

Division of United Nuclear Corporation  
AUC RESOURCES Company

PO Box 3951  
Albuquerque, New Mexico 87190

4831 Indian School Road, N.E.  
Albuquerque, New Mexico 87110  
Telephone 505-265-4421

#### POOL SURVEY

On August 15, 1979 a survey of standing pools of water was conducted by flying a helicopter over the stream bed, and dropping in to sample as pools were noted.

To determine whether the water was affected by the spill, analysis was performed for Total Uranium concentration. The data was to be compared to stream samples taken over the last three and one-half (3 1/2) years from just below the State Road 566 Bridge.

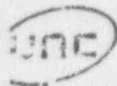
Results, on the attached sheet, show that none of the pools contain significant amounts of Uranium and therefore no removal of solutions is required.

10/15/79

10/17/79, 10/21/79

Soil  
measurements

8104230 786



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POOL SURVEY SAMPLES

<u>Pool Number</u>	<u>Uranium (mg/l)</u>	<u>Pool Number</u>	<u>Uranium (mg/l)</u>
1.	0.21	24.	0.11
2.	0.21	25.	0.11
3.	0.13	26.	0.17
4.	0.28	27.	0.24
5.	0.34	28.	0.26
6.	0.22	29.	0.16
7.	0.37	30.	0.31
8.	0.51 <sup>*</sup>	31.	0.15
9.	0.54 <sup>*</sup> HIGH.	32.	0.10
10.	0.11	33.	0.13
11.	0.38	34.	0.18
12.	0.12	35.	0.12
13.	0.28	36.	0.11
14.	0.39	37.	0.07
15.	0.41	38.	0.19
16.	0.36	39.	0.20
17.	0.18	40.	0.21
18.	0.37	41.	0.23
19.	0.13	42.	0.22
20.	0.13	43.	0.21
21.	0.38	44.	0.22
22.	0.16	45.	0.20
23.	0.17		



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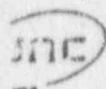
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#### CRYSTALLIZED SALTS SAMPLING

Samples of surface salts and encrustations were taken in the affected channel bed on July 17, 1979 and natural salts and encrustations were sampled at six (6) locations through July 26.

The material was dried, pulverized, digested and then analyzed for the required parameters. Results for all but Lead-210 concentrations appear on the attached sheets.



1.8542 4 point to mg  
0.01359  
1.8542 4 point to mg

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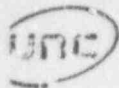
### CRYSTALLIZED SALTS ANALYSES

PARAMETER		BACKGROUND COMPOSITE <i>at 6 locations</i>	BELOW PUERCO CONFLUENCE (7-18-79)		566 BRIDGE (7-18-79)	WHITEROCK BRIDGE (7-18-79)
Aluminum	%	1.8892	2.556		1.222	1.667
Antimony	%	0.0109	0.0121		0.0102	0.0093
Arsenic	%	0.0008	0.0011		0.0014	0.0012
Bismuth	%	0.1080	0.0740		0.0700	0.0760
Carbonate	%	1.054	7.612		2.489	1.610
Chlorine	%	<0.0001	<0.0001		<0.0001	<0.0001
Cadmium	%	0.0008	0.0008		0.0006	0.0003
Calcium	%	0.800	0.630		0.410	0.410
Chloride	%	0.273	0.328		0.218	0.218
Cromium	%	0.0016	0.0026		0.0012	0.0014
Cobalt	%	0.0008	0.0009		0.0007	0.0008
Copper	%	0.0010	0.0037		0.0008	0.0008
Cyanide	%	0.0076	0.0061		0.0068	0.0076
Fluoride	%	0.0106	0.0209		0.0219	0.0182
Iron	%	1.417	1.380		0.833	0.861
Lead	%	0.0013	0.0008		0.0290	0.0007
Magnesium	%	0.310	0.320		0.170	0.230
Manganese	%	0.1250	0.0500		0.0500	0.0500
Mercury, Total	%	<0.0001	<0.0001		<0.0001	<0.0001
Molybdenum	%	0.0016	0.0017		0.0016	0.0016
Nickel	%	0.0152	0.0313		0.0782	0.0090
Nitrate	%					
Nitrite	%					
Potassium	%	1.690	1.660		1.130	1.250
Selenium	%	0.0007	0.0007		0.0006	0.0006
Silver	%	<0.0001	<0.0001		<0.0001	<0.0001
Sulfur	%	0.584	0.365		0.942	0.604
Sulfate	%	0.183	3.060		1.069	1.587
Sodium	%	0.0047	0.0075		0.0043	0.0057
Strontium	%	0.0116	0.0180		0.0092	0.0094
Thallium-210	PCi/g					
Thallium-226	PCi/g	4.0	9.4		3.3	6.6
Thallium-230	PCi/g					
Thallium	%	0.0019	0.0045		0.0009	0.0013

1/10/79

CCP  
CCP

6.7 2.4



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CRYSTALIZED SALTS ANALYSES

Telephone 505/265-4421

PARAMETER		ABOVE PUERCO CONFLUENCE (8-14-79)
aluminum	%	3.000
boron	%	0.007
barium	%	0.0010
calcium	%	0.0940
carbonate	%	1.069
chromium	%	<0.0001
cadmium	%	0.0009
lead	%	0.011
chloride	%	0.328
chromium	%	0.0036
barium	%	0.0014
potassium	%	0.0061
nitride	%	0.0084
fluoride	%	0.0039
iron	%	1.839
lead	%	0.0004
gallium	%	0.300
vanadium	%	0.2750
mercury, Total	%	<0.0001
lybdenum	%	0.0009
nickel	%	0.0053
triste	%	
triste	%	
potassium	%	0.363
barium	%	0.0007
liver	%	<0.0001
thium	%	0.693
litate	%	8.534
radium	%	0.0089
ic	%	0.0164
id-210	pCi/g	
thium-226	pCi/g	15.9
thium-230	pCi/g	
thium	%	0.0079

## STREAM SEDIMENT SAMPLING PROGRAM

*Trenches are  
recommended  
Cold Springs*

### LOCATIONS:

Initially samples will be taken from the top one (1) foot of sediment in two (2) inch increments. Trenches will be cut perpendicular to the arroyo banks in three (3) locations ranging from stream bank to the side of the arroyo. The following sites will be sampled in this manner.

Pinedale Stream Crossing  
State Road 566 Bridge  
Northeast of El Paso Natural Gas  
New Mexico Port of Entry

*if contamination  
is found at 1 ft  
will take more  
further*

### FREQUENCY:

The program will continue as required to delineate the extent of contamination and assure effective cleanup. This will be determined by data from the initial set of samples and in cleaned areas followup sampling to a depth of two (2) inches to determine residual levels in the sediments. If samples indicate levels higher than the agreed upon guidelines, continued cleanup will occur until the limits are met and/or concentrations cannot be effectively lowered by further cleanup.

### PARAMETERS:

Aluminum	Manganese
Nitrogen (Ammonia)	Total Mercury
Arsenic	Molybdenum
Barium	Nickel
Bicarbonate	Nitrogen (as Nitrate)
Boron	Nitrite
Cadmium	pH
Calcium	Potassium
Chloride	Selenium
Chromium	Silver
Cobalt	Sodium
Conductivity	Sulfate
Copper	Vanadium
Cyanide	Zinc
Fluoride	Lead-210
Iron	Radium-226
Lead	Thorium-230
Magnesium	Total Uranium

### REPORTING:

Data will be forwarded as soon as the set of analyses are finalized. This may entail a one month lag due to the Lead-210 requirement.

## SURFACE WATER SAMPLING PROGRAM

### LOCATIONS:

1.5 miles upstream at ford in road.  
0.5 miles upstream at waterfall.  
4.5 miles downstream at Pinedale Road crossing.  
5.0 miles downstream at 566 Bridge.  
13.0 miles downstream North East of El Paso Refinery.  
16.0 miles downstream at Hogback East of Gallup.  
36.0 miles downstream at Weigh Station East of Arizona border.

### FREQUENCY:

Weekly for 3 months.  
Monthly for 3 months.  
Quarterly until further notice.

### PARAMETERS:

Aluminum	Manganese
Nitrogen (Ammonia)	Total Mercury
Arsenic	Molybdenum
Barium	Nickel
Bicarbonate	Nitrogen (as Nitrate)
Boron	Nitrite
Cadmium	pH
Calcium	Potassium
Chloride	Selenium
Chromium	Silver
Cobalt	Sodium
Conductivity	Sulfate
Copper	Vanadium
Cyanide	Zinc
Fluoride	Lead-210
Iron	Radium-226
Lead	Thorium-230
Magnesium	Total Uranium

### REPORTING:

Data will be forwarded as soon as the set of analyses are finalized. This may entail a one month lag due to the Lead-210 requirement.



## GROUNDWATER SAMPLING PROGRAM

w/ Bel &amp; Tel

LOCATIONS:

As many of the following alluvial wells as are operable will be sampled.

<u>Navajo Tribal Well Number</u>	<u>Pump Type</u>	<u>Location</u>
16-5-2	Hand	Section 24 T16N - R17W
16K-340	Mill	Section 25 T16N - R17W
16K-336	Mill	Section 33 T8N - R17W
16P-372	Hand	Section 31 T15N - R19W
16-1	Hand	Section 19 T14N - R20W
* Parker Spring	Hand	Section 3 T14N - R20W
Sunnyside Well	Electric	Section 14 T15N - R18W

25' 50' from stream  
about 1/2 mi. S. of  
the stream

FREQUENCY:

Monthly for 3 months,  
Quarterly until further notice.

Take sample on 18 Jul & Sep/Oct 1968

PARAMETERS:

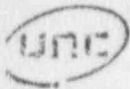
Aluminum	Manganese
Nitrogen (Ammonia)	Total Mercury
Arsenic	Molybdenum
Barium	Nickel
Bicarbonate	Nitrogen (as Nitrate)
Boron	Nitrite
Cadmium	pH
Calcium	Potassium
Chloride	Selenium
Chromium	Silver
Cobalt	Sodium
Conductivity	Sulfate
Copper	Vanadium
Cyanide	Zinc
Fluoride	Lead-210
Iron	Radium-226
Lead	Thorium-230
Magnesium	Total Uranium

REPORTING:

Data will be forwarded as soon as the set of analyses are finalized. This may entail a one month lag due to the Lead-210 requirement.

2 wells have been sampled on 18 Jul





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WARNING SIGNS

*45 signs by 179.2*

Signs were placed <sup>~</sup>every one-half ( $\frac{1}{2}$ ) mile along the banks of the Río Puerco starting at 8:00 a.m. on Thursday the 16th of August. By 4:00 p.m. forty-five (45) signs had been placed from the mill area to a point ten (10) miles downstream. These signs state "Warning! All use of water from this river is discouraged by the N. M. E. I. D." (in English, Spanish and Navajo). Placement of signs will continue until both sides of the arroyo are posted to the state line, this will be a total of 175 signs.

# UNC MINING AND MILLING

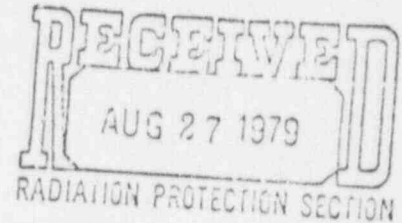


Division of United Nuclear Corporation  
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Church Rock Operations  
P.O. Drawer 00

Gallup, New Mexico 87301  
Telephone 505/722-6651

August 24, 1979



Dr. Ted Wolff  
NMEID  
Radiation Protection Section  
Box 968  
Santa Fe, New Mexico 87503

Dear Ted:

As required in Mr. Baca's letter of August 13, find enclosed the weekly follow-up report. If you have any questions about the format please let me know.

By way of explanation: sediment sampling to determine vertical and lateral movement was initiated on August 9; cleanup was limited by excess rainfall on August 10, 12, and 13, and by lack of direction due to confusion over cleanup criteria on the 17th; cleanup of all visible salts was completed on August 16 and no more have reappeared.

*TO BE SET  
COP. 2/20*

If you have any further questions please call me.

Regards,

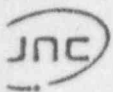
Todd Miller,  
Manager of Environmental Operations

TM/cr

Enclosures (2)

cc: H. J. Abbiss, UNC Mining & Milling  
C. N. Ofelt, UNC Mining & Milling

*27/8  
Results of Sampling  
urgently needed*



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TAILINGS BREACH FOLLOW-UP REPORT

Week of 8-10-79 through 8-16-79

	<u>Material</u> (salt, sediment, water)	<u>Volume</u> (gal or ft <sup>3</sup> )	<u>Date Sampled</u> <u>or Removed</u>	<u>Manpower</u> <u>Utilized</u>
<u>Pools</u>	Surveyed and sampled water	45 samples	8-15-79	
<u>Salts</u>	Salts removed		8-14-79	42
	Salts removed	355 Ft. <sup>3</sup>	8-15-79	47
	Salts removed	290 Ft. <sup>3</sup>	8-16-79	58
<u>Sediments</u>	Trench samples taken four (4) locations		8-9-79	
<u>Runoff</u>	Water - Pinedale Bridge		8-14-79	
	Water - 566 Bridge		8-15-79	
<u>Cleanup</u>	Sediment removal.	188 Ft. <sup>3</sup>	8-11-79	7

ADD LOCATION



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TAILINGS BREACH FOLLOW-UP REPORT

Week of 8-17-79 through 8-23-79

	<u>Material</u> <u>(salt, sediment, water)</u>	<u>Volume</u> <sub>3</sub> <u>(gal or ft<sup>3</sup>)</u>	<u>Date Sampled</u> <u>or Removed</u>	<u>Manpower</u> <u>Utilized</u>
<u>Pools</u>	No further action due to low levels observed in initial survey.			
<u>Salts</u>	No further salt formation observed.			
<u>Sediments</u>	trench samples in laboratory.			
<u>Runoff</u>	No precipitation events.			
<u>Cleanup</u>	Sediment removed.	261 ft. <sup>3</sup>	8-17-79	5
	Sediment removed.	442 ft. <sup>3</sup>	8-18-79	20
	Sediment removed.	341 ft. <sup>3</sup>	8-19-79	19
	Sediment removed.	370 ft. <sup>3</sup>	8-20-79	43
	Sediment removed.	370 ft. <sup>3</sup>	8-21-79	46
	Sediment removed.	413 ft. <sup>3</sup>	8-22-79	48
	Sediment removed.	638 ft. <sup>3</sup>	8-23-79	47



The attached Fact Sheet presents current data on the Church Rock Mill's tailings pond breach, the actions undertaken by UNC as well as some of the results to date.

We will be pleased to discuss any of the numerous aspects and issues involved. Please address your inquiries to Charles Ofelt (telephone number 505-265-4421). They will be handled promptly.

## FACT SHEET

UNC

August 23, 1979

This Fact Sheet has been prepared to provide the latest available information concerning the tailings dam breach on July 16, 1979 at the Church Rock Mill of United Nuclear Corporation near Gallup, New Mexico, its effects and remedial steps taken by UNC. Situated 15 miles northeast of Gallup, the Church Rock Mill has been in operation since May, 1977. It processes uranium ore from the nearby UNC Church Rock Mine and other mining properties. Waste materials from the mill are discharged into a tailings pond.

### Background

Upon discovery of the breach and release of tailings liquid into the arroyo leading to the Rio Puerco, early in the morning on July 16, the New Mexico Environmental Improvement Division was notified and summoned to the area, while work crews erected a temporary secondary dam to stop the flow of liquid.

The leak was stopped within two to three hours of its discovery. Mill shut-down procedures by UNC were started immediately and discharging into the tailings pond was stopped. An estimated 100 million gallons of tailings liquid containing low-level radioactive waste materials were released by the breach.

The tailings liquid passed through Gallup downstream to a point near Chambers, Arizona. Arizona state officials were notified of the spill at Church Rock.

### Tailings Dam

The cause of the breach continues to be under investigation by independent engineering firms retained by UNC who will present their findings directly to the Environmental Improvement Division and the Office of the New Mexico State Engineer. The tailings dam design conforms to established industry standards and received approval by the Office of the New Mexico State Engineer on April 7, 1976. The Church Rock Mill will not be reopened until the conclusive cause or causes of the breach are established and until authorization is received from the New Mexico Environmental Improvement Division, the New Mexico State Engineer and the U.S. Mine Safety and Health Administration. The mill employs about 150 workers, most of whom reside in the nearby Gallup area.

### Analysis of the Tailings Spill

UNC follows a practice of periodically testing surface water conditions up and downstream from its Church Rock Mill.

Water samples taken on July 16, after the tailings dam breach, at various locations from Church Rock to a point 36 miles downstream, showed abnormally high concentrations of such chemical elements as total Uranium, Radium 226 and Thorium 230. However, readings taken for these chemicals at the same locations since the spill showed that concentrations have diminished sharply to levels approaching normal background intensities. These data have been supplied to the New Mexico Environmental Improvement Division and to officials of the Navajo Nation. (See attached test data.)



UNC

#### Action Taken By UNC

In addition to notifying the Environmental Improvement Division of the dam breach, UNC informed the City of Gallup, the NRC, Mine Safety and Health Administration and personal visits were made by UNC representatives to residents of local settlements who do not have telephones. As a precautionary measure, the residents were advised that drinking water would be made available to them by the UNC Mill.

Press and other media were advised by both Environmental Improvement Division and UNC and press statements were issued to the local media and national wire services. Concurrently with the plant shut down, UNC immediately dispatched sampling teams to track the spill and to sample the river waters and streambed soils for the length of the spill.

Using uranium readings as the basis, UNC began clean-up operations throughout the affected areas, particularly seeking out any possibly contaminated standing pools of water. These operations continue today in accordance with Environmental Improvement Division guidelines.

The clean-up process is slow of necessity since the soft riverbeds preclude the use of heavy equipment such as bulldozers. Clean-up crews must resort to shovels and buckets -- a procedure that is slow but considerably more thorough.

In compliance with the Environmental Improvement Division's directive of August 13th, UNC has on August 15th again surveyed and sampled standing pools of water using work crews and a helicopter. Of the 45 pools identified none contained significant amounts of uranium.

A soil sampling program to define the exact amount of soil contamination and the effectiveness of the clean-up operation is ongoing. Initially, elevated levels of Radium, a key radioactive element, were observed only within five miles downstream from the dam and not farther. To date, the arroyo has been sampled as far as Gallup, and findings are being forwarded to the Environmental Improvement Division.

A surface and ground water sampling program is also continuing, including a number of Navajo tribal water wells.

Signs in English, Spanish and Navajo, discouraging use the Rio Puerco, have been posted at half-mile intervals stretching from the mill to the Arizona border.

UNC has so far delivered over 100,000 gallons of drinking and livestock water to Navajo families and ranchers in potentially affected areas. Deliveries are being made on a continuing basis.

#### Effect on UNC

Notwithstanding the Mill shut-down, no employees have been laid off. The Church Rock Mine has continued in full production. Mill operation will resume when all regulatory agency approvals are received.



SPILL WATER SAMPLES  
TAILINGS DAM BREACH

ing Date: 08-09-79

ICIESQS	*1.5 ml. upstream at Ford in Road		4.5 ml. downstream at Pinedale Road Crossing		5 mi. downstream at State Road 565 Bridge		13 mi. downstream North East of El Paso Refinery		16 mi. downstream at Hoback East of Gallup		36 mi downstream at Keim Station E. of Arizona Border	
	0.330	0.076	0.189	0.223	0.160	1.091	0.021	0.021	0.021	0.021	0.021	0.021
um (mg/l)	0.005	0.007	0.037	0.023	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
ic (mg/l)	0.032	0.060	0.231	0.011	1.005	0.312	0.011	0.011	0.011	0.011	0.011	0.011
um (mg/l)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
um (mg/l)	7.6	6.7	11.6	44.9	262.2	133.1	133.1	133.1	133.1	133.1	133.1	133.1
um (mg/l)	11.5	13.7	17.6	18.7	20.9	23.6	23.6	23.6	23.6	23.6	23.6	23.6
um (mg/l)	0.007	0.009	0.003	0.007	0.005	0.009	0.009	0.009	0.009	0.009	0.009	0.009
um (mg/l)	0.013	0.015	0.029	0.023	0.031	0.026	0.026	0.026	0.026	0.026	0.026	0.026
activity (micro/cm) 250	650	560	1110	1190	2139	2170	2170	2170	2170	2170	2170	2170
um (mg/l)	0.000	0.010	0.017	0.019	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
um (mg/l)	0.10	0.59	0.07	0.28	0.13	0.04	0.04	0.04	0.04	0.04	0.04	0.04
um (mg/l)	0.36	0.39	0.72	0.79	0.51	0.44	0.44	0.44	0.44	0.44	0.44	0.44
um (mg/l)	0.114	0.111	0.094	0.024	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
um (mg/l)	0.024	0.023	0.037	0.042	0.065	0.064	0.064	0.064	0.064	0.064	0.064	0.064
um (mg/l)	6.2	5.3	15.1	13.2	36.9	41.5	41.5	41.5	41.5	41.5	41.5	41.5
um (mg/l)	0.0015	0.0010	0.0095	0.0021	0.0219	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131
um (mg/l)	0.267	0.254	0.283	0.263	0.296	0.212	0.212	0.212	0.212	0.212	0.212	0.212
um (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
um (mg/l)	0.6	1.1	8.3	1.0	9.1	3.4	3.4	3.4	3.4	3.4	3.4	3.4
um (mg/l)	0.00	0.07	0.03	7.94	7.99	7.57	7.57	7.57	7.57	7.57	7.57	7.57
um (mg/l)	0.009	0.057	0.035	0.030	0.024	0.021	0.021	0.021	0.021	0.021	0.021	0.021
um (mg/l)	0.005	0.055	0.015	0.0035	0.026	0.016	0.016	0.016	0.016	0.016	0.016	0.016
um (mg/l)	2089.2	3173.0	2523.9	2136.5	2202.5	1695.0	1695.0	1695.0	1695.0	1695.0	1695.0	1695.0
um (mg/l)	137.0	152.0	457.0	522.8	1496.6	1838.6	1838.6	1838.6	1838.6	1838.6	1838.6	1838.6
um (mg/l)	5.0	6.04	1010	1269	2332	3038	3038	3038	3038	3038	3038	3038
um (mg/l)	0.005	0.009	0.004	0.008	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006
um (mg/l)	0.022	0.060	0.053	0.045	0.028	0.034	0.034	0.034	0.034	0.034	0.034	0.034
um (mg/l)	0.0011	0.0002	0.0004	0.0021	0.0035	0.0121	0.0121	0.0121	0.0121	0.0121	0.0121	0.0121
um (mg/l)	0.05	0.09	0.65	0.54	0.73	0.17	0.17	0.17	0.17	0.17	0.17	0.17
um (mg/l)	2.6	5.1	<0.5	0.9	0.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7
um (mg/l)	20.6	25.4	11.8	14.7	9.8	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
um (mg/l)	293	364	167	73	34	12	12	12	12	12	12	12
um (mg/l)	41.8	38.5	240.4	173.5	606.6	653.9	653.9	653.9	653.9	653.9	653.9	653.9

\* Upstream data is the background against which downstream data is compared. Upstream is above the tailings dam and downstream is below the dam.

# UNC MINING AND MILLING



Division of United Nuclear Corporation  
A UNC RESOURCES Company

Church Rock Operations  
PO Drawer QQ

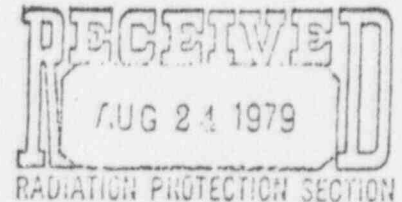
Gallup, New Mexico 87301  
Telephone 505/722-6651

August 22, 1979

10-1-1  
AUG 24 1979

Mr. Dir's Office

Thomas E. Baca, Director  
NMEID  
P. O. Box 968  
Santa Fe, New Mexico 87503



Dear Mr. Baca;

In compliance with element three (3) of your letter dated August 13, 1979, to Mr. D. D. Turberville, Vice-President, UNC Mining & Milling, please find attached the complete results of the analyses on the crystallized salt samples taken July 18, 1979.

Also attached are the results of analyses on surface water samples which have been taken on a weekly basis since the dam breach.

If any other information is required, please contact me.

Sincerely,

A handwritten signature in cursive script, appearing to read "Richard D. Wooten, Jr.".

R. D. Wooten, Jr.  
Radiation Safety Coordinator

RDW/cr

Attachments (7)

cc: H. J. Abbiss, Vice-President  
Environmental and Safety Services  
UNC Mining & Milling



Division of United Nuclear Corporation  
AUC RESOURCES Company

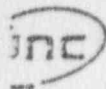
PO Box 3951  
Albuquerque, New Mexico 87190

4801 Indian School Road, N.E.  
Albuquerque, New Mexico 87110

Telephone 505/265-4421

# CRYSTALIZED SALTS ANALYSES

METER		BACKGROUND COMPOSITE	BELOW PUERCO CONFLUENCE (7-18-79)	566 BRIDGE (7-18-79)	WHITEROCK BRIDGE (7-18-79)
Aluminum	Z	1889 1.889	2.556	1.222	1.667
Antimony	Z	0.0109	0.0121	0.0102	0.0093
Barium	Z	0.0008	0.0011	0.0014	0.0012
Bismuth	Z	0.1080	0.0740	0.0700	0.0760
Carbonate	Z	1.054	7.612	2.489	1.610
Cadmium	Z	<0.0001	<0.0001	<0.0001	<0.0001
Copper	Z	0.0008	0.0008	0.0006	0.0003
Fluorine	Z	0.800	0.630	0.410	0.410
Iron	Z	0.273	0.328	0.218	0.218
Lead	Z	0.0016	0.0026	0.0012	0.0014
Lithium	Z	0.0008	0.0009	0.0007	0.0008
Magnesium	Z	0.0010	0.0037	0.0008	0.0008
Manganese	Z	0.0076	0.0061	0.0088	0.0076
Molybdenum	Z	0.0106	0.0209	0.0219	0.0182
Nickel	Z	1.417	1.380	0.833	0.861
Phosphorus	Z	0.0013	0.0008	0.0290	0.0007
Potassium	Z	0.310	0.320	0.170	0.230
Selenium	Z	0.1250	0.0500	0.0500	0.0500
Silver, Total	Z	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	Z	0.0016	0.0017	0.0016	0.0016
Sulfur	Z	0.0152	0.0313	0.0782	0.0090
Tellurium	Z	0.005	0.004	0.005	0.005
Thallium	Z	<0.01	<0.01	<0.01	<0.01
Vanadium	Z	1.690	1.660	1.130	1.250
Zinc	Z	0.0007	0.0007	0.0006	0.0006
Chlorine	Z	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	Z	0.584	0.365	0.942	0.604
Cyanide	Z	0.183	3.060	1.069	1.587
Mercury	Z	0.0047	0.0075	0.0043	0.0057
Strontium	Z	0.0116	0.0180	0.0092	0.0094
210	pCi/g	9.5	36.9	10.8	5.0
226	pCi/g	4.0	9.4	3.3	6.6
230	pCi/g	2.8	71.4	26.5	39.9
Uranium	Z	0.0019	0.0045	0.0009	0.0013



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# CRYSTALIZED SALTS ANALYSES

PARAMETER		ABOVE PUERCO CONFLUENCE (8-14-79)
minum	%	3.000
onia	%	0.007
enic	%	0.0010
ium	%	0.0940
arbonate	%	1.069
on	%	<0.0001
mium	%	0.0009
cium	%	0.011
oride	%	0.328
onium	%	0.0036
alt	%	0.0014
per	%	0.0061
nide	%	0.0084
oride	%	0.0039
n	%	1.889
d	%	0.0004
nesium	%	0.300
ganese	%	0.2750
cury, Total	%	<0.0001
ybdenum	%	0.0009
kel	%	0.0053
rate	%	0.003
rite	%	0.01
assium	%	0.363
enium	%	0.0007
ver	%	<0.0001
lum	%	0.693
ate	%	8.534
adium	%	0.0089
	%	0.0164
210	pCi/g	38.4
226	pCi/g	15.9
230	pCi/g	124.4
ium	%	0.0079

# TAILINGS DAM BREACH SURFACE WATER SAMPLES

Sampling Date: 7-18-79

PARC-1185

	1.5 mi. upstream at Ford in Road	1.5 mi. upstream at Waterfall	4.5 mi. downstream at Pinedale Road Crossing	5 mi. downstream at State Road 556 3-16ge	13 mi. downstream North East of El Paso Refinery	16 mi. downstream at Hogback East of Gallup	36 mi. downstream at Leigh Station E. of Arizona Border
Aluminum (mg/l)	<0.2	<0.2	1073.0	1037.0	781.0	709.3	<0.2
Arsenic (mg/l)	0.008	0.009	0.003	0.010	0.012	0.010	0.007
Barium (mg/l)	1.67	1.47	0.08	0.69	0.39	0.59	0.08
Calcium (mg/l)	0.004	0.004	0.082	0.058	0.063	0.057	0.015
Chloride (mg/l)	26.9	24.1	153.0	161.7	190.0	196.0	132.0
Copper (mg/l)	19.4	13.3	5513.6	2322.7	3525.0	282.0	215.2
Cyanide (mg/l)	<0.02	<0.02	1.57	1.51	1.20	1.01	<0.02
Cobalt (mg/l)	0.09	0.08	0.785	0.619	0.593	0.633	0.432
Conductivity (umhos/cm) 25°C	650	620	35,000.	20,400.	13,500	12,800	1820
Copper (mg/l)	<0.01	<0.01	4.2	3.5	2.1	2.1	<0.01
Granite (mg/l)	<0.01	0.02	0.13	0.23	0.12	0.35	<0.01
Fluoride (mg/l)	0.30	0.26	27.3	22.5	14.0	11.7	0.95
Iron (mg/l)	<0.04	<0.04	2210.0	1751.0	939.5	7025.0	<0.04
Lead (mg/l)	<0.05	<0.05	0.55	0.52	0.16	0.16	<0.05
Magnesium (mg/l)	9.15	10.23	1038.00	959.0	879.0	929.0	32.3
Manganese (mg/l)	<0.01	<0.01	73.0	75.60	92.00	96.00	0.44
Polychlorine (mg/l)	0.17	0.17	0.56	0.50	0.14	0.09	0.22
Mercury Total (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate (Nitrate) (mg/l)							
Potassium (mg/l)	4.61	2.76	95.9	96	87.6	88.5	13.8
pH	8.07	8.90	1.40	1.41	2.49	2.59	8.18
Selenium (mg/l)	0.016	0.015	0.081	0.051	0.013	0.011	0.015
Silver (mg/l)	<0.01	<0.01	0.15	0.12	0.09	0.09	0.02
Sulfate (mg/l)	7304.0	2406.0	7701.0	11,755.0	6367.0	10,660.0	2030.0
Sulfate (mg/l)	125.9	131.5	27,372.6	20,018	16,154.0	14,940.0	1170.0
Total Dissolved Solid (mg/l)	4.8.0	434.0	41,108.0	43,293.0	29,410.0	25,676.0	2492.0
Nickel (mg/l)	<0.04	<0.04	3.00	3.00	3.00	2.90	<0.04
Vanadium (mg/l)	<0.1	<0.1	58.8	56.3	27.0	7.3	<0.01
Zinc (mg/l)	0.066	0.009	10,400	11,960	8,500	8,800	6,009
Total Uranium (mg/l)	0.71	0.79	6.49	7.49	6.81	6.37	0.51
Radon-226 (pCi/l)	2.5	5.5	100.2	545.9	53.0	23.0	3.4
Thorium-232 (pCi/l)	37.8	39.3	8095.5	10.1	7428.9	47,862.9	29.7
Gross Alpha (pCi/l)	303	209	122	4351.0	4067.5	4520.0	105
Hardness (mg/l)	104.8	10.2	4654.4	4351.0	4067.5	4520.0	462.5



TAILINGS DAM BREACH  
SURFACE WATER SAMPLES

Sampling Date: 7-19-79	1.5 mi. upstream at Ford In Road	.5 mi. upstream at Waterfall	4.5 mi. downstream at Pinedale Road Crossing	5 mi. downstream at State Road 566 Bridge	13 mi. downstream North East of El Paso Refinery	16 mi. downstream at Hogback East of Gallup	36 mi. downstream at Veach Station E. of Arizona Border
Aluminum (mg/l)	0.3	<0.2	0.4	1.7	0.2	<0.2	<0.2
Arsenic (mg/l)	0.03	0.037	0.005	0.009	0.005	0.005	0.005
Barium (mg/l)	1.7	1.2	1.4	6.7	0.5	0.7	1.0
Cadmium (mg/l)	<0.034	<0.034	<0.004	<0.004	<0.004	0.005	<0.004
Calcium (mg/l)	10.0	6.0	134.0	114.0	222.0	212.0	134.0
Chloride (mg/l)	21.8	10.9	27.3	45.1	43.7	92.8	49.1
Chromium (mg/l)	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	1.05
Cobalt (mg/l)	0.005	0.005	0.009	0.116	0.256	0.233	0.116
Conductivity (microhm/cm) 25°C	630	680	1800	1950	3203	3500	3600
Copper (mg/l)	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Cyanide (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fluoride (mg/l)	0.27	0.32	0.22	0.31	0.17	0.17	0.24
Iron (mg/l)	2.83	2.83	242.5	450.9	532.1	29.25	4.7
Lead (mg/l)	0.05	0.10	0.09	0.09	0.16	0.10	0.09
Manganese (mg/l)	11.1	17.0	31.6	41.0	96.3	123.0	100.0
Magnesium (mg/l)	1.1	0.53	3.2	5.2	15.8	31.1	14.7
Nickel (mg/l)	0.19	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Mercury Total (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrogen (Nitrate) (mg/l)							
Potassium (mg/l)	4.44	2.83	9.70	10.91	20.20	31.52	23.54
pH	8.65	8.63	5.07	4.58	5.62	6.28	6.00
Selenium (mg/l)	0.017	0.012	0.011	0.014	0.011	0.010	0.011
Silver (mg/l)	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium (mg/l)	4807	2623	3121	3403	3515	3587	3623
Sulfate (mg/l)	123.0	165.0	1146	1304	2393	2566	2415
Total Dissolved Solids (mg/l)	412.6	441.0	1748.8	2014.2	3601.6	4015.0	3701.2
Nickel (mg/l)	<0.01	0.08	<0.04	<0.04	0.15	0.10	0.03
Vanadium (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc (mg/l)	0.015	0.047	0.035	0.035	0.129	0.031	0.020
Total Uranium (mg/l)	0.81	0.80	0.02	0.03	0.01	0.04	0.01
Bidion-22 (mg/l)	12.2	17.6	9.4	11.0	4.6	4.8	4.6
Bidion-23 (mg/l)	9.3	10.9	0.6	20.7	0.5	0.6	0.6
Gross Alpha (dpm/l)	300	365	25	10	10	2	12
Hardness (mg/l)	70.7	85.0	472.7	553.3	1108.8	1210.4	1051.1

TAILINGS DAM BREACH  
SURFACE WATER SAMPLES

Sampling Date: 7-27-79	1.5 mi. upstream at Ford in Road	.5 mi. upstream at Waterfall	4.5 mi. downstream at Pinedale Road Crossing	5 mi. downstream at State Road 566 Bridge	13 mi. downstream North East of El Paso Refinery	16 mi. downstream at Hogback East of Gallup	36 mi. downstream at Veach Station E. of Arizona Border
PERMITTERS							
Aluminum (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arsenic (mg/l)	0.0220	0.0239	0.0125	0.0178	<0.001	<0.001	<0.001
Boron (mg/l)	1.4	1.6	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium (mg/l)	1.97	2.15	12.12	15.10	45.97	45.45	40.91
Chloride (mg/l)	36.2	30.1	18.1	35.2	48.2	48.2	132.6
Copper (mg/l)	<0.02	<0.02	<0.02	<0.02	<0.02	0.5	0.5
Cobalt (mg/l)	<0.01	<0.01	<0.01	<0.01	0.44	0.12	0.12
Conductivity (microhm/cm) 25°C	550	570	1130	1200	2600	2600	3030
Copper (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Granite (mg/l)							
Fluoride (mg/l)	0.296	0.319	0.503	0.605	0.166	0.138	0.765
Iron (mg/l)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Lead (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Magnesium (mg/l)	1.15	1.01	2.30	3.31	22.01	23.00	18.56
Manganese (mg/l)	<0.01	<0.01	0.36	0.44	0.95	0.47	1.75
Molybdenum (mg/l)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Mercury Total (mg/l)							
Nitrogen (Nitrate) (mg/l)							
Nitrogen (mg/l)	1.47	1.57	3.21	2.75	6.85	5.17	13.76
Fluoride (mg/l)	0.73	0.77	7.49	7.43	6.03	5.54	7.81
Selenium (mg/l)	0.1252	0.1119	0.1254	0.1232	0.1055	0.0502	0.1123
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur (mg/l)							
Sulfate (mg/l)	134.3	141.2	765.0	513.6	1930.2	2044.6	1917.6
Total Dissolved Solid (mg/l)	456.0	426.0	505.0	976.0	3274.0	3350.0	3326.0
Nickel (mg/l)	<0.01	<0.01	<0.01	<0.01	0.13	0.08	<0.01
Vanadium (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc (mg/l)	<0.01	<0.01	0.01	0.03	0.04	0.04	0.03
Total Uranium (mg/l)	0.90	0.86	0.53	0.56	<0.01	<0.01	0.19
Bismuth-206 (mg/l)	2.5	3.0	2.0	3.0	2.6	2.6	6.6
Bismuth-210 (mg/l)	21.5	21.5	11.0	7.0	<0.6	<0.6	4.0
Free Alpha (mg/l)	9.7	9.5	21.5	59.0	207.9	200.6	173.5
Hardness (mg/l)							



TAILINGS DAM BREACH

Sampling Date: 8-04-79

Parameter	1.5 mi. upstream at Ford in Road	1.5 mi. upstream at Waterfall	4.5 mi. downstream at Pinedale Road Crossing	5 mi. downstream at Plate Road 46 Bridge	13 mi. downstream North East of El Paso Refinery	16 mi. downstream at Hoeback East of Gallup	38 mi. downstream at Veach Station E. of Arizona Border
Aluminum (mg/l)	0.737	0.583	339	260	0.271	0.373	0.323
Arsonic (mg/l)	0.003	<0.001	0.0		0.003	0.004	0.003
Barium (mg/l)	0.759	0.866	0.6	12	1.212	0.443	0.121
Cadmium (mg/l)	0.0007	0.0007	0.001	0.0012	0.0019	0.0021	0.0021
Calcium (mg/l)	3.74	2.32	14.31	17.43	43.93	41.12	31.78
Chloride (mg/l)	25.0	30.0	20.0	20.0	25.0	30.0	45.0
Copper (mg/l)	0.016	0.011	0.019	0.024	0.034	0.089	0.051
Cobalt (mg/l)	0.041	0.003	0.076	0.021	0.092	0.053	0.022
Conductivity (micro/cm) 25°C	380	596	940	1010	1810	2020	2620
Copper (mg/l)	0.0073	0.0032	0.0290	0.0083	0.0006	0.0021	0.0138
Cyanide (mg/l)	40.01	<0.01	40.01	40.01	40.01	<0.01	<0.01
Fluoride (mg/l)	0.39	0.35	0.80	0.35	0.41	0.57	0.29
Iron (mg/l)	0.352	0.121	0.353	0.209	0.507	0.057	0.235
Lead (mg/l)	0.0231	0.0258	0.0764	0.0600	0.0635	0.0368	0.0326
Magnesium (mg/l)	3.12	3.06	2.43	6.41	26.76	28.11	20.40
Manganese (mg/l)	0.0014	0.0012	0.0121	0.0033	0.5612	0.1322	0.7610
Nitrate (mg/l)	0.363	0.357	0.417	0.411	0.374	0.377	0.377
Nitrogen Total (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrogen (nitrate) (mg/l)							
Sulfur (mg/l)	3.52	2.31	3.44	5.13	7.86	13.31	9.75
PH (mg/l)	6.83	8.57	7.65	7.71	7.43	7.52	7.73
Selenium (mg/l)	0.041	0.012	0.012	0.010	0.007	0.008	0.014
Silver (mg/l)	0.0030	0.0031	0.0032	0.0023	0.0041	0.0076	0.0065
Sodium (mg/l)	3698.0	4013.6	2742.0	2435.0	2572.0	1313.0	3371.0
Sulfate (mg/l)	134.8	150.4	403.4	471.7	1176.9	1274.4	1506.0
Total Dissolved Solids (mg/l)	1294	1320	1698	1792	2750	3122	3560
Mercur (mg/l)	0.007	0.012	0.016	0.008	0.007	0.006	0.003
Vanadium (mg/l)	0.001	0.012	0.007	0.009	0.005	0.008	0.008
Zinc (mg/l)	0.0071	0.0042	0.0034	0.0031	0.0031	0.0015	0.0020
Total Uranium (mg/l)	0.85	0.86	0.68	0.67	0.16	0.06	0.16
Enrichment 226 (pCi/l)	2.1	2.4	1.0	2.5	3.2	3.0	4.7
Thorium-230 (pCi/l)	54.6	15.5	36.3	8.4	<0.6	<0.6	1.6
Cross Alpha (pCi/l)	210	306	103	89	17	10	7
Permeability (mg/l)	18.63	18.31	45.32	66.77	212.24	123.41	89.76

# TAILINGS DAM BREACH

Sampling Date: Aug. 9, 1972	1.5 ml. upstream at Ford in Road	.5 ml. upstream at Waterfall	4.5 ml. downstream at Pinedale Road Crossing	5 ml. downstream 566 Bridge	13 ml. downstream North End of El Paso Refinery	16 ml. downstream at Hogback East of Gallup	36 ml. downstream at Leigh Station E. of Arizona Border
Ammonia (mg/l)	0.330	0.076	0.189	0.223	0.160	1.091	0.551
Arsenic (mg/l)	0.005	0.007	0.032	0.023	0.014	0.030	0.016
Boron (mg/l)	0.0572	0.665	0.231	1.011	1.005	0.312	0.075
Calcium (mg/l)	0.0037	0.3004	0.0005	0.0007	0.0006	0.0007	0.0005
Chloride (mg/l)	7.6	6.7	21.4	44.9	207.2	193.3	97.4
Cyanide (mg/l)	11.5	13.7	17.0	16.7	73.9	28.6	35.7
Copper (mg/l)	0.037	0.009	0.003	0.007	0.005	0.009	0.010
Fluoride (mg/l)	0.013	0.015	0.029	0.023	0.021	0.026	0.022
Conductivity (mhos/cm) 25°C	650	580	1110	1193	2150	2720	2010
Copper (mg/l)	0.008	0.010	0.017	0.019	0.013	0.019	0.017
Granite (mg/l)	0.10	0.29	0.07	0.26	0.13	0.04	0.06
Fluoride (mg/l)	6.36	0.39	0.22	0.70	0.51	0.44	0.59
Iron (mg/l)	0.114	0.011	0.004	0.024	0.018	0.024	0.011
Lead (mg/l)	0.024	0.025	0.032	0.042	0.055	0.058	0.055
Manganese (mg/l)	6.1	5.3	15.1	15.1	36.9	41.6	31.1
Nitrate (mg/l)	0.0015	0.0010	0.0055	0.0021	0.010	0.011	0.010
Nitrogen (mg/l)	6.247	0.254	0.213	0.253	0.236	0.213	0.162
Mercury Total (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrogen (Nitrate) (mg/l)							
Potassium (mg/l)	0.6	1.1	6.3	1.7	9.1	3.4	3.8
Sulfur (mg/l)	8.83	8.87	8.03	7.94	7.69	7.57	7.64
Selenium (mg/l)	0.038	3.067	0.035	0.030	0.034	0.041	0.020
Silver (mg/l)	0.0045	0.0055	0.0015	0.0013	0.0036	0.0046	0.0072
Sodium (mg/l)	2336.4	3173.0	2224.7	2136.5	2207.5	1695.0	1765.1
Sulfate (mg/l)	132.0	152.0	457.0	522.8	1394.6	1836.5	1773.8
Total Dissolved Solids (mg/l)	530	604	1010	1083	2317	3063	2524
Silica (mg/l)	0.056	0.009	0.004	0.003	0.005	0.004	0.007
Sulfuric Acid (mg/l)	0.022	0.006	0.009	0.045	0.046	0.094	0.001
Titanium (mg/l)	0.0041	0.0022	0.0084	0.0071	0.0035	0.0021	0.0031
Total Uranium (mg/l)	0.83	0.19	0.45	0.54	0.23	0.17	0.12
Uranium-238 (mg/l)	2.6	4.1	0.6	0.9	0.8	2.7	1.3
Uranium-235 (mg/l)	20.6	25.4	11.8	14.7	9.8	<0.6	11.6
Uranium Alpha (mg/l)	293	345	167	73	3-	12	7
Vanadium (mg/l)	41.8	38.5	260.4	173.5	806.8	653.9	371.7



# STATE OF NEW MEXICO

OFFICE OF THE GOVERNOR

SANTA FE

87503

BRUCE KING  
GOVERNOR

August 21, 1979

Mr. John DuBoise, President  
Manuelito Charter  
The Navajo Nation  
P. O. Box 1254  
Window Rock, Arizona 86515

Dear Mr. DuBoise:

The State of New Mexico has been actively following up the spill of radioactive material with several courses of action. Copies of the state orders and news releases are attached for your information.

Direct action by State of New Mexico included the following:

1. Issued order on July 16, 1979 prohibiting use of tailings dam.
2. Issued advisory against use of Rio Puerco water for domestic, livestock and irrigation.
3. Issued order on July 18, 1979 directing clean-up.
4. Issued order on July 18, 1979 prohibiting use of dam until State Engineer's office had reviewed the cause of dam failure and plans for rebuilding.
5. Issued order on August 8, 1979 stopping additional construction raising the existing dam structure.
6. Issued order on August 13, 1979 covering clean-up criteria and sampling procedures.
7. Provided state laboratory support for sample analyses and funds for commercial laboratory analyses.

Other action requested by State of New Mexico:

1. Nuclear Regulatory Commission was advised of the failure on July 16, 1979 and provided the following support:
  - a. Geo-Technic Engineer for on-site visit for consultation and advice July 18-20, 1979.
  - b. Offered assistance of the federal laboratory in Idaho for sample analyses which was accepted by the state.

August 21, 1979

- c. Provided two additional consultants for review and advice on August 6, 1979.
  - d. Provided consultative advice and assistance of clean-up criteria.
  - e. Provided a member of the HRC Regional office to assist in sampling on July 18-20, 1979.
2. Environmental Protection Agency was advised of the dam breach on July 16, 1979 and provided the state the following assistance:
    - a. Provided an aircraft mission on July 16, 1979 for aerial photos of the dam breach and Rio Puerco.
    - b. Provided assistance with sampling in Gallup area.
    - c. Provided assistance with developing clean-up criteria through coordination with headquarters HRC.
  3. U. S. Army Corps of Engineers, Albuquerque District was requested to provide assistance on evaluation of the dam breach. The Corps had members of its organization visit the site on July 19, 1979 and provided technical advice on investigative areas concerning the dam stability and safety. They will provide assistance for the stability evaluation of the dam and also investigate the stability and safety of the existing tailings dam.
  4. The state has also asked the Center for Disease Control to review the potential health effects to determine if any additional action of follow-up programs are warranted.

Additional cooperative assistance involving the State of New Mexico:

1. Supported HRC offer of drinking water and stock water in the local potentially affected area of the Rio Puerco.
2. Advised the State Veterinarian that testing animals by the Indian Health Service was a prudent course of action.
3. Advised the Indian Health Service that doing tests on people concerned about potential health effects was certainly within their prerogative.

The actual loss of tailing solution was approximately 95 million gallons and 1100 tons of solid material. Sampling results to date has not indicated that

August 21, 1979

any acute health problems exist. The Health and Environment Department has asked the Center for Disease Control to review the potential for very long term health effects.

Sincerely,

BRUCE KING  
Governor

BK/gsg

Attachments



Bruce King  
GOVERNOR

George S. Goldstein, Ph.D.  
SECRETARY

Larry J. Gordon, M.S., Ph.D.  
DEPUTY SECRETARY

ENVIRONMENTAL IMPROVEMENT DIVISION  
P.O. Box 248, Santa Fe, New Mexico 87503  
(505) 827-5271

Thomas E. Baca, M.P.H., Director

August 13, 1979

Mr. D. D. Turberville, Vice-President  
UNC MINING & MILLING  
P. O. Box 3951  
Albuquerque, NM 87110

Dear Mr. Turberville:

On July 31, 1979 and August 7, 1979, Environmental Improvement Division staff visited the UNC tailings impoundment area and the Puerco River (Pinedale, Rt. 566 and Freemont Crossing). Obvious soil coloration and crusting indicated the extent of the contamination of the stream from the materials and solution released from your tailings impoundment breach on July 16, 1979. Reports indicate visual evidence of contamination as far as Gallup and possibly beyond. Environmental Improvement Division personnel were informed that your clean-up crew at that time consisted of six to ten personnel. In view of these observations, I do not consider that your present clean-up activities meet the requirements of paragraph two of the Environmental Improvement Division order amending your license NM-UNC-HL issued on July 16, 1979, or of Section 1-203 of the New Mexico Water Quality Control Commission Regulations.

Section 1-203 of the New Mexico Water Quality Control Commission Regulations requires that any person in charge of a facility which discharges water contaminants such as those released when the UNC tailings retention dam breached and released solid tailings and liquid slurry materials in

"such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or the use of property, shall immediately: ... take appropriate and necessary steps to contain and remove or mitigate the damage caused by the discharge."

Additionally, paragraph two of my order dated July 16, 1979, stated in part "the licensee shall immediately take all necessary steps to minimize further dispersal of contaminants in the Rio Puerco channel and to recover, to the extent practicable, contaminants which have escaped from the tailings pond."

We are not satisfied with the progress to date in removing the tailings materials which have been deposited along the beds of the Rio Puerco and its tributaries. An adequate clean-up program should contain at a minimum, but is not limited to, the following elements:



Mr. D. D. Turberville  
Page -2-  
August 13, 1979

(1) A complete survey of the affected Puerco channel and tributaries thereto to be conducted immediately from the breached retention dam area to the point where no evidence of the release is detectable. UNC shall: a) locate all stranded pools which show evidence of being affected by the spill; b) map such pools utilizing USGS 7 1/2 minute topographic quadrangles; and c) forward the maps to the Environmental Improvement Division on or before August 17, 1979. All such stranded pools shall be pumped to remove contaminated effluent and underlying contaminated soil. This material should be disposed of within the licensed tailings retention area. A record of the volume of effluent pumped, contaminated soil removed and daily manpower committed to this task is to be forwarded weekly to the New Mexico Environmental Improvement Division until completion of this task.

(2) Removal of the crystallized salts along the length of the stream channel from the breach area downstream should be undertaken immediately. Such clean-up should entail a commitment of manpower sufficient to accomplish the clean-up on or before September 15, 1979. Due to the moist condition of the channel sediments, use of heavy equipment may be hindered or precluded. However, every effort should be made to remove the deposits of salts which have formed as a result of the spill, so as to avoid future mobilization and transport subsequent to storm runoff events. Weekly reports should be forwarded to the New Mexico Environmental Improvement Division detailing the progress of salt removal and indicating the daily manpower commitment to this task.

(3) The salts crystallizing along the affected channel bed of the Rio Puerco should be sampled separately at three representative sites located between Gallup and the breached tailings dam. A chemical analysis of these samples should be performed and the results forwarded to the New Mexico Environmental Improvement Division on or before August 17, 1979, for all the following parameters, with the exception of radium-226, lead-210, and thorium-230, which should be reported by August 22, 1979:

aluminum	cooper	nitrite
ammonia	cyanide	potassium
arsenic	fluoride	selenium
barium	iron	silver
bicarbonate	lead	sodium
boron	magnesium	sulfate
cadmium	manganese	vanadium
calcium	total mercury	zinc
chloride	molybdenum	lead-210
chromium	nickel	radium-226
cobalt	nitrate	thorium-230
		uranium



(4) A soil sampling program adequate to define the extent of soil contamination and effectiveness of the clean-up operations should be prepared and submitted to the New Mexico Environmental Improvement Division for review on or before August 17, 1979. This program should include, but should not be limited to, soil sampling which analyses contaminant variation with depth, lateral contamination outward from the active stream channel, and soil sampling which defines contamination along the linear extent of the Rio Puerco channel and its tributaries in a downstream direction. Soil samples shall be analyzed for all contaminants listed under paragraph three. Implementation of the soil sample program should take place on or before August 24. Following implementation, progress reports shall be submitted to the New Mexico Environmental Improvement Division weekly until further notice.

(5) UNC shall provide to the Environmental Improvement Division on or before August 22, 1979, a written analysis of the possibility of the diversion of all mine water discharged into the Rio Puerco upstream from the breached area, northward into the San Juan Basin, including the technical and legal ramifications. In developing the analysis such a potential diversion should be contemplated with regard to the possible requirement for major sediment removal from the Rio Puerco channel and the possible advantages offered by a dry channel.

(6) After rainstorms of 0.1 inch or greater along any portion of the affected Puerco Channel, UNC shall sample runoff and suspended sediment for the contaminants listed in paragraph three at locations along the Rio Puerco adequate to assess the dispersal and movement of contaminants. The New Mexico Environmental Improvement Division should be informed weekly of those events and results of this sampling until further notice from the Division. The weekly reports should also include information regarding the clean-up of the dispersed contaminants.

(7) Pursuant to Section 4-100 B., New Mexico Radiation Protection Regulations, every reasonable effort should be made to maintain radiation exposure to the public in unrestricted areas as far below the limits specified in part four of the regulations as practicable. Under Section 4-100B., UNC shall clean up all areas contaminated by the tailings spill in accordance with the following criteria:

- (a) All contaminated areas shall be cleaned up to background levels of all radionuclides;
- (b) If clean-up to background as specified in part (a) should prove impractical for limited areas of contamination, upon specific approval by the New Mexico Environmental Improvement Division, those areas shall be cleaned up so that radium-226 and thorium-230 concentrations are less than:

radium-226      10 pCi/g

thorium-230     30 pCi/g

Mr. D. D. Turberville  
Page -4-  
August 13, 1979

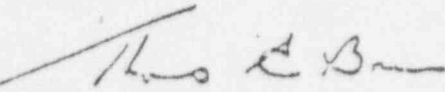
Concentration limits for other radionuclides will be specified later, if deemed necessary. The above clean-up limits for radium-226 and thorium-230 are preliminary and should be considered subject to revision as more data becomes available.

(8) A surface and ground water sampling program \* adequate to define the extent of contamination and effectiveness of clean-up operations should be prepared and submitted to the Environmental Improvement Division on or before August 17, 1979. The program should detail the proposed surface and ground water sampling locations, frequency of sampling and reporting schedule. Surface water samples should be analyzed for all the parameters listed under paragraph three, as well as pH and conductivity. Ground water sample parameters should include at least pH, TDS, sulfate, uranium and chloride.

(9) On or before August 17, 1979, warning signs should be posted along both sides of the Rio Puerco at ½ mile intervals downstream from the breached dam to the New Mexico - Arizona border advising that use of the Rio Puerco for domestic, irrigation and livestock water supply is discouraged. Such signs should be written in English, Spanish and Navajo.

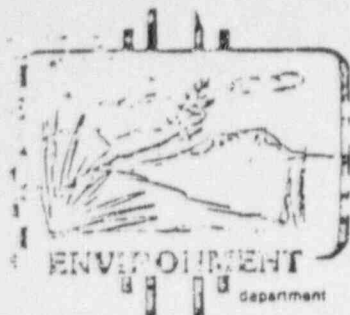
Unless United Nuclear Corporation implements a clean-up program such as that set forth above, this Division will consider UNC in violation of both Section 1-203 of the Water Quality Control Commission Regulations and of conditions No. 2 in my July 16, 1979 order and condition No. 3 of my August 13, 1979 order amending New Mexico Radioactive Material License No. NM-UNC-ML.

Sincerely,



Thomas E. Baca  
Director

\* All programs or plans required to be submitted to the New Mexico Environmental Improvement Division pursuant to this letter shall be subject to Division review and amendment.



STATE OF NEW MEXICO  
ENVIRONMENTAL IMPROVEMENT DIVISION  
P.O. Box 968, Santa Fe, New Mexico 87503  
(505) 827-5271

Thomas E. Baca, M.P.H., Director

Bruce King  
GOVERNOR

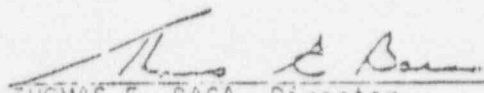
George S. Goldstein, Ph.D.  
SECRETARY

Larry J. Gordon, M.S., M.P.H.  
DEPUTY SECRETARY

ORDER

Order of this Division relative to New Mexico Radioactive Material License No. NM-UNC-ML dated 16th day of July, 1979 is amended to include the following additional requirement and condition.

3. The licensee shall immediately comply with the recommendations for an adequate clean-up program contained in letter dated August 13, 1979, Mr. Thomas E. Baca, NM EID, to Mr. D. D. Tuberville, United Nuclear Corporation, as applicable to radioactive materials and the associated radioactive contamination.

  
THOMAS E. BACA, Director  
New Mexico Environmental Improvement  
Division

DATED at Santa Fe, New Mexico, this 13 day of August, 1979



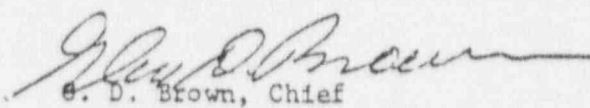
UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 1000  
ARLINGTON, TEXAS 76012

September 6, 1979

(1) Vending  
(5) St. Helen  
(3) NM File

MEMORANDUM FOR: J. H. Sniezek, Division of FFMSI, IE  
FROM: G. D. Brown, Chief, FFMS Branch, Region IV  
SUBJECT: UNITED NUCLEAR CORPORATION, CHURCH ROCK, NEW MEXICO  
TAILINGS DAM BREACH

Attached is Special Inspection Report No. 79-01 of subject facility.

  
G. D. Brown, Chief  
Fuel Facility and Material  
Safety Branch

Enclosure as stated

cc:  
Wayne Kerr - State Programs  
R. Scarano - NMSS

DUPLICATE

Dupe of 79-025066 Add 5

U. S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT  
REGION IV

Report of Special Inspection

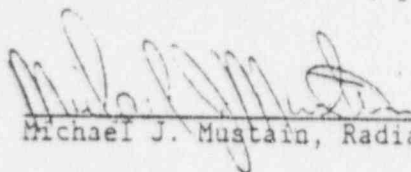
IE Special Inspection Report No. 79-01

United Nuclear Corporation  
Mining and Milling  
Church Rock Operations  
P. O. Drawer 00  
Gallup, NM 87301

Subject: Tailings Dam Breach

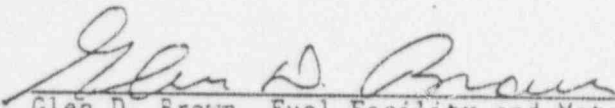
Period of Special Inspection: July 18-20, 1979

Inspector:

  
Michael J. Mustain, Radiation Specialist

8/31/79  
Date

Reviewed by:

  
Glen D. Brown, Fuel Facility and Material  
Safety Branch

9/4/79  
Date

Special Inspection Summary:

Speical Inspection on: July 18-20, 1979 (Report No. 79-01)

Areas Inspected: Assistance to the State of New Mexico, data gathering concerning the breach, and downstream sampling to determine the extent and concentration of contamination from tailings solution. The special inspection involved twenty-five (25) inspector hours on site by one (1) NRC IE inspector.

Results: United Nuclear Corporation is a State of New Mexico licensee; therefore, the IE inspector assisted the state with program and document review but cited no specific items of noncompliance.

Copy of NRC 250675 Add-S  
(4pp)  
DUPLICATE