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**Sampling and Analyses Report for June 1992
Semiannual Postburn Sampling at the RM1 UCG Site,
Hanna, Wyoming**

Topical Report

S.R. Lindblom

August 1992

Work Performed Under Contract No.: DE-FG21-88MC25038

For
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
The University of Wyoming Research Corporation
Western Research Institute
Laramie, Wyoming

MASTER

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at the RMI UCG Site, Hanna, Wyoming

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SUMMARY

During June 1992, groundwater was sampled at the site of the November 1987-February 1988 Rocky Mountain 1 (RM1) underground coal gasification test near Hanna, Wyoming. With a few exceptions, the groundwater is near baseline conditions. Data from the field measurements and analysis of samples are presented. Benzene concentrations in the groundwater were below analytical detection limits (<0.01 mg/L) for all wells except levels of 0.019 mg/L and 0.021 mg/L in coal seam wells EMW-3 and EMW-1, respectively.

INTRODUCTION

The Rocky Mountain 1 (RM1) underground coal gasification (UCG) test was conducted from November 16, 1987 through February 26, 1988 (United Engineers and Constructors 1989) at a site approximately one mile south of Hanna, Wyoming (Figure 1). The test consisted of dual module operation to evaluate the controlled retracting injection point (CRIP) technology, the elongated linked well (ELW) technology, and the interaction of closely spaced modules operating simultaneously. The test caused two cavities to be formed in the Hanna No. 1 coal seam and associated overburden. The Hanna No. 1 coal seam is approximately 30 ft thick and lays at depths between 350 ft and 365 ft below the surface in the test area. The coal seam is overlain by sandstones, siltstones and claystones deposited by various fluvial environments. Details of the geology and hydrology were reported by Oliver (1987) and Mason et al. (1987).

The groundwater monitoring was designed to satisfy the requirements of the Wyoming Department of Environmental Quality (WDEQ) in addition to providing research data toward the development of UCG technology that minimizes environmental impacts. Further background material and the sampling and analytical procedures associated with the sampling task are described in the Rocky Mountain 1 Postburn Groundwater Monitoring Quality Assurance Plan (Mason and Johnson 1988).

The June 1992 semiannual groundwater sampling took place from June 10 through June 13, 1992. This event occurred nearly 34 months after the second groundwater restoration at the RM1 site and was the fifteenth sampling event since UCG operations ceased. Samples were collected for analyses of a limited suite set of parameters as listed in Table 1 (Tables are located in Appendix A) with additional benzene samples from inner ring coal seam wells, according to the sampling schedule shown in Table 2.

SAMPLING ACTIVITIES

Water levels were measured across the site before any sampling activities were begun. Water table elevations in the coal seam aquifer rose approximately 3 ft since December 1991. Water level elevations measured on June 10, 1992 are listed in Table 3. A map of the potentiometric surface of the Hanna No. 1 coal seam (Figure 2) shows a hydraulic gradient from the southeast corner of the site to the northwest corner with a maximum elevation change of about 6 ft.

A total of 20 of the specified 22 wells were sampled during the June 1992 semiannual sampling. No sample was collected from unit C overburden well EMW-4 because of an obstruction in the well bore at a depth of approximately 115 ft. This obstruction was first encountered during the December 1990 quarterly sampling. This deletion was discussed with WDEQ at the May 23, 1991 Technical Advisory Subcommittee (TASc) meeting. CRIP cavity well CCW-1 was sampled in place of cavity well CPW-2 because roof collapse in the CRIP cavity caused the casing to shift in CPW-2 (Lindblom 1990). This substitution was approved by WDEQ

Figure 1. Location of Rocky Mountain 1 Underground Coal Gasification Site

Figure 2. Potentiometric Surface Map of the Hanna No. 1 Coal Seam on June 10, 1992

at the November 28, 1990 TASC meeting. An obstruction was encountered at a depth of 240 ft when lowering the sampling pump in well CCW-1. After several attempts, the sampling pump was successfully lowered to 335 ft. This depth is approximately 20 ft lower than was attained in previous sampling events.

Three quality assurance/quality control samples were also submitted to check sampling and analytical accuracy. All wells were sampled for the limited suite (LS) of parameters, which are listed in Table 1. In addition, samples for benzene analyses were collected from inner ring coal seam wells.

The sampling activities performed by Western Research Institute (WRI) at the RM1 site during June 1992 are summarized in Table 4. This list shows the wells sampled, sampling date, sampling method, sample parameter suite, and observations made during sampling.

The wells were purged before sample collection to ensure that the samples were obtained from the hydrostratigraphic unit and not from the well bore. Stabilization of purging parameters (purge time, temperature, conductivity, pH, Eh, water level, and pump discharge rate) was used to indicate formation water recovery. As required by WDEQ, wells were purged a minimum of 80 minutes at approximately 1.0 gal/min to ensure sampling of formation water. Flow rates were reduced only after 80 minutes of pumping to obtain a sample; except in the case of well EMW-10, where the water level in the well bore dropped below the pump after only 60 minutes. Data were collected at 20-minute intervals during well purging and recorded. Well purging data are listed in Appendix C.

Also included in Appendix C is the WRI groundwater sampling record form. This form includes general sampling information, stabilized purging parameter data, field alkalinity titration data, and analytical submissions. Appendix C contains these data for each well sampled.

DISCUSSION OF ANALYSES AND RESULTS

Analyses of samples collected during the June 1992 semiannual sampling has shown that most parameters are consistent with previous sampling events and that groundwater quality at the RM1 site is at or near baseline levels. Results from the limited suite analysis of cavity, coal seam, and overburden wells are listed in Tables 5 and 6.

Benzene concentrations at the RM1 site in June 1992 were below detection limits (<0.01 mg/L), except in coal seam wells EMW-1 and EMW-3. Well EMW-1 has shown benzene levels ranging from below detection limits to a high in recent years of 0.044 mg/L. In December 1991 and June 1992, benzene levels in EMW-1 remained near 0.02 mg/L, with 0.019 mg/L detected in December 1991 and 0.021 mg/L in June 1992. Benzene concentrations in EMW-3 have also remained constant. Results from December 1991 and June 1992 both show benzene concentrations of 0.019 mg/L. The low recovery on the benzene quality assurance/quality control sample (0.06 mg/L detected on 0.10 mg/L standard) leaves the possibility

open that the benzene concentrations in EMW-1 and EMW-3 may be higher than the analytical results of VOA (volatile organic analysis) samples indicate.

The highest baseline concentration (HBC) was established for some constituents prior to gasification operations at the RM1 site. These baseline concentrations are based on the highest concentrations measured in four sampling events over one year. Concentrations of total organic carbon (TOC), total dissolved solids (TDS), and ammonia exceeding HBC levels have been consistently measured in coal seam wells in the eastern section of the RM1 site. These high concentrations are probably due to an influx of water from off-site rather than directly resulting from UCG operations (Lindblom and Covell 1991). In June 1992, groundwater from six coal seam wells on the west side of the site exceeded HBC levels of TOC. HBC levels of ammonia were not exceeded in any coal seam wells. HBC levels of TDS in coal seam wells were only exceeded in cavity well VIW-1. Of overburden the wells, EMW-2 and EMW-8 exceeded overburden HBC levels of TDS, EMW-2 exceeded HBC levels of ammonia, and EMW-8 exceeded HBC levels of TOC (Table 7).

Boron concentrations in the CRIP and the ELW cavities have also consistently exceeded baseline levels (Table 7). Boron concentrations have exceeded HBC in non-cavity coal seam wells on four occasions since postburn sampling started. Boron concentrations have not exceeded HBC by more than 0.01 mg/L in any of the non-cavity coal seam wells at any time during the RM1 study. Two groundwater restorations at the RM1 site were unable to reduce these boron levels (Covell et al. 1992).

The values obtained for the limited suite parameters in June 1992 are comparable to baseline values (Table 8) obtained prior to gasification operations. Except for the instances noted above, the groundwater is near baseline conditions.

QUALITY ASSURANCE AND QUALITY CONTROL

The results of the quality assurance and quality control (QA/QC) standard, duplicate, and blank samples are presented in Table 9. Also included in the table are the expected results for each sample as determined by WRI's QA/QC officer, Dr. John McKay. The expected results for the duplicate sample were the results obtained from the regular sample of well EMW-1. Expected results for the blank sample were below analytical detection limits.

Acceptable variations from expected values are specific to each parameter. When the actual result is near or outside the acceptable limit, the parameter is reexamined to determine the cause. Questions concerning QA/QC acceptable limits should be addressed to WRI's QA/QC officer, Dr. John McKay or WRI's manager of analytical research, Dr. John Schabron.

Concentrated stock solutions were supplied by the WRI QA/QC officer and submitted as field standard samples. Field standards were designed to check analytical accuracy and the effects of transportation and

storage on samples of known concentrations. Standards of each element or compound to be analyzed were submitted anonymously within the regular sample set according to the instructions of the QA/QC officer. The sample preparation and analytical procedures were also supplied by the QA/QC officer.

All reported analyses for field standards were within acceptable limits with the exception of benzene and sulfide. The analysis of the cyanide standard was on the lower limit of acceptability. Benzene had an expected value of 0.100 mg/L and a reported value of 0.060 mg/L. The analyst stated that other standards run the day of the analyses were also low, yet were within the acceptable range of analyses. Recoveries are usually in the 0.080 to 0.100 mg/L range. The QA/QC officer recommended that the mass spectrometer be calibrated carefully in future experiments. Sulfide had an expected value of 8.3 mg/L and a reported value of 4.59 mg/L. The analyst suggested that the sulfide concentration of the standard was too high for the method and that volatility of the sulfide sample may be a problem. The QA/QC officer recommended that the concentration of the standard of the sulfide sample be reduced in future tests. The cyanide standard had an expected value of 0.315 mg/L and a reported value of 0.178 mg/L. This QA/QC sample was produced by a commercial supplier, ERA, in Colorado. The acceptable range quoted by ERA was 0.18 mg/L to 0.40 mg/L. Rounded to three significant figures, the value of 0.178 mg/L becomes 0.18 mg/L and falls within the acceptable limits.

A field duplicate sample was collected from well EMW-1, which has been one of the most contaminated wells at the RMI site. The regular and duplicate samples were prepared and preserved in an identical manner. The duplicate sample was submitted anonymously using a predetermined name. Field duplicates were designed to check analytical accuracy and precision. All values for the duplicate sample fell within an acceptable range of accuracy and precision.

Rinsate sampling is intended to simulate the rinsing that occurs while purging each well before sampling. For this reason, the amount of rinsate water pumped through the sampling system for rinsate sampling represents an average amount of water pumped from each well.

Seventy-five gallons of local tap water were pumped through the sampling system. The line was then evacuated using compressed air. Finally, 10 gallons of Type I water were pumped through the line and sampled. Type I water is high-purity, deionized, distilled water prepared in WRI's analytical laboratory using distilled water as a feedstock and processed through a Millipore water purification system. The Millipore system recirculates water through four cartridges (one carbon adsorption, one particulate trap, and two ion exchanges) and has a conductivity of less than 2 μ mhos/cm. The Type I water is, thus, assumed to be blank, and any level of parameters detected in the blank samples is assumed to be the result of cross-contamination from the sample line. The nitrite detected in the rinsate samples may be due to incomplete rinsing of the tap water in the sample line by the Type I water.

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DISCLAIMER

Mention of specific brand names or models of equipment is for information only and does not imply endorsement of any particular brand.

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APPENDIX A

Tables

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Table 1. Rocky Mountain 1 Groundwater Analysis Suites

Compliance Suite	Limited Suite	Full Suite	Field Measurements
Ammonia	Ammonia	Alkalinity	Alkalinity
Boron	Bicarbonate	Aluminum	Conductivity
Cyanide	Boron	Ammonia	Discharge Rate
Phenols	Cyanide	Arsenic	Eh
Sulfate	Fluoride	Barium	pH
Sulfide	Manganese	Bicarbonate	Pumping Time
TDS	Nitrate	BNA	Temperature
TOC	Nitrite	Boron	Water Level
	Phenols	Bromide	
	Sodium	Cadmium	
	Sulfate	Calcium	
	Sulfide	Carbonate	
	TDS	Chemical Oxygen Demand	
	TKN	Chloride	
	TOC	Chromium	
		Copper	
		Cyanide	
		Fluoride	
		Iron	
		Lead	
		Lithium	
		Magnesium	
		Manganese	
		Mercury	
		Molybdenum	
		Nickel	
		Nitrate	
		Nitrite	
		pH	
		Phenols	
		Potassium	
		Selenium	
		Silver	
		Sodium	
		Sulfate	
		Sulfide	
		TDS	
		TKN	
		Thiocyanate	
		TOC	
		Volatile Organics	
		Vanadium	
		Zinc	

Table 2. Rocky Mountain 1 Groundwater Restoration Monitoring Schedule

Year	Quarter	Inner-Ring Wells	Outer-Ring Wells	Cavity Wells
1988	1. March	FS	FS	FS
	2. June	CS	CS	FS
	3. September	CS	CS	CS
	4. December	CS	CS	CS
1989	1. March	CS	CS	CS
	2. June	CS, VOA	CS	CS, VOA
	3. September	CS, VOA	CS	CS, VOA
	4. December	FS	FS	FS
1990	1. March	CS, VOA	CS	CS, VOA
	2. June	LS, VOA	LS	LS, VOA
	3. September	CS, VOA	CS	CS, VOA
	4. December	FS	FS	FS
1991	2. June	LS, Benzene	LS, Benzene	LS, Benzene
	4. December	FS	FS	FS
1992	2. June	LS, Benzene	LS, Benzene	LS, Benzene
	4. December	FS	FS	FS

CS - Compliance Suite

LS - Limited Suite

FS - Full Suite

VOA - Volatile Organic Analysis

Table 3. Water Level Elevations at the RM1 Site on June 10, 1992

Well Name	Well Casing Elevation, ft	Water Level Depth, ft	Water Level Elevation, ft	Pretest
				Water Level Elevation ^a , ft
EMW-1	6984.8	83.70	6901.10	6898.8
EMW-2	6986.3	90.40	6895.90	--
EMW-3	7006.0	103.80	6902.20	6899.3
EMW-4	6981.4	107.75	6873.65	--
EMW-6	6960.7	31.85	6928.85	--
EMW-8	6964.6	158.20	6806.40	--
EMW-9	6961.7	61.85	6899.85	68.97.2
EMW-10	6964.2	92.80	6871.40	--
EMW-11a	6980.8	81.05	6899.75	6897.1
TW-2	6993.9	95.80	6900.60	6899.2
TW-3	6998.2	96.40	6901.80	6899.6
TW-4	6964.8	64.10	6900.70	6897.2
TW-5	6968.6	68.70	6899.90	6895.9
TW-11	7007.6	104.60	6903.00	6902.0
TW-12	7009.2	104.95	6904.25	6903.9
TW-13	6978.8	76.05	6902.75	6900.5
TW-14	6950.7	72.15	6878.55	6867.0
TW-14a	6956.4	55.60	6900.80	--
TW-15	6967.4	67.75	6899.65	6895.8
TW-16	6986.4	87.80	6898.60	6893.3
TW-17	6973.6	73.20	6900.70	6898.1
TW-18	6995.1	92.80	6902.30	6900.4
VIW-1	6968.0	67.60	6900.4	--
CCW-1	6994.16	92.40	6901.76	--

^a From November 13, 1987, Hanna No.1 coal seam measurements

Table 4. RM1 Sampling Summary for June 1992

Well Name	Date Sampled	Sample Method	Parameter Suite	Comments
EMW-1	6/12/92	Bennett pump benzene	LS	Water is clear, moderate sulfur odor.
EMW-2	6/12/92	Teflon bailer	LS	Colorless, odor free water. Organic material in water.
EMW-3	6/12/92	Bennett pump benzene	LS	Water has yellow tint, moderate sulfur odor.
EMW-8	6/11/92	Teflon bailer	LS	Colorless, odor free water. Organic material in water.
EMW-9	6/11/92	Bennett pump benzene	LS	Colorless, odor free water
EMW-10	6/11/92	Bennett pump benzene	LS	Colorless, odor free water.
EMW-11a	6/12/92	Bennett pump benzene	LS	Colorless water, moderate sulfur odor.
TW-2	6/12/92	Bennett pump benzene	LS	Colorless water, slight sulfur odor.
TW-3	6/12/92	Bennett pump benzene	LS	Colorless, water moderate sulfur odor.
TW-4	6/12/92	Bennett pump benzene	LS	Colorless, odor free water.
TW-5	6/11/92	Bennett pump benzene	LS	Colorless, odor free water.

Table 4. RM1 Sampling Summary for June 1992 (continued)

Well Name	Date Sampled	Sample Method	Parameter Suite	Comments
TW-11	6/11/92	Bennett pump	LS	Colorless water, slight sulfur odor.
TW-12	6/11/92	Bennett pump	LS	Colorless water, slight sulfur odor.
TW-13	6/11/92	Bennett pump	LS	Water is cloudy, gray and odor free.
TW-15	6/10/92	Bennett pump	LS	Colorless, slight sulfur odor. Pump hit bottom at 396 ft, pump set at 389 ft.
TW-16	6/10/92	Bennett pump	LS	Colorless water, slight sulfur odor.
TW-17	6/10/92	Bennett pump	LS	Colorless water, slight sulfur odor.
TW-18	6/10/92	Bennett pump	LS	Colorless water, slight sulfur odor.
VIW-1	6/13/92	Bennett pump benzene	LS	Colorless water, slight sulfur or petroleum odor.
CCW-1	6/13/92	Bennett pump benzene	LS	Water has dark tint, slight sulfur odor. Well bore obstructed at 240 ft, pump lowered to 335 ft.

Table 5. Analyses for Samples Obtained from the Two Cavity Wells

Well Name	VIW-1	CCW-1
<u>Parameter</u>		
Benzene, mg/L	<0.01	<0.01
Total Phenol, mg/L	<0.02	<0.02
Ammonia, mg/L	4.9	6.2
Nitrite, mg/L	<0.05	<0.05
Nitrate, mg/L	<0.05	<0.05
Total Kjeldahl Nitrogen, mg/L	5.1	7.3
Total Organic Carbon, mg/L	11	<10
Sulfide, mg/L	<1	<1
Alkalinity (lab), meq CaCO ₃	491	303
Bicarbonate, meq CaCO ₃	488	298
Fluoride, mg/L	2.8	6.1
pH (lab)	7.9	8.3
Sulfate, mg/L	2010	1020
Total Dissolved Solids, mg/L	3370	1860
Cyanide, µg/L	<0.02	<0.02
Arsenic, mg/L	<0.005	0.022
Boron, mg/L	0.598	0.618
Manganese, mg/L	0.299	0.068
Sodium	619	518
Sample Temperature, °C	16.4	19.1
Corrected Conductivity, µmhos/cm (field)	3700	2540
pH (field)	7.80	8.38
Eh, mV (field) ^b	-27.66	-33.99
Sample Discharge Rate, gpm	1.2	1.2
Alkalinity, meq CaCO ₃ (field)	500.4	313.2

^b Corrected to Standard H⁺ Electrode

Table 6. Analyses for Samples Obtained from Coal Seam and Overburden Monitoring Wells

Well Name	EMW-1	EMW-2	EMW-3	EMW-8	EMW-9	EMW-10	EMW-11a	TW-2	TW-3
<u>Parameter</u>									
Benzene, mg/L	0.021	^a 0.019		^a	<0.01	<0.01	<0.01	<0.01	<0.01
Total Phenol, mg/L	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02
Ammonia, mg/L	4.2	7.2	2.8	2.9	3.2	3.8	3.4	3.7	2.6
Nitrite, mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate, mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen, mg/L	4.8	8.6	3.2	3.3	3.8	3.8	5.2	4.8	3.1
Total Organic Carbon, mg/L	24	<10	26	11	32	<10	67	32	14
Sulfide, mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (lab), meq CaCO ₃	1120	1150	798	1020	651	452	1110	907	407
Bicarbonate, meq CaCO ₃	1110	931	788	1020	639	449	1100	896	399
Fluoride, mg/L	1.1	1.3	1.0	2.0	1.4	<0.2	1.0	1.0	1.4
pH (lab)	7.9	9.4	8.1	8.4	8.3	7.8	8.1	8.1	8.3
Sulfate, mg/L	520	17.4	520	100	880	880	580	700	570
Total Dissolved Solids, mg/L	2030	1360	1580	1370	1960	547	2200	2000	1610
Cyanide mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic, mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005
Boron, mg/L	<0.020	0.055	<0.020	0.050	0.025	0.047	<0.020	<0.020	0.03
Manganese, mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	0.048	<0.003	<0.003	<0.003
Sodium, mg/L	627	477	512	461	590	95.8	666	637	498
Sample Temperature, °C	11.4	12.2	13.1	11.7	12.2	14.5	11.1	12.2	13.5
Corrected Conductivity, µmhos/cm (field)	2400	2050	2090	1950	2620	880	2170	2700	2180
pH (field)	7.86	9.52	7.98	8.58	8.27	7.31	7.94	8.08	8.24
Eh, mV (field) ^b	37.66	-52.38	13.61	-22.23	62.82	121.25	-20.99	-13.48	-40.95
Sample Discharge Rate, gpm	1.2	^c	0.9	^c	0.9	0.15	1.2	0.9	1.1
Alkalinity (field), meq CaCO ₃	1155.6	^a 810.0		^a 651.6	453.6	1119.6	946.8	727.2	

^a Not measured

^b Corrected to Standard H⁺ Electrode

^c Bailed sample--Sample Discharge Rate not available

Table 6. Analyses for Samples Obtained from Coal Seam and Overburden Monitoring Wells (continued)

Well Name	TW-4	TW-5	TW-11	TW-12	TW-13	TW-15	TW-16	TW-17	TW-18
<u>Parameter</u>									
Benzene, mg/L	<0.01	<0.01	^a	^a	^a	^a	^a	^a	^a
Total Phenol, mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ammonia, mg/L	2.2	3.6	3.2	2.9	2.3	2.4	2.9	3.5	6.9
Nitrite, mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate, mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen, mg/L	3.1	4.8	4.4	3.6	3.2	2.6	4.0	4.6	6.6
Total Organic Carbon, mg/L	24	54	22	17	35	52	66	72	71
Sulfide, mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (lab), meq CaCO ₃	784	670	776	707	731	805	679	790	759
Bicarbonate, meq CaCO ₃	766	661	764	694	717	786	669	781	752
Fluoride, mg/L	2.0	1.5	1.3	1.5	1.8	2.3	1.8	1.3	0.86
pH (lab)	8.4	8.2	8.2	8.3	8.3	8.4	8.2	8.1	8.0
Sulfate, mg/L	360	1200	470	590	400	410	740	1030	1060
Total Dissolved Solids, mg/L	1400	2380	1550	1660	1410	1470	1840	2220	2290
Cyanide µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic, mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Boron, mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	0.025	0.028	<0.02	<0.02
Manganese, mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.012
Sodium, mg/L	471	690	464	521	461	474	557	672	550
Sample Temperature, °C	11.6	10.6	9.4	10.2	10.3	12.6	10.8	11.3	11.1
Corrected Conductivity, µmhos/cm (field)	2000	3100	2060	1550	1740	2040	2330	2020	2110
pH (field)	8.27	8.32	8.03	8.10	8.29	8.06	8.03	8.22	8.03
Eh, mV (field) ^b	49.96	33.26	1.14	42.22	30.07	88.76	16.08	12.83	-4.69
Sample Discharge Rate, gpm	1.2	0.75	1.1	1.1	0.75	0.34	1.1	1.2	1.1
Alkalinity (field), meq CaCO ₃	799.2	684.0	770.4	716.4	705.6	774.0	709.2	802.8	813.6

^a Not measured

^b Corrected to Standard H⁺ Electrode

Table 7. Wells Exceeding Highest Baseline Concentrations of Indicator Constituents, June 1992 (all units are mg/L)

Coal Seam Wells	Overburden Wells
<u>TDS</u>	<u>TDS</u>
VIW-1 = 3370	EMW-2 = 1360
HBC = 2750	EMW-8 = 1370
	HBC = 1040
<u>TOC</u>	<u>TOC</u>
TW-5 = 54	EMW-8 = 11
TW-15 = 52	HBC = 10
TW-16 = 66	
TW-17 = 72	
TW-18 = 71	
EMW-11a = 67	
HBC = 45	
<u>Boron</u>	<u>Ammonia</u>
VIW-1 = 0.598	EMW-2 = 7.2
CCW-1 = 0.618	HBC = 4.7
HBC = 0.037	

Table 8. Baseline Groundwater Parameters RM1 UCG Project, Hanna, Wyoming^a

Parameters	Range of Concentrations RM1 Baseline Coal Aquifer Wells, mg/L ^b
TOC	11-45
PNAs	Trace
Volatile Organics	Trace
Phenols	<0.020 ^c
Ammonia	2.4 - 7.9
Alkalinity (Field)	638 - 855
pH	7.7 - 9.24
Sulfates	300 - 1400
TDS	1360 - 2750
Cyanide	<0.02
Boron	<0.01 - 0.037
Aluminum	<0.03 - 0.0253
Cadmium	<0.01
Chromium	<0.01
Copper	<0.01
Lead	<0.05
Mercury	<0.00005
Nickel	<0.01
Selenium	<0.005
Arsenic	<0.005
Barium	0.016 - 0.162
Iron	0.042 - 1.060
Manganese	<0.005 - 0.024
Zinc	<0.015

^a From Covell et al. 1992

^b The baseline analyses are for October and December 1986 (WRI 1986a and 1986b) and March and August 1987 (WRI 1987a and 1987b)

^c Less than (<) indicates that the concentrations are below detection limits

Table 9. Analyses for Quality Assurance/Quality Control Samples

Sample Type Result Type	Rinsate ^a	Standard		Duplicate	
	Actual	Actual	Expected	Actual	Expected
<u>Parameter</u>					
Benzene, mg/L	<0.01	0.060	0.100	0.024	0.021
Total Phenol, mg/L	<0.02	0.090	0.090	<0.02	<0.02
Ammonia, mg/L	<0.2	9.6	10	4.2	4.2
Nitrate, mg/L	<0.05	6.58	6.7	<0.05	<0.05
Nitrite, mg/L	0.59	1.90	1.88	<0.05	<0.05
TKN, mg/L	<0.5	7.6	6.4	5.4	4.8
TOC, mg/L	<10	52	53.7	22	24
Sulfide, mg/L	<1	4.59	8.3	<1	<1
Cyanide, mg/L	<0.02	0.178	0.315	<0.02	<0.02
Alk. (lab), meq CaCO ₃	<10	160	155	1130	1120
Bicarb., meq CaCO ₃	<10	146	138	1120	1110
Fluoride, mg/L	<0.2	7.6	7.8	1.4	1.1
pH (lab)	6.7	9.1	9.1	8.0	7.9
Sulfate, mg/L	<0.5	196	188	520	520
TDS, mg/L	<10	920	996	2010	2030
Arsenic, mg/L	<0.005	0.071	0.075	<0.005	<0.005
Boron, mg/L	<0.020	1.98	2.00	<0.02	<0.02
Manganese, mg/L	<0.003	0.079	0.075	<0.003	<0.003
Sodium, mg/L	<0.06	1.93	2.00	621	627

^a Expected results for blank sample parameters are below detection limit

REFERENCES

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Western Research Institute, 1986a, Baseline Sampling for the RM1 Site, Hanna, Wyoming, October 1986. Unpublished WRI Sampling and Analyses Report to Stearns Catalytic Corporation, Laramie, WY, WRI-91-R047.

Western Research Institute, 1986b, Baseline Sampling for the RM1 Site, Hanna, WY, December 1986. Unpublished WRI Sampling and Analyses Report to Stearns Catalytic Corporation, Laramie, WY, WRI-91-R048.

Western Research Institute, 1987a, Baseline Sampling for the RM1 Site, Hanna, WY, March 1987. Unpublished WRI Sampling and Analyses Report to Stearns Catalytic Corporation, Laramie, WY, WRI-91-R049.

Western Research Institute, 1987b, Baseline Sampling for the RM1 Site, Hanna, WY, August 1987. Unpublished WRI Sampling and Analyses Report to Stearns Catalytic Corporation, Laramie, WY, WRI-92-R003.

APPENDIX B
VOA Analytical Results

Organics Analysis Data Sheet

(Page 1)

! Sample Number !
! 0653-75-24-TW2-A !

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RMO12::AO

Sample Matrix: WATER

Data release Authorized by: Jeff Clane

ACN No.: 42839

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)

Date Extracted: .....

Date Analyzed: 06/16/92 09:49

Conc/Dil factor: 1.0 pH: .....

Percent Moisture: (Not Decanted) .....

C.A.S.

ug/L

Number

71-43-2 Benzene

-----
10. U

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.

U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.

C - This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/ul in the final extract should be confirmed by GC/MS.

B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.

Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

N - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

| Sample Number |
| 0653-71-24-TW3-A |

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RM007::AO

Sample Matrix: WATER

Data release Authorized by: Jeff Clark

ACN No.: 42849

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
Date Extracted: .....
Date Analyzed: 06/15/92 16:25
Conc/Dil factor: 1.0 pH : .....
Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
-----	-----
71-43-2 Benzene	3. J

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters wherer than or the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/ul in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

N - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 | Sample Number |
 | 10653-69-24-TU4-A |

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RMO09::AO

Sample Matrix: WATER

Data release Authorized by: Jeff Clark

ACN No.: 42848

QC Report No.: 1

Client: STEVE LIMBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/16/92 07:49
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
-----	-----
71-43-2 Benzene	10. U

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters wherer than or the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 | Sample Number |
 | 0653-67-24-TW5-A1 |

Laboratory Name: WESTERN RESEARCH INSTITUTE

ACN No.: 42847

Lab Sample ID: >RMD02::AD

QC Report No.: 1

Sample Matrix: WATER

Client: STEVE LINDBLOM

Data release Authorized by: Jeff Clark

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/15/92 13:00
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
-----	-----
71-43-2 Benzene	10. U

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters wherer than or the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 | Sample Number |
 | 0653-43-24-TU30-R |

Laboratory Name: WESTERN RESEARCH INSTITUTE
 Lab Sample ID: >RM003::R0
 Sample Matrix: WATER
 Data release Authorized by: JH Clark

ACN No.: 42851
 QC Report No.: 1
 Client: STEVE LINDBLOM
 Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/15/92 13:38
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
-----	-----
71-43-2 Benzene	60.

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

! Sample Number !
!0653-43-24-TW31-A!

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RM004::AD

Sample Matrix: WATER

Data release Authorized by: Jeff Clark

ACN No.: 42842

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)

Date Extracted: .....

Date Analyzed: 06/15/92 14:16

Conc/Dil factor: 1.0 pH: .....

Percent Moisture: (Not Decanted) .....

C.A.S.

ug/L

Number

71-43-2 Benzene

24.

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

- Value - If the result is a value greater than or equal to the detection limit, report the value.
- U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
- J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.
- C - This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/ul in the final extract should be confirmed by GC/MS.
- B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
- Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 Sample Number 1
 10653-43-24-TW32-A1

Laboratory Name: WESTERN RESEARCH INSTITUTE
 Lab Sample ID: >RMO13::AO
 Sample Matrix: WATER
 Data release Authorized by: Jeff Clark

ACN No.: 42852
 QC Report No.: 1
 Client: STEVE LINDBLOM
 Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/16/92 10:26
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
-----	-----
71-43-2 Benzene	10. U

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters wherer than or the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

N - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 | Sample Number |
 |0653-79-24-EMU1-A|

Laboratory Name: WESTERN RESEARCH INSTITUTE
 Lab Sample ID: >RM008::AD
 Sample Matrix: WATER
 Data release Authorized by: Jeff Clark

ACN No.: 42841
 QC Report No.: 1
 Client: STEVE LINDBLOM
 Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/16/92 07:11
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
-----	-----
71-43-2 Benzene	21.

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥ 10 ng/ul in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 | Sample Number |
 | 0653-73-24-EMU3-A1 |

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RMD14::A0

Sample Matrix: WATER

Data release Authorized by: Jeff Clark

ACN No.: 42850

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/16/92 11:05
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
-----	-----
71-43-2 Benzene	19.

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters wherer than or the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

W - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 | Sample Number |
 | D653-65-24-ENV9-A |

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RMO11::AO

Sample Matrix: WATER

Data release Authorized by: Jeff Clark

ACM No.: 42846

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)

Date Extracted: .....

Date Analyzed: 06/16/92 09:15

Conc/Dil factor: 1.0 pH: .....

Percent Moisture: (Not Decanted) .....

C.A.S.
Number

ug/L

71-43-2 Benzene

10. U

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

- Value - If the result is a value greater than or equal to the detection limit, report the value.
- U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
- J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.
- C - This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
- B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
- Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

N - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 / Sample Number /
 10653-61-24-EMU10-A1

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RMD15::AO

Sample Matrix: WATER

Data release Authorized by: Jeff Clark

ACN No.: 42845

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/16/92 11:50
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
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71-43-2 Benzene	10. U

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters wherer than or the identification has been confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration file.

Form 1

Organics Analysis Data Sheet

(Page 1)

| Sample Number |
10653-77-24-EMJ11a-A1

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RM006::AD

Sample Matrix: WATER

Data release Authorized by:

ACN No.: 42840

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)

Date Extracted: .....

Date Analyzed: 06/15/92 15:27

Conc/Dil factor: 1.0 pH: .....

Percent Moisture: (Not Decanted) .....

C.A.S.

ug/L

Number

71-43-2 Benzene

3. J

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

- Value - If the result is a value greater than or equal to the detection limit, report the value.
- U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
- J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.
- C - This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
- B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
- Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 Sample Number 1
 10653-85-24-VIWI-A1

Laboratory Name: WESTERN RESEARCH INSTITUTE

Lab Sample ID: >RMD01::AO

Sample Matrix: WATER

Data release Authorized by: Jeff Clark

ACN No.: 42844

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/15/92 12:01
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
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71-43-2 Benzene	2. J

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters wherer than or the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/uL in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration file.

Form 1

Organics Analysis Data Sheet

(Page 1)

 | Sample Number |
 | 10653-83-24-CCU1-A1 |

Laboratory Name: TETRA RESEARCH INSTITUTE

Lab Sample ID: >RMD16::A0

Sample Matrix: WATER

Data release Authorized by:

[Signature]

ACH No.: 42843

QC Report No.: 1

Client: STEVE LINDBLOM

Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/16/92 13:09
 Conc/Dil factor: 1.0 pH: .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
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71-43-2 Benzene	10. U

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters wherer than or the identification has been confirmed by GC/MS. Single component pesticides >= 10 ng/ul in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is < than the specified detection limit but > than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

N - Compound not present in Calibration File.

Form 1

Organics Analysis Data Sheet

(Page 1)

 | Sample Number |
 | 10653-83-24-CCW1-A1 |

Laboratory Name: WESTERN RESEARCH INSTITUTE
 Lab Sample ID: >RMD17::AO
 Sample Matrix: WATER
 Data release Authorized by: *J. J. Clark*

ACM No.: 42843 DUPLICATE
 QC Report No.: 1
 Client: STEVE LINDBLOM
 Date Sample Received: 06/13/92

Volatile Compounds

Concentration: Low High (Circle One)
 Date Extracted: .....
 Date Analyzed: 06/16/92 13:43
 Conc/Dil factor: 1.0 pH : .....
 Percent Moisture: (Not Decanted) .....

C.A.S. Number	ug/L
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71-43-2 Benzene	10. U

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However the definition of each flag must be explicit.

Value - If the result is a value greater than or equal to the detection limit, report the value.	C - This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥ 10 ng/uL in the final extract should be confirmed by GC/MS.
U - Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action (This is not necessarily the instrument detection limit). The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.	B - This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns data the user to take appropriate action.
J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is $<$ than the specified detection limit but $>$ than zero (e.g. 10J). If limit of detection is 10 ug/L and a concentration of 3.0 ug/L is calculated, report as 3J.	Other - Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

OPTIONAL FLAGS

M - Compound not present in Calibration File.

Form 1

APPENDIX C
Field Sampling Data

46

TITLE

TW-15

PROJECT NO. 0013/130

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project RM-1Well Name TW-15Date 10 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
1020	n.m.	standardizing	probes	—	58.7	1.1
1040	10.6	2030	7.98	n.m.	86.7	1.2
1100	10.6	1980	8.04	-121.6	106.4	1.2
1120	10.6	1980	8.06	-123.4	123.3	1.2
1140	11.2	1980	8.07	-117.9	135.55	1.1
1150	11.3	1990	8.06	-121.7	136.8	0.75
1200	12.6	2040	8.06	-118.9	134.2	0.34
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COMMENTS

Bennett Pump hit well bottom at 396'. Set pump at 389'
for sampling.

pH meter calibrated in pH 7.00 and 10.02 buffers

Cond meter reads 12050 µmhos/cm in 0.10 M KCl at 15.4°C

Eh meter reads 243.3 mV in Zebell standard at 15.6°C

(Water is clear with slight sulfur odor)

1140 - Reduced flow rate to 0.75 gpm (50 psig)

1150 Reduced flow rate to 0.34 gpm (35 psig)

SCIENTIFIC BINDERY PRODUCTS CHICAGO 00003

SIGNATURE

DATE

6/15/92

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

6/15/92

TITLE

TW-15

PROJECT NO. 00131930
BOOK NO. 0653

47

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-15
 Date 10 JUNE 92 Field Crew LINDA M. LOWEY
 Weather SUNNY, CALM Air Temperature 65 (F°)
 Measuring Point T.O.C. Sampling Device BENNETT PUMP
 Depth to Water 67.75 Depth of Sampling Device 389'

Field Analyses at Time of Sampling

Temperature 12.6 (°C)
 Corrected Conductivity 2040 (µmhos/cm at 25°C)
 pH 8.06
 Eh -118.9 (mV, Field Electrode)
 Eh 88.76 (mV, Corrected to Standard Hydrogen Electrode)
 Discharge Rate 0.34 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.04
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 21.5 ml
 Normality of HCl 0.0180 N
 Total Alkalinity 774.0 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0653-47-24-TW15 -C	Total Phenols	A9117
0653-47-24-TW15 -D	TKN, NH ₃ , TOC, COD, NO ₃ , NO ₂	A9118
0653-47-24-TW15 -E	Sulfide	A9119
0653-47-24-TW15 -F	Cyanide	A9120
0653-47-24-TW15 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK	A9121
0653-47-24-TW15 -H	Metals, SCN	A9122
-J	TSS	
0653-47-24-TW15	ALK, pH	A9123

SCIENT

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DATE

WITNESS

DATE

TITLE

TW-16

PROJECT NO. 00131430

BOOK NO. 0653

49

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM 1Well Name TW-16Date 10 JUNE 92Field Crew LINDBLUM, LOWRYWeather SUNNY, CALMAir Temperature 65 (F°)Measuring Point TOCSampling Device BENNETT PumpDepth to Water 87.9Depth of Sampling Device 395'

Field Analyses at Time of Sampling

Temperature 10.6 (°C)Corrected Conductivity 2330 (µmhos/cm at 25°C)pH 8.03Eh -193.2 (mV, Field Electrode)Eh 16.08 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 1.1 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.41mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 12.7 mlNormality of HCl 0.0180 NTotal Alkalinity 709.2 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0653-44-24-TW16 -C	Total Phenols	A9124
0653-44-24-TW16 -D	TKN, NH ₃ , TOC, COD, NO ₃ /NO ₂	A9125
0653-44-24-TW16 -E	Sulfide	A9126
0653-44-24-TW16 -F	Cyanide	A9127
0653-44-24-TW16 -G	Sulfate, (DS) Br, Cl, F, HCO ₃ , CO ₃ , ALK	A9128
0653-44-24-TW16 -H	Metal, SCN	A9129
-I	TSS	
0653-44-24-TW16 -J	(TK) (pH)	A9130

SCIENTIST

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DATE

WITNESS

DATE

TITLE

TW-17

PROJECT NO. 00081430
BOOK NO. 0653

51

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM1Well Name TW-17Date 10 JUNE 92Field Crew LINDALOM, LEWISWeather SUNNY, CALMAir Temperature 68 (F°)Measuring Point TXCSampling Device BENNETT PUMPDepth to Water 73.40Depth of Sampling Device 329'

Field Analyses at Time of Sampling

Temperature 11.3 (°C)Corrected Conductivity 2020 (µmhos/cm at 25°C)pH 8.22Eh -196.0 (mV, Field Electrode)Eh 12.83 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 1.2 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.31mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 22.30 mlNormality of HCl 0.0180 NTotal Alkalinity 802.50 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0653-51-24-TW17 -C	Total Phenols	A9131
0653-51-24-TW17 -D	TKN, NH ₃ , TDS, COD, NO ₃ , NO ₂	A9132
0653-51-24-TW17 -E	Sulfide	A9133
0653-51-24-TW17 -F	Cyanide	A9134
0653-51-24-TW17 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK	A9135
0653-51-24-TW17 -H	Metals, SCN	A9136
-J	TSS	
0653-51-24-TW17	Alk, pH	A9137

SIGN

SIGN

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

52

TITLE

TW-18

PROJECT NO. 0131930
BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project RM1Well Name TW-18Date 10 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1600</u>	<u>11.5</u>	<u>2470</u>	<u>8.12</u>	<u>-216.5</u>	<u>86.8</u>	<u>NM</u>
<u>1620</u>	<u>10.6</u>	<u>2300</u>	<u>8.15</u>	<u>-228.4</u>	<u>102.0</u>	<u>1.0</u>
<u>1640</u>	<u>11.0</u>	<u>2280</u>	<u>8.05</u>	<u>-211.7</u>	<u>104.15</u>	<u>1.1</u>
<u>1700</u>	<u>11.8</u>	<u>2240</u>	<u>8.03</u>	<u>-199.9</u>	<u>104.9</u>	<u>1.1</u>
<u>1720</u>	<u>11.1</u>	<u>2110</u>	<u>8.03</u>	<u>-213.7</u>	<u>105.3</u>	<u>1.1</u>
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COMMENTS

water is clear and slight sulfur odor

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DATE

WITNESS

DATE

John R. LuskBrain Lusk6/22/92
6/22/92

TITLE

TW-18

PROJECT NO. 00131430
BOOK NO. 0653

53

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM1
Date 10 JUNE 92
Weather SUNNY, CALMWell Name TW-18
Field Crew LINDSEY, LARRY
Air Temperature 65 (F°)Measuring Point TOCSampling Device BENNETT PUMPDepth to Water 42.9Depth of Sampling Device 294

Field Analyses at Time of Sampling

Temperature 11.1 (°C)
Corrected Conductivity 2110 (µmhos/cm at 25°C)
pH 8.03
Eh -213.7 (mV, Field Electrode)
Eh -4.69 (mV, Corrected to Standard Hydrogen Electrode)
Discharge Rate 1.1 (gallons/min)
Alkalinity Titration
Filtered Sample pH 8.11
mls of Sample Tested 2.5 ml
mls of HCl Added to Reach pH 4.5 22.6 ml
Normality of HCl 0.0180 N
Total Alkalinity 813.60 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	S-4042
-C	Total Phenol	AK A9138
-D	TKN, NH ₃ , TOC, COD, (NO ₃ , NO ₂)	A9139
-E	Sulfide	A9140
-F	Cyanide	A9141
-G	Sulfate, TDS, Br, Li, F, HCO ₃ , CO ₃ , A.K.	A9142
-H	Metals, SCN	A9143
-J	TSS	A9144
-K	(AK), (2H)	

SCIENTIFIC I

SIGNATURE

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

6/22/92

DATE

6/22/92

Project RM 1Well Name TW-11Date 11 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
0655	n.m. - standardizing probes				99.4	1.2
0715	9.0	1960	8.22	-199.2	120.1	1.1
0735	9.1	1970	8.14	-214.9	125.25	1.1
0755	9.3	2120	8.03	-208.4	127.0	1.1
0815	9.4	2060	8.03	-209.4	127.6	1.1
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COMMENTS

pH meter calibrated in pH 7.00 and 10.02 buffers
 Cond meter reads 12460 µmhos/cm in 0.1M KCl at 15.3°C
 Eh meter reads 243.2 mV in Zebell solution at 15.6°C
 water is clear. slight sulfur odor

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

 6/22/92
 6/22/92

TITLE

TW-11

PROJECT NO. 00131430
BOOK NO.

55

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM 1 Well Name TW-11
 Date 11 JUNE 92 Field Crew LINDA LOM, LAUREY
 Weather CLEAR, CALM Air Temperature 55 (F°)

Measuring Point TOL Sampling Device BENNETT PUMP
 Depth to Water 104.95 Depth of Sampling Device 331'

Field Analyses at Time of Sampling

Temperature 9.4 (°C)
 Corrected Conductivity 2060 (µmhos/cm at 25°C)
 pH 8.03
 Eh -209.4 (mV, Field Electrode)
 Eh 114 (mV, Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.1 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.04
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 21.4 ml
 Normality of HCl 0.018 N
 Total Alkalinity 770.4 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0653-55-24-TW11 -C	Total Phenols	A9145
0653-55-24-TW11 -D	TKN, NH ₃ , TOC, COD, NO ₃ , NO ₂	A9146
0653-55-24-TW11 -E	Sulfide	A9147
0653-55-24-TW11 -F	Cyanide	A9148
0653-55-24-TW11 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK	A9149
0653-55-24-TW11 -H	Metals, SCN	A9150
-J	TSS	
0653-55-24-TW11 -I	Alk, pH	A9151

BCH

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56

TITLE

TW-12

PROJECT NO. 0013193

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project RM 1Well Name TW-12Date 11 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
0835	10.2	2230	8.08	-180.8	97.6	1.1
0855	9.7	2110	8.10	-159.5	116.15	1.1
0915	9.8	1900	8.09	-163.3	120.0	1.1
0935	10.0	1710	8.10	-168.9	121.45	1.1
0955	10.2	1550	8.10	-167.6	122.20	1.1
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COMMENTS

Water is clear, slight sulfur odor

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Steve Brown / 6/11/92

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6/22/92

6/22/92

TITLE

TW-12

PROJECT NO. 0003430
BOOK NO. 0653

57

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM 1Well Name TW-12Date 11 JUNE 92Field Crew LINDBLUM, LOWMYWeather CLEAR, CALMAir Temperature 60 (F°)Measuring Point TOCSampling Device BENNETT PUMPDepth to Water 105.35Depth of Sampling Device 344'

Field Analyses at Time of Sampling

Temperature 10.2 (°C)
Corrected Conductivity 1550 (µmhos/cm at 25°C)pH 8.10Eh -167.6 (mV, Field Electrode)Eh 42.22 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 1.1 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.09mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 19.9 mlNormality of HCl 0.018 NTotal Alkalinity 716.4 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0653-57-24-TW12 -C	Total Phenol	A9152
0653-57-24-TW12 -D	(TKN), (NH ₃), (TOC), (COD), (NO ₃), (NO ₂)	A9153
0653-57-24-TW12 -E	Sulfide	A9154
0653-57-24-TW12 -F	Cyanide	A9155
0653-57-24-TW12 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK	A9156
0653-57-24-TW12 -H	Metal, SCN	A9157
-J	ISS	
0653-57-24-TW12 -I	(Alk), (pH)	A9158

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TITLE

PROJECT NO. 3213/430

BOOK NO. 163

WESTERN RESEARCH INSTITUTE

Well Name Tw-13

Date 6/11/92

Power Requirements_____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

1200 - FLOW Rate reduced to 0.75 gpm

Winter is cloudy, gray and odor free.

SCIENTIFIZIL BILDER: KENNEN SIE EINIGE BEISPIELE?

SIGNATURE

St. R. Lull

DATE _____

6/22/91

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WITNESS
Brian Lutz

DATE

6/22/92

TITLE

TW-13

PROJECT NO. 00131430

59

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM1Well Name TW-13Date 11 JUNE 92Field Crew Lindholm, LowryWeather Clear, calmAir Temperature 65 (F°)Measuring Point TOCSampling Device Bennett PumpDepth to Water 76.55Depth of Sampling Device 361'

Field Analyses at Time of Sampling

Temperature 10.7 (°C)Corrected Conductivity 1740 (µmhos/cm at 25°C)pH 8.29Eh -179.3 (mV, Field Electrode)Eh 30.07 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 0.75 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.21mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 19.6 mlNormality of HCl 0.018 NTotal Alkalinity 705.60 (mg/L Equiv. CaCO₃)

Analytical Submissions

Analysis Requested

Tag Numbers

-A	VOA	
-B	BNA	
0653-59-24-TW13 -C	Total Phenols	A9159
0653-59-24-TW13 -D	TKN, NH ₃ , TOC, COD, NO ₃ , NO ₂	A9160
0653-59-24-TW13 -E	Sulfide	A9161
0653-59-24-TW13 -F	Cyanide	A9162
0653-59-24-TW13 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK	A9163
0653-59-24-TW13 -H	Metals, SCN	A9164
-J	TSS	
0653-59-24-TW13 -T	(ALK, pH)	A9165

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6/22/92

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6/22/92

60

TITLE

EMW-10

PROJECT NO. (9)13493
BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project RMIWell Name EMW-10Date 11 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μ mhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
1240	13.1	790	7.27	51.2	90.8	40.8 1.2
1300	10.9	700	7.24	-52.3	118.4	1.1
1320	11.0	720	7.25	-66.6	130.55	1.1
1340	13.7	830	7.42	-66.4	142.6	0.15
1400	14.5	880	7.31	-84.7	134.5	0.15
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COMMENTS

1340 - pump broke suction. water level below pump. Reduced flow rate

water is clear and ^{sl. white} slight odor free

SCIENTIFIC

SIGNATURE	<u>Shirley R. Smith</u>	DATE	<u>6/22/92</u>
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		<u>Brian Smith</u>	<u>6/22/92</u>

TITLE

EMW-10

PROJECT NO. 00131430
BOOK NO. 0653

61

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM1 Well Name EMW-10
 Date 11 JUNE 92 Field Crew LINDALUM, LOWRY
 Weather CLEAR, CALM Air Temperature 65 (F°)
 Measuring Point TOE Sampling Device Bennett Pump
 Depth to Water 112.8 Depth of Sampling Device 147'

Field Analyses at Time of Sampling

Temperature 14.5 (°C)
 Corrected Conductivity 880 (µmhos/cm at 25°C)
 pH 7.31
 Eh -84.7 (mV, Field Electrode)
 Eh 121.25 (mV, Corrected to Standard Hydrogen Electrode)
 Discharge Rate 0.15 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 7.42
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 12.6 ml
 Normality of HCl 0.018 N
 Total Alkalinity 453.60 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
0653-61-24-EMW10 -A	Advp	A9166, A9167
-B	BNA	
0653-61-24-EMW10 -C	Total Phenols	A9168
0653-61-24-EMW10 -D	TKN, NH ₃ , TOC, COD, NO ₃ , NO ₂	A9169
0653-61-24-EMW10 -E	Sulfide	A9170
0653-61-24-EMW10 -F	Cyanide	A9171
0653-61-24-EMW10 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK	A9172
0653-61-24-EMW10 -H	Metals, SCN	A9173
-J	TSS	
0653-61-24-EMW10 -Z	ALK, pH	A9174

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DATE

BOOK NO. 0653

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Water is clear with some organic matter

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6/22/92

TITLE

EMW-8

PROJECT NO. 00131430
BOOK NO. 0653

63

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM1Well Name EMW-8Date 11 JUNE 92Field Crew LINDBLOMWeather CLEAR, CALMAir Temperature 65 (F°)Measuring Point TOCSampling Device TEFLON BAILERDepth to Water 158.40Depth of Sampling Device 324'

Field Analyses at Time of Sampling

Temperature 11.7 (°C) 1950 (µmhos/cm at 25°C)

Corrected Conductivity

pH 8.58Eh -230.7 (mV, Field Electrode)Eh -22.23 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate BAIL (gallons/min)

Alkalinity Titration

Filtered Sample pH

mls of Sample Tested

mls of HCl Added to Reach pH 4.5

Normality of HCl

Total Alkalinity (mg/L Equiv. CaCO₃)

Analytical Submissions

Analysis Requested

Tag Numbers

	-A	VOA	
	-B	BNA	
<u>0653-63-24-EMW8</u>	-C	<u>Total Phenols</u>	<u>A9175</u>
<u>0653-63-24-EMW8</u>	-D	<u>TKN, NH₃, TOC, COD, NO₃, NO₂</u>	<u>A9176</u>
<u>0653-63-24-EMW8</u>	-E	<u>Sulfide</u>	<u>A9177</u>
<u>0653-63-24-EMW8</u>	-F	<u>Cyanide</u>	<u>A9178</u>
<u>0653-63-24-EMW8</u>	-G	<u>Sulfate, TDS, Br, Cl, F, HCO₃, CO₃, ALK</u>	<u>A9179</u>
<u>0653-63-24-EMW8</u>	-H	<u>Metals, SCN</u>	<u>A9180</u>
	-J	<u>TSS</u>	
<u>0653-63-24-EMW8</u>		<u>Alk, pH</u>	<u>A9181</u>

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PROJECT NO. 2013/430
BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project Rm1

Well Name ENW-9

Date 11 JUNE 92

Power Requirements_____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Water is clear and odor free

1595 - Reduced flow rate to 50 psi / 0.9 gpm

SCIENTIFIC BINDER PRODUCTS CHICAGO 60605

SIGNATURE

Stuart

DATE _____

622/17

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<i>Brian Lopez</i>	6/22/92

DATE

4-6/22/92

TITLE

EMW-9

PROJECT NO. 02B1930
BOOK NO. 0653

65

WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RMIWell Name EMW-9Date 11 JUNE 92Field Crew LINDHOLM, LOWRYWeather CLEAR, CALM

Air Temperature _____ (F°)

Measuring Point T.O.C.Sampling Device BENTONITE PUMPDepth to Water 62.6Depth of Sampling Device 364'

Field Analyses at Time of Sampling

Temperature 12.2 (°C)Corrected Conductivity 2620 (µmhos/cm at 25°C)pH 8.27Eh -145.2 (mV, Field Electrode)Eh 61.82 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 0.9 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.14mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 18.1 mlNormality of HCl 0.015 NTotal Alkalinity 651.60 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
0653-65-24-EMW9 -A	Adup	A9182, A9183
-B	BNA	
0653-65-24-EMW9 -C	Total Phenols	A9184
0653-65-24-EMW9 -D	TKN, NH ₄ , TOC, COD, NO ₂ , NO ₃	A9185
0653-65-24-EMW9 -E	Sulfide	A9186
0653-65-24-EMW9 -F	Cyanide	A9187
0653-65-24-EMW9 -G	Sulfate, TD ₅ , Br, Cl, F, HCO ₃ , CO ₃ , ALK	A9188
0653-65-24-EMW9 -H	Metals, SCN	A9189
-J	TSS	
0653-65-24-EMW9 -I	(ALK), (PH)	A9190

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TITLE

SL 6/11/12
EMW-9 TW-5PROJECT NO. 0013143
BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project RM1Well Name EMW-9 TW-5Date 11 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
1615	11.1	2730	8.71	-229.8	62.0	1.5
1635	10.9	2670	8.76	-232.7	85.05	1.5
1655	10.9	2640	8.69	-225.9	94.45	1.5
1715	10.9	2750	8.45	-195.4	97.80	1.3
1735	10.9	3010	8.41	-191.6	99.3	1.2
1745	10.6	3100	8.32	-176.2	96.5	0.75
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COMMENTS

Water is clear and odor free
1735. Reduced flow rate to SD pig. (0.9 gpm)

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605

SIGNATURE	<u>Steve R. Luth</u>		DATE	<u>6/21/92</u>
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		<u>Ernie Luth</u>	<u>6/22/92</u>	

TITLE

WESTERN RESEARCH INSTITUTE

PROJECT NO. 00131430

BOOK NO. 0653

67

WRI GROUNDWATER SAMPLING RECORD

Project Rm 1Well Name EMW 9 TW-5Date 11 JUNE 92Field Crew Lindblom, LaceyWeather Cloudy, windy

Air Temperature _____ (F°)

Measuring Point T.O.C.Sampling Device BENNETT PUMPDepth to Water 71.7Depth of Sampling Device 359'

Field Analyses at Time of Sampling

Temperature 10.6 (°C)Corrected Conductivity 3100 (µmhos/cm at 25°C)pH 8.32Eh -176.2 (mV, Field Electrode)Eh 332.6 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 0.75 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.34mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 19.0 mlNormality of HCl 0.018 NTotal Alkalinity 684.0 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
<u>0653-67-24-TW5</u> -A	<u>Adyp</u> <u>VOA</u>	<u>A60911; A60912</u>
-B	<u>BNA</u>	
<u>0653-67-24-TW5</u> -C	<u>Total Phenols</u>	<u>A60913</u>
<u>0653-67-24-TW5</u> -D	<u>TKN, NH₃, TOC, COD, NO₂, NO₃</u>	<u>A60914</u>
<u>0653-67-24-TW5</u> -E	<u>Sulfide</u>	<u>A60915</u>
<u>0653-67-24-TW5</u> -F	<u>Cyanide</u>	<u>A60916</u>
<u>0653-67-24-TW5</u> -G	<u>Sulfate, TD₃, Br, Cl, F, HCO₃, CO₃, ALK</u>	<u>A60917</u>
<u>0653-67-24-TW5</u> -H	<u>(Metals), SCN</u>	<u>A60918</u>
-J	<u>TSS</u>	
<u>0653-67-24-TW5</u> -I	<u>ADP</u> <u>PH</u>	<u>A60919</u>

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68

TITLE

TW-4

PROJECT NO. 2013143

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project Rm1Well Name TW-4Date 12 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
0650	not measured	Standardizing	probes		57.4	—
0710	11.6	2050	8.46	-183.4	78.6	1.2
0730	11.6	2020	8.51	-187.5	85.25	1.2
0750	11.6	2010	8.36	-170.4	87.75	1.2
0810	11.6	2000	8.27	-158.6	88.7	1.2
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COMMENTS

pH meter calibrated in pH 7.00 and 12.00 buffer
 Cond. meter reads 12380 µmhos/cm in 0.10 M KCl at 14.1 °C
 Eh meter reads 247.0 mV in Zobell standard at 12.8 °C

water is clear and odor free

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TITLE

TW-4

PROJECT NO. 00131430

69

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RMIWell Name TW-4Date 12 JUNE 92Field Crew LINDZUM, LOWRYWeather CLEAR CALMAir Temperature 55 (F°)Measuring Point TOCSampling Device BENNETT PUMPDepth to Water 85.15Depth of Sampling Device 372'

Field Analyses at Time of Sampling

Temperature 11.6 (°C)Corrected Conductivity 2000 (µmhos/cm at 25°C)pH 8.27Eh -158.6 (mV, Field Electrode)Eh 49.96 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 1.2 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.23mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 22.2 mlNormality of HCl 0.018 NTotal Alkalinity 799.20 (mg/L Equiv. CaCO₃)

Analytical Submissions

Analysis Requested

Tag Numbers

<u>0653-69-24-TW4</u>	<u>-A; Adup</u>	<u>VGA</u>	<u>A6101; A6102</u>
<u>-B</u>	<u>BNA</u>		
<u>0653-69-24-TW4</u>	<u>-C</u>	<u>Total Phenols</u>	<u>A6103</u>
<u>0653-69-24-TW4</u>	<u>-D</u>	<u>TKN, NH₃, TOC, COD, NO₃, NO₂</u>	
<u>0653-69-24-TW4</u>	<u>-E</u>	<u>Sulfide</u>	
<u>0653-69-24-TW4</u>	<u>-F</u>	<u>Cyanide</u>	
<u>0653-69-24-TW4</u>	<u>-G</u>	<u>Sulfate, TDS, Br, Cl, F, HCO₃, CO₃, ALK</u>	
<u>0653-69-24-TW4</u>	<u>-H</u>	<u>Metals, SCN</u>	
<u>-J</u>	<u>TSS</u>		
<u>0653-69-24-TW4-T</u>			

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Project RM 1

Well Name TW-3

Date 12 JUNE 92

Power Requirements_____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Water is clear. Moderate sulfur odor

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Sh. R. K.

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Brian L. ...

DATE

6/22/92

DATE _____

6/22/92

DL 12/10/14

TITLE

TW-3

PROJECT NO. 00131430

71

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM1Well Name TW-3Date 12 JUNE 92Field Crew LINDALEM, LOWRYWeather CLEAR CALMAir Temperature 60 (F°)Measuring Point TOLSampling Device BENNETT PUMPDepth to Water 97.25Depth of Sampling Device 343

Field Analyses at Time of Sampling

Temperature 13.5 (°C)Corrected Conductivity 2180 (μmhos/cm at 25°C)pH 8.24Eh -247.8 (mV, Field Electrode)Eh -40.95 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 1.1 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.23mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 20.2 mlNormality of HCl 0.018 NTotal Alkalinity 727.20 (mg/L Equiv. CaCO₃)

Analytical Submissions

Analysis Requested

Tag Numbers

<u>0653-71-24-TW3</u>	<u>-A</u>	<u>Adyp</u>	<u>VOA</u>	<u>AG110, AG111</u>
	<u>-B</u>		<u>BNA</u>	
<u>0653-71-24-TW3</u>	<u>-C</u>		<u>Total Phenols</u>	<u>AG112</u>
<u>0653-71-24-TW3</u>	<u>-D</u>		<u>(TKN), (NH₃), (TOC), (COD), (NO₃), (NO₂)</u>	<u>AG113</u>
<u>0653-71-24-TW3</u>	<u>-E</u>		<u>Sulfide</u>	<u>AG114</u>
<u>0653-71-24-TW3</u>	<u>-F</u>		<u>Cyanide</u>	<u>AG115</u>
<u>0653-71-24-TW3</u>	<u>-G</u>	<u>Sulfate, TDS</u>	<u>Br, Cl, F, HCO₃, CO₃, ALK</u>	<u>AG116</u>
<u>0653-71-24-TW3</u>	<u>-H</u>		<u>Metals, SCN</u>	<u>AG117</u>
	<u>-J</u>		<u>TSS</u>	
<u>0653-71-24-TW3-I</u>			<u>(ALK), (pH)</u>	<u>AG118</u>

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WITNESS

DATE

PROJECT NO. 20131430
BOOK NO. 0653

Well Name ENW-3

Power Requirements_____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Water is yellow tinted, moderate sulfur odor.

1140 Reduced flow rate to 0.9 gpm

SCIENT

SIGNATURE _____

DISCLOSED TO AND UNDERSTOOD BY

DATE _____

WITNESS

DATE _____

PAID

TITLE

EMW-3

PROJECT NO. 00131430

73

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project Rm1Well Name EMW-3Date 12 JUNE 92Field Crew LINDBLAD, LINDYWeather CLEAR CALM

Air Temperature _____ (F°)

Measuring Point TOLSampling Device BENNETT PUMPDepth to Water 105.40Depth of Sampling Device 344'

Field Analyses at Time of Sampling

Temperature 13.1 (°C)Corrected Conductivity 2090 (µmhos/cm at 25°C)pH 7.98Eh -193.6 (mV, Field Electrode)Eh 13.61 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 0.9 (gallons/min)

Alkalinity Titration

Filtered Sample pH 7.97mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 22.5 mlNormality of HCl 0.018 NTotal Alkalinity 810.0 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
0653-73-24-EMW3 -A	Allyp (VOA)	A6119; A6120
-B	BNA	
0653-73-24-EMW3 -C	Total Phenols	A6121
0653-73-24-EMW3 -D	TKN, NH ₄ , TOC, COD, NO ₃ , NO ₂	A6122
0653-73-24-EMW3 -E	Sulfide	A6123
0653-73-24-EMW3 -F	Cyanide	A6124
0653-73-24-EMW3 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK	A6125
0653-73-24-EMW3 -H	Metals, SCN	A6126
-J	TSS	
0653-73-24-EMW3 -I	(ALK) (pH)	A6127

SCIENTIFIC 8

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74

TITLE

TW-2

PROJECT NO. 00131430

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project RM1Well Name TW-2Date 12 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
1215	12.1	2700	8.20	-218.6	89.55	1.1
1235	10.9	2630	8.25	-240.6	113.1	1.1
1255	10.9	2710	8.37	-264.3	112.15	1.0
1315	11.0	2650	8.21	-246.6	122.5	1.0
1335	11.3	2680	8.15	-241.2	123.85	1.1
1345	12.2	2700	8.08	-221.5	121.0	0.9
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—	—	—	—	—	—	—

COMMENTS

1335. Reduce flow rate to 0.9 gpm

water is clear with slight sulfur odor

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TITLE

TW-2

PROJECT NO. 00131930

BOOK NO. 0653

75

WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project Rm1Well Name TW-2Date 12 JUNE 92Field Crew LINDALAM, LOWRYWeather CLEAR, CALM

Air Temperature _____ (F°)

Measuring Point TOLSampling Device BENNETT PUMPDepth to Water 97.8Depth of Sampling Device 340'

Field Analyses at Time of Sampling

Temperature 12.2 (°C)Corrected Conductivity 2700 (µmhos/cm at 25°C)pH 8.08Eh -221.5 (mV, Field Electrode)Eh -13.48 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 0.9 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.06mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 26.3 mlNormality of HCl 0.018 NTotal Alkalinity 946.80 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
<u>0653-75-24-TW2 -A</u>	<u>VOA</u>	<u>AW28; AB129</u>
<u>-B</u>	<u>BNA</u>	
<u>0653-75-24-TW2 -C</u>	<u>Total Phenols</u>	<u>AB130</u>
<u>0653-75-24-TW2 -D</u>	<u>(TKN, NH₃, TOC, COD, NO₂, NO₃)</u>	<u>AB131</u>
<u>0653-75-24-TW2 -E</u>	<u>Sulfide</u>	<u>AB132</u>
<u>0653-75-24-TW2 -F</u>	<u>Cyanide</u>	<u>AB133</u>
<u>0653-75-24-TW2 -G</u>	<u>Sulfate, TD₅, Br, Cl, F, HCO₃, CO₃, ALK</u>	<u>AB134</u>
<u>0653-75-24-TW2 -H</u>	<u>(Metals, SCN)</u>	<u>AB135</u>
<u>-J</u>	<u>TSS</u>	
<u>0653-75-24-TW2 -I</u>	<u>(AIA, pH)</u>	<u>AB136</u>

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BOOK NO. 0653

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Water is clear. Moderate sulfur odor

SCIENTIFIC BINDER: PAPERBACK COVERED WITH...

10/22/92.

TITLE

EMW-11a

PROJECT NO. 0031930

77

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project Rm1Well Name EMW-11aDate 12 JUNE 92Field Crew LINDALOM, LOWERYWeather CLEAR, CMMAir Temperature 70 (F°)Measuring Point TOCSampling Device BENNETT PUMPDepth to Water 82.8Depth of Sampling Device 349

Field Analyses at Time of Sampling

Temperature 11.1 (°C)Corrected Conductivity 2170 (µmhos/cm at 25°C)pH 7.44Eh -230.0 (mV, Field Electrode)Eh -20.99 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 1.2 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.02mls of Sample Tested 2.5 mlmls of HCl Added to Reach pH 4.5 31.1 mlNormality of HCl 0.018 NTotal Alkalinity 1119.6 (mg/L Equiv. CaCO₃)

Analytical Submissions

Analysis Requested

Tag Numbers

0653-77-24-EMW11a -A

Adip

VOA

A6137, A6138

-B

BNA

0653-77-24-EMW11a -C

Total Phenols

A6139

0653-77-24-EMW11a -D

TKN, NH₃, TOC, COD, NO₂, NO₃

A6140

0653-77-24-EMW11a -E

Sulfide

A6141

0653-77-24-EMW11a -F

Cyanide

A6142

0653-77-24-EMW11a -G

Sulfate, TDS, Br, Cl, F, HCO₃, CO₃, ALK

A6143

0653-77-24-EMW11a -H

Metals, SCN

A6144

-J

TSS

0653-77-24-EMW11a -I

Alk, pH

A6145

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DATE

WITNESS

DATE

PROJECT NO. 2013193
BOOK NO. 063

Well Name EMW-1

Date 12 JUNE 42

Power Requirements

Phase.

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Water is clear. Moderate sulfur/petroleum odor

SCIENTIFIC METHOD: A SYSTEMATIC APPROACH TO KNOWLEDGE

SIGNATURE

James R. L. 62

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DATE _____

WITNESS

WITNESS
Brian Louie

DATE	DESCRIPTION	AMOUNT	BALANCE
1968			
1-1	Balance		100.00
1-15	Deposit	50.00	150.00
2-1	Withdrawal	25.00	125.00
2-15	Deposit	75.00	200.00
3-1	Withdrawal	100.00	100.00
3-15	Deposit	50.00	150.00
4-1	Withdrawal	75.00	75.00
4-15	Deposit	25.00	100.00
5-1	Withdrawal	50.00	50.00
5-15	Deposit	50.00	100.00
6-1	Withdrawal	100.00	0.00
6-15	Deposit	100.00	100.00
7-1	Withdrawal	50.00	50.00
7-15	Deposit	50.00	100.00
8-1	Withdrawal	100.00	0.00
8-15	Deposit	100.00	100.00
9-1	Withdrawal	50.00	50.00
9-15	Deposit	50.00	100.00
10-1	Withdrawal	100.00	0.00
10-15	Deposit	100.00	100.00
11-1	Withdrawal	50.00	50.00
11-15	Deposit	50.00	100.00
12-1	Withdrawal	100.00	0.00
12-15	Deposit	100.00	100.00
1969			
1-1	Balance		100.00
1-15	Deposit	50.00	150.00
2-1	Withdrawal	25.00	125.00
2-15	Deposit	75.00	200.00
3-1	Withdrawal	100.00	100.00
3-15	Deposit	50.00	150.00
4-1	Withdrawal	75.00	75.00
4-15	Deposit	25.00	100.00
5-1	Withdrawal	50.00	50.00
5-15	Deposit	50.00	100.00
6-1	Withdrawal	100.00	0.00
6-15	Deposit	100.00	100.00
7-1	Withdrawal	50.00	50.00
7-15	Deposit	50.00	100.00
8-1	Withdrawal	100.00	0.00
8-15	Deposit	100.00	100.00
9-1	Withdrawal	50.00	50.00
9-15	Deposit	50.00	100.00
10-1	Withdrawal	100.00	0.00
10-15	Deposit	100.00	100.00
11-1	Withdrawal	50.00	50.00
11-15	Deposit	50.00	100.00
12-1	Withdrawal	100.00	0.00
12-15	Deposit	100.00	100.00
1970			
1-1	Balance		100.00
1-15	Deposit	50.00	150.00
2-1	Withdrawal	25.00	125.00
2-15	Deposit	75.00	200.00
3-1	Withdrawal	100.00	100.00
3-15	Deposit	50.00	150.00
4-1	Withdrawal	75.00	75.00
4-15	Deposit	25.00	100.00
5-1	Withdrawal	50.00	50.00
5-15	Deposit	50.00	100.00
6-1	Withdrawal	100.00	0.00
6-15	Deposit	100.00	100.00
7-1	Withdrawal	50.00	50.00
7-15	Deposit	50.00	100.00
8-1	Withdrawal	100.00	0.00
8-15	Deposit	100.00	100.00
9-1	Withdrawal	50.00	50.00
9-15	Deposit	50.00	100.00
10-1	Withdrawal	100.00	0.00
10-15	Deposit	100.00	100.00
11-1	Withdrawal	50.00	50.00
11-15	Deposit	50.00	100.00
12-1	Withdrawal	100.00	0.00
12-15	Deposit	100.00	100.00
1971			
1-1	Balance		100.00
1-15	Deposit	50.00	150.00
2-1	Withdrawal	25.00	125.00
2-15	Deposit	75.00	200.00
3-1	Withdrawal	100.00	100.00
3-15	Deposit	50.00	150.00
4-1	Withdrawal	75.00	75.00
4-15	Deposit	25.00	100.00
5-1	Withdrawal	50.00	50.00
5-15	Deposit	50.00	100.00
6-1	Withdrawal	100.00	0.00
6-15	Deposit	100.00	100.

1/22/92

157

DATE 6/22/92

TITLE

EMW-1

PROJECT NO. 00131430

79

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM1Well Name EMW-1Date 12 JUNE 92Field Crew LINDSEY, LAUREYWeather CLEAR, CALMAir Temperature 70 (°F)Measuring Point TOCSampling Device BENNET PUMPDepth to Water 86.3Depth of Sampling Device 354

Field Analyses at Time of Sampling

Temperature 11.4 (°C)Corrected Conductivity 2400 (µmhos/cm at 25°C)pH 7.86Eh -246.4 (mV, Field Electrode)Eh 37.66 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate 1.2 (gallons/min)

Alkalinity Titration

Filtered Sample pH 7.85mls of Sample Tested 25 mlmls of HCl Added to Reach pH 4.5 32.1 mlNormality of HCl 0.018 NTotal Alkalinity 1155.6 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
<u>0653-79-24-EMW1</u> -A; Adp	<u>VOA</u>	<u>A6146</u>
<u>0653-79-24-EMW1</u> -B	<u>BNA</u>	<u>A6147, A6148</u>
<u>0653-79-24-EMW1</u> -C	<u>Total Phenols</u>	<u>A6149</u>
<u>0653-79-24-EMW1</u> -D	<u>TKN, NH₃, TOC, COD, NO₃, NO₂</u>	<u>A6150</u>
<u>0653-79-24-EMW1</u> -E	<u>Sulfid</u>	<u>A6151</u>
<u>0653-79-24-EMW1</u> -F	<u>Cyanide</u>	<u>A6152</u>
<u>0653-79-24-EMW1</u> -G	<u>Sulfate, TD₅, Br, Cl, F, HCO₃, CO₃, ALK</u>	<u>A6153</u>
<u>0653-79-24-EMW1</u> -H	<u>Metal, SCN</u>	<u>A6154</u>
<u>0653-79-24-EMW1</u> -J	<u>TSS</u>	<u>A6155</u>
<u>0653-79-24-EMW1</u> -I	<u>(A6156) (A6157)</u>	<u>A6155</u>

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Emw-2

BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project RMI

Well Name EMW-2

Date 12 JUNE 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

water is clear, odor free.

slight amount of organic material in water

RC1E

SIGNATURE

Geno. P. Luth

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WITNESS
Brian Long

DATE

6/22/67

DATE _____

6/22/92

Attila 6/2/92

TITLE

WESTERN RESEARCH INSTITUTE

EMW-2

PROJECT NO. 0031430

BOOK NO. 0653

81

WRI GROUNDWATER SAMPLING RECORD

Project RM 1Well Name EMW-2Date 12 JUNE 92Field Crew LINDSEY J. LARSENWeather ptly cloudy, calmAir Temperature 68 (F°)Measuring Point TOCSampling Device TEFLON BAILERDepth to Water 81.95Depth of Sampling Device 301'

Field Analyses at Time of Sampling

Temperature 12.2 (°C)Corrected Conductivity 250 (µmhos/cm at 25°C)pH 9.52Eh -260.4 (mV, Field Electrode)Eh -32.38 (mV, Corrected to Standard Hydrogen Electrode)Discharge Rate BAIL (gallons/min)

Alkalinity Titration

Filtered Sample pH _____

mls of Sample Tested _____ ml

mls of HCl Added to Reach pH 4.5 _____ ml

Normality of HCl _____ N

Total Alkalinity _____ (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0653-81-24-EMW2 -C	Total Phenols	46165
0653-81-24-EMW2 -D	(TKN), NH ₄ , TOC, COD, NO ₃ , NO ₂	46166
0653-81-24-EMW2 -E	(Sulfide)	46167
0653-81-24-EMW2 -F	(Cyanide)	46168
0653-81-24-EMW2 -G	(Sulfate), TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK	46169
0653-81-24-EMW2 -H	(Metals), SCN	46170
-J	TSS	
0653-81-24-EMW2 -I	(AK) (pH)	46171

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TITLE

PROJECT NO. 2013143
BOOK NO. 0653

WESTERN RESEARCH INSTITUTE

Project RM I

Well Name CCW-1

Date 13 JUNE 92

Power Requirements_____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Well bore obstructed at 240'. Eventually dropped pump to 335'. Water level in well bore dropped 0.9 feet from before pump in well to while pump in well. Perhaps broke through obstruction at 240' allowed water to equilibrate.

pH meter calibrated in pH 7.00 and 10.00 buffer
(and meter reads 1220 $\mu\text{mhos}/\text{cm}$ in 0.1M KCl at 14.0 $^{\circ}\text{C}$)
Eh meter reads 246.0 mV in 2 cell stack. at 14.0 $^{\circ}\text{C}$.

water has dark tint, slight sulfur smell

SCIENCE

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WITNESS

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TITLE

CCW-1

PROJECT NO. 00131430
BOOK NO. 0653

83

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM 1 Well Name CCW-1
Date 13 JUNE 92 Field Crew LINDBLUM, LOWRY
Weather CLEAR, BREEZY Air Temperature 60 (F°)
Measuring Point TOX Sampling Device BENNETT PUMP
Depth to Water 92.7 Depth of Sampling Device 335'

Field Analyses at Time of Sampling

Temperature 19.1 (°C)
Corrected Conductivity 2540 (µmhos/cm at 25°C)
pH 8.38
Eh -235.8 (mV, Field Electrode)
Eh -33.99 (mV, Corrected to Standard Hydrogen Electrode)
Discharge Rate 1.2 (gallons/min)
Alkalinity Titration
Filtered Sample pH 8.37
mls of Sample Tested 25 ml
mls of HCl Added to Reach pH 4.5 8.7 ml
Normality of HCl 0.018 N
Total Alkalinity 313.20 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
<u>0653-83-24-CCW1 -A</u>	<u>VOA</u>	<u>AG172; AG173</u>
<u>-B</u>	<u>BNA</u>	
<u>0653-83-24-CCW1 -C</u>	<u>Total Phenols</u>	<u>AG174</u>
<u>0653-83-24-CCW1 -D</u>	<u>TKN, NH₃, TOC, COD, NO₂, NO₃</u>	<u>AG175</u>
<u>0653-83-24-CCW1 -E</u>	<u>Sulfide</u>	<u>AG176</u>
<u>0653-83-24-CCW1 -F</u>	<u>Cyanide</u>	<u>AG177</u>
<u>0653-83-24-CCW1 -G</u>	<u>Sulfate, TD₅, Br, Cl, F, HCO₃, CO₃, ALK</u>	<u>AG178</u>
<u>0653-83-24-CCW1 -H</u>	<u>Metals, SCN</u>	<u>AG179</u>
<u>-J</u>	<u>TSS</u>	
<u>0653-83-24-CCW1 -I</u>	<u>ALK, pH</u>	<u>AG180</u>

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84

TITLE

V1W-1

PROJECT NO. 00131930
BOOK NO. 0053

WESTERN RESEARCH INSTITUTE

Project Rm1Well Name V1W-1Date 13 JUN 92

Power Requirements _____

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
0945	15.4	3840	7.90	-216.70	68.6	1.2
1005	16.3	3810	7.75	-220.3	69.9	1.2
1025	16.2	3830	7.76	-225.9	70.6	1.2
1045	16.3	3760	7.80	-230.8	71.35	1.2
1105	16.4	3700	7.80	-231.9	71.75	1.2
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COMMENTS

water is clear. Moderate sulfur/petroleum odor

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6/22/92

TITLE

V1W-1

PROJECT NO. 00131430
BOOK NO. 0653

85

WRI WESTERN RESEARCH INSTITUTE

WRI GROUNDWATER SAMPLING RECORD

Project RM1 Well Name V1W-1
 Date 13 JUNE 92 Field Crew LINDSEY, LARRY
 Weather CLEAR BREEZY Air Temperature 60 (F°)

Measuring Point TOC Sampling Device BENNETT PUMP
 Depth to Water 68.9 Depth of Sampling Device 375'

Field Analyses at Time of Sampling

Temperature 16.4 (°C)
 Corrected Conductivity 3700 (µmhos/cm at 25°C)
 pH 7.80
 Eh -231.9 (mV, Field Electrode)
 Eh -27.66 (mV, Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.2 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 7.85
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 13.9 ml
 Normality of HCl 0.018 N
 Total Alkalinity 500.4 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
0653-85-24-V1W1 -A; AMUP	VOA	AG151; AG152
-B	BNA	
0653-85-24-V1W1 -C	Total Phenols	AG153
0653-85-24-V1W1 -D	(TKN) NH ₃ , TOC, COD, NO ₃ , NO ₂	AG154
0653-85-24-V1W1 -E	Sulfide	AG155
0653-85-24-V1W1 -F	Cyanide	AG156
0653-85-24-V1W1 -G	Sulfate, TDS, Br, Cl, (F) HCO ₃ , CO ₃ , ALK	AG157
0653-85-24-V1W1 -H	Metals, SCN	AG158
-J	TSS	
0653-85-24-V1W1	(ALK) (pH)	AG159

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WITNESS

DATE

**DATE
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8 / 23 / 93

END