

DEC 23 2004



PEABODY WESTERN COAL COMPANY

For

Navajo County, Arizona

Kayenta Mine

N9-D

Temporary Sedimentation Structure

DESIGN REPORT

TABLE OF CONTENTS

| | |
|---|---|
| INTRODUCTION | 1 |
| INSPECTION | 1 |
| SITE DESCRIPTION | 2 |
| LAND USE | 2 |
| DESIGN ANALYSES | 2 |
| GENERAL | 2 |
| STABILITY | 2 |
| HYDROLOGY | 3 |
| HYDRAULICS | 4 |
| EMERGENCY SPILLWAY AND OUTLET CHANNEL | 6 |
| STORAGE CAPACITY | 6 |

| | |
|------------|--|
| 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) 25-Year, 6-Hour Storm Event |
| EXHIBIT #1 | -N9-D Proposed Sedimentation Pond |

The construction site of the proposed Structure N9-D was inspected in October, 2004 by a Registered Professional Engineer from Woodson Engineering, to assure that the site is suitable and no adverse conditions exist to prevent the successful construction of this structure. A detailed geotechnical investigation was not performed; rather, the information in Chapter 6, Attachment D was utilized for embankment design and will be utilized during construction to construct a stable embankment.

INSPECTION

1. This design report contains information specific to Structure N9-D. Mine-wide design, construction, and reclamation information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona, for Peabody Western Coal Company", December, 1985 (PAP), Chapter 6, Attachment D, Volume 2, along with the methods and results of analyses used for slope stability, hydrology, and hydraulics, and in Chapter 6, Pages 11 to 42, "Sediment and Water Control Facility Plan".

Sedimentation Structure N9-D will be an earthen embankment, designed and constructed by Peabody Western Coal Company (PWCC) as a temporary sedimentation structure to control runoff and sediment from portions of the N9 disturbed surface mining area at the Kayenta Mine. The location of Structure N9-D and its watershed boundary are shown on Drawing No. 85400, (Sheet K-7), and Drawing No. 85405. The site-specific general construction plans are shown on the attached Exhibit

INTRODUCTION

SITE DESCRIPTION

LAND USE

The N9-D Structure has a watershed of 109.64 acres and is located on a tributary upstream of Yellow Water Canyon Wash at the Kayenta Mine. The 109.64-acre watershed, which contributes directly to structure N9-D, is classified as 61% undisturbed and 39% spoil.

DESIGN ANALYSES

GENERAL

Structure N9-D was designed under the supervision of a Registered Professional Engineer from Peabody Western Coal Company. The design was performed in accordance with applicable 30 CFR 780 and 816 regulations of the United States Department of Interior, Office of Surface Mining (OSM) and included a review of available project files. The most current information contained in the Peabody Western Coal Company files includes topographic maps developed from aerial photography flown in 1983 for Peabody Western Coal Company and was used in the analyses of the structure

STABILITY

Structure N9-D is assumed to be a Category A-3 embankment. The structure will be a homogeneous earthen embankment, compacted in lifts to design specifications, and approximately 15 feet wide on top. A minimum upstream slope of 2H:1V and minimum downstream slope of 4H:1V were assumed. Based on the total embankment height of approximately 19.5 feet, these slopes are equal to or flatter than the recommended "worst case" embankment/foundation condition slopes in Table 3-6, Attachment D, Chapter 6; therefore, the embankment will be stable. The emergency spillway will be a minimum 20-foot wide, riprap-lined, trapezoidal channel.

Appendices A, B, and C).

The SEDCAD4 and HYDROCALC computer programs were used to evaluate inflow to the sedimentation structure, outflow from the structure and the resulting water surface elevations. The initial conditions and results of the analysis are summarized in the following table (supporting calculations are presented in

HYDRAULICS

Values reported represent the watershed, which drains directly to Pond N9-D.

| | | |
|----|---|------------------|
| 6. | Drainage Area | 109.64 acres |
| 5. | Rainfall Depth, 10-year, 24-hour storm 25-year, 6-hour storm | 2.1 in 1.9 in |
| 4. | NRCS Curve Number | 84 |
| 3. | Time of Concentration, T _c | 0.283 hr |
| 2. | Elevation Difference, H | 210 ft |
| 1. | Water Course length, L | 0.873 mi |

The following parameters were used in the hydrologic analysis:

storage volume, without discharging into the Yellow Water Canyon Wash. The storage capacity of structure N9-D was analyzed using the 10-year, 24-hour storm event. The pond was conservatively assumed to be full to the emergency spillway at the time of 25-year storm event. 20 acre-feet; therefore, the spillway was analyzed using the 25-year, 6-hour storm event. The structure natural stream elevation to the emergency spillway invert elevation. The structure has capacity less than 20 acre-feet and be less than 20 vertical feet in height from the upstream toe of the embankment of the area is sparsely populated with no one living in the downstream floodplain. The structure will impound less C). Structure N9-D is classified as a low hazard structure (see Drawing No. 85408). In addition, the mine The hydrologic analysis was completed using the computer program SEDCAD4 (see Appendices A, B, and

HYDROLOGY

N9-D SEDIMENTATION POND HYDRAULICS TABLE

| | Units | 10-Yr, 24-Hr Storm | 25-Yr, 6-Hr Storm |
|------------------------------------|-------|--------------------|----------------------------|
| Initial Reservoir Volume Condition | | Empty | Full to emergency spillway |
| Inflow | | | |
| Peak Flow | cfs | 72.28 | 84.57 |
| Volume | ac-ft | 7.45 | 6.16 |
| Storage | | | |
| Peak Stage | msl | N/A | 6662.8 |
| Emerg. Spillway Elev. | msl | 6662.0 | 6662.0 |
| Peak Storage | ac-ft | N/A | 18.94 |
| Storage Capacity | ac-ft | 17.35 | 17.35 |
| Outflow | | | |
| Peak Flow | cfs | N/A | 47.42 |
| Spillway Elevation | msl | 6662.0 | 6662.0 |
| Embankment Crest Elev. | msl | 6664.9 | 6664.9 |
| Peak Stage | msl | -- | 6662.8 |
| Freeboard | ft | -- | 2.1 |
| Emergency Spillway Channel | | | |
| Flow Depth | ft | -- | 0.8 |
| Critical Velocity | fps | -- | 4.8 |
| Mannings "n" | -- | -- | 0.048 |
| Width | ft | -- | 20 |
| Outflow Channel | | | |
| Slope | % | -- | 25 |
| Normal Velocity | fps | -- | 7.4 |
| Normal Depth | ft | -- | 0.5 |
| Mannings "n" | -- | -- | 0.063 |
| Riprap D ₅₀ | in | -- | 6 |

| | | |
|----|----------------------------|------|
| 1. | Rainfall Factor, R | 40 |
| 2. | Soil Erodibility Factor, K | 0.13 |
| 3. | Slope Factor, LS | 7.93 |
| 4. | Cover Factor, C | 0.77 |
| 5. | Erosion Control Factor, P | 0.86 |

Universal Soil Loss Equation with the following parameters:

The calculations for the sediment load entering structure N9-D were made utilizing the Revised

approximately 17.35 acre-foot.

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

STORAGE CAPACITY

as a transition into the downstream channel.

A minimum 15-foot long riprap-lined channel will be constructed beyond the toe of the embankment

| | | | |
|-------------------------------------|------------|--------|------------|
| Minimum Channel Depth | (Spillway) | 2.0 | ft |
| Channel Width | | 20 | ft |
| Channel Length | (Spillway) | 33 | ft |
| Sideslopes (Horizontal to Vertical) | | 3:1 | or flatter |
| Average Slope | (Spillway) | 0 | % |
| Maximum Slope | (Outflow) | 25 | % |
| Spillway Elevation | | 6662.0 | ft |

listed below. The alignment and dimensions are shown on Exhibit 1.

The emergency spillway and outlet channel for N9-D will be a trapezoidal channel with dimensions

EMERGENCY SPILLWAY AND OUTLET CHANNEL

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) 25-Year, 6-Hour Storm Event

Exhibit #1- N9-D Proposed Sedimentation Pond

* * *

| | |
|---|-------|
| N9-D | |
| Total Storage Capacity (ac-ft) | 17.35 |
| 10-Year, 24-Hour Storm Inflow (ac-ft) | 7.45 |
| Available Sediment Storage Capacity (ac-ft) | 9.90 |
| Sediment Inflow Rate/Year (ac-ft/yr) | 1.31 |
| Sediment Storage Life (yr) | 7.6 |

Storage for Structure N9-D

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-D has sufficient storage capacity to contain the 10-year, 24-hour storm event. The storage capacity was determined for N9-D Structure and the results of the analysis are presented in the following table.

Hydrology, Hydraulic, and Sedimentation Calculations

APPENDIX A

**PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA**

PROJECT: N-9 MINING AREA

STRUCTURE: D

TIME OF CONCENTRATION:

Start Elevation (ft) = 6855
 End Elevation (ft) = 6645
 Elevation Difference, E (ft) = 210
 Watercourse Length (ft) = 4611
 Watercourse Length (mi) = 0.873
 $T_c = (1.49L^{0.76}/E)^{0.385} = 0.283$ 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 | B | 65 | 3.791 | 246.415 |
| Pinyon Juniper | D | 83 | 26.403 | 2191.449 |
| Saltbrush | B | 60 | 0.5 | 30 |
| Saltbrush | D | 79 | 1.419 | 112.101 |
| Distributed Land | B | 86 | 77.53 | 6667.58 |
| TOTAL: | | | | 9247.545 |

Weighted CN = Total CN * Area / Total Area =

84

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:

109.643 Acres

PEABODY WESTERN COAL COMPANY
CALCULATED SEDIMENTOLOGY DATA

STRUCTURE: D

SOIL ERODIBILITY FACTOR:

| Soil Type | Erodibility Factor, K | Area | K*Area |
|-----------|-----------------------|---------|--------|
| 11AB | 0.49 | 1.298 | 0.64 |
| 12AB | 0.43 | 2.993 | 1.29 |
| 1AB | 0.16 | 3.152 | 0.50 |
| 3CD | 0.16 | 1.782 | 0.29 |
| 3DE | 0.15 | 12.94 | 1.94 |
| 3F | 0.02 | 9.948 | 0.20 |
| Disturbed | 0.12 | 77.53 | 9.30 |
| TOTAL | | 109.643 | 14.16 |

Weighted K = Total K * Area / Total Area =

0.13

SLOPE FACTOR:

| Length (ft) | Slope (%) | m | Slope Angle (deg) | LS Factor |
|-------------|-----------|------|-------------------|-----------|
| 648 | 13.89% | 0.60 | 7.91 | 6.74 |
| 90 | 13.89% | 0.60 | 7.91 | 6.74 |
| 693 | 17.17% | 0.60 | 9.74 | 9.07 |
| 119 | 17.17% | 0.60 | 9.74 | 9.07 |
| 864 | 13.66% | 0.60 | 7.78 | 7.84 |
| 118 | 13.66% | 0.60 | 7.78 | 7.84 |
| 937 | 13.45% | 0.60 | 7.66 | 8.07 |
| 126 | 13.45% | 0.60 | 7.66 | 8.07 |

Average LS = 7.93

The LS Factor was calculated by:

LS=(Slope Length/72.6)^m*(10.8sin(slope angle)+.03) for slopes < 9%
 LS=(Slope Length/72.6)^m*(16.8sin(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: D

Cover and Practice Factors:

| Cover Type | Cover (%) | Canopy (%) | Area (acres) | Cover Factor, C | C * Area | Practice Factor, P | P * Area | |
|------------------|-----------|------------|--------------|-----------------|----------|--------------------|----------|----------------|
| Pinyon Juniper | 40% | 25% | 30.194 | 0.22 | 6.64 | 1.00 | 30.194 | |
| Sagebrush, Grass | 40% | 25% | 0 | 0.2 | 0.00 | 1.00 | 0 | |
| Saltbrush | 40% | 25% | 1.919 | 0.2 | 0.38 | 1.00 | 1.919 | |
| Disturbed | 0% | 0% | 77.53 | 1 | 77.53 | 0.80 | 62.024 | |
| TOTAL: | | | | | | | | 94.14 |
| | | | | | | | | 109.643 |
| | | | | | | | | 84.56 |

Weighted C = Total C * Area / Total Area = 0.77
 Weighted P = Total P * Area / Total Area = 0.86

RAINFALL FACTOR:
 R = 40

**PEABODY WESTERN COAL COMPANY
CALCULATED SEDIMENT YIELD**

STRUCTURE: D

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.

| PARAMETER DESCRIPTION | VALUE |
|---------------------------------|----------------------------|
| Annual Rainfall Factor (R) | 40.00 |
| Soil Erodibility Factor (K) | 0.13 |
| Length Slope Factor (L) | 7.93 |
| Cover Factor(C) | 0.77 |
| Practice Factor (P) | 0.86 |
| Gross Annual Sediment Yield | 27.11 tons/acre/year |
| Sediment Density | 94.00 pcf |
| Gross Annual Sediment Yield | 0.0132 acre-feet/acre/year |
| Sediment Delivery Ratio | 90% |
| Estimated Annual Sediment Yield | 0.0119 acre-feet/acre/year |
| Watershed Area | 109.64 acres |
| Watershed Annual Sediment Yield | 1.31 acre-feet/year |
| Number of Years | 1.00 years |
| Calculated Sediment Volume | 1.31 acre-feet |

TRAPEZOIDAL CHANNEL ANALYSIS
 CRITICAL DEPTH COMPUTATION
 N9-D POND
 November 8, 2004

| DESCRIPTION | VALUE |
|---|-------|
| Flow Rate (cfs)..... | 84.57 |
| 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)..... | 20.0 |

| DESCRIPTION | VALUE |
|---|--------|
| Critical Depth (ft)..... | 0.79 |
| Critical Slope (ft/ft)..... | 0.0381 |
| Flow Velocity (fps)..... | 4.79 |
| Froude Number..... | 1.0 |
| Velocity Head (ft)..... | 0.36 |
| Energy Head (ft)..... | 1.15 |
| Cross-Sectional Area of Flow (sq ft)..... | 17.65 |
| Top Width of Flow (ft)..... | 24.73 |

HYDROCALC Hydraulics for Windows, Version 1.2 Copyright (c) 1996
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N9-D POND OUTFLOW CHANNEL

Material: Riprap

Trapezoidal Channel

| Freeboard Mult. x (VxD) | Freeboard % of Depth | Depth (ft) | Slope (%) | | | Bottom Width (ft) |
|-------------------------------|-------------------------|------------|--------------------|-------------------|-------|----------------------|
| | | | Right Sideslope | Left Sideslope | 3.0:1 | |
| | | 1.00 | 25.0 | 3.0:1 | 3.0:1 | 20.00 |

PADER Method - Steep Slope Design

| | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|-----------|-------------------|---------|--------|----------|------------|----------|-----------|----------|-----------------|-------------|-------------------|-------|----------------|------|--------------|--------|-------|---------|------|---------|-------|---------|
| w/o Freeboard | 84.57 cfs | Design Discharge: | 1.53 ft | Depth: | 23.19 ft | Top Width: | 29.19 ft | Velocity: | 7.36 fps | X-Section Area: | 11.48 sq ft | Hydraulic Radius: | 0.491 | Froude Number: | 1.84 | Manning's n: | 0.0630 | Dmin: | 3.00 in | D50: | 6.00 in | Dmax: | 9.00 in |
|---------------|-----------|-------------------|---------|--------|----------|------------|----------|-----------|----------|-----------------|-------------|-------------------|-------|----------------|------|--------------|--------|-------|---------|------|---------|-------|---------|

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

APPENDIX B

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

Gary Altsis!

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) |
|----------------------------------|------------------------------|----------------------|-----------------------------|
| 109.640 | 109.640 | 72.28 | 7.45 |

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 | 109.640 | 0.283 | 0.000 | 0.000 | 84.000 | F | 72.28 | 7.451 |
| | | Σ | 109.640 | | | | | 72.28 | 7.451 |

SEDGAD4 (Input and Output) 25-Year, 6-Hour Storm Event

APPENDIX C

Peabody Western Coal
Kayenta Mine
N9-D POND DESIGN
25-YR 6-HR STORM

Gary Altstis!

General Information

Storm Information:

| | |
|-----------------|--------------|
| Storm Type: | NRCS Type II |
| Design Storm: | 25 yr - 6 hr |
| Rainfall Depth: | 1.900 inches |

Structure Networking:

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|------|--------|--------------|--------|---------------|---------|-------------|
| Pond | #1 | >= | End | 0.000 | 0.000 | |

#1
Pond

Structure Summary:

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|-------|---|---------------------------------------|----------------------------|--------------------------------------|
| #1 In | 109.640 | 109.640 | 84.57 | 6.16 |
| Out | | | 47.42 | 6.16 |

Structure Detail:

Structure #1 (Pond)

Pond Inputs:

| | |
|--------------------|-------------|
| Initial Pool Elev: | 6,662.00 |
| Initial Pool: | 17.35 ac-ft |

Emergency Spillway

| | | | | | | | | | |
|---------------|----------|-------------------|-------|------------|--------|-------------|---------|-------------------|-------|
| Spillway Elev | 6,662.00 | Crest Length (ft) | 33.00 | Left Slope | 3:00:1 | Right Slope | 30:00:1 | Bottom Width (ft) | 20.00 |
|---------------|----------|-------------------|-------|------------|--------|-------------|---------|-------------------|-------|

Pond Results:

| | |
|-----------------|-----------|
| Peak Elevation: | 6,662.80 |
| Dewater Time: | 0.24 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) |
|-----------|-----------|------------------|-----------------|--------------------|
| 6,645.00 | 0.265 | 0.000 | 0.000 | 0.000 |
| 6,645.50 | 0.307 | 0.143 | 0.000 | 0.000 |
| 6,646.00 | 0.353 | 0.308 | 0.000 | 0.000 |
| 6,646.50 | 0.401 | 0.496 | 0.000 | 0.000 |
| 6,647.00 | 0.453 | 0.710 | 0.000 | 0.000 |
| 6,647.50 | 0.508 | 0.950 | 0.000 | 0.000 |
| 6,648.00 | 0.566 | 1.218 | 0.000 | 0.000 |
| 6,648.50 | 0.628 | 1.517 | 0.000 | 0.000 |
| 6,649.00 | 0.692 | 1.847 | 0.000 | 0.000 |
| 6,649.50 | 0.760 | 2.209 | 0.000 | 0.000 |
| 6,650.00 | 0.830 | 2.607 | 0.000 | 0.000 |
| 6,650.50 | 0.833 | 3.022 | 0.000 | 0.000 |
| 6,651.00 | 0.836 | 3.440 | 0.000 | 0.000 |
| 6,651.50 | 0.840 | 3.859 | 0.000 | 0.000 |
| 6,652.00 | 0.843 | 4.280 | 0.000 | 0.000 |
| 6,652.50 | 0.846 | 4.702 | 0.000 | 0.000 |
| 6,653.00 | 0.849 | 5.126 | 0.000 | 0.000 |
| 6,653.50 | 0.852 | 5.551 | 0.000 | 0.000 |

| Combined | Total | Elevation | Emergency | Spillway (cfs) | Discharge | (cfs) |
|----------|---------|-----------|-----------|----------------|-----------|-------|
| 6,650.00 | 0.000 | 6,650.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,650.50 | 0.000 | 6,650.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,651.00 | 0.000 | 6,651.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,651.50 | 0.000 | 6,651.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,652.00 | 0.000 | 6,652.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,652.50 | 0.000 | 6,652.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,653.00 | 0.000 | 6,653.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,653.50 | 0.000 | 6,653.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,654.00 | 0.000 | 6,654.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,654.50 | 0.000 | 6,654.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,655.00 | 0.000 | 6,655.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,655.50 | 0.000 | 6,655.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,656.00 | 0.000 | 6,656.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,656.50 | 0.000 | 6,656.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,657.00 | 0.000 | 6,657.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,657.50 | 0.000 | 6,657.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,658.00 | 0.000 | 6,658.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,658.50 | 0.000 | 6,658.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,659.00 | 0.000 | 6,659.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,659.50 | 0.000 | 6,659.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,660.00 | 0.000 | 6,660.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,660.50 | 0.000 | 6,660.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,661.00 | 0.000 | 6,661.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,661.50 | 0.000 | 6,661.50 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,662.00 | 0.000 | 6,662.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6,662.50 | 29,468 | 6,662.50 | 29,468 | 0.000 | 0.000 | 0.000 |
| 6,663.00 | 58,936 | 6,663.00 | 58,936 | 0.000 | 0.000 | 0.000 |
| 6,663.50 | 151,045 | 6,663.50 | 151,045 | 0.000 | 0.000 | 0.000 |
| 6,664.00 | 278,261 | 6,664.00 | 278,261 | 0.000 | 0.000 | 0.000 |
| 6,664.50 | 457,372 | 6,664.50 | 457,372 | 0.000 | 0.000 | 0.000 |
| 6,665.00 | 705,403 | 6,665.00 | 705,403 | 0.000 | 0.000 | 0.000 |

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 | 109.640 | 0.283 | 0.000 | 0.000 | 84.000 | F | 84.57 | 6.158 |
| | Σ | 109.640 | | | | | | 84.57 | 6.158 |

Peabody Western Coal

Kayenta Mine

N9-D POND TEMPORARY DIVERSION

DESIGN

100-YR 6-HR STORM

Gary Altsis!

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) |
|---|---------------------------------------|----------------------------|--------------------------------------|
| 17.350 | 17.350 | 26.19 | 1.50 |
| # 1 | | | |

Subwatershed Hydrology Detail:

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|--------|-------|---------------|--------------------|--------|--------|--------------|-----|----------------------|-----------------------|
| #1 | 1 | 17.350 | 0.000 | 0.188 | 0.311 | 84.000 | F | 29.24 | 1.502 |
| | | Σ | | | | | | 26.19 | 1.502 |

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 | 7.89 | 150.00 | 1,900.00 | 2.800 | 0.188 |
| #1 | 1 | Muskingum K: | | | | | 0.188 |

N9-D POND TEMPORARY DIVERSION

Material: Shales and hardpans

Triangular Channel

| Left Side Slope Ratio | Right Side Slope 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: | 26.19 cfs |
| Depth: | 1.29 ft |
| Top Width: | 7.73 ft |
| Velocity: | 5.26 fps |
| X-Section Area: | 4.98 sq ft |
| Hydraulic Radius: | 0.611 |
| Froude Number: | 1.15 |

