

PEABODY WESTERN COAL COMPANY

For

Navajo County, Arizona

Kayenta Mine

N9-B (Lower)

Temporary Sedimentation Structure

DESIGN REPORT

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EXHIBIT #1 -N9-B2, N9-B1, and N9-B Proposed Sedimentation Ponds

N9-B SEDIMENTATION POND HYDRAULICS TABLE

	Units	10-Yr. 24-Hr Storm	100-Yr. 6-Hr Storm
Initial Reservoir Volume Condition		Empty	Full to emergency spillway
Inflow			
Peak Flow	cfs	74.61	313.28
Volume	ac-ft	5.73	37.97
Storage			
Peak Stage	msl	N/A	6694.5
Emerg. Spillway Elev.	msl	6692.4	6692.4
Peak Storage	ac-ft	N/A	24.2
Storage Capacity	ac-ft	19.56	19.56
Outflow			
Peak Flow	cfs	N/A	286.7
Spillway Elevation	msl	6692.4	6692.4
Embankment Crest Elev.	msl	6697.4	6697.4
Peak Stage	msl	--	6694.5
Freeboard	ft	--	2.9
Emergency Spillway Channel			
Flow Depth	ft	--	2.1
Critical Velocity	fps	--	6.2
Mannings "n"	--	--	0.048
Width	ft	--	35
Outflow Channel			
Slope	%	--	25
Normal Velocity	fps	--	9.8
Normal Depth	ft	--	0.9
Mannings "n"	--	--	0.065
Riprap D ₅₀	in	--	9

EMERGENCY SPILLWAY AND OUTLET CHANNEL

The emergency spillway and outlet channel for N9-B will be a trapezoidal channel with dimensions listed below. The alignment and dimensions are shown on Exhibit 1.

Minimum Channel Depth	(Spillway)	2.5	ft
	(Outflow)	2.0	ft
Channel Width		35	ft
Channel Length	(Spillway)	45	ft
	(Outflow)	156	ft
Sideslopes (Horizontal to Vertical)		3:1	or flatter
Average Slope	(Spillway)	0	%
Maximum Slope	(Outflow)	25	%
Spillway Elevation		6692.4	ft

A minimum 15-foot long riprap-lined channel will be constructed beyond the toe of the embankment as a transition into the downstream channel.

STORAGE CAPACITY

The impoundment stage-capacity table (see Exhibit 1) is based on the 1983 aerial topographic mapping conducted for Peabody Western Coal Company. Structure N9-B is designed to contain approximately 19.56 acre-feet.

The calculations for the sediment load entering structure N9-B were made utilizing the Revised Universal Soil Loss Equation with the following parameters:

1.	Rainfall Factor, R	40
2.	Soil Erodibility Factor, K	0.12
3.	Slope Factor, LS	5.44
4.	Cover Factor, C	1.0
5.	Erosion Control Factor, P	0.8

The hydrologic analysis gives the storage volume required to contain the 10-year, 24-hour storm, and the remaining storage volume available for storing sediment. Structure N9-B has sufficient storage capacity to contain the 10-year, 24-hour storm and has additional capacity to store excess runoff from the N9-B1 and N9-B2 watersheds. The combined storage capacity was determined for all three structures in series and the results of the analysis are presented in the following table.

Combined Storage for Structures N9-B2, N9-B1 and N9-B

	N9-B2 (Upper)	N9-B1 (Middle)	N9-B (Lower)	COMBINED
Total Storage Capacity (ac-ft)	19.55	19.58	19.56	58.69
10-Year, 24-Hour Storm Inflow(ac-ft)	8.80	15.34	5.73	29.86
Available Sediment Storage Capacity	-	-	-	28.83
Sediment Inflow Rate/Year (ac-ft/yr)	1.37	1.77	0.68	3.82
Sediment Storage Life (yr)	-	-	-	7.5

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The following appendices and drawing are attached and complete this design report.

Appendix A- Hydrology, Hydraulic, and Sedimentation Calculations

Appendix B- SEDCAD4 (Input and Output) 10-Year, 24-Hour Storm Event

Appendix C- SEDCAD4 (Input and Output) 100-Year, 6-Hour Storm Event

Exhibit #1- N9-B2, N9-B1 and N9-B Proposed Sedimentation Ponds

APPENDIX A

Hydrology, Hydraulic, and Sedimentation Calculations

**PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA**

PROJECT: N-9 MINING AREA

STRUCTURE: B

TIME OF CONCENTRATION:

Start Elevation (ft) =	6695	
End Elevation (ft) =	6683	
Elevation Difference, E (ft) =	12	
Watercourse Length (ft) =	352	
Watercourse Length (mi) =	0.067	
$T_c = (11.9L^3/E)^{0.385} =$	0.044	hours

ROUTING PARAMETERS:

Between structure routing parameters were calculated using the SCS Upland method in SEDCAD4. Input and output parameters are shown on the SEDCAD4 printouts in Appendices C.

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Pinyon Juniper	D	83	0.058	4.814
Saltbrush	D	79	0.009	0.711
Disturbed Land	B	86	74.27	6387.22
TOTAL:			74.337	6392.745

Weighted CN = Total CN * Area / Total Area = 86

Note: During Operations the open pit will collect most of the runoff from disturbed areas. The worst case is when the open pit is reclaimed and runoff from a larger area or regraded soil reports directly to the pond.

DRAINAGE BASIN AREA:

74.337 Acres

**PEABODY WESTERN COAL COMPANY
CALCULATED SEDIMENTOLOGY DATA**

STRUCTURE: B

SOIL ERODIBILITY FACTOR:

Soil Type	Erodibility Factor, K	Area	K*Area
3F	0.02	0.067	0.00
Disturbed	0.12	74.27	8.91
TOTAL		74.337	8.91

Weighted K = Total K * Area / Total Area = 0.12

SLOPE FACTOR:

Length (ft)		Slope (%)	m	Slope Angle (deg)	LS Factor
391	50	12.79%	0.60	7.29	4.48
302	65	21.52%	0.60	12.15	7.14
312	60	19.23%	0.60	10.89	6.41
412	45	10.92%	0.60	6.23	3.75

Average LS = 5.45

The LS Factor was calculated by:

$LS = (\text{Slope Length} / 72.6)^m * (10.8 \sin(\text{slope angle}) + 0.03)$ for slopes < 9%

$LS = (\text{Slope Length} / 72.6)^m * (16.8 \sin(\text{slope angle}) - 0.5)$ for slopes > 9%

Where:

Slope < 3% m = 0.3

Slope = 4% m = 0.4

5% > Slope < 10% m = 0.5

Slope > 10% m = 0.6

STRUCTURE: B

Cover and Practice Factors:

Cover Type	Cover (%)	Canopy (%)	Area (acres)	Cover Factor, C	C * Area	Practive Factor, P	P * Area
Pinyon Juniper	40%	25%	0.058	0.22	0.01	1.00	0.058
Sagebrush, Grass	40%	25%	0	0.2	0.00	1.00	0
Saltbrush	40%	25%	0.009	0.2	0.00	1.00	0.009
Disturbed	0%	0%	74.27	1	74.27	0.80	59.416
TOTAL:			74.337		74.28		59.48

$$\text{Weighted C} = \text{Total C * Area} / \text{Total Area} = \underline{\underline{1.00}}$$

$$\text{Weighted P} = \text{Total P * Area} / \text{Total Area} = \underline{\underline{0.80}}$$

RAINFALL FACTOR:

R= 40

**PEABODY WESTERN COAL COMPANY
CALCULATED SEDIMENT YIELD**

STRUCTURE: B

The following spreadsheet calculates the predicted sediment yield for the project area. The gross sediment yield is determined according to the Revised Universal Soil Loss Equation.

<u>PARAMETER DESCRIPTION</u>	<u>VALUE</u>
Annual Rainfall Factor (R)	40.00
Soil Erodibility Factor (K)	0.12
Length Slope Factor (L)	5.45
Cover Factor(C)	1.00
Practice Factor (P)	0.80
Gross Annual Sediment Yield	20.89 tons/acre/year
Sediment Density	94.00 pcf
Gross Annual Sediment Yield	0.0102 acre-feet/acre/year
Sediment Delivery Ratio	90%
Estimated Annual Sediment Yield	0.0092 acre-feet/acre/year
Watershed Area	74.34 acres
Watershed Annual Sediment Yield	0.68 acre-feet/year
Number of Years	1.00 years
Calculated Sediment Volume	0.68 acre-feet

TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION
N9-B POND
November 16, 2004

PROGRAM INPUT DATA	
DESCRIPTION	VALUE
Flow Rate (cfs).....	313.28
Channel Bottom Slope (ft/ft).....	0.005
Manning's Roughness Coefficient (n-value).....	0.048
Channel Left Side Slope (horizontal/vertical).....	3.0
Channel Right Side Slope (horizontal/vertical).....	3.0
Channel Bottom Width (ft).....	35.0

COMPUTATION RESULTS	
DESCRIPTION	VALUE
Critical Depth (ft).....	1.3
Critical Slope (ft/ft).....	0.0321
Flow Velocity (fps).....	6.17
Froude Number.....	1.0
Velocity Head (ft).....	0.59
Energy Head (ft).....	1.9
Cross-Sectional Area of Flow (sq ft).....	50.74
Top Width of Flow (ft).....	42.82

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N9-B POND OUTFLOW CHANNEL

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
35.00	3.0:1	3.0:1	25.0	4.15		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	313.28 cfs	
Depth:	0.85 ft	5.00 ft
Top Width:	40.10 ft	65.00 ft
Velocity:	9.80 fps	
X-Section Area:	31.95 sq ft	
Hydraulic Radius:	0.791	
Froude Number:	1.94	
Manning's n:	0.0650	
Dmin:	5.00 in	
D50:	9.00 in	
Dmax:	12.00 in	

APPENDIX B

SEDCAD4 (Input and Output) 10-Year, 24-Hour Storm Event

Peabody Western Coal
Kayenta Mine
N9-B POND DESIGN
10YR 24HR STORM

Gary Altsisi

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	2.100 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	74.340	74.340	74.61	5.73

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	74.340	0.044	0.000	0.000	86.000	F	74.61	5.733
	Σ	74.340						74.61	5.733

APPENDIX C

SEDCAD4 (Input and Output) 100-Year, 6-Hour Storm Event

Peabody Western Coal
Kayenta Mine
N9-B POND DESIGN
100YR 6HR STORM

Gary Altsisi

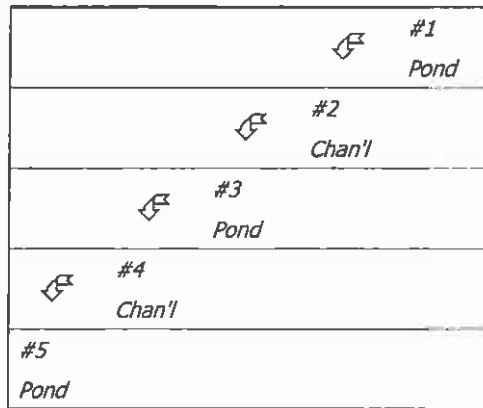
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.400 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	#2	0.000	0.000	N9-B2 POND
Channel	#2	==>	#3	0.000	0.000	N9-B2 SPILLWAY
Pond	#3	==>	#4	0.000	0.000	N9-B1 POND
Channel	#4	==>	#5	0.000	0.000	N9-B1 SPILLWAY
Pond	#5	==>	End	0.000	0.000	N9-B POND



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	147.510	147.510	155.58	11.37
	Out			101.19	11.38
#2		0.000	147.510	101.19	11.37
#3	In	211.720	359.230	323.66	30.77
	Out			286.05	30.77
#4		0.000	359.230	286.05	30.77
#5	In	74.340	433.570	313.28	37.97
	Out			286.65	37.97

Structure Detail:

Structure #1 (Pond)

N9-B2 POND

Pond Inputs:

Initial Pool Elev:	6,776.80
Initial Pool:	19.55 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,776.80	34.20	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	6,778.32
Dewater Time:	0.36 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,760.00	0.475	0.000	0.000	
6,760.50	0.514	0.247	0.000	
6,761.00	0.554	0.514	0.000	
6,761.50	0.596	0.802	0.000	
6,762.00	0.640	1.111	0.000	
6,762.50	0.685	1.442	0.000	
6,763.00	0.731	1.796	0.000	
6,763.50	0.779	2.173	0.000	
6,764.00	0.829	2.575	0.000	
6,764.50	0.880	3.002	0.000	
6,765.00	0.932	3.455	0.000	
6,765.50	0.959	3.928	0.000	
6,766.00	0.985	4.414	0.000	
6,766.50	1.012	4.913	0.000	
6,767.00	1.039	5.426	0.000	
6,767.50	1.067	5.953	0.000	
6,768.00	1.095	6.493	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,768.50	1.124	7.048	0.000	
6,769.00	1.152	7.617	0.000	
6,769.50	1.181	8.200	0.000	
6,770.00	1.211	8.798	0.000	
6,770.50	1.264	9.417	0.000	
6,771.00	1.318	10.062	0.000	
6,771.50	1.374	10.735	0.000	
6,772.00	1.430	11.437	0.000	
6,772.50	1.488	12.166	0.000	
6,773.00	1.547	12.925	0.000	
6,773.50	1.607	13.713	0.000	
6,774.00	1.668	14.532	0.000	
6,774.50	1.731	15.382	0.000	
6,775.00	1.794	16.263	0.000	
6,775.50	1.812	17.164	0.000	
6,776.00	1.829	18.075	0.000	
6,776.50	1.847	18.994	0.000	
6,776.80	1.858	19.549	0.000	Spillway #1
6,777.00	1.890	19.924	6.305	5.15
6,777.50	1.971	20.890	22.053	2.20
6,778.00	2.054	21.896	63.313	0.95
6,778.32	2.110	22.573	101.195	0.40 Peak Stage
6,778.50	2.139	22.944	121.954	
6,779.00	2.226	24.036	193.061	
6,779.50	2.314	25.170	282.223	
6,780.00	2.404	26.350	391.648	

Detailed Discharge Table

Elevation	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,760.00	0.000	0.000
6,760.50	0.000	0.000
6,761.00	0.000	0.000
6,761.50	0.000	0.000
6,762.00	0.000	0.000
6,762.50	0.000	0.000
6,763.00	0.000	0.000
6,763.50	0.000	0.000

Elevation	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,764.00	0.000	0.000
6,764.50	0.000	0.000
6,765.00	0.000	0.000
6,765.50	0.000	0.000
6,766.00	0.000	0.000
6,766.50	0.000	0.000
6,767.00	0.000	0.000
6,767.50	0.000	0.000
6,768.00	0.000	0.000
6,768.50	0.000	0.000
6,769.00	0.000	0.000
6,769.50	0.000	0.000
6,770.00	0.000	0.000
6,770.50	0.000	0.000
6,771.00	0.000	0.000
6,771.50	0.000	0.000
6,772.00	0.000	0.000
6,772.50	0.000	0.000
6,773.00	0.000	0.000
6,773.50	0.000	0.000
6,774.00	0.000	0.000
6,774.50	0.000	0.000
6,775.00	0.000	0.000
6,775.50	0.000	0.000
6,776.00	0.000	0.000
6,776.50	0.000	0.000
6,776.80	0.000	0.000
6,777.00	6.305	6.305
6,777.50	22.053	22.053
6,778.00	0.000	63.313
6,778.50	0.000	121.954
6,779.00	0.000	193.061
6,779.50	0.000	282.223
6,780.00	0.000	391.648

Structure #2 (Riprap Channel)

N9-B2 SPILLWAY

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
20.00	3.0:1	3.0:1	25.0	2.62		

Riprap Channel Results:

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	101.19 cfs	
Depth:	0.57 ft	3.19 ft
Top Width:	23.45 ft	39.17 ft
Velocity:	8.11 fps	
X-Section Area:	12.48 sq ft	
Hydraulic Radius:	0.528	
Froude Number:	1.96	
Manning's n:	0.0600	
Dmin:	3.00 in	
D50:	6.00 in	
Dmax:	9.00 in	

Structure #3 (Pond)

N9-B1 POND

Pond Inputs:

Initial Pool Elev:	6,703.60
Initial Pool:	19.58 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,703.60	45.00	3.00:1	3.00:1	35.00

Pond Results:

Peak Elevation:	6,705.72
Dewater Time:	0.38 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,690.00	1.000	0.000	0.000	
6,690.50	1.032	0.508	0.000	
6,691.00	1.064	1.032	0.000	
6,691.50	1.097	1.572	0.000	
6,692.00	1.130	2.129	0.000	
6,692.50	1.164	2.702	0.000	
6,693.00	1.198	3.293	0.000	
6,693.50	1.233	3.900	0.000	
6,694.00	1.268	4.525	0.000	
6,694.50	1.304	5.168	0.000	
6,695.00	1.340	5.829	0.000	
6,695.50	1.367	6.506	0.000	
6,696.00	1.394	7.196	0.000	
6,696.50	1.421	7.900	0.000	
6,697.00	1.449	8.617	0.000	
6,697.50	1.476	9.348	0.000	
6,698.00	1.504	10.093	0.000	
6,698.50	1.533	10.853	0.000	
6,699.00	1.561	11.626	0.000	
6,699.50	1.590	12.414	0.000	
6,700.00	1.619	13.216	0.000	
6,700.50	1.660	14.036	0.000	
6,701.00	1.701	14.876	0.000	
6,701.50	1.742	15.737	0.000	
6,702.00	1.784	16.618	0.000	
6,702.50	1.826	17.521	0.000	
6,703.00	1.869	18.444	0.000	
6,703.50	1.912	19.390	0.000	
6,703.60	1.921	19.582	0.000	Spillway #1
6,704.00	1.935	20.353	25.197	5.95
6,704.50	1.952	21.324	56.700	1.90
6,705.00	1.969	22.304	136.422	0.75
6,705.50	2.086	23.318	235.292	0.35
6,705.72	2.138	23.780	286.048	0.15 Peak Stage
6,706.00	2.206	24.391	353.166	
6,706.50	2.329	25.524	498.252	
6,707.00	2.456	26.720	669.401	
6,707.50	2.586	27.981	868.331	
6,708.00	2.719	29.307	1,081.005	
6,708.50	2.856	30.701	1,318.253	
6,708.60	2.884	30.988	1,368.679	

Detailed Discharge Table

Elevation	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,690.00	0.000	0.000
6,690.50	0.000	0.000
6,691.00	0.000	0.000
6,691.50	0.000	0.000
6,692.00	0.000	0.000
6,692.50	0.000	0.000
6,693.00	0.000	0.000
6,693.50	0.000	0.000
6,694.00	0.000	0.000
6,694.50	0.000	0.000
6,695.00	0.000	0.000
6,695.50	0.000	0.000
6,696.00	0.000	0.000
6,696.50	0.000	0.000
6,697.00	0.000	0.000
6,697.50	0.000	0.000
6,698.00	0.000	0.000
6,698.50	0.000	0.000
6,699.00	0.000	0.000
6,699.50	0.000	0.000
6,700.00	0.000	0.000
6,700.50	0.000	0.000
6,701.00	0.000	0.000
6,701.50	0.000	0.000
6,702.00	0.000	0.000
6,702.50	0.000	0.000
6,703.00	0.000	0.000
6,703.50	0.000	0.000
6,703.60	0.000	0.000
6,704.00	25.197	25.197
6,704.50	56.700	56.700
6,705.00	136.422	136.422
6,705.50	235.292	235.292
6,706.00	353.166	353.166
6,706.50	498.252	498.252
6,707.00	669.401	669.401
6,707.50	868.331	868.331
6,708.00	0.000	1,081.005

Elevation	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,708.50	0.000	1,318.253
6,708.60	0.000	1,368.679

Structure #4 (Riprap Channel)

N9-B1 SPILLWAY

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
35.00	3.0:1	3.0:1	25.0	4.19		

Riprap Channel Results:

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	286.05 cfs	
Depth:	0.81 ft	5.00 ft
Top Width:	39.88 ft	65.02 ft
Velocity:	9.39 fps	
X-Section Area:	30.46 sq ft	
Hydraulic Radius:	0.759	
Froude Number:	1.89	
Manning's n:	0.0660	
Dmin:	5.00 in	
D50:	9.00 in	
Dmax:	12.00 in	

Structure #5 (Pond)

N9-B POND

Pond Inputs:

Initial Pool Elev:	6,692.40
Initial Pool:	19.56 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,692.40	45.00	3.00:1	3.00:1	35.00

Pond Results:

Peak Elevation:	6,694.53
Dewater Time:	0.40 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,680.00	1.000	0.000	0.000	
6,680.50	1.059	0.515	0.000	
6,681.00	1.120	1.060	0.000	
6,681.50	1.183	1.635	0.000	
6,682.00	1.247	2.243	0.000	
6,682.50	1.313	2.883	0.000	
6,683.00	1.381	3.557	0.000	
6,683.50	1.451	4.265	0.000	
6,684.00	1.522	5.008	0.000	
6,684.50	1.595	5.787	0.000	
6,685.00	1.669	6.603	0.000	
6,685.50	1.667	7.437	0.000	
6,686.00	1.664	8.270	0.000	
6,686.50	1.661	9.101	0.000	
6,687.00	1.659	9.931	0.000	
6,687.50	1.656	10.760	0.000	
6,688.00	1.653	11.587	0.000	
6,688.50	1.650	12.413	0.000	
6,689.00	1.648	13.237	0.000	
6,689.50	1.645	14.060	0.000	
6,690.00	1.642	14.882	0.000	
6,690.50	1.765	15.734	0.000	
6,691.00	1.892	16.648	0.000	
6,691.50	2.024	17.626	0.000	
6,692.00	2.160	18.672	0.000	
6,692.40	2.272	19.558	0.000	Spillway #1
6,692.50	2.265	19.785	7.649	5.20
6,693.00	2.232	20.909	45.856	1.75
6,693.50	2.199	22.017	84.064	1.50

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,694.00	2.167	23.108	174.574	0.60
6,694.50	2.135	24.184	279.950	0.40
6,694.53	2.133	24.239	286.654	0.05 Peak Stage
6,695.00	2.103	25.243	407.605	
6,695.50	2.263	26.334	563.656	
6,696.00	2.429	27.507	745.489	
6,696.50	2.600	28.764	952.365	
6,697.00	2.778	30.108	1,172.390	
6,697.40	2.924	31.248	1,368.679	

Detailed Discharge Table

Elevation	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,680.00	0.000	0.000
6,680.50	0.000	0.000
6,681.00	0.000	0.000
6,681.50	0.000	0.000
6,682.00	0.000	0.000
6,682.50	0.000	0.000
6,683.00	0.000	0.000
6,683.50	0.000	0.000
6,684.00	0.000	0.000
6,684.50	0.000	0.000
6,685.00	0.000	0.000
6,685.50	0.000	0.000
6,686.00	0.000	0.000
6,686.50	0.000	0.000
6,687.00	0.000	0.000
6,687.50	0.000	0.000
6,688.00	0.000	0.000
6,688.50	0.000	0.000
6,689.00	0.000	0.000
6,689.50	0.000	0.000
6,690.00	0.000	0.000
6,690.50	0.000	0.000
6,691.00	0.000	0.000
6,691.50	0.000	0.000
6,692.00	0.000	0.000

Elevation	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,692.40	0.000	0.000
6,692.50	7.649	7.649
6,693.00	45.856	45.856
6,693.50	84.064	84.064
6,694.00	174.574	174.574
6,694.50	279.950	279.950
6,695.00	407.605	407.605
6,695.50	563.656	563.656
6,696.00	745.489	745.489
6,696.50	952.365	952.365
6,697.00	1,172.390	1,172.390
6,697.40	1,368.679	1,368.679

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	147.510	0.289	0.000	0.000	82.000	F	155.58	11.374
	Σ	147.510						155.58	11.374
#2	Σ	147.510						101.19	11.374
#3	1	211.720	0.438	0.000	0.000	85.000	F	228.17	19.396
	Σ	359.230						323.66	30.770
#4	Σ	359.230						286.05	30.770
#5	1	74.340	0.044	0.000	0.000	86.000	F	135.99	7.200
	Σ	433.570						313.28	37.970

Peabody Western Coal
Kayenta Mine
N9-B POND TEMPORARY DIVERSION
DESIGN
100YR 6HR STORM

Gary Altsisi

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.400 Inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	23.590	23.590	24.44	2.28

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	23.590	0.453	0.453	0.272	86.000	F	26.50	2.285
		Σ 23.590						24.44	2.285

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.09	135.00	3,300.00	2.020	0.453
#1	1	Time of Concentration:					0.453

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.09	135.00	3,300.00	2.020	0.453
#1	1	Muskingum K:					0.453

N9-B POND TEMPORARY DIVERSION

Material: Shales and hardpans

Triangular Channel

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.0:1	3.0:1	1.5	0.0250	1.00			6.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	24.44 cfs	
Depth:	1.26 ft	2.26 ft
Top Width:	7.53 ft	13.53 ft
Velocity:	5.17 fps	
X-Section Area:	4.73 sq ft	
Hydraulic Radius:	0.596	
Froude Number:	1.15	