CROW BUTTE RESOURCES, INC.

Mine Unit 1 Restoration Report

Crow Butte Uranium Project

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United States Nuclear Regulatory Commission
Source Materials License SUA-1534

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Office of Nuclear Material Safety and Safeguards
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1 INTRODUCTION

Crow Butte Resources, Inc. (CBR) operates a uranium solution mine in Dawes County, Nebraska. The permitted area includes approximately 2,800 acres in all or portions of Sections 11, 12, and 13 of Township 31N, Range 52W and Sections 18, 19, 20, 29 and 30 of Township 31N, Range 51W. The process plant is located in Section 19, Township 31 North, Range 51 West. The wellfields for current mining operations are located in Sections 18 and 19.

Solution mining involves the injection of an oxidant- and carbonate-charged solution ("lixiviant") into the production zone aquifer through injection wells. With slight pH adjustments, the reduced uranium is oxidized and dissolved by complexation with the carbonate. The uranium-rich solution ("pregnant" lixiviant) is drawn to recovery wells where it is pumped to the surface and transferred to the process plant. Injection and production flows are carried to and from the process plant through underground pipelines.

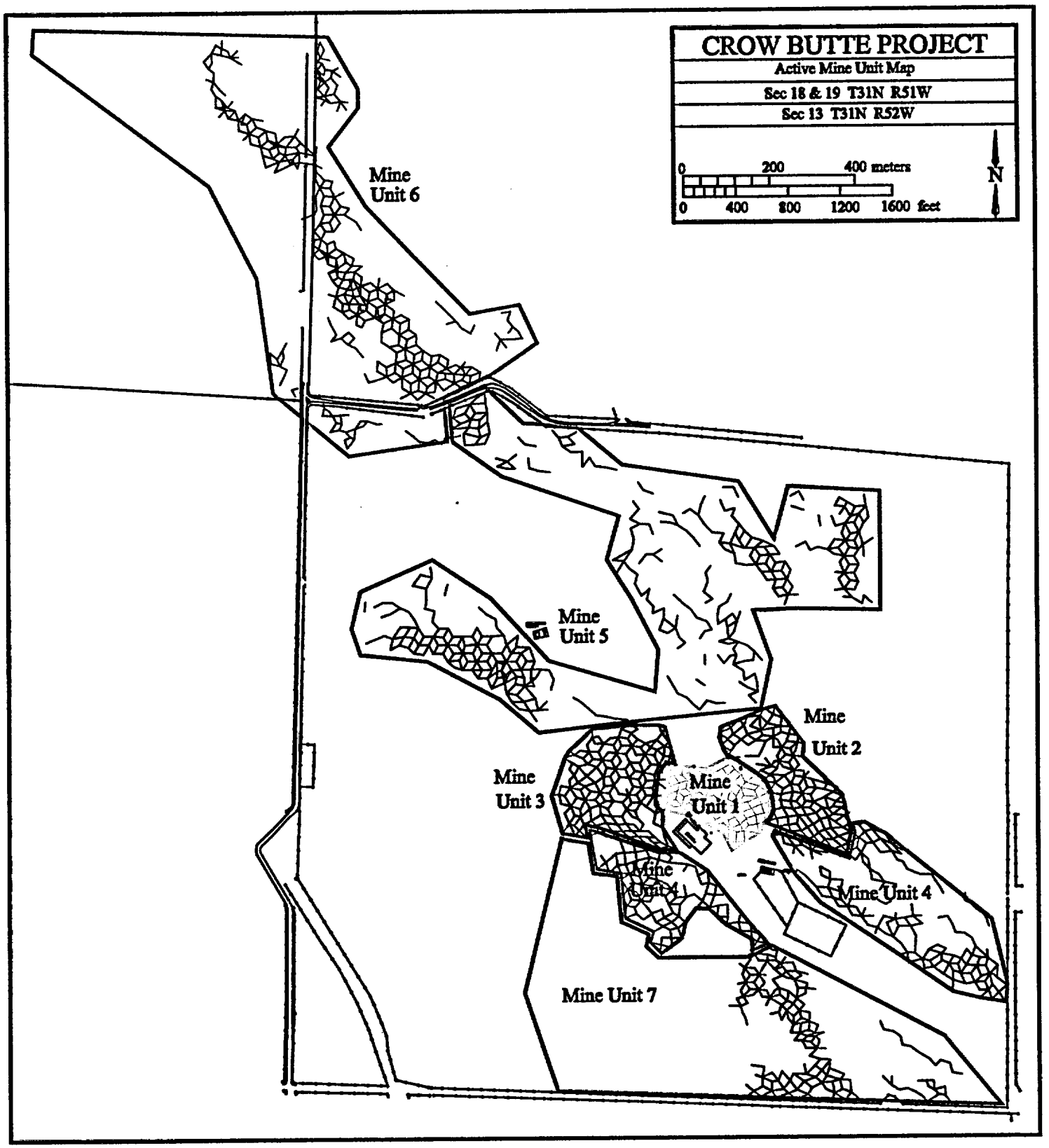
The uranium is removed from the mining solution by adsorption onto ion exchange resin. The now barren lixiviant is recharged with an oxidant and carbonate and is reinjected into the production zone for additional uranium recovery. The production cycle is continued until the ore zone is depleted to the point economic uranium recovery is no longer feasible.

During production, there is a constant movement of lixiviant through the aquifer from outlying injection wells to internal recovery wells. The injection wells and recovery wells are arranged in any of a number of geometric patterns depending upon the configuration of the orebody and the aquifer permeability. Most often, wells are placed in five- or seven-spot patterns. Monitoring wells, which are screened in appropriate stratigraphic horizons, surround the wellfield pattern area to detect any lixiviant that may migrate out of the production zone, either vertically or horizontally.

Following the completion of uranium recovery in a particular mining area, the affected groundwater is restored to appropriate standards, which include preoperational baseline conditions or pre-mining class-of-use limits.

Currently, there are seven mine units, designated as Mine Units 1 through 7, at the Crow Butte project. Of these seven mine units, Mine Units 1, 2 and 3 are in restoration and Mine Units 4 through 7 are in production. Figure 1 shows the general location of the mine units within the permitted area.

FIGURE 1


CROW BUTTE PROJECT
Active Mine Unit Map
Sec 18 & 19 T31N R51W
Sec 13 T31N R52W
0 200 400 meters
0 400 800 1200 1600 feet
N
Mine Unit 6
Mine Unit 5
Mine Unit 2
Mine Unit 3
Mine Unit 1
Mine Unit 4
Mine Unit 4
Mine Unit 7

2 MINE UNIT 1 MINING HISTORY

2.1 Mine Unit 1 Description

Mine Unit 1 encompasses 9.3 acres immediately adjacent to the main process plant. Mine Unit 1 has an average screen thickness of approximately 20 feet and a porosity of 0.29. These parameters result in an estimated pore volume for Mine Unit 1 of 17.2 million gallons.

The mine unit consisted of 38 patterns as designed with an average pattern size of 10,624 square feet. The original design of Mine Unit 1 consisted of 38 production wells, 72 injection wells, 11 production zone monitor wells, and 3 shallow monitor wells. Included in this total were five wells that were originally mined as part of the research and development operation of the pilot plant beginning in 1986. Two additional production wells and four additional injection wells were added to Mine Unit 1 in 1992.

Mine Unit 1 includes two wellhouses (Wellhouse 1 and 2) that serve to connect main trunk lines from the process plant to injection and recovery wells. Figure 2 shows the location of Mine Unit 1 and the associated wells and wellhouses.

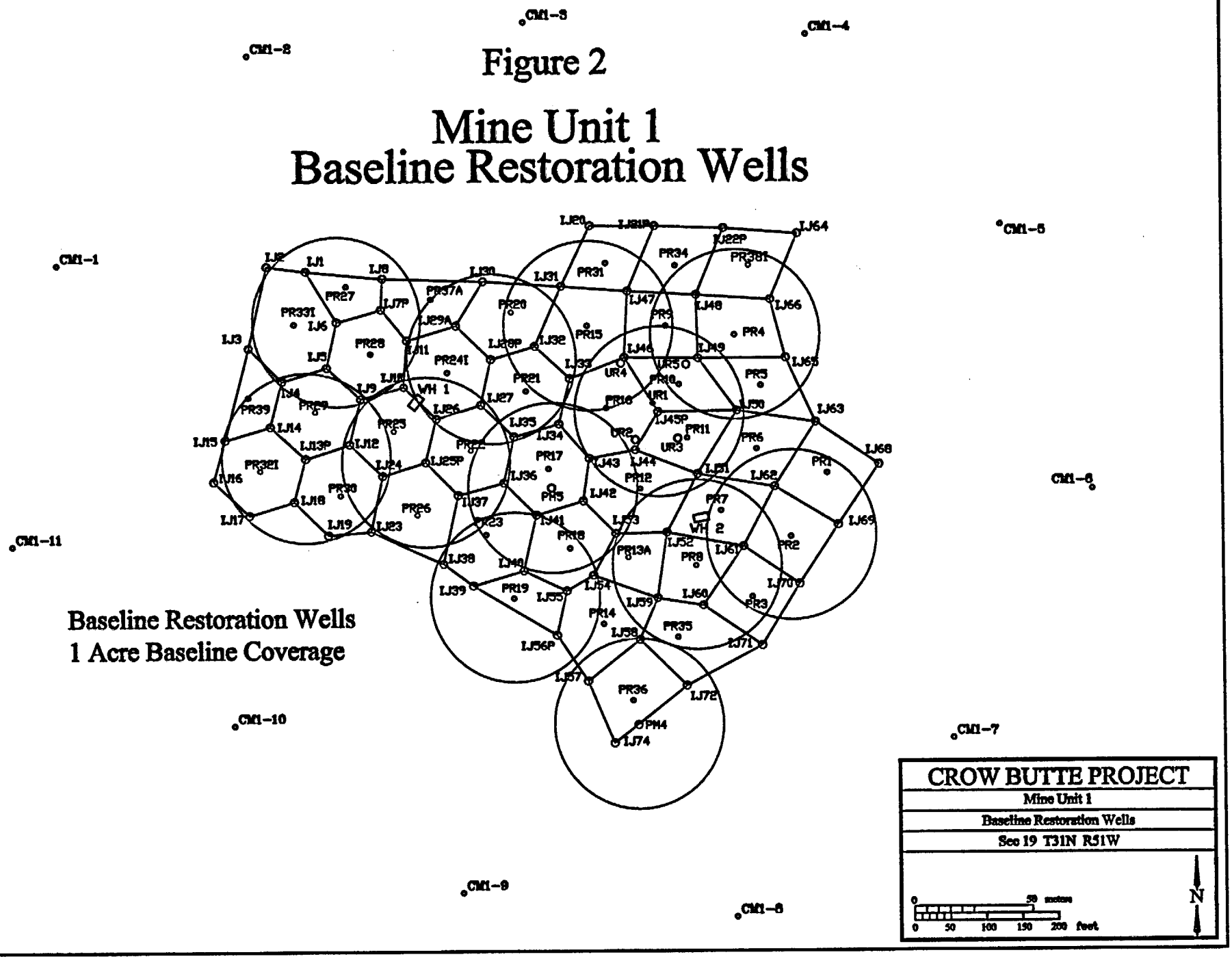
2.2 Determination of Baseline Water Quality

CBR is required to determine pre-operational baseline groundwater quality in a mine unit before mining. For Mine Unit 1, baseline groundwater quality determination was required at a minimum density of one production or injection well per one acre. These selected wells are designated as baseline restoration (BLR) wells. NDEQ requires a minimum of ten BLR wells per mine unit. Figure 2 shows the location of the twelve BLR wells in Mine Unit 1. BLR wells are shown in blue. A red circle depicts the 1-acre area for each well.

In addition to these restoration wells, License Condition 10.4A requires that one shallow monitor well per five acres must be established in the upper aquifer (Brule). Perimeter monitor wells are required in the production zone horizon (i.e., the Basal Chadron) surrounding the mine unit at a distance of 300 feet or less from the mineralized zone and not more than 400 feet apart.

Figure 2

Mine Unit 1
Baseline Restoration Wells



A minimum of three samples are collected at two-week intervals from each of the restoration, shallow monitor, and perimeter monitor wells to determine baseline groundwater quality. Based on the results of the shallow and perimeter monitor wells, upper control limits (UCLs) are established for each mine unit. The results of restoration well sampling are used to establish the restoration goals for that mine unit.

For Mine Unit 1, twelve wells were used to determine baseline restoration goals. These wells are designated PM-1 (PR-4), PM-4, PM-5, PT-5 (PR-2), PT-9 (PR-8), IJ-6, IJ-13, IJ-25, IJ-28, IJ-45, PR-15, and PR-19 and are shown in Figure 2. Many of these wells were completed before 1990 during operation of the pilot plant. Therefore, additional analytical data was available to determine baseline for these wells. Table 1 provides specific information on each well concerning the data that was used for determination of average baseline restoration goals.

Table 1: Wells Used to Establish Mine Unit 1 Baseline Groundwater Quality

Well Number	Formation	Dates Sampled	Number of Analyses
PT-5	Chadron	1985	4
PT-9	Chadron	1982 – 1984	7
PM-1	Chadron	1982 – 1990	25
PM-4	Chadron	1982 – 1990	25
PM-5	Chadron	1985 – 1990	19
IJ-6	Chadron	1990	3
IJ-13	Chadron	1990	3
IJ-25	Chadron	1990	3
IJ-28	Chadron	1990	3
IJ-45	Chadron	1990	3
PR-15	Chadron	1990	3
PR-19	Chadron	1990	3

PM-1 and PT-5 were relabeled later when they were used as mining wells. They became PR-4 and PR-2 respectively. In addition by the end of mining, PT-9 had become non-functional and was unable to be sampled. Therefore, CBR requested and received permission from NDEQ and NRC to replace PT-9 with PR-8. Copies of the letters regarding this matter are attached in Appendix 1.

CBR is required to determine the baseline groundwater quality for a list of 35 water quality parameters. The baseline average for each well is determined for each parameter. These well averages are then used to determine the overall mine unit average for each parameter. Table 2 lists each of the parameters and the average concentration for Mine Unit 1.

Table 2 also lists the standard deviation of the well averages for each parameter. Where a standard deviation is not listed, this is due to analytical results that were less than the reporting level for that parameter. In these cases, the numerical value of the reporting level was used to determine the average. A tabular presentation of the baseline average for each restoration well is contained in Appendix 2. Copies of the laboratory reports were previously submitted to NRC.

Table 2: Baseline Groundwater Quality Data for Mine Unit 1

Parameter	MU-1 Baseline	MU-1 Standard Deviation
Alkalinity (mg/l)	294	20
Ammonium (mg/l)	<0.37	
Arsenic (mg/l)	<0.002	
Barium (mg/l)	<0.1	
Bicarbonate (mg/l)	344	26
Boron (mg/l)	0.93	0.04
Cadmium (mg/l)	<0.006	
Calcium (mg/l)	12.5	3.2
Carbonate (mg/l)	7.2	3.9
Chloride (mg/l)	203.9	38
Chromium (mg/l)	<0.03	
Copper (mg/l)	<0.017	
Fluoride (mg/l)	0.69	0.04
Iron (mg/l)	<0.044	
Lead (mg/l)	<0.031	
Magnesium (mg/l)	3.2	0.8
Manganese (mg/l)	<0.011	
Mercury (mg/l)	<0.001	
Molybdenum (mg/l)	<0.069	
Nickel (mg/l)	<0.034	
Nitrate (mg/l)	<0.05	
Nitrite (mg/l)	<0.01	
pH (Std. Units)	8.46	0.2

Table 2: Baseline Groundwater Quality Data for Mine Unit 1

Parameter	MU-1 Baseline	MU-1 Standard Deviation
Potassium (mg/l)	12.5	1.5
Radium-226 (pCi/L)	229.7	177.1
Selenium (mg/l)	<0.003	
Silica (mg/l)	16.7	3.5
Sodium (mg/l)	412	19.2
Specific Conductivity (µmho/cm)	1947	70
Sulfate (mg/l)	356	9.4
TDS (mg/l)	1170.2	47.6
Uranium (mg/l)	0.092	0.089
Vanadium (mg/l)	<0.066	
Zinc (mg/l)	<0.036	

2.3 Establishment of Restoration Goals

The goal of restoration is to reduce the concentration of mobilized constituents remaining in the groundwater after the completion of mining. CBR is required to return groundwater quality to baseline as a primary goal under SUA-1534.

If baseline concentrations for the monitored parameters cannot be achieved through the reasonable application of best practicable technology, the NRC secondary goal is to return the water quality to levels consistent with pre-mining class-of-use. These secondary restoration goals are based upon standards set by the NDEQ in CBR's UIC permit.

For those parameters that have a numerical groundwater standard established in Title 118 of the NDEQ Rules and Regulations[1] or in other established documents, the UIC Permit requires restoration to successfully return the groundwater to that standard. However, if the baseline preoperational mean for the mine unit exceeds the standard for any parameter, the restoration standard for that parameter is set at the baseline mean plus two standard deviations. For those parameters where no standard is established in Title 118, the UIC restoration standard is calculated from the baseline average. In the case of calcium, potassium, magnesium and sodium, the restoration standard is set at one order of magnitude above the baseline mean due to the ability of some major ions to vary by this amount depending on the pH. Total carbonate is limited to 50 percent of the total dissolved solids (TDS) value. TDS is limited to the baseline mean plus one standard deviation.

If a groundwater parameter cannot be restored to its NRC primary or secondary goal after reasonable restoration efforts, then it must be demonstrated that leaving the parameter at a higher concentration would not be a threat to public health and safety and that, on a parameter-by-parameter basis, water use would not be significantly degraded. Approval of the use of an alternate standard for a parameter would require amendment of SUA-1534.

Table 3 provides the restoration goals for Mine Unit 1. The baseline concentration (NRC primary goal) is listed for each parameter. The wellfield standard deviation is also provided since it is used to calculate some of the UIC standards for which there is no standard in Title 118. The restoration standard from the UIC Permit for each parameter is also listed. Where no UIC Permit standard is listed, these parameters are included in CBR's NRC Source Materials License but are not considered a parameter of concern in the UIC permit.

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1 *Title 118 – Ground Water Quality Standards and Use Classification*, NDEQ July 29, 1996.

Table 3: Mine Unit 1 Restoration Goals

Parameter	Baseline Average (Primary Goal)	Standard Deviation	UIC Permit Standard
Alkalinity	293	20	None
Ammonium (mg/l)	<0.37		10
Arsenic (mg/l)	<0.002		0.05
Barium (mg/l)	<0.1		1.00
Bicarbonate (mg/l)	344	26	None
Boron (mg/l)	0.93	0.04	None
Cadmium (mg/l)	<0.006		0.01
Calcium (mg/l)	12.5	3.2	125
Carbonate (mg/l)	7.2	3.9	None
Chloride (mg/l)	203.9	36.0	250
Chromium (mg/l)	<0.03		None
Copper (mg/l)	<0.017		1.00
Fluoride (mg/l)	0.69	0.04	4.00
Iron (mg/l)	<0.044		0.30
Lead (mg/l)	<0.031		0.05
Magnesium (mg/l)	3.2	0.8	32
Manganese (mg/l)	<0.011		0.05
Mercury (mg/l)	<0.001		0.002
Molybdenum (mg/l)	<0.069		1.00
Nickel (mg/l)	<0.034		0.15
Nitrate (mg/l)	<0.05		10.0
Nitrite (mg/l)	<0.01		None
pH (Std. Units)	8.46	0.2	6.5 – 8.5

Table 3: Mine Unit 1 Restoration Goals

Parameter	Baseline Average (Primary Goal)	Standard Deviation	UIC Permit Standard
Potassium (mg/l)	12.5	1.5	125
Radium-226 (pCi/l)	229.7	177.1	584
Selenium (mg/l)	<0.003		0.01
Silica (mg/l)	16.7	3.5	None
Sodium (mg/l)	412	19.2	4122
Specific Conductivity (µmho/cm)	1947	70	None
Sulfate (mg/l)	356	9.4	375
TDS (mg/l)	1170.2	47.6	1218
Uranium (mg/l)	0.092	0.089	5.0
Vanadium (mg/l)	<0.066		0.2
Zinc (mg/l)	<0.036		5.00

2.4 History of Mining Activities

Commercial operation of Mine Unit 1 began in April 1991. Mining was completed in March 1994 and restoration was begun. During the course of mining and development of adjacent areas, other Mine Units absorbed the original Mine Unit 1 perimeter monitor wells.

2.5 Mine Unit 1 Excursions

Mine Unit 1 did not have any shallow or perimeter monitor wells on excursion status during mining or during restoration. As noted in Section 2.4, all perimeter monitor wells were absorbed into adjacent Mine Units. Consequently, no additional wells need to be added to the BLR well list as required in the UIC permit.

2.6 Determination of Post-Mining Water Quality

Before commencing restoration activities, CBR establishes post mining water quality data for all of the required parameters. For Mine Unit 1, this consisted of sampling the designated wells and having each sample analyzed for the water quality parameters.

Mine Unit 1 was shut in on March 14, 1994. The twelve restoration wells were sampled on March 23, 1994. These samples were split with the NDEQ. Table 4 contains the results of the post-mining water quality for Mine Unit 1. The laboratory reports for these samples are contained in Appendix 3.

Table 4: Post Mining Water Quality for Mine Unit 1 Restoration Well Sampling

	PM-1	PM-4	PM-5	PT-5	IJ-6	IJ-13	IJ-25	IJ-28	IJ-45	PR-8	PR-15	PR-19
Water Quality Parameters												
Calcium (mg/l)	87.9	87.1	80.8	87.9	87.6	93.9	89.4	89.6	89.9	85.4	86.7	98.3
Magnesium (mg/l)	22.6	20.6	22.7	23.8	21.4	23.9	22.5	23.1	24.8	23.2	23.1	23.8
Sodium (mg/l)	1154	942	1054	1144	1054	1174	1177	1182	1126	1144	1172	1083
Potassium (mg/l)	32.7	26.3	30	30	27.2	31.3	30	31.3	32.7	30	30	28.6
Carbonate (mg/l)	0	0	0	0	0	0	0	0	0	0	0	0
Bicarbonate (mg/l)	1099	900	972	981	1057	1086	1111	1207	1104	1170	1170	959
Sulfate (mg/l)	1109	959	1115	1240	1031	1209	1119	1112	1134	1115	1115	1283
Chloride (mg/l)	598	455	586	594	544	598	594	619	607	603	603	590
Ammonium (mg/l)	0.33	0.67	0.14	0.33	0.44	0.07	< 0.05	< 0.05	0.33	0.27	0.15	0.49
Nitrate (mg/l)	1.06	< 0.1	0.97	0.99	1.29	0.74	0.86	1.3	1.25	1.46	1.6	0.46
Fluoride (mg/l)	0.37	0.26	0.54	0.45	0.45	0.37	0.38	0.45	0.43	0.43	0.4	0.35
TDS (mg/l)	3694	3121	3756	3851	3515	3899	3751	3886	3873	3820	3807	3765
Conductivity (µmho/cm)	5843	4841	5590	5964	5445	6012	5807	6025	5916	5819	5940	5819
Alkalinity as $CaCO_3$ (mg/l)	901	738	797	804	866	890	911	989	905	959	959	786
pH (Std. units)	7.65	6.87	6.85	7.28	7.16	7.35	7.65	7.81	7.37	7.46	7.78	6.92

Table 4: Post Mining Water Quality for Mine Unit 1 Restoration Well Sampling

	PM-1	PM-4	PM-5	PT-5	IJ-6	IJ-13	IJ-25	IJ-28	IJ-45	PR-8	PR-15	PR-19
Trace Metals												
Arsenic	0.018	0.007	0.018	0.017	0.031	0.028	0.02	0.028	0.023	0.028	0.024	0.011
Barium (mg/l)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron (mg/l)	1.17	1.44	1.09	1.36	1.06	1.26	1.13	1.19	1.15	1.23	1.25	1.17
Cadmium (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chromium (mg/l)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper (mg/l)	< 0.01	< 0.01	0.05	< 0.01	0.02	< 0.01	< 0.01	< 1	< 0.01	< 0.01	< 0.01	< 0.01
Iron (mg/l)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.38
Lead (mg/l)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Manganese (mg/l)	0.02	0.11	0.05	0.04	0.14	0.15	0.08	0.06	0.06	0.02	< 0.01	0.16
Mercury (mg/l)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum (mg/l)	0.6	0.2	0.42	0.53	0.47	0.5	0.56	0.54	0.53	0.59	0.53	0.37
Nickel (mg/l)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.12	0.12	0.12	< 0.05	< 0.05	< 0.05	< 0.05
Selenium (mg/l)	0.139	0.012	0.129	0.24	0.112	0.122	0.1	0.138	0.149	0.154	0.148	0.041
Vanadium (mg/l)	1	0.1	0.38	1.15	1.12	1.18	1.03	1.24	1.29	1.23	1.56	0.28
Zinc (mg/l)	< 0.01	0.14	0.11	0.01	0.11	0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Table 4: Post Mining Water Quality for Mine Unit 1 Restoration Well Sampling

	PM-1	PM-4	PM-5	PT-5	IJ-6	IJ-13	IJ-25	IJ-28	IJ-45	PR-8	PR-15	PR-19
Radionuclides												
Uranium (mg/l)	8.63	6.29	54.52	9.3	13.9	9.31	9.9	2.52	14.83	5.24	5.18	6.78
Ra-226 (pCi/l)	370	126	329	1139	1113	1558	1258	1147	681	417	109	1182

3 MINE UNIT 1 RESTORATION

Restoration activities include four steps that are designed to optimize restoration equipment used in treating groundwater and to minimize the number of pore volumes circulated during the restoration stage. CBR monitors the quality of selected wells during restoration to determine the efficiency of the operations and to determine if additional techniques are necessary.

3.1 Groundwater Transfer

During the groundwater transfer step, water may be transferred between the mine unit commencing restoration and a mine unit commencing operations. Baseline quality water from the mine unit starting production may be pumped and injected into the mine unit in restoration. The higher TDS water from the mine unit in restoration may be recovered and injected into the mine unit commencing production. The direct transfer of water will act to lower the TDS in the mine unit being restored by displacing water affected by mining with baseline quality water.

The goal of groundwater transfer is to blend the water in the two mine units to conserve process chemicals and reduce waste production. The recovered water may be passed through ion exchange columns and filtration during this step if suspended solids are sufficient in concentration to present a problem with blocking the injection well screens. For the groundwater transfer to occur, a newly constructed mine unit must be ready to commence mining.

The ground water transfers took place in five stages. The first two transfers were conducted independent of other restoration activities, while the last three were run concurrent with the groundwater treatment stage. In four of the groundwater transfers, the transfers were in both directions. This means baseline quality water from a new wellfield was pumped into Mine Unit 1, while lixiviant was pumped out of Mine Unit 1 to a newly constructed wellfield. In order to have a direct transfer of baseline quality water to Mine Unit 1, 2-inch high-density polyethylene (HDPE) lines were laid above ground to each new wellfield that was ready for start up. These lines were connected from the individual producers of the new wellfield to the injectors in Mine Unit 1. The producers from Mine Unit 1 were pumped through ion exchange columns to remove residual uranium before pumping the solution to the injectors of the new wellfield. During these operations, Mine Unit 1 flow rates were balanced to prevent the migration of lixiviant from the surrounding mine units. As each producer in the new wellfield showed signs of lixiviant breakthrough, they were shut in and new unaffected wells were brought on line. This continued until all of the producers in the new wellfield had

been affected. A producer was considered affected if it showed higher than baseline conductivity or an increase in headgrade.

The fifth transfer was from one producer in Wellhouse 17. This transfer was a one-way transfer where baseline quality water was pumped into Mine Unit 1. This transfer was used to help balance Mine Unit 1 during a portion of the Reverse Osmosis (RO) phase of groundwater treatment.

During the first transfer, the baseline water was pumped into the injection wells situated along the boundaries between Mine Unit 1 and Mine Units 2 and 3. Successive transfers worked inward towards the center of Mine Unit 1. Figures 3 through 6 show the wells used during each transfer. The quality of the groundwater following each of the first four transfers was tracked using six of the twelve BLR wells for Mine Unit 1. The parameters used were chloride, sulfate, sodium, conductivity, and alkalinity. These parameters were chosen simply because they could be assayed on site. They were used only as a general guide. The benefits of the transfers can be seen in the average water quality data of the selected wells as presented in Appendix 4. The groundwater transfers improved the quality of the water in Mine Unit 1 without sending a large amount of water to the waste disposal system.

As noted, Mine Unit 1 was shut in on March 14, 1994. This corresponded with the approval of mining operations in Mine Unit 4. In April and May 1994 groundwater sweep activities were begun as described in Section 3.2.

Data for the five steps of groundwater transfer are as follows:

- In late May and June of 1994, 3,640,590 gallons (0.21 pore volumes) were transferred between Mine Unit 1 and Wellhouse 10 in Mine Unit 4.
- In August and September of 1994, 2,942,980 gallons (0.17 pore volume) were transferred between Mine Unit 1 and Wellhouse 11 in Mine Unit 4.
- In November and December of 1994, 3,314,915 gallons (0.19 pore volumes) were transferred between Mine Unit 1 and Wellhouse 12 in Mine Unit 4.
- In April and May 1995, 4,217,689 gallons (0.25 pore volumes) were transferred between Mine Unit 1 and Wellhouse 13 in Mine Unit 4.
- From May 1997 to July 1997, a total of 1,077,530 gallons (0.06 pore volumes) were transferred between Mine Unit 1 and P1100-17.

These separate groundwater transfer steps resulted in a total of 15,193,704 gallons or 0.89 pore volumes transferred from Mine Unit 1 to Mine Unit 4.

Figure 3

Mine Unit 1
Water Transfer Wells

May - June 1994

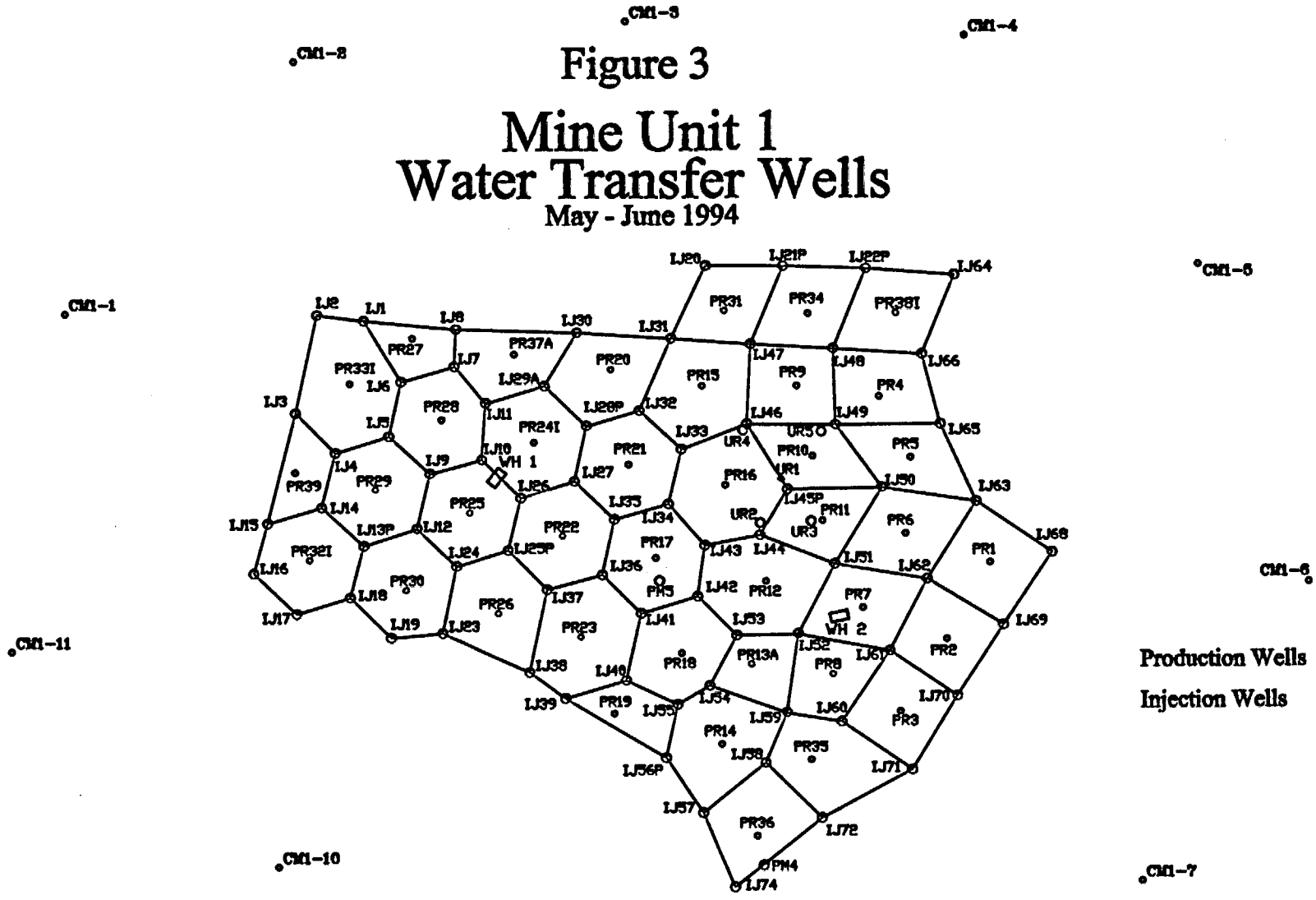
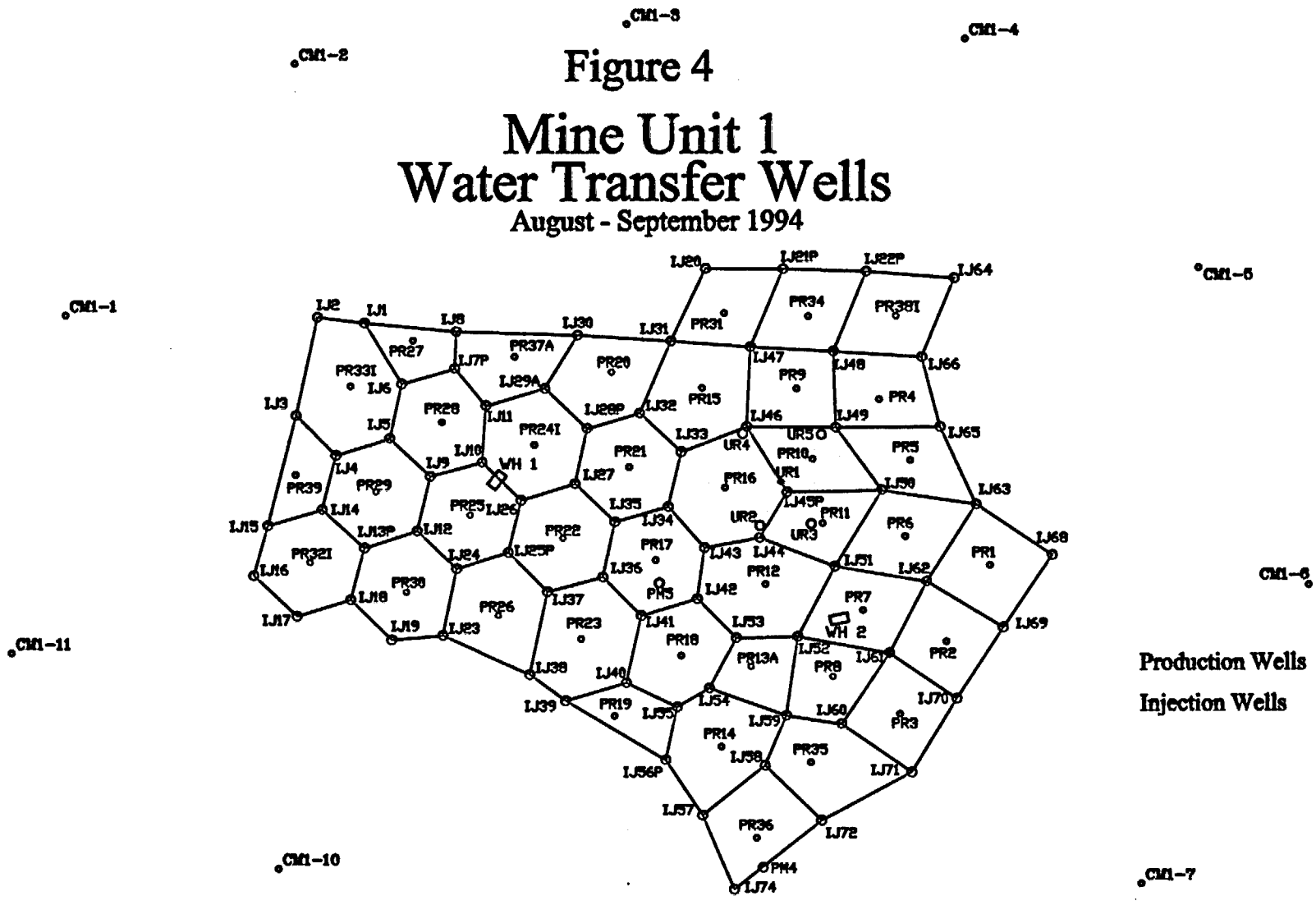


Figure 4

Mine Unit 1
Water Transfer Wells

August - September 1994



Production Wells

Injection Wells

CROW BUTTE PROJECT
Mine Unit 1
Water Transfer #2
Sec 19 T31N R51W

0 50 meters

0 50 100 150 200 feet

N

Figure 5

Mine Unit 1
Water Transfer Wells

November - December 1994

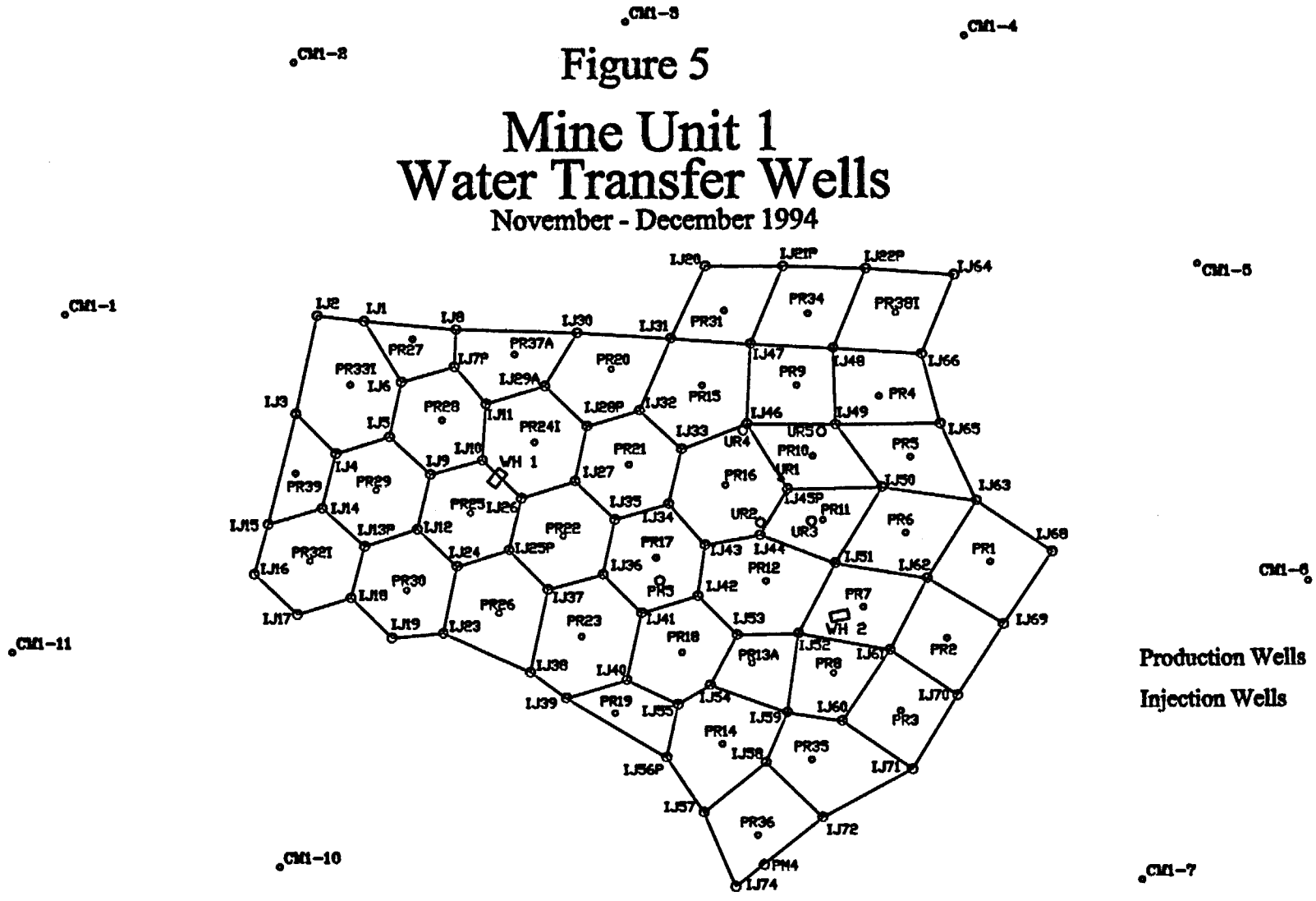
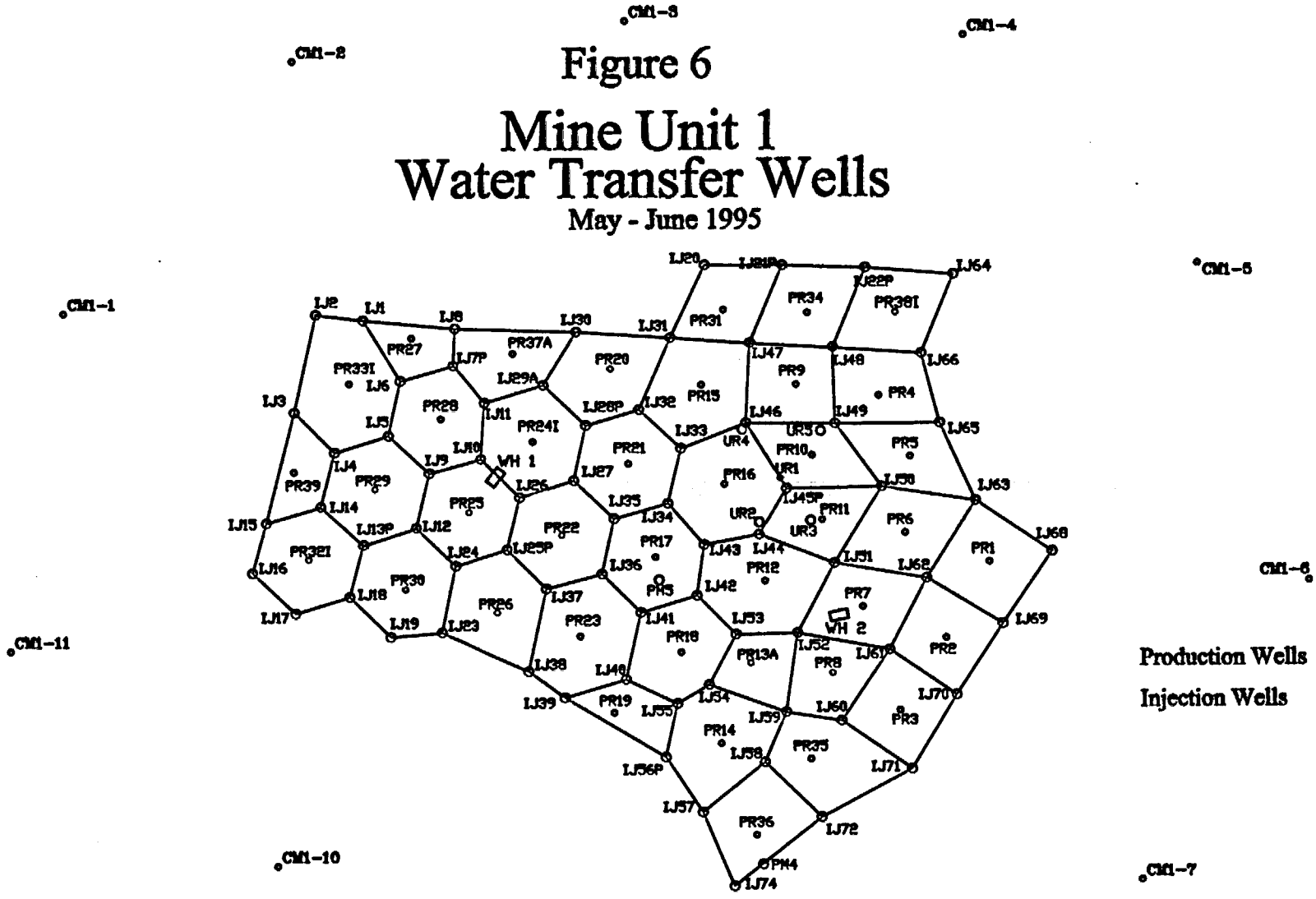


Figure 6

Mine Unit 1
Water Transfer Wells

May - June 1995



CROW BUTTE PROJECT
Mine Unit 1
Water Transfer #4
Sec 19 T3IN R51W

0 50 meters
0 50 100 150 200 feet
N

3.2 Groundwater Sweep

During groundwater sweep, water is pumped without injection from the wellfield causing an influx of baseline quality water from the perimeter of the mining unit that sweeps the affected portion of the aquifer. The cleaner baseline water has lower ion concentrations that act to strip off the cations that have attached to the clays during mining. The plume of affected water near the edge patterns of the wellfield is also drawn into the boundaries of the mine unit.

During the groundwater sweep stage, one producer, IJ28P-1, was on line pumping at an average flow rate of 13 gallons per minute (gpm). This well was an injection well, which had been converted to a producer. The well was producing without injection. The main purpose of this well was to control the migration of mining solutions from Mine Unit 1 to the north and south of the mine unit. Ordinarily, groundwater sweep would be used to pull baseline quality water inside the perimeter of the mine unit. This would be the method for restoring any affected groundwater between the monitor wells and the wellfield. However, it is apparent from the location map in Figure 1 that this type of approach would not work for Mine Unit 1. At the time groundwater sweep was performed, Mine Unit 1 was surrounded on three sides by active mine units. Any attempt to do a complete groundwater sweep for Mine Unit 1 would only result in bringing in contaminated water from the other mine units. In addition, all of the Mine Unit 1 monitor wells had been discontinued from service as monitoring wells. They were removed from service as the other wellfields were brought on line. Based on this situation, the groundwater sweep effort for Mine Unit 1 was kept to a minimum.

The open areas to the north and south of Mine Unit 1 will require restoration at some point in time. CBR's future restoration plans include clean up of these areas with the restoration of the mine units surrounding Mine Unit 1.

Active restoration of Mine Unit 1 began with groundwater sweep activities. In April and May 1994, a total of 1,139,299 gallons (0.06 pore volumes) of groundwater sweep was removed from Mine Unit 1 production wells and sent to the plant production circuit. Additional groundwater sweep to main production was also performed in July 1994. The total volume for July 1994 was 569,650 gallons (0.03 pore volumes). These two periods of groundwater sweep resulted in a total of 1,708,949 gallons (0.10 pore volumes) of groundwater sweep during restoration of Mine Unit 1.

3.3 Groundwater Treatment

Following groundwater sweep and the initial groundwater transfers, water is pumped from production wells to treatment equipment and then reinjected into the wellfield. Ion exchange and RO treatment equipment are utilized during this stage as shown in Figure 7. The ion exchange step uses fixed bed downflow ion exchange columns located at the main plant.

Water recovered from restoration containing a significant amount of uranium may be passed through the ion exchange system. The ion exchange columns exchange the majority of the contained soluble uranium for chloride or sulfate. Once the solubilized uranium is removed, a small amount of reductant is metered into the restoration wellfield injection to reduce any pre-oxidized minerals. The concentration and type of trace elements encountered determine the concentration of reductant injected into the formation. The goal of reductant addition is to reduce those minerals that are solubilized by carbonate complexes to prevent build-up of dissolved solids, which would increase the time required to complete restoration.

A portion of the restoration recovery water can be sent to the RO unit. The use of a RO unit has several effects:

- Reduces the total dissolved solids in the contaminated groundwater;
- Reduces the quantity of water that must be removed from the aquifer to meet restoration limits;
- Concentrates the dissolved contaminates in a smaller volume of brine to facilitate waste disposal; and
- Enhances the exchange of ions from the formation due to the large difference in ion concentration.

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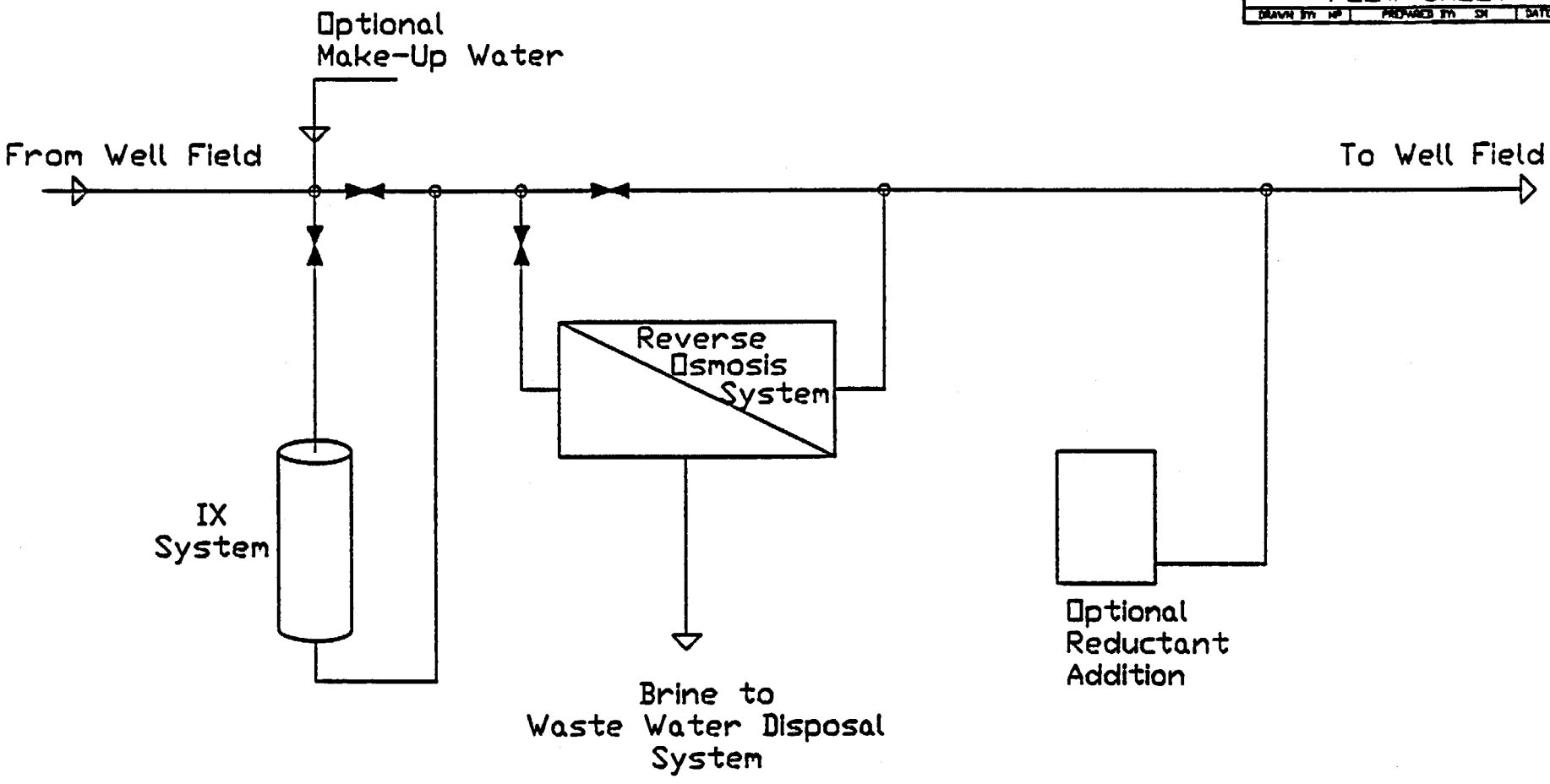
CROW BUTTE PROJECT
Dawes County, Nebraska

REV	DESCRIPTION	BY	DATE

Commercial Process Plant

RESTORATION FLOW SHEET

DRAWN BY: NP | PREPARED BY: SN | DATE: 3/99



Before the RO unit is used to process the water, the soluble uranium is removed by the ion exchange system. The water is then filtered, the pH lowered for decarbonation to prevent calcium carbonate plugging of the membranes (this step is needed for cellulose acetate membranes only), and then pressurized by a pump. The RO unit contains membranes that pass about 60 to 80 percent of the water through, leaving 60 to 90 percent of the dissolved salts in the water that will not pass the membrane. Table 5 shows typical manufacturers specification data for removal of ion constituents. The clean water, called permeate, is reinjected, sent to storage for use in the mining process, or sent to the waste disposal system. The twenty to forty percent of water that is rejected, referred to as the brine, contains the majority of dissolved salts that contaminate the groundwater and is sent for disposal in the wastewater system. The brine stream that is bled to disposal also results in a groundwater sweep that pulls unaffected groundwater into the mine unit. However, because other active mine units border Mine Unit 1 as discussed above, a large groundwater sweep program was precluded. Therefore, Mine Unit 1 was operated as close to balanced as possible during RO operations. Clean water from several different sources was used to make up for the rejected brine.

The sodium sulfide reductant that may be added to the injection stream during this stage will reduce the oxidation-reduction potential (Eh) of the aquifer. During mining operations certain trace elements are oxidized. By adding a reductant, the Eh of the aquifer is lowered thereby decreasing the solubility of these elements.

The number of pore volumes treated and re-injected during the groundwater treatment stage depends on the efficiency of the RO unit in removing total dissolved solids and the reductant in lowering the uranium and trace element concentrations.

The groundwater treatment stage of restoration evolved slowly over time as additional equipment and piping were installed. Initially, groundwater treatment consisted of circulating Mine Unit 1 water through ion exchange columns (IX). The second step was to add treatment of the water with RO. The final step involved the addition of sodium sulfide reductant to the injection stream to Mine Unit 1.

Table 5: Typical Reverse Osmosis Membrane Rejection

NAME	SYMBOL	% REJECTION
	Cations	
Aluminum	Al^{+3}	99+
Ammonium	NH_4^{+1}	88-95
Cadmium	Cd^{+2}	96-98
Calcium	Ca^{+2}	96-98
Copper	Cu^{+2}	98-99
Hardness	Ca and Mg	96-98
Iron	Fe^{+2}	98-99
Magnesium	Mg^{+2}	96-98
Manganese	Mn^{+2}	98-99
Mercury	Hg^{+2}	96-98
Nickel	Ni^{+2}	98-99
Potassium	K^{+1}	94-96
Silver	Ag^{+1}	94-96
Sodium	Na^{+}	94-96
Strontium	Sr^{+2}	96-99
Zinc	Zn^{+2}	98-99
	Anions	
Bicarbonate	HCO_3^{-1}	95-96
Borate	$B_4O_7^{-2}$	35-70
Bromide	Br^{-1}	94-96
Chloride	Cl^{-1}	94-95
Chromate	CrO_4^{-2}	90-98
Cyanide	CN^{-1}	90-95
Ferrocyanide	$Fe(CN)_6^{-3}$	99+
Fluoride	F^{-1}	94-96
Nitrate	NO_3^{-1}	95
Phosphate	PO_4^{-3}	99+
Silicate	SiO_2^{-1}	80-95
Sulfate	SO_4^{-2}	99+
Sulfite	SO_3^{-2}	98-99
Thiosulfate	$S_7O_3^{-2}$	99+

The method employed by CBR during the restoration of Mine Unit 1 was restoration on a pattern-by-pattern basis. In this method, the producer of each pattern in Mine Unit 1 was brought on line to the restoration circuit and then permeate from the RO unit(s) (usually with reductant added) was circulated to every injector in that pattern to recreate the original flowpaths developed during mining. This was to ensure that the mining solutions were displaced or diluted.

Full water quality analyses of seven of the first restored patterns showed that conductivity could be used as a suitable indicator of successful restoration. The results from these analyses are contained in Appendix 5. Therefore, when the conductivity of the producer was reduced to below baseline conductivity, the pattern was considered restored.

The flowrates during groundwater treatment were balanced to prevent the migration of lixiviant from the surrounding wellfields into Mine Unit 1. There were thirty-nine original patterns in Mine Unit 1. The actual number of patterns restored was thirty-nine. During mining, a few producers became unusable; therefore, injectors were used in their place to restore the pattern.

3.3.1 Ion Exchange Treatment

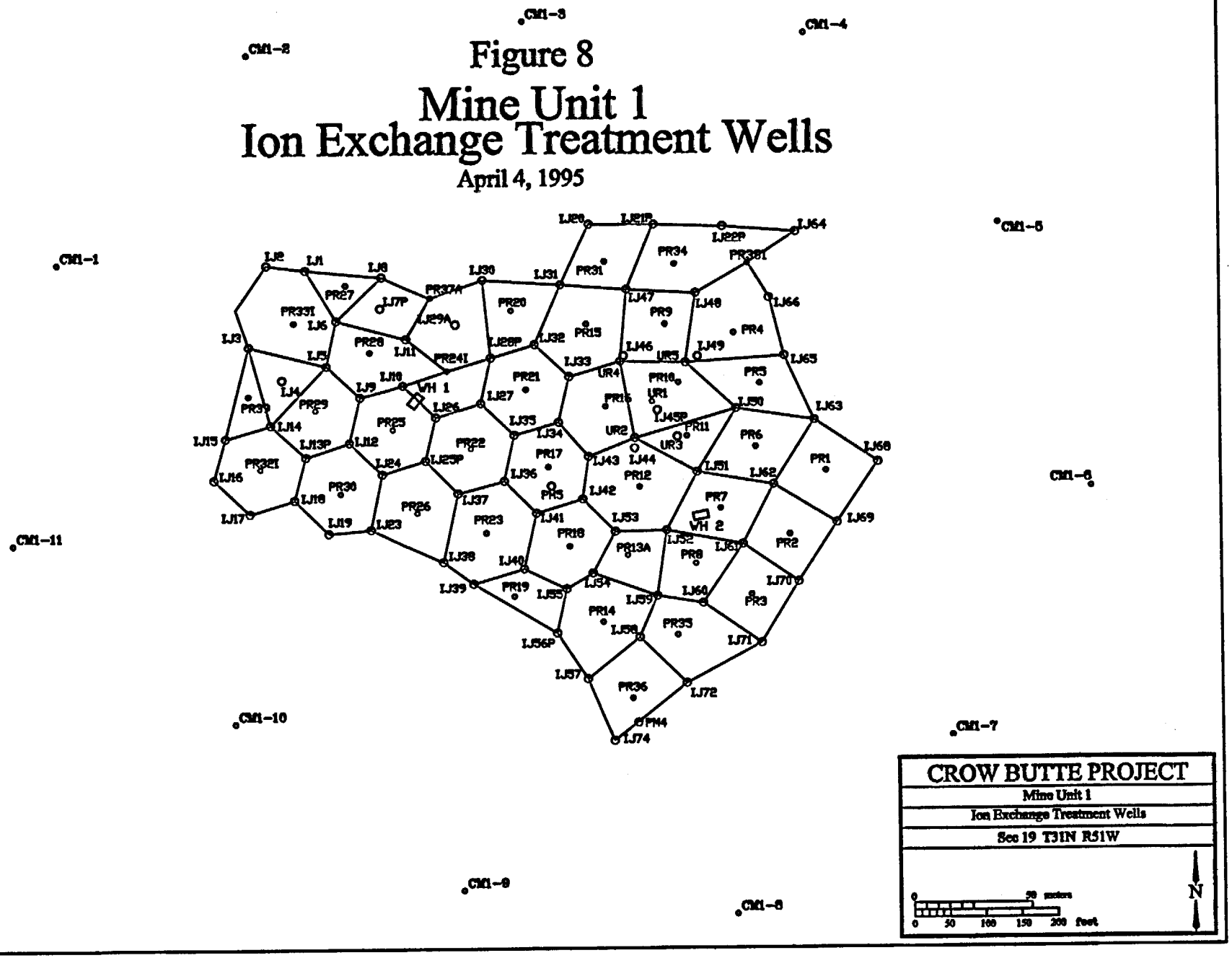
Groundwater treatment in Mine Unit 1 began on September 12, 1994 with ion exchange operations. Treatment through the ion exchange columns without RO operation was performed through September 1995. After RO treatment was begun, ion exchange treatment was continued for a portion of the restoration flow. During recirculation as discussed in Section 3.4, ion exchange treatment was continued for residual uranium removal. The total volume treated by ion exchange was 456,946,618 gallons (26.62 pore volumes). The average treatment flow rate during this ion exchange phase was 420 gpm.

The purpose for groundwater treatment through the restoration ion exchange columns was to reduce the amount of soluble uranium as much as possible. This was performed before beginning treatment with the RO unit(s). To do this, between 17 and 20 higher headgrade producers were online throughout the wellfield. Figure 8 illustrates which wells were online during the period with the highest flowrate. The results of this operation can be seen in the drop in average headgrade. At the beginning in September of 1994, the average headgrade was approximately 22 ppm. At the end of this phase of groundwater treatment, the average headgrade of the online producers had been lowered to approximately 9 ppm.

Figure 8

Mine Unit 1
Ion Exchange Treatment Wells

April 4, 1995



3.3.2 Ion Exchange and Reverse Osmosis Treatment

On September 28, 1995, treatment with RO was begun at a flow rate of 45 gpm. Groundwater treatment operations with the ion exchange columns were also continued. From October 1995 through July 1998, treatment with ion exchange and RO was performed. During this period, a total of 103,413,312 gallons (6.02 pore volumes) were treated through the RO units.

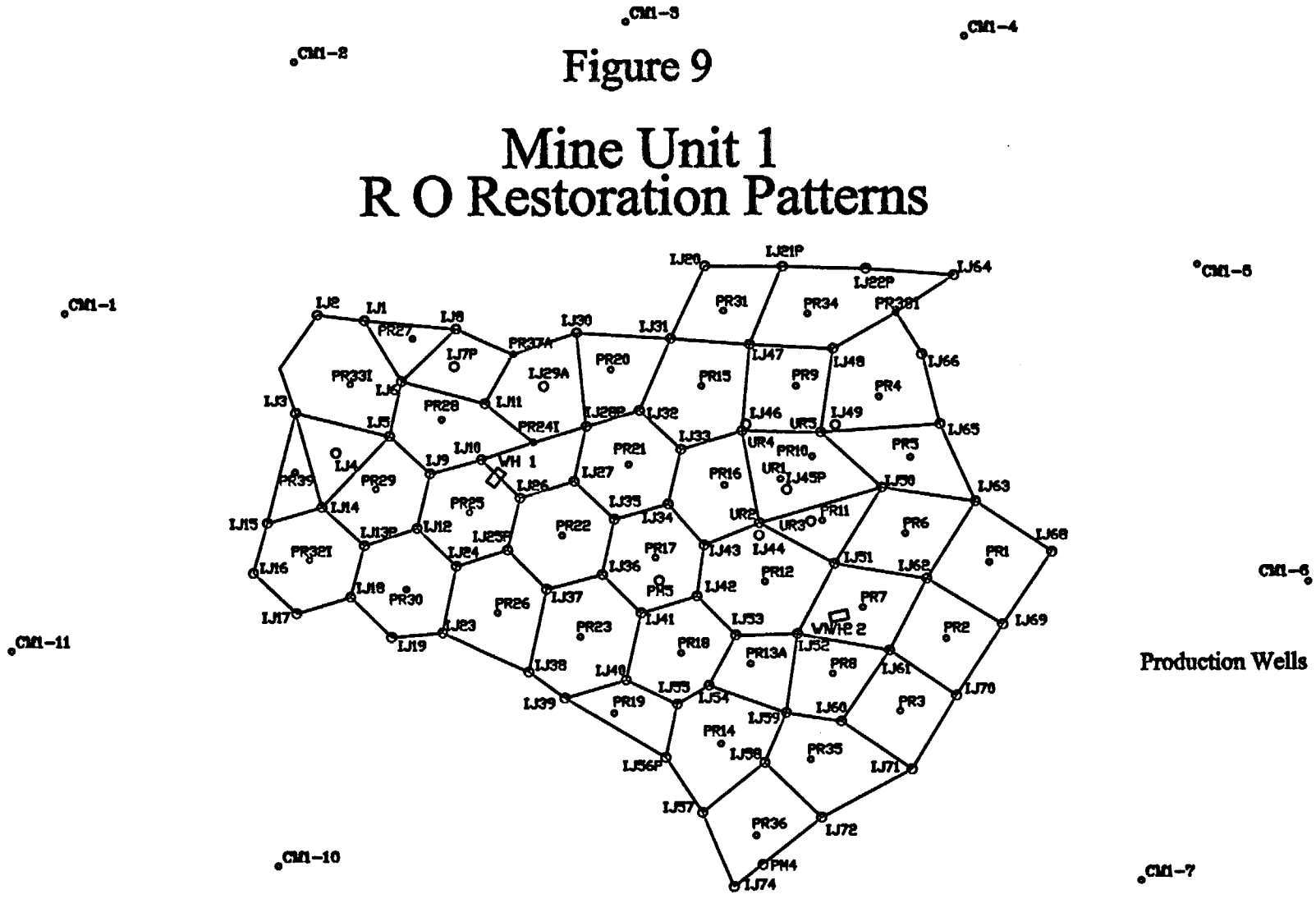
The unit used during the initial stage of restoration was a cellulose acetate membrane RO with a 50-gpm capacity. This RO was designated RO Unit 1. The initial RO capacity determined the method that CBR used to restore Mine Unit 1. Restoration was accomplished on a pattern-by-pattern basis. The method consisted of restoring a pattern and then moving to another pattern. By the end of groundwater treatment, all patterns in Mine Unit 1 had been restored with RO permeate. Figure 9 shows the final Mine Unit 1 wellfield configuration and the patterns restored by RO. Table 6 lists each production well, the total pore volumes of combined RO treatment for the associated pattern, and the final conductivity.

The final configuration of Mine Unit 1 was the result of changes during mining operations such as well reversals. A well reversal occurred when an injection well was converted to a producer and vice versa. This type of reversal was necessary for some patterns in restoration since the producer was no longer operational. Therefore, the pattern was restored using an injector. An example of this is the pattern formed by PR-16. When viewing Figure 9, it appears as if this pattern was not covered during RO restoration. PR-16 developed problems during mining, which prevented it from being used during restoration. IJ-33 was reversed with PR-16 to restore this pattern. Permeate was added to the injectors on the opposite side of the pattern in order to pull the solution across PR-16. This type of operation was used to restore PR-5 (IJ-49 as producer) and PR-14 (IJ-56P as producer).

In other cases, if a reversal had been performed and the producer was still operational, it was used as an injector to enhance restoration. PR-21, PR-32, and PR-38 are examples of patterns restored in this manner.

Figure 9

Mine Unit 1
R O Restoration Patterns



CROW BUTTE PROJECT

Mine Unit 1

R O Restoration Patterns

Sec 19 T31N R51W

0 50 meters

0 50 100 150 200 feet

N

Table 6: Restoration Pattern Final RO Pore Volumes and Conductivity

Well Number	Cumulative Pore Volume	Final Conductivity (µmho/cm)
PR1	2.4	1813
PR2	25.8	1890
PR3	1.9	1803
PR4	5.8	867
PR6	6.6	1852
PR7	1.9	1730
PR8	14.9	712
PR9	2.9	1743
PR11	1.2	1646
PR12	3.9	1582
PR13a	3.9	1624
PR15	7.4	1834
PR17	5.6	1780
PR18	4.8	1871
PR19	34.4	1748
PR20	9.9	1660
PR22	5.2	1858
PR23	1.9	1664
PR26	0.7	1651
PR27	12.9	1625
PR28	11.1	1799
PR29	21.3	1929
PR30	5.4	1842
PR31	1.0	1602
PR33	4.5	1200
PR34	8.4	1938
PR35	4.7	1702
PR36	7.5	1928
PR39	17.4	835
IJ7p	4.0	1373
IJ13p	20.4	2520
IJ25p	5.2	1786
IJ28p	4.5	1685
IJ29p	1.1	1374
IJ33p	2.0	931
IJ45p	10.0	1637
IJ49p	2.9	1738
IJ56p	15.6	2000

The number of patterns in RO restoration at any given time was dependent upon RO flow capacity. Therefore, when RO Unit 1 was brought on line, only two patterns were selected for RO restoration. At the same time, 11 to 13 other patterns were online to ion exchange treatment. As restoration progressed, new RO units were constructed. Eventually RO Unit 1 was shut down and replaced with three thin film membrane RO units. The flow capacity with these three new RO units was 200 gpm, so at the end of groundwater treatment for Mine Unit 1, there were nine patterns in RO restoration.

In addition to newer and better RO units, new restoration pipelines were installed which provided increased flow capacity and more versatile flow arrangements. This allowed for more efficient RO operations. These improvements to the restoration system should significantly reduce the number of pore volumes for the restoration of future mine units.

3.3.3 Reductant Addition

In April 1996 the addition of sodium sulfide as a reductant was begun in Mine Unit 1. Groundwater treatment continued through the ion exchange and RO systems with reductant addition through July 1998.

3.4 Wellfield Recirculation

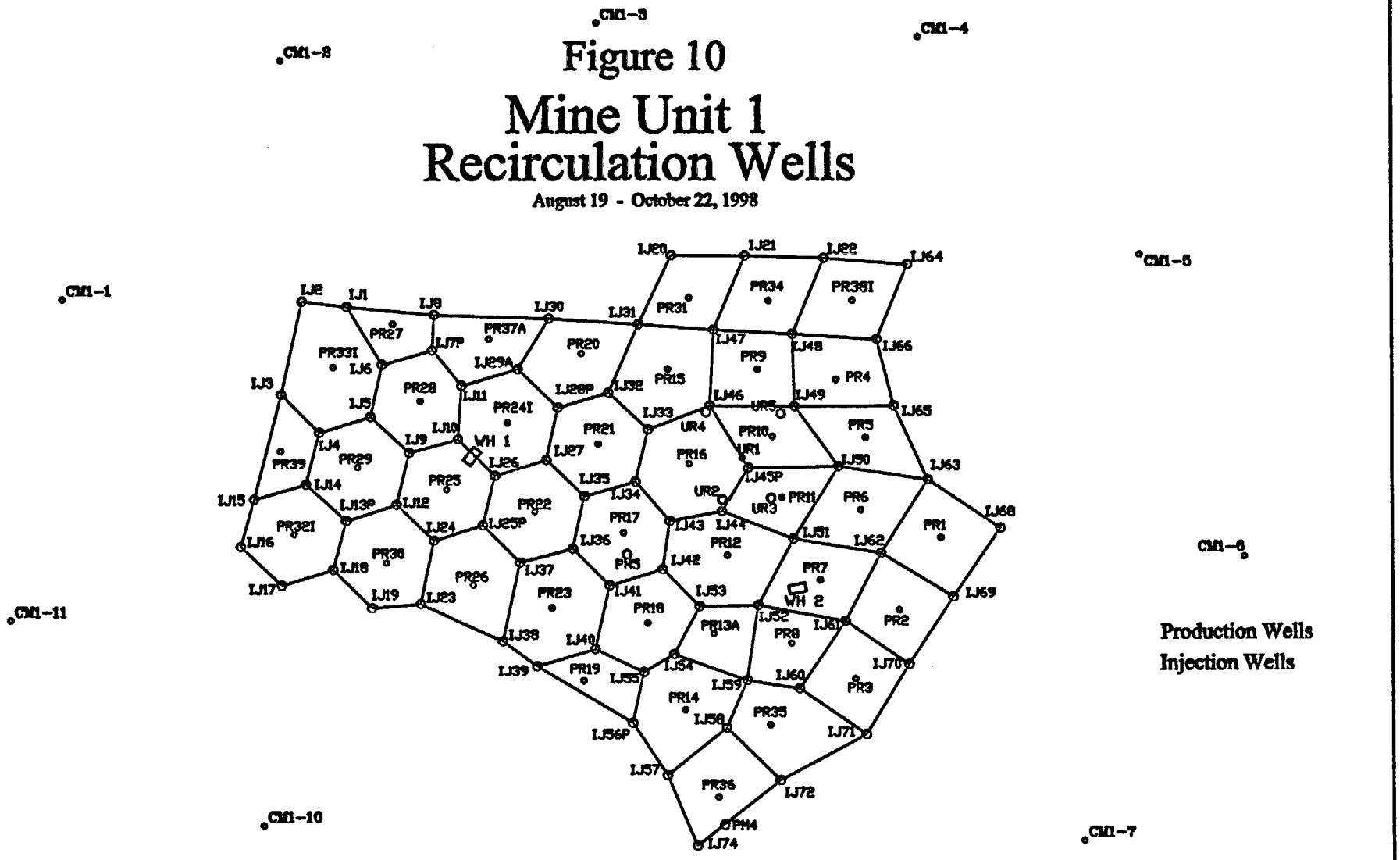
At the completion of the groundwater treatment stages, wellfield recirculation may be initiated. In order to homogenize the aquifer, pumping from the production wells and re-injecting the recovered solution into injection wells can be performed to recirculate solutions.

Mine Unit 1 was placed in recirculation on August 19, 1998. Figure 10 depicts the wells that were used to recirculate the mine unit. Recirculation was conducted until February 18, 1999 when the mine unit was placed in stabilization. A total of 48,946,046 gallons, or 2.85 pore volumes, was recirculated through the ion exchange system to provide final uranium removal.

Figure 10

Mine Unit 1
Recirculation Wells

August 19 - October 22, 1998



3.5 Post Restoration Sampling

CBR obtained composite samples from the restoration wells on October 30, 1998. This sampling indicated that, with the exception of vanadium, all parameters met either baseline or UIC Permit restoration standards. CBR continued restoration activities to reduce the vanadium concentrations.

All restoration wells were sampled on January 22, 1999 and analyzed for vanadium. The analytical results indicated that the UIC Permit standard for vanadium had been met.

Table 7 provides the analytical data from the Mine Unit 1 post-restoration sampling. The results for all parameters except vanadium are from the October 1998 composite sampling. The vanadium results are from the January 1999 sampling. The table segregates the parameters into those that were returned to baseline and those that exceeded baseline but met the UIC Permit standards at the end of active restoration.

Based upon the results of the sampling performed in October 1998 and the vanadium sampling performed in January 1999, CBR notified the NDEQ and NRC on February 17, 1999 of the initiation of the stabilization stage.

Table 7: Mine Unit 1 Post-Restoration Analytical Results

Parameter	Baseline Average (Primary Goal)	UIC Permit Standard	Post-Restoration Average Water Quality
Parameters Returned to Baseline			
Ammonium (mg/l)	0.37	10	0.08
Barium (mg/l)	0.1	1.00	<0.1
Boron (mg/l)	0.93	None	0.4
Cadmium (mg/l)	0.006	0.01	<0.005
Carbonate (mg/l)	7.2	None	<1.0
Chloride (mg/l)	204	250	124
Chromium (mg/l)	<0.03	None	<0.05
Copper (mg/l)	0.017	1.00	<0.01
Fluoride (mg/l)	0.69	4.00	0.55
Iron (mg/l)	0.044	0.30	<0.05
Lead (mg/l)	0.031	0.05	<0.05
Manganese (mg/l)	0.11	0.05	0.01
Mercury (mg/l)	0.001	0.002	<0.001
Molybdenum (mg/l)	0.069	1.00	<0.10
Nickel (mg/l)	0.034	0.15	<0.05
Nitrate (mg/l)	0.05	10.0	<0.10
Nitrite (mg/l)	0.01	None	<0.1
pH (Std. Units)	8.5	6.5 – 8.5	7.95
Selenium (mg/l)	0.003	0.01	0.001
Silica (mg/l)	16.7	None	13.6
Sodium (mg/l)	412.2	4122	315
Specific Conductivity (µmho/cm)	1947	None	1620
Sulfate (mg/l)	356.2	375	287
TDS (mg/l)	1170.2	1218	967

Table 7: Mine Unit 1 Post-Restoration Analytical Results

Parameter	Baseline Average (Primary Goal)	UIC Permit Standard	Post-Restoration Average Water Quality
Zinc (mg/l)	0.036	5.00	<0.01
Parameters Above Baseline but Meeting UIC Permit Standards			
Arsenic (mg/l)	0.002	0.05	0.024
Radium-226 (pCi/l)	229.7	584	246.7
Vanadium (mg/l)	0.066	0.2	0.13
Calcium (mg/l)	12.5	125	16.0
Potassium (mg/l)	12.5	125	13.0
Magnesium (mg/l)	3.2	32	4.4
Uranium (mg/l)	0.092	5.0	0.963
Parameters Above Baseline With No UIC Permit Standards			
Alkalinity (mg/l)	293	None	321
Bicarbonate (mg/l)	344	None	392

4 STABILIZATION

Upon completion of restoration, a groundwater stabilization and monitoring program was begun in which the restoration wells were sampled and assayed. Sampling frequency was one sample per month for each well for a period of six months. The initial sample was obtained on February 19, 1999 at the beginning of the stabilization phase. NDEQ obtained split samples at the same time from all restoration wells for submittal to the State of Nebraska Health and Human Services (HHS) Environmental Testing Laboratory.

Following collection of the initial samples at the beginning of the stabilization period, CBR collected samples from each restoration well on a monthly basis. The samples were submitted to Energy Laboratories in Casper, Wyoming for full water quality analysis. Samples were collected on March 18, April 15, May 20, June 17, and July 15, 1999.

The analytical results during the stabilization period indicate that the mine unit average for all parameters is below the baseline concentration or the UIC restoration standard and are stable. Table 8 summarizes the results of each stabilization sample event. The table shows the mine unit average for each parameter for each sample event. The minimum, maximum, and average of the mine unit average data for each parameter are also shown. A comparison of the restoration standards with the maximum of the mine unit average data indicates that at no time during the stabilization period did the mine unit average exceed the UIC Permit standard for any parameter.

Figure 11 depicts the mine unit average for each parameter from each of the six sampling events. The values are shown as a percentage of the UIC Permit restoration standards.

Copies of the stabilization laboratory summary reports for each of the BLR wells is included in Appendix 6.

Table 8: Mine Unit 1 Stabilization Analytical Results

Parameter (mg/l)	MU-1 Baseline Average	UIC Permit Restoration Standard	Six Sampling Periods			Stabilization Sample # 1 2/18/99	Stabilization Sample # 2 3/18/99	Stabilization Sample # 3 4/15/99	Stabilization Sample # 4 5/20/99	Stabilization Sample # 5 6/17/99	Stabilization Sample # 6 7/15/99
			Maximum	Minimum	Average						
Alkalinity	293	None	363	331	347	331	337	342	349	363	360
Ammonium	0.37	10.00	0.18	0.07	0.12	0.07	0.10	0.13	0.08	0.15	0.18
Arsenic	0.002	0.050	0.020	0.016	0.018	0.016	0.020	0.018	0.017	0.018	0.019
Barium	0.2	1.0	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bicarbonate	344	None	403	440	421	403	409	415	423	440	435
Boron	0.93	N/A	0.53	0.33	0.46	0.46	0.47	0.33	0.47	0.48	0.53
Cadmium	0.006	0.01	0.005	0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium	12.5	125.0	22.1	16.6	19.9	16.6	19.1	19.8	20.3	22.1	21.2
Carbonate	7.2	None	2.7	1.2	1.9	1.2	1.5	1.6	2.0	2.1	2.7
Chloride	204	250	158	130	139	131	130	141	141	158	136
Chromium	<0.03	None	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Copper	0.017	1.0	0.0	0.0	0.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	0.69	4.00	0.63	0.51	0.55	0.55	0.52	0.51	0.53	0.53	0.63
Iron	0.044	0.300	0.127	0.049	0.089	0.049	0.070	0.080	0.090	0.118	0.127
Lead	0.031	0.05	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Magnesium	3.2	32.0	6.1	4.3	5.3	4.3	5.0	5.2	5.3	5.7	6.1

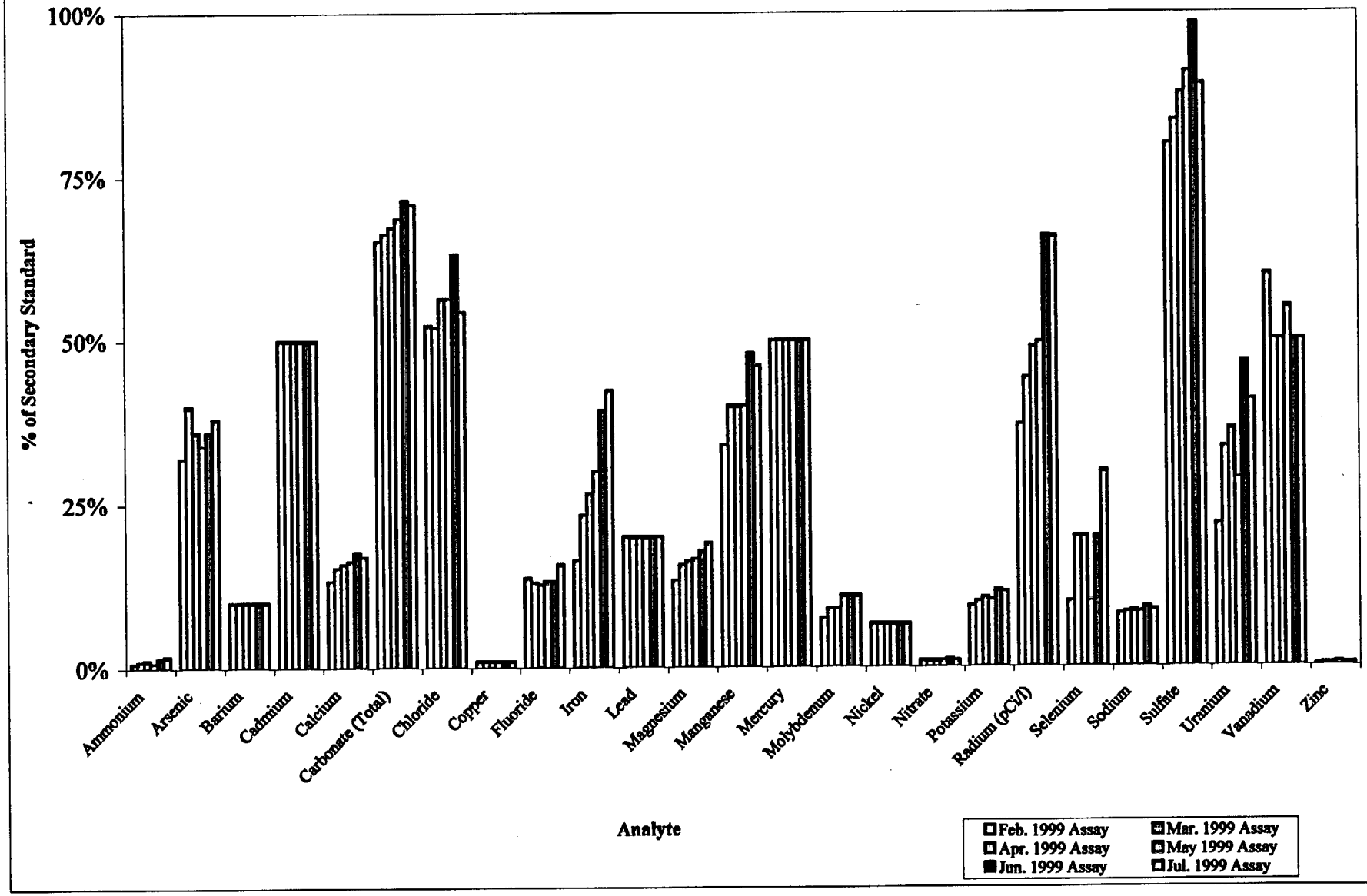
Table 8: Mine Unit 1 Stabilization Analytical Results

Parameter (mg/l)	MU-1 Baseline Average	UIC Permit Restoration Standard	Six Sampling Periods			Stabilization Sample # 1 2/18/99	Stabilization Sample # 2 3/18/99	Stabilization Sample # 3 4/15/99	Stabilization Sample # 4 5/20/99	Stabilization Sample # 5 6/17/99	Stabilization Sample # 6 7/15/99
			Maximum	Minimum	Average						
Manganese	0.011	0.050	0.024	0.017	0.021	0.017	0.020	0.020	0.020	0.024	0.023
Mercury	0.001	0.002	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	0.069	1.000	0.110	0.075	0.098	0.075	0.090	0.090	0.110	0.110	0.110
Nickel	0.034	0.15	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	0.05	10.0	0.1	0.1	0.1	<0.1	<0.1	0.1	<0.1	0.12	<0.1
Nitrite	0.01	None	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
pH (Std. Units)	8.5	6.5-8.5	8.29	8.12	8.18	8.15	8.12	8.20	8.16	8.16	8.29
Potassium	12.5	125.0	14.7	11.7	13.2	11.7	12.6	13.3	12.8	14.7	14.4
Radium-226 (pCi/l)	230	584	385	216	303	216	258	286	290	385	384
Selenium	0.003	0.01	0.003	0.001	0.002	0.001	0.002	0.002	0.001	0.002	0.003
Silica	16.7	None	15.4	13.6	14.4	13.6	15.1	15.4	14.7	13.8	13.7
Sodium	412	4122	376	332	352	332	346	355	345	376	360
Specific Conductivity (µmho/cm)	1947	None	1888	1702	1787	1702	1728	1758	1815	1888	1833
Sulfate	356	375	369	300	331	300	313	329	341	369	334
TDS	1170	1218	1153	1026	1094	1026	1056	1097	1108	1153	1125
Uranium	0.09	5.00	2.33	1.09	1.73	1.09	1.68	1.82	1.44	2.33	2.04

Table 8: Mine Unit 1 Stabilization Analytical Results

Parameter (mg/l)	MU-1 Baseline Average	UIC Permit Restoration Standard	Six Sampling Periods			Stabilization Sample # 1 2/18/99	Stabilization Sample # 2 3/18/99	Stabilization Sample # 3 4/15/99	Stabilization Sample # 4 5/20/99	Stabilization Sample # 5 6/17/99	Stabilization Sample # 6 7/15/99
			Maximum	Minimum	Average						
Vanadium	0.07	0.20	0.12	0.10	0.11	0.12	0.10	0.10	0.11	0.10	0.10
Zinc	0.04	5.00	0.03	0.01	0.02	0.01	0.02	0.02	0.03	0.02	0.02

Figure 11
MU-1 Stabilization Trends and % of Secondary Standard



5 EFFECTIVENESS OF MINE UNIT 1 RESTORATION

5.1 Restoration Summary

Restoration of Mine Unit 1 was conducted in accordance with the Restoration Plan[2] developed by CBR and incorporated by the NRC in SUA-1534. The restoration was accomplished using a combination of each of the restoration steps identified in the plan. A summary of the application of these steps is shown in Table 9.

Table 9: Restoration Summary

Restoration Step	Date Begun	Date Completed	Total Gallons	Total Pore Volumes
Groundwater Transfer	May 1994	July 1997[1]	15,193,704	0.89
Groundwater Sweep	April 1994	July 1994	1,708,949	0.09
Groundwater Ion Exchange Treatment	September 1994	February 1999	456,946,618	26.62
Groundwater Reverse Osmosis Treatment	October 1995	July 1998	103,413,312	6.02
Wellfield Recirculation	August 1998	February 1999	48,946,046	2.85
Stabilization	February 1999	August 1999	N/A	N/A

Notes:

1 Groundwater Transfer was accomplished in five discreet steps during this time period.

2 Crow Butte Resources, Inc., *Groundwater Restoration Plan, Revision 1*, November 26, 1996.

5.2 Restoration Results

The results of the monitoring performed during the stabilization period indicate that CBR has successfully completed restoration of Mine Unit 1 to a stable condition that meets baseline concentrations or UIC Permit standards for all parameters. As shown in Table 10, seventeen of the monitored water quality parameters have been returned to an average concentration that is below the baseline concentrations. All of the remaining monitored parameters are below the UIC restoration standards established by the NDEQ.

The mine unit average for each parameter on each successive sampling event during the stabilization period was below the appropriate standards. There are no important trends in the data for any parameter as shown in Figure 11.

Table 10: Mine Unit 1 Restoration Results

Parameter	Baseline Water Quality	UIC Permit Restoration Standard	Post-Mining Average Water Quality	Post-Restoration Average Water Quality	Stabilization Period Average Water Quality
Alkalinity	293	None	875	321	347
Ammonium	0.37	10	0.277	0.08	0.12
Arsenic	0.002	0.05	0.021	0.024	0.017
Barium	0.1	1.00	<0.10	<0.10	<0.10
Bicarbonate	344	None	1068	392	421
Boron	0.93	N/A	1.22	0.4	0.46
Cadmium	0.006	0.01	<0.01	<0.005	<0.005
Calcium	12.5	125	88.7	16.0	19.9
Carbonate	7.2	None	0	<1.0	1.9
Chloride	204	250	583	124	139
Chromium	<0.03	None	<0.05	<0.05	<0.05
Copper	0.017	1.00	0.035	<0.01	<0.01
Fluoride	0.69	4.00	0.41	0.55	0.54
Iron	0.044	0.30	0.078	<0.05	0.09
Lead	0.031	0.05	<0.05	<0.05	<0.01
Magnesium	3.2	32	23	4.4	5.3
Manganese	0.11	0.05	0.075	0.01	0.02
Mercury	0.001	0.002	<0.001	<0.001	<0.001
Molybdenum	0.069	1.00	0.487	<0.10	0.10

Table 10: Mine Unit 1 Restoration Results

Parameter	Baseline Water Quality	UIC Permit Restoration Standard	Post-Mining Average Water Quality	Post-Restoration Average Water Quality	Stabilization Period Average Water Quality
Nickel	0.034	0.15	0.068	<0.05	<0.01
Nitrate	0.05	10.0	1.01	<0.10	<0.11
Nitrite	0.01	None		<0.10	<0.1
pH (Std. Units)	8.5	6.5 – 8.5	7.35	7.95	8.18
Potassium	12.5	125	30.0	13.0	13.2
Radium-226 (pCi/l)	229.7	584	786	246.7	303
Selenium	0.003	0.01	0.124	0.001	<0.002
Silica	16.7	None		13.6	14.4
Sodium	412.2	4122	1117	315	352
Specific Conductivity (µmho/cm)	1947	None	5752	1620	1787
Sulfate	356.2	375	1128	287	331
TDS	1170.2	1218	3728	967	1094
Uranium	0.092	0.44	12.2	0.963	1.73
Vanadium	0.066	0.2	0.96	0.26	0.11
Zinc	0.036	5.00	0.038	<0.01	<0.02

Appendix 1

Baseline Restoration Well Correspondence

KN

FERRET EXPLORATION COMPANY OF NEBRASKA, INC.

P.O. Box 169
Crawford, Nebraska 69339

Office (308) 665-2215
FAX (308) 665-2341

March 22, 1994

Mr. U. Gale Hutton
Nebraska Department of Environmental Quality
P.O. Box 98922
Lincoln, Nebraska 68509-8922

Dear Gale:

In the Notice of Intent to Operate Mine Unit 1 submittal dated December 17, 1990, FEN designated well PT-9 as a baseline restoration well. FEN has ceased mining activities in Mine Unit 1 and is preparing to establish post-mining water quality by sampling all designated restoration wells in the mine unit. Well PT-9 has become non-functional and FEN is unable to obtain a water sample from the well. FEN proposes to use the nearest well, PR-8 as a replacement for PT-9. Both wells are screened in a similar manner in the Chadron Sandstone.

Discussion with personnel from your office indicated this is an acceptable replacement well. FEN plans to sample all designated restoration wells in Mine Unit 1 this week and split these samples with the Department. FEN also plans to plug PT-9 in accordance with the approved Plugging and Abandonment Plan. Should you have any questions regarding this matter, please do not hesitate to contact me.

Sincerely,

Ralph Knode

Ralph Knode
Vice President

bc: SPC
Frank Mills/NDEQ

FERRET EXPLORATION COMPANY OF NEBRASKA, INC.

216 Sixteenth Street Mall, Suite 810
Denver, Colorado 80202

(303) 825-2266
(303) 825-1544 - FAX

March 21, 1994

Mr. Ramon Hall
U.S. Nuclear Regulatory Commission
Uranium Recovery Field Office
P.O. Box 25325
Denver, Colorado 80225

RE: Docket No. 40-8943
License No. SUA-1534

Dear Mr. Hall:

The cover letter to License Amendment No. 22 asked FEN to propose appropriate revision to License SUA-1534 as a result of revision in 10 CFR Part 20 which became effective January 1, 1994.

The following changes are necessary to correct reference to 10 CFR 20.

	Old 10 CFR 20	New 10 CFR 20
License Condition 17	20.203 (e) (2)	20.1902(e)
License Condition 23	20.103 (a) (2)	20.1201
	20.103 (b) (2)	20.1702
License Condition 30	20.203 (d)	20.1003
License Condition 52	20.103	20.1204

In the Notice of Intent to Operate Mine Unit 1, submittal dated December 17, 1990, FEN designated well PT-9 as a baseline restoration well. FEN has ceased mining activities in Mine Unit 1 and is preparing to establish post mining water quality by sampling all designated restoration wells in the Mine Unit. Well PT-9 has become non-functional and is unable to be sampled. FEN proposes to use the nearest well, PR-8 as a replacement for PT-9. Both wells are screened in a similar manner in the production zone. FEN requests that your agency approve PR-8 as a replacement restoration well for PT-9, and reference to this letter be added to License Condition 44 if necessary.

FEN also requests that License Condition 11 be changed to allow the disposal of waste byproduct material from the Crow Butte facility at any mill tailings or other waste facility that is licensed by USNRC or Agreement State to accept the material. This will allow FEN more flexibility in waste disposal and eliminate the need for a license amendment each time the name of the disposal facility changes.

If you need any further information, please contact me.

Sincerely,

Steve Collings

Stephen P. Collings
President

Appendix 2

Preoperational Baseline Sampling Results

Mine Unit 1

well number			pm-1	pm-4	pm-5	pt-5	IJ-6	pt-9	IJ-13	pr-15	pr-19	IJ-25	IJ-28	IJ-45	
2nd Well Number			pr-4			pr-2		pr-8*							
Major Ions			bl_avg	bl_avg	bl_avg	bl_avg	bl_avg	bl_avg	bl_avg	bl_avg	bl_avg	bl_avg	bl_avg	bl_avg	Wellfield Average
calcium	Ca	mg/l	14.7	15.3	15.5	8.2	12.7	13.0	9.5	13.2	14.0	8.7	17.3	7.6	12.5
magnesium	Mg	mg/l	3.5	3.6	3.9	2.3	3.1	2.1	2.8	3.9	3.8	2.5	4.6	2.2	3.2
sodium	Na	mg/l	402.5	398.6	400.0	464.8	429.7	407.7	401.7	398.7	406.7	402.3	410.7	423.3	412.2
potassium	K	mg/l	12.8	11.6	11.8	15.4	11.3	13.4	10.6	11.1	12.3	12.8	12.1	14.9	12.5
carbonate	CO3	mg/l	6.8	3.4	6.5	17.4	5.6	13.6	5.6	5.9	4.9	5.8	4.2	7.1	7.2
bicarbonate	HCO3	mg/l	370.4	373.3	365.4	305.0	334.7	358.0	314.7	361.7	348.7	306.7	371.7	314.7	344
sulfate	SO4	mg/l	355.7	354.2	355.5	330.5	365.3	351.7	358.3	352.3	361.3	360.3	363.7	365.7	356
chloride	Cl	mg/l	186.8	182.4	186.5	316.5	216.7	186.6	190.3	180.3	188.7	204.3	189.3	218.0	204
ammonium	NH4	mg/l	0.38	0.40	0.38	0.39	0.41	0.44	0.35	0.53	0.28	0.39	0.32	0.19	0.37
nitrite	NO2	mg/l	0.01	0.008	0.01	0.00	0.01	0.01	0.01	0.03	0.01	0.02	0.01	0.01	0.01
nitrate	NO3	mg/l	0.04	0.04	0.03	0.04	0.06	0.10	0.03	0.05	0.03	0.13	0.02	0.02	0.05
fluoride	F	mg/l	0.63	0.63	0.63	0.75	0.74	0.66	0.73	0.69	0.69	0.70	0.68	0.71	0.69
silica	SiO2	mg/l	13.2	13.3	12.0	11.4	18.8	16.1	22.0	16.7	17.2	22.9	17.9	18.5	16.7
Non-Metals															
total dissolved solids	TDS	mg/l	1156	1148	1147	1302	1196	1176	1129	1137	1154	1126	1173	1197	1170.2
conductivity (umho/cm)	Cond	umho/cm	1897	1871	1889	2136	1964	1866	1974	1867	1994	1970	1980	1951	1946.6
alkalinity as CaCO3	Alk	mg/l	310.3	309.5	302.0	279.1	283.7	323.9	267.3	306.7	294.0	261.0	311.7	270.0	293.3
pH (std units)	pH	std. units	8.22	8.16	8.15	8.54	8.56	8.60	8.57	8.55	8.47	8.60	8.43	8.68	8.5
Trace Metals															
aluminum	Al	mg/l	0.10	0.10	0.10	n/a	0.10	0.15	0.10	0.10	0.10	0.10	0.10	0.10	0.10
arsenic	As	mg/l	0.002	0.002	0.001	0.004	0.001	0.007	0.004	0.001	0.001	0.001	0.001	0.001	0.002
barium	Ba	mg/l	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
boron	B	mg/l	0.93	0.94	0.90	0.89	0.91	0.94	0.94	0.91	0.94	0.93	0.95	0.92	0.92
cadmium	Cd	mg/l	0.001	0.001	0.001	0.001	0.010	0.002	0.010	0.010	0.010	0.010	0.010	0.010	0.006
chromium	Cr	mg/l	0.00	0.00	0.01	0.01	0.05	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.03
copper	Cu	mg/l	0.01	0.01	0.10	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.017
iron	Fe	mg/l	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.044
lead	Pb	mg/l	0.01	0.01	0.01	0.01	0.05	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.031
manganese	Mn	mg/l	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.011
mercury	Hg	mg/l	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.001
molybdenum	Mo	mg/l	0.02	0.02	0.02	0.01	0.10	0.05	0.10	0.10	0.10	0.10	0.10	0.10	0.069
nickel	Ni	mg/l	0.01	0.01	0.01	0.01	0.05	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.034
selenium	Se	mg/l	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.003
vanadium	V	mg/l	0.01	0.01	0.01	0.01	0.10	0.05	0.10	0.10	0.10	0.10	0.10	0.10	0.066
zinc	Zn	mg/l	0.10	0.09	0.10	0.03	0.01	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.036
Radiometric															
uranium natural (mg/l)	U-nat	mg/l	0.0511	0.0152	0.0378	0.0870	0.1083	0.3040	0.2412	0.0558	0.0361	0.0348	0.0594	0.0727	0.092
radium 226 (pCi/l)	Ra226	pCi/l	129.2	68.9	333.4	467.8	156.7	420.4	566.3	18.5	250.7	148.2	108.3	88.1	229.7
radium 226 precision	Ra226_precis		4.8	3.6	9.0	12.1	4.6	4.7	8.9	1.0	6.4	4.5	3.9	3.4	5.6

* PT9 was replaced by PR8; See letter submitted March 21,1994.

Mine Unit 1

Well Number			pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1	pm-1
2ND Well Number			pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4
Date			Jul-90	Dec-82	Jan-83	Apr-83	Jul-83	Oct-83	Jan-84	Apr-84	Dec-85	Jul-86	Oct-86	Jan-87	Apr-87	Jul-87	Oct-87	Jan-88	Apr-88	Jul-88	Oct-88	Feb-89	May-89	Jul-89	Oct-89	Jan-90	Apr-90	Jul-90
Major Ions			Average	bl1	bl2	bl3	bl4	bl5	bl6	bl7	bl8	bl9	bl10	bl11	bl12	bl13	bl14	bl15	bl16	bl17	bl18	bl19	bl20	bl21	bl22	bl23	bl24	bl25
calcium	Ca	mg/l	14.7	17.0	13.0	12.0	14.0	12.0	11.0	12.0	14.8	15.4	15.1	16.6	16.5	13.3	13.1	15.4	14.4	15.2	14.7	17.0	16.0	16.0	14.7	15.6	16.6	15.8
magnesium	Mg	mg/l	3.5	2.9	2.2	1.9	2.2	2.5	2.8	3.0	3.3	4.1	3.3	3.7	4.1	4.2	3.8	4.1	3.9	3.8	3.2	4.3	3.9	4.2	4.3	4.2	4.2	4.2
sodium	Na	mg/l	402.5	417.0	440.0	440.0	410.0	420.0	420.0	419.0	399.0	397.0	387.0	398.0	398.0	413.0	406.0	397.0	390.0	398.0	398.0	398.0	395.0	396.0	404.0	395.0	396.0	397.0
potassium	K	mg/l	12.8	13.0	16.0	18.0	17.0	18.0	16.0	15.0	11.7	10.5	9.6	9.8	11.7	11.5	11.8	11.6	11.0	11.6	11.7	11.4	11.0	12.5	15.3	11.6	11.5	12.2
carbonate	CO3	mg/l	6.8	13.0	12.0	0.0	0.0	12.0	5.0	12.0	3.3	0.0	0.0	0.0	4.2	0.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
bicarbonate	HCO3	mg/l	370.4	368.0	370.0	376.0	374.0	378.0	387.0	378.0	357.2	371.0	363.0	357.0	339.0	373.0	380.0	380.0	362.0	376.0	361.0	365.0	363.0	376.0	376.0	383.0	387.0	359.0
sulfate	SO4	mg/l	355.7	358.0	380.0	361.0	365.0	351.0	363.0	330.0	354.0	363.0	332.0	363.0	368.0	348.0	357.0	348.0	358.0	363.0	353.0	363.0	358.0	371.0	350.0	344.0	341.0	351.0
chloride	Cl	mg/l	186.8	208.0	210.0	215.1	199.0	193.7	188.0	194.0	180.0	176.0	182.0	187.0	173.0	203.0	191.0	185.0	175.0	182.0	181.0	180.0	179.0	176.0	183.0	181.0	180.0	179.0
ammonium	NH4	mg/l	0.38	0.48	0.28	0.39	0.25	0.10	0.17	0.71	0.20	0.39	0.39	0.42	0.45	0.41	0.43	0.44	0.42	0.42	0.38	0.38	0.42	0.43	0.43	0.39	0.49	0.28
nitrite	NO2	mg/l	<0.00964	0.02	<.01	0.01	<.01	<.01	<.01	<.01	<.001	<.01	<.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.07	0.00	0.01	<.01
nitrate	NO3	mg/l	<0.044	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.01	0.01	0.03	0.01	0.01	0.02	<.01	0.02	<.01	0.01	0.01	0.05	0.01	0.01	0.13	0.01	0.13	<.1
fluoride	F	mg/l	0.63	0.67	0.60	0.70	0.80	0.50	0.50	0.48	0.57	0.66	0.62	0.65	0.58	0.75	0.75	0.79	0.62	0.63	0.58	0.62	0.56	0.58	0.57	0.80	0.57	0.68
silica	SiO2	mg/l	13.2	15.0	14.0	14.0	16.0	14.0	15.0	16.5	14.2	13.4	13.1	12.1	12.8	12.8	12.4	12.8	12.8	10.7	9.8	13.1	12.4	12.2	13.1	13.1	12.0	12.7
Non-Metals																													
total dissolved solids	TDS	mg/l	1156	1260	1208	1226	1199	1223	1200	1168	1154	1186	1134	1178	1146	1176	1180	1124	1128	1136	1102	1082	1086	1097	1142	1116	1089	1166
conductivity (umhos/cm)	Cond	umhos/cm	1897	1940	1930	1825	1970	2040	2000	1830	1853	1844	1891	1986	1881	1847	1795	1883	1921	1927	1936	1839	1843	1878	1968	1948	1920	1950
alkalinity as CaCO3	Alk	mg/l	310.3	324.0	330.0	320.0	321.0	339.0	342.0	330.0	298.3	304.0	297.0	292.0	285.0	306.0	312.0	312.0	304.0	308.0	296.0	299.0	298.0	308.0	308.0	314.0	317.0	294.0
pH (std units)	pH	std. units	8.22	8.61	8.70	8.42	8.25	8.42	8.35	8.20	8.38	8.15	8.17	8.22	8.43	8.13	8.17	8.07	8.40	8.32	7.96	8.00	8.29	7.70	8.16	8.27	7.86	7.96
Trace Metals																													
aluminum	Al	mg/l	<0.10333	n/a	<.1	<.1	<.1	<.1	<.1	0.170	n/a	<.1	<.1	<.1	<.1	<.1	<.1	n/a	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
arsenic	As	mg/l	<0.001875	0.001	<.002	<.01	<.005	<.005	n/a	<.004	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
barium	Ba	mg/l	<0.097917	0.005	0.000	0.000	0.000	0.000	n/a	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
boron	B	mg/l	0.928	0.990	0.880	0.960	0.890	1.060	n/a	1.040	1.030	0.900	0.910	0.920	0.960	0.910	0.890	0.910	0.980	0.770	0.870	0.980	0.950	0.920	0.980	0.930	0.900	0.930
cadmium	Cd	mg/l	<0.001379	<.0001	<.001	<.01	<.001	<.001	n/a	0.002	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.001	<.001	<.001	<.001	<.001
chromium	Cr	mg/l	<0.064652	<.001	<.001	n/a	<.005	<.005	n/a	0.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
copper	Cu	mg/l	<0.009583	0.005	0.005	<.01	<.01	<.01	n/a	0.010	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
iron	Fe	mg/l	<0.034167	0.020	<.05	<.05	<.03	<.03	n/a	0.090	<.03	<.03	<.03	<.03	<.03	<.03	<.03	0.040	<.03	<.03	<.03	0.030	<.03	<.03	<.03	<.03	<.03	<.03
lead	Pb	mg/l	<0.005292	<.001	<.005	<.01	<.005	<.005	n/a	<.005	<.005	<.005	<.005	0.009	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
manganese	Mn	mg/l	<0.011958	0.004	<.1	<.01	<.005	<.005	n/a	<.005	0.007	0.007	0.007	0.008	0.008	0.009	<.005	0.009	0.007	0.008	0.009	0.010	0.010	0.010	0.010	0.011	0.011	0.012
mercury	Hg	mg/l	<0.000212	<.0001	<.0001	<.0003	<.0002	<.0002	n/a	0.000	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	0.001	<.0002	<.0002	<.0002	<.0002
molybdenum	Mo	mg/l	<0.0235	0.020	0.024	<.1	<.01	<.01	n/a	0.020	0.020	0.020	0.010	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.030	0.040	0.030	<.01	0.020	0.020	0.020
nickel	Ni	mg/l	<0.011333	<.01	<.002	<.05	<.01	<.01	n/a	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
selenium	Se	mg/l	<0.001417	<.001	<.002	<.01	<.001	<.001	n/a	<.001	<.001	0.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
vanadium	V	mg/l	<0.013458	<.01	0.006	<.1	<.01	<.01	n/a	0.007	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
zinc	Zn	mg/l	<0.100292	0.012	<.005	<.01	<.01	<.01	n/a	0.020	<.01	0.110	0.200	0.180	0.160	0.150	0.130	0.120	0.110	0.120	0.120	0.140	0.130	0.140	0.190	0.160	0.170	<.01
Radionuclide																													
uranium natural (mg/l)	U-nat	mg/l	0.051	0.085	0.081	0.054	0.033	0.036	0.054	0.041	0.055	0.051	0.020	0.106	0.052	0.039	0.050	0.053	0.038	0.074	0.052	0.048	0.056	0.057	0.048	0.042	0.004	0.068
radium 226 (pCi/l)	Ra226	pCi/l	129.2	99.0	47.6	43.4	50.7	40.0	45.0	62.0	144.2	144.8	163.5	148.7	152.9	142.6	147.0	170.0	167.0	185.0	196.0	183.0	139.3	162.6	176.0	154.0	148.7	116.0
radium 226 precision	Ra226	precis	4.8	1.0	1.0	1.4	1.5	1.0	1.0	2.0	3.9	4.4	4.8	3.8	3.6	3.3	2.9	3.5	9.6	19.7	21.4	3.9	2.5	6.0	4.6	4.8	4.3	4.4

Mine Unit 1

Well Number			pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4	pm-4
2ND Well Number																													
Date			Jul-90	Dec-82	Jan-83	Apr-83	Jul-83	Oct-83	Jan-84	Apr-84	Dec-85	Jul-86	Oct-86	Jan-87	Apr-87	Jul-87	Oct-87	Jan-88	Apr-88	Jul-88	Oct-88	Feb-89	May-89	Jul-89	Oct-89	Jan-90	Apr-90	Jul-90
Major Ions			Average	bl1	bl2	bl3	bl4	bl5	bl6	bl7	bl8	bl9	bl10	bl11	bl12	bl13	bl14	bl15	bl16	bl17	bl18	bl19	bl20	bl21	bl22	bl23	bl24	bl25
calcium	Ca	mg/l	15.3	16.0	14.0	15.0	14.0	14.0	14.0	14.0	16.1	12.1	15.3	16.6	15.9	16.9	13.6	15.4	14.8	15.3	14.5	16.6	16.0	16.5	15.2	14.8	16.6	17.2
magnesium	Mg	mg/l	3.6	3.5	3.3	3.1	2.9	3.0	3.4	3.0	3.3	3.2	3.1	3.7	4.0	4.4	3.5	3.9	3.5	4.1	3.0	3.5	3.9	4.0	4.4	3.9	3.6	4.2
sodium	Na	mg/l	398.6	408.0	390.0	410.0	390.0	400.0	410.0	408.0	399.0	404.0	399.0	395.0	392.0	395.0	415.0	399.0	393.0	399.0	404.0	396.0	392.0	406.0	390.0	402.0	396.0	391.0
potassium	K	mg/l	11.6	11.0	11.0	10.2	11.0	13.0	14.0	12.0	11.3	10.2	9.2	9.9	12.0	11.5	11.5	11.2	11.0	11.2	11.9	11.4	11.0	12.4	15.2	11.5	11.4	12.8
carbonate	CO3	mg/l	3.4	0.0	14.0	<1	<1	<1	<1	0.0	1.4	0.0	0.0	0.0	3.9	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
bicarbonate	HCO3	mg/l	373.3	386.0	360.0	379.0	370.0	399.0	385.0	390.0	364.9	371.0	361.0	358.0	338.0	376.0	378.0	376.0	363.0	376.0	383.0	371.0	363.0	373.0	379.0	384.0	387.0	362.0
sulfate	SO4	mg/l	354.2	359.0	370.0	358.0	360.0	347.0	362.0	333.0	360.0	344.0	338.0	360.0	362.0	360.0	366.0	360.0	346.0	365.0	356.0	361.0	350.0	371.0	339.0	347.0	331.0	350.0
chloride	Cl	mg/l	182.4	187.0	170.0	170.3	186.0	186.9	187.0	196.0	178.0	182.0	186.0	186.0	173.0	186.0	194.0	196.0	176.0	187.0	186.0	178.0	171.0	180.0	180.0	183.0	177.0	179.0
ammonium	NH4	mg/l	0.40	0.49	0.46	0.37	0.30	0.06	0.19	0.48	0.26	0.43	0.43	0.46	0.47	0.43	0.44	0.46	0.46	0.45	0.43	0.41	0.43	0.48	0.48	0.42	0.49	0.30
nitrite	NO2	mg/l	<0.008	<.01	<.01	0.01	<.01	<.01	<.01	<.01	<.001	<.01	<.01	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.04	0.00	0.00	<.01
nitrate	NO3	mg/l	<0.037	0.02	<.01	<.1	<.1	<.1	<.1	<.1	<.01	0.01	<.01	0.01	<.01	<.01	<.01	<.01	<.01	<.01	0.01	0.03	0.02	0.01	0.01	0.02	0.09	<.1
fluoride	F	mg/l	0.63	0.66	0.60	0.70	0.40	0.50	0.60	0.56	0.68	0.72	0.68	0.70	0.70	0.42	0.70	0.54	0.64	0.69	0.56	0.66	0.58	0.63	0.60	0.80	0.66	0.70
silica	SiO2	mg/l	13.3	18.0	14.0	16.0	16.0	16.0	16.0	16.3	11.0	13.3	13.0	11.7	12.8	12.8	12.8	12.8	12.8	10.7	9.8	12.8	12.4	12.6	12.6	12.6	11.8	12.5
Non-Metals																													
total dissolved solids	TDS	mg/l	1148	1250	1100	1106	1209	1170	1175	1104	1120	1172	1118	1174	1144	1158	1244	1126	1068	1132	1150	1100	1126	1111	1138	1158	1176	1174
conductivity (unbaum)	Cond	umhos/cm	1871	1820	1790	1599	1890	1980	1950	1790	1818	1867	1881	1879	1881	1872	1814	1890	1908	1926	1948	1858	1849	1864	1876	1931	1950	1958
alkalinity as CaCO3	Alk	mg/l	309.5	316.0	320.0	322.0	317.0	337.0	328.0	320.0	301.4	304.0	296.0	293.0	284.0	308.0	310.0	308.0	304.0	308.0	314.0	304.0	297.0	306.0	310.0	315.0	317.0	297.0
pH (std units)	pH	std. units	8.16	8.26	8.60	8.05	8.09	8.30	8.24	8.10	8.32	8.09	8.07	8.20	8.40	8.18	8.08	8.07	8.37	8.30	7.85	8.00	8.28	7.90	8.18	8.26	7.90	8.02
Trace Metals																													
aluminum	Al	mg/l	<0.100952	n/a	<.1	<.1	<.1	<.1		0.120	n/a	<.1	<.1	<.1	<.1	<.1	<.1	n/a	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
arsenic	As	mg/l	<0.001875	0.001	<.001	<.001	<.001	<.001	<.001	<.004	<.001	<.001	<.001	<.001	0.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
barium	Ba	mg/l	<0.097083	0.030	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
boron	B	mg/l	0.935	1.000	0.500	1.000	0.870	1.010		1.040	1.050	0.910	0.930	0.910	0.990	0.950	0.940	0.930	0.980	0.790	0.890	0.980	0.970	0.970	0.950	0.940	0.980	0.970
cadmium	Cd	mg/l	<0.001338	<.0001	<.001	<.01	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.001	<.001	<.001	<.001	<.001	<.001	<.001
chromium	Cr	mg/l	<0.004652	<.001	<.001	n/a	<.005	<.005		0.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
copper	Cu	mg/l	<0.0095	0.004	0.004	<.01	<.01	<.01		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	0.010
iron	Fe	mg/l	<0.03225	0.030	<.05	<.05	0.030	0.030		0.044	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03
lead	Pb	mg/l	<0.005167	<.001	<.005	<.01	<.005	<.005		<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	0.007	0.006	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
manganese	Mn	mg/l	<0.013875	0.014	<.1	<.01	0.010	0.005		0.007	<.012	0.010	0.011	0.010	0.011	0.011	<.005	0.011	0.008	0.009	0.010	0.011	0.011	0.011	0.011	0.011	0.012	0.012
mercury	Hg	mg/l	<0.000212	<.0001	<.0001	<.0008	<.0002	<.0002		0.000	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.002	0.004	<0.0002	<0.0002	<0.0002	<0.0002
molybdenum	Mo	mg/l	<0.022917	0.020	0.023	<.1	<.01	<.01		0.021	0.020	0.020	0.020	0.016	0.020	0.020	<.01	0.020	0.020	0.030	0.020	0.030	0.020	0.030	0.020	0.020	0.020	0.020
nickel	Ni	mg/l	<0.011333	<.01	<.002	<.05	<.01	<.01		0.010	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
selenium	Se	mg/l	<0.001583	<.001	<.002	<.01	<.001	0.002		<.001	<.001	0.004	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.001	<.001	<.001	<.001	<.001
vanadium	V	mg/l	<0.01375	0.020	0.005	<.1	<.01	<.01		0.007	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
zinc	Zn	mg/l	0.094	0.019	0.005	<.01	<.01	0.010		0.032	<.01	0.190	0.230	0.230	0.210	0.190	0.140	0.110	0.080	0.090	0.090	0.090	0.090	0.090	0.110	0.100	0.100	<.01
Radiometric																													
uranium natural (mg/l)	U-nat	mg/l	0.002	0.036	0.029	0.012	0.019	0.010	0.023	0.018	0.025	0.019	0.008	0.023	0.013	0.005	0.008	0.013	0.008	0.010	0.014	0.012	0.022	0.008	0.009	0.009	0.011	0.016
radium 226 (pCi/l)	Ra226	pCi/l	68.9	71.0	51.4	35.1	60.0	35.0	44.0	56.0	82.6	70.1	95.9	66.5	70.5	98.5	74.2	80.9	80.6	83.5	120.0	73.5	66.5	73.6	74.4	63.0	57.0	51.8
radium 226 precision	Ra226	precis	3.6	1.0	1.1	1.2	1.4	1.0	1.0	2.0	3.0	3.0	3.7	2.0	2.5	2.6	2.2	2.5	4.7	13.0	18.5	2.2	1.8	4.7	3.3	3.1	2.7	1.0

Mine Unit 1

Well Number			pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5	pm-5
2ND Well Number																								
Date			Jul-90	Nov-85	Nov-85	Nov-85	Dec-85	Jul-86	Oct-86	Jan-87	Apr-87	Jul-87	Oct-87	Jan-88	Apr-88	Jul-88	Oct-88	Feb-89	Apr-89	Jul-89	Oct-89	Jan-90	Apr-90	Jul-90
Major Ions			Average	bl1	bl2	bl3	bl4	bl5	bl6	bl7	bl8	bl9	bl10	bl11	bl12	bl13	bl14	bl15	bl16	bl17	bl18	bl19	bl20	bl21
calcium	Ca	mg/l	15.5	9.8	14.0	14.1	14.4	13.0	15.2	17.0	16.8	17.0	16.0	15.8	17.3	17.8	14.7	18.1	15.2	16.2	13.8	15.4	17.0	17.1
magnesium	Mg	mg/l	3.9	3.9	5.0	3.5	3.4	3.4	3.2	4.0	4.1	4.7	3.8	4.1	3.5	4.2	2.9	4.1	3.9	4.2	4.4	4.1	4.2	4.3
sodium	Na	mg/l	400.0	439.0	408.0	416.0	400.0	409.0	396.0	395.0	393.0	413.0	394.0	398.0	396.0	398.0	390.0	395.0	394.0	407.0	390.0	395.0	393.0	391.0
potassium	K	mg/l	11.8	11.5	13.0	12.7	11.9	10.7	9.5	10.1	12.0	11.8	11.7	11.7	11.4	11.4	12.9	11.5	11.3	12.8	15.4	11.8	11.7	11.6
carbonate	CO3	mg/l	6.5	2.4	19.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.0
bicarbonate	HCO3	mg/l	365.4	351.5	312.0	374.0	362.5	367.0	361.0	352.0	340.0	376.0	374.0	371.0	367.0	378.0	365.0	372.0	359.0	376.0	378.0	378.0	387.0	395.0
sulfate	SO4	mg/l	355.5	355.0	294.0	359.0	348.0	367.0	353.0	360.0	371.0	400.0	354.0	360.0	346.0	371.0	345.0	368.0	354.0	377.0	351.0	346.0	341.0	346.0
chloride	Cl	mg/l	186.5	219.0	235.0	205.0	193.0	196.0	182.0	192.0	175.0	191.0	182.0	180.0	179.0	190.0	175.0	173.0	173.0	173.0	180.0	178.0	176.0	177.0
ammonium	NH4	mg/l	<0.381	0.64	<.01	0.62	0.15	0.40	0.40	0.41	0.43	0.40	0.42	0.42	0.38	0.42	0.40	0.39	0.40	0.45	0.46	<.05	0.45	0.27
nitrite	NO2	mg/l	<0.006	<.001	0.00	0.00	<.001	<.01	<.01	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.02	0.00	0.02	<.01
nitrate	NO3	mg/l	<0.033	<.01	<.05	0.06	<.01	0.07	<.01	<.01	0.01	0.01	<.01	<.01	<.01	<.01	0.11	0.04	0.04	0.01	0.02	0.02	0.07	0.01
fluoride	F	mg/l	0.63	0.62	0.74	0.71	0.65	0.72	0.64	0.70	0.64	0.40	0.67	0.54	0.60	0.69	0.58	0.64	0.54	0.60	0.60	0.60	0.62	0.01
silica	SiO2	mg/l	12.0	11.1	11.5	10.9	11.0	12.7	12.6	11.6	12.8	12.8	12.8	12.8	12.8	10.3	9.8	12.4	12.2	12.2	12.2	12.4	12.4	12.7
Non-Metals																								
total dissolved solids	TDS	mg/l	1147	1192	1236	1210	1104	1196	1104	1128	1162	1174	1156	1134	1112	1130	1190	1092	1120	1126	1148	1122	1123	1156
conductivity (umho/cm)	Cond	umho/cm	1889	1820	1980	1896	1853	1879	1907	1879	1881	1860	1835	1904	1921	1925	1902	1867	1839	1902	1876	1948	1950	1959
alkalinity as CaCO3	Alk	mg/l	302.0	292.0	298.0	306.5	297.1	301.0	296.0	288.0	285.0	308.0	307.0	310.0	307.0	310.0	299.0	305.0	294.0	308.0	310.0	316.0	317.0	298.0
pH (std units)	pH	std. units	8.15	8.34	8.26	8.30	8.24	8.05	8.06	8.18	8.38	8.07	8.06	8.05	8.32	8.25	7.96	8.00	8.31	7.88	8.16	8.32	7.91	8.08
Trace Metals																								
aluminum	Al	mg/l	<0.1	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
arsenic	As	mg/l	<0.00146	0.002	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
barium	Ba	mg/l	<0.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
boron	B	mg/l	0.901	0.890	0.980	0.940	1.020	0.880	0.910	0.910	0.960	0.920	0.940	0.420	0.980	0.770	0.870	0.950	0.930	0.940	0.910	0.920	0.930	0.970
cadmium	Cd	mg/l	<0.00119	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.003	<.001	<.001	<.001	<.001	<.001	<.001	0.003
chromium	Cr	mg/l	<0.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
copper	Cu	mg/l	<0.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
iron	Fe	mg/l	<0.032381	0.080	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3
lead	Pb	mg/l	<0.005476	<.005	<.005	0.009	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	0.006	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
manganese	Mn	mg/l	<0.006143	0.005	<.005	<.005	<.005	<.005	0.005	0.006	0.006	0.006	0.006	0.006	<.005	<.005	0.005	0.006	0.007	0.007	0.006	0.007	0.007	0.009
mercury	Hg	mg/l	<0.00021	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.000	0.000	0.000	<0.0002	<0.0002	<0.0002
molybdenum	Mo	mg/l	<0.01981	0.020	<.01	<.01	0.020	0.020	0.020	0.016	0.020	0.020	<.01	0.020	0.020	0.030	0.030	0.030	0.010	0.030	0.020	0.020	0.020	0.020
nickel	Ni	mg/l	<0.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
selenium	Se	mg/l	<0.001048	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.002	<.001	<.001	<.001
vanadium	V	mg/l	<0.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
zinc	Zn	mg/l	<0.095952	<.01	0.115	<.01	<.01	0.160	0.190	0.180	0.160	0.140	0.120	0.090	0.080	0.080	0.080	0.080	0.090	0.090	0.110	0.110	0.090	0.020
Radionuclides																								
uranium natural (mg/l)	U-nat	mg/l	0.038	0.053	0.132	0.051	0.037	0.030	0.120	0.038	0.027	0.015	0.022	0.023	0.022	0.024	0.028	0.026	0.054	0.020	0.018	0.020	0.021	0.033
radium 226 (pCi/l)	Ra226	pCi/l	333.4	301.6	189.0	285.0	299.2	302.4	296.2	329.7	326.7	323.5	348.4	477.0	352.0	412.0	526.0	386.0	348.5	362.0	343.0	339.0	285.5	169.0
radium 226 precision	Ra226	precis	9.0	6.4	17.0	6.7	5.7	6.3	6.3	4.6	5.4	5.0	4.9	5.8	4.0	28.6	38.8	4.9	4.1	4.3	6.9	7.2	5.9	5.4

Mine Unit 1

Well Number			pt-5	pt-5	pt-5	pt-5	pt-5
2ND Well Number			pr-2	pr-2	pr-2	pr-2	pr-2
Date			Dec-85	Nov-85	Nov-85	Nov-85	Dec-85
Major Ions			Average	M1	M2	M3	M4
calcium	Ca	mg/l	8.2	5.7	7.0	9.4	10.8
magnesium	Mg	mg/l	2.3	1.4	3.0	2.4	2.6
sodium	Na	mg/l	464.8	499.0	492.0	445.0	423.0
potassium	K	mg/l	15.4	14.1	17.0	15.8	14.8
carbonate	CO3	mg/l	17.4	13.6	24.0	9.4	22.6
bicarbonate	HCO3	mg/l	305.0	293.6	268.0	334.8	323.7
sulfate	SO4	mg/l	338.5	343.0	290.0	341.0	348.0
chloride	Cl	mg/l	316.5	371.0	395.0	256.0	234.0
ammonium	NH4	mg/l	0.39	0.38	0.57	0.38	0.22
nitrite	NO2	mg/l	<0.001	<0.001	0.00	<0.001	<0.001
nitrate	NO3	mg/l	0.04	0.03	0.00	0.07	0.00
fluoride	F	mg/l	0.75	0.64	0.99	0.70	0.66
silica	SiO2	mg/l	11.4	10.1	12.1	12.5	11.0
Non-Metals							
total dissolved solids	TDS	mg/l	1302	1398	1420	1226	1172
conductivity (umhos/cm)	Cond	umhos/cm	2136	2249	2400	1992	1903
alkalinity as CaCO3	Alk	mg/l	279.1	263.4	260.0	290.1	303.0
pH (std units)	pH	std. units	8.54	8.72	8.36	8.52	8.54
Trace Metals							
aluminum	Al	mg/l	n/a	n/a	n/a	n/a	n/a
arsenic	As	mg/l	<0.0035	0.002	<0.01	<0.001	<0.001
barium	Ba	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1
boron	B	mg/l	0.885	0.720	0.930	0.870	1.020
cadmium	Cd	mg/l	<0.001	<0.001	0.001	<0.001	<0.001
chromium	Cr	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005
copper	Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
iron	Fe	mg/l	<0.03	<0.03	<0.03	<0.03	<0.03
lead	Pb	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005
manganese	Mn	mg/l	<0.007	<0.005	<0.01	0.008	<0.005
mercury	Hg	mg/l	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
molybdenum	Mo	mg/l	0.013	0.010	0.000	0.010	0.020
nickel	Ni	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
selenium	Se	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
vanadium	V	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
zinc	Zn	mg/l	0.033	0.020	0.023	0.020	<0.01
Radiometric							
uranium natural (mg/l)	U-nat	mg/l	0.087	0.091	0.078	0.100	0.079
radium 226 (pCi/l)	Ra226	pCi/l	467.8	408.2	260.0	612.0	591.0
radium 226 precision	Ra226	precis	12.1	7.9	19.0	9.9	11.5

Well Number	LJ-6	LJ-6	LJ-6	LJ-6
Date	Nov-90	Oct-90	Nov-90	Nov-90
Major Ions	Average	M1	M2	M3
calcium	12.7	12.0	11.0	15.1
magnesium	3.1	2.6	3.0	3.7
sodium	429.7	430.0	430.0	429.0
potassium	11.3	11.0	11.0	11.9
carbonate	5.6	4.7	6.5	5.7
bicarbonate	334.7	323.0	336.0	345.0
sulfate	365.3	379.0	359.0	358.0
chloride	216.7	227.0	203.0	220.0
ammonium	0.41	0.36	0.42	0.45
nitrite	<0.01	<0.01	<0.01	<0.01
nitrate	<0.06	0.15	<0.01	<0.01
fluoride	0.74	0.67	0.76	0.78
silica	18.8	19.0	20.8	16.7
Non-Metals				
total dissolved solids	1196	1229	1167	1193
conductivity (umhos/cm)	1964	1991	2008	2003
alkalinity as CaCO3	283.7	273.0	296.0	292.0
pH (std units)	8.56	8.50	8.62	8.55
Trace Metals				
aluminum	<0.1	<0.1	<0.1	<0.1
arsenic	<0.001	<0.001	<0.001	<0.001
barium	<0.1	<0.1	<0.1	<0.1
boron	0.907	0.910	0.920	0.890
cadmium	<0.01	<0.01	<0.01	<0.01
chromium	<0.05	<0.05	<0.05	<0.05
copper	<0.01	<0.01	<0.01	<0.01
iron	<0.05	<0.05	<0.05	<0.05
lead	<0.05	<0.05	<0.05	<0.05
manganese	<0.01	<0.01	<0.01	<0.01
mercury	<0.001	<0.001	<0.001	<0.001
molybdenum	<0.1	<0.1	<0.1	<0.1
nickel	<0.05	<0.05	<0.05	<0.05
selenium	<0.001	<0.001	<0.001	<0.001
vanadium	<0.1	<0.1	<0.1	<0.1
zinc	0.013	0.010	0.010	0.020
Radiometric				
uranium natural (mg/l)	0.108	0.110	0.146	0.069
radium 226 (pCi/l)	156.7	161.0	150.0	159.0
radium 226 precision	4.6	4.9	4.7	4.2

Well Number	pt-9	pt-9	pt-9	pt-9	pt-9	pt-9	pt-9	pt-9
2ND Well Number	pr-8	pr-8	pr-8	pr-8	pr-8	pr-8	pr-8	pr-8
Date	Apr-84	Dec-82	Jan-83	Apr-83	Jul-83	Oct-83	Jan-84	Apr-84
Major Ions	Average	M1	M2	M3	M4	M5	M6	M7
calcium	13.0	17.0	15.0	14.0	12.0	12.0	10.0	11.0
magnesium	2.1	2.8	2.5	2.0	1.6	2.1	1.9	2.0
sodium	407.7	408.0	390.0	420.0	400.0	400.0	420.0	416.0
potassium	13.4	13.0	13.0	12.0	15.0	15.0	13.0	13.0
carbonate	13.6	23.0	17.0	<1	<1	16.0	15.0	24.0
bicarbonate	358.0	353.0	350.0	379.0	365.0	357.0	361.0	341.0
sulfate	351.7	355.0	350.0	353.0	367.0	337.0	367.0	333.0
chloride	186.6	190.0	190.0	184.8	190.0	184.4	181.0	196.0
ammonium	0.44	0.82	0.40	0.45	0.41	0.18	0.26	0.58
nitrite	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01
nitrate	<0.1	<0.01	<0.01	<0.1	<0.1	0.10	<0.1	<0.1
fluoride	0.66	0.60	0.70	0.70	0.60	0.60	0.70	0.60
silica	16.1	13.0	14.0	21.0	17.0	15.0	17.0	16.0
Non-Metals								
total dissolved solids	1176	1240	1200	1162	1156	1157	1185	1134
conductivity (umhos/cm)	1866	1900	1820	1590	1970	1970	1990	1820
alkalinity as CaCO3	323.9	327.0	320.0	323.0	310.0	331.0	336.0	320.0
pH (std units)	8.60	8.82	8.80	8.41	8.29	8.56	8.65	8.70
Trace Metals								
aluminum	<0.146	n/a	0.100	<0.1	<0.1	0.300		0.130
arsenic	<0.007	0.014	0.007	<0.01	<0.005	<0.005		<0.001
barium	<0.1	0.100	<1	<1	<1	<1		<1
boron	0.943	0.990	0.700	0.960	0.860	1.000		1.150
cadmium	<0.00235	<0.001	<0.01	<0.01	<0.001	<0.001		<0.001
chromium	<0.0034	<0.01	<0.01	n/a	<0.05	<0.05		<0.05
copper	<0.00933	0.004	0.005	<0.01	<0.01	<0.01		0.017
iron	<0.046167	0.020	<.05	<.05	<.03	0.090		0.037
lead	<0.006833	<.001	<.005	0.020	<.005	<.005		<.005
manganese	<0.022333	0.000	<.1	<.01	<.005	0.006		<.005
mercury	<0.0002	<.0001	<.0001	<.0005	<.0002	<.0002		0.000
molybdenum	<0.047677	0.050	0.075	<.1	<.01	0.010		0.041
nickel	<0.01533	<.01	<.002	<.05	<.01	<.01		<.01
selenium	<0.02667	<.001	<.002	<.01	<.001	0.001		<.01
vanadium	<0.04833	0.030	0.025	<.1	0.030	0.030		0.030
zinc	<0.015667	0.008	<.005	0.040	<.01	<.01		0.021
Radiometric								
uranium natural (mg/l)	0.304	0.441	0.390	0.305	0.280	0.254	0.229	0.229
radium 226 (pCi/l)	420.4	602.0	207.0	491.0	369.0	543.0	267.0	464.0
radium 226 precision	4.7	2.0	5.0	4.5	3.2	7.0	4.0	7.0

Well Number	LJ-13	LJ-13	LJ-13	LJ-13
Date	Nov-90	Oct-90	Nov-90	Nov-90
Major Ions	Average	M1	M2	M3
calcium	9.5	11.0	7.9	9.5
magnesium	2.8	3.0	2.2	3.1
sodium	401.7	405.0	410.0	390.0
potassium	10.6	11.0	11.0	9.7
carbonate	5.6	4.1	7.4	5.2
bicarbonate	314.7	343.0	296.0	315.0
sulfate	358.3	368.0	364.0	341.0
chloride	190.3	189.0	193.0	189.0
ammonium	0.35	0.37	0.37	0.31
nitrite	<0.01	<0.01	<0.01	<0.01
nitrate	<0.03	0.05	0.02	<0.01
fluoride	0.73	0.59	0.82	0.78
silica	22.0	19.7	23.7	20.7
Non-Metals				
total dissolved solids	1129	1149	1118	1120
conductivity (umhos/cm)	1974	2014	1903	2006
alkalinity as CaCO3	267.3	282.0	267.0	267.0
pH (std units)	8.57	8.41	8.75	8.55
Trace Metals				
aluminum	<0.1	<0.1	<0.1	<0.1
arsenic	0.004	0.004	0.005	0.004
barium	<0.1	<0.1	<0.1	<0.1
boron	0.937	0.920	0.920	0.970
cadmium	<0.01	<0.01	<0.01	<0.01
chromium	<0.05	<0.05	<0.05	<0.05
copper	<0.01	<0.01	<0.01	<0.01
iron	<0.05	<0.05	<0.05	<0.05
lead	<0.05	<0.05	<0.05	<0.05
manganese	<0.01	<0.01	<0.01	<0.01
mercury	<0.001	<0.001	<0.001	<0.001
molybdenum	<0.1	<0.1	<0.1	<0.1
nickel	<0.05	<0.05	<0.05	<0.05
selenium	<0.001	<0.001	<0.001	<0.001
vanadium	<0.1	<0.1	<0.1	<0.1
zinc	<0.0133	0.020	<0.01	0.010
Radiometric				
uranium natural (mg/l)	0.241	0.199	0.223	0.241
radium 226 (pCi/l)	566.3	554.0	413.0	432.0
radium 226 precision	8.9	12.0	7.2	7.0

Mine Unit 1

Well Number			LJ-13	LJ-13	LJ-13	LJ-13
2ND Well Number						
Date			Nov-90	Oct-90	Nov-90	Nov-90
Major Ions			Average	bl1	bl2	bl3
calcium	Ca	mg/l	9.5	11.0	7.9	9.5
magnesium	Mg	mg/l	2.8	3.0	2.2	3.1
sodium	Na	mg/l	401.7	405.0	410.0	390.0
potassium	K	mg/l	10.6	11.0	11.0	9.7
carbonate	CO3	mg/l	5.6	4.1	7.4	5.2
bicarbonate	HCO3	mg/l	314.7	343.0	286.0	315.0
sulfate	SO4	mg/l	358.3	368.0	366.0	341.0
chloride	Cl	mg/l	190.3	189.0	193.0	189.0
ammonium	NH4	mg/l	0.35	0.37	0.37	0.31
nitrite	NO2	mg/l	<0.01	<0.01	<0.01	<0.01
nitrate	NO3	mg/l	<0.03	0.05	0.02	<0.01
fluoride	F	mg/l	0.73	0.59	0.82	0.78
silica	SiO2	mg/l	22.0	19.7	25.7	20.7
Non-Metals						
total dissolved solids	TDS	mg/l	1129	1149	1118	1120
conductivity (umhos/cm)	Cond	umhos/cm	1974	2014	1903	2006
alkalinity as CaCO3	Alk	mg/l	267.3	288.0	247.0	267.0
pH (std units)	pH	std. units	8.57	8.41	8.75	8.55
Trace Metals						
aluminum	Al	mg/l	<0.1	<0.1	<0.1	<0.1
arsenic	As	mg/l	0.004	0.004	0.005	0.004
barium	Ba	mg/l	<0.1	<0.1	<0.1	<0.1
boron	B	mg/l	0.937	0.920	0.920	0.970
cadmium	Cd	mg/l	<0.01	<0.01	<0.01	<0.01
chromium	Cr	mg/l	<0.05	<0.05	<0.05	<0.05
copper	Cu	mg/l	<0.01	<0.01	<0.01	<0.01
iron	Fe	mg/l	<0.05	<0.05	<0.05	<0.05
lead	Pb	mg/l	<0.05	<0.05	<0.05	<0.05
manganese	Mn	mg/l	<0.01	<0.01	<0.01	<0.01
mercury	Hg	mg/l	<0.001	<0.001	<0.001	<0.001
molybdenum	Mo	mg/l	<0.1	<0.1	<0.1	<0.1
nickel	Ni	mg/l	<0.05	<0.05	<0.05	<0.05
selenium	Se	mg/l	<0.001	<0.001	<0.001	<0.001
vanadium	V	mg/l	<0.1	<0.1	<0.1	<0.1
zinc	Zn	mg/l	<0.0133	0.020	<0.01	0.010
Radiometric						
uranium natural (mg/l)	U-nat	mg/l	0.241	0.199	0.283	0.241
radium 226 (pCi/l)	Ra226	pCi/l	566.3	854.0	413.0	432.0
radium 226 precision	Ra226	precis	8.9	12.0	7.8	7.0

Well Number			pr-15	pr-15	pr-15	pr-15
2ND Well Number						
Date			Nov-90	Oct-90	Nov-90	Nov-90
Major Ions			Average	bl1	bl2	bl3
calcium	Ca	mg/l	13.2	5.9	16.0	17.8
magnesium	Mg	mg/l	3.9	3.0	4.1	4.7
sodium	Na	mg/l	398.7	405.0	410.0	381.0
potassium	K	mg/l	11.1	10.0	11.0	12.3
carbonate	CO3	mg/l	5.9	5.0	7.1	5.7
bicarbonate	HCO3	mg/l	361.7	360.0	361.0	364.0
sulfate	SO4	mg/l	352.3	357.0	352.0	348.0
chloride	Cl	mg/l	180.3	186.0	176.0	179.0
ammonium	NH4	mg/l	0.53	0.32	0.94	0.33
nitrite	NO2	mg/l	<0.033	<0.01	0.05	0.04
nitrate	NO3	mg/l	0.05	0.04	0.09	0.02
fluoride	F	mg/l	0.69	0.59	0.76	0.72
silica	SiO2	mg/l	16.7	15.0	18.2	16.9
Non-Metals						
total dissolved solids	TDS	mg/l	1137	1139	1130	1143
conductivity (umhos/cm)	Cond	umhos/cm	1867	1799	1939	1903
alkalinity as CaCO3	Alk	mg/l	306.7	304.0	308.0	308.0
pH (std units)	pH	std. units	8.55	8.48	8.63	8.55
Trace Metals						
aluminum	Al	mg/l	<0.1	<0.1	<0.1	<0.1
arsenic	As	mg/l	<0.001	<0.001	<0.001	<0.001
barium	Ba	mg/l	<0.1	<0.1	<0.1	<0.1
boron	B	mg/l	0.910	0.840	0.890	1.000
cadmium	Cd	mg/l	<0.01	<0.01	<0.01	<0.01
chromium	Cr	mg/l	<0.05	<0.05	<0.05	<0.05
copper	Cu	mg/l	<0.01	<0.01	<0.01	<0.01
iron	Fe	mg/l	<0.0533	<0.05	0.060	<0.05
lead	Pb	mg/l	<0.05	<0.05	<0.05	<0.05
manganese	Mn	mg/l	0.013	0.020	0.010	0.010
mercury	Hg	mg/l	<0.001	<0.001	<0.001	<0.001
molybdenum	Mo	mg/l	<0.1	<0.1	<0.1	<0.1
nickel	Ni	mg/l	<0.05	<0.05	<0.05	<0.05
selenium	Se	mg/l	<0.001	<0.001	<0.001	<0.001
vanadium	V	mg/l	<0.1	<0.1	<0.1	<0.1
zinc	Zn	mg/l	<0.02	<0.01	0.040	0.010
Radiometric						
uranium natural (mg/l)	U-nat	mg/l	0.056	0.034	0.079	0.054
radium 226 (pCi/l)	Ra226	pCi/l	18.5	24.7	18.6	18.1
radium 226 precision	Ra226	precis	1.0	1.1	0.9	1.0

Well Number			pr-19	pr-19	pr-19	pr-19
2ND Well Number						
Date			Nov-90	Oct-90	Nov-90	Nov-90
Major Ions			Average	bl1	bl2	bl3
calcium	Ca	mg/l	14.0	14.0	13.0	14.9
magnesium	Mg	mg/l	3.8	3.5	3.7	4.2
sodium	Na	mg/l	406.7	410.0	410.0	400.0
potassium	K	mg/l	12.3	13.0	12.0	12.0
carbonate	CO3	mg/l	4.9	3.3	6.6	4.8
bicarbonate	HCO3	mg/l	348.7	351.0	349.0	346.0
sulfate	SO4	mg/l	361.3	370.0	362.0	352.0
chloride	Cl	mg/l	188.7	191.0	186.0	189.0
ammonium	NH4	mg/l	0.28	0.34	0.22	0.28
nitrite	NO2	mg/l	<0.01	<0.01	<0.01	<0.01
nitrate	NO3	mg/l	0.03	0.02	0.03	0.05
fluoride	F	mg/l	0.69	0.59	0.73	0.75
silica	SiO2	mg/l	17.2	18.2	18.6	14.7
Non-Metals						
total dissolved solids	TDS	mg/l	1154	1156	1142	1165
conductivity (umhos/cm)	Cond	umhos/cm	1994	2024	1962	1995
alkalinity as CaCO3	Alk	mg/l	294.0	293.0	297.0	292.0
pH (std units)	pH	std. units	8.47	8.31	8.61	8.48
Trace Metals						
aluminum	Al	mg/l	<0.1	<0.1	<0.1	<0.1
arsenic	As	mg/l	<0.001	0.001	<0.001	<0.001
barium	Ba	mg/l	<0.1	<0.1	<0.1	<0.1
boron	B	mg/l	0.943	0.910	0.920	1.000
cadmium	Cd	mg/l	<0.01	<0.01	<0.01	<0.01
chromium	Cr	mg/l	<0.05	<0.05	<0.05	<0.05
copper	Cu	mg/l	<0.01	<0.01	<0.01	<0.01
iron	Fe	mg/l	<0.05	<0.05	<0.05	<0.05
lead	Pb	mg/l	<0.05	<0.05	<0.05	<0.05
manganese	Mn	mg/l	<0.01	<0.01	<0.01	<0.01
mercury	Hg	mg/l	<0.001	<0.001	<0.001	<0.001
molybdenum	Mo	mg/l	<0.1	<0.1	<0.1	<0.1
nickel	Ni	mg/l	<0.05	<0.05	<0.05	<0.05
selenium	Se	mg/l	<0.001	<0.001	<0.001	<0.001
vanadium	V	mg/l	<0.1	<0.1	<0.1	<0.1
zinc	Zn	mg/l	<0.01	<0.01	0.010	0.010
Radiometric						
uranium natural (mg/l)	U-nat	mg/l	0.036	0.041	0.032	0.036
radium 226 (pCi/l)	Ra226	pCi/l	250.7	244.0	263.0	245.0
radium 226 precision	Ra226	precis	6.4	6.7	6.3	6.3

Well Number			LJ-25	LJ-25	LJ-25	LJ-25
2ND Well Number						
Date			Nov-90	Oct-90	Nov-90	Nov-90
Major Ions			Average	bl1	bl2	bl3
calcium	Ca	mg/l	8.7	10.0	5.8	10.4
magnesium	Mg	mg/l	2.5	2.9	2.0	2.6
sodium	Na	mg/l	402.3	408.0	410.0	397.0
potassium	K	mg/l	12.8	13.0	13.0	12.3
carbonate	CO3	mg/l	5.8	4.0	6.0	7.3
bicarbonate	HCO3	mg/l	306.7	321.0	277.0	322.0
sulfate	SO4	mg/l	360.3	367.0	371.0	343.0
chloride	Cl	mg/l	204.3	203.0	213.0	197.0
ammonium	NH4	mg/l	0.39	0.32	0.55	0.29
nitrite	NO2	mg/l	<0.0166	<0.01	<0.01	0.03
nitrate	NO3	mg/l	0.13	0.13	0.02	0.05
fluoride	F	mg/l	0.70	0.61	0.70	0.78
silica	SiO2	mg/l	22.9	21.2	23.7	23.9
Non-Metals						
total dissolved solids	TDS	mg/l	1126	1116	1133	1128
conductivity (umhos/cm)	Cond	umhos/cm	1970	2016	1961	1933
alkalinity as CaCO3	Alk	mg/l	261.0	270.0	257.0	276.0
pH (std units)	pH	std. units	8.60	8.43	8.67	8.69
Trace Metals						
aluminum	Al	mg/l	<0.1	<0.1	<0.1	<0.1
arsenic	As	mg/l	<0.001	<0.001	<0.001	0.001
barium	Ba	mg/l	<0.1	<0.1	<0.1	<0.1
boron	B	mg/l	0.933	0.900	0.920	0.980
cadmium	Cd	mg/l	<0.01	<0.01	<0.01	<0.01
chromium	Cr	mg/l	<0.05	<0.05	<0.05	<0.05
copper	Cu	mg/l	<0.01	<0.01	<0.01	<0.01
iron	Fe	mg/l	<0.05	<0.05	<0.05	<0.05
lead	Pb	mg/l	<0.05	<0.05	<0.05	<0.05
manganese	Mn	mg/l	<0.01	<0.01	<0.01	<0.01
mercury	Hg	mg/l	<0.001	<0.001	<0.001	<0.001
molybdenum	Mo	mg/l	<0.1	<0.1	<0.1	<0.1
nickel	Ni	mg/l	<0.05	<0.05	<0.05	<0.05
selenium	Se	mg/l	<0.001	<0.001	<0.001	<0.001
vanadium	V	mg/l	<0.1	<0.1	<0.1	<0.1
zinc	Zn	mg/l	<0.0133	0.020	<0.01	<0.01
Radiometric						
uranium natural (mg/l)	U-nat	mg/l	0.035	0.036	0.026	0.043
radium 226 (pCi/l)	Ra226	pCi/l	148.2	228.0	89.8	127.0
radium 226 precision	Ra226	precis	4.5	6.0	3.7	3.8

Well Number			LJ-28	LJ-28	LJ-28	LJ-28
2ND Well Number						
Date			Nov-90	Oct-90	Nov-90	Nov-90
Major Ions			Average	bl1	bl2	bl3
calcium	Ca	mg/l	17.3	14.0	14.0	23.8
magnesium	Mg	mg/l	4.6	3.9	4.0	5.8
sodium	Na	mg/l	416.7	410.0	420.0	419.0
potassium	K	mg/l	12.1	12.0	12.0	12.3
carbonate	CO3	mg/l	4.2	0.0	6.8	5.7
bicarbonate	HCO3	mg/l	371.7	381.0	368.0	366.0
sulfate	SO4	mg/l	363.7	363.0	371.0	357.0
chloride	Cl	mg/l	189.3	189.0	196.0	193.0
ammonium	NH4	mg/l	0.32	0.35	0.25	0.35
nitrite	NO2	mg/l	<0.01	<0.01	<0.01	<0.01
nitrate	NO3	mg/l	<0.02	0.04	<0.01	<0.01
fluoride	F	mg/l	0.68	0.54	0.73	0.78
silica	SiO2	mg/l	17.9	16.3	17.1	20.3
Non-Metals						
total dissolved solids	TDS	mg/l	1173	1173	1163	1183
conductivity (umhos/cm)	Cond	umhos/cm	1980	2044	1982	1913
alkalinity as CaCO3	Alk	mg/l	311.7	312.0	313.0	310.0
pH (std units)	pH	std. units	8.43	8.16	8.60	8.53
Trace Metals						
aluminum	Al	mg/l	<0.1	<0.1	<0.1	<0.1
arsenic	As	mg/l	<0.001	<0.001	<0.001	<0.001
barium	Ba	mg/l	<0.1	<0.1	<0.1	<0.1
boron	B	mg/l	0.953	0.900	0.905	1.000
cadmium	Cd	mg/l	<0.01	<0.01	<0.01	<0.01
chromium	Cr	mg/l	<0.05	<0.05	<0.05	<0.05
copper	Cu	mg/l	<0.01	<0.01	<0.01	<0.01
iron	Fe	mg/l	<0.05	<0.05	<0.05	<0.05
lead	Pb	mg/l	<0.05	<0.05	<0.05	<0.05
manganese	Mn	mg/l	<0.01	<0.01	<0.01	0.010
mercury	Hg	mg/l	<0.001	<0.001	<0.001	<0.001
molybdenum	Mo	mg/l	<0.1	<0.1	<0.1	<0.1
nickel	Ni	mg/l	<0.05	<0.05	<0.05	<0.05
selenium	Se	mg/l	<0.001	<0.001	<0.001	<0.001
vanadium	V	mg/l	<0.1	<0.1	<0.1	<0.1
zinc	Zn	mg/l	0.017	0.010	0.020	0.020
Radiometric						
uranium natural (mg/l)	U-nat	mg/l	0.059	0.061	0.050	0.068
radium 226 (pCi/l)	Ra226	pCi/l	108.3	110.0	114.0	101.0
radium 226 precision	Ra226	precis	3.9	4.4	4.1	3.1

Mine Unit 1

Well Number			LJ-45	LJ-45	LJ-45	LJ-45
2ND Well Number						
Date			Nov-90	Oct-90	Nov-90	Nov-90
Major Ions			Average	bl1	bl2	bl3
calcium	Ca	mg/l	7.6	6.9	4.5	11.5
magnesium	Mg	mg/l	2.2	1.8	1.3	3.5
sodium	Na	mg/l	423.3	420.0	440.0	410.0
potassium	K	mg/l	14.9	13.0	14.0	17.6
carbonate	CO3	mg/l	7.1	6.3	9.4	5.7
bicarbonate	HCO3	mg/l	314.7	299.0	300.0	345.0
sulfate	SO4	mg/l	365.7	364.0	367.0	366.0
chloride	Cl	mg/l	218.0	241.0	227.0	186.0
ammonium	NH4	mg/l	<0.1933	0.28	0.25	<0.05
nitrite	NO2	mg/l	<0.01	<0.01	<0.01	<0.01
nitrate	NO3	mg/l	<0.01667	0.01	0.03	<0.01
fluoride	F	mg/l	0.71	0.62	0.79	0.72
silica	SiO2	mg/l	18.5	18.4	21.4	15.7
Non-Metals						
total dissolved solids	TDS	mg/l	1197	1187	1203	1204
conductivity (umhos/cm)	Cond	umhos/cm	1951	1900	2045	1909
alkalinity as CaCO3	Alk	mg/l	270.0	256.0	262.0	292.0
pH (std units)	pH	std. units	8.68	8.66	8.83	8.55
Trace Metals						
aluminum	Al	mg/l	<0.1	<0.1	<0.1	<0.1
arsenic	As	mg/l	<0.001	<0.001	<0.001	<0.001
barium	Ba	mg/l	<0.1	<0.1	<0.1	<0.1
boron	B	mg/l	0.920	0.870	0.920	0.970
cadmium	Cd	mg/l	<0.01	<0.01	<0.01	<0.01
chromium	Cr	mg/l	<0.05	<0.05	<0.05	<0.05
copper	Cu	mg/l	<0.01	<0.01	<0.01	0.010
iron	Fe	mg/l	<0.05	<0.05	<0.05	<0.05
lead	Pb	mg/l	<0.05	<0.05	<0.05	<0.05
manganese	Mn	mg/l	<0.01	<0.01	<0.01	<0.01
mercury	Hg	mg/l	<0.001	<0.001	<0.001	<0.001
molybdenum	Mo	mg/l	<0.1	<0.1	<0.1	<0.1
nickel	Ni	mg/l	<0.05	<0.05	<0.05	<0.05
selenium	Se	mg/l	<0.001	<0.001	<0.001	<0.001
vanadium	V	mg/l	<0.1	<0.1	<0.1	<0.1
zinc	Zn	mg/l	<0.01	<0.01	<0.01	<0.01
Radionuclides						
uranium natural (mg/l)	U-nat	mg/l	0.073	0.050	0.086	0.082
radium 226 (pCi/l)	Ra226	pCi/l	88.1	92.4	57.0	115.0
radium 226 precision	Ra226	precis	3.4	3.7	2.9	3.5

Appendix 3

Mine Unit 1 Post-Mining Water Quality Sampling Results

ENERGY LABORATORIES

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	1J-25
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8712
MAJOR IONS mg:l	
Ca - Calcium	89.4
Mg - Magnesium	22.5
Na - Sodium	1177
K - Potassium	30.0
CO3 - Carbonate	0
HCO3 - Bicarbonate	1111
SO4 - Sulfate	1119
Cl - Chloride	594
NH4 - Ammonium	<0.05
NO2 - Nitrite	<0.01
NO3 - Nitrate	0.86
F - Fluoride	0.38
SiO2 - Silica	26.4
TDS - Total Dissolved Solids	3751
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5807
Alk - Alkalinity as CaCO3 (CaCO3)	911
pH (std units)	7.65
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.020
Ba - Barium	<0.10
B - Boron	1.13
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.08
Hg - Mercury	<0.001
Mo - Molybdenum	0.56
Ni - Nickel	0.12
Se - Selenium	0.100
V - Vanadium	1.03
Zn - Zinc	0.02
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	9.90
Ra226 - Radium 226	1258
Radium 226 Precision	12.3
Quality Assurance Data:	
Anion Milliequivalents	58.35
Cation Milliequivalents	58.31
WDEQ A/C Bal.%	-0.03
Calculated TDS mg/l	3618
TDS Balance A/C %	1.04

Report Approved By: R.A. Starling

kmk 8712fer

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	IJ-6
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8713
MAJOR IONS mg:l	
Ca - Calcium	87.6
Mg - Magnesium	21.4
Na - Sodium	1054
K - Potassium	27.2
CO3 - Carbonate	0
HCO3 - Bicarbonate	1057
SO4 - Sulfate	1031
Cl - Chloride	544
NH4 - Ammonium	0.44
NO2 - Nitrite	0.11
NO3 - Nitrate	1.29
F - Fluoride	0.45
SiO2 - Silica	33.3
TDS - Total Dissolved Solids	3515
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5445
Alk - Alkalinity as CaCO3 (CaCO3)	866
pH (std units)	7.16
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.031
Ba - Barium	<0.10
B - Boron	1.06
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	0.02
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.14
Hg - Mercury	<0.001
Mo - Molybdenum	0.47
Ni - Nickel	<0.05
Se - Selenium	0.112
V - Vanadium	1.12
Zn - Zinc	0.11
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	13.90
Ra226 - Radium 226	1113
Radium 226 Precision	11.4
Quality Assurance Data:	
Anion Milliequivalents	54.25
Cation Milliequivalents	52.74
WDEQ A/C Bal.%	-1.41
Calculated TDS mg/l	3334
TDS Balance A/C %	1.05

Report Approved By: R.A. Gearing

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	IJ-13
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8714
MAJOR IONS mg:l	
Ca - Calcium	93.9
Mg - Magnesium	23.6
Na - Sodium	1174
K - Potassium	31.3
CO3 - Carbonate	0
HCO3 - Bicarbonate	1086
SO4 - Sulfate	1209
Cl - Chloride	598
NH4 - Ammonium	0.07
NO2 - Nitrite	<0.01
NO3 - Nitrate	0.74
F - Fluoride	0.37
SiO2 - Silica	34.3
TDS - Total Dissolved Solids	3899
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	6012
Alk - Alkalinity as CaCO3 (CaCO3)	890
pH (std units)	7.35
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.028
Ba - Barium	<0.10
B - Boron	1.26
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.15
Hg - Mercury	<0.001
Mo - Molybdenum	0.50
Ni - Nickel	0.12
Se - Selenium	0.122
V - Vanadium	1.18
Zn - Zinc	0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	9.31
Ra226 - Radium 226	1558
Radium 226 Precision	18.1
Quality Assurance Data:	
Anion Milliequivalents	59.91
Cation Milliequivalents	58.56
WDEQ A/C Bal.%	-1.14
Calculated TDS mg/l	3711
TDS Balance A/C %	1.05

Report Approved By: R.A. Starling

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	IJ-28
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8715
MAJOR IONS mg:l	
Ca - Calcium	89.6
Mg - Magnesium	23.1
Na - Sodium	1182
K - Potassium	31.3
CO3 - Carbonate	0
HCO3 - Bicarbonate	1207
SO4 - Sulfate	1112
Cl - Chloride	619
NH4 - Ammonium	<0.05
NO2 - Nitrite	<0.01
NO3 - Nitrate	1.30
F - Fluoride	0.45
SiO2 - Silica	31.6
TDS - Total Dissolved Solids	3886
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	6025
Alk - Alkalinity as CaCO3 (CaCO3)	989
pH (std units)	7.81
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.028
Ba - Barium	<0.10
B - Boron	1.19
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.06
Hg - Mercury	<0.001
Mo - Molybdenum	0.51
Ni - Nickel	0.12
Se - Selenium	0.138
V - Vanadium	1.24
Zn - Zinc	<0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	2.52
Ra226 - Radium 226	1147
Radium 226 Precision	11.8
Quality Assurance Data:	
Anion Milliequivalents	60.50
Cation Milliequivalents	58.62
WDEQ A/C Bal.%	-1.58
Calculated TDS mg/l	3698
TDS Balance A/C %	1.05

Report Approved By: R.A. Starling

kmk 8712fer

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	PR-15
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8716
MAJOR IONS mg:l	
Ca - Calcium	86.7
Mg - Magnesium	23.1
Na - Sodium	1172
K - Potassium	30.0
CO3 - Carbonate	0
HCO3 - Bicarbonate	1170
SO4 - Sulfate	1115
Cl - Chloride	603
NH4 - Ammonium	0.15
NO2 - Nitrite	<0.01
NO3 - Nitrate	1.60
F - Fluoride	0.40
SiO2 - Silica	30.0
TDS - Total Dissolved Solids	3807
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5940
Alk - Alkalinity as CaCO3 (CaCO3)	959
pH (std units)	7.78
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.024
Ba - Barium	<0.10
B - Boron	1.25
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	<0.01
Hg - Mercury	<0.001
Mo - Molybdenum	0.53
Ni - Nickel	<0.05
Se - Selenium	0.148
V - Vanadium	1.56
Zn - Zinc	<0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	5.18
Ra226 - Radium 226	109
Radium 226 Precision	3.5
Quality Assurance Data:	
Anion Milliequivalents	59.53
Cation Milliequivalents	58.01
WDEQ A/C Bal.%	-1.29
Calculated TDS mg/l	3653
TDS Balance A/C %	1.04

Report Approved By: R.A. Gearing

kmk 8712fer

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	PR-19
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8717
MAJOR IONS mg:l	
Ca - Calcium	98.3
Mg - Magnesium	23.8
Na - Sodium	1083
K - Potassium	28.6
CO3 - Carbonate	0
HCO3 - Bicarbonate	959
SO4 - Sulfate	1283
Cl - Chloride	590
NH4 - Ammonium	0.49
NO2 - Nitrite	0.05
NO3 - Nitrate	0.46
F - Fluoride	0.35
SiO2 - Silica	22.2
TDS - Total Dissolved Solids	3765
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5819
Alk - Alkalinity as CaCO3 (CaCO3)	786
pH (std units)	6.92
TRACE METALS mg/l:	
Al - Aluminum	0.29
As - Arsenic	0.011
Ba - Barium	<0.10
B - Boron	1.17
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	0.38
Pb - Lead	<0.05
Mn - Manganese	0.16
Hg - Mercury	<0.001
Mo - Molybdenum	0.37
Ni - Nickel	<0.05
Se - Selenium	0.041
V - Vanadium	0.28
Zn - Zinc	<0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	6.78
Ra226 - Radium 226	1182
Radium 226 Precision	11.8
Quality Assurance Data:	
Anion Milliequivalents	59.12
Cation Milliequivalents	54.82
WDEQ A/C Bal.%	-3.78
Calculated TDS mg/l	3612
TDS Balance A/C %	1.04

Report Approved By: R.A. Searling

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	PR-8
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8718
MAJOR IONS mg:l	
Ca - Calcium	85.4
Mg - Magnesium	23.2
Na - Sodium	1144
K - Potassium	30.0
CO3 - Carbonate	0
HCO3 - Bicarbonate	1170
SO4 - Sulfate	1115
Cl - Chloride	603
NH4 - Ammonium	0.27
NO2 - Nitrite	0.05
NO3 - Nitrate	1.46
F - Fluoride	0.43
SiO2 - Silica	33.2
TDS - Total Dissolved Solids	3820
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5819
Alk - Alkalinity as CaCO3 (CaCO3)	959
pH (std units)	7.46
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.028
Ba - Barium	<0.10
B - Boron	1.23
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.02
Hg - Mercury	<0.001
Mo - Molybdenum	0.59
Ni - Nickel	<0.05
Se - Selenium	0.154
V - Vanadium	1.23
Zn - Zinc	<0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	5.24
Ra226 - Radium 226	417
Radium 226 Precision	6.9
Quality Assurance Data:	
Anion Milliequivalents	59.53
Cation Milliequivalents	56.75
WDEQ A/C Bal.%	-2.39
Calculated TDS mg/l	3626
TDS Balance A/C %	1.05

Report Approved By: R.A. Starling

kmk 8712fer

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	PT-5
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8719
MAJOR IONS mg:l	
Ca - Calcium	87.9
Mg - Magnesium	23.8
Na - Sodium	1144
K - Potassium	30.0
CO3 - Carbonate	0
HCO3 - Bicarbonate	981
SO4 - Sulfate	1240
Cl - Chloride	594
NH4 - Ammonium	0.33
NO2 - Nitrite	<0.01
NO3 - Nitrate	0.99
F - Fluoride	0.45
SiO2 - Silica	24.7
TDS - Total Dissolved Solids	3651
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5964
Alk - Alkalinity as CaCO3 (CaCO3)	804
pH (std units)	7.28
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.017
Ba - Barium	<0.10
B - Boron	1.36
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.04
Hg - Mercury	<0.001
Mo - Molybdenum	0.53
Ni - Nickel	<0.05
Se - Selenium	0.240
V - Vanadium	1.15
Zn - Zinc	0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	9.30
Ra226 - Radium 226	1139
Radium 226 Precision	11.3
Quality Assurance Data:	
Anion Milliequivalents	58.74
Cation Milliequivalents	56.93
WDEQ A/C Bal.%	-1.57
Calculated TDS mg/l	3640
TDS Balance A/C %	1.06

Report Approved By: R.A. Gearing

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	IJ-45
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8721
MAJOR IONS mg:l	
Ca - Calcium	89.9
Mg - Magnesium	24.8
Na - Sodium	1126
K - Potassium	32.7
CO3 - Carbonate	0
HCO3 - Bicarbonate	1104
SO4 - Sulfate	1134
Cl - Chloride	607
NH4 - Ammonium	0.33
NO2 - Nitrite	0.04
NO3 - Nitrate	1.25
F - Fluoride	0.43
SiO2 - Silica	28.3
TDS - Total Dissolved Solids	3873
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5916
Alk - Alkalinity as CaCO3 (CaCO3)	905
pH (std units)	7.37
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.023
Ba - Barium	<0.10
B - Boron	1.15
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.06
Hg - Mercury	<0.001
Mo - Molybdenum	0.53
Ni - Nickel	<0.05
Se - Selenium	0.149
V - Vanadium	1.29
Zn - Zinc	<0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	14.83
Ra226 - Radium 226	681
Radium 226 Precision	9.2
Quality Assurance Data:	
Anion Milliequivalents	58.94
Cation Milliequivalents	56.40
WDEQ A/C Bal.%	-2.20
Calculated TDS mg/l	3601
TDS Balance A/C %	1.08

Report Approved By: R.A. Starling

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	PM-5
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8722
MAJOR IONS mg:l	
Ca - Calcium	80.8
Mg - Magnesium	22.7
Na - Sodium	1054
K - Potassium	30.0
CO3 - Carbonate	0
HCO3 - Bicarbonate	972
SO4 - Sulfate	1115
Cl - Chloride	586
NH4 - Ammonium	0.14
NO2 - Nitrite	0.09
NO3 - Nitrate	0.97
F - Fluoride	0.54
SiO2 - Silica	35.3
TDS - Total Dissolved Solids	3756
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5590
Alk - Alkalinity as CaCO3 (CaCO3)	797
pH (std units)	6.85
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.018
Ba - Barium	<0.10
B - Boron	1.09
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	0.05
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.05
Hg - Mercury	<0.001
Mo - Molybdenum	0.42
Ni - Nickel	<0.05
Se - Selenium	0.129
V - Vanadium	0.38
Zn - Zinc	0.11
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	54.52
Ra226 - Radium 226	329
Radium 226 Precision	6.2
Quality Assurance Data:	
Anion Milliequivalents	55.78
Cation Milliequivalents	52.56
WDEQ A/C Bal.%	-2.98
Calculated TDS mg/l	3415
TDS Balance A/C %	1.10

Report Approved By: R.A. Gearing

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	PM-1
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-8720
MAJOR IONS mg:l	
Ca - Calcium	87.9
Mg - Magnesium	22.6
Na - Sodium	1154
K - Potassium	32.7
CO3 - Carbonate	0
HCO3 - Bicarbonate	1099
SO4 - Sulfate	1109
Cl - Chloride	598
NH4 - Ammonium	0.33
NO2 - Nitrite	<0.01
NO3 - Nitrate	1.06
F - Fluoride	0.37
SiO2 - Silica	25.7
TDS - Total Dissolved Solids	3694
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	5843
Alk - Alkalinity as CaCO3 (CaCO3)	901
pH (std units)	7.65
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.018
Ba - Barium	<0.10
B - Boron	1.17
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.02
Hg - Mercury	<0.001
Mo - Molybdenum	0.60
Ni - Nickel	<0.05
Se - Selenium	0.139
V - Vanadium	1.00
Zn - Zinc	<0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	8.63
Ra226 - Radium 226	370
Radium 226 Precision	6.5
Quality Assurance Data:	
Anion Milliequivalents	58.07
Cation Milliequivalents	57.33
WDEQ A/C Bal.%	-0.64
Calculated TDS mg/l	3585
TDS Balance A/C %	1.03

Report Approved By: R.A. Leading

kmk 8712fer

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration

Sample Identification:	PM-4
Sample Date:	03-23-94
Report Date:	04-13-94
Laboratory I.D. #:	94-6723
MAJOR IONS mg:l	
Ca - Calcium	87.1
Mg - Magnesium	20.6
Na - Sodium	942
K - Potassium	26.3
CO3 - Carbonate	0
HCO3 - Bicarbonate	900
SO4 - Sulfate	659
Cl - Chloride	455
NH4 - Ammonium	0.67
NO2 - Nitrite	0.02
NO3 - Nitrate	<0.10
F - Fluoride	0.26
SiO2 - Silica	18.2
TDS - Total Dissolved Solids	3121
TSS - Total Suspended Solids	
EC - Conductivity (umho/cm)	4841
Alk - Alkalinity as CaCO3 (CaCO3)	738
pH (std units)	6.87
TRACE METALS mg/l:	
Al - Aluminum	<0.10
As - Arsenic	0.007
Ba - Barium	<0.10
B - Boron	1.44
Cd - Cadmium	<0.01
Cr - Chromium	<0.05
Cu - Copper	<0.01
Fe - Iron	<0.05
Pb - Lead	<0.05
Mn - Manganese	0.11
Hg - Mercury	<0.001
Mo - Molybdenum	0.20
Ni - Nickel	<0.05
Se - Selenium	0.012
V - Vanadium	<0.10
Zn - Zinc	0.14
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	6.29
Ra226 - Radium 226	126
Radium 226 Precision	5.0
Quality Assurance Data:	
Anion Milliequivalents	47.58
Cation Milliequivalents	47.77
WDEQ A/C Bal.%	0.21
Calculated TDS mg/l	2960
TDS Balance A/C %	1.05

Report Approved By: R.A. Gearing

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FERRET EXPLORATION OF NEBRASKA, INC.

PROJECT: MU-1 Initial Restoration Samples

MAJOR IONS mg:l	Det. Limit
Ca - Calcium	0.10
Mg - Magnesium	0.10
Na - Sodium	0.10
K - Potassium	0.10
CO3 - Carbonate	0.10
HCO3 - Bicarbonate	0.10
SO4 - Sulfate	1.00
Cl - Chloride	0.10
NH4 - Ammonium	0.05
NO2 - Nitrite	0.01
NO3 - Nitrate	0.1
F - Fluoride	0.1
SiO2 - Silica	1.0
TDS - Total Dissolved Solids	1.0
TSS - Total Suspended Solids	1.0
EC - Conductivity (umho/cm)	1.0
Alk - Alkalinity as CaCO3 (CaCO3)	0.1
pH (std units)	1-14
TRACE METALS mg/l:	
Al - Aluminum	0.10
As - Arsenic	0.001
Ba - Barium	0.10
B - Boron	0.10
Cd - Cadmium	0.01
Cr - Chromium	0.05
Cu - Copper	0.01
Fe - Iron	0.05
Pb - Lead	0.05
Mn - Manganese	0.01
Hg - Mercury	0.001
Mo - Molybdenum	0.10
Ni - Nickel	0.05
Se - Selenium	0.001
V - Vanadium	0.10
Zn - Zinc	0.01
RADIOMETRIC pCi/l:	
U-nat - Uranium Natural (mg/l)	0.0003
Ra226 - Radium 226	0.2
Radium 226 Precision	

Quality Assurance Data:	Acceptable Range
Anion Milliequivalents	
Cation Milliequivalents	
WDEQ A/C Bal.%	-5 - +5
Calculated TDS mg/l	
TDS Balance A/C %	0.90-1.10

Report Approved By:
kmk 8712fer

ELI

QUALITY ASSURANCE REPORT – Ferret Exploration of Nebraska, Inc.
Report Date: 04-26-94
ELI #(s): 94:8712-8723

MAJOR IONS mg/l:	METHOD	Dup #1 %	Dup #2 %	Spk #1 %	Spk #2 %	ANALYST	DATE SAMPLE ANALYZED
Calcium	EPA-200.7	100	–	100	–	PG	03-31-94
Magnesium	EPA-200.7	100	–	100	–	PG	03-31-94
Sodium	EPA-200.7	104	–	104	–	PG	03-31-94
Potassium	EPA-258.1	100	–	100	–	PG	03-31-94
Carbonate	EPA-310.1	100	–	100	–	RK	03-28-94
Bicarbonate	EPA-310.1	100	–	100	–	RK	03-28-94
Sulfate	EPA-375.3	98	–	98	–	RK	03-29-94
Chloride	EPA-325.3	98	–	101	–	RK	03-30-94
Ammonium	EPA-350.1	92	–	98	–	RK	04-05-94
Nitrite	EPA-354.1	100	–	85	–	RK	04-04-94
Nitrate	EPA-353.2	100	–	97	–	RK	04-01-94
Fluoride	EPA-340.2	105	–	100	–	DC	03-30-94
Silica	EPA-200.7	102	–	104	–	CP	04-01-94
TDS @ 180 C	EPA-160.1	100	–	–	–	RCB	03-31-94
Cond (umho/cm)	EPA-120.1	100	–	–	–	RCB	03-30-94
Alkalinity	EPA-310.1	100	–	100	–	RK	03-28-94
pH (units)	EPA-150.1	100	–	–	–	RK	03-28-94
TRACE METALS mg/l:							
Aluminum	EPA-200.7	100	–	80	–	CP	04-01-94
Arsenic	EPA-206.3	109	–	98	–	PG	04-06-94
Barium	EPA-200.7	100	–	103	–	CP	04-11-94
Boron	EPA-200.7	103	–	100	–	CP	04-11-94
Cadmium	EPA-200.7	100	–	94	–	CP	04-11-94
Chromium	EPA-200.7	100	–	93	–	CP	04-11-94
Copper	EPA-200.7	100	–	95	–	CP	04-11-94
Iron	EPA-200.7	100	–	100	–	CP	04-11-94
Lead	EPA-239.2	100	–	107	–	CP	04-11-94
Manganese	EPA-200.7	100	–	101	–	CP	04-11-94
Mercury	EPA-245.2	100	–	106	–	PG	03-28-94
Molybdenum	EPA-200.7	100	–	98	–	CP	04-01-94
Nickel	EPA-200.7	100	–	92	–	CP	04-01-94
Selenium	EPA-270.3	100	–	110	–	PG	04-07-94
Vanadium	EPA-200.7	99	–	101	–	CP	04-01-94
Zinc	EPA-200.7	100	–	100	–	CP	04-01-94

RADIOMETRIC:	METHOD	Dup #1 %	Dup #2 %	Spk #1 %	Spk #2 %	ANALYST	DATE SAMPLE ANALYZED
Uranium	EPA-908.1	126	–	123	–	DB	03-30-94
Ra226	EPA-903.0	86	–	97	–	DB	04-05-94

USEPA-ESML-LV INTERCOMPARISON STUDY RESULTS

Radiometric	Method	ELI Value	Standard	Difference	Analyst	Date
Uranium	EPA-908.1	20.73	25.30	-4.57	DB	08-13-93
Ra226	EPA-903.1	15.23	14.90	0.33	DB	09-17-93
Ra228	EPA-904.1	16.13	20.40	-4.27	DB	09-17-93
Gross Alpha	EPA-900.0	16.00	20.00	-4.00	DB	10-29-93
Gross Beta	EPA-900.0	19.00	15.00	4.00	DB	10-29-93

Report Approved By: DB

wla 94:8712-8723

Appendix 4

Affect of Groundwater Transfer on Selected Parameters

Periodic Water Analysis of Selected Wells in Mine Unit 1

Chloride Analysis (mg/l)

Sample Date	Well						Average
	IJ 25P-1	IJ 28P-1	IJ 45P-2	PR 6-2	PR 15-1	PR 19-1	
Baseline	204	189	218	187	180	189	195
03/24/94	594	619	607	603	603	590	603
07/06/94	596	596	596	467	524	560	557
10/19/94	506	525	493	519	495	512	508
05/11/95	456	495	440	503	417	468	463

Sulfate Analysis (mg/l)

Sample Date	Well						Average
	IJ 25P-1	IJ 28P-1	IJ 45P-2	PR 6-2	PR 15-1	PR 19-1	
Baseline	360	364	366	352	352	361	359
03/24/94	1,119	1,112	1,134	1,115	1,115	1,283	1,146
07/06/94	1,333	1,191	1,414	1,007	1,117	1,361	1,237
10/19/94	1,139	1,148	1,086	1,119	1,088	1,146	1,121
05/11/95	953	1,042	873	1,055	838	957	953

Sodium Analysis (mg/l)

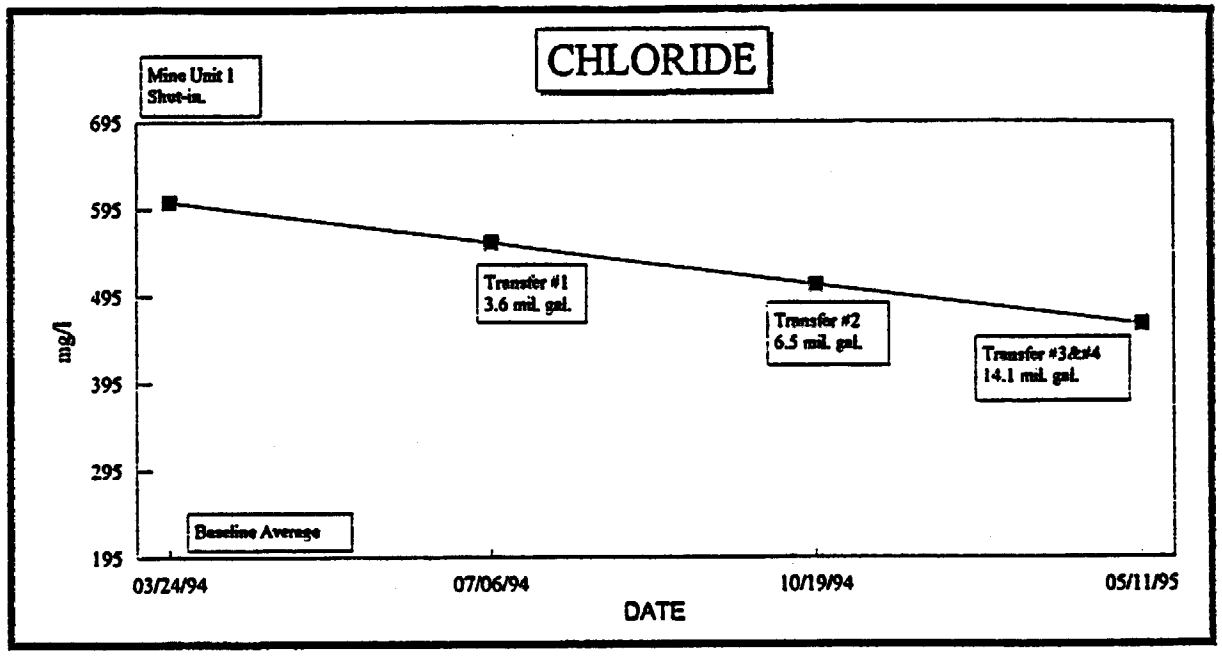
Sample Date	Well						Average
	IJ 25P-1	IJ 28P-1	IJ 45P-2	PR 6-2	PR 15-1	PR 19-1	
Baseline	402	411	423	408	399	407	408
03/24/94	1,177	1,182	1,126	1,144	1,172	1,083	1,147
07/06/94	1,309	1,260	1,276	979	1,199	1,177	1,200
10/19/94	1,133	1,177	1,122	1,133	1,172	1,128	1,144
05/11/95	1,012	1,111	962	1,100	952	1,243	1,063

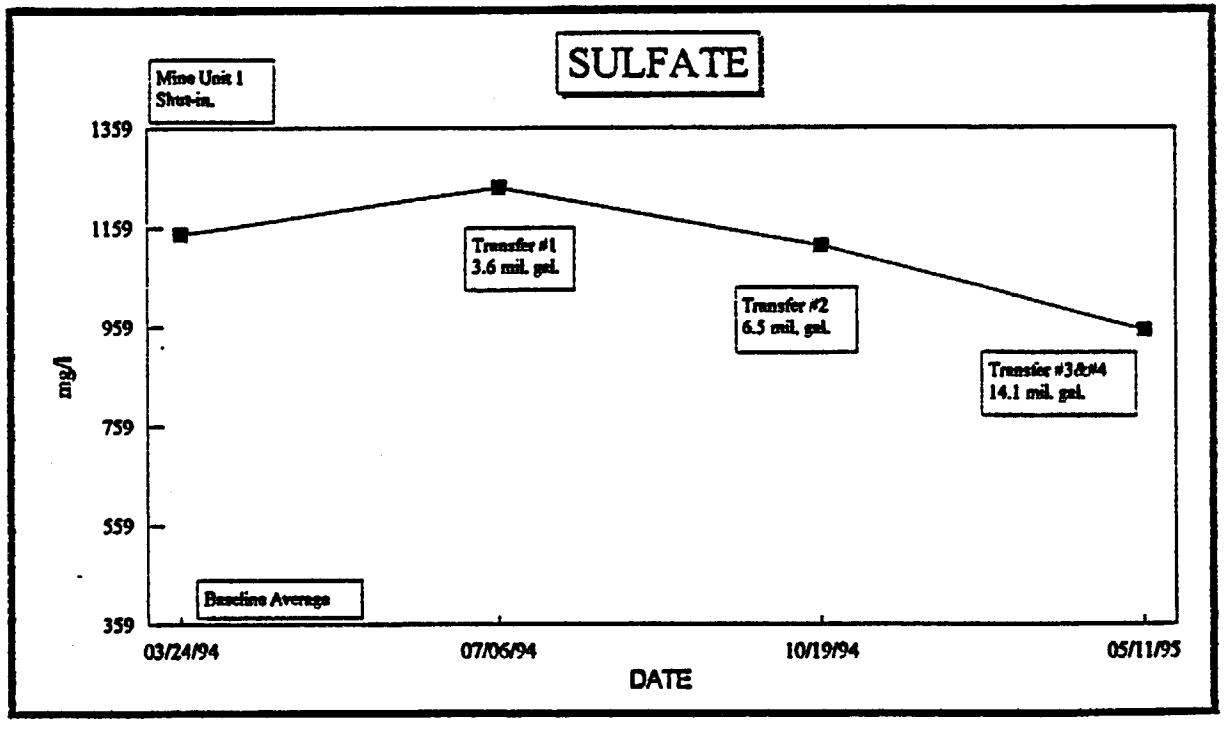
Conductivity Analysis (umhos/cm)

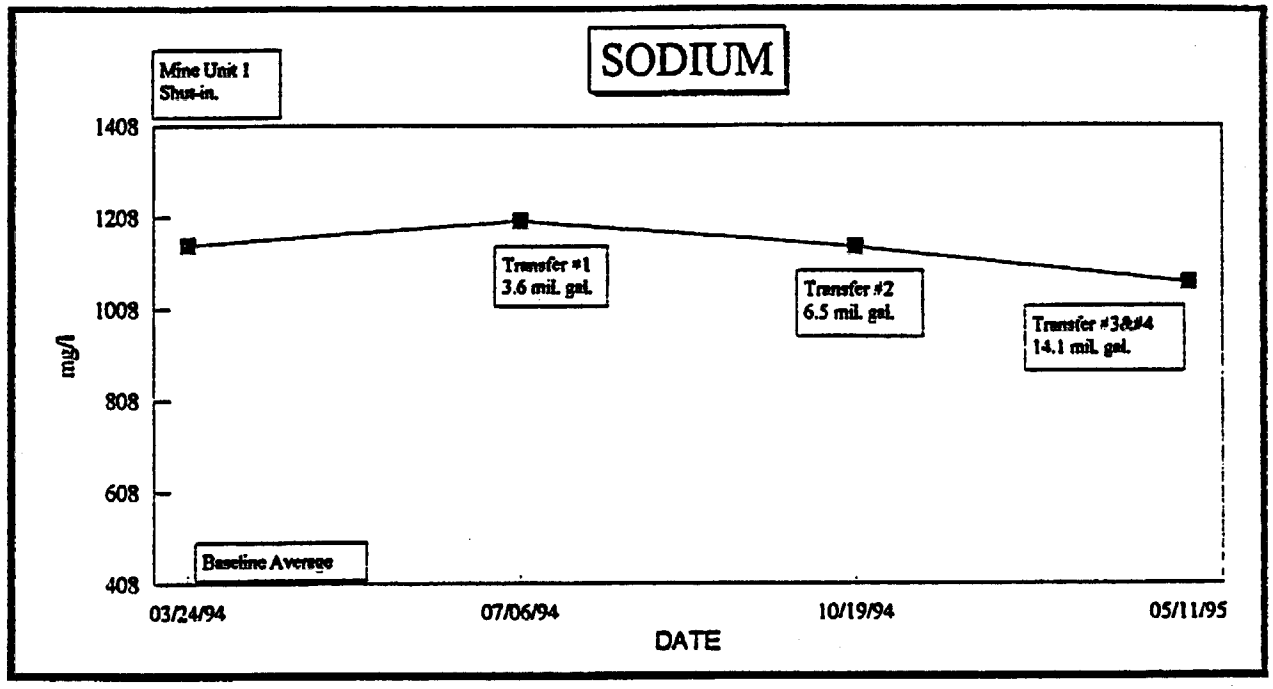
Sample Date	Well						Average
	IJ 25P-1	IJ 28P-1	IJ 45P-2	PR 6-2	PR 15-1	PR 19-1	
Baseline	1,970	1,980	1,951	1,866	1,867	1,994	1,938
03/24/94	5,807	6,025	5,916	5,819	5,940	5,819	5,888
07/06/94	5,800	5,630	5,760	4,750	5,170	5,470	5,430
10/19/94	5,140	5,340	4,980	5,130	5,090	5,110	5,132
05/11/95	4,510	4,900	4,290	4,880	4,160	4,690	4,572

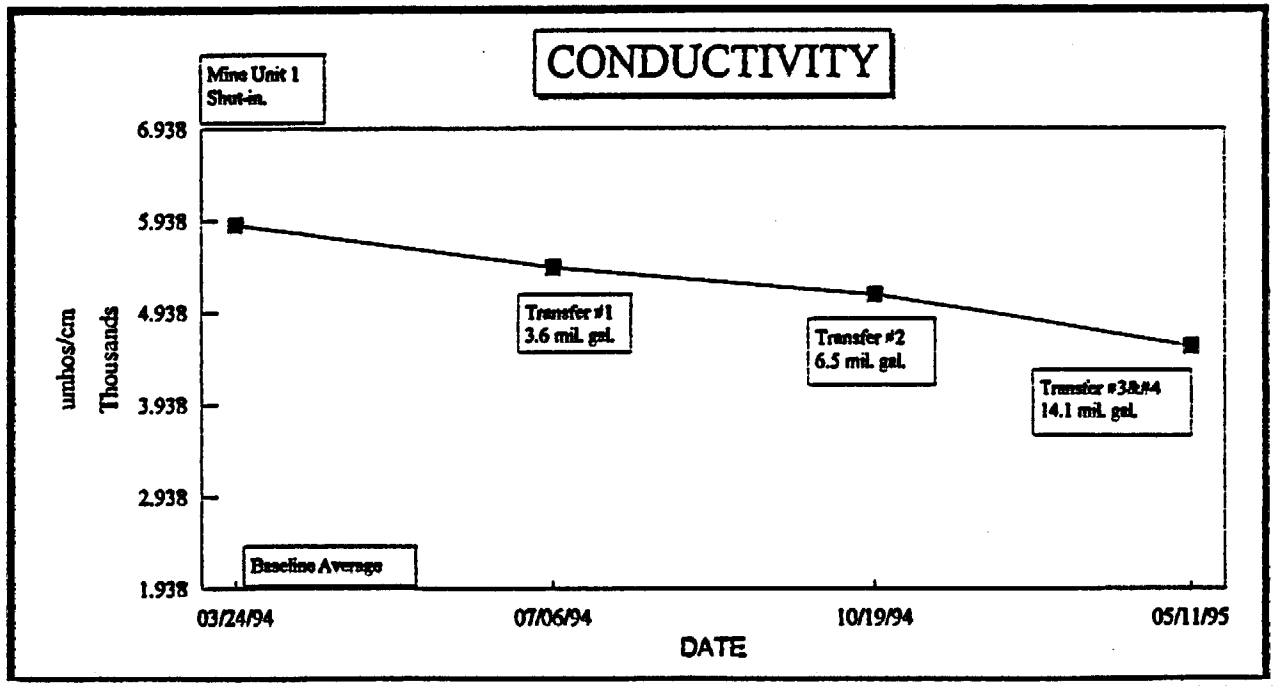
Alkalinity Analysis (mg/l)

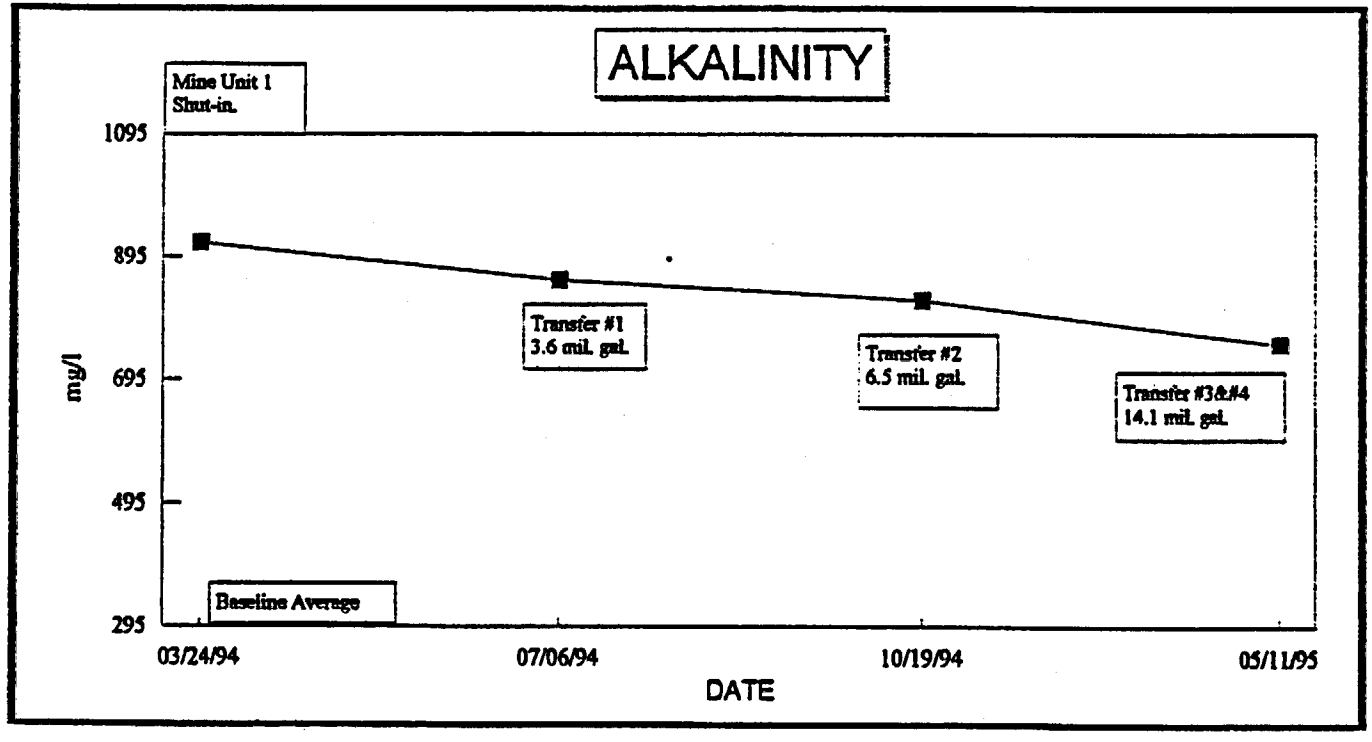
Sample Date	Well						Average
	IJ 25P-1	IJ 28P-1	IJ 45P-2	PR 6-2	PR 15-1	PR 19-1	
Baseline	261	312	270	324	307	294	295
03/24/94	911	989	905	959	959	786	918
07/06/94	920	948	840	780	880	770	856
10/19/94	825	880	800	800	850	788	824
05/11/95	739	810	700	780	700	790	753


CHLORIDE
Mine Unit 1
Shut-in.
695
595
495
395
295
195
mg/l
Transfer #1
3.6 mil. gal.
Transfer #2
6.5 mil. gal.
Transfer #3&#4
14.1 mil. gal.
Baseline Average
03/24/94
07/06/94
10/19/94
05/11/95
DATE


SULFATE
Mine Unit 1
Shut-in.
1359
1159
959
759
559
359
mg/l
Transfer #1
3.6 mil. gal.
Transfer #2
6.5 mil. gal.
Transfer #3&#4
14.1 mil. gal.
Baseline Average
03/24/94
07/06/94
10/19/94
05/11/95
DATE


SODIUM
Mine Unit 1
Shut-in.
1408
1208
1008
808
608
408
mg/l
Transfer #1
3.6 mil. gal.
Transfer #2
6.5 mil. gal.
Transfer #3&#4
14.1 mil. gal.
Baseline Average
03/24/94
07/06/94
10/19/94
05/11/95
DATE


CONDUCTIVITY
Mine Unit 1
Shut-in.
6.938
5.938
4.938
3.938
2.938
1.938
umhos/cm
Thousands
Transfer #1
3.6 mil. gal.
Transfer #2
6.5 mil. gal.
Transfer #3&#4
14.1 mil. gal.
Baseline Average
03/24/94
07/06/94
10/19/94
05/11/95
DATE


ALKALINITY
Mine Unit 1
Shut-in.
1095
895
695
495
295
mg/l
Transfer #1
3.6 mil. gal.
Transfer #2
6.5 mil. gal.
Transfer #3&#4
14.1 mil. gal.
Baseline Average
03/24/94
07/06/94
10/19/94
05/11/95
DATE

Appendix 5

Conductivity Indicator Data

well number date of sample (end of intial restoration)				pr3 21-Mar-96	pr8 11-Apr-96	pr13a 2-May-96	pr35 7-Feb-96	pr17 19-Sep-96	pr7 4-Dec-96	pr2 22-Mar-97
Major Ions			NDEQ Standard							
calcium	Ca	mg/l	125	23.7	14.2	16	18.3	19.1	16.5	13.9
magnesium	Mg	mg/l	32	6.7	3.7	4.8	5	5.7	4.6	4.2
sodium	Na	mg/l	4120	402	281	305	352	343	344	306
potassium	K	mg/l	125	14.6	9.5	11.1	12.7	12.4	11.5	9.8
carbonate	CO3	mg/l	0	0	0	0	0	0	0	0
bicarbonate	HCO3	mg/l	585	420	298	331	310	366	383	354
sulfate	SO4	mg/l	375	309	201	247	242	283	274	242
chloride	Cl	mg/l	250	256	163	180	236	200	188	142
ammonium	NH4	mg/l	10	<0.05	<0.05	<0.05	<0.05	0.1	0.09	<0.05
nitrite	NO2	mg/l		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
nitrate	NO3	mg/l	10	0.76	0.93	0.9	0.2	0.46	<0.10	<0.10
fluoride	F	mg/l	4	1.02	0.87	0.93	0.71	0.83	0.9	0.93
silica	SiO2	mg/l		15.5	13.8	17.4	13.6	15.7	17.5	16.2
Non-Metals										
total dissolved solids	TDS	mg/l	1170	1127	844	963	1066	1040	1016	906
conductivity (umho/cm)	Cond	umho/cm	1912	2013	1423	1558	1860	1754	1730	1480
alkalinity as CaCO3	Alk	mg/l		344	244	271	254	300	314	290
pH (std units)	pH	std. units	6.5-8.5	7.87	7.97	7.84	8.18	7.77	7.96	8.01
Trace Metals										
aluminum	Al	mg/l		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic	As	mg/l	0.05	0.034	0.029	0.046	0.039	0.083	0.066	0.033
barium	Ba	mg/l	1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
boron	B	mg/l		0.69	0.67	0.68	0.84	0.65	0.67	0.57
cadmium	Cd	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
chromium	Cr	mg/l		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
copper	Cu	mg/l	1	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
iron	Fe	mg/l	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
lead	Pb	mg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
manganese	Mn	mg/l	0.05	0.01	0.01	0.01	0.01	0.02	0.02	0.01
mercury	Hg	mg/l	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
molybdenum	Mo	mg/l	1	0.16	0.12	0.11	0.15	0.17	0.17	0.12
nickel	Ni	mg/l	0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
selenium	Se	mg/l	0.01	0.061	0.014	0.018	0.021	0.022	0.009	0.016
vanadium	V	mg/l	0.2	0.98	0.78	0.66	0.75	0.52	0.54	0.83
zinc	Zn	mg/l	5	0.11	0.05	0.05	0.08	0.01	<0.01	<0.01
Radiometric										
uranium natural (mg/l)	U-nat	mg/l	5	1.433	2.361	1.509	0.923	1.981	4.74	2.58
radium 226 (pCi/l)	Ra-226	pCi/l	584	359	66	70.8	56.3	127	279	265
radium 226 precision	Ra-226 precision			5.4	2.3	3.2	2.2	3.1	5.1	5.2

Appendix 6

Stabilization Water Quality Sampling Results

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	UJ6P	UJ6	UJ6	UJ6	UJ6	UJ6
Round:	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Laboratory ID:	99-16097	99-20850	99-24839	99-28317	99-30541	99-35537
Sample Matrix:	Water	Water	Water	Water	Water	Water
Sample Date:	02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99
Report Date:	March 12, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999
Revised Report Date:	•	April 15, 1999	•	•	•	•

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	16.7	18.0	18.9	19.0	18.2	18.0
Magnesium	Mg	mg/L	1.0	4.4	4.9	5.0	5.0	4.8	5.4
Sodium	Na	mg/L	1.0	347	354	353	345	352	353
Potassium	K	mg/L	1.0	11.9	12.5	12.7	12.2	13.6	14.0
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	5.7	5.2	6.4
Bicarbonate	HCO_3	mg/L	1.0	409	423	427	428	432	438
Sulfate	SO_4	mg/L	1.0	325	325	342	331	332	323
Chloride	Cl	mg/L	1.0	131	126	138	129	138	126
Ammonium as N	NH_4	mg/L	0.05	0.05	0.08	0.14	< 0.05	0.13	0.15
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.61	0.64	0.69	0.70	0.71	0.80
Silica	SiO_2	mg/L	1.0	15.5	17.7	16.4	17.0	15.6	14.6
Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1040	1050	1080	1080	1120	1060
Conductivity		µmhos/cm	1.0	1720	1740	1730	1780	1730	1800
Alkalinity	$CaCO_3$	mg/L	1.0	336	347	350	359	362	368
pH		std. units	0.10	8.08	8.25	8.18	8.37	8.33	8.41
Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.003	0.003	0.003	0.002	0.002	0.001
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.44	0.43	0.30	0.45	0.44	0.54
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.01	< 0.01	0.01	< 0.01	0.01	0.01
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	< 0.05*	< 0.01	0.02	0.03	0.03	0.03
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.001	0.001	0.002	0.001	0.002	0.005
Vanadium	V	mg/L	0.01	0.04	0.02	0.02	0.01	0.01	0.01
Zinc	Zn	mg/L	0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01
Radiometrics									
Uranium	^{238}U	mg/L	0.0003	0.208	0.291	0.345	0.269	0.347	0.314
Radium 226	^{226}Ra	pCi/L	0.2	127	115	124	133	130	143
Radium Error Estimate ±				5.1	3.2	3.4	3.6	3.3	3.7
Quality Assurance Data			Target Range						
Anion	meq			17.22	17.30	18.06	17.75	18.09	17.69
Cation	meq			16.61	17.04	17.06	16.70	16.98	17.08
WYDEQ A/C Balance	%		-5 - +5	-1.80	-0.76	-2.84	-3.07	-3.15	-1.75
Calc TDS	mg/L			1058	1071	1101	1078	1096	1080
TDS A/C Balance	dec. %		0.80 - 1.20	0.98	0.98	0.98	1.00	1.02	0.98

*Molybdenum was analyzed at a detection limit of 0.05 for this Round

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:		PR-15	PR-15	PR-15	PR-15	PR-15	PR-15
Round:		Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Laboratory ID:		99-16100	99-20859	99-24861	99-28321	99-30543	99-35538
Sample Matrix:		Water	Water	Water	Water	Water	Water
Sample Date:		02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99
Report Date:		March 12, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999
Revised Report Date:			April 15, 1999	-	-	-	-
Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	11.6	13.8	13.6	11.2	10.8	11.2
Magnesium	Mg	mg/L	1.0	2.7	3.2	3.2	2.6	2.6	3.3
Sodium	Na	mg/L	1.0	210	214	214	217	230	228
Potassium	K	mg/L	1.0	10.9	11.5	12.0	11.5	12.9	13.0
Carbonate	CO_3	mg/L	1.0	3.7	3.3	3.4	4.1	5.3	7.5
Bicarbonate	HCO_3	mg/L	1.0	289	289	291	335	354	375
Sulfate	SO_4	mg/L	1.0	160	156	163	152	155	139
Chloride	Cl	mg/L	1.0	87.7	86.2	92.5	81.0	85.8	72.0
Ammonium as N	NH_4	mg/L	0.05	< 0.05	0.06	0.06	< 0.05	0.07	0.13
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.51	0.47	0.49	0.58	0.59	0.68
Silica	SiO_2	mg/L	1.0	13.6	14.1	13.5	13.0	13.0	12.0
Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	606	651	670	675	685	669
Conductivity		µmho/c	1.0	1070	1110	1090	1140	1100	1140
Alkalinity	$CaCO_3$	mg/L	1.0	243	242	244	281	298	318
pH		std. unit	0.10	8.35	8.31	8.31	8.34	8.42	8.55
Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.033	0.030	0.034	0.041	0.043	0.045
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.41	0.40	0.25	0.40	0.40	0.49
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.02	0.02	0.02	< 0.01	0.02	0.05
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	0.13	0.14	0.12	0.16	0.15	0.14
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.002	0.002	0.002	0.003	0.003	0.003
Vanadium	V	mg/L	0.01	0.32	0.29	0.33	0.42	0.38	0.38
Zinc	Zn	mg/L	0.01	0.01	< 0.01	< 0.01	0.02	0.01	< 0.01
Radiometrics									
Uranium	^{Nat}U	mg/L	0.0003	0.307	0.420	0.403	0.468	0.808	0.862
Radium 226	^{226}Ra	pCi/L	0.2	12.8	25.0	29.5	30.4	25.5	31.7
Radium Error Estimate ±				0.7	1.5	1.7	1.7	1.5	1.8
Quality Assurance Data			Target Range						
Anion	meq			10.70	10.55	10.91	11.11	11.64	11.33
Cation	meq			10.23	10.57	10.58	10.52	11.11	11.11
WYDEQ A/C Balance	%		-5 - +5	-2.23	0.11	-1.57	-2.70	-2.37	-0.99
Calc TDS	mg/L			646	647	662	661	693	674
TDS A/C Balance	dec. %		0.80 - 1.20	0.94	1.01	1.01	1.02	0.99	0.99

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	PR-19	PR-19	PR-19	PR-19	PR-19	PR-19
Round:	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Laboratory ID:	99-16101	99-20858	99-24862	99-28328	99-30542	99-35539
Sample Matrix:	Water	Water	Water	Water	Water	Water
Sample Date:	02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99
Report Date:	March 12, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999
Revised Report Date:		April 15, 1999	-	-	-	-

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	26.4	27.8	30.7	35.0	51.2	67.0
Magnesium	Mg	mg/L	1.0	6.5	6.9	7.7	8.5	13.2	18.0
Sodium	Na	mg/L	1.0	346	359	381	385	513	616
Potassium	K	mg/L	1.0	11.3	12.0	13.6	14.0	19.5	24.0
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	406	412	429	444	534	607
Sulfate	SO_4	mg/L	1.0	320	341	391	402	589	696
Chloride	Cl	mg/L	1.0	145	141	172	170	263	313
Ammonium as N	NH_4	mg/L	0.05	0.06	0.15	0.17	0.14	0.28	0.36
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.44	0.42	0.40	0.41	0.37	0.36
Silica	SiO_2	mg/L	1.0	9.8	10.9	10.6	11.0	10.8	10.5
Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1060	1130	1200	1280	1740	2120
Conductivity		µmhos/cm	1.0	1770	1820	1930	2090	2650	3300
Alkalinity	$CaCO_3$	mg/L	1.0	333	338	352	365	438	498
pH		std. units	0.10	8.07	7.93	7.90	7.98	7.90	8.30
Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.016	0.016	0.020	0.018	0.018	0.018
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.50	0.52	0.59	0.55	0.63	0.85
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.09	0.19	0.28	0.40	0.46	0.70
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.03	0.03	0.04	0.04	0.06	0.09
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	< 0.05*	0.08	0.08	0.11	0.14	0.13
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Selenium	Se	mg/L	0.001	0.001	0.002	0.002	0.002	0.003	0.004
Vanadium	V	mg/L	0.01	0.09	0.07	0.06	0.06	0.07	0.08
Zinc	Zn	mg/L	0.01	0.01	0.04	0.03	0.07	0.04	0.04
Radiometrics									
Uranium	^{238}U	mg/L	0.0003	1.05	1.34	1.66	1.19	2.70	4.17
Radium 226	^{226}Ra	pCi/L	0.2	439	623	730	711	1600	1910
Radium Error Estimate ±				7.5	7.2	8.3	8.5	11.6	13.3
Quality Assurance Data			Target Range						
Anion		meq		17.44	17.87	20.06	20.49	28.47	33.30
Cation		meq		17.20	17.92	19.13	19.60	26.52	32.33
WYDEQ A/C Balance		%	-5 - +5	-0.70	0.14	-2.37	-2.22	-3.53	-1.48
Calc TDS		mg/L		1069	1106	1223	1250	1728	2050
TDS A/C Balance		dec. %	0.80 - 1.20	0.99	1.02	0.98	1.02	1.01	1.03

*Molybdenum was analyzed at a detection limit of 0.05 for this Round.

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	12-28 P	12-28-P	12-28-P	12-28-P	12-28-P	12-28-P
Round:	Round 8	Round 8	Round 8	Round 4	Round 8	Round 8
Laboratory ID:	99-18099	99-30856	99-34864	99-28319	99-30545	99-35546
Sample Matrix:	Water	Water	Water	Water	Water	Water
Sample Date:	03-19-99	03-18-99	04-18-99	05-20-99	06-17-99	07-18-99
Report Date:	March 12, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 6, 1999	August 03, 1999
Revised Report Date:		April 15, 1999	•	•	•	•

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	18.5	20.3	19.4	20.0	19.2	18.0
Magnesium	Mg	mg/L	1.0	4.5	5.1	5.0	4.9	4.8	5.2
Sodium	Na	mg/L	1.0	335	348	357	336	357	340
Potassium	K	mg/L	1.0	9.7	10.8	11.5	11.0	12.0	12.0
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.8
Bicarbonate	HCO_3	mg/L	1.0	405	418	426	424	429	416
Sulfate	SO_4	mg/L	1.0	291	307	310	312	332	299
Chloride	Cl	mg/L	1.0	130	131	133	131	140	122
Ammonium as N	NH_4	mg/L	0.05	0.05	0.11	0.11	0.06	0.12	0.14
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	0.27	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.58	0.54	0.53	0.56	0.59	0.68
Silica	SiO_2	mg/L	1.0	14.0	14.8	15.7	14.0	14.0	14.2
Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1010	1050	1080	1050	1060	1020
Conductivity		µmhos/cm	1.0	1630	1740	1740	1750	1700	1700
Alkalinity	$CaCO_3$	mg/L	1.0	333	343	351	348	352	348
pH		std. units	0.10	8.17	7.99	8.23	8.12	8.13	8.31
Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.022	0.023	0.026	0.025	0.027	0.029
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.44	0.46	0.51	0.44	0.44	0.53
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.04	0.04	0.05	0.06	0.06	0.06
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.03	0.04	0.03	0.04	0.04	0.03
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	0.08	0.11	0.12	0.10	0.11	0.10
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.002	0.003	0.003	0.003	0.003	0.003
Vanadium	V	mg/L	0.01	0.16	0.16	0.13	0.14	0.14	0.13
Zinc	Zn	mg/L	0.01	< 0.01	0.02	0.01	0.03	0.02	0.01
Radiometrics									
Uranium	^{238}U	mg/L	0.0001	0.463	0.739	0.734	0.456	0.756	0.710
Radium 226	^{226}Ra	pCi/L	0.2	160	192	212	203	206	185
Radium Error Estimate ±				4.5	4.1	4.4	4.4	4.1	4.1
Quality Assurance Data			Target Range						
Anion		meq		16.43	16.98	17.26	17.19	17.94	16.67
Cation		meq		16.13	16.87	17.23	16.32	17.22	16.45
WYDEQ A/C Balance		%	-5 - +5	-0.93	-0.33	-0.09	-2.58	-2.06	-0.66
Calc TDS		mg/L		1008	1047	1067	1042	1095	1024
TDS A/C Balance		dec. %	0.80 - 1.20	1.00	1.00	1.01	1.01	0.97	1.00

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:		13-25 P	13-25-P	13-25-P	13-25-P	13-25-P	13-25-P	13-25-P	13-25-P
Round:		Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8
Laboratory ID:		99-10098	99-20337	99-30363	99-30318	99-30547	99-35541	99-40[illegible]	99-45[illegible]
Sample Matrix:		Water	Water	Water	Water	Water	Water	Water	Water
Sample Date:		02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99	08-[illegible]-99	09-[illegible]-99
Report Date:		March 13, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999	[illegible]	[illegible]
Revised Report Date:		-	April 15, 1999	-	-	-	-	-	-
Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	19.0	18.6	18.2	17.0	16.9	16.0
Magnesium	Mg	mg/L	1.0	4.8	4.8	4.5	4.3	4.2	4.7
Sodium	Na	mg/L	1.0	336	339	333	329	351	341
Potassium	K	mg/L	1.0	13.2	13.2	13.2	12.5	14.3	14.4
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	419	410	409	421	425	430
Sulfate	SO_4	mg/L	1.0	310	304	315	315	331	302
Chloride	Cl	mg/L	1.0	127	120	133	127	138	118
Ammonium as N	NH_4	mg/L	0.05	0.07	0.11	0.11	< 0.05	0.10	0.15
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_2 + NO_3$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.16	< 0.10
Fluoride	F	mg/L	0.10	0.56	0.57	0.58	0.60	0.63	0.69
Silica	SiO_2	mg/L	1.0	13.7	14.3	13.6	14.0	13.3	13.4
Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1030	1050	1030	1040	1070	1030
Conductivity		µmhos/cm	1.0	1690	1680	1670	1720	1670	1710
Alkalinity	$CaCO_3$	mg/L	1.0	344	337	336	346	349	353
pH		std. units	0.10	8.10	7.97	8.06	8.11	8.15	8.21
Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.020	0.020	0.025	0.023	0.025	0.027
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.49	0.51	0.55	0.51	0.50	0.64
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.04	0.04	0.06	0.05	0.05	0.04
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	0.07	0.10	0.10	0.11	0.11	0.10
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.002	0.002	0.003	0.002	0.002	0.003
Vanadium	V	mg/L	0.01	0.08	0.07	0.07	0.09	0.09	0.10
Zinc	Zn	mg/L	0.01	< 0.01	0.02	0.03	0.04	0.02	0.01
Radiometrics									
Uranium	^{238}U	mg/L	0.0003	0.757	1.04	0.966	0.666	1.12	1.26
Radium 226	^{226}Ra	pCi/L	0.2	253	218	236	225	242	202
Radium Error Estimate ±				5.4	4.4	4.7	4.7	4.5	4.3
Quality Assurance Data			Target Range						
Anion		meq		16.95	16.49	17.07	17.10	17.81	16.72
Cation		meq		16.32	16.44	16.13	15.85	16.85	16.41
WYDEQ A/C Balance		%	-5 - +5	-1.91	-0.13	-2.83	-3.78	-2.78	-0.93
Calc TDS		mg/L		1015	1021	1037	1031	1083	1026
TDS A/C Balance		dec. %	0.80 - 1.20	1.00	1.03	1.01	1.01	0.99	1.00

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	U-13 P	U-13 P	U-13 P	U-13 P	U-13 P	U-13 P	U-13 P
Round:	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7
Laboratory ID:	99-16106	99-20860	99-24860	99-28322	99-30546	99-33542	[illegible]
Sample Matrix:	Water	Water	Water	Water	Water	Water	Water
Sample Date:	02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99	[illegible]
Report Date:	March 02, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999	[illegible]
Revised Report Date:	•	April 15, 1999	•	•	•	•	[illegible]

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	16.0	19.7	20.2	21.0	20.9	19.6
Magnesium	Mg	mg/L	1.0	4.2	5.2	5.3	5.3	5.4	5.7
Sodium	Na	mg/L	1.0	332	350	354	339	367	346
Potassium	K	mg/L	1.0	11.3	12.3	12.7	12.0	13.7	13.4
Carbonate	CO_3	mg/L	1.0	< 1.0	5.1	< 1.0	5.0	6.1	6.2
Bicarbonate	HCO_3	mg/L	1.0	402	419	432	424	439	434
Sulfate	SO_4	mg/L	1.0	306	326	335	351	353	319
Chloride	Cl	mg/L	1.0	126	125	139	135	145	123
Ammonium as N	NH_4	mg/L	0.05	0.05	0.15	0.24	0.13	0.26	0.30
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.25	< 0.10
Fluoride	F	mg/L	0.10	0.59	0.64	0.63	0.61	0.62	0.72
Silica	SiO_2	mg/L	1.0	14.0	15.8	14.2	15.0	13.9	14.2

Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1060	1080	1110	1100	1120	1080
Conductivity		µmho/c	1.0	1720	1740	1750	1820	1760	1780
Alkalinity	$CaCO_3$	mg/L	1.0	330	351	354	355	369	365
pH		std. unit	0.10	8.18	8.33	8.28	8.32	8.39	8.40

Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.006	0.012	0.017	0.013	0.016	0.016
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.43	0.41	0.28	0.44	0.45	0.54
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.02	0.10	0.13	0.05	0.07	0.06
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.01	0.02	0.02	0.02	0.02	0.02
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	< 0.05*	0.10	0.13	0.21	0.19	0.21
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Vanadium	V	mg/L	0.01	0.05	0.03	0.02	0.02	0.02	0.02
Zinc	Zn	mg/L	0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01

Radiometrics									
Uranium	^{238}U	mg/L	0.0003	0.242	1.27	1.60	1.49	1.75	1.71
Radium 226	^{226}Ra	pCi/L	0.2	376	665	764	770	920	849
Radium Error Estimate ±				6.5	7.6	8.5	8.7	8.7	9.1

Quality Assurance Data		Target Range							
Anion	meq		16.56	17.37	18.01	18.25	18.87	17.46
Cation	meq		15.89	16.98	17.21	16.56	17.84	16.88
WYDEQ A/C Balance	%	-5 - +5	-2.07	-1.15	-2.30	-4.86	-2.81	-1.68
Calc TDS	mg/L		1012	1069	1098	1096	1146	1065
TDS A/C Balance	dec. %	0.80 - 1.20	1.05	1.01	1.01	1.00	0.98	1.01

*Molybdenum was analyzed at a detection limit of 0.05 for this Round.

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	PAI-8	PAI-8	PAI-8	PAI-8	PAI-8	PAI-8
Round:	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Laboratory ID:	99-16102	99-20855	99-24366	99-28323	99-30548	99-33543
Sample Matrix:	Water	Water	Water	Water	Water	Water
Sample Date:	02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99
Report Date:	March 12, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999
Revised Report Date:	•	April 15, 1999	•	•	•	

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	13.6	19.3	29.6	38.0	39.4	25.0
Magnesium	Mg	mg/L	1.0	3.8	5.5	8.5	10.1	10.8	7.0
Sodium	Na	mg/L	1.0	349	387	466	477	555	441
Potassium	K	mg/L	1.0	14.4	17.0	19.2	20.0	23.1	19.0
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	418	436	494	519	560	483
Sulfate	SO_4	mg/L	1.0	306	358	459	514	595	437
Chloride	Cl	mg/L	1.0	132	152	201	226	267	184
Ammonium as N	NH_4	mg/L	0.05	< 0.05	0.07	0.12	0.08	0.17	0.16
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.42	0.39	0.38	0.39	0.39	0.46
Silica	SiO_2	mg/L	1.0	13.3	14.5	16.7	15.0	14.5	14.4

Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1070	1180	1460	1610	1760	1420
Conductivity		µmho/c	1.0	1770	1920	2330	2560	2680	2270
Alkalinity	$CaCO_3$	mg/L	1.0	343	357	406	426	459	396
pH		std. unit	0.10	8.21	8.05	8.22	8.08	8.13	8.11

Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.013	0.011	0.013	0.012	0.012	0.013
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.43	0.54	0.46	0.60	0.64	0.65
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Iron	Fe	mg/L	0.01	< 0.01	0.01	0.05	0.06	0.06	0.04
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	< 0.01	0.01	0.03	0.03	0.04	0.02
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	< 0.05*	0.08	0.06	0.06	0.09	0.08
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.001	0.002	0.003	0.002	0.003	0.003
Vanadium	V	mg/L	0.01	0.20	0.19	0.15	0.20	0.17	0.14
Zinc	Zn	mg/L	0.01	0.01	0.03	0.02	0.04	0.03	0.02

Radiometrics									
Uranium	^{238}U	mg/L	0.0003	3.03	3.65	5.26	5.01	9.35	6.54
Radium 226	^{226}Ra	pCi/L	0.2	35.8	58.5	119	172	202	114
Radium Error Estimate ±				2.2	2.3	3.3	4.0	4.1	3.3

Quality Assurance Data		Target Range						
Anion	meq		16.98	18.91	23.37	25.62	29.12	22.24
Cation	meq		16.56	18.70	22.97	24.02	27.62	21.52
WYDEQ A/C Balance	%	-5 - +5	-1.27	-0.54	-0.88	-3.23	-2.65	-1.64
Calc TDS	mg/L		1042	1172	1449	1561	1786	1370
TDS A/C Balance	dec. %	0.80 - 1.20	1.03	1.01	1.01	1.03	0.99	1.04

*Molybdenum was analyzed at a detection limit of 0.05 for this Round.

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	PAI-4	PAI-4	PAI-4	PAI-4	PAI-4	PAI-4	PAI-4
Round:	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	
Laboratory ID:	99-16107	99-20354	99-24863	99-28324	99-30549	99-33544	
Sample Matrix:	Water	Water	Water	Water	Water	Water	
Sample Date:	02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99	
Report Date:	March 12, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999	
Revised Report Date:		April 15, 1999	•	•	•		

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	16.2	18.2	17.0	15.0	15.3	15.2
Magnesium	Mg	mg/L	1.0	4.4	5.1	4.8	4.4	4.2	4.7
Sodium	Na	mg/L	1.0	334	350	345	319	319	314
Potassium	K	mg/L	1.0	12.0	13.1	13.2	12.0	13.0	13.0
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	429	421	399	396	393	393
Sulfate	SO_4	mg/L	1.0	300	307	304	306	298	278
Chloride	Cl	mg/L	1.0	144	136	133	125	129	112
Ammonium as N	NH_4	mg/L	0.05	0.10	0.13	0.13	0.09	0.14	0.17
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.50	0.47	0.48	0.50	0.51	0.60
Silica	SiO_2	mg/L	1.0	12.3	13.7	14.4	14.0	12.3	12.7

Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1080	1060	1050	997	982	960
Conductivity		µmho/c	1.0	1790	1750	1710	1670	1570	1600
Alkalinity	$CaCO_3$	mg/L	1.0	352	346	327	325	323	323
pH		std. unit	0.10	8.28	8.23	8.26	8.16	8.16	8.28

Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.49	0.50	0.35	0.49	0.47	0.46
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.05	0.05	0.05	0.06	0.06	0.05
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.02	0.02	0.02	0.02	0.01	0.01
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	0.10	0.12	0.12	0.15	0.16	0.17
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	< 0.001	0.002	0.001	< 0.001	< 0.001	0.001
Vanadium	V	mg/L	0.01	< 0.10*	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	Zn	mg/L	0.01	< 0.01	0.02	0.01	< 0.01	0.01	0.01

Radiometrics									
Uranium	^{238}U	mg/L	0.0003	0.172	0.158	0.122	0.103	0.129	0.130
Radium 226	^{226}Ra	pCi/L	0.2	174	173	184	160	161	157
Radium Error Estimate ±				4.4	3.9	4.2	3.9	3.6	3.9

Quality Assurance Data		Target Range						
Anion	meq		17.38	17.18	16.65	16.43	16.34	15.45
Cation	meq		16.03	16.91	16.61	15.32	15.34	15.16
WYDEQ A/C Balance	%	-5 - +5	-4.04	-0.78	-0.12	-3.51	-3.13	-0.92
Calc TDS	mg/L		1039	1055	1032	995	989	948
TDS A/C Balance	dec. %	0.80 - 1.20	1.04	1.00	1.02	1.00	0.99	1.01

*Vanadium was analyzed at a detection limit of 0.10 for this Round.

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	FR-8	FR-8	FR-8	FR-8	FR-8	FR-8	FR-8
Round:	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7
Laboratory ID:	99-16103	99-20853	99-24869	99-28327	99-30551	99-33545	[illegible]
Sample Matrix:	Water	Water	Water	Water	Water	Water	Water
Sample Date:	02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99	[illegible]
Report Date:	March 12, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999	[illegible]
Revised Report Date:	•	April 15, 1999	•	•	•	•	[illegible]

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	15.0	16.2	17.5	17.0	18.9	18.0
Magnesium	Mg	mg/L	1.0	3.9	4.8	4.6	4.5	4.7	5.0
Sodium	Na	mg/L	1.0	371	386	375	366	387	371
Potassium	K	mg/L	1.0	10.9	11.9	12.1	12.0	13.6	13.0
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	431	429	403	421	433	428
Sulfate	SO_4	mg/L	1.0	352	355	343	368	384	348
Chloride	Cl	mg/L	1.0	157	150	143	152	164	138
Ammonium as N	NH_4	mg/L	0.05	0.13	0.12	0.17	0.15	0.18	0.21
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.59	0.53	0.48	0.52	0.51	0.60
Silica	SiO_2	mg/L	1.0	12.6	14.5	15.2	14.0	12.7	13.3

Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1160	1160	1150	1160	1190	1160
Conductivity		µmho/c	1.0	1960	1900	1830	1880	1920	1870
Alkalinity	$CaCO_3$	mg/L	1.0	353	352	331	346	355	351
pH		std. unit	0.10	8.11	8.09	8.20	8.17	8.04	8.23

Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.025	0.021	0.024	0.022	0.023	0.024
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.47	0.50	0.32	0.47	0.47	0.44
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.12	0.17	0.15	0.23	0.25	0.20
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	0.06	0.07	0.08	0.09	0.09	0.09
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.001	0.003	0.003	0.003	0.004	0.004
Vanadium	V	mg/L	0.01	0.17	0.08	0.05	0.05	0.05	0.04
Zinc	Zn	mg/L	0.01	< 0.01	0.04	0.03	0.02	0.02	0.02

Radiometrics									
Uranium	^{238}U	mg/L	0.0003	2.28	2.1	1.62	1.08	1.56	1.58
Radium 226	^{226}Ra	pCi/L	0.2	204	190	184	199	206	192
Radium Error Estimate ±				4.9	4.1	4.1	4.4	4.2	4.3

Quality Assurance Data		Target Range						
Anion	meq		18.83	18.70	17.83	18.90	19.75	18.20
Cation	meq		17.51	18.43	17.91	17.48	18.55	17.82
WYDEQ A/C Balance	%	-5 - +5	-3.69	-0.72	0.22	-3.91	-3.14	-1.05
Calc TDS	mg/L		1139	1156	1113	1146	1203	1122
TDS A/C Balance	dec. %	0.80 - 1.20	1.02	1.00	1.03	1.01	0.99	1.03

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	U-45 P	U-45 P	U-45 P	U-45 P	U-45 P	U-45 P
Round:	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Laboratory ID:	99-16104	99-20851	99-24870	99-28326	99-30544	99-33548
Sample Matrix:	Water	Water	Water	Water	Water	Water
Sample Date:	02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99
Report Date:	March 12, 1999	April 13, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999
Revised Report Date:		April 15, 1999	•	•	•	

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	16.6	18.1	17.6	17.0	18.7	18.1
Magnesium	Mg	mg/L	1.0	4.3	4.8	4.7	5.0	4.8	5.2
Sodium	Na	mg/L	1.0	342	349	353	334	355	343
Potassium	K	mg/L	1.0	12.2	12.8	13.1	12.0	13.9	14.0
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	404	404	402	399	403	412
Sulfate	SO_4	mg/L	1.0	304	312	319	339	347	313
Chloride	Cl	mg/L	1.0	139	136	140	146	149	127
Ammonium as N	NH_4	mg/L	0.05	0.05	0.06	0.06	< 0.05	0.09	0.12
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	0.12	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.58	0.55	0.54	0.55	0.56	0.61
Silica	SiO_2	mg/L	1.0	15.7	17.2	18.1	17.0	15.8	16.0
Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1060	1070	1090	1090	1080	1090
Conductivity		µmhos/c	1.0	1790	1740	1750	1760	1710	1730
Alkalinity	$CaCO_3$	mg/L	1.0	332	332	330	328	330	338
pH		std. unit	0.10	7.98	7.99	8.17	8.00	8.01	8.27
Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.035	0.033	0.037	0.031	0.033	0.035
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.54	0.55	0.39	0.51	0.53	0.51
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.10	0.10	0.10	0.12	0.26	0.20
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.02	0.02	0.02	0.02	0.03	0.02
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	0.16	0.16	0.15	0.16	0.16	0.16
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.002	0.002	0.002	0.001	0.002	0.002
Vanadium	V	mg/L	0.01	0.22	0.22	0.22	0.21	0.18	0.18
Zinc	Zn	mg/L	0.01	< 0.01	0.03	0.03	0.02	0.03	0.02
Radiometrics									
Uranium	^{Nat}U	mg/L	0.0003	0.932	1.20	1.18	0.828	1.16	1.22
Radium 226	^{226}Ra	pCi/L	0.2	445	431	447	468	509	487
Radium Error Estimate ±				7.2	6.2	6.2	6.7	6.5	6.7
Quality Assurance Data			Target Range						
Anion		meq		16.93	17.01	17.23	17.77	18.06	16.90
Cation		meq		16.39	16.83	16.98	16.12	17.16	16.64
WYDEQ A/C Balance		%	-5 - +5	-1.60	-0.52	-0.73	-4.88	-2.56	-0.77
Calc TDS		mg/L		1037	1054	1068	1071	1107	1054
TDS A/C Balance		dec. %	0.80 - 1.20	1.02	1.02	1.02	1.02	0.98	1.04

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:		PT-5 PR-2	PT-5 PR-2	PT-5 PR-2	PT-5 PR-2	PT-5 PR-2	PT-5 PR-2
Round:		Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Laboratory ID:		99-16105	99-20852	99-24868	99-28328	99-30550	99-33547
Sample Matrix:		Water	Water	Water	Water	Water	Water
Sample Date:		02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99
Report Date:		March 18, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 8, 1999	August 13, 1999
Revised Report Date:			April 13, 1999	•	•	•	
Major Ions		**Units**	**Reporting Limit**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
Calcium	Ca	mg/L	1.0	12.9	13.4	14.8	14.0	14.6	14.0
Magnesium	Mg	mg/L	1.0	3.5	4.3	4.2	4.0	4.0	4.4
Sodium	Na	mg/L	1.0	346	355	360	349	355	351
Potassium	K	mg/L	1.0	10.5	11.2	12.0	11.2	12.2	12.0
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	HCO_3	mg/L	1.0	405	407	421	400	405	401
Sulfate	SO_4	mg/L	1.0	302	325	334	352	356	334
Chloride	Cl	mg/L	1.0	127	127	134	135	141	126
Ammonium as N	NH_4	mg/L	0.05	0.08	0.06	0.09	0.08	0.09	0.14
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoride	F	mg/L	0.10	0.58	0.49	0.51	0.50	0.49	0.58
Silica	SiO_2	mg/L	1.0	14.0	16.2	16.8	15.5	14.2	14.2
Non-Metals									
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1070	1060	1080	1100	1090	1050
Conductivity		µmhos/c	1.0	1750	1740	1760	1790	1740	1750
Alkalinity	$CaCO_3$	mg/L	1.0	332	334	345	328	332	329
pH		std. unit	0.10	8.06	8.06	8.22	8.13	8.09	8.17
Trace Metals									
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	As	mg/L	0.001	0.011	0.011	0.014	0.010	0.012	0.011
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Boron	B	mg/L	0.10	0.41	0.42	0.27	0.39	0.39	0.39
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	Fe	mg/L	0.01	0.07	0.05	0.04	0.07	0.07	0.07
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	Mn	mg/L	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	Mo	mg/L	0.01	0.05	0.06	0.05	0.07	0.07	0.08
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	Se	mg/L	0.001	0.001	0.002	0.002	0.001	0.002	0.002
Vanadium	V	mg/L	0.01	0.09	0.08	0.09	0.07	0.07	0.06
Zinc	Zn	mg/L	0.01	< 0.01	0.03	0.02	0.03	0.02	0.02
Radiometrics									
Uranium	^{238}U	mg/L	0.0003	2.06	2.36	2.22	1.68	2.36	2.40
Radium 226	^{226}Ra	pCi/L	0.2	263	243	248	259	246	233
Radium Error Estimate ±				5.5	4.7	4.8	5.0	4.5	4.7
Quality Assurance Data			**Target Range**						
Anion		meq		16.55	17.06	17.67	17.73	18.06	17.13
Cation		meq		16.27	16.87	17.07	16.52	16.83	16.66
WYDEQ A/C Balance		%	-5 - +5	-0.84	-0.56	-1.72	-3.54	-3.52	-1.37
Calc TDS		mg/L		1020	1059	1087	1082	1101	1057
TDS A/C Balance		dec. %	0.80 - 1.20	1.05	1.00	0.99	1.02	0.99	0.99

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LABORATORY ANALYSIS REPORT - CROW BUTTE RESOURCES

Sample ID:	PR-4	PR-4 (PA1-1)	PR-4 (PA1-1)	PR-4 (PA1-1)	PR-4 (PA1-1)	PR-4 (PA1-1)	PR-4 (PA1-1)
Round:	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7
Laboratory ID:	99-16108	99-20861	99-24867	99-28325	99-30552	99-33548	[illegible]
Sample Matrix:	Water	Water	Water	Water	Water	Water	Water
Sample Date:	02-19-99	03-18-99	04-15-99	05-20-99	06-17-99	07-15-99	[illegible]
Report Date:	March 12, 1999	April 12, 1999	May 6, 1999	June 8, 1999	July 6, 1999	August 13, 1999	[illegible]
Revised Report Date:		April 15, 1999	•	•	•	•	

Major Ions		Units	Reporting Limit	Results	Results	Results	Results	Results	Results	Results
Calcium	Ca	mg/L	1.0	16.8	21.5	20.4	19.6	21.1	14.0	[illegible]
Magnesium	Mg	mg/L	1.0	4.4	5.6	5.4	5.3	5.4	4.2	[illegible]
Sodium	Na	mg/L	1.0	341	362	369	348	365	271	[illegible]
Potassium	K	mg/L	1.0	11.8	13.2	13.8	13.0	14.6	11.0	[illegible]
Carbonate	CO_3	mg/L	1.0	< 1.0	< 1.0	5.7	< 1.0	< 1.0	< 1.0	[illegible]
Bicarbonate	HCO_3	mg/L	1.0	413	442	444	460	468	399	[illegible]
Sulfate	SO_4	mg/L	1.0	319	345	337	347	354	225	[illegible]
Chloride	Cl	mg/L	1.0	124	130	132	130	134	76.0	[illegible]
Ammonium as N	NH_4	mg/L	0.05	0.07	0.07	0.11	0.08	0.11	0.15	[illegible]
Nitrite as N	NO_2	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	[illegible]
Nitrate + Nitrite as N	$NO_3 + NO_2$	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	[illegible]
Fluoride	F	mg/L	0.10	0.39	0.48	0.42	0.44	0.43	0.79	[illegible]
Silica	SiO_2	mg/L	1.0	14.5	17.9	19.0	17.0	15.9	14.5	[illegible]

Non-Metals										
Total Dissolved Solids @ 180°C	TDS	mg/L	2.0	1060	1130	1140	1120	937	839	[illegible]
Conductivity		µmho/c	1.0	1760	1860	1810	1820	2420	1340	[illegible]
Alkalinity	$CaCO_3$	mg/L	1.0	339	362	372	377	384	327	[illegible]
pH		std. unit	0.10	8.24	8.20	8.36	8.18	8.21	8.28	[illegible]

Trace Metals										
Aluminum	Al	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	[illegible]
Arsenic	As	mg/L	0.001	0.004	0.004	0.003	0.002	0.002	0.002	[illegible]
Barium	Ba	mg/L	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	[illegible]
Boron	B	mg/L	0.10	0.42	0.41	0.26	0.37	0.36	0.33	[illegible]
Cadmium	Cd	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	[illegible]
Chromium	Cr	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	[illegible]
Copper	Cu	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	[illegible]
Iron	Fe	mg/L	0.01	0.02	0.03	0.04	< 0.01	0.05	0.04	[illegible]
Lead	Pb	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	[illegible]
Manganese	Mn	mg/L	0.01	0.01	0.02	0.02	0.02	0.02	0.01	[illegible]
Mercury	Hg	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	[illegible]
Molybdenum	Mo	mg/L	0.01	< 0.05*	0.03	0.04	0.08	0.07	0.04	[illegible]
Nickel	Ni	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	[illegible]
Selenium	Se	mg/L	0.001	0.001	0.001	0.002	< 0.001	0.001	0.001	[illegible]
Vanadium	V	mg/L	0.01	0.04	0.02	0.01	0.02	0.01	0.01	[illegible]
Zinc	Zn	mg/L	0.01	< 0.01	0.01	0.01	0.02	0.01	< 0.01	[illegible]

Radiometrics										
Uranium	^{238}U	mg/L	0.0003	1.62	3.43	3.74	4.08	3.88	3.56	[illegible]
Radium 226	^{226}Ra	pCi/L	0.2	105	168	155	155	166	99.1	[illegible]
Radium Error Estimate ±				3.7	3.8	3.8	3.8	3.7	3.0	[illegible]

Quality Assurance Data		Target Range								
Anion	meq		16.96	18.12	18.21	18.46	18.86	13.42	[illegible]
Cation	meq		16.35	17.64	17.89	16.90	17.77	13.14	[illegible]
WYDEQ A/C Balance	%	-5 - +5	-1.81	-1.35	-0.88	-4.40	-2.97	-1.05	[illegible]
Calc TDS	mg/L		1039	1117	1124	1111	1145	816	[illegible]
TDS A/C Balance	dec. %	0.80 - 1.20	1.02	1.01	1.01	1.01	0.82	1.03	[illegible]

*Molybdenum was analyzed at a detection limit of 0.05 for this Round.

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COMPLETE ANALYTICAL SERVICES

Appendix 7

NDEQ Acceptance of Mine Unit 1 Restoration

STATE OF NEBRASKA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Suite 400, The Atrium
1200 'N' Street
P.O. Box 98922
Lincoln, Nebraska 68509-8922
Phone (402) 471-2186

Mike Johanns
Governor

NOV 18 1999

Mr. Steve Collings
Crow Butte Resources, Inc.
1670 Broadway, Suite 3450
Denver, CO 80202

Dear Mr. Collings:

As per the Departments request for a submittal of monitoring well locations for the boundaries of mine units 2 and 3, the locations were presented via telephone on October 22, 1999 by Mr. Michael Griffin of CBR. Three production/injection wells (PR8, IJ13, and PR15) which meet the screened interval requirements were proposed for this purpose. Wells PR8 and PR15 would monitor the boundary of Mine Unit 2 and well IJ13 would monitor the boundary of Mine Unit 3. It was also proposed that sampling of the three monitoring wells would be completed at the time restoration was completed for each Mine Unit.

The Department has reviewed this proposal and determined that the location and construction of the proposed monitoring wells is acceptable. However, sampling of these three monitoring wells should be the same as the current production zone monitoring well schedule (biweekly) for each Mine Unit.

The Department hereby accepts the restoration of Mine Unit 1. All production/injection and monitoring wells associated with Mine Unit 1 may be abandoned according to Title 122, Chapter 36 and Tilte 178, Chapter 12.

If you have any questions concerning this matter, please contact David Miesbach of my staff at (402) 471-0096. Thank-you.

Sincerely,

Michael Linder
Director

ML/ML/dlm
dave/cbr/letter/mu1don2.doc
pc: Dave Carlson, NDEQ
Mike Griffin, CBR