4.0

TABLE 4.1

ESTIMATED INTERIM STABILIZATION EARTHWORK QUANTITIES

Description	Area (acres)	Cut Volume (bank cubic yards)	Fill Volume (bank cubic yards)
Tailings Regrading	100	490,000	490,000
Wind-blown Tailings	50	37,000	37,000
Embankment Grading	--	164,000	24,000
Interim Soil Cover	100	NA	161,000
Borrow Stockpile	--	20,000	NA
Mill Area/Ore Pad	25	70,000	NA
Mill Area Cap	16	NA	26,000
Catch Basins	8	30,000	NA

TABLE 4.2

PERMANENT SEED MIXTURE AND APPLICATION RATES
FOR NORTH CELL, WIND-BLOWN, AND DISTURBED AREAS

Scientific Name	Common Name	Growth (b) Habit	Application Rate (a) Pounds Pure Live Seed/Acre
Agropyron smithii	Western wheatgrass	NS	5.0
Bouteloua gracilis	Blue grama	NB	2.0
Oryzopsis hymenoides	Indian ricegrass	NB	4.0
Sporobolus airoides	Alkali sacaton	NB	0.5
Bouteloua curtipendula	Sideoats grama	NB	2.0
Hilaria jamisii	Galleta	NS	3.0

(a) Seeding rate is for drill seeding. If broadcast seeding is used, the seeding rate will be doubled.

(b) NB = native bunchgrass
NS = native sodgrass

TABLE 4.3

TEMPORARY SEED MIXTURE AND APPLICATION RATES
FOR CENTRAL CELL

Scientific Name	Common Name	Growth (b) Habit	Application Rate (a) Pounds Pure Live Seed/Acre
Agropyron tricophorum	Pubescent wheatgrass	IS	8.0
Agropyron intermadium	Intermediate wheatgrass	IS	4.0
Agropyron elongatum	Tall wheatgrass	IB	8.0
Agropyron desertorum	Crested wheatgrass	IB	2.0
Elymus juncas	Russian wildrye	IB	2.0

(a) Seeding rate is for drill seeding. If broadcast seeding is used, the seeding rate will be doubled.

(b) IS = introduced sodformer
IB = introduced bunchgrass

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COARSE TAILINGS LABORATORY TEST DATA

General Description	Boring Number	Depth (feet)	Specific Gravity	Dry Bulk Density (pcf)	Porosity	Moisture Content (percent) (a)	Radium Content (pCi/g)	Diffusion Coefficient (cm2/sec) (b)	Emanation Coefficient
Tailings	658	15	NT	105	0.40	NT	NT	NT	NT
Sands	658	20	2.83	104	0.41	23.5	160	0.0000053	0.32
	658	30	2.81	98	0.44	23.4	141	0.000019	0.27
	658	40	2.89	92	0.49	31.2	212	0.000002	0.25
	659	10	2.84	95	0.46	6.1	125	0.037	0.18
	659	20	2.83	94	0.47	10.5	227	0.023	0.21
	659	30	2.74	97	0.43	13.1	132	0.016	0.20
	659	32.5	NT	106	0.47	8.1	115	0.042	0.27
	662	20	NT	97	0.49	34.1	NT	NT	NT
	662	25	2.78	96	0.36	25.1	108	0.0000025	0.33
	662	30	2.79	94	0.46	29.6	177	0.0000013	0.28
Supplemental (c)							143.1		
Average			2.81	97.5	0.45	20.47	154	NA	0.26
95 Percent Confidence Interval			2.77 to 2.84	NA	0.43 to 0.47	NA	125.0 to 183	NA	0.25 to 0.27

NT = Not tested

(a) Moisture contents are not indicative of long-term values, which will typically be lower; therefore, the radon computer model default value of 60 percent was used.

(b) Diffusion coefficients are typically low due to the high moisture content values; therefore, calculated values will be used.

(c) Value for radium content from Environmental Report on Uranium Mill Tailings Backfill presented in April 8, 1981 letter from United Nuclear to the New Mexico Environmental Improvement Division.

TABLE 5.2

FINE TAILINGS LABORATORY TEST DATA

General Description	Boring Number	Depth (feet)	Specific Gravity	Dry Bulk Density (pcf)	Porosity	Moisture Content (percent)	Radium Content (pCi/g)	Diffusion Coefficient (cm2/sec)	Emanation Coefficient
Fine-Grained	659	37.5	2.72	78	0.54	29.6	602	0.0056	0.16
Tailings	660	8.0	2.81	74	0.58	44.27	341	0.0000011	0.37
Slimes	660	15.0	2.84	94	0.47	60.0	1099	0.0000016	0.31
	660	27.5	2.75	89	0.48	32.2	285	0.0000016	0.26
	660	37.5	2.84	79	0.56	41.4	526	0.0000027	0.28
	662	40.0	2.72	84	0.51	36.4	574	0.0000062	0.21
	662	42.5	NT	89	0.55	43.8	NT	NT	NT
	658	10.0	2.81	88	0.50	17.4	402	0.0067	0.22
	658	32.5	NT	97	0.55	43.6	NT	NT	NT
Average			2.78	86	0.53	38.7	547	0.00076	0.26
95 Percent Confidence Interval			2.73 to 2.83	NA	0.50 to 0.56	29.7 to 47.7	296 to 798	0.00022 to 0.0053	0.20 to 0.32

NT = Not tested

TABLE 5.3

SOIL COVER THICKNESS DESIGN PARAMETERS USING
RADON COMPUTER CODE

Trial No.	Layer Type	Porosity	Mass Density (gm/cm3)	Radium Activity (pCi/g)	Weight Percent Moisture	Diffusion Coefficient (cm2/sec)	Emanation Coefficient	Thickness (ft)
Final Design	Fine-grained tailings	0.48	1.45	547	6.0 (a)	0.0400 (b)	0.26	16.4
	Coarse-grained tailings	0.47	1.56	154	6.0 (a)	0.0360 (b)	0.26	7.0
	Soil cover	0.33	1.73	0	12.9	0.0036 (b)	NA	1.5

(a) Default value from NRC Regulatory Guide 3.64.

(b) Diffusion coefficient calculated by RADON computer model.

NA = Not applicable.

TABLE 5.4

SUMMARY OF THE FIELD TESTING AND INSPECTION PLAN

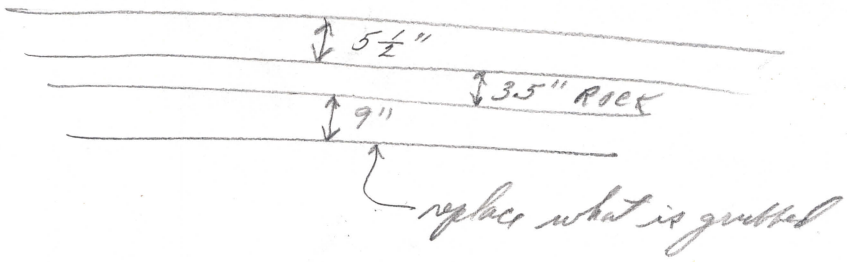
Quality Control Activity	NRC Staff Technical Position Frequency (a)
Full Proctor tests (ASTM D 698)	One test per every 15 field density tests
One-point Proctor tests	One test per every 5 field density tests
Field test for moisture/density	One test for each 500 cubic yards (cy) of cover soil or a minimum of two tests for each day of cover soil in excess of 150 cy
Nuclear density guage correlation (if appropriate)	One sand cone test and one oven-dry test per every 10 nuclear density tests
Gradation and classification testing of cover soil (includes Atterberg limits)	Minimum of one test each day of cover soil in excess of 150 cy and one test per 1,000 cy
Rock durability tests (specific gravity, absorption, soundness, L.A. Abrasion)	One test series at 10,000 cy and 20,000 cy riprap placed, then one test series per 10,000 cy of riprap placed in excess of 30,000 cy

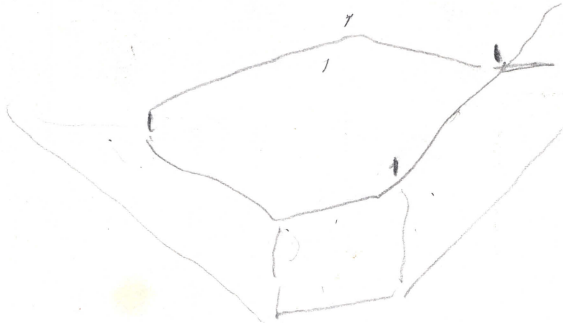
(a) The August 1990 NRC Staff Position Paper is officially titled "Testing and Inspection Plans during Construction of DOE's Remedial Action at Inactive Uranium Mill Tailings Sites."

TABLE 5.5

BRANCH SWALE CHARACTERISTICS

Swale Designation	Length (ft)	Slope (ft/ft)	Bottom Width (ft)	Peak Discharge (cfs)	Depth of Flow (ft)	Minimum Swale Depth (ft)	Riprap D 50 (in)	Riprap Thickness (in)
A	2,600	0.0038	10	40	0.98	2.0	1.5	3.0
B	3,600	0.0083	20	97	0.97	2.0	1.5	3.0
C	3,400	0.0050	10	75	1.38	2.0	1.5	3.0
D	3,200	0.0028	10	68	1.43	2.0	1.5	3.0
E	1,350	0.0037	10	85	1.53	2.5	1.5	3.0
F	1,600	0.0031	10	126	2.00	2.5	1.5	3.0
G	1,400	0.0021	10	99	1.88	2.5	1.5	3.0
H 21.675'	2,550	0.0085	20	284	1.90	2.5	3.0	6.0
I +2.20'	550	0.0040	20	385	2.65	3.5	3.0	6.0
J	1,900	0.0047	10	101	1.66	2.5	1.5	3.0





Note: See Figures 5–1 and 5–2 for swale locations.

TABLE 5.6

RIPRAP MATERIAL GRADATION REQUIREMENTS (a)

Location	D 50 (b) (inches)	Layer Thickness (inches)	Sieve Size:	Percent Passing by Weight									
				20 Inch	15 Inch	12 Inch	10 Inch	6 Inch	5 Inch	4 Inch	3 Inch	1 Inch	No. 4
Upper Section South Cell Drainage Channel	9 15	15 23		100		28-40		8-21		2-14	0-10		
North Cell Drainage Channel	9	15			100		45-58		10-33		0-23		
North Diversion Ditch	6.0	10					100	28-51		13-36		0-9	
Buried Jetty	6.0	96					100	28-51		13-36		0-9	
Branch Swales H and I, Lower Reach of Runoff Control Ditch	3.0	6						100		45-67		0-22	
Soil/Rock Matrix, Branch Swales, Upper Reach of Runoff Control Ditch	1.5	3									100	8-37	0-8

(a) The rock quality will be determined in accordance with Appendix D of the NRC's Staff Technical Position (STP) on "Design of Erosion Protection Covers" dated August 1990.
(b) Rock sizes shown will be oversized, if required, based on their rock quality rating by the methods provided in Appendix D of the NRC's STP.
(c) See Table 5.7 for bedding material requirements.

TABLE 5.7

Revised: July 8, 1992

BEDDING MATERIAL REQUIREMENTS

Location	Bedding Layers	Bedding D 50 (inches)	Thickness (inches)
Upper Section South Cell Drainage Channel	Layer 1	0.02	3
	Layer 2	0.35	3
North Cell Drainage Channel	Layer 1	0.02	3
	Layer 2	0.35	3
North Diversion Ditch	Layer 1	0.02	3
	Layer 2	0.35	3
Buried Jetty	None	NA	NA
Branch Swales H and I and Lower Reach of Runoff Control Ditch	Layer 1	0.02	3
	Layer 2	0.35	3
Soil/Rock Matrix	None	NA	NA
Branch Swales and Upper Reach of Runoff Control Ditch	Layer 1	0.02	3

Sieve Size:	Bedding D 50 (inches)	Bedding Material Gradation					
		3-inch	3/4 inch	No. 4	No. 10	No. 40	No. 200
Bedding Layer 1	0.02	100	85-100	65-100	47-94	23-70	15-30
Bedding Layer 2	0.35	65-100	43-80	22-60	15-38	5-12	0-10

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TABLE 5.8

NORTH DIVERSION DITCH CHARACTERISTICS

Section	Average Sideslopes (H:V)	Base Width (ft)	Channel Slope (ft/ft)	Contributing Drainage Basins	Maximum Flow Rate of PMF (cfs)	Normal Depth of Flow (ft)	Average Flow Velocity (fps)
T	2.5:1	18	0.0054	A_2	1081	4.2	9.0
U	2.1:1	20	0.0071	A_1+A_2	2265	5.7	12.0
V	7.6:1	20	0.0075	A_1+A_2	2265	4.3	9.9
W	3.3:1	22	0.0075	A_1+A_2+B	5850	8.0	16.4
X	1.1:1	12	0.0075	A_1+A_2+B	5850	12.5	18.0

Note: See Figure 5-6 for section locations.

TABLE 5.9

NORTH DIVERSION DITCH
TOTAL HEAD COMPARISONS AT CONFLUENCES
WITH CONTRIBUTING TRIBUTARIES

Cross Section Location	Peak Discharge (cfs)	Channel Slope (ft/ft)	Depth of Flow (ft)	Flow Velocity (fps)	Velocity Head (ft)	Total Head (ft)
K	1081	0.00544	4.22	9.0	1.26	5.48
A1	383	0.044	0.88	11.2	1.95	2.93
L	2265	0.00714	5.69	12.5	2.43	8.12
A2	765	0.020	1.81	10.8	1.82	3.63
M	2265	0.00746	4.34	9.8	1.49	5.83
B	2046	0.019	2.48	13.2	2.17	5.19
N	5850	0.00746	8.02	15.1	3.54	11.56

Note: Figure 5-7 provides the cross section locations.

TABLE 5.10

GEOMORPHOLOGICAL PARAMETERS FOR PIPELINE ARROYO AND NORTH FORK RIO PUERCO

Area	Parameter	Date			
		1952	1978	1983	1985
Upstream of Nickpoint	Sinuosity	1.05	1.06	1.09	1.08
	Width/Depth Ratio	10	40	50	40
	Meander Wavelength (ft)	230	650	500	360
	Meander Amplitude (ft)	50	170	150	110
Downstream of Nickpoint	Sinuosity	1.13	1.03	1.08	1.12
	Width/Depth Ratio	4	2	2	2
	Meander Wavelength (ft)	310	640	500	320
	Meander Amplitude (ft)	95	105	145	145
North Fork Rio Puerco downstream of confluence with Pipeline Arroyo	Sinuosity	1.51	NA	NA	1.37
	Width/Depth Ratio	6	NA	NA	6
	Meander Wavelength (ft)	690	NA	NA	620
	Meander Amplitude (ft)	425	NA	NA	470

NA = not available

TABLE 5.11

DRAINAGE BASIN DESCRIPTIONS

Basin Destination	Area (square miles)	Maximum Relief (feet)	Longest Drainage Path (miles)	Curve Number	PMP (inches)	PMF (cfs)
Pipeline Arroyo (a)	18.20	819	6.18	79	6.2	26300
North and South Diversion Ditches (a)						
A1	0.15	200	0.62	80	8.4	1220
A2	0.12	360	0.62	80	8.4	1080
B	0.57	440	1.23	80	8.4	3950
C	0.17	400	0.73	80	8.4	1370
Runoff Control Area (b)	0.052	88	1.06	80	8.5	270
South Cell (b)	0.20	66	0.59	77	8.5	1260
North Cell (b)						
Main Swale	0.15	55	0.75	77	8.5	840
Typical Branch	0.05	23	0.47	77	8.5	315

(a) See Figure 5-5 for basin locations.

(b) See Figures 5-1 and 5-2 for basin locations.

TABLE 5.12

SUMMARY OF MEANDER PATTERNS

Pipeline Arroyo

Elevation Contour	Channel Distance (ft)	Slope (ft/ft)	Valley Distance (ft)	Sinuosity (ft/ft)	Average Meander Amplitude (ft)	Average Meander Wave Length (ft)
6840						
6880	3800	0.011	3375	1.126	200	1150
6920	5200	0.008	5025	1.035	150	1250
6960	7000	0.006	6500	1.077	100	2275
7000	2000	0.020	1675	1.194	100	2000
7040	7200	0.006	6025	1.195	100	1750
7080	3600	0.011	3225	1.116	200	750

Watershed Area = 20.12 square miles
Maximum Amplitude = 570 feet

Hard Ground Canyon

Elevation Contour	Channel Distance (ft)	Slope (ft/ft)	Valley Distance (ft)	Sinuosity (ft/ft)	Average Meander Amplitude (ft)	Average Meander Wave Length (ft)
6800	0					
6840	5600	0.007	5300	1.057	150	1050
6880	3400	0.012	3300	1.030	150	675
6920	7000	0.006	6800	1.029	200	1800
6960	3300	0.012	2500	1.320	350	1000
7000	7900	0.005	7500	1.053	150	1780
7040	2800	0.014	2600	1.077	100	1400
7080	2300	0.017	2150	1.070	75	2000

Watershed Area = 14.11 square miles
Maximum Amplitude = 350 feet

TABLE 5.13

ESTIMATED FINAL RECLAMATION
EARTHWORK QUANTITIES

Description	Estimated Area (acres)	Estimated Cut Volume (cubic yards)	Estimated Fill Volume (cubic yards)
Pipeline Arroyo and Runoff Control Ditch	27	36,000	103,000
Buried Jetty	--	8,500 (a)	5,050
South Drainage Channel	1	84,000 (a)	NA
Evaporation Pond Closure	10	NA	49,000
Soil Cover	100		109,000
Soil/Rock Matrix (Soil)	110	NA	60,000
Borrow Pit No. 2 Backfill	9		155,000
Soil Stockpile	10	352,600 (b)	

(a) Excess material used in fill sections near arroyo.

(b) Indicates anticipated volume of soil to be borrowed from stockpile.