

04008697090E

ROCKY MOUNTAIN ENERGY

RENO CREEK

PATTERN 2

RESTORATION REPORT

ADDENDUM

JULY 16, 1982

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8208050035 820716
PDR ADOCK 04008697
C PDR

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Table III-A
(cont.)

Parameter	Baseline Range	Well P-10 4/1/82		Well P-11 4/1/82	
		NML	CDM	NML	CDM
<u>Radiochemistry</u>					
Uranium ³	0.012 - 0.287	3.51	3.5	2.11	2.3
Radium-226	106 - 768		320		250
Thorium-230	0 - 1.9		6.1		31

¹All values expressed as mg/l except pH (standard units), conductivity (umhos/cm), radium and thorium (pCi/l).

²Baseline range is for all pattern production zone wells following outlier removal.

³NML values are U₃O₈; CDM values are U nat.

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Table III-A
(cont.)

Reno Creek
Pattern 2 Production Wells
Restoration Data

Parameter ¹	Baseline Range ²	Well P-10 4/1/82		Well P-11 4/1/82	
		NML	CDM	NML	CDM
<u>Field</u>					
pH	8.2 - 8.9	7.6	8.1	7.7	8.0
Conductivity	1890 - 2234	2000	2500	1990	2400
<u>Major Constituents</u>					
Bicarbonate (HCO ₃)	89 - 178	187	160	159	130
Carbonate (CO ₃)	0 - 14	0	0	0	0
Alkalinity (as CaCO ₃ eq)	73 - 146	153	130	130	110
Calcium	108 - 153	118	110	92	105
Chloride	7.0 - 18.8	18	11	16	12
Magnesium	19 - 33	17	22	16	22
Potassium	5.8 - 9.5	7.5	8.1	6.8	7.3
Sodium	287 - 360	295	350	282	330
Sulfate	818 - 1002	783	960	644	910
TDS	1340 - 1580	1330	1510	1160	1410
Anion/Cation Balance	-	101	99	105	101
<u>Minor Constituents</u>					
Ammonia as N	<0.2		<0.2		<0.2
Nitrate as N	<0.05		<0.05		<0.05
Nitrite as N	<0.05		<0.05		<0.05
Aluminum	<0.2		<0.5		<0.5
Arsenic	0.001 - 0.016		0.006		0.007
Barium	0.08 - 0.40		<0.2		<0.2
Boron	<0.1		<0.1		<0.1
Cadmium	0.01 - 0.02		0.012		0.009
Chromium	0.02 - 0.11		<0.005		<0.005
Copper	0.01 - 0.02		<0.005		<0.005
Fluoride	0.09 - 0.15		0.1		<0.1
Iron	0.03 - 0.61	0.08	0.13	0.03	0.08
Lead	0.03 - 0.11		<0.005		<0.005
Manganese	0.01 - 0.14		0.068		0.071
Mercury	<0.0001		0.0001		0.0001
Molybdenum	0.01 - 0.11		0.008		0.011
Nickel	0.01 - 1.10		0.02		<0.02
Selenium	0.009 - 0.017		<0.005		<0.005
Vanadium	0.05 - 0.34	0.31	0.39	0.39	0.43
Zinc	0.01 - 0.09		<0.005		<0.005

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Table IV-A
(cont.)

Reno Creek
Pattern 2 Injection Wells
Restoration Water Quality

Field	Well I-12 4/1/82		Well I-13 4/1/82		Well I-14 4/1/82		Well I-15 4/1/82	
	NML	CDM	NML	CDM	NML	CDM	NML	CDM
pH	7.8	8.1	7.7	8.1	7.9	8.2	7.8	8.1
Conductivity	1990	2400	2000	2500	2000	2500	1990	2400
<u>Major Constituents</u>								
Bicarbonate (HCO ₃)	187	150	198	160	183	150	144	120
Carbonate (CO ₃)	0	0	0	0	0	0	0	0
Alkalinity	153	120	162	130	150	120	118	96
Calcium	97	100	92	95	75	90	112	120
Chloride	18	9	16	12	21	16	17	9
Magnesium	21	27	25	26	21	25	30	30
Potassium	8.7	8.3	9.8	8.9	9.5	9.7	10.2	8.9
Sodium	301	310	361	360	350	360	321	300
Sulfate	819	920	935	960	835	950	849	940
TDS	1358	1450	1236	1490	1401	1460	1409	1410
Ionic Balance	98	96	99	99	100	99	104	100
<u>Minor Constituents</u>								
Boron		< 0.1		< 0.1		< 0.1		< 0.1
Chromium		< 0.005		< 0.005		< 0.005		< 0.005
Copper		< 0.005		< 0.005		< 0.005		< 0.005
Fluoride		< 0.1		< 0.1		< 0.1		< 0.1
Iron	0.05	0.12	0.12	0.27	0.06	0.13	0.06	0.10
Lead		< 0.005		< 0.005		< 0.005		< 0.005
Manganese		0.083		0.099		0.08		0.084
Molybdenum		0.005		0.007		0.006		0.008
Nickel		0.02		< 0.02		0.03		0.02
Vanadium	0.22	0.26	0.25	0.29	0.16	0.10	0.16	0.12
Zinc		< 0.005		0.013		< 0.005		0.008
<u>Radiochemistry</u>								
Uranium ¹	4.1	4.4	3.72	3.4	4.82	4.9	4.0	3.0
Radium-226		170		260		150		180.0
Thorium-230		30		3.4		240		4.3

Note: All values reported as mg/l except pH (standard units), conductivity umhos/cm), radium, thorium (pCi/l).

¹NML values are U₃O₈; CDM values are U nat.

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Table VI

Reno Creek
 Pattern 2 Stabilization Data
 Quarterly Check (Jan. 1981)

<u>Parameter</u>	<u>Baseline¹ Range</u>	<u>Well P-10</u>	<u>Well P-11</u>	<u>Well I-12</u>
pH	8.2 - 8.9	8.3	8.06	8.10
Conductivity	1890 - 2234	2100	2000	2000
Bicarbonate (HCO ₃)	89 - 178	132	188	187
Carbonate (CO ₃)	0 - 14	0	0	0
Alkalinity	73 - 146	108	154	153
Calcium	108 - 153	90	125	97
Chloride	7.0 - 18.8	16	14	18
Magnesium	19 - 33	23	18	21
Potassium	5.8 - 9.5	9.9	8.7	8.7
Sodium	287 - 360	342	384	262
Sulfate	818 - 1002	891	838	823
TDS	1340 - 1580	1600	1400	1350
Aluminum	<0.2	0.31	0.09	0.08
Cadmium	0.01 - <0.02	0.001	0.01	0.01
Chromium	0.01 - 0.11	0.01	0.03	0.03
Fluoride	0.09 - 0.15	0.10	0.1	0.1
Iron	0.03 - 0.61	0.10	0.04	0.05
Lead	0.03 - 0.11	0.04	0.01	<0.01
Molybdenum	0.01 - 0.11	--	0.13	0.06
Manganese	0.01 - 0.14	0.08	0.53	0.74
Nickel	0.01 - 1.10	0.02	0.03	0.01
Vanadium	0.05 - 0.34	0.38	0.44	0.30
Zinc	0.01 - 0.09	0.01	0.01	0.01
Uranium as U ₃ O ₈	0.012 - 0.287	4.29	2.60	5.08

Note: All results are in mg/l (ppm) except pH (standard units) and conductivity (umhos/cm)

¹Baseline range is for all production zone wells following outlier removal.

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Table V
(updated)

Reno Creek
Pattern 2 Stabilization Data
Interior Wells
4/16/81 - 4/1/82

Date	Parameter ¹	P-10	P-11	I-12	I-13	I-14	I-15	Pattern Average
4/16/81	Uranium	0.97	1.20	2.79	0.81	1.19	0.47	1.24
	Bicarb.	121	126	133	119	119	123	124
	TDS ²	1529	1480	1450	1510	1475	1525	1494
5/19/81	Uranium	2.43	2.25	3.42	1.31	1.74	1.12	2.05
	Bicarb.	153	148	154	154	147	126	147
	TDS	1440	1460	1420	1460	1440	1480	1450
6/16/81	Uranium	3.81	2.76	3.58	1.68	3.06	2.18	2.85
	Bicarb.	129	133	125	121	138	131	130
	TDS	1600	1520	1420	1580	1560	1660	1557
7/16/81	Uranium	3.29	3.00	4.34	1.89	2.48	1.97	2.83
	Bicarb.	146	133	141	140	133	133	138
	TDS	1540	1500	1480	1520	1560	1520	1520
8/17/81	Uranium	4.37	3.35	5.54	2.56	3.26	3.00	3.68
	Bicarb.	148	133	148	121	103	112	128
	TDS	1540	1540	1500	1520	1540	1540	1530
9/9/81	Uranium	3.66	2.71	3.56	2.90	3.87	3.06	3.29
	Bicarb.	154	145	167	152	153	132	151
	TDS	1660	1540	1640	1680	1580	1600	1617
10/12/81	Uranium	4.14	2.91	4.08	2.76	3.91	2.96	3.46
	Bicarb.	164	145	157	163	157	131	153
	TDS ²	1489	1347	1369	1377	1351	1355	1381
1/24/82	Uranium	4.29	2.60	5.08				4.0
	Bicarb.	132	188	188				169
	TDS	1600	1400	1350				1450
4/1/82	Uranium	3.51	2.11	4.10	3.72	4.82	4.00	3.71
	Bicarb.	187	159	187	198	183	144	176
	TDS ²	1420	1285	1404	1363	1430	1409	1385

¹All values given as mg/l.

²Values are average of Nine Mile Lake and CDM analyses.

Note: Uranium values are U₃O₈; U nat values can be determined by multiplying U₃O₈ values by 0.85.

Pat Spieles
 May 18, 1982
 Page 4 of 9

RE: 8669-14266-11
 P.O. AP2-1483, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-6	8669-14266-11-7	8669-14266-11-8	8669-14266-11-9	8669-14266-11-10
Sponsor Designation	I-15	M-16	M-17	M-18	M-19
	4-1-82	4-1-82	4-1-82	4-1-82	4-1-82

Determination (mg/L)

pH	8.1	10.9	8.1	10.9	8.0
Conductivity, μ mhos/cm	2400	2400	2200	2200	2300
Bicarbonate (as HCO_3)	120	56	87	0	23
Carbonate (as CO_3)	0	38	0	21	0
Alkalinity (as CaCO_3)	96	110	72	55	19
Calcium, total	120	120	110	110	120
Chloride	9	10	9	10	9
Magnesium, total	30	34	23	8	15
Potassium, total	8.9	8.9	6.5	9.5	8.6
Sodium, total	300	280	270	260	280
Sulfate (as SO_4)	940	860	880	790	910
TDS (at 180°C)	1410	1280	1280	1130	1310
Anion/Cation, %	100	104	99	102	100

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ADDENDUM A

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 May 18, 1982
 Page 5 of 9

RE: 8669-14266-11
 P.O. AP2-1483, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-6	8669-14266-11-7	8669-14266-11-8	8669-14266-11-9	8669-14266-11-10
Sponsor Designation	I-15	M-16	M-17	M-18	M-19
	4-1-82	4-1-82	4-1-82	4-1-82	4-1-82

Determination (mg/L)

Ammonia (as N)	<0.2	0.2	<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
Aluminum, total	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic, total	<0.005	<0.005	<0.005	<0.005	<0.005
Barium, total	0.2	0.2	<0.2	<0.2	0.2
Boron	0.1	<0.1	0.1	<0.1	0.1
Cadmium, total	0.008	0.009	0.011	0.008	0.008
Chromium, total	<0.005	<0.005	<0.005	<0.005	<0.005
Copper, total	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	<0.1	<0.1	0.1	<0.1	<0.1
Iron, total	0.10	0.25	0.12	0.10	0.10
Lead, total	<0.005	0.012	<0.005	<0.005	<0.005
Manganese, total	0.084	0.040	0.079	0.033	0.044
Mercury, total	0.0001	0.0001	0.0001	0.0001	0.0001
Molybdenum, total	0.008	<0.005	<0.005	<0.005	<0.005
Nickel, total	0.02	0.02	0.03	<0.02	<0.02

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A-5

20588

Pat Spieles
 May 18, 1982
 Page 6 of 9

RE: 8669-14266-11
 P.O. AP2-1483, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-6	8669-14266-11-7	8669-14266-11-8	8669-14266-11-9	8669-14266-11-10
Sponsor Designation	I-15	M-16	M-17	M-18	M-19
	4-1-82	4-1-82	4-1-82	4-1-82	4-1-82
<u>Determination (mg/L)</u>					
Selenium, total	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium, total	0.12	<0.005	0.011	0.077	0.010
Zinc, total	0.008	0.18	0.011	<0.005	<0.005

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A-6

20588

Pat Spieles
 April 30, 1982
 Page 2 of 3

RE: 700-14266-11
 P.O. AP2-1433, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	700-14266-11-6	700-14266-11-7	700-14266-11-8	700-14266-11-9	700-14266-11-10
Sponsor Designation	I-15	M-16	M-17	M-18	M-19
	4-1-82	4-1-82	4-1-82	4-1-82	4-1-82

Determination

Uranium (as U) total, mg/L	3.0	0.019	0.090	0.022	0.067
Radium-226, total, pCi/L					
± counting error	180 ± 10	45 ± 3	900 ± 20	68 ± 4	86 ± 4
Thorium-230, total, pCi/L					
± counting error	4.3 ± 1.2	-0.2 ± 0.9	-0.3 ± 0.9	0.2 ± 1.0	-0.2 ± 0.8

*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.

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CDM

environmental engineers, scientists,
planners, & management consultants

CAMP DRESSER & MCKEE INC.

11455 West 48th Avenue
Wheat Ridge, Colorado 80033
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April 30, 1982
Page 1 of 3

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

RE: 700-14266-11
P.O. AP2-1483, Rel. 611
Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	700-14266-11-1	700-14266-11-2	700-14266-11-3	700-14266-11-4	700-14266-11-5
Sponsor Designation	P-10 4-1-82	P-11 4-1-82	I-12 4-1-82	I-13 4-1-82	I-14 4-1-82
<u>Determination</u>					
Uranium (as U) total, mg/L	3.5	2.3	4.4	3.4	4.9
Radium-226, total, pCi/L					
± counting error	320 ± 10	250 ± 10	170 ± 10	260 ± 10	150 ± 10
Thorium-230, total, pCi/L					
± counting error	6.1 ± 1.5	31 ± 3	30 ± 3	3.4 ± 1.2	240 ± 10

*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.

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ADDENDUM B

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CAMP DRESSER & McKEE INC.

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Wheat Ridge, Colorado 80033
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May 18, 1982
Page 1 of 9

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

RE: 8669-14266-11
P.O. AP2-1483, Rel. 611
Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-1	8669-14266-11-2	8669-14266-11-3	8669-14266-11-4	8669-14266-11-5
Sponsor Designation	P-10	P-11	I-12	I-13	I-14
	4-1-82	4-1-82	4-1-82	4-1-82	4-1-82

Determination (mg/L)

pH	8.1	8.0	8.1	8.1	8.2
Conductivity, μ mhos/cm	2500	2400	2400	2500	2500
Bicarbonate (as HCO_3)	160	130	150	160	150
Carbonate (as CO_3)	0	0	0	0	0
Alkalinity (as CaCO_3)	130	110	120	130	120
Calcium, total	110	105	100	95	90
Chloride	11	12	9	12	16
Magnesium, total	22	22	27	26	25
Potassium, total	8.1	7.3	8.3	8.9	9.7
Sodium, total	350	330	310	360	360
Sulfate (as SO_4)	960	910	920	960	950
TDS (at 180°C)	1510	1410	1450	1490	1460
Anion/Cation, %	99	101	96	99	99

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B-6

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 May 18, 1982
 Page 2 of 9

RE: 8669-14266-11
 P.O. AP2-1483, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-1	8669-14266-11-2	8669-14266-11-3	8669-14266-11-4	8669-14266-11-5
Sponsor Designation	P-10	P-11	I-12	I-13	I-14
	4-1-82	4-1-82	4-1-82	4-1-82	4-1-82

Determination (mg/L)

Ammonia (as N)	<0.2	<0.2	<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
Aluminum, total	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic, total	0.006	0.007	<0.005	0.005	0.006
Barium, total	<0.2	<0.2	<0.2	<0.2	0.2
Boron	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium, total	0.012	0.009	0.009	0.013	0.010
Chromium, total	<0.005	<0.005	<0.005	<0.005	<0.005
Copper, total	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	0.1	<0.1	<0.1	<0.1	<0.1
Iron, total	0.13	0.08	0.12	0.27	0.13
Lead, total	<0.005	<0.005	<0.005	<0.005	<0.005
Manganese, total	0.068	0.071	0.083	0.099	0.081
Mercury, total	0.0001	0.0001	0.0001	0.0001	0.0001
Molybdenum, total	0.008	0.011	0.005	0.007	0.006
Nickel, total	0.02	<0.02	0.02	<0.02	0.03

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Pat Spieles
 May 18, 1982
 Page 3 of 9

RE: 8669-14266-11
 P.O. AP2-1483, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-1	8669-14266-11-2	8669-14266-11-3	8669-14266-11-4	8669-14266-11-5
Sponsor Designation	P-10	P-11	I-12	I-13	I-14
	4-1-82	4-1-82	4-1-82	4-1-82	4-1-82
<u>Determination (mg/L)</u>					
Selenium, total	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium, total	0.39	0.43	0.26	0.29	0.10
Zinc, total	<0.005	<0.005	<0.005	0.013	<0.005

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 May 18, 1982
 Page 7 of 9

RE: 8669-14266-11
 P.O. AP2-1483, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-11
Sponsor Designation	LSM-21 4-1-82

Determination (mg/L)

pH	10.4
Conductivity, μ mhos/cm	460
Bicarbonate (as HCO_3)	0
Carbonate (as CO_3)	61
Alkalinity (as CaCO_3)	110
Calcium, total	4
Chloride	23
Magnesium, total	4
Potassium, total	8.9
Sodium, total	73
Sulfate (as SO_4)	56
TDS (at 180°C)	220
Anion/Cation, %	1.02

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 May 18, 1982
 Page 8 of 9

RE: 8669-14266-11
 P.O. AP2-1483, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-11
Sponsor Designation	LSM-21 4-1-82

Determination (mg/L)

Ammonia (as N)	0.4
Nitrate (as N)	<0.05
Nitrite (as N)	<0.05
Aluminum, total	<0.5
Arsenic, total	<0.005
Barium, total	<0.2
Boron	0.1
Cadmium, total	<0.005
Chromium, total	<0.005
Copper, total	<0.005
Fluoride	0.7
Iron, total	0.54
Lead, total	<0.005
Manganese, total	0.047
Mercury, total	0.0001
Molybdenum, total	<0.005
Nickel, total	<0.02

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

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Pat Spieles
May 18, 1982
Page 9 of 9

RE: 8669-14266-11
P.O. AP2-1483, Rel. 611
Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	8669-14266-11-11
Sponsor Designation	LSM-21 4-1-82

Determination (mg/L)

Selenium, total	<0.005
Vanadium, total	0.013
Zinc, total	0.008

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

BY Chris Shugarts
Chris Shugarts
Water Laboratory
Supervisor

CS/srf

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Pat Spieles
 April 30, 1982
 Page 3 of 3

RE: 700-14266-11
 P.O. AP2-1483, Rel. 611
 Date Samples Rec'd 4-20-82

REPORT OF ANALYSIS

Lab Designation	700-14266-11-11
Sponsor Designation	LSM-21
	4-1-82

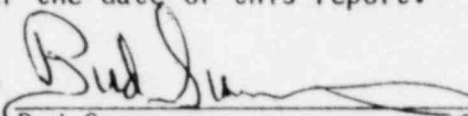
Determination

Uranium (as U) total, mg/L	0.006
Radium-226, total, pCi/L ± counting error	6.0 ± 1.2
Thorium-230, total, pCi/L ± counting error	0.5 ± 1.0

*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.

BY



Bud Summers
 Radiochemistry
 Supervisor

BS/srf

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