

SPECIFICATIONS

FOR

EARTHWORK FOR ADDITIONAL SLIMES TAILING DAM

Mines Development, Inc. - Edgemont, S.D.

*Lee BV*  
POND # 3



Prepared by

O. W. WALVOORD, INC.

Denver, Colorado

13 May 1958

9612240246 580513  
PDR ADOCK 04001341  
C PDR

10585

9

I - GENERAL REQUIREMENTS

- a. Special Note: The general conditions of the contract are a part of this specification, and the Subcontractor shall consult them in detail for instructions pertaining to his work.
- b. The Subcontractor acknowledges that he has visited the site and examined the conditions of the work.
- c. Surveys, Permits, and Regulations: The Contractor shall furnish all surveys unless otherwise specified. Permits and licenses of a temporary nature necessary for the prosecution of the work shall be secured and paid for by the Subcontractor. Permits, licenses, and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Contractor, unless otherwise specified. The Subcontractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Subcontractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the Contractor in writing.
- d. Drawings: The location and details of the dam shall be given on drawings prepared by O. W. Walvoord, Inc., of Denver, Colorado. Deviations from plans should not be made without written permission from the Contractor's Representative.
- e. Lines, Grades, and Stakes: The Subcontractor shall be required to establish the required lines, grades and stakes necessary for construction.
- f. All existing structures, pipes, and foundations which are to be incorporated into the final work shall be adequately protected or replaced by the Subcontractor without cost to the Contractor.

II - PREPARATION OF FOUNDATION

- a. Foundation for Earth Fill: After all necessary stripping and excavation have been completed, the foundation area shall be unwatered and the foundation for the earth fill shall be prepared by scraping and compacting.
- b. Stripping for Embankment "Fill" Material: The entire area from which "Fill" material is to be borrowed within the dam site shall be stripped or excavated to a sufficient depth to remove all materials not suitable, as determined by the Contractor's Representative, for the embankment "Fill". The unsuitable materials to be removed shall include top soil, all rubbish, vegetable matter of every kind, roots, and all other perishable or objectionable materials which might interfere with the proper compacting of the materials in the embankments or be otherwise objectionable. The stripped materials shall be wasted or saved in the areas designated by the Owner's Representative.

CONTRACTOR'S

### III - EMBANKMENT

- a. Embankment Construction, General: The term "embankment" shall include the earth-fill portion of the dam. The embankment shall be constructed to the lines and grades shown on the drawings. No brush, roots, sod, or other perishable or unsuitable materials shall be placed in the embankment. The suitability of each part of the foundation for placing embankment materials thereon, and of all materials for use in the embankment construction, will be determined by the Contractor's Representative.
- b. Earth Fill in Embankment: No earth fill materials shall be placed until the foundation for them has been unwatered and suitably prepared. The distribution and gradation of materials throughout the earth-fill portion of the dam shall be such that the earth embankment will be free from lenses, pockets, streaks, or layers of material differing materially in texture or gradation from the surrounding material. Lumps of frozen material shall be broken down into particles less than six (6) inches in diameter by harrowing and compaction before being placed in the embankment.

The material shall be placed in the earth embankment in continuous, approximately horizontal, layers not more than 6 inches in thickness after compaction. Compaction shall be accomplished by making not less than two passes over any unit area with a caterpillar tread tractor.

### IV - PERMANENT EQUIPMENT & STRUCTURES

All Permanent equipment, piping and other structures indicated on the drawings or specified shall be furnished, installed, and painted by others. The Subcontractor shall endeavor to coordinate his work with that of all other contractors engaged in work on this project and shall advise the Contractor's Representative of any conditions that may delay the scheduled completion of his work.

### V - BASIS OF PAYMENT

Payment for all work (excavating, loading, transporting, spreading, and compacting) shall be based on the measured quantities of earth-fill in place at the quoted unit price per cubic yard.

Cubic yardage shall be determined by a survey of the dam site before construction and a survey of the dam structure after completion.

## SPECIFICATIONS

### Settling Ponds and Tailings Pond

#### I - Scope of Work:

##### Work Included:

Stripping of waste material from the designated areas in the Settling Ponds #4, #5, and #6 and from the Tailings Pond #7.

Excavation and Construction of the Earthen Embankments for Settling Ponds #4, #5, and #6, and for Tailings Pond #7 according to the lines and grades as indicated on the plans.

##### Work Not Included:

All permanent equipment, electrical apparatus, piping, trestles, machinery, or other structures indicated on the drawings shall be furnished, installed and painted by others.

#### II - General Requirements:

- a. The General Conditions of the contract are a part of this specification and the Subcontractor shall consult them in detail for instruction pertaining to his work.
- b. The Subcontractor acknowledges that he has visited the site and has examined the conditions of the work.
- c. Surveys, Permits and Regulations: The Engineer shall furnish all surveys unless otherwise specified. Permits and licenses of a temporary nature necessary for the prosecution of the work shall be secured and paid for by the Subcontractor. Permits, licenses, easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Engineer, unless otherwise specified. The Subcontractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Subcontractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the Engineer in writing.
- d. Drawings: The location and details of the work shall be given on drawings furnished by O. W. Walvoord, Inc. of Denver, Colo. Deviations from plans should not be made without written permission from O. W. Walvoord, Inc.

## Specifications

### General Requirements (Continued)

- e. Lines, Grades and Stakes: The Engineer shall establish the required lines, grades and stakes necessary for construction.
- f. All existing structures, pipes, and foundations which are to be incorporated into the final work shall be adequately protected or replaced by the Subcontractor without cost to the Engineer.

### III - Stripping:

#### a. Stripping of "Waste" Material:

The entire area from which "Fill" material is to be borrowed within the dam sites and the area beneath all embankments shall be stripped or excavated to a depth of 4 inches to remove all materials not suitable. Should the above specified 4-inch prove unsuitable for the Engineer's requirements, then the Engineer may order additional stripping by the Subcontractor. Such additional stripping, if required, shall be paid for on a machine and operator per hour basis at the rental rates furnished by the Subcontractor in his original bid proposal.

Unsuitable materials which shall be stripped shall include top soil, all rubbish, vegetable matter of every kind, roots, and all other perishable or objectionable materials which might interfere with the proper compaction of the materials in the embankments or might be otherwise objectionable.

The waste material from embankment areas or from borrow areas shall be deposited Southeast of a line running between the S.W. and N.E. corner of Pond No. 7, as shown on the plans. Such waste material shall be spread and smoothed evenly, and not within 50' of any natural drainage.

### IV - Preparation of Foundation for Earth Fill

- a. The areas which are to receive the earthen embankments shall be leveled, cleaned of all grass, vegetation, etc. to a depth of 4". After all necessary stripping and excavation has been completed, the foundation area shall be watered and the foundation for earth fill shall be scarified to provide a bond with the first lift of fill.

## Specifications

### V - Embankment:

- a. Embankment Construction, General: The term "embankment" shall include the earth-fill portion of the dams. The embankments shall be constructed to the lines and grades shown on the drawings. No brush, roots, sod, or other perishable or unsuitable materials shall be placed in the embankment. The suitability of each part of the foundations for placing embankment materials thereon, and of all materials for use in the embankment construction, will be determined by the Engineer's Representative.
- b. Earthfill in Embankment: No earth-fill materials shall be placed until the foundation for them has been unwatered and suitably prepared. The distribution and gradation of materials throughout the earth-fill portion of the dams shall be such that the earthen embankment shall be free from lenses, pockets, streaks or layers of material differing materially in texture or gradation from the surrounding material.
  1. The material for constructing the embankments of Settling Ponds #4, #5 and #6 shall be obtained from the basins within the respective areas of each pond. Additional borrow area for embankment of the Settling Ponds, if required, shall be the area within the confines of Tailings Pond #7.
  2. The material for constructing the embankments for Tailings Pond #7 shall be obtained from within the pond area, but NOT within 30 feet of the inside toe of the embankment.
  3. The material shall be placed in the embankments in continuous horizontal layers (except for ramps) and shall be not more than 6" in thickness after compaction.
  4. Compaction shall be accomplished by making not less than six (6) passes over any unit area of each 6" layer with a sheepfoot roller. This sheepfoot roller shall meet the following requirements:
    - a) Roller feet must project 8" clear from drum.
    - b) There must be one (1) roller foot per 100 square inches of roller area.
    - c) Roller must be equipped with cleaning fingers to prevent build-up of material between roller feet.
    - d) Roller should be weighted with water, sand, or both, to produce a minimum weight of 4000 lbs. per lineal foot of drum.

Material being compacted should have a moisture content of from 11 - 15%, by weight, and provisions shall be made to obtain this moisture content. Water will be made available (without charge) to the subcontractor by the owner, Mines Development, Inc.

The Subcontractor's charges for the equipment necessary to obtain the required moisture content and compaction shall be included in the unit prices quoted under Items 2 and 3 of the Proposal.



b. (Earthfill in Embankment) - (Continued)

- 5) Ramps can be constructed within the embankment cross section for convenience in lessening the length of haul. When "filling in" the ramp section, which shall not be steeper than a 6:1 slope, the surfaces shall be thoroughly scarified to knit with the ramp section fill.
- 6) After the embankments have reached their design elevation, they shall be finished off to a smooth and uniform slope as detailed on the drawings.

VI - Excavation for Basins for Settling Ponds #4, #5 and #6

- a. The excavation portion of the basins of Settling Ponds #4, #5, and #6 shall conform to the slopes, size and shape as shown on the drawings.
- b. If, in the opinion of the Engineer, pervious layers of earth strata are encountered in the construction of the basins and remedial action is required, then the Subcontractor shall make available to the Engineer the use of such machines and equipment as is necessary to correct such difficulties.

The use and terms of such equipment as is required shall conform to the terms of the "rental rates" as submitted by the Subcontractor in his original proposal, and according to the terms and conditions of the Engineers "Construction Equipment Rental Agreement" which is included in the "Exhibits" section of these documents.

VII - Coordination of Work:

The installation of fences, pipe, trestles, or machinery by other trades will be in progress in conjunction with the excavation and embankment work, and the excavation Subcontractor shall cooperate and coordinate his work with that of the other trades.

Specifications

VIII - Basis of Payment

- a. Payment for stripping and hauling of waste material to designated waste area shall be on a Lump Sum basis.
- b. Payment for the construction of Settling Basins and Embankments for Settling Ponds #4, #5 and #6 (as a four-sided structure) shall be on a unit price per cubic yard of compacted material in place as determined by a survey of the area before construction and a final survey after completion.
- c. Payment for the construction of the Embankment for Tailings Pond #7 shall be on a unit price per cubic yard of compacted material in place as determined by a survey of the area before construction and a final survey after completion.



JUL 11 1961

SW-#16  
Eugene

Soil Test

WOODWARD CLYDE SHERRARD AND ASSOCIATES

CONSULTING SOIL ENGINEERS AND GEOLOGISTS

1401 WEST 10TH AVENUE  
DENVER 22, COLORADO

July 7, 1961

Subject: Consultation on Compaction for  
a Tailings Dike near Edgemont,  
South Dakota  
Job No. 4776

O. W. Walvoord  
301 Detroit Street  
Denver 6, Colorado

Attn: Mr. C. W. Mathews

Gentlemen:

As requested, we have accomplished classification and compaction tests on a sample furnished to us on the subject job near Edgemont, South Dakota. Our comments on the soils and our compaction recommendations are set forth below and the results of the tests are attached.

As discussed previously, we have accomplished neither foundation investigations nor borrow investigations in connection with the dike, and are therefore not in position to reach conclusions or make recommendations, relative to its design. We can only consider the suitability of the submitted sample of soil for use in such a dike and recommend the appropriate compaction.

The sample submitted is a tan, lean clay (CL), maximum density as determined by <sup>the sand for a copy</sup> ASTM Designation D698-58T is 109 lbs per cubic foot, and the optimum moisture content is 13.8 percent. These soils, when properly compacted, should result in an impervious dike.

We recommend that this material be compacted to a minimum density of 95% of the maximum obtained by the ASTM Designation D698-58T compaction test. Material should be placed in approximately horizontal layers with thickness after compaction not greater than 6 inches. Material should be moistened or aerated as necessary to achieve the optimum moisture content for compaction, as nearly as is practical, as determined by a soils engineer. The moisture content should be uniform throughout the layers. Your specifications should state that the contractor may be required to add the necessary moisture to the fill material in the excavation,

12.8%  
Moisture

1-copy to all hand



if in the opinion of the soil engineer it is not possible to obtain uniform moisture content by adding water on the surface of the fill.

4-8  
pages

Normally, on these materials we would anticipate that 4 to 8 passes of a sheepfoot roller would be sufficient to obtain the recommended density, however, field density determinations on the compacted fill will be necessary to determine the actual number of passes required. The feet on the sheepfoot roller shall extend approx. 8 inches in clear projection from the roller's cylindrical surface, and shall be so spaced as to provide approximately 1 tamper foot per 100 square inches of roller area. The roller shall be provided with cleaner bars so designed and attached as to prevent accumulation of material between the tamper feet. The roller shall be of the type which can have its weight increased by the addition to the drum of water or sand or both. The weight of the roller when fully loaded shall not be less than 4000 lbs per lineal foot of drum.

It is possible that with appropriate moisture control the density recommended above can be obtained with a controlled movement of hauling and spreading equipment. However, this depends not only on the soils involved but also on the equipment used in the earthwork operations. The feasibility of using this type of compactive effort can only be determined by field density determinations early in the job.

For your information we plan to have a field engineer in the Wyoming-South Dakota area sometime in the next two weeks and would therefore be in a position to accomplish field density determinations if you so desire.

If we may be of further service, please do not hesitate to call on us.

Very truly yours,

By S. T. Thompson  
S. T. Thompson

STT:lp

(2 copies sent)

per  
C-7

Help me to remember to investigate the use of the  
room - if we are moving desk



U. S. ATOMIC ENERGY COMMISSION  
IDAHO OPERATIONS OFFICE  
HEALTH AND SAFETY BRANCH  
IDO H & S SAMPLE RECORD SHEET

Serial No. \_\_\_\_\_

ROUTINE \_\_\_\_\_ SPECIAL \_\_\_\_\_

Sample from: Mines Development Inc., Edgemont, S.D. Samples Received: \_\_\_\_\_ Analyzed by: \_\_\_\_\_  
Collected by: \_\_\_\_\_ Analysis Completed: \_\_\_\_\_  
Date submitted: 6/14/62 Method: End Window \_\_\_\_\_; Prop. counter \_\_\_\_\_; Spectrophotometric \_\_\_\_\_; Fluorometric \_\_\_\_\_; Polarographic \_\_\_\_\_.

Sample No.	Date	Hour	Sample Description	Anal. for	Quant. used, ml.	U <sup>235</sup> or K <sup>40</sup> Trans.	Count time, min.	Total Count.	Gross Count, c/m.	Bkgd., c/m.	Net count, c/m.	K <sup>40</sup> corr., c/m.	Foreign activity	
													c/m.	d./m.
A	6/13		Cottonwood creek, immediately below point of sand tails entry	Ra 226									187 ± 2	X 10 <sup>-9</sup> mc/ml
				Th 230										
B	6/13		Cottonwood creek, 150 yds upstream from confluence with Cheyenne river	Ra 226									12.7 ± 0.6	mc/ml
				Th 230										
C	6/13		Sand tails, at point of entry into Cottonwood creek.	Ra 226									982 ± 5	X 10 <sup>-7</sup> mc/g.
				Th 230										

Notified: \_\_\_\_\_ Time: \_\_\_\_\_ Resampling Yes \_\_\_\_\_

recommended: No \_\_\_\_\_

Approved: \_\_\_\_\_

Chief, Analysis Section



Serial No. 26316

ROUTINE \_\_\_\_\_ SPECIAL \_\_\_\_\_

Sample from **Mines Development Inc., Edgemont, S.D.**

Samples Received:

Analyzed by: NWC

U. S. ATOMIC ENERGY COMMISSION  
REGION IV DIVISION OF COMPLIANCE

Analysis Completed: 7-23-62

Date submitted: 6/14/62 P. O. BOX 15266  
DENVER 15, COLORADO

Method: End Window\_\_\_; Prop. counter ☒; Spectrophotometric\_\_\_; Fluorometric\_\_\_; Polarographic\_\_\_

Sample No.	Date	Hour	Sample Description	Anal. for	Quant. used, ml.	$^{235}\text{U}$ or $\text{K}^+$ Trans.	Count time, min.	Total Count.	Gross Count, c/m.	Bkgd., c/m.	Net count, c/m.	$\text{K}^{40}$ corr., c/m.	Foreign activity	
													c/m.	d/m.
6/13			Mud from Cottonwood creek, 150 yds upstream from confluence with Cheyenne river	Ra 226	10 gm	$7.13 \pm 0.13$	30	6427		7/30m	6420/30m			
						$7.20 \pm 0.13$	30	15547		2/30m	15545/30m			$18.3 \pm 0.2 \text{ pc/gm}$
				Th 230	10 gm		30	1535	$51.2 \pm 1.3$	$0.4 \pm 0.1$ 12/30m	$50.8 \pm 1.3$			$5.7 \pm 0.1 \text{ pc/gm}$

Notified: \_\_\_\_\_ Time: \_\_\_\_\_ Resampling Yes \_\_\_\_\_

recommended: No \_\_\_\_\_

Approved:

Chief, Analysis Section



U. S. ATOMIC ENERGY COMMISSION  
IDAHO OPERATIONS OFFICE  
HEALTH AND SAFETY BRANCH  
IDO H & S SAMPLE RECORD SHEET

 Serial No. 26315

 ROUTINE ☐ SPECIAL ☐

 Sample from: Mines Development Inc., Edgemont, S. D.

 Analyzed by: AWC

U. S. ATOMIC ENERGY COMMISSION

 Collected by: REGION IV DIVISION OF COMPLIANCE

 Analysis Completed: 7-23-62

P. O. BOX 15266

 Date submitted: 6/14/62 DENVER 15, COLORADO

 Method: End Window ☐; Prop. counter ☒; Spectrophotometric ☐; Fluorometric ☐; Polarographic ☐

Sample No.	Date	Hour	Sample Description	Anal. for	Quant. used, ml.	U <sup>235</sup> or K <sup>40</sup> Trans.	Count time, min.	Total Count.	Gross Count, c/m.	Bkgd., c/m.	Net count, c/m.	K <sup>40</sup> corr., c/m.	Foreign activity	
													c/m.	d/m.
A	6/13		Cottonwood creek, immediately below point of sand tails entry	Ra 226	1500	7-16								
						1215	30	6821		13/30m	6808			
						7-23								
						1300	30	16278		7/30m	16271		127 ± 2	× 10 <sup>-9</sup> ncp/ml
				Th 230	50									
							30	154	5.1 ± 0.4	0.2 ± 0.1	4.9 ± 0.4			
										7/30m	147/30m		9.8 ± 0.8	× 10 <sup>-8</sup> ncp/ml
B	6/13		Cottonwood creek, 150 yds upstream from confluence with Cheyenne river	Ra 226	1500	7-16								
						1215	30	1038		13/30m	1025/30m			
						7-23								
						1300	30	2410		7/30m	2403/30m		18.7 ± 0.6	× 10 <sup>-9</sup> ncp/ml
				Th 230	50									
							30	34	1.1 ± 0.2	0.4 ± 0.1	0.7 ± 0.2		1.4 ± 0.4	× 10 <sup>-8</sup> ncp/ml
C	6/13		Sand tails, at point of entry into Cottonwood creek	Ra 226	10 gms	7-13								
						1230	30	28620		7/30m	28614/30m			
						7-10								
						1100	30	74463		2/30m	74441/30m		98.2 ± 0.5	pc/gms
				Th 230	10 gms									
							30	14226	474.2 ± 4	0.2 ± 0.1	474 ± 4		53.4 ± 0.5	pc/gms

Notified: \_\_\_\_\_ Time: \_\_\_\_\_ Resampling Yes \_\_\_\_\_

recommended: No \_\_\_\_\_

Approved:

 CWS by AWC  
Chief, Analysis Section

Exhibit B

<u>AEC #</u>	<u>Photo #</u>	<u>Caption!</u>
NRTS-62 3782	1	Sand tail <sup>slurry</sup> being dumped on top of pile. Note the dike on the left of the photo.
NRTS-62 3778	2	Sand tail pile a) Cottonwood creek b.) area where sand tail avalanched into the creek. <del>c) sand tail pile</del>
NRTS-62 3781	3	Eroded area where slurry flowed down the top of avalanche into Cottonwood creek. Note the width & depth of the eroded area.

Jimmy Richardson will be RSO 7/1/62  
F.A. Perry, Production Mng.

7.5 x 10<sup>8</sup> tons of  
sand rule - total

Full branch - Dixon - Nelson - Web

150 tons

120 - 140 ft

Unable to stop -

combination of main and dyke slope

contains 20% of Ra-226 total -

No idea - "went pretty fast"

(3x faster than it flows right now)

goes into Angostura Reservoir

Wants Characterization of the Reservoir in Pulp extraction Process

USPHS Trough - Kalpa - Deepwater

Navigation & recreation

They are studying & changing method of discharge to  
compensate.

Webb rough estimate - 8-9000 gpm

based on observation of Cascade creek.

March, 1958

Chyane -  $10^8 \times 10^3$  -  $29 \times 10^3$   
Feb 1958  
 $90 \times 10^3$

>

early 1000 gpm  
- 40,000 gpm - from evening

At Gull - weatherman - Black Hills Power & Light.

Mon - rain gage at motel 0.7 inch

weather gage at mill: 0.15 inches Tuesday

0.63 inches Monday

no rain - Fri, Sat, Sun - heavy

0.19 inches thru

same up

drainage

0.5 inches Wed

raised ~ .5 to 1 inches / day in week before

C. E. Carl, Director, Engineering Div., S.D. State  
Health Dept

No time or money loss

Valdez -

pass to G. that pre license renewal inspection to  
be conducted at Huron in 6 or 7 ???

Melvin O. Nelson, District Engineer, S.D. state dept of  
Health, Rapid City.



Taken from ~~the~~ modern bore.

Gauge ft.	3.15		7.20			
	20	3.35	27	5.05	3	2.45
16	58	21	3.70	5.70	4	2.35
17	7.05		5.8	6.35		11
18	2.35	22	6.25	6.50	5	2.35
19	3.05	23	7.40	7.15	6	2.10
		24	5.1	30	4.45	7
		25	3.75	31	3.27	8
		26	5.70	1	2.20	9
				2	1.85	

Called - 4 S G S

Water Resource Division SW.

State School of Mines

Rapid City, S.D.

all water soil  $U_3O_8$  — 4 samples

CW - upstream ~100 yds

down " ~100 yds

CW = confluence = Cheyenne

~1 mi upstream - Cheyenne - South

Avalanche -  $175'w \times 6'h \times 100'long = 4.5 \times 10^4$  cubic feet

erosion -  $10'w \times 2.5'h \times 100'long = 2.5 \times 10^3$  cubic feet

145 tons  
↓  
eroded area

180 #  
 $8.5 \times 10^3$   
800  
240  
 $290.0 \times 10^5 = 2.9 \times 10^5$

# Details

4. <sup>10</sup> Report of Incident -

5. <sup>10</sup> Unit to the mill -

6. <sup>10</sup> Tailings Storage Area -

7. <sup>10</sup> Sand Tailings Release -

8. <sup>10</sup> Analysis data -

11)

3.1 <sup>10</sup> put off to PC yesterday

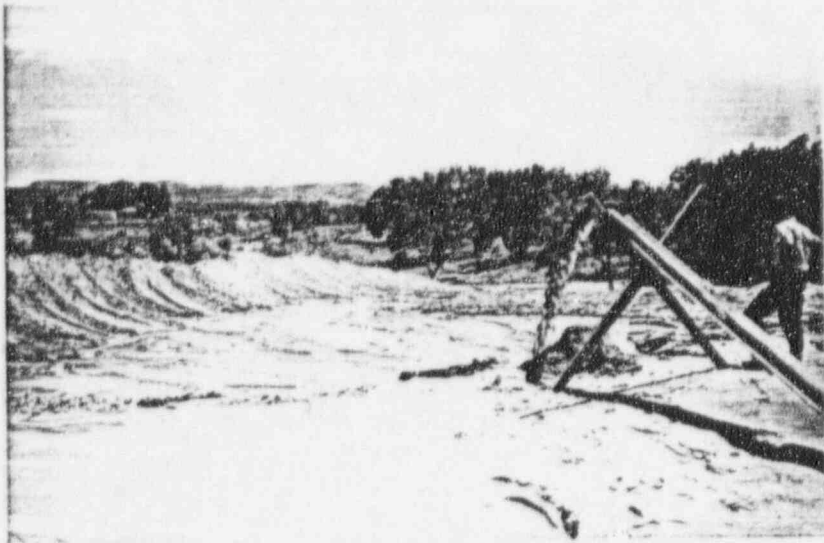
9	434	sec-ft	
10 + 11	268	sec-ft	ft <sup>3</sup> /sec
12	1000	sec-ft	
13	much higher		

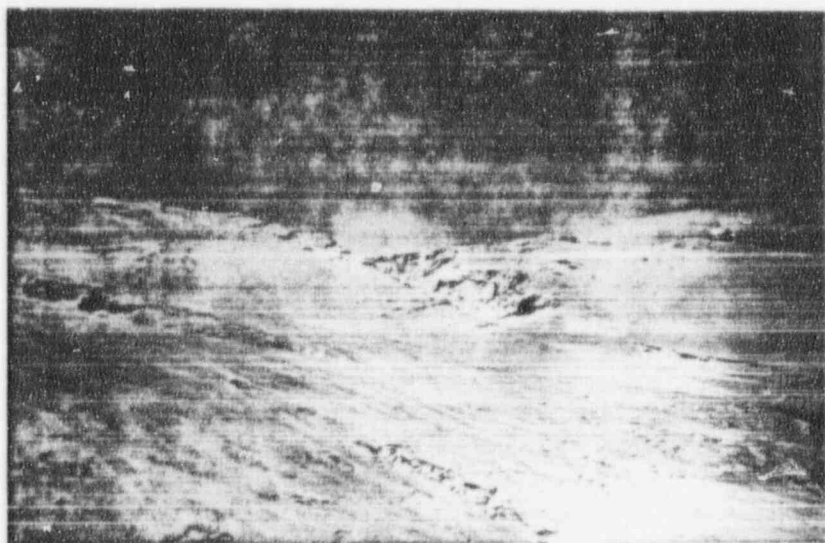
L.B. Yarger, Engineer in Charge













300 tons

2000

60000 #

 $6 \times 10^5 \#$ 

424 g/#

2724

 $2.7 \times 10^3$  grams $2 \times 10^3$  ppm $3.8 \times 10^3$  ml/gal $30.4 \times 10^6$  ml/min $30.4 \times 10^6$  ml/min60  
1800

$$60 \text{ min} \quad \frac{4 \times 10^4 \text{ mc}}{1.8 \times 10^9 \text{ ml/min}} = 2.2 \times 10^{-5}$$

 $2.7 \times 10^3$  grams = 300 tons $1.8 \times 10^9$  mc/gram

$$240 \text{ min} \quad \frac{4 \times 10^4 \text{ mc}}{7.8 \times 10^9 \text{ ml/24 min}} = 1.05 \times 10^{-5}$$

 $1.35 \times 10^4$ 

57

4.05

 $4 \times 10^4$  mc (100 release)

$$360 \text{ min} \quad \frac{4 \times 10^4 \text{ mc}}{10.8 \times 10^9 \text{ ml/360 min}} = 3.7 \times 10^{-7}$$

$$\frac{65}{72400} = 9 \times 10^{-5}$$

$$\frac{10 \times 10^3}{10 \times 10^3} = 1$$

 $4 \times 10^4$  mc (100 release) $1 \times 10^{-8}$  mc/ml = MFC for Ka-226

$$\frac{4 \times 10^4 \text{ mc}}{1 \times 10^{-8} \text{ mc/ml}} = 4 \times 10^{12} \text{ ml dilution needed}$$

$$\frac{4 \times 10^{12} \text{ ml}}{30.4 \times 10^6 \text{ ml/min}} = .013 \times 10^4 = 1.3 \times 10^4 \text{ min}$$

$$= \frac{60}{.02 \times 10^4} \text{ hours}$$

$$2 \times 10^4 = 200 \text{ hours}$$

$$\frac{1513}{24 \times 400} = 15.13$$



samples 6/11/64 - taken with no. 1000. 7000 alt

2 mi south on Cottonwood Creek (upstream from mill).

Ra-226  $0.17 \times 10^{-8}$  uc/ml

Th-230  $0.80 \times 10^{-6}$  uc/ml

1/4 mi south Ra-226  $0.97 \times 10^{-8}$  uc/ml

Th-230  $0.09 \times 10^{-6}$  uc/ml

Cottonwood River 1/2 mi West (upstream from mill)

Ra-226  $0.11 \times 10^{-8}$  uc/ml

Th-230  $0.05 \times 10^{-6}$  uc/ml

1 mi East

Ra-226  $0.12 \times 10^{-8}$  uc/ml

Th-230  $0.61 \times 10^{-6}$  uc/ml.

Land tail liquor

Ra-226  $1.98 \times 10^{-8}$  uc/ml

Th-230  $0.91 \times 10^{-6}$  uc/ml

Umat  $0.233 \times 10^{-5}$  uc/ml

solid:

Ra-226  $15,660 \times 10^{-5}$  uc/gm

Th-230  $5.15 \times 10^{-6}$  uc/gm

%  $U_3O_8$  = 0.004

$(1.82 \times 10^{-7})$

STP

slime Ra-226  $30.8 \times 10^{-8}$  uc/ml

Th-230  $21.1 \times 10^{-6}$  uc/ml

Howard Lyon called in above info. 2/16/65, 7/12/62.  
Samples analyzed by Hyman Research, Inc., Denver, Colo.

Things to cover

### A Cause

1. Could it have been prevented?
2. What actions to prevent recurrence?
3. Quantities & concentrations
4. Rain fall that day (from USGS) -
5. River flow & stream flow that day (USGS)

### B Effect:

1. What was water flow?
2. Who uses water - for what?
3. Is drinking water R before use?
4. What do local people think - do not disturb nature.

### C Details:

1. Quantities released & concentrations
2. Quantity to stream 150
3. Possible or probable dilution factor
4. Visible signs of release - river & not look
5. Why licensee feels it is not reportable - because of little reabsorption
6. All data licensee may have on analysis. (-ml-)

Bill Joyce Ta. 57681

Gen. Bryant Mng. Met. Div.  
Susquehanna Western

Edgemont, S. Dakota

10 CFR 20 maybe reportable.

Sand tailings washed - about noon

200-300 tons into Cottonwood Creek  
normally dry - on to Cheyenne River  
normally dry

Total 0.005 - <sup>wt of</sup> 0.118 / 308  
0.007 avg.

Th or Ra <sup>226</sup> - highly washed these  
shld. be in slimes.

Gilliland - Consultant w/ Dr. Bell  
James A Div. of Ind. Hygiene  
U of Colo

... granted



Lacrosse

Chapman

down on Sand tails

at 300 tons

often used as a - gas stream

Chapman river

centau 205 - 0.11%  $U_3O_8$

ave. .007

Sand arc :

Pond #2  
#3

{ Ra. 226 is Th. 230 - could be given  
determination  
How soon?

Pond # Sand Tails pond

In 1958 & 1959 requested permission from Price to sell sand  
tails - state would not grant permission but AEC granted  
permission to sell