



**ROCKY MOUNTAIN
ENERGY**

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40-8697

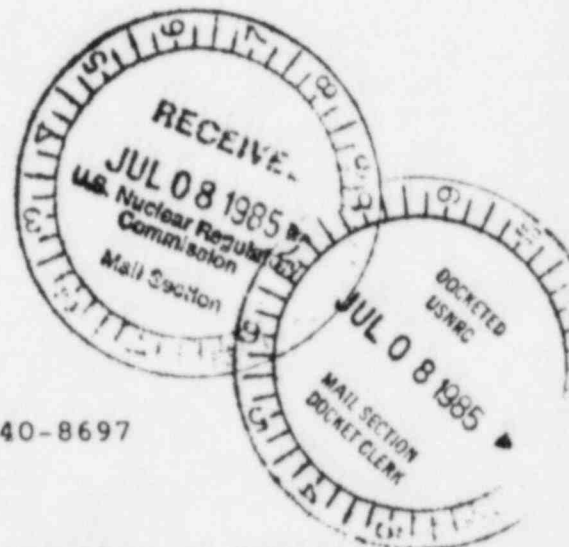
RETURN ORIGINAL TO PDR, HQ.

July 3, 1985

Ms. Sandra Wastler, Project Manager
U. S. Nuclear Regulatory Commission
Uranium Recovery Field Office
P. O. Box 25325
Denver, Colorado 80225

Dear Ms. Wastler:

Re: License SUA-1338, Docket No. 40-8697
LQD Permit No. 479
Reno Creek R&D Project



Enclosed are results of the April sampling of Pattern 1 wells which were analyzed for the "full suite" of Guideline No. 8 parameters as requested by the NRC and DEQ. Data evaluation confirms that no apparent deterioration of water quality has occurred after nearly four years of stabilization monitoring.

Sample Analyses

Duplicate samples were obtained from Pattern 1 wells during the routine April sampling and delivered to the Nine Mile Lake and Accu-Labs Research laboratories for analysis. Attachment A presents Accu-Labs results which include all major and minor parameters as well as radionuclides. Samples were also analyzed for major anions and cations, iron, vanadium, and uranium at the Nine Mile Lake lab. Results of both lab analyses are given in Attachment B. Comparison of the data suggests the Nine Mile Lake results are more accurate for major parameters, based upon the respective anion-cation balances.

Sample results were compared with the baseline range for each well on a parameter-by-parameter basis (note the same baseline range was used for the two production wells, P-1 and P-2). Values which are underlined exceed the baseline range for that well.

Production Wells

Water quality within the two production wells is nearly identical with TDS levels roughly 500 to 1,000 mg/l

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Ms. Sandra Wastler
July 3, 1985
Page Two

above baseline. Calcium, chloride, magnesium, potassium, sulfate, and iron contribute to the elevated TDS levels. Ammonia, aluminum, and manganese concentrations are also elevated somewhat but are either below WDEQ Class III standards, within the pattern baseline range or not regulated for livestock use. Radionuclides, including uranium, are well within the P-1 baseline range. pH values for both wells have gradually increased from 4.8 (std. units) to 5.8 in P-1 and 4.7 to 5.6 in P-2, since June 1981, providing strong evidence that geochemical equilibrium is being reestablished.

Monitor Wells

TDS levels in all production zone monitor wells are within respective baseline ranges as are all major anions and cations but sodium. Sodium values for wells M-1, M-3, and M-4 are slightly above respective baseline ranges but are well within the range observed for the production zone. All minor constituents except uranium in well M-4 and possibly manganese in wells M-4 and M-3 are also within respective baseline ranges. The manganese values of 0.032 mg/l and 0.064 mg/l, respectively, for M-3 and M-4 are within the range of natural baseline variability for the production zone, (<0.01 - 0.09 mg/l). Nickel and zinc concentrations would appear slightly elevated in some wells but probably only reflect a more sensitive analytical technique than used for the baseline sampling done in 1978.

Radium and thorium are all within individual well baseline ranges except the 29 pCi/l for radium in well M-2 which slightly exceeds the high baseline range of 24 pCi/l. Considering that well M-1 had baseline levels in excess of 350 pCi/l and the Class I, II, and III standard of 5 pCi/l, a 5 pCi/l increase in one well is insignificant and probably reflects natural variability.

Water quality in the upper and lower sand monitor wells indicates minor changes from respective baseline ranges which is not surprising considering the nature of the "aquifers" monitored. Extreme difficulty has been encountered while sampling both wells over the years as neither sand produces a sufficient quantity of water to allow collection of pumped samples. Regardless, the data clearly confirms the absence of leach solution or affected groundwater in the stratigraphically adjacent sand units.

Ms. Sandra Wastler
July 3, 1985
Page Three

Conclusion

Water quality within the interior of Pattern 1 has improved gradually but measurably over a four-year stabilization monitoring period. Uranium concentrations have decreased significantly while pH has increased a thousandfold in both production wells, suggesting that natural restoration may be occurring more rapidly than predicted by RME evaluations prior to discontinuing induced restoration efforts.

Monthly samples taken over a continuous four-year period from underlying, overlying, and surrounding monitor wells confirm that affected groundwater has not moved beyond the pattern interior. There has been no impairment of premining groundwater use suitability and evidence suggests that restoration to essentially baseline conditions will occur as equilibration progresses.

We would encourage a prompt review of the enclosed data so that a final confirmation sampling with NRC and/or DEQ personnel can be arranged in the near future, if necessary. As you know, the Reno Creek decommissioning plan has been approved and the Source Material License will again expire in September (1985). RME plans to begin decommissioning and reclamation of the test facility prior to that time, assuming that NRC and DEQ approval to abandon Pattern 1 wells has been received.

We are investigating possible methods of sampling the Pattern 1 injection wells. RME has strong reservations regarding the propriety of conducting any additional sampling at this time, however. There is no doubt that sufficient data exists to fully assess groundwater impacts. It should be noted that RME has already collected monthly samples for three years beyond the stipulated one-year time period in the DEQ's original approval to discontinue restoration (see Attachment C).

Ms. Sandra Wastler
July 3, 1985
Page Four

Please give me a call if you have any questions.

Sincerely,

Michael R. Neumann

Michael R. Neumann
Senior Licensing Specialist

MRN/asm

Enclosure

cc: Mr. Roger Shaffer
Mr. Ed Hawkins
Mr. Glenn Hooney
Ms. Paula Schmitt diel



Accu-Labs Research, Inc.

11485 W. 48th Avenue Wheat Ridge, Colorado 80033
(303) 423-2766

May 20, 1985

Page 1 of 2

Mr. Pat Spieles
Rocky Mountain Energy Co.
P.O. Box 3719
Casper, WY 82602

RE: 8756-19807-8
Date Samples Rec'd 4-23-85
P.O. No. AP4-1938

REPORT OF ANALYSIS

ALR Designation	8756-19807-8-1	8756-19807-8-2	8756-19807-8-3	8756-19807-8-4	8756-19807-8-5
Sponsor Designation	<u>P-1</u> <u>4-1-85</u>	<u>P-2</u> <u>4-1-85</u>	<u>M-1</u> <u>4-85</u>	<u>M-2</u> <u>4-85</u>	<u>M-3</u> <u>4-85</u>
Determination: pCi/L					
Uranium (as U), total, mg/L	0.49	0.56	0.026	0.015	0.26
Radium-226, total, ± counting error*	500 ± 20	520 ± 20	130 ± 10	29 ± 4	94 ± 7
Thorium-230, total, ± counting error*	0.9 ± 0.4	0.0 ± 0.2	0.2 ± 0.3	0.0 ± 0.2	0.0 ± 0.2

ATTACHMENT A

May 20, 1985

Page 2 of 2

Mr. Pat Spieles
Rocky Mountain Energy Co.

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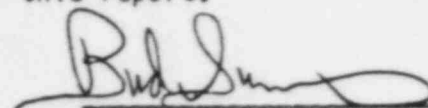
REPORT OF ANALYSIS

ALR Designation	8756-19807-8-6	8756-19807-8-7	8756-19807-8-8
Sponsor Designation	M-4	LSM	USM
	<u>4-85</u>	<u>4-1-85</u>	<u>4-1-85</u>
Determination: pCi/L			
Uranium (as U), total, mg/L	1.7	0.005	0.002
Radium-226, total, ± counting error*	49 ± 5	4.2 ± 1.4	1.8 ± 1.0
Thorium-230, total, ± counting error*	-0.1 ± 0.2	0.0 ± 0.2	-0.1 ± 0.2

*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ.
These samples are scheduled to be disposed of 45 days after the date of this report.

BS/dh

dh


Bud Summers
Radiochemistry
Supervisor



Accu-Labs Research, Inc.

11485 W. 48th Avenue Wheat Ridge, Colorado 80033
(303) 423-2766

May 20, 1985

Page 1 of 4

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REPORT OF ANALYSIS

ALR Designation	8756-19807-8-1	8756-19807-8-2	8756-19807-8-3	8756-19807-8-4	8756-19807-8-5
Sponsor Designation	P-1	P-2	M-1	M-2	M-3
	4-1-85	4-1-85	4-85	4-85	4-85
Determination: mg/L					
Bicarbonate (as HCO_3)	<5	<5	140	100	92
Carbonate (as CO_3)	<5	<5	<5	<5	<5
Total Alkalinity, as CaCO_3 to pH 4.5	<5	<5	120	85	75
Calcium, total	200	210	84	91	99
Chloride	22	32	12	9	9
Magnesium, total	50	60	18	19	19
Potassium, total	24	43	4.6	5.0	5.4
Sodium, total	240	250	230	240	250
Sulfate (as SO_4)	1300	1500	740	810	900
TDS (at 180°C)	2000	2300	1200	1200	1300
Cation/Anion Balance	0.91	0.85	0.88	0.89	0.85
Ammonia (as N)*	0.8	1.2	<0.2	<0.2	<0.2
Nitrate (as N)**	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite (as N)**	<0.05	<0.05	<0.05	<0.05	<0.05

* Ammonia improperly preserved.

** Nitrate and Nitrite past recommended holding times.

May 20, 1985

Page 2 of 4

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Rocky Mountain Energy Co.

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ALR Designation	8756-19807-8-1	8756-19807-8-2	8756-19807-8-3	8756-19807-8-4	8756-19807-8-5
Sponsor Designation	P-1	P-2	M-1	M-2	M-3
	4-1-85	4-1-85	4-85	4-85	4-85
Determination: mg/L					
Aluminum, total	1.8	1.2	<0.5	<0.5	<0.5
Arsenic, total	0.10	<0.005	<0.005	<0.005	<0.005
Barium, total	<0.2	<0.2	<0.2	<0.2	<0.2
Boron, total	0.3	0.4	0.2	0.1	0.1
Cadmium, total	0.016	0.019	0.009	0.013	0.009
Chromium, total	0.006	0.013	0.007	0.006	0.011
Copper, total	0.007	0.010	<0.005	<0.005	<0.005
Iron, total	23	49	0.01	0.09	0.04
Fluoride	<0.5	<0.5	<0.5	<0.5	<0.5
Lead, total	<0.005	<0.005	<0.005	<0.005	<0.005
Manganese, total	0.84	1.5	0.061	0.051	0.032
Mercury, total	<0.0001	0.0002	<0.0001	<0.0001	<0.0001
Molybdenum, total	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel, total	0.06	0.05	0.02	0.03	0.01
Selenium, total	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium, total	0.16	0.039	0.006	<0.005	<0.005
Zinc, total	0.032	0.071	0.014	0.019	0.046

May 20, 1985

Page 3 of 4

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Rocky Mountain Energy Co.

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ALR Designation	8756-19807-8-6	8756-19807-8-7	8756-19807-8-8
Sponsor Designation	M-4	LSM	USM
	<u>4-85</u>	<u>4-1-85</u>	<u>4-1-85</u>
Determination: mg/L			
Bicarbonate (as HCO_3)	92	<5	380
Carbonate (as CO_3)	<5	61	6
Total Alkalinity, as CaCO_3 to pH 4.5	75	160	330
Calcium, total	110	43	30
Chloride	10	21	23
Magnesium, total	.3	0.32	5.7
Fluoride, total	5.7	2.6	3.2
Sulfate, total	270	91	120
Sulfate (as SO_4)	970	36	10
TDS (at 180°C)	1500	270	420
Cation/Anion Balance	0.88	0.89	1.00
Ammonia (as N)*	<0.2	2.1	<0.2
Nitrate (as N)**	<0.05	<0.05	<0.05
Nitrite (as N)**	<0.05	<0.05	<0.05

May 20, 1985

Page 4 of 4

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Rocky Mountain Energy Co.

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REPORT OF ANALYSIS

ALR Designation	8756-19807-8-6	8756-19807-8-7	8756-19807-8-8
Sponsor Designation	M-4	LSM	USM
	<u>4-85</u>	<u>4-1-85</u>	<u>4-1-85</u>
Determination: mg/L			
Aluminum, total	<0.5	2.8	<0.5
Arsenic, total	<0.005	<0.005	<0.005
Barium, total	<0.2	<0.2	0.2
Boron, total	0.2	0.3	0.2
Cadmium, total	0.008	0.005	<0.005
Chromium, total	0.006	0.013	0.014
Copper, total	0.006	0.39	<0.005
Iron, total	0.02	0.55	1.4
Fluoride	<0.5	<0.5	0.7
Lead, total	<0.005	0.018	0.012
Manganese, total	0.064	0.012	0.13
Mercury, total	<0.0001	<0.0001	0.0001
Molybdenum, total	<0.005	<0.005	<0.005
Nickel, total	0.05	0.01	<0.02
Selenium, total	<0.005	<0.005	<0.005
Vanadium, total	<0.005	0.055	<0.005
Zinc, total	0.015	0.030	0.026

These samples are scheduled to be disposed of 30 days after the date of this report.

Cathy Cairns
Cathy Cairns
Supervisor
Water Laboratory

CC/dh *dh*

RENO CREEK
 • Pattern I
PRODUCTION WELL P-1

ATTACHMENT B

Field	Parameter*	Baseline Range	NML 1/2/85	NML 2/1/85	NML 3/1/85	NML 4/1/85	Accu 4/1/85
	pH	7.9-8.6	5.9	5.9	5.9	5.8	--
	Conductivity	1400-2000	2566	2875	2552	2500	--
<u>Major Constituents</u>							
	Bicarbonate	13-98	40	43	8	39	<5
	Carbonate	0-75	0	0	0	0	0
	Alkalinity (as CaCO ₃ eq)	11-80	33	35	7	32	<5
	Calcium	80-120	246	224	236	219	200
	Chloride	8-18	25	34	28	21	22
	Magnesium	15-29	44	42	42	54	50
	Potassium	10-20	31.7	34.7	33.1	38.5	24
	Sodium	210-323	286	249	250	279	240
	Sulfate	700-900	1229	1276	1346	1307	1300
	TDS	1124-1492	2040	1980	2040	2020	2000
	Anion/cation		104	99	96	100	91
<u>Minor Constituents</u>							
	Ammonia as N	0.1-0.5					0.8
	Nitrate as N	0.1-0.5					<0.05
	Nitrite as N	0.1					<0.05
	Aluminum	0.10-0.28					1.8
	Arsenic	0.01-0.03	0.044				0.10
	Barium	0.1					<0.2
	Boron	0.11-2.6					0.3
	Cadmium	0.01					0.016
	Chromium	0.01					0.006
	Copper	0.01					0.007
	Fluoride	ND-0.22					<0.5
	Iron	0.01-0.21	25.8	24.6	26.4	27.9	23
	Lead	0.01					<0.005
	Manganese	0.01-0.03					0.84
	Mercury	0.0001					<0.000
	Molybdenum	ND-0.08					<0.005
	Nickel	0.01					0.06
	Selenium	ND-0.05	0.048				<0.005
	Vanadium	0.05-0.38	0.334	0.199	0.172	0.128	0.16
	Zinc	0.1					0.03
	Silica (SiO ₂)						
<u>Radiochemistry</u>							
	Uranium as U ₃ O ₈	0.15-1.05	0.428	0.380	0.454	0.487	0.49
	Radium - 226	160-686	656				500+20
	Thorium - 230	0.4-0.8					0.9+0.

its in mg/l (ppm) except pH (std. units), conductivity (umhos/cm) and Ra-226, Th-230 (pCi/l).

• RENO CREEK
Pattern I
Production Well P-2

<u>Parameter*</u>	<u>Baseline Range**</u>	<u>NML 1/2/85</u>	<u>NML 2/1/85</u>	<u>NML 3/1/85</u>	<u>NML 4/1/85</u>	<u>Accu. 4/1/85</u>
<u>Field</u>						
pH	7.9-8.6	5.6	5.6	5.6	5.6	--
Conductivity	1400-2000	2895	2875	3061	2812	--
<u>Major Constituents</u>						
Bicarbonate	13-98	44	44	2	33	<5
Carbonate	0-75	0	0	0	0	0
Alkalinity (as CaCO ₃ eq)	11-18	36	36	2	27	<5
Calcium	18-120	258	244	248	234	210
Chloride	8-18	38	43	37	31	32
Magnesium	15-29	54	52	50	67	60
Potassium	10-20	58.7	62.2	58.6	67.8	43
Sodium	210-323	301	271	270	297	250
Sulfate	700-900	1408	1469	1494	1582	1500
TDS	1124-1492	2280	2280	2260	2420	2300
Anion/cation		101	98	96	96	85
<u>Minor Constituents</u>						
Ammonia as N	0.1-0.5					1.2
Nitrate as N	0.1-0.5					<0.05
Nitrite as N	0.1					<0.05
Aluminum	0.10-0.28					1.2
Arsenic	0.01-0.03	0.002				<0.005
Barium	0.1					<0.2
Boron	0.11-2.6					0.4
Cadmium	0.01					0.019
Chromium	0.01					0.013
Copper	0.01					0.010
Fluoride	ND-0.22					<0.5
Iron	0.01-0.21	45.5	48.0	60.1	55.9	49
Lead	0.01					<0.005
Manganese	0.01-0.03					1.5
Mercury	0.0001					0.0002
Molybdenum	ND-0.08					<0.005
Nickel	0.01					0.05
Selenium	ND-0.05	0.003				<0.005
Vanadium	0.05-0.38	0.075	0.072	0.034	0.045	0.039
Zinc	0.1					0.071
Silica (SiO ₂)						
<u>Radiochemistry</u>						
Uranium as U ₃ O ₈	0.15-1.05	0.371	0.436	0.410	0.439	0.660
Radium - 226	160-686	553				520
Thorium - 230	0.4-0.6					0.0

* Units in mg/l (ppm) except pH (std. units), conductivity (umhos/cm) and Ra²²⁶,
 ** Same baseline range as RC-P1. Th²³⁰ (pCi/l).

RENO CREEK, PATTERN 1
MONITOR WELL M-1

PARAMETER*	BASILINE RANGE	NML 1/2/85	NML 2/1/85	NML 3/1/85	NML 4/1/85	Accu 4/1/85
<u>Field</u>						
pH	7.8-8.3	8.2	7.8	7.8	8.0	--
Conductivity	1220-1570	1697	1750	1684	1698	--
<u>Major Constituents</u>						
Bicarbonate	57-122	152	130	168	150	140
Carbonate	0-48	0	0	0	0	0
Alkalinity as						
CaCO ₃	47-100	125	107	138	123	120
Calcium	79-99	91	94	84	91	84
Chloride	14-21	19	12	20	17	12
Magnesium	13-22	16	16	15	20	18
Potassium	7.0-11.2	5.9	7.3	6.6	8.1	4.6
Sodium	201-208	264	242	240	277	230
Sulfate	486-776	688	719	708	726	740
TDS	1006-1292	1200	1140	1160	1140	1200
Anion/Cation		100	98	94	101	88
<u>Minor Constituents</u>						
Ammonia as N	0.01-0.18					<0.2
Nitrate as N	0.10-0.24					<0.05
Nitrite as N	0.1					<0.05
Aluminum	0.10-0.18					<0.5
Arsenic	0.01-0.03	0.003				<0.005
Barium	0.1					<0.2
Boron	0.10-0.26					0.2
Cadmium	0.01					0.009
Chromium	0.01					0.007
Copper	0.01					<0.005
Fluoride	0.10-0.67					<0.5
Iron	0.01-0.24	0.11	0.07	0.13	0.05	0.01
Lead	0.01					<0.005
Manganese	0.01-0.07					0.061
Mercury	0.0001					<0.0001
Molybdenum	0.01					<0.005
Nickel	0.01					0.02
Selenium	0.01-0.02	0.011				<0.005
Vanadium	0.05-0.17	0.005	0.004	0.001	0.001	0.006
Zinc	0.1					0.014
Silica (SiO ₂)						
<u>Radiochemistry</u>						
Uranium as U ₃ O ₈	0.023-0.102	0.016	0.027	0.064	0.060	0.031
Radium-266	109-398	151				130
Thorium-230	0.6-1.0					0.2

NOTE: *Units in mg/l (ppm) except conductivity (umhos/cm) and radionuclides (pCi/l).

**Bailed Sample

***Airlifted Sample

RENO CREEK, PATTERN 1
MONITOR WELL M-2

PARAMETER*	BASILINE RANGE	NML 2/1/85	NML 3/1/85	NML 4/1/85	Accu. 4/1/85	NML 5/1/85
<u>Field</u>						
pH	7.9-8.2	8.0	8.1	8.0	--	8.1
Conductivity	1250-1760	1875	1735	1721	--	1700
<u>Major Constituents</u>						
Bicarbonate	56-121	105	119	107	100	95
Carbonate	0.32	0	0	0	0	0
Alkalinity as CaCO ₃	46-99	86	98	88	85	78
Calcium	88-119	99	96	98	91	85
Chloride	6-22	10	15	14	9	15
Magnesium	15-28	16	15	22	19	18
Potassium	7.0-11.3	7.3	6.8	8.8	5.0	9.0
Sodium	220-290	249	238	277	240	241
Sulfate	640-860	786	759	829	810	772
TDS	1103-1392	1220	1220	1260	1200	1190
Anion/Cation		97	95	99	89	96
<u>Minor Constituents</u>						
Ammonia as N	0.10-0.85				<0.2	
Nitrate as N	0.10-0.26				<0.05	
Nitrite as N	0.1				<0.05	
Aluminum	0.10-0.49				<0.5	
Arsenic	0.01-0.03				<0.005	
Barium	0.1				<0.2	
Boron	0.10-1.49				0.1	
Cadmium	0.01				0.013	
Chromium	0.01				0.006	
Copper	0.01				<0.005	
Fluoride	0.10-0.57				<0.5	
Iron	0.01-0.17	0.07	0.07	0.06	0.09	0.07
Lead	0.01				<0.005	
Manganese	0.01-0.09				0.051	
Mercury	0.0001				<0.0001	
Molybdenum	ND-0.05				<0.005	
Nickel	0.01				0.03	
Selenium	0.01-0.02				<0.005	
Vanadium	0.05-0.17	0.006	0.001	0.001	<0.005	
Zinc	0.1				0.019	
Silica (SiO ₂)						
<u>Radiochemistry</u>						
Uranium as U ₃ O ₈	0.007-0.027	0.013	0.085	0.033	0.018	0.023
Radium-226	11.7-23.9				29	
Thorium-230	0.6-2.6				0.0	

NOTE: *Units in mg/l (ppm) except conductivity (umhos/cm) and radionuclides (pCi/l)

RENO CREEK, PATTERN 1
MONITOR WELL M-3

PARAMETER*	BASELINE RANGE	NML 2/1/85	NML 3/1/85	NML 4/1/85	Accu 4/1/85	NML 5/1/85
<u>Field</u>						
pH	8.2-10.8	8.4	8.4	8.5	--	8.5
Conductivity	1300-2000	1875	1939	1875	--	1800
<u>Major Constituents</u>						
Bicarbonate	48-102	95	90	91	92	84
Carbonate	0-32	0	15	4	0	4.5
Alkalinity as CaCO ₃	39-84	78	99	83	75	76
Calcium	88-113	108	113	110	99	106
Chloride	10-19	10	13	14	9	15
Magnesium	17-29	17	17	22	19	21
Potassium	8-14	7.9	8.1	10.1	5.4	11.3
Sodium	220-272	262	262	299	250	280
Sulfate	625-821	863	878	876	900	809
TDS	1063-1466	1300	1375	1420	1300	1290
Anion/Cation		96	95	101	85	102
<u>Minor Constituents</u>						
Ammonia as N	ND-0.74				<0.2	
Nitrate as N	ND-0.5				<0.05	
Nitrite as N	0.1				<0.05	
Aluminum	0.1-0.6				<0.5	
Arsenic	0.01-0.02				<0.005	
Barium	0.1				<0.2	
Boron	0.10-0.36				0.1	
Cadmium	0.01				0.009	
Chromium	0.01				0.011	
Copper	0.01				<0.005	
Fluoride	0.10-0.23				<0.5	
Iron	0.10-0.13	0.06	0.09	0.05	0.04	0.06
Lead	0.01				<0.005	
Manganese	0.01-0.02				0.032	
Mercury	0.0001				<0.0001	
Molybdenum	ND-0.09				<0.005	
Nickel	0.01				0.01	
Selenium	0.01-0.02				<0.005	
Vanadium	0.05-0.14	0.007	0.003	0.003	<0.005	
Zinc	0.1				0.046	
Silica (SiO ₂)						
<u>Radiochemistry</u>						
Uranium as U ₃ O ₈	0.205-0.750	0.118	0.166	0.527	0.307	0.154
Radium-226	67-207				94	
Thorium-230	0.6-0.9				0.0	

NOTE: Units expressed in mg/l (ppm) except conductivity (umhos/cm) and radionuclides

**Bailed Sample

***Airlifted Sample

(pCi/l).

RENO CREEK, PATTERN 1
MONITOR WELL M-4

PARAMETER*	BASELINE RANGE	NML 1/2/85	NML 2/1/85	NML 3/1/85	NML 4/1/85	Accu 4/1/85	NML 5/1/85
<u>Field</u>							
pH	7.8-9.0	8.6	8.6	8.5	8.5	--	8.6
Conductivity	1220-1650	1434	1969	2040	1979	--	1900
<u>Major Constituents</u>							
Bicarbonate	33-102	69	95	92	96	92	81
Carbonate	0-65	45	3	17	3	0	4.5
Alkalinity as CaCO ₃	27-84	132	80	104	84	75	115
Calcium	90-117	125	123	123	118	110	15
Chloride	8-17	21	10	19	15	10	23
Magnesium	19-29	20	19	19	25	23	11.0
Potassium	8.0-12.9	7.9	8.1	8.4	10.1	5.7	284
Sodium	200-278	319	275	276	317	270	928
Sulfate	670-953	987	908	899	895	970	1420
TDS	970-1452	1540	1400	1420	1430	1500	98
Anion/Cation		96	98	97	103	88	
<u>Minor Constituents</u>							
Ammonia as N	0.01-0.85					<0.2	
Nitrate as N	0.1-0.8					<0.05	
Nitrate as N	0.1					<0.05	
Aluminum	0.1-0.2					<0.5	
Arsenic	ND-0.01	0.003				<0.005	
Barium	0.1					<0.2	
Boron	90-117					0.2	
Cadmium	0.01					0.008	
Chromium	0.01					0.006	
Copper	0.01					0.006	
Fluoride	0.01-0.14					<0.5	
Iron	0.10-0.34	0.06	0.04	0.08	0.05	0.02	0.05
Lead	0.01					<0.005	
Manganese	0.01-0.04					0.064	
Mercury	0.0001					<0.0001	
Molybdenum	ND-0.10					<0.005	
Nickel	0.01					0.05	
Selenium	0.01-0.02	<0.001				<0.005	
Vanadium	ND-0.05	0.009	0.005	0.001	0.001	<0.005	
Zinc	0.01					0.015	
Silica (SiO ₂)							
<u>Radiochemistry</u>							
Uranium as U ₃ O ₈	0.27-0.55	1.06	1.02	1.06	1.25	2.00	1.07
Radium-226	40-136	60.1				49	
Thorium-230	0.6-0.9					-0.1	

NOTE: * Units expressed in mg/l (ppm) except conductivity (umhos/cm) and radionuclides
 ** Bailed sample *** Airlifted Sample (pCi/l).

RENO CREEK, PATTERN 1
MONITOR WELL LSM-1

PARAMETER*	BASELINE RANGE	NML 4/1/85	Accu 4/1/85	NML 5/1/85
Field pH	11.7-12.2	11.6	--	11.1
Conductivity	1840-2700	813	--	600
Major Constituents				
Bicarbonate	0	0	0	0
Carbonate	58-145	255	61	141
Alkalinity as CaCO ₃	236-589	425	160	235
Calcium	114-150	47	43	39
Chloride	13-66	29	21	25
Magnesium	6-20	0.2	0.32	0.3
Potassium	16-29	4.0	2.6	5.1
Sodium	203-245	101	91	94
Sulfate	25-99	28	36	76
TDS	1118-1370	300	270	350
Anion/Cation			89	100

Minor Constituents

Ammonia as N	ND-0.15		2.1	
Nitrate as N	ND-0.2		<0.05	
Nitrite as N	0.1		<0.05	
Aluminum	0.78-1.03		2.8	
Arsenic	ND-0.01		<0.005	
Barium	0.1		<0.2	
Boron	0.04-1.08		0.3	
Cadmium	0.01		0.005	
Chromium	0.01		0.013	
Copper	0.01		0.39	
Fluoride	0.29-0.40		<0.5	
Iron	0.03-3.0	0.20	0.55	0.50
Lead	0.1		0.018	
Manganese	ND-0.12		0.012	
Mercury	0.0001		<0.0001	
Molybdenum	0.01		<0.005	
Nickel	0.01		0.01	
Selenium	ND-0.04		<0.005	
Vanadium	ND-0.10	0.040	0.055	
Zinc	0.1		0.030	
Silica (SiCO ₂)				

Radiochemistry

Uranium as U ₃ O ₈	0.001-0.003	0.037	0.006	0.019
Radium-226	2.1-27.8		4.2	
Thorium-230	0.6-2.1		0.0	

NOTE: *Units in mg/l (ppm) except conductivity (µmhos/cm) and radionuclides (pCi/l).

**Bailed Sample

***Airlifted Sample

ENO CREEK, PATTERN 1
ONITOR WELL USM-1

PARAMETER	BASELINE RANGE	NML 4/1/85	Accu. 4/1/85	NML 5/1/85
field				
pH	7.9-8.7	7.8	--	7.8
Conductivity	300-430	729	--	710
<u>Major Constituents</u>				
Bicarbonate	59-297	460	380	404
Carbonate	0-129	0	6	0
Alkalinity as				
CaCO ₃	85-258	377	330	331
Calcium	10-20	33	30	31
Chloride	17-36	26	23	26
Magnesium	2.7-8.0	6	5.7	5.3
Potassium	6-13	5.5	3.2	6.4
Sodium	95-110	136	120	124
Sulfate	11-25	8.4	10	8
TDS	320-364	400	420	400
Anion/Cation		98	100	100

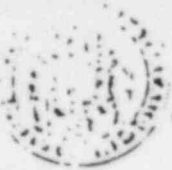
Minor Constituents

Ammonia as N	ND-0.19		<0.2	
Nitrate as N	ND-0.5		<0.05	
Nitrite as N	0.1		<0.05	
Aluminum	ND-1.45		<0.5	
Arsenic	0.01-0.03		<0.005	
Barium	0.1		0.2	
Boron	1.14-1.25		0.2	
Cadmium	0.01		<0.005	
Chromium	0.01		0.014	
Copper	0.01		<0.005	
Fluoride	0.95-1.00		0.7	
Iron	ND-3.0	1.38	1.4	1.75
Lead	0.1		0.012	
Manganese	0.01-1.10		0.13	
Mercury	0.0001		0.0001	
Molybdenum	0.01		<0.005	
Nickel	0.01		<0.02	
Selenium	0.01		<0.005	
Vanadium	ND-0.07	0.001	<0.005	
Zinc	0.1		0.026	
Silica (SiO ₂)				

Radiochemistry

Uranium as U ₃ O ₈	ND-0.014	0.012	0.002	0.009
Radium-226	3.3-31.2		1.8	
Thorium-230	0.6-2.3		-0.1	

NOTE: *Units in mg/l (ppm) except conductivity (umhos/cm) and radionuclides (pCi/l).
Bailed Sample *Airlifted Sample

*Department of Environmental Quality*

LAND QUALITY DIVISION

DISTRICT IV OFFICE

30 EAST GRINNELL STREET

TELEPHONE 307-672-6488

SHERIDAN, WYOMING 82901

June 3, 1981

Mr. Michael R. Neumann
Field Environmental Coordinator
Rocky Mountain Energy Company
4704 Harlan Street
Denver, Colorado 80212

RE: Pattern 1 Restoration, Reno Creek ISL, TFN 1 4/192

Dear Mr. Neumann:

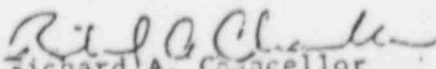
This letter constitutes authorization to enter a period of stabilization for pattern #1, Reno Creek R&D site. In conjunction with this stabilization, Rocky Mountain Energy Company is required to do the following:

- 1) Predict the rate and extent of contaminant movement and the effect on water quality at the pump wells and monitor wells.
- 2) Set reasonable limits on indicative groundwater parameters at each of the eight (8) wells to be monitored. These reasonable limits should include the possible error produced in sampling and analysis. These limits should be based on stable water quality at the six (6) monitor wells and water quality, improving through time, at the pump wells.
- 3) Sample each well monthly and report to the Department of Environmental Quality, Land Quality Division within twenty-four (24) hours if the reasonable limits have been exceeded at any well for any indicative parameter.
- 4) The groundwater quality limits and predictions of contaminant movement must be submitted by July 1, 1981.

The Department of Environmental Quality, Land Quality Division, will review the monthly water quality data after one (1) year of stabilization to determine future actions.

If you should have any questions concerning the above requirements, please feel free to contact me.

Sincerely,


Richard A. Chancellor
District IV Engineer

cc: Jim Brinkman, WQD
Anthony Mancini, WQD