DESIGN REPORT

Temporary Impoundment Structure

BM-FWP

Black Mesa Mine

Navajo County, Arizona

For

PEABODY WESTERN COAL COMPANY

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INTRODUCTION

Impoundment Structure BM-FWP is an incised impoundment, designed and constructed by Peabody Western Coal Company as a temporary impoundment structure to contain clean water for use by the Black Mesa plant. BM-FWP was constructed to store clean water pumped from the upstream pipeline and wells WW-5 and 6. Clean water is gravity fed from the impoundment to the Black Mesa plant via a 14-inch underground waterline. The location of Structure BM-FWP is shown on Drawing No. 85400 (Sheet L-9) and Drawing No. 85405. The site-specific general construction plans are shown on the attached Exhibit 1.

This design report contains information specific to Structure BM-FWP. 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".

INSPECTION

The construction site of the Structure BM-FWP was inspected in February, 1998 by a Registered Professional Engineer from Peabody Western Coal Company to assure that the site is suitable and no adverse conditions exist for this structure. A detailed geotechnical investigation was not performed; rather, the information in Chapter 6, Attachment D was utilized for incised slope design.

SITE DESCRIPTION

LAND USE

The tributary area for structure BM-FWP is limited to the pond surface, basin, and crest. The total tributary area is 2.3 acres.

DESIGN ANALYSES

GENERAL

Structure BM-FWP 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 1990 for Peabody Western Coal Company and was used in the analyses of the structure.

STABILITY

Structure BM-FWP is completely incised impoundment. The incised slopes are approximately 5.5:1 (horizontal to vertical). Based on the total pond depth of approximately 10 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 basin slopes will be stable.

HYDROLOGY

The hydrologic analysis was completed using the computer program SEDCAD+ (see Appendices A and B). Structure BM-FWP is classified as a low hazard structure (see Drawing No. 85408). In addition, the mine area is sparsely populated with no one living in the downstream floodplain. The structure will impound less than 20 acre-feet and be less than 20 vertical feet in depth. The impoundment does not contain a spillway. Adequate storage will be maintained in the impoundment above the normal operating level to contain the storm run-off from the 25-year storm event. To assure that adequate storm water storage volume is available, the operating water level in the impoundment will be maintained at or below elevation 6611.0. Water level management and stormwater de-watering will be accomplished through control of process water feed rates to the plant with discharge through the existing outlet structure (two 8-inch steel pipes). This design methodology and compliance with applicable regulatory requirements were verified through discussions with OSM personnel.

The following parameters were used in the hydrologic analysis:

		25yr-6hr Storm	
1.	Water Course length, L	0.015	mi.
2.	Elevation Difference, H	2	ft
3.	Time of Concentration, T_c	0.016	hr
4.	SCS Curve Number	96	
5.	Rainfall Depth, 25-year, 6-hour storm	1.9	in
6.	Drainage Area	2.3	acres

The SEDCAD+ computer program was used to evaluate inflow to the impoundment structure. The initial conditions and results of the analysis are summarized in the following table (supporting calculations are presented in Appendices A and B).

BM-FWP POND HYDROLOGY TABLE

	Units	25-Yr, 6-Hr Storm
Initial Reservoir Volume Condition		Full to emergency spillway
Inflow		
Peak Flow	cfs	4.4
Volume	ac-ft	0.28
Storage		
Peak Stage	msl	6611.2
Operational Elev.	msl	6611.0
Peak Storage	ac-ft	8.21
Storage Capacity	ac-ft	7.94
Top of Impoundment	msl	6612.2
Freeboard	ft	1.0

Notes: The Storage Capacity figure reflects available pond storage up to the defined Operational Elevation. The Peak Storage figure reflects available pond storage up to the Peak Stage elevation and includes Storage Capacity plus stormwater inflow volume (7.93 + 0.28).

INLET AND OUTLET STRUCTURES

The inlet structures consist of two, 8-inch steel pipes at elevations 6612.4 and 6612.8, which are fed from the upstream pipeline and wells WW-5 and 6. The outlet structure consists of two, 8-inch steel pipe at elevation 6602.5 and are connected to a 14-inch underground steel pipe that transfers discharge to the Black Mesa plant. The alignment and dimensions are shown on Exhibit 1.

* * *

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

APPENDIX A	Hydrology Calculations
APPENDIX B	SEDCAD+ (Input and Output) 25-Year, 6-Hour Storm Event
Exhibit # 1	BM-FWP Temporary Impoundment Design

APPENDIX A

Hydrology Calculations

PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA

PROJECT: TEMPORARY IMPOUNDMENT

STRUCTURE: FWP

TIME OF CONCENTRATION:

Start Elevation (ft) =	6613
End Elevation (ft) =	6611
Elevation Difference, E (ft) =	2
Watercourse Length (ft) =	80
Watercourse Length, L (mi) =	0.015
Tc = (11.9L^3/E)^0.385 =	0.016 hours

ROUTING PARAMETERS:

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Disturbed	C	91	0.98	89.18
Pond	C	100	1.32	132
TOTAL:			2.3	221.18

Weighted CN = Total CN*Area/ Total Area = 96

DRAINAGE BASIN AREA:

2.3 Acres

APPENDIX B

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

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

PEABODY WESTERN COAL COMPANY :BM-FWP TEMPORARY IMPOUNDMENT

by

Name: D. GLEASON

Company Name: ACZ, INC.
File Name: J:\861\1000\SEDCAD\FWP

Date: 04-09-1998

Company Name: ACZ, INC.
Filename: J:\861\1000\SEDCAD\FWP User: D. GLEASON
Date: 04-09-1998 Time: 15:34:04
PEABODY WESTERN COAL COMPANY :BM-FWP TEMPORARY IMPOUNDMENT
Storm: 1.90 inches, 25 year- 6 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	2.30	96	F	0.016	0.000	0.000	0.0	0.28	4.42
		Type: Null Label: BM-FWP								
111	Structure	2.30							0.28	
111	Total IN/OUT	2.30							0.28	4.42