58.11	1.25	38.8	61.91	1.80	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
10/31/98	600	179	44.2	14.97	4.02	48.3	53.13	5.20	51.9	47.83	11.57	36.5	58.11	1.25	38.8	61.91	1.80	
	1400	180	44.2	14.97	4.02	48.3	53.13	5.20	52	47.76	11.64	36.5	58.11	1.25	38.9	61.84	1.87	
	2200	181	44.2	14.97	4.02	48.4	53.06	5.27	53	47.07	12.34	36.5	58.11	1.25	38.9	61.84	1.87	
11/1/98	600	182	44.2	14.97	4.02	48.4	53.06	5.27	53.2	46.93	12.47	36.5	58.11	1.25	38.9	61.84	1.87	
	1400	183	44.2	14.97	4.02	48.4	53.06	5.27	53.5	46.72	12.68	36.5	58.11	1.25	38.9	61.84	1.87	
	2200	184	44.2	14.97	4.02	48.4	53.06	5.27	53.5	46.72	12.68	36.5	58.11	1.25	38.9	61.84	1.87	
11/2/98	600	185	44.2	14.97	4.02	48.4	53.06	5.27	53.5	46.72	12.68	36.5	58.11	1.25	38.9	61.84	1.87	
	1400	186	44.2	14.97	4.02	48.4	53.06	5.27	54	46.38	13.03	36.5	58.11	1.25	39	61.77	1.94	
	2200	187	44.2	14.97	4.02	48.4	53.06	5.27	53.9	46.45	12.96	36.5	58.11	1.25	38.9	61.84	1.87	
11/3/98	600	188	44.2	14.97	4.02	48.4	53.06	5.27	54.3	46.17	13.24	36.5	58.11	1.25	38.9	61.84	1.87	
	1400	189	44.2	14.97	4.02	48.4	53.06	5.27	54.4	46.10	13.31	36.5	58.11	1.25	38.9	61.84	1.87	
	2200	190	44.2	14.97	4.02	48.4	53.06	5.27	54.5	46.03	13.37	36.4	58.17	1.18	38.8	61.91	1.80	
11/4/98	600	191	44.2	14.97	4.02	48.4	53.06	5.27	54.8	45.82	13.58	36.4	58.17	1.18	38.8	61.91	1.80	
	1400	192	44.6	14.69	4.30	48.6	52.92	5.41	55.5	45.34	14.07	36.4	58.17	1.18	38.9	61.84	1.87	
	2200	193	44.6	14.69	4.30	48.6	52.92	5.41	55.6	45.27	14.14	36.4	58.17	1.18	39	61.77	1.94	
11/5/98	600	194	44.6	14.69	4.30	48.5	52.99	5.34	55.4	45.41	14.00	36.2	58.31	1.04	38.5	62.12	1.59	
	1400	195	44.4	14.83	4.16	48.4	53.06	5.27	55.7	45.20	14.21	36.3	58.24	1.11	38.7	61.98	1.73	
	2200	196	44.4	14.83	4.16	48.5	52.99	5.34	55.8	45.13	14.28	36.3	58.24	1.11	38.7	61.98	1.73	
11/6/98	600	197	44.4	14.83	4.16	48.5	52.99	5.34	55.8	45.13	14.28	36.3	58.24	1.11	38.7	61.98	1.73	
	1400	198	44.4	14.83	4.16	48.5	52.99	5.34	56.1	44.92	14.48	36.2	58.31	1.04	38.7	61.98	1.73	
	2200	199	44.4	14.83	4.16	48.5	52.99	5.34	56.9	44.37	15.04	36.2	58.31	1.04	38.7	61.98	1.73	
11/7/98	600	200	44.5	14.76	4.23	48.6	52.92	5.41	56.8	44.44	14.97	36.3	58.24	1.11	38.7	61.98	1.73	
	1400	201	44.5	14.76	4.23	48.3	53.13	5.20	57	44.30	15.11	36.4	58.17	1.18	38.8	61.91	1.80	
	2200	202	44.6	14.69	4.30	48.4	53.06	5.27	57	44.30	15.11	36.3	58.24	1.11	38.8	61.91	1.80	
11/8/98	600	203	44.6	14.69	4.30	48.4	53.06	5.27	57	44.30	15.11	36.3	58.24	1.11	38.8	61.91	1.80	
	1400	204	44.6	14.69	4.30	48.4	53.06	5.27	56.9	44.37	15.04	36.3	58.24	1.11	38.8	61.91	1.80	
	2200	205	44.5	14.76	4.23	48.4	53.06	5.27	56.9	44.37	15.04	36.3	58.24	1.11	38.7	61.98	1.73	
11/9/98	600	206	44.6	14.69	4.30	48.4	53.06	5.27	56.9	44.37	15.04	36.3	58.24	1.11	38.7	61.98	1.73	
	1400	207	44.5	14.76	4.23	48.3	53.13	5.20	57	44.30	15.11	36.3	58.24	1.11	38.8	61.91	1.80	
	2200	208	44.5	14.76	4.23	48.3	53.13	5.20	57	44.30	15.11	36.3	58.24	1.11	38.8	61.91	1.80	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
11/10/98	600	209	44.5	14.76	4.23	48.7	52.85	5.47	56.9	44.37	15.04	36.3	58.24	1.11	38.8	61.91	1.80	
	1400	210	44.3	14.90	4.09	48.7	52.85	5.47	57.1	44.23	15.18	36.3	58.24	1.11	38.7	61.98	1.73	
	2200	211	44.4	14.83	4.16	48.7	52.85	5.47	57	44.30	15.11	36.2	58.31	1.04	38.5	62.12	1.59	
11/11/98	600	212	44.5	14.76	4.23	48.8	52.78	5.54	57.1	44.23	15.18	36.2	58.31	1.04	38.5	62.12	1.59	
	1400	213	44.5	14.76	4.23	48.8	52.78	5.54	57.1	44.23	15.18	36.2	58.31	1.04	38.6	62.05	1.66	
	2200	214	44.5	14.76	4.23	48.8	52.78	5.54	57.3	44.09	15.32	36.2	58.31	1.04	38.6	62.05	1.66	
11/12/98	600	215	44.5	14.76	4.23	48.9	52.71	5.61	57.4	44.02	15.38	36.2	58.31	1.04	38.6	62.05	1.66	
	1400	216	44.9	14.48	4.50	48.8	52.78	5.54	58.8	43.05	16.35	36.2	58.31	1.04	38.7	61.98	1.73	
	2200	217	44.9	14.48	4.50	48.9	52.71	5.61	58.8	43.05	16.35	36.2	58.31	1.04	38.7	61.98	1.73	
11/13/98	600	218	44.9	14.48	4.50	48.7	52.85	5.47	58.7	43.12	16.29	36.2	58.31	1.04	38.7	61.98	1.73	
	1400	219	44.9	14.48	4.50	48.8	52.78	5.54	58.7	43.12	16.29	36.3	58.24	1.11	38.7	61.98	1.73	
	2200	220	44.6	14.69	4.30	48.9	52.71	5.61	58.6	43.19	16.22	36.3	58.24	1.11	38.8	61.91	1.80	
11/14/98	600	221	44.6	14.69	4.30	48.9	52.71	5.61	58.6	43.19	16.22	36.3	58.24	1.11	38.8	61.91	1.80	
	1400	222	44.6	14.69	4.30	48.8	52.78	5.54	58.5	43.26	16.15	36.3	58.24	1.11	38.8	61.91	1.80	
	2200	223	45	14.42	4.57	48.8	52.78	5.54	58.4	43.33	16.08	36.3	58.24	1.11	38.6	62.05	1.66	
11/15/98	600	224	45	14.42	4.57	48.8	52.78	5.54	58.4	43.33	16.08	36.2	58.31	1.04	38.5	62.12	1.59	
	1400	225	44.9	14.48	4.50	48.8	52.78	5.54	58.4	43.33	16.08	36.3	58.24	1.11	38.7	61.98	1.73	
	2200	226	45.1	14.35	4.64	48.9	52.71	5.61	59.6	42.50	16.91	36.4	58.17	1.18	38.7	61.98	1.73	
11/16/98	600	227	45.1	14.35	4.64	49	52.64	5.68	59.4	42.64	16.77	36.4	58.17	1.18	38.8	61.91	1.80	
	1400	228	44.9	14.48	4.50	49.1	52.57	5.75	60.5	41.87	17.53	36.2	58.31	1.04	38.9	61.84	1.87	
	2200	229	44.6	14.69	4.30	49.1	52.57	5.75	60.4	41.94	17.46	36.1	58.38	0.97	38.5	62.12	1.59	
11/17/98	600	230	44.8	14.55	4.44	48.7	52.85	5.47	59.9	42.29	17.12	36	58.45	0.90	38.5	62.12	1.59	
	1400	231	45.1	14.35	4.64	49.2	52.50	5.82	60.9	41.60	17.81	36.1	58.38	0.97	38.5	62.12	1.59	
	2200	232	45.2	14.28	4.71	49.3	52.44	5.89	59.9	42.29	17.12	36.1	58.38	0.97	38.5	62.12	1.59	
11/18/98	600	233	45.2	14.28	4.71	49.4	52.37	5.96	59.9	42.29	17.12	36.2	58.31	1.04	38.6	62.05	1.66	
	1400	234	44.9	14.48	4.50	49.1	52.57	5.75	60.3	42.01	17.39	36.2	58.31	1.04	38.9	61.84	1.87	
	2200	235	44.9	14.48	4.50	48.9	52.71	5.61	60.4	41.94	17.46	36.1	58.38	0.97	38.8	61.91	1.80	
11/19/98	600	236	44.9	14.48	4.50	48.9	52.71	5.61	60.3	42.01	17.39	36.1	58.38	0.97	38.7	61.98	1.73	
	1400	237	44.9	14.48	4.50	48.9	52.71	5.61	60.3	42.01	17.39	36.1	58.38	0.97	38.7	61.98	1.73	
	2200	238	45	14.42	4.57	49	52.64	5.68	61.5	41.18	18.23	36.1	58.38	0.97	38.7	61.98	1.73	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
11/20/98	600	239	45	14.42	4.57	49.1	52.57	5.75	61.1	41.46	17.95	36.1	58.38	0.97	38.7	61.98	1.73	
	1400	240	45	14.42	4.57	49	52.64	5.68	61.2	41.39	18.02	36.1	58.38	0.97	38.7	61.98	1.73	
	2200	241	45.1	14.35	4.64	49.1	52.57	5.75	61.2	41.39	18.02	36.1	58.38	0.97	38.6	62.05	1.66	
11/21/98	600	242	45.1	14.35	4.64	49.2	52.50	5.82	61.1	41.46	17.95	36.1	58.38	0.97	38.7	61.98	1.73	
	1400	243	45.1	14.35	4.64	49.3	52.44	5.89	61.1	41.46	17.95	36.1	58.38	0.97	38.7	61.98	1.73	
	2200	244	45.1	14.35	4.64	49.2	52.50	5.82	61.1	41.46	17.95	36.1	58.38	0.97	38.7	61.98	1.73	
11/22/98	600	245	45.1	14.35	4.64	49.2	52.50	5.82	61.1	41.46	17.95	36.1	58.38	0.97	38.7	61.98	1.73	
	1400	246	45.3	14.21	4.78	49.1	52.57	5.75	60.4	41.94	17.46	36	58.45	0.90	38.5	62.12	1.59	
	2200	247	45.3	14.21	4.78	49.2	52.50	5.82	60.4	41.94	17.46	36	58.45	0.90	38.6	62.05	1.66	
11/23/98	600	248	45.4	14.14	4.85	49.3	52.44	5.89	60.3	42.01	17.39	36	58.45	0.90	38.6	62.05	1.66	
	1400	249	45.3	14.21	4.78	49.2	52.50	5.82	60.2	42.08	17.33	36	58.45	0.90	38.5	62.12	1.59	
	2200	250	45.4	14.14	4.85	49.4	52.37	5.96	60.4	41.94	17.46	36	58.45	0.90	38.4	62.19	1.52	
11/24/98	600	251	45.5	14.07	4.92	49.5	52.30	6.03	60.6	41.80	17.60	36.1	58.38	0.97	38.5	62.12	1.59	
	1400	252	45.4	14.14	4.85	49.4	52.37	5.96	60.5	41.87	17.53	36.1	58.38	0.97	38.6	62.05	1.66	
	2200	253	45.5	14.07	4.92	49.5	52.30	6.03	60.7	41.73	17.67	36.1	58.38	0.97	38.6	62.05	1.66	
11/25/98	600	254	45.5	14.07	4.92	49.5	52.30	6.03	60.7	41.73	17.67	36.1	58.38	0.97	38.7	61.98	1.73	
	1400	255	45.4	14.14	4.85	49.4	52.37	5.96	61.8	40.97	18.43	36	58.45	0.90	38.6	62.05	1.66	
	2200	256	45.4	14.14	4.85	49.4	52.37	5.96	61.6	41.11	18.30	35.9	58.52	0.83	38.4	62.19	1.52	
11/26/98	600	257	45.5	14.07	4.92	49.5	52.30	6.03	61.7	41.04	18.36	35.9	58.52	0.83	38.4	62.19	1.52	
	1400	258	45.5	14.07	4.92	49.5	52.30	6.03	61.6	41.11	18.30	36	58.45	0.90	38.5	62.12	1.59	
	2200	259	45.6	14.00	4.99	49.6	52.23	6.10	61.7	41.04	18.36	36	58.45	0.90	38.5	62.12	1.59	
11/27/98	600	260	45.6	14.00	4.99	49.7	52.16	6.17	61.8	40.97	18.43	36	58.45	0.90	38.5	62.12	1.59	
	1400	261	45.5	14.07	4.92	49.5	52.30	6.03	61.6	41.11	18.30	36	58.45	0.90	38.5	62.12	1.59	
	2200	262	45.6	14.00	4.99	49.6	52.23	6.10	61.8	40.97	18.43	36	58.45	0.90	38.5	62.12	1.59	
11/28/98	600	263	45.6	14.00	4.99	49.7	52.16	6.17	61	41.53	17.88	36	58.45	0.90	38.6	62.05	1.66	
	1400	264	45.5	14.07	4.92	49.6	52.23	6.10	60.9	41.60	17.81	36	58.45	0.90	38.6	62.05	1.66	
	2200	265	45.6	14.00	4.99	49.7	52.16	6.17	61.1	41.46	17.95	36	58.45	0.90	38.6	62.05	1.66	
11/29/98	600	266	45.6	14.00	4.99	49.7	52.16	6.17	61	41.53	17.88	36	58.45	0.90	38.6	62.05	1.66	
	1400	267	45.5	14.07	4.92	49.6	52.23	6.10	61	41.53	17.88	36	58.45	0.90	38.6	62.05	1.66	
	2200	268	45.5	14.07	4.92	49.6	52.23	6.10	61.1	41.46	17.95	36	58.45	0.90	38.5	62.12	1.59	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
11/30/98	600	269	45.5	14.07	4.92	49.6	52.23	6.10	61.1	41.46	17.95	36	58.45	0.90	38.5	62.12	1.59	
	1400	270	45.5	14.07	4.92	49.6	52.23	6.10	61.1	41.46	17.95	36	58.45	0.90	38.6	62.05	1.66	
	2200	271	45.6	14.00	4.99	49.7	52.16	6.17	61.1	41.46	17.95	35.9	58.52	0.83	38.4	62.19	1.52	
12/1/98	600	272	45.6	14.00	4.99	49.7	52.16	6.17	61.2	41.39	18.02	35.8	58.59	0.76	38.4	62.19	1.52	
	1400	273	45.6	14.00	4.99	49.7	52.16	6.17	61.2	41.39	18.02	35.9	58.52	0.83	38.5	62.12	1.59	
	2200	274	45.7	13.93	5.06	49.7	52.16	6.17	61.3	41.32	18.09	35.9	58.52	0.83	38.6	62.05	1.66	
12/2/98	600	275	45.7	13.93	5.06	49.8	52.09	6.24	61.4	41.25	18.16	35.9	58.52	0.83	38.6	62.05	1.66	
	1400	276	45.6	14.00	4.99	49.7	52.16	6.17	61.4	41.25	18.16	35.9	58.52	0.83	38.6	62.05	1.66	
	2200	277	45.7	13.93	5.06	49.8	52.09	6.24	61.5	41.18	18.23	35.9	58.52	0.83	38.6	62.05	1.66	
12/3/98	600	278	45.6	14.00	4.99	49.7	52.16	6.17	61.4	41.25	18.16	35.9	58.52	0.83	38.5	62.12	1.59	
	1400	279	45.6	14.00	4.99	49.7	52.16	6.17	61.3	41.32	18.09	35.9	58.52	0.83	38.6	62.05	1.66	
	2200	280	45.6	14.00	4.99	49.7	52.16	6.17	61.3	41.32	18.09	35.8	58.59	0.76	38.4	62.19	1.52	
12/4/98	600	281	45.6	14.00	4.99	49.8	52.09	6.24	61.5	41.18	18.23	35.8	58.59	0.76	38.5	62.12	1.59	
	1400	282	45.6	14.00	4.99	49.7	52.16	6.17	61.4	41.25	18.16	35.8	58.59	0.76	38.5	62.12	1.59	
	2200	283	45.7	13.93	5.06	49.8	52.09	6.24	61.7	41.04	18.36	35.8	58.59	0.76	38.5	62.12	1.59	
12/5/98	600	284	45.7	13.93	5.06	49.8	52.09	6.24	61.7	41.04	18.36	35.9	58.52	0.83	38.6	62.05	1.66	
	1400	285	45.8	13.86	5.13	49.9	52.02	6.31	63.3	39.93	19.47	35.9	58.52	0.83	38.7	61.98	1.73	
	2200	286	45.9	13.79	5.20	50	51.95	6.38	63	40.14	19.27	35.9	58.52	0.83	38.7	61.98	1.73	
12/6/98	600	287	45.9	13.79	5.20	50.1	51.88	6.44	63	40.14	19.27	35.9	58.52	0.83	38.7	61.98	1.73	
	1400	288	46	13.72	5.27	50.2	51.81	6.51	63.1	40.07	19.33	36	58.45	0.90	38.8	61.91	1.80	
	2200	289	46	13.72	5.27	50.2	51.81	6.51	63.1	40.07	19.33	36	58.45	0.90	38.8	61.91	1.80	
12/7/98	600	290	46	13.72	5.27	50.1	51.88	6.44	62.8	40.28	19.13	35.8	58.59	0.76	38.6	62.05	1.66	
	1400	291	46	13.72	5.27	50.3	51.74	6.58	63	40.14	19.27	35.9	58.52	0.83	38.5	62.12	1.59	
	2200	292	46.1	13.65	5.34	50.3	51.74	6.58	63.1	40.07	19.33	35.9	58.52	0.83	38.5	62.12	1.59	
12/8/98	600	293	46.1	13.65	5.34	50.3	51.74	6.58	63.1	40.07	19.33	35.9	58.52	0.83	38.5	62.12	1.59	
	1400	294	46.1	13.65	5.34	50.3	51.74	6.58	63.1	40.07	19.33	35.9	58.52	0.83	38.5	62.12	1.59	
	2200	295	46.1	13.65	5.34	50.3	51.74	6.58	63.2	40.00	19.40	35.9	58.52	0.83	38.5	62.12	1.59	
12/9/98	600	296	46.1	13.65	5.34	50.3	51.74	6.58	63.2	40.00	19.40	35.8	58.59	0.76	38.5	62.12	1.59	
	1400	297	46.1	13.65	5.34	50.2	51.81	6.51	66.2	37.92	21.48	35.8	58.59	0.76	38.3	62.26	1.46	#10 injecting at 239 gpm
	2200	298	46.1	13.65	5.34	50.1	51.88	6.44	68.6	36.26	23.15	35.7	58.66	0.69	38.6	62.05	1.66	#10 injecting at 250 gpm

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
12/10/98	600	299	46.1	13.65	5.34	50.1	51.88	6.44	68.6	36.26	23.15	35.7	58.66	0.69	38.6	62.05	1.66	
	1400	300	46.4	13.44	5.54	50	51.95	6.38	62.8	40.28	19.13	35.9	58.52	0.83	38.5	62.12	1.59	#10 injection corrected,
	2200	301	46.3	13.51	5.47	50.3	51.74	6.58	62.3	40.63	18.78	35.7	58.66	0.69	38.5	62.12	1.59	bad valve
12/11/98	600	302	46.3	13.51	5.47	50.3	51.74	6.58	62.4	40.56	18.85	35.7	58.66	0.69	38.5	62.12	1.59	
	1400	303	46.4	13.44	5.54	50.4	51.67	6.65	64.8	38.89	20.51	35.8	58.59	0.76	38.5	62.12	1.59	
	2200	304	46.5	13.38	5.61	50.4	51.67	6.65	64.7	38.96	20.44	35.8	58.59	0.76	38.6	62.05	1.66	
12/12/98	600	305	46.5	13.38	5.61	50.5	51.60	6.72	64.6	39.03	20.37	35.8	58.59	0.76	38.6	62.05	1.66	
	1400	306	46.4	13.44	5.54	50.4	51.67	6.65	64.5	39.10	20.30	35.8	58.59	0.76	38.6	62.05	1.66	
	2200	307	46.4	13.44	5.54	50.4	51.67	6.65	64.5	39.10	20.30	35.8	58.59	0.76	38.6	62.05	1.66	
12/13/98	600	308	46.4	13.44	5.54	50.4	51.67	6.65	64.5	39.10	20.30	35.8	58.59	0.76	38.6	62.05	1.66	
	1400	309	46.4	13.44	5.54	50.4	51.67	6.65	64.5	39.10	20.30	35.7	58.66	0.69	38.6	62.05	1.66	
	2200	310	46.5	13.38	5.61	49.9	52.02	6.31	64.8	38.89	20.51	35.7	58.66	0.69	38.5	62.12	1.59	
12/14/98	600	311	46.5	13.38	5.61	50	51.95	6.38	64.9	38.82	20.58	35.7	58.66	0.69	38.5	62.12	1.59	
	1400	312	46.1	13.65	5.34	50	51.95	6.38	63.8	39.59	19.82	35.7	58.66	0.69	38.6	62.05	1.66	
	2200	313	46.1	13.65	5.34	50.1	51.88	6.44	65.3	38.55	20.86	35.7	58.66	0.69	38.6	62.05	1.66	
12/15/98	600	314	46.1	13.65	5.34	50.1	51.88	6.44	65.3	38.55	20.86	35.7	58.66	0.69	38.6	62.05	1.66	
	1400	315	46.3	13.51	5.47	50.2	51.81	6.51	68.3	36.47	22.94	35.8	58.59	0.76	38.7	61.98	1.73	
	2200	316	46.4	13.44	5.54	50.3	51.74	6.58	68.3	36.47	22.94	35.8	58.59	0.76	38.7	61.98	1.73	
12/16/98	600	317	46.5	13.38	5.61	50.3	51.74	6.58	67.6	36.95	22.45	35.8	58.59	0.76	38.8	61.91	1.80	
	1400	318	46.4	13.44	5.54	50.3	51.74	6.58	67.3	37.16	22.25	35.8	58.59	0.76	38.8	61.91	1.80	
	2200	319	46.4	13.44	5.54	50.3	51.74	6.58	67.3	37.16	22.25	35.8	58.59	0.76	38.7	61.98	1.73	
12/17/98	600	320	46.5	13.38	5.61	50.3	51.74	6.58	67.4	37.09	22.31	35.7	58.66	0.69	38.6	62.05	1.66	
	1400	321																system off for repairs to
	2200	322																sparge ring in water tank
12/18/98	600	323																No re-injection taking place
	1400	324																
	2200	325																
12/19/98	600	326																
	1400	327																
	2200	328	46.6	13.31	5.68	50	51.95	6.38	67.5	37.02	22.38	35.3	58.94	0.42	38.2	62.33	1.39	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
12/20/98	600	329	46.7	13.24	5.75	50.2	51.81	6.51	67.5	37.02	22.38	35.5	58.80	0.55	38.3	62.26	1.46	
	1400	330	46.8	13.17	5.82	50.3	51.74	6.58	67.5	37.02	22.38	35.4	58.87	0.49	38.3	62.26	1.46	
	2200	331	46.8	13.17	5.82	50.3	51.74	6.58	67.5	37.02	22.38	35.5	58.80	0.55	38.3	62.26	1.46	
12/21/98	600	332	46.8	13.17	5.82	50.3	51.74	6.58	67.5	37.02	22.38	35.5	58.80	0.55	38.4	62.19	1.52	
	1400	333	46.8	13.17	5.82	50.3	51.74	6.58	67.5	37.02	22.38	35.6	58.73	0.62	38.4	62.19	1.52	
	2200	334	47	13.03	5.96	50.4	51.67	6.65	67.9	36.75	22.66	35.4	58.87	0.49	38.2	62.33	1.39	
12/22/98	600	335	47.2	12.89	6.10	50.5	51.60	6.72	67.7	36.88	22.52	35.3	58.94	0.42	38	62.47	1.25	
	1400	336																system off to facilitate
	2200	337																discharge to river. No
12/23/98	600	338																re-injection taking place
	1400	339																
	2200	340																
12/24/98	600	341																
	1400	342																
	2200	343																
12/25/98	600	344																
	1400	345																
	2200	346																
12/26/98	600	347																
	1400	348																
	2200	349																
12/27/98	600	350																
	1400	351																
	2200	352																
12/28/98	600	353																
	1400	354																
	2200	355																
12/29/98	600	356																
	1400	357																
	2200	358																

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
12/30/98	600	359																
	1400	360																
	2200	361																
12/31/98	600	362																
	1400	363																
	2200	364	46.6	13.31	5.68	47.1	53.96	4.37	64.9	38.82	20.58	34.7	59.35	0.00	36.9	63.23	0.49	Flow in 9 decreased to
1/1/99	600	365	46.8	13.17	5.82	47.6	53.61	4.71	59.2	42.77	16.63	38.5	56.72	2.63	38.9	61.84	1.87	150 gpm, lost restriction
	1400	366	46.7	13.24	5.75	47.6	53.61	4.71	62.8	40.28	19.13	34.7	59.35	0.00	37.4	62.88	0.83	orifice
	2200	367	48.9	11.71	7.28	47.6	53.61	4.71	62.8	40.28	19.13	34.8	59.28	0.07	37.5	62.81	0.90	
1/2/99	600	368	49.1	11.57	7.42	47.7	53.54	4.78	60.9	41.60	17.81	35	59.15	0.21	37.7	62.67	1.04	
	1400	369	49	11.64	7.35	47.6	53.61	4.71	63.4	39.86	19.54	35	59.15	0.21	37.7	62.67	1.04	
	2200	370	49	11.64	7.35	47.6	53.61	4.71	63.4	39.86	19.54	34.9	59.21	0.14	37.4	62.88	0.83	
1/3/99	600	371	49.2	11.50	7.48	47.7	53.54	4.78	63.9	39.52	19.89	34.8	59.28	0.07	37.3	62.95	0.76	
	1400	372	49.2	11.50	7.48	47.7	53.54	4.78	64.4	39.17	20.24	34.9	59.21	0.14	37.3	62.95	0.76	
	2200	373	49.3	11.44	7.55	47.7	53.54	4.78	64.6	39.03	20.37	34.9	59.21	0.14	37.3	62.95	0.76	
1/4/99	600	374	49.5	11.30	7.69	47.9	53.41	4.92	65.2	38.62	20.79	34.9	59.21	0.14	37.4	62.88	0.83	
	1400	375	49.6	11.23	7.76	48	53.34	4.99	65.5	38.41	21.00	35	59.15	0.21	37.4	62.88	0.83	
	2200	376	49.6	11.23	7.76	48	53.34	4.99	65.4	38.48	20.93	35	59.15	0.21	37.4	62.88	0.83	
1/5/99	600	377	49.7	11.16	7.83	48.1	53.27	5.06	65.8	38.20	21.21	35	59.15	0.21	37.5	62.81	0.90	
	1400	378	50.3	10.74	8.25	48.1	53.27	5.06	74	32.52	26.89	35.5	58.80	0.55	37.8	62.60	1.11	
	2200	379	50.4	10.67	8.32	48.2	53.20	5.13	74.1	32.45	26.96	35.6	58.73	0.62	41.6	59.97	3.74	
1/6/99	600	380	50	10.95	8.04	48.4	53.06	5.27	74.9	31.89	27.51	35.7	58.66	0.69	36.5	63.51	0.21	
	1400	381	50	10.95	8.04	48	53.34	4.99	73.3	33.00	26.40	35.7	58.66	0.69	36.5	63.51	0.21	
	2200	382	50	10.95	8.04	47.9	53.41	4.92	76.4	30.85	28.55	35.5	58.80	0.55	37.6	62.74	0.97	
1/7/99	600	383	50.5	10.60	8.39	48.4	53.06	5.27	75.6	31.41	28.00	35.5	58.80	0.55	37.7	62.67	1.04	
	1400	384	50.5	10.60	8.39	48.4	53.06	5.27	75.3	31.62	27.79	35.6	58.73	0.62	37.9	62.54	1.18	
	2200	385	50.4	10.67	8.32	48.4	53.06	5.27	75.4	31.55	27.86	35.6	58.73	0.62	38	62.47	1.25	
1/8/99	600	386	50.5	10.60	8.39	48.4	53.06	5.27	75.4	31.55	27.86	35.7	58.66	0.69	38	62.47	1.25	
	1400	387																system off to facilitate
	2200	388																discharge to river. No
																		re-injection taking place.

000198

TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
1/9/99	600	389																
	1400	390																
	2200	391																
1/10/99	600	392																
	1400	393																
	2200	394																
1/11/99	600	395																
	1400	396																
	2200	397																
1/12/99	600	398																
	1400	399																
	2200	400																
1/13/99	600	401																
	1400	402																
	2200	403																
1/14/99	600	404																
	1400	405																
	2200	406																
1/15/99	600	407																
	1400	408																
	2200	409																
1/16/99	600	410																
	1400	411																
	2200	412																
1/17/99	600	413																
	1400	414																
	2200	415																
1/18/99	600	416																
	1400	417																
	2200	418																

2999

000199

TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
1/19/99	600	419																
	1400	420																
	2200	421																
1/20/99	600	422																
	1400	423																
	2200	424																
1/21/99	600	425																
	1400	426																
	2200	427																
1/22/99	600	428																
	1400	429																
	2200	430	53.1	8.80	10.19	50.3	51.74	6.58	77.2	30.30	29.11	36.4	58.17	1.18	38.5	62.12	1.59	
1/23/99	600	431	52.5	9.22	9.77	44.2	55.97	2.36	72.3	33.70	25.71	36.5	58.11	1.25	38.7	61.98	1.73	
	1400	432	52.8	9.01	9.98	54.4	48.90	9.42	73.3	33.00	26.40	36.6	58.04	1.32	38.7	61.98	1.73	
	2200	433	53.6	8.46	10.53	52.2	50.43	7.90	73.6	32.80	26.61	36.6	58.04	1.32	38.6	62.05	1.66	
1/24/99	600	434																operators missed readings at
	1400	435																DCS
	2200	436																
1/25/99	600	437	54.4	7.90	11.09	53	49.87	8.45	76.7	30.65	28.76	36.9	57.83	1.52	39	61.77	1.94	
	1400	438	54.2	8.04	10.95	53.3	49.66	8.66	78.5	29.40	30.01	36.9	57.83	1.52	39.5	61.43	2.29	
	2200	439	54.7	7.69	11.30	53.3	49.66	8.66	78.1	29.68	29.73	37.2	57.62	1.73	39.5	61.43	2.29	
1/26/99	600	440	54.8	7.62	11.37	53.4	49.59	8.73	78.1	29.68	29.73	37.3	57.55	1.80	39.7	61.29	2.43	
	1400	441																operators missed readings at
	2200	442	54.8	7.62	11.37	53.4	49.59	8.73	78.2	29.61	29.80	37.4	57.48	1.87	39.9	61.15	2.56	DCS
1/27/99	600	443	54.7	7.69	11.30	53.5	49.52	8.80	78.4	29.47	29.94	37.4	57.48	1.87	39.9	61.15	2.56	
	1400	444	54.7	7.69	11.30	53.5	49.52	8.80	78.4	29.47	29.94	37.5	57.41	1.94	39.9	61.15	2.56	
	2200	445	54.8	7.62	11.37	53.6	49.46	8.87	78.6	29.33	30.08	37.5	57.41	1.94	39.8	61.22	2.49	
1/28/99	600	446	54.8	7.62	11.37	53.6	49.46	8.87	78.7	29.26	30.15	37.5	57.41	1.94	39.8	61.22	2.49	
	1400	447	54.8	7.62	11.37	53.6	49.46	8.87	78.7	29.26	30.15	37.5	57.41	1.94	39.9	61.15	2.56	
	2200	448	54.9	7.55	11.43	53.8	49.32	9.01	79.1	28.98	30.42	37.5	57.41	1.94	39.9	61.15	2.56	

000200

TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
1/29/99	600	449	54.9	7.55	11.43	53.8	49.32	9.01	79.1	28.98	30.42	37.6	57.34	2.01	39.9	61.15	2.56	
	1400	450	54.9	7.55	11.43	53.8	49.32	9.01	79.1	28.98	30.42	37.7	57.27	2.08	40.1	61.01	2.70	
	2200	451	54.9	7.55	11.43	53.8	49.32	9.01	79.2	28.91	30.49	37.7	57.27	2.08	40.1	61.01	2.70	
1/30/99	600	452	55	7.49	11.50	53.9	49.25	9.08	79.3	28.85	30.56	37.7	57.27	2.08	40.1	61.01	2.70	
	1400	453	54.9	7.55	11.43	53.8	49.32	9.01	79.3	28.85	30.56	37.8	57.20	2.15	40.2	60.94	2.77	
	2200	454	55	7.49	11.50	53.9	49.25	9.08	79.5	28.71	30.70	37.8	57.20	2.15	40.2	60.94	2.77	
1/31/99	600	455	55	7.49	11.50	53.9	49.25	9.08	79.5	28.71	30.70	37.8	57.20	2.15	40.3	60.87	2.84	
	1400	456	55	7.49	11.50	53.9	49.25	9.08	79.5	28.71	30.70	37.8	57.20	2.15	40.4	60.80	2.91	
	2200	457	55.1	7.42	11.57	54	49.18	9.15	79.7	28.57	30.84	37.9	57.14	2.22	40.4	60.80	2.91	
2/1/99	600	458	55.1	7.42	11.57	54	49.18	9.15	79.6	28.64	30.77	37.9	57.14	2.22	40.4	60.80	2.91	
	1400	459	55.4	7.21	11.78	54.2	49.04	9.29	80.1	28.29	31.12	38.1	57.00	2.36	40.6	60.66	3.05	
	2200	460	55.3	7.28	11.71	54.2	49.04	9.29	79.8	28.50	30.91	38	57.07	2.29	40.5	60.73	2.98	
2/2/99	600	461	55.4	7.21	11.78	54.2	49.04	9.29	80	28.36	31.05	38	57.07	2.29	40.6	60.66	3.05	
	1400	462	55.3	7.28	11.71	54.2	49.04	9.29	80	28.36	31.05	38.1	57.00	2.36	40.6	60.66	3.05	
	2200	463	55.4	7.21	11.78	54.2	49.04	9.29	80.1	28.29	31.12	37.9	57.14	2.22	40.4	60.80	2.91	
2/3/99	600	464	55.5	7.14	11.85	54.4	48.90	9.42	80.4	28.08	31.32	38	57.07	2.29	40.5	60.73	2.98	
	1400	465	55.5	7.14	11.85	54.3	48.97	9.36	80.4	28.08	31.32	38.2	56.93	2.43	40.7	60.59	3.12	
	2200	466	55.6	7.07	11.92	54.4	48.90	9.42	80.5	28.01	31.39	38.2	56.93	2.43	40.7	60.59	3.12	
2/4/99	600	467	55.6	7.07	11.92	54.4	48.90	9.42	80.5	28.01	31.39	38.1	57.00	2.36	40.6	60.66	3.05	
	1400	468	55.6	7.07	11.92	54.4	48.90	9.42	80.4	28.08	31.32	38	57.07	2.29	40.4	60.80	2.91	
	2200	469	55.7	7.00	11.99	54.6	48.76	9.56	80.7	27.87	31.53	38.1	57.00	2.36	40.6	60.66	3.05	
2/5/99	600	470	55.7	7.00	11.99	54.6	48.76	9.56	80.7	27.87	31.53	38.2	56.93	2.43	40.8	60.53	3.19	
	1400	471	55.6	7.07	11.92	54.6	48.76	9.56	80.7	27.87	31.53	38.4	56.79	2.56	41	60.39	3.33	
	2200	472	55.7	7.00	11.99	54.7	48.69	9.63	80.9	27.74	31.67	38.4	56.79	2.56	41.1	60.32	3.40	
2/6/99	600	473																Electrical Outage. No
	1400	474																re-injection taking place.
	2200	475																
2/7/99	600	476																
	1400	477										38.4	56.79	2.56	40.8	60.53	3.19	Loss of communication with
	2200	478										38.3	56.86	2.49	40.7	60.59	3.12	IW-8 and IW-9 at DCS.

000201

2999

TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
2/8/99	600	479										38.5	56.72	2.63	41.2	60.25	3.47	
	1400	480	56.2	6.65	12.34	54.8	48.62	9.70	82.1	26.90	32.50	38.8	56.51	2.84	41.4	60.11	3.60	
	2200	481	57.2	5.96	13.03	55	48.49	9.84	84.2	25.45	33.96	39.1	56.30	3.05	41.4	60.11	3.60	
2/9/99	600	482	57.3	5.89	13.10	55	48.49	9.84	84	25.59	33.82	39.3	56.17	3.19	41.3	60.18	3.53	
	1400	483	56.8	6.24	12.75	55	48.49	9.84	82.8	26.42	32.99	39.6	55.96	3.40	41.3	60.18	3.53	
	2200	484	57	6.10	12.89	55.2	48.35	9.98	83.2	26.14	33.26	41.1	54.92	4.44	41.4	60.11	3.60	
2/10/99	600	485	57.1	6.03	12.96	55.2	48.35	9.98	83.3	26.07	33.33	43.1	53.53	5.82	41.4	60.11	3.60	
	1400	486	57.8	5.54	13.44	34.2	48.30	10.03	65.7	26.47	32.94	38.9	45.04	14.31	17.1	60.15	3.56	Transducers adjusted to new
	2200	487	57.5	5.75	13.24	27.9	52.67	5.66	65.8	26.40	33.01				17.1	60.15	3.56	depths to match variance
2/11/99	600	488	57.5	5.75	13.24	34.4	48.16	10.16	65.8	26.40	33.01				17.1	60.15	3.56	50.03.79-2. Operators
	1400	489	57.5	5.75	13.24	34.3	48.23	10.10	65.6	26.54	32.87	21.8	56.89	2.46	17.2	60.08	3.63	missed readings for IW-11 at
	2200	490	57.6	5.68	13.31	34.4	48.16	10.16	65.7	26.47	32.94	21.7	56.96	2.39	17.1	60.15	3.56	DCS.
2/12/99	600	491	57.7	5.61	13.37	34.6	48.02	10.30	66	26.26	33.14	21.7	56.96	2.39	17	60.22	3.49	
	1400	492	57.8	5.54	13.44	34.7	47.95	10.37	66.1	26.19	33.21	21.9	56.82	2.53	17.3	60.01	3.70	
	2200	493	57.9	5.48	13.51	34.8	47.88	10.44	66.2	26.12	33.28	21.9	56.82	2.53	17.2	60.08	3.63	
2/13/99	600	494	57.9	5.48	13.51	34.8	47.88	10.44	66.2	26.12	33.28	21.8	56.89	2.46	17.1	60.15	3.56	
	1400	495	57.9	5.48	13.51	34.8	47.88	10.44	66.2	26.12	33.28	21.9	56.82	2.53	17.3	60.01	3.70	
	2200	496	58	5.41	13.58	34.9	47.81	10.51	66.5	25.92	33.49	22	56.75	2.60	17.1	60.15	3.56	
2/14/99	600	497	58.1	5.34	13.65	35	47.75	10.58	66.6	25.85	33.56	22	56.75	2.60	17.1	60.15	3.56	
	1400	498	58	5.41	13.58	34.9	47.81	10.51	66.3	26.05	33.35	22.1	56.68	2.67	17.6	59.80	3.91	
	2200	499	58.1	5.34	13.65	35	47.75	10.58	66.5	25.92	33.49	22.1	56.68	2.67	17.6	59.80	3.91	
2/15/99	600	500	58.1	5.34	13.65	35	47.75	10.58	66.5	25.92	33.49	22.1	56.68	2.67	17.6	59.80	3.91	
	1400	501	58	5.41	13.58	35	47.75	10.58	66.5	25.92	33.49	22.2	56.62	2.74	17.7	59.73	3.98	
	2200	502	58.1	5.34	13.65	35	47.75	10.58	66.6	25.85	33.56	22.2	56.62	2.74	17.6	59.80	3.91	
2/16/99	600	503	58.1	5.34	13.65	35.1	47.68	10.65	66.6	25.85	33.56	22.2	56.62	2.74	17.7	59.73	3.98	
	1400	504	58.2	5.27	13.72	35.1	47.68	10.65	66.7	25.78	33.63	22.3	56.55	2.81	17.8	59.66	4.05	
	2200	505	58.2	5.27	13.72	35.1	47.68	10.65	66.8	25.71	33.70	22.3	56.55	2.81	17.7	59.73	3.98	
2/17/99	600	506	58.3	5.20	13.79	35.2	47.61	10.72	66.8	25.71	33.70	22.3	56.55	2.81	17.7	59.73	3.98	
	1400	507	58.9	4.78	14.21	35.6	47.33	11.00	71.1	22.73	36.68	22.4	56.48	2.88	17.9	59.60	4.12	
	2200	508	59	4.71	14.28	35.6	47.33	11.00	70.2	23.35	36.06	22.4	56.48	2.88	17.8	59.66	4.05	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
2/18/99	600	509	59	4.71	14.28	35.7	47.26	11.07	69.9	23.56	35.85	22.5	56.41	2.95	17.9	59.60	4.12	
	1400	510	59	4.71	14.28	35.7	47.26	11.07	69.8	23.63	35.78	22.5	56.41	2.95	18	59.53	4.19	
	2200	511	59.1	4.64	14.35	35.7	47.26	11.07	69.8	23.63	35.78	22.5	56.41	2.95	18	59.53	4.19	
2/19/99	600	512	59.1	4.64	14.35	35.8	47.19	11.14	69.7	23.70	35.71	22.6	56.34	3.01	18	59.53	4.19	
	1400	513	59.1	4.64	14.35	35.8	47.19	11.14	69.6	23.77	35.64	22.6	56.34	3.01	18.1	59.46	4.26	
	2200	514	59.2	4.57	14.41	35.8	47.19	11.14	69.7	23.70	35.71	22.6	56.34	3.01	18	59.53	4.19	
2/20/99	600	515	59.1	4.64	14.35	35.8	47.19	11.14	69.7	23.70	35.71	22.6	56.34	3.01	18	59.53	4.19	
	1400	516	59.1	4.64	14.35	35.8	47.19	11.14	69.6	23.77	35.64	22.6	56.34	3.01	18.1	59.46	4.26	
	2200	517	60.1	3.95	15.04	36.1	46.98	11.34	74.5	20.37	39.03	22.6	56.34	3.01	18.1	59.46	4.26	
2/21/99	600	518	60.2	3.88	15.11	36.2	46.91	11.41	71.5	22.45	36.96	22.6	56.34	3.01	18.1	59.46	4.26	
	1400	519	60.2	3.88	15.11	35.9	47.12	11.20	71.4	22.52	36.89	22.7	56.27	3.08	18.3	59.32	4.40	
	2200	520	60.3	3.81	15.18	35.9	47.12	11.20	71.4	22.52	36.89	22.7	56.27	3.08	18.2	59.39	4.33	
2/22/99	600	521	60.3	3.81	15.18	35.9	47.12	11.20	71.3	22.59	36.82	22.7	56.27	3.08	18.2	59.39	4.33	
	1400	522	60.3	3.81	15.18	35.9	47.12	11.20	71.5	22.45	36.96	22.8	56.20	3.15	18.4	59.25	4.46	
	2200	523	60.3	3.81	15.18	35.9	47.12	11.20	71.4	22.52	36.89	22.8	56.20	3.15	18.4	59.25	4.46	
2/23/99	600	524	60.4	3.74	15.25	35.9	47.12	11.20	71.4	22.52	36.89	22.8	56.20	3.15	18.4	59.25	4.46	
	1400	525	60.3	3.81	15.18	35.9	47.12	11.20	71.4	22.52	36.89	22.9	56.13	3.22	18.5	59.18	4.53	
	2200	526	60.3	3.81	15.18	35.9	47.12	11.20	71.3	22.59	36.82	22.8	56.20	3.15	18.4	59.25	4.46	
2/24/99	600	527	60.3	3.81	15.18	36	47.05	11.27	71.3	22.59	36.82	22.8	56.20	3.15	18.4	59.25	4.46	
	1400	528	60.3	3.81	15.18	35.9	47.12	11.20	71.3	22.59	36.82	22.9	56.13	3.22	18.5	59.18	4.53	
	2200	529	60.4	3.74	15.25	36	47.05	11.27	71.6	22.38	37.03	22.8	56.20	3.15	18.5	59.18	4.53	
2/25/99	600	530	60.5	3.67	15.32	36	47.05	11.27	71.5	22.45	36.96	22.9	56.13	3.22	18.5	59.18	4.53	
	1400	531	60.5	3.67	15.32	36	47.05	11.27	71.6	22.38	37.03	22.9	56.13	3.22	18.5	59.18	4.53	
	2200	532	60.5	3.67	15.32	36	47.05	11.27	71.6	22.38	37.03	22.8	56.20	3.15	18.4	59.25	4.46	
2/26/99	600	533	60.5	3.67	15.32	36.1	46.98	11.34	71.6	22.38	37.03	22.8	56.20	3.15	18.5	59.18	4.53	IW-8 Turned off. Water Level
	1400	534				35.4	47.47	10.86	72.5	21.76	37.65	23	56.06	3.29	18.6	59.11	4.60	Reached Shut off alarm.
	2200	535				35.8	47.19	11.14	78	17.95	41.46	23.1	55.99	3.36	18.7	59.04	4.67	Second rehab to address
2/27/99	600	536				35.9	47.12	11.20	74	20.72	38.69	23.2	55.92	3.43	18.8	58.97	4.74	plugging.
	1400	537																Planned Power Outage on
	2200	538																Site. No re-injection taking
																		place.

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
2/28/99	600	539																
	1400	540				35.9	47.12	11.20	74.9	20.09	39.31	23.2	55.92	3.43	18.5	59.18	4.53	
	2200	541				36	47.05	11.27	72.2	21.97	37.44	23.2	55.92	3.43	18.6	59.11	4.60	
3/1/99	600	542				36.1	46.98	11.34	72.7	21.62	37.79	23.2	55.92	3.43	18.6	59.11	4.60	
	1400	543				36	47.05	11.27	72.9	21.48	37.93	23.2	55.92	3.43	18.7	59.04	4.67	
	2200	544				36.2	46.91	11.41	73	21.41	38.00	23.4	55.78	3.57	18.7	59.04	4.67	
3/2/99	600	545				36.3	46.84	11.48	73.3	21.20	38.20	23.4	55.78	3.57	18.8	58.97	4.74	
	1400	546				36.3	46.84	11.48	73.4	21.13	38.27	23.5	55.71	3.64	18.9	58.90	4.81	
	2200	547				36.3	46.84	11.48	73.5	21.06	38.34	23.5	55.71	3.64	19	58.83	4.88	
3/3/99	600	548				36.4	46.77	11.55	73.7	20.93	38.48	23.5	55.71	3.64	18.9	58.90	4.81	
	1400	549				36.4	46.77	11.55	73.8	20.86	38.55	23.5	55.71	3.64	18.9	58.90	4.81	
	2200	550				36.5	46.71	11.62	74	20.72	38.69	23.5	55.71	3.64	18.8	58.97	4.74	
3/4/99	600	551				36.6	46.64	11.69	74	20.72	38.69	23.5	55.71	3.64	18.8	58.97	4.74	
	1400	552																Re-Hab on IW-8 complete
	2200	553	49.2	11.50	7.48	36.7	46.57	11.76	74.7	20.23	39.17	23.5	55.71	3.64	19	58.83	4.88	Operators missed reading
3/5/99	600	554	49.2	11.50	7.48	36.8	46.50	11.83	74.7	20.23	39.17	23.5	55.71	3.64	19.1	58.76	4.95	in other wells at DCS.
	1400	555	49.1	11.57	7.42	37.7	45.87	12.45	75.5	19.68	39.73	23.5	55.71	3.64	19	58.83	4.88	
	2200	556	49.3	11.44	7.55	37.4	46.08	12.24	75.7	19.54	39.87	23.6	55.65	3.71	19.1	58.76	4.95	
3/6/99	600	557	49.4	11.37	7.62	37.5	46.01	12.31	75.7	19.54	39.87	23.5	55.71	3.64	19.1	58.76	4.95	
	1400	558	49.4	11.37	7.62	37.6	45.94	12.38	75.7	19.54	39.87	23.5	55.71	3.64	19.2	58.69	5.02	
	2200	559	49.5	11.30	7.69	37.6	45.94	12.38	75.7	19.54	39.87	23.3	55.85	3.50	18.7	59.04	4.67	
3/7/99	600	560	49.8	11.09	7.90	37.7	45.87	12.45	75.8	19.47	39.94	23.5	55.71	3.64	18.9	58.90	4.81	
	1400	561	49.8	11.09	7.90	37.7	45.87	12.45	75.8	19.47	39.94	23.6	55.65	3.71	19	58.83	4.88	
	2200	562	49.9	11.02	7.97	37.8	45.80	12.52	75.9	19.40	40.01	23.6	55.65	3.71	19.1	58.76	4.95	
3/8/99	600	563	49.9	11.02	7.97	37.8	45.80	12.52	76	19.33	40.07	23.6	55.65	3.71	19.1	58.76	4.95	
	1400	564	49.9	11.02	7.97				75.9	19.40	40.01	23.9	55.44	3.92	19.4	58.56	5.16	IW-10 shut down to repair
	2200	565	49.9	11.02	7.97				75.9	19.40	40.01	23.9	55.44	3.92	19.6	58.42	5.30	downcomer
3/9/99	600	566	50	10.95	8.04				75.9	19.40	40.01	23.9	55.44	3.92	19.5	58.49	5.23	
	1400	567	50	10.95	8.04				75.9	19.40	40.01	23.9	55.44	3.92	19.4	58.56	5.16	
	2200	568	49.9	11.02	7.97				75.9	19.40	40.01	23.7	55.58	3.78	19.2	58.69	5.02	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
3/10/99	600	569	49.9	11.02	7.97				76	19.33	40.07	23.7	55.58	3.78	19.2	58.69	5.02	
	1400	570	49.9	11.02	7.97				76	19.33	40.07	23.8	55.51	3.85	19.3	58.63	5.09	
	2200	571	50	10.95	8.04				76.4	19.05	40.35	23.8	55.51	3.85	19.4	58.56	5.16	
3/11/99	600	572	50.1	10.88	8.11				76.5	18.99	40.42	23.8	55.51	3.85	19.4	58.56	5.16	
	1400	573	49.8	11.09	7.90				75.3	19.82	39.59	24	55.37	3.98	19.4	58.56	5.16	
	2200	574	50.2	10.81	8.18	29.6	51.49	6.84	75.4	19.75	39.66	23.9	55.44	3.92	19.6	58.42	5.30	
3/12/99	600	575	50.3	10.74	8.25	29.6	51.49	6.84	76.4	19.05	40.35	24	55.37	3.98	19.7	58.35	5.37	
	1400	576	50.2	10.81	8.18	29.6	51.49	6.84	77.5	18.29	41.11	23.9	55.44	3.92	19.7	58.35	5.37	
	2200	577	50.3	10.74	8.25	29.7	51.42	6.91	77.5	18.29	41.11	24	55.37	3.98	19.7	58.35	5.37	
3/13/99	600	578	50.3	10.74	8.25	29.8	51.35	6.98	77.6	18.22	41.18	24	55.37	3.98	19.7	58.35	5.37	
	1400	579	50.8	10.40	8.59	30.1	51.14	7.18	84.8	13.23	46.17	24.2	55.23	4.12	20	58.14	5.57	
	2200	580	51.1	10.19	8.80	30.4	50.93	7.39	83.2	14.34	45.06	24.3	55.16	4.19	20.1	58.07	5.64	
3/14/99	600	581	51.1	10.19	8.80	30.4	50.93	7.39	82.6	14.76	44.65	24.4	55.09	4.26	20.2	58.00	5.71	
	1400	582	51.2	10.12	8.87	30.4	50.93	7.39	82.3	14.97	44.44	24.4	55.09	4.26	20.1	58.07	5.64	
	2200	583	51.2	10.12	8.87	30.5	50.86	7.46	82.1	15.10	44.30	24.3	55.16	4.19	20	58.14	5.57	
3/15/99	600	584																All injection wells shut down
	1400	585																for DCS upgrade, Y2K issue
	2200	586																
3/16/99	600	587																
	1400	588																
	2200	589	51.3	10.05	8.94	34	48.44	9.89	82.1	15.10	44.30	24.17	55.25	4.10	19.8	58.28	5.43	
3/17/99	600	590	51.3	10.05	8.94	34.1	48.37	9.96	81.1	15.80	43.61	24.2	55.23	4.12	19.9	58.21	5.50	
	1400	591	51.7	9.77	9.22	34.1	48.37	9.96	83	14.48	44.93	24.3	55.16	4.19	20	58.14	5.57	
	2200	592	51.7	9.77	9.22	34.2	48.30	10.03	80.3	16.35	43.05	24.7	54.88	4.47	19.6	58.42	5.30	
3/18/99	600	593	51.7	9.77	9.22	34.1	48.37	9.96	80.4	16.28	43.12	25.8	54.12	5.23	19.2	58.69	5.02	
	1400	594	51.7	9.77	9.22	34	48.44	9.89	82.6	14.76	44.65	24.2	55.23	4.12	19.9	58.21	5.50	
	2200	595	51.8	9.70	9.29	34.2	48.30	10.03	82.7	14.69	44.72	24.2	55.23	4.12	19.9	58.21	5.50	
3/19/99	600	596	51.8	9.70	9.29	34.3	48.23	10.10	82.8	14.62	44.79	24.3	55.16	4.19	20	58.14	5.57	
	1400	597	51.9	9.63	9.36	34.4	48.16	10.16	82.9	14.55	44.86	24.4	55.09	4.26	20.3	57.93	5.78	
	2200	598	51.9	9.63	9.36	34.3	48.23	10.10	82.9	14.55	44.86	24.4	55.09	4.26	20.4	57.86	5.85	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
3/20/99	600	599	51.9	9.63	9.36	34.5	48.09	10.23	83.2	14.34	45.06	24.5	55.02	4.33	20.5	57.79	5.92	
	1400	600																Communication lost with DCS
	2200	601							83.8	13.93	45.48	24.6	54.95	4.40	20.2	58.00	5.71	Repair downcomer in IW-9.
3/21/99	600	602							83.5	14.13	45.27	24.7	54.88	4.47	20.4	57.86	5.85	Repair transducer in IW-8.
	1400	603							83.6	14.07	45.34	24.7	54.88	4.47	20.4	57.86	5.85	
	2200	604							90.5	9.28	50.12	24.8	54.81	4.54	20.5	57.79	5.92	
3/22/99	600	605							88.5	10.67	48.74	24.8	54.81	4.54	20.5	57.79	5.92	
	1400	606				34.7	47.95	10.37	83.5	14.13	45.27	24.7	54.88	4.47	20.5	57.79	5.92	
	2200	607				35.3	47.54	10.79	86.4	12.12	47.28	24.6	54.95	4.40	20.6	57.72	5.99	
3/23/99	600	608				35.4	47.47	10.86	86.3	12.19	47.21	24.7	54.88	4.47	20.6	57.72	5.99	
	1400	609				35.5	47.40	10.93	86.3	12.19	47.21	24.8	54.81	4.54	20.7	57.65	6.06	
	2200	610				35.7	47.26	11.07	89.2	10.18	49.22	24.8	54.81	4.54	20.7	57.65	6.06	
3/24/99	600	611				35.8	47.19	11.14	88.5	10.67	48.74	24.8	54.81	4.54	20.7	57.65	6.06	
	1400	612				35.6	47.33	11.00	86.4	12.12	47.28	25.1	54.61	4.75	20.9	57.52	6.20	
	2200	613				35.6	47.33	11.00	87	11.71	47.70	25.1	54.61	4.75	20.9	57.52	6.20	
3/25/99	600	614				35.7	47.26	11.07	86.9	11.78	47.63	25	54.68	4.68	20.9	57.52	6.20	
	1400	615				36.2	46.91	11.41	89.2	10.18	49.22	25	54.68	4.68	20.7	57.65	6.06	
	2200	616				35.9	47.12	11.20	87.8	11.15	48.25	25.1	54.61	4.75	20.8	57.59	6.13	
3/26/99	600	617				36	47.05	11.27	87.9	11.09	48.32	25.1	54.61	4.75	20.8	57.59	6.13	
	1400	618	53.4	8.59	10.40	36.2	46.91	11.41	85.5	12.75	46.66	25.2	54.54	4.82	21.2	57.31	6.40	IW-8 Transducer Fixed.
	2200	619	53.6	8.46	10.53	36.5	46.71	11.62	86.9	11.78	47.63	25.1	54.61	4.75	21	57.45	6.27	
3/27/99	600	620	53.5	8.52	10.46	36.5	46.71	11.62	86.8	11.85	47.56	25	54.68	4.68	20.9	57.52	6.20	
	1400	621	53.5	8.52	10.46	36.5	46.71	11.62	86.8	11.85	47.56	25.1	54.61	4.75	21	57.45	6.27	
	2200	622	53.5	8.52	10.46	36.5	46.71	11.62	87	11.71	47.70	25.1	54.61	4.75	21	57.45	6.27	
3/28/99	600	623	53.5	8.52	10.46	36.5	46.71	11.62	87.1	11.64	47.77	25.1	54.61	4.75	21	57.45	6.27	
	1400	624	53.3	8.66	10.33	36.5	46.71	11.62	86.9	11.78	47.63	25.1	54.61	4.75	21	57.45	6.27	
	2200	625	53.2	8.73	10.26	36.5	46.71	11.62	87	11.71	47.70	25	54.68	4.68	20.9	57.52	6.20	
3/29/99	600	626	53.2	8.73	10.26	36.5	46.71	11.62	87.1	11.64	47.77	25	54.68	4.68	20.9	57.52	6.20	
	1400	627	53	8.87	10.12	36	47.05	11.27	86	12.40	47.00	25	54.68	4.68	21	57.45	6.27	
	2200	628				36.8	46.50	11.83	90	9.63	49.78	24.8	54.81	4.54	21.1	57.38	6.34	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
3/30/99	600	629	53.3	8.66	10.33	36.6	46.64	11.69	89.9	9.70	49.71	24.8	54.81	4.54	21.1	57.38	6.34	
	1400	630	53.2	8.73	10.26	36.5	46.71	11.62	89.4	10.05	49.36	24.9	54.74	4.61	21.3	57.24	6.47	
	2200	631	53.1	8.80	10.19	36.2	46.91	11.41	87.1	11.64	47.77	24.9	54.74	4.61	21	57.45	6.27	
3/31/99	600	632	53.1	8.80	10.19	36.2	46.91	11.41	87.2	11.57	47.84	24.8	54.81	4.54	21	57.45	6.27	
	1400	633	53.7	8.39	10.60	36.8	46.50	11.83	88.5	10.67	48.74	25	54.68	4.68	21.5	57.10	6.61	
	2200	634	53.8	8.32	10.67	36.5	46.71	11.62	88.8	10.46	48.94	25.1	54.61	4.75	21.3	57.24	6.47	
4/1/99	600	635	53.8	8.32	10.67	36.4	46.77	11.55	88.7	10.53	48.88	25	54.68	4.68	21.2	57.31	6.40	
	1400	636	53.8	8.32	10.67	36.2	46.91	11.41	87.2	11.57	47.84	24.7	54.88	4.47	20.7	57.65	6.06	
	2200	637	54.2	8.04	10.95	36.9	46.43	11.90	92.5	7.90	51.51	24.8	54.81	4.54	21	57.45	6.27	
4/2/99	600	638	54.3	7.97	11.02	37.1	46.29	12.04	91.8	8.38	51.02	24.8	54.81	4.54	21.1	57.38	6.34	
	1400	639	54.2	8.04	10.95	37	46.36	11.97	91	8.94	50.47	25	54.68	4.68	21	57.45	6.27	
	2200	640	54.3	7.97	11.02	37.3	46.15	12.17				24.8	54.81	4.54	21.3	57.24	6.47	
4/3/99	600	641	54	8.18	10.81	36.7	46.57	11.76	89.8	9.77	49.64	24.9	54.74	4.61	21.1	57.38	6.34	
	1400	642	54.1	8.11	10.88	36.6	46.64	11.69	90.5	9.28	50.12	24.8	54.81	4.54	21	57.45	6.27	
	2200	643	54.1	8.11	10.88	37.2	46.22	12.11	89.9	9.70	49.71	24.8	54.81	4.54	21.1	57.38	6.34	
4/4/99	600	644	54.2	8.04	10.95	37.3	46.15	12.17	89.5	9.98	49.43	25.1	54.61	4.75	21	57.45	6.27	
	1400	645	54.4	7.90	11.09	37.5	46.01	12.31	90.7	9.14	50.26	24.9	54.74	4.61	21.1	57.38	6.34	
	2200	646	54.6	7.76	11.23	37.1	46.29	12.04	90.9	9.01	50.40	24.9	54.74	4.61	21.2	57.31	6.40	
4/5/99	600	647	54.7	7.69	11.30	37.2	46.22	12.11	91	8.94	50.47	24.9	54.74	4.61	21.2	57.31	6.40	
	1400	648	54.7	7.69	11.30	37.2	46.22	12.11	90.8	9.08	50.33	25	54.68	4.68	21.3	57.24	6.47	
	2200	649	54.8	7.62	11.37	37.3	46.15	12.17	91	8.94	50.47	25.1	54.61	4.75	21.4	57.17	6.54	
4/6/99	600	650	54.9	7.55	11.43	37.3	46.15	12.17	90.9	9.01	50.40	25	54.68	4.68	21.3	57.24	6.47	
	1400	651	54.5	7.83	11.16	37.7	45.87	12.45	91.3	8.73	50.68	24.7	54.88	4.47	21.3	57.24	6.47	
	2200	652	54.4	7.90	11.09	37.8	45.80	12.52	93	7.55	51.86	25	54.68	4.68	21	57.45	6.27	
4/7/99	600	653	54.3	7.97	11.02	37.9	45.74	12.59	92	8.24	51.16	25	54.68	4.68	21	57.45	6.27	
	1400	654																Operators missed a reading
	2200	655	54.6	7.76	11.23	38	45.67	12.66	93.8	7.00	52.41	24.9	54.74	4.61	21.4	57.17	6.54	at the DCS.
4/8/99	600	656	54.6	7.76	11.23	38.2	45.53	12.80	93.3	7.34	52.06	24.9	54.74	4.61	21.4	57.17	6.54	
	1400	657	54.4	7.90	11.09	38.2	45.53	12.80	92.9	7.62	51.79	24.9	54.74	4.61	21.5	57.10	6.61	
	2200	658	54.5	7.83	11.16	38.1	45.60	12.73	93	7.55	51.86	25	54.68	4.68	21.5	57.10	6.61	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
4/9/99	600	659	54.2	8.04	10.95	37.6	45.94	12.38	91.9	8.31	51.09	25	54.68	4.68	21.3	57.24	6.47	
	1400	660	55.1	7.42	11.57	37.8	45.80	12.52	91.9	8.31	51.09	25	54.68	4.68	21.3	57.24	6.47	
	2200	661	55.2	7.35	11.64	38.2	45.53	12.80	92	8.24	51.16	24.9	54.74	4.61	21.2	57.31	6.40	
4/10/99	600	662	55.4	7.21	11.78	38.1	45.60	12.73	92.2	8.11	51.30	25	54.68	4.68	21.4	57.17	6.54	
	1400	663	55.4	7.21	11.78	38.1	45.60	12.73	92.1	8.17	51.23	25.1	54.61	4.75	21.5	57.10	6.61	
	2200	664	55.5	7.14	11.85	38.2	45.53	12.80	92.4	7.97	51.44	25.3	54.47	4.89	21.6	57.03	6.68	
4/11/99	600	665	55.5	7.14	11.85	38.3	45.46	12.87	92.5	7.90	51.51	25.2	54.54	4.82	21.6	57.03	6.68	
	1400	666	55.5	7.14	11.85	38.3	45.46	12.87	92.4	7.97	51.44	25.2	54.54	4.82	21.5	57.10	6.61	
	2200	667	55.6	7.07	11.92	38.4	45.39	12.94	92.8	7.69	51.72	25.1	54.61	4.75	21.4	57.17	6.54	
4/12/99	600	668	55.7	7.00	11.99	38.5	45.32	13.01	92.9	7.62	51.79	25.1	54.61	4.75	21.5	57.10	6.61	
	1400	669	55.8	6.93	12.06	38.5	45.32	13.01				25	54.68	4.68	21.5	57.10	6.61	Well 10, offline for first re-hab
	2200	670	55.7	7.00	11.99	38.4	45.39	12.94				25	54.68	4.68	21.5	57.10	6.61	to address plugging.
4/13/99	600	671	55.7	7.00	11.99	38.4	45.39	12.94				25	54.68	4.68	21.5	57.10	6.61	
	1400	672	55.6	7.07	11.92	38.4	45.39	12.94				25	54.68	4.68	21.6	57.03	6.68	
	2200	673	55.7	7.00	11.99	38.5	45.32	13.01				25	54.68	4.68	21.6	57.03	6.68	
4/14/99	600	674	55.7	7.00	11.99	38.5	45.32	13.01				25	54.68	4.68	21.6	57.03	6.68	
	1400	675	55.5	7.14	11.85	38.4	45.39	12.94				25	54.68	4.68	21.6	57.03	6.68	
	2200	676	55.6	7.07	11.92	38.5	45.32	13.01				25	54.68	4.68	21.6	57.03	6.68	
4/15/99	600	677	55.5	7.14	11.85	38.6	45.25	13.08				25.1	54.61	4.75	21.8	56.89	6.82	
	1400	678	55.6	7.07	11.92	38.6	45.25	13.08				25.1	54.61	4.75	21.8	56.89	6.82	
	2200	679	55.6	7.07	11.92	38.6	45.25	13.08				25	54.68	4.68	21.6	57.03	6.68	
4/16/99	600	680	55.8	6.93	12.06	39.1	44.90	13.42				24.9	54.74	4.61	21.5	57.10	6.61	
	1400	681	55.9	6.86	12.13	40.2	44.14	14.18				24.9	54.74	4.61	21.5	57.10	6.61	
	2200	682	55.9	6.86	12.13	40.2	44.14	14.18				24.9	54.74	4.61	21.5	57.10	6.61	
4/17/99	600	683	56	6.79	12.20	40.6	43.86	14.46				25	54.68	4.68	21.6	57.03	6.68	
	1400	684	55.6	7.07	11.92							24.8	54.81	4.54	21.6	57.03	6.68	Well 9 offline to repair
	2200	685	55.6	7.07	11.92							24.9	54.74	4.61	21.5	57.10	6.61	downcomer
4/18/99	600	686	55.7	7.00	11.99							24.9	54.74	4.61	21.5	57.10	6.61	
	1400	687	55.6	7.07	11.92							24.9	54.74	4.61	21.6	57.03	6.68	
	2200	688	55.7	7.00	11.99							24.8	54.81	4.54	21.5	57.10	6.61	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
4/19/99	600	689	55.7	7.00	11.99							24.9	54.74	4.61	21.6	57.03	6.68	
	1400	690	55.3	7.28	11.71	37.1	46.29	12.04				24.9	54.74	4.61	21	57.45	6.27	Well 9 back on line
	2200	691	55.6	7.07	11.92	37.3	46.15	12.17				25	54.68	4.68	21.6	57.03	6.68	
4/20/99	600	692	55.6	7.07	11.92	37.5	46.01	12.31				25	54.68	4.68	21.6	57.03	6.68	
	1400	693	55.9	6.86	12.13	37.7	45.87	12.45	30.5	50.86	8.54	24.9	54.74	4.61	21.3	57.24	6.47	Well 10 back on line
	2200	694	56.3	6.58	12.40	37.8	45.80	12.52	30.9	50.59	8.82	25.3	54.47	4.89	21.7	56.96	6.75	4/20/99 9:07
4/21/99	600	695	55.7	7.00	11.99	38.3	45.46	12.87	31.2	50.38	9.03	25.3	54.47	4.89	21.8	56.89	6.82	
	1400	696	56.1	6.72	12.27	37.9	45.74	12.59	31	50.52	8.89	25.4	54.40	4.96	21.6	57.03	6.68	
	2200	697																system down. No re-injection
4/22/99	600	698	56.4	6.51	12.47	38.2	45.53	12.80	34	48.44	10.97	25.3	54.47	4.89	21.8	56.89	6.82	taking place.
	1400	699	56.6	6.38	12.61	39.1	44.90	13.42	35	47.75	11.66	25.5	54.33	5.02	22.1	56.68	7.03	
	2200	700	57	6.10	12.89	38.7	45.18	13.14	35	47.75	11.66	25.6	54.26	5.09	21.8	56.89	6.82	
4/23/99	600	701	57.1	6.03	12.96	38.8	45.11	13.21	35.2	47.61	11.80	25.5	54.33	5.02	22	56.75	6.96	
	1400	702	57.1	6.03	12.96	38.9	45.04	13.28	35.2	47.61	11.80	25.4	54.40	4.96	21.9	56.82	6.89	
	2200	703	57.3	5.89	13.10	39	44.97	13.35	35.6	47.33	12.08	25.4	54.40	4.96	21.9	56.82	6.89	
4/24/99	600	704	57.3	5.89	13.10	39.1	44.90	13.42	35.8	47.19	12.22	25.5	54.33	5.02	22	56.75	6.96	
	1400	705	57.3	5.89	13.10	39.4	44.70	13.63	35.9	47.12	12.29	25.6	54.26	5.09	22.2	56.62	7.10	
	2200	706	57.4	5.82	13.17	39.4	44.70	13.63	36	47.05	12.35	25.6	54.26	5.09	22.1	56.68	7.03	
4/25/99	600	707	57.5	5.75	13.24	39.3	44.77	13.56	36.1	46.98	12.42	25.6	54.26	5.09	22.2	56.62	7.10	
	1400	708	57.4	5.82	13.17	39.3	44.77	13.56	36.2	46.91	12.49	25.7	54.19	5.16	22.3	56.55	7.17	
	2200	709	57.5	5.75	13.24	39.6	44.56	13.77	36.3	46.84	12.56	25.7	54.19	5.16	22.3	56.55	7.17	
4/26/99	600	710	57.6	5.68	13.31	39.5	44.63	13.70	36.3	46.84	12.56	25.7	54.19	5.16	22.3	56.55	7.17	
	1400	711	57.5	5.75	13.24	39.4	44.70	13.63	36.4	46.77	12.63	25.7	54.19	5.16	22.3	56.55	7.17	
	2200	712	57.5	5.75	13.24	39.6	44.56	13.77	36.4	46.77	12.63	25.6	54.26	5.09	22.3	56.55	7.17	
4/27/99	600	713	57.5	5.75	13.24	39.6	44.56	13.77	36.4	46.77	12.63	25.6	54.26	5.09	22.2	56.62	7.10	
	1400	714	57.5	5.75	13.24	39.6	44.56	13.77	36.4	46.77	12.63	25.6	54.26	5.09	22.2	56.62	7.10	system off-line. No
	2200	715																comunication with DCS.
4/28/99	600	716																
	1400	717																
	2200	718																

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
4/29/99	600	719																
	1400	720																
	2200	721																
4/30/99	600	722																
	1400	723	57.3	5.89	13.10				39.2	44.83	14.57	25	54.68	4.68	21.9	56.82	6.89	
	2200	724	58	5.41	13.58				40.2	44.14	15.27	25.4	54.40	4.96	22.2	56.62	7.10	
5/1/99	600	725	58	5.41	13.58				40.5	43.93	15.47	25.5	54.33	5.02	22.3	56.55	7.17	
	1400	726	57.9	5.48	13.51				40.5	43.93	15.47	25.6	54.26	5.09	22.3	56.55	7.17	
	2200	727	57.9	5.48	13.51				40.7	43.79	15.61	25.6	54.26	5.09	22.3	56.55	7.17	
5/2/99	600	728	57.9	5.48	13.51				41.1	43.52	15.89	25.7	54.19	5.16	22.3	56.55	7.17	
	1400	729	57.7	5.61	13.37				41.1	43.52	15.89	25.7	54.19	5.16	22.4	56.48	7.24	
	2200	730	57.8	5.54	13.44				41.3	43.38	16.03	25.7	54.19	5.16	22.4	56.48	7.24	
5/3/99	600	731	57.8	5.54	13.44				41.4	43.31	16.10	25.7	54.19	5.16	22.4	56.48	7.24	
	1400	732				38.3	45.46	12.87	42.3	42.69	16.72	25.9	54.05	5.30	22.5	56.41	7.31	re-hab IW-8 to address
	2200	733				38.5	45.32	13.01	42.1	42.82	16.58	25.9	54.05	5.30	22.5	56.41	7.31	plugging.
5/4/99	600	734				38.4	45.39	12.94	42.2	42.76	16.65	25.9	54.05	5.30	22.5	56.41	7.31	
	1400	735				38.5	45.32	13.01	42.2	42.76	16.65	25.9	54.05	5.30	22.6	56.34	7.38	
	2200	736				38.4	45.39	12.94	42.3	42.69	16.72	25.9	54.05	5.30	22.6	56.34	7.38	
5/5/99	600	737				38.4	45.39	12.94	42.4	42.62	16.79	25.9	54.05	5.30	22.5	56.41	7.31	
	1400	738				38.4	45.39	12.94	42.3	42.69	16.72	25.8	54.12	5.23	22.5	56.41	7.31	
	2200	739				38.5	45.32	13.01	44.2	41.37	18.04	25.9	54.05	5.30	22.5	56.41	7.31	
5/6/99	600	740				39.4	44.70	13.63	44.7	41.02	18.38	26	53.98	5.37	22.8	56.20	7.51	
	1400	741																System Down, Lightening
	2200	742																Strike. No re-injection
5/7/99	600	743																taking place.
	1400	744																
	2200	745																
5/8/99	600	746																
	1400	747	49.4	11.37	7.62	38.8	45.11	13.21	44.1	41.44	17.97	25.3	54.47	4.89	21.9	56.82	6.89	
	2200	748	49.8	11.09	7.90	40	44.28	14.05	45.4	40.54	18.87	25.7	54.19	5.16	22.5	56.41	7.31	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
5/9/99	600	749	50	10.95	8.04	40.5	43.93	14.39	45.9	40.19	19.22	25.9	54.05	5.30	22.7	56.27	7.44	
	1400	750	50.1	10.88	8.11	40.4	44.00	14.32	45.9	40.19	19.22	26	53.98	5.37	22.8	56.20	7.51	
	2200	751	50.1	10.88	8.11	40.4	44.00	14.32	46.2	39.98	19.42	26	53.98	5.37	22.9	56.13	7.58	
5/10/99	600	752	50.1	10.88	8.11	40.5	43.93	14.39	46.4	39.84	19.56	26	53.98	5.37	22.9	56.13	7.58	
	1400	753	50.1	10.88	8.11	40.7	43.79	14.53	46.2	39.98	19.42	26	53.98	5.37	23	56.06	7.65	
	2200	754	50.1	10.88	8.11	40.7	43.79	14.53	46.4	39.84	19.56	26	53.98	5.37	23	56.06	7.65	
5/11/99	600	755	50.2	10.81	8.18	40.8	43.73	14.60	46.6	39.71	19.70	26	53.98	5.37	23	56.06	7.65	
	1400	756	50.1	10.88	8.11	40.6	43.86	14.46	46.5	39.78	19.63	26	53.98	5.37	23	56.06	7.65	
	2200	757	50.2	10.81	8.18	40.8	43.73	14.60	46.7	39.64	19.77	26	53.98	5.37	23	56.06	7.65	
5/12/99	600	758	50.2	10.81	8.18	40.9	43.66	14.67	46.9	39.50	19.91	26	53.98	5.37	23	56.06	7.65	
	1400	759	49.9	11.02	7.97	40.1	44.21	14.11	46.3	39.91	19.49	25.9	54.05	5.30	22.8	56.20	7.51	
	2200	760	50.3	10.74	8.25	40.5	43.93	14.39	47.1	39.36	20.05	25.7	54.19	5.16	22.9	56.13	7.58	
5/13/99	600	761	50.3	10.74	8.25	41	43.59	14.74	47.9	38.81	20.60	26	53.98	5.37	22.9	56.13	7.58	
	1400	762	50.3	10.74	8.25	40.8	43.73	14.60	47.7	38.94	20.46	26	53.98	5.37	22.9	56.13	7.58	
	2200	763	50.3	10.74	8.25	41.1	43.52	14.81	47.5	39.08	20.32	25.9	54.05	5.30	22.8	56.20	7.51	
5/14/99	600	764	50.3	10.74	8.25	40.9	43.66	14.67	47.7	38.94	20.46	25.9	54.05	5.30	22.8	56.20	7.51	
	1400	765	50.3	10.74	8.25	40.8	43.73	14.60	47.8	38.87	20.53	25.9	54.05	5.30	22.8	56.20	7.51	
	2200	766	50.3	10.74	8.25	40.9	43.66	14.67	48	38.74	20.67	25.9	54.05	5.30	22.8	56.20	7.51	
5/15/99	600	767	50.4	10.67	8.32	41	43.59	14.74	48.1	38.67	20.74	26	53.98	5.37	22.9	56.13	7.58	
	1400	768	50.4	10.67	8.32	40.9	43.66	14.67	48.2	38.60	20.81	26	53.98	5.37	22.9	56.13	7.58	
	2200	769	50.4	10.67	8.32	40.9	43.66	14.67	48.4	38.46	20.95	26	53.98	5.37	22.9	56.13	7.58	
5/16/99	600	770	50.5	10.60	8.39	41	43.59	14.74	48.4	38.46	20.95	26	53.98	5.37	22.9	56.13	7.58	
	1400	771	50.4	10.67	8.32	40.8	43.73	14.60	48.3	38.53	20.88	26	53.98	5.37	22.9	56.13	7.58	
	2200	772	50.4	10.67	8.32	41.1	43.52	14.81	48.6	38.32	21.09	26	53.98	5.37	23	56.06	7.65	
5/17/99	600	773	50.4	10.67	8.32	41.3	43.38	14.95	48.6	38.32	21.09	25.9	54.05	5.30	22.9	56.13	7.58	
	1400	774	50.3	10.74	8.25	40.9	43.66	14.67	48.4	38.46	20.95	25.9	54.05	5.30	22.9	56.13	7.58	
	2200	775	50.3	10.74	8.25	40.8	43.73	14.60	48.7	38.25	21.16	25.8	54.12	5.23	22.8	56.20	7.51	
5/18/99	600	776	50.5	10.60	8.39	41.4	43.31	15.02	49.7	37.56	21.85	25.6	54.26	5.09	22.5	56.41	7.31	
	1400	777	50.4	10.67	8.32	40.5	43.93	14.39	49.2	37.90	21.50	25.8	54.12	5.23				IW-12 lost comm. With DCS
	2200	778	50.5	10.60	8.39	40.7	43.79	14.53	49.3	37.84	21.57	25.6	54.26	5.09	22.8	56.20	7.51	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			*Transducers adjusted to*
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
5/19/99	600	779	50.4	10.67	8.32	40.9	43.66	14.67	48.9	38.11	21.29	25.5	54.33	5.02	22.7	56.27	7.44	
	1400	780	50.2	10.81	8.18	40.7	43.79	14.53	48.6	38.32	21.09	25.9	54.05	5.30	22.8	56.20	7.51	
	2200	781	50.2	10.81	8.18	41	43.59	14.74	49	38.04	21.36	25.6	54.26	5.09	22.9	56.13	7.58	
5/20/99	600	782	50.3	10.74	8.25	41.1	43.52	14.81	49	38.04	21.36	25.6	54.26	5.09	22.9	56.13	7.58	
	1400	783	50.2	10.81	8.18	40.6	43.86	14.46	49.1	37.97	21.43	25.6	54.26	5.09	22.9	56.13	7.58	
	2200	784	50.2	10.81	8.18	40.9	43.66	14.67	49.3	37.84	21.57	25.6	54.26	5.09	22.9	56.13	7.58	
5/21/99	600	785	50.2	10.81	8.18	40.7	43.79	14.53	49.4	37.77	21.64	25.6	54.26	5.09	22.9	56.13	7.58	
	1400	786	50.1	10.88	8.11	40.8	43.73	14.60	49.6	37.63	21.78	26	53.98	5.37	22.9	56.13	7.58	
	2200	787	50.4	10.67	8.32	41.5	43.24	15.09	51.2	36.52	22.89	25.6	54.26	5.09	22.9	56.13	7.58	
5/22/99	600	788	50.4	10.67	8.32	41.7	43.10	15.22	50.8	36.80	22.61	25.6	54.26	5.09	22.9	56.13	7.58	
	1400	789	50.3	10.74	8.25	41.5	43.24	15.09	50.1	37.28	22.13	25.5	54.33	5.02	22.8	56.20	7.51	
	2200	790	50.3	10.74	8.25	41.7	43.10	15.22	50.4	37.07	22.33	25.5	54.33	5.02	22.9	56.13	7.58	
5/23/99	600	791	50.3	10.74	8.25	41.8	43.03	15.29	50.5	37.00	22.40	25.6	54.26	5.09	23	56.06	7.65	
	1400	792	50.3	10.74	8.25	41.6	43.17	15.15	50.5	37.00	22.40	25.6	54.26	5.09	23	56.06	7.65	
	2200	793	50.3	10.74	8.25	41.8	43.03	15.29	50.7	36.86	22.54	25.6	54.26	5.09	23	56.06	7.65	
5/24/99	600	794	50.4	10.67	8.32	41.5	43.24	15.09	50.8	36.80	22.61	25.6	54.26	5.09	22.9	56.13	7.58	
	1400	795	50.3	10.74	8.25	41.5	43.24	15.09	50.8	36.80	22.61	25.5	54.33	5.02	22.9	56.13	7.58	
	2200	796	49.9	11.02	7.97	40.7	43.79	14.53	50.3	37.14	22.26	25.8	54.12	5.23	23.1	55.99	7.72	
5/25/99	600	797	50.1	10.88	8.11	41	43.59	14.74	50.8	36.80	22.61	25.7	54.19	5.16	23.1	55.99	7.72	
	1400	798	50	10.95	8.04	40.9	43.66	14.67	50.7	36.86	22.54	25.6	54.26	5.09	23	56.06	7.65	
	2200	799	50	10.95	8.04	41	43.59	14.74	50.8	36.80	22.61	25.6	54.26	5.09	23	56.06	7.65	
5/26/99	600	800	50	10.95	8.04	41.3	43.38	14.95	50.9	36.73	22.68	25.6	54.26	5.09	23.1	55.99	7.72	
	1400	801	49.9	11.02	7.97	41.1	43.52	14.81	50.8	36.80	22.61	25.6	54.26	5.09	23	56.06	7.65	
	2200	802	50	10.95	8.04	41.2	43.45	14.88	51	36.66	22.75	25.6	54.26	5.09	23	56.06	7.65	
5/27/99	600	803	50	10.95	8.04	41.2	43.45	14.88	51.2	36.52	22.89	25.6	54.26	5.09	23.1	55.99	7.72	
	1400	804	49.9	11.02	7.97	41.2	43.45	14.88	51.1	36.59	22.82	25.6	54.26	5.09	23.1	55.99	7.72	
	2200	805	49.9	11.02	7.97	41.3	43.38	14.95	51.1	36.59	22.82	25.6	54.26	5.09	23.1	55.99	7.72	
5/28/99	600	806	49.9	11.02	7.97	41.3	43.38	14.95	51.1	36.59	22.82	25.6	54.26	5.09	23	56.06	7.65	
	1400	807	49.9	11.02	7.97	41.3	43.38	14.95	51.1	36.59	22.82	25.6	54.26	5.09	23.1	55.99	7.72	
	2200	808	49.9	11.02	7.97	41.3	43.38	14.95	51.3	36.45	22.96	25.6	54.26	5.09	23	56.06	7.65	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
5/29/99	600	809	49.9	11.02	7.97	41.3	43.38	14.95	51.5	36.31	23.10	25.6	54.26	5.09	23.1	55.99	7.72	
	1400	810	49.8	11.09	7.90	41.3	43.38	14.95	51.3	36.45	22.96	25.6	54.26	5.09	23	56.06	7.65	
	2200	811	49.8	11.09	7.90	41.7	43.10	15.22	52.1	35.89	23.51	25.6	54.26	5.09	23	56.06	7.65	
5/30/99	600	812	49.9	11.02	7.97	42	42.89	15.43	52.4	35.69	23.72	25.7	54.19	5.16	23	56.06	7.65	
	1400	813	49.9	11.02	7.97	41.7	43.10	15.22	52.2	35.83	23.58	25.7	54.19	5.16	23.1	55.99	7.72	
	2200	814	50	10.95	8.04	42.2	42.76	15.57	53.2	35.13	24.27	25.7	54.19	5.16	23.2	55.92	7.79	
5/31/99	600	815	50	10.95	8.04	42.2	42.76	15.57	53.1	35.20	24.20	25.7	54.19	5.16	23.2	55.92	7.79	
	1400	816	49.9	11.02	7.97	41.8	43.03	15.29	53.1	35.20	24.20	25.7	54.19	5.16	23.2	55.92	7.79	
	2200	817	49.9	11.02	7.97	42.1	42.82	15.50	53	35.27	24.14	25.6	54.26	5.09	23.2	55.92	7.79	
6/1/99	600	818	49.9	11.02	7.97	42.1	42.82	15.50	53	35.27	24.14	25.6	54.26	5.09	23.2	55.92	7.79	
	1400	819	49.8	11.09	7.90	42.1	42.82	15.50	52.9	35.34	24.07	25.6	54.26	5.09	23.1	55.99	7.72	
	2200	820	49.8	11.09	7.90	42.1	42.82	15.50	53	35.27	24.14	25.6	54.26	5.09	23.1	55.99	7.72	
6/2/99	600	821	49.8	11.09	7.90	42.2	42.76	15.57	53.2	35.13	24.27	25.6	54.26	5.09	23.1	55.99	7.72	
	1400	822	49.8	11.09	7.90	41.9	42.96	15.36	53.1	35.20	24.20	25.5	54.33	5.02	23	56.06	7.65	
	2200	823	50.2	10.81	8.18	42.6	42.48	15.85	54.8	34.02	25.38	25.5	54.33	5.02	23	56.06	7.65	
6/3/99	600	824	50.3	10.74	8.25	42.7	42.41	15.92	54.4	34.30	25.11	25.5	54.33	5.02	23	56.06	7.65	
	1400	825	50.2	10.81	8.18	42.6	42.48	15.85	54.3	34.37	25.04	25.5	54.33	5.02	23	56.06	7.65	
	2200	826	50.5	10.60	8.39	43.4	41.92	16.40	56.6	32.78	26.63	25.6	54.26	5.09	23.2	55.92	7.79	
6/4/99	600	827	50.6	10.53	8.45	43.4	41.92	16.40	57.7	32.01	27.39	25.6	54.26	5.09	23.2	55.92	7.79	
	1400	828	50.6	10.53	8.45	43.4	41.92	16.40	57.1	32.43	26.98	25.6	54.26	5.09	23.4	55.78	7.93	
	2200	829	50.7	10.46	8.52	43.3	41.99	16.33	57.1	32.43	26.98	25.7	54.19	5.16	23.5	55.71	8.00	
6/5/99	600	830	50.7	10.46	8.52	43.5	41.85	16.47	57.1	32.43	26.98	25.6	54.26	5.09	23.4	55.78	7.93	
	1400	831	50.6	10.53	8.45	42.9	42.27	16.06	57	32.50	26.91	25.6	54.26	5.09	23.3	55.85	7.86	
	2200	832	50.6	10.53	8.45	43.1	42.13	16.19	57.2	32.36	27.05	25.5	54.33	5.02	23.3	55.85	7.86	
6/6/09	600	833	50.6	10.53	8.45	43.3	41.99	16.33	57.2	32.36	27.05	25.5	54.33	5.02	23.3	55.85	7.86	
	1400	834	50.5	10.60	8.39	43.3	41.99	16.33	57	32.50	26.91	25.5	54.33	5.02	23.3	55.85	7.86	
	2200	835	50.7	10.46	8.52	43.2	42.06	16.26	58.7	31.32	28.09	25.7	54.19	5.16	23.3	55.85	7.86	
6/7/99	600	836	50.7	10.46	8.52	43.6	41.79	16.54	58.4	31.53	27.88	25.7	54.19	5.16	23.4	55.78	7.93	
	1400	837	50.6	10.53	8.45	43.5	41.85	16.47	58.4	31.53	27.88	25.6	54.26	5.09	23.4	55.78	7.93	
	2200	838	50.4	10.67	8.32	43	42.20	16.12	58	31.81	27.60	25.5	54.33	5.02	23.1	55.99	7.72	

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7-2999

TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
6/8/99	600	839	50.5	10.60	8.39	42.8	42.34	15.99	58.5	31.46	27.95	25.5	54.33	5.02	23.2	55.92	7.79	
	1400	840																no reading recorded at DCS.
	2200	841	50.5	10.60	8.39	42.9	42.27	16.06	58.8	31.25	28.15	25.5	54.33	5.02	23.1	55.99	7.72	
6/9/99	600	842	50.5	10.60	8.39	43	42.20	16.12	58.5	31.46	27.95	25.5	54.33	5.02	23.2	55.92	7.79	
	1400	843	50.4	10.67	8.32	42.8	42.34	15.99	58.4	31.53	27.88	25.5	54.33	5.02	23.2	55.92	7.79	
	2200	844	50.5	10.60	8.39	43.2	42.06	16.26	58.5	31.46	27.95	25.5	54.33	5.02	23.2	55.92	7.79	
6/10/99	600	845	50.5	10.60	8.39	43.3	41.99	16.33	58.6	31.39	28.02	25.5	54.33	5.02	23.1	55.99	7.72	
	1400	846	50.4	10.67	8.32	42.9	42.27	16.06	59	31.11	28.29	25.4	54.40	4.96	23.1	55.99	7.72	
	2200	847																no reading recorded at DCS.
6/11/99	600	848	50.8	10.40	8.59	43.5	41.85	16.47	60.4	30.14	29.26	25.4	54.40	4.96	22.8	56.20	7.51	
	1400	849	50.9	10.33	8.66	43.3	41.99	16.33	60.2	30.28	29.13	25.4	54.40	4.96	22.9	56.13	7.58	
	2200	850																off line due to electric storm
6/12/99	600	851																No re-injection taking place
	1400	852	51.1	10.19	8.80	42.9	42.27	16.06	58.7	31.32	28.09	25.2	54.54	4.82	23.2	55.92	7.79	
	2200	853	51.4	9.98	9.01	43.3	41.99	16.33	59.3	30.91	28.50	25.3	54.47	4.89	23.3	55.85	7.86	
6/13/99	600	854	51.2	10.12	8.87	43.7	41.72	16.61	59.9	30.49	28.92	25.5	54.33	5.02	23.3	55.85	7.86	
	1400	855																no reading recorded at DCS.
	2200	856	51.2	10.12	8.87	43.7	41.72	16.61	60	30.42	28.99	25.5	54.33	5.02	23.3	55.85	7.86	
6/14/99	600	857	51.2	10.12	8.87	43.7	41.72	16.61	60	30.42	28.99	25.5	54.33	5.02	23.3	55.85	7.86	
	1400	858	51.4	9.98	9.01	44	41.51	16.82	60.3	30.21	29.19	25.3	54.47	4.89	23.2	55.92	7.79	
	2200	859	51.6	9.84	9.15	44.2	41.37	16.96	60.4	30.14	29.26	25.4	54.40	4.96	23.3	55.85	7.86	
6/15/99	600	860	51.6	9.84	9.15	44.3	41.30	17.03	60.6	30.00	29.40	25.4	54.40	4.96	23.3	55.85	7.86	
	1400	861	51.5	9.91	9.08	44.3	41.30	17.03	60.8	29.87	29.54	25.4	54.40	4.96	23.4	55.78	7.93	
	2200	862	51.6	9.84	9.15	44.4	41.23	17.09	60.9	29.80	29.61	25.5	54.33	5.02	23.4	55.78	7.93	
6/16/99	600	863	51.6	9.84	9.15	44.4	41.23	17.09	61	29.73	29.68	25.5	54.33	5.02	23.5	55.71	8.00	
	1400	864	51.4	9.98	9.01	44.2	41.37	16.96	60.7	29.93	29.47	25.8	54.12	5.23	23.4	55.78	7.93	
	2200	865	51.5	9.91	9.08	44.2	41.37	16.96	60.9	29.80	29.61	25.3	54.47	4.89	23.3	55.85	7.86	
6/17/99	600	866	51.5	9.91	9.08	44.5	41.16	17.16	61.2	29.59	29.82	25.4	54.40	4.96	23.4	55.78	7.93	
	1400	867	51.5	9.91	9.08	44.5	41.16	17.16	61.2	29.59	29.82	25.4	54.40	4.96	23.4	55.78	7.93	
	2200	868	51.4	9.98	9.01	44.5	41.16	17.16	61.6	29.31	30.10	25.3	54.47	4.89	23.3	55.85	7.86	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
6/18/99	600	869	51.6	9.84	9.15	44.3	41.30	17.03	61.8	29.17	30.23	25.4	54.40	4.96	23.5	55.71	8.00	
	1400	870	51.5	9.91	9.08	44.2	41.37	16.96	61.7	29.24	30.16	25.4	54.40	4.96	23.6	55.65	8.07	
	2200	871	51.4	9.98	9.01	43.9	41.58	16.75	61.1	29.66	29.75	25.3	54.47	4.89	23.3	55.85	7.86	
6/19/99	600	872	51.3	10.05	8.94	43.9	41.58	16.75	61	29.73	29.68	25.6	54.26	5.09	23.3	55.85	7.86	
	1400	873	51.2	10.12	8.87	43.7	41.72	16.61	60.9	29.80	29.61	25.6	54.26	5.09	23.3	55.85	7.86	
	2200	874	51.3	10.05	8.94	43.8	41.65	16.68	61.2	29.59	29.82	25.6	54.26	5.09	23.3	55.85	7.86	
6/20/99	600	875	51.4	9.98	9.01	43.9	41.58	16.75	61.4	29.45	29.96	25.6	54.26	5.09	23.3	55.85	7.86	
	1400	876	51.2	10.12	8.87	43.8	41.65	16.68	61.2	29.59	29.82	25.5	54.33	5.02	23.3	55.85	7.86	
	2200	877	51.3	10.05	8.94	43.8	41.65	16.68	62	29.03	30.37	25.5	54.33	5.02	23.3	55.85	7.86	
6/21/99	600	878	51.3	10.05	8.94	43.9	41.58	16.75	62	29.03	30.37	25.5	54.33	5.02	23.3	55.85	7.86	
	1400	879	51.2	10.12	8.87	43.8	41.65	16.68	62	29.03	30.37	25.5	54.33	5.02	23.3	55.85	7.86	
	2200	880	51.3	10.05	8.94	43.9	41.58	16.75	62.2	28.90	30.51	25.5	54.33	5.02	23.3	55.85	7.86	
6/22/99	600	881	51.3	10.05	8.94	44	41.51	16.82	62.2	28.90	30.51	25.5	54.33	5.02	23.3	55.85	7.86	
	1400	882	51.2	10.12	8.87	44.2	41.37	16.96	62.4	28.76	30.65	25.5	54.33	5.02	23.6	55.65	8.07	
	2200	883	51.2	10.12	8.87	44.4	41.23	17.09	62.6	28.62	30.79	25.5	54.33	5.02	23.6	55.65	8.07	
6/23/99	600	884	51.3	10.05	8.94	44.5	41.16	17.16	62.6	28.62	30.79	25.6	54.26	5.09	23.7	55.58	8.14	
	1400	885	51.3	10.05	8.94	44.6	41.09	17.23	62.6	28.62	30.79	25.7	54.19	5.16	23.8	55.51	8.21	
	2200	886	51.4	9.98	9.01	45.2	40.68	17.65	63	28.34	31.07	25.5	54.33	5.02	23.5	55.71	8.00	
6/24/99	600	887	51.7	9.77	9.22	45.3	40.61	17.72	63.7	27.86	31.55	25.7	54.19	5.16	23.8	55.51	8.21	
	1400	888	51.7	9.77	9.22	45.2	40.68	17.65	63.7	27.86	31.55	25.7	54.19	5.16	23.5	55.71	8.00	
	2200	889	51.8	9.70	9.29	45.2	40.68	17.65	63.2	28.20	31.20	25.7	54.19	5.16	23.4	55.78	7.93	
6/25/99	600	890	52	9.56	9.42	45.3	40.61	17.72	63.4	28.06	31.34	25.6	54.26	5.09	23.4	55.78	7.93	
	1400	891	52	9.56	9.42	45.3	40.61	17.72	63.4	28.06	31.34	25.6	54.26	5.09	23.4	55.78	7.93	
	2200	892	52.2	9.43	9.56	45.5	40.47	17.86	63.5	27.99	31.41	25.6	54.26	5.09	23.4	55.78	7.93	
6/26/99	600	893	52.3	9.36	9.63	45.6	40.40	17.93	63.7	27.86	31.55	25.7	54.19	5.16	23.4	55.78	7.93	
	1400	894	52.2	9.43	9.56	45.6	40.40	17.93	63.6	27.93	31.48	25.7	54.19	5.16	23.5	55.71	8.00	
	2200	895	52.3	9.36	9.63	44.5	41.16	17.16	64	27.65	31.76	25.7	54.19	5.16	23.5	55.71	8.00	
6/27/99	600	896	52.3	9.36	9.63	44.6	41.09	17.23	64.1	27.58	31.83	25.8	54.12	5.23	23.6	55.65	8.07	
	1400	897	52.3	9.36	9.63	44.6	41.09	17.23	64.2	27.51	31.90	25.4	54.40	4.96	23.6	55.65	8.07	
	2200	898	52	9.56	9.42	44.9	40.88	17.44	63.2	28.20	31.20	25.8	54.12	5.23	23.3	55.85	7.86	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
6/28/99	600	899	52	9.56	9.42	45	40.82	17.51	63.4	28.06	31.34	25.7	54.19	5.16	23.3	55.85	7.86	
	1400	900	51.9	9.63	9.36	44.9	40.88	17.44	63.4	28.06	31.34	25.7	54.19	5.16	23.3	55.85	7.86	
	2200	901	51.9	9.63	9.36	45.2	40.68	17.65	63.6	27.93	31.48	25.7	54.19	5.16	23.3	55.85	7.86	
6/29/99	600	902	52	9.56	9.42	45.1	40.75	17.58	63.7	27.86	31.55	25.7	54.19	5.16	23.3	55.85	7.86	
	1400	903	51.9	9.63	9.36	45	40.82	17.51	63.7	27.86	31.55	25.6	54.26	5.09	23.2	55.92	7.79	
	2200	904	52	9.56	9.42	45.1	40.75	17.58	64	27.65	31.76	25.6	54.26	5.09	23.2	55.92	7.79	
6/30/99	600	905	52	9.56	9.42	45.2	40.68	17.65	63.5	27.99	31.41	25.7	54.19	5.16	23.4	55.78	7.93	
	1400	906	51.9	9.63	9.36	45	40.82	17.51	63.3	28.13	31.27	25.6	54.26	5.09	23.3	55.85	7.86	
	2200	907	51.9	9.63	9.36	45	40.82	17.51	63.5	27.99	31.41	25.6	54.26	5.09	23.4	55.78	7.93	
7/1/99	600	908	51.8	9.70	9.29	45.1	40.75	17.58	63.6	27.93	31.48	25.7	54.19	5.16	23.4	55.78	7.93	
	1400	909	51.8	9.70	9.29	45	40.82	17.51	63.8	27.79	31.62	25.6	54.26	5.09	23.4	55.78	7.93	
	2200	910	51.8	9.70	9.29	45.1	40.75	17.58	64	27.65	31.76	25.7	54.19	5.16	23.4	55.78	7.93	
7/2/99	600	911	51.9	9.63	9.36	45.2	40.68	17.65	64.2	27.51	31.90	25.6	54.26	5.09	23.3	55.85	7.86	
	1400	912	51.9	9.63	9.36	44.8	40.95	17.37	62.7	28.55	30.86	25.1	54.61	4.75	23.3	55.85	7.86	
	2200	913	51.9	9.63	9.36	44.9	40.88	17.44	63.4	28.06	31.34	25.5	54.33	5.02	23.3	55.85	7.86	
7/3/99	600	914	52.2	9.43	9.56	45.5	40.47	17.86	64.6	27.23	32.17	25.4	54.40	4.96	23.6	55.65	8.07	
	1400	915	52.1	9.49	9.49	45.3	40.61	17.72	64.4	27.37	32.04	25.4	54.40	4.96	23.6	55.65	8.07	
	2200	916	52.2	9.43	9.56	45.5	40.47	17.86	64.6	27.23	32.17	25.4	54.40	4.96	23.6	55.65	8.07	
7/4/99	600	917	52.2	9.43	9.56	45.5	40.47	17.86	64.7	27.16	32.24	25.4	54.40	4.96	23.6	55.65	8.07	
	1400	918	52.1	9.49	9.49	45.3	40.61	17.72	64.6	27.23	32.17	25.4	54.40	4.96	23.6	55.65	8.07	
	2200	919	52.2	9.43	9.56	45.5	40.47	17.86	64.9	27.02	32.38	25.4	54.40	4.96	23.6	55.65	8.07	
7/5/99	600	920	52.2	9.43	9.56	45.5	40.47	17.86	65.1	26.89	32.52	25.4	54.40	4.96	23.6	55.65	8.07	
	1400	921	52.1	9.49	9.49	45.4	40.54	17.79	64.8	27.09	32.31	25.4	54.40	4.96	23.6	55.65	8.07	
	2200	922	51.6	9.84	9.15	45.7	40.33	18.00	65.3	26.75	32.66	25.4	54.40	4.96	23.7	55.58	8.14	
7/6/99	600	923	51.6	9.84	9.15	45.8	40.26	18.07	65.3	26.75	32.66	25.4	54.40	4.96	23.6	55.65	8.07	
	1400	924	51.5	9.91	9.08	45.6	40.40	17.93	65.1	26.89	32.52	25.4	54.40	4.96	23.6	55.65	8.07	
	2200	925	51.9	9.63	9.36	45.1	40.75	17.58	64.5	27.30	32.10	25.2	54.54	4.82	23.3	55.85	7.86	
7/7/99	600	926	52	9.56	9.42	45.3	40.61	17.72	64.8	27.09	32.31	25.2	54.54	4.82	23.4	55.78	7.93	
	1400	927	51.9	9.63	9.36	45.1	40.75	17.58	64.7	27.16	32.24	25.2	54.54	4.82	23.4	55.78	7.93	
	2200	928	52	9.56	9.42	45.2	40.68	17.65	64.9	27.02	32.38	25.2	54.54	4.82	23.4	55.78	7.93	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
7/8/99	600	929	51.9	9.63	9.36	45.2	40.68	17.65	65	26.96	32.45	25.2	54.54	4.82	23.3	55.85	7.86	
	1400	930	52	9.56	9.42	45.6	40.40	17.93	67.9	24.95	34.46	25.5	54.33	5.02	23.4	55.78	7.93	
	2200	931	52.3	9.36	9.63	47	39.43	18.90	69	24.18	35.22	25.7	54.19	5.16	23.7	55.58	8.14	
7/9/99	600	932	52.3	9.36	9.63	47	39.43	18.90	68.5	24.53	34.88	25.7	54.19	5.16	23.7	55.58	8.14	
	1400	933	52.3	9.36	9.63	46.1	40.05	18.27	68.1	24.81	34.60	25.6	54.26	5.09	23.6	55.65	8.07	
	2200	934	52.6	9.15	9.84	46	40.12	18.20	67	25.57	33.84	25.1	54.61	4.75	23.4	55.78	7.93	
7/10/99	600	935	52.8	9.01	9.98	45.7	40.33	18.00	67.5	25.22	34.18	25.4	54.40	4.96	23.2	55.92	7.79	
	1400	936	52.7	9.08	9.91	45.7	40.33	18.00	67.6	25.15	34.25	25.4	54.40	4.96	23.2	55.92	7.79	
	2200	937	52.7	9.08	9.91	45.9	40.19	18.13	67.8	25.01	34.39	25.4	54.40	4.96	23.1	55.99	7.72	
7/11/99	600	938	52.7	9.08	9.91	46	40.12	18.20	67.9	24.95	34.46	25.5	54.33	5.02	23.2	55.92	7.79	
	1400	939	52.7	9.08	9.91	45.9	40.19	18.13	67.9	24.95	34.46	25.5	54.33	5.02	23.3	55.85	7.86	
	2200	940	52.7	9.08	9.91	45.9	40.19	18.13	67.8	25.01	34.39	25.5	54.33	5.02	23.3	55.85	7.86	
7/12/99	600	941	52.8	9.01	9.98	46	40.12	18.20	67.9	24.95	34.46	25.5	54.33	5.02	23.3	55.85	7.86	
	1400	942	52.7	9.08	9.91	45.7	40.33	18.00	67.6	25.15	34.25	25.3	54.47	4.89	23.2	55.92	7.79	
	2200	943	52.8	9.01	9.98	46.2	39.98	18.34	68.3	24.67	34.74	25.5	54.33	5.02	23.4	55.78	7.93	
7/13/99	600	944	52.9	8.94	10.05	46.3	39.91	18.41	68.5	24.53	34.88	25.5	54.33	5.02	23.4	55.78	7.93	
	1400	945	52.8	9.01	9.98	46.3	39.91	18.41	68.3	24.67	34.74	25.5	54.33	5.02	23.5	55.71	8.00	
	2200	946	52.9	8.94	10.05	46.4	39.84	18.48	68.5	24.53	34.88	25.5	54.33	5.02	23.5	55.71	8.00	
7/14/99	600	947	52.9	8.94	10.05	46.4	39.84	18.48	68.6	24.46	34.95	25.5	54.33	5.02	23.4	55.78	7.93	
	1400	948	52.8	9.01	9.98	46.3	39.91	18.41	69	24.18	35.22	25.5	54.33	5.02	23.4	55.78	7.93	
	2200	949	52.9	8.94	10.05	46.5	39.78	18.55	69.2	24.04	35.36	25.4	54.40	4.96	23.5	55.71	8.00	
7/15/99	600	950	53	8.87	10.12	46.6	39.71	18.62	69.2	24.04	35.36	25.3	54.47	4.89	23.4	55.78	7.93	
	1400	951	52.9	8.94	10.05	46.3	39.91	18.41	69	24.18	35.22	25.3	54.47	4.89	23.4	55.78	7.93	
	2200	952	52.9	8.94	10.05	46.7	39.64	18.69	69.4	23.91	35.50	25.3	54.47	4.89	23.5	55.71	8.00	
7/16/99	600	953	52.9	8.94	10.05	46.6	39.71	18.62	69.5	23.84	35.57	25.3	54.47	4.89	23.5	55.71	8.00	
	1400	954	52.8	9.01	9.98	46.3	39.91	18.41	69.1	24.11	35.29	25.3	54.47	4.89	23.4	55.78	7.93	
	2200	955	52.8	9.01	9.98	46.5	39.78	18.55	69.5	23.84	35.57	25.3	54.47	4.89	23.4	55.78	7.93	
7/17/99	600	956	52.9	8.94	10.05	46.7	39.64	18.69	69.8	23.63	35.78	25.3	54.47	4.89	23.5	55.71	8.00	
	1400	957	52.9	8.94	10.05	46.6	39.71	18.62	69.7	23.70	35.71	25.3	54.47	4.89	23.3	55.85	7.86	
	2200	958	52.9	8.94	10.05	46.7	39.64	18.69	70	23.49	35.92	25.3	54.47	4.89	23.3	55.85	7.86	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS) (Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
7/18/99	600	959	52.9	8.94	10.05	47.1	39.36	18.97	70.1	23.42	35.99	25.3	54.47	4.89	23.3	55.85	7.86	
	1400	960	52.9	8.94	10.05	46.8	39.57	18.76	70.1	23.42	35.99	25.3	54.47	4.89	23.3	55.85	7.86	
	2200	961	52.7	9.08	9.91	46.9	39.50	18.83	70.4	23.21	36.19	25.3	54.47	4.89	23.3	55.85	7.86	
7/19/99	600	962	52.7	9.08	9.91	47.1	39.36	18.97	70.5	23.14	36.26	25.3	54.47	4.89	23.3	55.85	7.86	
	1400	963	53.4	8.59	10.40	46.7	39.64	18.69	74.4	20.44	38.97	25.4	54.40	4.96	23.6	55.65	8.07	
	2200	964	53.7	8.39	10.60	46.3	39.91	18.41	73.7	20.93	38.48	25.1	54.61	4.75	23.8	55.51	8.21	
7/20/99	600	965	53.6	8.46	10.53	46.5	39.78	18.55	73.4	21.13	38.27	25.2	54.54	4.82	23.4	55.78	7.93	
	1400	966	53.5	8.52	10.46	46.4	39.84	18.48	73.1	21.34	38.06	25.1	54.61	4.75	23.3	55.85	7.86	
	2200	967	53.7	8.39	10.60	46.6	39.71	18.62	73.7	20.93	38.48	25.3	54.47	4.89	23.4	55.78	7.93	
7/21/99	600	968	53.1	8.80	10.19	47	39.43	18.90	73.7	20.93	38.48	25.3	54.47	4.89	23.4	55.78	7.93	
	1400	969	53.3	8.66	10.33	47.4	39.15	19.17	72.4	21.83	37.58	25.1	54.61	4.75	23.1	55.99	7.72	
	2200	970	53.5	8.52	10.46	47.5	39.08	19.24	73.2	21.27	38.13	25.2	54.54	4.82	23.2	55.92	7.79	
7/22/99	600	971	53.7	8.39	10.60	47.2	39.29	19.04	73.5	21.06	38.34	25.3	54.47	4.89	23.4	55.78	7.93	
	1400	972	53.6	8.46	10.53	47.6	39.01	19.31	74.7	20.23	39.17	25.1	54.61	4.75	23.7	55.58	8.14	
	2200	973	53.8	8.32	10.67	46.8	39.57	18.76	75.1	19.96	39.45	25.1	54.61	4.75	23.3	55.85	7.86	
7/23/99	600	974	53.5	8.52	10.46	46.8	39.57	18.76	74.4	20.44	38.97	25.1	54.61	4.75	23.4	55.78	7.93	
	1400	975	53.5	8.52	10.46	46.8	39.57	18.76	74.4	20.44	38.97	25.1	54.61	4.75	23.4	55.78	7.93	
	2200	976	53.2	8.73	10.26	47	39.43	18.90	73.5	21.06	38.34	25.5	54.33	5.02	23.6	55.65	8.07	
7/24/99	600	977	53.6	8.46	10.53	47.8	38.87	19.45	74.8	20.16	39.24	25.3	54.47	4.89	23.4	55.78	7.93	
	1400	978	53.5	8.52	10.46	48	38.74	19.59	74.5	20.37	39.03	25.2	54.54	4.82	23.4	55.78	7.93	
	2200	979	53.6	8.46	10.53	47.9	38.81	19.52	74.9	20.09	39.31	25.2	54.54	4.82	23.4	55.78	7.93	
7/25/99	600	980	53.6	8.46	10.53	47.9	38.81	19.52	74.9	20.09	39.31	25.2	54.54	4.82	23.4	55.78	7.93	
	1400	981	53.5	8.52	10.46	46.8	39.57	18.76	72.5	21.76	37.65	25.1	54.61	4.75	23.1	55.99	7.72	
	2200	982	53.8	8.32	10.67	47.8	38.87	19.45	74.9	20.09	39.31	25.1	54.61	4.75	23.3	55.85	7.86	
7/26/99	600	983	53.9	8.25	10.74	47.6	39.01	19.31	75.2	19.89	39.52	25.2	54.54	4.82	23.4	55.78	7.93	
	1400	984	53.9	8.25	10.74	47.3	39.22	19.10	74.9	20.09	39.31	25.1	54.61	4.75	23.3	55.85	7.86	
	2200	985	53.3	8.66	10.33	47.6	39.01	19.31	76.1	19.26	40.14	25	54.68	4.68	23	56.06	7.65	
7/27/99	600	986	53.4	8.59	10.40	47.8	38.87	19.45	74.9	20.09	39.31	25	54.68	4.68	23	56.06	7.65	
	1400	987	53.1	8.80	10.19	46.7	39.64	18.69	73.7	20.93	38.48	24.8	54.81	4.54	23.3	55.85	7.86	
	2200	988	53.9	8.25	10.74	47.2	39.29	19.04	74.9	20.09	39.31	25	54.68	4.68	23.5	55.71	8.00	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
7/28/99	600	989	54	8.18	10.81	47.3	39.22	19.10	74.9	20.09	39.31	25.1	54.61	4.75	23.5	55.71	8.00	
	1400	990	53.9	8.25	10.74	47.5	39.08	19.24	74.6	20.30	39.10	25.1	54.61	4.75	23.5	55.71	8.00	
	2200	991	54	8.18	10.81	47.8	38.87	19.45	74.7	20.23	39.17	25.1	54.61	4.75	23.5	55.71	8.00	
7/29/99	600	992	54	8.18	10.81	47.5	39.08	19.24	74.9	20.09	39.31	25	54.68	4.68	23.5	55.71	8.00	
	1400	993	54.2	8.04	10.95	47.8	38.87	19.45	78.4	17.67	41.74	25.1	54.61	4.75	23.6	55.65	8.07	
	2200	994	54.3	7.97	11.02	48.1	38.67	19.66	77.2	18.50	40.91	25.3	54.47	4.89	23.5	55.71	8.00	
7/30/99	600	995	54.3	7.97	11.02	47.8	38.87	19.45	77	18.64	40.77	25.3	54.47	4.89	23.4	55.78	7.93	
	1400	996	54.2	8.04	10.95	47.5	39.08	19.24	76.7	18.85	40.56	25.2	54.54	4.82	23.4	55.78	7.93	
	2200	997	54.3	7.97	11.02	48.2	38.60	19.73	76.7	18.85	40.56	25.2	54.54	4.82	23.4	55.78	7.93	
7/31/99	600	998	54.4	7.90	11.09	47.9	38.81	19.52	77	18.64	40.77	25.2	54.54	4.82	23.5	55.71	8.00	
	1400	999	54.3	7.97	11.02	48.2	38.60	19.73	76.6	18.92	40.49	25.2	54.54	4.82	23.4	55.78	7.93	
	2200	1000	54.6	7.76	11.23	47.6	39.01	19.31	77.3	18.43	40.98	25.2	54.54	4.82	23.2	55.92	7.79	
8/1/99	600	1001	54.1	8.11	10.88	47.1	39.36	18.97	72.4	21.83	37.58	24.5	55.02	4.33	22.7	56.27	7.44	
	1400	1002	54.2	8.04	10.95	47.5	39.08	19.24	74.2	20.58	38.83	24.9	54.74	4.61	23.6	55.65	8.07	
	2200	1003	54.5	7.83	11.16	48.1	38.67	19.66	75.4	19.75	39.66	25	54.68	4.68	23.1	55.99	7.72	
8/2/99	600	1004	54.9	7.55	11.43	48.6	38.32	20.01	78.4	17.67	41.74	25	54.68	4.68				Missed reading on 12
	1400	1005	54.9	7.55	11.43	48.2	38.60	19.73	77.1	18.57	40.84	25.1	54.61	4.75	23.5	55.71	8.00	
	2200	1006	54.7	7.69	11.30	48.3	38.53	19.80	77.1	18.57	40.84	25.1	54.61	4.75	23.5	55.71	8.00	
8/3/99	600	1007	54.8	7.62	11.37	48.5	38.39	19.94	77	18.64	40.77	25.2	54.54	4.82	23.6	55.65	8.07	
	1400	1008	54.7	7.69	11.30	48.7	38.25	20.07	76.7	18.85	40.56	25.2	54.54	4.82	23.8	55.51	8.21	
	2200	1009	54.8	7.62	11.37	48.5	38.39	19.94	77.1	18.57	40.84	25.2	54.54	4.82	23.6	55.65	8.07	
8/4/99	600	1010	54.9	7.55	11.43	48.1	38.67	19.66	76.8	18.78	40.63	25.4	54.40	4.96	23.1	55.99	7.72	
	1400	1011	54.9	7.55	11.43	48.1	38.67	19.66	76.8	18.78	40.63	25.4	54.40	4.96	23.1	55.99	7.72	
	2200	1012																Expansion System Down.
8/5/99	600	1013	55	7.49	11.50	48.3	38.53	19.80	77.2	18.50	40.91	24.9	54.74	4.61	23.1	55.99	7.72	No re-injection taking place.
	1400	1014	55	7.49	11.50	48.2	38.60	19.73	76.6	18.92	40.49	24.8	54.81	4.54	23.2	55.92	7.79	
	2200	1015	55	7.49	11.50	48.7	38.25	20.07	78.5	17.60	41.81	24.9	54.74	4.61	23.3	55.85	7.86	
8/6/99	600	1016	55.1	7.42	11.57	49	38.04	20.28	78.8	17.39	42.01	25	54.68	4.68	23.5	55.71	8.00	
	1400	1017	55.1	7.42	11.57	48.9	38.11	20.21	79.1	17.18	42.22	25	54.68	4.68	23.5	55.71	8.00	
	2200	1018	55.2	7.35	11.64	49.2	37.90	20.42	80.2	16.42	42.99	25	54.68	4.68	23.6	55.65	8.07	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
8/7/99	600	1019	55.3	7.28	11.71	49.4	37.77	20.56	79.6	16.84	42.57	25.1	54.61	4.75	23.6	55.65	8.07	
	1400	1020	55.3	7.28	11.71	48.8	38.18	20.14	79.4	16.98	42.43	25.1	54.61	4.75	23.6	55.65	8.07	
	2200	1021	55.3	7.28	11.71	49.2	37.90	20.42	79.5	16.91	42.50	25	54.68	4.68	23.6	55.65	8.07	
8/8/99	600	1022	55.3	7.28	11.71	49.3	37.84	20.49	78	17.95	41.46	25	54.68	4.68	23.5	55.71	8.00	
	1400	1023	55.4	7.21	11.78	48.7	38.25	20.07	78.7	17.46	41.95	25	54.68	4.68	23.6	55.65	8.07	
	2200	1024	55.2	7.35	11.64	49.5	37.70	20.63	79.1	17.18	42.22	25	54.68	4.68	23.5	55.71	8.00	
8/9/99	600	1025	55.3	7.28	11.71	49.5	37.70	20.63	80	16.56	42.85	25	54.68	4.68	23.6	55.65	8.07	
	1400	1026	55.1	7.42	11.57	49.4	37.77	20.56	79.9	16.63	42.78	25	54.68	4.68	23.6	55.65	8.07	
	2200	1027	55.2	7.35	11.64	49.6	37.63	20.70	80	16.56	42.85	25.1	54.61	4.75	23.7	55.58	8.14	
8/10/99	600	1028																Clean out sparge ring in
	1400	1029	54.9	7.55	11.43	47.2	39.29	19.04	72.8	21.55	37.86	24.7	54.88	4.47	23.4	55.78	7.93	aeration tank. No re-injection
	2200	1030	54.8	7.62	11.37	47.7	38.94	19.38	74.8	20.16	39.24	24.8	54.81	4.54	23.4	55.78	7.93	taking place.
8/11/99	600	1031	54.9	7.55	11.43	47.7	38.94	19.38	75.8	19.47	39.94	24.8	54.81	4.54	23.5	55.71	8.00	
	1400	1032	54.3	7.97	11.02	47.8	38.87	19.45	76.2	19.19	40.21	24.6	54.95	4.40	23.1	55.99	7.72	
	2200	1033	54.4	7.90	11.09	48	38.74	19.59	78	17.95	41.46	24.6	54.95	4.40	23.2	55.92	7.79	
8/12/99	600	1034	54.8	7.62	11.37	48.5	38.39	19.94	79.5	16.91	42.50	24.8	54.81	4.54	23.4	55.78	7.93	
	1400	1035	54.7	7.69	11.30	48.3	38.53	19.80	79.5	16.91	42.50	24.7	54.88	4.47	23.4	55.78	7.93	
	2200	1036	54.7	7.69	11.30	48.6	38.32	20.01	76.2	19.19	40.21	24.8	54.81	4.54	23.6	55.65	8.07	
8/13/99	600	1037	54.8	7.62	11.37	49	38.04	20.28	78.8	17.39	42.01	24.8	54.81	4.54	23.5	55.71	8.00	
	1400	1038	54.8	7.62	11.37	48.6	38.32	20.01	80	16.56	42.85	24.8	54.81	4.54	23.5	55.71	8.00	
	2200	1039	54.9	7.55	11.43	48.9	38.11	20.21	80.7	16.07	43.33	24.7	54.88	4.47	23.4	55.78	7.93	
8/14/99	600	1040	54.9	7.55	11.43	49.1	37.97	20.35	81	15.87	43.54	24.8	54.81	4.54	23.6	55.65	8.07	
	1400	1041	54.9	7.55	11.43	49.1	37.97	20.35	81.2	15.73	43.68	24.7	54.88	4.47	23.5	55.71	8.00	
	2200	1042	55	7.49	11.50	49.1	37.97	20.35	77.9	18.02	41.39	24.7	54.88	4.47	23.6	55.65	8.07	
8/15/99	600	1043	55.1	7.42	11.57	49.3	37.84	20.49	79.7	16.77	42.64	24.8	54.81	4.54	23.6	55.65	8.07	
	1400	1044	54.9	7.55	11.43	49.2	37.90	20.42	80.8	16.01	43.40	24.8	54.81	4.54	23.7	55.58	8.14	
	2200	1045	54.7	7.69	11.30	49	38.04	20.28	80.2	16.42	42.99	24.6	54.95	4.40	23.4	55.78	7.93	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
8/16/99	600	1046	54.8	7.62	11.37	49.1	37.97	20.35	80.6	16.14	43.26	24.6	54.95	4.40	23.4	55.78	7.93	
	1400	1047	55	7.49	11.50	49.4	37.77	20.56	80.6	16.14	43.26	24.6	54.95	4.40	23.3	55.85	7.86	
	2200	1048	55.1	7.42	11.57	49.9	37.42	20.91	80.7	16.07	43.33	24.6	54.95	4.40	23.3	55.85	7.86	
8/17/99	600	1049	55.2	7.35	11.64	49.7	37.56	20.77	80.8	16.01	43.40	24.6	54.95	4.40	23.4	55.78	7.93	
	1400	1050	55.1	7.42	11.57	49.6	37.63	20.70	81.1	15.80	43.61	24.6	54.95	4.40	23.4	55.78	7.93	
	2200	1051	55.1	7.42	11.57	49.7	37.56	20.77	81.3	15.66	43.75	24.7	54.88	4.47	23.3	55.85	7.86	
8/18/99	600	1052	55.4	7.21	11.78	50.7	36.86	21.46	77	18.64	40.77	24.9	54.74	4.61	23.6	55.65	8.07	
	1400	1053	55.4	7.21	11.78	50.2	37.21	21.11	78.4	17.67	41.74	24.9	54.74	4.61	23.6	55.65	8.07	
	2200	1054	55.5	7.14	11.85	50.6	36.93	21.39	81.5	15.52	43.89	24.9	54.74	4.61	23.7	55.58	8.14	
8/19/99	600	1055	55.6	7.07	11.92	51.3	36.45	21.88	82.4	14.90	44.51	25	54.68	4.68	23.8	55.51	8.21	
	1400	1056	55.6	7.07	11.92	50.5	37.00	21.32	82.5	14.83	44.58	25	54.68	4.68	23.8	55.51	8.21	
	2200	1057	55.7	7.00	11.99	50.6	36.93	21.39	82.7	14.69	44.72	24.9	54.74	4.61	23.8	55.51	8.21	
8/20/99	600	1058	55.6	7.07	11.92	51	36.66	21.67	82.8	14.62	44.79	24.9	54.74	4.61	23.7	55.58	8.14	
	1400	1059	55.6	7.07	11.92	50.5	37.00	21.32	82.7	14.69	44.72	24.8	54.81	4.54	23.8	55.51	8.21	
	2200	1060	55.8	6.93	12.06	50.8	36.80	21.53	86.5	12.06	47.35	24.9	54.74	4.61	23.8	55.51	8.21	
8/21/99	600	1061	56	6.79	12.20	51.3	36.45	21.88	78.8	17.39	42.01	25	54.68	4.68	23.9	55.44	8.28	
	1400	1062	55.9	6.86	12.13	51.2	36.52	21.81	82.9	14.55	44.86	24.9	54.74	4.61	23.9	55.44	8.28	
	2200	1063	56	6.79	12.20	51.1	36.59	21.74	83.1	14.41	44.99	24.9	54.74	4.61	23.8	55.51	8.21	
8/22/99	600	1064	56	6.79	12.20	51.7	36.17	22.15	83.6	14.07	45.34	24.9	54.74	4.61	23.9	55.44	8.28	
	1400	1065	55.9	6.86	12.13	51	36.66	21.67	83.4	14.20	45.20	24.9	54.74	4.61	23.9	55.44	8.28	
	2200	1066	56	6.79	12.20	51.1	36.59	21.74	83	14.48	44.93	24.9	54.74	4.61	23.9	55.44	8.28	
8/23/99	600	1067	56	6.79	12.20	51.5	36.31	22.02	83.9	13.86	45.55	24.9	54.74	4.61	23.9	55.44	8.28	
	1400	1068																System down for
	2200	1069	56.4	6.51	12.47	51.2	36.52	21.81	85.8	12.54	46.87	24.5	55.02	4.33	24.1	55.30	8.41	Communication testing and
8/24/99	600	1070	56.6	6.38	12.61	51.3	36.45	21.88	86.7	11.92	47.49	24.6	54.95	4.40	23.9	55.44	8.28	power outage. No re-injection
	1400	1071	57	6.10	12.89	52.4	35.69	22.64	89.4	10.05	49.36	24.6	54.95	4.40	24	55.37	8.35	taking place.
	2200	1072	56.4	6.51	12.47	51.8	36.10	22.22	86.9	11.78	47.63	24.6	54.95	4.40	24.1	55.30	8.41	
8/25/99	600	1073	56.5	6.45	12.54	51.9	36.03	22.29	86.8	11.85	47.56	24.6	54.95	4.40	24.2	55.23	8.48	
	1400	1074	57.2	5.96	13.03	52.7	35.48	22.85	81.9	15.24	44.16	24.4	55.09	4.26	23.9	55.44	8.28	
	2200	1075	57.3	5.89	13.10	52.7	35.48	22.85	84.9	13.16	46.24	24.4	55.09	4.26	24	55.37	8.35	

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TABLE B-1

WATER LEVEL DATA (FROM RE-INJECTIOIN WELLS)
(Continued)

inj-tab																		Operational Notes
			IW-8			IW-9			IW-10			IW-11			IW-12			Settings used from start of
High Water Level (Feet, BTOW)			2.63			20.7			18.8			17.5			23			re-injection to Feb. 10, 1999
Installation Depths (Feet, BTOW)			45.6			86.6			83.8			83.4			88.8			
Completion Method			FP			FP			Natural			FP			FP			
Diameter of Well			8 inch			12 inch			16 inch			16 inch			16 inch			
				%			%			%			%					
Mnt. Set Point (Feet, BTOW)			6.1	57		9.6	90		9.6	90		9.6	90		9.6			Transducers adjusted to
Shut Off Point (Feet, BTOW)			3.5	62		3.4	95		3.4	95		3.4	95		3.4			set points defined in variance
Depth to Trans., (Feet, BTOW)			45.6			72			72			72			72			50.03.79-2 on Feb. 10, 1999
Date	Time		%	Depth	IW-8	%	Depth	IW-9	%	Depth	IW-10	%	Depth	IW-11	%	Depth	IW-12	
8/26/99	600	1076	57.4	5.82	13.17	52.7	35.48	22.85	85.3	12.89	46.52	24.4	55.09	4.26	24	55.37	8.35	
	1400	1077	57.4	5.82	13.17	52.6	35.55	22.78	82.7	14.69	44.72	24.4	55.09	4.26	24	55.37	8.35	
	2200	1078	57.4	5.82	13.17	52.7	35.48	22.85	84.8	13.23	46.17	24.5	55.02	4.33	24	55.37	8.35	
8/27/99	600	1079	57.5	5.75	13.24	52.1	35.89	22.43	85.5	12.75	46.66	24.5	55.02	4.33	24.1	55.30	8.41	
	1400	1080	57.5	5.75	13.24	52	35.96	22.36	85.3	12.89	46.52	24.4	55.09	4.26	24	55.37	8.35	
	2200	1081	57.6	5.68	13.31	52.4	35.69	22.64	86.7	11.92	47.49	24.4	55.09	4.26	24.1	55.30	8.41	
8/28/99	600	1082	57.7	5.61	13.37	52.4	35.69	22.64	87.9	11.09	48.32	24.5	55.02	4.33	24.1	55.30	8.41	
	1400	1083	57.6	5.68	13.31	52.2	35.83	22.50	87.5	11.36	48.04	24.4	55.09	4.26	24.1	55.30	8.41	
	2200	1084	57.7	5.61	13.37	52.3	35.76	22.57	84.7	13.30	46.10	24.5	55.02	4.33	24.1	55.30	8.41	
8/29/99	600	1085	57.4	5.82	13.17	52.6	35.55	22.78	86.9	11.78	47.63	24.5	55.02	4.33	24.2	55.23	8.48	
	1400	1086	57.3	5.89	13.10	52.5	35.62	22.71	87.4	11.43	47.97	24.4	55.09	4.26	24.1	55.30	8.41	
	2200	1087	57.4	5.82	13.17	52.7	35.48	22.85	88.1	10.95	48.46	24.7	54.88	4.47	24.1	55.30	8.41	
8/30/99	600	1088	57.5	5.75	13.24	52.8	35.41	22.92	88.6	10.60	48.81	24.7	54.88	4.47	24.2	55.23	8.48	
	1400	1089	57.3	5.89	13.10	52.6	35.55	22.78	88.4	10.74	48.67	24.7	54.88	4.47	24.1	55.30	8.41	
	2200	1090	57.5	5.75	13.24	52.8	35.41	22.92	88	11.02	48.39	24.7	54.88	4.47	24.2	55.23	8.48	
8/31/99	600	1091	57.6	5.68	13.31	52.9	35.34	22.99	88.2	10.88	48.53	24.7	54.88	4.47	24.2	55.23	8.48	
	1400	1092	57.4	5.82	13.17	52.7	35.48	22.85	88.8	10.46	48.94	24.6	54.95	4.40	24.2	55.23	8.48	
	2200	1093	57.5	5.75	13.24	53.4	34.99	23.33	85.7	12.61	46.80	24.4	55.09	4.26	24.2	55.23	8.48	
9/1/99	600	1094	57.7	5.61	13.37	52.7	35.48	22.85	88.1	10.95	48.46	24.5	55.02	4.33	24.2	55.23	8.48	
	1400	1095	57.5	5.75	13.24	53.4	34.99	23.33	89.8	9.77	49.64	24.4	55.09	4.26	24.2	55.23	8.48	
	2200	1096	57.7	5.61	13.37	53.4	34.99	23.33	83.4	14.20	45.20	24.4	55.09	4.26	24.1	55.30	8.41	
9/2/99	600	1097	57.7	5.61	13.37	53.5	34.92	23.40	83.6	14.07	45.34	24.4	55.09	4.26	24.2	55.23	8.48	

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APPENDIX C

IRON BACTERIA DATA

APPENDIX C

This appendix contains a tabulation of iron bacteria data collected during the Demonstration. Iron bacteria monitoring results are discussed in Section 3 of this report.

Prepared Biological Activity Reaction Test (BART) kits were utilized for the sampling activity. Each sampling event tested for iron related bacteria (IRB), slime forming bacteria (SLM), and total aerobic bacteria (TAB).

As outlined in the Re-Injection Demonstration Test Plan, sampling for iron bacteria took place at a re-injection well and a designated observation well each time that the Re-Injection well underwent a treatment for plugging. Tables C-1 through C-4 are the bacterial sampling results from the four iron plugging treatments that took place at Re-Injection Well IW-8. Tables C-5 and C-6 are the bacterial sampling results from the two plugging treatments that took place at Re-Injection Well IW-10.

Each BART kit is essentially a bacterial culture. Color changes within the test vile over time indicate general conditions concerning the aggressiveness of the iron bacteria growth and the approximate amount of colony forming units per milliliter (cfu/ml). Tables B-1 through B-6 present the pre-injection test results, as well as the re-habilitation testing results so that a comparison can be made.

TABLE C-1

BACTERIA DATA FROM THE FIRST REHABILITATION OF IW-8
October 22, 1999 to October 29, 1999

Observation Well 22299	Pre-Injection 08/14/98	Before Re-Habilitation 10/21/1998 - 0842 hours	Following Re-Habilitation 10/29/98 - 1450 hours	Following Re-Habilitation 10/29/1998 - 1629 hours	Following Re-Habilitation 11/5/1998 - 0930 hours
Iron Related Bacteria (IRB)	Aggressive Growth IRB and anaerobic bacteria Approx. 5,000 cfu/ml	Aggressive Growth Possible IRB. Approx. 5,000 cfu/ml	Aggressive Growth Possible IRB and Enterics Approx. 5,000 cfu/ml	Aggressive Growth Possible IRB, pseudomorphs and entrics IRB approx. 100 to 5,000 cfu/ml pseudomonades and entrics	Aggressive Growth Possible IRB Approx. 100 cfu/ml
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slime Bacteria Approx 500,000 cfu/ml	Aggressive Growth Posible Slime Forming bacteria approx. 500,000 cfu/ml	Not Aggressive No Reaction	Not Aggressive No Reaction	Not Aggressive No Reaction
Total Aerobic Bacteria (TAB)	Aggressive Growth Aerobic Bacteria Approx. 1000 cfu/ml	Aggressive Growth Aerobic Bacteria Approx. 500,000 cfu/ml	Aggressive Growth Aerobic Bacteria Approx. 1,000 cfu/ml	Aerobic Bacteria Approx. 1,000 cfu/ml	Aggressive Growth

IW-8 Extraction Well - 22107	Pre-Injection 08/14/98	Before Re-Habilitation 10/22/1998 - 1600 hours	Following Re-Habilitation 10/29/1998 - 1530 hours	Following Re-Habilitation 10/29/1998 - 1629 hours	Following Re-Habilitation 11/5/1998 - 0930 hours
Iron Related Bacteria (IRB)	Aggressive Growth IRB and anaerobic bacteria 100 - 5000 cfu/ml	Aggressive Growth Possible IRB. Pseudomonads 5,000 to 100,000 cfu/ml	Aggressive Growth Possible IRB. Approx. 100 cfu	NS	NS
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slym Bacteria Approx. 500,000 cfu/ml	Aggressive Growth Possible Slym Bacteria 10,000 to 500,000 cfu/ml	Aggressive Growth Possible Slym Bacteria approx. 100 cfu/ml	NS	NS
Total Aerobic Bacteria (TAB)	Aggressive Growth Aerobic Bacteria Approx. 100 cfu/ml	Aggressive Growth Aerobic Bacteria Approx. 500,000 cfu/ml	Aggressive Growth Possible Aerobic Bacteria Approx. 100 cfu/ml	NS	NS

NS = Not Sampled.

000225

TABLE C-2

BACTERIA DATA FROM THE SECOND REHABILITATION OF IW-8
February 26, 1999 to March 4, 1999

Observation Well 22299	Pre-Injection 8/14/98	Before Re-Habilitation	Following Re-Habilitation 3/4/1999 - 1400 hours	Following Re-Habilitation 3/4/1999 - 1405 hours	Following Re-Habilitation 3/4/1999 - 1600 hours	Following Re-Habilitation 3/15/1999 - 1500 hours
Iron Related Bacteria (IRB)	Aggressive Growth IRB and anaerobic bacteria Approx. 5,000 cfu/ml	NS	Aggressive Growth Possible IRB 100 to 5,000 cfu/ml	Aggressive Growth Possible IRB Posible pseudomonods and entrics. IRB 100 to 5,000 cfu/ml Pseudomonods and entrics approx. 100 cfu/ml	Aggressive Growth Possible IRB Possible anaerobic bacteria 100 to 5,000 cfu/ml	Aggressive Growth Possible IRB Approx. 5,000 cfu/ml
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slime Bacteria Approx 500,000 cfu/ml	NS	Aggressive Growth Possible SLM 1,000 to 10,000 cfu/ml	Aggressive Growth Possible SLM Approx. 10,000 cfu/ml	Aggressive Growth Possible SLM 10,000 to 500,000 cfu/ml	Aggressive Growth Possible SLM 1,000 to 10,000 cfu/ml
Total Aerobic Bacteria (TAB)	Aggressive Growth Aerobic Bacteria Approx. 1000 cfu/ml	NS	Aggressive Growth Possibe TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	
IW-8 Extraction Well - 22107	**Pre-Injection 8/14/98**	**Before Re-Habilitation 3/1/99**	**Following Re-Habilitation**	**Following Re-Habilitation 3/4/1999 - 1405 hours**	**Following Re-Habilitation 3/4/1999 - 1600 hours**	**Following Re-Habilitation 3/15/1999 - 1500 hours**
Iron Related Bacteria (IRB)	Aggressive Growth IRB and anaerobic bacteria 100 - 5000 cfu/ml	Aggressive Growth Possible anaerobic bacteria and IRB Anaerobic Bacteria Approx. 5,000 cfu/ml IRB approx. 100 cfu/ml	NS	NS	NS	NS
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slym Bacteria Approx. 500,000 cfu/ml	Aggressive Growth Possible SLM and fluorescing pseudomonads SLM approx. 1,000 cfu/ml fluorescing pseudomonads 100 cfu/ml	NS	NS	NS	NS
Total Aerobic Bacteria (TAB)	Aggressive Growth Aerobic Bacteria Approx. 100 cfu/ml	Aggressive Growth Possible Aerobic Bacteria Approx. 1,000 cfu/ml	NS	NS	NS	NS

NS = Not sampled

000226

2999

TABLE C-3

BACTERIA DATA FROM THE THIRD REHABILITATION OF IW-8
May 3, 1999 to May 6, 1999

Observation Well 22299	Pre-Injection 8/14/98	Before Re-habilitation 5/3/99	Following Re-Habilitation 5/5/1999 - 1425 hours	Following Re-Habilitation 5/6/1999 - 1030 hours	Following Re-Habilitation 5/6/1999 - 1230 hours	Following Re-Habilitation 5/11/1999 - 0915 hours
Iron Related Bacteria (IRB)	Aggressive Growth IRB and anaerobic bacteria Approx. 5,000 cfu/ml	Aggressive Growth Possible IRB & enterics Possible anaerobic IRB: 100 to 5,000 cfu/ml Pseudo & entrics: Approx. 100 cfu/ml Anaerobic: 100 to 5,000 cfu/ml	Aggressive Growth Possible anaerobic Aprox. 100 cfu/ml	Aggressive Growth Possible IRB, anaerobic, pseudomonods and entrics. IRB: Approx. 5,00 cfu/ml. Anaerobic: Approx. 5,000 cfu/ml pseudomonods and entrics Approx. 100 cfu/ml.	Aggressive Growth Possible IRB, pseudomonds & enterics IRB: 100 to 5,000 cfu/ml pseudomonds & entrics: Approx. 100 cfu/ml	Aggressive Growth Possible IRB, anaerobic bacteria IRB: 100 to 5,000 cfu/ml
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slime Bacteria Approx 500,000 cfu/ml	Aggressive Growth Possible SLM & fluorescing pseudomonads SLM: Approx. 10,000 cfu/ml Fluorescing psedomonads: 100 to 1,000 cfu/ml	Aggressive Growth Possible SLM Approx. 100 cfu/ml	Aggressive Growth Possible SLM Approx. 10,000 cfu/ml	Aggressive Growth Possible SLM Approx. 10,000 cfu/ml	Aggressive Growth Possible SLM 1,000 to 10,000 cfu/ml
Total aerobic Bacteria (TAB)	Aggressive Growth Aerobic Bacteria Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 500,000 cfu/ml	Not Aggressive No Reaction	Aggressive Growth Possible TAB Approx. 500,000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml
IW-8 Extraction Well - 22107	**Pre-Injection 8/14/98**	**Before Re-habilitation 5/3/99**	**Following Re-Habilitation**	**Following Re-Habilitation 5/6/1999 - 1030 hours**	**Following Re-Habilitation 5/6/1999 - 1230 hours**	**Following Re-Habilitation 5/11/1999 - 0915 hours**
Iron Related Bacteria (IRB)	Aggressive Growth IRB and anaerobic bacteria 100 - 5000 cfu/ml	Aggressive Growth Possible IRB Approx. 100 cfu/ml	NS	NS	NS	NS
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slym Bacteria Approx. 500,000 cfu/ml	Aggressive Growth Possible SLM Approx. 1000 cfu/ml	NS	NS	NS	NS
Total Aerobic Bacteria (TAB)	Aggressive Growth Aerobic Bacteria Approx. 100 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	NS	NS	NS	NS

NS = Not sampled

000227

TABLE C-4

BACTERIA DATA FROM THE FOURTH REHABILITATION OF IW-8
September 7, 1999 to September 13, 1999

Observation Well 22299	Pre-Injection 8/14/98	Before Re-Habilitation 9/7/1999 - 0945 hours	After Re-Habilitation 9/13/1999 - 1010 hours	After Re-Habilitation 9/13/1999 - 1435 hours	After Re-Habilitation 9/13/1999 - 1640 hours	After Re-Habilitation 9/20/1999 - 0935 hours
Iron Related Bacteria (IRB)	Aggressive Growth IRB and anaerobic bacteria Approx. 5,000 cfu/ml	Aggressive Growth Possible IRB and AnaerobicBacteria IRB: Approx. 5,000 cfu/ml. Anaerobic: Approx. 5,000 cfu/ml	Aggressive Growth Posible IRB, pseudomonads and entrics IRB: 100 to 5,000 cfu/ml pseudomonds & entrics Approx. 100 cfu/ml	Aggressive Growth Possible IRB, anaerobic and entric bacteria IRB: 100 to 5,000 cfu/ml Enteric: Approx. 100 cfu/ml Aerobic: 5,000 to 100,000 cfu/ml	Aggressive Growth Possible IRB, anaerobic IRB: 100 cfu to 5,000 cfu/ml Anaerobic: 5,000 to 100,000 cfu/ml	Aggressive Growth Possible IRB and anaerobic bacteria IRB: Approx. 100 cfu/ml
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slime Bacteria Approx 500,000 cfu/ml	Not Aggressive No Reaction	Aggressive Growth Possible SLM 10,000 to 500,000 cfu/ml	Aggressive Growth Possible SLM Approx. 500,000 cfu/ml	Aggressive Growth Possible SLM 10,000 to 500,000 cfu/ml	Aggressive Growth Possible SLM 10,000 to 500,000 cfu/ml
Total Aerobic Bacteria (TAB)	Aggressive Growth Aerobic Bacteria Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 500,000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 100 cfu/ml	Aggressive Growth Possible TAB Approx. 100 cfu/ml
IW-8 Extraction Well - 22107	**Pre-Injection 8/14/98**	**Before Re-Habilitation 9/7/1999 - 0945 hours**	**After Re-Habilitation**	**After Re-Habilitation 9/13/1999 - 1435 hours**	**After Re-Habilitation 9/13/1999 - 1640 hours**	**After Re-Habilitation 9/20/1999 - 0935 hours**
Iron Related Bacteria (IRB)	Aggressive Growth IRB and anaerobic bacteria 100 - 5000 cfu/ml	Aggressive Growth Possible IRB, pseudomonds, and entrics bacteria IRB: Approx. 5,000 cfu/ml Pseudomonads and entrics Approx. 100 to 5,000 cfu/ml Anaerobic: Approx. 5,000 cfu/ml	NS	NS	NS	NS
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slym Bacteria Approx. 500,000 cfu/ml	No Aggressive Growth No Reaction	NS	NS	NS	NS
Total Aerobic Bacteria (TAB)	Aggressive Growth Aerobic Bacteria Approx. 100 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	NS	NS	NS	NS

NA= Not Sampled.

000228

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TABLE C-5

BACTERIA DATA FROM THE FIRST REHABILITATION OF IW-10
April 12, 1999 to April 20, 1999

Observation Well 22301	Pre-Injection 8/14/98	Before Re-Habilitation 4/8/1999 - 1545 hours	Following Re-Habilitation 4/20/1999 - 0900 hours	Following Re-Habilitation 4/20/1999 - 0907 hours	Following Re-Habilitation 4/20/1999 - 1107 hours	Following Re-Habilitation
Iron Related Bacteria (IRB)	Aggressive Growth IRB, and anaerobic 100 to 5,000 cfu/ml	Aggressive Growth Possible pseudomonds & entrics. IRB IRB: Approx. 100,000 cfu/ml Pseud. and entrics: 5,000 to 100,000 cfu/ml	Aggressive Growth Possible IRB, Entrics & pseudomonads IRB: Approx. 5,000 cfu/ml pseud. & entrics: Approx. 100 cfu/ml	Aggressive Growth Possible IRB, Entrics & pseudomonads IRB: 100 to 5,000 cfu/ml pseudo & entrics: 100 cfu/ml	Aggressive Growth Possible IRB, entrics & pseudomonads IRB: Approx. 5,000 cfu/ml pseud. & entrics: 100 cfu/ml	NS
Slime Forming Bacteria (SLM)	Aggressive Growth SLM: 500,000 cfu/ml	Aggressive Growth Possilbe SLM Approx. 500,000 cfu/ml	Aggressive Growth Possible SLM Approx. 500,000 cfu/ml	Aggressive Growth Possible SLM 1,000 to 10,000 cfu/ml	Aggressive Growth Possible SLM Approx. 500,000 cfu/ml	NS
Total Aerobic Bacteria (TAB)	Aggressive Growth TAB: Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 100 cfu/ml	Aggressive Growth Possible TAB 100 cfu/ml	Aggressive Growth Possible TAB Approx. 100 cfu/ml	NS
IW-10 Extraction Well - 22109	**Pre-Injection 8/14/98**	**Before Re-Habilitation 4/12/1999 - 1145 hours**	**Following Re-Habilitation 4/19/1999 - 1515 hours**	**Following Re-Habilitation 4/20/1999 - 0907 hours**	**Following Re-Habilitation 4/20/1999 - 1107 hours**	**Following Re-Habilitation**
Iron Related Bacteria (IRB)	Aggressive Growth IRB, pseudomonods and entrics 100 to 5,000 cfu/ml	Aggressive Growth Possible IRB, entrics and pseudomonods IRB: 5,000 cfu/ml Entrics and pseudomonods: 100 cfu/ml	Aggressive Growth Possible IRB, entrics & pseudomonads IRB: Approx. 5,000 cfu/ml Pseud & Entrics: Approx. 100 cfu/ml	NS	NS	NS
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slime bacteria	Aggressive Growth Approx: 5000 cfu/ml	Aggressive Growth Posible SLM Approx. 100 cfu/ml	NS	NS	NS
Total Aerobic Bacteria (TAB)	Aggressive Growth TAB: 100 to 1,000 cfu/ml	Aggressive Growth: Possible TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 100 cfu/ml	NS	NS	NS

NA = Not Sampled

000229

TABLE C-6

BACTERIA DATA FROM THE SECOND REHABILITATION OF IW-10
September 13, 1999 to September 21, 1999

Observation Well 22301	**Pre-Injection 08/14/98**	**Before Re-Habilitation 9/13/1999 - 1105 hours**	**Following Re-Habilitation 9/30/1999 - 1045 hours**	**Following Re-Habilitation 9/30/1999 - 1200 hours**	**Following Re-Habilitation 10/11/1999 - hours**
Iron Related Bacteria (IRB)	Aggressive Growth IRB, and anaerobic 100 to 5,000 cfu/ml	Aggressive Growth Possible IRB 100 to 5,000 cfu/ml	Aggressive Growth Possible IRB, entrics, & pseudomonads IRB: 100 to 5,000 cfu/ml psued. & entrics: 100 to 5,000 cfu/ml	Aggressive Growth Possible IRB, entrics, & pseudomonads IRB: Approx. 100 cfu/ml pseud. & entrics: Approx. 100 cfu/ml	Aggressive Growth Possible IRB & entrics IRB: Approx 100 cfu/ml Enterics: Approx. 100 cfu/ml
Slime Forming Bacteria (SLM)	Aggressive Growth SLM: 500,000 cfu/ml	No Reaction	Aggressive Growth Possible SLM Approx. 10,000 cfu/ml	Aggressive Growth Possible SLM 10,000 to 500,000 cfu/ml	Aggressive Growth Possible SLM Approx. 10,000 cfu/ml
Total Aerobic Bacteria (TAB)	Aggressive Growth TAB: Approx. 1000 cfu/ml	Aggressive Growth Approx. 100 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml	Aggressive Growth Possible TAB Approx. 1000 cfu/ml
IW-10 Extraction Well 22109	**Pre-Injection 08/14/98**	**Before Re-Habilitation 9/13/1999 - 1350 hours**	**Following Re-Habilitation 9/30/1999 - 1045 hours**	**Following Re-Habilitation 9/30/1999 - 1200 hours**	**Following Re-Habilitation 10/11/1999 - hours**
Iron Related Bacteria (IRB)	Aggressive Growth IRB, pseudomonods and entrics 100 to 5,000 cfu/ml	Aggressive Growth Possible IRB, entrics and psudomonads IRB: 100 to 5,000 cfu/ml pseud. & entrics: 100 to 5,000 cfu/ml	NS	NS	NS
Slime Forming Bacteria (SLM)	Aggressive Growth Dense Slime bacteria	Aggressive Growth Possible SLM fluorescing pseudomonads IRB: 100 to 5,000 cfu/ml pseud. & entrics: 100 to 5,000 cfu/ml	NS	NS	NS
Total Aerobic Bacteria (TAB)	Aggressive Growth TAB: 100 to 1,000 cfu/ml	Aggressive Growth Approx. 500,000 cfu/ml	NS	NS	NS

NS = Not Sampled.

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APPENDIX D

WATER LEVEL DATA (FROM MONITORING WELLS)

APPENDIX D

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This appendix contains a tabulation of water level data collected in groundwater monitoring wells during the Demonstration. Water level data is discussed in Section 4 of the report. The locations for these monitoring wells are shown in Figure 4-4. Table D-1 presents water level data collected from August 24, 1998 through September 28, 1998. Table D-2 presents the water level data collected from October 1998 through August 1999. The week or the month that the water levels were collected in, are posted at the top of each column in each table. Water levels are presented in feet amsl.

Re-Injection began on September 2, 1998. Data collected the week of September 24, 1998 represent water level conditions after startup of the additional South Plume Extraction Wells and South Field Extraction Wells but prior to the start of re-injection.

TABLE D-1

WATER LEVEL DATA FROM MONITORING WELLS AUGUST 1998 THROUGH SEPTEMBER 1998

(Data Presented in Units of Feet above Mean Sea Level)

	Well Number	Week of 8/24/98	Week of 9/3/98	Week of 9/7/98	Week of 9/14/98	Week of 9/21/98	Week of 9/28/98
1	2002	516.01	515.45	515.23	515.35	515.1	514.85
2	2014	519.51	519.19	519.65	518.96	518.86	518.62
3	2015	518.9	518.72	518.7	518.65	518.37	518.22
4	2016	520.29	519.69	519.51	519.27	519.09	518.99
5	2017	519.8	519.69	519.69	519.55	519.4	519.26
6	2045	519.38	518.82	518.11	518.59	518.4	518.38
7	2048	520	519.42	519.28	519.07	518.85	518.65
8	2049	519.24	518.79	518.72	518.58	513.38	518.27
9	2070	519.37	518.84	518.67	518.43	518.23	517.99
10	2093	518.02	517.51	517.34	517.27	516.94	516.74
11	2095	517.67	517.19	517.08	517.06	516.93	516.61
12	2096	523.05	530.65	522.15	522.19	522.11	521.91
13	21033	519.36		518.82	518.6	518.4	518.21
14	21063	518.57	518.14	517.94	517.78	517.47	517.33
15	2107						
16	2166	519.02	518.71	518.64	518.47	518.21	518.07
17	22299	519.47	520.39	520.47	520.37		520.08
18	22300	519.56	520.2	520.18	520.24	519.93	519.75
19	22301	518.71	519.21	519.17	519.06	518.81	518.7
20	22302	519.17	519.28	519.27	519.14	518.82	518.74
21	22303	519.5	519.47	519.34	519.26	518.91	518.74
22	2387	519.23	518.68	518.59	518.44	518.27	518.01
23	2390	519.72	519.43	519.43	518.31	519.09	518.92
24	2397	520.27	519.7	519.51	519.22	518.99	519.15
25	2398	519.1	518.76	518.68	518.54	517.33	518.07
26	2399	519.47	518.88	518.71	518.5	518.31	518.06
27	2434	519.05	518.76	518.85	518.65	518.32	518.22
28	2550	519.1	518.79	518.8	518.69	518.54	518.35
29	2551	519.44		518.97	518.81	518.77	518.54
30	2880	516.89	516.35	516.25	516.26	516.11	515.74
31	2881	516.97	516.51	516.4	516.4	516.19	515.89
32	2897	517.27	516.73	516.61	516.61	516.35	516.05
33	2899	515.58	515.06	514.78	514.85	514.69	514.24
34	3014	519.49	519.15	519.18	518.93	518.83	518.58
35	3015	518.54	518.72	518.63	518.48	518.28	518.17
36	3017	519.88	519.69	519.67	519.52	519.34	519.2
37	3045	519.46	518.99	518.97	518.76	518.6	518.51
38	3049	519.38	518.84	518.76	518.64	513.44	518.33
39	3069	518.78	518.56	518.54	518.45	518.09	517.99
40	3070	519.46	518.89	518.69	518.48	518.27	518.02
41	3093	518.08	517.32	517.92	517.31	516.98	516.83
42	3095	517.76	517.27	517.18	517.12	517.02	516.71
43	3096	523.13	522.78	522.58	522.36	522.28	521.9
44	3106	519.14	518.79	519.14	519.01	518.88	518.69
45	32304	516.61	517.62	516.62	516.53		516.17
46	32305	519.54	519.55	519.59	519.44	519.24	519.07
47	32306	518.89	518.88	518.83	518.78	518.5	518.38
48	32307	519.19	519.06	519.05	518.94	518.62	518.49
49	3387		518.82	518.72	518.53	518.38	518.15
50	3390	519.16	518.94	518.97	518.84	518.61	518.47
51	3398	519.4	519.01	519.22	518.81	518.49	518.33
52	3550	519.2	518.94	518.92	518.81	518.66	518.49
53	3551	519.43		518.94	518.83	518.76	518.54
54	3880	516.87	515.21	516.24	516.24	516.07	515.73
55	3881	517.22	516.69	516.58	516.64	516.38	516
56	3897	517.41	516.83	516.71	516.7	516.19	516.13

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TABLE D-2

WATER LEVEL DATA FROM MONITORING WELLS OCTOBER 1998 THROUGH AUGUST 1999

(Data Presented in Units of Feet above Mean Sea Level))

	Well Number	Oct. 98	Nov. 98	Dec. 98	Jan. 99	Feb. 99	Mar. 99	Apr. 99	May-99	Jun. 99	Jul. 99	Aug. 99
1	2002	514.22	513.15	512.49	513.57	515.07	515.39	515.49	515.31	512.77	513.61	512.76
2	2014	518.02	517.34	516.42	518.21	519.32	519.86	519.68	519.3	518.39	517.37	516.56
3	2015	517.72	516.61	515.93	517.07	518.53	518.86	518.66	518.95	518.05	517.14	516.04
4	2016	518.23	517.77	520.5	519.17	519.74	521.15	520.19	519.57	518.59	517.59	516.63
5	2017	518.36	517.71	517.19	519.05	519.33	520.58	520.35	519.74	518.88	517.95	517.11
6	2045	517.57	517.27	515.8	517.47	518.6	519.09	519.24	518.98	517.99	517.08	516.09
7	2048	518.03	517.16	516.29	517.63	518.78	519.19	519.45	519.74	517.52	517.47	516.51
8	2049	523.55	516.75	515.75	517.24	518.47	518.91	519.08	518.95	518.13	517.11	516.07
9	2070	517.26	516.29	515.7	515.84	517.82	518.21	518.6	518.6	518.10	517.09	515.81
10	2093	516.19	516.09		515.01	516.64	517.12	517.33	517.35	516.70	515.71	514.99
11	2095	516.13	514.89	516.42	516.57	517.45	518.29	517.72	517.22	516.34	515.38	514.46
12	2096	521.35	520.67	519.62	520.33	521.44	521.64	522.06	521.73	520.35	520.32	519.61
13	21033	517.54	516.6	515.8	517.1	518.35	518.8	519.1	518.97	518.15	517.13	516.05
14	21063	516.83	522.05		515.48	517.08	517.65	517.94	517.88	517.33	516.35	515.49
15	2107	520.94			521.82			523.84			518.59	
16	2166	517.43	516.36	515.44	520.89	517.99	518.33	518.81	518.72	518.1	517.12	515.9
17	22299	519.52	517.59	517.01	518.79	518.94	520.36	520.1	519.7	518.1	517.86	515.83
18	22300	519.17	518.21	517.44	518.77	520.05	519.77	519.66	520.43	519.57	518.56	516.91
19	22301	518.13	517.09	516.41	517.5	518.96	519.28	518.6	519.43	518.56	517.59	515.97
20	22302	518.13	517.11	516.2	517.13	518.74	519.07	519.46	519.46	518.76	517.79	
21	22303	518.1		516.17	516.73	518.63	518.86	519.48	519.44	518.83	517.83	516.24
22	2387	517.43	516.23	515.59	516.71	518.05	518.52	518.85	518.74	518.09	517.1	512.99
23	2390	518.33	517.47	516.53	518.1	519.36	519.75	519.69	519.64	518.71	517.8	516.79
24	2397	518.03	516.92	516.38	516.73	518.21	518.63	519.34	519.3		517.76	516.63
25	2398	517.41	516.34	515.61	516.17	517.94	518.25	518.81	518.73	518.11	517.1	515.89
26	2399	517.36	516.24	515.41	515.9	517.66	518.07	518.8	518.68	518.13	517.13	515.98
27	2434	517.63	516.66	515.76	516.78	518.31	518.62	521.92	518.86	518.23	517.19	516.07
28	2550	517.77	516.77	516.32	518.16	519.15	519.63	519.43		518.02	517.07	516.16
29	2551	518.01	516.94	517.16	518.92	519.63	520.36	520.03	518.94			
30	2880	515.27	513.88	513.67	514.55	516.29	516.78	516.73	516.19	515.58	514.7	513.63
31	2881	515.34	514.19	513.59	514.9	516.18	516.52	516.6	516.48	515.72	514.79	513.79
32	2897	515.53	514.41	513.71	514.65	516.18	516.6	516.8	516.69		514.97	514.19
33	2899	513.18	512.68	512.01	513.43	514.68	515.07	515.02	514.76	518.21	513.11	512.19
34	3014	517.96	517.31	516.21	518.17	519.32	519.8	519.65	519.26	518.33	517.38	516.47
35	3015	517.55	516.55	515.86	517.04	518.48	518.82	518.64	518.91	517.95	517.07	515.93
36	3017	518.62	517.72	517.17	519.02	519.58	520.54	520.31	519.71	518.87	517.93	517.08
37	3045	517.77	517.32	515.98	517.67	518.8	519.26	519.36	519.16	518.22	517.3	516.26
38	3049	517.61	516.82	515.84	517.28	518.49	518.98	519.12	518.99	518.1	517.15	516.14
39	3069	517.39	516.38	515.55	516.51	518.05	518.42	518.69	518.62	517.99	517.05	515.79
40	3070	517.31	516.34	515.73	515.89	517.82	518.27	518.66	518.62	518.15	516.88	515.85
41	3093	516.26	515.19	515.02	515.08	516.71	517.21	517.44	517.44	516.75	515.76	514.76
42	3095	516.12	514.99	514.88		517.44	518.24	517.94	517.29	516.38	514.45	514.54
43	3096	521.53	520.79	519.76	520.51	522.55	521.8	522.16	521.83	520.38	520.42	519.76
44	3106	518.19	517.18	516.58	518.19	519.35	519.71	519.58	519.19	518.36	517.49	516.28
45	32304	515.58	514.66	514.03	515.76		517.29	517.15	516.63	515.75	514.9	513.73
46	32305	518.51	517.51	516.74	518.19	519.46	519.66	519.6	519.74	518.9	517.88	516.8
47	32306	517.8	516.91	516.05	518.83	518.6	518.9	518.82	519.04	518.2	517.23	516.12
48	32307	517.89	516.9	515.98	516.9		518.8	519.21	519.7	518.5	517.52	516.2
49	3387	517.52	516.38	515.65	516.83	518.2	518.63	518.98	518.9	518.22	517.21	516.12
50	3390	517.88	516.97	516.09	517.66	518.93	519.26	519.22	519.14	518.34	517.31	516.33
51	3398	517.64	516.56	515.74	516.41	518.17	518.49	519.07	518.94	518.36	517.38	516.2
52	3550	517.91	516.91	516.55	518.27	519.24	519.8	519.55		518.2	517.26	516.32
53	3551	517.99	516.92	517.04	518.78	519.57	520.18	519.92	517.91			
54	3880	515.23	513.9	513.53	515.06	516.24	517.69	516.7	516.32	515.53	514.65	513.62
55	3881	515.58	514.4	513.68	514.87	516.33	516.7	516.8	516.66	515.92	515.01	514
56	3897	509.43	514.55	514.04	514.67	516.37	516.68	516.87	516.8		514.11	514.13
57	31566		517.29	516.56	517.59	518.75	519.26	519.64	520.41	518.51	517.49	516.51

APPENDIX E

FLOW DIRECTION DATA

APPENDIX E

This appendix presents flow direction measurements which were recorded before and during the Demonstration at four deep observation wells (32304, 32305, 32306, and 32307) using a colloidal borescope. The collection of this data is discussed in Section 4 of the report. The locations of the wells are shown in Figure 4-4. The four deep observation wells were specifically installed to monitor each re-injection well location as described in the Re-Injection Demonstration Test Plan. The objective of the measurements was to assess flow conditions beneath the base of the 20 μg/L uranium plume. Flow measurements were collected:

- Prior to the start-up of the South Field (Phase I) Extraction System,
- Following start-up of the South Field System (after the aquifer had stabilized to the new pumping conditions), and
- During the demonstration on a quarterly schedule.

As discussed below the data presented in this appendix were not used to evaluate the demonstration. Approximately half way through the Demonstration, a conclusion was reached at Fernald regarding flow direction data collected with the colloidal borescope. The borescope appears to be a useful tool only for observing real-time flow direction changes. Real-time means that stress changes are being applied to the aquifer during the time that measurements are being collected. An example of a stress change would be a change to pumping rates in nearby extraction wells. Unless a stress change is being applied at the same time that measurements are being made, it is very hard to interpret the flow direction results.

Flow measurements were collected during the following time periods:

- Pre-startup: June 25, 1998 to June 29, 1998 (Table E-1).
- Pre-startup: July 28, 1998 to July 30, 1998 (Table E-2).
- Pre-startup: August 26, 1998 to August 27, 1998 (Table E-3).
- September 14, 1998 to September 15, 1998 (Table E-4).
- November 23, 1998 to November 24, 1998 (Table E-5).
- March 29, 1999 to March 31, 199 (Table E-6).
- June 9, 1999 to June 16, 1999 (Table E-7).

TABLE E-1

PRE-RE-INJECTION COLLOIDAL BORESCOPE DATA
JUNE 25, 1998 TO JUNE 29, 1998

Well #	Root File #	Placement Depth (TPC)	Water Level (TPC)	Ft. Below Water Level	Average Direction	Standard Deviation	Date
32304	0167	101.0	16.39	84.61	197.64	16.15	6/26/98
32305	0162	139.0	56.54	82.46	57.86	23.75	6/25/98
32306	0172	143.0	58.52	84.48	140.14	41.41	6/29/98
32307	0170	141.5	57.52	83.98	90.22	25.87	6/26/98

PUMPING CONDITIONS

	South Plume Extraction System	South Field Extraction System	South Field Re-Injection System	South Plume Optimization Extraction Wells
Online	3924 3925 3926 3927			
Offline		31550 31560 31561 31562 31563 31564 31565 31566 31567 32276	22107 22108 22109 22240 22111	32308 32309

000237

TABLE E-2

PRE-RE-INJECTION COLLOIDAL BORESCOPE DATA
JULY 28, 1998 TO JULY 30, 1998

Well #	Root File #	Placement Depth (TPC)	Water Level (TPC)	Ft. Below Water Level	Average Direction	Standard Deviation	Date
32304	0179	102.0	19.6	82.4	200.2	23.5	7/30/98
32305	0176	140.5	57.54	82.96	46.5	31.7	7/28/98
32306	0178	143.0	60.38	82.62	215.6	40.9	7/30/98
32307	0175	140.0	59.14	80.86	50.8	17.4	7/28/98

PUMPING CONDITIONS

	South Plume Extraction System	South Field Extraction System	South Field Re-Injection System	South Plume Optimization Extraction Wells
Online	3924	31550		
	3925	31560		
	3926	31561		
	3927	31562		
		31563		
		31564		
		31565		
		31566		
		31567		
		32276		
Offline			22107	32308
			22108	32309
			22109	
			22240	
			22111	

TABLE E-3

PRE-RE-INJECTION COLLOIDAL BORESCOPE DATA
AUGUST 26, 1998 TO AUGUST 27, 1998

Well #	Root File #	Placement Depth (TPC)	Water Level (TPC)	Ft. Below Water Level	Average Direction	Standard Deviation	Date
32304	0201	100.0	21.54	78.46	72.4	11.8	8/27/98
32305	0198	139.0	59.68	79.32	173.3	27.6	8/26/98
32306	0199	143.0	62.39	80.61	218.8	91.5	8/26/98
32307	0200	138.5	61.14	77.36	101.7	102.4	8/27/98

PUMPING CONDITIONS

	South Plume Extraction System	South Field Extraction System	South Field Re-Injection System	South Plume Optimization Extraction Wells
Online	3924 3925 3926 3927	31550 31560 31561 31562 31563 31564 31565 31566 31567 32276		32308 32309
Offline			22107 22108 22109 22240 22111	

000239

TABLE E-4

COLLOIDAL BORESCOPE DATA
SEPTEMBER 14, 1998 TO SEPTEMBER 15, 1998

Well #	Root File #	Placement Depth (TPC)	Water Level (TPC)	Ft. Below Water Level	Average Direction	Standard Deviation	Date
32304	0206	102.0	20.42	81.58	139.2	52.2	9/15/98
32305	0205	140.5	59.63	80.87	78.7	62.1	9/15/98
32306	0204	143.0	62.32	80.68	174.8	23.5	9/15/98
32307	0203	140.0	61.08	78.92	50.3	10.7	9/14/98

PUMPING CONDITIONS

	South Plume Extraction System	South Field Extraction System	South Field Re-Injection System	South Plume Optimization Extraction Wells
Online	3924 3925 3926 3927	31550 31560 31561 31562 31563 31564 31565 31566 31567 32276	22107 22108 22109 22240 22111	32308 32309
Offline	3927			

TABLE E-5

COLLOIDAL BORESCOPE DATA
NOVEMBER 23, 1998 TO NOVEMBER 24, 1998

Well #	Root File #	Placement Depth (TPC)	Water Level (TPC)	Ft. Below Water Level	Average Direction	Standard Deviation	Date
32304	0226	102.0	22.29	79.71	130.3	83.2	11/24/98
32305	0224	140.5	61.56	78.94	71.6	84.2	11/23/98
32306	0225	143.0	64.19	78.81	197.6	13.2	11/24/98
32307	0222	140.0	63.26	76.74	169.2	95.6	11/23/98

PUMPING CONDITIONS

	South Plume Extraction System	South Field Extraction System	South Field Re-Injection System / Injection Rate	South Plume Optimization Extraction Wells
Online	3924 3925 3926 3927	31561 31562 31564 31565 31566 31567 32276	22107 / 198 gpm 22108 / 199 gpm 22109 / 195 gpm 22240 / 198 gpm 22111 / 198 gpm	32308 32309
Offline		31563 : 11/9 - 11/24 31550 : 11/23 - 11/24 31560 : 11/24 for superchlorination		

000241

TABLE E-6

COLLOIDAL BORESCOPE DATA
MARCH 29, 1999 TO MARCH 31, 1999

Well #	Root File #	Placement Depth (TPC)	Water Level (TPC)	Ft. Below Water Level	Average Direction	Standard Deviation	Date
32304	0248	102.0	19.64	82.36	209.51	7.8	3/31/99
32305	0249	140.0	58.90	81.10	196.05	30.8	3/31/99
32306	0245	143.0	61.59	81.41	351.85	65.6	3/29/99
32307	0250	140.0	60.63	79.37	387.26	50.8	3/31/99

PUMPING CONDITIONS

	South Plume Extraction System	South Field Extraction System	South Field Re-Injection System / Injection Rate	South Plume Optimization Extraction Wells
Online	3924	31550	22107 / 198 gpm	32308
	3925	31560	22108 / 200 gpm	32309
	3926	31561	22109 / 197 gpm	
	3927	31562	22240 / 202 gpm	
		31563	22111 / 198 gpm	
		31564		
		31565		
		31566		
		31567		
		32276		
Offline				

TABLE E-7

COLLOIDAL BORESCOPE DATA
JUNE 9, 1999 TO JUNE 16, 1999

Well #	Root File #	Placement Depth (TPC)	Water Level (TPC)	Ft. Below Water Level	Average Direction	Standard Deviation	Date
32304	0169	102.0	21.06	80.94	226.0	111.1	6/9/99
32305	0171	140.5	60.17	80.33	166.6	46.1	6/10/99
32306	0172	143.0	62.81	80.19	129.3	7.1	6/10/99
32307	0173	140.0	61.75	78.25	210.1	16.9	6/16/99

PUMPING CONDITIONS

	South Plume Extraction System	South Field Extraction System	South Field Re-Injection System / Injection Rate	South Plume Optimization Extraction Wells
Online	3924 3925 3926 3927	31550 31560 31561 31562 31563 31564 31565 31566 31567 32276	22107 / 200gpm 22108 / 200gpm 22109 / 200 gpm 22240 / 205 gpm 22111 / 198 gpm	32308 32309
Offline				

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APPENDIX F
URANIUM CONCENTRATION DATA

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APPENDIX F

Appendix F contains uranium concentration data collected during the Demonstration. Uranium concentration results are discussed in Section 4 of the report. Groundwater samples were collected from twenty-three monitoring wells during the demonstration and analyzed for uranium. The locations of these 23 monitoring wells are shown in Figure 4-5. Sampling of the monitoring wells was conducted quarterly and coordinated with IEMP quarterly sampling events. Sampling at these 23 wells for uranium provided for the collection of samples from fixed depths within the aquifer. Table F-1 presents the quarterly uranium concentration data from the 23-groundwater wells.

Groundwater samples were also collected from seven direct-push sampling locations during the Demonstration. Sampling using a direct-push technique allows groundwater samples to be collected within the aquifer from several different depths, at the same location, without installing a monitoring well. A sampling tool is pushed into the ground to facilitate the collection of a groundwater sample. By pushing the tool to different depths, samples from different discrete depths can be collected and analyzed. This strategy provides data that can be used to construct a complete vertical profile through a contaminant plume. After samples from all of the targeted depths have been collected, the rod is pulled from the ground, and the hole is filled with grout.

Direct-push sampling during the Demonstration consisted of the collection of water samples at the water table and ten-foot depth intervals beneath the water table. Sufficient samples were collected to define the vertical thickness of the 20 µg/L total uranium plume. Figure 4-6 shows the seven direct-push locations (12367, 12368, 12369, 12370, 12371, 12372, and 12373). Locations 12367, 12368, 12369, 12370, and 12373 are situated just south of their respective re-injection wells. Locations 12372 and 12373 are located east and west of Re-Injection Well IW-10.

Six rounds of direct-push sampling (designated by letter) were conducted during the demonstration.

- Round A:May to June 1998
- Round B:July 1998
- Round C:December 1998 to January 1999
- Round D:March 1999
- Round E: June to July 1999
- Found F: September to November 1999

Table F-2 presents uranium concentration data collected at Direct Push Sampling Locations, which were only sampled twice during the Demonstration. The first column of Table F-2 identifies whether or not

the concentration is a filtered or unfiltered concentration. At the start of the demonstration there was a concern that if samples were filtered it would lead to extensive filter plugging problems in the field. Limited filtered sampling, using a 0.45-micron filter was conducted at Locations 12367 and 12368. The sampling showed that passing the groundwater sample through a 0.45-micron filter did not lead to filter plugging problems. Therefore, all of the rest of the locations sampled in Round A and all of the locations in the subswquent sampling rounds used the following procedure.

All groundwater samples (with the exception of the sample collected for total uranium analysis) were run through a 5-micorn filter and a 0.45-micron filter. Samples run through both a 5-micron and a 0.45-micron filter are identified as "filtered."

Both a filtered and an unfiltered groundwater sample were collected for the analysis of total uranium, with the exception of Location 12367 and 12368 in Round A. For these two locations in Round A, unfiltered and filtered samples for uranium were only collected at the 10 foot and 30 foot depth below the water table intervals. The second column identifies the depth at which the sample came from in feet beneath the water table. Columns 4 through 6 present uranium concentration data collected during Sampling Rounds A and F.

Table F-3 presents uranium concentration data collect at Direct Push Sampling Locations, which were sampled six times during the Demonstration. The first column of Table F-3 identifies whether or not the concentration is a filtered or unfiltered concentration. The second column identifies the depth at which the sample came from in feet beneath the water table. Columns 3 through and 14 present uranium concentration results by sampling Round (Rounds A through F). Columns 15 through 17 provide some descriptive statistics (minimum, maximum, and average concentration).

The direct push sampling data were used to construct several cross sections depicting the vertical profile of the uranium plume through time during the Demonstration. Figures F-1 through F-8 are the same cross sections presented in a composite format in Figures 4-12 and 4-13.

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TABLE F-1

UNFILTERED URANIUM CONCENTRATION DATA (μg/L) COLLECTED FROM MONITORING WELLS

Well	Aug. 1998	Dec. 1998	Mar. 1999	Jun.-Aug. 1999
2015	142	129	123	160
2017	4.1	3.3	5.41	3.1
2060	23.1	8.4	121	106
2070	U 2.5	0.9	0.8	0.987
2106	39.6/40.9	33.0	50	37
2166	95.1	69	79	61
2398	29.9	26	26.1	22
2434	U 2.5	1.1	1.5	1.4
3015	2.71	1.6	1.5/1.5	1.2
3069	150	209	386	242/238
3070	U 2.5	0.3	0.2	0.35
3106	U 2.5	1.3	1.0	1.2
3398	U 2.5	0.6/0.7	0.8	0.9
4398	U 2.5	0.1	0.1	0.1
22299	16.5	0.3/0.3	4.9	12
22300	74.2	0.9	6.0	3.7
22301	271	3.4	4.5	11
22302	98.2	0.7	9.6	11
22303	5.63	0.8	5.69/2.6	5.4
32304	3.32	3.1	3.86	3.9
32305	U 2.5	0.4	1	0.7/0.7
32306	35.5	2.3	2.39	2.1
32307	6.36	17	14.9	13

TABLE F-2

URANIUM CONCENTRATION RESULTS (µg/L) FOR DIRECT PUSH LOCATIONS SAMPLED TWICE

Constituent	Depth	Round A Result with Validation Qualifier	Round F Result with Validation Qualifier
Analytical Results at Location 12367			
uranium - filtered	1		6.7
uranium - filtered	10	30	6.6
uranium - filtered	20		11
uranium - filtered	20-(D)		10
uranium - filtered	30	23	11
uranium - filtered	40		9.4
uranium - filtered	50		5.2
uranium - filtered	60		3.1
uranium - filtered	70		1.5
Minimum		23	1.5
Maximum		30	11
Average		27	7.2
uranium - unfiltered	1	23	7.1
uranium - unfiltered	10	28	6.9
uranium - unfiltered	20	18	12
uranium - unfiltered	20-(D)	17	11
uranium - unfiltered	30	22	11
uranium - unfiltered	40	24	9.7
uranium - unfiltered	50	4.9	5.8
uranium - unfiltered	60	2.4	3.8
uranium - unfiltered	70	2.5	2.5
Minimum		2.4	2.5
Maximum		28	12
Average		16	8
Analytical Results at Location 12368			
uranium - filtered	1		72
uranium - filtered	10	65.1	10
uranium - filtered	20		21
uranium - filtered	20-(D)		21
uranium - filtered	30	47.9	9.8
uranium - filtered	40		5.7
uranium - filtered	50		5.7
uranium - filtered	60		9.6
uranium - filtered	70		1.4
Minimum		15	1.4
Maximum		65.1	72
Average		43	17

000248

TABLE F-2

**URANIUM CONCENTRATION RESULTS (µg/L)
FOR DIRECT PUSH LOCATIONS SAMPLED TWICE (Cont'd)**

Constituent	Depth	Round A Result with Validation Qualifier	Round F Result with Validation Qualifier
Analytical Results at Location 12368 (Cont'd)			
uranium - unfiltered	1	63.4	74
uranium - unfiltered	10	66.7	11
uranium - unfiltered	20	48.4	21
uranium - unfiltered	20-(D)	50.6	21
uranium - unfiltered	30	45.9	11
uranium - unfiltered	40	17	6.1
uranium - unfiltered	50	15	7.8
uranium - unfiltered	60	1.5	9.7
uranium - unfiltered	70	0.7	1.7
Minimum		0.7	1.7
Maximum		66.7	74
Average		36.8	18
Analytical Results at Location 12370			
uranium - filtered	1	2.5U	1.5
uranium - filtered	10	2.5U	4.1
uranium - filtered	20	2.5U	5.8
uranium - filtered	20-(D)	2.5U	5.8
uranium - filtered	30	72.1	12
uranium - filtered	40	197	8.9
uranium - filtered	50	4.7	3.7
uranium - filtered	60	2.6	2.6
uranium - filtered	70	0.8	0.8
uranium - filtered	80	1.2	1.2
uranium - filtered	90	2.8	0.2J
Minimum		0.8	0.2
Maximum		197	12
Average		26.0	4.2
uranium - unfiltered	1	2.5	1.7
uranium - unfiltered	10	2.5	4.7
uranium - unfiltered	20	3	6
uranium - unfiltered	20-(D)	2.9	6.1
uranium - unfiltered	30	46.8	13
uranium - unfiltered	40	131	9.3
uranium - unfiltered	50	4.6	4
uranium - unfiltered	60	3.5	2.8
uranium - unfiltered	70	0.9	1.1
uranium - unfiltered	80	1.5	1
uranium - unfiltered	90	4.9	0.5
Minimum		0.9	0.5
Maximum		131	13
Average		18.3	4.6

TABLE F-2

URANIUM CONCENTRATION RESULTS (µg/L) FOR DIRECT PUSH LOCATIONS SAMPLED TWICE (Cont'd)

Constituent	Depth	Round A with Validation Qualifier	Round F with Validation Qualifier
Analytical Results at Location 12371			
uranium - filtered	1	2.5U	0.7
uranium - filtered	10	2.5U	1.7
uranium - filtered	20	2.5U	0.8
uranium - filtered	20-(D)	2.5U	0.8
uranium - filtered	30	2.5U	0.8
uranium - filtered	40	2.5U	0.8
uranium - filtered	50	3.9	0.6
uranium - filtered	60	2.5U	
uranium - filtered	70	6.2	
uranium - filtered	80	2.5U	
Minimum		1.25	0.6
Maximum		6.2	1.7
Average		2.0	0.89
uranium - unfiltered	1	3	0.8
uranium - unfiltered	10	2.5	1.7
uranium - unfiltered	20	2.5	1.6
uranium - unfiltered	20-(D)	2.5	1.7
uranium - unfiltered	30	2.5	1
uranium - unfiltered	40	2.5	3
uranium - unfiltered	50	13.8	0.7
uranium - unfiltered	60	2.5	
uranium - unfiltered	70	2.5	
uranium - unfiltered	80	3	
Minimum		1.25	0.7
Maximum		13.8	3
Average		2.98	1.5

D = duplicate sample
U = undetect

000250

TABLE F-3

URANIUM CONCENTRATION RESULTS (µg/L) FOR DIRECT PUSH LOCATIONS SAMPLED SIX TIMES

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E* Result	VQ	Round F Result	VQ	Min.	Max.	Avg.
Analytical Results at Location 12369																
Uranium-filtered	1	2.6		22.2		12		24.8		30		41		2.6	41	22.1
Uranium-filtered	10	2.5	U	84.1		117		84.9		48		14		1.25	117	58.2
Uranium-filtered	20	123		93		35		106		22		11		11	123	65.0
Uranium-filtered	20-D	125		85.4		34		107		22		11		11	125	64.1
Uranium-filtered	30	4.6		4.36		18		24.6		9.3		6.4		4.36	18	11.3
Uranium-filtered	40	1.1		6.1		12		4.38		8.8		6.5		1.1	12	6.5
Uranium-filtered	50	11		2.5		20		16.2		13		6.1		2.5	16.2	11.5
Uranium-filtered	60	1.7		2.5				4.23		10		2		1.25	10	3.8
Uranium-filtered	70	1.2		2.5				4.08		11		1.2		1.2	11	3.7
Minimum		1.1		1.25		12		4.08		88		1.2				
Maximum		125		93		117		107		48		41				
Average		30.2		33.4		35.4		41.8		19.3		11.1				
Uranium-unfiltered	1	2.9		25.3		12		24.7		31		46		2.9	46	23.5
Uranium-unfiltered	10	2.5		76.9		117		113		59		16		2.5	117	64.1
Uranium-unfiltered	20	128		87.4		34		110		23		12		12	128	65.7
Uranium-unfiltered	20-D	127		88.9		34		114		24		12		12	127	66.7
Uranium-unfiltered	30	5.4		5.7		18		24.8		10		7		5.4	24.8	11.8
Uranium-unfiltered	40	1.3		5.75		12		6.01		9.1		6.8		1.3	12	6.8
Uranium-unfiltered	50	10		2.81		21		16.3		14		6.4		2.81	21	11.8
Uranium-unfiltered	60	2.6		2.5				5.04		11		2.4		1.25	11	4.5
Uranium-unfiltered	70	1.9		2.5				7.97		12		1.5		1.25	12	4.9
Minimum		1.3		1.25		12		5.04		9.1		1.4				
Maximum		128		88.9		117		114		59		46				
Average		31.3		32.7		35.4		46.9		21.5		12.2				

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TABLE F-3

URANIUM CONCENTRATION RESULTS (µg/L) FOR DIRECT PUSH LOCATIONS SAMPLED SIX TIMES (Cont'd)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E* Result	VQ	Round F Result	VQ	Min.	Max.	Avg.
Analytical Results at Location 12372																
Uranium-filtered	1	87.9		74.5		75.6		73		72		98		72	98	80.2
Uranium-filtered	10	78.4		78.7		90.7		69		85		104		69	104	84.3
Uranium-filtered	20	77.7		93.9		76.4		95		112		100		76.4	112	91.0
Uranium-filtered	20-E	80.2		92.6		75.1		96		111		100		75.1	111	91.0
Uranium-filtered	30	42.5		53.2		16.8		36		40		25		16.8	53.2	35.6
Uranium-filtered	40	7.4		9.07		9.5		5.2		8.5		4.9		4.9	9.5	7.4
Uranium-filtered	50	138		2.55		7.1		1.3		1.9		2		1.3	7.1	2.8
Uranium-filtered	60	1.6		2.5		3.2		1.7		2		7		1.6	7	3.0
Uranium-filtered	70	2.2		2.5		2.2		0.7		15				0.7	15	4.3
Minimum		1.6		1.25		2.2		0.7		1.9		2				
Maximum		87.9		93.9		90.7		96		112		104				
Average		42.2		45.4		39.6		42.0		49.7		40.2				
Uranium-unfiltered	1	89.1		78.6		77.4		73.0		77		97		73	97	82.0
Uranium-unfiltered	10	77.6		82.8		90		74		93		104		74	104	86.9
Uranium-unfiltered	20	78.2		83.1		79		98		115		100		78.2	115	90.7
Uranium-unfiltered	20-E	81.8		97.4		75.8		103		115		100		75.8	115	94.6
Uranium-unfiltered	30	37.1		51.9		19.1		36		42		26		19.1	51.9	35.4
Uranium-unfiltered	40	9.1		8.75		9.4		5.7		9.6		5.6		5.6	9.6	8.0
Uranium-unfiltered	50	2.9		3.31		5.9		1.4		2.1		2.2		1.4	5.9	3.0
Uranium-unfiltered	60	1.8		3.27		3.9		1.6		2.3		12		1.6	12	4.1
Uranium-unfiltered	70	2.5		2.5		2.1		2.2		19				1.25	19	5.4
Minimum		1.8		1.25		2.1		1.4		2.1		2.2				
Maximum		89.1		97.4		90		103		115		104				
Average		42.2		45.6		40.3		43.9		52.8		41.1				

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TABLE F-3

URANIUM CONCENTRATION RESULTS (μg/L) FOR DIRECT PUSH LOCATIONS SAMPLED SIX TIMES (Cont'd)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E* Result	VQ	Round F Result	VQ	Min.	Max.	Avg.
Analytical Results at Location 12373																
Uranium-filtered	1	18		79.2		60		50		109		202		18	202	80
Uranium-filtered	10	25.1		108		447		326		382		338		25.1	447	272
Uranium-filtered	20	460		421		422		337		315		361		337	430	391
Uranium-filtered	20-D	460		425		424		346		319		360		346	430	401
Uranium-filtered	30	329		359		249		274		213		201		201	359	289
Uranium-filtered	40	201		195		207		232		135		205		195	232	212
Uranium-filtered	50	143		141		13		132		170		133		13	164	121
Uranium-filtered	60	25		10.3		2.9		9		11		6.8		2.7	25	9.5
Uranium-filtered	70	9.2		2.5		2.4		12		7.6		11		2.4	15	8.7
Uranium-filtered	80									2.6		2.4				
Uranium-filtered	90									2.8		1.9				
Uranium-filtered	100									1.8						
Uranium-filtered	110									4.6						
Uranium-filtered	120									5.1						
Minimum		9.2		2.5		2.4		9		1.8		1.9				
Maximum		460		425		447		346		382		361				
Average		151		165		176		173		120		166				
Uranium-unfiltered	1	27.1		70.4		59.6		53		117		207		27.1	207	81.5
Uranium-unfiltered	10	24.7		110		454		334		394		358		2437	454	277
Uranium-unfiltered	20	451		458		440		338		325		411		338	458	416
Uranium-unfiltered	20-D	382		461		426		336		332		402		336	461	408
Uranium-unfiltered	30	357		369		249		274		214		207		207	369	297
Uranium-unfiltered	40	172		195		221		253		141		208		172	253	214
Uranium-unfiltered	50	141		143		13		134		173		139		13	172	124
Uranium-unfiltered	60	26		8.8		3.5		14		12		7.4		3.3	26	11
Uranium-unfiltered	70	9.5		2.7		2.6		21		9.3		13		2.6	21	11
Uranium-unfiltered	80									4.0		3.8				
Uranium-unfiltered	90									3.5		2.4				
Uranium-unfiltered	100									2.2						
Uranium-unfiltered	110									7.7						
Uranium-unfiltered	120									13						
Minimum		9.5		2.7		2.6		14		2.2		2.4				
Maximum		451		461		454		338		394		411				
Average		177		202		208		195		125		178				

*Round E results are for location 12449

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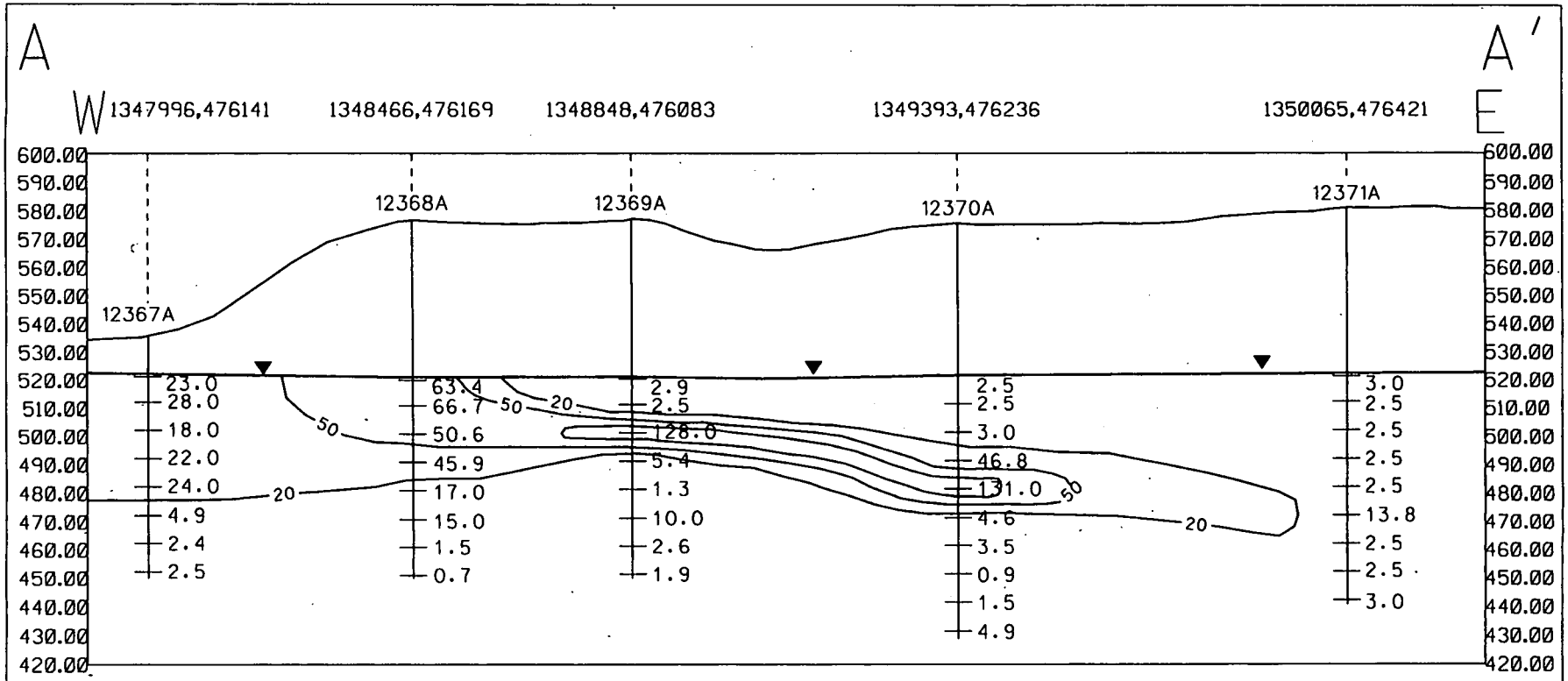
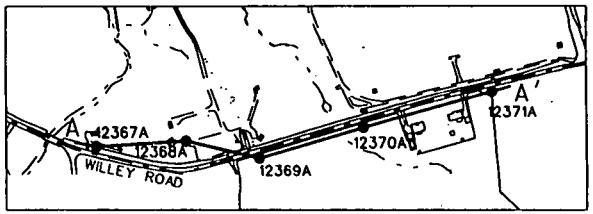


LEGEND:

+ 1.5 TOTAL URANIUM IN GROUNDWATER µg/L



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v:*5crw2*dgn*ken_b*ken00016.dgn
STATE PLANAR COORDINATE SYSTEM 1983

24-FEB-2000

FIGURE F-1. TOTAL URANIUM IN GROUNDWATER, ROUND - A (MAY THRU JUNE 1998) SOUTH OF RE-INJECTION WELLS

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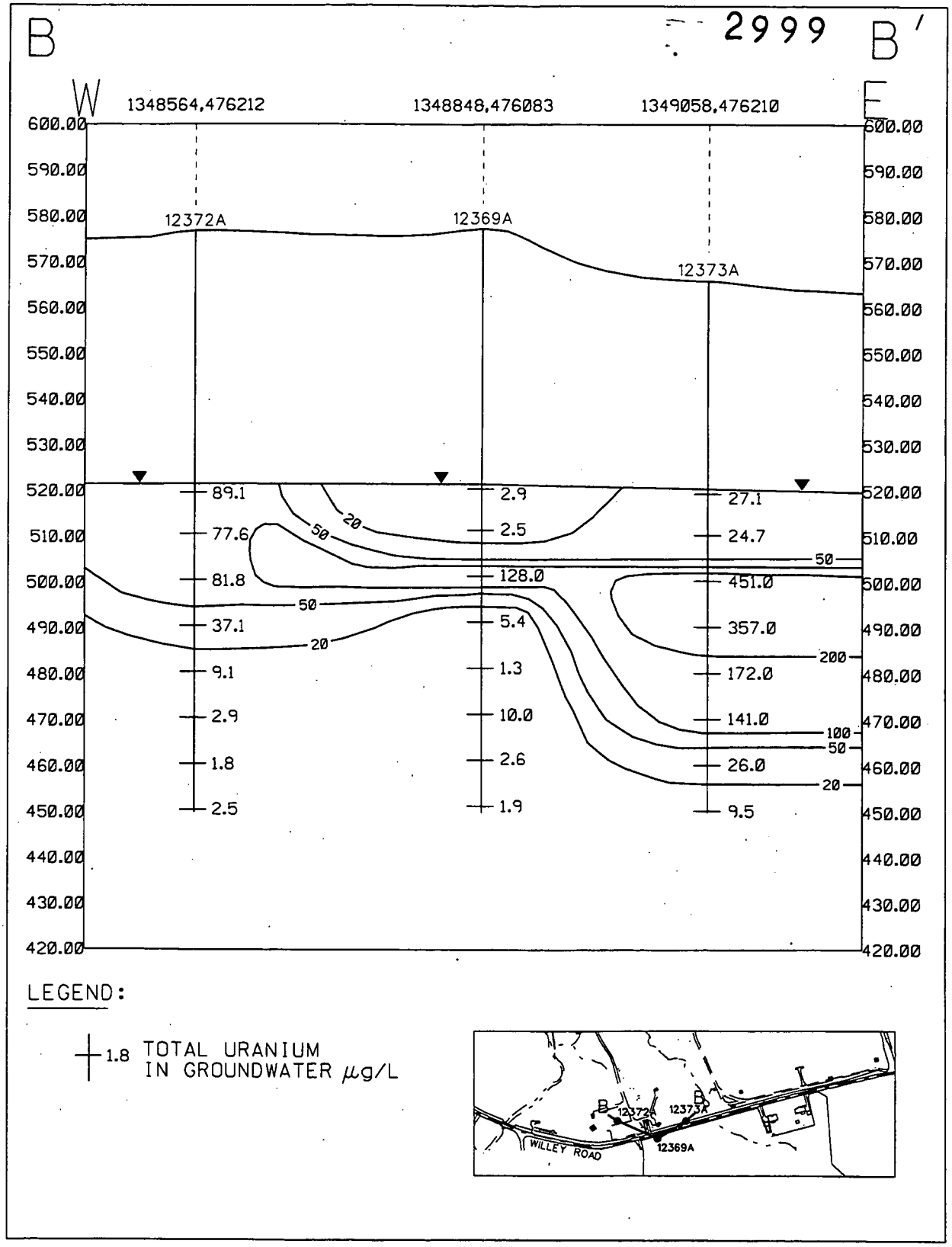

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FIGURE F-2. TOTAL URANIUM IN GROUNDWATER ROUND-A, (JUNE 1998) NEXT TO AND SOUTH OF IW-10

V:/SCRW2/DGN/KEN_B/KEN00017.DGN

STATE PLANAR COORDINATE SYSTEM 1983

24-FEB-2000

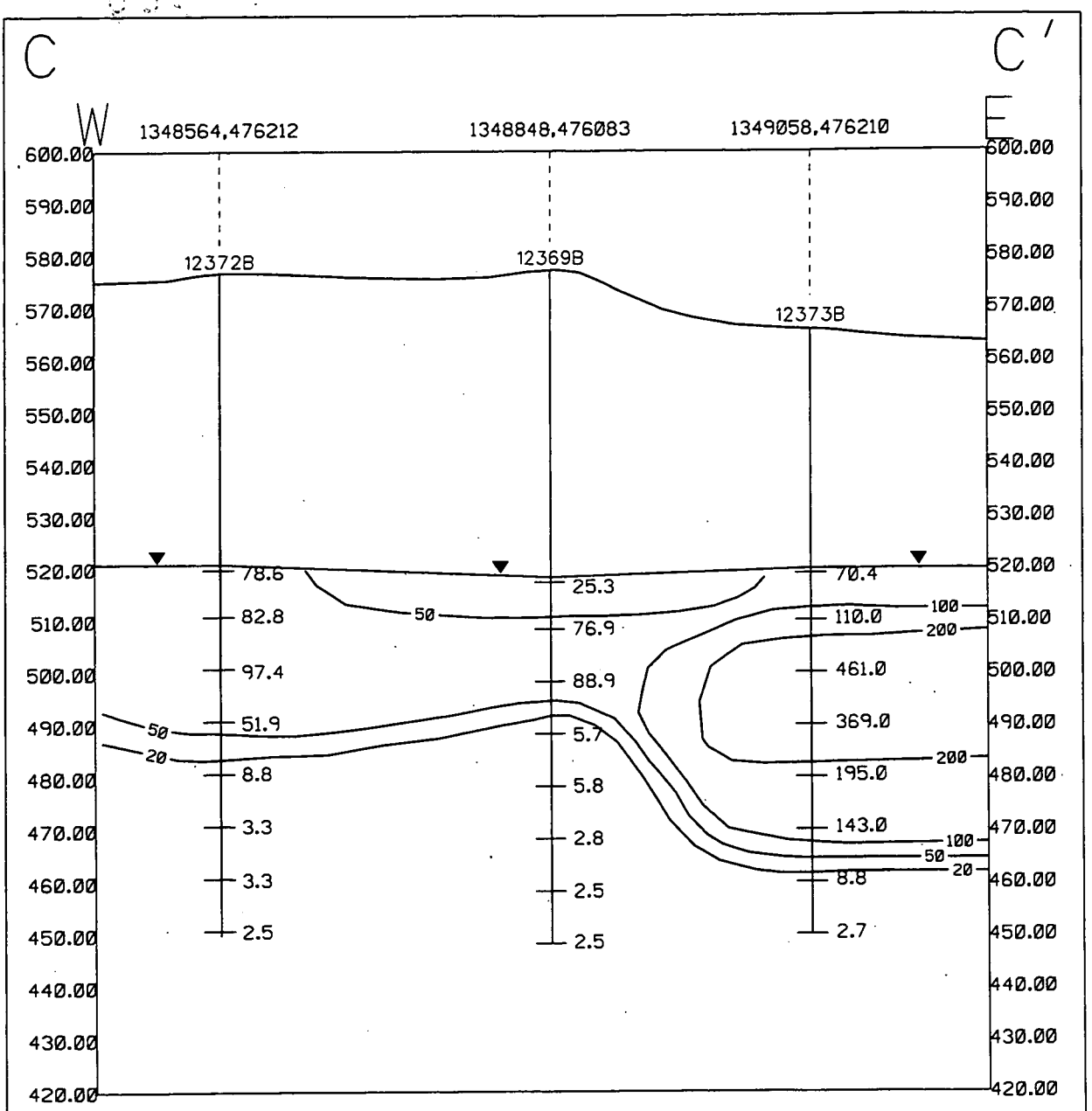

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FIGURE F-3. TOTAL URANIUM IN GROUNDWATER ROUND - B, (JULY 1998) NEXT TO AND SOUTH OF IW-10

V:/5CRW2/DGN/KEN_B/KEN00018.DGN

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V:/SCRW2/DGN/KEN.B/KEN00019.DGN

STATE PLANAR COORDINATE SYSTEM 1983

24-FEB-2000

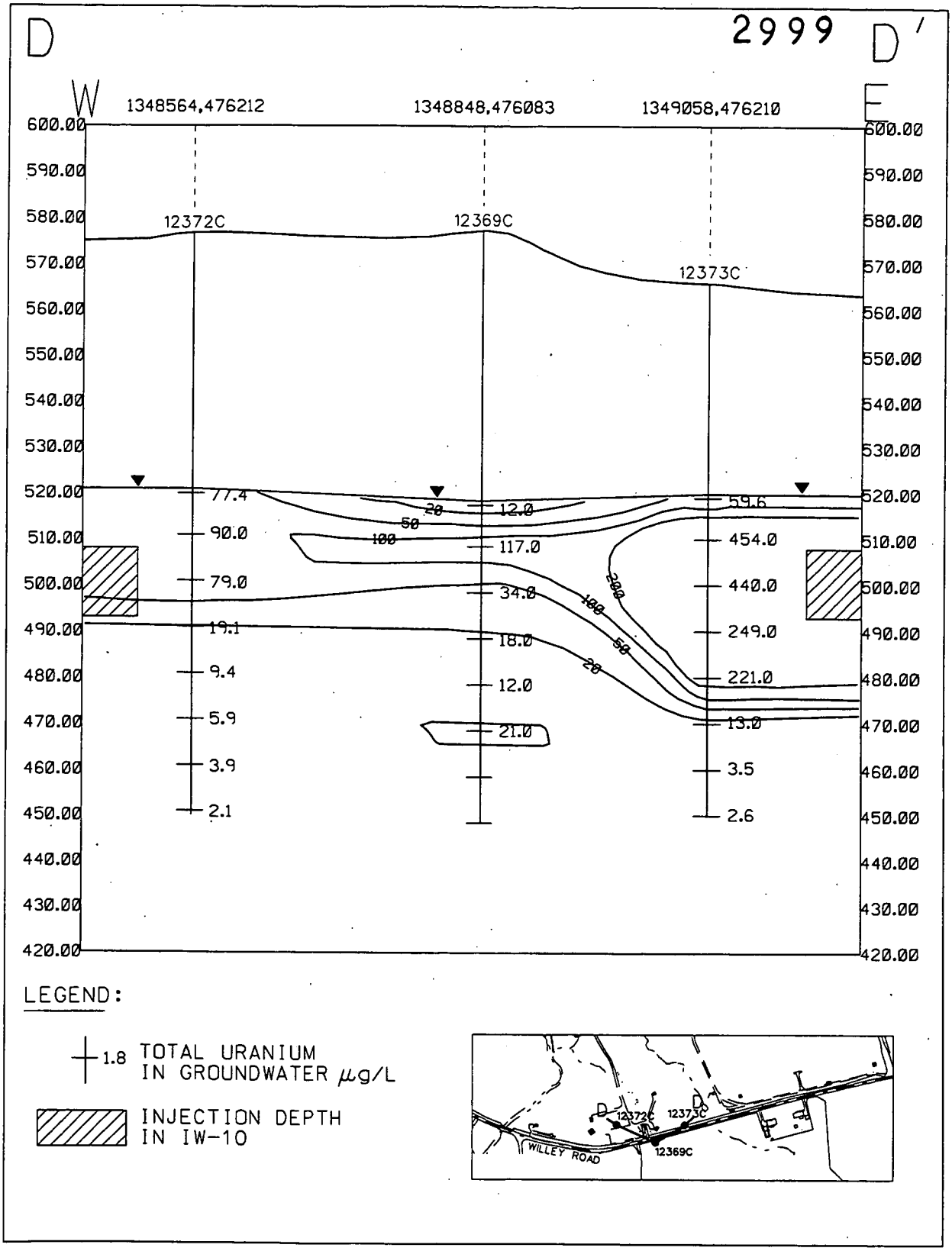

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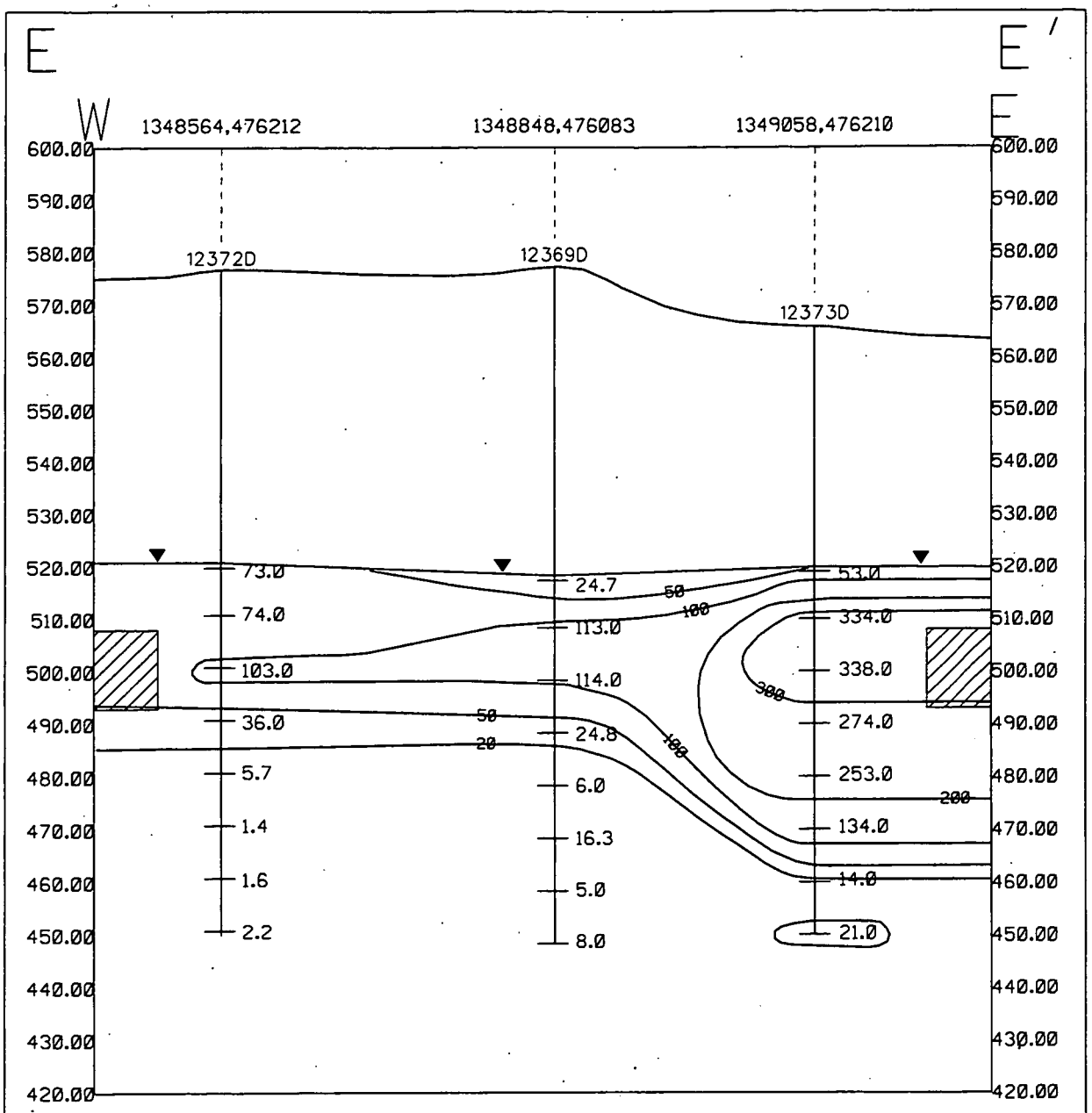
FIGURE F-4. TOTAL URANIUM IN GROUNDWATER ROUND - C (DECEMBER 1998 TO JANUARY 1999) NEXT AND SOUTH OF IW-10



FINAL

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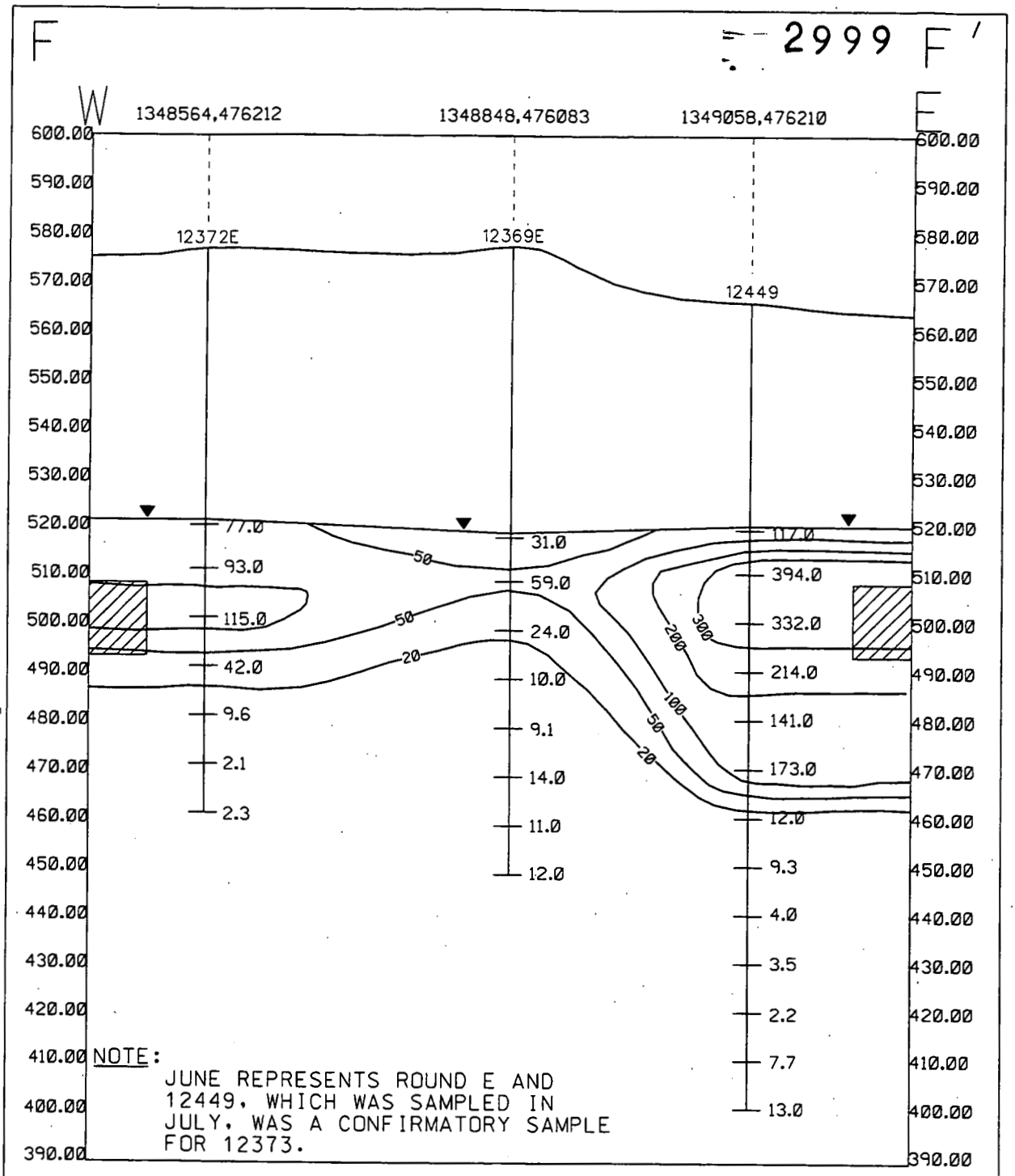
FIGURE F-5. TOTAL URANIUM IN GROUNDWATER ROUND - D, (MARCH 1999) NEXT TO AND SOUTH OF IW-10

V:/SFGP1/DGN/99OTR2/99OT2019.DGN

STATE PLANAR COORDINATE SYSTEM 1983

24-FEB-2000



FINAL

FIGURE F-6. TOTAL URANIUM IN GROUNDWATER ROUND - E, (JUNE THRU JULY 1999) NEXT TO AND SOUTH OF IW-10

V:/5FGP1/DGN/99OTR3/99OT3018.DGN

STATE PLANAR COORDINATE SYSTEM 1983

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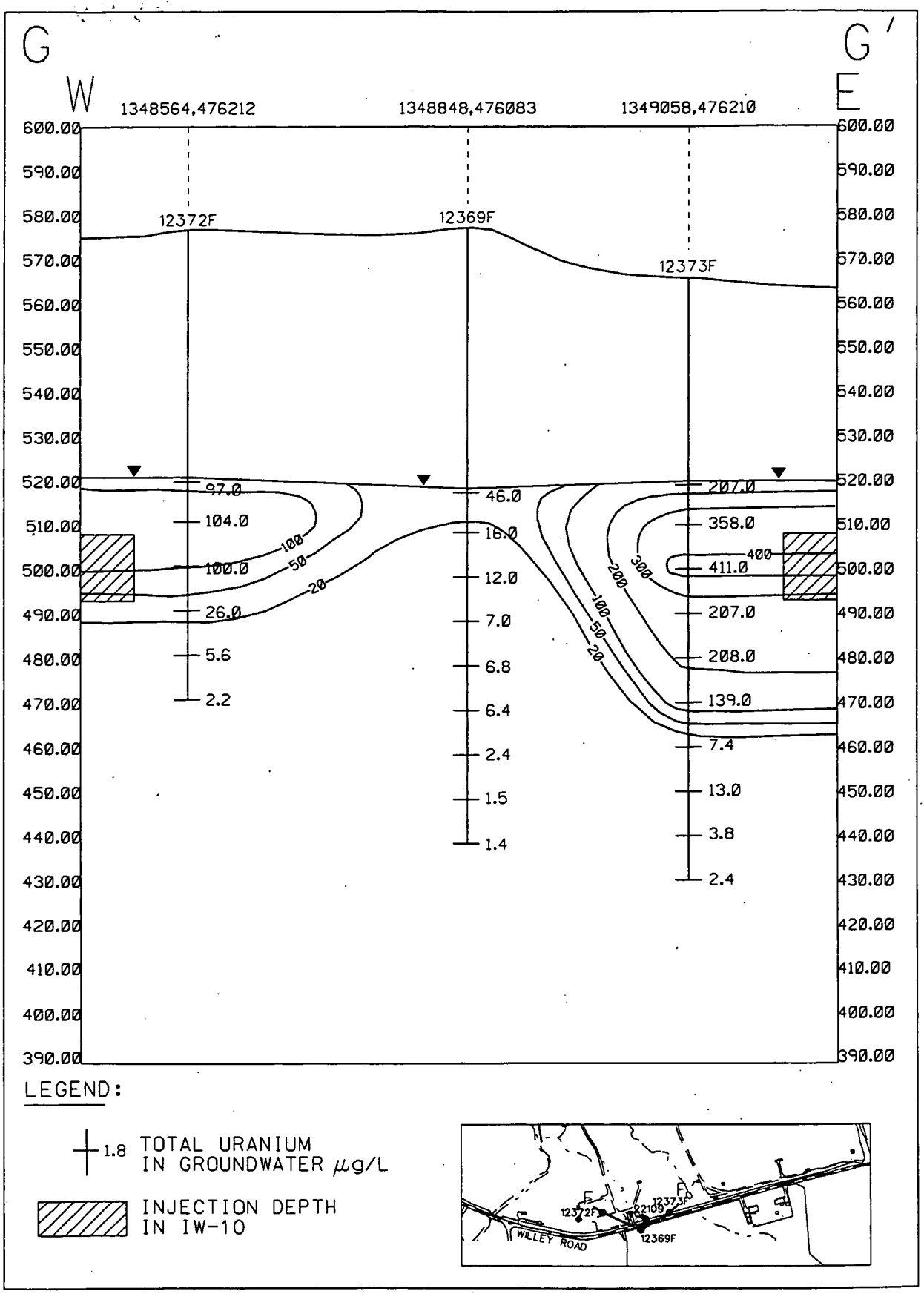

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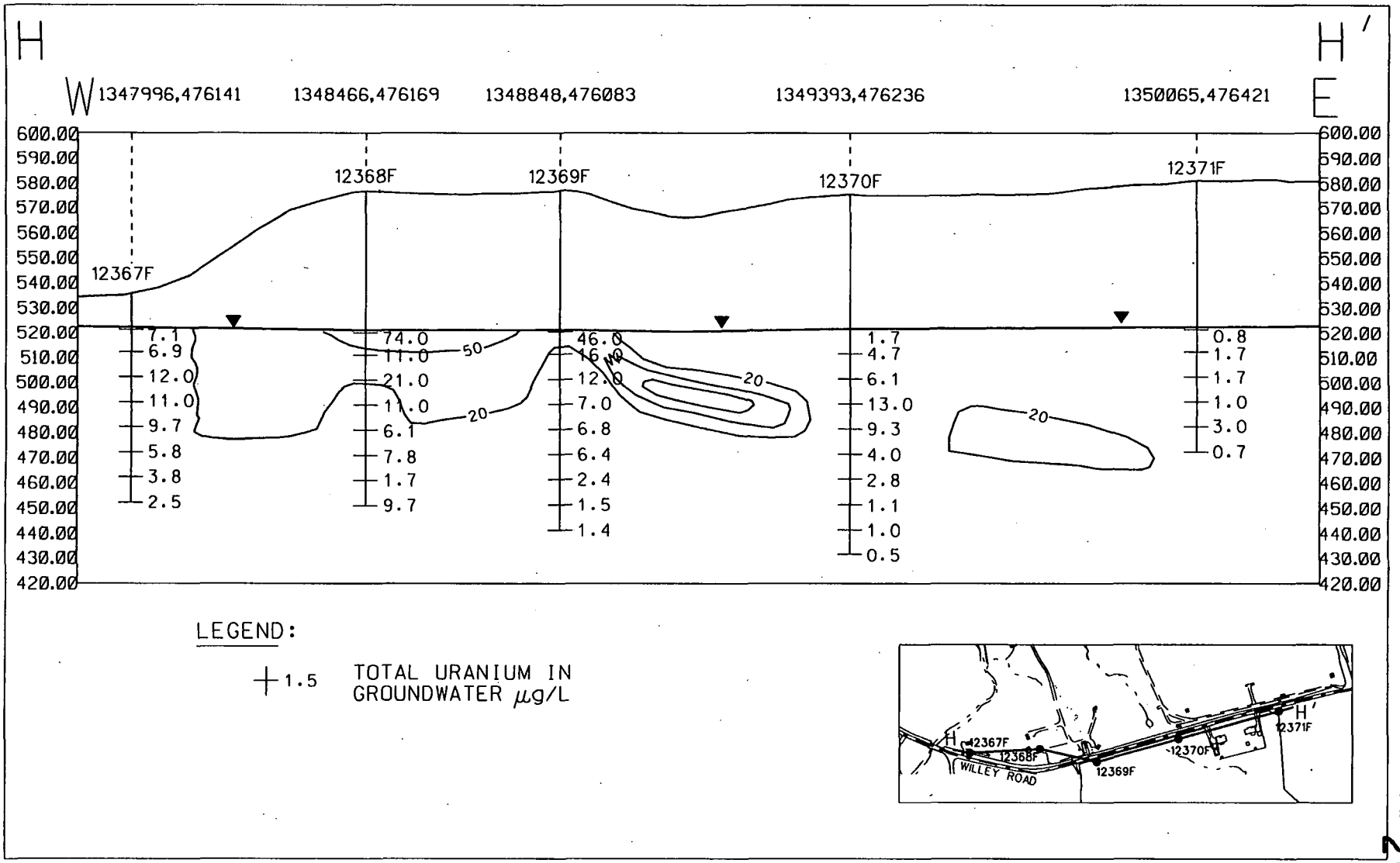
FIGURE F-7. TOTAL URANIUM IN GROUNDWATER ROUND - F, (SEPTEMBER THRU NOVEMBER 1999) NEXT TO AND SOUTH OF IW-10

V:/5CRW2/DGN/KEN_B/KEN00042.DGN

STATE PLANAR COORDINATE SYSTEM 1983

24-FEB-2000



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v:\5crw2\dgn\ken_b\ken00052.dgn
STATE PLANAR COORDINATE SYSTEM 1983

13-MAR-2000

FIGURE F-8. TOTAL URANIUM IN GROUNDWATER ROUND - F, (SEPTEMBER THRU NOVEMBER 1999) SOUTH OF RE-INJECTION WELLS

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APPENDIX G

WATER CHEMISTRY DATA

APPENDIX G

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This appendix contains water chemistry data collected during the re-injection demonstration. The Re-Injection Demonstration Test Plan prescribed three monitoring activities that focused on documenting water chemistry changes in the aquifer:

1) The collection of groundwater samples from twenty-three groundwater-monitoring wells within the Demonstration area. The samples were analyzed for major anions and cations, along with uranium. Sampling results are presented in Section G-1 in both a tabulated format and in Piper-Trilinear Diagrams.

2) The collection of groundwater samples from direct-push sampling locations. The samples were analyzed for major anions and cations, along with uranium. The data are presented in Section G-2, in both a tabular and Piper-Trilinear Diagram format.

3) The monitoring of water temperature, pH, specific conductivity, dissolved oxygen, and Eh in nine observation wells utilizing a down-hole water quality probe. These are referred to in this report as "*in situ*" parameters. *In situ* data collected at the start of re-injection at Monitoring Wells 22300 and 32306 are presented in Section G-3. Monthly *in situ* water quality data collected at each monitoring well location are presented in Section G-4. *In situ* water quality data collected in January 2000 are presented in Section G-5.

Results of an analysis of a grab sample of water from the Southeast Drainage Ditch, as prescribed in the Re-Injection Demonstration Test Plan, are also presented in this Appendix, in Section G-6.

A detailed list of tables and figures found in each section of this appendix is provided below.

Section G-1: Monitoring Well data.

- Table G-1: Monitoring Well data collected prior to the start of re-injection.
- Table G-2: Monitoring Well data collected in December of 1998.
- Table G-3: Monitoring Well data collected in March of 1999.
- Table G-4: Monitoring Well data collected from June through august of 1999.
- Figure G-1: Piper Diagram for Monitoring Well 2015.
- Figure G-2: Piper Diagram for Monitoring Well 2017.
- Figure G-3: Piper Diagram for Monitoring Well 2060.
- Figure G-4: Piper Diagram for Monitoring Well 2070.
- Figure G-5: Piper Diagram for Monitoring Well 2106.
- Figure G-6: Piper Diagram for Monitoring Well 2166.
- Figure G-7: Piper Diagram for Monitoring Well 2398.
- Figure G-8: Piper Diagram for Monitoring Well 2434.
- Figure G-9: Piper Diagram for Monitoring Well 22299.
- Figure G-10: Piper Diagram for Monitoring Well 22300.
- Figure G-11: Piper Diagram for Monitoring Well 22301.
- Figure G-12: Piper Diagram for Monitoring Well 22302.
- Figure G-13: Piper Diagram for Monitoring Well 22303.

- Figure G-14: Piper Diagram for Monitoring Well 3015.
- Figure G-15: Piper Diagram for Monitoring Well 3069.
- Figure G-16: Piper Diagram for Monitoring Well 3070.
- Figure G-17: Piper Diagram for Monitoring Well 3106.
- Figure G-18: Piper Diagram for Monitoring Well 3398.
- Figure G-19: Piper Diagram for Monitoring Well 32304.
- Figure G-20: Piper Diagram for Monitoring Well 32305.
- Figure G-21: Piper Diagram for Monitoring Well 32306.
- Figure G-22: Piper Diagram for Monitoring Well 32307.
- Figure G-23: Piper Diagram for Monitoring Well 4398.

Section G-2: Direct Push Sampling Location Data.

- Table G-5: Data from Geoprobe Location 12367.
- Table G-6: Data from Geoprobe Location 12368.
- Table G-7: Data from Geoprobe Location 12369.
- Table G-8: Data from Geoprobe Location 12370.
- Table G-9: Data from Geoprobe Location 12371.
- Table G-10: Data from Geoprobe Location 12372.
- Table G-11: Data from Geoprobe Location 12373.
- Figure G-24: Piper Diagram for Geoprobe Location 12369, Depth of 20 feet bwt.
- Figure G-25: Piper Diagram for Geoprobe Location 12372, Depth of 20 feet bwt.
- Figure G-26: Piper Diagram for Geoprobe Location 12373, Depth of 20 feet bwt.

Section G-3: In-situ Water Quality Data Collected at the start of re-injection

- Table G-12 Monitoring Well 22300
- Table G-13 Monitoring Well 32306

Section G-4: Monthly *In Situ* Water Quality Data

- Table G-14 Monitoring Well 22299
- Table G-15 Monitoring Well 22300
- Table G-16 Monitoring Well 22301
- Table G-17 Monitoring Well 22302
- Table G-18 Monitoring Well 22303
- Table G-19 Monitoring Well 32304
- Table G-20 Monitoring Well 32305
- Table G-21 Monitoring Well 32306
- Table G-22 Monitoring Well 32307

Section G-5: In-Situ Water Quality Data

- Table G-23 Data from Geoprobe Location 32306 Collected in January 2000
- Table G-24 Data from Geoprobe Location 32307 Collected in January 2000

Section G-6: Surface water sampling in Southeast Drainage Ditch

- Table G-25 Water Quality at Well 2434 and in Southeast Drainage Ditch
- Figure G-27 Piper Diagram for 2434 and Southeast Drainage Ditch

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SECTION G-1

MONITORING WELL DATA

TABLE G-1

GROUNDWATER MONITORING RESULTS
SAMPLES COLLECTED PRIOR TO THE START OF RE-INJECTION

Constituent		Well 2015 8/18/98	Well 2017 8/17/98	Well 2060 8/18/98	Well 2070 8/19/98	Well 2106 8/17/98	Well2106-D 8/17/98	Well 2166 8/17/98	Well 2398. 8/18/98	Well 2434 8/17/98	Well 3015 8/18/98	Well 3069 8/17/98	Well 3106 8/25/98	Well 3070 8/19/98	Rinsate 8/18/98	FB 8/17/98
aluminum	mg/L	0.0264 U	0.026 U	0.0264 U	0.0139	.026 U	0.057	0.026 U	0.026 U	.026 U	0.0264 U	0.0264 U	0.0098 U	0.0609	0.0354	.026 U
calcium	mg/L	73.3	133.2	65.1	106	81.3	87.7	134	80.5	84.5	80.5	85.8	89.4	89.7	0.692	1.19
iron	mg/L	.0032 U	0.0032 U	2.43	6.29	0.0723	0.18	0.036	0.803	0.0776	2.61	0.0099	0.0116	2.67	0.106	0.0048
magnesium	mg/L	18.3	29.6	16.8	32	20.3	21.6	35.46	22.3	22.45	19.6	21.2	20.9	22.2	0.15	0.259
manganese	mg/L	0.0023	0.0029	0.064	0.367	0.0033	0.0019	0.0032	0.052	0.0076	0.345	0.0064	0.0063	0.305	0.0007 U	0.0007 U
potassium	mg/L	2.75	2.25	3.3	3.48	2.66	2.7	3.56	2.84	2.88	2.87	2.63	2.77	2.2	0.324 U	0.324 U
silicon	mg/L	2.96	4.38	2.39	4.307	2.34	2.96	4.62	4.06	4.02	3.25	3.55	4.48	4.624	0.1224	0.0682
sodium	mg/L	13	14.1	12.4	14.4	14.3	15.4	17	31.15	19.53	13.3	14.3	13.9	8.88	0.465	0.223
ammonia	mg/L	0.1 U	0.10 U	0.25	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.1 U	0.10 U	0.10 U	0.15	0.1 U	0.10 U
nitrite-nitrate-nitrogen	mg/L	2.4	331	0.1 U	0.1 U	1.0	1.0	2.1	1.0	2.6	0.1 U	2.0	1.5	0.1 U	0.1 U	0.1 U
uranium	ug/L	142	4.1	23.1	2.5 U	39.6	40.9	95.1	29.9	2.5 U	2.71	150	2.5 U	2.5 U	2.5 U	2.5 U
alkalinity	mg/l	221	310	205	264	315	255	330	250	245	220	245	205	231	2	1 U
chloride	mg/l	26	56	28	67.4	32	32	40	60	32	34.8	28	38	24	5	•
fluoride	mg/l	0.37	0.15	0.39	0.12	0.25	0.25	0.14	0.12	0.20	0.14	0.15	0.13	0.13	0.02	•
sulfate	mg/l	40.3	138.4	38.2	90.7	38.2	36.8	139.4	58.9	43.8	76.9	43.4	60.6	91.1	1.14	•
TDS	mg/l	407	660	410	378	366	363	661	495	405	432	389	430	284	23	10 U
TSS	mg/l	3	2 U	6.8	18	2 U	2 U	2 U	11.8	2.0	6.8	2 U	2 U	128	2 U	2 U
phosphate(total)	mg/l	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
bicarbonate	mg/l	270	378	250	322	384	311	403	305	299	268	299	250	282	251	1 U
carbonate	mg/l	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1 U

		Well 3398 8/18/98	Well 4398 8/17/98	Well 22299 8/19/98	Wel 22300 8/18/98	Well 22301 8/18/98	Wel 22302 8/18/98	Well 22303 8/19/98	Well 32304 8/19/98	Well 32305 8/18/98	Well 32306 8/18/98	Well 32307 8/18/98	Well32307-D 8/18/98	FB 8/19/98	FB 8/18/98	FB 8/25/98
aluminum	mg/L	0.026 U	0.026 U	2.76	0.091	0.0972	1.78	8.7	0.142	0.0264 U	0.591	0.026 U	0.026	0.04	0.0712	.0098 U
calcium	mg/L	84.24	103	119	77.7	92.8	184.5	380	93.6	83	64.2	82.7	85.4	1.66	0.625	0.095
iron	mg/L	1.23	1.66	11.9	0.294	0.172	1.68	26.2	0.938	0.0507	0.777	1.23	1.3	0.192	0.078	0.021
magnesium	mg/L	21.14	26	35.7	19.2	23.4	45.15	113	24	20.6	15.6	19.8	20.13	0.357	0.104	0.0175 U
manganese	mg/L	0.27	0.528	0.209	0.0216	0.029	0.414	1.07	0.471	0.0048	0.126	0.267	0.26	0.0045	0.0013	0.0009 U
potassium	mg/L	2.3	0.934	3.34	3.0	3.05	3.2	7.9	3.1	2.75	4.68	2.48	2.6	0.031	0.0314	0.0075 U
silicon	mg/L	4.83	5.68	5.634	3.77	3.47	50.97	17.06	4.691	4.17	7.86	3.8	3.57	0.0468	0.101	0.0792
sodium	mg/L	10	8.27	12.2	12.8	9.46	20.56	38.7	12.7	13	12.7	11.5	11.6	0.121	0.0663	0.031
ammonia	mg/L	0.16	0.15	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.13	0.14	0.1 U	0.10 U	0.10 U
nitrite-nitrate-nitrogen	mg/L	0.1 U	0.1 U	0.3	1.9	1.8	10.3	0.6	0.1 U	2.0	0.7	1.6	0.9	0.1 U	0.10 U	0.10 U
uranium	ug/L	2.5 U	2.5 U	16.5	74.2	271	98.2	5.63	3.32	2.5 U	35.5	6.36	2.7	2.5 U	2.5 U	2.5 U
alkalinity	mg/L	235	245	211	216	271	299	283	246	226	138	217	220	1 U	1 U	1 U
chloride	mg/L	30	24	27.8	28	30	40	76.6	36.4	34	25.6	28	30	8	1 U	1 U
fluoride	mg/L	0.13	0.13	0.24	0.26	0.41	0.42	0.24	0.13	0.12	0.19	0.13	0.13	0.02	0.01	0.01
sulfate	mg/L	75.3	95.5	54.2	38.6	36	67.2	78.8	76.6	20.4	67	70.4	86	1 U	1 U	1 U
TDS	mg/L	437	480	243	323	436	1157	799	427	362	276	376	369	10 U	10 U	10 U
TSS	mg/L	4	2.8	470	31.4	11	NR	419.2	2.4	5.6	139.2	4.8	5.2	2 U	2 U	2 U
phosphate(total)	mg/L	0.1 U	0.1 U	0.34	0.1 U	0.1 U	0.43	0.35	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
bicarbonate	mg/L	287	299	257	264	331	365	345	300	276	168	265	268	1 U	1 U	1 U
carbonate	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1 U	1 U	1 U

• No result, sample accidently acidified.
FB = field blank

000266

2999

TABLE G-2

PRELIMINARY GROUNDWATER MONITORING RESULTS
SAMPLES COLLECTED IN DECEMBER 1998 FOR THE RE-INJECTION DEMONSTRATION

Constituent		Well 2015 12/30/98	Well 2017 12/30/98	Well 2060 12/30/98	Well 2070 12/29/98	Well 2106 12/30/98	Well 2166 12/31/98	Well 2398 12/29/98	Well 2434 12/29/98	Well 3015 12/30/98	Well 3069 12/29/98	Well 3106 12/30/98	Well 3070 12/29/98	Rinsate 12/29/98	FB 12/29/98	Well 3398 12/29/98
aluminum	mg/L	0.036	0.021	0.038	0.0705	0.0264U	0.027	0.164	0.053	0.028	0.019	0.130	0.128	0.025	0.0264U	0.0264U
calcium	mg/L	87.330	162.1	62.15	109.0	93.0	113.3	81.2	87.66	80.93	100.5	92.5	96.0	5.590	1.27	89.1
iron	mg/L	0.090	0.047	1.80	3.35	0.237	0.077	1.380	0.209	1.48	0.224	0.115	4.250	0.041	0.287	1.35
magnesium	mg/L	21.4	31.9	18.2	29.4	22.0	28.2	22.7	22.6	19.2	24.0	22.8	23.0	0.979	0.316	21.9
manganese	mg/L	0.0088	0.0037	0.078	0.264	0.0037	0.0065	0.0322	0.019	0.267	0.016	0.0329	0.325	0.0017	0.0009	0.294
potassium	mg/L	3.350	3.0	3.6	4.040	3.46	3.42	3.74	3.010	3.4	3.28	3.56	2.82	0.184	0.324U	2.940
silicon	mg/L	3.270	5.370	1.26	3.9	2.78	4.43	3.96	3.580	3.49	4.1	4.06	4.38	0.309	0.038U	3.880
sodium	mg/L	15.9	16.2	13.9	16.9	17.0	15.6	33.7	17.4	15.8	15.2	17.9	11.9	0.756	0.979	12.0
ammonia	mg/L	0.10U	0.10U	0.24	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.12	0.10U	0.10U	0.10U
nitrate-nitrogen	mg/L	1.1	0.9	0.1U	0.1U	0.7	1.7	0.8	0.9	0.1U	2.1	0.8	0.1U	0.1U	6.2	0.1U
uranium	ug/L	129	3.3	8.4	0.9	33.0	69	26	1.1	1.6	209	1.3	0.3	0.0U	0.0U	0.7
alkalinity	mg/L	250.0	320.0	220.0	260.0	240.0	280.0	290.0	230.0	230.0	250.0	230.0	250.0	1.0U	1.0U	250.0
chloride	mg/L	30.0	44.0	28.0	70.0	34.0	32.0	60.0	32.0	24.0	34.0	32.0	36.0	1.0U	1.0U	32.0
fluoride	mg/L	0.39	0.16	0.44	0.13	0.26	0.15	0.13	0.22	0.15	0.17	0.13	0.14	0.1U	0.1U	0.14
sulfate	mg/L	65.7	179.4	55.5	79.9	84.0	112.0	59.3	70.2	55.4	63.8	97.0	76.0	1.0U	1.0U	70.5
TDS	mg/L	508	811	296	495	459	509	449	370	421	432	481	413	83.0	2.0	390
TSS	mg/L	3.6	2U	18.8	7.0	3.6	2U	2.4	3.2	7.2	2U	3.6	20.0	3.2	2U	5.2
phosphate(total)	mg/L	0.1U	0.1U	0.1U	0.1U	•	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
bicarbonate	mg/L	305	390	268	317	293	342	354	281	281	305	281	305	1.0U	1.0U	305
carbonate	mg/L	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

		3398-D 12/29/98	Well 4398 12/31/98	Well 22299 12/29/98	22299-D 12/29/98	Wel 22300 12/30/98	Well 22301 12/29/98	Wel 22302 12/30/98	Well 22303 12/31/98	Well 32304 12/31/98	Well 32305 12/29/98	Well 32306 12/29/98	Well 32307 12/30/98	FB 12/30/98	FB 12/31/98	RIN 12/31/98
Aluminum	mg/L	0.0883	0.0264U	0.028	0.060	0.032	0.034	0.414	0.118	0.063	0.059	0.041	0.042	0.014	0.025	0.0098U
Calcium	mg/L	84.8	107.0	93.1	88.56	96.89	84.640	101.1	94.1	102.3	94.99	99.12	97.71	0.369	3.3	1.1
Iron	mg/L	1.46	1.44	0.17	0.106	0.189	0.890	0.756	8.99	0.264	0.545	1.29	1.42	0.078	0.039	0.043
magnesium	mg/L	21.0	26.4	23.7	23.2	24.1	23.2	23.4	23.1	22.3	22.0	23.0	23.3	0.075	0.870	0.282
manganese	mg/L	0.278	0.454	0.0091	0.0033	0.0068	0.013	0.048	0.0123	0.520	0.017	0.302	0.32	0.0019	0.0019	0.0041
Potassium	mg/L	2.85	1.38	3.2	3.2	3.19	3.17	3.04	3.37	3.59	3.77	3.930	3.38	0.041	0.114	0.052
Silicon	mg/L	3.71	5.78	3.94	3.89	3.99	3.76	4.17	4.04	4.10	3.750	3.590	3.56	0.038U	0.103	0.038U
Sodium	mg/L	11.6	9.52	16.5	16.1	16.1	15.9	15.4	16.4	17.2	16.6	16.8	16.1	0.274	0.670	0.396
Ammonia	mg/L	0.10U	0.14	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U
nitrate-nitrogen	mg/L	0.1U	0.1U	0.7	0.7	6.3	0.7	0.7	0.8	0.1U	1.2	0.1U	0.1U	0.1U	9.5	0.1U
Uranium	ug/L	0.6	0.1	0.3	0.3	0.9	3.4	0.7	0.8	3.1	0.4	2.3	17	0.0U	0.0U	0.0U
Alkalinity	mg/L	255.0	250.0	250.0	240.0	230.0	255.0	240.0	230.0	250.0	240.0	250.0	230.0	1.0U	1.0U	1.0U
Chloride	mg/L	32.0	32.0	36.0	30.0	32.0	32.0	32.0	28.0	32.0	32.0	32.0	32.0	1.0U	1.0U	1.0U
Fluoride	mg/L	0.13	0.14	0.23	0.24	0.24	0.24	0.25	0.31	0.12	0.15	0.13	0.13	0.1U	0.1U	0.1U
Sulfate	mg/L	64.4	126.5	77.2	83.7	74.3	72.6	78.0	85.5	87.5	65.9	96.1	89.2	1.0U	1.0U	1.0U
TDS	mg/L	376	502	411	422	395	410	430	423	465	388	454	453	58.0	19.0	1.0
TSS	mg/L	4.0	5.6	2U	3.6	2.0	2U	114.4	23.0	2U	2U	7.2	32.0	2U	2U	2U
phosphate(total)	mg/L	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
bicarbonate	mg/L	311	305	305	293	281	311	293	281	305	293	305	281	1.0U	1.0U	1.0U
Carbonate	mg/L	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

• Sample was misplaced and not delivered to lab within holdtime.
FB = field blank

TABLE G-3

PRELIMINARY GROUNDWATER MONITORING RESULTS
SAMPLES COLLECTED IN MARCH 1999 FOR THE RE-INJECTION DEMONSTRATION

Constituent		Well 2015 03/23/99	Well 2017 03/24/99	Well 2060 03/25/99	Well 2070 03/22/99	Well 2106 03/22/99	Well 2166 03/22/99	Well 2398 03/23/99	Well 2434 03/22/99	Well 3015 03/23/99	Well 3015-D 03/23/99	Well 3069 03/22/99	Well 3106 03/22/99	Well 3070 03/22/99	Well 3398 03/23/99	Well 4398 03/23/99
aluminum	mg/L	0.0266U	0.0515	0.0266U	0.0453	0.0806	0.0418	0.0428	0.0736	0.0266U	0.0369	0.0456	0.048	0.0764	0.0754	0.0343
calcium	mg/L	83.6	150	87.7	101	78.1	124	89.2	76.2	93.6	93.2	96.0	89.6	84.2	92.8	110
iron	mg/L	0.0047	0.0024U	0.187	2.3	0.228	0.0024U	1.38	0.085	0.787	0.785	0.0226	0.0024U	2.9	0.693	0.969
magnesium	mg/L	21.1	33.8	21.8	33.5	25.9	34.9	25.4	25	22.2	22.3	27.6	26.3	24.2	23.3	27.8
manganese	mg/L	0.0007U	0.0007	0.0033	0.233	0.0014U	0.0007U	0.0492	0.0007	0.308	0.309	0.0007U	0.0007U	0.301	0.268	0.654
potassium	mg/L	3.07	2.460	3.14	3.54	2.967	3.59	3.16	2.9	3.07	3.2	3.24	3.22	2.6	2.73	1.03
silicon	mg/L	3.42	5.540	2.95	4.4	3.250	4.8	4.32	3.85	3.39	3.4	4.42	4.25	3.97	4.19	6.28
sodium	mg/L	13.7	12.1	14.4	15.2	16.830	16.3	36.7	15.8	14.2	14.2	15.5	16.2	9.71	10.6	6.66
ammonia	mg/L	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.11	0.10U	0.19
nitrate-nitrogen	mg/L	2.1	0.4	1.5	0.1U	0.8	1.5	0.8	0.8	0.1U	0.1U	2.0	0.8	0.1U	0.1U	0.1U
uranium	ug/L	123	5.41	121	0.8	50	79	26.1	1.5	1.5	1.5	386	1.0	0.2J	0.8	0.1J
alkalinity	mg/L	225	355	225	255	225	280	250	215	230	230	280	225	230	240	235
chloride	mg/L	30	30.0	30	66	38.0	38.0	68.0	38	32.0	32.0	38	38.0	30.0	34.0	22.0
fluoride	mg/L	0.37	0.15	0.33	0.11	0.27	0.14	0.12	0.22	0.12	0.12	0.18	0.12	0.13	0.12	0.12
sulfate	mg/L	45.3	149.0	47.9	88.6	63.8	97.6	14.6	54.2	103.0	102.3	17.3	34.7	106.6	75.2	94.3
TDS	mg/L	385	667	404	557	435	561	508	431	458	458	484	445	443	453	461
TSS	mg/L	2U	2U	1.8U	10.0	10.0	2U	7.2	2.0	6.4	6.8	2.0U	2U	7.0	2.8	4.4
phosphate(total)	mg/L	0.1U	0.1U	0.1U	0.1U	0.1	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
bicarbonate	mg/L	275	433	275	311	275	342	305	262	281	281	342	275	281	293	287
carbonate	mg/L	1.0U	1.0U	1.0U	1.0U	1.0U	1U	1.0U	1U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

		Well 22299 03/22/99	Well 22300 03/23/99	Well 22301 03/24/99	Well 22302 03/23/99	Well 22303 03/23/99	Well 22303-D 03/23/99	Well 32304 03/24/99	Well 32305 03/24/99	32306 03/24/99	Well 32307 03/23/99	FB 03/22/99	FB 03/23/99	Rinsate 03/23/99	FB 03/24/99	FB 03/25/99
aluminum	mg/L	19.78	2.580	0.958	25.7	1.59	1.12	0.0287	0.233	0.128	0.0472	0.0653	0.170	0.0266	0.0868	0.0266U
calcium	mg/L	172	175	90.2	167	124	115	105	92.4	101	97.8	2.57	0.177	0.0717	0.235	0.0349
iron	mg/L	32.9	11.9	3.34	40	4.43	3.67	0.103	0.0434	1.26	1.16	0.0091	0.0522	0.0548	0.0076	0.0268
magnesium	mg/L	94	50.2	24.3	42.4	33.6	30.9	23.9	22.3	23.9	24.4	0.807	0.0668	0.025	0.036	0.0217U
manganese	mg/L	0.304	0.298	0.0814	0.665	0.233	0.191	0.423	0.0011	0.320	0.377	0.0007U	0.0007U	0.0007U	0.0007U	0.0007U
potassium	mg/L	10.7	3.180	2.45	6.190	3.23	3.02	2.890	3.240	3.790	3.04	0.251	0.289U	0.289U	0.289U	0.289U
silicon	mg/L	50.7	6.760	4.49	31.3	5.79	5.16	4.260	3.830	3.880	3.63	0.236	0.336	0.0461	0.116	0.0339
sodium	mg/L	16.96	14.6	11.9	13.8	14.6	14.3	15.8	15.3	15.4	17	0.567	0.147U	0.147U	0.147U	0.147U
ammonia	mg/L	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U
nitrate-nitrogen	mg/L	0.8	0.8	0.7	0.7	0.4	0.7	0.2	1.1	0.1U	0.1U	0.1U	0.10U	0.1U	0.10U	0.1U
uranium	ug/L	4.9	6.00	4.50	9.61	5.69	2.6	3.86	1U	2.39	14.9	0U	0U	0U	1U	1U
alkalinity	mg/L	230	240	230	240	210	230	255	230	230	230	1.0U	1.0U	1.0U	1.0U	0.1U
chloride	mg/L	44	36.0	34.0	36.0	40	38	36.0	36.0	40.0	40.0	1.0U	1.0U	1.0U	1.0U	1.0U
fluoride	mg/L	0.22	0.22	0.21	0.29	0.26	0.25	0.11	0.13	0.11	0.15	0.10U	0.10U	0.10U	0.10U	0.10U
sulfate	mg/L	66.3	63.6	64.5	96.8	55.2	55.0	114.2	51.5	92.4	116.8	1.0U	1.0U	1.0U	1.0U	1.0U
TDS	mg/L	441	459	439	514	457	458	464	418	462	501	10U	10U	10U	10U	10U
TSS	mg/L	76	649	225	1340	628	601	2.0U	2.0U	5.2	9.0	2U	2U	2.0U	2.0U	2.0U
phosphate(total)	mg/L	0.13	0.15	0.1U	0.15	0.13	0.13	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
bicarbonate	mg/L	281	293	281	293	256	281	311	281	281	281	1.0U	1.0U	1.0U	1.0U	1.0U
carbonate	mg/L	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

FB = field blank

000268

TABLE G-4

PRELIMINARY GROUNDWATER MONITORING RESULTS
SAMPLES COLLECTED JUNE THROUGH AUGUST, 1999 FOR THE RE-INJECTION DEMONSTRATION

Constituent		Well 2015 8/5/99	Well 2017 8/5/99	Well 2060 7/28/99	Well 2070 7/7/99	Well 2106 7/7/99	Well 2166 8/11/99	Well 2166-D 8/11/99	Well 2398 7/6/99	Well 2434 7/6/99	Well 3015 8/5/99	Well 3069 7/6/99	Well 3069-D 7/6/99	Well 3106 7/7/99	Well 3070 7/7/99	Well 3398 7/6/99	Well 4398 7/6/99	Well 22299 6/8/99	Well 22300 6/7/99
aluminum	mg/L	0.0232	0.086	U 0.0208	U 0.0248	0.0266	U 0.0208	U 0.0208	U 0.0248	0.0815	U 0.0208	U 0.0248	U 0.0248	U 0.0248	U 0.0248	U 0.0248	U 0.0248	4.520	4.250
calcium	mg/L	93	142	92.6	109	97.6	111	1.95	89.6	89.8	96	99.3	99.9	92.1	97.4	96.5	10.7	268	513
iron	mg/L	0.0437	0.244	0.0375	2.58	0.192	U 0.0031	0.0076	0.218	0.292	1.16	U 0.0074	U 0.0074	0.0242	3.93	1.190	0.632	13.7	14
magnesium	mg/L	24.9	32.7	23.1	31.8	25.7	28.9	0.531	25.6	23.9	23.8	24.5	24.6	24.2	25	24.2	26.9	97.3	182
manganese	mg/L	0.003	0.0077	0.0043	0.263	0.0052	0.0035	U0.0012	0.0223	0.0139	0.352	0.00930	0.0092	0.0116	0.320	0.282	0.412	0.308	0.637
potassium	mg/L	3.22	2.840	3.75	3.42	2.72	3.410	U 0.431	2.98	2.940	3.520	2.950	3.04	2.750	2.420	2.650	1.17	4.200	4.09
silicon	mg/L	3.46	5.450	3.13	4.17	3.59	4.540	4.44	4.45	3.640	3.7	4.480	4.4	4.190	4.990	4.150	6.32	10.2	9.66
sodium	mg/L	16.2	22.3	164	17.3	17.6	14.7	0.407	21.7	17.6	16	15.8	16.3	17.20	11.6	11.4	8.34	15.4	16.6
ammonia	mg/L	U 0.10	U 0.10	U 0.10	U 0.10	U 0.10	U 0.10	U 0.10	U 0.1	U 0.10	U 0.10	U 0.1	U 0.10	U 0.10	0.11	U 0.10	0.12	U 0.00010	U 0.00010
nitrate-nitrogen	mg/L	0.5	U 0.1	0.6	0.1	0.8	1.2	1.2	1.0	1.0	U 0.1	0.6	0.6	0.8	U 0.1	0.1	0.0003	0.7	0.6
uranium	ug/L	160	3.1	106	0.858	36.8	61	NS	22	1.4	1.2	242	238	0.997	0.221	0.9	0.1 J	12	3.7
alkalinity	mg/L	270	360	227	262	247	279	275	254	237	257	260	258	266	240	264	255	260	269
chloride	mg/L	32.8	72.2	36.0	76.0	36.0	31.6	31.4	34.0	32.0	36	34	34.0	34.0	26.0	36.0	26.0	34	32
fluoride	mg/L	0.50	0.14	0.35	0.15	0.27	0.16	0.16	0.13	0.22	0.15	0.24	0.14	0.14	0.11	0.12	0.13	0.23	0.24
sulfate	mg/L	78.5	78.0	70.6	78.6	77.4	113.5	111.5	86.1	71.1	93.5	85.9	85.0	74.4	82.6	67.0	108.1	85.2	87.6
TDS	mg/L	496	741	456	655	467	564	554	502	477	533	520	532	456	465	489	554	501	522
TSS	mg/L	U 2.0	9.2	U 2.0	13	U 2.0	U 2	U 2	2.0	2.8	8.0	U 2	U 2	U 2.0	13	3.2	3.6	628	1114
phosphate(total)	mg/L	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	0.14	0.16
bicarbonate	mg/L	329	439	277	320	301	340	336	310	289	314	317	315	325	293	322	311	317	328
carbonate	mg/L	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1	U 1.0

		Well 22301 6/8/99	Well 22302 6/7/99	Well 22303 6/7/99	Well 32304 6/9/99	Well 32305 6/9/99	Well 2305-D 6/9/99	Well 32306 6/8/99	Well 32307 6/8/99	FB 6/7/99	Rinsate 6/7/99	FB 6/8/99	FB 6/9/99	FB 7/6/99	FB 7/7/99	FB 7/28/99	Rinsate 7/28/99	FB 8/5/99	FB 8/11/99
aluminum	mg/L	0.0791	10.4	1.27	U 0.0248	0.0461	0.0401	U 0.0248	0.0296	0.054	U 0.0248	U 0.0248	0.0337	U 0.0248	U 0.0248	U 0.0208	U 0.0208	U 0.0208	U 0.0208
calcium	mg/L	91.5	137	123	91.6	85.6	87.2	93.4	94.7	2.110	1.630	0.0377	0.316	0.0421	0.110	0.0558	1.33	2.580	110
iron	mg/L	0.460	17.9	3.43	0.0176	0.52	0.063	1.35	1.19	0.0979	0.0524	U 0.0074	0.0863	U 0.0074	0.0717	0.0065	0.0078	0.128	0.0031
magnesium	mg/L	23.6	37.4	34.6	21.9	22.3	22.4	23.1	24.0	0.668	0.529	U 0.0369	0.104	U 0.0369	U 0.0369	U 0.023	0.327	0.577	28.2
manganese	mg/L	0.0156	0.325	0.206	0.339	0.007	0.0066	0.322	0.459	U 0.0006	U 0.0006	U 0.0006	0.002	U 0.0006	U 0.0006	U 0.0012	U 0.0012	0.0089	0.0039
potassium	mg/L	2.850	5.05	3.53	2.870	3.160	3.220	3.77	3.290	U 0.224	U 0.224	U 0.224	U 0.224	U 0.2224	U 0.224	U 0.431	U 0.431	U 0.431	3.38
silicon	mg/L	4.560	2038	5.89	3.960	3.910	3.880	4.05	3.870	0.172	0.122	0.0398	0.441	0.065	U 0.0988	U 0.0133	0.023	0.0906	0.104
sodium	mg/L	15.1	15.0	15.9	14.400	14.400	14.9	15.1	15.4	U 0.162	0.219	U 0.162	U 0.162	U 0.162	U 0.162	U 0.130	0.165	0.465	14.5
ammonia	mg/L	U 0.10	U 0.00010	U 0.00010	U 0.10	U 0.10	U 0.1	U 0.10	U 0.10	U 0.00010	U 0.00010	U 0.00010	U 0.10	U 0.10	U 0.10	U 0.0001	U 0.0001	U 0.10	U 0.10
nitrate-nitrogen	mg/L	0.9	0.6	0.6	0.3	0.7	0.8	NR	U 0.1	U 0.0001	U 0.0001	U 0.0001	U 1.0	U 0.1	0.1	U 0.0001	U 0.0001	U 0.1	U 0.1
uranium	ug/L	11	11	5.4	3.9	0.7	0.7	2.1	13	U 0	0.1 J	U 0.02	U 0.02	U 0	U 0	U 0	U 0	U 0	U 0
alkalinity	mg/L	256	253	250	260	258	256	262	259	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0
chloride	mg/L	34.0	32.0	34.0	34	34	34	36	36.0	U 1.0	U 1.0	1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0
fluoride	mg/L	0.19	0.27	0.23	0.11	0.14	0.14	00.10	0.17	U 0.1	U 0.1	0.1	U 0.14	U 0.10	U 0.10	U 0.1	U 0.1	U 0.1	U 0.1
sulfate	mg/L	82.8	80.8	84.8	77.6	87.6	86.0	108.4	102.47	U 1.0	U 1.0	1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0
TDS	mg/L	460	472	481	464	400	416	502	441	U 10	U 10	10	U 10	U 10	37	U 10	U 10	18	U 10
TSS	mg/L	U 2	572	18.8	U 2	U 2	U 2	4.0	8.8	U 2	U 2	2	U 2	U 2	U 2	U 2.0	U 2.0	U 2.0	U 2.0
phosphate(total)	mg/L	U 0.1	0.14	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1	U 0.1
bicarbonate	mg/L	312	309	305	317	315	312	320	316	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0
carbonate	mg/L	U 1.0	U 1	U 1	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0	U 1.0

FB = field blank
NS = not sampled

000269

Figure G-1, Piper Diagram

Monitoring Well 2015

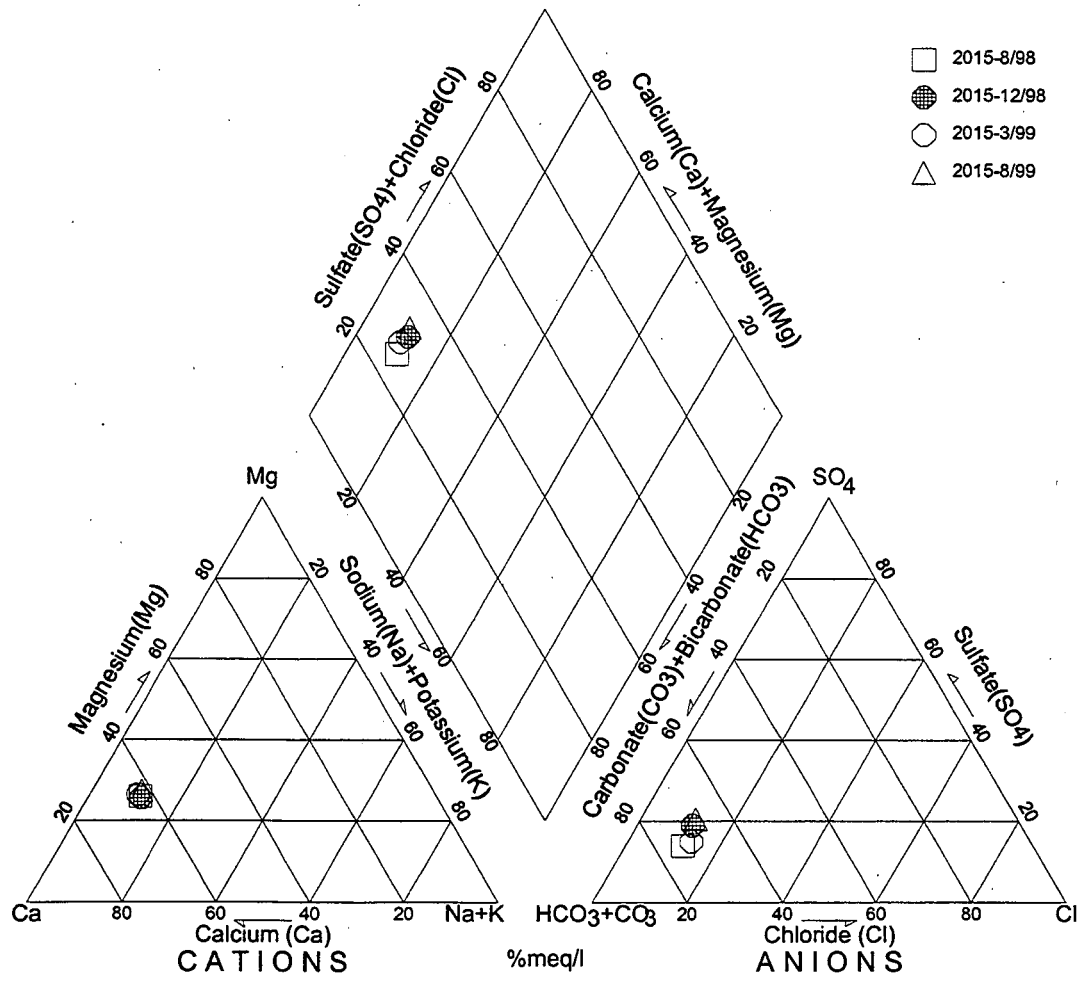


Figure G-2, Piper Diagram

Monitoring Well 2017

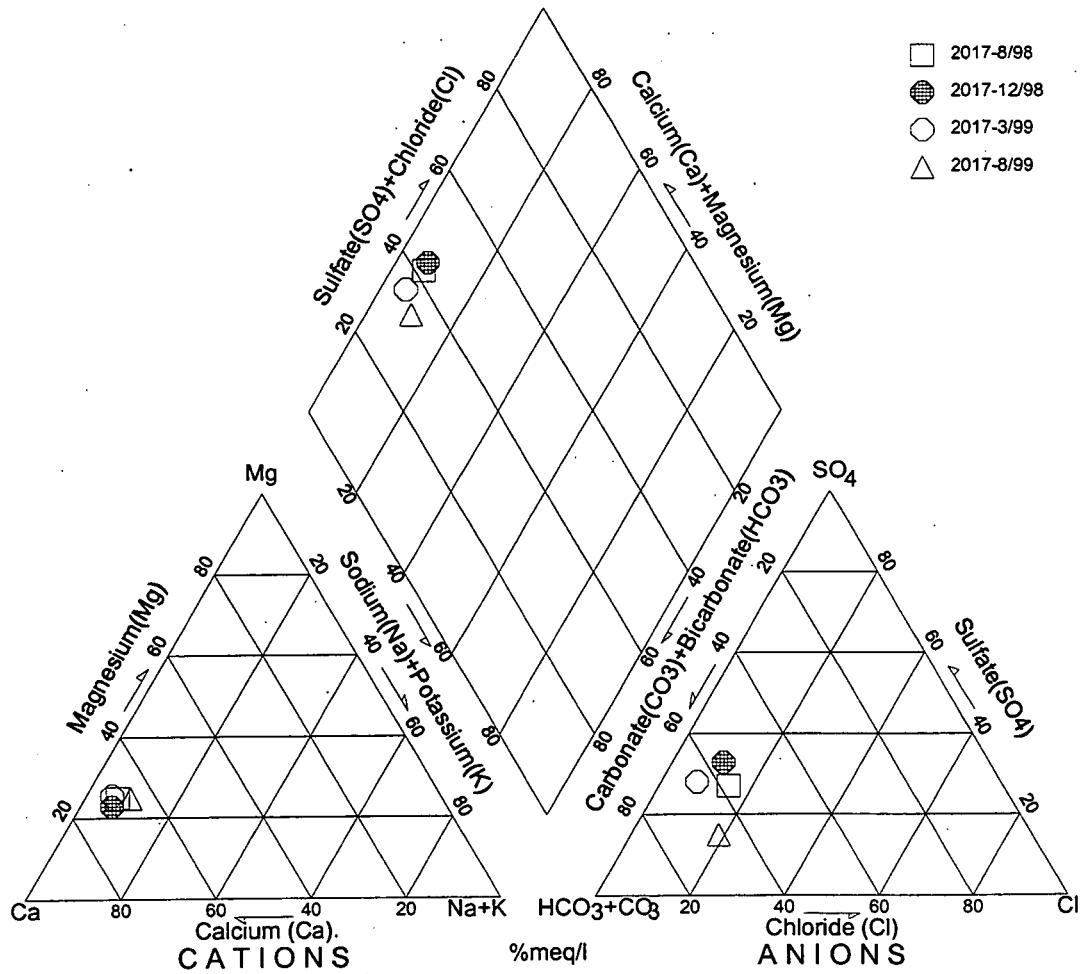


Figure G-3, Piper Diagram

Monitoring Well 2060

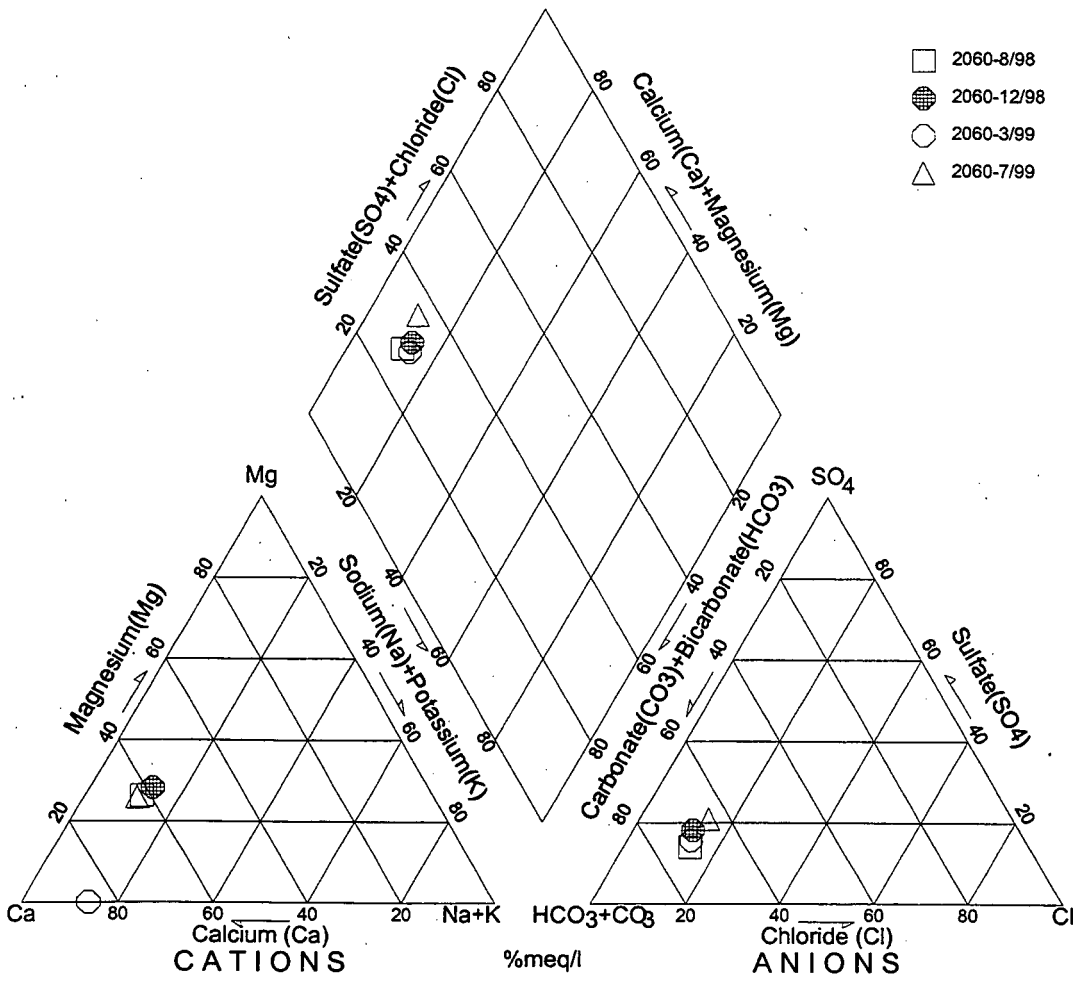


Figure G-4, Piper Diagram

Monitoring Well 2070

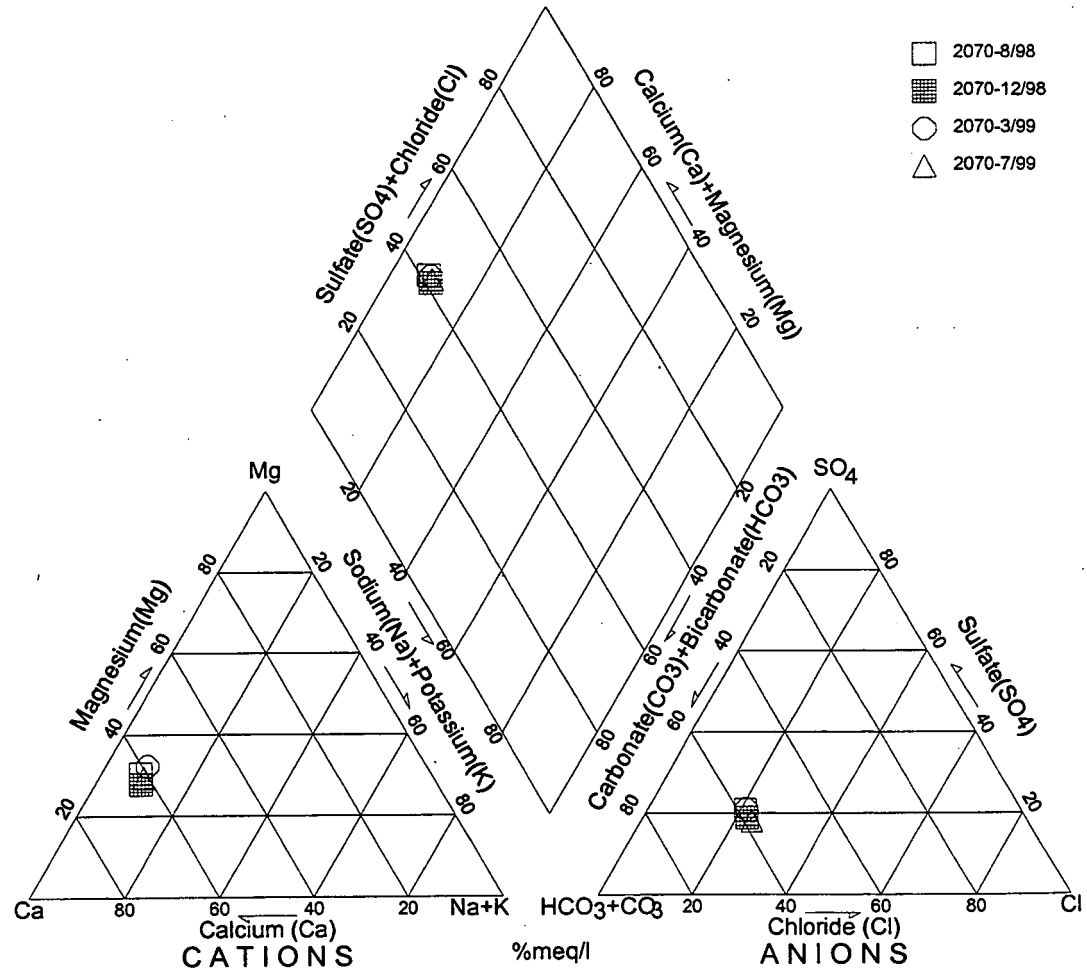


Figure G-5, Piper Diagram

Monitoring Well 2106

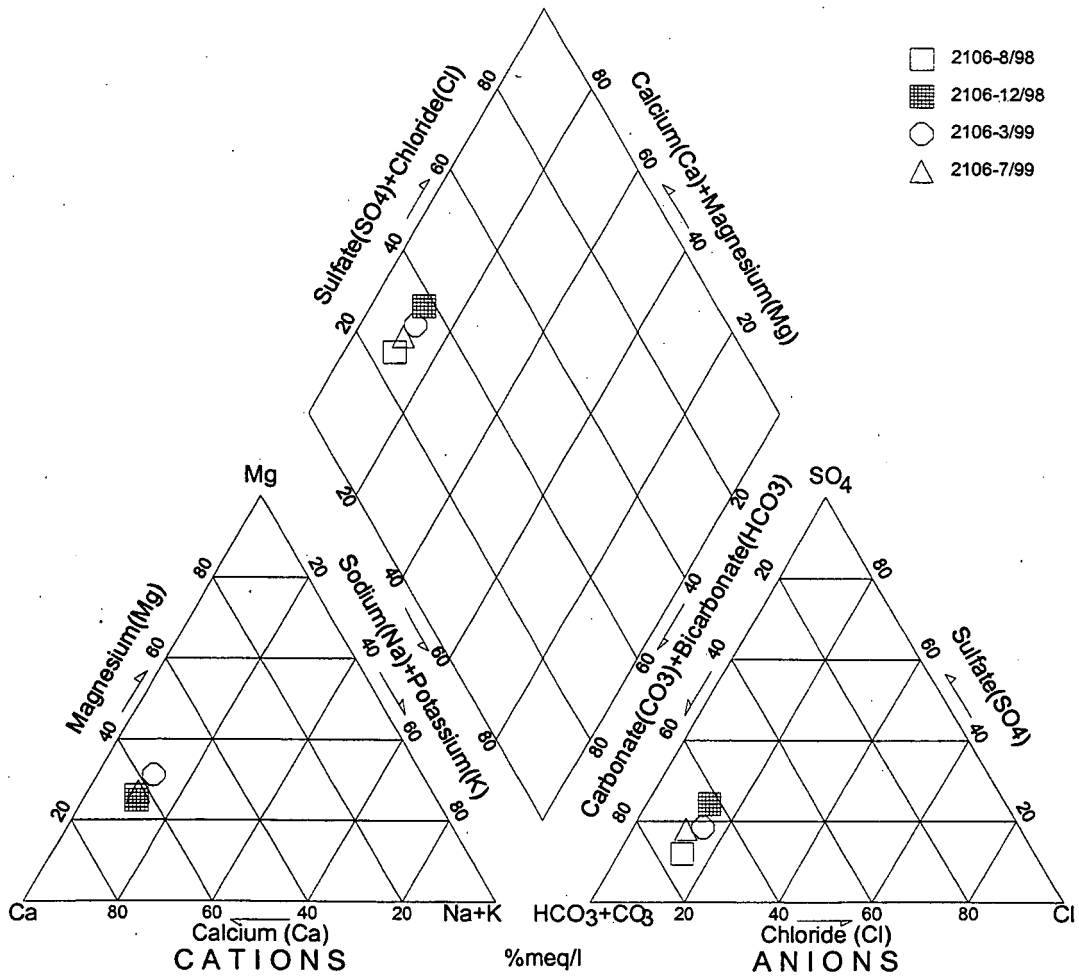


Figure G-6, Piper Diagram

Monitoring Well 2166

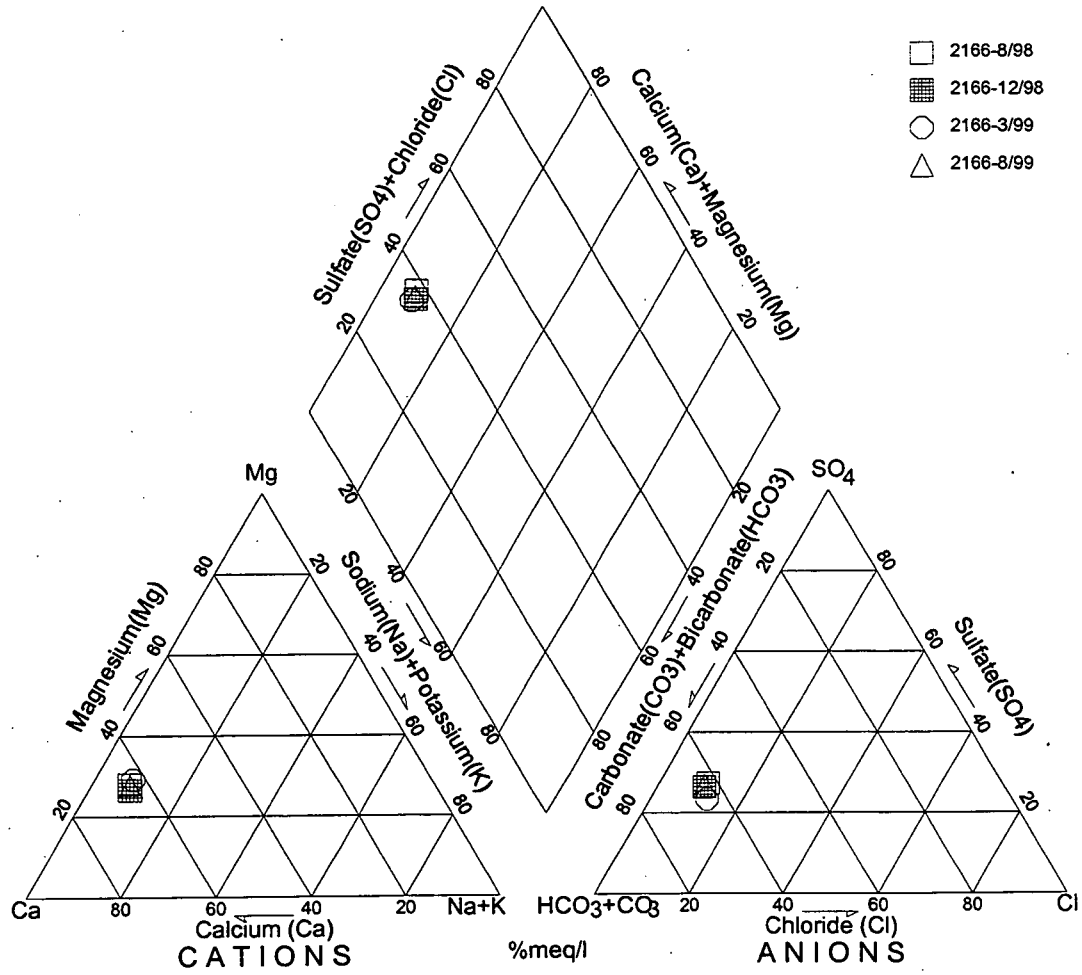


Figure G-7, Piper Diagram

Monitoring Well 2398

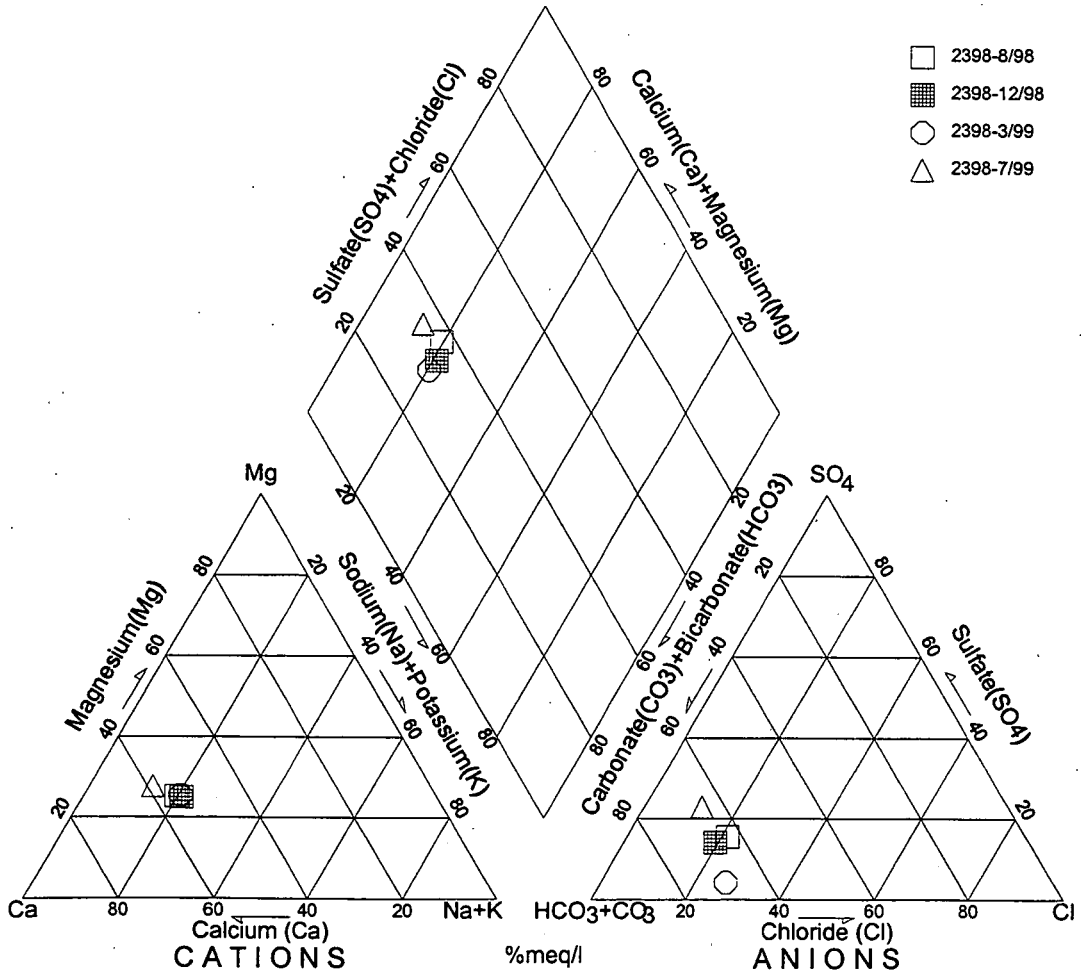


Figure G-8, Piper Diagram

Monitoring Well 2434

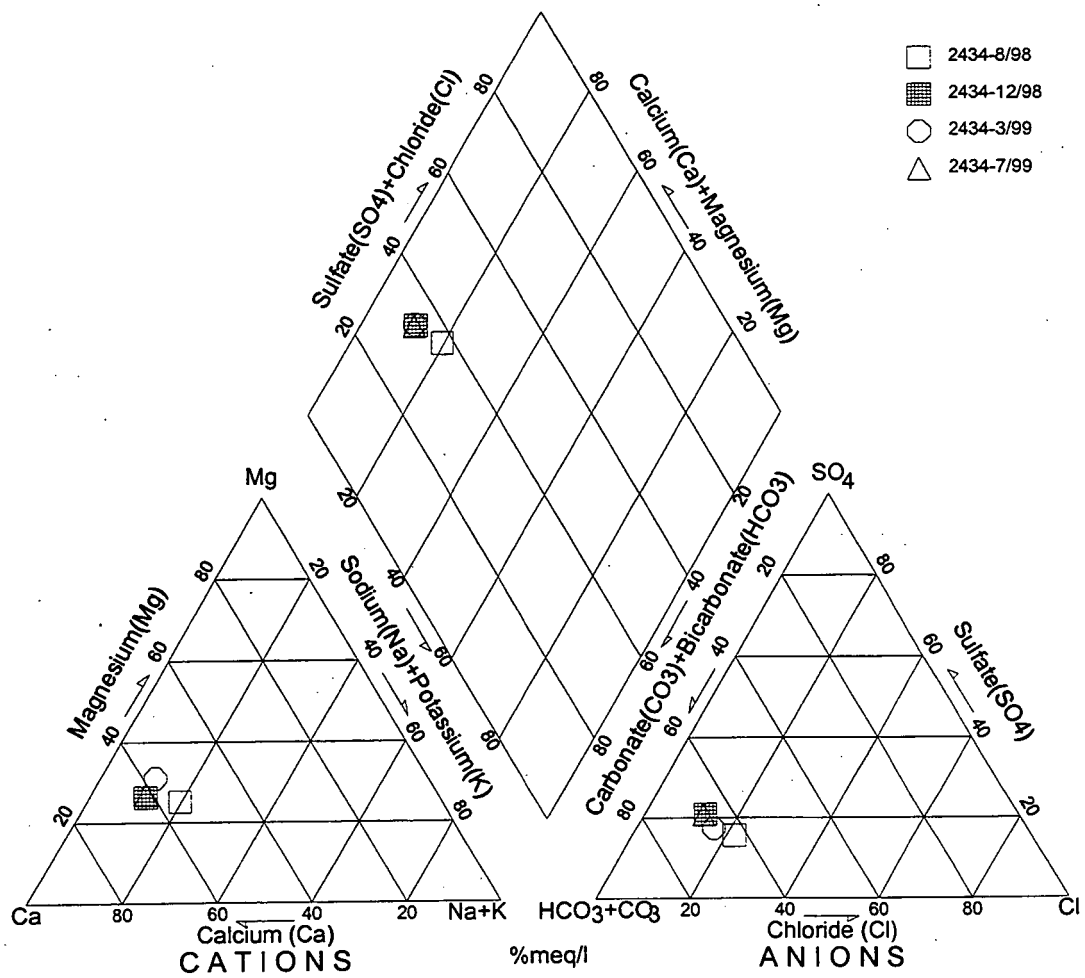


Figure G-9, Piper Diagram

Monitoring Well 22299

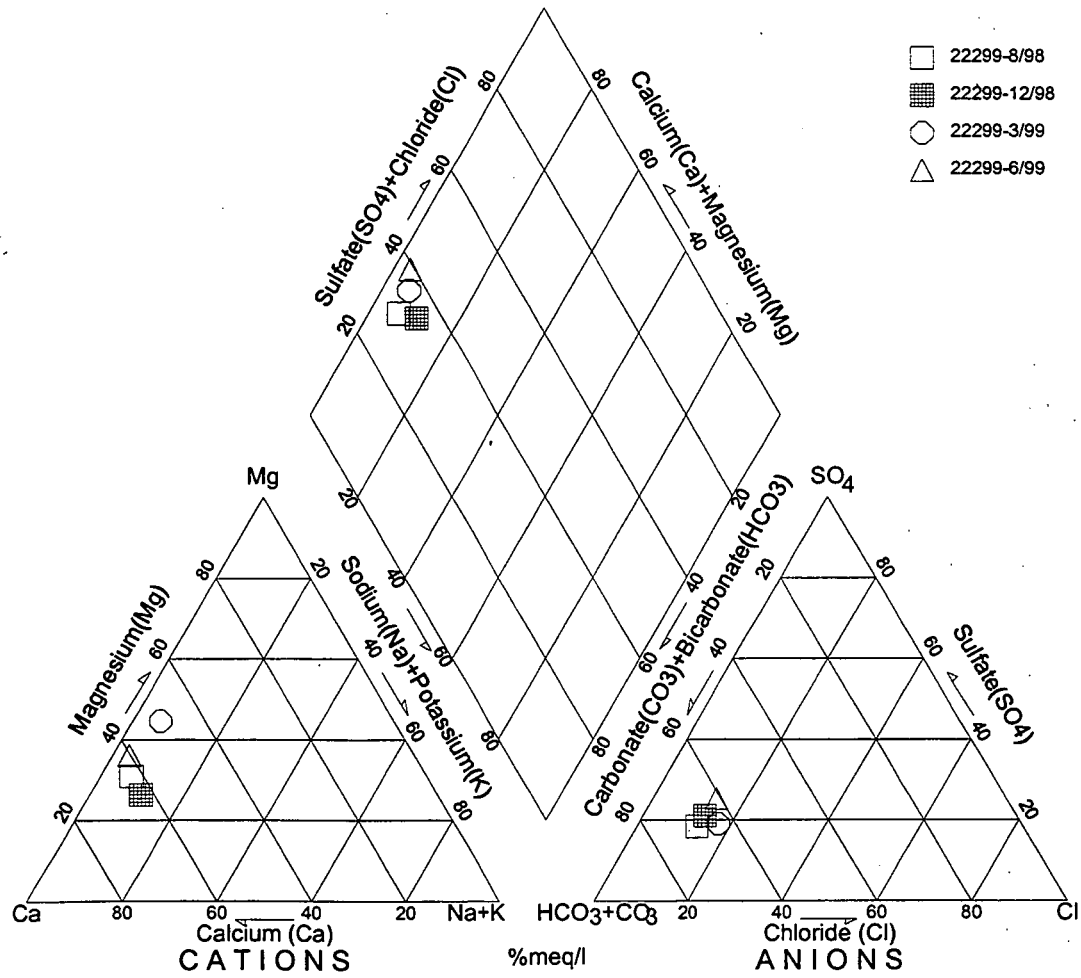


Figure G-10, Piper Diagram

Monitoring Well 22300

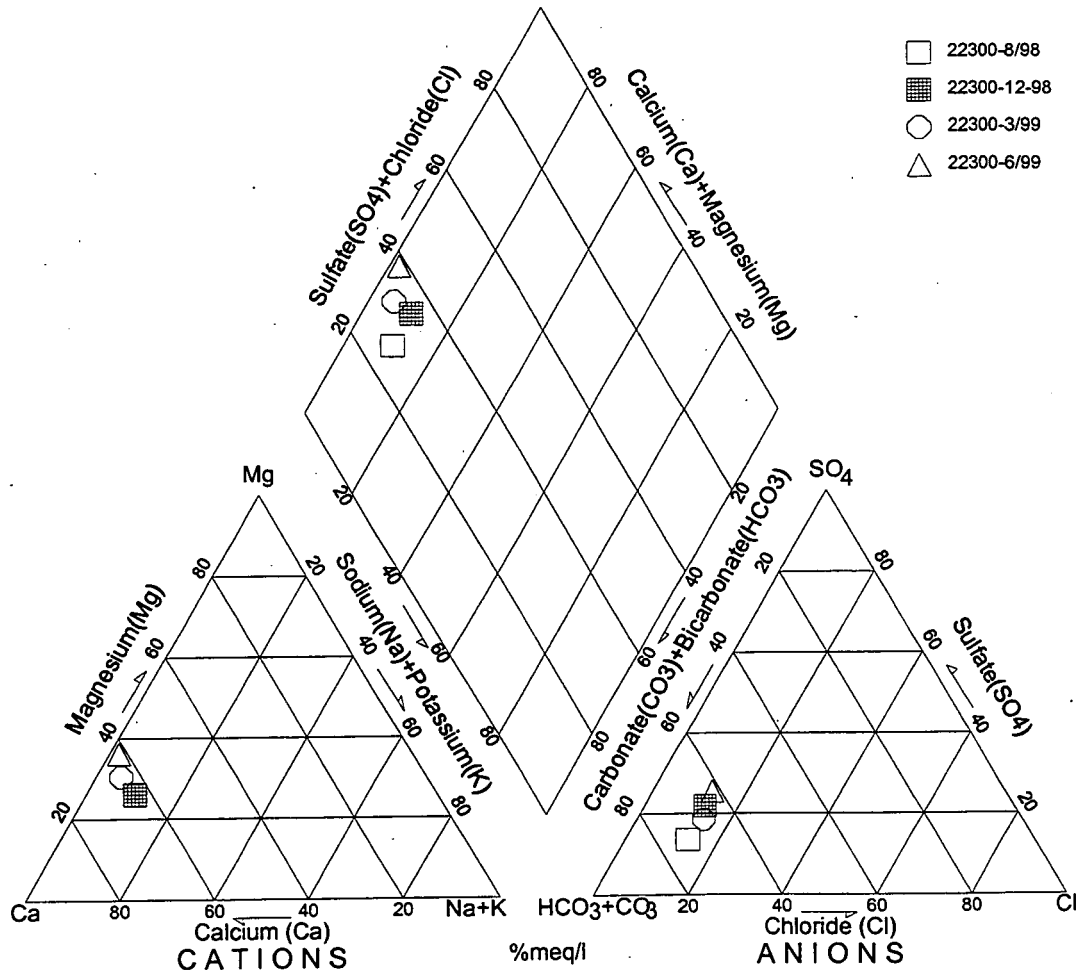


Figure G-11, Piper Diagram

Monitoring Well 22301

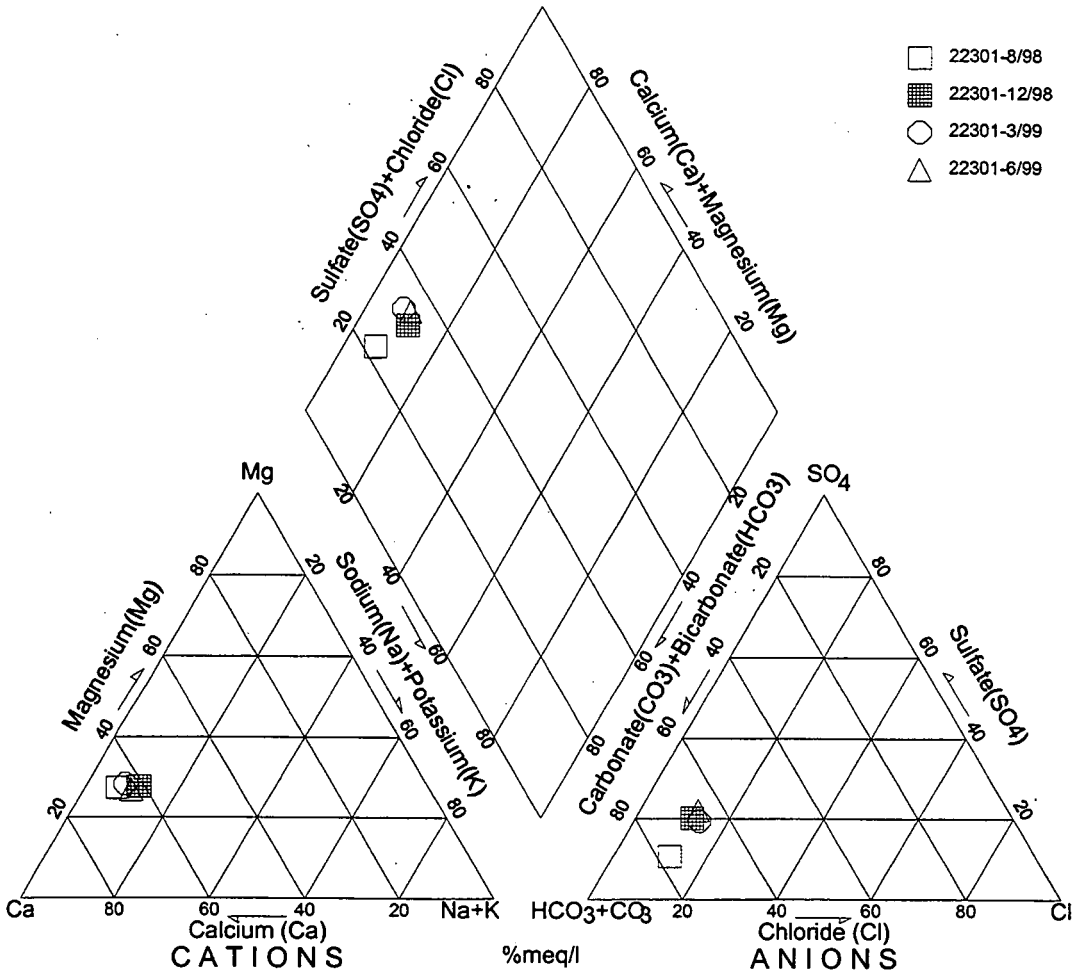


Figure G-12, Piper Diagram

Monitoring Well 22302

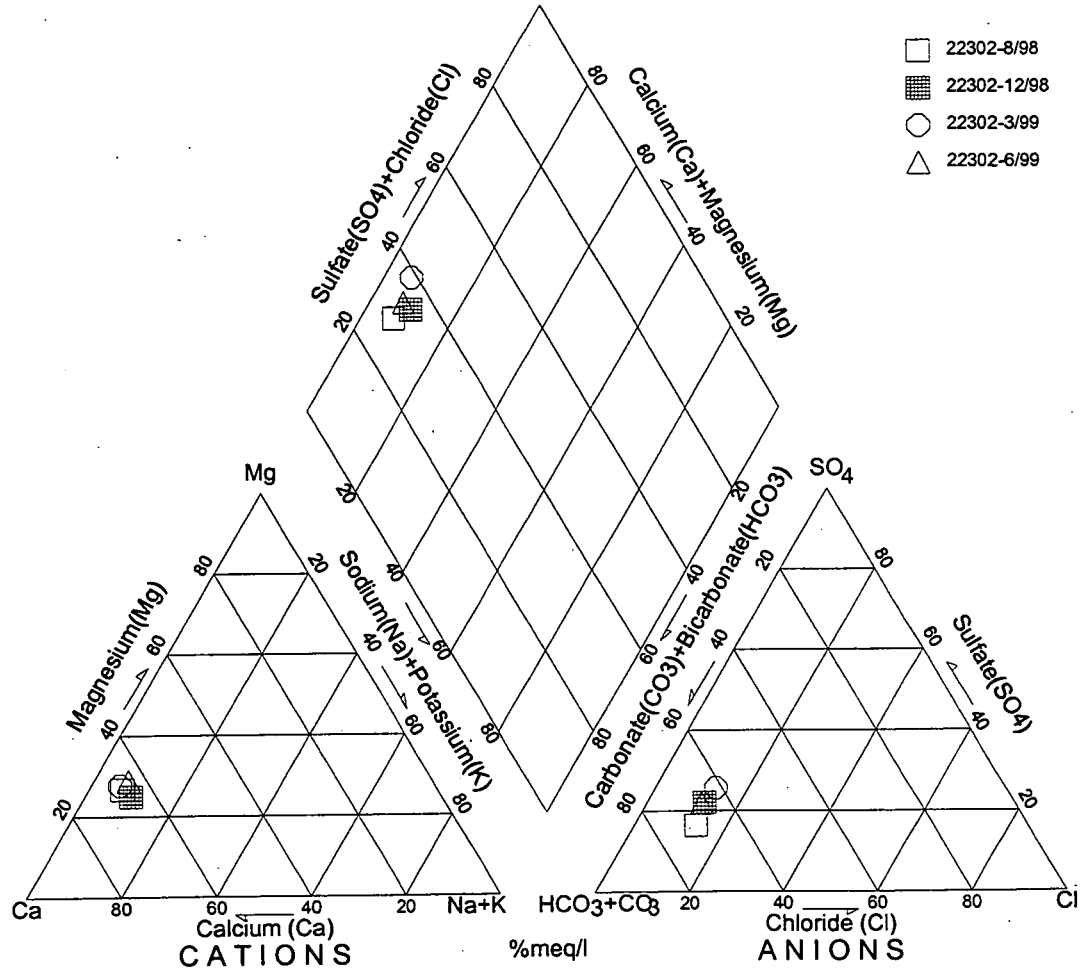


Figure G-13, Piper Diagram

Monitoring Well 22303

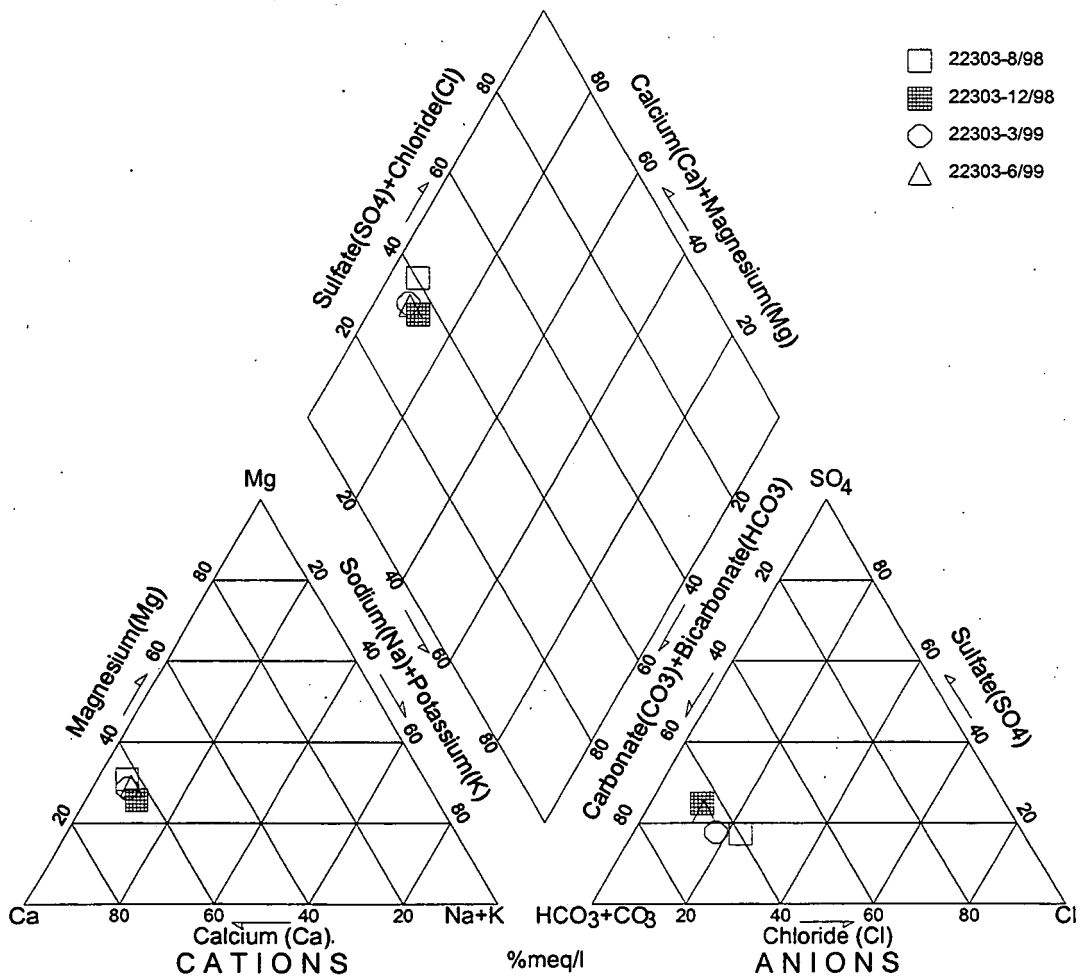


Figure G-14, Piper Diagram

Monitoring Well 3015

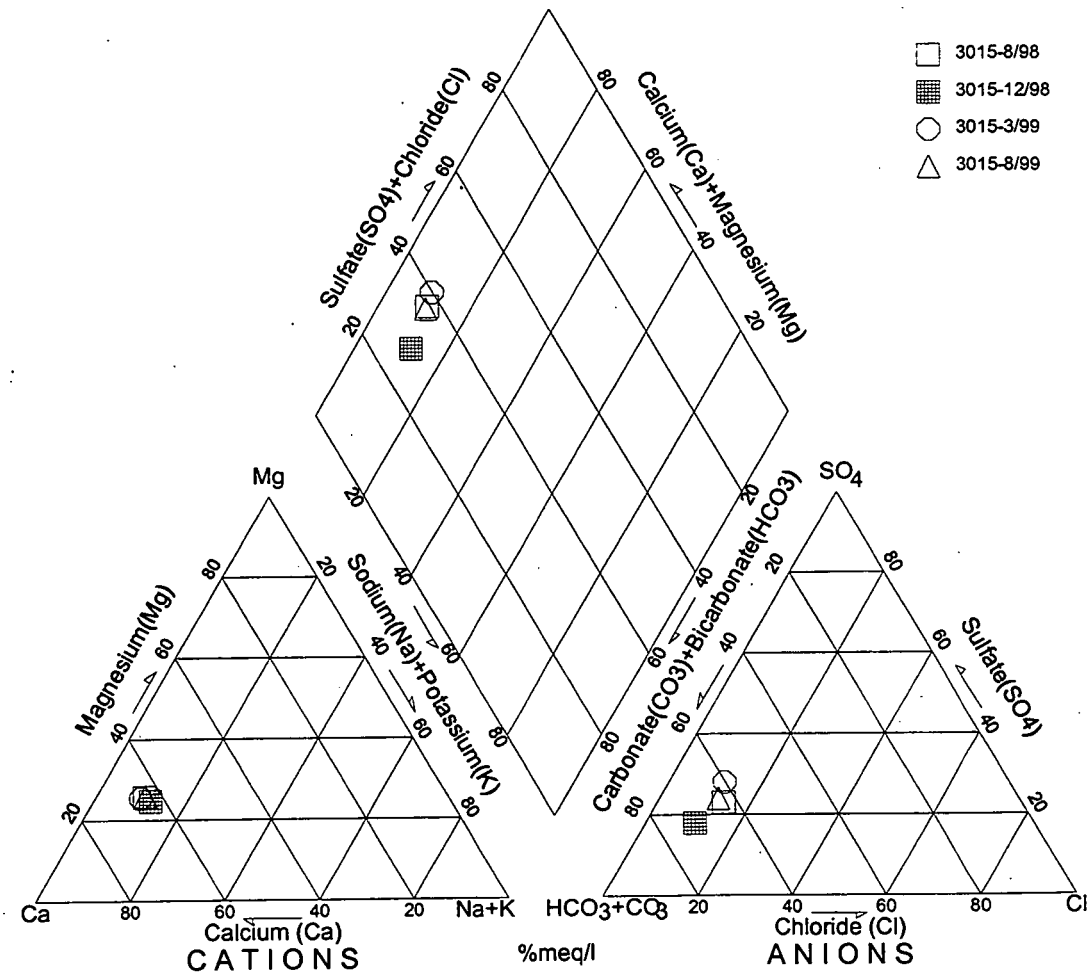


Figure G-15, Piper Diagram

Monitoring Well 3069

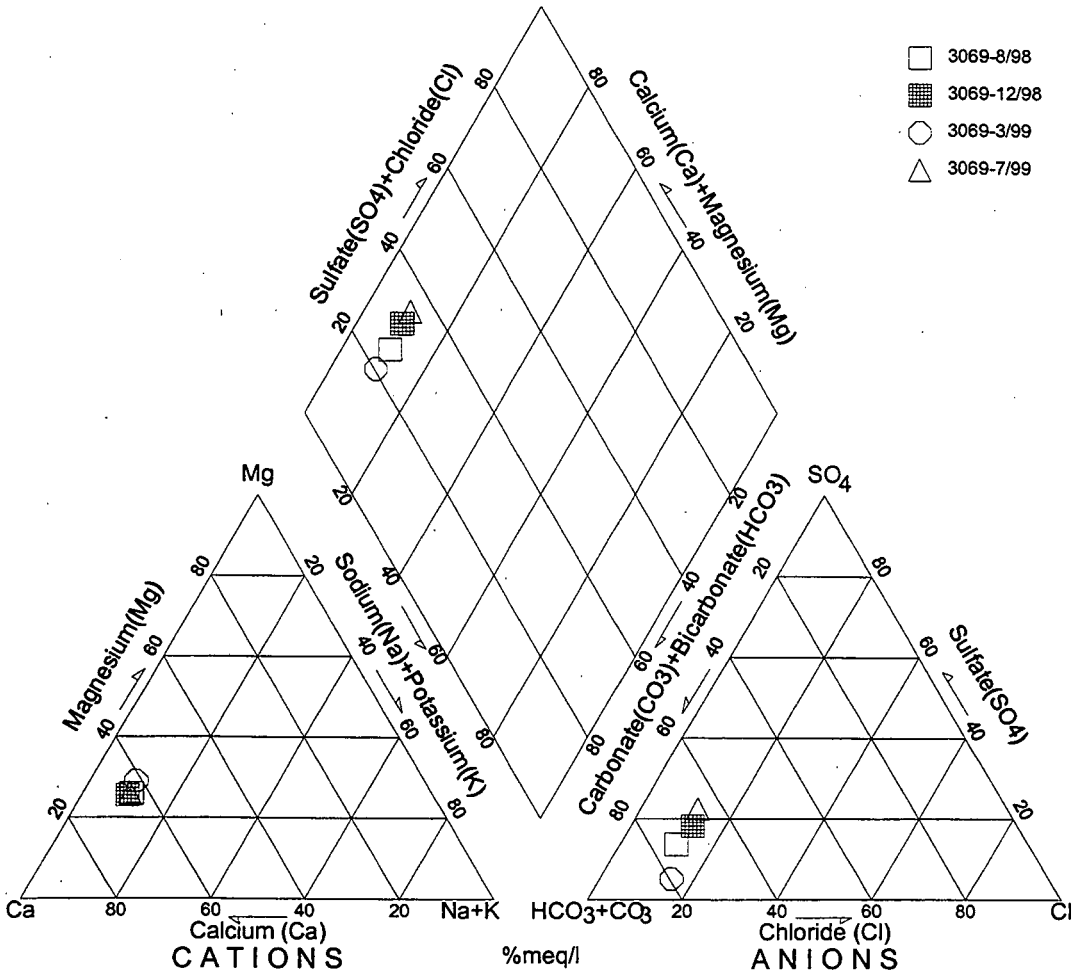


Figure G-16, Piper Diagram

Monitoring Well 3070

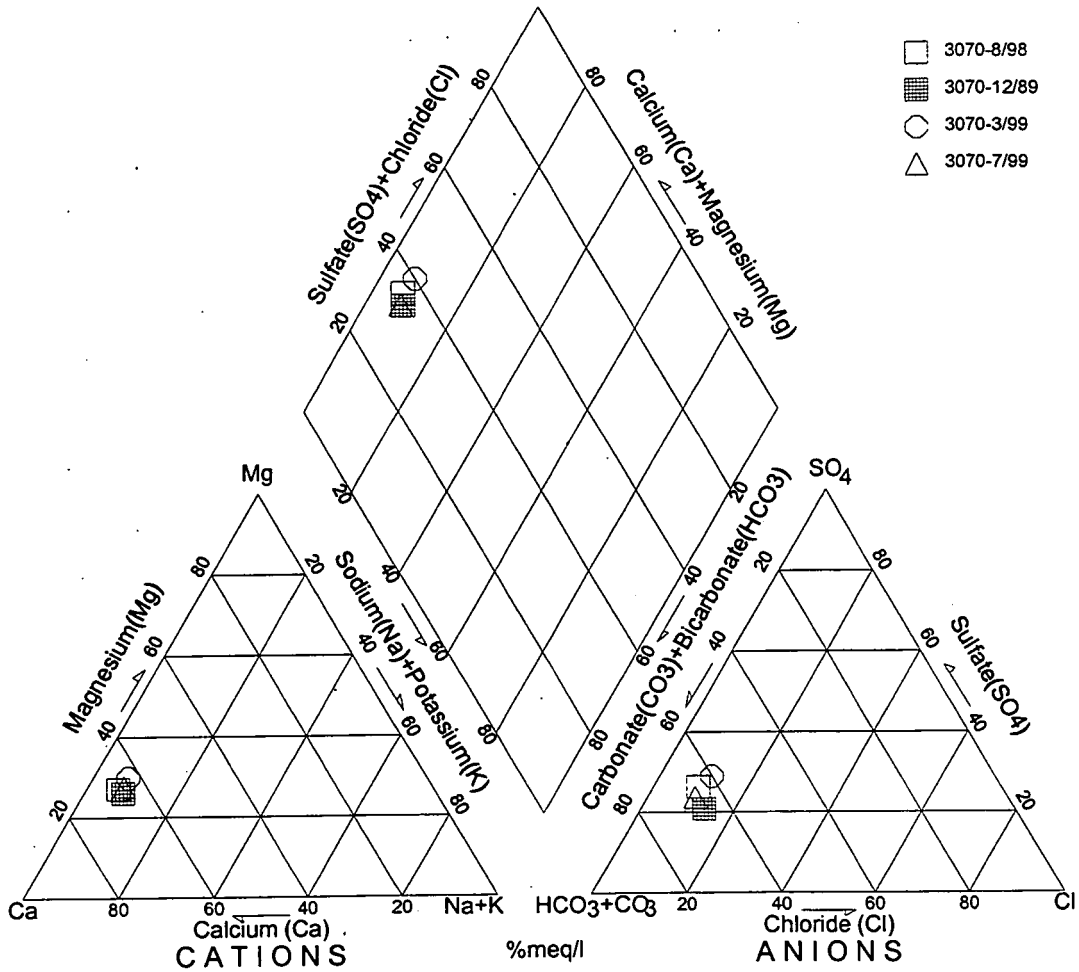


Figure G-17, Piper Diagram

Monitoring Well 3106

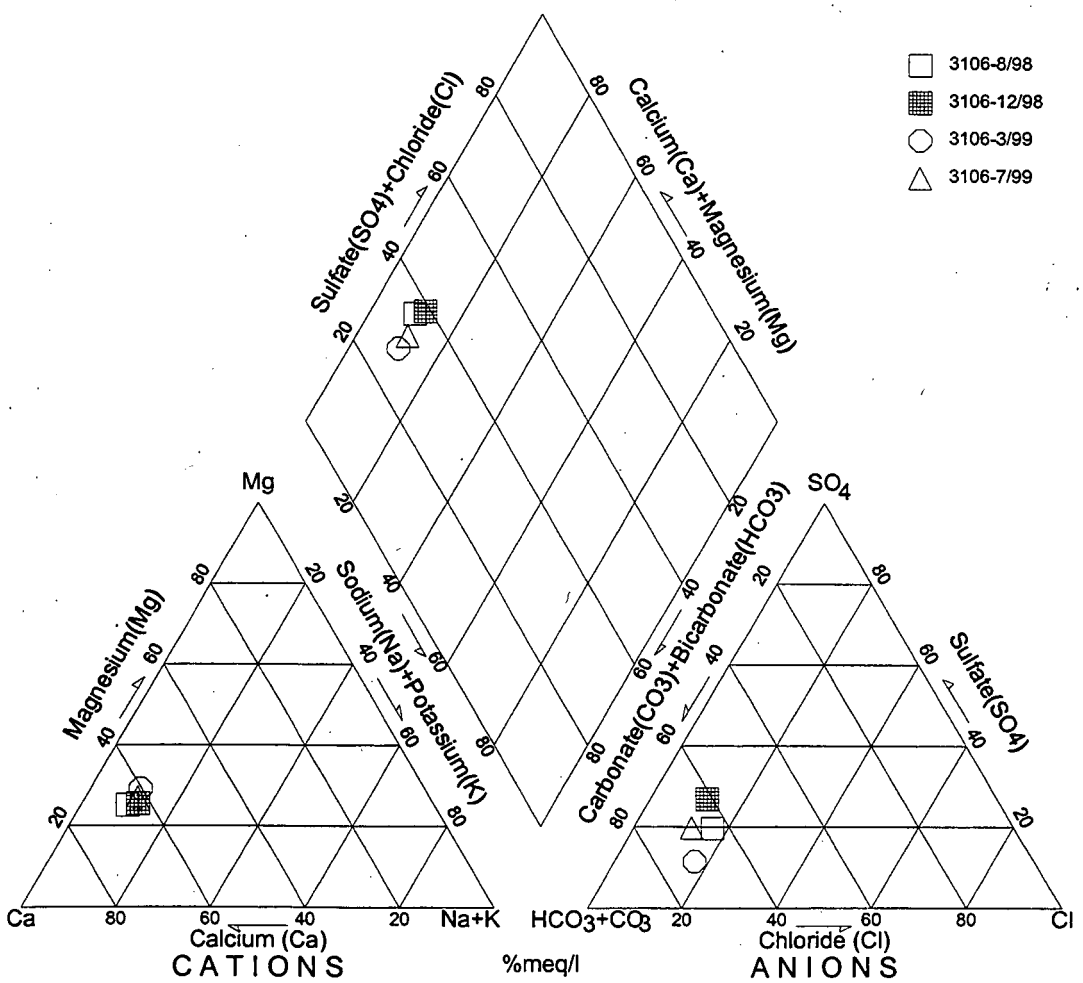


Figure G-18, Piper Diagram

Monitoring Well 3398

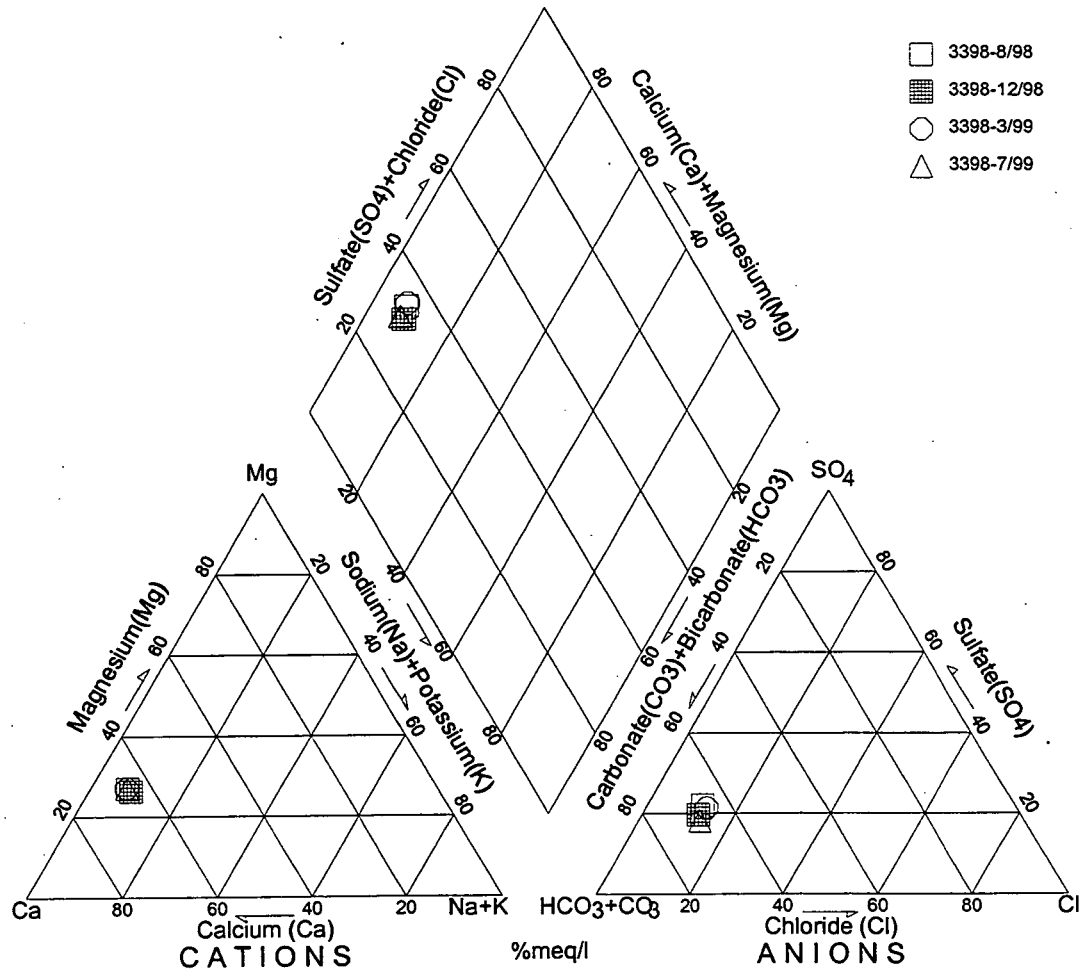


Figure G-19, Piper Diagram

Monitoring Well 32304

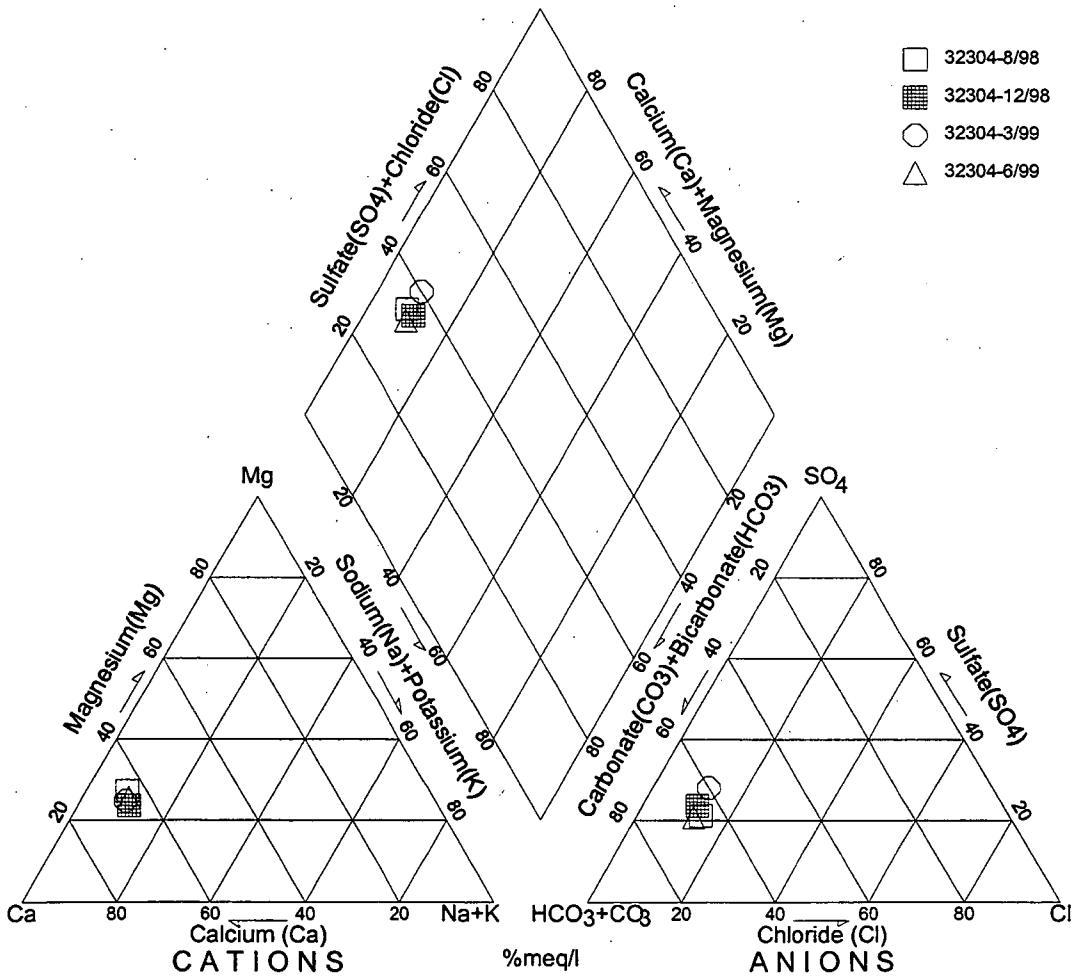


Figure G-20, Piper Diagram

Monitoring Well 32305

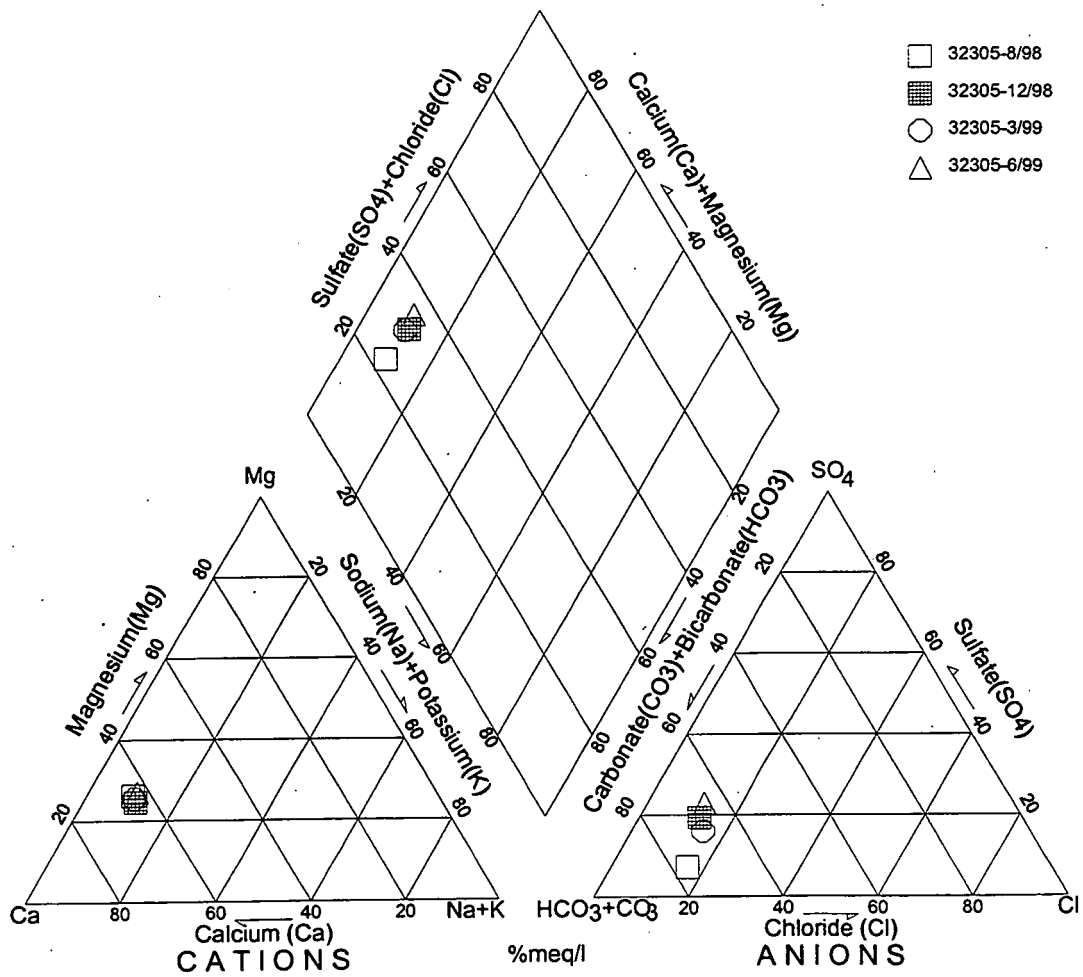


Figure G-21, Piper Diagram

Monitoring Well 32306

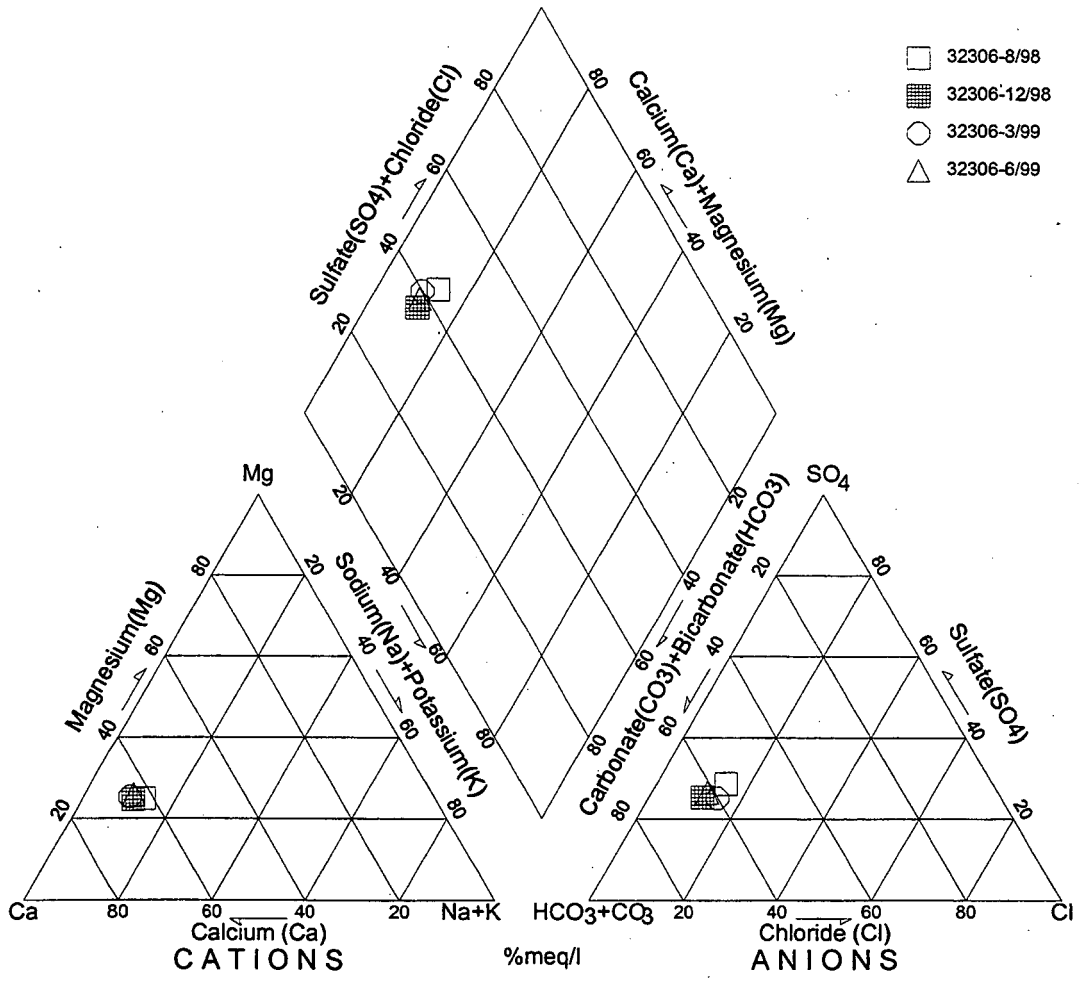


Figure G-22, Piper Diagram

Monitoring Well 32307

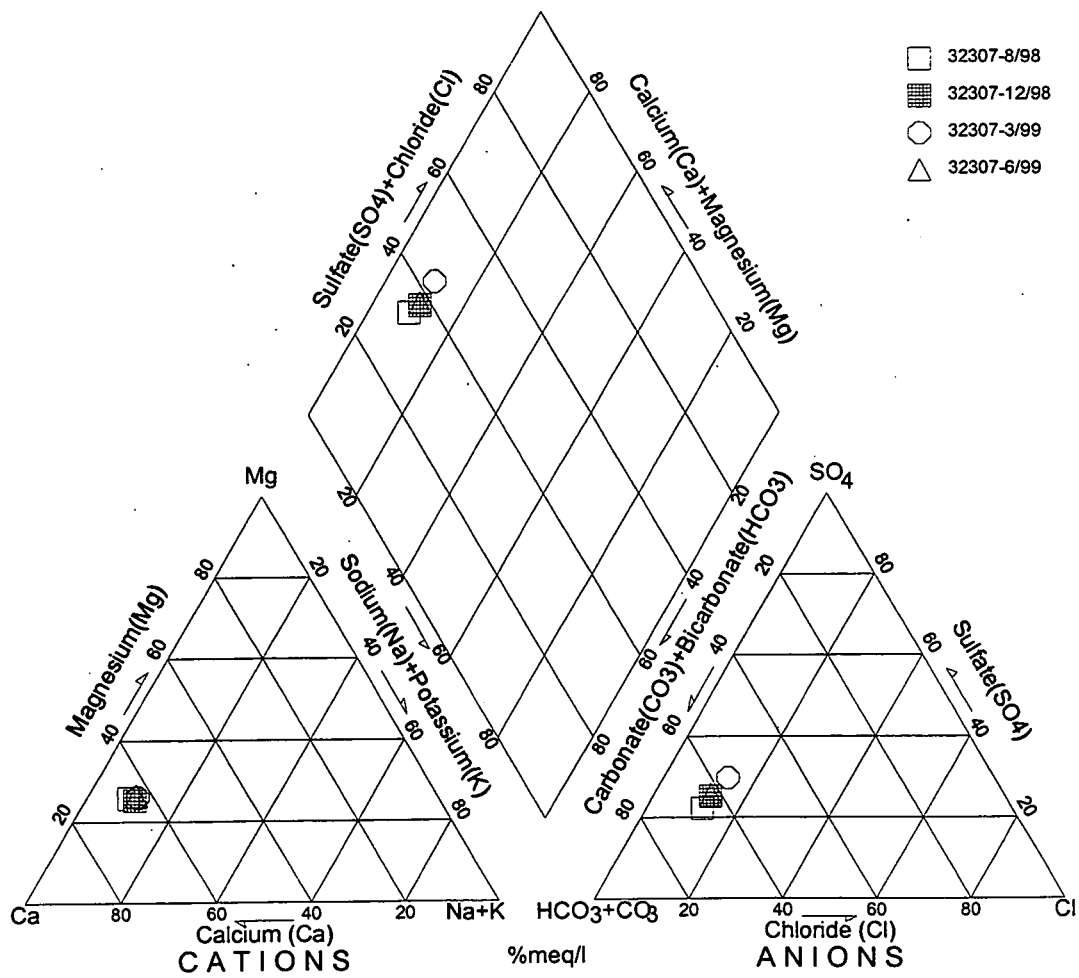
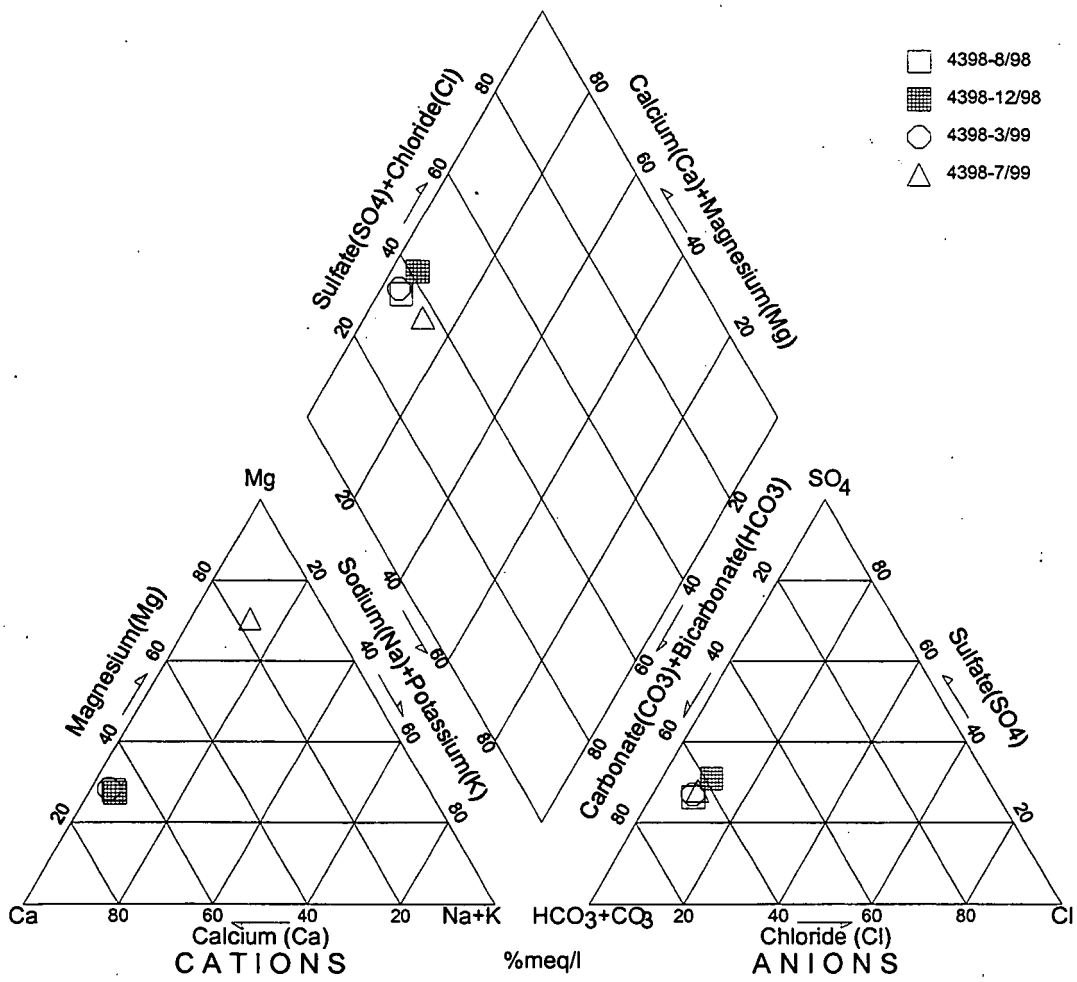


Figure G-23, Piper Diagram

Monitoring Well 4398



SECTION G-2

DIRECT PUSH SAMPLING LOCATION DATA

TABLE G-5

DATA FROM GEOPROBE LOCATION 12367

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
alkalinity	1	324		248		286
alkalinity	10	208		242		225
alkalinity	20	204		232		218
alkalinity	20-D	200		232		216
alkalinity	30	208		236		222
alkalinity	40	276		224		250
alkalinity	50	256		233		245
alkalinity	60	276		234		255
alkalinity	70	244		259		252
Minimum		200		224		
Maximum		324		259		
Average		244		238		
aluminum	1	0.133		0.0208	U	0.0717
aluminum	10	0.136		0.0208	U	0.0732
aluminum	20	5.152		0.0291		2.5906
aluminum	20-D	1.437		0.0208	U	0.7237
aluminum	30	0.34		0.0263		0.1832
aluminum	40	0.0388		0.0223		0.0306
aluminum	50	0.123		0.0208	U	0.0667
aluminum	60	0.147		0.0268		0.0869
aluminum	70	0.326		0.0208	U	0.1682
Minimum		0.0388		0.0104		
Maximum		5.15		0.0291		
Average		0.870		0.0174		
ammonia	1	0.1	U	0.1	U	0.05
ammonia	10	0.1	U	0.1	U	0.05
ammonia	20	0.1	U	0.1	U	0.05
ammonia	20-D	0.1	U	0.1	U	0.05
ammonia	30	0.1	U	0.1	U	0.05
ammonia	40	0.1	U	0.1	U	0.05
ammonia	50	0.1	U	0.1	U	0.05
ammonia	60	0.1	U	0.1	U	0.05
ammonia	70	0.1	U	0.1	U	0.05
Minimum		0.05		0.05		
Maximum		1.4		0.05		
Average		0.2		0.05		
bicarbonate	1	395		303		349
bicarbonate	10	254		295		275
bicarbonate	20	249		283		266
bicarbonate	20-D	244		283		264
bicarbonate	30	254		288		271
bicarbonate	40	337		273		305
bicarbonate	50	312		284		298
bicarbonate	60	337		285		311
bicarbonate	70	298		316		307
Minimum		244		273		
Maximum		395		316		
Average		298		290		

TABLE G-5

DATA FROM GEOPROBE LOCATION 12367
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
calcium	1	80.3		95		88
calcium	10	83.6		89.6		87
calcium	20	78.2		87.2		83
calcium	20-D	78.7		91.3		85
calcium	30	71		94.8		83
calcium	40	102.1		91.9		97
calcium	50	97.2		93.3		95
calcium	60	93.7		98.3		96
calcium	70	92.7		104		98
Minimum		71		87		
Maximum		102.1		104		
Average		86.4		94		
carbonate	1	1	U	1	U	0.5
carbonate	10	1	U	1	U	0.5
carbonate	20	1	U	1	U	0.5
carbonate	20-D	1	U	1	U	0.5
carbonate	30	1	U	1	U	0.5
carbonate	40	1	U	1	U	0.5
carbonate	50	1	U	1	U	0.5
carbonate	60	1	U	1	U	0.5
carbonate	70	1	U	1	U	0.5
Minimum		0.5		0.5		
Maximum		0.5		0.5		
Average		0.5		0.5		
chloride	1	23		29.4		26
chloride	10	44.8		31		38
chloride	20	37.6		31.2		34.4
chloride	20-D	37.6		31.2		34.4
chloride	30	41.6		30.4		36.0
chloride	40	56.8		31.6		44.2
chloride	50	43.4		33.2		38.3
chloride	60	44.4		28.6		36.5
chloride	70	37.6		29.8		33.7
Minimum		23		28.6		
Maximum		56.8		33.2		
Average		41		31		
fluoride	1	0.29		0.2		0.2
fluoride	10	0.29		0.3		0.3
fluoride	20	0.28		0.3		0.3
fluoride	20-D	0.27		0.3		0.3
fluoride	30	0.3		0.3		0.3
fluoride	40	0.26		0.3		0.3
fluoride	50	0.21		0.3		0.3
fluoride	60	0.142		0.3		0.2
fluoride	70	0.13		0.2		0.2
Minimum		0.13		0.2		
Maximum		0.3		0.3		
Average		0.2		0.3		

TABLE G-5

DATA FROM GEOPROBE LOCATION 12367
(Continued)

2999

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
iron	1	1.011		0.0213		0.516
iron	10	0.205		0.0152		0.11
iron	20	10.842		0.0713		5.457
iron	20-D	3.256		0.0337		1.645
iron	30	3.598		0.446		2.022
iron	40	0.167		0.189		0.178
iron	50	0.488		0.215		0.352
iron	60	1.608		1.23		1.419
iron	70	3.112		2.14		2.626
Minimum		0.167		0.015		
Maximum		10.842		2.140		
Average		2.699		0.485		
magnesium	1	17.5		23.8		21
magnesium	10	20.8		26.2		24
magnesium	20	21.6		24.6		23
magnesium	20-D	21.0		24.2		23
magnesium	30	18.4		25.3		22
magnesium	40	26.4		23.8		25
magnesium	50	24.0		23.6		24
magnesium	60	22.1		26.7		24
magnesium	70	21.9		27.5		25
Minimum		17.5		23.6		
Maximum		26.4		27.5		
Average		21.6		25.1		
manganese	1	0.44		0.284		0.362
manganese	10	0.294		0.378		0.336
manganese	20	0.264		0.287		0.276
manganese	20-D	0.217		0.19		0.204
manganese	30	0.192		0.0896		0.141
manganese	40	0.491		0.132		0.312
manganese	50	0.383		0.146		0.265
manganese	60	0.366		0.519		0.443
manganese	70	0.321		0.481		0.401
Minimum		0.192		0.090		
Maximum		0.491		0.519		
Average		0.330		0.279		
nitrate-nitrogen	1	4.6		0.4		2.5
nitrate-nitrogen	10	7.5		0.4		4.0
nitrate-nitrogen	20	8.2		0.4		4.3
nitrate-nitrogen	20-D	8.2		0.4		4.3
nitrate-nitrogen	30	8		0.4		4
nitrate-nitrogen	40	7.5		0.4		4
nitrate-nitrogen	50	1		0.5		0.8
nitrate-nitrogen	60	0.4	U	0.1	U	0.1
nitrate-nitrogen	70	0.4	U	0.1	U	0.1
Minimum		0.2		0.05		
Maximum		8.2		0.5		
Average		5.0		0.3		

TABLE G-5

DATA FROM GEOPROBE LOCATION 12367
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
phosphate(total)	1	0.1	U	0.1	U	0.05
phosphate(total)	10	0.1	U	0.1	U	0.05
phosphate(total)	20	0.1	U	0.1		0.08
phosphate(total)	20-D	0.1	U	0.1	U	0.05
phosphate(total)	30	0.1	U	0.1	U	0.05
phosphate(total)	40	0.1	U	0.1	U	0.05
phosphate(total)	50	0.1	U	0.1	U	0.05
phosphate(total)	60	0.1	U	0.1	U	0.05
phosphate(total)	70	0.1	U	0.1	U	0.05
Minimum		0.05		0.05		
Maximum		0.05		0.1		
Average		0.05		0.06		
potassium	1	1.52		3.61		2.57
potassium	10	3.40		4.26		3.83
potassium	20	4.08		3.46		3.77
potassium	20-D	3.26		3.53		3.4
potassium	30	2.25		3.46		2.86
potassium	40	2.16		3.27		2.72
potassium	50	2.56		3.2		2.88
potassium	60	2.37		0.35		1.36
potassium	70	2.74		3.75		3.25
Minimum		1.52		0.351		
Maximum		4.08		4.26		
Average		2.70		3.21		
silicon	1	2.24		4.28		3.26
silicon	10	2.85		4.17		3.51
silicon	20	13.60		4.01		8.81
silicon	20-D	4.90		4.27		4.59
silicon	30	2.93		3.74		3.34
silicon	40	3.32		4.37		3.85
silicon	50	4.53		4.68		4.61
silicon	60	4.04		3.63		3.84
silicon	70	4.77		4.33		4.55
Minimum		2.24		3.63		
Maximum		13.6		4.68		
Average		4.80		4.16		
sodium	1	7.6		15.6		11.61
sodium	10	14.8		15.8		15.34
sodium	20	23.0		15.6		19.30
sodium	20-D	25.0		15.9		20.49
sodium	30	21.5		16.4		18.97
sodium	40	13.9		15.5		14.30
sodium	50	15.6		14.9		15.28
sodium	60	13.4		16.5		14.98
sodium	70	11.6		16.3		13.96
Minimum		7.6		14.9		
Maximum		25		16.5		
Average		16.0		15.8		

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TABLE G-5

DATA FROM GEOPROBE LOCATION 12367
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
sulfate	1	38.9		80		59
sulfate	10	58.1		81.5		69.8
sulfate	20	55.8		80		68
sulfate	20-D	54.1		84.5		69.3
sulfate	30	56		81		69
sulfate	40	61.2		84		73
sulfate	50	72.9		81.5		77.2
sulfate	60	69.7		93.5		81.6
sulfate	70	77.5		94.5		86.0
Minimum		38.9		80.0		
Maximum		77.5		94.5		
Average		60.5		84.5		
TDS	1	429		350		390
TDS	10	349		358		354
TDS	20	298		380		339
TDS	20-D	330		410		370
TDS	30	379		395		387
TDS	40	479		402		441
TDS	50	507		431		469
TDS	60	470		432		451
TDS	70	478		452		465
Minimum		298		350		
Maximum		507		452		
Average		413		401		
TSS	1	20.4		2	U	11
TSS	10	86		2		44
TSS	20	1	U	2	U	0.8
TSS	20-D	1	U	2		1
TSS	30	7.2		2	U	4
TSS	40	4.4		2	U	3
TSS	50	2	U	2	U	1
TSS	60	2	U	8		5
TSS	70	8		3.6		6
Minimum		0.5		1		
Maximum		86		8		
Average		14		2		

TABLE G-6

DATA FROM GEOPROBE LOCATION 12368

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
alkalinity	1	272		248		260
alkalinity	10	248		248		248
alkalinity	20	276		234		255
alkalinity	20-D	275		234		255
alkalinity	30	276		260		268
alkalinity	40	258		240		249
alkalinity	50	234		240		237
alkalinity	60	238		248		243.4
alkalinity	70	234		250		242.2
Minimum		234		234		
Maximum		276		260		
Average		257		245		
aluminum	1	0.873		0.0248		0.4489
aluminum	10	0.801		0.0208	U	0.4057
aluminum	20	0.085		0.0208	U	0.0477
aluminum	20-D	0.085		0.0208	U	0.0477
aluminum	30	0.318		0.0208	U	0.1642
aluminum	40	0.0576		0.0307		0.0442
aluminum	50	0.0738		0.0208	U	0.0421
aluminum	60	0.0892		0.0208	U	0.0498
aluminum	70	0.101		0.0208	U	0.0557
Minimum		0.0576		0.0104		
Maximum		0.8730		0.0307		
Average		0.2760		0.0143		
ammonia	1	0.1	U	0.1	U	0.05
ammonia	10	0.1	U	0.1	U	0.05
ammonia	20	0.1	U	0.1	U	0.05
ammonia	20-D	0.1	U	0.1	U	0.05
ammonia	30	0.1	U	0.1	U	0.05
ammonia	40	0.1	U	0.1	U	0.05
ammonia	50	0.1	U	0.1	U	0.05
ammonia	60	0.1	U	0.1	U	0.05
ammonia	70	0.1	U	0.1	U	0.05
Minimum		0.05		0.05		
Maximum		0.05		0.05		
Average		0.05		0.05		

TABLE G-6

DATA FROM GEOPROBE LOCATION 12368
(Continued)

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Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
bicarbonate	1	332		303		318
bicarbonate	10	303		303		303
bicarbonate	20	337		285		311
bicarbonate	20-D	336		285		311
bicarbonate	30	338		317		328
bicarbonate	40	315		293		304
bicarbonate	50	286		293		290
bicarbonate	60	291		303		297.0
bicarbonate	70	286		305		296.0
Minimum		286.0		285		
Maximum		338.0		317		
Average		314		299		
calcium	1	93.8		98.1		96.0
calcium	10	80.6		95.4		88.0
calcium	20	93.1		93.9		93.5
calcium	20-D	96.8		93.3		95.1
calcium	30	103		92.9		98.0
calcium	40	92.4		94.1		93.3
calcium	50	83.6		90.6		87.1
calcium	60	84		98.8		91.4
calcium	70	88.1		99.6		93.9
Minimum		80.6		90.6		
Maximum		103.0		99.6		
Average		90.6		95.2		
carbonate	1	1	U	1	U	0.5
carbonate	10	1	U	1	U	0.5
carbonate	20	1	U	1	U	0.5
carbonate	20-D	1	U	1	U	0.5
carbonate	30	1	U	1	U	0.5
carbonate	40	1	U	1	U	0.5
carbonate	50	1	U	1	U	0.5
carbonate	60	1	U	1	U	0.5
carbonate	70	1	U	1	U	0.5
Minimum		0.5		0.5		
Maximum		0.5		0.5		
Average		0.5		0.5		

TABLE G-6

DATA FROM GEOPROBE LOCATION 12368
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
chloride	1	22		29.2		26
chloride	10	16		29		23
chloride	20	22		29.2		26
chloride	20-D	22		32		27
chloride	30	26		31		29
chloride	40	30		28.2		29
chloride	50	28		29.2		29
chloride	60	22		29.6		26
chloride	70	30		31		31
Minimum		16		28.2		
Maximum		30		32		
Average		24		30		
fluoride	1	0.3		0.4		0.4
fluoride	10	0.32		0.3		0.3
fluoride	20	0.23		0.3		0.3
fluoride	20-D	0.22		0.3		0.3
fluoride	30	0.24		0.3		0.3
fluoride	40	0.21		0.3		0.3
fluoride	50	0.22		0.3		0.3
fluoride	60	0.16		0.3		0.23
fluoride	70	0.13		0.2		0.17
Minimum		0.13		0.2		
Maximum		0.32		0.4		
Average		0.23		0.3		
iron	1	3.62		0.093		1.857
iron	10	2.87		0.114		1.492
iron	20	0.326		0.0274		0.177
iron	20-D	0.191		0.0191		0.105
iron	30	0.929		0.0051		0.467
iron	40	0.558		0.0061		0.282
iron	50	1.422		0.0398		0.731
iron	60	0.199		1.04		0.620
iron	70	1.3		0.6		0.950
Minimum		0.191		0.005		
Maximum		3.620		1.040		
Average		1.268		0.216		

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TABLE G-6

DATA FROM GEOPROBE LOCATION 12368
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
magnesium	1	26.8		26		26.4
magnesium	10	20.7		24.2		22.5
magnesium	20	25.6		24.4		25.0
magnesium	20-D	26.9		24.4		25.7
magnesium	30	24.1		25.1		24.6
magnesium	40	21.2		25		23.1
magnesium	50	20.8		25.9		23.4
magnesium	60	21		26.4		23.7
magnesium	70	22		25.1		23.6
Minimum		20.7		24.2		
Maximum		26.9		26.4		
Average		23.2		25.2		
manganese	1	0.845		0.216		0.531
manganese	10	0.4		0.115		0.258
manganese	20	0.625		0.144		0.385
manganese	20-D	0.658		0.149		0.404
manganese	30	0.484		0.305		0.395
manganese	40	0.578		0.395		0.487
manganese	50	0.9		0.355		0.628
manganese	60	0.338		0.313		0.326
manganese	70	0.121		0.393		0.257
Minimum		0.121		0.115		
Maximum		0.900		0.395		
Average		0.550		0.265		
nitrate-nitrogen	1	7.1		0.5		4
nitrate-nitrogen	10	9		0.5		5
nitrate-nitrogen	20	11.4		0.5		6
nitrate-nitrogen	20-D			0.5		0.5
nitrate-nitrogen	30	13.6		0.5		7
nitrate-nitrogen	40	10.1		0.6		5
nitrate-nitrogen	50	11.3		0.6		6
nitrate-nitrogen	60	9.9		0.2		5
nitrate-nitrogen	70	10.8		0.4		6
Minimum		7.1		0.2		
Maximum		13.6		0.6		
Average		10.4		0.5		

TABLE G-6

DATA FROM GEOPROBE LOCATION 12368
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
phosphate(total)	1	0.1	U	0.1	U	0.05
phosphate(total)	10	0.2		0.1	U	0.125
phosphate(total)	20	0.1	U	0.1	U	0.05
phosphate(total)	20-D	0.1	U	0.1	U	0.05
phosphate(total)	30	0.16		0.1	U	0.105
phosphate(total)	40	0.1	U	0.1	U	0.05
phosphate(total)	50	0.1	U	0.1	U	0.05
phosphate(total)	60	0.1	U	0.1	U	0.05
phosphate(total)	70	0.1	U	0.1	U	0.05
Minimum		0.05		0.05		
Maximum		0.2		0.05		
Average		0.08		0.05		
potassium	1	3.32		3.34		3.33
potassium	10	3.11		2.73		2.92
potassium	20	2.93		3.14		3.04
potassium	20-D	3.01		2.86		2.94
potassium	30	2.24		3.58		2.91
potassium	40	2.46		3.45		2.96
potassium	50	3.52		4.44		3.98
potassium	60	2.26		3.61		2.94
potassium	70	2.58		0.342		1.46
Minimum		2.24		0.342		
Maximum		3.52		4.44		
Average		2.83		3.05		
silicon	1	4.01		4.13		4.07
silicon	10	4.7		4.58		4.64
silicon	20	2.74		4.15		3.45
silicon	20-D	2.79		4.24		3.52
silicon	30	3.9		4.29		4.10
silicon	40	3.07		4.16		3.62
silicon	50	3.01		3.9		3.46
silicon	60	3.38		3.73		3.56
silicon	70	3.65		4.29		3.97
Minimum		2.74		3.73		
Maximum		4.70		4.58		
Average		3.47		4.16		

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TABLE G-6

DATA FROM GEOPROBE LOCATION 12368
(Continued)

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Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
sodium	1	13.2		15.2		14.2
sodium	10	12.8		15.43		14.1
sodium	20	9.79		15.3		12.5
sodium	20-D	10.4		15.6		13.0
sodium	30	10.6		16.1		13.4
sodium	40	14.89		15.8		15.3
sodium	50	14		15.7		14.9
sodium	60	11.8		15.6		13.7
sodium	70	13.6		15.3		14.5
Minimum		9.8		15.2		
Maximum		14.9		16.1		
Average		12.3		15.6		
sulfate	1	125.2		78.8		102
sulfate	10	76.7		80.8		78.8
sulfate	20	103		76.4		89.7
sulfate	20-D	96.6		76.6		86.6
sulfate	30	50.1		78.6		64.4
sulfate	40	54.4		92.4		73.4
sulfate	50	48.2		80.8		64.5
sulfate	60	46.8		90.8		68.8
sulfate	70	56.5		80.9		68.7
Minimum		46.8		76.4		
Maximum		125.2		92.4		
Average		73.1		81.8		
TDS	1	454		497		476
TDS	10	389		477		433
TDS	20	515		481		498
TDS	20-D	504		483		494
TDS	30	419		496		458
TDS	40	397		469		433
TDS	50	376		502		439
TDS	60	250		503		377
TDS	70	478		475		477
Minimum		250		469		
Maximum		515		503		
Average		420		487		

TABLE G-6

DATA FROM GEOPROBE LOCATION 12368
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
TSS	1	8.8		2	U	5
TSS	10	76		2	U	39
TSS	20	2	U	2	U	1
TSS	20-D	2	U	2	U	1
TSS	30	42.8		2	U	22
TSS	40	2	U	2	U	1
TSS	50	2	U	2	U	1
TSS	60	2	U	2	U	1
TSS	70	1.2		2	U	1
Minimum		1		1		
Maximum		76		1		
Average		15		1		

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TABLE G-7

DATA FROM GEOPROBE LOCATION 12369
(Concentrations Reported in mg/L)

2999

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
alkalinity	1	290		290		250		260		260		240		240	290	265
alkalinity	10	280		248		250		240		255		239		239	280	252
alkalinity	20	235		244		260		230		259		242		230	260	245
alkalinity	20-D	235		236		230		225		260		242		225	260	238
alkalinity	30	220		236		260		230		263		242		220	263	242
alkalinity	40	215		226		330		230		259		238		215	330	250
alkalinity	50	220		220		230		220		254		249		220	254	232
alkalinity	60	215		215				225		254		238		215	254	229
alkalinity	70	215		205				215		234		243		205	243	222
Minimum		215		205		230		215		234		238				
Maximum		290		290		330		260		263		249				
Average		236		236		259		231		255		241				
aluminum	1	0.013	U	0.0098	U	0.0264	U	0.0266		0.0248	U	0.0236	U	0.00490	0.02660	0.01257
aluminum	10	0.013	U	0.0571				0.0266	U	0.0248	U	0.0236	U	0.00000	0.05710	0.01685
aluminum	20	0.013	U	0.0515		0.0485		0.0294		0.0248	U	0.074		0.00650	0.07400	0.03705
aluminum	20-D	0.013	U	0.0539		0.0264	U	0.0266	U	0.0248	U	0.0236	U	0.00650	0.05390	0.01852
aluminum	30	0.013	U	0.0581		0.0264		0.0474		0.0248	U	0.0236	U	0.00650	0.05810	0.02710
aluminum	40	0.069		0.0539		0.0264		0.183		0.0248	U	0.0236	U	0.01180	0.18300	0.05942
aluminum	50	0.052		0.0587		0.0264	U	0.225		0.0248	U	0.0236	U	0.01180	0.22500	0.06218
aluminum	60	0.08		0.0535				0.0305		0.0511		0.0236	U	0.01180	0.08000	0.04538
aluminum	70	0.0131		0.0492				0.0302		0.0248	U	0.0276		0.01240	0.04920	0.02650
aluminum	80											0.0236	U	0.01180	0.01180	0.01180
Minimum		0.00650		0.00490		0.01320		0.01330		0.01240		0.01180				
Maximum		0.08000		0.05870		0.04850		0.22500		0.05110		0.07400				
Average		0.02740		0.04898		0.02348		0.06652		0.01670		0.01960				
ammonia	1	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	10	0.1	U	0.16				0.1	U	0.1	U	0.1	U	0.05	0.16	0.07
ammonia	20	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	20-D	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	30	0.1	U	0.1	U	0.19		0.1	U	0.1	U	0.1	U	0.05	0.19	0.07
ammonia	40	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	50	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	60	0.1	U	0.1	U			0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	70	0.1	U	0.1	U			0.15		0.1	U	0.1	U	0.05	0.15	0.07
Minimum		0.05		0.05		0.05		0.05		0.05		0.05				
Maximum		0.05		0.16		0.19		0.15		0.05		0.05				
Average		0.05		0.06		0.07		0.06		0.05		0.05				
bicarbonate	1	354		354		305		317		317		293		317	354	323
bicarbonate	10	342		303		305		293		311		292		303	342	308
bicarbonate	20	288		298		317		281		316		295		281	317	299
bicarbonate	20-D	288		288		281		275		317		295		275	317	291
bicarbonate	30	268		288		317		281		321		295		268	321	295
bicarbonate	40	262		276		403		281		316		290		262	403	305
bicarbonate	50	268		268		281		268		310		304		268	310	283
bicarbonate	60	262		262				275		310		290		262	310	280
bicarbonate	70	262		250				262		285		296		250	285	271
Minimum		262		250		281		262		285		290				
Maximum		354		354		403		317		321		304				
Average		288		288		316		282		311		294				
calcium	1	96.6		94.81		91.9		89.4		86.2		92.7		86.2	96.6	91.9
calcium	10	90.1		92.5				82.4		90.3		95.5		82.4	95.5	90.2
calcium	20	78.7		83.3		85.9		83.6		92.6		94.4		78.7	94.4	86.4
calcium	20-D	78.9		84.9		92.4		82.2		93.6		96.1		78.9	96.1	88.0
calcium	30	69.7		76.2		90.7		84.2		90.6		88.3		69.7	90.7	83.3
calcium	40	69.5		79		93		82.4		92.3		89.5		69.5	93.0	84.3
calcium	50	78.7		82.2		98.4		80.8		86		91.2		78.7	98.4	86.2
calcium	60	89		90.6				86.2		95.8		95.7		86.2	95.8	91.5
calcium	70	89		90.1				78.6		87.4		98.6		78.6	98.6	88.7
calcium	80											97.9		97.9	97.9	97.9
Minimum		69.5		76.2		85.9		78.6		86.0		88.3				
Maximum		96.6		94.8		98.4		89.4		95.8		98.6				
Average		82.2		86.0		92.1		83.3		90.5		94.0				

TABLE G-7

DATA FROM GEOPROBE LOCATION 12369
(Concentrations Reported in mg/L)
(Continued)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
carbonate	1	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	10	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	20	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	20-D	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	30	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	40	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	50	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	60	1	U	1	U			1	U	1	U	1	U	0.5	0.5	0.5
carbonate	70	1	U	1	U			1	U	1	U	1	U	0.5	0.5	0.5
Minimum		0.5		0.5		0.5		0.5		0.5		0.5				
Maximum		0.5		0.5		0.5		0.5		0.5		0.5				
Average		0.5		0.5		0.5		0.5		0.5		0.5				
chloride	1	24		32		44		48		36		30.6		24	48	36
chloride	10	28		24		30		56		34		29.6		24	56	34
chloride	20	36		24		38		44		32		31		24	44	34
chloride	20-D	40		24		34		44		34		30.4		24	44	34
chloride	30	60		24		40		40		32		32.4		24	60	38
chloride	40	44		24		36		40		34		32.4		24	44	35
chloride	50	48		32		38		40		32		33.2		32	48	37
chloride	60	40		48				44		32		32.6		32	48	39
chloride	70	44		44				40		34		36		34	44	40
Minimum		24		24		30		40		32		29.6				
Maximum		60		48		44		56		36		36				
Average		40		31		37		44		33		32				
fluoride	1	0.16		0.17		0.21		0.2		0.24		0.3		0.16	0.30	0.2
fluoride	10	0.18		0.28		0.42		0.34		0.32		0.3		0.18	0.42	0.3
fluoride	20	0.43		0.32		0.3		0.36		0.25		0.3		0.25	0.43	0.3
fluoride	20-D	0.43		0.32		0.3		0.37		0.26		0.3		0.26	0.43	0.3
fluoride	30	0.24		0.31		0.24		0.19		0.24		0.3		0.19	0.31	0.3
fluoride	40	0.2		0.21		0.22		0.19		0.24		0.3		0.19	0.3	0.2
fluoride	50	0.24		0.15		0.19		0.19		0.23		0.3		0.15	0.3	0.2
fluoride	60	0.17		0.13				0.13		0.23		0.2		0.13	0.23	0.2
fluoride	70	0.16		0.13				0.16		0.22		0.1		0.1	0.22	0.2
Minimum		0.16		0.13		0.19		0.13		0.22		0.1				
Maximum		0.43		0.32		0.42		0.37		0.32		0.3				
Average		0.2		0.22		0.3		0.2		0.25		0.3				
iron	1	0.002	U	0.0053	U	0.0494		0.0024	U	0.0311		0.0284		0.00100	0.04940	0.01896
iron	10	0.002	U	0.0135				0.0024	U	0.0443		0.0096		0.00000	0.04430	0.01160
iron	20	0.002	U	0.0053		0.0523		0.0024	U	0.0204		0.0224		0.00100	0.05230	0.01710
iron	20-D	0.002	U	0.0053	U	0.0295		0.0057		0.0156		0.0039		0.00100	0.02950	0.00973
iron	30	0.002	U	0.0053	U	0.008		0.0024	U	0.0074	U	0.0705		0.00100	0.07050	0.01451
iron	40	0.002	U	0.0103		0.111		0.0024	U	0.0074	U	0.0075		0.00100	0.11100	0.02245
iron	50	0.002	U	0.0367		0.188		0.0024	U	0.0757		0.0713		0.00100	0.18800	0.06232
iron	60	0.259		0.607				1.06		0.0319		0.0373		0.03190	1.06000	0.39904
iron	70	0.62		0.802				0.163		0.0733		0.871		0.07330	0.87100	0.50586
iron	80											1.82		1.82000	1.82000	1.82000
Minimum		0.00100		0.00265		0.00800		0.00120		0.00370		0.00390				
Maximum		0.62000		0.80200		0.18800		1.06000		0.07570		1.82000				
Average		0.09844		0.16475		0.07303		0.13732		0.03330		0.29419				
magnesium	1	28.7		25.19		24.4		25.4		25.7		26.4		24.4	28.7	26.0
magnesium	10	26		25.7				24.5		26.6		27		24.5	27.0	26.0
magnesium	20	20		21.2		24.7		25		24.9		28.3		20.0	28.3	24.0
magnesium	20-D	21		21.1		25.3		24.8		25.2		28.6		21.0	28.6	24.3
magnesium	30	21		21		24.4		25.1		25.3		24.3		21.0	25.3	23.5
magnesium	40	19.4		21		24.9		25.3		25.2		25.1		19.4	25.3	23.5
magnesium	50	21.9		20.5		24.3		24.9		24.3		25.9		20.5	25.9	23.6
magnesium	60	22.3		21.8				24.1		25.4		25.2		21.8	25.4	23.8
magnesium	70	22.2		22.1				24.7		25.4		25.6		22.1	25.6	24.0
magnesium	80											25.1		25.1	25.1	25.1
Minimum		19.4		20.5		24.3		24.1		24.3		24.3				
Maximum		28.7		25.7		25.3		25.4		26.6		28.6				
Average		22.5		22.2		24.7		24.9		25.3		26.2				

TABLE G-7

DATA FROM GEOPROBE LOCATION 12369
(Concentrations Reported in mg/L)
(Continued)

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Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
manganese	1	0.214		0.322		0.302		0.402		0.262		0.224		0.214	0.402	0.288
manganese	10	0.309		0.84				0.337		0.469		0.57		0.309	0.840	0.505
manganese	20	0.227		0.204		0.324		0.362		0.271		0.663		0.204	0.663	0.342
manganese	20-D	0.227		0.206		0.338		0.36		0.272		0.663		0.206	0.663	0.344
manganese	30	0.586		0.666		0.343		0.292		0.533		0.434		0.292	0.666	0.476
manganese	40	0.441		0.341		0.532		0.444		0.437		0.478		0.341	0.532	0.446
manganese	50	0.991		0.629		0.745		0.371		0.614		0.738		0.371	0.991	0.681
manganese	60	0.573		0.588				0.496		0.499		0.484		0.484	0.588	0.528
manganese	70	0.303		0.404				0.342		0.376		0.374		0.303	0.404	0.360
Minimum		0.214		0.204		0.302		0.292		0.262		0.224				
Maximum		0.991		0.840		0.745		0.496		0.614		0.738				
Average		0.430		0.467		0.431		0.378		0.415		0.514				
nitrate-nitrogen	1	5.2		1.4		0.7		0.8		0.7		0.6		0.6	5.2	1.6
nitrate-nitrogen	10	4.9		1.3				0.7		0.8		0.5		0.5	4.9	1.6
nitrate-nitrogen	20	8.3		2.3		0.8		0.7		0.7		0.5		0.5	8.3	2.2
nitrate-nitrogen	20-D	8		2.3		0.8		0.7		0.7		0.4		0.4	8.0	2.2
nitrate-nitrogen	30	6.4		1.4		0.7		0.7		0.7		0.3		0.3	6.4	1.7
nitrate-nitrogen	40	8.3		1.9		0.7		0.7		0.7		0.5		0.5	8.3	2.1
nitrate-nitrogen	50	7.8		0.5		0.1	U	0.7		0.6		0.2		0.1	7.8	1.6
nitrate-nitrogen	60	0.4	U	0.1	U			0.1	U	0.1		0.1	U	0.1	0.2	0.1
nitrate-nitrogen	70	0.4	U	0.1	U			0.1		0.3		0.1	U	0.1	0.3	0.1
Minimum		0.2		0.05		0.05		0.05		0.1		0.05				
Maximum		8.3		2.3		0.8		0.8		0.8		0.6				
Average		5.5		1.2		0.6		0.6		0.6		0.3				
phosphate(total)	1	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	10	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	20	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	20-D	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	30	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	40	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	50	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	60	0.1	U	0.1	U			0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	70	0.1	U	0.1	U			0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
Minimum		0.05		0.05		0.05		0.05		0.05		0.05				
Maximum		0.05		0.05		0.05		0.05		0.05		0.05				
Average		0.05		0.05		0.05		0.05		0.05		0.05				
potassium	1	3.09		3.837		4.45		3.59		3.97		3.14		3.09	4.45	3.68
potassium	10	2.87		3.99				3.49		4.09		3.46		2.87	4.09	3.58
potassium	20	2.47		3.78		3.57		2.88		3.32		3.34		2.47	3.78	3.23
potassium	20-D	2.5		3.56		3.77		2.9		3.55		3.36		2.50	3.77	3.27
potassium	30	2.7		3.92		3.6		3.24		3.39		2.74		2.70	3.92	3.27
potassium	40	2.66		4.09		3.95		3.26		3.24		3.8		2.66	4.09	3.50
potassium	50	3.06		3.99		4.14		3.34		3.1		3.89		3.06	4.14	3.59
potassium	60	3.3		4.1				3.6		3.46		3.72		3.30	4.10	3.64
potassium	70	3.13		4.01				3.96		3.73		4.19		3.13	4.19	3.80
Minimum		2.47		3.56		3.57		2.88		3.10		2.74				
Maximum		3.30		4.10		4.45		3.96		4.09		4.19				
Average		2.86		3.92		3.91		3.36		3.54		3.52				
silicon	1	3.434		4.06		4.17		3.54		3.8		3.74		3.43	4.17	3.79
silicon	10	3.484		3.65				2.94		3.79		4.02		2.94	4.02	3.58
silicon	20	2.66		1.57		3.55		2.94		3.79		3.89		1.57	3.89	3.07
silicon	20-D	2.9		3.4		3.48		2.99		3.98		3.94		2.90	3.98	3.45
silicon	30	2.538		0.415		2.96		3.08		3.62		3.71		0.42	3.71	2.72
silicon	40	2.548		3.15		2.86		3.65		3.61		3.58		2.55	3.65	3.23
silicon	50	3.026		0.38		2.82		3.72		2.76		3.08		0.38	3.72	2.63
silicon	60	3.23		2.12				2.9		2.8		3.28		2.12	3.28	2.87
silicon	70	3.066		3.52				2.94		2.55		3.73		2.55	3.73	3.16
Minimum		2.54		0.38		2.82		2.90		2.55		3.08				
Maximum		3.48		4.06		4.17		3.72		3.98		4.02				
Average		2.99		2.47		3.31		3.19		3.41		3.66				

TABLE G-7

DATA FROM GEOPROBE LOCATION 12369
(Concentrations Reported in mg/L)
(Continued)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
sodium	1	10.1		11.31		17.4		14.3		16.4		14.6		10.1	17.4	14.0
sodium	10	8.68		11.6				16.6		17		15.3		8.7	17.0	13.8
sodium	20	10.8		15		14.7		17.2		16		15.8		10.8	17.2	14.9
sodium	20-D	11.2		15.1		15.6		16.8		16.3		15.9		11.2	16.8	15.2
sodium	30	12.5		15.6		15.7		17.2		16.2		15.2		12.5	17.2	15.4
sodium	40	13.7		15.3		16.6		17.6		16.6		15.6		13.7	17.6	15.9
sodium	50	13.7		15.3		16		17.4		16.2		15		13.7	17.4	15.6
sodium	60	13.8		14.4				15.6		17.6		15.2		13.8	17.6	15.3
sodium	70	12.3		14.9				16.4		17.8		14.8		12.3	17.8	15.2
Minimum		8.7		11.3		14.7		14.3		16.0		14.6				
Maximum		13.8		15.6		17.4		17.6		17.8		15.9				
Average		11.9		14.3		16.0		16.6		16.7		15.3				
sulfate	1	32.8		35.5		69.4		96.9		77.1		67.6		32.8	96.9	63.2
sulfate	10	35.3		36		70.5		42.4		87.2		71.4		35.3	87.2	57.1
sulfate	20	33.9		42		71.4		99		80.7		77.6		33.9	99.0	67.4
sulfate	20-D	29.5		40		72.4		101.2		81.8		77.4		29.5	101.2	67.1
sulfate	30	56.8		51.5		71		87.2		79.9		79.2		51.5	87.2	70.9
sulfate	40	50.6		50		68.7		63		80.7		78		50.0	80.7	65.2
sulfate	50	54.6		59.5		95.2		65		83.6		80.8		54.6	95.2	73.1
sulfate	60	74.8		73.5				115.1		81.4		91.6		73.5	115.1	87.3
sulfate	70	74		72				82.6		79.6		94.5		72.0	94.5	80.5
Minimum		29.5		35.5		68.7		42.4		77.1		67.6				
Maximum		74.8		73.5		95.2		115.1		87.2		94.5				
Average		49.1		51.1		74.1		83.6		81.3		79.8				
TDS	1	452		416		413		466		521		397		397	521	444
TDS	10	438		374		432		457		529		390		374	529	437
TDS	20	457		374		418		451		523		392		374	523	436
TDS	20-D	469		375		421		439		527		389		375	527	437
TDS	30	392		421		397		447		538		382		382	538	430
TDS	40	400		429		401		418		496		378		378	496	420
TDS	50	404		372		422		427		527		403		372	527	426
TDS	60	469		411				456		661		417		411	661	483
TDS	70	491		408				431		455		399		399	491	437
Minimum		392		372		397		418		455		378				
Maximum		491		429		432		466		661		417				
Average		441		398		415		444		531		394				
TSS	1	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	10	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	20	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	20-D	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	30	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	40	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	50	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	60	2	U	2	U			2	U	2	U	2		1	2	1
TSS	70	2	U	2	U			2	U	2	U	2.4		1	2.4	1
Minimum		1		1		1		1		1		1				
Maximum		1		1		1		1		1		2.4				
Average		1		1		1		1		1		1				

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TABLE G-8

DATA FROM GEOPROBE LOCATION 12370

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
alkalinity	1	250		228		239
alkalinity	10	255		236		246
alkalinity	20	250		235		243
alkalinity	20-D	250		231		241
alkalinity	30	260		242		251
alkalinity	40	270		237		254
alkalinity	50	280		228		254
alkalinity	60	290		240		265
alkalinity	70	230		257		244
alkalinity	80	210		242		226
alkalinity	90	210		266		238
Minimum		210		228		
Maximum		290		266		
Average		250		240		
aluminum	1	0.0338	U	0.0208	U	0.0137
aluminum	10	0.0382		0.901		0.4696
aluminum	20	0.0222		0.0208	U	0.0163
aluminum	20-D	0.0294		0.0349		0.0322
aluminum	30	0.0169	U	0.0208	U	0.0094
aluminum	40	0.0239		0.0311		0.0275
aluminum	50	0.0708		0.0208	U	0.0406
aluminum	60	0.0794		0.0277		0.0536
aluminum	70	0.0924		0.0208	U	0.0514
aluminum	80	0.156		0.0208	U	0.0832
aluminum	90	0.0574		0.0335		0.0455
Minimum		0.00845		0.01040		
Maximum		0.15600		0.90100		
Average		0.05410		0.09915		
ammonia	1	0.1	U	0.1	U	0.05
ammonia	10	0.11		0.1	U	0.08
ammonia	20	0.1	U	0.1	U	0.05
ammonia	20-D	0.1	U	0.1	U	0.05
ammonia	30	0.1	U	0.1	U	0.05
ammonia	40	0.33		0.1	U	0.2
ammonia	50	0.1	U	0.1	U	0.05
ammonia	60	0.1	U	0.1	U	0.05
ammonia	70	0.1	U	0.1	U	0.05
ammonia	80	0.1	U	0.11		0.08
ammonia	90	0.19		0.18		0.19
Minimum		0.05		0.05		
Maximum		0.33		0.18		
Average		0.09		0.07		

TABLE G-8

DATA FROM GEOPROBE LOCATION 12370
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
bicarbonate	1	305		278		292
bicarbonate	10	311		288		300
bicarbonate	20	305		287		296
bicarbonate	20-D	305		282		294
bicarbonate	30	317		295		306
bicarbonate	40	329		289		309
bicarbonate	50	342		278		310
bicarbonate	60	354		293		324
bicarbonate	70	281		314		298
bicarbonate	80	256		295		276
bicarbonate	90	256		325		291
Minimum		256		278		
Maximum		354		325		
Average		305		293		
calcium	1	93860		89900		91880
calcium	10	93.86		89.9		91.88
calcium	20	87.77		99		93.39
calcium	20-D	86.9		95.5		91.20
calcium	30	83.36		92		87.68
calcium	40	88.47		94.8		91.64
calcium	50	97.66		96.6		97.13
calcium	60	81.4		90.6		86.00
calcium	70	98.2		96.3		97.25
calcium	80	82.9		101		91.95
calcium	90	75.7		100		87.85
Minimum		75.70		89.90		
Maximum		98.20		104.00		
Average		86.69		96.34		
carbonate	1	1	U	1	U	0.5
carbonate	10	1	U	1	U	0.5
carbonate	20	1	U	1	U	0.5
carbonate	20-D	1	U	1	U	0.5
carbonate	30	1	U	1	U	0.5
carbonate	40	1	U	1	U	0.5
carbonate	50	1	U	1	U	0.5
carbonate	60	1	U	1	U	0.5
carbonate	70	1	U	1	U	0.5
carbonate	80	1	U	1	U	0.5
carbonate	90	1	U	1	U	0.5
Minimum		0.5		0.5		
Maximum		0.5		0.5		
Average		0.5		0.5		

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TABLE G-8

DATA FROM GEOPROBE LOCATION 12370
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
chloride	1	58		31.8		45
chloride	10	60		31.6		46
chloride	20	46		30.2		38
chloride	20-D	52		30.6		41
chloride	30	42		30		36
chloride	40	48		31		40
chloride	50	46		32		39
chloride	60	46		30.4		38
chloride	70	42		31		37
chloride	80	36		31.2		34
chloride	90	36		30		33
Minimum		36		30.0		
Maximum		60		32.0		
Average		47		31.2		
fluoride	1	0.26		0.3		0.3
fluoride	10	0.26		0.3		0.30
fluoride	20	0.24		0.3		0.27
fluoride	20-D	0.24		0.3		0.27
fluoride	30	0.43		0.3		0.37
fluoride	40	0.51		0.3		0.4
fluoride	50	0.13		0.3		0.2
fluoride	60	0.13		0.2		0.17
fluoride	70	0.13		0.2		0.17
fluoride	80	0.14		0.2		0.17
fluoride	90	0.14		0.2		0.2
Minimum		0.13		0.2		
Maximum		0.51		0.3		
Average		0.24		0.3		
iron	1	0.0086	U	0.0169		0.01060
iron	10	0.0043	U	3.6		1.80108
iron	20	0.0791		0.0756		0.07735
iron	20-D	0.0143		0.0717		0.04300
iron	30	0.0104		0.0862		0.04830
iron	40	0.0442		0.09		0.06710
iron	50	0.0914		0.0408		0.06610
iron	60	0.163		0.125		0.14400
iron	70	0.444		0.388		0.41600
iron	80	0.291		0.134		0.21250
iron	90	0.172		2.93		1.55100
Minimum		0.00215		0.01690		
Maximum		0.44400		3.60000		
Average		0.11962		0.68711		

TABLE G-8

DATA FROM GEOPROBE LOCATION 12370
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
magnesium	1	27.28		25.4		26.3
magnesium	10	26.31		27.1		26.7
magnesium	20	25.36		25.3		25.3
magnesium	20-D	23.41		24.6		24.0
magnesium	30	25.39		26		25.7
magnesium	40	26.77		27		26.9
magnesium	50	21.9		26.2		24.1
magnesium	60	26.6		27.4		27.0
magnesium	70	20.6		27.6		24.1
magnesium	80	18.2		27.7		23.0
magnesium	90	18.4		28.7		23.6
Minimum		18.2		24.6		
Maximum		27.3		28.7		
Average		23.7		26.6		
manganese	1	0.23		0.463		0.347
manganese	10	0.717		0.539		0.628
manganese	20	0.416		0.323		0.370
manganese	20-D	0.366		0.309		0.338
manganese	30	0.394		0.232		0.313
manganese	40	0.758		0.746		0.752
manganese	50	1.16		0.75		0.955
manganese	60	1.59		0.508		1.049
manganese	70	0.865		0.636		0.751
manganese	80	0.381		0.43		0.406
manganese	90	0.207		0.592		0.400
Minimum		0.207		0.232		
Maximum		1.590		0.750		
Average		0.644		0.503		
nitrate-nitrogen	1	14.1		0.4		7
nitrate-nitrogen	10	14.3		0.5		7
nitrate-nitrogen	20	14.4		0.5		7
nitrate-nitrogen	20-D	14.2		0.5		7
nitrate-nitrogen	30	11.3		0.4		6
nitrate-nitrogen	40	11.2		0.4		6
nitrate-nitrogen	50	9.9		0.5		5
nitrate-nitrogen	60	10.3		0.5		5
nitrate-nitrogen	70	6.1		0.1	U	3
nitrate-nitrogen	80	0.4	U	0.1		0.2
nitrate-nitrogen	90			0.1	U	0.1
Minimum		0.2		0.1		
Maximum		14.4		0.5		
Average		10.6		0.4		

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TABLE G-8

DATA FROM GEOPROBE LOCATION 12370
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
phosphate(total)	1	0.12		0.1	U	0.09
phosphate(total)	10	0.1	U	0.1	U	0.05
phosphate(total)	20	0.1	U	0.1	U	0.05
phosphate(total)	20-D	0.1	U	0.1	U	0.05
phosphate(total)	30	0.1	U	0.1	U	0.05
phosphate(total)	40	0.1	U	0.1	U	0.05
phosphate(total)	50	0.1	U	0.1	U	0.05
phosphate(total)	60	0.1	U	0.1	U	0.05
phosphate(total)	70	0.1	U	0.1	U	0.05
phosphate(total)	80					
phosphate(total)	90	0.1	U	0.1	U	0.05
Minimum		0.05		0.05		
Maximum		0.12		0.05		
Average		0.06		0.05		
potassium	1	3.17		3.32		3.25
potassium	10	3.65		3.49		3.57
potassium	20	3.26		3.02		3.14
potassium	20-D	3.42		3.21		3.32
potassium	30	3.54		3.43		3.49
potassium	40	3.81		3.77		3.79
potassium	50	2.39		4.3		3.35
potassium	60	2.97		3.52		3.25
potassium	70	2.09		3.63		2.86
potassium	80	1.84		3.92		2.88
potassium	90	2.39		3.59		2.99
Minimum		1.84		3.02		
Maximum		3.81		4.30		
Average		2.96		3.56		
silicon	1	4.09		3.74		3.92
silicon	10	3.53		5.19		4.36
silicon	20	4.15		4.11		4.13
silicon	20-D	3.63		4.04		3.84
silicon	30	4.09		3.96		4.03
silicon	40	4.08		4.01		4.05
silicon	50	3.45		3.58		3.52
silicon	60	4.41		4.03		4.22
silicon	70	4.03		3.77		3.90
silicon	80	3.47		4.5		3.99
silicon	90	3.64		4.81		4.23
Minimum		3.45		3.58		
Maximum		4.41		5.19		
Average		3.87		4.16		

TABLE G-8

DATA FROM GEOPROBE LOCATION 12370
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
sodium	1	26.12		15.1		20.61
sodium	10	27.23		14.4		20.82
sodium	20	20.78		16.3		18.54
sodium	20-D	19.67		15.3		17.49
sodium	30	20.57		15.2		17.89
sodium	40	20.04		16.6		18.32
sodium	50	13.2		16.1		14.65
sodium	60	15		15.8		15.40
sodium	70	12.1		15		13.55
sodium	80	10.7		15.7		13.20
sodium	90	9.97		16.1		13.04
Minimum		9.97		14.40		
Maximum		27.23		16.60		
Average		17.76		15.55		
sulfate	1	66.9		80.4		74
sulfate	10	68.4		78.0		73
sulfate	20	62.2		75.0		69
sulfate	20-D	61.5		75.0		68
sulfate	30	58.6		74.0		66
sulfate	40	62.4		76.6		70
sulfate	50	61.8		75.2		69
sulfate	60	62		77.4		70
sulfate	70	68.6		92.8		81
sulfate	80	71		89.6		80
sulfate	90	69.6		96.6		83
Minimum		58.6		74.0		
Maximum		71.0		96.6		
Average		64.8		81.0		
TDS	1	504		431		468
TDS	10	506		418		462
TDS	20	505		438		472
TDS	20-D	493		444		469
TDS	30	475		457		466
TDS	40	506		442		474
TDS	50	551		445		498
TDS	60	576		429		503
TDS	70	523		440		482
TDS	80	472		461		467
TDS	90	476		460		468
Minimum		472		418		
Maximum		576		461		
Average		508		442		

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TABLE G-8

DATA FROM GEOPROBE LOCATION 12370
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
TSS	1	2	U	2	U	1
TSS	10	2	U	29.6	U	15
TSS	20	2	U	2	U	1
TSS	20-D	2		2	U	2
TSS	30	2	U	2	U	1
TSS	40	2	U	2	U	1
TSS	50	2	U	2	U	1
TSS	60	2	U	2	U	1
TSS	70	2	U	2	U	1
TSS	80	2	U	2	U	1
TSS	90	2		10		6
Minimum		1		1		
Maximum		2		30		
Average		1		5.2		

TABLE G-9

DATA FROM GEOPROBE LOCATION 12371

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
alkalinity	1	235		247		241
alkalinity	10	220		231		226
alkalinity	20	217		241		229
alkalinity	20-D	217		238		228
alkalinity	30	227		250		239
alkalinity	40	218		250		234
alkalinity	50	212		266		239
alkalinity	60	198		244		221
alkalinity	70	199		255		227
alkalinity	80	204		266		235
Minimum		198		231		
Maximum		235		266		
Average		215		249		
aluminum	1	0.0449		0.0358		0.0404
aluminum	10	0.034	U	0.0208	U	0.0137
aluminum	20	0.1		0.0263		0.0632
aluminum	20-D	0.037		0.0249		0.0310
aluminum	30	0.0679		0.0208	U	0.0392
aluminum	40	0.034	U	0.0208	U	0.0137
aluminum	50	0.045		0.0228		0.0339
aluminum	60	0.051		0.0349		0.043
aluminum	70	0.044		0.0452		0.0446
aluminum	80	0.034	U	0.0308		0.0239
Minimum		0.017		0.010		
Maximum		0.100		0.0452		
Average		0.044		0.0225		
ammonia	1	0.1	U	0.1	U	0.05
ammonia	10	0.1	U	0.1	U	0.05
ammonia	20	0.1	U	0.1	U	0.05
ammonia	20-D	0.1	U	0.1	U	0.05
ammonia	30	0.1	U	0.1	U	0.05
ammonia	40	0.1	U	0.1	U	0.05
ammonia	50	0.1	U	0.1	U	0.05
ammonia	60	0.1	U	0.1	U	0.05
ammonia	70	0.1	U	0.1	U	0.05
ammonia	80	0.16		0.1	U	0.11
Minimum		0.05		0.05		
Maximum		0.16		0.05		
Average		0.06		0.05		

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TABLE G-9

DATA FROM GEOPROBE LOCATION 12371
(Continued)

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Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
bicarbonate	1	287		301		294
bicarbonate	10	268		282		275
bicarbonate	20	265		294		280
bicarbonate	20-D	265		290		278
bicarbonate	30	277		305		291
bicarbonate	40	266		305		286
bicarbonate	50	259		325		292
bicarbonate	60	242		298		270
bicarbonate	70	243		311		277
bicarbonate	80	249		325		287
Minimum		242		282		
Maximum		287		325		
Average		262		304		
calcium	1	95.2		84.9		90.1
calcium	10	88.3		85.9		87.1
calcium	20	92.1		85.2		88.7
calcium	20-D	96		90.7		93.4
calcium	30	102		96.7		99.4
calcium	40	101		102		101.5
calcium	50	90.1		99.3		94.7
calcium	60	85.7		102		93.9
calcium	70	92.5		103		97.8
calcium	80	101		108		104.5
Minimum		85.7		84.9		
Maximum		102.0		108		
Average		94.4		95.8		
carbonate	1	1	U	1	U	0.5
carbonate	10	1	U	1	U	0.5
carbonate	20	1	U	1	U	0.5
carbonate	20-D	1	U	1	U	0.5
carbonate	30	1	U	1	U	0.5
carbonate	40	1	U	1	U	0.5
carbonate	50	1	U	1	U	0.5
carbonate	60	1	U	1	U	0.5
carbonate	70	1	U	1	U	0.5
carbonate	80	1	U	1	U	0.5
Minimum		0.5		0.5		
Maximum		0.5		0.5		
Average		0.5		0.5		

TABLE G-9

DATA FROM GEOPROBE LOCATION 12371
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
chloride	1	72		30.2		51
chloride	10	78		35.6		57
chloride	20	70		29.6		50
chloride	20-D	74		29.8		52
chloride	30	62		33		48
chloride	40	50		29.4		40
chloride	50	52		33		43
chloride	60	32		33.2		33
chloride	70	32		32.8		32
chloride	80	32		33		33
Minimum		32		29.4		
Maximum		78		35.6		
Average		55		32		
fluoride	1	0.15		0.2		0.2
fluoride	10	0.14		0.2		0.2
fluoride	20	0.13		0.2		0.2
fluoride	20-D	0.12		0.2		0.2
fluoride	30	0.13		0.2		0.2
fluoride	40	0.15		0.2		0.2
fluoride	50	0.15		0.2		0.2
fluoride	60	0.14		0.2		0.2
fluoride	70	0.14		0.2		0.2
fluoride	80	0.14		0.2		0.2
Minimum		0.12		0.2		
Maximum		0.15		0.2		
Average		0.14		0.2		
iron	1	0.0343		0.0652		0.0498
iron	10	0.0722		0.044		0.0581
iron	20	0.0846		0.0347		0.0597
iron	20-D	0.0672		0.0389		0.0531
iron	30	0.435		0.161		0.2980
iron	40	0.324		0.283		0.3035
iron	50	1.7		0.228		0.9640
iron	60	1.2		0.727		0.9635
iron	70	0.975		0.222		0.5985
iron	80	1.71		3.63		2.6700
Minimum		0.034		0.035		
Maximum		1.710		3.630		
Average		0.660		0.543		

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TABLE G-9

DATA FROM GEOPROBE LOCATION 12371
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
magnesium	1	27.2		110.3		68.8
magnesium	10	24.6		110.3		67.5
magnesium	20	24.3		25.8		25.1
magnesium	20-D	25.3		27.3		26.3
magnesium	30	26		26.4		26.2
magnesium	40	24.6		27		25.8
magnesium	50	23.2		28.1		25.7
magnesium	60	20.9		25.9		23.4
magnesium	70	22.6		26.5		24.6
magnesium	80	24.7		26.7		25.7
Minimum		21		26		
Maximum		27		110		
Average		24		43		
manganese	1	0.362		0.157		0.260
manganese	10	0.379		0.238		0.309
manganese	20	0.237		0.51		0.374
manganese	20-D	0.246		0.519		0.383
manganese	30	0.63		0.49		0.560
manganese	40	0.306		0.343		0.325
manganese	50	0.245		0.376		0.311
manganese	60	0.233		0.294		0.264
manganese	70	0.266		0.328		0.297
manganese	80	0.38		0.336		0.358
Minimum		0.23		0.16		
Maximum		0.63		0.52		
Average		0.33		0.36		
nitrate-nitrogen	1	4.1		0.5		2.3
nitrate-nitrogen	10	4.2		0.5		2.4
nitrate-nitrogen	20	4.2		0.6		2.4
nitrate-nitrogen	20-D	4		0.6		2.3
nitrate-nitrogen	30	0.4	U	0.1	U	0.1
nitrate-nitrogen	40	0.4	U	0.1	U	0.1
nitrate-nitrogen	50	0.4	U	0.2		0.2
nitrate-nitrogen	60	0.4	U	0.1		0.15
nitrate-nitrogen	70	0.4	U	0.1		0.15
nitrate-nitrogen	80	0.4	U	0.1		0.15
Minimum		0.2		0.1		
Maximum		4.2		0.6		
Average		1.8		0.4		

TABLE G-9

DATA FROM GEOPROBE LOCATION 12371
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
phosphate(total)	1	0.1	U	0.1	U	0.05
phosphate(total)	10	0.1	U	0.1	U	0.05
phosphate(total)	20	0.12		0.1	U	0.09
phosphate(total)	20-D	0.1	U	0.1	U	0.05
phosphate(total)	30	0.1		0.1	U	0.08
phosphate(total)	40	0.1		0.1	U	0.08
phosphate(total)	50	0.1		0.1	U	0.08
phosphate(total)	60	0.11		0.1	U	0.08
phosphate(total)	70	0.1	U	0.1	U	0.05
phosphate(total)	80	0.1	U	0.1	U	0.05
Minimum		0.05		0.05		
Maximum		0.12		0.05		
Average		0.08		0.05		
potassium	1	2.9		3.01		2.96
potassium	10	3.47		3.3		3.39
potassium	20	2.04		4.03		3.04
potassium	20-D	3.34		4.06		3.70
potassium	30	2.39		3.33		2.86
potassium	40	2.6		3.77		3.19
potassium	50	3		4.07		3.54
potassium	60	2.49		4.11		3.3
potassium	70	2.31		4.38		3.35
potassium	80	2.05		3.97		3.01
Minimum		2.04		3.01		
Maximum		3.47		4.38		
Average		2.66		3.80		
silicon	1	4.64		4.28		4.46
silicon	10	4.64		4		4.32
silicon	20	4.45		3.81		4.13
silicon	20-D	4.59		3.89		4.24
silicon	30	4.58		4.14		4.36
silicon	40	4.48		4.05		4.27
silicon	50	3.82		3.64		3.73
silicon	60	4.13		4.13		4.13
silicon	70	4.2		4.11		4.16
silicon	80	4.29		4.73		4.51
Minimum		3.82		3.64		
Maximum		4.64		4.73		
Average		4.38		4.08		

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TABLE G-9

DATA FROM GEOPROBE LOCATION 12371
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
sodium	1	25.9		14.4		20.2
sodium	10	30.6		14.3		22.5
sodium	20	20.8		14.8		17.8
sodium	20-D	22.5		15.9		19.2
sodium	30	13.4		14.2		13.8
sodium	40	11.6		14.3		13.0
sodium	50	11.2		16.1		13.7
sodium	60	10.2		16.0		13.1
sodium	70	11.4		16.9		14.2
sodium	80	11.9		16.9		14.4
Minimum		10.2		14.2		
Maximum		30.6		16.9		
Average		17.0		15.4		
sulfate	1	62.4		78		70
sulfate	10	55.1		74		65
sulfate	20	53.4		78.5		66
sulfate	20-D	56.4		78.5		67
sulfate	30	65.4		93		79
sulfate	40	67.5		89		78
sulfate	50	70.9		88		79
sulfate	60	73.4		86		80
sulfate	70	70.8		84.5		78
sulfate	80	89.2		92.5		91
Minimum		53.4		74.0		
Maximum		89.2		93.0		
Average		66.5		84.2		
TDS	1	513		410		462
TDS	10	502		393		448
TDS	20	508		377		443
TDS	20-D	486		395		441
TDS	30	524		350		437
TDS	40	458		418		438
TDS	50	454		434		444
TDS	60	409		476		443
TDS	70	536		454		495
TDS	80	533		492		513
Minimum		409		350		
Maximum		536		492		
Average		492		420		

TABLE G-9

DATA FROM GEOPROBE LOCATION 12371
(Continued)

Constituent	Depth	Round A Result (mg/L)	VQ	Round F Result (mg/L)	VQ	Average
TSS	1	1	U	2	U	0.8
TSS	10	2	U	2	U	1
TSS	20	1	U	2	U	0.8
TSS	20-D	2	U	2	U	1
TSS	30	1	U	2	U	0.8
TSS	40	2	U	2	U	1
TSS	50	2		2	U	2
TSS	60	2	U	2	U	1
TSS	70	2.8		2	U	2
TSS	80	4.4		5.2		5
Minimum		0.5		1		
Maximum		4.4		5.2		
Average		1.5		1.4		

000323

TABLE G-10

DATA FROM GEOPROBE LOCATION 12372
(Concentrations Reported in mg/L)

2999

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
alkalinity	1	293.2		282		250		275		274				250	293	275
alkalinity	10	246		248		240		220		247		252		220	252	242
alkalinity	20	222.4		244		230		225		278		257		222	278	243
alkalinity	20-D	221.6		236		245		230		274		253		222	274	243
alkalinity	30	222		236		245		225		255		245		222	255	238
alkalinity	40	221.6		226		250		220		246		252		220	252	236
alkalinity	50	226		222		255		230		249		255		222	255	240
alkalinity	60	231.6		246		235		230		252		242		230	252	239
alkalinity	70	236		230		230		230		231				230	236	231
Minimum		221.6		222		230		220		231		242				
Maximum		293		282		255		275		278		257				
Average		236		241		242		232		256		251				
aluminum	1	0.0728		0.02		0.0888		0.0337		0.0248	U	0.0227		0.010	0.089	0.040
aluminum	10	0.0772		0.02	U	0.0264	U	0.039		0.0273		0.0208	U	0.010	0.077	0.030
aluminum	20	0.0338	U	0.02	U	0.0264	U	0.0266	U	0.0447		0.0232		0.010	0.045	0.020
aluminum	20-D	0.093		0.02	U	0.0264	U	0.0923		0.0344		0.0237		0.010	0.093	0.044
aluminum	30	0.0616		0.02	U	0.0407		0.0266	U	0.0411		0.0273		0.010	0.062	0.032
aluminum	40	0.0338	U	0.063		0.0681		0.0432		0.0248	U	0.0437		0.012	0.068	0.041
aluminum	50	0.0376		0.02	U	0.0532		0.0266	U	0.0248	U	0.0352		0.010	0.053	0.027
aluminum	60	0.0338	U	0.02	U	0.0827		0.0266	U	0.0248	U	0.0208		0.010	0.083	0.026
aluminum	70	0.0338	U	0.02	U	0.0264	U	0.0266	U	0.0248	U			0.010	0.017	0.013
Minimum		0.0169		0.0100		0.0132		0.0133		0.0124		0.0104				
Maximum		0.0930		0.0630		0.0888		0.0923		0.0447		0.0437				
Average		0.0455		0.0159		0.0429		0.0305		0.0233		0.0259				
ammonia	1	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	10	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	20	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	20-D	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	30	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	40	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	50	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	60	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	70	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.05	0.05	0.05
Minimum		0.05		0.05		0.05		0.05		0.05		0.05				
Maximum		0.05		0.05		0.05		0.05		0.05		0.05				
Average		0.05		0.05		0.05		0.05		0.05		0.05				
bicarbonate	1	258		344		305		336		334		310		258	344	315
bicarbonate	10	300		303		293		268		301		307		268	307	295
bicarbonate	20	271		298		281		275		339		314		271	339	296
bicarbonate	20-D	270		288		299		281		334		309		270	334	297
bicarbonate	30	271		288		299		275		311		299		271	311	291
bicarbonate	40	270		276		305		268		300		307		268	307	288
bicarbonate	50	276		271		311		281		304		311		271	311	292
bicarbonate	60	283		300		287		281		307		295		281	307	292
bicarbonate	70	288		281		281		281		282				281	295	283
Minimum		270.0		271		281		268		282		295				
Maximum		357.0		344		311		336		339		314				
Average		288.0		294		295		283		312		306				
calcium	1	96.3		88.3		93.4		97.7		92.2		95.6		88.3	97.7	93.9
calcium	10	89.44		83.4		90.2		84.8		89.5		95.6		83.4	95.6	88.8
calcium	20	79.5		77.9		92.2		89		91.4		88.3		77.9	92.2	86.4
calcium	20-D	80.24		82.4		95.1		93.1		92.9		95.1		80.2	95.1	89.8
calcium	30	75.64		85.2		87.3		92.1		97.7		90.4		75.6	97.7	88.1
calcium	40	74.88		81.5		95		93.2		94.8		91		74.9	95.0	88.4
calcium	50	86.82		78.6		91.3		91.8		96		96.7		78.6	96.7	90.2
calcium	60	85.42		79.4		89.7		97.8		103		101		79.4	103.0	92.7
calcium	70	83.36		82.9		92.1		92.4		82.6				82.6	92.4	86.7
Minimum		75		78		87		85		83		88				
Maximum		96		88		95		98		103		101				
Average		84		82		92		92		93		94				

TABLE G-10

DATA FROM GEOPROBE LOCATION 12372
(Concentrations Reported in mg/L)
(Continued)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
carbonate	1	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	10	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	20-D	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	20	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	30	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	40	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	50	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	60	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	70	1	U	1	U	1	U	1	U	1	U			0.5	0.5	0.5
Minimum		0.5		0.5		0.5		0.5		0.5		0.5				
Maximum		0.5		0.5		0.5		0.5		0.5		0.5				
Average		0.5		0.5		0.5		0.5		0.5		0.5				
chloride	1	22		32		32		34		34		31.2		22	34	31
chloride	10	22		28		28		32		34		33.8		22	34	30
chloride	20	26		24		32		42		32		32		24	42	31
chloride	20-D	26		24		32		36		34		32.2		24	36	31
chloride	30	30		24		28		36		34		31.6		24	36	31
chloride	40	30		24		32		36		32		31		24	36	31
chloride	50	30		24		36		38		34		30.8		24	38	32
chloride	60	22		20		32		36		32		31.6		20	36	29
chloride	70	26		24		28		38		32				24	38	30
Minimum		22		20		28		32		32		30.8				
Maximum		30		32		36		42		34		33.8				
Average		26		25		31		36		33		31.8				
fluoride	1	0.29		0.35		0.32		0.29		0.3		0.37		0.29	0.37	0.32
fluoride	10	0.3		0.33		0.32		0.3		0.3		0.34		0.30	0.34	0.32
fluoride	20	0.28		0.32		0.31		0.29		0.31		0.43		0.28	0.43	0.32
fluoride	20-D	0.28		0.32		0.31		0.29		0.31		0.45		0.28	0.45	0.33
fluoride	30	0.26		0.31		0.19		0.23		0.25		0.31		0.19	0.31	0.26
fluoride	40	0.19		0.21		0.16		0.17		0.17		0.24		0.16	0.24	0.19
fluoride	50	0.18		0.2		0.14		0.16		0.16		0.22		0.14	0.22	0.18
fluoride	60	0.16		0.18		0.12		0.16		0.13		0.19		0.12	0.19	0.16
fluoride	70	0.14		0.15		0.1		0.17		0.2				0.10	0.20	0.15
Minimum		0.14		0.15		0.10		0.16		0.13		0.19				
Maximum		0.30		0.35		0.32		0.30		0.31		0.45				
Average		0.23		0.26		0.22		0.23		0.24		0.32				
iron	1	0.173		0.06		0.307		0.0419		0.0522		0.138		0.042	0.307	0.129
iron	10	0.0086	U	0.057		0.132		0.0699		0.0122		0.0031	U	0.002	0.132	0.046
iron	20	0.134		0.072		0.201		0.0459		0.0174		0.0031	U	0.002	0.201	0.079
iron	20-D	0.272		0.08		0.106		0.0705		0.0146		0.0031	U	0.002	0.272	0.091
iron	30	0.544		0.049		0.0464		0.0287		0.0272		0.0031	U	0.002	0.544	0.116
iron	40	0.0696		0.042		0.0212	U	0.0387		0.0269		0.0058		0.006	0.070	0.032
iron	50	0.105		0.053		0.0258		0.123		0.0189		0.106		0.019	0.123	0.072
iron	60	0.189		0.403		0.869		1.42		0.461		1.93		0.189	1.930	0.879
iron	70	2.97		1.87		0.63		1.14		0.141				0.141	2.970	1.350
Minimum		0.0043		0.0420		0.0106		0.0287		0.0122		0.0016				
Maximum		2.9700		1.8700		0.8690		1.4200		0.4610		1.9300				
Average		0.4957		0.2984		0.2586		0.3310		0.0857		0.2733				
magnesium	1	26.16		26.7		24.4		27.9		24.9		24.8		24	28	26
magnesium	10	28.2		23.3		23.3		24.1		24.7		24.9		23	28	25
magnesium	20	19.908		20.9		23		24.5		26.3		25.2		20	26	23
magnesium	20-D	20.16		21.5		23.8		24.6		26.2		26.3		20	26	24
magnesium	30	17.734		20.7		19.8		21.7		24.2		25		18	25	22
magnesium	40	16.842		21.2		23		23.4		23.3		25.2		17	25	22
magnesium	50	23.3		22.1		23.7		24.8		24.4		25.2		22	25	24
magnesium	60	20.38		20.8		22.7		25.7		26		24		20	26	23
magnesium	70	20.62		21		23		27.4		25				21	27	23
Minimum		17		21		20		22		23		24				
Maximum		28		27		24		28		26		26				
Average		21		22		23		25		25		25				

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TABLE G-10

DATA FROM GEOPROBE LOCATION 12372
(Concentrations Reported in mg/L)
(Continued)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
manganese	1	0.137		0.652		0.286		0.591		0.337		0.0667		0.067	0.652	0.345
manganese	10	0.318		0.348		0.305		0.616		0.418		0.168		0.168	0.616	0.362
manganese	20	0.222		0.248		0.415		0.509		0.411		0.334		0.222	0.509	0.357
manganese	20-D	0.221		0.261		0.436		0.516		0.405		0.328		0.221	0.516	0.361
manganese	30	0.226		0.374		0.806		0.323		0.395		0.451		0.226	0.806	0.429
manganese	40	0.431		0.643		0.708		0.426		0.538		0.435		0.426	0.708	0.530
manganese	50	0.729		0.641		0.541		0.871		0.395		0.444		0.395	0.871	0.604
manganese	60	0.378		0.471		0.4		0.453		0.5		0.461		0.378	0.500	0.444
manganese	70	0.53		0.444		0.868		0.461		0.399				0.399	0.868	0.540
Minimum		0.137		0.248		0.286		0.323		0.337		0.067				
Maximum		0.729		0.652		0.868		0.871		0.538		0.461				
Average		0.355		0.454		0.529		0.530		0.422		0.336				
nitrate-nitrogen	1	7.3		1.8		0.8		0.9		0.7		0.6		0.6	7.3	2.0
nitrate-nitrogen	10	8.6		1.8		0.8		0.7		0.7		0.5		0.5	8.6	2.2
nitrate-nitrogen	20	7.5		1.8		0.8		0.8		0.6		0.5		0.5	7.5	2.0
nitrate-nitrogen	20-D	7.5		1.8		0.8		0.7		0.7		0.5		0.5	7.5	2.0
nitrate-nitrogen	30	6.7		2		0.6		0.7		0.7		0.5		0.5	6.7	1.9
nitrate-nitrogen	40	7.3		1.8		0.6		0.7		0.7		0.5		0.5	7.3	1.9
nitrate-nitrogen	50	8.4		2		0.6		0.7		0.7		0.4		0.4	8.4	2.1
nitrate-nitrogen	60	0.4	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	0.2	0.1
nitrate-nitrogen	70	0.4	U	0.2		0.6		0.4		0.4				0.2	0.6	0.4
Minimum		0.2		0.05		0.05		0.05		0.05		0.05				
Maximum		8.6		2.0		0.8		0.9		0.7		0.6				
Average		6.0		1.5		0.6		0.6		0.6		0.4				
phosphate(total)	10	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	0.1	0.1
phosphate(total)	20	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	0.1	0.1
phosphate(total)	20-D	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	0.1	0.1
phosphate(total)	30	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	0.1	0.1
phosphate(total)	40	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	0.1	0.1
phosphate(total)	50	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	0.1	0.1
phosphate(total)	60	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	0.1	0.1
phosphate(total)	70	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	0.1	0.1
Minimum		0.05		0.05		0.05		0.05		0.05		0.05				
Maximum		0.05		0.05		0.05		0.05		0.05		0.05				
Average		0.05		0.05		0.05		0.05		0.05		0.05				
potassium	1	2.522		2.68		3.35		4.2		3.55		3.7		2.52	4.20	3.33
potassium	10	3.602		2.65		3.35		4.25		3.56		3.56		2.65	4.25	3.50
potassium	20	2.934		2.44		2.85		3.36		3.83		3.22		2.44	3.83	3.11
potassium	20-D	2.634		2.51		3.01		3.78		3.86		3.87		2.51	3.87	3.28
potassium	30	1.984		2		2.46		2.87		2.92		2.98		1.98	2.98	2.54
potassium	40	1.753		2.47		4.07		3.88		4.14		2.99		1.75	4.14	3.22
potassium	50	2.856		2.79		4.07		4.61		4.54		4.17		2.79	4.61	3.84
potassium	60	2.088		2.9		3.81		4.67		5.01		3.68		2.09	5.01	3.69
potassium	70	3.088		2.97		3.28		5.04		4.44				2.97	5.04	3.76
Minimum		1.75		2.00		2.46		2.87		2.92		2.98				
Maximum		3.60		2.97		4.07		5.04		5.01		4.17				
Average		2.61		2.60		3.36		4.07		3.98		3.52				
silicon	1	3.85		3.3		3.01		3.25		3.24		5.22		3.0	5.2	3.6
silicon	10	3.28		3.25		3.07		2.673		3.16		4.5		2.7	4.5	3.3
silicon	20	2.71		2.73		2.99		2.36		2.9		4.49		2.4	4.5	3.0
silicon	20-D	2.45		2.75		3.06		2.72		2.91		4.29		2.5	4.3	3.0
silicon	30	2.47		3.1		2.87		2.71		3.19		4.52		2.5	4.5	3.1
silicon	40	1.8		2.84		3.14		2.81		3.14		4.64		1.8	4.6	3.1
silicon	50	3.51		2.87		3.42		2.88		3.5		5.16		2.9	5.2	3.6
silicon	60	1.31		3.25		3.48		3.15		3.96		5		1.3	5.0	3.4
silicon	70	3.26		3.48		3.66		3.1		3.68				3.1	3.7	3.4
Minimum		1.3		2.7		2.9		2.4		2.9		4.3				
Maximum		3.9		3.5		3.7		3.3		4.0		5.2				
Average		2.7		3.1		3.2		2.9		3.3		4.7				

TABLE G-10

DATA FROM GEOPROBE LOCATION 12372
(Concentrations Reported in mg/L)
(Continued)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
sodium	1	10.652		10.3		17.5		18		16.7		16.7		10.3	18.0	15.0
sodium	10	18.982		11.2		16.4		18.7		16.8		15.9		11.2	19.0	16.3
sodium	20	14.1		12.1		15.5		14.3		16.1		14.8		12.1	16.1	14.5
sodium	20-D	14.15		12.8		15.9		15.3		16.6		16.4		12.8	16.6	15.2
sodium	30	13.052		13		15.1		14.9		17.1		15.6		13.0	17.1	14.8
sodium	40	11.994		12.9		16.8		15.4		17.3		15.3		12.0	17.3	14.9
sodium	50	14.722		12.5		16.6		16.2		17		16.2		12.5	17.0	15.5
sodium	60	12.46		12.3		14.5		16.2		18.1		16.4		12.3	18.1	15.0
sodium	70	14.244		13.3		14.9		17.3		14.5				13.3	17.3	14.8
Minimum		10.7		10.3		14.5		14.3		14.5		14.8				
Maximum		19.0		13.3		17.5		18.7		18.1		16.7				
Average		13.8		12.3		15.9		16.3		16.7		15.9				
sulfate	1	58.9		50		82.5		81		83.2		62.4		50.0	83.2	69.7
sulfate	10	47.8		46		77.5		110.5		85.6		76.7		46.0	110.5	74.0
sulfate	20	46.2		42		78.5		82.5		79.6		73.7		42.0	82.5	67.1
sulfate	20-D	49.7		40		78.5		108.5		80.4		63.4		40.0	108.5	70.1
sulfate	30	54.9		51.5		79.5		107		83.6		75.9		51.5	107.0	75.4
sulfate	40	55.6		50		76.5		108		81.6		78.3		50.0	108.0	75.0
sulfate	50	56		50		78.5		101.5		80.8		89.4		50.0	101.5	76.0
sulfate	60	64.9		52.5		78		106		101.2		96.8		52.5	106.0	83.2
sulfate	70	74		58		76.5		123		74				58.0	123.0	81.1
Minimum		46.2		40		76.5		81		74		62.4				
Maximum		74		58		82.5		123		101.2		96.8				
Average		56.4		48.9		78.4		103.1		83.3		77.1				
TDS	10	346		459		419		413		464		418		346	464	420
TDS	20	338		374		416		432		496		414		338	496	412
TDS	20-D	343		375		421		419		485		416		343	485	410
TDS	30	346		421		402		390		458		419		346	458	406
TDS	40	339		429		412		441		469		435		339	469	421
TDS	50	357		419		409		436		526		452		357	526	433
TDS	60	357.8		396		366		461		498		446		358	498	421
TDS	70	369		374		402		466		412				369	466	405
Minimum		338		374		366		390		412		414				
Maximum		404		532		429		466		526		452				
Average		356		420		408		434		475		427				
TSS	1	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	10	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	20	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	20-D	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	30	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	40	2	U	2	U	2	U	2		2	U	2		1	2	1
TSS	50	2	U	2	U	2	U	2	U	2	U	2.4		1	2	1
TSS	60	2	U	2	U	2	U	4.8		2	U	4.8		1	5	2
TSS	70	2	U	2	U	2	U	2.4		2	U			1	2	1
Minimum		1		1		1		1		1		1				
Maximum		1		1		1		4.8		1		4.8				
Average		1		1		1		1.7		1		1.8				

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TABLE G-11

DATA FROM GEOPROBE LOCATION 12373
(Concentrations Reported in mg/L)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
alkalinity	1	310		350		315		135		289		242		135	350	274
alkalinity	10	300		346		300		110		278		230		110	346	261
alkalinity	20	270		292		250		120		266		226		120	292	237
alkalinity	20-D	265		290		250		110		266		236		110	290	236
alkalinity	30	260		288		270		110		290		245		110	290	244
alkalinity	40	230		240		240		105		269		225		105	269	218
alkalinity	50	210		220		240		120		265		234		120	265	215
alkalinity	60	210		210		230		110		259		243		110	259	210
alkalinity	70	205		205		240		105		231		246		105	246	205
alkalinity	80									221		224				
alkalinity	90									233		216				
Minimum		205		205		230		105		221		216				
Maximum		310		350		315		135		290		246				
Average		251		271		259		114		261		233				
aluminum	1	0.0472		0.0054		0.145		0.0266	U	0.0248	U	0.0458		0.0054	0.145	0.0449
aluminum	10	0.0548		0.0098	U	0.0264	U	0.0266	U	0.0248	U	0.0381		0.0049	0.0548	0.0228
aluminum	20	0.0338		0.0546		0.0264	U	0.0266	U	0.0248	U	0.0423		0.0124	0.0546	0.0283
aluminum	20-D	0.0338	U	0.0528	U	0.0264.	U	0.0266	U	0.0248	U	0.0208	U	0.0104	0.0264	0.0154
aluminum	30	0.0338	U	0.0528	U	0.0098	U	0.0266	U	0.0248	U	0.0294		0.0049	0.0294	0.0172
aluminum	40	0.0338	U	0.0528	U	0.0098	U	0.0266	U	0.0248	U	0.0269		0.0049	0.0269	0.0168
aluminum	50	0.0338	U	0.0528	U	0.0445		0.205		0.0248	U	0.0208	U	0.0104	0.205	0.0526
aluminum	60	0.0338	U	0.0528	U	0.0098	U	0.0266	U	0.0248	U	0.0208	U	0.0049	0.0264	0.0141
aluminum	70	0.0338	U	0.0528	U	0.0098	U	0.0266	U	0.0248	U	0.0208	U	0.0049	0.0264	0.0141
aluminum	80									0.0248	U	0.0208	U			
aluminum	90									0.0248	U	0.0208	U			
Minimum		0.0169		0.0049		0.0049		0.0133		0.0104		0.0104				
Maximum		0.0548		0.0546		0.1450		0.2050		0.0124		0.0458				
Average		0.0264		0.0248		0.0276		0.0346		0.0122		0.0235				
ammonia	1	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	10	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	20	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	20-D	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	30	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	40	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	50	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	60	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	70	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
ammonia	80									0.1	U	0.1				
ammonia	90									0.14		0.1	U			
Minimum		0.05		0.05		0.05		0.05		0.05		0.05				
Maximum		0.05		0.05		0.05		0.05		0.14		0.10				
Average		0.05		0.05		0.05		0.05		0.06		0.05				
bicarbonate	1	378		427		384		165		353		295		165	427	334
bicarbonate	10	366		422		366		134		339		281		134	422	318
bicarbonate	20	329		356		305		146		325		276		146	356	290
bicarbonate	20-D	323		354		305		134		325		288		134	354	288
bicarbonate	30	317		351		329		134		354		299		134	354	297
bicarbonate	40	281		293		293		128		328		275		128	293	266
bicarbonate	50	256		268		293		146		323		285		146	323	262
bicarbonate	60	256		256		288		134		316		296		134	316	258
bicarbonate	70	250		250		293		128		282		300		128	293	251
bicarbonate	80									270		273				
bicarbonate	90									284		264				
Minimum		250		250		288		128		270		264				
Maximum		378		427		384		165		354		300				
Average		306		331		316		139		318		284				

TABLE G-11

DATA FROM GEOPROBE LOCATION 12373
(Concentrations Reported in mg/L)
(Continued)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
calcium	1	107		120		101		106		104.5		96.6		96.6	120	106
calcium	10	103		128		103		92.6		99.9		93		92.6	128	103
calcium	20	95.7		102		81.3		98		97.5		89.9		81.3	102	94
calcium	20-D	105		113		90.1		91.8		95.8		94.1		90.1	113	98
calcium	30	94.7		102		86.7		97		98		91.2		86.7	102	95
calcium	40	86.22		91		85.7		86.4		92.6		91.7		85.7	92.6	89
calcium	50	78.94		83.8		77.8		92.1		90.1		88.2		77.8	92.1	85
calcium	60	87.18		85.9		88.3		98		92		106		85.9	106	93
calcium	70	86.14		87.2		90.8		87.6		82.6		110		82.6	110	91
calcium	80									77.9		87.8				
calcium	90									82.9		90.1				
Minimum		79		84		78		86		78		88				
Maximum		107		128		103		106		105		110				
Average		94		101		89		94		92		94				
carbonate	1	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	10	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	20	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	20-D	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	30	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	40	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	50	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	60	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	70	1	U	1	U	1	U	1	U	1	U	1	U	0.5	0.5	0.5
carbonate	80									1	U	1	U			
carbonate	90									1	U	1	U			
Minimum		0.5		0.5		0.5		0.5		0.5		0.5				
Maximum		0.5		0.5		0.5		0.5		0.5		0.5				
Average		0.5		0.5		0.5		0.5		0.5		0.5				
chloride	1	40		52		24		48		54		37.8		24	54	43
chloride	10	42		32		24		38		32		33		24	42	34
chloride	20	32		40		32		40		36		33		32	40	36
chloride	20-D	30		40		28		38		32		32.8		28	40	33
chloride	30	34		44		28		42		32		34.6		28	44	36
chloride	40	30		28		28		40		32		35		28	40	32
chloride	50	38		32		28		38		36		33.2		28	38	34
chloride	60	32		38		32		40		30		33.8		30	40	34
chloride	70	33		36		36		44		32		34		32	44	36
chloride	80									34		30.8				
chloride	90									32		29.4				
Minimum		30		28		24		38		30		29				
Maximum		42		52		36		48		54		38				
Average		35		38		29		41		35		33				
fluoride	1	0.17		0.22		0.18		0.21		0.23		0.49		0.17	0.49	0.25
fluoride	10	0.33		0.33		0.54		0.57		0.58		0.58		0.33	0.58	0.49
fluoride	20	0.6		0.55		0.5		0.53		0.57		0.61		0.5	0.61	0.6
fluoride	20-D	0.61		0.56		0.5		0.53		0.58		0.63		0.5	0.63	0.6
fluoride	30	0.48		0.43		0.38		0.39		0.44		0.37		0.37	0.48	0.42
fluoride	40	0.42		0.44		0.38		0.36		0.38		0.38		0.36	0.44	0.39
fluoride	50	0.37		0.36		0.15		0.28		0.3		0.3		0.15	0.37	0.3
fluoride	60	0.17		0.16		0.13		0.15		0.13		0.16		0.13	0.17	0.15
fluoride	70	0.16		0.13		0.13		0.2		0.2		0.17		0.13	0.2	0.2
fluoride	80									0.31		0.13				
fluoride	90									0.19		0.14				
Minimum		0.16		0.13		0.13		0.15		0.13		0.13				
Maximum		0.61		0.56		0.54		0.57		0.58		0.63				
Average		0.37		0.35		0.32		0.36		0.36		0.36				

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TABLE G-11

DATA FROM GEOPROBE LOCATION 12373
(Concentrations Reported in mg/L)
(Continued)

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Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
iron	10	0.041		0.033		0.0228		0.0024	U	0.0074	U	0.0031	U	0.0012	0.041	0.017
iron	20	0.0516		0.108		0.0212	U	0.0024	U	0.0074	U	0.0031	U	0.0012	0.108	0.029
iron	20-D	0.0762		0.114		0.0212	U	0.0024	U	0.0074	U	0.0031	U	0.0012	0.114	0.035
iron	30	0.118		0.026		0.0053	U	0.0024	U	0.0325		0.0031	U	0.0012	0.118	0.030
iron	40	0.0846		0.131		0.0053	U	0.0519		0.0074	U	0.0031	U	0.00155	0.131	0.046
iron	50	0.0482		0.059		0.305		0.0363		0.0144		0.0031	U	0.00155	0.305	0.077
iron	60	0.231		0.295		0.544		0.242		0.0853		0.378		0.0853	0.544	0.296
iron	70	0.426		1.18		1.3		0.411		0.141		0.435		0.141	1.3	0.649
iron	80									0.168		1.35				
iron	90									0.810		0.128				
Minimum		0.0410		0.0260		0.0027		0.0012		0.0037		0.0016				
Maximum		0.4260		1.1800		1.3000		0.4110		0.8100		1.3500				
Average		0.1325		0.2222		0.2466		0.0830		0.1173		0.2095				
magnesium	1	30.6		33.5		27.8		30.6		29.3		25.7		25.7	33.5	29.6
magnesium	10	28.2		34.1		28		26.8		27.3		24		24	34.1	28.1
magnesium	20	23.5		27.5		22.2		26.7		26.9		24.1		22.2	27.5	25.2
magnesium	20-D	26		30		24.8		25.2		26.5		25.3		24.8	30	26.3
magnesium	30	26.34		27.2		22		27.4		26.6		25		22	27.4	25.8
magnesium	40	21.64		24.8		23.5		24		26.9		25.1		21.64	26.9	24.3
magnesium	50	21.64		21.7		19.6		26.2		24.8		24.1		19.6	26.2	23.0
magnesium	60	20.9		21.7		22.9		26.4		23.3		28.1		20.9	28.1	23.9
magnesium	70	22		21.8		23		25.4		25		28.1		21.8	28.1	24.2
magnesium	80									22.9		25.1				
magnesium	90									25.1		22.9				
Minimum		20.90		21.70		19.60		24.00		22.90		22.90				
Maximum		30.60		34.10		28.00		30.60		29.30		28.10				
Average		24.54		26.92		23.76		26.52		25.87		25.23				
manganese	1	0.27		0.735		0.49		0.261		0.29		0.435		0.261	0.735	0.414
manganese	10	0.783		0.462		0.755		0.802		0.6		0.637		0.462	0.802	0.673
manganese	20	0.494		0.69		0.416		0.536		0.895		0.354		0.354	0.895	0.564
manganese	20-D	0.477		0.769		0.505		0.477		0.89		0.338		0.338	0.89	0.576
manganese	30	0.576		0.411		0.465		0.856		0.347		0.445		0.347	0.856	0.517
manganese	40	0.66		1.1		0.349		0.44		0.381		0.347		0.347	1.1	0.546
manganese	50	0.541		0.613		0.443		0.566		0.402		0.401		0.401	0.613	0.494
manganese	60	0.849		0.833		0.341		1.27		0.457		0.368		0.341	1.27	0.686
manganese	70	0.804		0.449		0.355		0.622		0.399		0.504		0.355	0.804	0.522
manganese	80									0.338		0.822				
manganese	90									0.513		0.214				
Minimum		0.270		0.411		0.341		0.261		0.290		0.214				
Maximum		0.849		1.100		0.755		1.270		0.895		0.822				
Average		0.606		0.674		0.458		0.648		0.501		0.442				
nitrate-nitrogen	1	8.8		8.4		2.2		1		0.9		0.7		0.7	8.8	3.7
nitrate-nitrogen	10	7.8		8.4		2.4		0.8		1.1		0.6		0.6	8.4	3.5
nitrate-nitrogen	20	11.1		3.2		1.2		0.8		0.9		0.6		0.6	11.1	3.0
nitrate-nitrogen	20-D	11.2		3		1.3		0.8		0.8		0.6		0.6	11.2	3.0
nitrate-nitrogen	30	11.5		3.1		2.9		0.7		0.7		0.6		0.6	11.5	3.3
nitrate-nitrogen	40	11.6		3		2.7		0.7		0.7		0.6		0.6	11.6	3.2
nitrate-nitrogen	50	10.2		2.9		2.8		0.8		0.9		0.6		0.6	10.2	3.0
nitrate-nitrogen	60	11.6		2.1		0.1	U	0.2		1.4		0.1	U	0.05	11.6	2.6
nitrate-nitrogen	70	0.4	U	0.5		0.1	U	0.3		0.4		0.1	U	0.05	0.5	0.3
nitrate-nitrogen	80									0.4		0.1	U			
nitrate-nitrogen	90									0.1	U	0.1	U			
Minimum		0.2		0.5		0.05		0.2		0.1		0.05				
Maximum		11.6		8.4		2.9		1.0		1.4		0.7				
Average		9.3		3.8		1.7		0.7		0.8		0.4				

TABLE G-11

DATA FROM GEOPROBE LOCATION 12373
(Concentrations Reported in mg/L)
(Continued)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
phosphate(total)	1	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	10	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	20	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	20-D	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	30	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	40	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	50	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	60	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	70	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.05	0.05	0.05
phosphate(total)	80									0.1	U	0.1	U			
phosphate(total)	90									0.1	U	0.1	U			
Minimum		0.05		0.05		0.05		0.05		0.05		0.05				
Maximum		0.05		0.05		0.05		0.05		0.05		0.05				
Average		0.05		0.05		0.05		0.05		0.05		0.05				
potassium	1	3.81		4.82		3.74		4.23		4.44		3.57		3.57	4.82	4.10
potassium	10	4.02		4.9		3.78		4.22		4.23		4.16		3.78	4.9	4.22
potassium	20	3.04		3.99		2.85		4.02		3.93		3.65		2.85	4.02	3.58
potassium	20-D	3.44		4.04		3.31		3.97		3.94		3.93		3.31	4.04	3.77
potassium	30	3.454		3.24		3.4		3.66		3.28		3.9		3.24	3.9	3.49
potassium	40	3.44		3.42		3.79		3.61		4.34		3.58		3.42	4.34	3.70
potassium	50	2.856		3.1		3.14		4.52		4.17		4.09		2.856	4.52	3.65
potassium	60	3.122		3.08		3.9		4.29		3.39		5.23		3.08	5.23	3.84
potassium	70	3.158		3.48		4.32		4.54		4.44		4.37		3.158	4.54	4.05
potassium	80									3.49		4.84				
potassium	90									4.66		3.69				
Minimum		2.86		3.08		2.85		3.61		3.28		3.57				
Maximum		4.02		4.90		4.32		4.54		4.66		5.23				
Average		3.37		3.79		3.58		4.12		4.03		4.09				
silicon	1	3.478		4.26		4.15		4.28		4.54		4.34		3.48	4.54	4.17
silicon	10	4.368		4.77		3.94		3.72		4.25		3.94		3.72	4.77	4.16
silicon	20	3		4.31		3.43		3.75		3.97		3.58		3.00	4.31	3.67
silicon	20-D	3.45		4.79		3.75		3.579		3.98		3.75		3.45	4.79	3.88
silicon	30	3.474		4.44		3.37		3.78		4.25		4.03		3.37	4.44	3.89
silicon	40	3.8		4.04		3.46		3.33		4.12		3.76		3.33	4.12	3.75
silicon	50	3.08		3.51		3.49		3.26		4.44		3.92		3.08	4.44	3.62
silicon	60	3.35		3.74		3.23		3.6		5.58		4.45		3.23	5.58	3.99
silicon	70	2.7		3.41		3.2		2.95		3.68		4		2.70	4.00	3.32
silicon	80									3.12		4.08				
silicon	90									3.53		4.23				
Minimum		2.70		3.41		3.20		2.95		3.12		3.58				
Maximum		4.37		4.79		4.15		4.28		5.58		4.45				
Average		3.41		4.14		3.56		3.58		4.13		4.01				
sodium	1	20.6		29.8		15.8		20.2		23.6		16.2		15.8	29.8	21.0
sodium	10	16.6		18.4		16.3		18.3		17.1		16.3		16.3	18.4	17.2
sodium	20	13.6		15.5		13.1		17		16.9		16.1		13.1	17	15.4
sodium	20-D	15		17.1		14.2		16.1		16.6		17.3		14.2	17.3	16.1
sodium	30	15.13		16.8		14.6		18.6		16.6		16.5		14.6	18.6	16.4
sodium	40	15.102		15.8		15.2		18		16.8		17.2		15.1	18	16.4
sodium	50	13.956		15.6		13.6		21.3		16.3		16.6		13.6	21.3	16.2
sodium	60	13.72		13.7		13.4		19.2		14.3		18.4		13.4	19.2	15.5
sodium	70	12.364		12.6		12.5		18.8		14.5		18.2		12.4	18.8	14.8
sodium	80									14.2		13.2				
sodium	90									13.9		12.1				
Minimum		12.4		12.6		12.5		16.1		13.9		12.1				
Maximum		20.6		29.8		16.3		21.3		23.6		18.4				
Average		15.1		17.3		14.3		18.6		16.4		16.2				

000331

2999

TABLE G-11

DATA FROM GEOPROBE LOCATION 12373
(Concentrations Reported in mg/L)
(Continued)

Constituent	Depth	Round A Result	VQ	Round B Result	VQ	Round C Result	VQ	Round D Result	VQ	Round E Result	VQ	Round F Result	VQ	Minimum	Maximum	Average
sulfate	1	99.2		87		67.5		89		82.8		73.8		67.5	99.2	83.2
sulfate	10	37.2		59		67		87		80.8		75.2		37.2	87.0	67.7
sulfate	20	27.6		53		66		89.5		88.4		77.3		27.6	89.5	67.0
sulfate	20-D	25.8		49.5		67		108		88		78.4		25.8	108.0	69.5
sulfate	30	37.3		80.5		55		92.8		82.8		76		37.3	92.8	70.7
sulfate	40	36		53		56.2		98		85.6		74.6		36.0	98.0	67.2
sulfate	50	51.9		51.5		57.4		88.4		76.8		77.4		51.5	88.4	67.2
sulfate	60	46.5		62.5		72.2		124.1		68.4		84.2		46.5	124.1	76.3
sulfate	70	57.3		74		73.1		81.4		74		89.8		57.3	89.8	74.9
sulfate	80									83.2		65.6				
sulfate	90									80.1		69.2				
Minimum		25.8		49.5		55.0		81.4		68.4		65.6				
Maximum		99.2		87.0		73.1		124.1		88.4		89.8				
Average		46.5		63.3		64.6		95.4		81.0		76.5				
TDS	1	678		581		475		457		584		392		392	678	528
TDS	10	580		534		453		431		491		382		382	580	479
TDS	20	504		446		399		440		481		379		379	504	442
TDS	20-D	611		434		416		440		402		381		381	611	447
TDS	30	486		444		448		442		459		398		398	486	446
TDS	40	456		392		397		443		446		406		392	456	423
TDS	50	435		401		391		443		448		428		391	448	424
TDS	60	466		412		399		456		459		446		399	466	440
TDS	70	468		429		404		430		412		458		404	468	434
TDS	80									453		435				
TDS	90									440		439				
Minimum		435		392		391		430		402		379				
Maximum		678		581		475		457		584		458				
Average		520		453		420		442		461		413				
TSS	1	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	10	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	20	2	U	2	U	2	U	2	U	2	U	2	U	1	1	1
TSS	20-D	2	U	2	U	2	U	2	U	2	U	2		1	2	1
TSS	30	2	U	2	U	2	U	2	U	2	U	2.4		1	2.4	1
TSS	40	2	U	2	U	2	U	2	U	2	U	2		1	2	1
TSS	50	2	U	2	U	3.2		2	U	2	U	2	U	1	3.2	1
TSS	60	2	U	2	U	2	U	2	U	2	U	3.6		1	3.6	1
TSS	70	2	U	2		2		2	U	2	U	2		1	2	2
TSS	80									2	U	2				
TSS	90									2	U	2	U			
Minimum		1		1		1		1		1		1				
Maximum		1		2		3.2		1		1		3.6				
Average		1		1		1		1		1		2				

Figure G-24, Piper Diagram

Direct Push Location 12369, 20 feet BWT

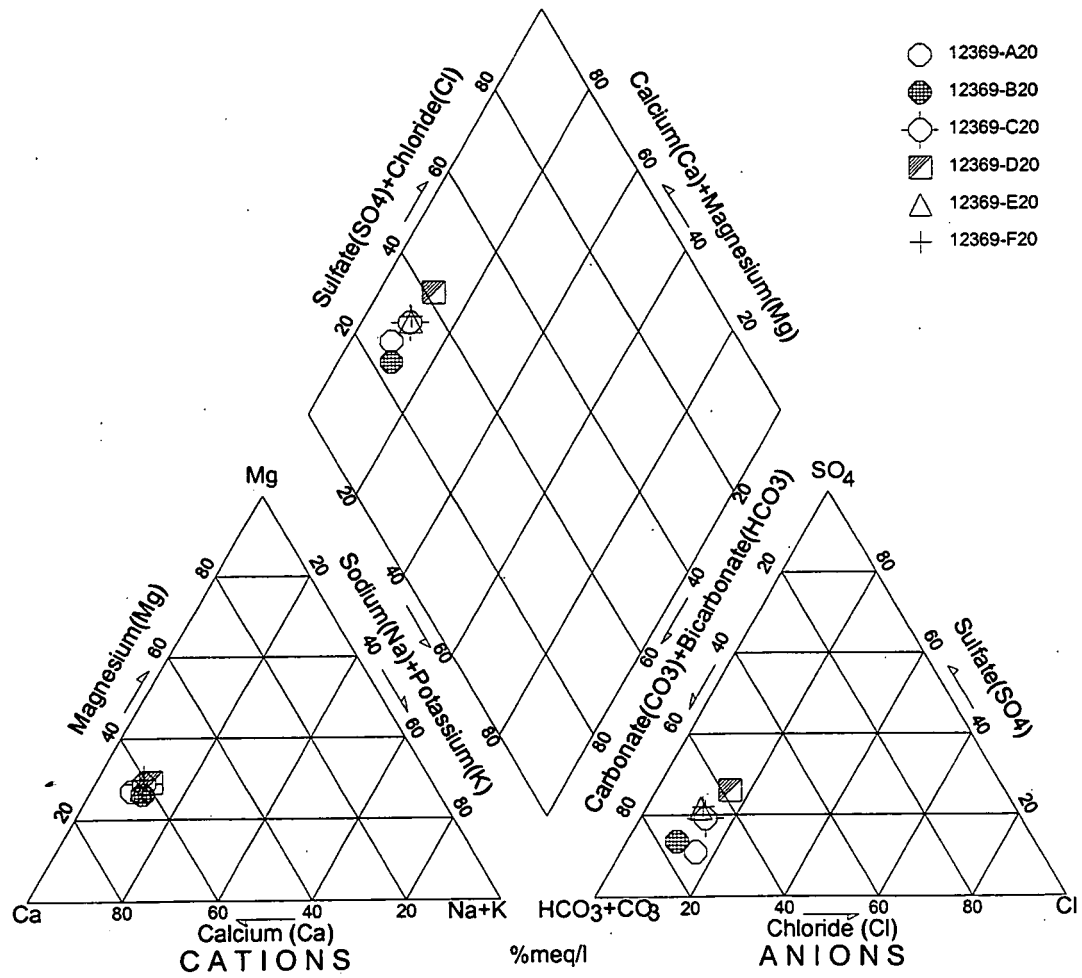


Figure G-25, Piper Diagram

Direct Push Location 12372, 20 feet BWT

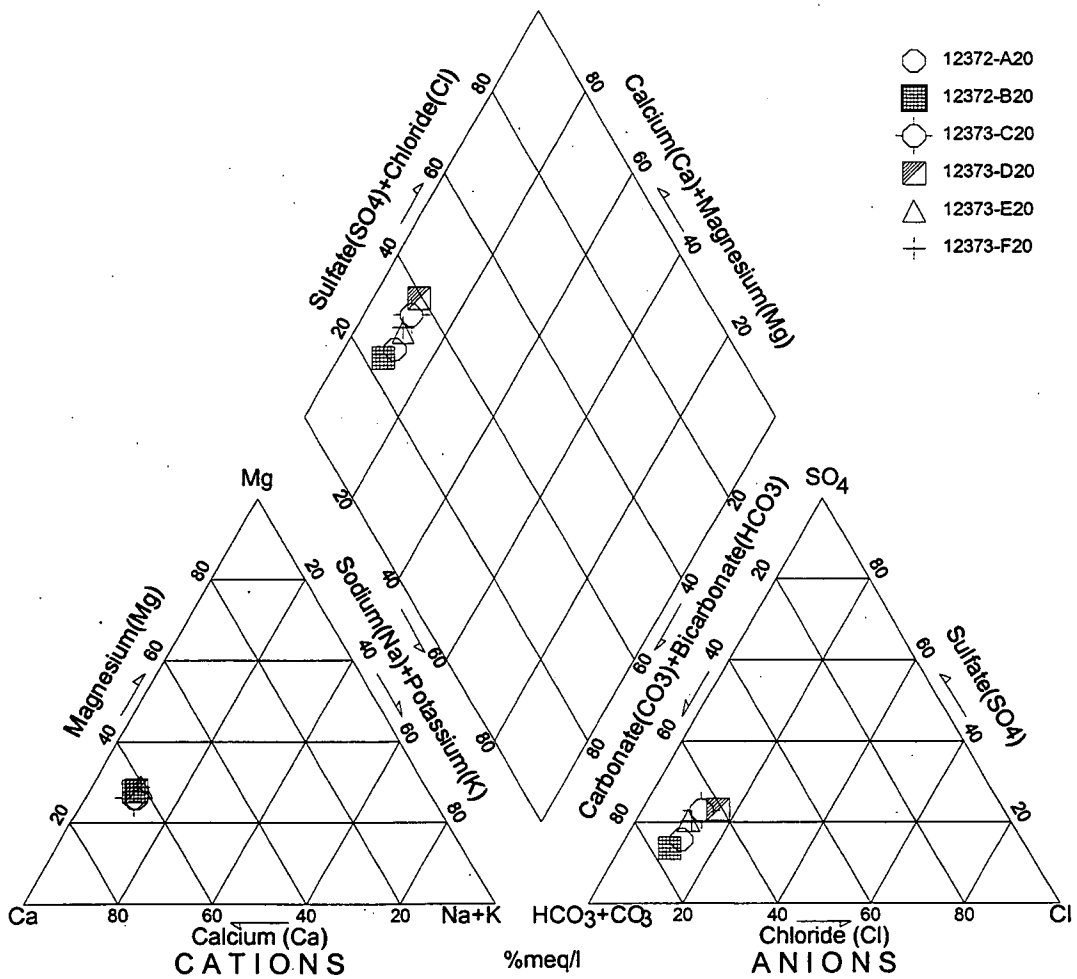
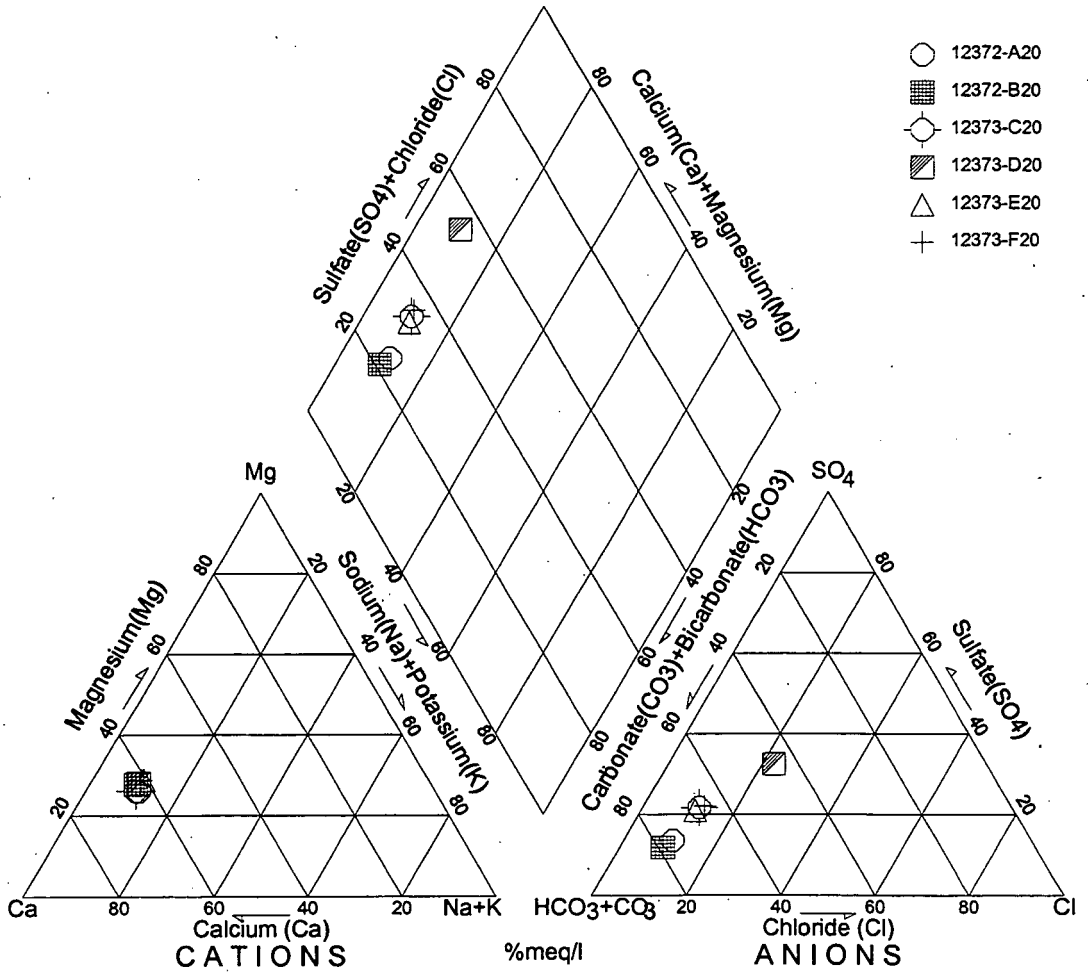


Figure G-26, Piper Diagram

Direct Push Location 12373, 20 feet BWT



SECTION G-3

IN SITU WATER QUALITY DATA COLLECTED AT THE START OF RE-INJECTION

TABLE G-12

MONITORING WELL 22300

2999

Log File Name : 08319822300
Setup Date (MMDDYY) : 083198
Setup Time (HHMMSS) : 092241
Starting Date (MMDDYY) : 083198
Starting Time (HHMMSS) : 093000
Stopping Date (MMDDYY) : 090398
Stopping Time (HHMMSS) : 093000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
83198	93000	11.17	7.05	0.674	33.7	3.62	542
83198	103000	11.17	7.05	0.674	37.7	4.05	544
83198	113000	11.17	7.05	0.674	38	4.08	545
83198	123000	11.17	7.06	0.674	38	4.08	546
83198	133000	11.16	7.06	0.673	38	4.08	547
83198	143000	11.16	7.06	0.673	37.9	4.07	548
83198	153000	11.16	7.06	0.672	37.9	4.07	549
83198	163000	11.16	7.06	0.673	37.7	4.05	550
83198	173000	11.16	7.07	0.673	37.7	4.05	550
83198	183000	11.16	7.07	0.672	37.6	4.04	551
83198	193000	11.16	7.07	0.672	37.6	4.04	551
83198	203000	11.14	7.07	0.672	37.5	4.03	552
83198	213000	11.14	7.07	0.673	37.5	4.03	553
83198	223000	11.14	7.06	0.673	37.4	4.02	555
83198	233000	11.14	7.06	0.673	37.4	4.02	555
90198	3000	11.14	7.07	0.673	37.5	4.03	556
90198	13000	11.14	7.07	0.673	37.5	4.03	557
90198	23000	11.14	7.06	0.672	37.7	4.06	558
90198	33000	11.14	7.06	0.672	37.6	4.04	558
90198	43000	11.12	7.06	0.672	37.4	4.02	559
90198	53000	11.12	7.07	0.672	37.3	4.01	559
90198	63000	11.12	7.08	0.672	37.3	4.01	559
90198	73000	11.12	7.07	0.672	37.2	4	560
90198	83000	11.12	7.07	0.672	37.2	4	561
90198	93000	11.12	7.07	0.672	37.2	4	561
90198	103000	11.12	7.06	0.672	37.3	4.01	562
90198	113000	11.12	7.07	0.671	37.3	4.01	562
90198	123000	11.12	7.07	0.671	37.3	4.01	562
90198	133000	11.11	7.08	0.671	37.3	4.01	563
90198	143000	11.11	7.08	0.672	37.2	4	563
90198	153000	11.11	7.08	0.671	37.1	3.99	564

TABLE G-12

MONITORING WELL 22300
(Continued)

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90198	163000	11.11	7.08	0.67	37.2	4	564
90198	173000	11.11	7.08	0.672	37.2	4	565
90198	183000	11.11	7.08	0.672	37	3.97	565
90198	193000	11.11	7.08	0.671	37	3.97	565
90198	203000	11.11	7.08	0.672	37	3.97	565
90198	213000	11.11	7.09	0.672	37	3.97	565
90198	223000	11.11	7.09	0.672	36.8	3.96	566
90198	233000	11.11	7.09	0.672	37.1	3.99	566
90298	3000	11.09	7.09	0.672	37.1	3.99	566
90298	13000	11.09	7.09	0.672	37.1	3.99	567
90298	23000	11.11	7.09	0.672	37	3.97	567
90298	33000	11.09	7.09	0.672	37	3.98	567
90298	43000	11.09	7.09	0.672	37	3.98	567
90298	53000	11.09	7.09	0.672	37	3.98	567
90298	63000	11.09	7.09	0.672	36.7	3.95	568
90298	73000	11.09	7.09	0.672	36.7	3.95	569
90298	83000	11.09	7.09	0.672	36.9	3.96	569
90298	93000	11.09	7.09	0.672	36.9	3.96	569
90298	103000	11.09	7.09	0.671	37	3.98	570
90298	113000	11.09	7.1	0.683	39.3	4.22	569
90298	123000	11.19	7.08	0.717	41.3	4.43	571
90298	133000	11.45	7.08	0.729	37.6	4.01	572
90298	143000	11.78	7.09	0.726	39.6	4.19	571
90298	153000	12.36	7.07	0.733	39.7	4.15	572
90298	163000	13.58	7.06	0.73	46.4	4.72	559
90298	173000	13.86	7.15	0.737	51.4	5.19	497
90298	183000	13.16	7.14	0.744	82.7	8.49	559
90298	193000	12.75	7.16	0.744	81	8.39	566
90298	203000	12.59	7.2	0.744	81.2	8.44	567
90298	213000	12.49	7.19	0.744	80.9	8.43	568
90298	223000	12.47	7.17	0.743	83.1	8.66	569
90298	233000	12.42	7.17	0.742	82.6	8.62	570
90398	3000	12.39	7.18	0.742	81.6	8.52	570
90398	13000	12.34	7.19	0.741	81	8.47	571
90398	23000	12.29	7.19	0.742	80.2	8.4	571
90398	33000	12.24	7.2	0.741	80.3	8.41	572
90398	43000	12.21	7.2	0.741	80.1	8.4	572
90398	53000	12.19	7.2	0.741	80	8.39	573
90398	63000	12.16	7.2	0.74	79.9	8.39	573
90398	73000	12.14	7.2	0.74	79.7	8.37	573
90398	83000	12.13	7.21	0.74	79.5	8.35	574
90398	93000	12.11	7.22	0.74	79.8	8.39	574

Recovery finished at 090998 080958

000338

TABLE G-13

MONITORING WELL 32306

2999

Log File Name : 08319832306
Setup Date (MMDDYY) : 083198
Setup Time (HHMMSS) : 093054
Starting Date (MMDDYY) : 083198
Starting Time (HHMMSS) : 094000
Stopping Date (MMDDYY) : 090398
Stopping Time (HHMMSS) : 094000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
83198	94000	8.95	7.57	0.0658	1.9	0.22	-206
83198	104000	8.95	7.58	0.0658	2.9	0.32	-203
83198	114000	8.95	7.58	0.0658	2.8	0.31	-203
83198	124000	8.95	7.58	0.0658	2.8	0.31	-204
83198	134000	8.95	7.58	0.0658	2.7	0.3	-204
83198	144000	8.95	7.58	0.0657	2.8	0.31	-204
83198	154000	8.95	7.58	0.0658	2.8	0.31	-204
83198	164000	8.95	7.58	0.0657	2.7	0.3	-205
83198	174000	8.95	7.58	0.0657	2.8	0.31	-205
83198	184000	8.95	7.58	0.0657	2.7	0.3	-205
83198	194000	8.95	7.58	0.0657	2.8	0.31	-205
83198	204000	8.95	7.58	0.0657	2.7	0.3	-205
83198	214000	8.95	7.58	0.0658	2.8	0.31	-205
83198	224000	8.95	7.59	0.0658	3	0.33	-205
83198	234000	8.95	7.59	0.0658	2.9	0.32	-206
90198	4000	8.95	7.59	0.0657	2.9	0.32	-206
90198	14000	8.95	7.59	0.0657	2.6	0.29	-206
90198	24000	8.95	7.59	0.0658	2.6	0.29	-207
90198	34000	8.95	7.59	0.0658	2.5	0.29	-207
90198	44000	8.95	7.59	0.0657	2.4	0.28	-207
90198	54000	8.95	7.59	0.0657	2.7	0.3	-207
90198	64000	8.95	7.59	0.0658	2.9	0.32	-207
90198	74000	8.95	7.59	0.0658	2.7	0.3	-208
90198	84000	8.95	7.59	0.0658	2.7	0.3	-208
90198	94000	8.95	7.59	0.0658	2.7	0.3	-208
90198	104000	8.95	7.59	0.0658	2.7	0.3	-208
90198	114000	8.95	7.59	0.0658	2.6	0.29	-209
90198	124000	8.95	7.59	0.0657	3	0.33	-209
90198	134000	8.95	7.59	0.0658	2.7	0.3	-209
90198	144000	8.95	7.59	0.0657	2.7	0.3	-209
90198	154000	8.95	7.59	0.0658	2.5	0.29	-209
90198	164000	8.95	7.59	0.0657	2.6	0.29	-209
90198	174000	8.95	7.59	0.0657	2.8	0.31	-209
90198	184000	8.95	7.59	0.0657	2.6	0.29	-210

TABLE G-13

MONITORING WELL 32306
(Continued)

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90198	194000	8.95	7.59	0.0657	2.9	0.32	-210
90198	204000	8.95	7.59	0.0658	2.9	0.32	-210
90198	214000	8.95	7.59	0.0657	2.6	0.29	-210
90198	224000	8.95	7.59	0.0657	2.6	0.29	-210
90198	234000	8.95	7.59	0.0657	2.6	0.29	-211
90298	4000	8.95	7.6	0.0657	2.5	0.29	-211
90298	14000	8.95	7.6	0.0657	2.8	0.31	-211
90298	24000	8.95	7.59	0.0656	2.7	0.3	-211
90298	34000	8.95	7.6	0.0657	2.8	0.31	-212
90298	44000	8.95	7.6	0.0658	2.6	0.29	-212
90298	54000	8.95	7.6	0.0657	2.6	0.29	-212
90298	64000	8.95	7.6	0.0657	2.8	0.31	-212
90298	74000	8.95	7.6	0.0657	2.7	0.3	-212
90298	84000	8.95	7.6	0.0656	2.7	0.3	-212
90298	94000	8.95	7.6	0.0657	2.6	0.29	-212
90298	104000	8.95	7.6	0.0657	8.7	0.98	-213
90298	114000	8.95	7.59	0.0626	2.9	0.32	-212
90298	124000	8.95	7.59	0.0621	2.6	0.29	-196
90298	134000	8.95	7.59	0.0621	2.6	0.29	-172
90298	144000	8.95	7.59	0.062	2.9	0.32	-162
90298	154000	8.95	7.61	0.062	2.4	0.28	-161
90298	164000	8.95	7.63	0.062	2.5	0.29	-166
90298	174000	8.95	7.65	0.0619	2.4	0.28	-167
90298	184000	8.95	7.66	0.0618	2.4	0.28	-160
90298	194000	8.95	7.67	0.0618	2.4	0.28	-156
90298	204000	8.95	7.67	0.0618	2.4	0.28	-150
90298	214000	8.95	7.67	0.0618	2.5	0.29	-149
90298	224000	8.95	7.67	0.0617	2.5	0.29	-164
90298	234000	8.95	7.67	0.0617	2.5	0.29	-179
90398	4000	8.95	7.67	0.0617	2.4	0.28	-185
90398	14000	8.95	7.66	0.0617	2.6	0.29	-186
90398	24000	8.95	7.66	0.0617	2.5	0.29	-186
90398	34000	8.95	7.66	0.0616	2.3	0.27	-196
90398	44000	8.95	7.65	0.0616	2.3	0.27	-202
90398	54000	8.95	7.65	0.0617	2.3	0.26	-205
90398	64000	8.95	7.65	0.0617	2.3	0.27	-208
90398	74000	8.95	7.65	0.0616	2.4	0.28	-210
90398	84000	8.95	7.65	0.0617	2.5	0.29	-210
90398	94000	8.95	7.64	0.0617	2.4	0.28	-207

Recovery finished at 090998 082029

SECTION G-4

MONTHLY IN-SITU WATER QUALITY DATA

TABLE G-14

MONITORING WELL 22299

2999

Log File Name : 09219822299
Setup Date (MMDDYY) : 092198
Setup Time (HHMMSS) : 110803
Starting Date (MMDDYY) : 092198
Starting Time (HHMMSS) : 111000
Stopping Date (MMDDYY) : 092298
Stopping Time (HHMMSS) : 111000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
92198	111000	12.36	7.32	0.0688	92.4	9.99	286
92198	121000	12.25	7.39	0.0692	102.9	11.16	311
92198	131000	12.28	7.42	0.0692	111	12.02	325
92198	141000	12.36	7.42	0.0688	108.6	11.74	334
92198	151000	12.53	7.43	0.0691	113	12.17	341
92198	161000	12.91	7.42	0.0696	104.4	11.16	348
92198	171000	13.01	7.43	0.0698	113.8	12.13	352
92198	181000	12.81	7.43	0.0696	104.7	11.21	356
92198	191000	12.6	7.43	0.0697	104.9	11.28	359
92198	201000	12.46	7.44	0.0696	114.8	12.38	362
92198	211000	12.4	7.45	0.0696	106.9	11.55	365
92198	221000	12.36	7.45	0.0695	109.1	11.79	368
92198	231000	12.33	7.45	0.0695	112.4	12.17	370
92298	1000	12.32	7.45	0.0696	110.9	12.01	373
92298	11000	12.28	7.45	0.0697	109	11.81	375
92298	21000	12.27	7.46	0.0696	101.1	10.96	376
92298	31000	12.25	7.46	0.0694	111.4	12.08	378
92298	41000	12.23	7.46	0.0693	111	12.04	380
92298	51000	12.23	7.47	0.0692	95.4	10.35	381
92298	61000	12.25	7.48	0.0690	100	10.85	382
92298	71000	12.25	7.49	0.0692	111.1	12.05	384
92298	81000	12.27	7.5	0.0693	112.4	12.18	385
92298	91000	12.25	7.5	0.0693	100.1	10.86	387
92298	101000	12.25	7.5	0.0693	111.8	12.13	388
92298	111000	12.22	7.5	0.0694	112.1	12.17	390

Recovery finished at 093098 123354

TABLE G-14

MONITORING WELL 22299
(Continued)

Log File Name : 10129822299
Setup Date (MMDDYY) : 101298
Setup Time (HHMMSS) : 133323
Starting Date (MMDDYY) : 101298
Starting Time (HHMMSS) : 134500
Stopping Date (MMDDYY) : 101398
Stopping Time (HHMMSS) : 134500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
101298	134500	12.26	7.66	0.738	115.8	12.46	263
101298	144500	12.09	7.65	0.74	117.1	12.65	282
101298	154500	11.95	7.65	0.739	117.4	12.71	291
101298	164500	11.91	7.65	0.739	116.8	12.66	297
101298	174500	11.91	7.65	0.739	116.8	12.66	302
101298	184500	11.93	7.65	0.739	116.5	12.63	306
101298	194500	11.93	7.65	0.739	116.5	12.63	310
101298	204500	11.93	7.64	0.739	116.6	12.64	314
101298	214500	11.93	7.64	0.739	116.4	12.62	318
101298	224500	11.9	7.64	0.739	116.6	12.64	322
101298	234500	11.86	7.64	0.738	116.8	12.68	325
101398	4500	11.83	7.64	0.737	117	12.71	328
101398	14500	11.8	7.64	0.738	116.8	12.7	331
101398	24500	11.78	7.64	0.738	116.9	12.71	335
101398	34500	11.76	7.64	0.737	116.8	12.7	338
101398	44500	11.75	7.63	0.736	116.6	12.69	342
101398	54500	11.75	7.63	0.736	116.4	12.66	345
101398	64500	11.73	7.62	0.735	116.6	12.69	349
101398	74500	11.73	7.61	0.735	116.5	12.68	353
101398	84500	11.73	7.61	0.734	116.6	12.69	357
101398	94500	11.73	7.61	0.73	116.4	12.67	361
101398	104500	11.76	7.6	0.731	115.3	12.54	366
101398	114500	11.8	7.6	0.729	113.7	12.36	371
101398	124500	11.78	7.62	0.725	115.6	12.57	375
101398	134500	11.9	7.61	0.728	113.3	12.29	381

Recovery finished at 102198 075711

TABLE G-14

MONITORING WELL 22299
(Continued)

2999

Log File Name : 11309822299
Setup Date (MMDDYY) : 113098
Setup Time (HHMMSS) : 121830
Starting Date (MMDDYY) : 113098
Starting Time (HHMMSS) : 112500
Stopping Date (MMDDYY) : 120198
Stopping Time (HHMMSS) : 112600
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
113098	122500	11.56	7.44	0.0623	97.5	10.89	292
113098	132500	11.54	7.47	0.0623	98.4	11	297
113098	142500	11.54	7.49	0.0623	98.4	11	301
113098	152500	11.54	7.5	0.0623	98.4	11	305
113098	162500	11.56	7.5	0.0622	99.3	11.09	308
113098	172500	11.57	7.51	0.0622	99.6	11.12	311
113098	182500	11.59	7.51	0.0623	101.6	11.34	313
113098	192500	11.61	7.51	0.0622	101	11.27	316
113098	202500	11.61	7.51	0.0621	101.1	11.28	317
113098	212500	11.62	7.52	0.0622	100.4	11.2	319
113098	222500	11.62	7.52	0.0622	98.2	10.96	320
113098	232500	11.62	7.52	0.0622	96	10.7	322
120198	2500	11.61	7.52	0.0622	95.9	10.7	323
120198	12500	11.59	7.52	0.0622	95.1	10.61	324
120198	22500	11.59	7.52	0.0622	95.3	10.63	326
120198	32500	11.57	7.52	0.0623	97.3	10.86	326
120198	42500	11.57	7.52	0.0623	102.1	11.4	327
120198	52500	11.57	7.52	0.0623	95.2	10.63	328
120198	62500	11.57	7.52	0.0622	94.4	10.54	329
120198	72500	11.57	7.52	0.0622	101.8	11.36	330
120198	82500	11.57	7.53	0.0623	101.5	11.33	331
120198	92500	11.57	7.53	0.0623	103.6	11.57	331
120198	102500	11.54	7.53	0.0624	95.5	10.67	332
120198	112500	11.49	7.52	0.0624	102.7	11.49	333

Recovery finished at 120198 162027

TABLE G-14

MONITORING WELL 22299
(Continued)

Log File Name : 12029822299
Setup Date (MMDDYY) : 120298
Setup Time (HHMMSS) : 095059
Starting Date (MMDDYY) : 120298
Starting Time (HHMMSS) : 090000
Stopping Date (MMDDYY) : 120398
Stopping Time (HHMMSS) : 090100
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
120298	100000	11.41	7.55	0.062	79.7	8.93	347
120298	110000	11.41	7.55	0.062	81.1	9.09	349
120298	120000	11.41	7.55	0.062	77	8.63	349
120298	130000	11.41	7.55	0.062	81	9.08	350
120298	140000	11.41	7.55	0.062	76.8	8.61	351
120298	150000	11.41	7.55	0.0621	77.2	8.65	352
120298	160000	11.43	7.55	0.0624	77.1	8.64	353
120298	170000	11.44	7.55	0.0625	77	8.62	354
120298	180000	11.48	7.55	0.0623	75.6	8.46	355
120298	190000	11.51	7.55	0.0623	75.3	8.42	356
120298	200000	11.54	7.55	0.0621	75.6	8.45	357
120298	210000	11.56	7.56	0.0622	74.9	8.37	359
120298	220000	11.57	7.55	0.062	75.8	8.47	360
120298	230000	11.57	7.56	0.062	75.9	8.48	362
120398	0	11.57	7.56	0.0621	74.2	8.28	363
120398	10000	11.57	7.56	0.0622	74.8	8.35	365
120398	20000	11.57	7.56	0.0623	74.7	8.34	367
120398	30000	11.54	7.56	0.0622	75.2	8.41	369
120398	40000	11.51	7.55	0.0623	74.3	8.31	371
120398	50000	11.48	7.55	0.0623	76.2	8.53	373
120398	60000	11.46	7.55	0.0623	75.9	8.5	376
120398	70000	11.44	7.55	0.0622	75.8	8.49	378
120398	80000	11.44	7.55	0.0622	74.9	8.38	381
120398	90000	11.44	7.55	0.0622	75.4	8.45	383

Recovery finished at 121098 093427

000345

TABLE G-14

MONITORING WELL 22299
(Continued)

2999

Log File Name : 01189922299
Setup Date (MMDDYY) : 011899
Setup Time (HHMMSS) : 101021
Starting Date (MMDDYY) : 011899
Starting Time (HHMMSS) : 101500
Stopping Date (MMDDYY) : 011999
Stopping Time (HHMMSS) : 103000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
11899	101500	10.92	7.04	0.0699	97.4	10.94	388
11899	111500	11.11	7.05	0.0701	112.1	12.54	393
11899	121500	11.13	7.04	0.07	109.3	12.22	393
11899	131500	11.13	7.03	0.0703	108.2	12.1	392
11899	141500	11.13	7.03	0.0704	106.1	11.87	391
11899	151500	11.13	7.03	0.0703	104.9	11.73	391
11899	161500	11.13	7.03	0.0703	110.3	12.33	390
11899	171500	11.15	7.03	0.0703	103	11.51	389
11899	181500	11.15	7.03	0.0702	102.1	11.42	387
11899	191500	11.13	7.03	0.0702	142.6	15.95	387
11899	201500	11.15	7.02	0.0702	110.6	12.36	387
11899	211500	11.15	7.02	0.0702	105.2	11.76	386
11899	221500	11.15	7.02	0.0701	102	11.41	385
11899	231500	11.13	7.02	0.0702	103.1	11.53	384
11999	1500	11.15	7.03	0.0701	111.1	12.42	383
11999	11500	11.15	7.03	0.0701	109.1	12.19	383
11999	21500	11.15	7.03	0.0702	109.3	12.21	383
11999	31500	11.15	7.03	0.0701	108.9	12.17	383
11999	41500	11.15	7.03	0.0702	100.4	11.22	380
11999	51500	11.13	7.03	0.0701	107.3	11.99	381
11999	61500	11.15	7.03	0.0702	106.9	11.95	382
11999	71500	11.15	7.03	0.0701	110.8	12.38	382
11999	81500	11.15	7.03	0.0701	103.3	11.54	379
11999	91500	11.15	7.03	0.0701	112.1	12.53	380
11999	101500	11.15	7.03	0.07	109.4	12.23	380

Recovery finished at 012199 104304

TABLE G-14

MONITORING WELL 22299
(Continued)

Log File Name : 02109922299
Setup Date (MMDDYY) : 021099
Setup Time (HHMMSS) : 104405
Starting Date (MMDDYY) : 021099
Starting Time (HHMMSS) : 105000
Stopping Date (MMDDYY) : 021199
Stopping Time (HHMMSS) : 105000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
21099	105000	11.16	7.32	0.0689	73.3	8.19	243
21099	115000	11.2	7.34	0.069	72.8	8.12	287
21099	125000	11.2	7.34	0.0692	66.5	7.42	304
21099	135000	11.2	7.35	0.0703	76.2	8.51	317
21099	145000	11.21	7.35	0.0703	80.8	9.02	327
21099	155000	11.21	7.35	0.0703	72.4	8.08	336
21099	165000	11.25	7.35	0.0703	72.3	8.06	344
21099	175000	11.26	7.35	0.0702	71.6	7.98	352
21099	185000	11.29	7.35	0.0702	70.8	7.89	359
21099	195000	11.33	7.35	0.0702	69.8	7.77	365
21099	205000	11.36	7.35	0.0703	69.2	7.7	372
21099	215000	11.38	7.34	0.0704	81.7	9.09	378
21099	225000	11.38	7.34	0.0704	67.1	7.46	384
21099	235000	11.38	7.35	0.0705	67.9	7.55	391
21199	5000	11.36	7.35	0.0707	74.3	8.27	398
21199	15000	11.36	7.36	0.0708	75.1	8.36	404
21199	25000	11.34	7.36	0.0708	70.2	7.81	411
21199	35000	11.31	7.36	0.0708	65.9	7.34	418
21199	45000	11.29	7.36	0.0708	69.2	7.71	424
21199	55000	11.28	7.36	0.0708	68.4	7.62	430
21199	65000	11.28	7.35	0.0708	66.4	7.4	436
21199	75000	11.28	7.35	0.0708	67.5	7.52	441
21199	85000	11.28	7.35	0.0707	65.4	7.28	445
21199	95000	11.28	7.35	0.0708	67.7	7.54	449
21199	105000	14.5	8.38	0.001	112	11.61	376

Recovery finished at 021299 115134

000347

2999

TABLE G-14

MONITORING WELL 22299
(Continued)

Log File Name : 04139922299
Setup Date (MMDDYY) : 041399
Setup Time (HHMMSS) : 082805
Starting Date (MMDDYY) : 041399
Starting Time (HHMMSS) : 093000
Stopping Date (MMDDYY) : 041499
Stopping Time (HHMMSS) : 094500
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
41399	93000	11.49	8.01	0.0695	54.9	5.94	431
41399	103000	11.49	8.01	0.0696	53	5.74	450
41399	113000	11.46	8.01	0.0695	51.8	5.6	457
41399	123000	11.47	8.01	0.0695	50.8	5.5	461
41399	133000	11.46	8.01	0.0694	50.1	5.43	464
41399	143000	11.49	8.01	0.0695	49.5	5.35	466
41399	153000	11.51	8.01	0.0695	49	5.3	467
41399	163000	11.55	8.01	0.0695	48.5	5.24	469
41399	173000	11.57	8.01	0.0695	48.2	5.2	470
41399	183000	11.6	8.01	0.0695	47.9	5.17	470
41399	193000	11.64	8.01	0.0695	47.5	5.13	471
41399	203000	11.65	8.01	0.0695	47.2	5.09	472
41399	213000	11.67	8.01	0.0694	47	5.06	473
41399	223000	11.67	8.01	0.0695	46.8	5.04	473
41399	233000	11.67	8.01	0.0695	46.6	5.02	474
41499	3000	11.65	8.01	0.0696	46.4	5	474
41499	13000	11.62	8.01	0.0697	46.3	5	476
41499	23000	11.6	8.01	0.0697	46.1	4.98	476
41499	33000	11.57	8.01	0.0697	46	4.97	476
41499	43000	11.55	8.01	0.0696	46	4.96	477
41499	53000	11.54	8.01	0.0696	46	4.97	478
41499	63000	11.52	8.02	0.0696	45.8	4.95	478
41499	73000	11.5	8.02	0.0696	45.7	4.94	478
41499	83000	11.49	8.02	0.0696	45.5	4.92	479
41499	93000	11.49	8.02	0.0694	45.5	4.92	479

Recovery finished at 041599 112420

TABLE G-14

MONITORING WELL 22299
(Continued)

Log File Name : 05189922299
Setup Date (MMDDYY) : 051899
Setup Time (HHMMSS) : 125936
Starting Date (MMDDYY) : 051899
Starting Time (HHMMSS) : 141000
Stopping Date (MMDDYY) : 051999
Stopping Time (HHMMSS) : 141000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
51899	141000	11.75	7.29	0.0684	78.9	8.48	432
51899	151000	11.75	7.29	0.0683	78	8.39	457
51899	161000	11.75	7.29	0.0685	78.1	8.4	468
51899	171000	11.75	7.44	0.0686	78.1	8.4	466
51899	181000	11.75	7.47	0.0686	77.3	8.31	469
51899	191000	11.75	7.46	0.0686	77	8.28	472
51899	201000	11.77	7.46	0.0684	77.5	8.32	474
51899	211000	11.78	7.47	0.0684	77.6	8.33	476
51899	221000	11.77	7.47	0.0684	78.2	8.41	477
51899	231000	11.75	7.47	0.0685	78.8	8.47	478
51999	1000	11.73	7.47	0.0685	78.8	8.48	480
51999	11000	11.72	7.47	0.069	78.4	8.43	481
51999	21000	11.69	7.47	0.0689	78	8.4	482
51999	31000	11.67	7.47	0.0687	78.1	8.41	483
51999	41000	11.65	7.48	0.0686	78.2	8.43	484
51999	51000	11.62	7.48	0.0686	78.1	8.42	484
51999	61000	11.62	7.48	0.0686	77.8	8.39	485
51999	71000	11.6	7.48	0.0685	78	8.41	486
51999	81000	11.6	7.48	0.0686	77.9	8.4	486
51999	91000	11.59	7.48	0.0686	77.7	8.38	486
51999	101000	11.59	7.48	0.0686	77.5	8.37	486
51999	111000	11.59	7.48	0.0685	77.5	8.37	487
51999	121000	11.6	7.48	0.0684	77.4	8.35	487
51999	131000	11.62	7.48	0.0683	77.2	8.32	488
51999	141000	11.65	7.48	0.0683	76.9	8.29	488

Recovery finished at 052599 063526

000349

TABLE G-14

MONITORING WELL 22299
(Continued)

2999

Setup Time (HHMMSS) : 082837
Starting Date (MMDDYY) : 060299
Starting Time (HHMMSS) : 093000
Stopping Date (MMDDYY) : 060399
Stopping Time (HHMMSS) : 093100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
60299	93000	11.97	7.68	0.0692	67	7.17	506
60299	103000	11.92	7.67	0.0708	60.5	6.47	510
60299	113000	11.9	7.67	0.0708	53.6	5.74	529
60299	123000	11.9	7.67	0.0706	49.8	5.34	538
60299	133000	11.9	7.68	0.0705	49.3	5.28	541
60299	143000	11.9	7.68	0.0704	49.5	5.3	541
60299	153000	11.9	7.68	0.0704	49.8	5.34	539
60299	163000	11.9	7.68	0.0704	50.7	5.43	541
60299	173000	11.88	7.68	0.0703	50.1	5.37	540
60299	183000	11.9	7.68	0.0702	50.7	5.43	536
60299	193000	11.88	7.68	0.0703	51.2	5.48	528
60299	203000	11.9	7.68	0.0707	50.9	5.46	526
60299	213000	11.9	7.68	0.0703	51	5.47	534
60299	223000	11.92	7.68	0.0703	50	5.36	536
60299	233000	11.92	7.68	0.0703	49	5.24	537
60399	3000	11.93	7.68	0.0703	47.8	5.12	541
60399	13000	11.95	7.68	0.0703	47.5	5.08	543
60399	23000	11.97	7.68	0.0703	46.7	5	543
60399	33000	11.98	7.68	0.0703	46.2	4.94	543
60399	43000	11.98	7.68	0.0703	45.1	4.82	543
60399	53000	11.98	7.68	0.0703	44	4.7	542
60399	63000	11.98	7.68	0.0703	43.1	4.61	542
60399	73000	11.97	7.68	0.0703	42.4	4.53	541
60399	83000	11.95	7.68	0.0703	41.5	4.44	540
60399	93000	18.86	7.06	0.0006	101.3	9.35	393

Recovery finished at 061499 125510

TABLE G-14

MONITORING WELL 22299
(Continued)

Log File Name : 07149922299
Setup Date (MMDDYY) : 071499
Setup Time (HHMMSS) : 092628
Starting Date (MMDDYY) : 071499
Starting Time (HHMMSS) : 103500
Stopping Date (MMDDYY) : 071599
Stopping Time (HHMMSS) : 103600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
71499	103500	11.78	7.29	0.0718	61.9	6.77	510
71499	113500	11.78	7.31	0.0718	62.1	6.79	524
71499	123500	11.78	7.31	0.0718	63.5	6.95	531
71499	133500	11.8	7.31	0.0718	64.1	7.02	535
71499	143500	11.83	7.32	0.0718	64.3	7.03	539
71499	153500	11.86	7.32	0.0717	64.5	7.04	542
71499	163500	11.9	7.32	0.0716	64.6	7.05	544
71499	173500	11.93	7.32	0.0717	64.4	7.03	547
71499	183500	11.95	7.32	0.0717	64.4	7.02	549
71499	193500	11.96	7.32	0.0717	64.8	7.06	551
71499	203500	11.98	7.32	0.0718	65	7.08	552
71499	213500	11.98	7.32	0.0718	65	7.08	554
71499	223500	11.99	7.32	0.0717	64.8	7.06	555
71499	233500	11.98	7.32	0.0716	65.4	7.13	556
71599	3500	11.96	7.32	0.0715	66	7.2	556
71599	13500	11.93	7.32	0.0715	66.2	7.22	557
71599	23500	11.91	7.32	0.0715	65.9	7.19	558
71599	33500	11.88	7.32	0.0716	65.7	7.17	558
71599	43500	11.86	7.32	0.0717	65.3	7.13	559
71599	53500	11.85	7.33	0.0717	64.7	7.07	559
71599	63500	11.83	7.33	0.0718	64.5	7.05	560
71599	73500	11.81	7.33	0.0718	64.1	7.01	560
71599	83500	11.81	7.33	0.0718	63.4	6.93	561
71599	93500	11.8	7.33	0.0718	62.9	6.88	561
71599	103500	11.8	7.33	0.0718	62.6	6.85	561

Recovery finished at 072299 112137

000351

TABLE G-14

MONITORING WELL 22299
(Continued)

2999

Log File Name : 08039922299
Setup Date (MMDDYY) : 080399
Setup Time (HHMMSS) : 075614
Starting Date (MMDDYY) : 080399
Starting Time (HHMMSS) : 090700
Stopping Date (MMDDYY) : 080499
Stopping Time (HHMMSS) : 091000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
80399	90700	11.98	7.65	0.0729	49.4	5.22	450
80399	100700	11.9	7.65	0.0728	43.1	4.57	433
80399	110700	11.87	7.66	0.0729	41.7	4.42	427
80399	120700	11.85	7.66	0.0731	40.6	4.31	426
80399	130700	11.85	7.66	0.0731	42.2	4.48	427
80399	140700	11.87	7.66	0.0732	38.1	4.05	429
80399	150700	11.88	7.66	0.0731	37.6	3.99	430
80399	160700	11.9	7.66	0.0727	37.7	4	434
80399	170700	11.93	7.66	0.0726	39.8	4.22	436
80399	180700	11.97	7.66	0.0728	40.3	4.27	437
80399	190700	11.98	7.66	0.0728	40.9	4.33	438
80399	200700	12	7.66	0.0728	41.1	4.35	440
80399	210700	12.01	7.66	0.0727	41.2	4.35	441
80399	220700	12.01	7.66	0.0727	40.9	4.32	443
80399	230700	12.03	7.66	0.0727	40.6	4.29	444
80499	700	12.03	7.66	0.0727	40.8	4.32	444
80499	10700	12.03	7.66	0.0726	40.5	4.28	446
80499	20700	12	7.65	0.0688	55.6	5.88	458
80499	30700	12	7.65	0.0725	43.4	4.6	471
80499	40700	11.98	7.65	0.0723	41.9	4.44	475
80499	50700	11.95	7.64	0.0723	41.2	4.36	477
80499	60700	11.93	7.65	0.0724	40.9	4.33	480
80499	70700	11.92	7.65	0.0725	40.9	4.34	481
80499	80700	11.9	7.65	0.0725	41.7	4.42	482
80499	90700	11.88	7.65	0.0726	40.6	4.31	483

Recovery finished at 081799 054100

TABLE G-15

MONITORING WELL 22300

Log File Name : 09039822300
Setup Date (MMDDYY) : 090398
Setup Time (HHMMSS) : 100415
Starting Date (MMDDYY) : 090398
Starting Time (HHMMSS) : 100500
Stopping Date (MMDDYY) : 091098
Stopping Time (HHMMSS) : 100500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90398	100500	12.09	7.21	0.741	72.5	7.62	574
90398	110500	12.08	7.22	0.74	114.9	12.08	575
90398	120500	12.08	7.21	0.741	114.9	12.08	576
90398	130500	12.08	7.22	0.741	114.9	12.08	575
90398	140500	12.08	7.21	0.741	114.5	12.05	576
90398	150500	12.09	7.21	0.742	114.3	12.02	576
90398	160500	12.14	7.21	0.743	114.2	12	577
90398	170500	12.18	7.22	0.743	114.6	12.03	576
90398	180500	12.21	7.23	0.744	115.1	12.07	576
90398	190500	12.26	7.23	0.745	115.5	12.1	575
90398	200500	12.27	7.23	0.746	115.7	12.12	575
90398	210500	12.29	7.23	0.746	115.7	12.11	576
90398	220500	12.31	7.23	0.744	115.7	12.1	576
90398	230500	12.32	7.23	0.744	115.4	12.07	576
90498	500	12.37	7.24	0.741	115.3	12.05	576
90498	10500	12.41	7.24	0.742	115.7	12.08	577
90498	20500	12.41	7.25	0.742	115.6	12.07	577
90498	30500	12.42	7.25	0.739	116.7	12.18	577
90498	40500	12.41	7.25	0.737	116	12.11	577
90498	50500	12.47	7.25	0.742	115.9	12.08	578
90498	60500	12.52	7.27	0.745	115.8	12.06	575
90498	70500	12.37	7.26	0.749	116.9	12.22	576
90498	80500	12.24	7.27	0.747	118.2	12.38	578
90498	90500	12.18	7.28	0.748	117.8	12.36	578
90498	100500	12.14	7.29	0.748	118.2	12.41	578
90498	110500	12.13	7.28	0.749	117.6	12.36	578
90498	120500	12.13	7.27	0.746	117	12.29	578
90498	130500	12.13	7.27	0.745	117.2	12.31	579
90498	140500	12.14	7.26	0.745	116.6	12.25	579
90498	150500	12.16	7.26	0.747	116.5	12.23	579
90498	160500	12.19	7.26	0.747	116.5	12.22	579

000353

2999

TABLE G-15

MONITORING WELL 22300
(Continued)

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90498	170500	12.24	7.27	0.747	116	12.15	579
90498	180500	12.27	7.27	0.747	115.5	12.09	579
90498	190500	12.31	7.27	0.747	114.4	11.97	578
90498	200500	12.34	7.27	0.747	114.9	12.02	577
90498	210500	12.36	7.26	0.748	115.3	12.05	578
90498	220500	12.37	7.26	0.748	115.5	12.06	578
90498	230500	12.37	7.28	0.748	115.6	12.07	578
90598	500	12.36	7.28	0.748	115.6	12.08	578
90598	10500	12.32	7.27	0.747	116.6	12.19	579
90598	20500	12.29	7.29	0.747	116.6	12.2	579
90598	30500	12.24	7.3	0.747	116.8	12.24	578
90598	40500	12.21	7.29	0.746	117.2	12.29	579
90598	50500	12.18	7.3	0.746	116.8	12.25	579
90598	60500	12.16	7.29	0.746	117.4	12.32	580
90598	70500	12.13	7.3	0.746	117.3	12.32	580
90598	80500	12.11	7.3	0.745	117.2	12.32	580
90598	90500	12.11	7.29	0.743	117	12.3	581
90598	100500	12.11	7.29	0.743	116.5	12.25	581
90598	110500	12.14	7.29	0.744	115.7	12.15	581
90598	120500	12.23	7.3	0.745	115.9	12.15	581
90598	130500	12.19	7.29	0.747	116.3	12.2	581
90598	140500	12.13	7.29	0.747	116.9	12.28	582
90598	150500	12.13	7.29	0.745	116.6	12.25	582
90598	160500	12.16	7.29	0.745	116.7	12.25	582
90598	170500	12.22	7.29	0.746	116.6	12.22	582
90598	180500	12.24	7.3	0.747	116.3	12.19	582
90598	190500	12.27	7.3	0.747	115.8	12.13	582
90598	200500	12.31	7.3	0.747	115.4	12.08	582
90598	210500	12.32	7.3	0.746	115.5	12.08	582
90598	220500	12.34	7.29	0.742	115.5	12.08	583
90598	230500	12.39	7.3	0.742	114.8	11.98	583
90698	500	12.49	7.3	0.742	114.4	11.92	583
90698	10500	12.52	7.3	0.744	114.8	11.95	583
90698	20500	12.41	7.3	0.748	116.3	12.14	583
90698	30500	12.32	7.31	0.747	117.6	12.3	584
90698	40500	12.27	7.31	0.748	117.2	12.27	584
90698	50500	12.26	7.32	0.747	117.7	12.33	585
90698	60500	12.24	7.32	0.747	117.4	12.3	585
90698	70500	12.21	7.31	0.746	117.1	12.28	585
90698	80500	12.19	7.31	0.746	117.8	12.35	586
90698	90500	12.18	7.31	0.746	117.8	12.36	587

000354

TABLE G-15

MONITORING WELL 22300
(Continued)

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90698	100500	12.16	7.31	0.746	118.4	12.43	587
90698	110500	12.14	7.31	0.746	118.3	12.42	587
90698	120500	12.13	7.31	0.746	118.2	12.42	587
90698	130500	12.13	7.31	0.746	118.3	12.43	588
90698	140500	12.14	7.31	0.745	118.2	12.41	588
90698	150500	12.18	7.3	0.746	118	12.39	588
90698	160500	12.21	7.3	0.746	117.5	12.32	588
90698	170500	12.27	7.3	0.746	117.3	12.28	588
90698	180500	12.32	7.31	0.746	116.6	12.19	588
90698	190500	12.36	7.31	0.746	116	12.13	588
90698	200500	12.39	7.3	0.745	116.3	12.15	588
90698	210500	12.41	7.31	0.746	116.5	12.17	589
90698	220500	12.42	7.31	0.746	116.6	12.17	589
90698	230500	12.42	7.31	0.746	117.1	12.22	589
90798	500	12.39	7.31	0.747	117.1	12.23	589
90798	10500	12.34	7.31	0.747	117.9	12.33	590
90798	20500	12.29	7.3	0.747	118.1	12.36	591
90798	30500	12.26	7.31	0.747	117.9	12.35	591
90798	40500	12.23	7.31	0.747	118.1	12.38	591
90798	50500	12.21	7.3	0.746	118.3	12.41	592
90798	60500	12.19	7.3	0.746	118	12.38	592
90798	70500	12.18	7.31	0.745	117.9	12.37	592
90798	80500	12.18	7.31	0.746	117.5	12.33	592
90798	90500	12.16	7.31	0.745	117.6	12.35	592
90798	100500	12.16	7.31	0.746	117.4	12.32	592
90798	110500	12.18	7.31	0.746	117.5	12.33	593
90798	120500	12.18	7.31	0.746	117.2	12.3	593
90798	130500	12.18	7.31	0.746	117.1	12.29	593
90798	140500	12.18	7.31	0.746	117.2	12.3	593
90798	150500	12.18	7.3	0.746	117.3	12.31	594
90798	160500	12.21	7.31	0.745	117.3	12.3	594
90798	170500	12.24	7.31	0.745	116.7	12.23	594
90798	180500	12.29	7.31	0.745	115.9	12.13	594
90798	190500	12.32	7.31	0.744	115.8	12.11	594
90798	200500	12.37	7.31	0.741	115.3	12.05	594
90798	210500	12.44	7.31	0.738	114.9	11.99	594
90798	220500	12.59	7.31	0.738	114.1	11.87	594
90798	230500	12.67	7.31	0.74	115	11.94	594
90898	500	12.51	7.32	0.746	115.8	12.07	594
90898	10500	12.37	7.32	0.747	117.8	12.31	594
90898	20500	12.27	7.32	0.748	118.2	12.38	595

2999

TABLE G-15

MONITORING WELL 22300
(Continued)

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90898	30500	12.21	7.32	0.747	118.3	12.41	595
90898	40500	12.16	7.32	0.746	118.2	12.41	595
90898	50500	12.13	7.32	0.746	117.5	12.35	595
90898	60500	12.09	7.32	0.745	116.8	12.28	595
90898	70500	12.08	7.32	0.745	117.2	12.32	596
90898	80500	12.06	7.32	0.744	117.4	12.35	596
90898	90500	12.04	7.32	0.745	117.4	12.36	597
90898	100500	12.03	7.32	0.745	117.7	12.39	597
90898	110500	12.01	7.31	0.744	117.7	12.4	597
90898	120500	12.01	7.31	0.744	117.7	12.4	598
90898	130500	12.01	7.31	0.744	117.7	12.4	598
90898	140500						

Recovery finished at 090998 080654

000356

TABLE G-15

MONITORING WELL 22300
(Continued)

Log File Name : 09309822300
Setup Date (MMDDYY) : 093098
Setup Time (HHMMSS) : 104054
Starting Date (MMDDYY) : 100298
Starting Time (HHMMSS) : 110000
Stopping Date (MMDDYY) : 100398
Stopping Time (HHMMSS) : 110000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
100298	110000	11.93	7.6	0.722	115.2	12.49	500
100298	120000	11.93	7.6	0.721	114.9	12.45	501
100298	130000	11.93	7.6	0.721	115.1	12.48	502
100298	140000	11.93	7.6	0.724	115.1	12.48	503
100298	150000	11.95	7.6	0.733	115.2	12.48	503
100298	160000	11.96	7.61	0.737	115.4	12.5	504
100298	170000	11.93	7.6	0.737	115.1	12.48	505
100298	180000	11.9	7.6	0.737	115.1	12.48	506
100298	190000	11.88	7.6	0.739	115.1	12.49	507
100298	200000	11.86	7.6	0.739	115.1	12.49	508
100298	210000	11.86	7.6	0.739	114.8	12.46	509
100298	220000	11.85	7.6	0.741	114.7	12.45	511
100298	230000	11.83	7.6	0.741	114.9	12.48	512
100398	0	11.81	7.59	0.741	115	12.49	513
100398	10000	11.8	7.59	0.741	115.2	12.52	514
100398	20000	11.78	7.59	0.739	114.8	12.48	515
100398	30000	11.76	7.6	0.739	114.8	12.49	516
100398	40000	11.81	7.6	0.74	114.5	12.44	517
100398	50000	11.83	7.6	0.74	115.2	12.51	518
100398	60000	11.8	7.6	0.74	115.2	12.52	519
100398	70000	11.76	7.59	0.739	114.9	12.5	521
100398	80000	11.75	7.59	0.739	115.1	12.52	522
100398	90000	11.73	7.59	0.739	114.7	12.48	524
100398	100000	11.73	7.59	0.739	114.7	12.48	525
100398	110000	11.71	7.58	0.739	115	12.52	527

Recovery finished at 102198 075341

000357

2999

TABLE G-15

MONITORING WELL 22300
(Continued)

Log File Name : 11239822300
Setup Date (MMDDYY) : 112398
Setup Time (HHMMSS) : 154354
Starting Date (MMDDYY) : 112398
Starting Time (HHMMSS) : 144500
Stopping Date (MMDDYY) : 112498
Stopping Time (HHMMSS) : 144600
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
112398	154500	11.58	7.63	0.0708	73.9	8.25	193
112398	164500	11.58	7.64	0.0712	112	12.51	221
112398	174500	11.6	7.64	0.0709	112.4	12.55	231
112398	184500	11.6	7.64	0.0708	112.6	12.57	238
112398	194500	11.62	7.64	0.0708	112.9	12.6	245
112398	204500	11.62	7.64	0.0707	113.1	12.62	250
112398	214500	11.62	7.64	0.0707	113.5	12.66	254
112398	224500	11.62	7.64	0.071	113.6	12.67	258
112398	234500	11.63	7.64	0.0712	113.2	12.63	261
112498	4500	11.63	7.64	0.0712	113.9	12.7	263
112498	14500	11.65	7.65	0.0712	114.2	12.73	265
112498	24500	11.65	7.65	0.0711	114.1	12.72	267
112498	34500	11.65	7.64	0.071	114.2	12.73	269
112498	44500	11.65	7.64	0.0708	114.3	12.74	272
112498	54500	11.65	7.64	0.0708	114.1	12.72	274
112498	64500	11.63	7.64	0.0709	114.4	12.76	276
112498	74500	11.63	7.63	0.0708	114.1	12.72	278
112498	84500	11.63	7.63	0.0707	113.4	12.65	280
112498	94500	11.62	7.63	0.0706	113.5	12.66	282
112498	104500	11.62	7.63	0.0706	114.5	12.78	283
112498	114500	11.6	7.63	0.0706	112.5	12.56	285
112498	124500	11.58	7.64	0.0706	101.5	11.33	287
112498	134500	11.58	7.64	0.0708	100.3	11.2	289
112498	144500	11.6	7.63	0.0712	100.8	11.25	288

Recovery finished at 113098 093427

TABLE G-15

MONITORING WELL 22300
(Continued)

Log File Name : 12169822300
Setup Date (MMDDYY) : 121698
Setup Time (HHMMSS) : 103702
Starting Date (MMDDYY) : 121698
Starting Time (HHMMSS) : 093500
Stopping Date (MMDDYY) : 121798
Stopping Time (HHMMSS) : 093600
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
121698	113500	11.39	7.74	0.0689	119.2	13.37	501
121698	123500	11.39	7.74	0.0688	118.9	13.34	501
121698	133500	11.37	7.75	0.0687	118.7	13.32	502
121698	143500	11.37	7.75	0.0689	118.8	13.33	502
121698	153500	11.37	7.76	0.0689	118.5	13.3	502
121698	163500	11.37	7.77	0.0687	118.8	13.33	501
121698	173500	11.39	7.76	0.0687	118.4	13.28	502
121698	183500	11.39	7.76	0.0687	118.6	13.3	503
121698	193500	11.4	7.76	0.0687	117.8	13.21	504
121698	203500	11.42	7.75	0.0688	118	13.22	504
121698	213500	11.42	7.76	0.0689	118.2	13.25	504
121698	223500	11.43	7.76	0.0689	117.6	13.18	504
121698	233500	11.43	7.77	0.0689	117.6	13.18	504
121798	3500	11.43	7.77	0.069	117.8	13.2	504
121798	13500	11.43	7.77	0.0688	117.1	13.12	505
121798	23500	11.43	7.76	0.0687	117.1	13.12	505
121798	33500	11.42	7.76	0.0685	116.5	13.05	506
121798	43500	11.43	7.75	0.0687	116.9	13.09	507
121798	53500	11.43	7.75	0.0688	117.2	13.13	508
121798	63500	11.43	7.75	0.0688	118	13.22	508
121798	73500	11.43	7.75	0.0688	118	13.22	508
121798	83500	11.43	7.77	0.0688	118.1	13.23	507
121798	93500	11.42	7.77	0.0688	117.7	13.19	507

Recovery finished at 122398 095344

000359

TABLE G-15

MONITORING WELL 22300
(Continued)

2999

Log File Name : 01119922300
Setup Date (MMDDYY) : 011199
Setup Time (HHMMSS) : 103242
Starting Date (MMDDYY) : 011199
Starting Time (HHMMSS) : 103500
Stopping Date (MMDDYY) : 011299
Stopping Time (HHMMSS) : 104500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
11199	103500	9.23	6.8	0.0539	59.6	6.97	349
11199	113500	10.74	7.06	0.0578	92.1	10.39	347
11199	123500	11	7.11	0.061	93.1	10.44	345
11199	133500	11.08	7.12	0.0627	93.5	10.46	344
11199	143500	11.1	7.12	0.064	93.5	10.47	343
11199	153500	11.11	7.12	0.0651	95.5	10.68	342
11199	163500	11.11	7.12	0.0658	95.3	10.66	341
11199	173500	11.13	7.12	0.0666	94.5	10.57	341
11199	183500	11.13	7.12	0.0671	94.9	10.62	340
11199	193500	11.13	7.11	0.0676	96.5	10.79	340
11199	203500	11.13	7.11	0.068	94.6	10.58	340
11199	213500	11.13	7.1	0.0682	92.7	10.36	339
11199	223500	11.13	7.1	0.0686	96.2	10.75	339
11199	233500	11.13	7.09	0.0687	97.3	10.88	338
11299	3500	11.13	7.09	0.069	101.3	11.33	337
11299	13500	11.15	7.09	0.0692	93.8	10.48	337
11299	23500	11.15	7.09	0.0693	94.6	10.57	336
11299	33500	11.15	7.08	0.0696	99.8	11.16	336
11299	43500	11.15	7.08	0.0696	92.4	10.32	336
11299	53500	11.15	7.08	0.0699	99	11.06	335
11299	63500	11.15	7.08	0.07	100.2	11.2	335
11299	73500	11.15	7.08	0.0701	94.5	10.56	335
11299	83500	11.15	7.07	0.0705	99.5	11.12	336
11299	93500	11.15	7.07	0.0706	96.6	10.8	336
11299	103500	11.15	7.07	0.0706	92.7	10.36	337

Recovery finished at 011499 142230

TABLE G-15

MONITORING WELL 22300
(Continued)

Log File Name : 02049922300
Setup Date (MMDDYY) : 020499
Setup Time (HHMMSS) : 111131
Starting Date (MMDDYY) : 020499
Starting Time (HHMMSS) : 111500
Stopping Date (MMDDYY) : 020599
Stopping Time (HHMMSS) : 111600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
20499	111500	11.24	7.23	0.0658	60.9	6.79	242
20499	121500	11.29	7.24	0.0666	64.9	7.23	272
20499	131500	11.31	7.26	0.0671	64.7	7.21	282
20499	141500	11.32	7.29	0.0673	64.3	7.16	287
20499	151500	11.29	7.31	0.0674	64.1	7.14	292
20499	161500	11.3	7.33	0.0673	64.1	7.14	295
20499	171500	11.29	7.35	0.0674	63.5	7.08	297
20499	181500	11.29	7.37	0.0674	62.6	6.98	299
20499	191500	11.29	7.36	0.0675	62.2	6.93	301
20499	201500	11.29	7.36	0.0675	61.9	6.89	303
20499	211500	11.3	7.36	0.0674	61.5	6.85	305
20499	221500	11.31	7.37	0.0675	61.4	6.84	306
20499	231500	11.31	7.38	0.0676	61.1	6.8	307
20599	1500	11.32	7.38	0.0676	60.8	6.77	309
20599	11500	11.34	7.38	0.0675	60.7	6.76	311
20599	21500	11.34	7.38	0.0675	60.4	6.72	312
20599	31500	11.32	7.39	0.0677	60.3	6.71	313
20599	41500	11.32	7.4	0.0677	60.2	6.7	315
20599	51500	11.32	7.4	0.0676	60.2	6.7	316
20599	61500	11.31	7.41	0.0678	60.1	6.69	318
20599	71500	11.3	7.41	0.0678	60	6.68	319
20599	81500	11.29	7.41	0.0678	59.6	6.63	319
20599	91500	11.29	7.41	0.0678	59.3	6.61	320
20599	101500	11.27	7.43	0.0679	59.2	6.6	320
20599	111500	11.26	7.43	0.0679	59	6.58	320

Recovery finished at 020999 071053

000361

TABLE G-15

MONITORING WELL 22300
(Continued)

2999

Log File Name : 04019922300
Setup Date (MMDDYY) : 040199
Setup Time (HHMMSS) : 110751
Starting Date (MMDDYY) : 040199
Starting Time (HHMMSS) : 111500
Stopping Date (MMDDYY) : 040299
Stopping Time (HHMMSS) : 111600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
40199	111500	11.73	7.62	0.0705	56.5	6.07	294
40199	121500	11.54	7.68	0.0779	52.4	5.67	293
40199	131500	11.49	7.72	0.0782	49.6	5.37	293
40199	141500	11.49	7.73	0.0738	48.1	5.2	295
40199	151500	11.5	7.74	0.0754	46.1	4.98	296
40199	161500	11.5	7.74	0.0777	45.6	4.94	299
40199	171500	11.5	7.75	0.078	44.5	4.81	300
40199	181500	11.49	7.75	0.0781	43.5	4.71	301
40199	191500	11.49	7.76	0.076	44.9	4.86	302
40199	201500	11.51	7.77	0.0758	42.7	4.62	303
40199	211500	11.53	7.76	0.0776	42	4.54	304
40199	221500	11.57	7.76	0.0771	42.3	4.56	305
40199	231500	11.61	7.76	0.0766	41	4.43	306
40299	1500	11.61	7.77	0.0769	40.2	4.34	306
40299	11500	11.62	7.77	0.077	40.3	4.34	308
40299	21500	11.64	7.77	0.0769	39.5	4.26	308
40299	31500	11.65	7.77	0.0776	38.1	4.1	308
40299	41500	11.62	7.77	0.0779	37.5	4.04	309
40299	51500	11.57	7.77	0.078	37.4	4.03	309
40299	61500	11.55	7.77	0.0777	37.2	4.01	309
40299	71500	11.54	7.78	0.0777	37	3.99	309
40299	81500	11.52	7.78	0.0774	36.8	3.97	309
40299	91500	11.5	7.78	0.0774	36.5	3.95	310
40299	101500	11.49	7.79	0.0772	36.3	3.93	311
40299	111500	11.5	7.78	0.0772	36	3.9	311

Recovery finished at 041299 060238

TABLE G-15

MONITORING WELL 22300
(Continued)

Log File Name : 05139922300
Setup Date (MMDDYY) : 051399
Setup Time (HHMMSS) : 103017
Starting Date (MMDDYY) : 051399
Starting Time (HHMMSS) : 120000
Stopping Date (MMDDYY) : 051499
Stopping Time (HHMMSS) : 120100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
51399	120000	11.65	7.2	0.0688	61.9	6.67	367
51399	130000	11.65	7.19	0.0687	60.4	6.51	368
51399	140000	11.67	7.18	0.0687	57.9	6.24	369
51399	150000	11.7	7.18	0.0687	57.7	6.21	369
51399	160000	11.73	7.18	0.0688	58.2	6.26	370
51399	170000	11.75	7.18	0.0688	58.5	6.29	370
51399	180000	11.77	7.19	0.0688	57.4	6.17	371
51399	190000	11.75	7.2	0.0688	59.7	6.42	371
51399	200000	11.73	7.2	0.0688	60.8	6.54	372
51399	210000	11.72	7.21	0.0688	60.9	6.56	372
51399	220000	11.7	7.22	0.0687	61	6.56	373
51399	230000	11.69	7.22	0.0687	60.3	6.49	373
51499	0	11.67	7.23	0.0687	61.2	6.59	373
51499	10000	11.65	7.24	0.0687	60.6	6.52	373
51499	20000	11.65	7.25	0.0687	61	6.57	374
51499	30000	11.64	7.25	0.0687	61.2	6.6	374
51499	40000	11.64	7.26	0.0682	61.7	6.65	374
51499	50000	11.64	7.27	0.0683	62.4	6.73	374
51499	60000	11.72	7.27	0.0686	57.2	6.15	375
51499	70000	11.72	7.27	0.0687	58.3	6.27	375
51499	80000	11.65	7.28	0.0688	60.2	6.49	376
51499	90000	11.62	7.28	0.0688	60.4	6.51	376
51499	100000	11.6	7.28	0.0688	60	6.48	376
51499	110000	11.6	7.29	0.0689	60.7	6.55	376
51499	120000	11.62	7.29	0.0688	61.3	6.62	377

Recovery finished at 052599 063125

000363

TABLE G-15

MONITORING WELL 22300
(Continued)

2999

Log File Name : 06169922300
Setup Date (MMDDYY) : 061699
Setup Time (HHMMSS) : 100601
Starting Date (MMDDYY) : 061699
Starting Time (HHMMSS) : 111500
Stopping Date (MMDDYY) : 061799
Stopping Time (HHMMSS) : 111600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
61699	111500	11.68	7.32	0.0707	63.2	6.93	355
61699	121500	11.68	7.32	0.0704	63.7	6.99	355
61699	131500	11.71	7.32	0.0702	63.4	6.95	355
61699	141500	11.73	7.32	0.0701	63.1	6.92	354
61699	151500	11.76	7.32	0.07	63.1	6.91	354
61699	161500	11.78	7.33	0.07	63.1	6.91	354
61699	171500	11.8	7.33	0.07	63.2	6.91	354
61699	181500	11.81	7.33	0.07	63.1	6.9	354
61699	191500	11.83	7.33	0.0699	63.2	6.91	354
61699	201500	11.83	7.33	0.07	62.9	6.87	353
61699	211500	11.85	7.33	0.07	62.8	6.87	353
61699	221500	11.85	7.34	0.07	63.5	6.94	353
61699	231500	11.83	7.34	0.0694	61.1	6.68	353
61799	1500	11.81	7.34	0.0696	65.5	7.17	353
61799	11500	11.81	7.34	0.07	65.3	7.15	353
61799	21500	11.95	7.34	0.0699	63.9	6.97	353
61799	31500	11.95	7.34	0.0698	65.1	7.1	353
61799	41500	11.83	7.34	0.0699	64.6	7.06	353
61799	51500	11.76	7.35	0.07	63.6	6.97	353
61799	61500	11.73	7.35	0.07	63.2	6.93	353
61799	71500	11.71	7.35	0.07	63.2	6.92	353
61799	81500	11.7	7.35	0.07	63.3	6.94	353
61799	91500	11.7	7.35	0.07	63.3	6.94	353
61799	101500	11.7	7.35	0.07	63.3	6.94	353
61799	111500	11.68	7.35	0.07	63.4	6.95	354

Recovery finished at 062999 083427

TABLE G-15

MONITORING WELL 22300
(Continued)

Log File Name : 07019922300
Setup Date (MMDDYY) : 070199
Setup Time (HHMMSS) : 090200
Starting Date (MMDDYY) : 070199
Starting Time (HHMMSS) : 101500
Stopping Date (MMDDYY) : 070299
Stopping Time (HHMMSS) : 103000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
70199	101500	11.88	7.27	0.0719	51	5.56	514
70199	111500	11.9	7.28	0.0719	49.3	5.38	532
70199	121500	11.91	7.28	0.0719	47.9	5.23	539
70199	131500	11.95	7.28	0.072	48.2	5.26	544
70199	141500	11.99	7.28	0.072	47.6	5.18	547
70199	151500	12.01	7.28	0.072	47.9	5.21	549
70199	161500	12.04	7.28	0.0719	47.3	5.15	550
70199	171500	12.08	7.28	0.0719	47	5.11	550
70199	181500	12.09	7.28	0.072	47.6	5.17	551
70199	191500	12.09	7.28	0.0719	47.6	5.17	552
70199	201500	12.09	7.28	0.0719	46.9	5.1	552
70199	211500	12.09	7.28	0.0719	47.3	5.14	553
70199	221500	12.09	7.28	0.0721	48	5.22	554
70199	231500	12.09	7.28	0.0723	46.9	5.1	554
70299	1500	12.06	7.28	0.0722	49	5.33	554
70299	11500	12.03	7.28	0.072	48.7	5.3	554
70299	21500	11.95	7.28	0.0719	48.8	5.33	555
70299	31500	11.9	7.28	0.0717	48.6	5.3	556
70299	41500	11.86	7.27	0.0716	47.9	5.23	556
70299	51500	11.85	7.27	0.0716	47.6	5.2	557
70299	61500	11.85	7.27	0.0716	48.2	5.27	558
70299	71500	11.85	7.27	0.0714	48.2	5.27	558
70299	81500	11.85	7.28	0.0717	54	5.9	558
70299	91500	11.85	7.27	0.0714	57.8	6.31	559
70299	101500	11.83	7.27	0.0715	52.9	5.79	559

Recovery finished at 072299 111814

000365

2999

TABLE G-15

MONITORING WELL 22300
(Continued)

Log File Name : 08039922300
Setup Date (MMDDYY) : 080399
Setup Time (HHMMSS) : 084421
Starting Date (MMDDYY) : 080399
Starting Time (HHMMSS) : 094000
Stopping Date (MMDDYY) : 080499
Stopping Time (HHMMSS) : 094100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
80399	94000	11.95	7.17	0.0752	61.5	6.51	348
80399	104000	11.83	7.18	0.0747	52.4	5.55	353
80399	114000	11.8	7.18	0.0745	49.6	5.26	358
80399	124000	11.78	7.18	0.0748	47.7	5.07	361
80399	134000	11.78	7.18	0.0741	47.5	5.05	363
80399	144000	11.8	7.18	0.074	47.7	5.07	366
80399	154000	11.81	7.18	0.074	46.4	4.92	368
80399	164000	11.85	7.18	0.0745	44.2	4.68	370
80399	174000	11.86	7.18	0.0742	43.5	4.61	371
80399	184000	11.9	7.18	0.074	43.5	4.61	373
80399	194000	11.91	7.18	0.074	44.2	4.68	374
80399	204000	11.93	7.18	0.0741	44	4.66	375
80399	214000	11.93	7.18	0.0742	42.4	4.48	376
80399	224000	11.95	7.18	0.0738	41.5	4.39	377
80399	234000	11.96	7.18	0.0739	41.3	4.37	378
80499	4000	11.96	7.18	0.0741	41.7	4.41	379
80499	14000	11.95	7.18	0.0739	41.3	4.37	380
80499	24000	11.95	7.16	0.0738	44.2	4.68	380
80499	34000	11.91	7.17	0.074	42.8	4.53	382
80499	44000	11.9	7.17	0.0739	42.5	4.5	383
80499	54000	11.86	7.17	0.0735	41.8	4.43	383
80499	64000	11.85	7.17	0.074	41.7	4.42	384
80499	74000	11.83	7.17	0.074	40.5	4.3	385
80499	84000	11.81	7.17	0.074	40.8	4.32	386
80499	94000	11.81	7.17	0.0739	40.5	4.29	386

Recovery finished at 081299 074347

TABLE G-16

MONITORING WELL 22301

Log File Name : 09099822301
Setup Date (MMDDYY) : 090998
Setup Time (HHMMSS) : 105916
Starting Date (MMDDYY) : 090998
Starting Time (HHMMSS) : 110500
Stopping Date (MMDDYY) : 091698
Stopping Time (HHMMSS) : 110500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90998	110500	11.92	7.83	0.0685	106.2	11.21	157
90998	120500	11.9	7.85	0.0683	111.4	11.77	194
90998	130500	11.9	7.84	0.0682	117.8	12.44	213
90998	140500	11.92	7.84	0.0682	117.6	12.41	225
90998	150500	11.94	7.83	0.0681	117	12.35	234
90998	160500	11.95	7.83	0.068	113.8	12	241
90998	170500	11.97	7.83	0.0679	113	11.91	246
90998	180500	12	7.82	0.0678	119.1	12.55	251
90998	190500	12.02	7.82	0.0676	119.4	12.58	254
90998	200500	12.04	7.82	0.0677	116	12.21	258
90998	210500	12.05	7.82	0.0676	114.5	12.05	261
90998	220500	12.05	7.81	0.0676	115.7	12.18	263
90998	230500	12.05	7.81	0.0675	112.5	11.84	266
91098	500	12.04	7.81	0.0675	116.6	12.28	268
91098	10500	12.02	7.8	0.0675	117.7	12.4	270
91098	20500	12	7.8	0.0674	113.3	11.94	273
91098	30500	11.99	7.8	0.0674	121.2	12.77	275
91098	40500	11.97	7.79	0.0673	118.4	12.48	276
91098	50500	11.94	7.79	0.0674	107.1	11.31	279
91098	60500	11.92	7.79	0.0674	117.1	12.36	280
91098	70500	11.9	7.79	0.0673	119.4	12.61	282
91098	80500	11.89	7.79	0.0673	117.3	12.39	283
91098	90500	11.89	7.79	0.0673	117.5	12.41	285
91098	100500	11.87	7.79	0.0672	117.3	12.4	287
91098	110500	11.87	7.79	0.0672	117.8	12.45	289

TABLE G-16

MONITORING WELL 22301
(Continued)

2999

Log File Name : 10089822301
Setup Date (MMDDYY) : 100898
Setup Time (HHMMSS) : 095518
Starting Date (MMDDYY) : 100898
Starting Time (HHMMSS) : 100000
Stopping Date (MMDDYY) : 100998
Stopping Time (HHMMSS) : 100000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
100898	100000	11.84	7.51	0.0523	34.3	3.75	290
100898	110000	11.8	7.51	0.0530	34.5	3.78	316
100898	120000	11.79	7.52	0.0539	36.3	3.98	327
100898	130000	11.79	7.52	0.0543	34.9	3.82	331
100898	140000	11.79	7.53	0.0542	31.4	3.44	334
100898	150000	11.77	7.51	0.0542	35.6	3.9	336
100898	160000	11.77	7.51	0.0542	35.4	3.88	337
100898	170000	11.76	7.51	0.0542	33.8	3.71	338
100898	180000	11.76	7.51	0.0543	31.3	3.43	339
100898	190000	11.76	7.51	0.0543	33.9	3.72	340
100898	200000	11.74	7.52	0.0543	29.6	3.25	341
100898	210000	11.74	7.53	0.0543	30	3.29	341
100898	220000	11.72	7.53	0.0543	29.3	3.22	342
100898	230000	11.72	7.52	0.0544	30.4	3.33	343
100998	0	11.71	7.52	0.0544	29.1	3.19	345
100998	10000	11.71	7.53	0.0545	28.6	3.14	347
100998	20000	11.69	7.56	0.0545	28.3	3.11	347
100998	30000	11.67	7.56	0.0545	31.9	3.5	347
100998	40000	11.67	7.54	0.0545	28.8	3.16	349
100998	50000	11.67	7.49	0.0546	30.8	3.39	345
100998	60000	11.66	7.46	0.0546	30.4	3.34	342
100998	70000	11.66	7.45	0.0546	27.1	2.98	339
100998	80000	11.66	7.47	0.0546	27.3	3	340
100998	90000	11.64	7.47	0.0547	30.2	3.32	343
100998	100000	11.64	7.45	0.0547	27.9	3.06	347

Recovery finished at 102698 093630

TABLE G-16

MONITORING WELL 22301

(Continued)

Log File Name : 11059822301
Setup Date (MMDDYY) : 110598
Setup Time (HHMMSS) : 121022
Starting Date (MMDDYY) : 110598
Starting Time (HHMMSS) : 111000
Stopping Date (MMDDYY) : 110698
Stopping Time (HHMMSS) : 111000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
110598	131000	11.47	7.53	0.0678	116.4	13.03	345
110598	141000	11.47	7.53	0.068	116	12.98	345
110598	151000	11.48	7.53	0.0681	115.5	12.93	346
110598	161000	11.5	7.53	0.0682	115.3	12.89	346
110598	171000	11.5	7.53	0.0682	114.8	12.85	347
110598	181000	11.52	7.53	0.0682	114.4	12.79	347
110598	191000	11.53	7.54	0.0682	114	12.75	348
110598	201000	11.55	7.54	0.0682	113.7	12.7	348
110598	211000	11.58	7.54	0.0684	113.6	12.69	349
110598	221000	11.6	7.54	0.0686	113.9	12.72	350
110598	231000	11.58	7.55	0.0689	113.7	12.7	350
110698	1000	11.57	7.55	0.0691	113.8	12.71	351
110698	11000	11.55	7.55	0.0693	113.6	12.69	351
110698	21000	11.55	7.55	0.0694	113.8	12.71	352
110698	31000	11.53	7.56	0.0695	113.7	12.71	352
110698	41000	11.52	7.56	0.0695	113.7	12.72	353
110698	51000	11.5	7.57	0.0695	113.6	12.71	353
110698	61000	11.5	7.57	0.0695	113.7	12.73	354
110698	71000	11.48	7.57	0.0695	113.7	12.72	355
110698	81000	11.48	7.57	0.0695	113.8	12.73	355
110698	91000	11.48	7.58	0.0695	113.6	12.71	356
110698	101000	11.48	7.58	0.0695	113.6	12.71	357
110698	111000	11.48	7.58	0.0695	113.8	12.73	357

Recovery finished at 113098 093708

000369

2999

TABLE G-16

MONITORING WELL 22301
(Continued)

Log File Name : 12079822301
Setup Date (MMDDYY) : 120798
Setup Time (HHMMSS) : 104758
Starting Date (MMDDYY) : 120798
Starting Time (HHMMSS) : 100000
Stopping Date (MMDDYY) : 120898
Stopping Time (HHMMSS) : 100100
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
120798	110000	11.62	7.61	0.069	77.5	8.65	437
120798	120000	11.6	7.7	0.0689	77.4	8.64	455
120798	130000	11.58	7.71	0.0689	77.4	8.65	472
120798	140000	11.57	7.71	0.0689	77.3	8.64	481
120798	150000	11.57	7.71	0.0689	77.2	8.63	486
120798	160000	11.55	7.71	0.0689	77.1	8.62	489
120798	170000	11.55	7.72	0.0689	77.1	8.62	491
120798	180000	11.57	7.72	0.0691	77	8.6	493
120798	190000	11.55	7.72	0.069	76.9	8.6	495
120798	200000	11.55	7.72	0.0688	76.9	8.6	496
120798	210000	11.55	7.73	0.0683	76.8	8.58	497
120798	220000	11.55	7.72	0.0686	77	8.61	498
120798	230000	11.53	7.73	0.0689	76.9	8.6	499
120898	0	11.52	7.73	0.069	77	8.61	499
120898	10000	11.52	7.73	0.0691	76.8	8.58	500

TABLE G-16

MONITORING WELL 22301
(Continued)

Log File Name : 01139922301
Setup Date (MMDDYY) : 011399
Setup Time (HHMMSS) : 095231
Starting Date (MMDDYY) : 011399
Starting Time (HHMMSS) : 100000
Stopping Date (MMDDYY) : 011499
Stopping Time (HHMMSS) : 101500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
11399	100000	10.86	7.29	0.0657	101.1	11.38	187
11399	110000	11.14	7.31	0.0665	104	11.63	221
11399	120000	11.19	7.32	0.0692	103.2	11.52	234
11399	130000	11.2	7.32	0.0706	102.7	11.47	242
11399	140000	11.2	7.33	0.0713	102.3	11.42	248
11399	150000	11.2	7.35	0.0723	102.4	11.43	249
11399	160000	11.2	7.34	0.0728	102.3	11.42	254
11399	170000	11.2	7.36	0.0736	102.2	11.41	255
11399	180000	11.2	7.35	0.0743	102	11.38	256
11399	190000	11.2	7.36	0.0744	101.4	11.32	255
11399	200000	11.2	7.34	0.0744	101.2	11.29	252
11399	210000	11.2	7.33	0.0743	100.7	11.25	254
11399	220000	11.2	7.33	0.0743	100.4	11.21	251
11399	230000	11.2	7.32	0.0744	99.9	11.15	250
11499	0	11.2	7.3	0.0743	99.4	11.1	252
11499	10000	11.2	7.3	0.0743	98.7	11.01	257
11499	20000	11.22	7.3	0.0744	98.1	10.94	254
11499	30000	11.2	7.29	0.0744	97.9	10.93	254
11499	40000	11.2	7.28	0.0743	97.6	10.89	260
11499	50000	11.2	7.27	0.0744	97.3	10.87	262
11499	60000	11.22	7.28	0.0743	97.5	10.88	261
11499	70000	11.22	7.27	0.074	97.3	10.86	272
11499	80000	11.22	7.28	0.0738	97.3	10.86	274
11499	90000	11.22	7.29	0.074	97.3	10.86	276
11499	100000	11.22	7.29	0.0739	97.3	10.86	272

Recovery finished at 011499 143747

000371

2999

TABLE G-16

MONITORING WELL 22301
(Continued)

Log File Name : 02059922301
Setup Date (MMDDYY) : 020599
Setup Time (HHMMSS) : 120432
Starting Date (MMDDYY) : 020599
Starting Time (HHMMSS) : 121500
Stopping Date (MMDDYY) : 020699
Stopping Time (HHMMSS) : 121600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
20599	121500	11.07	7.29	0.0633	69.2	7.75	239
20599	131500	11.2	7.31	0.0635	78.2	8.73	259
20599	141500	11.21	7.31	0.0638	76.9	8.58	267
20599	151500	11.21	7.32	0.0638	73.3	8.18	274
20599	161500	11.23	7.32	0.0641	75.8	8.45	280
20599	171500	11.23	7.32	0.0643	67.8	7.57	286
20599	181500	11.25	7.32	0.0643	69.6	7.76	290
20599	191500	11.26	7.32	0.0643	74	8.25	295
20599	201500	11.28	7.31	0.0643	64.2	7.16	299
20599	211500	11.29	7.33	0.0644	75.1	8.37	302
20599	221500	11.31	7.33	0.0644	63.9	7.12	305
20599	231500	11.31	7.33	0.0645	75.4	8.4	306
20699	1500	11.33	7.34	0.0645	72.8	8.11	309
20699	11500	11.33	7.33	0.0645	69.8	7.77	311
20699	21500	11.33	7.32	0.0644	73.4	8.18	312
20699	31500	11.33	7.33	0.0645	73.5	8.19	316
20699	41500	11.31	7.34	0.0647	59.4	6.62	318
20699	51500	11.31	7.33	0.0646	73.8	8.21	318
20699	61500	11.31	7.33	0.0645	65.8	7.33	316
20699	71500	11.31	7.31	0.0613	73.2	8.15	315
20699	81500	11.31	7.3	0.0607	67.4	7.5	314
20699	91500	11.31	7.3	0.0605	69.4	7.73	313
20699	101500	11.31	7.3	0.0603	69.4	7.73	310
20699	111500	11.31	7.31	0.0603	65.2	7.26	307
20699	121500	11.31	7.31	0.0603	66.9	7.44	305

Recovery finished at 020999 071408

TABLE G-16

MONITORING WELL 22301
(Continued)

Log File Name : 04019922301
Setup Date (MMDDYY) : 040199
Setup Time (HHMMSS) : 104116
Starting Date (MMDDYY) : 040199
Starting Time (HHMMSS) : 105000
Stopping Date (MMDDYY) : 040299
Stopping Time (HHMMSS) : 105100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
40199	105000	11.63	7.5	0.719	55.7	5.94	347
40199	115000	11.52	7.51	0.754	53.8	5.75	344
40199	125000	11.5	7.51	0.706	53.2	5.69	342
40199	135000	11.5	7.52	0.737	50.9	5.45	341
40199	145000	11.5	7.52	0.716	51.7	5.53	340
40199	155000	11.5	7.52	0.761	51.4	5.5	341
40199	165000	11.5	7.53	0.747	54.1	5.79	341
40199	175000	11.5	7.53	0.748	48.6	5.2	341
40199	185000	11.52	7.53	0.744	49.2	5.26	341
40199	195000	11.55	7.53	0.749	49.8	5.32	342
40199	205000	11.57	7.53	0.748	50	5.34	341
40199	215000	11.57	7.54	0.747	49.5	5.29	341
40199	225000	11.6	7.55	0.747	49.7	5.3	342
40199	235000	11.62	7.55	0.753	49.9	5.33	342
40299	5000	11.62	7.54	0.755	47.9	5.12	342
40299	15000	11.6	7.54	0.755	48.1	5.13	341
40299	25000	11.58	7.54	0.756	48.3	5.15	340
40299	35000	11.57	7.55	0.757	48.2	5.15	340
40299	45000	11.57	7.54	0.759	48.3	5.16	340
40299	55000	11.53	7.54	0.76	48.3	5.16	341
40299	65000	11.53	7.54	0.758	48.3	5.16	341
40299	75000	11.52	7.54	0.757	48.5	5.19	341
40299	85000	11.5	7.54	0.755	48.4	5.18	341
40299	95000	11.5	7.54	0.754	48.6	5.2	340
40299	105000	11.5	7.53	0.754	48.8	5.22	340

Recovery finished at 041299 072618

000373

2999

TABLE G-16

MONITORING WELL 22301
(Continued)

Log File Name : 05189922301
Setup Date (MMDDYY) : 051899
Setup Time (HHMMSS) : 123353
Starting Date (MMDDYY) : 051899
Starting Time (HHMMSS) : 133500
Stopping Date (MMDDYY) : 051999
Stopping Time (HHMMSS) : 133500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
51899	133500	11.71	7.44	0.0684	47.7	5.08	235
51899	143500	11.68	7.43	0.0717	42.6	4.53	242
51899	153500	11.68	7.43	0.0718	40.6	4.33	245
51899	163500	11.68	7.43	0.0719	38.7	4.12	248
51899	173500	11.68	7.43	0.0721	37.9	4.04	251
51899	183500	11.68	7.43	0.0722	37.9	4.04	253
51899	193500	11.68	7.44	0.0722	37.3	3.97	255
51899	203500	11.7	7.44	0.0723	36.3	3.87	258
51899	213500	11.7	7.44	0.0725	35.9	3.83	259
51899	223500	11.7	7.44	0.0726	35.8	3.82	262
51899	233500	11.7	7.44	0.0727	35	3.73	263
51999	3500	11.7	7.44	0.0728	34.8	3.71	265
51999	13500	11.7	7.44	0.073	34.6	3.69	267
51999	23500	11.71	7.44	0.0731	33.9	3.61	268
51999	33500	11.71	7.44	0.0733	33.6	3.58	269
51999	43500	11.7	7.45	0.0735	33.3	3.54	271
51999	53500	11.68	7.47	0.0736	33.1	3.53	272
51999	63500	11.67	7.47	0.0738	32.7	3.48	272
51999	73500	11.63	7.48	0.074	32.1	3.42	274
51999	83500	11.62	7.48	0.0742	32.3	3.45	275
51999	93500	11.6	7.49	0.0743	32.2	3.44	276
51999	103500	11.58	7.49	0.0745	31.6	3.37	277
51999	113500	11.57	7.49	0.0747	31.7	3.39	278
51999	123500	11.55	7.49	0.0749	31.6	3.38	279
51999	133500	11.55	7.49	0.0751	31.6	3.38	279

Recovery finished at 052099 065055

TABLE G-16

MONITORING WELL 22301
(Continued)

Log File Name : 06169922301
Setup Date (MMDDYY) : 061699
Setup Time (HHMMSS) : 104216
Starting Date (MMDDYY) : 061699
Starting Time (HHMMSS) : 114000
Stopping Date (MMDDYY) : 061799
Stopping Time (HHMMSS) : 114100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
61699	114000	11.7	7.63	0.0698	96.2	10.54	258
61699	124000	11.72	7.63	0.0696	93.5	10.25	267
61699	134000	11.73	7.64	0.0695	92.3	10.11	274
61699	144000	11.77	7.64	0.0695	91.6	10.03	279
61699	154000	11.78	7.65	0.0695	91.1	9.97	283
61699	164000	11.8	7.65	0.0694	90.7	9.92	287
61699	174000	11.8	7.65	0.0694	90.1	9.86	290
61699	184000	11.82	7.65	0.0694	89.8	9.82	293
61699	194000	11.82	7.66	0.0694	89.3	9.76	296
61699	204000	11.82	7.66	0.0695	88.6	9.69	298
61699	214000	11.8	7.66	0.0695	88	9.63	300
61699	224000	11.78	7.66	0.069	86.5	9.46	303
61699	234000	11.87	7.66	0.0692	87.6	9.57	304
61799	4000	11.9	7.66	0.0693	87.1	9.5	306
61799	14000	11.85	7.66	0.0694	86.4	9.44	308
61799	24000	11.8	7.66	0.0694	85.9	9.4	310
61799	34000	11.75	7.67	0.0694	85.5	9.37	312
61799	44000	11.72	7.67	0.0694	85.2	9.33	313
61799	54000	11.7	7.67	0.0695	84.8	9.29	315
61799	64000	11.69	7.67	0.0695	84.6	9.28	316
61799	74000	11.69	7.67	0.0694	84.4	9.25	318
61799	84000	11.67	7.67	0.0695	84.2	9.24	319
61799	94000	11.67	7.67	0.0695	83.7	9.19	320
61799	104000	11.67	7.67	0.0694	83.5	9.17	321
61799	114000	11.69	7.67	0.0694	83.2	9.13	323

Recovery finished at 062999 085245

000375

2999

TABLE G-16

MONITORING WELL 22301
(Continued)

Log File Name : 07079922301
Setup Date (MMDDYY) : 070799
Setup Time (HHMMSS) : 072903
Starting Date (MMDDYY) : 070799
Starting Time (HHMMSS) : 083000
Stopping Date (MMDDYY) : 070899
Stopping Time (HHMMSS) : 093000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
70799	83000	11.78	7.59	0.0709	73.2	8.01	552
70799	93000	11.77	7.59	0.0712	73.1	8	552
70799	103000	11.77	7.58	0.0712	73.2	8.01	552
70799	113000	11.78	7.58	0.0711	73.4	8.03	552
70799	123000	11.8	7.58	0.071	73.6	8.05	552
70799	133000	11.83	7.58	0.0711	73.3	8.02	552
70799	143000	11.83	7.58	0.071	72.9	7.97	551
70799	153000	11.87	7.58	0.0711	72.4	7.9	551
70799	163000	11.88	7.58	0.071	72.7	7.93	550
70799	173000	11.9	7.58	0.071	73.3	8	550
70799	183000	11.92	7.58	0.0709	73.8	8.05	550
70799	193000	11.93	7.59	0.071	74	8.07	550
70799	203000	11.93	7.59	0.071	74.2	8.09	549
70799	213000	11.93	7.59	0.0711	74.2	8.09	549
70799	223000	11.93	7.59	0.071	74.3	8.1	549
70799	233000	11.9	7.59	0.0709	74.2	8.1	549
70899	3000	11.87	7.6	0.0709	74	8.09	549
70899	13000	11.83	7.6	0.071	73.8	8.06	549
70899	23000	11.82	7.6	0.071	73.4	8.02	549
70899	33000	11.78	7.6	0.071	73.2	8.01	549
70899	43000	11.77	7.6	0.0711	72.6	7.94	550
70899	53000	11.75	7.59	0.0711	71.3	7.81	550
70899	63000	11.75	7.59	0.0712	70	7.67	550
70899	73000	11.73	7.58	0.0712	69.6	7.63	550
70899	83000	11.72	7.58	0.0712	69.5	7.62	550
70899	93000	11.42	7.48	0.0712	3.5	0.39	35

Recovery finished at 071399 135322

TABLE G-16

MONITORING WELL 22301
(Continued)

Log File Name : 08059922301
Setup Date (MMDDYY) : 080599
Setup Time (HHMMSS) : 141658
Starting Date (MMDDYY) : 080599
Starting Time (HHMMSS) : 151500
Stopping Date (MMDDYY) : 080699
Stopping Time (HHMMSS) : 151600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
80599	151500	11.96	7.2	0.0692	61.9	6.55	419
80599	161500	11.99	7.21	0.0692	61.8	6.53	414
80599	171500	12.01	7.21	0.0692	61.7	6.51	410
80599	181500	12.04	7.21	0.0691	61.6	6.5	407
80599	191500	12.06	7.22	0.0691	61.7	6.51	405
80599	201500	12.06	7.22	0.0691	61.9	6.53	404
80599	211500	12.06	7.22	0.0691	61.8	6.52	402
80599	221500	12.04	7.22	0.0691	61.8	6.53	401
80599	231500	12.03	7.22	0.0691	62.1	6.55	400
80699	1500	11.99	7.22	0.069	62.3	6.58	399
80699	11500	11.96	7.23	0.069	62.1	6.57	398
80699	21500	11.93	7.23	0.0691	61.8	6.54	398
80699	31500	11.9	7.23	0.0692	61.5	6.52	397
80699	41500	11.88	7.23	0.0692	61	6.47	397
80699	51500	11.86	7.23	0.0693	60.3	6.39	397
80699	61500	11.85	7.22	0.0693	59.9	6.35	397
80699	71500	11.83	7.22	0.0693	59.7	6.33	396
80699	81500	11.83	7.22	0.0694	59.5	6.31	396
80699	91500	11.81	7.22	0.0694	59.2	6.28	396
80699	101500	11.81	7.21	0.0694	59.1	6.27	396
80699	111500	11.81	7.21	0.0693	59.6	6.33	396
80699	121500	11.81	7.21	0.0692	60	6.36	396
80699	131500	11.85	7.21	0.0692	60.2	6.39	396
80699	141500	11.88	7.21	0.0692	60.4	6.4	396
80699	151500	11.91	7.22	0.0692	60.6	6.41	396

Recovery finished at 081299 074552

000377

2999

TABLE G-17

MONITORING WELL 22302

Log File Name : 09249822302
Setup Date (MMDDYY) : 092498
Setup Time (HHMMSS) : 133304
Starting Date (MMDDYY) : 092498
Starting Time (HHMMSS) : 134500
Stopping Date (MMDDYY) : 092598
Stopping Time (HHMMSS) : 134500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
92498	134500	12.56	7.38	0.0748	92.8	9.99	171
92498	144500	12.22	7.42	0.0751	96.1	10.43	196
92498	154500	12.15	7.43	0.0765	90.1	9.8	208
92498	164500	12.12	7.43	0.0769	89.1	9.69	216
92498	174500	12.12	7.44	0.0764	107.7	11.71	221
92498	184500	12.1	7.45	0.0763	85.6	9.32	226
92498	194500	12.1	7.44	0.0764	93.7	10.2	231
92498	204500	12.1	7.43	0.0765	77.1	8.39	236
92498	214500	12.1	7.43	0.0762	96.1	10.45	239
92498	224500	12.1	7.44	0.0766	85.6	9.32	242
92498	234500	12.08	7.44	0.0765	94.3	10.26	243
92598	4500	12.08	7.43	0.0761	96.4	10.49	246
92598	14500	12.08	7.43	0.0760	93.6	10.19	249
92598	24500	12.07	7.43	0.0761	87.1	9.49	251
92598	34500	12.07	7.41	0.0758	84.5	9.2	256
92598	44500	12.07	7.4	0.0758	127.1	13.84	257
92598	54500	12.07	7.4	0.0758	88.6	9.65	258
92598	64500	12.05	7.39	0.0759	84.9	9.25	262
92598	74500	12.05	7.39	0.0759	90.5	9.86	266
92598	84500	12.05	7.4	0.0761	85	9.26	268
92598	94500	12.05	7.4	0.0761	92.8	10.11	265
92598	104500	12.05	7.4	0.0760	82.5	8.99	267
92598	114500	12.04	7.4	0.0760	86.1	9.38	269
92598	124500	12.04	7.42	0.0761	93.5	10.19	271
92598	134500	12.04	7.41	0.0762	92.6	10.09	272

Recovery finished at 093098 123838

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 10219822302
Setup Date (MMDDYY) : 102198
Setup Time (HHMMSS) : 094529
Starting Date (MMDDYY) : 102198
Starting Time (HHMMSS) : 094500
Stopping Date (MMDDYY) : 102298
Stopping Time (HHMMSS) : 094500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
102198	104500	11.76	7.6	0.743	80.1	8.71	208
102198	114500	11.75	7.6	0.739	78.2	8.51	215
102198	124500	11.75	7.59	0.741	77.8	8.47	222
102198	134500	11.75	7.58	0.74	77.4	8.42	229
102198	144500	11.76	7.57	0.741	76.3	8.3	235
102198	154500	11.76	7.56	0.741	75.5	8.21	240
102198	164500	11.76	7.57	0.742	74.7	8.13	244
102198	174500	11.76	7.56	0.741	74	8.05	249
102198	184500	11.76	7.56	0.74	73.2	7.97	250
102198	194500	11.76	7.55	0.739	72.6	7.89	252
102198	204500	11.76	7.54	0.739	71.8	7.81	252
102198	214500	11.76	7.53	0.739	71	7.72	255
102198	224500	11.76	7.54	0.738	68.6	7.46	259
102198	234500	11.76	7.54	0.737	67.2	7.31	262
102298	4500	11.76	7.52	0.737	65.8	7.15	265
102298	14500	11.76	7.53	0.737	64.8	7.05	265
102298	24500	11.76	7.52	0.737	64.1	6.98	269
102298	34500	11.75	7.52	0.736	63.3	6.89	269
102298	44500	11.76	7.51	0.737	63	6.86	268
102298	54500	11.75	7.51	0.736	62.6	6.81	269
102298	64500	11.76	7.49	0.736	62.5	6.8	272
102298	74500	11.76	7.49	0.736	62.3	6.78	271
102298	84500	11.75	7.49	0.736	61.6	6.71	271
102298	94500	11.75	7.48	0.735	60.9	6.63	268

Recovery finished at 102698 095318

000379

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 11109822302
Setup Date (MMDDYY) : 111098
Setup Time (HHMMSS) : 104822
Starting Date (MMDDYY) : 111098
Starting Time (HHMMSS) : 101000
Stopping Date (MMDDYY) : 111198
Stopping Time (HHMMSS) : 101000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
111098	111000	11.95	7.3	0.0621	69.5	7.7	197
111098	121000	11.71	7.36	0.0626	60.6	6.75	214
111098	131000	11.66	7.37	0.0632	58.7	6.54	221
111098	141000	11.62	7.38	0.0634	56.5	6.3	226
111098	151000	11.62	7.38	0.0627	55.6	6.2	233
111098	161000	11.62	7.38	0.0631	55	6.13	236
111098	171000	11.62	7.38	0.0632	54.1	6.04	238
111098	181000	11.61	7.38	0.0632	54.1	6.03	241
111098	191000	11.61	7.38	0.0632	53.7	5.99	244
111098	201000	11.61	7.38	0.0632	54.2	6.05	246
111098	211000	11.61	7.38	0.0633	53.7	5.99	249
111098	221000	11.61	7.38	0.0632	53.6	5.98	250
111098	231000	11.61	7.38	0.0631	52.8	5.89	252
111198	1000	11.61	7.38	0.0632	52.5	5.86	253
111198	11000	11.61	7.38	0.0632	52.7	5.88	255
111198	21000	11.61	7.38	0.0632	52	5.81	257
111198	31000	11.61	7.38	0.0632	52.5	5.86	258
111198	41000	11.59	7.38	0.0631	51.4	5.74	259
111198	51000	11.61	7.38	0.0633	51.1	5.71	261
111198	61000	11.59	7.38	0.0632	50.5	5.64	262
111198	71000	11.59	7.38	0.0632	51.7	5.77	263
111198	81000	11.59	7.38	0.0632	49.9	5.57	265
111198	91000	11.61	7.38	0.0633	57.3	6.4	266
111198	101000	11.61	7.38	0.0633	50.2	5.6	267

Recovery finished at 112598 150955

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 1210982302
Setup Date (MMDDYY) : 121098
Setup Time (HHMMSS) : 140733
Starting Date (MMDDYY) : 121098
Starting Time (HHMMSS) : 132000
Stopping Date (MMDDYY) : 121198
Stopping Time (HHMMSS) : 132500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
121098	142000	11.44	7.56	0.062	99.7	11.16	486
121098	152000	11.44	7.57	0.062	99.8	11.18	487
121098	162000	11.44	7.56	0.062	98.2	11	488
121098	172000	11.44	7.56	0.0619	100.6	11.26	487
121098	182000	11.43	7.56	0.062	100.1	11.21	490
121098	192000	11.43	7.57	0.0621	100.2	11.23	491
121098	202000	11.43	7.56	0.062	100.6	11.27	493
121098	212000	11.43	7.56	0.0618	98.6	11.05	493
121098	222000	11.43	7.56	0.0618	98.1	10.99	494
121098	232000	11.43	7.56	0.0618	96.9	10.86	495
121198	2000	11.43	7.56	0.0618	98.2	11	496
121198	12000	11.43	7.56	0.0619	98.7	11.06	497
121198	22000	11.43	7.56	0.0619	97.6	10.93	497
121198	32000	11.43	7.56	0.0618	97.1	10.88	498
121198	42000	11.43	7.56	0.0618	98.6	11.05	499
121198	52000	11.43	7.57	0.0618	100.6	11.27	500
121198	62000	11.43	7.56	0.0618	97.7	10.94	500
121198	72000	11.43	7.56	0.0619	95.9	10.75	501
121198	82000	11.43	7.57	0.0618	96.5	10.81	501
121198	92000	11.43	7.57	0.0618	96.3	10.79	502
121198	102000	11.43	7.57	0.0618	98.2	11	502
121198	112000	11.43	7.57	0.0618	99.4	11.14	503
121198	122000	11.43	7.56	0.0619	99.7	11.17	503
121198	132000	11.43	7.57	0.062	96.7	10.83	504

Recovery finished at 122398 095057

000381

2999

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 01079922302
Setup Date (MMDDYY) : 010799
Setup Time (HHMMSS) : 150756
Starting Date (MMDDYY) : 010799
Starting Time (HHMMSS) : 142000
Stopping Date (MMDDYY) : 010899
Stopping Time (HHMMSS) : 144500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
10799	152000	11.03	7.09	0.0563	75.5	8.46	246
10799	162000	11.33	7.11	0.0559	72.7	8.1	265
10799	172000	11.38	7.11	0.0562	75.9	8.44	275
10799	182000	11.38	7.1	0.0563	75.5	8.4	280
10799	192000	11.39	7.09	0.0563	82.1	9.13	290
10799	202000	11.39	7.09	0.0563	75.6	8.4	294
10799	212000	11.41	7.09	0.0564	77.1	8.57	295
10799	222000	11.39	7.09	0.0565	81	9	297
10799	232000	11.41	7.08	0.0566	76.4	8.49	303
10899	2000	11.41	7.09	0.0567	77.4	8.6	302
10899	12000	11.41	7.08	0.0567	75.2	8.35	301
10899	22000	11.41	7.08	0.0569	70.1	7.79	303
10899	32000	11.41	7.07	0.0569	72.1	8.02	304
10899	42000	11.41	7.07	0.0569	69.2	7.69	306
10899	52000	11.41	7.07	0.0568	66.1	7.34	308
10899	62000	11.41	7.06	0.0568	65.9	7.32	308
10899	72000	11.39	7.06	0.0569	65.5	7.28	308
10899	82000	11.41	7.06	0.0569	65.3	7.26	308
10899	92000	11.41	7.06	0.0569	62.7	6.97	308
10899	102000	11.41	7.06	0.0569	63.8	7.09	305
10899	112000	11.39	7.06	0.0568	64.3	7.15	308
10899	122000	11.41	7.07	0.0569	60.3	6.7	310
10899	132000	11.41	7.06	0.0569	63.3	7.03	313
10899	142000	11.39	7.06	0.0569	61.9	6.88	313

Recovery finished at 011499 142018

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 02109922302
Setup Date (MMDDYY) : 021099
Setup Time (HHMMSS) : 100907
Starting Date (MMDDYY) : 021099
Starting Time (HHMMSS) : 101000
Stopping Date (MMDDYY) : 021199
Stopping Time (HHMMSS) : 101500
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
Late probe turn on at 021099 100908							
21099	101000	10.88	6.61	0.0577	54.5	6.13	225
21099	111000	11.21	7.41	0.0583	52	5.81	245
21099	121000	11.27	7.46	0.059	49.7	5.54	256
21099	131000	11.32	7.46	0.0591	47.5	5.29	265
21099	141000	11.32	7.47	0.0591	46.2	5.15	273
21099	151000	11.32	7.49	0.0591	45.8	5.1	278
21099	161000	11.32	7.48	0.0591	44.8	4.99	282
21099	171000	11.32	7.47	0.0592	44.3	4.93	282
21099	181000	11.31	7.47	0.0594	44.2	4.92	282
21099	191000	11.32	7.46	0.0593	43.6	4.85	285
21099	201000	11.32	7.46	0.0591	42.3	4.71	288
21099	211000	11.31	7.46	0.0593	41.4	4.61	290
21099	221000	11.31	7.45	0.0593	40.8	4.54	291
21099	231000	11.31	7.45	0.0593	40.1	4.47	294
21199	1000	11.31	7.45	0.0594	39.4	4.39	296
21199	11000	11.32	7.44	0.0593	38.8	4.32	298
21199	21000	11.32	7.44	0.0593	38.4	4.28	301
21199	31000	11.31	7.44	0.0594	37.9	4.22	304
21199	41000	11.32	7.43	0.0593	37.2	4.14	306
21199	51000	11.31	7.44	0.0594	36.8	4.1	308
21199	61000	11.31	7.44	0.0594	36.3	4.04	309
21199	71000	11.31	7.45	0.0593	36	4.01	310
21199	81000	11.31	7.45	0.0593	36.1	4.02	312
21199	91000	11.31	7.46	0.0593	35.8	3.99	313
21199	101000	11.32	7.47	0.0592	35	3.9	315

Recovery finished at 021299 120159

000383

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 04129922302
Setup Date (MMDDYY) : 041299
Setup Time (HHMMSS) : 084126
Starting Date (MMDDYY) : 041299
Starting Time (HHMMSS) : 094500
Stopping Date (MMDDYY) : 041399
Stopping Time (HHMMSS) : 094600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
41299	94500	11.52	7.77	0.7	44.6	4.77	490
41299	104500	11.5	7.77	0.7	44.6	4.78	490
41299	114500	11.5	7.77	0.7	44.6	4.78	490
41299	124500	11.5	7.77	0.7	44.6	4.78	490
41299	134500	11.48	7.77	0.699	44.7	4.79	490
41299	144500	11.48	7.77	0.699	44.9	4.81	490
41299	154500	11.48	7.77	0.699	45	4.82	491
41299	164500	11.48	7.77	0.699	45.2	4.84	491
41299	174500	11.48	7.77	0.699	45.4	4.86	491
41299	184500	11.48	7.77	0.698	45.5	4.87	491
41299	194500	11.48	7.77	0.699	45.3	4.85	492
41299	204500	11.5	7.77	0.698	45	4.82	492
41299	214500	11.5	7.77	0.698	44.5	4.77	492
41299	224500	11.52	7.77	0.698	44.1	4.72	493
41299	234500	11.52	7.77	0.698	44.6	4.77	493
41399	4500	11.53	7.77	0.699	44.5	4.76	493
41399	14500	11.53	7.77	0.7	43.9	4.7	494
41399	24500	11.55	7.77	0.701	45.5	4.86	494
41399	34500	11.55	7.77	0.701	46.8	5	494
41399	44500	11.55	7.78	0.701	47.3	5.05	494
41399	54500	11.55	7.78	0.701	47.4	5.07	494
41399	64500	11.55	7.78	0.7	45	4.81	495
41399	74500	11.53	7.78	0.701	44.7	4.78	495
41399	84500	11.53	7.78	0.701	45.7	4.89	495
41399	94500	11.53	7.78	0.701	46.2	4.94	495

Recovery finished at 041599 112250

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 05209922302
Setup Date (MMDDYY) : 052099
Setup Time (HHMMSS) : 101047
Starting Date (MMDDYY) : 052099
Starting Time (HHMMSS) : 111500
Stopping Date (MMDDYY) : 052199
Stopping Time (HHMMSS) : 112000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
52099	111500	11.99	7.55	0.0721	57.9	6.12	277
52099	121500	11.8	7.55	0.0717	50.8	5.4	278
52099	131500	11.73	7.55	0.0714	50.8	5.4	281
52099	141500	11.71	7.56	0.0716	48.8	5.2	282
52099	151500	11.7	7.56	0.0717	47.7	5.08	283
52099	161500	11.7	7.56	0.0716	48	5.12	284
52099	171500	11.68	7.56	0.0718	47.7	5.09	285
52099	181500	11.68	7.57	0.0717	46.7	4.98	286
52099	191500	11.68	7.57	0.0718	47.2	5.03	286
52099	201500	11.68	7.57	0.0717	47.3	5.04	286
52099	211500	11.68	7.57	0.0719	46.9	5	287
52099	221500	11.68	7.57	0.072	47.2	5.03	287
52099	231500	11.68	7.57	0.0719	46.6	4.97	288
52199	1500	11.68	7.57	0.0719	47	5.01	288
52199	11500	11.68	7.57	0.0718	47.5	5.07	289
52199	21500	11.68	7.57	0.0718	46.8	4.99	289
52199	31500	11.68	7.57	0.0719	46.7	4.98	289
52199	41500	11.67	7.57	0.072	46.8	4.99	289
52199	51500	11.67	7.58	0.072	45.8	4.88	289
52199	61500	11.67	7.58	0.072	46.4	4.95	289
52199	71500	11.67	7.58	0.0719	46.9	5	289
52199	81500	11.67	7.58	0.0721	48.3	5.14	289
52199	91500	11.67	7.58	0.0722	47.1	5.03	289
52199	101500	11.67	7.58	0.072	45.7	4.87	290
52199	111500	11.67	7.58	0.072	45.9	4.9	290

Recovery finished at 060299 060515

000385

TABLE G-17

MONITORING WELL 22302
(Continued)

2999

Log File Name : 06039922302
Setup Date (MMDDYY) : 060399
Setup Time (HHMMSS) : 094607
Starting Date (MMDDYY) : 060399
Starting Time (HHMMSS) : 104500
Stopping Date (MMDDYY) : 060499
Stopping Time (HHMMSS) : 104600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
60399	104500	11.73	7.7	0.07	56.4	6	397
60399	114500	11.65	7.7	0.0706	50.6	5.4	400
60399	124500	11.63	7.71	0.0704	45	4.8	400
60399	134500	11.62	7.71	0.0704	44	4.7	401
60399	144500	11.62	7.71	0.0705	42.6	4.55	401
60399	154500	11.62	7.71	0.0705	41.1	4.38	400
60399	164500	11.62	7.71	0.0706	40.6	4.33	401
60399	174500	11.62	7.71	0.0706	40	4.27	401
60399	184500	11.62	7.71	0.0706	38.5	4.11	401
60399	194500	11.6	7.71	0.0706	38.3	4.09	401
60399	204500	11.6	7.71	0.0706	37.4	3.99	401
60399	214500	11.6	7.71	0.0706	37.9	4.05	401
60399	224500	11.6	7.71	0.0706	37.9	4.05	401
60399	234500	11.6	7.71	0.0706	37.5	4	400
60499	4500	11.6	7.71	0.0706	37.8	4.04	400
60499	14500	11.62	7.71	0.0706	38.2	4.08	400
60499	24500	11.6	7.71	0.0706	37.6	4.01	400
60499	34500	11.62	7.71	0.0707	37.1	3.96	401
60499	44500	11.6	7.71	0.0707	36.8	3.93	400
60499	54500	11.62	7.7	0.0706	37	3.95	400
60499	64500	11.6	7.71	0.0706	37.9	4.05	400
60499	74500	11.6	7.7	0.0707	38.1	4.07	399
60499	84500	11.62	7.7	0.0707	38.2	4.08	399
60499	94500	11.62	7.7	0.0708	37.4	3.99	399
60499	104500	11.62	7.7	0.0709	37.6	4.01	400

Recovery finished at 061499 132820

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 07159922302
Setup Date (MMDDYY) : 071599
Setup Time (HHMMSS) : 104511
Starting Date (MMDDYY) : 071599
Starting Time (HHMMSS) : 115000
Stopping Date (MMDDYY) : 071699
Stopping Time (HHMMSS) : 120000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
71599	115000	12.11	7.77	0.0687	69.9	7.59	284
71599	125000	11.99	7.77	0.0696	65	7.08	291
71599	135000	11.96	7.77	0.0697	61.6	6.72	297
71599	145000	11.94	7.77	0.0699	58.4	6.37	302
71599	155000	11.94	7.77	0.0701	56.2	6.12	306
71599	165000	11.93	7.77	0.0701	54	5.89	311
71599	175000	11.94	7.77	0.0701	52.3	5.7	315
71599	185000	11.94	7.77	0.07	50.4	5.49	319
71599	195000	11.93	7.77	0.07	49.6	5.41	323
71599	205000	11.93	7.77	0.0699	49	5.35	327
71599	215000	11.93	7.77	0.07	47.8	5.21	332
71599	225000	11.92	7.77	0.0699	47.2	5.15	338
71599	235000	11.93	7.77	0.0699	46.6	5.08	344
71699	5000	11.93	7.77	0.0698	45.9	5	350
71699	15000	11.93	7.77	0.0698	45.2	4.93	357
71699	25000	11.93	7.77	0.0698	44.4	4.84	364
71699	35000	11.93	7.77	0.0698	43.6	4.75	371
71699	45000	11.93	7.77	0.0698	42.6	4.65	377
71699	55000	11.93	7.77	0.0698	42.3	4.61	384
71699	65000	11.93	7.77	0.0698	42.1	4.59	390
71699	75000	11.93	7.77	0.0698	41.8	4.56	396
71699	85000	11.92	7.77	0.0699	42	4.58	403
71699	95000	11.93	7.77	0.0698	41.9	4.57	409
71699	105000	11.93	7.77	0.0698	42	4.58	415
71699	115000	11.93	7.77	0.0698	41.7	4.54	420

Recovery finished at 072299 115008

000387

2999

TABLE G-17

MONITORING WELL 22302
(Continued)

Log File Name : 08199922302
Setup Date (MMDDYY) : 081999
Setup Time (HHMMSS) : 100406
Starting Date (MMDDYY) : 081999
Starting Time (HHMMSS) : 113000
Stopping Date (MMDDYY) : 082099
Stopping Time (HHMMSS) : 113100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
81999	113000	12.03	7.98	0.0684	57.6	6.09	309
81999	123000	11.97	7.99	0.0688	54.9	5.81	333
81999	133000	11.95	7.99	0.0689	51.2	5.42	352
81999	143000	11.93	7.99	0.0689	47	4.98	367
81999	153000	11.93	7.99	0.0688	43.9	4.65	380
81999	163000	11.93	7.99	0.0687	42.5	4.5	390
81999	173000	11.93	7.99	0.0689	40.9	4.33	399
81999	183000	11.93	7.99	0.069	39.7	4.21	399
81999	193000	11.93	7.99	0.069	38.2	4.05	404
81999	203000	11.93	7.99	0.0688	37.6	3.98	414
81999	213000	11.93	7.99	0.069	37.6	3.98	422
81999	223000	11.93	7.99	0.069	37.6	3.98	427
81999	233000	11.93	7.99	0.069	38.4	4.07	432
82099	3000	11.92	7.99	0.069	38	4.03	435
82099	13000	11.92	7.99	0.069	39	4.13	439
82099	23000	11.92	7.99	0.0689	38.6	4.1	443
82099	33000	11.92	7.99	0.069	38.9	4.12	446
82099	43000	11.92	7.99	0.069	38.2	4.05	449
82099	53000	11.92	7.99	0.0689	38.5	4.08	452
82099	63000	11.92	7.99	0.069	38.5	4.08	454
82099	73000	11.92	7.99	0.069	38.8	4.11	457
82099	83000	11.92	7.99	0.0691	39	4.13	458
82099	93000	11.92	7.99	0.0691	38.9	4.12	460
82099	103000	11.93	7.99	0.0691	38.6	4.09	460
82099	113000	11.92	7.98	0.0692	38.4	4.07	460

Recovery finished at 082399 122317

TABLE G-18

MONITORING WELL 22303

Log File Name : 09229822303
Setup Date (MMDDYY) : 092298
Setup Time (HHMMSS) : 140631
Starting Date (MMDDYY) : 092298
Starting Time (HHMMSS) : 141000
Stopping Date (MMDDYY) : 092398
Stopping Time (HHMMSS) : 141000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
92298	141000	13.37	6.98	0.724	62.1	6.52	346
92298	151000	12.47	7.07	0.753	40.7	4.35	354
92298	161000	12.34	7.14	0.774	34.3	3.68	356
92298	171000	12.29	7.16	0.772	38.8	4.17	360
92298	181000	12.27	7.19	0.769	36.9	3.97	356
92298	191000	12.26	7.22	0.765	37	3.98	348
92298	201000	12.24	7.22	0.76	39.2	4.22	337
92298	211000	12.24	7.24	0.756	40.2	4.32	326
92298	221000	12.24	7.27	0.754	41	4.41	325
92298	231000	12.24	7.3	0.75	41.8	4.49	333
92398	1000	12.23	7.3	0.747	42.3	4.55	339
92398	11000	12.23	7.32	0.743	43.5	4.68	342
92398	21000	12.23	7.33	0.739	44.5	4.79	347
92398	31000	12.23	7.31	0.737	42.4	4.57	349
92398	41000	12.23	7.32	0.737	42.6	4.59	353
92398	51000	12.23	7.34	0.738	44.7	4.81	357
92398	61000	12.23	7.34	0.735	44.5	4.79	359
92398	71000	12.23	7.35	0.734	43.5	4.68	363
92398	81000	12.23	7.35	0.736	43	4.62	365
92398	91000	12.23	7.35	0.733	43.6	4.69	367
92398	101000	12.23	7.34	0.733	44.5	4.79	370
92398	111000	12.23	7.36	0.733	45.7	4.91	370
92398	121000	12.23	7.36	0.734	44.6	4.8	371
92398	131000	12.23	7.37	0.733	43.7	4.71	370
92398	141000	12.23	7.38	0.735	45.7	4.91	371

Recovery finished at 092998 154526

000389

2999

TABLE G-18

MONITORING WELL 22303
(Continued)

Log File Name : 10219822303
Setup Date (MMDDYY) : 102198
Setup Time (HHMMSS) : 092240
Starting Date (MMDDYY) : 102198
Starting Time (HHMMSS) : 093000
Stopping Date (MMDDYY) : 102298
Stopping Time (HHMMSS) : 093000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
102198	93000	12.56	7.3	0.0683	74.7	8.04	228
102198	103000	11.85	7.38	0.0686	66.1	7.24	247
102198	113000	11.74	7.41	0.0692	66.3	7.28	257
102198	123000	11.72	7.44	0.0697	65.8	7.23	264
102198	133000	11.71	7.45	0.0698	70.1	7.7	269
102198	143000	11.69	7.46	0.0696	69	7.58	274
102198	153000	11.69	7.47	0.0699	68.2	7.5	280
102198	163000	11.69	7.48	0.0696	67.6	7.42	285
102198	173000	11.69	7.48	0.0699	68	7.47	285
102198	183000	11.67	7.48	0.0696	68.1	7.48	286
102198	193000	11.67	7.47	0.0702	66.9	7.35	288
102198	203000	11.67	7.47	0.0698	68.8	7.55	290
102198	213000	11.67	7.47	0.0702	68.2	7.49	292
102198	223000	11.66	7.48	0.0703	67.4	7.4	293
102198	233000	11.66	7.48	0.0701	68.6	7.54	293
102298	3000	11.66	7.49	0.0702	68.2	7.5	293
102298	13000	11.66	7.5	0.0701	69.1	7.59	294
102298	23000	11.66	7.51	0.070	67.7	7.44	295
102298	33000	11.66	7.51	0.0699	70	7.69	295
102298	43000	11.66	7.51	0.0699	70.2	7.72	296
102298	53000	11.66	7.51	0.0688	70.2	7.72	298
102298	63000	11.66	7.51	0.0695	80.5	8.85	300
102298	73000	11.66	7.51	0.0698	76.6	8.41	300
102298	83000	11.66	7.51	0.0698	78.4	8.61	300
102298	93000	11.66	7.52	0.0698	77.5	8.51	301

Recovery finished at 102698 092547

TABLE G-18

MONITORING WELL 22303
(Continued)

Log File Name : 12039822303
Setup Date (MMDDYY) : 120398
Setup Time (HHMMSS) : 121718
Starting Date (MMDDYY) : 120398
Starting Time (HHMMSS) : 113000
Stopping Date (MMDDYY) : 120498
Stopping Time (HHMMSS) : 113100
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
120398	123000	11.84	7.42	0.0625	71.1	7.89	348
120398	133000	11.64	7.43	0.0625	69.6	7.76	361
120398	143000	11.61	7.43	0.0626	68.9	7.69	348
120398	153000	11.59	7.44	0.0625	69.9	7.8	345
120398	163000	11.57	7.46	0.0626	69.9	7.8	353
120398	173000	11.57	7.47	0.0626	70.6	7.89	364
120398	183000	11.57	7.47	0.0628	72.1	8.05	373
120398	193000	11.57	7.48	0.0625	72	8.04	377
120398	203000	11.57	7.47	0.0624	71.3	7.96	382
120398	213000	11.57	7.48	0.0627	73.9	8.25	387
120398	223000	11.56	7.48	0.0627	73.8	8.25	390
120398	233000	11.56	7.48	0.0626	74.2	8.29	395
120498	3000	11.56	7.48	0.0624	74.5	8.32	401
120498	13000	11.56	7.48	0.0622	75.7	8.45	408
120498	23000	11.56	7.49	0.0623	75.6	8.44	414
120498	33000	11.56	7.48	0.0621	76.2	8.51	418
120498	43000	11.56	7.49	0.0623	76.7	8.56	418
120498	53000	11.56	7.49	0.0623	77.3	8.64	420
120498	63000	11.56	7.49	0.0623	77.5	8.66	423
120498	73000	11.54	7.49	0.0623	78.3	8.75	432
120498	83000	11.54	7.49	0.0622	79.3	8.86	439
120498	93000	11.54	7.49	0.0618	79.1	8.83	444
120498	103000	11.54	7.49	0.0621	79.2	8.85	448
120498	113000	11.54	7.49	0.0623	78.7	8.79	452

Recovery finished at 120798 115438

000391

2999

TABLE G-18

MONITORING WELL 22303
(Continued)

Log File Name : 1059922303
Setup Date (MMDDYY) : 010599
Setup Time (HHMMSS) : 103855
Starting Date (MMDDYY) : 010598
Starting Time (HHMMSS) : 093500
Stopping Date (MMDDYY) : 010699
Stopping Time (HHMMSS) : 093600
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
10599	113500	10.8	7.24	0.0721	97	10.93	406
10599	123500	11.07	7.28	0.0722	95.9	10.73	410
10599	133500	11.14	7.28	0.0723	94.8	10.6	415
10599	143500	11.16	7.3	0.0725	94.8	10.59	420
10599	153500	11.17	7.32	0.0727	94.2	10.52	423
10599	163500	11.19	7.32	0.0726	93.9	10.49	426
10599	173500	11.19	7.33	0.0727	93	10.38	426
10599	183500	11.19	7.32	0.0728	91.2	10.18	429
10599	193500	11.19	7.33	0.0729	90.4	10.1	430
10599	203500	11.19	7.35	0.0731	89.9	10.04	427
10599	213500	11.19	7.35	0.0731	89.5	10	427
10599	223500	11.19	7.36	0.0731	89.5	10	427
10599	233500	11.19	7.35	0.0733	88.9	9.93	426
10699	3500	11.19	7.36	0.0733	88.1	9.84	425
10699	13500	11.19	7.38	0.0732	87.1	9.73	424
10699	23500	11.19	7.36	0.0732	86.1	9.62	426
10699	33500	11.19	7.36	0.0733	85.1	9.51	426
10699	43500	11.19	7.36	0.0733	84.4	9.42	423
10699	53500	11.19	7.36	0.0735	82.5	9.21	421
10699	63500	11.18	7.39	0.0735	81.4	9.1	416
10699	73500	11.19	7.38	0.0735	80.3	8.97	415
10699	83500	11.19	7.37	0.0735	78	8.71	416
10699	93500	11.19	7.36	0.0735	76.5	8.54	417

Recovery finished at 011499 143122

TABLE G-18

MONITORING WELL 22303
(Continued)

Log File Name : 02119922303
Setup Date (MMDDYY) : 021199
Setup Time (HHMMSS) : 103458
Starting Date (MMDDYY) : 021199
Starting Time (HHMMSS) : 104000
Stopping Date (MMDDYY) : 021299
Stopping Time (HHMMSS) : 104500
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
21199	104000	11.55	7.33	0.0726	63.9	7.08	343
21199	114000	11.34	7.41	0.0728	66.2	7.37	334
21199	124000	11.32	7.42	0.0729	65.6	7.3	333
21199	134000	11.3	7.43	0.073	64.7	7.21	336
21199	144000	11.29	7.42	0.0732	61.8	6.88	341
21199	154000	11.29	7.42	0.0737	60.3	6.72	342
21199	164000	11.29	7.42	0.0738	60.2	6.71	343
21199	174000	11.29	7.42	0.0736	59.8	6.66	343
21199	184000	11.29	7.43	0.0736	59.4	6.62	340
21199	194000	11.3	7.43	0.0736	59	6.57	337
21199	204000	11.29	7.44	0.0738	58.8	6.55	336
21199	214000	11.29	7.45	0.0739	58.3	6.5	339
21199	224000	11.29	7.45	0.074	57.7	6.43	343
21199	234000	11.29	7.46	0.0739	57.4	6.39	345
21299	4000	11.3	7.46	0.074	57.6	6.41	351
21299	14000	11.32	7.44	0.0743	58.1	6.47	356
21299	24000	11.31	7.43	0.0744	58.4	6.51	363
21299	34000	11.31	7.45	0.0746	57.9	6.45	367
21299	44000	11.32	7.44	0.0745	57.1	6.36	373
21299	54000	11.32	7.45	0.0744	57	6.34	374
21299	64000	11.31	7.45	0.0744	57	6.35	374
21299	74000	11.32	7.45	0.0744	56.9	6.33	377
21299	84000	11.31	7.45	0.0744	56.8	6.32	383
21299	94000	11.31	7.45	0.0744	56.9	6.34	389
21299	104000	11.31	7.45	0.0744	56.7	6.31	393

Recovery finished at 021299 115842

000393

2999

TABLE G-18

MONITORING WELL 22303
(Continued)

Log File Name : 04139922303
Setup Date (MMDDYY) : 041399
Setup Time (HHMMSS) : 102755
Starting Date (MMDDYY) : 041399
Starting Time (HHMMSS) : 114000
Stopping Date (MMDDYY) : 041499
Stopping Time (HHMMSS) : 115000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
41399	114000	11.58	7.7	0.738	41.7	4.45	386
41399	124000	11.55	7.71	0.73	38.5	4.12	390
41399	134000	11.53	7.72	0.728	37.4	4	394
41399	144000	11.53	7.72	0.727	36	3.84	396
41399	154000	11.53	7.72	0.724	36.2	3.87	398
41399	164000	11.53	7.72	0.723	35.4	3.78	400
41399	174000	11.52	7.72	0.724	34.5	3.69	402
41399	184000	11.52	7.72	0.726	34.5	3.69	403
41399	194000	11.52	7.72	0.725	33.8	3.61	403
41399	204000	11.52	7.72	0.725	34.2	3.65	403
41399	214000	11.52	7.73	0.725	34.1	3.64	403
41399	224000	11.52	7.73	0.723	33.2	3.55	405
41399	234000	11.52	7.73	0.723	32.7	3.49	407
41499	4000	11.52	7.74	0.724	32.8	3.51	409
41499	14000	11.52	7.74	0.725	32.8	3.51	411
41499	24000	11.5	7.74	0.725	32	3.42	413
41499	34000	11.5	7.75	0.725	30.1	3.22	414
41499	44000	11.5	7.75	0.725	30.2	3.23	415
41499	54000	11.5	7.74	0.724	31.7	3.39	416
41499	64000	11.5	7.74	0.723	32.6	3.49	417
41499	74000	11.5	7.74	0.724	32.4	3.46	418
41499	84000	11.52	7.74	0.723	32.4	3.46	419
41499	94000	11.52	7.74	0.72	31.7	3.39	420
41499	104000	11.52	7.74	0.727	31.4	3.36	422
41499	114000	17.59	7.93	0.7	57.5	5.38	252

Recovery finished at 041599 112424

TABLE G-18

MONITORING WELL 22303
(Continued)

Log File Name : 05279922303
Setup Date (MMDDYY) : 052799
Setup Time (HHMMSS) : 080842
Starting Date (MMDDYY) : 052799
Starting Time (HHMMSS) : 090500
Stopping Date (MMDDYY) : 052899
Stopping Time (HHMMSS) : 091500
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
52799	90500	11.83	7.57	0.0716	56.3	5.98	259
52799	100500	11.71	7.58	0.0712	48.3	5.15	267
52799	110500	11.68	7.59	0.0713	46.1	4.91	272
52799	120500	11.67	7.59	0.0712	43.6	4.65	275
52799	130500	11.67	7.6	0.0712	44.9	4.79	278
52799	140500	11.67	7.6	0.0711	43.5	4.63	281
52799	150500	11.67	7.6	0.0711	43.3	4.61	284
52799	160500	11.67	7.6	0.0709	42.5	4.53	287
52799	170500	11.65	7.6	0.0707	41.3	4.41	289
52799	180500	11.65	7.6	0.0707	40.6	4.33	292
52799	190500	11.65	7.6	0.0707	40.6	4.33	293
52799	200500	11.65	7.6	0.0709	40.8	4.35	295
52799	210500	11.65	7.6	0.0709	41.2	4.4	297
52799	220500	11.65	7.6	0.0708	41.7	4.44	299
52799	230500	11.65	7.6	0.0709	41.6	4.43	300
52899	500	11.65	7.6	0.0709	41	4.38	302
52899	10500	11.65	7.6	0.071	40.8	4.35	303
52899	20500	11.63	7.6	0.0709	40.8	4.36	305
52899	30500	11.65	7.6	0.0709	41.1	4.39	306
52899	40500	11.65	7.6	0.0709	41.2	4.4	308
52899	50500	11.65	7.6	0.0709	41.1	4.39	310
52899	60500	11.63	7.6	0.071	41.3	4.4	311
52899	70500	11.65	7.6	0.0709	40.8	4.35	313
52899	80500	11.63	7.6	0.0708	41	4.37	314
52899	90500	11.65	7.6	0.0708	40.7	4.34	316

Recovery finished at 060299 064013

TABLE G-18

MONITORING WELL 22303
(Continued)

2999

Log File Name : 06029922303
Setup Date (MMDDYY) : 060299
Setup Time (HHMMSS) : 085411
Starting Date (MMDDYY) : 060299
Starting Time (HHMMSS) : 094000
Stopping Date (MMDDYY) : 060399
Stopping Time (HHMMSS) : 094100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
60299	94000	11.78	7.65	0.0704	61.4	6.53	502
60299	104000	11.78	7.65	0.0708	56.1	5.97	506
60299	114000	11.8	7.65	0.0709	54.9	5.83	507
60299	124000	11.8	7.66	0.0708	52.8	5.61	508
60299	134000	11.8	7.66	0.0708	50.3	5.35	508
60299	144000	11.8	7.66	0.0707	49.3	5.24	508
60299	154000	11.8	7.65	0.0705	48.8	5.19	507
60299	164000	11.8	7.65	0.0704	47.3	5.02	504
60299	174000	11.8	7.66	0.0703	46.2	4.92	504
60299	184000	11.8	7.66	0.0704	47	4.99	507
60299	194000	11.8	7.66	0.0703	45.2	4.81	510
60299	204000	11.8	7.67	0.0702	43.7	4.64	510
60299	214000	11.8	7.67	0.0701	42.9	4.56	510
60299	224000	11.8	7.67	0.0702	43.2	4.59	511
60299	234000	11.8	7.67	0.0701	43.6	4.63	511
60399	4000	11.8	7.67	0.07	44.3	4.71	511
60399	14000	11.8	7.67	0.07	44.1	4.69	511
60399	24000	11.8	7.67	0.07	44.4	4.72	511
60399	34000	11.8	7.67	0.07	44.5	4.73	511
60399	44000	11.8	7.67	0.0702	44.2	4.7	511
60399	54000	11.81	7.67	0.0704	46	4.89	511
60399	64000	11.81	7.67	0.0703	45.4	4.83	511
60399	74000	11.81	7.68	0.0703	43.9	4.66	510
60399	84000	11.81	7.68	0.0704	45	4.78	510
60399	94000	12.19	7.85	0.0677	100.4	10.57	367

Recovery finished at 061499 131206

TABLE G-18

MONITORING WELL 22303
(Continued)

Log File Name : 07209922303
Setup Date (MMDDYY) : 072099
Setup Time (HHMMSS) : 131419
Starting Date (MMDDYY) : 072099
Starting Time (HHMMSS) : 141500
Stopping Date (MMDDYY) : 072199
Stopping Time (HHMMSS) : 141600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
72099	141500	12.33	7.62	0.0711	48.9	5.28	513
72099	151500	12.1	7.63	0.0712	42.7	4.64	523
72099	161500	12.03	7.63	0.071	41.6	4.53	529
72099	171500	12.01	7.64	0.0709	40.4	4.39	532
72099	181500	12	7.64	0.0709	39.7	4.33	533
72099	191500	11.98	7.64	0.0709	39.1	4.26	535
72099	201500	11.98	7.65	0.071	38.6	4.2	535
72099	211500	11.98	7.65	0.0709	38.8	4.23	536
72099	221500	11.97	7.65	0.0709	38.3	4.17	536
72099	231500	11.97	7.65	0.071	39.7	4.32	536
72199	1500	11.97	7.66	0.0709	38.8	4.23	538
72199	11500	11.97	7.66	0.0709	39.3	4.29	538
72199	21500	11.97	7.65	0.0709	39.8	4.33	538
72199	31500	11.97	7.66	0.0709	39.2	4.28	539
72199	41500	11.97	7.66	0.0709	38.8	4.23	539
72199	51500	11.97	7.66	0.0709	38.9	4.24	540
72199	61500	11.97	7.66	0.0709	38.9	4.24	540
72199	71500	11.97	7.66	0.0709	38.8	4.23	540
72199	81500	11.97	7.66	0.0709	39.1	4.26	540
72199	91500	11.98	7.66	0.071	39	4.25	540
72199	101500	11.98	7.66	0.071	39	4.25	541
72199	111500	11.98	7.66	0.071	39	4.25	541
72199	121500	11.98	7.66	0.071	39.3	4.29	542
72199	131500	11.98	7.66	0.071	39.2	4.27	542
72199	141500	11.98	7.66	0.071	39.2	4.27	543

Recovery finished at 072299 115153

000397

2999

TABLE G-18

MONITORING WELL 22303
(Continued)

Log File Name : 08059922303
Setup Date (MMDDYY) : 080599
Setup Time (HHMMSS) : 124751
Starting Date (MMDDYY) : 080599
Starting Time (HHMMSS) : 140000
Stopping Date (MMDDYY) : 080699
Stopping Time (HHMMSS) : 140100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
80599	140000	12.26	7.64	0.0721	44.7	4.7	437
80599	150000	12.1	7.66	0.0717	36.9	3.9	423
80599	160000	12.06	7.67	0.0715	37	3.9	422
80599	170000	12.05	7.67	0.0711	38.4	4.05	420
80599	180000	12.03	7.68	0.0714	38	4.02	415
80599	190000	12.01	7.68	0.0715	37.6	3.98	416
80599	200000	12.01	7.68	0.0715	35.8	3.79	420
80599	210000	12	7.68	0.0719	32.9	3.48	424
80599	220000	12	7.68	0.0723	30.8	3.25	421
80599	230000	12	7.69	0.0721	31.9	3.38	420
80699	0	11.98	7.69	0.072	35.4	3.74	427
80699	10000	11.98	7.69	0.0721	35.6	3.77	434
80699	20000	11.98	7.69	0.0719	36.4	3.85	439
80699	30000	11.97	7.69	0.0719	36.1	3.83	445
80699	40000	11.97	7.69	0.0718	36.7	3.88	449
80699	50000	11.97	7.7	0.0717	37.4	3.96	453
80699	60000	11.97	7.7	0.0716	37.7	3.99	456
80699	70000	11.97	7.7	0.0718	38.1	4.03	458
80699	80000	11.97	7.7	0.0717	39.6	4.19	460
80699	90000	11.97	7.7	0.0718	39.6	4.19	461
80699	100000	11.97	7.7	0.0717	37.7	3.99	462
80699	110000	11.95	7.71	0.0717	36.2	3.83	462
80699	120000	11.95	7.71	0.0717	34.5	3.66	463
80699	130000	11.95	7.72	0.0716	32.8	3.48	463
80699	140000	11.95	7.72	0.0716	32.7	3.46	464

Recovery finished at 081799 062729

TABLE G-19

MONITORING WELL 32304

Log File Name : 09299832304
Setup Date (MMDDYY) : 092998
Setup Time (HHMMSS) : 092850
Starting Date (MMDDYY) : 092998
Starting Time (HHMMSS) : 093000
Stopping Date (MMDDYY) : 093098
Stopping Time (HHMMSS) : 093000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
92998	93000	11.11	7.15	0.073	7.4	0.83	3
92998	103000	11.05	7.2	0.075	8.4	0.94	-31
92998	113000	11.03	7.21	0.075	6.3	0.7	-40
92998	123000	11.03	7.22	0.075	5.8	0.65	-44
92998	133000	11.02	7.22	0.075	5.5	0.62	-52
92998	143000	11.02	7.22	0.075	6.1	0.68	-60
92998	153000	11.02	7.23	0.075	5.4	0.6	-66
92998	163000	11.02	7.23	0.075	4.9	0.54	-73
92998	173000	11.02	7.23	0.075	5.3	0.59	-76
92998	183000	11.02	7.23	0.075	5.7	0.64	-78
92998	193000	11.02	7.23	0.075	18.1	2.02	-80
92998	203000	11.02	7.23	0.075	5.5	0.62	-81
92998	213000	11.02	7.23	0.075	5.4	0.6	-81
92998	223000	11.02	7.23	0.076	6	0.66	-81
92998	233000	11.02	7.24	0.076	5.9	0.65	-82
93098	3000	11.02	7.24	0.076	4.3	0.48	-82
93098	13000	11.02	7.24	0.076	4.1	0.45	-82
93098	23000	11.02	7.24	0.076	4	0.44	-84
93098	33000	11.02	7.24	0.076	4.5	0.51	-84
93098	43000	11.02	7.24	0.076	3.5	0.39	-85
93098	53000	11.02	7.24	0.076	4.5	0.5	-85
93098	63000	11.02	7.24	0.076	3.8	0.42	-86
93098	73000	11.02	7.24	0.076	4.8	0.53	-87
93098	83000	11.02	7.25	0.076	4.1	0.45	-87
93098	93000	11.02	7.25	0.077	4.7	0.53	-87

Recovery finished at 093098 124040

000399

2999

TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 10149832304
Setup Date (MMDDYY) : 101498
Setup Time (HHMMSS) : 114113
Starting Date (MMDDYY) : 101498
Starting Time (HHMMSS) : 114500
Stopping Date (MMDDYY) : 101598
Stopping Time (HHMMSS) : 114500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
101498	114500	11.43	7.42	0.712	41	4.5	-27
101498	124500	11.27	7.43	0.735	18.5	2.04	-76
101498	134500	11.24	7.44	0.735	11.3	1.25	-87
101498	144500	11.24	7.44	0.737	9.6	1.06	-91
101498	154500	11.24	7.44	0.738	9.2	1.01	-94
101498	164500	11.24	7.44	0.737	9.2	1.01	-94
101498	174500	11.24	7.44	0.739	8.8	0.97	-96
101498	184500	11.24	7.44	0.74	8.7	0.96	-97
101498	194500	11.24	7.44	0.741	8.6	0.95	-97
101498	204500	11.24	7.44	0.741	8.6	0.95	-97
101498	214500	11.24	7.44	0.741	8.5	0.94	-97
101498	224500	11.24	7.44	0.74	8.3	0.91	-96
101498	234500	11.25	7.44	0.74	7.9	0.86	-95
101598	4500	11.25	7.44	0.74	7.6	0.84	-95
101598	14500	11.25	7.45	0.74	7.5	0.83	-95
101598	24500	11.25	7.45	0.741	7.5	0.83	-95
101598	34500	11.25	7.45	0.741	7.5	0.83	-95
101598	44500	11.25	7.45	0.741	7.5	0.83	-95
101598	54500	11.25	7.45	0.742	7.4	0.82	-94
101598	64500	11.25	7.45	0.742	7.4	0.82	-95
101598	74500	11.25	7.45	0.742	7.4	0.82	-95
101598	84500	11.25	7.45	0.743	7.4	0.82	-94
101598	94500	11.25	7.45	0.743	7.4	0.82	-95
101598	104500	11.27	7.45	0.744	7.4	0.82	-94
101598	114500	11.27	7.45	0.743	7.4	0.82	-94

Recovery finished at 102198 075847

TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 11309832304
Setup Date (MMDDYY) : 113098
Setup Time (HHMMSS) : 120652
Starting Date (MMDDYY) : 113098
Starting Time (HHMMSS) : 110500
Stopping Date (MMDDYY) : 120198
Stopping Time (HHMMSS) : 110600
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
113098	130500	11.73	7.4	0.0685	36.4	4.06	236
113098	140500	11.7	7.43	0.0697	31.5	3.51	242
113098	150500	11.68	7.42	0.0705	21.2	2.36	200
113098	160500	11.68	7.41	0.0705	17	1.89	185
113098	170500	11.68	7.41	0.0705	16	1.79	181
113098	180500	11.68	7.41	0.0706	15.9	1.77	186
113098	190500	11.68	7.41	0.0706	16.6	1.85	195
113098	200500	11.68	7.41	0.0705	16.6	1.85	204
113098	210500	11.68	7.41	0.0706	16.5	1.83	215
113098	220500	11.68	7.41	0.0707	16.2	1.81	220
113098	230500	11.67	7.41	0.0707	15.9	1.77	224
120198	500	11.68	7.41	0.0707	14.8	1.65	229
120198	10500	11.68	7.41	0.0707	15	1.67	232
120198	20500	11.67	7.41	0.0707	15.2	1.69	237
120198	30500	11.68	7.41	0.0707	13.4	1.5	242
120198	40500	11.68	7.41	0.0707	14.7	1.64	246
120198	50500	11.68	7.41	0.0707	14.7	1.64	247
120198	60500	11.68	7.41	0.0707	14.7	1.64	249
120198	70500	11.68	7.41	0.0707	14.8	1.65	253
120198	80500	11.68	7.41	0.0707	14.6	1.63	256
120198	90500	11.68	7.41	0.0707	14.7	1.64	259
120198	100500	11.68	7.41	0.0707	14.6	1.63	261
120198	110500	11.68	7.41	0.0707	14.7	1.64	266

Recovery finished at 120198 161355

000401

TABLE G-19

MONITORING WELL 32304
(Continued)

2999

Log File Name : 12029832304
Setup Date (MMDDYY) : 120298
Setup Time (HHMMSS) : 100321
Starting Date (MMDDYY) : 120298
Starting Time (HHMMSS) : 090500
Stopping Date (MMDDYY) : 120398
Stopping Time (HHMMSS) : 090600
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
120298	100500	11.68	7.43	0.0707	7.7	0.86	443
120298	110500	11.68	7.42	0.0707	14.3	1.59	451
120298	120500	11.68	7.42	0.0707	14.3	1.59	459
120298	130500	11.68	7.42	0.0707	14.3	1.59	462
120298	140500	11.68	7.42	0.0707	14.3	1.59	467
120298	150500	11.68	7.42	0.0707	14.5	1.62	469
120298	160500	11.68	7.43	0.0707	14.4	1.61	473
120298	170500	11.68	7.43	0.0707	14.3	1.59	476
120298	180500	11.68	7.43	0.0707	14.3	1.59	479
120298	190500	11.68	7.43	0.0707	14.4	1.61	481
120298	200500	11.68	7.43	0.0707	14.4	1.61	484
120298	210500	11.68	7.43	0.0707	14.2	1.58	485
120298	220500	11.68	7.43	0.0707	14.1	1.57	487
120298	230500	11.68	7.43	0.0707	14.3	1.59	488
120398	500	11.68	7.43	0.0707	14.2	1.58	487
120398	10500	11.68	7.43	0.0707	14.2	1.58	489
120398	20500	11.68	7.43	0.0707	14.2	1.58	489
120398	30500	11.68	7.43	0.0707	14.1	1.57	491
120398	40500	11.7	7.43	0.0707	14.3	1.59	493
120398	50500	11.68	7.43	0.0707	14.1	1.57	492
120398	60500	11.68	7.43	0.0707	14.2	1.58	494
120398	70500	11.7	7.43	0.0707	14.2	1.58	493
120398	80500	11.68	7.43	0.0707	14.1	1.57	494
120398	90500	11.68	7.43	0.0707	14.2	1.58	494

Recovery finished at 121598 143203

TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 01189932304
Setup Date (MMDDYY) : 011899
Setup Time (HHMMSS) : 103208
Starting Date (MMDDYY) : 011899
Starting Time (HHMMSS) : 103500
Stopping Date (MMDDYY) : 011999
Stopping Time (HHMMSS) : 104000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
11899	103500	11.53	7.1	0.0731	12	1.33	82
11899	113500	11.57	7.1	0.0732	14	1.55	116
11899	123500	11.57	7.09	0.0732	13.7	1.51	127
11899	133500	11.58	7.09	0.0736	12.5	1.38	118
11899	143500	11.58	7.09	0.0744	11.4	1.26	117
11899	153500	11.58	7.08	0.0746	9.7	1.08	121
11899	163500	11.58	7.07	0.0749	9	0.99	128
11899	173500	11.58	7.06	0.0749	8.8	0.97	127
11899	183500	11.58	7.06	0.0746	8.3	0.92	118
11899	193500	11.58	7.06	0.0747	8.3	0.92	108
11899	203500	11.58	7.06	0.0745	8.1	0.9	88
11899	213500	11.58	7.05	0.0744	8	0.88	74
11899	223500	11.58	7.05	0.0745	8.1	0.9	69
11899	233500	11.58	7.05	0.0744	8	0.88	61
11999	3500	11.58	7.05	0.0744	8	0.88	58
11999	13500	11.58	7.05	0.0745	7.9	0.87	57
11999	23500	11.58	7.05	0.0745	7.8	0.86	55
11999	33500	11.58	7.06	0.0745	7.8	0.86	53
11999	43500	11.58	7.05	0.0745	7.8	0.86	50
11999	53500	11.58	7.05	0.0745	7.8	0.86	46
11999	63500	11.58	7.05	0.0745	7.9	0.87	44
11999	73500	11.58	7.05	0.0745	7.7	0.85	42
11999	83500	11.58	7.05	0.0745	7.7	0.85	40
11999	93500	11.58	7.05	0.0744	7.7	0.85	37
11999	103500	11.58	7.05	0.0745	7.7	0.85	35

Recovery finished at 012199 140954

000403

2999

TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 02099932304
Setup Date (MMDDYY) : 020999
Setup Time (HHMMSS) : 090519
Starting Date (MMDDYY) : 020999
Starting Time (HHMMSS) : 091000
Stopping Date (MMDDYY) : 021099
Stopping Time (HHMMSS) : 091500
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
20999	91000	11.39	7.03	0.0698	28.2	3.14	196
20999	101000	11.51	7.07	0.0698	30.1	3.34	267
20999	111000	11.54	7.07	0.0702	33.1	3.67	284
20999	121000	11.54	7.07	0.0707	29.3	3.24	294
20999	131000	11.54	7.08	0.0706	27.3	3.03	301
20999	141000	11.54	7.08	0.0705	28.4	3.14	305
20999	151000	11.54	7.07	0.0704	28.5	3.15	293
20999	161000	11.56	7.07	0.0704	31.5	3.49	282
20999	171000	11.56	7.07	0.0704	32.2	3.57	282
20999	181000	11.54	7.07	0.0704	30.9	3.42	273
20999	191000	11.54	7.07	0.0704	28.1	3.11	257
20999	201000	11.54	7.07	0.0704	26.8	2.97	243
20999	211000	11.54	7.07	0.0703	26.3	2.92	246
20999	221000	11.54	7.07	0.0704	32	3.55	254
20999	231000	11.54	7.07	0.0704	31.7	3.51	262
21099	1000	11.54	7.07	0.0704	28.9	3.2	269
21099	11000	11.54	7.07	0.0704	28.8	3.19	277
21099	21000	11.56	7.07	0.0704	31	3.43	284
21099	31000	11.56	7.08	0.0703	27.9	3.09	290
21099	41000	11.56	7.08	0.0702	29.1	3.22	293
21099	51000	11.56	7.08	0.0702	33.2	3.68	297
21099	61000	11.56	7.08	0.0702	29.9	3.31	296
21099	71000	11.56	7.08	0.07	35.1	3.89	297
21099	81000	11.56	7.08	0.07	36.6	4.05	306
21099	91000	11.56	7.08	0.0702	38.5	4.26	307

Recovery finished at 021299 115002

TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 04079932304
Setup Date (MMDDYY) : 040799
Setup Time (HHMMSS) : 102003
Starting Date (MMDDYY) : 040799
Starting Time (HHMMSS) : 112500
Stopping Date (MMDDYY) : 040899
Stopping Time (HHMMSS) : 112600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
40799	112500	11.49	7.57	0.0741	19.3	2.09	296
40799	122500	11.46	7.58	0.0758	11.3	1.22	300
40799	132500	11.43	7.58	0.0765	8.6	0.93	302
40799	142500	11.44	7.59	0.0756	9.8	1.06	304
40799	152500	11.44	7.58	0.0765	6.8	0.74	305
40799	162500	11.44	7.58	0.0756	6.6	0.71	304
40799	172500	11.43	7.58	0.0754	6.7	0.73	305
40799	182500	11.44	7.59	0.0752	6	0.65	298
40799	192500	11.43	7.59	0.0739	5.9	0.64	300
40799	202500	11.44	7.59	0.0744	6.5	0.7	303
40799	212500	11.44	7.59	0.0746	7.3	0.79	304
40799	222500	11.43	7.59	0.075	6.8	0.74	305
40799	232500	11.44	7.59	0.0752	7	0.76	305
40899	2500	11.44	7.59	0.0754	7.2	0.78	306
40899	12500	11.44	7.59	0.0755	6.9	0.75	306
40899	22500	11.44	7.6	0.0755	6.7	0.72	307
40899	32500	11.44	7.6	0.0755	6.8	0.74	308
40899	42500	11.43	7.6	0.0755	7.3	0.79	309
40899	52500	11.44	7.6	0.0756	7.2	0.78	309
40899	62500	11.43	7.6	0.0758	7.1	0.77	306
40899	72500	11.44	7.61	0.0755	8.1	0.88	301
40899	82500	11.44	7.61	0.0752	7.7	0.84	302
40899	92500	11.44	7.61	0.0748	8.2	0.89	293
40899	102500	11.44	7.62	0.0749	7.9	0.86	299
40899	112500	11.44	7.62	0.0751	7.7	0.84	296

Recovery finished at 041299 070301

000405

2999

TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 05209932304
Setup Date (MMDDYY) : 052099
Setup Time (HHMMSS) : 091115
Starting Date (MMDDYY) : 052099
Starting Time (HHMMSS) : 103000
Stopping Date (MMDDYY) : 052199
Stopping Time (HHMMSS) : 103500
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
52099	103000	11.41	7.28	0.072	40.4	4.37	467
52099	113000	11.39	7.29	0.0723	37.5	4.06	453
52099	123000	11.39	7.3	0.0723	36.5	3.96	440
52099	133000	11.39	7.3	0.0724	35.8	3.89	437
52099	143000	11.39	7.3	0.0725	34.6	3.75	437
52099	153000	11.39	7.31	0.0725	34	3.68	440
52099	163000	11.39	7.31	0.073	34.5	3.74	452
52099	173000	11.39	7.31	0.0731	37.8	4.1	464
52099	183000	11.39	7.31	0.0731	38.3	4.15	471
52099	193000	11.39	7.32	0.0732	39.2	4.24	483
52099	203000	11.38	7.32	0.0732	37.8	4.1	488
52099	213000	11.39	7.32	0.0733	37.3	4.04	488
52099	223000	11.39	7.32	0.0733	29.9	3.24	490
52099	233000	11.39	7.32	0.0735	27.4	2.96	490
52199	3000	11.39	7.32	0.0733	25.7	2.79	486
52199	13000	11.39	7.32	0.0732	26.7	2.89	485
52199	23000	11.39	7.32	0.0734	27.7	3	486
52199	33000	11.39	7.33	0.0734	28.1	3.05	486
52199	43000	11.39	7.33	0.0734	28.5	3.08	488
52199	53000	11.39	7.33	0.0733	29	3.14	490
52199	63000	11.39	7.33	0.0733	30.3	3.29	493
52199	73000	11.39	7.33	0.0733	31.4	3.41	494
52199	83000	11.39	7.33	0.0731	32.3	3.5	497
52199	93000	11.39	7.33	0.0734	32	3.47	500
52199	103000	11.39	7.33	0.0731	32.2	3.49	503

Recovery finished at 052599 063707

TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 06019932304
Setup Date (MMDDYY) : 052599
Setup Time (HHMMSS) : 084638
Starting Date (MMDDYY) : 060199
Starting Time (HHMMSS) : 060000
Stopping Date (MMDDYY) : 060299
Stopping Time (HHMMSS) : 060100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
60199	60000	11.44	7.43	0.0705	33.4	3.62	531
60199	70000	11.44	7.42	0.0703	33.5	3.63	530
60199	80000	11.44	7.42	0.0703	33.4	3.62	530
60199	90000	11.44	7.42	0.0704	33.4	3.62	530
60199	100000	11.44	7.42	0.0704	33.5	3.63	531
60199	110000	11.44	7.42	0.0703	33.6	3.64	532
60199	120000	11.44	7.42	0.0704	33.6	3.64	532
60199	130000	11.44	7.42	0.0704	33.2	3.59	533
60199	140000	11.44	7.43	0.0705	32.1	3.47	533
60199	150000	11.44	7.43	0.0705	30.8	3.33	534
60199	160000	11.44	7.43	0.0706	30.1	3.26	534
60199	170000	11.44	7.42	0.0706	30.1	3.26	534
60199	180000	11.44	7.43	0.0706	30.4	3.29	535
60199	190000	11.44	7.41	0.0706	30.1	3.26	533
60199	200000	11.44	7.42	0.0706	29	3.14	533
60199	210000	11.44	7.41	0.0706	28.5	3.09	533
60199	220000	11.44	7.41	0.0706	28.2	3.05	533
60199	230000	11.46	7.41	0.0706	27.9	3.02	534
60299	0	11.46	7.41	0.0707	27.7	2.99	534
60299	10000	11.46	7.42	0.0707	27.8	3.01	534
60299	20000	11.46	7.41	0.0709	27.8	3.01	535
60299	30000	11.46	7.42	0.0708	27.5	2.98	535
60299	40000	11.44	7.41	0.0709	27.8	3.01	535
60299	50000	11.46	7.4	0.0707	27.7	2.99	535
60299	60000	11.46	7.4	0.0708	27.5	2.98	535

Recovery finished at 061499 125324

000407

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TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 07269932304
Setup Date (MMDDYY) : 072699
Setup Time (HHMMSS) : 110244
Starting Date (MMDDYY) : 072699
Starting Time (HHMMSS) : 123000
Stopping Date (MMDDYY) : 072799
Stopping Time (HHMMSS) : 123100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
72699	123000	11.85	7.26	0.074	26.1	2.77	393
72699	133000	11.77	7.23	0.0756	22.4	2.39	391
72699	143000	11.75	7.22	0.0763	18.7	1.99	391
72699	153000	11.73	7.21	0.0761	14.7	1.56	391
72699	163000	11.73	7.2	0.0751	12.6	1.34	391
72699	173000	11.73	7.2	0.0745	11.7	1.24	390
72699	183000	11.73	7.21	0.0742	11.2	1.19	390
72699	193000	11.72	7.2	0.0755	11.2	1.2	390
72699	203000	11.73	7.2	0.0735	11	1.17	388
72699	213000	11.73	7.21	0.0738	10.1	1.08	388
72699	223000	11.72	7.22	0.0739	9.9	1.06	387
72699	233000	11.72	7.22	0.0742	10.4	1.1	387
72799	3000	11.73	7.23	0.074	10.5	1.11	386
72799	13000	11.72	7.24	0.0739	10.5	1.11	386
72799	23000	11.72	7.24	0.074	10.8	1.15	385
72799	33000	11.73	7.25	0.074	10.8	1.15	385
72799	43000	11.73	7.25	0.0744	11.1	1.18	385
72799	53000	11.73	7.26	0.074	11.2	1.19	385
72799	63000	11.73	7.26	0.0738	11.2	1.19	384
72799	73000	11.73	7.27	0.0737	11.2	1.19	384
72799	83000	11.72	7.27	0.0736	11.2	1.2	384
72799	93000	11.72	7.28	0.0734	11.1	1.18	384
72799	103000	11.73	7.28	0.0735	10.5	1.11	384
72799	113000	11.73	7.28	0.0735	10.3	1.09	384
72799	123000	11.73	7.28	0.0748	11.4	1.22	384

Recovery finished at 072999 053606

TABLE G-19

MONITORING WELL 32304
(Continued)

Log File Name : 08019932304
Setup Date (MMDDYY) : 072999
Setup Time (HHMMSS) : 090420
Starting Date (MMDDYY) : 080199
Starting Time (HHMMSS) : 060000
Stopping Date (MMDDYY) : 080299
Stopping Time (HHMMSS) : 061000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
80199	60000	11.75	7.52	0.0695	7.6	0.8	431
80199	70000	11.75	7.52	0.0695	8.5	0.91	431
80199	80000	11.75	7.53	0.0695	8.7	0.93	432
80199	90000	11.75	7.53	0.0694	8.7	0.93	434
80199	100000	11.75	7.53	0.0693	8.3	0.88	434
80199	110000	11.75	7.52	0.0694	7.9	0.84	436
80199	120000	11.75	7.52	0.0694	7.3	0.78	437
80199	130000	11.75	7.52	0.0695	7.2	0.77	437
80199	140000	11.75	7.52	0.0693	7.3	0.78	438
80199	150000	11.75	7.53	0.0693	7.3	0.78	439
80199	160000	11.75	7.53	0.0693	7.7	0.81	440
80199	170000	11.75	7.53	0.0693	7.7	0.81	441
80199	180000	11.75	7.53	0.0692	7.8	0.83	442
80199	190000	11.75	7.53	0.0694	8	0.85	443
80199	200000	11.75	7.52	0.0694	7.7	0.81	444
80199	210000	11.75	7.52	0.0693	7.9	0.84	445
80199	220000	11.75	7.52	0.0693	7.9	0.84	446
80199	230000	11.75	7.52	0.0693	7.9	0.84	447
80299	0	11.75	7.52	0.0691	7.9	0.84	447
80299	10000	11.75	7.52	0.0691	8	0.85	448
80299	20000	11.75	7.53	0.0691	7.9	0.84	449
80299	30000	11.75	7.53	0.0689	7.7	0.81	450
80299	40000	11.75	7.53	0.069	7.6	0.8	451
80299	50000	11.75	7.53	0.069	7.8	0.83	452
80299	60000	11.75	7.53	0.0689	7.7	0.81	453

Recovery finished at 081799 053924

000409

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TABLE G-20

MONITORING WELL 32305

Log File Name : 09099832305
Setup Date (MMDDYY) : 090998
Setup Time (HHMMSS) : 103443
Starting Date (MMDDYY) : 090998
Starting Time (HHMMSS) : 104000
Stopping Date (MMDDYY) : 091698
Stopping Time (HHMMSS) : 104000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90998	104000	9.94	7	0.622	4	0.44	316
90998	114000	9.82	7.06	0.619	7.4	0.82	377
90998	124000	9.82	7.07	0.618	7.7	0.86	330
90998	134000	9.82	7.08	0.617	5.5	0.61	358
90998	144000	9.82	7.09	0.618	4.3	0.48	347
90998	154000	9.82	7.09	0.617	3.9	0.43	322
90998	164000	9.82	7.09	0.617	3.6	0.4	302
90998	174000	9.82	7.09	0.617	3.2	0.35	276
90998	184000	9.82	7.09	0.617	2.9	0.32	257
90998	194000	9.82	7.09	0.617	3	0.34	246
90998	204000	9.81	7.09	0.617	2.9	0.33	242
90998	214000	9.81	7.09	0.617	2.8	0.31	247
90998	224000	9.82	7.1	0.617	2.7	0.3	253
90998	234000	9.82	7.1	0.617	2.6	0.29	262
91098	4000	9.82	7.1	0.616	2.5	0.27	271
91098	14000	9.82	7.1	0.616	2.5	0.27	283
91098	24000	9.82	7.1	0.616	2.5	0.27	296
91098	34000	9.82	7.1	0.616	2.3	0.26	309
91098	44000	9.82	7.1	0.616	2.5	0.27	324
91098	54000	9.82	7.1	0.616	2.3	0.26	340
91098	64000	9.82	7.1	0.616	2.3	0.26	354
91098	74000	9.82	7.1	0.616	2.3	0.26	371
91098	84000	9.82	7.1	0.616	2.5	0.27	389
91098	94000	9.82	7.1	0.616	2.3	0.26	410
91098	104000	9.81	7.11	0.616	2.3	0.26	430

TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 10019832305
Setup Date (MMDDYY) : 100198
Setup Time (HHMMSS) : 092126
Starting Date (MMDDYY) : 100298
Starting Time (HHMMSS) : 093000
Stopping Date (MMDDYY) : 100398
Stopping Time (HHMMSS) : 093000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
100298	93000	9.85	7.26	0.067	34.2	3.92	322
100298	103000	9.85	7.26	0.067	34.9	4	323
100298	113000	9.85	7.26	0.067	38.1	4.37	323
100298	123000	9.85	7.26	0.067	21.7	2.49	324
100298	133000	9.85	7.26	0.067	32.6	3.74	325
100298	143000	9.85	7.26	0.067	31.2	3.58	326
100298	153000	9.85	7.27	0.067	33.1	3.8	326
100298	163000	9.85	7.26	0.067	30.7	3.52	326
100298	173000	9.85	7.26	0.067	31.1	3.57	327
100298	183000	9.85	7.26	0.067	28.5	3.27	328
100298	193000	9.85	7.26	0.067	27.9	3.2	329
100298	203000	9.85	7.26	0.067	27.9	3.2	329
100298	213000	9.85	7.26	0.067	29.9	3.42	330
100298	223000	9.85	7.26	0.067	29.8	3.41	331
100298	233000	9.85	7.26	0.067	28	3.21	331
100398	3000	9.85	7.26	0.067	31	3.56	332
100398	13000	9.85	7.26	0.067	32	3.66	333
100398	23000	9.85	7.26	0.067	30.9	3.55	333
100398	33000	9.85	7.26	0.067	31.5	3.6	334
100398	43000	9.87	7.26	0.067	29.8	3.42	335
100398	53000	9.85	7.26	0.067	32.3	3.7	335
100398	63000	9.87	7.26	0.067	27.5	3.15	336
100398	73000	9.87	7.26	0.067	28.2	3.24	336
100398	83000	9.87	7.26	0.067	28.5	3.27	337
100398	93000	9.87	7.26	0.067	29.6	3.39	338

Recovery finished at 102198 080222

000411

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TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 11249832305
Setup Date (MMDDYY) : 112498
Setup Time (HHMMSS) : 151643
Starting Date (MMDDYY) : 112498
Starting Time (HHMMSS) : 141500
Stopping Date (MMDDYY) : 112598
Stopping Time (HHMMSS) : 141700
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
112498	161500	11.57	7.48	0.0663	61.5	6.87	270
112498	171500	11.57	7.48	0.0666	57.2	6.39	279
112498	181500	11.57	7.48	0.0666	57.3	6.4	283
112498	191500	11.57	7.48	0.0666	56.8	6.34	286
112498	201500	11.57	7.49	0.0666	56.3	6.29	288
112498	211500	11.57	7.48	0.0666	56.1	6.27	290
112498	221500	11.57	7.48	0.0666	55.8	6.23	292
112498	231500	11.57	7.49	0.0666	56.9	6.35	293
112598	1500	11.57	7.48	0.0666	58.7	6.56	295
112598	11500	11.57	7.47	0.0666	61	6.81	296
112598	21500	11.57	7.47	0.0666	61.4	6.86	298
112598	31500	11.57	7.47	0.0666	61	6.81	299
112598	41500	11.57	7.49	0.0666	59.1	6.61	299
112598	51500	11.57	7.49	0.0666	58.3	6.51	301
112598	61500	11.57	7.5	0.0666	58.7	6.56	301
112598	71500	11.57	7.5	0.0666	62.2	6.94	303
112598	81500	11.57	7.5	0.0666	64	7.15	304
112598	91500	11.57	7.49	0.0665	64.8	7.24	306
112598	101500	11.57	7.49	0.0666	66.6	7.44	307
112598	111500	11.57	7.5	0.0666	69.4	7.75	308
112598	121500	11.57	7.5	0.0666	71.9	8.03	310
112598	131500	11.57	7.5	0.0666	73.5	8.21	311
112598	141500	11.57	7.49	0.0666	74.5	8.33	313

Recovery finished at 113098 093549

TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 12149832305
Setup Date (MMDDYY) : 121498
Setup Time (HHMMSS) : 105648
Starting Date (MMDDYY) : 121498
Starting Time (HHMMSS) : 100000
Stopping Date (MMDDYY) : 121598
Stopping Time (HHMMSS) : 100100
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
121498	110000	11.48	7.53	0.0663	102.3	11.45	250
121498	120000	11.57	7.58	0.0671	94.9	10.6	285
121498	130000	11.57	7.59	0.0675	97.5	10.89	302
121498	140000	11.57	7.59	0.0675	105.2	11.76	316
121498	150000	11.57	7.6	0.0675	108.6	12.13	329
121498	160000	11.57	7.6	0.0675	108.9	12.17	342
121498	170000	11.57	7.6	0.0675	109	12.18	355
121498	180000	11.57	7.6	0.0675	109.7	12.25	368
121498	190000	11.57	7.6	0.0675	109.4	12.23	381
121498	200000	11.57	7.6	0.0675	109	12.18	394
121498	210000	11.57	7.61	0.0675	109	12.18	406
121498	220000	11.57	7.61	0.0675	108.8	12.15	417
121498	230000	11.57	7.61	0.0675	108.3	12.09	426
121598	0	11.57	7.61	0.0675	109.4	12.23	435
121598	10000	11.57	7.6	0.0675	108.3	12.09	442
121598	20000	11.57	7.6	0.0675	108.4	12.11	450
121598	30000	11.57	7.6	0.0676	108	12.07	455
121598	40000	11.57	7.6	0.0676	108	12.07	460
121598	50000	11.57	7.6	0.0676	108.2	12.08	464
121598	60000	11.57	7.6	0.0676	108.3	12.09	468
121598	70000	11.57	7.6	0.0675	108	12.07	472
121598	80000	11.57	7.6	0.0676	108	12.07	475
121598	90000	11.57	7.6	0.0675	107.9	12.06	477
121598	100000	11.57	7.6	0.0676	108	12.07	480

Recovery finished at 121598 143723

000413

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TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 01139932305
Setup Date (MMDDYY) : 011399
Setup Time (HHMMSS) : 103056
Starting Date (MMDDYY) : 011399
Starting Time (HHMMSS) : 103500
Stopping Date (MMDDYY) : 011499
Stopping Time (HHMMSS) : 105000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
11399	103500	11.15	7	0.0636	57.3	6.41	311
11399	113500	11.05	7	0.065	61.8	6.92	319
11399	123500	11.06	7.01	0.0643	51.1	5.72	322
11399	133500	11.05	7.01	0.0642	48	5.38	324
11399	143500	11.03	7.01	0.0641	45.3	5.08	325
11399	153500	11.03	7.02	0.0638	40.6	4.55	326
11399	163500	11.02	7.02	0.064	44.2	4.95	328
11399	173500	11	7.02	0.064	40.7	4.57	329
11399	183500	11.02	7.02	0.064	39.4	4.42	330
11399	193500	11	7.02	0.064	40.9	4.59	331
11399	203500	11	7.02	0.064	41.9	4.7	332
11399	213500	11	7.02	0.0639	45.6	5.12	333
11399	223500	11	7.02	0.0639	38.4	4.3	334
11399	233500	11	7.02	0.064	39.9	4.48	334
11499	3500	11	7.02	0.0639	39.9	4.48	335
11499	13500	10.98	7.02	0.0639	42.7	4.79	336
11499	23500	10.98	7.02	0.0639	40.4	4.54	337
11499	33500	10.98	7.02	0.0639	40.4	4.54	337
11499	43500	10.98	7.02	0.0639	36.6	4.11	338
11499	53500	10.98	7.02	0.0641	40.4	4.54	339
11499	63500	10.97	7.02	0.064	35.4	3.98	340
11499	73500	10.97	7.02	0.0637	35.1	3.94	340
11499	83500	10.97	7.02	0.0639	36.7	4.11	341
11499	93500	10.97	7.02	0.0639	40.9	4.6	342
11499	103500	10.97	7.02	0.0639	40	4.49	343

Recovery finished at 011499 142422

TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 02059932305
Setup Date (MMDDYY) : 020599
Setup Time (HHMMSS) : 123831
Starting Date (MMDDYY) : 020599
Starting Time (HHMMSS) : 124500
Stopping Date (MMDDYY) : 020699
Stopping Time (HHMMSS) : 124600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
20599	124500	11.42	7.3	0.0646	22.5	2.5	254
20599	134500	11.41	7.3	0.0647	22.3	2.47	282
20599	144500	11.42	7.31	0.0651	23	2.56	292
20599	154500	11.39	7.3	0.0655	22.8	2.54	297
20599	164500	11.41	7.31	0.0654	22.6	2.51	301
20599	174500	11.39	7.31	0.0653	22.2	2.46	304
20599	184500	11.41	7.31	0.0653	21.9	2.44	306
20599	194500	11.42	7.31	0.0653	21.7	2.41	308
20599	204500	11.41	7.32	0.0653	21.4	2.38	309
20599	214500	11.41	7.32	0.0653	21.2	2.35	310
20599	224500	11.39	7.32	0.0654	21	2.33	311
20599	234500	11.4	7.32	0.0654	20.7	2.3	312
20699	4500	11.42	7.33	0.0655	20.4	2.27	312
20699	14500	11.39	7.32	0.0653	20.1	2.23	306
20699	24500	11.41	7.32	0.0655	19.9	2.21	307
20699	34500	11.42	7.33	0.0655	19.6	2.18	309
20699	44500	11.41	7.32	0.0655	19.5	2.17	311
20699	54500	11.41	7.33	0.0655	19.3	2.15	311
20699	64500	11.41	7.33	0.0653	19.3	2.15	305
20699	74500	11.42	7.32	0.0651	18.9	2.1	299
20699	84500	11.39	7.32	0.0652	18.4	2.05	297
20699	94500	11.4	7.32	0.0652	18.2	2.02	298
20699	104500	11.4	7.32	0.0652	18	2	299
20699	114500	11.39	7.33	0.0653	17.7	1.96	300
20699	124500	11.4	7.33	0.0653	17.5	1.95	303

Recovery finished at 020999 071253

000415

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TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 04059932305
Setup Date (MMDDYY) : 040599
Setup Time (HHMMSS) : 083038
Starting Date (MMDDYY) : 040599
Starting Time (HHMMSS) : 093500
Stopping Date (MMDDYY) : 040699
Stopping Time (HHMMSS) : 093600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
40599	93500	11.29	7.65	0.0691	41.1	4.47	323
40599	103500	11.27	7.65	0.069	39.8	4.32	323
40599	113500	11.27	7.65	0.0691	38.9	4.23	323
40599	123500	11.27	7.66	0.069	38.2	4.15	323
40599	133500	11.27	7.66	0.0691	37.7	4.1	323
40599	143500	11.26	7.66	0.0691	37.5	4.07	324
40599	153500	11.27	7.66	0.0692	37.2	4.04	324
40599	163500	11.27	7.66	0.0691	37	4.02	324
40599	173500	11.27	7.66	0.0692	36.8	4	324
40599	183500	11.27	7.66	0.0692	36.6	3.98	325
40599	193500	11.26	7.67	0.0692	36.5	3.97	325
40599	203500	11.27	7.67	0.0692	36.4	3.96	325
40599	213500	11.27	7.67	0.0692	36.3	3.95	326
40599	223500	11.27	7.67	0.0692	36.3	3.94	326
40599	233500	11.27	7.67	0.0692	36.3	3.94	326
40699	3500	11.27	7.67	0.0692	36.3	3.94	326
40699	13500	11.27	7.67	0.0692	36.3	3.95	326
40699	23500	11.27	7.67	0.0692	36.3	3.94	326
40699	33500	11.27	7.67	0.0692	36.3	3.94	326
40699	43500	11.27	7.68	0.0692	36.3	3.94	327
40699	53500	11.27	7.68	0.0692	36.3	3.95	327
40699	63500	11.26	7.68	0.0692	36.2	3.94	328
40699	73500	11.27	7.68	0.0692	36.3	3.94	328
40699	83500	11.27	7.68	0.0691	36.3	3.94	328
40699	93500	11.26	7.68	0.0692	36.3	3.95	329

Recovery finished at 041299 070116

TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 05179932305
Setup Date (MMDDYY) : 051799
Setup Time (HHMMSS) : 094105
Starting Date (MMDDYY) : 051799
Starting Time (HHMMSS) : 110000
Stopping Date (MMDDYY) : 051899
Stopping Time (HHMMSS) : 110100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
51799	110000	11.34	7.01	0.0751	46.7	5.07	358
51799	120000	11.32	7.21	0.0759	41.9	4.55	378
51799	130000	11.31	7.26	0.076	42.4	4.6	391
51799	140000	11.31	7.25	0.076	46	5	402
51799	150000	11.31	7.25	0.0762	46.9	5.1	412
51799	160000	11.31	7.26	0.0763	48	5.22	420
51799	170000	11.31	7.26	0.0763	48.5	5.26	427
51799	180000	11.31	7.26	0.0762	47.8	5.19	432
51799	190000	11.31	7.26	0.0763	48.3	5.24	437
51799	200000	11.31	7.26	0.076	48.7	5.29	442
51799	210000	11.31	7.26	0.0756	51.6	5.6	445
51799	220000	11.31	7.27	0.0762	48.1	5.23	449
51799	230000	11.31	7.27	0.0764	48.8	5.3	452
51899	0	11.31	7.28	0.0763	49.1	5.34	456
51899	10000	11.31	7.27	0.0763	49.6	5.38	460
51899	20000	11.31	7.27	0.0764	50.7	5.5	462
51899	30000	11.29	7.27	0.0758	49.3	5.35	462
51899	40000	11.31	7.27	0.0759	51.1	5.55	464
51899	50000	11.31	7.28	0.0762	47.7	5.18	465
51899	60000	11.31	7.28	0.0762	47	5.11	466
51899	70000	11.31	7.28	0.0762	48.3	5.24	469
51899	80000	11.31	7.28	0.0759	47.8	5.19	471
51899	90000	11.31	7.29	0.0759	48	5.22	473
51899	100000	11.31	7.29	0.0759	47.7	5.18	475
51899	110000	11.31	7.29	0.0759	47.7	5.18	477

Recovery finished at 052599 063312

2999

TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 06159932305
Setup Date (MMDDYY) : 061599
Setup Time (HHMMSS) : 083717
Starting Date (MMDDYY) : 061599
Starting Time (HHMMSS) : 094500
Stopping Date (MMDDYY) : 061699
Stopping Time (HHMMSS) : 094600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
61599	94500	11.43	7.07	0.0688	68.7	7.58	377
61599	104500	11.42	7.09	0.0688	69.6	7.69	373
61599	114500	11.42	7.1	0.0689	68.4	7.55	370
61599	124500	11.42	7.11	0.0688	67.7	7.47	368
61599	134500	11.42	7.11	0.0689	66.9	7.39	366
61599	144500	11.42	7.12	0.0689	66.7	7.36	365
61599	154500	11.42	7.12	0.0689	66.3	7.32	364
61599	164500	11.42	7.13	0.0689	65.9	7.27	363
61599	174500	11.42	7.13	0.0689	65.6	7.24	363
61599	184500	11.42	7.14	0.0689	65.3	7.2	362
61599	194500	11.42	7.14	0.0689	65.1	7.18	362
61599	204500	11.42	7.14	0.0689	65.1	7.18	362
61599	214500	11.42	7.15	0.0689	65	7.17	361
61599	224500	11.42	7.15	0.0689	64.6	7.12	361
61599	234500	11.42	7.15	0.0688	64.7	7.14	361
61699	4500	11.42	7.16	0.0688	64.6	7.12	360
61699	14500	11.42	7.16	0.0688	64.4	7.11	360
61699	24500	11.42	7.16	0.0688	64.7	7.14	360
61699	34500	11.42	7.16	0.0687	64.3	7.1	360
61699	44500	11.42	7.17	0.0688	64.2	7.09	360
61699	54500	11.42	7.17	0.0688	64.3	7.1	360
61699	64500	11.42	7.17	0.0687	64.3	7.1	360
61699	74500	11.42	7.17	0.0688	64.3	7.1	360
61699	84500	11.42	7.18	0.0688	64.2	7.09	360
61699	94500	11.42	7.18	0.0688	64.2	7.09	360

Recovery finished at 062999 083306

TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 07089932305
Setup Date (MMDDYY) : 070899
Setup Time (HHMMSS) : 084427
Starting Date (MMDDYY) : 070899
Starting Time (HHMMSS) : 100000
Stopping Date (MMDDYY) : 070999
Stopping Time (HHMMSS) : 100100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
70899	100000	11.53	7.33	0.0689	68.6	7.55	450
70899	110000	11.53	7.34	0.069	69.5	7.65	497
70899	120000	11.53	7.34	0.069	68.9	7.58	514
70899	130000	11.53	7.34	0.069	68.4	7.53	522
70899	140000	11.53	7.34	0.0691	67.9	7.47	527
70899	150000	11.52	7.34	0.0691	67.4	7.42	531
70899	160000	11.52	7.34	0.0691	67.2	7.4	535
70899	170000	11.53	7.34	0.0691	66.9	7.37	540
70899	180000	11.53	7.34	0.0691	66.8	7.36	544
70899	190000	11.53	7.34	0.0691	66.6	7.33	547
70899	200000	11.52	7.34	0.0691	66.5	7.33	549
70899	210000	11.53	7.34	0.0691	66.3	7.3	551
70899	220000	11.53	7.34	0.0691	66.2	7.29	552
70899	230000	11.53	7.34	0.0691	66.1	7.28	553
70999	0	11.53	7.34	0.0691	66.2	7.29	554
70999	10000	11.53	7.35	0.0691	66.4	7.31	555
70999	20000	11.53	7.35	0.0691	66.4	7.31	556
70999	30000	11.53	7.35	0.0691	66.3	7.3	557
70999	40000	11.53	7.35	0.0691	66.3	7.3	558
70999	50000	11.53	7.35	0.0691	66.2	7.29	558
70999	60000	11.53	7.35	0.0691	66.2	7.29	559
70999	70000	11.53	7.35	0.0691	66.2	7.29	559
70999	80000	11.53	7.35	0.0691	66.1	7.28	560
70999	90000	11.53	7.35	0.0691	66	7.27	561
70999	100000	11.53	7.35	0.0691	66	7.27	561

Recovery finished at 072299 112002

000419

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TABLE G-20

MONITORING WELL 32305
(Continued)

Log File Name : 08019932305
Setup Date (MMDDYY) : 072999
Setup Time (HHMMSS) : 095718
Starting Date (MMDDYY) : 080199
Starting Time (HHMMSS) : 060000
Stopping Date (MMDDYY) : 080299
Stopping Time (HHMMSS) : 061000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
80199	60000	11.65	7.14	0.0681	50.1	5.34	389
80199	70000	11.65	7.14	0.0682	51.7	5.5	389
80199	80000	11.65	7.14	0.0682	52.1	5.55	389
80199	90000	11.65	7.14	0.0682	52.3	5.57	389
80199	100000	11.65	7.14	0.0682	52.4	5.58	389
80199	110000	11.65	7.15	0.0682	52.6	5.6	389
80199	120000	11.65	7.15	0.0682	52.8	5.62	389
80199	130000	11.65	7.15	0.0682	52.9	5.63	389
80199	140000	11.65	7.15	0.0682	53	5.65	389
80199	150000	11.65	7.15	0.0683	53.2	5.67	389
80199	160000	11.65	7.15	0.0683	53.4	5.69	389
80199	170000	11.65	7.15	0.0683	53.7	5.72	389
80199	180000	11.65	7.15	0.0683	53.7	5.72	389
80199	190000	11.65	7.15	0.0683	54	5.75	390
80199	200000	11.65	7.15	0.0683	54	5.75	390
80199	210000	11.65	7.16	0.0683	54.2	5.77	390
80199	220000	11.65	7.16	0.0683	54.2	5.77	390
80199	230000	11.65	7.16	0.0683	54.2	5.77	390
80299	0	11.65	7.16	0.0683	54.4	5.79	390
80299	10000	11.65	7.16	0.0683	54.5	5.8	390
80299	20000	11.65	7.16	0.0683	54.4	5.79	390
80299	30000	11.65	7.16	0.0683	54.3	5.78	390
80299	40000	11.65	7.16	0.0684	54.3	5.78	390
80299	50000	11.65	7.16	0.0684	54.2	5.77	390
80299	60000	11.65	7.17	0.0684	54.2	5.77	390

Recovery finished at 081299 074155

TABLE G-21

MONITORING WELL 32306

Log File Name : 09039832306
Setup Date (MMDDYY) : 090398
Setup Time (HHMMSS) : 100745
Starting Date (MMDDYY) : 090398
Starting Time (HHMMSS) : 101000
Stopping Date (MMDDYY) : 091098
Stopping Time (HHMMSS) : 101000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90398	101000	8.95	7.64	0.0617	8.2	0.92	-209
90398	111000	8.95	7.66	0.0617	7.5	0.85	-202
90398	121000	8.95	7.65	0.0616	7.6	0.86	-202
90398	131000	8.95	7.65	0.0617	8.6	0.97	-200
90398	141000	8.95	7.66	0.0617	9.5	1.07	-203
90398	151000	8.95	7.65	0.0617	8.2	0.92	-202
90398	161000	8.95	7.65	0.0617	7.1	0.81	-202
90398	171000	8.95	7.65	0.0617	7.4	0.84	-202
90398	181000	8.95	7.65	0.0617	7.4	0.84	-201
90398	191000	8.95	7.65	0.0617	7.4	0.84	-201
90398	201000	8.95	7.65	0.0616	6.8	0.77	-200
90398	211000	8.95	7.65	0.0617	7.5	0.85	-200
90398	221000	8.93	7.64	0.0617	7.7	0.88	-200
90398	231000	8.93	7.64	0.0616	6.9	0.78	-199
90498	1000	8.95	7.64	0.0616	7.6	0.86	-199
90498	11000	8.95	7.64	0.0617	7.6	0.86	-199
90498	21000	8.95	7.64	0.0617	7.8	0.88	-198
90498	31000	8.95	7.64	0.0617	8.1	0.91	-197
90498	41000	8.95	7.64	0.0616	6.7	0.76	-197
90498	51000	8.95	7.64	0.0616	7.4	0.84	-196
90498	61000	8.95	7.64	0.0617	7.4	0.84	-196
90498	71000	8.95	7.64	0.0617	7.1	0.81	-195
90498	81000	8.95	7.64	0.0617	7.4	0.84	-195
90498	91000	8.95	7.63	0.0617	7.4	0.84	-194
90498	101000	8.95	7.63	0.0617	6.1	0.69	-190
90498	111000	8.93	7.63	0.0617	6.2	0.7	-190
90498	121000	8.95	7.63	0.0616	7.5	0.85	-189
90498	131000	8.95	7.63	0.0617	7.2	0.82	-188
90498	141000	8.95	7.63	0.0618	7.6	0.86	-187
90498	151000	8.95	7.63	0.0618	7.3	0.83	-187

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TABLE G-21

MONITORING WELL 32306
(Continued)

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90498	161000	8.95	7.63	0.0617	7.2	0.82	-188
90498	171000	8.95	7.63	0.0618	7.1	0.81	-191
90498	181000	8.95	7.63	0.0618	7.1	0.81	-191
90498	191000	8.95	7.63	0.0618	7.1	0.81	-191
90498	201000	8.95	7.64	0.0617	7.1	0.81	-193
90498	211000	8.95	7.64	0.0618	7.1	0.81	-192
90498	221000	8.95	7.64	0.0617	7.4	0.84	-192
90498	231000	8.95	7.63	0.0617	8.1	0.91	-193
90598	1000	8.93	7.63	0.0618	8	0.9	-193
90598	11000	8.95	7.63	0.0618	6.9	0.78	-192
90598	21000	8.95	7.63	0.0618	7.1	0.81	-192
90598	31000	8.95	7.63	0.0617	7	0.8	-192
90598	41000	8.95	7.63	0.0618	6.9	0.79	-191
90598	51000	8.95	7.63	0.0618	7.1	0.81	-189
90598	61000	8.95	7.63	0.0618	6.8	0.77	-187
90598	71000	8.95	7.63	0.0618	7	0.8	-186
90598	81000	8.95	7.63	0.0618	7.5	0.85	-185
90598	91000	8.95	7.63	0.0619	7.6	0.86	-182
90598	101000	8.95	7.62	0.0619	8	0.9	-175
90598	111000	8.93	7.62	0.0619	8.3	0.94	-175
90598	121000	8.95	7.62	0.0619	8	0.9	-173
90598	131000	8.95	7.62	0.0619	7.5	0.85	-172
90598	141000	8.93	7.62	0.0619	7.6	0.87	-172
90598	151000	8.95	7.62	0.0619	8.2	0.92	-172
90598	161000	8.93	7.62	0.0619	7.1	0.81	-172
90598	171000	8.95	7.62	0.0619	12	1.36	-172
90598	181000	8.95	7.62	0.0619	6.1	0.69	-172
90598	191000	8.95	7.62	0.0619	8	0.9	-176
90598	201000	8.95	7.62	0.0619	8.1	0.91	-175
90598	211000	8.95	7.62	0.062	8.1	0.91	-176
90598	221000	8.95	7.62	0.062	8.7	0.98	-177
90598	231000	8.95	7.62	0.062	7.4	0.84	-178
90698	1000	8.95	7.62	0.062	6.3	0.71	-179
90698	11000	8.95	7.62	0.062	6.3	0.72	-179
90698	21000	8.95	7.62	0.062	6.3	0.72	-178
90698	31000	8.95	7.62	0.062	6	0.68	-179
90698	41000	8.93	7.62	0.062	5.3	0.6	-179
90698	51000	8.95	7.62	0.062	6	0.68	-179
90698	61000	8.95	7.62	0.062	6.1	0.69	-180
90698	71000	8.93	7.62	0.062	6.2	0.7	-180
90698	81000	8.95	7.62	0.062	5.5	0.62	-179

TABLE G-21

MONITORING WELL 32306
(Continued)

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90698	91000	8.95	7.62	0.0619	5.7	0.65	-178
90698	101000	8.95	7.62	0.0621	6	0.68	-177
90698	111000	8.95	7.63	0.0619	6.1	0.69	-183
90698	121000	8.95	7.63	0.0619	6.8	0.77	-183
90698	131000	8.95	7.63	0.0619	6	0.68	-184
90698	141000	8.95	7.63	0.0619	6.3	0.71	-184
90698	151000	8.93	7.63	0.0619	6	0.68	-185
90698	161000	8.95	7.63	0.0619	6.4	0.73	-185
90698	171000	8.95	7.63	0.0619	5.2	0.59	-185
90698	181000	8.95	7.63	0.0619	6.1	0.69	-184
90698	191000	8.95	7.63	0.0619	6.1	0.69	-183
90698	201000	8.95	7.63	0.0619	6	0.68	-182
90698	211000	8.93	7.63	0.0619	6.4	0.73	-183
90698	221000	8.95	7.63	0.0618	6.2	0.7	-184
90698	231000	8.95	7.63	0.0618	6.2	0.7	-184
90798	1000	8.95	7.63	0.0619	5.6	0.64	-183
90798	11000	8.95	7.63	0.0618	6.3	0.72	-183
90798	21000	8.95	7.63	0.0619	5.9	0.67	-182
90798	31000	8.95	7.63	0.0619	6.2	0.7	-182
90798	41000	8.95	7.63	0.0618	5.6	0.64	-184
90798	51000	8.95	7.63	0.0619	6.2	0.7	-182
90798	61000	8.95	7.63	0.0618	6.1	0.69	-184
90798	71000	8.93	7.63	0.0619	6.3	0.72	-183
90798	81000	8.93	7.63	0.0619	6.1	0.69	-183
90798	91000	8.95	7.63	0.0618	6.4	0.73	-183
90798	101000	8.95	7.63	0.0618	6.1	0.69	-181
90798	111000	8.95	7.63	0.0619	6.4	0.73	-182
90798	121000	8.95	7.64	0.0619	6.2	0.7	-189
90798	131000	8.95	7.64	0.0619	6.6	0.75	-193
90798	141000	8.93	7.64	0.062	6	0.68	-194
90798	151000	8.93	7.64	0.0619	6.1	0.69	-195
90798	161000	8.95	7.64	0.062	5.7	0.65	-195
90798	171000	8.95	7.64	0.062	6.2	0.7	-197
90798	181000	8.95	7.64	0.062	6.3	0.71	-197
90798	191000	8.95	7.64	0.0619	5.7	0.65	-194
90798	201000	8.95	7.64	0.062	6	0.68	-190
90798	211000	8.95	7.64	0.062	5.5	0.62	-187
90798	221000	8.95	7.64	0.0619	6	0.68	-187
90798	231000	8.95	7.64	0.0619	6.2	0.7	-186
90898	1000	8.93	7.64	0.0619	6.3	0.72	-188
90898	11000	8.95	7.64	0.0619	6.3	0.72	-185

2999

TABLE G-21

MONITORING WELL 32306
(Continued)

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
90898	21000	8.95	7.64	0.0619	6.4	0.73	-183
90898	31000	8.95	7.64	0.0619	6.6	0.75	-183
90898	41000	8.95	7.64	0.0619	6.1	0.69	-182
90898	51000	8.95	7.64	0.0619	6.4	0.73	-179
90898	61000	8.95	7.63	0.0619	7.6	0.86	-176
90898	71000	8.93	7.63	0.0619	7.2	0.82	-175
90898	81000	8.93	7.63	0.0619	6.1	0.69	-174
90898	91000	8.95	7.63	0.062	6.3	0.71	-175
90898	101000	8.93	7.64	0.062	7.8	0.89	-182
90898	111000	8.95	7.64	0.062	7.3	0.83	-186
90898	121000	8.95	7.64	0.062	6.1	0.69	-187
90898	131000	8.93	7.64	0.062	6.9	0.78	-188

Recovery finished at 090998 082357

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 10089832306
Setup Date (MMDDYY) : 100898
Setup Time (HHMMSS) : 102226
Starting Date (MMDDYY) : 100898
Starting Time (HHMMSS) : 103000
Stopping Date (MMDDYY) : 100998
Stopping Time (HHMMSS) : 103000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
100898	103000	9.27	7.5	0.606	9.2	1.06	54
100898	113000	9.04	7.53	0.623	9.8	1.14	39
100898	123000	9	7.54	0.631	10.1	1.18	0
100898	133000	9	7.53	0.639	10.4	1.2	-9
100898	143000	9	7.51	0.636	10.4	1.2	-49
100898	153000	9	7.5	0.639	9.8	1.14	-135
100898	163000	9	7.53	0.641	8.6	0.99	-84
100898	173000	9	7.54	0.642	8.7	1.01	-27
100898	183000	9	7.54	0.642	8.5	0.98	-19
100898	193000	9	7.54	0.642	8.3	0.97	-16
100898	203000	9	7.54	0.64	8.3	0.97	-15
100898	213000	9	7.54	0.638	8.1	0.94	-14
100898	223000	9	7.54	0.638	8	0.93	-15
100898	233000	9	7.54	0.636	8	0.93	-16
100998	3000	9	7.54	0.636	8.1	0.94	-17
100998	13000	9	7.54	0.633	8	0.93	-17
100998	23000	9	7.54	0.632	7.9	0.92	-20
100998	33000	9	7.54	0.631	7.9	0.92	-22
100998	43000	9	7.54	0.631	7.9	0.92	-29
100998	53000	9	7.54	0.631	8.1	0.94	-27
100998	63000	9	7.54	0.631	7.8	0.9	-26
100998	73000	9	7.54	0.631	7.9	0.92	-26
100998	83000	9	7.54	0.631	7.9	0.92	-27
100998	93000	9	7.54	0.631	7.8	0.9	-27
100998	103000	9	7.55	0.634	7.9	0.92	-29

Recovery finished at 102198 075538

000425

2999

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 11109832306
Setup Date (MMDDYY) : 111098
Setup Time (HHMMSS) : 112653
Starting Date (MMDDYY) : 111098
Starting Time (HHMMSS) : 103000
Stopping Date (MMDDYY) : 111198
Stopping Time (HHMMSS) : 103000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
111098	113000	10.58	7.51	0.0588	33.3	3.81	56
111098	123000	9.97	7.52	0.0616	12.5	1.44	28
111098	133000	9.91	7.5	0.0654	10	1.17	22
111098	143000	9.89	7.48	0.0675	9.7	1.13	23
111098	153000	9.89	7.48	0.0687	9.9	1.15	25
111098	163000	9.89	7.48	0.0696	9.8	1.14	26
111098	173000	9.89	7.47	0.0714	9.4	1.09	29
111098	183000	9.91	7.48	0.0715	9.3	1.08	16
111098	193000	9.91	7.5	0.0711	9	1.05	7
111098	203000	9.91	7.5	0.0711	9	1.05	4
111098	213000	9.91	7.5	0.0711	9	1.05	-1
111098	223000	9.91	7.5	0.0711	9	1.05	-1
111098	233000	9.91	7.5	0.0711	9	1.05	-9
111198	3000	9.91	7.49	0.0712	8.9	1.04	-9
111198	13000	9.92	7.49	0.0711	8.9	1.04	-7
111198	23000	9.92	7.49	0.0713	8.7	1.01	-10
111198	33000	9.92	7.5	0.0714	8.7	1.01	-13
111198	43000	9.92	7.49	0.0712	8.6	1	-10
111198	53000	9.92	7.49	0.0712	8.6	1	-9
111198	63000	9.92	7.49	0.0712	8.5	0.99	-10
111198	73000	9.92	7.49	0.0712	8.5	0.99	-12
111198	83000	9.92	7.49	0.0713	8.5	0.99	-14
111198	93000	9.92	7.49	0.0714	8.4	0.97	-16
111198	103000	9.92	7.5	0.0715	8.5	0.99	-19

Recovery finished at 120198 162022

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 12109832306
Setup Date (MMDDYY) : 121098
Setup Time (HHMMSS) : 095840
Starting Date (MMDDYY) : 121098
Starting Time (HHMMSS) : 091500
Stopping Date (MMDDYY) : 121198
Stopping Time (HHMMSS) : 091600
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
121098	101500	10.84	7.55	0.071	8.9	1.01	-36
121098	111500	10.84	7.55	0.071	9	1.03	-37
121098	121500	10.84	7.55	0.071	9	1.03	-38
121098	131500	10.84	7.55	0.0709	8.9	1.01	-40
121098	141500	10.86	7.55	0.071	8.9	1.01	-41
121098	151500	10.84	7.56	0.071	8.8	1	-44
121098	161500	10.84	7.56	0.071	8.8	1	-44
121098	171500	10.81	7.56	0.0712	8.7	0.99	-51
121098	181500	10.84	7.56	0.0707	8.8	1	-10
121098	191500	10.84	7.56	0.0711	8.7	0.99	-40
121098	201500	10.84	7.56	0.0711	8.7	0.99	-48
121098	211500	10.84	7.56	0.0711	8.6	0.98	-50
121098	221500	10.84	7.55	0.071	8.7	0.99	-50
121098	231500	10.84	7.56	0.0711	8.6	0.98	-52
121198	1500	10.86	7.55	0.071	8.6	0.98	-53
121198	11500	10.84	7.56	0.071	8.6	0.98	-54
121198	21500	10.86	7.56	0.071	8.6	0.98	-55
121198	31500	10.86	7.56	0.0711	8.6	0.98	-56
121198	41500	10.86	7.56	0.071	8.6	0.98	-57
121198	51500	10.86	7.56	0.0711	8.6	0.98	-58
121198	61500	10.86	7.56	0.0711	8.6	0.98	-59
121198	71500	10.86	7.56	0.071	8.6	0.98	-60
121198	81500	10.86	7.56	0.0711	8.6	0.98	-61
121198	91500	10.86	7.56	0.0711	8.6	0.98	-62

Recovery finished at 121598 143529

000427

TABLE G-21

MONITORING WELL 32306
(Continued)

2999

Log File Name : 01119932306
Setup Date (MMDDYY) : 011199
Setup Time (HHMMSS) : 105728
Starting Date (MMDDYY) : 011199
Starting Time (HHMMSS) : 110000
Stopping Date (MMDDYY) : 011299
Stopping Time (HHMMSS) : 111500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
11199	110000	10.93	7.09	0.0734	20.4	2.3	115
11199	120000	10.76	7.19	0.0749	11.4	1.29	75
11199	130000	10.74	7.21	0.0748	9	1.01	55
11199	140000	10.74	7.23	0.0747	8.6	0.97	39
11199	150000	10.74	7.23	0.0747	8.4	0.95	31
11199	160000	10.74	7.23	0.0747	8.3	0.94	24
11199	170000	10.74	7.23	0.0747	8.3	0.94	17
11199	180000	10.74	7.23	0.0746	8.3	0.94	12
11199	190000	10.74	7.23	0.0746	8.2	0.92	8
11199	200000	10.74	7.22	0.0746	8.2	0.92	3
11199	210000	10.73	7.22	0.0746	8.1	0.91	-1
11199	220000	10.73	7.21	0.0745	8.1	0.91	-6
11199	230000	10.73	7.21	0.0746	8	0.9	-10
11299	0	10.73	7.21	0.0745	8	0.9	-15
11299	10000	10.73	7.2	0.0746	7.9	0.89	-20
11299	20000	10.73	7.2	0.0745	7.9	0.89	-24
11299	30000	10.73	7.2	0.0744	8	0.9	-29
11299	40000	10.73	7.19	0.0745	7.9	0.89	-35
11299	50000	10.73	7.19	0.0744	8	0.9	-40
11299	60000	10.73	7.19	0.0745	7.9	0.89	-44
11299	70000	10.73	7.19	0.0744	7.9	0.89	-49
11299	80000	10.73	7.18	0.0745	7.9	0.89	-54
11299	90000	10.73	7.18	0.0745	7.9	0.89	-58
11299	100000	10.73	7.18	0.0745	7.9	0.89	-61
11299	110000	10.73	7.18	0.0745	7.8	0.87	-65

Recovery finished at 011499 143528

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 02049932306
Setup Date (MMDDYY) : 020499
Setup Time (HHMMSS) : 112920
Starting Date (MMDDYY) : 020499
Starting Time (HHMMSS) : 113500
Stopping Date (MMDDYY) : 020599
Stopping Time (HHMMSS) : 113700
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
20499	113500	11.15	7.09	0.0704	1.2	0.14	-95
20499	123500	10.98	7.13	0.0704	2.2	0.25	-81
20499	133500	10.97	7.13	0.0703	2.2	0.25	-56
20499	143500	10.97	7.14	0.0704	2.5	0.28	-45
20499	153500	10.95	7.14	0.0703	2.1	0.24	-35
20499	163500	10.95	7.15	0.0704	1.9	0.22	-15
20499	173500	10.95	7.15	0.0704	1.9	0.22	9
20499	183500	10.95	7.15	0.0705	16.7	1.88	28
20499	193500	10.95	7.16	0.0704	2	0.23	40
20499	203500	10.95	7.16	0.0706	1.9	0.22	51
20499	213500	10.95	7.16	0.0707	2	0.23	58
20499	223500	10.95	7.17	0.0709	2.5	0.28	62
20499	233500	10.95	7.17	0.0708	2.3	0.26	65
20599	3500	10.95	7.17	0.0708	1.6	0.18	67
20599	13500	10.95	7.17	0.0708	1.8	0.21	69
20599	23500	10.95	7.17	0.0708	2	0.23	70
20599	33500	10.95	7.17	0.0709	2	0.23	69
20599	43500	10.95	7.18	0.0709	24.6	2.76	69
20599	53500	10.95	7.18	0.0709	1.5	0.17	69
20599	63500	10.95	7.18	0.0709	1.6	0.18	70
20599	73500	10.95	7.18	0.0711	1.6	0.18	70
20599	83500	10.95	7.18	0.0711	1.9	0.22	71
20599	93500	10.95	7.18	0.0712	2.1	0.24	71
20599	103500	10.95	7.19	0.0712	1.8	0.21	70
20599	113500	10.95	7.19	0.0712	1.8	0.21	70

Recovery finished at 020999 071235

000429

2999

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 04059932306
Setup Date (MMDDYY) : 040599
Setup Time (HHMMSS) : 084827
Starting Date (MMDDYY) : 040599
Starting Time (HHMMSS) : 095500
Stopping Date (MMDDYY) : 040699
Stopping Time (HHMMSS) : 095600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
40599	95500	10.97	7.39	0.74	2	0.22	20
40599	105500	10.96	7.4	0.742	1.7	0.18	4
40599	115500	10.96	7.4	0.743	1.6	0.17	-6
40599	125500	10.96	7.4	0.743	1.5	0.16	-21
40599	135500	10.96	7.4	0.743	1.3	0.14	-20
40599	145500	10.96	7.4	0.743	1.3	0.14	-33
40599	155500	10.96	7.41	0.743	1.2	0.13	-38
40599	165500	10.96	7.41	0.743	1.1	0.12	-32
40599	175500	10.96	7.41	0.743	1	0.11	-37
40599	185500	10.96	7.41	0.744	1	0.11	-47
40599	195500	10.96	7.41	0.744	0.9	0.1	-42
40599	205500	10.96	7.41	0.744	0.8	0.09	-47
40599	215500	10.96	7.41	0.744	0.7	0.08	-56
40599	225500	10.96	7.41	0.744	0.7	0.08	-60
40599	235500	10.96	7.41	0.744	0.6	0.07	-59
40699	5500	10.96	7.41	0.744	0.5	0.05	-64
40699	15500	10.96	7.42	0.744	0.5	0.05	-67
40699	25500	10.96	7.42	0.744	0.4	0.04	-58
40699	35500	10.96	7.42	0.744	0.4	0.04	-70
40699	45500	10.96	7.42	0.744	0.4	0.04	-70
40699	55500	10.96	7.42	0.744	0.3	0.03	-72
40699	65500	10.96	7.42	0.744	0.3	0.03	-74
40699	75500	10.97	7.42	0.744	0.3	0.03	-74
40699	85500	10.97	7.42	0.745	0.3	0.03	-76
40699	95500	10.96	7.42	0.745	0.3	0.03	-77

Recovery finished at 041299 072752

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 05179932306
Setup Date (MMDDYY) : 051799
Setup Time (HHMMSS) : 102826
Starting Date (MMDDYY) : 051799
Starting Time (HHMMSS) : 113000
Stopping Date (MMDDYY) : 123199
Stopping Time (HHMMSS) : 113100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
51799	113000	10.99	7.25	0.0765	0.5	0.06	-88
51799	123000	10.99	7.26	0.0763	0.5	0.06	-98
51799	133000	10.99	7.26	0.0763	0.5	0.06	-104
51799	143000	10.99	7.26	0.0763	0.5	0.06	-107
51799	153000	10.99	7.26	0.076	0.5	0.06	-107
51799	163000	10.99	7.26	0.0761	0.5	0.06	-107
51799	173000	10.99	7.27	0.0761	0.5	0.06	-109
51799	183000	10.99	7.27	0.0761	0.5	0.06	-107
51799	193000	10.99	7.27	0.0759	0.5	0.06	-106
51799	203000	10.99	7.26	0.0761	0.5	0.06	-101
51799	213000	10.99	7.26	0.0762	0.5	0.06	-100
51799	223000	10.99	7.27	0.0761	0.5	0.06	-110
51799	233000	10.99	7.27	0.076	0.5	0.06	-113
51899	3000	10.99	7.28	0.0759	0.5	0.06	-116
51899	13000	10.99	7.27	0.0759	0.5	0.06	-114
51899	23000	10.99	7.28	0.0759	0.5	0.06	-115
51899	33000	10.99	7.27	0.0766	0.5	0.06	-111
51899	43000	10.99	7.27	0.0769	0.5	0.06	-108
51899	53000	10.99	7.28	0.076	0.5	0.06	-112
51899	63000	10.99	7.28	0.0759	0.5	0.06	-117
51899	73000	10.99	7.28	0.0759	0.5	0.06	-117
51899	83000	10.99	7.28	0.0758	0.5	0.06	-119
51899	93000	10.99	7.28	0.0758	0.5	0.06	-119
51899	103000	10.99	7.28	0.0757	0.5	0.06	-119
51899	113000	10.99	7.28	0.0757	0.5	0.06	-119
51899	123000	11.83	7.45	0.0667	81.3	8.63	189
51899	133000	11.71	7.45	0.0683	48.9	5.21	235
51899	143000	11.7	7.44	0.0717	43.2	4.6	242
51899	153000	11.68	7.43	0.0718	40.8	4.35	245

000431

TABLE G-21

MONITORING WELL 32306
(Continued)

2999

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
51899	163000	11.68	7.44	0.0719	38.7	4.12	248
51899	173000	11.68	7.44	0.0721	37.8	4.02	251
51899	183000	11.68	7.44	0.0721	37.9	4.04	253
51899	193000	11.68	7.44	0.0722	37.4	3.98	255
51899	203000	11.7	7.44	0.0723	36.3	3.87	257
51899	213000	11.7	7.44	0.0724	35.8	3.82	259
51899	223000	11.7	7.44	0.0726	35.8	3.82	262
51899	233000	11.7	7.44	0.0727	35.1	3.74	263
51999	3000	11.7	7.44	0.0728	34.7	3.7	265
51999	13000	11.7	7.44	0.073	34.6	3.69	267
51999	23000	11.71	7.44	0.0731	33.9	3.61	268
51999	33000	11.71	7.44	0.0733	33.7	3.59	269
51999	43000	11.7	7.45	0.0735	33.2	3.53	271
51999	53000	11.68	7.47	0.0736	33	3.51	272
51999	63000	11.67	7.47	0.0738	32.8	3.49	272
51999	73000	11.65	7.48	0.074	32.1	3.42	274
51999	83000	11.62	7.48	0.0741	32.3	3.45	275
51999	93000	11.6	7.49	0.0743	32.1	3.43	276
51999	103000	11.58	7.5	0.0745	31.6	3.37	277
51999	113000	11.57	7.5	0.0747	31.7	3.39	278
51999	123000	11.55	7.5	0.0749	31.6	3.38	279
51999	133000	11.55	7.5	0.075	31.5	3.37	279
51999	143000						

Recovery finished at 052099 064857

000432

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 06159932306
Setup Date (MMDDYY) : 061599
Setup Time (HHMMSS) : 091440
Starting Date (MMDDYY) : 061599
Starting Time (HHMMSS) : 101000
Stopping Date (MMDDYY) : 061699
Stopping Time (HHMMSS) : 101100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
61599	101000	11.18	7.23	0.0718	0.4	0.05	14
61599	111000	11.13	7.27	0.072	1.2	0.13	1
61599	121000	11.13	7.28	0.072	1.1	0.12	-11
61599	131000	11.13	7.29	0.072	1	0.11	-19
61599	141000	11.13	7.3	0.0721	1	0.11	-26
61599	151000	11.13	7.31	0.072	0.9	0.09	-49
61599	161000	11.11	7.32	0.072	1	0.11	-75
61599	171000	11.11	7.33	0.072	1.1	0.12	-48
61599	181000	11.11	7.33	0.072	1	0.11	-47
61599	191000	11.11	7.34	0.0721	0.9	0.09	-48
61599	201000	11.11	7.34	0.0721	0.9	0.09	-49
61599	211000	11.13	7.35	0.072	0.9	0.09	-51
61599	221000	11.11	7.35	0.072	1.1	0.12	-53
61599	231000	11.13	7.35	0.072	1.2	0.13	-51
61699	1000	11.11	7.35	0.0721	1.1	0.12	-56
61699	11000	11.11	7.36	0.0721	0.9	0.09	-57
61699	21000	11.11	7.36	0.0721	0.7	0.08	-58
61699	31000	11.11	7.37	0.072	0.6	0.07	-58
61699	41000	11.11	7.37	0.072	0.5	0.06	-59
61699	51000	11.13	7.37	0.072	0.4	0.05	-60
61699	61000	11.13	7.37	0.0719	0.3	0.04	-61
61699	71000	11.13	7.38	0.072	0.3	0.04	-62
61699	81000	11.13	7.38	0.0719	0.3	0.04	-61
61699	91000	11.13	7.38	0.0719	0.2	0.02	-61
61699	101000	11.13	7.38	0.0719	0.2	0.02	-63

Recovery finished at 062999 085116

2999

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 07089932306
Setup Date (MMDDYY) : 070899
Setup Time (HHMMSS) : 092702
Starting Date (MMDDYY) : 070899
Starting Time (HHMMSS) : 102500
Stopping Date (MMDDYY) : 070999
Stopping Time (HHMMSS) : 102600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
70899	102500	11.31	7.49	0.0713	1.3	0.14	42
70899	112500	11.27	7.5	0.0714	1	0.11	41
70899	122500	11.27	7.5	0.0714	0.5	0.06	39
70899	132500	11.26	7.5	0.0714	0.4	0.05	37
70899	142500	11.26	7.5	0.0714	0.3	0.04	36
70899	152500	11.26	7.5	0.0715	0.2	0.02	34
70899	162500	11.26	7.51	0.0715	0.2	0.02	32
70899	172500	11.26	7.51	0.0714	0.2	0.02	30
70899	182500	11.26	7.51	0.0715	0.2	0.02	29
70899	192500	11.26	7.51	0.0715	0.2	0.02	27
70899	202500	11.26	7.51	0.0715	0.1	0.01	26
70899	212500	11.27	7.51	0.0715	0.1	0.01	25
70899	222500	11.26	7.51	0.0715	0.1	0.01	24
70899	232500	11.26	7.51	0.0715	0.2	0.02	22
70999	2500	11.26	7.51	0.0715	0.2	0.02	22
70999	12500	11.26	7.51	0.0715	0.1	0.01	21
70999	22500	11.26	7.51	0.0715	0.1	0.01	20
70999	32500	11.26	7.51	0.0714	0.2	0.02	19
70999	42500	11.26	7.51	0.0714	0.1	0.01	18
70999	52500	11.27	7.51	0.0715	0.1	0.01	18
70999	62500	11.27	7.51	0.0715	0.1	0.01	17
70999	72500	11.26	7.51	0.0715	0.1	0.01	16
70999	82500	11.27	7.51	0.0715	0.1	0.01	16
70999	92500	11.27	7.51	0.0715	0.1	0.01	15
70999	102500	11.26	7.51	0.0716	0.1	0.01	14

Recovery finished at 071399 135437

TABLE G-21

MONITORING WELL 32306
(Continued)

Log File Name : 08129932306
Setup Date (MMDDYY) : 081299
Setup Time (HHMMSS) : 090358
Starting Date (MMDDYY) : 081299
Starting Time (HHMMSS) : 100000
Stopping Date (MMDDYY) : 081399
Stopping Time (HHMMSS) : 100500
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
81299	100000	11.65	7.17	0.072	2.7	0.29	82
81299	110000	11.57	7.18	0.0722	2.4	0.26	99
81299	120000	11.55	7.18	0.0729	2.3	0.24	120
81299	130000	11.55	7.18	0.0736	2.1	0.22	135
81299	140000	11.53	7.18	0.0743	1.9	0.2	147
81299	150000	11.53	7.17	0.074	1.7	0.18	159
81299	160000	11.53	7.17	0.0744	1.6	0.17	184
81299	170000	11.53	7.17	0.0741	1.6	0.17	185
81299	180000	11.53	7.17	0.0739	1.5	0.16	195
81299	190000	11.53	7.17	0.0738	1.5	0.16	208
81299	200000	11.53	7.17	0.0739	1.5	0.16	226
81299	210000	11.53	7.17	0.0738	1.4	0.14	238
81299	220000	11.53	7.17	0.074	1.4	0.14	250
81299	230000	11.53	7.18	0.0735	1.4	0.14	261
81399	0	11.53	7.18	0.0736	1.2	0.13	269
81399	10000	11.53	7.18	0.0739	1.2	0.13	277
81399	20000	11.53	7.18	0.0735	1.2	0.13	285
81399	30000	11.53	7.18	0.0732	1.2	0.13	289
81399	40000	11.53	7.18	0.0738	1.2	0.13	295
81399	50000	11.53	7.18	0.0735	1.2	0.13	300
81399	60000	11.53	7.18	0.0728	1.2	0.13	303
81399	70000	11.53	7.18	0.0738	1.2	0.13	307
81399	80000	11.55	7.18	0.0733	1.2	0.13	311
81399	90000	11.53	7.18	0.0734	1.1	0.12	315
81399	100000	11.53	7.18	0.0734	1.2	0.13	319

Recovery finished at 081999 133147

TABLE G-22

MONITORING WELL 32307

2999

Log File Name : 09289832307
Setup Date (MMDDYY) : 092898
Setup Time (HHMMSS) : 141254
Starting Date (MMDDYY) : 092898
Starting Time (HHMMSS) : 141500
Stopping Date (MMDDYY) : 092998
Stopping Time (HHMMSS) : 141500
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
92898	141500	11.22	7.33	0.743	6.7	0.73	-137
92898	151500	11.24	7.33	0.743	8.4	0.92	-128
92898	161500	11.24	7.33	0.743	8.3	0.91	-129
92898	171500	11.24	7.33	0.744	8.2	0.9	-129
92898	181500	11.24	7.33	0.743	8	0.88	-130
92898	191500	11.24	7.33	0.744	8.1	0.89	-130
92898	201500	11.25	7.33	0.744	7.9	0.86	-131
92898	211500	11.25	7.33	0.744	7.9	0.86	-131
92898	221500	11.25	7.33	0.744	8	0.88	-131
92898	231500	11.25	7.33	0.744	7.9	0.86	-132
92998	1500	11.25	7.33	0.743	7.9	0.86	-132
92998	11500	11.27	7.33	0.744	8	0.88	-133
92998	21500	11.27	7.33	0.744	8	0.88	-133
92998	31500	11.27	7.33	0.744	7.9	0.86	-134
92998	41500	11.27	7.33	0.744	7.9	0.86	-134
92998	51500	11.27	7.33	0.744	7.9	0.86	-134
92998	61500	11.27	7.33	0.744	7.9	0.86	-135
92998	71500	11.29	7.33	0.744	7.8	0.86	-135
92998	81500	11.29	7.33	0.744	7.8	0.86	-135
92998	91500	11.29	7.33	0.743	7.5	0.83	-137
92998	101500	11.29	7.33	0.744	7.7	0.85	-136
92998	111500	11.29	7.33	0.744	7.8	0.86	-137
92998	121500	11.3	7.33	0.744	7.8	0.86	-137
92998	131500	11.3	7.33	0.744	7.8	0.86	-137
92998	141500	11.3	7.33	0.744	7.7	0.85	-137

Recovery finished at 092998 154847

TABLE G-22

MONITORING WELL 32307
(Continued)

Log File Name : 10269832307
Setup Date (MMDDYY) : 102698
Setup Time (HHMMSS) : 122435
Starting Date (MMDDYY) : 102698
Starting Time (HHMMSS) : 113000
Stopping Date (MMDDYY) : 102798
Stopping Time (HHMMSS) : 113000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
102698	123000	12.13	6.99	0.0589	6.4	0.71	163
102698	133000	11.84	7.05	0.0598	5.1	0.57	91
102698	143000	11.8	7.06	0.0612	5.2	0.58	76
102698	153000	11.79	7.06	0.0628	5.5	0.61	78
102698	163000	11.79	7.04	0.063	4.8	0.54	36
102698	173000	11.79	7.05	0.0631	4.9	0.55	14
102698	183000	11.79	7.05	0.0631	4.9	0.55	0
102698	193000	11.79	7.06	0.0631	4.9	0.55	-11
102698	203000	11.79	7.06	0.0631	5.6	0.62	-18
102698	213000	11.79	7.07	0.0632	10.3	1.14	-24
102698	223000	11.79	7.07	0.0631	5.3	0.59	-29
102698	233000	11.79	7.07	0.0632	5.4	0.6	-33
102798	3000	11.79	7.07	0.0632	5.5	0.61	-37
102798	13000	11.79	7.08	0.0632	4.6	0.51	-40
102798	23000	11.79	7.08	0.0632	5.1	0.57	-42
102798	33000	11.79	7.08	0.0632	5.1	0.57	-44
102798	43000	11.79	7.08	0.0631	4.6	0.52	-46
102798	53000	11.79	7.08	0.0633	4.7	0.53	-48
102798	63000	11.79	7.09	0.0633	4.6	0.51	-49
102798	73000	11.79	7.09	0.0633	5.1	0.57	-50
102798	83000	11.79	7.09	0.0632	5.4	0.6	-51
102798	93000	11.79	7.09	0.0632	4.8	0.54	-52
102798	103000	11.79	7.09	0.0633	4.6	0.52	-52
102798	113000	11.77	7.1	0.0634	4.7	0.53	-53

Recovery finished at 102798 141347

000437

2999

TABLE G-22

MONITORING WELL 32307
(Continued)

Log File Name : 11059832307
Setup Date (MMDDYY) : 110598
Setup Time (HHMMSS) : 105349
Starting Date (MMDDYY) : 110598
Starting Time (HHMMSS) : 100000
Stopping Date (MMDDYY) : 110698
Stopping Time (HHMMSS) : 100000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
110598	110000	11.67	7.18	0.0642	1.4	0.15	-130
110598	120000	11.67	7.19	0.0641	1.8	0.2	-127
110598	130000	11.67	7.19	0.0641	1.7	0.19	-129
110598	140000	11.67	7.19	0.0641	1.8	0.2	-129
110598	150000	11.67	7.19	0.0642	1.7	0.19	-132
110598	160000	11.67	7.19	0.0642	1.9	0.21	-133
110598	170000	11.67	7.19	0.0642	1.7	0.19	-133
110598	180000	11.67	7.19	0.0641	1.9	0.21	-132
110598	190000	11.67	7.19	0.0641	1.8	0.2	-132
110598	200000	11.67	7.19	0.0641	1.6	0.18	-131
110598	210000	11.67	7.19	0.0641	1.8	0.2	-130
110598	220000	11.67	7.19	0.0641	1.9	0.21	-131
110598	230000	11.67	7.19	0.0641	1.7	0.19	-131
110698	0	11.67	7.19	0.0641	1.9	0.21	-131
110698	10000	11.67	7.19	0.0641	1.9	0.21	-131
110698	20000	11.67	7.19	0.0641	1.9	0.21	-131
110698	30000	11.67	7.19	0.0642	1.8	0.2	-131
110698	40000	11.67	7.19	0.0642	1.9	0.21	-131
110698	50000	11.67	7.19	0.0642	2	0.22	-132
110698	60000	11.67	7.19	0.0642	1.9	0.21	-133
110698	70000	11.67	7.19	0.0642	2	0.22	-132
110698	80000	11.67	7.19	0.0642	1.8	0.2	-133
110698	90000	11.67	7.19	0.0642	1.8	0.2	-134
110698	100000	11.67	7.19	0.064	1.8	0.2	-133

Recovery finished at 112598 150821

TABLE G-22

MONITORING WELL 32307
(Continued)

Log File Name : 12079832307
Setup Date (MMDDYY) : 120798
Setup Time (HHMMSS) : 141501
Starting Date (MMDDYY) : 120798
Starting Time (HHMMSS) : 133000
Stopping Date (MMDDYY) : 120898
Stopping Time (HHMMSS) : 133100
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
120798	143000	11.53	7.33	0.0622	4.8	0.53	85
120798	153000	11.53	7.33	0.0622	5.6	0.62	75
120798	163000	11.53	7.33	0.0624	5.5	0.61	81
120798	173000	11.53	7.33	0.0624	5.5	0.61	73
120798	183000	11.53	7.33	0.0624	5.3	0.59	73
120798	193000	11.53	7.33	0.0624	5.3	0.59	73
120798	203000	11.53	7.33	0.0624	4.8	0.53	72
120798	213000	11.53	7.33	0.0624	4.6	0.51	75
120798	223000	11.53	7.33	0.0624	4.4	0.49	74
120798	233000	11.53	7.33	0.0624	4.4	0.49	73
120898	3000	11.53	7.33	0.0624	4.2	0.47	77
120898	13000	11.53	7.33	0.0624	3.8	0.43	81
120898	23000	11.53	7.33	0.0624	3.6	0.4	78
120898	33000	11.53	7.33	0.0624	3.7	0.41	80
120898	43000	11.53	7.33	0.0624	3.4	0.38	85
120898	53000	11.53	7.33	0.0624	3.3	0.37	86
120898	63000	11.53	7.33	0.0624	3.3	0.37	93
120898	73000	11.53	7.33	0.0625	3.5	0.39	91
120898	83000	11.53	7.33	0.0626	3.6	0.4	93
120898	93000	11.53	7.33	0.0625	3.2	0.36	106
120898	103000	11.53	7.32	0.0626	3.4	0.38	97
120898	113000	11.53	7.32	0.0626	3.1	0.35	102
120898	123000	11.53	7.32	0.0626	3.1	0.35	104
120898	133000	11.53	7.32	0.0626	3.1	0.35	107

Recovery finished at 121098 093619

2999

TABLE G-22

MONITORING WELL 32307
(Continued)

Log File Name : 01059932307
Setup Date (MMDDYY) : 010599
Setup Time (HHMMSS) : 110156
Starting Date (MMDDYY) : 010599
Starting Time (HHMMSS) : 101000
Stopping Date (MMDDYY) : 010699
Stopping Time (HHMMSS) : 101000
Interval (HHMMSS) : 010000
Warmup : Disable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
10599	111000	11.06	6.8	0.0714	7	0.79	124
10599	121000	11.38	6.89	0.0691	7.4	0.82	99
10599	131000	11.44	6.9	0.07	6.7	0.74	88
10599	141000	11.46	6.91	0.0704	6.1	0.68	84
10599	151000	11.46	6.91	0.0707	6.5	0.72	73
10599	161000	11.46	6.91	0.0712	7.1	0.79	60
10599	171000	11.46	6.91	0.0716	7.2	0.8	48
10599	181000	11.46	6.91	0.0717	6	0.66	41
10599	191000	11.48	6.91	0.0718	5.7	0.63	32
10599	201000	11.46	6.92	0.0718	5.9	0.65	25
10599	211000	11.46	6.92	0.0717	5.7	0.63	19
10599	221000	11.48	6.92	0.0717	5.9	0.65	14
10599	231000	11.48	6.92	0.0718	5.6	0.62	11
10699	1000	11.48	6.92	0.0718	5.6	0.62	5
10699	11000	11.48	6.92	0.0717	5.4	0.6	2
10699	21000	11.48	6.92	0.0718	5.6	0.62	-4
10699	31000	11.48	6.92	0.0718	5.6	0.62	-9
10699	41000	11.48	6.92	0.0718	5.5	0.61	-11
10699	51000	11.48	6.92	0.0718	5.9	0.65	-14
10699	61000	11.48	6.92	0.0718	7.6	0.84	-17
10699	71000	11.48	6.91	0.0718	5	0.55	-19
10699	81000	11.48	6.92	0.0718	5.4	0.6	-21
10699	91000	11.48	6.92	0.0718	5.7	0.63	-22
10699	101000	11.48	6.92	0.0718	5.7	0.63	-22

Recovery finished at 011499 141745

TABLE G-22

MONITORING WELL 32307
(Continued)

Log File Name : 02099932307
Setup Date (MMDDYY) : 020999
Setup Time (HHMMSS) : 093256
Starting Date (MMDDYY) : 020999
Starting Time (HHMMSS) : 093500
Stopping Date (MMDDYY) : 021099
Stopping Time (HHMMSS) : 094000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
20999	93500	11.14	7.25	0.0718	10.9	1.22	32
20999	103500	11.35	7.25	0.0715	3.8	0.43	0
20999	113500	11.39	7.24	0.0719	3.2	0.35	10
20999	123500	11.39	7.24	0.0723	3	0.33	26
20999	133500	11.39	7.24	0.0723	2.9	0.32	40
20999	143500	11.4	7.23	0.072	2.7	0.3	43
20999	153500	11.39	7.24	0.072	2.7	0.3	47
20999	163500	11.39	7.23	0.0719	2.7	0.3	57
20999	173500	11.4	7.23	0.0718	2.7	0.3	58
20999	183500	11.39	7.23	0.0717	2.7	0.3	66
20999	193500	11.39	7.23	0.0717	2.7	0.3	70
20999	203500	11.39	7.23	0.0716	2.7	0.3	74
20999	213500	11.4	7.23	0.0716	2.6	0.29	76
20999	223500	11.39	7.23	0.0716	2.5	0.28	80
20999	233500	11.39	7.22	0.0715	2.4	0.27	84
21099	3500	11.4	7.22	0.0715	2.3	0.26	84
21099	13500	11.39	7.22	0.0715	2.3	0.26	84
21099	23500	11.4	7.22	0.0714	2.2	0.24	84
21099	33500	11.4	7.22	0.0713	2.2	0.24	83
21099	43500	11.4	7.22	0.0713	2.1	0.23	81
21099	53500	11.39	7.22	0.0713	2.1	0.23	79
21099	63500	11.39	7.22	0.0713	2	0.22	76
21099	73500	11.4	7.22	0.0708	1.9	0.21	68
21099	83500	11.39	7.22	0.0711	1.9	0.21	64
21099	93500	11.39	7.22	0.0712	1.9	0.21	64

Recovery finished at 021299 120040

TABLE G-22

MONITORING WELL 32307
(Continued)

- 2999

Log File Name : 04079932307
Setup Date (MMDDYY) : 040799
Setup Time (HHMMSS) : 094917
Starting Date (MMDDYY) : 040799
Starting Time (HHMMSS) : 110000
Stopping Date (MMDDYY) : 040899
Stopping Time (HHMMSS) : 110100
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
40799	110000	11.35	7.4	0.717	3.4	0.36	98
40799	120000	11.34	7.4	0.717	1.2	0.13	66
40799	130000	11.34	7.4	0.717	1.1	0.12	71
40799	140000	11.34	7.4	0.717	1	0.11	62
40799	150000	11.34	7.4	0.754	0.7	0.08	64
40799	160000	11.34	7.4	0.738	0.6	0.06	64
40799	170000	11.34	7.41	0.718	0.8	0.09	64
40799	180000	11.34	7.41	0.718	0.9	0.1	61
40799	190000	11.34	7.41	0.718	0.8	0.09	62
40799	200000	11.34	7.41	0.718	0.9	0.1	62
40799	210000	11.34	7.41	0.718	1	0.11	68
40799	220000	11.34	7.41	0.718	1.1	0.12	65
40799	230000	11.34	7.41	0.718	0.8	0.09	64
40899	0	11.34	7.41	0.718	0.9	0.1	69
40899	10000	11.34	7.41	0.718	0.9	0.1	70
40899	20000	11.34	7.41	0.718	0.8	0.09	73
40899	30000	11.34	7.41	0.718	0.8	0.09	75
40899	40000	11.34	7.41	0.718	0.8	0.09	79
40899	50000	11.34	7.41	0.718	0.7	0.08	80
40899	60000	11.34	7.42	0.718	0.7	0.08	83
40899	70000	11.34	7.42	0.718	0.7	0.08	88
40899	80000	11.34	7.42	0.718	0.6	0.06	91
40899	90000	11.34	7.42	0.718	0.5	0.05	94
40899	100000	11.34	7.42	0.718	0.5	0.05	103
40899	110000	11.34	7.42	0.718	0.5	0.05	107

Recovery finished at 041299 072921

TABLE G-22

MONITORING WELL 32307
(Continued)

Log File Name : 05259932307
Setup Date (MMDDYY) : 052599
Setup Time (HHMMSS) : 093813
Starting Date (MMDDYY) : 052599
Starting Time (HHMMSS) : 103500
Stopping Date (MMDDYY) : 052699
Stopping Time (HHMMSS) : 103600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
52599	103500	11.63	7.35	0.0701	5.4	0.58	133
52599	113500	11.63	7.33	0.0705	2.8	0.29	83
52599	123500	11.63	7.33	0.0704	2.6	0.28	47
52599	133500	11.63	7.34	0.0705	2.4	0.26	39
52599	143500	11.62	7.34	0.0705	2.4	0.26	34
52599	153500	11.63	7.34	0.0705	2.4	0.26	31
52599	163500	11.63	7.34	0.0705	2.2	0.24	29
52599	173500	11.63	7.34	0.0705	2.1	0.23	24
52599	183500	11.63	7.34	0.0705	2	0.22	24
52599	193500	11.62	7.34	0.0704	1.8	0.2	23
52599	203500	11.63	7.34	0.0704	1.5	0.16	22
52599	213500	11.63	7.34	0.0704	1.5	0.16	23
52599	223500	11.63	7.34	0.0704	1.3	0.14	23
52599	233500	11.63	7.34	0.0704	1.3	0.14	21
52699	3500	11.63	7.34	0.0704	1.2	0.13	22
52699	13500	11.63	7.34	0.0704	1	0.11	24
52699	23500	11.63	7.34	0.0704	1	0.11	26
52699	33500	11.63	7.34	0.0704	1	0.11	27
52699	43500	11.63	7.34	0.0704	0.9	0.1	29
52699	53500	11.63	7.34	0.0704	0.8	0.09	30
52699	63500	11.63	7.34	0.0704	0.7	0.08	33
52699	73500	11.63	7.34	0.0704	0.7	0.08	31
52699	83500	11.63	7.34	0.0704	0.7	0.08	31
52699	93500	11.63	7.34	0.0704	0.6	0.07	30
52699	103500	12.57	7.76	0.0008	93.5	9.76	158

Recovery finished at 060299 060650

2999

TABLE G-22

MONITORING WELL 32307
(Continued)

Log File Name : 06039932307
Setup Date (MMDDYY) : 060399
Setup Time (HHMMSS) : 100027
Starting Date (MMDDYY) : 060399
Starting Time (HHMMSS) : 111500
Stopping Date (MMDDYY) : 060499
Stopping Time (HHMMSS) : 111600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
60399	111500	11.72	7.34	0.07	33.4	3.59	97
60399	121500	11.7	7.35	0.07	18.8	2.02	52
60399	131500	11.69	7.36	0.07	10.9	1.17	39
60399	141500	11.69	7.37	0.07	6.7	0.72	27
60399	151500	11.69	7.38	0.07	4.2	0.45	20
60399	161500	11.69	7.38	0.07	2.9	0.31	14
60399	171500	11.69	7.39	0.0699	2.2	0.24	12
60399	181500	11.69	7.39	0.07	2	0.21	6
60399	191500	11.69	7.39	0.07	1.9	0.2	1
60399	201500	11.69	7.39	0.0701	1.8	0.19	-1
60399	211500	11.69	7.39	0.0701	1.5	0.17	-6
60399	221500	11.69	7.4	0.0701	1.6	0.18	-8
60399	231500	11.69	7.4	0.07	1.5	0.17	-11
60499	1500	11.69	7.4	0.0701	1.4	0.15	-13
60499	11500	11.69	7.4	0.0701	1.3	0.14	-14
60499	21500	11.69	7.4	0.0701	1.3	0.14	-15
60499	31500	11.69	7.4	0.0701	1.2	0.13	-21
60499	41500	11.69	7.4	0.0701	1.1	0.12	-23
60499	51500	11.69	7.4	0.0701	1.1	0.12	-26
60499	61500	11.69	7.4	0.0701	0.9	0.09	-26
60499	71500	11.69	7.4	0.0701	0.9	0.09	-25
60499	81500	11.69	7.4	0.0701	0.8	0.08	-26
60499	91500	11.69	7.4	0.0701	0.8	0.08	-28
60499	101500	11.69	7.4	0.0701	0.7	0.07	-30
60499	111500	11.69	7.4	0.0701	0.5	0.06	-33

Recovery finished at 061499 125648

TABLE G-22

MONITORING WELL 32307
(Continued)

Log File Name : 07149932307
Setup Date (MMDDYY) : 071499
Setup Time (HHMMSS) : 092107
Starting Date (MMDDYY) : 071499
Starting Time (HHMMSS) : 101500
Stopping Date (MMDDYY) : 071599
Stopping Time (HHMMSS) : 101600
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
71499	101500	11.98	7.43	0.0716	17.1	1.87	155
71499	111500	11.87	7.41	0.0723	4.4	0.48	68
71499	121500	11.87	7.41	0.0723	1.1	0.12	46
71499	131500	11.87	7.42	0.0724	0.6	0.07	41
71499	141500	11.87	7.43	0.0724	0.6	0.07	39
71499	151500	11.87	7.43	0.0724	0.6	0.07	38
71499	161500	11.87	7.44	0.0724	0.6	0.07	38
71499	171500	11.87	7.44	0.0724	0.6	0.07	38
71499	181500	11.87	7.44	0.0723	0.6	0.07	39
71499	191500	11.87	7.44	0.0724	0.5	0.06	40
71499	201500	11.87	7.44	0.0724	0.5	0.06	41
71499	211500	11.87	7.45	0.0724	0.5	0.06	42
71499	221500	11.87	7.45	0.0724	0.5	0.06	43
71499	231500	11.85	7.44	0.0725	0.4	0.05	44
71599	1500	11.87	7.45	0.0724	0.4	0.05	45
71599	11500	11.85	7.45	0.0725	0.4	0.05	46
71599	21500	11.87	7.45	0.0724	0.4	0.05	47
71599	31500	11.87	7.45	0.0724	0.4	0.05	49
71599	41500	11.87	7.45	0.0724	0.3	0.03	50
71599	51500	11.87	7.45	0.0724	0.3	0.03	53
71599	61500	11.87	7.45	0.0724	0.2	0.02	56
71599	71500	11.87	7.45	0.0724	0.2	0.02	59
71599	81500	11.87	7.45	0.0724	0.2	0.02	59
71599	91500	11.87	7.45	0.0724	0.2	0.02	59
71599	101500	11.87	7.45	0.0724	0.1	0.01	61

Recovery finished at 072299 114842

TABLE G-22

MONITORING WELL 32307
(Continued)

2999

Log File Name : 08129932307
Setup Date (MMDDYY) : 081299
Setup Time (HHMMSS) : 092010
Starting Date (MMDDYY) : 081299
Starting Time (HHMMSS) : 103500
Stopping Date (MMDDYY) : 081399
Stopping Time (HHMMSS) : 104000
Interval (HHMMSS) : 010000
Warmup : Enable

==> Follow Variable and Calibration Change(s) <==

Date MMDDYY	Time HHMMSS	Temp degC	pH units	SpCond mS/cm	DO %Sat	DO mg/l	Redox mV
81299	103500	12.03	7.62	0.0691	1	0.1	205
81299	113500	12	7.62	0.069	1	0.1	223
81299	123500	12	7.62	0.069	1	0.1	239
81299	133500	11.98	7.63	0.0691	1	0.1	256
81299	143500	11.98	7.63	0.0693	1	0.1	274
81299	153500	11.98	7.63	0.0694	1	0.1	292
81299	163500	11.98	7.63	0.0695	0.8	0.08	313
81299	173500	11.98	7.63	0.0695	0.8	0.08	330
81299	183500	11.98	7.63	0.0694	0.6	0.07	342
81299	193500	11.98	7.63	0.0695	0.8	0.08	349
81299	203500	11.98	7.63	0.0697	0.5	0.06	356
81299	213500	11.98	7.64	0.0699	0.6	0.07	361
81299	223500	11.98	7.64	0.0699	0.4	0.05	368
81299	233500	11.98	7.64	0.0698	0.4	0.05	371
81399	3500	11.98	7.64	0.0699	0.3	0.03	374
81399	13500	11.98	7.64	0.0701	0.3	0.03	379
81399	23500	11.98	7.64	0.0698	0.3	0.03	381
81399	33500	11.98	7.64	0.0701	0.3	0.03	384
81399	43500	11.98	7.64	0.0701	0.3	0.03	387
81399	53500	11.98	7.64	0.0699	0.2	0.02	388
81399	63500	11.98	7.64	0.0703	0.2	0.02	384
81399	73500	11.98	7.64	0.0703	0.1	0.01	388
81399	83500	11.98	7.64	0.0704	0.2	0.02	392
81399	93500	11.98	7.64	0.0703	0.2	0.02	394
81399	103500	11.98	7.64	0.0702	0.2	0.02	394

Recovery finished at 081799 053733

SECTION G-5

IN SITU WATER QUALITY DATA COLLECTED IN JANUARY 2000

TABLE G-23

DATA FROM GEOPROBE LOCATION 32306 COLLECTED IN JANUARY 2000

2999

Log File Name : 1240032306
Setup Date (MMDDYY) : 012400
Setup Time (HHMMSS) : 110017
Starting Date (MMDDYY) : 012400
Starting Time (HHMMSS) : 111000
Stopping Date (MMDDYY) : 012500
Stopping Time (HHMMSS) : 111000
Interval (HHMMSS) : 010000
Warmup (HHMMSS) : 000200

Date MMDDYY	Time HHMMSS	Temp deg C	pH Units	SpCond mS/cm	DO% Sat	Redox mV	Turb NTUs
12400	111000	11.61	7.48	0.7417	1.1	-41	276.6
12400	121000	11.62	7.47	0.7398	0.6	-72	356
12400	131000	11.61	7.47	0.7412	0.4	-82	287.4
12400	141000	11.62	7.47	0.7395	0.3	-88	288.9
12400	151000	11.61	7.47	0.7408	0.2	-91	310
12400	161000	11.61	7.47	0.7397	0.2	-92	353.5
12400	171000	11:61	7.46	0.74	0.1	-95	395.8
12400	181000	11.61	7.46	0.74	0.1	-96	425.3
12400	191000	11.62	7.46	0.7398	0.1	-98	465.9
12400	201000	11.61	7.46	0.74	0.1	-100	564.9
12400	211000	11.61	7.46	0.7396	0.1	-101	425.4
12400	221000	11.61	7.46	0.7386	0.1	-102	439.9
12400	231000	11.62	7.46	0.7391	0.1	-102	487.8
12500	1000	11.61	7.46	0.7396	0.1	-103	529.4
12500	11000	11.61	7.46	0.7401	0.1	-103	575.8
12500	21000	11.62	7.46	0.7405	0.1	-103	625.9
12500	31000	11.61	7.46	0.7405	0.1	-103	668.7
12500	41000	11.61	7.46	0.7401	0.1	-103	673.8
12500	51000	11.61	7.46	0.7404	0.1	-105	652.7
12500	61000	11.61	7.46	0.7416	0.1	-106	657.6
12500	71000	11.61	7.46	0.7412	0.1	-106	660.6
12500	81000	11.61	7.46	0.7398	0.1	-106	649.7
12500	91000	11.61	7.46	0.7398	0.1	-106	650.9
12500	101000	11.61	7.46	0.7409	0.1	-107	658.5
12500	111000	11.61	7.46	0.7393	0.1	-107	661.9

Recovery finished at 012600 132225

TABLE G-24

DATA FROM GEOPROBE LOCATION 32307 COLLECTED IN JANUARY 2000

Log File Name : 1240032307
Setup Date (MMDDYY) : 012400
Setup Time (HHMMSS) : 105415
Starting Date (MMDDYY) : 012400
Starting Time (HHMMSS) : 110000
Stopping Date (MMDDYY) : 012500
Stopping Time (HHMMSS) : 110100
Interval (HHMMSS) : 010000
Warmup (HHMMSS) : 000200

Date MMDDYY	Time HHMMSS	Temp deg C	pH Units	SpCond mS/cm	DO% Sat	Redox mV	Turb NTUs
12400	110000	11.46	8.82	0.07412	0	-113	145
12400	120000	11.46	9.22	0.0741	0	-155	143.4
12400	130000	11.46	9.03	0.07412	0	-137	144.6
12400	140000	11.46	8.98	0.07412	0	-132	141.7
12400	150000	11.46	8.99	0.07433	0	-134	143.9
12400	160000	11.46	8.94	0.07412	0	-129	143.4
12400	170000	11.46	8.94	0.07414	0	-129	143.6
12400	180000	11.46	8.94	0.07434	0	-130	144
12400	190000	11.46	8.85	0.07428	0	-122	145.1
12400	200000	11.46	8.96	0.07415	0	-133	142.9
12400	210000	11.46	8.99	0.07416	0	-137	144.1
12400	220000	11.46	9	0.0743	0	-139	144.3
12400	230000	11.46	8.96	0.07419	0	-135	143.5
12500	0	11.46	8.95	0.07418	0	-136	144.3
12500	10000	11.46	8.82	0.07422	0	-122	0
12500	20000	11.46	8.68	0.07421	0	-107	144.8
12500	30000	11.46	8.67	0.07434	0	-107	143.9
12500	40000	11.46	8.74	0.07422	0	-115	143.7
12500	50000	11.46	8.77	0.07434	0	-118	145.1
12500	60000	11.46	8.79	0.07419	0	-121	143.9
12500	70000	11.46	8.78	0.07424	0	-122	144.4
12500	80000	11.46	8.86	0.07436	0	-130	143.9
12500	90000	11.46	8.82	0.07435	0	-126	144.5
12500	100000	11.46	8.76	0.07438	0	-121	144.1
12500	110000	11.46	8.77	0.07423	0	-123	0

Recovery finished at 012600 131736

000449

SECTION G-6

SURFACE WATER SAMPLING IN THE SOUTHEAST DRAINAGE DITCH

SECTION G-6

2999

BACKGROUND

Monitoring Well 3069 is located just to the east of a drainage ditch called the South East Drainage Ditch. Figure 4.5 is a map showing the location of the South East Drainage Ditch and Monitoring Well 3069, and 2434. The top of the 20 μg/L total uranium plume at the location of Well 3069 is located approximately 30 feet beneath the water table surface. Recharge from the drainage ditch could be diluting the uranium plume at the water table surface.

Surface water sampling in the South East Drainage Ditch was conducted, concurrent with Groundwater sampling in Monitoring Well 2434 so that the water chemistry of the two samples could be compared. The water samples were analyzed for the major anions and cations listed in Table 4-2 of the Re-Injection Demonstration Test Plan.

Results

A groundwater sample for Monitoring Well 2434 and a surface water sample from the Southeast Drainage Ditch were collected on August 11, 1998. This date is prior to the start of re-injection. The results of the analysis are presented in Table G-25.

A Piper Diagram of the results from both locations is presented in Figure G-27. The chemistry of the two waters (surface and groundwater) is very similar. The groundwater has almost double the bicarbonate concentration that the surface water sample has. A higher bicarbonate concentration in the groundwater is expected and results from interaction of the water with the aquifer formation.

Based on the results of this sampling, it appears that the chemistry of the water in the Southeast Drainage Ditch is similar to the chemistry of the water in the aquifer directly beneath the Southeast Drainage Ditch. The correlation in chemistry is further support that the Southeast Drainage Ditch is recharging the aquifer in the area of Monitoring Well 3069. Due to the recharge, the uranium plume at the water table surface has been diluted. The upper surface of the 20 μg/L total uranium plume is located approximately 30 feet below the water table surface due, in part, to the recharge and resulting dilution. Textural changes in the aquifer could also be contributing to the migration of the plume in this area down deeper into the aquifer.

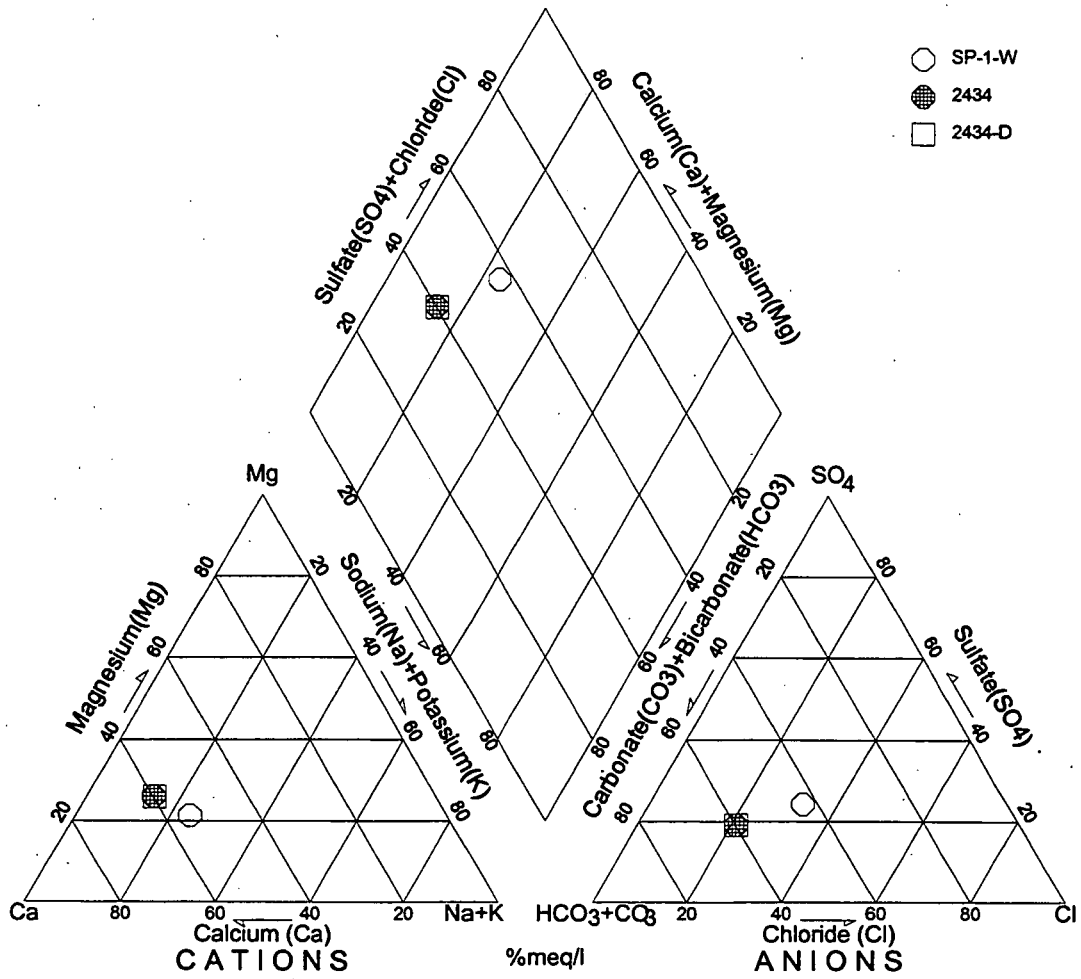
TABLE G-25

WATER QUALITY AT WELL 2434 AND IN SOUTHEAST DRAINAGE DITCH

		Well 2434	Well 2434-D	Well SP-1-W	Well SP-1-W (Rinsate)	Well SP-1-W (FB)
Constituent		8/11/98	8/11/98	8/11/98	8/11/98	8/11/98
aluminum	mg/L	0.0315	0.042	1.460	U 0.0264	U 0.0264
calcium	mg/L	89.3	133	52.6	1.590	0.309
iron	mg/L	0.125	0.201	1.970	0.0318	0.037
magnesium	mg/L	23.6	35.1	12.5	0.407	U 0.0281
manganese	mg/L	0.001	0.0075	0.0525	U 0.0007	U 0.0007
potassium	mg/L	3.240	4.980	7.620	U 0.324	U 0.324
silicon	mg/L	4	6	5.210	0.174	0.126
sodium	mg/L	22.3	33.7	22.2	0.342	U 0.146
ammonia	mg/L	U 0.1	U 0.1	0.55	U 0.1	U 0.1
nitrate-nitrogen	mg/L	3.6	3.7	2.9	U 0.1	U 0.1
alkalinite	mg/L	235	235	120	U 1	U 1
chloride	mg/L	48	48	52	U 1	U 1
fluoride	mg/L	0.2	0.2	0.23	U 0.1	U 0.1
sulfate	mg/L	59	59	53	U 1	U 1
TDS	mg/L	424	430	286	U 10	U 10
TSS	mg/L	6.2	6.2	40.4	U 2	U 2
phosphate (total)	mg/L	U 0.1	U 0.1	0.64	U 0.1	U 0.1
bicarbonate	mg/L	235	235	120	U 1	U 1
uranium	ug/L	1.2	1.3	0.5	U 0.02	U 0

U = undetected value

000452

Figure G-27, Piper Diagram

Monitoring Well 2434, and Southeast Drainage Ditch