



KERR-MCGEE CORPORATION

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April 24, 1981

ENVIRONMENT AND HEALTH MANAGEMENT DIVISION

40-8027

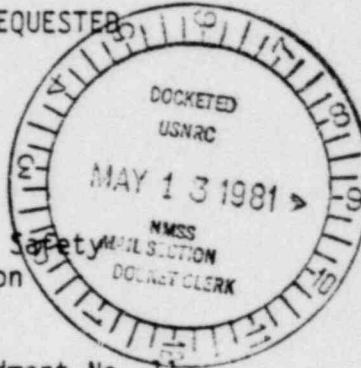
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Return to

D. Cramer
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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. R. G. Page, Acting Chief
Uranium Fuel Licensing Branch
Division of Fuel Cycle & Material Safety
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555



RE: Docket 40-8027, SUB-1010 Amendment No. 11
1980 Completion Report



Dear Mr. Page:

Enclosed find eight (8) copies of the 1980 completion report describing use of barium treated, neutralized solvent extraction raffinate at the Kerr-McGee Nuclear Sequoyah UF₆ facility as fertilizer on Kerr-McGee owned land. In accordance with License SUB-1010, Amendment No. 11, Condition (f), the completion report describes the 1980 fertilizer program and results obtained from the on-going environmental surveillance program.

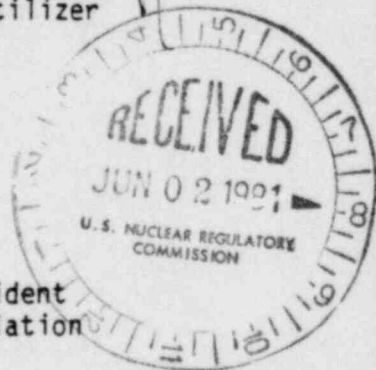
Condition (e) of the subject license amendment also requested that the raffinate neutralization and barium system be evaluated during 1980 so that the limits, expressed as pCi/gm total N or mg/g total N, could be established for Ra-226, Th-230, and Uranium in treated raffinate. Because this treatment system has been recently redesigned to include the addition of four clarifiers, it is requested that this requirement be deferred until 1981 when it is expected that more conclusive results can be obtained on treatment system operations. As indicated in the attached report, the quality of treated raffinate used in the 1980 fertilizer applications was similar to that used in previous years.

If you require any further information, please contact me.

Very truly yours,

W. J. Shelley

W. J. Shelley, Vice President
Nuclear Licensing & Regulation



U.S. NUCLEAR REG. COMMISSION
MAIL SECTION

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Enclosure

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RAFFINATE PROGRAM
LICENSE SUB-1010 - AMENDMENT NO. 11
1980 COMPLETION REPORT

INTRODUCTION

Source Material License SUB-1010 - Amendment No. 11 was issued to Kerr-McGee Nuclear Corporation June 17, 1980. The amendment authorizes continued use of barium treated, neutralized solvent extraction raffinate from the Sequoyah Facility for fertilizer on Kerr-McGee owned land. In accordance with condition (f) of the license amendment, the following completion report provides a description and results of the 1980 program.

Physical Area

Control structures were completed in 1977 and 1979 on the 160-acre and 270-acre areas, respectively. During 1980, much of the new expansion area (885 acres) required timber removal to allow sprayer equipment access. A survey was conducted and cleared strips 20 feet wide and on 100 foot centers were bulldozed through the timbered areas. These cleared strips were parallel to land contours to control erosion and provide a level path for tank sprayer wagons. Locations of control structures and access corridors on the expansion area are provided in Figure 1.

Treatment

Distribution of treated raffinate was accomplished with 1000 gallon tank sprayer wagons. Following USNRC license issuance, raffinate fertilizer applications began June 30, 1980. Due to dry summer conditions and late start of the 1980 program, only 400 pounds N/Acre was applied to available acreage.

Treated raffinate from Pond No. 3 (East) was analyzed, and two applications (approximately 200 pounds N/acre/application) were conducted. Applications were completed by September 26, 1980. A summary of the 1980 program and the average composition of treated raffinate applied are provided in Tables 1 and 2.

Based upon Oklahoma State University-Extension Service recommendations (Dr. Bill Tucker), 40 pounds/acre phosphate and 120 pounds/acre potassium commercial fertilizers were applied to the 160-acre and 270-acre areas. Material was applied by a commercial vendor, and results of chemical analyses of these commercial fertilizers are provided in Table 3.

Environmental Monitoring Program

Soils

Soil sampling was conducted on the 160 and 270-acre areas in fall 1979. These results were evaluated and provided a basis for 1980 recommendations for commercial fertilizer amendments (P, K). Prior to 1980 raffinate fertilizer applications, soil samples were collected from the 885 acre expansion area (Table 4). Additionally, post-season (September 1980) soil samples were collected from the 270-acre area for use in establishment of 1981 fertilizer rates (Table 5).

Analyses of residual soil $\text{NO}_3\text{-N}$ levels were conducted throughout the growing season to maintain fertilizer rates compatible with forage uptake and growing season conditions.

Water

Surface water from the 160-acre area was sampled in accordance with NPDES Permit No. OK0000191, and pre-and post-season surface water monitoring was

also conducted (Tables 6 and 7). Groundwater was sampled monthly and results are provided in Table 8. Retention ponds, surface stations (P₁, P₂, P₃), and monitor wells represent the same locations used in previous years.

Vegetation

Vegetation samples were collected in the fall of 1980 on the 270-acre area (Table 9). The pre and post-season vegetation sampling program will be modified during 1981 to include Uranium, Ra-226 and Th-230 evaluation for hay release, as provided in SUB-1010, Amendment No. 12.

Management Program

On May 9, 1980, the spring hay (Rye and fescue) was removed from the 160 and 270-acre areas in preparation for fertilizer applications. Following completion of raffinate fertilizer applications (400 pounds N/acre) in September 1980, summer forage removal (bermudagrass) was completed. Rye and fescue overseeding was also conducted in established pasture areas and in newly cleared strips of the 885 acre expansion area. Residue-crop management remains a vital component of the raffinate fertilizer program.

The 1981 program outline is presented in Figure 2. The program provides for continued environmental monitoring of raffinate applications, plant residue management, and timing of fertilizer applications to maximize N uptake by plants. Oklahoma State University Extension Agronomists (Dr. Tucker and Dr. Steigler) will continue to provide input and recommendations in overall program development.

TABLE 1. Summary of 1980 Treated Raffinate Applications.

<u>Application #</u>	<u>Date Start</u>	<u>Date Completed</u>	<u>Total Volume Raff. (1000 gal)</u>	<u>Ave N-Conc (gms N/l)</u>	<u>Total N Applied (lbs/Acre)</u>	<u>Acres Treated</u>
#1						
160 acre	6/30	7/2	45	34	211	60.5 ¹
270 acre	7/2	7/16	221	34	234.4	267.5
885 acre	7/11	9/12	509	38	201.9	799.4 ²
#2						
160 acre	7/24	7/25	41	37	209.2	60.5
270 acre	7/25	8/11	182	37	210	267.5
885 acre	8/4	9/26	545	39	221.8	799.4
Totals & Averages	6/30	9/26	1543	36.5	463	1127.4

Notes:

¹No applications were made to Province 4 and 5 of the 160 acre area in 1980.

²No applications were made to the eastern portion of the 885 acre expansion area but this area will be included in the 1981 program.

TABLE 2. Average Composition of Treated Raffinate - 1980 Land Application Program

<u>Sample Type</u>	<u>pH</u>	<u>Ra-226</u> <u>pCi/l</u>	<u>Th-230</u> <u>pCi/l</u>	<u>U</u> <u>mg/l</u>	<u>Cu</u> <u>mg/l</u>	<u>Mo</u> <u>mg/l</u>	<u>Ni</u> <u>mg/l</u>	<u>Ave. N Conc.</u> <u>gms N/l</u>
Treated Raffinate	7.65	1.07	.065	.045	5.4	9.65	12.0	36.5

TABLE 3. Analysis of Commercial Fertilizer ($K_2O - P_2O_5$) applied during 1980 to the 160 and 270-acre areas.

<u>Type</u>	<u>Amount</u>	<u>Date Applied</u>	<u>Ra-226</u> <u>pCi/g</u>	<u>Th-230</u> <u>pCi/g</u>	<u>U</u> <u>μg/g</u>
K_2O	120 lbs/acre	7/16	.035	.008	13
P_2O_5	40 lbs/acre	7/16	17	52.7	170

TABLE 4. Average 1980 Analyses (pH, Buffer Index, N, P, K) for the 885-Acre Area-0-6" Soil Zone.

<u>Application Sequence</u>	<u>Date Sampled</u>	<u>pH</u>	<u>Buffer Index</u>	<u>NO₃-N lbs./Acre</u>	<u>P lbs/Acre</u>	<u>K lbs/Acre</u>	<u>Number of Samples Analyzed</u>
Pre-Season Sampling	7/80	5.1	6.6	8	28	143	19
Application #1 (following 200 lbs/N/acre)	8/80	4.8	6.3	54	46	169	23
Post-Season Sampling (following 400 lbs/N/acre)	9/80	4.8	6.6	93	45	123	15

TABLE 5. Post-Season Soil Profile Analysis-Collected September 8, 1980 from the 270-Acre Area.

Identification	Soil Acidity		NO ₃ -N	P	K
	pH	B.I.	(lbs/A)	(lbs/A)	(lbs/A)
0-6" Composite (270 Middle)	5.9	7.1	71	59	279
0-6 "	5.5	6.9	48	48	177
6-12 "	5.5	6.8	176	16	40
12-18 "	5.0	7.1	67	13	40
18-24 "	6.1	6.5	38	6	207
24-30 "	6.2	7.0	11	3	181
30-36 "	6.0	6.8	5	6	140
36-42 "	5.7	6.8	3	5	135
0-6" Composite (270 North)	6.0	7.0	147	66	224
0-6 "	6.1	7.3	119	51	170
6-12 "	6.6	--	135	29	64
12-18 "	6.3	7.2	55	16	45
18-24 "	5.4	6.9	12	13	72
24-30 "	5.6	6.6	3	4	214
30-36 "	6.0	7.1	3	2	190
36-42 "	5.9	7.0	3	2	219
0-6" Composite (270 South)	5.5	7.0	96	59	236
0-6 "	5.5	6.9	107	28	101
6-12 "	5.1	7.1	294	10	42
12-18 "	5.2	7.1	42	11	47
18-24 "	5.9	7.1	11	4	209
24-30 "	6.1	--	4	6	154
30-36 "	6.3	7.1	3	8	111
36-42 "	6.0	7.1	1	6	119

TABLE 6. Sequoyah NPDES - Summary Sheet 1980 (002 Outfall-160-Acre Area).

	Permit Cond.	1980											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Runoff (160-ac. plot)													
TSS, mg/l													
Avg.	45						79	28					
Max.	90						199	28					
Diss. Ra-226, pCi/l													
Avg.	3						1.1	.14					
Max.	5	No Discharge	No Discharge	No Discharge	No Discharge	No Discharge	1.6	.14	No Discharge	No Discharge	No Discharge	No Discharge	No Discharge
Tot. Ra-226, pCi/l													
Avg.	10						2.8	.15					
Max.	30	No Discharge	No Discharge	No Discharge	No Discharge	No Discharge	4.7	.15	No Discharge	No Discharge	No Discharge	No Discharge	No Discharge
NH ₃ (N), mg/l													
Avg.	2.5						< .2	< .2					
Max.	N/A												
NO ₃ (N), mg/l													
Avg.	10						1.3	.6					
Max.	XXX												
pH (min./max.)	6-9						6.6/7.2	6.7/6.8					
Avg. Flow, mgd	XXX						.03	.43					

POOR ORIGINAL

TABLE 7. Surface Water Monitoring Results. (Pre and Post-Season)

<u>Location</u>	<u>Date</u>	<u>NO₃-N</u> <u>mg/l</u>	<u>U</u> <u>μg/l</u>	<u>pH</u>	<u>Ra-226</u> <u>pCi/l</u>
<u>Pre-Season</u>					
P-1	6/80	.2	<7	7.5	1.26
P-2	6/80	.1	<7	7.8	.29
P-3	6/80	.2	10	7.6	.71
160 Ret. Pond	6/80	.3	22	6.7	.17
270 Ret. Pond	6/80	.2	<7	7.6	.40
<u>Post-Season</u>					
P-1	10/80	.3	29	8.6	.43
P-2	10/80	.4	9	8.2	.67
P-3	10/80	.1	<7	7.7	.45
160 Ret. Pond	10/80	.2	7	7.2	.39
270 Ret. Pond	10/80	.4	<7	7.3	2.20

TABLE 8. Monitor Wells - 1980 Sequoyah Environmental Surveillance

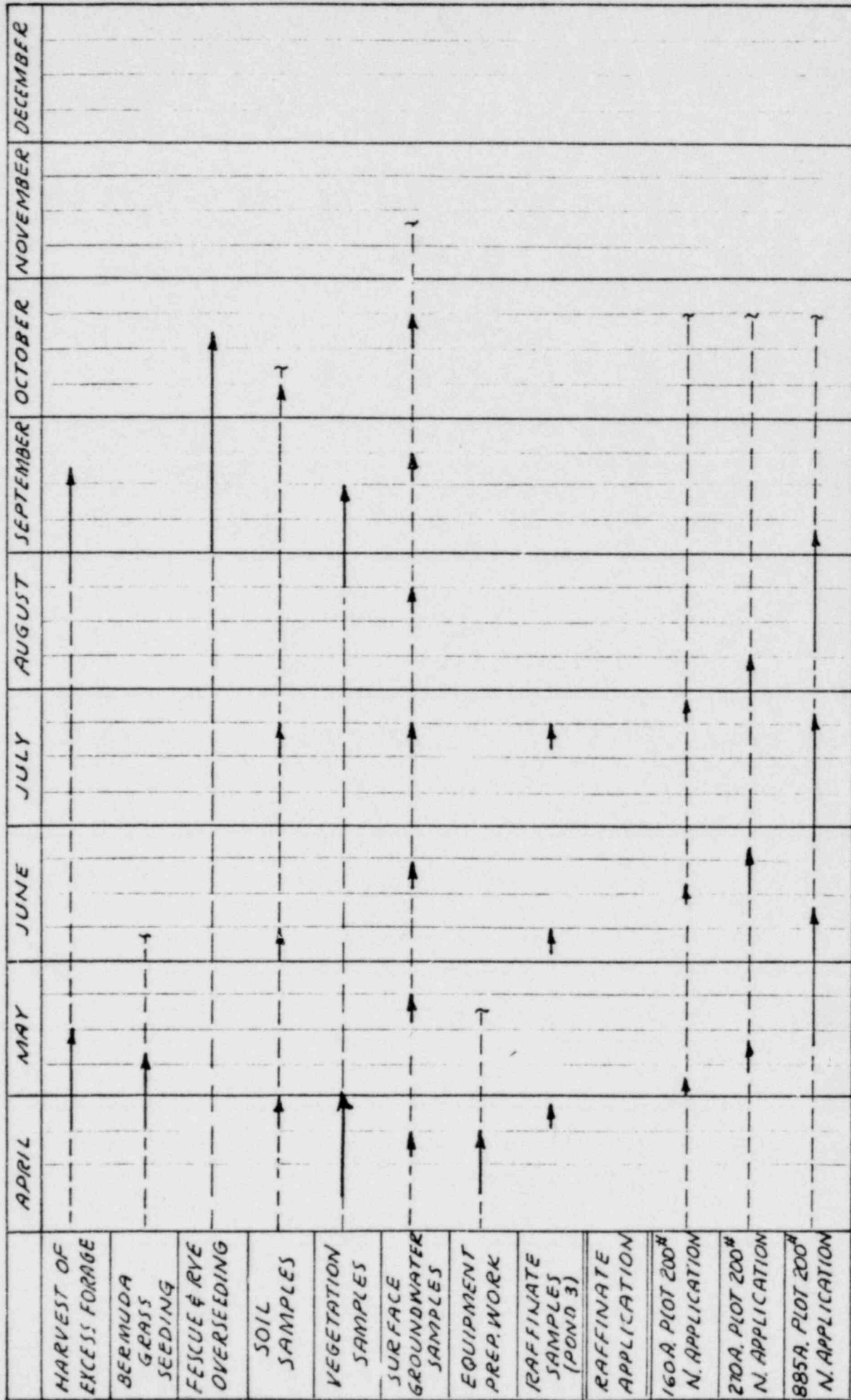
Location	Analysis	Units	January	February	March	April	May	June	July	August	September	October	November	December
FTP - 1A	Uranium	µg/l	79	136	80	106	81	34	37	30	30	47	24	45
	NO ₃ (N)	mg/l	1.0	0.5	.05	0.5	0.7	0.7	1.2	1.1	0.8	.7	0.8	.5
	Ra-226(tot)	pCi/l	.094	0.59	.46	.23	1.6	.26	.2	.07	.027	.69	.204	
	DTW	Ft.	19.0	19.8	20.0	19.4	19.2	18.7	18.75	18.5	18.8	19.2	19.6	19.8
FTP - 2A	Uranium	µg/l	4550	2009	2640	4310	3230	4846	4451	2985	3086	2834	1911	3134
	NO ₃ (N)	mg/l	15	2	2.0	2.4	2.0	1.4	1.4	1.2	1.0	1.2	2.08	.7
	Ra-226(tot)	pCi/l	.31	0.72	.75	.21	4.1	.36	.23	.90	.11	.26	.245	
	DTW	Ft.	16.2	23.5	23.5	20.0	19.8	18.6	17.8	16.8	16.2	15.7	16.4	16.3
FTP - 3A	Uranium	µg/l	20	24	55	27	18	7	19	12	8	15	8	12
	NO ₃ (N)	mg/l	30	36	31	25	42	44	12	15	10	14	18	13
	Ra-226(tot)	pCi/l	.23	.009	.022	.27	1.1	.63	.12	.26	.04	.50	.345	
	DTW	Ft.	15.0	14.7	14.8	14.4	14.3	14.7	14.6	13.8	.8	14.8	14.5	
FTP - 4A	Uranium	µg/l	34	16	59	31	25	11	20	14	21	< 7	14	45
	NO ₃ (N)	mg/l	0.7	0.5	0.6	0.4	0.4	0.5	1.0	0.7	0.4	.9	.28	< .1
	Ra-226(tot)	pCi/l	.25	.011	.25	.05	.17	.17	.26	.14	.08	.25	.198	
	DTW	Ft.	16.5	17.8	16.5	16.2	16.2	15.7	16.4	17.4	22.4	16.7	16.1	14.8
FTP - 5	Uranium	µg/l	32	16	13	9	17	< 7	< 7	< 7	< 7	< 7	< 7	7
	NO ₃ (N)	mg/l	0.1	0.6	0.2	0.2	0.1	0.2	0.1	0.2	0.2	.2	16	0.1
	Ra-226(tot)	pCi/l	.21	.008	.44	1.26	5.08	.43	.56	4.24	.36	.49	.245	
	DTW	Ft.	20.0	20.0	20.2	20.0	20.1	20.1	21.1	20.1	20.2	20.3	20.3	20.5
FTP - 6	Uranium	µg/l	63	30	40	42	30	31	26	27	11	13	17	13
	NO ₃ (N)	mg/l	0.3	0.3	0.3	0.3	0.2	0.4	0.3	0.7	0.6	.7	.64	.4
	Ra-226(tot)	pCi/l	.04	0.38	.17	.39	.53	.08	.21	.19	.21	.29	.202	
	DTW	Ft.	11.5	12.3	10.7	11.0	11.1	10.2	12.1	11.7	16.3	10.6	10.5	10.8
FTP - 7	Uranium	µg/l	64	20	74	58	36	33	21	51	33	22	20	33
	NO ₃ (N)	mg/l	0.2	0.2	0.3	0.2	0.2	0.2	0.2	1.0	0.2	.8	.52	.1
	Ra-226(tot)	pCi/l	.03	0.24	.38	.21	1.84	.16	.30	2.16	.08	2.27	.483	
	DTW	Ft.	35.0	36.0	35.8	35.5	35.6	35.6	35.8	35.4	35.3	35.8	35.7	35.6

TABLE 8. (Continued)

Location	Analysis	Units	January	February	March	April	May	June	July	August	September	October	November	December
270-GW-1	Uranium	$\mu\text{g/l}$	13	20				11	26	24	13	20	25	25
	NO_3 (N)	mg/l	1.4	0.9						0.6	0.4	.5	.56	.9
	Ra-226(tot)	pCi/l				No		.13	.21	.15	.10	.17	.064	
	DTW	Ft.	25.6	25.3		Samples				23.9	22.5	20.8	20.1	20.0
270-GW-2	Uranium	$\mu\text{g/l}$	12	10				10	33	47	32	15	19	7
	NO_3 (N)	mg/l	8.2	7.2						5.4	4.6	5.8	5.8	4.7
	Ra-226(tot)	pCi/l				"		.12	.14	.40	.08	.42	.198	
	DTW	Ft.	16.8	16.1		"				14.0	13.4	13.1	13.5	13.6
270-GW-3	Uranium	$\mu\text{g/l}$	8	12				7	19	23	28	13	15	21
	NO_3 (N)	mg/l	1.7	1.7						1.5	1.2	3.0	3.0	.6
	Ra-226(tot)	pCi/l						.17	.15	.09	.25	.40	.111	
	DTW	Ft.	6.2	6.4						7.2	7.4	7.9	7.9	7.0

TABLE 9. Analysis of Post-Season Forage Quality - 270-Acre Area

<u>Location</u>	<u>Date</u>	<u>Moisture (Percent)</u>	<u>Crude Protein (As Fed)</u>	<u>Crude Protein (Dry)</u>	<u>Digest. Protein (As Fed)</u>	<u>Digest. Protein (Dry)</u>	<u>Nitrates ppm</u>
270-North	9/80	6.7	7.5	8.0	3.7	4.0	500
270-South	9/80	7.3	10.5	11.3	6.5	7.1	3900
270-North	10/80	43.0	8.0	14.0	5.4	9.5	1300



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1981 TREATED RAFFINATE PROGRAM
FIGURE 2