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BRAD HENRY
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January 31, 2005

Ursula Lennox (6SF-LL)
US EPA – Region VI
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Re: Long Term Monitoring at Tar Creek, a part of After Action Monitoring

Dear Ursula:

Please find the analytical results for the third round of samples of the Long Term Monitoring (LTM) project at Tar Creek for the Roubidoux aquifer. The results are presented in the report attached for your review.

Please let me know if you have any comments. Thank you for your attention to this matter. If you have any questions please call me at (405) 702-5124.

Sincerely,

A handwritten signature in black ink that reads "David A. Cates". The signature is written in a cursive style with a long horizontal stroke at the end.

David A. Cates, P.E.
Land Protection Division

Long Term Monitoring Report (Third Round of Semi-annual Roubidoux Samples)
January 2005

Introduction:

The third round of samples of the Long Term Monitoring (LTM) project at Tar Creek for the Roubidoux aquifer was collected in October 2004. The analytical results are shown in Table 1. The previous results for the LTM wells are also included in the table. A map with the well locations (Figure 1) is attached along with graphs of the Picher #5 iron and sulfate concentrations over time (Figure 2), and a Piper Diagram for the water samples from the LTM wells (Figure 3).

The primary and secondary MCLs are identified in the header of the table for data comparison. The tolerance limits and Roubidoux background concentrations for the indicator parameters of mine water contamination are provided in the footnotes. The indicator parameters are: sulfate, iron, and zinc. The values for tolerance limits and Roubidoux background concentrations, respectively, are: 82 mg/l & 25 mg/l for **sulfate**; 207 ug/l & 61.5 ug/l for **iron**; and 43 ug/l & 8.8 ug/l for **zinc**. These parameters and their values were determined in Phase I of After Action Monitoring (AAM) of the Roubidoux at Tar Creek and are included in the Phase II AAM report "Summary of Roubidoux Water Quality Tests" (September, 2002).

QA/QC: Blanks, RPD, Cation-Anion Balance:

The analytical methods for metals analyses defined in the QAPP for the LTM project (EPA 200.8) were used for this round of sampling and the reporting limits (detection limits) for all the parameters analyzed are below the respective MCL values. The analytical results for antimony and thallium in all samples tested this time, as in previous analyses prior to the second round of LTM sampling, are less than the reporting limits of 2 ug/l and 1 ug/l, respectively. The analytical results of the second round of samples for antimony and thallium using EPA method 200.7 showed all LTM wells were below 10 ug/l detection limit. However, these were above the MCLs of 6 ug/l and 2 ug/l, respectively for antimony and thallium. This is not considered a problem since these parameters have never been detected above the MCLs in previous sampling events.

The Miami #1 well was inoperable at the time of sampling so the nearby Miami #3 well was substituted to provide a Roubidoux sample from outside the mine area for inter-well water quality comparisons. The Miami #3 well is located about 1/2 mile south of the Miami #1 well as shown on the figure. It is of similar age and completed similarly as indicated on the list of LTM wells. Historical water quality and production data is also available for the Miami #3 well.

The blanks for all three days of sampling showed no exceedances of detection limits for all parameters. For the three duplicates taken this round of sampling, the relative percent difference (RPD) calculations showed mostly less than 20 percent difference between the duplicate concentrations and the respective sample concentrations. A 33 percent difference between the

sample and the duplicate was calculated for dissolved (filtered) lead at the Fernandez well. This is acceptable considering the low concentrations of only 15 and 21 ug/l for the duplicates. Sulfate was just slightly greater than 20 percent (RPD = 21.7%). The wellhead samples from the Fernandez well are collected at a faucet in the water line exiting a pressure vessel that controls the activation of the downhole pump. The intermittent activation of the well pump by the pressure vessel during purging and sampling, as well as the location of the sampling port after the pressure vessel, may be sources of the sampling error indicated by the RPD values greater than 20 percent at this well.

The cation-anion balance calculations for the duplicate samples at the Fernandez well were both less than 10 percent indicating good analytical results for the major cations and anions. The cation-anion balance calculations were good (< 10 %) for all samples.

Results:

The Commerce #5, the Quapaw #4, and the Rural Water District #4 (Bluehole well) again have the best water quality, with specific conductance (SC) values less than 300 uS/cm, and total dissolved solids (TDS) concentrations less than 200 mg/l. The concentrations of sulfate, iron and zinc, the indicator parameters of mine water contamination, are below tolerance limits and are at or below background concentrations in these wells and at the Miami #3 well. The total iron concentration of 92 ug/l in the unfiltered sample from the Commerce #5 well is slightly above the background level of 61.5 ug/l for iron in the Roubidoux. However, the water from this well is considered representative of Roubidoux background concentrations because the dissolved iron concentration (filtered sample) is less than 20 ug/l. The unfiltered sample may contain some rust particles that probably are the cause for the slightly elevated total iron above background.

The primary MCL for lead (15 ug/l) was violated in the filtered sample and filtered duplicate at the Fernandez well. However, the total lead concentrations (unfiltered samples) for the duplicates from this well were less than reporting limits of 5 ug/l. Except for the aforementioned dissolved lead concentrations at the Fernandez well, no other exceedances of primary drinking water standards were observed at any other wells. Secondary standards were violated in the Picher #6, Quapaw #5, and the Fernandez wells for iron. The Quapaw #5 also had violations of SMCLs for sulfate and total dissolved solids concentrations. The well owners will be notified of these LTM results.

Three wells showed impacts by mine water: Quapaw #5, Picher #6 and the Fernandez well. Each well is discussed below. Mine water impacts are concluded when the indicator parameter concentrations exceed the tolerance limits. These are shown in bold type in Table 2 below.

Tests of the Quapaw #5 well continue to show that the Roubidoux water near this well is of very poor quality, exceeding secondary standards for iron, total dissolved solids (TDS), and sulfate. The iron, TDS, and sulfate concentrations observed are 3,060 ug/l, 1,010 mg/l and 410 mg/l, respectively. The manganese concentration (43 ug/l) is near the standard of 50 ug/l. Concentrations for all three of the indicator parameters (410 mg/l, 3,060 ug/l and 178 ug/l, respectively for sulfate, iron and zinc) are greater than tolerance limits at this well. Although the water is considered treatable (TDS < 3,000 mg/l), this well is not hooked up to the public water system. The concentrations for all three indicator parameters at the Fernandez well also exceed

tolerance limits so both of these wells are considered impacted by mine water. In the case of the Picher #5 well, that is relatively new and has casing installed to a depth of 850 feet, it can be concluded that the Roubidoux aquifer is impacted by mine water near this well.

Table 2: Concentrations of Indicator Parameters in LTM Wells.

WELL	Zinc (ug/l)		Iron (ug/l)		Sulfate (mg/l)
Background Conc.	8.8		61.5		25
Tolerance Limit	43		207		82
Secondary MCL	5,000		300		250
	Total	Dissolved	Total	Dissolved	
Cardin #1	9	<5	<i>126.5</i>	<i>114</i>	107
Commerce #4	<5	<5	90	86	126
Commerce #5	<5	<5	92	<20	13
<u>Fernandez</u>	247.5	158.5	353.5	330.2	103.7
Miami #1	<i>ns</i>	<i>ns</i>	Ns	ns	ns
<u>Miami #3</u>	<5	<5	<20	<20	13.5
Picher #5	<5	<5	<i>171</i>	<i>151</i>	140
Picher #6	<i>21</i>	<i>20</i>	531	507	170
Picher #7	<5	<5	<i>127</i>	<i>121</i>	112
<u>Quapaw #4</u>	<5	<5	<20	<20	12.75
Quapaw #5	178	160	3,060	2,750	410
RWD4 #4	<5	<5	26	<20	10.2

* Note: Bold type indicates value greater than tolerance limit.

Italicized values are above background but below tolerance limits.

Underlined wells have duplicate samples and mean values shown were calculated.

Detection limit values were used in calculation of means.

Ns - not sampled.

Concentrations greater than tolerance limits for two of three indicator parameters were observed at the Picher #6 well. Specifically, the iron and sulfate concentrations exceeded tolerance limits, but the zinc concentrations, though greater than background values, did not. The sulfate and iron concentrations are: 170 mg/l and 531 ug/l, respectively. The Picher #6 continues to show improved water quality compared to the first samples collected just after the well was completed in October 2000. The iron and sulfate concentrations are slightly greater than the last sampling event but much less than the initial sampling event on October 17, 2000, where sulfate and iron concentrations of 307 mg/l and 2,304 ug/l, respectively, were measured after purging for about 1 week. In subsequent sampling events the well was purged for only 24 hours prior to sample collection. This time the well was purged for four days to evaluate whether well purging was the cause of the initial high concentrations. Increased purging did not show an increase in concentrations compared to purging for 24 hours in previous sampling events. The probable explanation for the improved iron and sulfate concentrations is the presence of an inflatable packer in the well that was installed in 2001 after the well was first tested. This well is not hooked up to any distribution system and is not used as a public water supply well.

The iron concentration in the Picher #5 well decreased since the last sampling event as seen in Table 1 and the graph (Figure 2). The higher than normal iron concentration at the Picher #5, observed in April 2004 and the spike in 2001, are attributed to holes in the production pipe that

allows some of the water to circulate out of the production pipe, down the casing, into the water column, and back into the pipe through the downhole pump. This re-circulating process allows iron (i.e., rust) from the casing and the outside of the production pipe to enter the produced water. A few days after sampling in April 2004, the well was taken out of service to pull the downhole equipment as a result of the low water production from the well. Several ‘washouts’ (i.e., holes) were discovered at the pipe connections and repaired. Then the well was placed back in service shortly thereafter. During the downtime the city produced water from the Picher #7 well that was drilled in 2000 for discrete sampling of the Roubidoux as part of the TCAAM Phase II project. It has similar but slightly better water quality than the Picher #5.

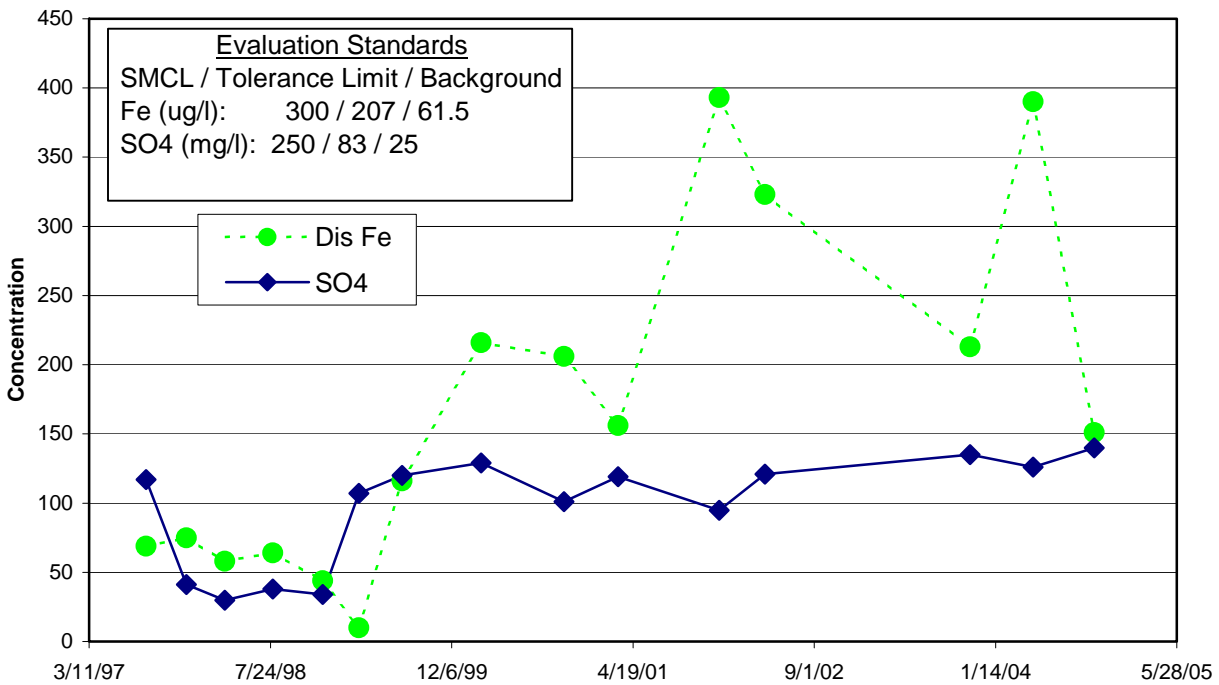


Figure 2: PICHER # 5 WELL (Dissolved Iron & Sulfate Concentrations)

Concentrations greater than tolerance limits for one of the three indicator parameters were observed at the Cardin Well (sulfate = 107 mg/l), Commerce #4 (sulfate = 126 mg/l), Picher #5 (sulfate = 140 mg/l), and Picher #7 (sulfate = 112 mg/l). The tolerance limit for sulfate is 82 mg/l. While the iron concentrations in these wells are above Roubidoux background values, both iron and zinc concentrations are below tolerance limits of 207 and 43 ug/l, respectively. Since all three wells in Picher and the Cardin well had sulfate concentrations greater than the tolerance limit, **possible** impacts from mine water to the Roubidoux near Picher and Cardin are indicated.

The Piper diagram (Figure 3) of the LTM water quality data shows that all but four wells are impacted slightly by mine water. This is graphically displayed in the lower right triangle of the diagram where the points representing the anion percentage composition of the water samples from the four wells (Commerce #5, Miami #3, Quapaw #4, and RWD4#4) plot near the Roubidoux background endpoint. The points representing the anion composition of the other wells plot midway between the mine water and Roubidoux background endpoints. The sodium and chloride concentrations in the Miami #3 well are relatively high compared to the other

Roubidoux background wells. As a result the point representing the Miami #3 water plots toward the Na and Cl apexes of the cation and anion triangles, respectively. The higher sodium and chloride concentrations may be the result of saltwater intrusion toward the large pumping center at Miami from deeper formations below the Roubidoux or from the west where the Roubidoux occurs at greater depths and contains greater sodium chloride water.

TABLE 1: Analytical Data for Tar Creek Long Term Monitoring of Roubidoux Wells

WELL	DATE	Spec Cond (Field) uS/cm	Temp (Field) °C	pH (Field)	D.O. mg/l	Alk (Field) CaCO ₃ mg/l	Alkalinity CaCO ₃ mg/l	Chloride Cl mg/l	Sulfate SO ₄ mg/l	Tot Dis Sol TDS mg/l	Hardness CaCO ₃ mg/l	Calcium Ca mg/l	Magnesium Mg mg/l	Sodium Na mg/l	Potassium K mg/l	
		MCL/(SMCL)						(250)	(250)	(500)						
Cardin #1:		SW SE SE 19-T29N-R23E; N 36 58 23.3, W 94 51 07.2, EL=817; TD=1150														
	11/6/03	Totals	595	17.6	6.47	n.a.	145	149	27.1	134	388	281	61	30	17	3
		Dissolved	-	-	-	-	-	-	-	-	-	-	61	30	17	3
	4/27/04	Totals	334	19.6	7.43	3.48	150	138	14.5	93.3	319	231	50	24	12	3
		Dissolved	-	-	-	-	-	-	-	-	-	-	50	24	12	3
	10/12/04	Totals	498	18.3	7.62	1.82	199	140	20.4	107	333	250	59	27	14	3
		Dissolved	-	-	-	-	-	-	-	-	-	-	56	26	13	3
		Averages	476	18.5	7.17	2.65	165	142	20.7	111.4	347	254	56	27	14	3
Commerce #4:		NW NE NW 6-T28N-R23E; N 36 56 31.9, W 94 52 21.1, EL=812; TD=1250														
	11/6/03	Totals	615	17.9	6.42	n.a.	153	150	37.9	119	383	260	61	26	28	3
		Dissolved	-	-	-	-	-	-	-	-	-	-	57	25	27	3
	4/27/04	Totals	403	18.7	7.75	3.39	218	144	59.5	107	409	252	54	24	35	3
		Dissolved	-	-	-	-	-	-	-	-	-	-	56	25	35	3
	10/12/04	Totals	614	19	7.47	1.61	183	148	43.5	126	403	270	65	27	29	3
		Dissolved	-	-	-	-	-	-	-	-	-	-	63	26	29	3
		Averages	544	18.5	7.21	2.50	185	147	47.0	117.3	398	261	59	26	31	3
Commerce #5 MW:		NW SE NW 6-T28N-R23E; N 36 56 19.4, W 94 52 17.9, EL=812; TD=1100														
	11/6/03	Totals	294	17.7	7.29	n.a.	108	112	15.6	12	155	127	26	13	11	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	26	13	11	2
	4/27/04	Totals	252	18.9	7.82	5.75	158	111	< 10	11.8	158	122	25	13	8	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	25	13	8	2
	* 4/27/04	Totals	252	18.9	7.82	5.75	158	111	< 10	11.8	158	123	25	13	8	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	26	13	8	2
	10/12/04	Totals	260	17.9	8.64	5.65	152	111	< 10	13	154	124	28	13	8	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	28	13	8	2
		Averages	265	18.4	7.89	5.72	144	111	11.4	12.2	156	124	26	13	9	2
Fernandez Well:		SE NW NW 24-T29N-R23E; N 36 59 04.7, W 94 46 20.3, EL=852; TD=1050														
	7/30/03	Dis Met	370	18.2	8.19	n.a.	na	145.0	11.1	126.0	368	na	60	29	8	2
	10/6/03	Totals	257	18.3	7.08	n.a.	130	98.9	< 10.0	14.0	148	124	26	14	5	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	26	14	5	2
	* 10/6/03	Totals	257	18.3	7.08	n.a.	130	98.6	< 10.0	16.4	132	126	26	14	5	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	26	14	5	2
	11/4/03	Totals	252	17.1	7.83	n.a.	115	114.0	< 10.0	16.4	138	126	27	14	5	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	27	14	5	2
	12/19/03	Totals	415	14.8	6.64	n.a.	125	147.0	< 10.0	85.5	274	213	46	23	8	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	46	24	8	2
	4/29/04	Totals	427	17.3	7.5	2.27	134	128	< 10.0	56.3	233	185	43	22	7	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	28	15	6	2
	* 4/29/04	Totals	427	17.3	7.5	2.27	134	144	< 10.0	103	328	236	39	20	7	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	28	15	6	2
	10/11/04	Totals	445	15.4	7.41	2.09	128	138	< 10.0	92.4	284	219	57	27	8	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	56	26	8	2
	* 10/11/04	Totals	445	15.4	7.41	2.09	128	148	< 10.0	115	327	248	57	27	8	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	54	25	7	2
		Averages	366	17	7.40	2.18	128	129.1	10.1	69.4	248	185	40	20	7	2

WELL	DATE	Antimony Sb mg/l	Arsenic As mg/l	Cadmium Cd mg/l	Chromium Cr mg/l	Iron Fe mg/l	Lead Pb mg/l	Manganese Mn mg/l	Mercury Hg mg/l	Nickel Ni mg/l	Selenium Se mg/l	Thallium Tl mg/l	Zinc Zn mg/l	CAT / AN BALANCE % Error
		0.006	0.01	0.005	0.1	(0.3)	0.015	0.05	0.002	0.1	0.05	0.002	(5)	
Cardin #1:														
	11/6/03	< 0.002	< 0.002	< 0.002	< 0.010	0.101	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.022	-1.58
		< 0.002	< 0.002	< 0.002	< 0.010	0.098	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	4/27/04	< 0.010	< 0.010	< 0.005	< 0.005	0.132	< 0.010	0.009	0.00005	< 0.010	< 0.010	< 0.010	0.033	-0.39
		< 0.010	< 0.010	< 0.005	< 0.005	0.112	< 0.010	0.009	< 0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
	10/12/04	< 0.002	< 0.002	< 0.002	< 0.010	0.139	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.009	2.19
		< 0.002	< 0.002	< 0.002	< 0.010	0.114	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
		0.005	0.005	0.003	0.008	0.116	0.007	0.010	0.0001	0.010	0.010	0.004	0.014	0.07
Commerce #4:														
	11/6/03	< 0.002	< 0.002	< 0.002	< 0.010	0.095	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	-0.50
		< 0.002	< 0.002	< 0.002	< 0.010	0.086	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	4/27/04	< 0.010	< 0.010	< 0.005	< 0.005	0.087	< 0.010	0.009	< 0.00005	< 0.010	< 0.010	< 0.010	< 0.005	-3.94
		< 0.010	< 0.010	< 0.005	< 0.005	0.085	< 0.010	0.010	< 0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
	10/12/04	< 0.002	< 0.002	< 0.002	< 0.010	0.090	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	-0.03
		< 0.002	< 0.002	< 0.002	< 0.010	0.086	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
		0.005	0.005	0.003	0.008	0.088	0.007	0.010	0.0001	0.010	0.010	0.004	0.007	-1.49
Commerce #5 MW:														
	11/6/03	< 0.002	< 0.002	< 0.002	< 0.010	0.080	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	-0.53
		< 0.002	< 0.002	< 0.002	< 0.010	0.048	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.010	
	4/27/04	< 0.010	< 0.010	< 0.005	< 0.005	0.093	< 0.010	< 0.010	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	-0.53
		< 0.010	< 0.010	< 0.005	< 0.005	0.034	< 0.010	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
	* 4/27/04	< 0.010	< 0.010	< 0.005	< 0.005	0.114	< 0.010	< 0.010	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	-0.53
		< 0.010	< 0.010	< 0.005	< 0.005	0.039	< 0.010	< 0.010	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
	10/12/04	< 0.002	< 0.002	< 0.002	< 0.010	0.092	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	1.70
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
		0.006	0.006	0.004	0.008	0.065	0.008	0.010	0.0001	0.010	0.010	0.006	0.006	0.02
Fernandez Well:														
	7/30/03	na	na	na	na	0.410	0.056	< 0.010	na	< 0.010	na	na	0.239	-0.46
	10/6/03	< 0.002	< 0.002	< 0.002	< 0.010	0.208	0.017	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.050	3.20
		< 0.002	< 0.002	< 0.002	< 0.010	0.288	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.067	
	* 10/6/03	< 0.002	< 0.002	< 0.002	< 0.010	0.287	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.065	2.34
		< 0.002	< 0.002	< 0.002	< 0.010	0.224	0.008	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.033	
	11/4/03	< 0.002	< 0.002	< 0.002	< 0.010	0.316	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.083	-2.35
		< 0.002	< 0.002	< 0.002	< 0.010	0.246	0.013	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.070	
	12/19/03	< 0.002	< 0.002	< 0.002	< 0.010	0.319	0.026	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.236	-4.30
		< 0.002	< 0.002	< 0.002	< 0.010	0.464	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.464	
	4/29/04	< 0.010	< 0.010	< 0.005	< 0.005	0.359	< 0.010	0.006	0.00006	< 0.010	< 0.010	< 0.010	0.299	3.60
		< 0.010	< 0.010	< 0.005	< 0.005	0.238	0.012	< 0.005	< 0.00005	< 0.010	< 0.010	< 0.010	0.089	
	* 4/29/04	< 0.010	< 0.010	< 0.005	< 0.005	0.359	< 0.010	0.006	< 0.00005	< 0.010	< 0.010	< 0.010	0.228	-14.66
		< 0.010	< 0.010	< 0.005	< 0.005	0.249	< 0.010	< 0.005	< 0.00005	< 0.010	< 0.010	< 0.010	0.037	
	10/11/04	< 0.002	< 0.002	< 0.002	< 0.010	0.349	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.244	4.82
		< 0.002	< 0.002	< 0.002	< 0.010	0.343	0.015	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.148	
	* 10/11/04	< 0.002	< 0.002	< 0.002	< 0.010	0.358	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.251	-1.52
		< 0.002	< 0.002	< 0.002	< 0.010	0.318	0.021	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.169	
		0.004	0.004	0.003	0.009	0.314	0.013	0.009	0.0001	0.010	0.010	0.003	0.163	-1.04

WELL	DATE		Spec Cond (Field) uS/cm	Temp (Field) °C	pH (Field)	D.O. mg/l	Alk (Field) CaCO ₃ mg/l	Alkalinity CaCO ₃ mg/l	Chloride Cl mg/l	Sulfate SO ₄ mg/l	Tot Dis Sol TDS mg/l	Hardness CaCO ₃ mg/l	Calcium Ca mg/l	Magnesium Mg mg/l	Sodium Na mg/l	Potassium K mg/l	
		MCL/(SMCL)				(250)	(250)	(500)									
Miami #1:	SW NE SW 30-T28N-R23E; N 36 52 30.9, W 94 52 23.4; EL=790; TD=1233																
	11/4/03	Totals	500	15.7	7.15	n.a.	na	117.0	83.6	12.4	262	133	30	15	50	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	30	15	50	3	
	* 11/4/03	Totals	500	15.7	7.15	n.a.	na	116.0	84.5	12.5	264	135	29	14	49	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	30	15	50	3	
	4/27/04	Totals	413	19.6	8.27	3.3	120	112	78.8	12.6	265	133	29	14	47	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	28	14	45	2	
		Averages	471	17.0	7.52	3.30	120	115	82.3	12.5	264	134	29	15	49	3	
Miami #3:	NE NW 31-T28N-R23E; N 36 52 10.28, W 94 52 23.82; EL=783; TD=1252																
	10/12/04	Totals	506	16.5	8.00	1.65	102	114	97.2	13.4	293	134	30	14	57	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	32	15	56	3	
	* 10/12/04	Totals	506	16.5	8.00	1.65	102	114	95.7	13.6	291	132	28	13	54	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	30	14	56	3	
		Averages	506	16.5	8.00	1.65	102	114	96.5	13.5	292	133	30	14	56	3	
Picher #5-MW:	SE SE NE 29-T29N-R23E; N 36 57 55.6, W 94 49 54.7; GL(topo)=815; TD=1100.																
	11/5/03	Totals	590	14	6.52	n.a.	na	140	25.6	135	381	278	61	29	18	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	59	28	18	3	
	4/27/04	Totals	536	20.7	7.33	3.19	142	134	28.3	126	384	253	55	26	19	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	55	27	18	3	
	10/12/04	Totals	569	18.3	7.68	2.33	122	136	26.4	140	398	279	63	29	17	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	62	28	17	3	
		Averages	565	17.7	7.18	2.76	132	137	26.8	133.7	388	270	59	28	18	3	
Picher #6 MW:	SE NW NW 21-T29N-R23E; N 36 59 00.7, W 94 49 38.7, EL=824 Topo; TD=1100																
	12/9/03	Totals	537	18.2	6.83	n.a.	135	143	< 10	150	380	280	65	29	13	2	
		Dissolved	-	-	-	-	-	-	-	-	-	-	60	27	12	2	
	* 12/9/03	Totals	537	18.2	6.83	n.a.	135	142	< 10	150	381	277	64	29	13	2	
		Dissolved	-	-	-	-	-	-	-	-	-	-	61	27	12	2	
	4/27/04	Totals	555	20.9	7.26	4.92	157	143	< 10	156	407	293	63	29	14	2	
		Dissolved	-	-	-	-	-	-	-	-	-	-	62	29	13	2	
	10/11/04	Totals	553	19.1	7.44	2.06	193	147	< 10	170	417	303	71	30	13	2	
		Dissolved	-	-	-	-	-	-	-	-	-	-	71	30	13	2	
		Averages	546	19.1	7.09	3.49	155	144	10.0	156.5	396	288	65	29	13	2	
Picher #7 MW:	aka: PICHER - CARDIN MW; NW SE SW 20-T29N-R23E; N 36 58 28.2, W 94 50 38.3, EL=815; TD=1100																
	11/5/03	Totals	563	14.7	6.89	n.a.	na	145	< 10	141	374	284	60	31	12	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	59	31	12	3	
	4/27/04	Totals	480	20.2	7.5	4.35	105	134	12.6	112	335	237	51	26	12	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	49	26	12	3	
	10/12/04	Totals	483	17.9	7.83	1.31	129	136	13.5	112	306	244	54	26	12	3	
		Dissolved	-	-	-	-	-	-	-	-	-	-	55	27	12	3	
		Averages	509	17.6	7.41	2.83	117	138	12.0	121.7	338	255	55	28	12	3	

WELL	DATE	Antimony Sb mg/l	Arsenic As mg/l	Cadmium Cd mg/l	Chromium Cr mg/l	Iron Fe mg/l	Lead Pb mg/l	Manganese Mn mg/l	Mercury Hg mg/l	Nickel Ni mg/l	Selenium Se mg/l	Thallium Tl mg/l	Zinc Zn mg/l	CAT / AN BALANCE % Error
		0.006	0.01	0.005	0.1	(0.3)	0.015	0.05	0.002	0.1	0.05	0.002	(5)	
Miami #1:														
	11/4/03	< 0.002	< 0.002	< 0.002	< 0.010	0.372	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.010	0.29
		< 0.002	< 0.002	< 0.002	< 0.010	0.062	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	* 11/4/03	< 0.002	< 0.002	< 0.002	< 0.010	0.057	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	-1.58
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	4/27/04	< 0.010	< 0.010	< 0.005	< 0.005	1.130	< 0.010	0.012	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	-0.03
		< 0.010	< 0.010	< 0.005	< 0.005	0.042	< 0.010	< 0.005	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
		0.005	0.005	0.003	0.008	0.281	0.007	0.010	0.0001	0.010	0.010	0.004	0.008	-0.44
Miami #3:														
	10/12/04	< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	-0.89
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
	* 10/12/04	< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	-3.62
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
		0.002	0.002	0.002	0.010	0.020	0.005	0.010	0.0001	0.010	0.010	0.001	0.005	-2.26
Picher #5-MW:														
	11/5/03	< 0.002	< 0.002	< 0.002	< 0.010	0.232	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	-0.32
		< 0.002	< 0.002	< 0.002	< 0.010	0.213	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	4/27/04	< 0.010	< 0.010	< 0.005	< 0.005	0.433	< 0.010	0.007	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	-2.62
		< 0.010	< 0.010	< 0.005	< 0.005	0.390	< 0.010	0.007	0.00008	< 0.010	< 0.010	< 0.010	< 0.005	
	10/12/04	< 0.002	< 0.002	< 0.002	< 0.010	0.171	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	-0.24
		< 0.002	< 0.002	< 0.002	< 0.010	0.151	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
		0.005	0.005	0.003	0.008	0.265	0.007	0.009	0.0001	0.010	0.010	0.004	0.007	-1.06
Picher #6 MW:														
	12/9/03	< 0.002	0.002	< 0.002	< 0.010	0.464	< 0.005	0.013	< 0.00005	< 0.010	< 0.010	< 0.001	0.016	-0.13
		< 0.002	0.002	< 0.002	< 0.010	0.337	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.015	
	* 12/9/03	< 0.002	0.002	< 0.002	< 0.010	0.460	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.014	-0.37
		< 0.002	0.002	< 0.002	< 0.010	0.337	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.016	
	4/27/04	< 0.010	< 0.010	< 0.005	< 0.005	0.444	< 0.010	0.011	0.00005	< 0.010	< 0.010	< 0.010	0.015	-1.57
		< 0.010	< 0.010	< 0.005	< 0.005	0.414	< 0.010	0.011	0.00005	< 0.010	< 0.010	< 0.010	0.019	
	10/11/04	< 0.002	0.002	< 0.002	< 0.010	0.531	< 0.005	0.012	< 0.00005	< 0.010	< 0.010	< 0.001	0.021	-0.97
		< 0.002	0.002	< 0.002	< 0.010	0.507	< 0.005	0.012	< 0.00005	< 0.010	< 0.010	< 0.001	0.020	
		0.004	0.004	0.003	0.009	0.437	0.006	0.011	0.0001	0.010	0.010	0.003	0.017	-0.76
Picher #7 MW:														
	11/5/03	< 0.002	< 0.002	< 0.002	< 0.010	0.166	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	0.24
		< 0.002	< 0.002	< 0.002	< 0.010	0.160	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	4/27/04	< 0.010	< 0.010	< 0.005	< 0.005	0.078	< 0.010	0.005	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	-0.76
		< 0.010	< 0.010	< 0.005	< 0.005	0.072	< 0.010	< 0.005	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
	10/12/04	< 0.002	< 0.002	< 0.002	< 0.010	0.127	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	0.03
		< 0.002	< 0.002	< 0.002	< 0.010	0.121	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
		0.005	0.005	0.003	0.008	0.121	0.007	0.008	0.0001	0.010	0.010	0.004	0.007	-0.17

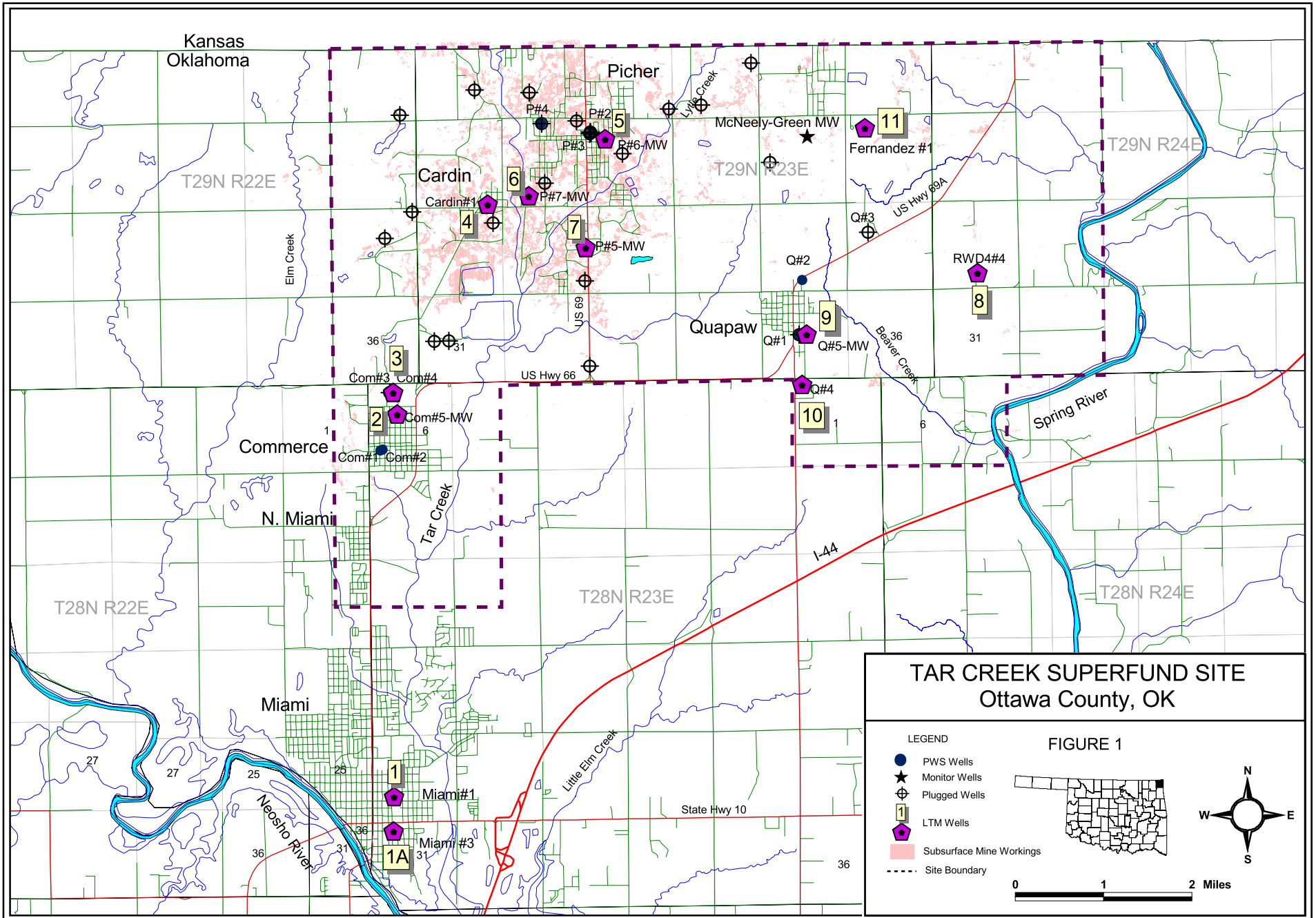
WELL	DATE	Spec Cond (Field) uS/cm	Temp (Field) °C	pH (Field)	D.O. mg/l	Alk (Field) CaCO ₃ mg/l	Alkalinity CaCO ₃ mg/l	Chloride Cl mg/l	Sulfate SO ₄ mg/l	Tot Dis Sol TDS mg/l	Hardness CaCO ₃ mg/l	Calcium Ca mg/l	Magnesium Mg mg/l	Sodium Na mg/l	Potassium K mg/l	
		MCL/(SMCL)						(250)	(250)	(500)						
Quapaw #4:		NW NW NW 1-T28N-R23E; N 36 56 33.4, W 94 47 11.2, EL(Topo)=845; TD=1350														
	11/6/03	Totals	249	17.7	7.03	n.a.	107	109	< 10	11.1	129	120	25	13	5	1
		Dissolved	-	-	-	-	-	-	-	-	-	-	24	13	5	1
*	11/6/03	Totals	249	17.7	7.03	n.a.	107	109	< 10	11.1	131	121	24	13	5	1
		Dissolved	-	-	-	-	-	-	-	-	-	-	25	13	5	1
	4/28/04	Totals	275	19.4	7.31	2.29	146	107	< 10	11.8	152	122	25	13	8	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	24	13	7	2
	10/13/04	Totals	242	17.4	7.86	1.43	124	104	< 10	12.7	149	121	27	14	5	1
		Dissolved	-	-	-	-	-	-	-	-	-	-	27	13	5	1
*	10/13/04	Totals	242	17.4	7.86	1.43	124	104	< 10	12.8	147	121	27	13	5	1
		Dissolved	-	-	-	-	-	-	-	-	-	-	27	14	5	1
		Averages	251	17.9	7.42	1.72	122	107	10.0	11.9	142	121	26	13	6	1
Quapaw #5 MW:		SW SW NE 35-T29N-R23E; N 36 57 04.4, W 94 47 07.3, EL=850 Topo; TD=1100														
	11/6/03	Totals	1427	18.5	6.41	n.a.	265	250	102	401	1050	751	146	70	58	8
		Dissolved	-	-	-	-	-	-	-	-	-	-	147	71	59	8
	4/28/04	Totals	1372	21.7	6.87	1.75	260	254	104	455	1083	754	148	71	59	8
		Dissolved	-	-	-	-	-	-	-	-	-	-	147	72	58	7
	10/13/04	Totals	1341	18.6	7.01	2.43	247	250	95.9	410	1010	739	159	70	53	7
		Dissolved	-	-	-	-	-	-	-	-	-	-	144	65	48	7
		Averages	1380	19.6	6.76	2.09	257	251	100.6	422.0	1048	748	149	70	56	8
RWD4 #4		(aka: Blue hole Well): NE SE SW 30-T29N-R24E; N 36 57 38.7, W 94 44 56.3, EL(Topo)=900; TD=1100														
	11/7/03	Totals	283	17.7	6.65	n.a.	110	114	14.8	< 10.0	133	135	27	15	6	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	27	15	6	2
*	11/7/03	Totals	283	17.7	6.65	n.a.	110	114	14.6	< 10.0	136	134	27	16	6	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	27	16	6	2
	4/28/04	Totals	273	19.9	7.42	3.34	124	110	15.2	< 10.0	160	135	26	15	6	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	26	15	6	2
*	4/28/04	Totals	273	19.9	7.42	3.34	124	110	15.2	< 10.0	159	132	25	15	6	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	26	15	6	2
	10/13/04	Totals	275	18.9	7.97	2.3	157	109	16.6	10.2	154	132	29	16	7	2
		Dissolved	-	-	-	-	-	-	-	-	-	-	28	15	6	2
		Averages	277	18.8	7.22	2.99	125	111	15.3	10.0	148	134	27	15	6	2

NOTE: 1) Detection limits used in calculation of means; 2) total and dissolved metals concentrations used in calculation of means; 3) means are in bold type; 4) Duplicate samples are highlighted with asterisk near date of sample; 5) a box indicates an MCL or SMCL violation; 6) shaded box is a Roubidoux background value; 7) underline indicates a value detected in blank; 8) na indicates not analyzed; 9) dash indicates not relevant; 10) Italics indicates value > Tolerance Limit; 11) Indicator parameters of mine water contamination with tolerance limits and Roubidoux background concentrations **Sulfate** (82 / 25 mg/l); **Iron** (207 / 61.5 ug/l); **Zinc** (43 / 8.8 ug/l).

WELL	DATE	Antimony Sb mg/l	Arsenic As mg/l	Cadmium Cd mg/l	Chromium Cr mg/l	Iron Fe mg/l	Lead Pb mg/l	Manganese Mn mg/l	Mercury Hg mg/l	Nickel Ni mg/l	Selenium Se mg/l	Thallium Tl mg/l	Zinc Zn mg/l	CAT / AN BALANCE % Error
		0.006	0.01	0.005	0.1	(0.3)	0.015	0.05	0.002	0.1	0.05	0.002	(5)	
Quapaw #4:														
	11/6/03	< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	-2.49
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	* 11/6/03	< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	-3.47
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	4/28/04	< 0.010	< 0.010	< 0.005	< 0.005	< 0.020	< 0.010	< 0.005	< 0.00005	< 0.010	< 0.010	< 0.010	0.005	0.94
		< 0.010	< 0.010	< 0.005	< 0.005	< 0.020	< 0.010	< 0.005	< 0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
	10/13/04	< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	2.20
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	0.005	
	* 10/13/04	< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	0.64
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
		0.004	0.004	0.003	0.009	0.020	0.006	0.009	0.0001	0.010	0.010	0.003	0.007	-0.44
Quapaw #5 MW:														
	11/6/03	< 0.002	0.005	< 0.002	< 0.010	<u>3.720</u>	< 0.005	0.046	< 0.00005	< 0.010	< 0.010	< 0.001	0.222	-1.40
		< 0.002	0.005	< 0.002	< 0.010	<u>3.690</u>	< 0.005	0.047	< 0.00005	< 0.010	< 0.010	< 0.001	0.213	
	4/28/04	< 0.010	< 0.010	< 0.005	< 0.005	<u>3.680</u>	< 0.010	<u>0.050</u>	< 0.00005	< 0.010	< 0.010	< 0.010	0.208	-4.43
		< 0.010	0.011	< 0.005	< 0.005	<u>3.580</u>	< 0.010	0.049	< 0.00005	< 0.010	< 0.010	< 0.010	0.194	
	10/13/04	< 0.002	0.005	< 0.002	< 0.010	<u>3.060</u>	< 0.005	0.043	< 0.00005	< 0.010	< 0.010	< 0.001	0.178	-0.18
		< 0.002	0.005	< 0.002	< 0.010	<u>2.750</u>	< 0.005	0.042	< 0.00005	< 0.010	< 0.010	< 0.001	0.160	
		0.005	0.007	0.003	0.008	3.413	0.007	0.046	0.0001	0.010	0.010	0.004	0.196	-2.00
RWD4 #4														
	11/7/03	< 0.002	< 0.002	< 0.002	< 0.010	0.044	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	-0.17
		< 0.002	< 0.002	< 0.002	< 0.010	0.038	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	* 11/7/03	< 0.002	< 0.002	< 0.002	< 0.010	0.045	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	1.33
		< 0.002	< 0.002	< 0.002	< 0.010	0.038	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.010	
	4/28/04	< 0.010	< 0.010	< 0.005	< 0.005	0.026	< 0.010	< 0.005	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	0.16
		< 0.010	< 0.010	< 0.005	< 0.005	0.027	< 0.010	< 0.005	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
	* 4/28/04	< 0.010	< 0.010	< 0.005	< 0.005	0.025	< 0.010	< 0.005	0.00005	< 0.010	< 0.010	< 0.010	< 0.005	-0.72
		< 0.010	< 0.010	< 0.005	< 0.005	0.029	< 0.010	< 0.005	< 0.00005	< 0.010	< 0.010	< 0.010	< 0.005	
	10/13/04	< 0.002	< 0.002	< 0.002	< 0.010	0.026	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	4.36
		< 0.002	< 0.002	< 0.002	< 0.010	< 0.020	< 0.005	< 0.010	< 0.00005	< 0.010	< 0.010	< 0.001	< 0.005	
		0.005	0.005	0.003	0.008	0.032	0.007	0.008	0.0001	0.010	0.010	0.005	0.007	0.99

NOTE:

- 1) Detection limits used in calculation of means; 2) total and dissolved metals concentrations used in calculation of means; 3) means are in bold type;
- 4) Duplicate samples are highlighted with asterisk near date of sample; 5) a box indicates an MCL or SMCL violation; 6) shaded box is a Roubidoux background value;
- 7) underline indicates a value detected in blank; 8) na indicates not analyzed; 9) dash indicates not relevant; 10) Italics indicates value > Tolerance Limit;
- 11) Indicator parameters of mine water contamination with tolerance limits and Roubidoux background concentrations **Sulfate** (82 / 25 mg/l); **Iron** (207 / 61.5 ug/l); **Zinc** (43 / 8.8 ug/l).



List of Long Term Monitoring Wells

- 1a. **Miami # 1:** SW NE SW S30-T28N-R23E (N 36° 52' 30.9'' W 94° 52' 23.4''); Public Water Supply Well; Elevation: 795'; Total Depth: 1233'; Casing Depth: 433'.
- 1b. **Miami #3:** SWNENW S31-T28N-R23E (N 36° 52' 06.0'' W 94° 52' 22.0''); Public Water Supply Well; Elevation: 783'; Total depth: 1252'; Casing Depth: 460'.
2. **Commerce # 5:** NW SE NW S6-T28N-R23E (N 36° 56' 19.4'' W 94° 52' 17.9''); Monitoring Well; Elevation: 810'; Total depth: 1100'; Casing Depth: 850'.
3. **Commerce # 4:** NW NE NW S6-T28N-R23E (N 36° 56' 31.9'' W 94° 52' 21.1''); Public Water Supply Well; Elevation: 812'; Total depth: 1,250'; Casing Depth: 680'.
4. **Cardin # 1:** SW SE SE S19-T29N-R23E (N 36° 58' 23.3'' W 94° 51' 07.2''); Public Water Supply Well; Elevation: 817'; Total depth: 1150'; Casing Depth: 600'.
5. **Picher # 6:** SE NW NW S21-T29N-R23E (N 36° 59' 00.7'' W 94° 49' 38.7''); Monitoring Well; Elevation: 822'; Total depth: 1100'; Casing Depth: 850'; Inflatable Packer at 800'.
6. **Picher # 7 (aka Picher-Cardin Well):** NW SE SW S20-T29N-R23E (N 36° 58' 28.2'' W 94° 50' 38.3''); Stand-By Well; Elevation: 814'; Total depth: 1100'; Casing Depth: 850'.
7. **Picher # 5:** SE SE NE S29-T29N-R23E (N 36° 57' 55.6'' W 94° 49' 54.7''); Public Water Supply Well; Elevation: 812'; Total depth: 1100'; Casing Depth: 850'.
8. **RWD4 # 4 (aka Bluehole Well):** NE SE SW S30-T29N-R24E (N 36° 57' 38.7'' W 94° 44' 56.3''); Public Water Supply Well; Elevation: 831'; Total depth: 1100'; Casing Depth: 800'.
9. **Quapaw # 5:** SW SW NE S35-T29N-R23E (N 36° 57' 04.4'' W 94° 47' 07.3''); Monitoring Well; Elevation: 850'; Total depth: 1100'; Casing Depth: 850'.
10. **Quapaw # 4:** NW NW NW S1-T28N-R23E (N 36° 56' 33.4'' W 94° 47' 11.2''); Public Water Supply Well; Elevation: 845'; Total depth: 1,350'; Casing Depth: 620'.
11. **Fernandez Well:** SE NW NW S24-T29N-R23E (N 36° 59' 04.7'' W 94° 46' 20.3''); Domestic Drinking Water Well; Elevation: 850'; Total depth: 1050'; Casing Depth: 450'.

FIGURE 3: PIPER PLOTS OF LTM WELLS
 Mine Water - Roubidoux Background Endpoints

Parameter	Mine Water	Roubidoux	Boone
Ca	395	31.7	53.4
Mg	133	14.4	1.75
Na	54	40.6	6.9
K	4	1.8	---
HCO ₃	61	124.9	149.9
SO ₄	1950	12.7	10.5
Cl	11.8	57.1	23.7
Fe	88	0.077	0.05
Al	4.9	---	---
Zn	175	0.005	0.015

Note: All values in mg/l

