DESIGN REPORT

Sedimentation Structure

N6-D1

Black Mesa Mine

Navajo County, Arizona

for

PEABODY COAL COMPANY

Dames & Moore
10139-011-22

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INTRODUCTION

Sedimentation Structure N6-D1 will be a partially incised structure with a small earthen embankment, designed and constructed by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from the disturbed mining areas of the Black Mesa Mine. The location of Structure N6-D1 is shown on Plate 1, Site Plan.

This design report contains information specific to Structure N6-D1. Regional site information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody Coal Company," along with the methods and results of analyses used for slope stability, hydrology and hydraulics.

INSPECTION

The proposed site of Structure N6-D1 was inspected by a senior geotechnical engineer from Dames & Moore in October, 1985 to ensure that the site is suitable and no adverse conditions exist to prevent the successful construction of the structure. A detailed geotechnical investigation was not performed.

SITE DESCRIPTION

LAND USE

Structure N6-D1 has a 343.0-acre tributary drainage area and is located near Moenkopi Wash at the Black Mesa Mine. The watershed is classified as 80% reclaimed, 15% disturbed, and 5% Pinion/Juniper.

EMBANKMENT

A partially incised, homogeneous earthen embankment was assumed for the hydraulic analysis and to develop the volume-elevation curve shown on Plate 2. Upstream and downstream slopes of 2:1 and 3:1 (horizontal to vertical), respectively, were used. The assumed slopes were not evaluated for geotechnical considerations such as slope stability since the foundation or embankment material types have not been determined.

DESIGN ANALYSES

GENERAL

Structure N6-D1 was designed by an interdisciplinary team of engineers from Dames & Moore. 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 Coal

Company files includes topographic maps developed from aerial photography flown in 1983 for Peabody Coal Company and was used in the analyses of the structure.

STABILITY

The slopes of Structure N6-D1 will be chosen based on the stability analyses performed for existing structures in the General Report. The embankment fill materials and the type of foundation will be identified in the field and the stable slopes chosen based on the category classification of the structure.

HYDROLOGY

The hydrologic analysis was completed using the U.S. Army Corps of Engineers generalized computer program HEC-1, Flood Hydrograph Package. Structure N6-D1 is located upstream from Structure N6-D. The two structures have a combined storage capacity that is greater than 20 acre-feet. However, the spillway for N6-D1 was analyzed using the 25-year, 6-hour storm because N6-D1 is the upstream structure. The storage capacity of Structure N6-D1 was analyzed using the 10-year, 24-hour storm.

The following parameters were used in the hydrologic analysis:

1.	Water Course length, L	1.47	mi
2.	Elevation Difference, H	242	ft
3.	Time of Concentration, T_c	0.489	h
4.	Lag time, $0.6T_c$	0.293	h
5.	SCS Curve Number	84	
6.	Rainfall Depth, 10-year, 24-hour storm .	2.1	in.
	25-year, 6-hour storm. .	1.9	in.
7.	Drainage Area	343.0	acres

HYDRAULICS

The HEC-1 program was used to evaluate inflow to the planned 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.

N6-D1 HYDRAULICS

	Units	10-year 24-hour Storm	25-year 6-hour Storm
Initial Reservoir Volume Condition		Empty	Full to the spillway elevation
Inflow			
Peak Flow	cfs	267	304
Volume	acre-ft	22.87	18.29
Storage			
Peak Stage	ft	6676.32*	6677.96*
Spillway Elevation . .	ft	6676.50	—
Peak Storage	acre-ft	22.87	—
Storage Capacity, Pond C	acre-ft	9.73	—
Storage Capacity, Pond A & B	acre-ft	23.97	—
Total Storage Capacity	acre-ft	33.70	—
Outflow			
Peak Flow	cfs	0	93
Embankment Crest Elevation	ft	—	6679.00
Peak Stage	ft	—	6677.96*
Freeboard	ft	—	1.04
Spillway Channel			
Flow Depth	ft	—	1.46
Critical Velocity. . .	fps	—	3.0
Manning's "n"		—	0.040
Outflow Channel			
Slope	%	—	3
Normal Velocity. . . .	fps	—	2.9
Normal Depth	ft	—	0.31
Manning's "n"		—	0.040

*Peak stage for Pond A and Pond B combined.

Spillway Channel

The spillway for N6-D1 will be a trapezoidal channel with the following dimensions:

Channel depth	2.5	ft
Channel width	100	ft
Channel length	50	ft
Side slopes (horizontal to vertical). .	15:1	
Average exit slope	0	percent

Outflow Channel

The outflow channel for Structure N6-D1 will be a trapezoidal channel with the following dimensions:

Channel width	50	ft
Channel length	125	ft
Side slopes (horizontal to vertical). .	15:1	
Average exit slope	3	percent

The alignment of the spillway and outflow channel are shown on Plate 1. The channel profile is shown on Plate 3 and the required dimensions are shown on Plate 4. Both the spillway and outflow channel should be protected against erosion using geotextile and riprap as shown on Plate 4.

STORAGE CAPACITY

The impoundment volume-elevation curve shown on Plate 2, Volume-Elevation Curve, N6-D1 is based on site specific topographic data developed for Peabody Coal Company in 1985, and 1985 site specific surveys, where available.

The calculations for the sediment load entering Structure N6-D1 were made utilizing the Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.38
3. Slope Factor, LS 3.77
4. Cover Factor, C 0.277
5. Erosion Control Factor, P 1.0

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. The storage capacity of N6-D1 is shown on Plate 2, Volume-Elevation Curve, N6-D1, and the results of the sediment inflow analysis are summarized in the following table.

N6-D1 STORAGE

Total Storage Capacity	33.70	acre-ft
10-year, 24-hour Storm Inflow	22.87	acre-ft
Available Sediment Storage Capacity . .	10.83	acre-ft
Sediment Inflow Rate	2.393	acre-ft/yr
Sediment Storage Life	5	yrs

* * *

The following plates and appendix are attached and complete this design report.

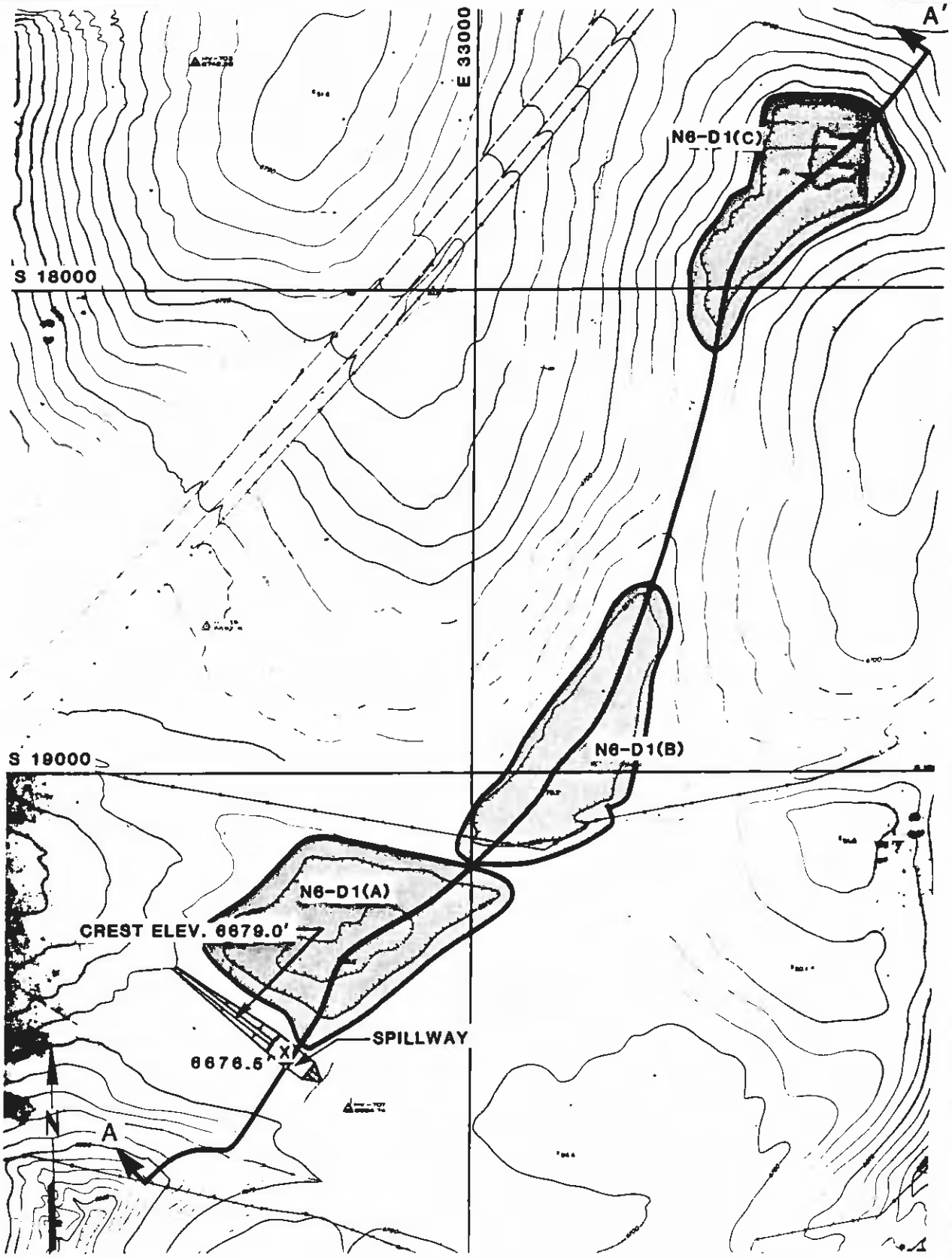
Plate 1 - Site Plan N6-D1

Plate 2 - Volume-Elevation Curve N6-D1

Plate 3 - Channel Profile N6-D1, A-A'

Plate 4 - Spillway and Outflow Channel Cross Section N6-D1

Appendix A - Hydrology and Hydraulic Calculations



SITE PLAN
N6-D1

SCALE
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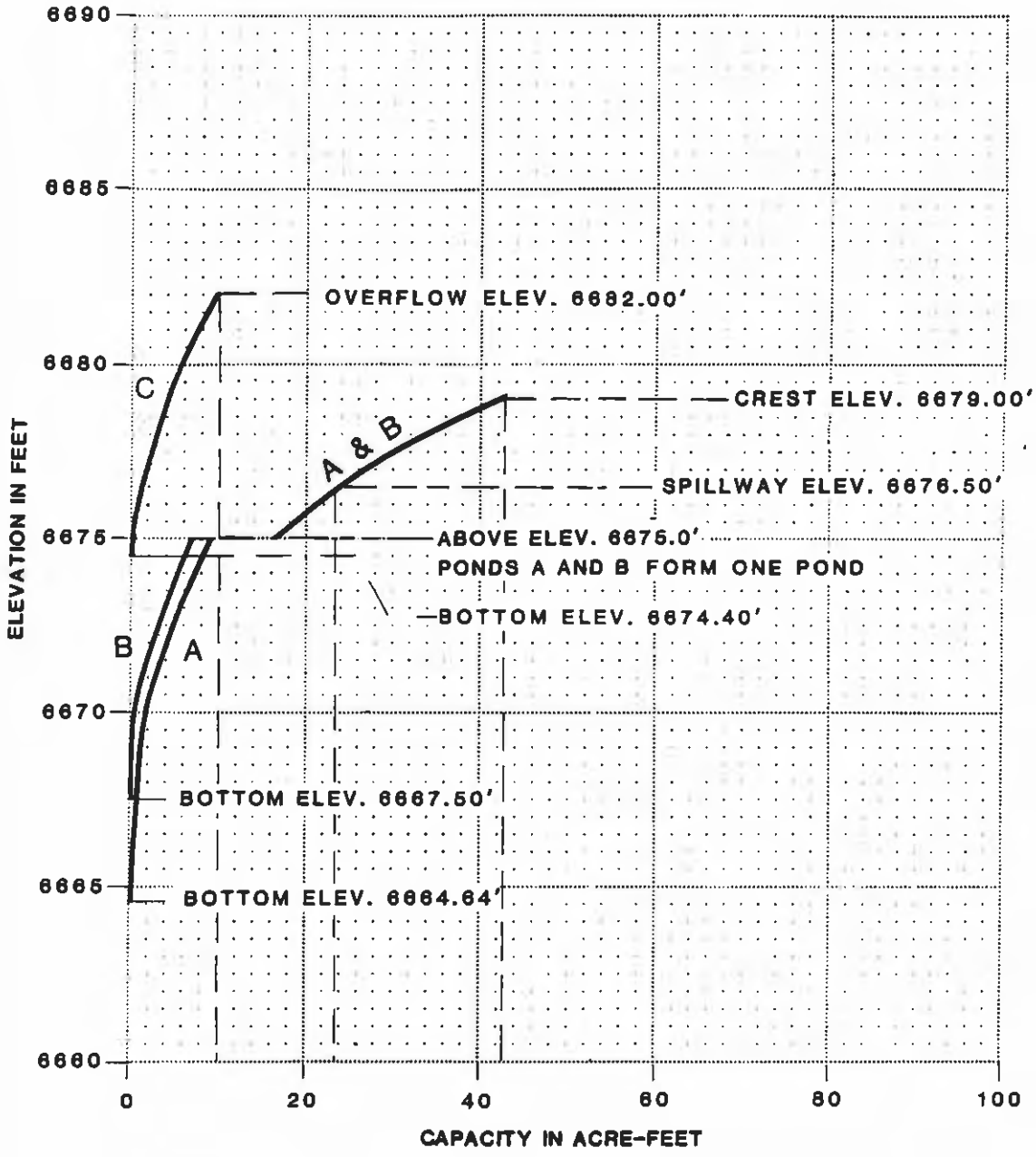
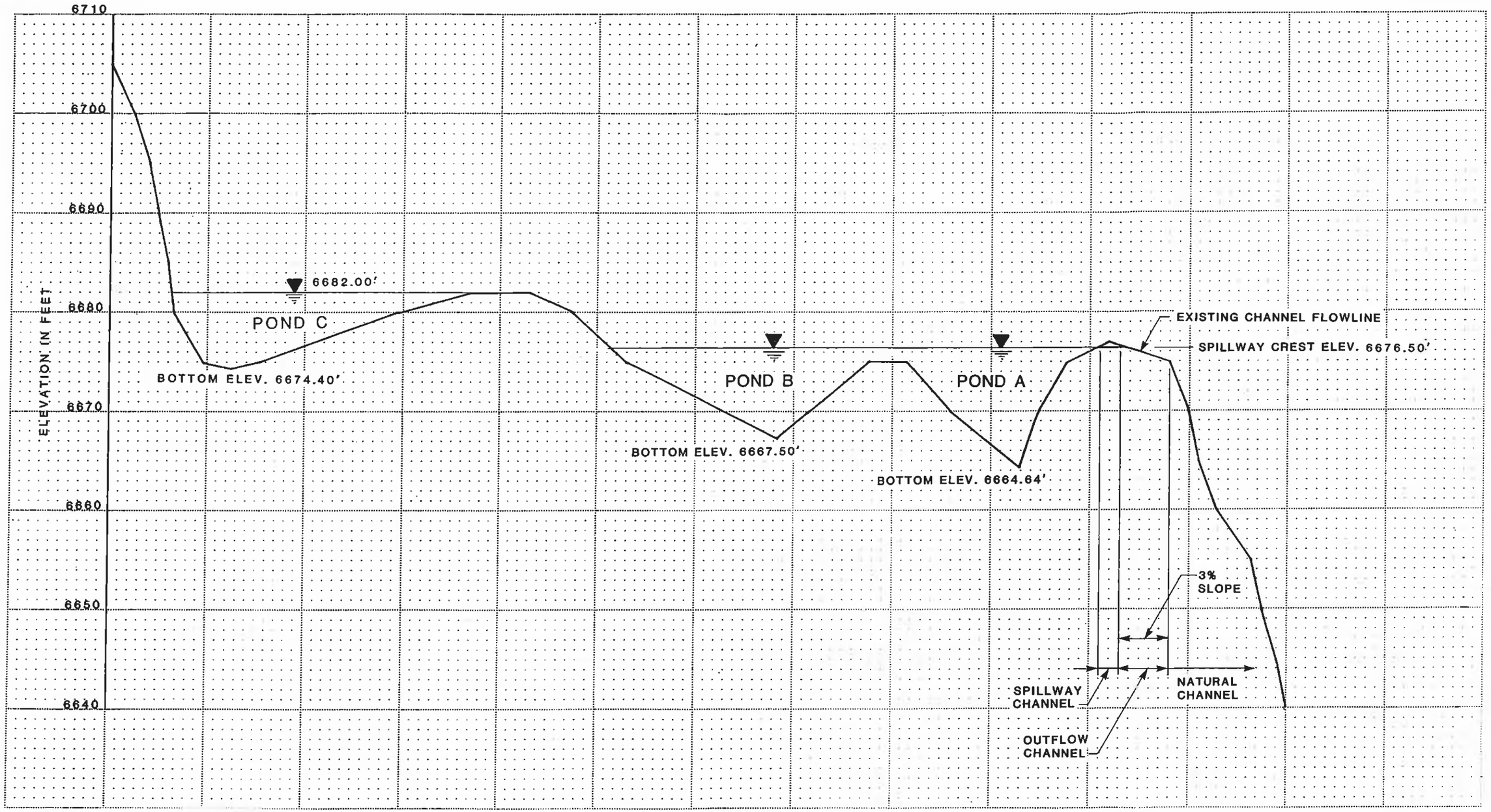
FEET

BY **Dames & Moore** Plate 1



VOLUME-ELEVATION CURVE N6-D1

BY **Dames & Moore** Plate 2



SCALE
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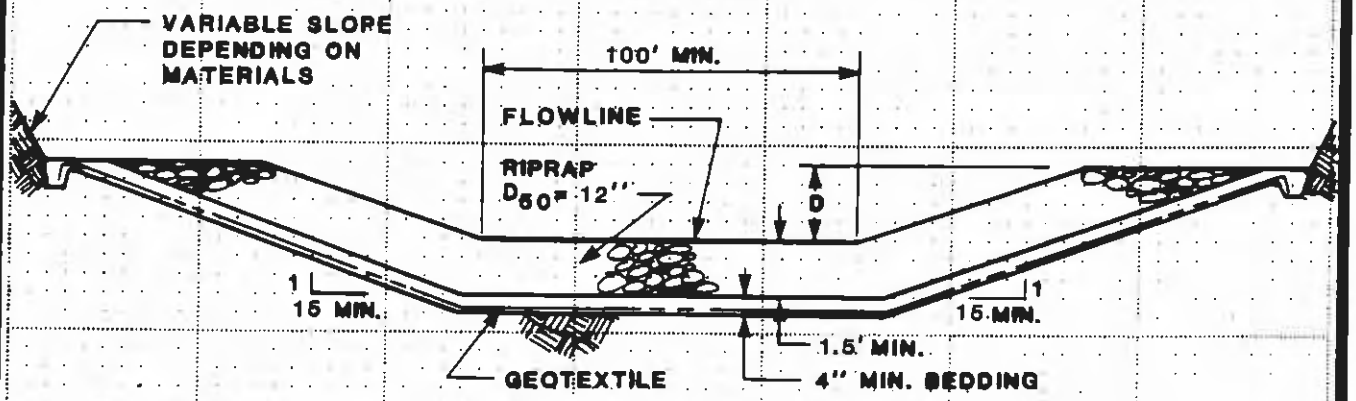
CHANNEL PROFILE A-A'
N6-D1

FOR LOCATION SEE PLATE 1

BY **Dames & Moore**. Plate 3



SPILLWAY CHANNEL

D = 2.5'

LENGTH = 50'

FLOWLINE ELEV.= 6676.50'

OUTFLOW CHANNEL

D = 1.5'

SPILLWAY AND OUTFLOW CHANNEL CROSS SECTION N6-D1

BY **Dames & Moore** Plate 4

APPENDIX A

HYDROLOGY AND HYDRAULIC CALCULATIONS

Time of Concentration

Elevation Difference = 6910.0 − 6668.0 = 242. ✓

Water Course Length = 7760.0 = 1.47 ✓

$$T_c = \left(\frac{11.9(1.47)^3}{242}\right)^{.385} = .489 \text{ hrs.}$$ ✓

Lag Time = $0.6 T_c$ = .293 hrs ✓

SCS Curve Number

Drainage Area (ac)	Cover Type	Hydrologic Condition	Soil Type	Weighted Curve Number
272.9	reclaimed	90% post law 10% pre law		[.9(81) + .1(87)] (.80)
29.7	disturbed	—	D	94 (.09)
17.2	P-J	average	D	83 (.05)
23.2	road	—	D	89 (.06)
		80% EH #35 15% EH #34 5% EH #33		83.2

use 84 ✓

Drainage Basin Area

343.0 acres 0.536 sq. mile ✓

UNIVERSAL SOIL LOSS EQUATION

RAINFALL FACTOR

R = 40

SOIL ERODIBILITY FACTOR

SOIL TYPE =	80%	EH #35	.8(.42)
	15%	EH #34	.15(.22)
	5%	EH #33	.05(.22)
			.38 ✓

K = .38

SLOPE FACTOR

LENGTH (ft.)	Δ ELEV (ft.)	SLOPE (%)	LS
800	120	15	7.24 (.05) ✓
900	75	8.3	3.15 (.75) ✓
600	80	13.3	5.21 (.20) ✓
			= 3.77

COVER FACTOR

AREA (ac.)	COVER TYPE	% COVER	CANOPY (%)	WEIGHTED C
15%	disturbed	—	—	.15 (1.0)
80%	reclaimed	—	—	.80 (.15)
5%	P-J	40	25	.05 (.14)
				C = .277 ✓

EROSION CONTROL FACTOR

P = 1.0

SEDIMENT INFLOW

$$A = 40(.38)(3.77)(.277)(1.0) = 15.87 \text{ ton/acre/year} \checkmark$$

$$A = (15.87)\left(\frac{1}{2047}\right)(343.)(.9) = 2.393 \text{ acre-feet/year} \checkmark$$

INSPECTION REPORT

Sedimentation Structure

N6-E

Black Mesa Mine

Navajo County, Arizona

for

PEABODY COAL COMPANY

Dames & Moore
10139-011-22

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APPENDIX A - INSPECTION CHECK LIST

APPENDIX B - HYDROLOGY AND HYDRAULIC CALCULATIONS

INTRODUCTION

Sedimentation Structure N6-E is a partially incised structure with an earthen embankment, designed and constructed in 1982 by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from the disturbed mining areas of the Black Mesa Mine. The location of Structure N6-E is shown on Plate 1, Site Plan.

This inspection report contains information specific to Structure N6-E. Regional site information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody Coal Company," along with the methods and results of analyses used for slope stability, hydrology and hydraulics.

INSPECTION

Structure N6-E was inspected on September 4, 1985 by an interdisciplinary team of engineers from Dames & Moore. The purpose of the inspection was to assess the safety and general condition of the structure with respect to United States Department of Interior, Office of Surface Mining (OSM) regulations.

Dames & Moore's inspection was performed in accordance with applicable 30 CFR 780 and 816 regulations and included a review of the N6-E project files and a field inspection of the structure. The most current information contained in the Peabody Coal Company files includes the 1984 and current survey data and inspections performed in 1984 and 1985 by

Peabody Coal Company. The survey data developed in August 1984 was used in the analyses of the structure. Results of the field inspection are included in this report as Appendix A.

SITE DESCRIPTION

LAND USE

Structure N6-E has a 82.0-acre tributary drainage area and is located near Coal Mine Wash at the Black Mesa Mine. The watershed is classified as 72% Pinion/Juniper and 25% disturbed.

EMBANKMENT

Structure N6-E is a partially incised structure with a homogeneous earthen embankment classified as a cross-valley embankment. Physical characteristics of the embankment are listed in the following table:

Structure N6-E

Embankment	Residual Sandstone Soil/Scoria
Foundation	Sandstone
Right Abutment	Sandstone/Shale
Left Abutment	Sandstone/Shale
Height	6.1 ft
Crest Width	14 ft
Upstream Slope	2.4 H : 1 V
Downstream Slope . . .	2.6 H : 1 V

A cross-section of the embankment is shown on Plate 2, Existing Maximum Cross Section N6-E, A-A'.

ANALYSES

STABILITY

Structure N6-E is a category A-5 embankment. A standard category A-5 embankment has static and seismic factors of safety equal to or greater than 1.5 and 1.2, respectively, under the following conditions:

1. Maximum height = 15 ft
2. Maximum upstream slope = 1.75 H : 1 V
3. Maximum downstream slope = 3.25 H : 1 V
4. Normal pool with steady seepage saturation conditions

The N6-E embankment is lower in height; however, the downstream slope is steeper than the category standard; therefore, the embankment has factors of safety less than the design minimum.

HYDROLOGY

The hydrologic analysis was completed using the U.S. Army Corps of Engineers generalized computer program HEC-1, Flood Hydrograph Package. Structure N6-E is not in series with any other structure and therefore the spillway was analyzed using the 25-year, 6-hour storm. The storage capacity of Structure N6-E was analyzed using the 10-year, 24-hour storm.

The following parameters were used in the hydrologic analysis:

1.	Water Course length, L	0.402	mi
2.	Elevation Difference, H	107	ft
3.	Time of Concentration, T_c	0.150	h
4.	Lag time, $0.6T_c$	0.090	h
5.	SCS Curve Number	91	
6.	Rainfall Depth, 10-year, 24-hour storm .	2.1	in.
	25-year, 6-hour storm. .	1.9	in.
7.	Drainage Area	82.0	acres

HYDRAULICS

The HEC-1 program was 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.

N6-E HYDRAULICS

	Units	10-year 24-hour Storm	25-year 6-hour Storm
Initial Reservoir Volume Condition		Empty	Full to the spillway elevation
Inflow			
Peak Flow	cfs	163	210
Volume	acre-ft	8.53	7.45
Storage			
Peak Stage	ft	6447.89	6458.16
Spillway Elevation . .	ft	6456.11	--
Peak Storage	acre-ft	8.53	--
Storage Capacity . . .	acre-ft	17.0	--
Outflow			
Peak Flow	cfs	--	124
Embankment Crest Elevation	ft	--	6460.58
Peak Stage	ft	--	6458.16
Freeboard	ft	--	2.42
Spillway Channel			
Flow Depth	ft	--	2.05
Critical Velocity. . .	fps	--	5.4
Manning's "n"		--	0.040
Outflow Channel			
Slope	%	--	26
Normal Velocity. . . .	fps	--	11.4
Normal Depth	ft	--	0.50
Manning's "n"		--	0.040

Spillway Channel

The existing spillway for N6-E has a trapezoidal channel with the following dimensions:

Channel depth	4.2	ft
Channel width	26	ft
Channel length	36	ft
Side slopes (horizontal to vertical). .	2:1	
Average exit slope	0	percent

There is presently partial erosion protection within the channel.

Outflow Channel

The existing outflow channel for N6-E has a trapezoidal channel with the following dimensions:

Channel width	30	ft
Channel length	100	ft
Side slopes (horizontal to vertical). .	2:1	
Average exit slope	34	percent

Rock provides adequate erosion protection within the channel.

STORAGE CAPACITY

The impoundment volume-elevation curve is based on site specific surveys conducted for Peabody Coal Company's August 1984 inspection, and 1985 resurveys, where available. Additionally, the most current topographic maps available were used in developing Plate 3, Volume-Elevation Curve, N6-E.

The calculations for the sediment load entering Structure N6-E were made utilizing the Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.16
3. Slope Factor, LS 3.60
4. Cover Factor, C 0.568
5. Erosion Control Factor, P 1.0

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. The existing storage capacity of N6-E and the results of the sediment inflow analysis are summarized in the following table.

N6-E STORAGE

Total Storage Capacity	17.0	acre-ft
10-year, 24-hour Storm Inflow	8.53	acre-ft
Available Sediment Storage Capacity . .	8.47	acre-ft
Sediment Inflow Rate	0.498	acre-ft/yr
Sediment Storage Life	17	yrs

REMEDIAL COMPLIANCE PLAN

GEOTECHNICS

The inspection of Structure N6-E indicated that the only geotechnical problem is rill and gully erosion on the upstream and downstream slopes. Correction of erosion is considered a periodic maintenance task and does not require remedial action. The downstream slope should be flattened to 3.25 horizontal to 1 vertical to meet stability requirements.

HYDRAULICS

The storage capacity and spillway capacity of Structure N6-E are adequate. The outflow channel is protected with riprap but the spillway channel is only partially protected with riprap. The spillway channel should be protected against erosion using geotextile and riprap as shown in Plate 5. A stilling basin should be constructed to the dimensions shown in Plate 6 and protected against erosion using geotextile and riprap as shown in Plate 5. Plate 4 shows the profile for the existing spillway, outflow channel and proposed stilling basin.

* * *

The following plates and appendix are attached and complete this inspection report.

Plate 1 - Site Plan N6-E

Plate 2 - Existing Maximum Cross Section N6-E, A-A'

Plate 3 - Volume-Elevation Curve N6-E

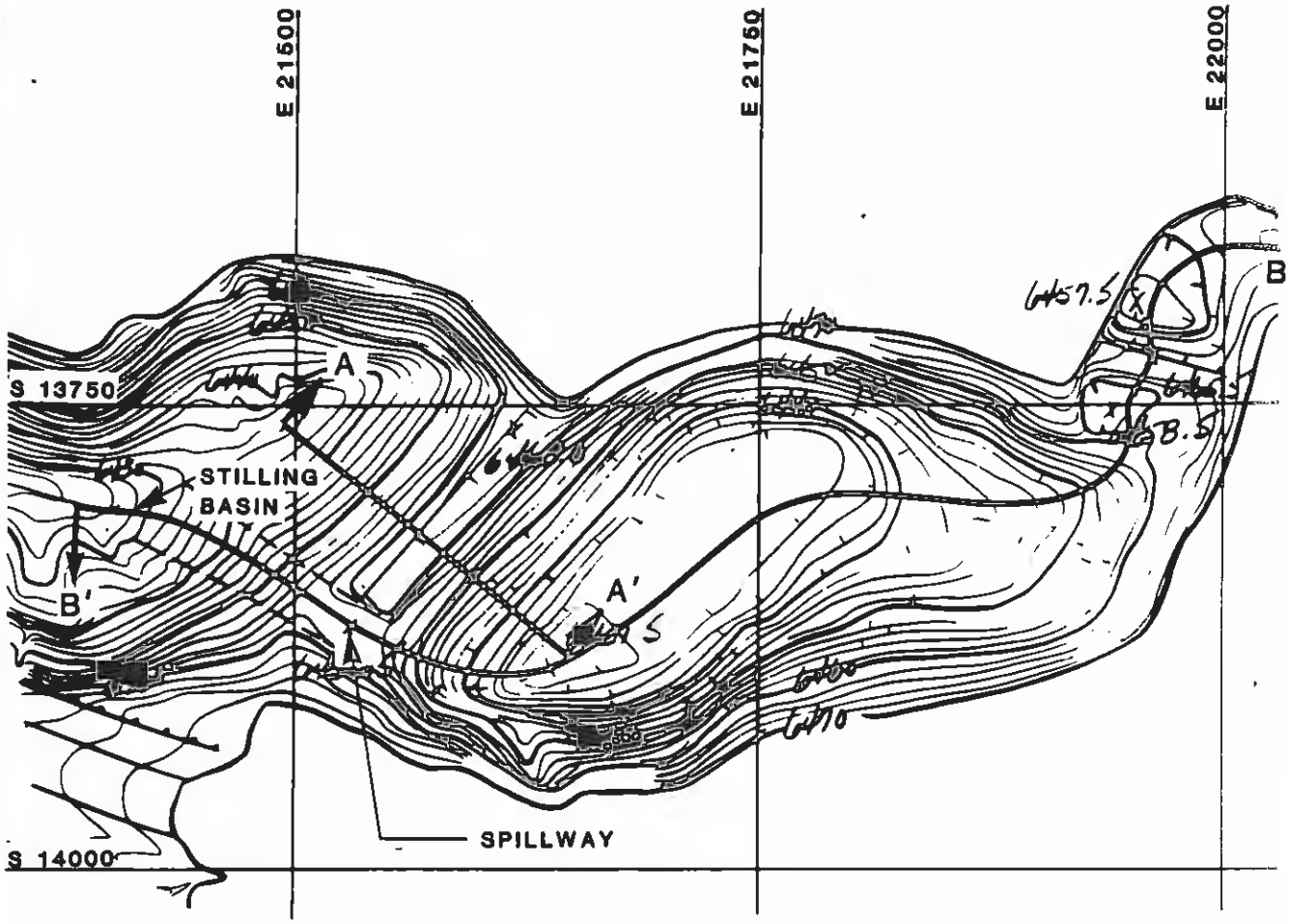
Plate 4 - Channel Profile N6-E, B-B'

Plate 5 - Spillway and Outflow Channel Cross Section N6-E

Plate 6 - Spillway Stilling Basin Plan N6-E

Appendix A - Inspection Check List

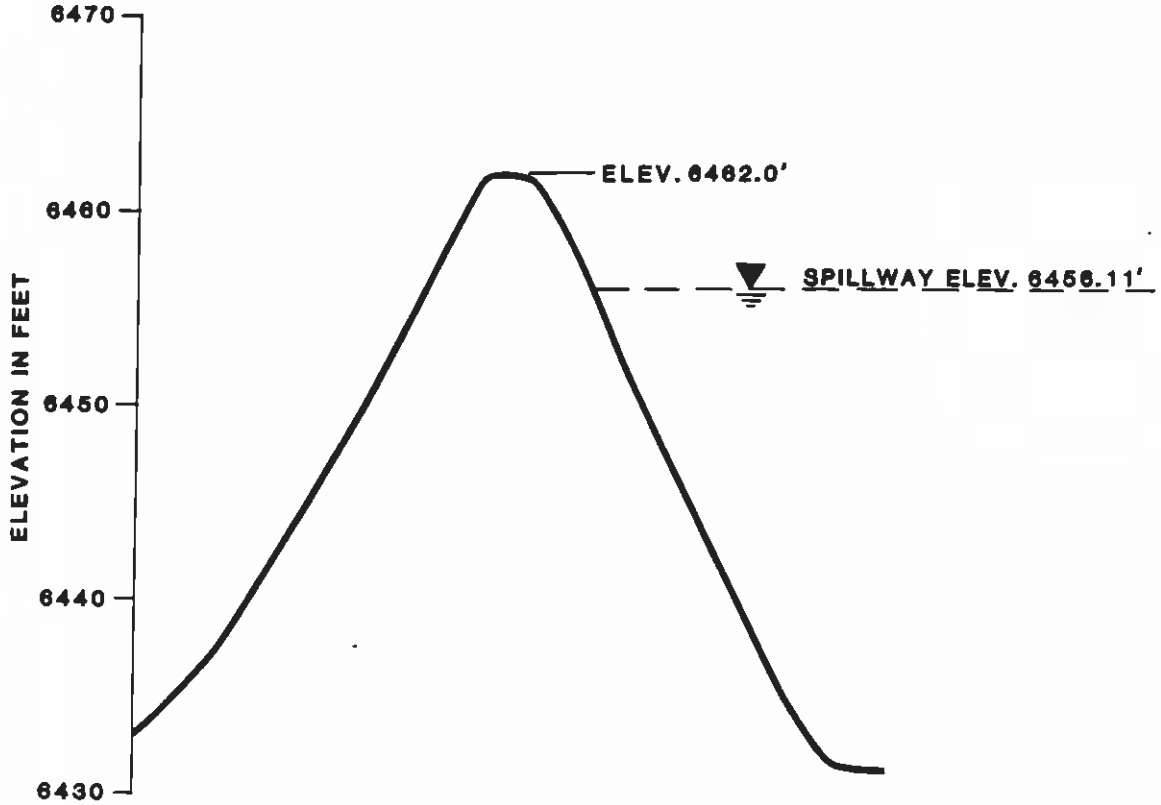
Appendix B - Hydrology and Hydraulic Calculations



SCALE
0 100 200
FEET

SITE PLAN
N6-E

BY **Dames & Moore** Plate 1

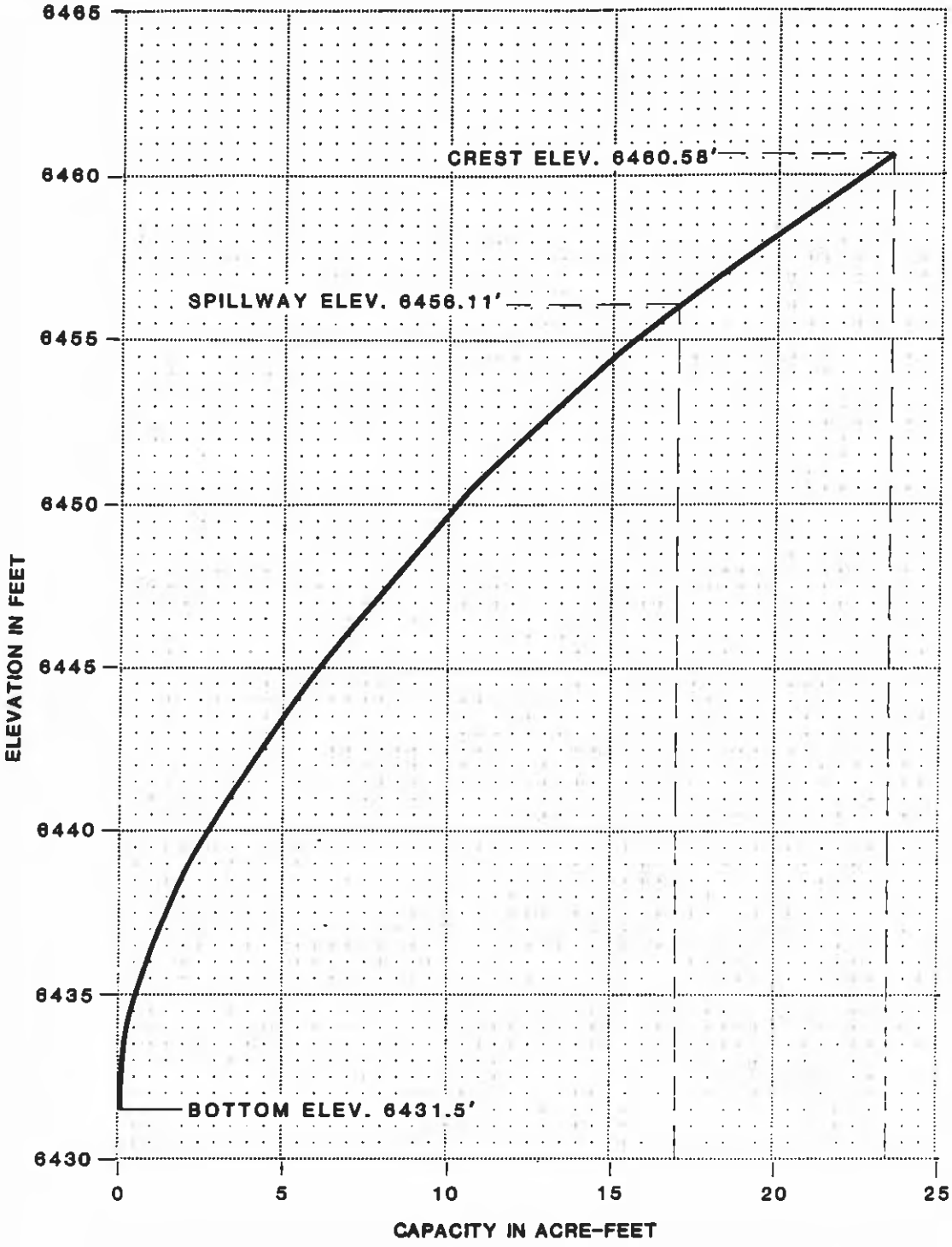


EXISTING MAXIMUM CROSS-SECTION A-A' N6-E

FOR LOCATION SEE PLATE 1

BY **Dames & Moore**

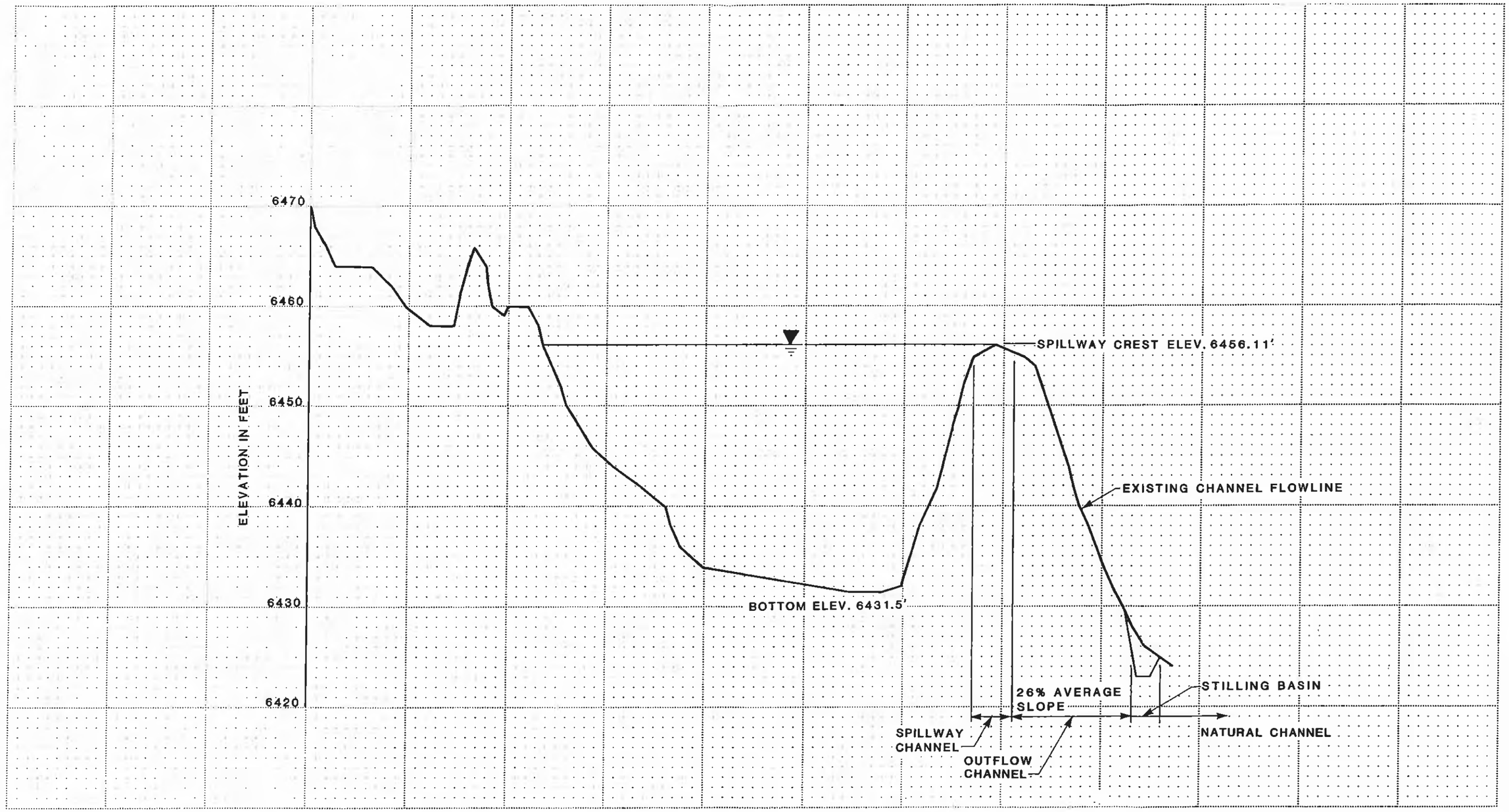
Plate 2



VOLUME-ELEVATION CURVE

N6-E

BY **Dames & Moore** Plate 3

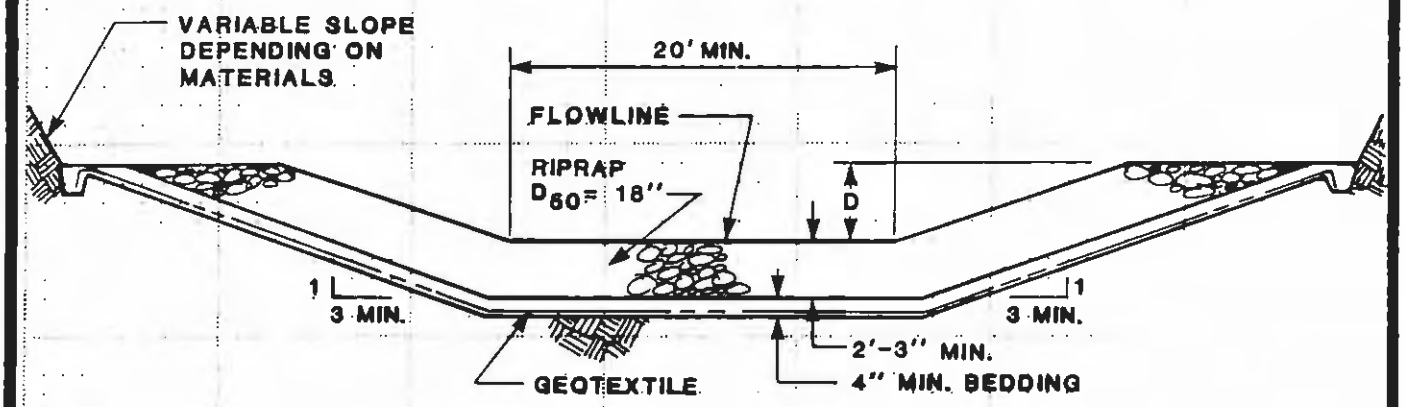


SCALE
0 100 200
FEET

CHANNEL PROFILE B-B'
N6-E

FOR LOCATION SEE PLATE 1

BY **Dames & Moore** Plate 4



SPILLWAY CHANNEL

D = 3.1'

LENGTH = 30'

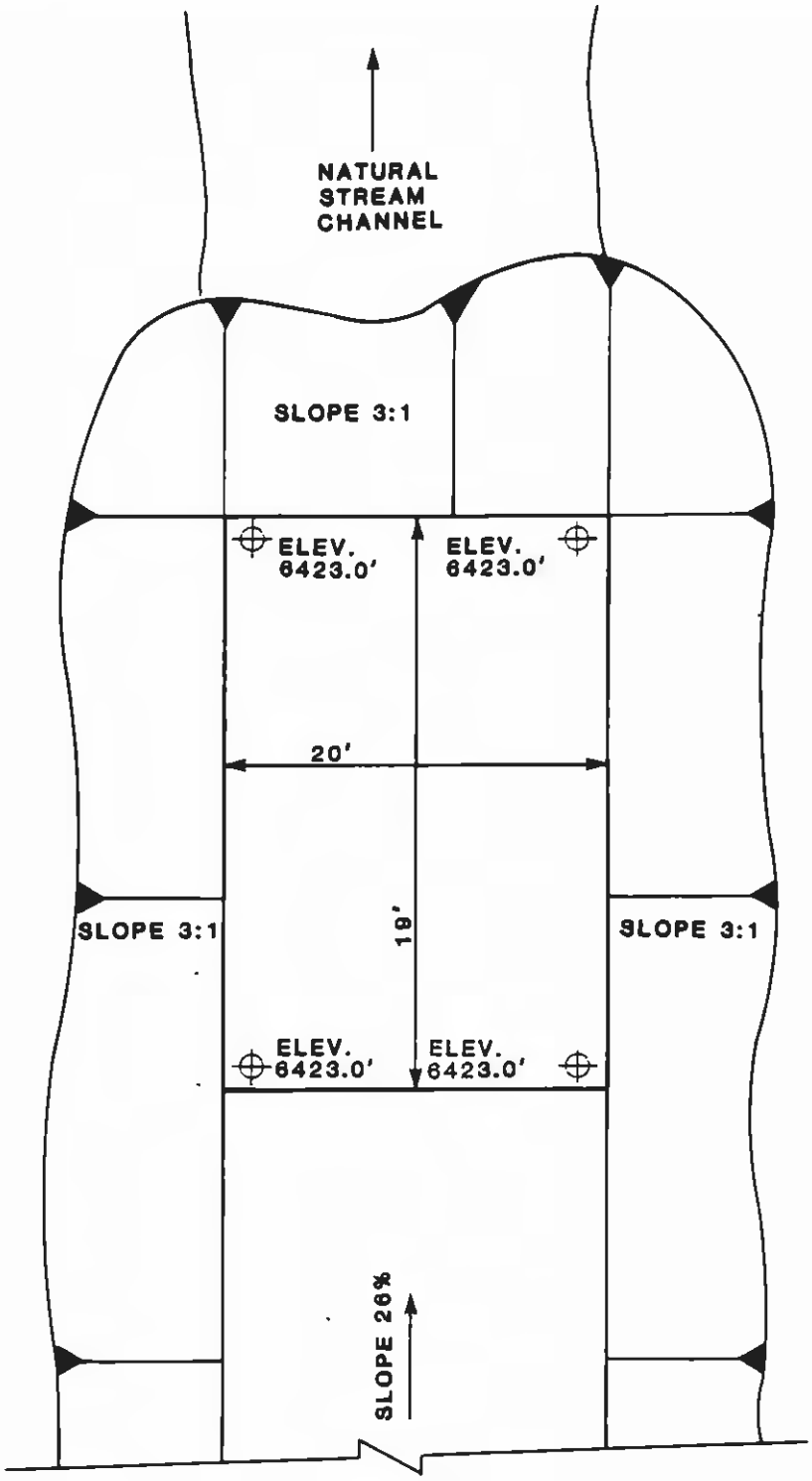
FLOWLINE ELEV. = 6456.11'

OUTFLOW CHANNEL

D = 1.5'

SPILLWAY AND OUTFLOW CHANNEL CROSS SECTION N6-E

BY **Dames & Moore** Plate 5



MINIMUM HEIGHT OF RIPRAP
ALONG SIDEWALLS ABOVE
THE BASIN FLOOR = 5.3'

MINIMUM DEPTH OF BASIN FLOOR
BELOW NATURAL STREAMBED = 3.1'

SPILLWAY STILLING BASIN PLAN N6-E

BY **Dames & Moore** Plate 6

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

ITEM	YES	NO	REMARKS
1. CREST			
a. Any visual settlements?		X	
b. Misalignment?		X	
c. Cracking?		X	
2. UPSTREAM SLOPE			23°
a. Adequate grass cover?		X	
b. Any erosion?	X		Gulley near L.A. Rill elsewhere
c. Are trees growing on slope?		X	
d. Longitudinal cracks?		X	
e. Transverse cracks?		X	
f. Adequate riprap protection?		X	
g. Any stone deterioration?			NA
h. Visual depressions or bulges?		X	
i. Visual settlements?		X	
j. Animal burrows?		X	
3. DOWNSTREAM SLOPE			21°
a. Adequate grass cover?		X	
b. Any erosion?	X		Rills growing into gulleys
c. Are trees growing on slope?		X	
d. Longitudinal cracks?		X	
e. Transverse cracks?		X	
f. Visual depressions or bulges?		X	
g. Visual settlements?		X	
h. Is the toe drain dry?			NA
i. Are the relief wells flowing?			NA
j. Are boils present at the toe?		X	
k. Is seepage present?		X	
l. Animal burrows?		X	
4. ABUTMENT CONTACT. RIGHT			
a. Any erosion?		X	
b. Visual differential movement?		X	
c. Any cracks noted?		X	
d. Is seepage present?		X	
e. Type of Material?			Rock
5. ABUTMENT CONTACT. LEFT			
a. Any erosion?		X	
b. Visual differential movement?		X	
c. Any cracks noted?		X	
d. Is seepage present?		X	
e. Type of Material?			Rock

ITEM	YES	NO	REMARKS
6. SPILLWAY/NORMAL			
a. Location:			
Left abutment?			
Right abutment?			
Crest of Embankments?	X		Near L.A.
b. Approach Channel:		X	
Are side slopes eroding?			NA
Are side slopes sloughing?			
Bottom of channel eroding?			
Obstructed?			
Erosion protection?			
c. Spillway Channel:	X		
Are side slopes eroding?		X	
Are side slopes sloughing?		X	
Bottom of channel eroding?		X	
Obstructed?		X	
Erosion protection?	X		½ Rock ½ No DSD 18"
d. Outflow Channel:	X		
Are side slopes eroding?		X	
Are side slopes sloughing?		X	
Bottom of channel eroding?		X	
Obstructed?		X	
Erosion protection?		X	Rock DSD 18
e. Weir:			
Condition?			
7. SPILLWAY/EMERGENCY			
a. Location:			
Left abutment?			
Right abutment?			
Crest of Embankments?			
b. Approach Channel:			
Are side slopes eroding?			
Are side slopes sloughing?			
Bottom of channel eroding?			
Obstructed?			
Erosion protection?			
c. Spillway Channel:			
Are side slopes eroding?			
Are side slopes sloughing?			
Bottom of channel eroding?			
Obstructed?			
Erosion protection?			
d. Outflow Channel:			
Are side slopes eroding?			
Are side slopes sloughing?			
Bottom of channel eroding?			
Obstructed?			
Erosion protection?			
e. Weir:			
Condition?			

ITEM	YES	NO	REMARKS
8. IMPOUNDMENT			
a. Sinkholes?		X	(Elev.) feet
b. Water present?	X		(Elev.) feet
c. Siltation?	X		Could not tell
d. Watershed matches soil map?		X	Bare 60

9. GENERAL COMMENTS

Canopy Cover 20 %
Ground Cover 30 %

APPENDIX B

HYDROLOGY AND HYDRAULIC CALCULATIONS

FILE Peabody Coal Co 10139-011-22
SUBJECT Sediment Pond Hydrology
N6-E SHEET ___ OF ___

REVISIONS BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

Time of Concentration

Elevation Difference = 6563 − 6456 = 107 ft.

Water Course Length = 5.5(400) = ~~2320~~ 2120 ft. = ~~0.439~~ 0.402 mi.

$$T_c = \left(\frac{11.9\,(\cancel{0.439}\ 0.402)^3}{107}\right)^{0.385} = \cancel{0.166}\ 0.150 \text{ hr.}$$

Lag Time = $0.6\,T_c$ = ~~0.100~~ 0.090 hr.

Note: Length reduced to match future reclamation plan.

Note: Two calculations on back.

SCS Curve Number

Drainage Area (ac)	Cover Type	Hydrologic Condition	Soil Type	Weighted Curve Number
18.0 (22%)	Scoria Pit	—	D	0.22(94) = 20.7
56.9 (72%)	2-J	poor	D	0.72(89) = 64.1
5.1 (6%)	Haul Road	—	D	0.06(91) = 5.5
				90.3

EH #21

Use 91

Drainage Basin Area

82.0 acre 0.128 sq mile

S. Dolan DATE 9-9-85
CHECKED BY ___
COPY TO EO ___

Dames & Moore

945 1 (3/72) PRINTED IN U.S.A.

REVISIONS
BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

UNIVERSAL SOIL LOSS EQUATION

RAINFALL FACTOR

R = 40

SOIL ERODIBILITY FACTOR

SOIL TYPE = 100% EH #24 = .16

K = .16

SLOPE FACTOR

LENGTH (ft.)	Δ ELEV (ft.)	SLOPE (%)	LS
600	50	8.3	2.58 (.3)
450	75	16.7	6.43 (.3)
700	60	8.6	2.90 (.3)
600	10	1.7	.3 (.10)
			use 3.60

COVER FACTOR

AREA (ac.)	COVER TYPE	% COVER	CANOPY (%)	WEIGHTED C
28%	disturbed	—	—	.28 (1.0)
72%	P-J	10	25	.72 (.4)
				C = .568

BY ___ DATE ___
CHECKED BY ___
COPY TO EO ___

EROSION CONTROL FACTOR

P = 1.0

SEDIMENT INFLOW

$$A = 40(.16)(3.6)(.568)(1.0) = 13.09 \text{ ton/acre/year}$$

$$A = 13.09\left(\frac{1}{2047}\right)(82.1)(.95) = .498 \text{ acre-feet/year}$$

DESIGN REPORT

Sedimentation Structure

N6-G

Black Mesa Mine

Navajo County, Arizona

for

PEABODY COAL COMPANY

Dames & Moore
10139-011-22

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INTRODUCTION

Sedimentation Structure N6-G will be a partially incised structure with an earthen embankment, designed and constructed by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from the disturbed mining areas of the Black Mesa Mine. The location of Structure N6-G is shown on Plate 1, Site Plan.

This design report contains information specific to Structure N6-G. Regional site information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody Coal Company," along with the methods and results of analyses used for slope stability, hydrology and hydraulics.

INSPECTION

The proposed site of Structure N6-G was inspected by a senior geotechnical engineer from Dames & Moore in October, 1985 to ensure that the site is suitable and no adverse conditions exist to prevent the successful construction of the structure. A detailed geotechnical investigation was not performed.

SITE DESCRIPTION

LAND USE

Structure N6-G has a 52.5-acre tributary drainage area and is located near Coal Mine Wash at the Black Mesa Mine. The watershed is classified as 100% reclaimed.

EMBANKMENT

A homogeneous earthen embankment was assumed for the hydraulic analysis and to develop the volume-elevation curve shown on Plate 2. Upstream and downstream slopes of 2:1 and 3:1 (horizontal to vertical), respectively, were used. The assumed slopes were not evaluated for geotechnical considerations such as slope stability since the foundation or embankment material types have not been determined. The incised portion of the structure will be excavated at 3:1 (horizontal to vertical) slopes.

DESIGN ANALYSES

GENERAL

Structure N6-G was designed by an interdisciplinary team of engineers from Dames & Moore. 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 Coal

Company files includes topographic maps developed from aerial photography flown in 1985 for Peabody Coal Company and was used in the analyses of the structure.

STABILITY

The slopes of Structure N6-G will be chosen based on the stability analyses performed for existing structures in the General Report. The embankment fill materials and the type of foundation will be identified in the field and the stable slopes chosen based on the category classification of the structure.

HYDROLOGY

The hydrologic analysis was completed using the U.S. Army Corps of Engineers generalized computer program HEC-1, Flood Hydrograph Package. Structure N6-G is not in series with any other structure and therefore the spillway was analyzed using the 25-year, 6-hour storm. The storage capacity of Structure N6-G was analyzed using the 10-year, 24-hour storm.

The following parameters were used in the hydrologic analysis:

1.	Water Course length, L	0.466	mi
2.	Elevation Difference, H	149	ft
3.	Time of Concentration, T_c	0.156	h
4.	Lag time, $0.6T_c$	0.094	h
5.	SCS Curve Number	81	
6.	Rainfall Depth, 10-year, 24-hour storm .	2.1	in.
	25-year, 6-hour storm. .	1.9	in.
7.	Drainage Area	52.5	acres

HYDRAULICS

The HEC-1 program was used to evaluate inflow to the planned 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.

N6-G HYDRAULICS

	Units	10-year 24-hour Storm	25-year 6-hour Storm
Initial Reservoir Volume Condition		Empty	Full to the spillway elevation
Inflow			
Peak Flow	cfs	53	62
Volume	acre-ft	2.89	2.23
Storage			
Peak Stage	ft	6466.99	--
Spillway Elevation . .	ft	6470.50	--
Peak Storage	acre-ft	2.89	--
Storage Capacity . . .	acre-ft	4.93	—
Outflow			
Peak Flow	cfs	0	3
Embankment Crest Elevation	ft	--	6472.50
Peak Stage	ft	--	6471.28
Freeboard	ft	--	1.22
Spillway Channel			
Flow Depth	ft	--	0.78
Critical Velocity. . .	fps	--	1.8
Manning's "n"		—	0.035
Outflow Channel			
Slope	%	--	8
Normal Velocity. . . .	fps	--	2.3
Normal Depth	ft	--	0.09
Manning's "n"		--	0.035

Spillway Channel

The spillway for N6-G will be a trapezoidal channel with the following dimensions:

Channel depth	1.9	ft
Channel width	15	ft
Channel length	50	ft
Side slopes (horizontal to vertical). .	3:1	
Average exit slope	0	percent

Outflow Channel

The outflow channel for Structure N6-G will be a trapezoidal channel with the following dimensions:

Channel width	15	ft
Channel length	20	ft
Side slopes (horizontal to vertical). .	3:1	
Average exit slope	8	percent

The alignment of the spillway and outflow channel are shown on Plate 1. The channel profile is shown on Plate 3 and the required dimensions are shown on Plate 4. Both the spillway and outflow channel should be protected against erosion using geotextile and gravel as shown on Plate 4.

STORAGE CAPACITY

The impoundment volume-elevation curve shown on Plate 2, Volume-Elevation Curve, N6-G is based on site specific topographic data developed for Peabody Coal Company in 1985, and 1985 site specific surveys, where available.

The calculations for the sediment load entering Structure N6-G were made utilizing the Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.42
3. Slope Factor, LS 1.46
4. Cover Factor, C 0.15
5. Erosion Control Factor, P 1.0

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. The storage capacity of N6-G is shown on Plate 2, Volume-Elevation Curve, N6-G, and the results of the sediment inflow analysis are summarized in the following table.

N6-G STORAGE

Total Storage Capacity	4.93	acre-ft
10-year, 24-hour Storm Inflow	2.89	acre-ft
Available Sediment Storage Capacity . .	2.04	acre-ft
Sediment Inflow Rate	0.090	acre-ft/yr
Sediment Storage Life	23	yrs

* * *

The following plates and appendix are attached and complete this design report.

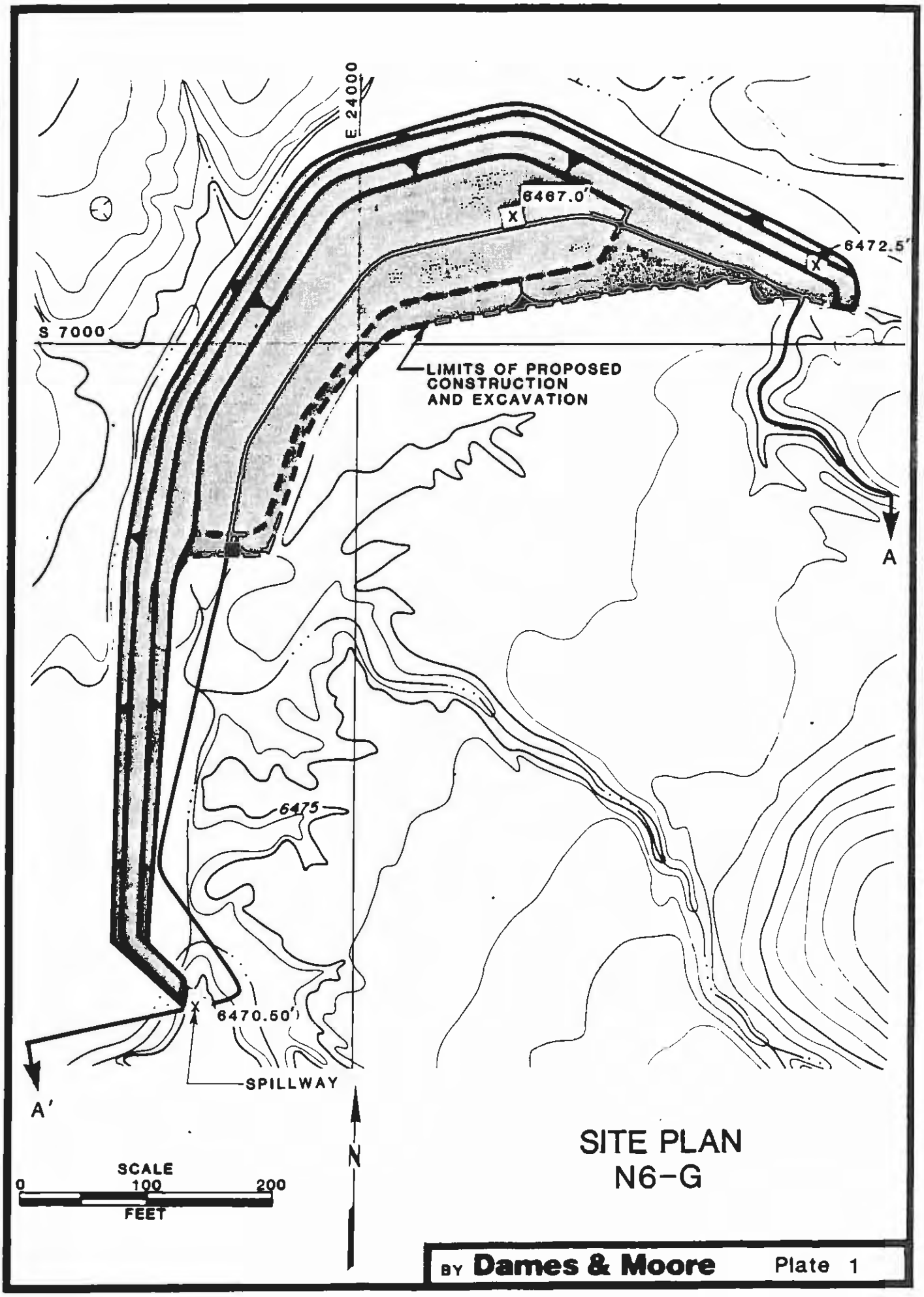
Plate 1 - Site Plan N6-G

Plate 2 - Volume-Elevation Curve N6-G

Plate 3 - Channel Profile N6-G, A-A'

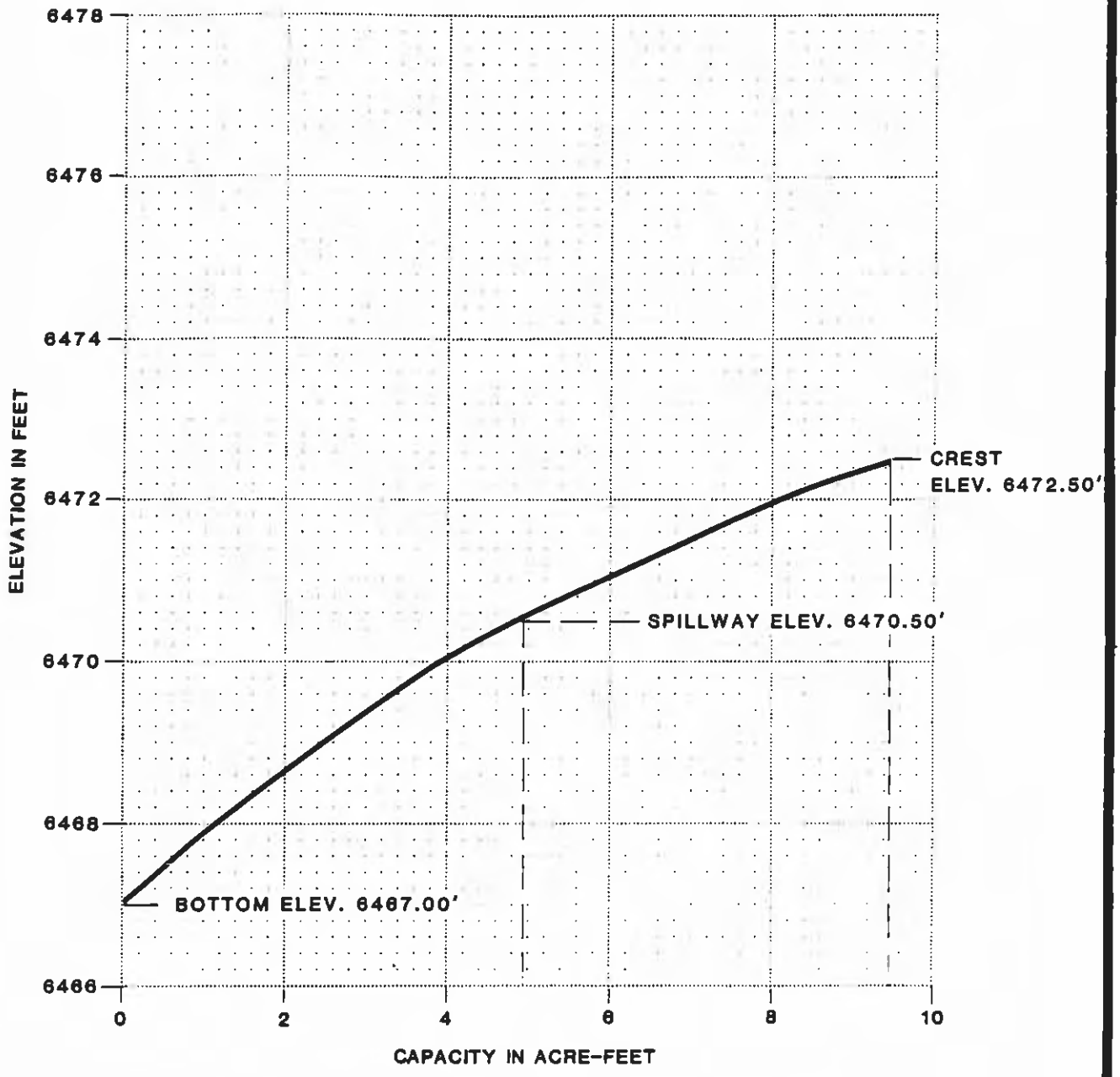
Plate 4 - Spillway and Outflow Channel Cross Section N6-G

Appendix A - Hydrology and Hydraulic Calculations



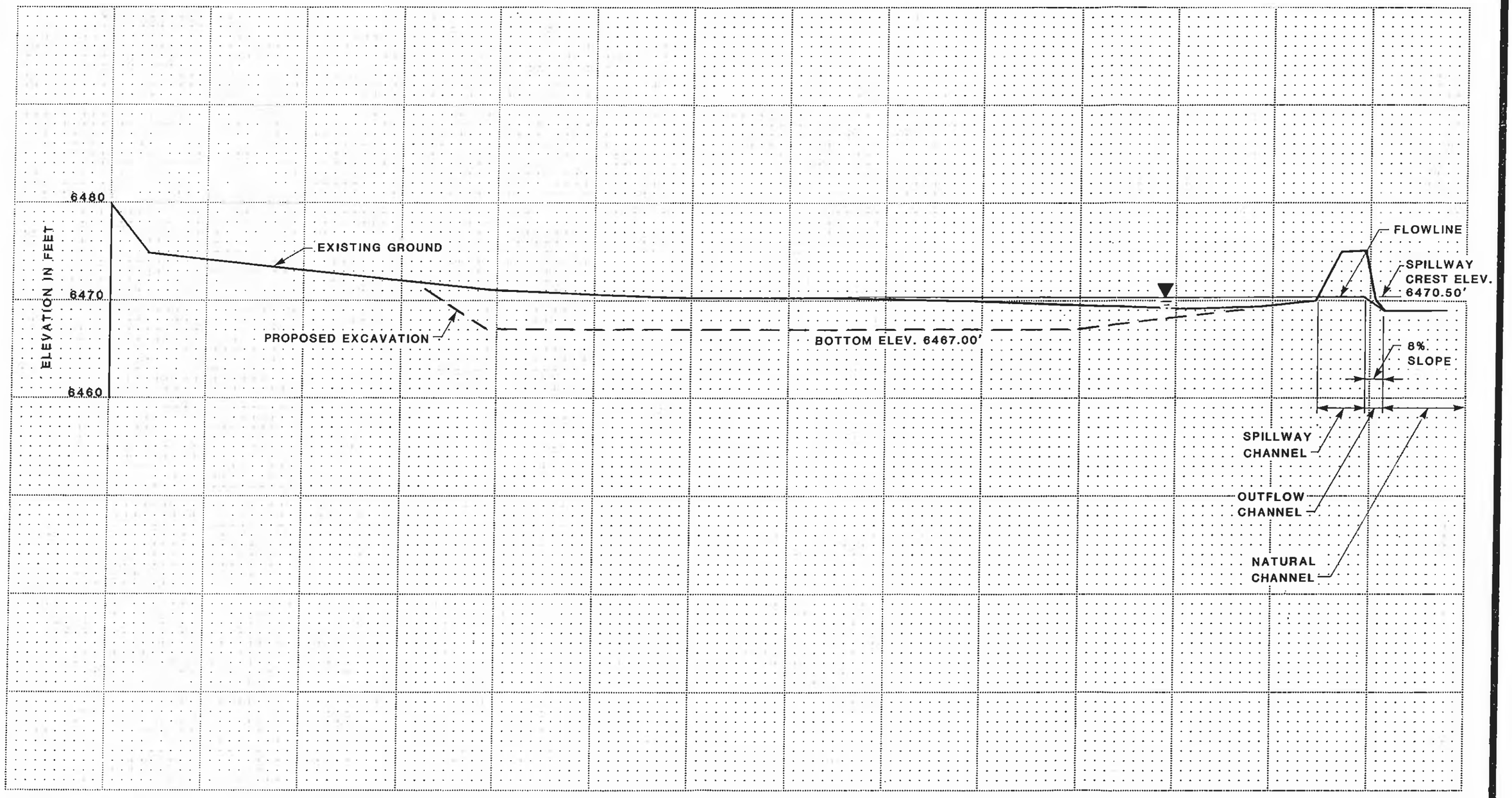
SITE PLAN
N6-G

BY **Dames & Moore** Plate 1



VOLUME-ELEVATION CURVE N6-G

BY **Dames & Moore** Plate 2

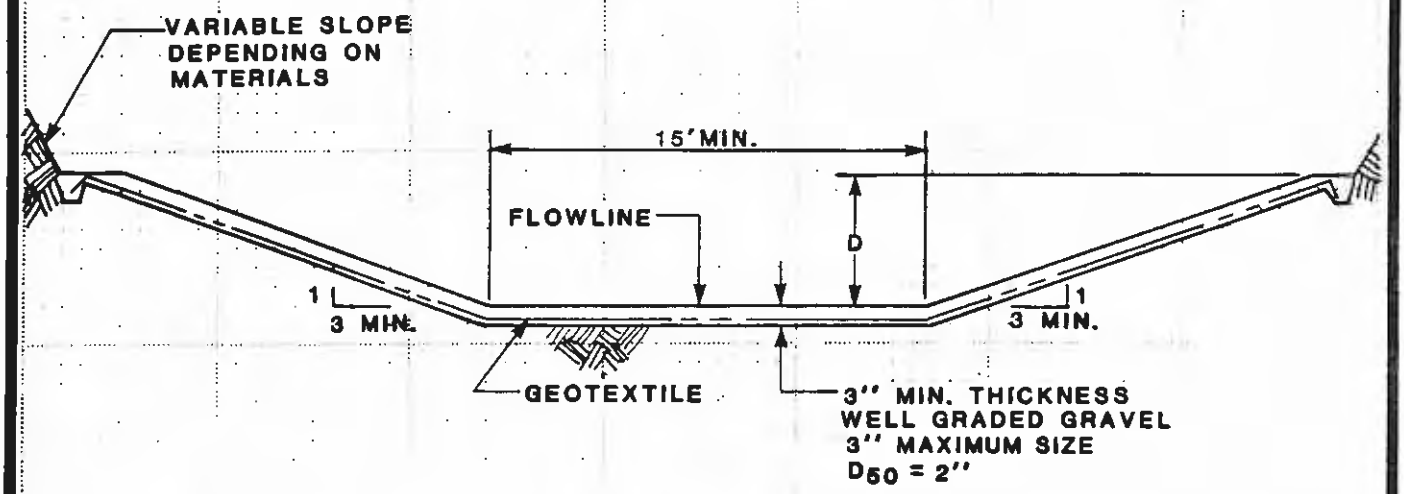


SCALE
0 100 200
FEET

CHANNEL PROFILE A-A'
N6-G

FOR LOCATION SEE PLATE 1

BY **Dames & Moore** Plate 3



SPILLWAY CHANNEL

D = 1.8'

LENGTH = 50'

FLOWLINE ELEV.= 6470.50'

OUTFLOW CHANNEL

D = 1.0'

SPILLWAY AND OUTFLOW CHANNEL CROSS SECTION N6-G

BY **Dames & Moore** Plate 4

APPENDIX A

HYDROLOGY AND HYDRAULIC CALCULATIONS

REVISIONS
BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

Time of Concentration

Elevation Difference = 6624 − 6475 = 149

Water Course Length = 2461' = .466 mi

T_c = 0.156 hr

Lag Time = $0.6T_c$ = 0.094 hr

SCS Curve Number

Drainage Area (ac)	Cover Type	Hydrologic Condition	Soil Type	Weighted Curve Number
52.5	reclaimed (post-law)	fair	—	81

worst case is 100% reclaimed

Drainage Basin Area

52.5 acre 0.082 sq mile

BY ___ DATE ___
CHECKED BY RHM 11/15/85
COPY TO EO ___

REVISIONS BY ___ DATE ___ TO EO ___ BY ___ DATE ___ TO EO ___

Universal Soil Loss Equation

Rainfall Factor

R = 40

Soil Erodibility Factor

Soil Type = 100% EH #35

K = 0.42

Slope Factor

Length (ft.)	Δ Elev (ft.)	Slope (%)	LS
500	45	9	2.64 (.3) ✓
1000	35	3.5	.67 (.30) ✓
350	25	7.1	1.59 (.2) ✓
200	10	5.0	.76 (.20) ✓
			1.46 ✓

Cover Factor

Area (ac)	Cover Type	% Cover	Canopy (%)	Weighted C
100%	reclaimed	—	—	0.15

Erosion Control Factor

P = 1.0

Sediment Inflow

$A = 40(.42)(1.46)(.15)(1.0) = 3.68$ ton/acre/year ✓

$A = 3.68\left(\frac{1}{2047}\right)(52.5)(.95) = 0.090$ acre-feet/year ✓

BY ___ DATE ___ CHECKED BY BHM 11/5/85 COPY TO EO ___

DESIGN REPORT

Sedimentation Structure

N6-H

Black Mesa Mine

Navajo County, Arizona

for

PEABODY COAL COMPANY

Dames & Moore
10139-011-22

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Outflow Channel	6
STORAGE CAPACITY	7
APPENDIX A - HYDROLOGY AND HYDRAULIC CALCULATIONS	

INTRODUCTION

Sedimentation Structure N6-H will be an earthen embankment, designed and constructed by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from the disturbed mining areas of the Black Mesa Mine. The location of Structure N6-H is shown on Plate 1, Site Plan.

This design report contains information specific to Structure N6-H. Regional site information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody Coal Company," along with the methods and results of analyses used for slope stability, hydrology and hydraulics.

INSPECTION

The proposed site of Structure N6-H was inspected by a senior geotechnical engineer from Dames & Moore in October, 1985 to ensure that the site is suitable and no adverse conditions exist to prevent the successful construction of the structure. A detailed geotechnical investigation was not performed.

SITE DESCRIPTION

LAND USE

Structure N6-H has a 10.7-acre tributary drainage area and is located near Coal Mine Wash at the Black Mesa Mine. The watershed is classified as 59% Sagebrush/grass, 36% Pinion/Juniper, and 5% reclaimed.

EMBANKMENT

A homogeneous earthen embankment was assumed for the hydraulic analysis and to develop the volume-elevation curve shown on Plate 2. Upstream and downstream slopes of 2:1 and 3:1 (horizontal to vertical), respectively, were used. The assumed slopes were not evaluated for geotechnical considerations such as slope stability since the foundation or embankment material types have not been determined.

DESIGN ANALYSES

GENERAL

Structure N6-H was designed by an interdisciplinary team of engineers from Dames & Moore. 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 Coal

Company files includes topographic maps developed from aerial photography flown in 1985 for Peabody Coal Company and was used in the analyses of the structure.

STABILITY

The slopes of Structure N6-H will be chosen based on the stability analyses performed for existing structures in the General Report. The embankment fill materials and the type of foundation will be identified in the field and the stable slopes chosen based on the category classification of the structure.

HYDROLOGY

The hydrologic analysis was completed using the U.S. Army Corps of Engineers generalized computer program HEC-1, Flood Hydrograph Package. Structure N6-H is not in series with any other structure and therefore the spillway was analyzed using the 25-year, 6-hour storm. The storage capacity of Structure N6-H was analyzed using the 10-year, 24-hour storm.

The following parameters were used in the hydrologic analysis:

1.	Water Course length, L	0.155	mi
2.	Elevation Difference, H	85	ft
3.	Time of Concentration, T_c	0.055	h
4.	Lag time, $0.6T_c$	0.033	h
5.	SCS Curve Number	74	
6.	Rainfall Depth, 10-year, 24-hour storm	2.1	in.
	25-year, 6-hour storm	1.9	in.
7.	Drainage Area	10.7	acres

HYDRAULICS

The HEC-1 program was used to evaluate inflow to the planned 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.

N6-H HYDRAULICS

	Units	10-year 24-hour Storm	25-year 6-hour Storm
Initial Reservoir Volume Condition		Empty	Full to the spillway elevation
Inflow			
Peak Flow	cfs	7	8
Volume	acre-ft	0.35	--
Storage			
Peak Stage	ft	6475.62	--
Spillway Elevation . .	ft	6476.00	--
Peak Storage	acre-ft	0.35	--
Storage Capacity . . .	acre-ft	0.55	--
Outflow			
Peak Flow	cfs	0	2
Embankment Crest Elevation	ft	--	6477.50
Peak Stage	ft	--	6476.27
Freeboard	ft	--	1.23
Spillway Channel			
Flow Depth	ft	--	0.27
Critical Velocity. . .	fps	--	1.6
Manning's "n"		--	0.035
Outflow Channel			
Slope	%	--	4
Normal Velocity. . . .	fps	--	1.6
Normal Depth	ft	--	0.08
Manning's "n"		--	0.035

Spillway Channel

The spillway for N6-H will be a trapezoidal channel with the following dimensions:

Channel depth	1.3	ft
Channel width	15	ft
Channel length	30	ft
Side slopes (horizontal to vertical). .	3:1	
Average exit slope	0	percent

Outflow Channel

The outflow channel for Structure N6-H will be a trapezoidal channel with the following dimensions:

Channel width	15	ft
Channel length	25	ft
Side slopes (horizontal to vertical). .	3:1	
Average exit slope	4	percent

The alignment of the spillway and outflow channel are shown on Plate 1. The channel profile is shown on Plate 3 and the required dimensions are shown on Plate 4. Both the spillway and outflow channel should be protected against erosion using geotextile and gravel as shown on Plate 4.

STORAGE CAPACITY

The impoundment volume-elevation curve shown on Plate 2, Volume-Elevation Curve, N6-H is based on site specific topographic data developed for Peabody Coal Company in 1985, and 1985 site specific surveys, where available.

The calculations for the sediment load entering Structure N6-H were made utilizing the Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.227
3. Slope Factor, LS 3.38
4. Cover Factor, C 0.135
5. Erosion Control Factor, P 1.0

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. The storage capacity of N6-H is shown on Plate 2, Volume-Elevation Curve, N6-H, and the results of the sediment inflow analysis are summarized in the following table.

N6-H STORAGE

Total Storage Capacity	0.55	acre-ft
10-year, 24-hour Storm Inflow	0.35	acre-ft
Available Sediment Storage Capacity . .	0.20	acre-ft
Sediment Inflow Rate	0.021	acre-ft/yr
Sediment Storage Life	10	yrs

* * *

The following plates and appendix are attached and complete this design report.

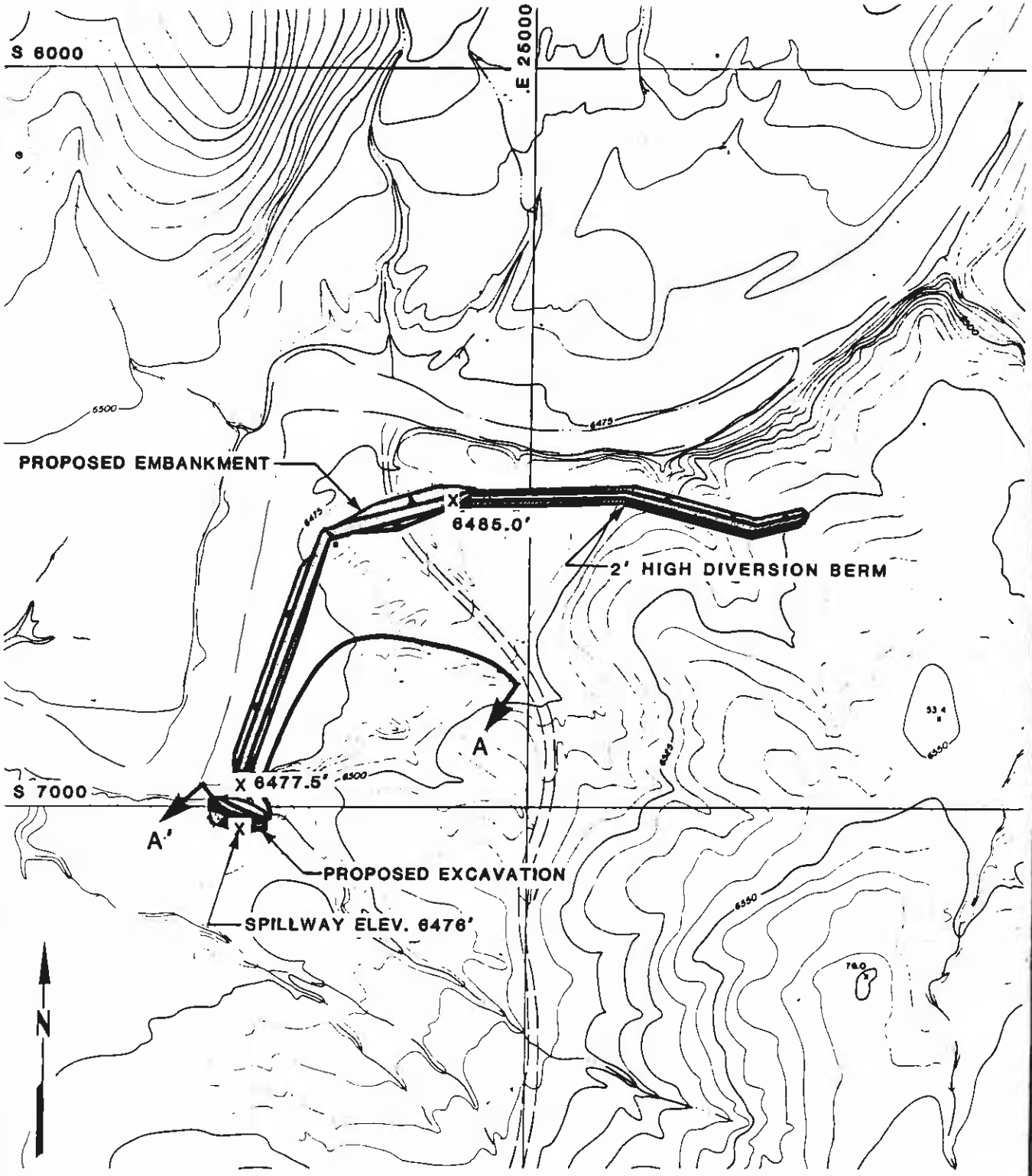
Plate 1 - Site Plan N6-H

Plate 2 - Volume-Elevation Curve N6-H

Plate 3 - Channel Profile N6-H, A-A'

Plate 4 - Spillway and Outflow Channel Cross Section N6-H

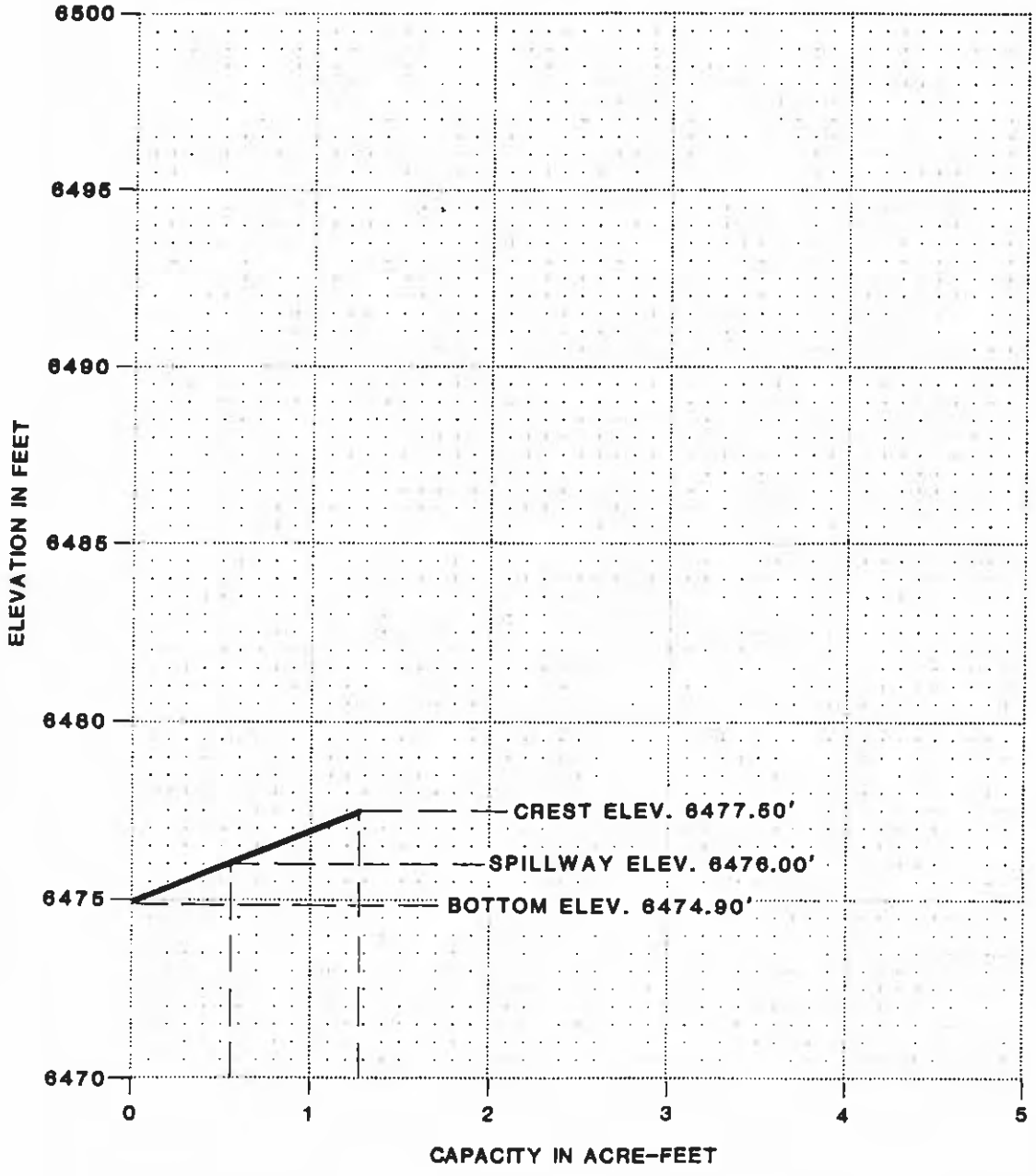
Appendix A - Hydrology and Hydraulic Calculations



SCALE
0 100 200
FEET

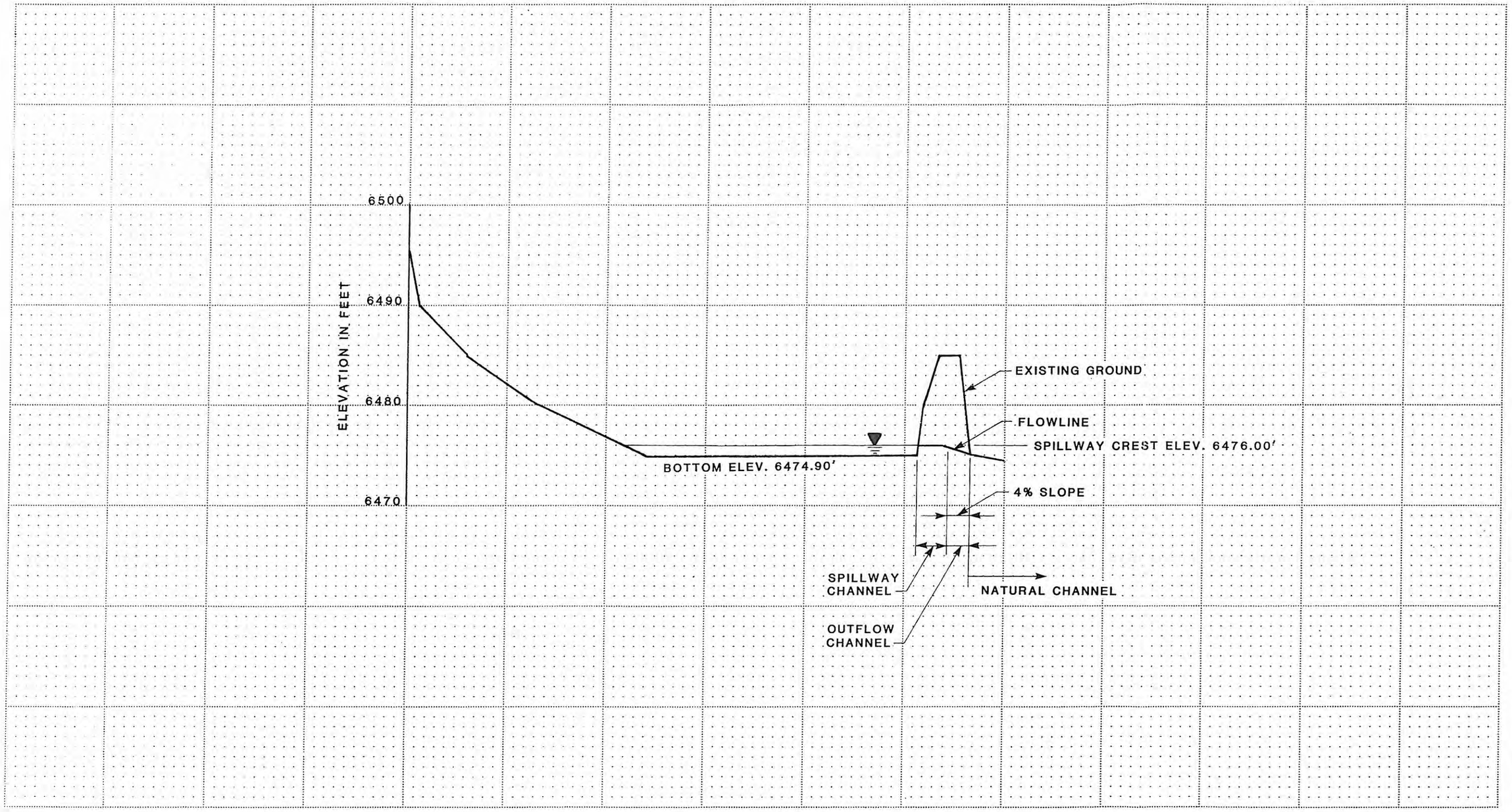
SITE PLAN
N6-H

BY **Dames & Moore** Plate 1



VOLUME-ELEVATION CURVE N6-H

BY **Dames & Moore** Plate 2

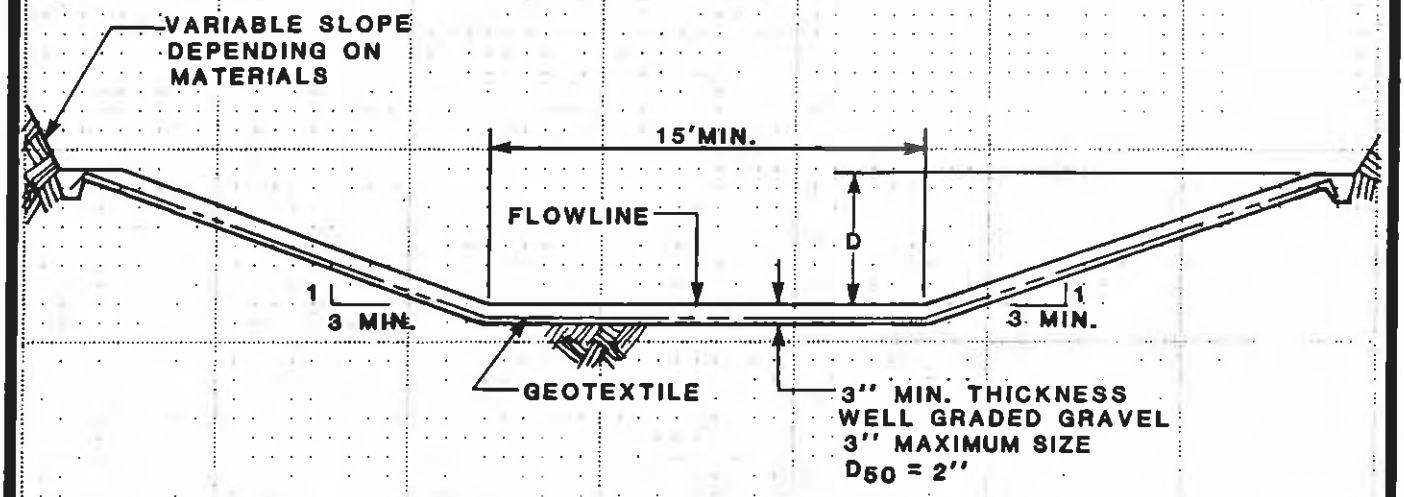


SCALE
0 100 200
FEET

CHANNEL PROFILE A-A'
N6-H

FOR LOCATION SEE PLATE 1

BY **Dames & Moore** Plate 3



SPILLWAY CHANNEL

D = 1.3'

LENGTH = 30'

FLOWLINE ELEV.= 6476.00'

OUTFLOW CHANNEL

D = 1.0'

SPILLWAY AND OUTFLOW CHANNEL CROSS SECTION N6-H

BY **Dames & Moore** Plate 4

APPENDIX A

HYDROLOGY AND HYDRAULIC CALCULATIONS

FILE Peabody Coal Co. 10139-011-22
SUBJECT Sediment Pond Hydrology
N6-H SHEET ___ OF ___

REVISIONS BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

Time of Concentration

Elevation Difference = 85'

Water Course Length = 820' = .155 mi

T_c = ~~0.055~~ .054 hr

Lag Time = $0.6 T_c$ = ~~0.033~~ .032 hr

SCS Curve Number

Drainage Area (ac)	Cover Type	Hydrologic Condition	Soil Type	Weighted Curve Number
.6	reclaimed (post law)	—	—	81 (.05)
3.8	P-J	ave	C	78 (.36)
6.3	S-G	ave	20% B 80% C	[.2(60) + .8(73)] (.59)
				73.7

use 74

Drainage Basin Area

10.7 acre ~~0.0168~~ 0.0167 sq mile

BY ___ DATE ___
CHECKED BY RHM DATE 11/5/85
COPY TO EO ___

Dames & Moore

FILE PEABODY COAL CO 10139-011-22
SUBJECT SEDIMENT INFLOW
NG-H SHEET ___ OF ___

REVISIONS BY ___ DATE ___ TO EO ___ BY ___ DATE ___ TO EO ___

UNIVERSAL SOIL LOSS EQUATION

RAINFALL FACTOR

R = 40

SOIL ERODIBILITY FACTOR

SOIL TYPE =	5%	EH #35	(.42)(.05)
	85%	EH #28	(.20)(.85)
	10%	EH #27	(.36)(.10)
			0.227 ✓

K = 0.227

SLOPE FACTOR

LENGTH (ft.)	Δ ELEV (ft.)	SLOPE (%)	LS
600	60	10%	3.38 ✓

COVER FACTOR

AREA (ac)	COVER TYPE	% COVER	CANOPY (%)	WEIGHTED C
5%	reclaimed	—	—	.15 (.05)
36%	P-J	40	25	.36 (.14)
59%	S-G	40	25	.59 (.13)
				0.135 ✓

EROSION CONTROL FACTOR

P = 1.0

SEDIMENT INFLOW

$A = 40(.227)(3.38)(0.135)(1.0) = 4.14$ ton/acre/year ✓

$A = 4.14\left(\frac{1}{2047}\right)(10.7)(.95) = 0.021$ acre-feet/year ✓

BY ___ DATE ___ CHECKED BY BHM 11/5/85 COPY TO EO ___

Dames & Moore

DESIGN REPORT

Sedimentation Structure
N6-I
Black Mesa Mine
Navajo County, Arizona

PEABODY COAL COMPANY

Registered Professional Engineer (Civil)
CERTIFICATE NO.
2099
R. G. GREGORY
Date Signed
ARIZONA, U.S.A.

JAN 3 0 1989

JAN 3 1 1989

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    Storage Capacity.....4

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PLATE 4 - Emergency Spillway Typical Cross Section

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APPENDIX B - SEDCAD+ (Input and Output) 10-Year, 24-Hour
APPENDIX C - SEDCAD+ (Input and Output) 25-Year, 6-Hour

JAN 31 1989

Introduction

Sedimentation Structure N6-I will be an earthen embankment, designed and constructed by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from disturbed areas of the Black Mesa Mine. The location of Structure N6-I is shown on Plate 1, Site Plan, Drawing No. 85400 (Sheet K-7), and Drawing No. 85405.

This design report contains information specific to Structure N6-I. Regional site information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody 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.

Inspection

The proposed site of Structure N6-I was inspected by a compliance engineer from Peabody Coal Company in August, 1988 to ensure that the site is suitable and no adverse conditions exist to prevent the successful construction of the structure. A detailed geotechnical investigation was not performed, rather the information in Chapter 6, Attachment D will be utilized for embankment design during construction.

Site Description

Land Use

Structure N6-I has a 98-acre tributary drainage area and is located on a tributary of Coal Mine Wash at the Black Mesa Mine. The watershed is classified as 15 percent Pinon/Juniper, 7 percent Sage-grass, 21 reclaimed, and 57 disturbed.

Embankment

A homogeneous earthen embankment, a minimum of fifteen feet wide, was assumed for the hydraulic analysis and to develop the stage-capacity chart shown on Plate 2. An upstream slope of 3:1 (horizontal to vertical) and a downstream slope of 4:1 were used. The assumed slopes were not specifically evaluated for geotechnical considerations such as slope stability since the foundation or embankment material types have not been determined. The assumed slopes were selected on the basis of Table 3-6, Attachment "D", of the Black Mesa PAP. The slopes selected are conservative for the design height of embankment based on the results of the aforementioned generalized stability analysis. The incised portion of the structure will be excavated at 3:1 (horizontal to vertical) slopes.

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Design Analyses

General

Structure N6-I was designed by a compliance engineer from Peabody 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 Coal Company files includes topographic maps developed from aerial photography flown in 1984 for Peabody Coal Company and was used in the analyses of the structure.

Stability

The slopes of Structure N6-I will be chosen based on the stability analyses performed for existing structures in the General Report. The embankment fill materials and the type of foundation will be identified in the field during construction and stable slopes will be chosen based on the category classification of the structure.

Hydrology

The hydrologic analysis was completed using the generalized computer program SEDCAD+ (see Appendix A, B, and C). Structure N6-I is not in series with any other structure nor does the structure fall under the guidelines of the 30 CFR Section 77.216 for MSHA size structures. Therefore, the spillway was analyzed using the 25-year, 6-hour storm. The storage capacity of Structure N6-I was analyzed using the 10-year, 24-hour storm.

The following parameters were used in the hydrologic analysis:

1. Water Course length, L	0.490 mi
2. Elevation Difference, H	129 ft
3. Time of Concentration, Tc	0.322 hr
4. SCS Curve Number	88
5. Rainfall Depth, 10-year, 24-hour storm	2.1 in
25-year, 6-hour storm	1.9 in
6. Drainage Area	98.0 ac

Hydraulics

The SEDCAD+ program was used to evaluate inflow to the planned 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.

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N6-I HYDRAULICS

	Units	10-Year 24-Hour Storm	25-Year 6-Hour Storm
Initial Reservoir Volume Condition		Empty	Full to the spillway elevation
Inflow			
Peak Flow	cfs	70.9	83.2
Volume	acre-ft	8.5	7.2
Storage			
Peak Stage	ft	6529.0	6533.0
Spillway Elevation. . .	ft	6532.0	--
Peak Storage. . . .	acre-ft	8.5	--
Storage Capacity .	acre-ft	12.4	--
Outflow			
Peak Flow	cfs	0	63.7
Embankment Crest Elevation	ft	--	6535.0
Peak Stage	ft	--	6533.0
Freeboard	ft	--	2.0
Spillway Channel			
Flow Depth	ft	--	1.0
Critical Velocity. . .	fps	--	3.96
Manning's "n".		--	0.044
Outflow Channel			
Slope.	%	--	25.0
Normal Velocity. . . .	fps	--	7.1
Normal Depth	ft	--	0.3
Manning's "n".		--	0.044

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Emergency Spillway Channel

The emergency spillway channel for N6-I will be a trapezoidal channel with the following dimensions:

Channel Depth (Spillway)	3.0 ft.
(Outflow)	2.0 ft.
Channel Width	30 ft.
Channel Length (Spillway)	28 ft.
(Outflow)	175 ft.
Side Slopes (Horizontal to Vertical)	3:1 or flatter
Average Exit Slope (Spillway)	0 percent
(Outlfow)	25 percent
Inlet Elevation	6532.0

Storage Capacity

The impoundment volume-elevation curve is based on site specific surveys conducted for Peabody Coal Company's August 1984 inspection, and 1985 resurveys, where available. Additionally, the most current topographic maps available were used in developing Plate 2, Volume-Elevation Curve, N6-I.

The calculations for the sediment load entering Structure N6-I were made utilizing the revised Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R	40
2. Soil Erodibility Factor, K	0.28
3. Slope Factor, LS	5.36
4. Cover Factor, C	0.30
5. Erosion Control Factor, P	1.00

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. The proposed storage capacity of N6-I and the results of the sediment inflow analysis are summarized in the following table.

N6-I STORAGE

Total Storage Capacity	12.39 acre-ft
10-year, 24-hour Storm Inflow	8.54 acre-ft
Available Sediment Storage Capacity	3.85 acre-ft
Sediment Inflow Rate	0.820 acre-ft/yr
Sediment Storage Life	4.70 years

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The following plates and appendix are attached and complete this inspection report.

* * *

Plate 1 - Site Plan N6-I

Plate 2 - Stage-Capacity Chart

Plate 3 - Channel Profile N6-I, A-A'

Plate 4 - Emergency Spillway Typical Cross Section

Appendix A - Hydrology and Hydraulic Calculations

Appendix B - SEDCAD+ (Input and Output) 10-Year, 24-Hour Storm

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

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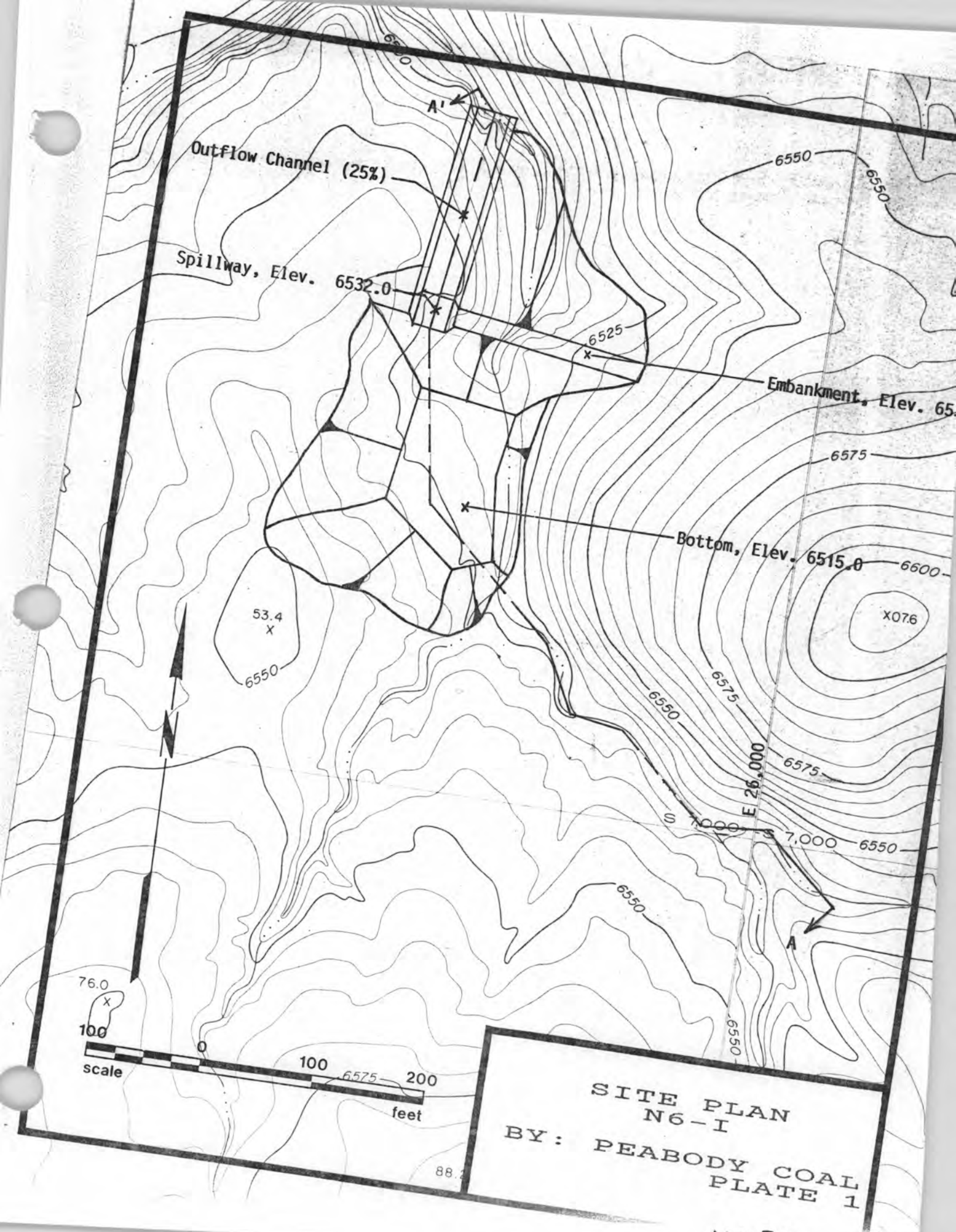
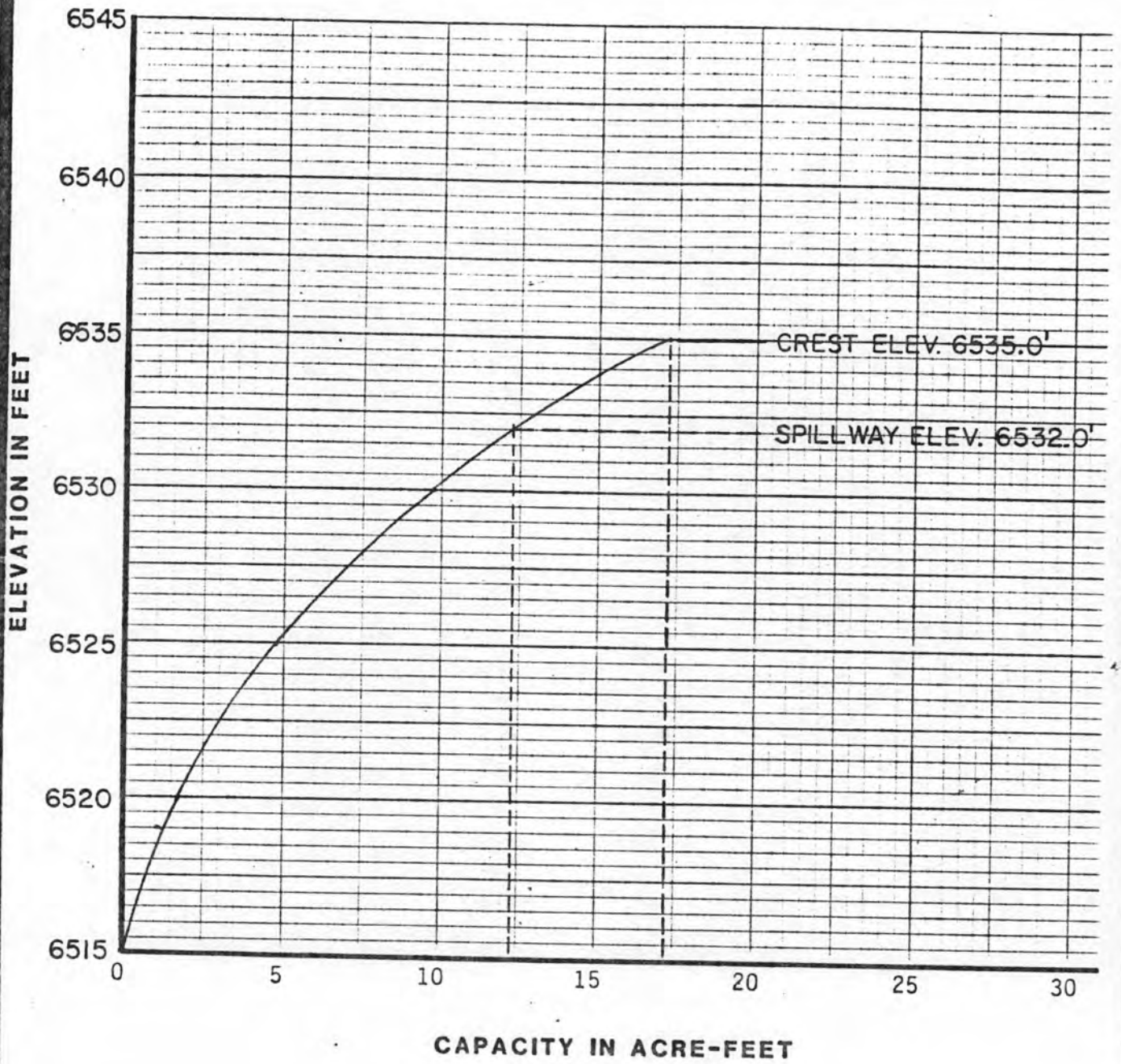


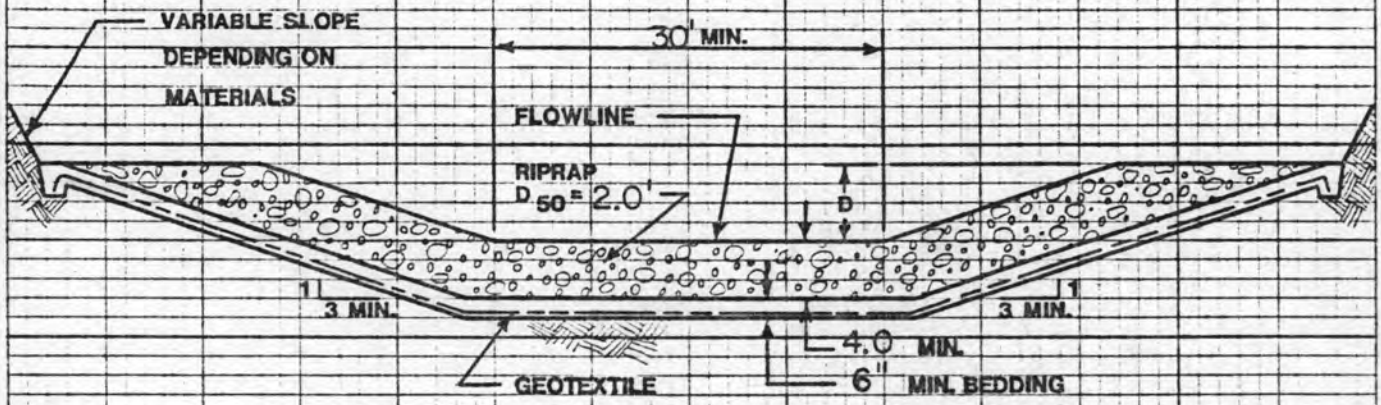
SITE PLAN
N6-I
BY: PEABODY COAL
PLATE 1



VOLUME-ELEVATION CURVE
N6-I

BY **PEABODY COAL CO.** Plate 2

JAN 31 1980



SPILLWAY CHANNEL

D = 3.0 ft
LENGTH = 28.0 ft
FLOWLINE ELEV. = 6532.0 ft-msl

OUTFLOW CHANNEL

D = 2.0 ft

SPILLWAY AND
OUTFLOW CHANNEL
CROSS SECTION
N6-I

BY **PEABODY COAL CO.** Plate 4

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APPENDIX A

HYDROLOGY AND HYDRAULIC CALCULATIONS N6-I

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N6-I

Hydrology and Hydraulic Calculations

Time of Concentration (T_c)

Overland Method (SEDCAD Utility)

Segment #1 = 2,690 ft. Horizontal
145 ft. Vertical

Near Bare, Overland, Land Use #5

T_c = 0.322 hrs.

USLE Calculation

$A = (R)(K)(LS)(C)(P)$

$R = 40$

$K = 0.28$

$LS = (L/72.6)^m(17.2 \sin \theta - 0.55)$

$= (420/72.6)^{0.6}(17.2 \sin(8.08\ ) - 0.55) = 5.36$

$C = 0.30$

$P = 1.00$

$A = (40)(0.28)(5.36)(0.30)(1.00) = 17.99$ tons/acre

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TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION
September 28, 1988

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	64.0
Manning's Roughness Coefficient (n-value).....	0.0440
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)...	3.00
Channel Bottom Width (feet).....	30.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Critical Depth (feet).....	0.51
Critical Slope (feet per foot).....	0.0361
Flow Velocity (feet per second).....	3.96
Froude Number.....	1.000
Velocity Head (feet).....	0.24
Energy Head (feet).....	0.76
Cross-Sectional Area of Flow (square feet).....	16.14
Top Width of Flow (feet).....	33.07

==========

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

JAN 31 1989

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
September 28, 1988

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	64.0
Channel Bottom Slope (feet per foot).....	0.2500
Manning's Roughness Coefficient (n-value).....	0.0440
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)...	3.00
Channel Bottom Width (feet).....	30.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	0.29
Flow Velocity (feet per second).....	7.21
Froude Number (Flow is Super-Critical).....	2.404
Velocity Head (feet).....	0.81
Energy Head (feet).....	1.10
Cross-Sectional Area of Flow (square feet).....	8.87
Top Width of Flow (feet).....	31.72

==========

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

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APPENDIX B

SEDCAD+ (Input and Output)
10-Year, 24-Hour Storm

JAN 31 1989

```
*****************************************************************************
*                                                                           *
*                              SEDCAD+(TM)                                  *
*          Sediment, Erosion, Discharge by Computer Aided Design            *
*                                                                           *
*                                  by                                       *
*                                                                           *
*                            Pamela J. Schwab                               *
*                           Civil Software Design                           *
*                              P.O. Box 11092                               *
*                        Lexington, Kentucky  40572                         *
*                                                                           *
*                         Version No. 2.15  (6/20/88)                       *
*                                                                           *
*    COPYRIGHT (c) 1987-1988 PAMELA J. SCHWAB.  ALL RIGHTS RESERVED.        *
*                                                                           *
*****************************************************************************
*                                                                           *
*    SEDCAD+(TM) Serial No. 194 has been Authorized and Released to:        *
*                                                                           *
*                  Peabody Coal Company                                     *
*                  1300 S. Yale                                             *
*                  Flagstaff, AZ  86001                                     *
*                  (602) 677-5289                                           *
*                                                                           *
*****************************************************************************
*                                                                           *
*    THE SEDCAD+ PROGRAM SYSTEM IS PROVIDED 'AS IS' WITHOUT WARRANTY OF ANY *
*    KIND, EITHER EXPRESS OR IMPLIED.  IN NO EVENT SHALL THE AUTHORS OR     *
*    CIVIL SOFTWARE DESIGN BE LIABLE FOR INCIDENTAL DAMAGES, CONSEQUENTIAL  *
*    DAMAGE, LOST PROFITS, LOST SAVINGS, OR ANY OTHER DAMAGES ARISING OUT   *
*    OF THE USE OR INABILITY TO USE THIS PROGRAM SYSTEM.                    *
*                                                                           *
*****************************************************************************

*****************************************************************************
*                                                                           *
*    Current Date and Time:          09-26-1988   15:32:26                  *
*    Computed Date and Time:         09-26-1988   15:31:27                  *
*    File Created By:                LGO                                    *
*    File Currently Being Printed:   [illegible]                            *
*                                                                           *
*****************************************************************************

************************* WATERSHED IDENTIFICATION **************************
*                                                                           *
* N6-1 WATERSHED (10YR-24HR)                                                *
*                                                                           *
*****************************************************************************

*****************************************************************************
*                                                                           *
*                  Storm Type          SCS TYPE 2                           *
*                  Rainfall Depth      [illegible] inches                   *
*                  Storm Duration      [illegible] hours                    *
*                                                                           *
*****************************************************************************
```

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WATERSHED NETWORK

JUNCTIONS	BRANCHES	STRUCTURES
1	1	1

SEDIMENTOLOGY INPUTS

Specific Gravity = 2.5

Submerged Bulk Specific Gravity = 1.25

PERCENT FINER DISTRIBUTIONS:

NO.	PARTICLE SIZE, (mm)	NO. 1
1	38.1000	100.00
2	4.7600	100.00
3	2.3800	100.00
4	1.1900	100.00
5	0.5900	100.00
6	0.2970	100.00
7	0.1490	100.00
8	0.0740	78.00
9	0.0370	53.00
10	0.0190	38.00
11	0.0090	30.00
12	0.0050	25.00
13	0.0020	19.00
14	0.0010	17.00
15	0.0001	0.00

BETWEEN STRUCTURE ROUTING PARAMETERS

J	B		TRAVEL TIME (hours)	MUSK. K (hours)	MUSK. X
1	1	Prior J or S to Structure 1	0.000	0.000	0.000

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<<< SEDCAD+ >>>
Peabody Coal Company

```
**********************************************
**********************************************
**                                          **
** JUNCTION  1 , BRANCH  1 , STRUCTURE  1   **
**          POND STRUCTURE                  **
**       N6-I                               **
**                                          **
**********************************************
**********************************************
```

```
*****************************************************************************
*                                                                           *
*                        SUBWATERSHED INFORMATION                           *
*                                                                           *
*****************************************************************************
*                                                                           *
*                        HYDRAULIC INPUT VALUES                             *
*                                                                           *
*        WATER   AREA    CURVE    TC     TT    ROUTING COEF'S  UNIT HYDRO   *
*        SHED   (acre)   NUMBER  (hr)   (hr)   K-(hr)    X      RESPONSE    *
*---------------------------------------------------------------------------*
*          1    98.00    88.00  0.322  0.000   0.000   0.000   MED         *
*                                                                           *
*                          SEDIMENT INPUT VALUES                            *
*                                                                           *
*            WATER   SEG     SOIL   LENGTH  SLOPE     CP     PART           *
*            SHED    NUM      K     (feet)   (%)     VALUE   OPT            *
*---------------------------------------------------------------------------*
*              1      1      0.28   420.0    14.5    0.300    1   (MUSLE)   *
*                                                                           *
*                                                                           *
*                COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS                  *
*                                                                           *
*                      PEAK FLOW   RUNOFF   SEDIMENT    D50                 *
*          WATERSHED    (cfs)    (inches)   (tons)     (mm)                *
*---------------------------------------------------------------------------*
*              1        70.861    1.046    1727.93    0.020                *
*                                                                           *
*****************************************************************************
```

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<<< SEDCAD+ >>>

--- Peabody Coal Company ---

```
*****************************************************************************
*                                                                           *
*                    JUNCTION  1 , BRANCH  1 , STRUCTURE  1                 *
*                         N6-I                                              *
*                         POND STRUCTURE INFORMATION                        *
*                                                                           *
*****************************************************************************
*                                                                           *
*   Time Increment of the Routed Hydrograph =     0.10 hours                *
*   Dead Space of Permanent Pool =               20.00 %                    *
*   Number of Continuous Stirred Reactors =       0                         *
*                                                                           *
*                                                                           *
*                      RIPRAP EMERGENCY SPILLWAY INPUTS                     *
*                                                                           *
*   Crest stage of the Emergency Spillway =       17.000 feet               *
*   Crest Length =                                28.000 feet               *
*   Width =                                       30.000 feet               *
*   Outslope factors:                                                       *
*     Slope =                                     25.00  %                  *
*     Side Slope Ratio =                           3.00:1                   *
*     Safety Factor =                              1.20                     *
*                                                                           *
*****************************************************************************
```

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<<< SEDCAD+ >>>
--- Peabody Coal Company ---

RESULTS TO N6-I

Total Drainage Area to This Point = 98.000 acres

Basin Trap Efficiency = 100.000 %

EMERGENCY SPILLWAY OUTSLOPE DESIGN:

Design Discharge =	54.602	cfs
Velocity =	6.782	fps
Depth of Flow =	0.246	feet
Manning's n =	0.042	
D50 Channel Bed =	1.522	feet
D50 Channel Bank =	1.054	feet

DETAILED STAGE-DISCHARGE INFORMATION

ELEVATION	STAGE (ft)	PSW #1 (cfs)	ESW (cfs)	TOTAL DISCHARGE (cfs)
6515.00	0.00	0.00	0.00	0.00
6515.50	0.50	0.00	0.00	0.00
6516.00	1.00	0.00	0.00	0.00
6516.50	1.50	0.00	0.00	0.00
6517.00	2.00	0.00	0.00	0.00
6517.50	2.50	0.00	0.00	0.00
6518.00	3.00	0.00	0.00	0.00
6518.50	3.50	0.00	0.00	0.00
6519.00	4.00	0.00	0.00	0.00
6519.50	4.50	0.00	0.00	0.00
6520.00	5.00	0.00	0.00	0.00
6520.50	5.50	0.00	0.00	0.00
6521.00	6.00	0.00	0.00	0.00
6521.50	6.50	0.00	0.00	0.00
6522.00	7.00	0.00	0.00	0.00
6522.50	7.50	0.00	0.00	0.00
6523.00	8.00	0.00	0.00	0.00
6523.50	8.50	0.00	0.00	0.00
6524.00	9.00	0.00	0.00	0.00
6524.50	9.50	0.00	0.00	0.00
6525.00	10.00	0.00	0.00	0.00
6525.50	10.50	0.00	0.00	0.00
6526.00	11.00	0.00	0.00	0.00
6526.50	11.50	0.00	0.00	0.00
6527.00	12.00	0.00	0.00	0.00
6527.50	12.50	0.00	0.00	0.00
6528.00	13.00	0.00	0.00	0.00
6528.50	13.50	0.00	0.00	0.00
6529.00	14.00	0.00	0.00	0.00
6529.50	14.50	0.00	0.00	0.00
6530.00	15.00	0.00	0.00	0.00

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*	6530.50	15.50	0.00	0.00	0.00	*
*	6531.00	16.00	0.00	0.00	0.00	*
*	6531.50	16.50	0.00	0.00	0.00	*
*	6532.00	17.00	0.00	0.00	0.00	*
*	6532.70	17.70	0.00	34.48	34.48	*
*	6532.80	17.80	0.00	44.57	44.57	*
*	6532.90	17.90	0.00	55.32	55.32	*
*	6533.00	18.00	0.00	67.18	67.18	*
*	6533.50	18.50	0.00	145.07	145.07	*
*	6534.00	19.00	0.00	236.89	236.89	*
*	6534.50	19.50	0.00	352.81	352.81	*
*	6535.00	20.00	0.00	492.90	492.90	*

****

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RESULTS TO N6-I
(continued)

INPUT AND CALCULATED BASIN GEOMETRY

ELEV-ATION	STAGE (ft)	AREA (ac)	DIS-CHARGE (cfs)	AVG. DEPTH (ft)	CAPACITY (ac-ft)	
6515.0	0.0	0.28	0.00	0.00	0.00	
6515.5	0.5	0.30	0.00	0.49	0.15	
6516.0	1.0	0.32	0.00	0.98	0.30	
6516.5	1.5	0.34	0.00	1.45	0.46	
6517.0	2.0	0.35	0.00	1.92	0.64	
6517.5	2.5	0.37	0.00	2.38	0.82	
6518.0	3.0	0.39	0.00	2.84	1.01	
6518.5	3.5	0.41	0.00	3.29	1.21	
6519.0	4.0	0.43	0.00	3.73	1.41	
6519.5	4.5	0.44	0.00	4.16	1.63	
6520.0	5.0	0.46	0.00	4.60	1.86	
6520.5	5.5	0.49	0.00	5.02	2.10	
6521.0	6.0	0.52	0.00	5.42	2.35	
6521.5	6.5	0.55	0.00	5.82	2.61	
6522.0	7.0	0.58	0.00	6.21	2.89	
6522.5	7.5	0.60	0.00	6.59	3.19	
6523.0	8.0	0.63	0.00	6.96	3.50	
6523.5	8.5	0.66	0.00	7.33	3.82	
6524.0	9.0	0.69	0.00	7.69	4.16	
6524.5	9.5	0.72	0.00	8.05	4.51	
6525.0	10.0	0.75	0.00	8.41	4.88	
6525.5	10.5	0.79	0.00	8.75	5.27	
6526.0	11.0	0.84	0.00	9.09	5.67	
6526.5	11.5	0.88	0.00	9.41	6.10	
6527.0	12.0	0.93	0.00	9.73	6.56	
6527.5	12.5	0.97	0.00	10.03	7.03	
6528.0	13.0	1.02	0.00	10.34	7.53	
6528.5	13.5	1.06	0.00	10.64	8.05	
6529.0	14.0	1.11	0.00	10.93	8.59	
6529.5	14.5	1.15	0.00	11.23	9.16	
6530.0	15.0	1.20	0.00	11.52	9.75	
6530.5	15.5	1.26	0.00	11.80	10.36	
6531.0	16.0	1.32	0.00	12.08	11.01	
6531.5	16.5	1.38	0.00	12.35	11.68	
6532.0	17.0	1.45	0.00	12.62	12.39	EMERGENCY SPILLWAY
6532.7	17.7	1.53	34.48	12.99	13.43	
6532.8	17.8	1.54	44.57	13.04	13.59	
	17.9				13.73	PEAK STAGE
6532.9	17.9	1.56	55.32	13.09	13.74	
6533.0	18.0	1.57	67.18	13.14	13.90	
6533.5	18.5	1.63	145.07	13.40	14.70	
6534.0	19.0	1.69	236.50	13.65	15.53	
6534.5	19.5	1.75	352.81	13.91	16.39	

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```
*   6535.0  20.0   1.82          492.90  14.17   17.28                          *
*                                                                                *
*        RUNOFF     PEAK     PEAK SEDIMENT  PEAK SETTLEABLE  SEDIMENT           *
*        VOLUME  DISCHARGE  CONCENTRATION   CONCENTRATION     YIELD             *
*        (ac-ft)   (cfs)       (mg/l)          (ml/l)         (tons)            *
*--------------------------------------------------------------------------------*
*  IN     8.545   70.861     242632.59        115.258       1727.93             *
*  OUT    8.546   54.602          0.00          0.000          0.00             *
*                                                                                *
*                                                                                *
*                                   AVERAGE SETTLEABLE CONCENTRATION:            *
*            TIME OF      VOLUME WEIGHTED DURING     ARITHMETIC DURING           *
*          SIGNIFICANT      TIME OF      PEAK          TIME OF      PEAK         *
*          CONCENTRATION   SIGN. CONC.  24 HOUR       SIGN. CONC.  24 HOUR        *
*            (hrs)           (ml/l)     (ml/l)          (ml/l)     (ml/l)        *
*--------------------------------------------------------------------------------*
*     IN      16.70          65.37      65.37          29.30      20.39          *
*     OUT      0.00           0.00       0.00           0.00       0.00          *
*                                                                                *
**********************************************************************************
```

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<<< SEDCAD+ >>>
--- Peabody Coal Company ---

JUNCTION 1 , BRANCH 1 , STRUCTURE 1
N6-I
HYDROGRAPH (AND SEDIMENTGRAPH) OUT OF THE STRUCTURE

HYDROGRAPH (AND SEDIMENTGRAPH)

Time (hr)	Discharge (cfs)	Sed Disch (mg/l)	Time (hr)	Discharge (cfs)	Sed Disch (mg/l)
0.00	0.000	0.000	0.10	0.000	0.000
0.20	0.000	0.000	0.30	0.000	0.000
0.40	0.000	0.000	0.50	0.000	0.000
0.60	0.000	0.000	0.70	0.000	0.000
0.80	0.000	0.000	0.90	0.000	0.000
1.00	0.000	0.000	1.10	0.000	0.000
1.20	0.000	0.000	1.30	0.000	0.000
1.40	0.000	0.000	1.50	0.000	0.000
1.60	0.000	0.000	1.70	0.000	0.000
1.80	0.000	0.000	1.90	0.000	0.000
2.00	0.000	0.000	2.10	0.000	0.000
2.20	0.000	0.000	2.30	0.000	0.000
2.40	0.000	0.000	2.50	0.000	0.000
2.60	0.000	0.000	2.70	0.000	0.000
2.80	0.000	0.000	2.90	0.000	0.000
3.00	0.000	0.000	3.10	0.000	0.000
3.20	0.000	0.000	3.30	0.000	0.000
3.40	0.000	0.000	3.50	0.000	0.000
3.60	0.000	0.000	3.70	0.000	0.000
3.80	0.000	0.000	3.90	0.000	0.000
4.00	0.000	0.000	4.10	0.000	0.000
4.20	0.000	0.000	4.30	0.000	0.000
4.40	0.000	0.000	4.50	0.000	0.000
4.60	0.000	0.000	4.70	0.000	0.000
4.80	0.000	0.000	4.90	0.000	0.000
5.00	0.000	0.000	5.10	0.000	0.000
5.20	0.000	0.000	5.30	0.000	0.000
5.40	0.000	0.000	5.50	0.000	0.000
5.60	0.000	0.000	5.70	0.000	0.000
5.80	0.000	0.000	5.90	0.000	0.000
6.00	0.000	0.000	6.10	0.000	0.000
6.20	0.000	0.000	6.30	0.000	0.000
6.40	0.000	0.000	6.50	0.000	0.000
6.60	0.000	0.000	6.70	0.000	0.000
6.80	0.000	0.000	6.90	0.000	0.000
7.00	0.000	0.000	7.10	0.000	0.000
7.20	0.000	0.000	7.30	0.000	0.000
7.40	0.000	0.000	7.50	0.000	0.000
7.60	0.000	0.000	7.70	0.000	0.000
7.80	0.000	0.000	7.90	0.000	0.000
8.00	0.000	0.000	8.10	0.000	0.000
8.20	0.000	0.000	8.30	0.000	0.000
8.40	0.000	0.000	8.50	0.000	0.000
8.60	0.000	0.000	8.70	0.000	0.000

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* 8.80	0.012	0.000	8.90	0.027	0.000	*
* 9.00	0.046	0.000	9.10	0.070	0.000	*
* 9.20	0.100	0.000	9.30	0.134	0.000	*
* 9.40	0.175	0.000	9.50	0.219	0.000	*
* 9.60	0.267	0.000	9.70	0.319	0.000	*
* 9.80	0.377	0.000	9.90	0.440	0.000	*
* 10.00	0.507	0.000	10.10	0.576	0.000	*
* 10.20	0.655	0.000	10.30	0.747	0.000	*
* 10.40	0.853	0.000	10.50	0.965	0.000	*
* 10.60	1.083	0.000	10.70	1.217	0.000	*
* 10.80	1.380	0.000	10.90	1.570	0.000	*
* 11.00	1.772	0.000	11.10	1.986	0.000	*
* 11.20	2.245	0.000	11.30	2.588	0.000	*
* 11.40	3.003	0.000	11.50	3.451	0.000	*
* 11.60	4.228	0.000	11.70	6.463	0.000	*
* 11.80	11.480	0.000	11.90	19.266	0.000	*
* 12.00	28.708	0.000	12.10	41.000	0.000	*
* 12.20	52.686	0.000	12.30	54.602	0.000	*
* 12.40	50.096	0.000	12.50	44.166	0.000	*
* 12.60	39.517	0.000	12.70	35.825	0.000	*
* 12.80	33.204	0.000	12.90	30.927	0.000	*
* 13.00	28.482	0.000	13.10	26.029	0.000	*
* 13.20	23.607	0.000	13.30	21.214	0.000	*
* 13.40	18.934	0.000	13.50	16.894	0.000	*
* 13.60	15.174	0.000	13.70	13.735	0.000	*
* 13.80	12.481	0.000	13.90	11.384	0.000	*
* 14.00	10.452	0.000	14.10	9.677	0.000	*
* 14.20	9.004	0.000	14.30	8.371	0.000	*
* 14.40	7.774	0.000	14.50	7.240	0.000	*
* 14.60	6.788	0.000	14.70	6.415	0.000	*
* 14.80	6.107	0.000	14.90	5.852	0.000	*
* 15.00	5.642	0.000	15.10	5.471	0.000	*
* 15.20	5.333	0.000	15.30	5.222	0.000	*
* 15.40	5.133	0.000	15.50	5.065	0.000	*
* 15.60	5.013	0.000	15.70	4.975	0.000	*
* 15.80	4.948	0.000	15.90	4.929	0.000	*
* 16.00	4.916	0.000	16.10	4.895	0.000	*
* 16.20	4.829	0.000	16.30	4.685	0.000	*
* 16.40	4.479	0.000	16.50	4.260	0.000	*
* 16.60	4.058	0.000	16.70	3.883	0.000	*
* 16.80	3.731	0.000	16.90	3.599	0.000	*
* 17.00	3.484	0.000	17.10	3.384	0.000	*
* 17.20	3.299	0.000	17.30	3.226	0.000	*
* 17.40	3.166	0.000	17.50	3.118	0.000	*
* 17.60	3.081	0.000	17.70	3.053	0.000	*
* 17.80	3.033	0.000	17.90	3.018	0.000	*
* 18.00	3.007	0.000	18.10	2.999	0.000	*
* 18.20	2.993	0.000	18.30	2.990	0.000	*
* 18.40	2.987	0.000	18.50	2.986	0.000	*
* 18.60	2.985	0.000	18.70	2.985	0.000	*
* 18.80	2.986	0.000	18.90	2.987	0.000	*
* 19.00	2.988	0.000	19.10	2.989	0.000	*
* 19.20	2.990	0.000	19.30	2.992	0.000	*
* 19.40	2.993	0.000	19.50	2.995	0.000	*
* 19.60	2.997	0.000	19.70	2.999	0.000	*
* 19.80	3.000	0.000	19.90	3.002	0.000	*
* 20.00	3.004	0.000	20.10	3.000	0.000	*
* 20.20	2.970	0.000	20.30	2.899	0.000	*
* 20.40	2.796	0.000	20.50	2.685	0.000	*
* 20.60	2.583	0.000	20.70	2.493	0.000	*

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* 20.80	2.416	0.000	20.90	2.348	0.000	*
* 21.00	2.289	0.000	21.10	2.238	0.000	*
* 21.20	2.194	0.000	21.30	2.157	0.000	*
* 21.40	2.126	0.000	21.50	2.101	0.000	*
* 21.60	2.082	0.000	21.70	2.067	0.000	*
* 21.80	2.057	0.000	21.90	2.049	0.000	*
* 22.00	2.043	0.000	22.10	2.038	0.000	*
* 22.20	2.035	0.000	22.30	2.033	0.000	*
* 22.40	2.032	0.000	22.50	2.031	0.000	*
* 22.60	2.030	0.000	22.70	2.030	0.000	*
* 22.80	2.030	0.000	22.90	2.030	0.000	*
* 23.00	2.030	0.000	23.10	2.031	0.000	*
* 23.20	2.031	0.000	23.30	2.032	0.000	*
* 23.40	2.033	0.000	23.50	2.033	0.000	*
* 23.60	2.034	0.000	23.70	2.035	0.000	*
* 23.80	2.035	0.000	23.90	2.036	0.000	*
* 24.00	2.037	0.000	24.10	2.025	0.000	*
* 24.20	1.963	0.000	24.30	1.816	0.000	*
* 24.40	1.603	0.000	24.50	1.375	0.000	*
* 24.60	1.165	0.000	24.70	0.982	0.000	*
* 24.80	0.822	0.000	24.90	0.682	0.000	*
* 25.00	0.560	0.000	25.10	0.455	0.000	*
* 25.20	0.364	0.000	25.30	0.286	0.000	*
* 25.40	0.222	0.000	25.50	0.169	0.000	*
* 25.60	0.129	0.000	25.70	0.098	0.000	*
* 25.80	0.074	0.000	25.90	0.056	0.000	*
* 26.00	0.043	0.000	26.10	0.033	0.000	*
* 26.20	0.025	0.000	26.30	0.019	0.000	*
* 26.40	0.014	0.000	26.50	0.011	0.000	*
* 26.60	0.008	0.000	26.70	0.006	0.000	*
* 26.80	0.005	0.000	26.90	0.004	0.000	*
* 27.00	0.003	0.000	27.10	0.002	0.000	*
* 27.20	0.002	0.000	27.30	0.001	0.000	*
*						*

****

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*** RUN COMPLETED ***

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APPENDIX C

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

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*****************************************************************************
*                                                                           *
*                              SEDCAD+(TM)                                  *
*          Sediment, Erosion, Discharge by Computer Aided Design            *
*                                                                           *
*                                  by                                       *
*                                                                           *
*                            Pamela J. Schwab                               *
*                           Civil Software Design                           *
*                              P.O. Box 11092                               *
*                         Lexington, Kentucky  40572                        *
*                                                                           *
*                          Version No. 2.15  (6/20/88)                      *
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*****************************************************************************
*                                                                           *
*   Current Date and Time:            09-26-1988   15:37:58                 *
*   Computed Date and Time:           09-26-1988   15:31:42                 *
*   File Created By:                  LGO                                   *
*   File Currently Being Printed:     C:N6-I                                *
*                                                                           *
*****************************************************************************

************************* WATERSHED IDENTIFICATION **************************
*                                                                           *
* N6-I WATERSHED (10YR-24HR)                                                *
*                  (SECOND EMERGENCY SPILLWAY RUN)                          *
*                                                                           *
*****************************************************************************

******************************** STORM INPUT ********************************
*                                                                           *
*                  Storm Type:          SCS TYPE 2                          *
*                  Rainfall Depth       4.9 inches                          *
*                  Storm Duration       6.0 hours                           *
*                                                                           *
*****************************************************************************
```

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********** WATERSHED NETWORK **********

JUNCTIONS	BRANCHES	STRUCTURES
1	1	1

********** SEDIMENTOLOGY INPUTS **********

Specific Gravity = 2.5

Submerged Bulk Specific Gravity = 1.25

PERCENT FINER DISTRIBUTIONS:

NO.	PARTICLE SIZE, (mm)	NO. 1
1	38.1000	100.00
2	4.7600	100.00
3	2.3800	100.00
4	1.1900	100.00
5	0.5900	100.00
6	0.2970	100.00
7	0.1490	100.00
8	0.0740	78.00
9	0.0370	53.00
10	0.0190	38.00
11	0.0090	30.00
12	0.0050	25.00
13	0.0020	19.00
14	0.0010	17.00
15	0.0001	0.00

********** BETWEEN STRUCTURE ROUTING PARAMETERS **********

J	B		TRAVEL TIME (hours)	MUSK. K (hours)	MUSK. X
1	1	Prior J or S to Structure 1	0.000	0.000	0.000

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*****************************************
*****************************************
**                                     **
** JUNCTION  1 , BRANCH  1 , STRUCTURE  1 **
**          POND STRUCTURE             **
**       N6-I                          **
**                                     **
*****************************************
*****************************************
```

SUBWATERSHED INFORMATION

HYDRAULIC INPUT VALUES

WATER SHED	AREA (acre)	CURVE NUMBER	TC (hr)	TT (hr)	ROUTING COEF'S K-(hr)	X	UNIT HYDRO RESPONSE
1	98.00	88.00	0.322	0 000	0.000	0.000	MED

SEDIMENT INPUT VALUES

WATER SHED	SEG NUM	SOIL K	LENGTH (feet)	SLOPE (%)	CP VALUE	PART OPT	
1	1	0.28	420.0	14.5	0.300	1	(MUSLE)

COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS

WATERSHED	PEAK FLOW (cfs)	RUNOFF (inches)	SEDIMENT (tons)	D50 (mm)
1	83.184	0.885	1721.38	0.018

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*****************************************************************************
*                                                                           *
*                    JUNCTION  1 , BRANCH  1 , STRUCTURE  1                 *
*                         N6-I                                              *
*                         POND STRUCTURE INFORMATION                        *
*                                                                           *
*****************************************************************************
*                                                                           *
*   Time Increment of the Routed Hydrograph =      0.10 hours              *
*   Dead Space of Permanent Pool =                20.00 %                  *
*   Number of Continuous Stirred Reactors =        0                       *
*                                                                           *
*                                                                           *
*                      RIPRAP EMERGENCY SPILLWAY INPUTS                     *
*                                                                           *
*   Crest stage of the Emergency Spillway =        17.000 feet             *
*   Crest Length =                                 28.000 feet             *
*   Width =                                        30.000 feet             *
*   Outslope factors:                                                      *
*     Slope =                                      25.00  %                *
*     Side Slope Ratio =                            3.00:1                 *
*     Safety Factor =                               1.20                   *
*                                                                           *
*****************************************************************************
```

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RESULTS TO N6-I

Total Drainage Area to This Point = 98.000 acres

Basin Trap Efficiency = 100.000 %

EMERGENCY SPILLWAY OUTSLOPE DESIGN:

Design Discharge =	63.716 cfs
Velocity =	7.120 fps
Depth of Flow =	0.272 feet
Manning's n =	0.043
D50 Channel Bed =	1.694 feet
D50 Channel Bank =	1.168 feet

DETAILED STAGE-DISCHARGE INFORMATION

ELEVATION	STAGE (ft)	PSW #1 (cfs)	ESW (cfs)	TOTAL DISCHARGE (cfs)
6515.00	0.00	0.00	0.00	0.00
6515.50	0.50	0.00	0.00	0.00
6516.00	1.00	0.00	0.00	0.00
6516.50	1.50	0.00	0.00	0.00
6517.00	2.00	0.00	0.00	0.00
6517.50	2.50	0.00	0.00	0.00
6518.00	3.00	0.00	0.00	0.00
6518.50	3.50	0.00	0.00	0.00
6519.00	4.00	0.00	0.00	0.00
6519.50	4.50	0.00	0.00	0.00
6520.00	5.00	0.00	0.00	0.00
6520.50	5.50	0.00	0.00	0.00
6521.00	6.00	0.00	0.00	0.00
6521.50	6.50	0.00	0.00	0.00
6522.00	7.00	0.00	0.00	0.00
6522.50	7.50	0.00	0.00	0.00
6523.00	8.00	0.00	0.00	0.00
6523.50	8.50	0.00	0.00	0.00
6524.00	9.00	0.00	0.00	0.00
6524.50	9.50	0.00	0.00	0.00
6525.00	10.00	0.00	0.00	0.00
6525.50	10.50	0.00	0.00	0.00
6526.00	11.00	0.00	0.00	0.00
6526.50	11.50	0.00	0.00	0.00
6527.00	12.00	0.00	0.00	0.00
6527.50	12.50	0.00	0.00	0.00
6528.00	13.00	0.00	0.00	0.00
6528.50	13.50	0.00	0.00	0.00
6529.00	14.00	0.00	0.00	0.00
6529.50	14.50	0.00	0.00	0.00
6530.00	15.00	0.00	0.00	0.00

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*	6530.50	15.50	0.00	0.00	0.00	*
*	6531.00	16.00	0.00	0.00	0.00	*
*	6531.50	16.50	0.00	0.00	0.00	*
*	6532.00	17.00	0.00	0.00	0.00	*
*	6532.70	17.70	0.00	34.48	34.48	*
*	6532.80	17.80	0.00	44.57	44.57	*
*	6532.90	17.90	0.00	55.32	55.32	*
*	6533.00	18.00	0.00	67.18	67.18	*
*	6533.50	18.50	0.00	145.07	145.07	*
*	6534.00	19.00	0.00	236.89	236.89	*
*	6534.50	19.50	0.00	352.81	352.81	*
*	6535.00	20.00	0.00	492.90	492.90	*

****

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RESULTS TO N6-I
(continued)

INPUT AND CALCULATED BASIN GEOMETRY

ELEV-ATION	STAGE (ft)	AREA (ac)	DIS-CHARGE (cfs)	AVG. DEPTH (ft)	CAPACITY (ac-ft)	
6515.0	0.0	0.28	0.00	0.00	0.00	
6515.5	0.5	0.30	0.00	0.49	0.15	
6516.0	1.0	0.32	0.00	0.98	0.30	
6516.5	1.5	0.34	0.00	1.45	0.46	
6517.0	2.0	0.35	0.00	1.92	0.64	
6517.5	2.5	0.37	0.00	2.38	0.82	
6518.0	3.0	0.39	0.00	2.84	1.01	
6518.5	3.5	0.41	0.00	3.29	1.21	
6519.0	4.0	0.43	0.00	3.73	1.41	
6519.5	4.5	0.44	0.00	4.16	1.63	
6520.0	5.0	0.46	0.00	4.60	1.86	
6520.5	5.5	0.49	0.00	5.02	2.10	
6521.0	6.0	0.52	0.00	5.42	2.35	
6521.5	6.5	0.55	0.00	5.82	2.61	
6522.0	7.0	0.58	0.00	6.21	2.89	
6522.5	7.5	0.60	0.00	6.59	3.19	
6523.0	8.0	0.63	0.00	6.96	3.50	
6523.5	8.5	0.66	0.00	7.33	3.82	
6524.0	9.0	0.69	0.00	7.69	4.16	
6524.5	9.5	0.72	0.00	8.05	4.51	
6525.0	10.0	0.75	0.00	8.41	4.88	
6525.5	10.5	0.79	0.00	8.75	5.27	
6526.0	11.0	0.84	0.00	9.09	5.67	
6526.5	11.5	0.88	0.00	9.41	6.10	
6527.0	12.0	0.93	0.00	9.73	6.56	
6527.5	12.5	0.97	0.00	10.03	7.03	
6528.0	13.0	1.02	0.00	10.34	7.53	
6528.5	13.5	1.06	0.00	10.64	8.05	
6529.0	14.0	1.11	0.00	10.93	8.59	
6529.5	14.5	1.15	0.00	11.23	9.16	
6530.0	15.0	1.20	0.00	11.52	9.75	
6530.5	15.5	1.26	0.00	11.80	10.36	
6531.0	16.0	1.32	0.00	12.08	11.01	
6531.5	16.5	1.38	0.00	12.35	11.68	
6532.0	17.0	1.45	0.00	12.62	12.39	EMERGENCY SPILLWAY
6532.7	17.7	1.53	34.48	12.99	13.43	
6532.8	17.8	1.54	44.57	13.04	13.59	
6532.9	17.9	1.56	55.32	13.09	13.74	
	18.0				13.85	PEAK STAGE
6533.0	18.0	1.57	67.18	13.14	13.90	
6533.5	18.5	1.63	145.07	13.40	14.70	
6534.0	19.0	1.69	236.37	13.63	15.53	
6534.5	19.5	1.75	352.01	13.91	16.39	

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```
*    6535.0  20.0   1.82          492.90  14.17   17.28                    *
*                                                                           *
*        RUNOFF    PEAK     PEAK SEDIMENT  PEAK SETTLEABLE  SEDIMENT       *
*        VOLUME  DISCHARGE  CONCENTRATION   CONCENTRATION    YIELD         *
*        (ac-ft)   (cfs)       (mg/l)          (ml/l)        (tons)         *
*---------------------------------------------------------------------------*
*  IN     7.230   83.184     234324.00        107.674       1721.38         *
*  OUT    7.231   63.716          0.00          0.000          0.00         *
*                                                                           *
*                                                                           *
*                              AVERAGE SETTLEABLE CONCENTRATION:            *
*            TIME OF      VOLUME WEIGHTED DURING     ARITHMETIC DURING      *
*          SIGNIFICANT     TIME OF      PEAK          TIME OF      PEAK     *
*          CONCENTRATION  SIGN. CONC.  24 HOUR       SIGN. CONC.  24 HOUR    *
*            (hrs)          (ml/l)     (ml/l)          (ml/l)     (ml/l)    *
*---------------------------------------------------------------------------*
*    IN        5.10          74.29      74.29          42.36       9.00     *
*    OUT       0.00           0.00       0.00           0.00       0.00     *
*                                                                           *
*****************************************************************************
```

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<<< SEDCAD+ >>>

--- Peabody Coal Company ---

JUNCTION 1 , BRANCH 1 , STRUCTURE 1

N6-I

HYDROGRAPH (AND SEDIMENTGRAPH) OUT OF THE STRUCTURE

HYDROGRAPH (AND SEDIMENTGRAPH)

Time (hr)	Discharge (cfs)	Sed Disch (mg/l)	Time (hr)	Discharge (cfs)	Sed Disch (mg/l)
0.00	0.000	0.000	0.10	0.000	0.000
0.20	0.000	0.000	0.30	0.000	0.000
0.40	0.000	0.000	0.50	0.000	0.000
0.60	0.000	0.000	0.70	0.000	0.000
0.80	0.000	0.000	0.90	0.000	0.000
1.00	0.000	0.000	1.10	0.000	0.000
1.20	0.000	0.000	1.30	0.000	0.000
1.40	0.000	0.000	1.50	0.000	0.000
1.60	0.000	0.000	1.70	0.000	0.000
1.80	0.000	0.000	1.90	0.000	0.000
2.00	0.000	0.000	2.10	0.000	0.000
2.20	0.000	0.000	2.30	0.009	0.000
2.40	0.055	0.000	2.50	0.173	0.000
2.60	0.617	0.000	2.70	2.399	0.000
2.80	7.095	0.000	2.90	15.404	0.000
3.00	26.675	0.000	3.10	42.405	0.000
3.20	59.404	0.000	3.30	63.716	0.000
3.40	58.845	0.000	3.50	52.134	0.000
3.60	46.917	0.000	3.70	42.953	0.000
3.80	39.057	0.000	3.90	35.020	0.000
4.00	32.653	0.000	4.10	30.409	0.000
4.20	28.042	0.000	4.30	25.559	0.000
4.40	23.088	0.000	4.50	20.818	0.000
4.60	18.875	0.000	4.70	17.227	0.000
4.80	15.768	0.000	4.90	14.470	0.000
5.00	13.357	0.000	5.10	12.425	0.000
5.20	11.606	0.000	5.30	10.825	0.000
5.40	10.080	0.000	5.50	9.409	0.000
5.60	8.839	0.000	5.70	8.367	0.000
5.80	7.976	0.000	5.90	7.652	0.000
6.00	7.386	0.000	6.10	7.129	0.000
6.20	6.756	0.000	6.30	6.153	0.000
6.40	5.376	0.000	6.50	4.573	0.000
6.60	3.847	0.000	6.70	3.223	0.000
6.80	2.685	0.000	6.90	2.219	0.000
7.00	1.817	0.000	7.10	1.470	0.000
7.20	1.173	0.000	7.30	0.922	0.000
7.40	0.714	0.000	7.50	0.545	0.000
7.60	0.414	0.000	7.70	0.314	0.000
7.80	0.239	0.000	7.90	0.181	0.000
8.00	0.138	0.000	8.10	0.105	0.000
8.20	0.079	0.000	8.30	0.060	0.000
8.40	0.046	0.000	8.50	0.035	0.000
8.60	0.026	0.000	8.70	0.020	0.000

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8.80	0.015	0.000	8.90	0.012	0.000	
9.00	0.009	0.000	9.10	0.007	0.000	
9.20	0.005	0.000	9.30	0.004	0.000	
9.40	0.003	0.000	9.50	0.002	0.000	
9.60	0.002	0.000	9.70	0.001	0.000	

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<<< SEDCAD+ >>>

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*** RUN COMPLETED ***

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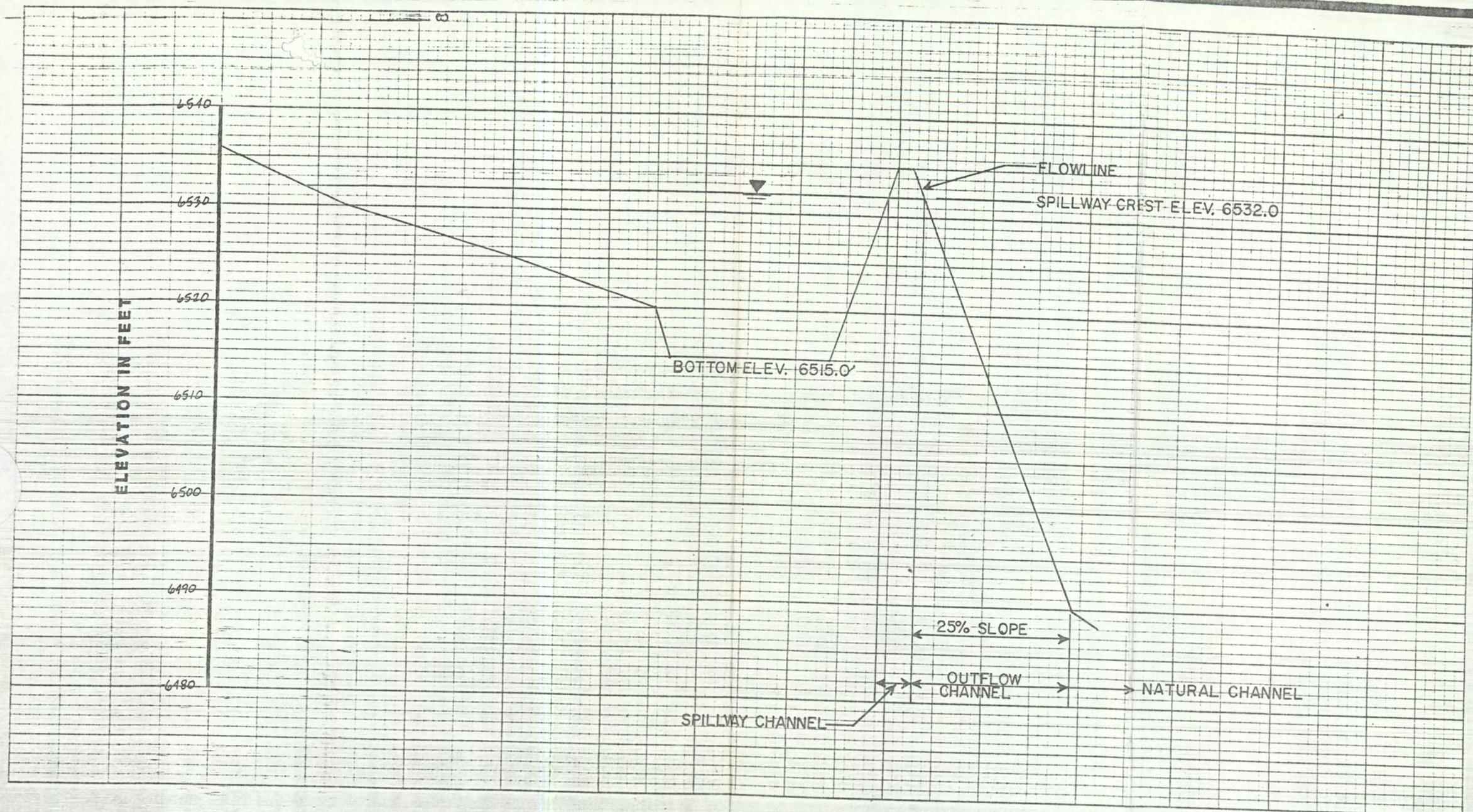

CHANNEL PROFILE A-A'

N6-I

Scale : 1"=100'

SEE PLATE 1 FOR LOCATION

BY **PEABODY COAL CO.** Plate 3

DESIGN REPORT

Sedimentation Structure
N6-J
Black Mesa Mine
Navajo County, Arizona

PEABODY COAL COMPANY

Registered Professional Engineer
CERTIFICATE NO. 20930
GREGORY
OHRN
Date Signed
ARIZONA, U.S.A.

JAN 3 0 1989

JAN 3 1 1989

TABLE OF CONTENTS

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Introduction.....1
Inspection.....1
Site Description.....1
    Land Use.....1
    Embankment.....1
Design Analyses.....2
    General.....2
    Stability.....2
    Hydrology.....2
    Hydraulics.....3
    Emergency Spillway Channel.....4
    Storage Capacity.....4

PLATE 1 - Site Plan
PLATE 2 - Stage-Capacity Chart
PLATE 3 - Channel Profile A-A'
PLATE 4 - Emergency Spillway Typical Cross Section

APPENDIX A - Hydrology and Hydraulic Calculations
APPENDIX B - SEDCAD+ (Input and Output) 10-Year, 24-Hour
APPENDIX C - SEDCAD+ (Input and Output) 25-Year, 6-Hour

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Introduction

Sedimentation Structure N6-J will be an earthen embankment, designed and constructed by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from disturbed areas of the Black Mesa Mine. The location of Structure N6-J is shown on Plate 1, Site Plan, Drawing No. 85400 (Sheet K-7), and Drawing No. 85405.

This design report contains information specific to Structure N6-J. Regional site information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody 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.

Inspection

The proposed site of Structure N6-J was inspected by a compliance engineer from Peabody Coal Company in August, 1988 to ensure that the site is suitable and no adverse conditions exist to prevent the successful construction of the structure. A detailed geotechnical investigation was not performed, rather the information in Chapter 6, Attachment D will be utilized for embankment design during construction.

Site Description

Land Use

Structure N6-J has a 98-acre tributary drainage area and is located on a tributary of Coal Mine Wash at the Black Mesa Mine. The watershed is classified as 40 percent Pinon/Juniper, 20 percent Sage-grass, and 40 percent disturbed.

Embankment

A homogeneous earthen embankment, a minimum of fifteen feet wide, was assumed for the hydraulic analysis and to develop the stage-capacity chart shown on Plate 2. An upstream slope of 3:1 (horizontal to vertical) and a downstream slope of 4:1 were used. The assumed slopes were not specifically evaluated for geotechnical considerations such as slope stability since the foundation or embankment material types have not been determined. The assumed slopes were selected on the basis of Table 3-6, Attachment "D", of the Black Mesa PAP. The slopes selected are conservative for the design height of embankment based on the results of the aforementioned generalized stability analysis. The incised portion of the structure will be excavated at 3:1 (horizontal to vertical) slopes.

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Design Analyses

General

Structure N6-J was designed by a compliance engineer from Peabody 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 Coal Company files includes topographic maps developed from aerial photography flown in 1984 for Peabody Coal Company and was used in the analyses of the structure.

Stability

The slopes of Structure N6-J will be chosen based on the stability analyses performed for existing structures in the General Report. The embankment fill materials and the type of foundation will be identified in the field during construction and stable slopes will be chosen based on the category classification of the structure.

Hydrology

The hydrologic analysis was completed using the generalized computer program SEDCAD+ (see Appendix A, B, and C). Structure N6-J is not in series with any other structure nor does the structure fall under the guidelines of the 30 CFR Section 77.216 for MSHA size structures. Therefore, the spillway was analyzed using the 25-year, 6-hour storm. The storage capacity of Structure N6-J was analyzed using the 10-year, 24-hour storm.

The following parameters were used in the hydrologic analysis:

1. Water Course length, L	0.300 mi
2. Elevation Difference, H	136 ft
3. Time of Concentration, Tc	0.117 hr
4. SCS Curve Number	83
5. Rainfall Depth, 10-year, 24-hour storm	2.1 in
25-year, 6-hour storm	1.9 in
6. Drainage Area	36.0 ac

Hydraulics

The SEDCAD+ program was used to evaluate inflow to the planned 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.

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N6-J HYDRAULICS

	Units	10-Year 24-Hour Storm	25-Year 6-Hour Storm
Initial Reservoir Volume Condition		Empty	Full to the spillway elevation
Inflow			
Peak Flow	cfs	30.0	38.1
Volume	acre-ft	2.3	1.9
Storage			
Peak Stage	ft	6515.1	6518.6
Spillway Elevation. . .	ft	6518.0	--
Peak Storage. . . .	acre-ft	2.3	--
Storage Capacity .	acre-ft	4.5	--
Outflow			
Peak Flow	cfs	0	19.8
Embankment Crest Elevation	ft	--	6520.0
Peak Stage	ft	--	6518.6
Freeboard	ft	--	1.4
Spillway Channel			
Flow Depth	ft	--	0.6
Critical Velocity. . .	fps	--	3.08
Manning's "n".		--	0.034
Outflow Channel			
Slope.	%	--	11.0
Normal Velocity. . . .	fps	--	4.84
Normal Depth	ft	--	0.2
Manning's "n".		--	0.034

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Emergency Spillway Channel

The emergency spillway channel for N6-J will be a trapezoidal channel with the following dimensions:

Channel Depth (Spillway)	2.0 ft.
(Outflow)	2.0 ft.
Channel Width	20 ft.
Channel Length (Spillway)	29 ft.
(Outflow)	205 ft.
Side Slopes (Horizontal to Vertical)	3:1 or flatter
Average Exit Slope (Spillway)	0 percent
(Outlfow)	11 percent
Inlet Elevation	6518.0

Storage Capacity

The impoundment volume-elevation curve is based on site specific surveys conducted for Peabody Coal Company's August 1984 inspection, and 1985 resurveys, where available. Additionally, the most current topographic maps available were used in developing Plate 2, Volume-Elevation Curve, N6-J.

The calculations for the sediment load entering Structure N6-J were made utilizing the revised Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R	40
2. Soil Erodibility Factor, K	0.36
3. Slope Factor, LS	3.50
4. Cover Factor, C.	0.25
5. Erosion Control Factor, P.	1.00

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. The proposed storage capacity of N6-J and the results of the sediment inflow analysis are summarized in the following table.

N6-J STORAGE

Total Storage Capacity	4.54 acre-ft
10-year, 24-hour Storm Inflow	2.29 acre-ft
Available Sediment Storage Capacity	2.25 acre-ft
Sediment Inflow Rate	0.210 acre-ft/yr
Sediment Storage Life	10.68 years

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The following plates and appendix are attached and complete this inspection report.

* * *

Plate 1 - Site Plan N6-J

Plate 2 - Stage-Capacity Chart

Plate 3 - Channel Profile N6-J, A-A'

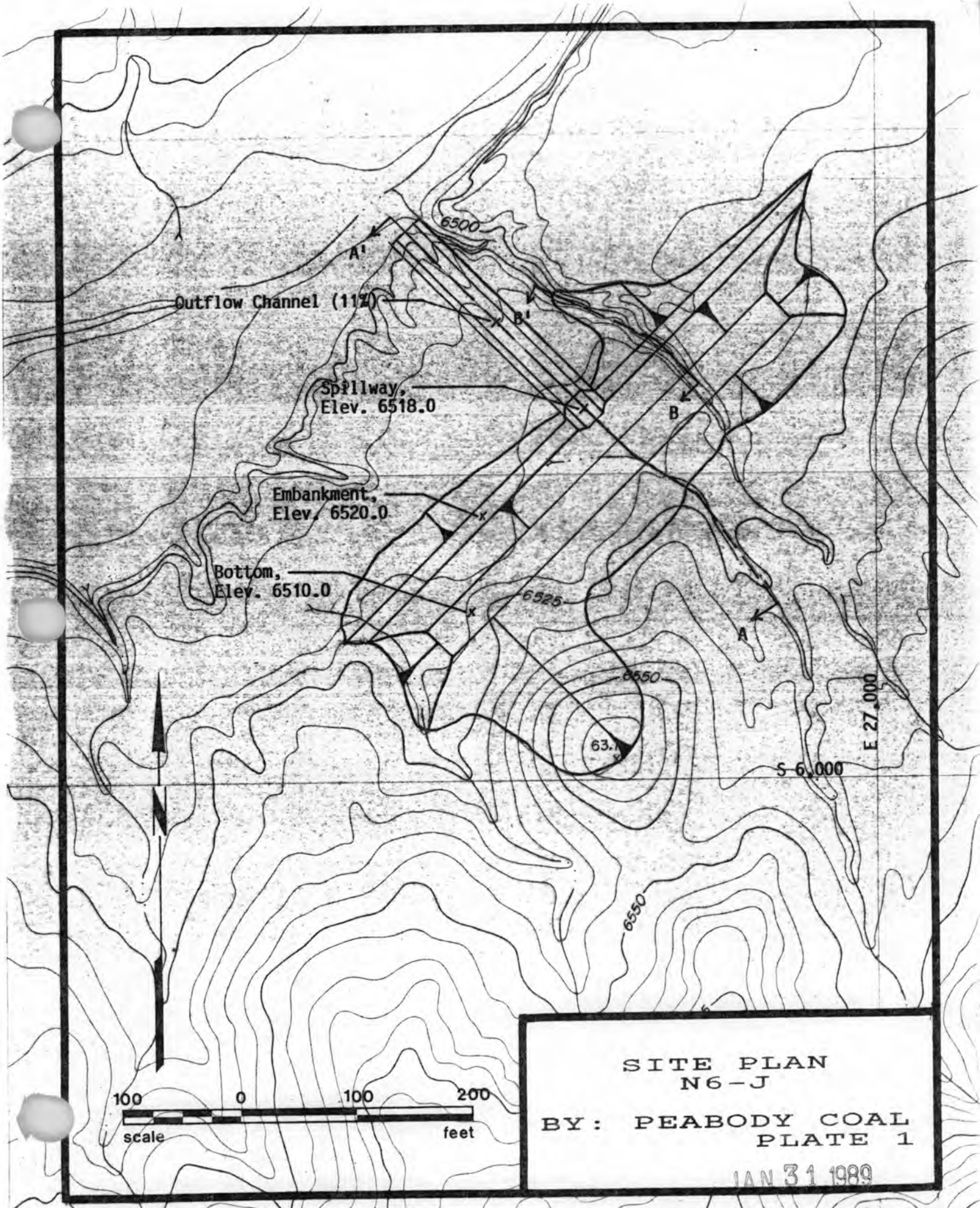
Plate 4 - Emergency Spillway Typical Cross Section

Appendix A - Hydrology and Hydraulic Calculations

Appendix B - SEDCAD+ (Input and Output) 10-Year, 24-Hour Storm

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

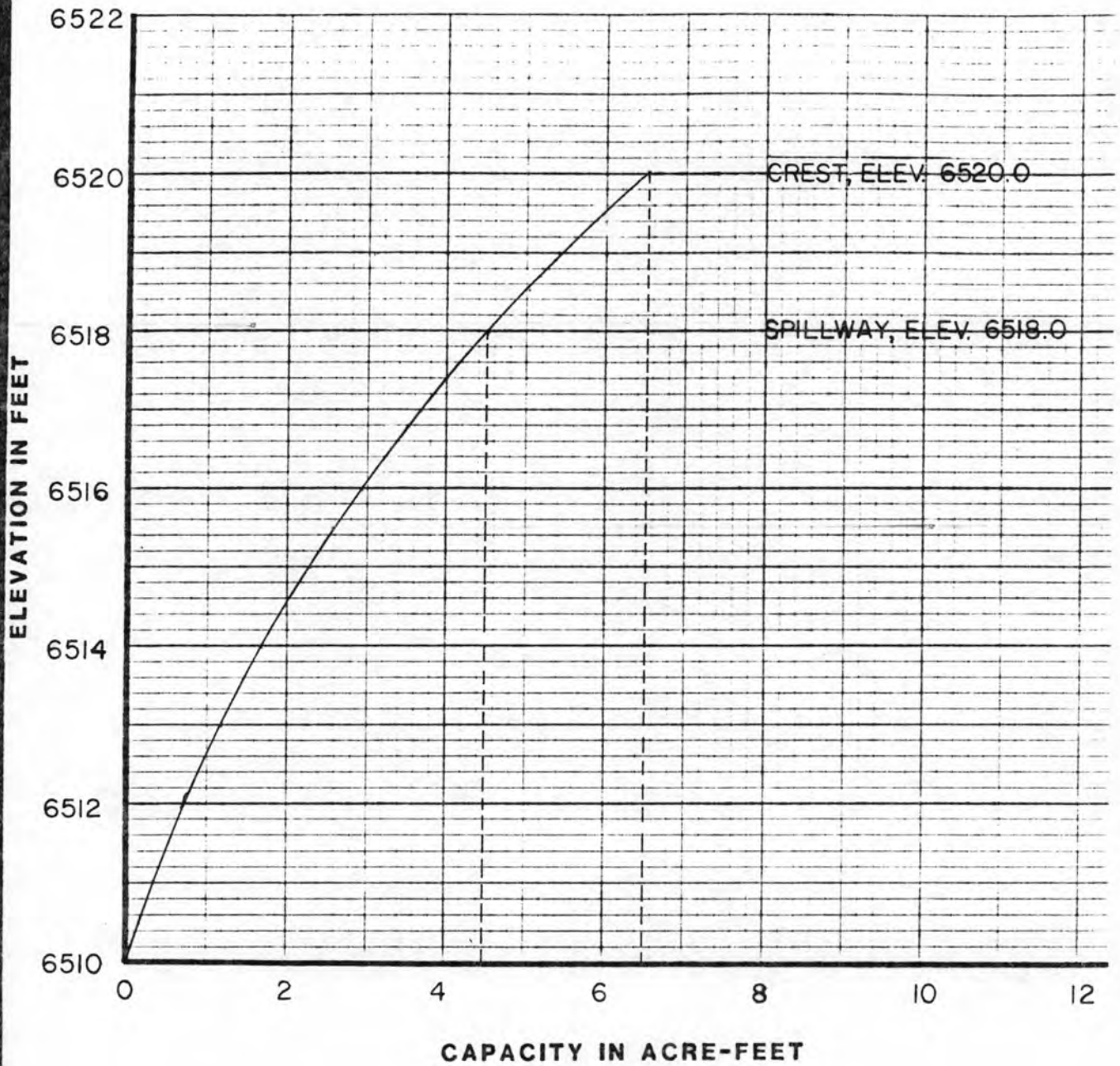
JAN 31 1989



SITE PLAN
N6-J

BY: PEABODY COAL
PLATE 1

JAN 31 1989

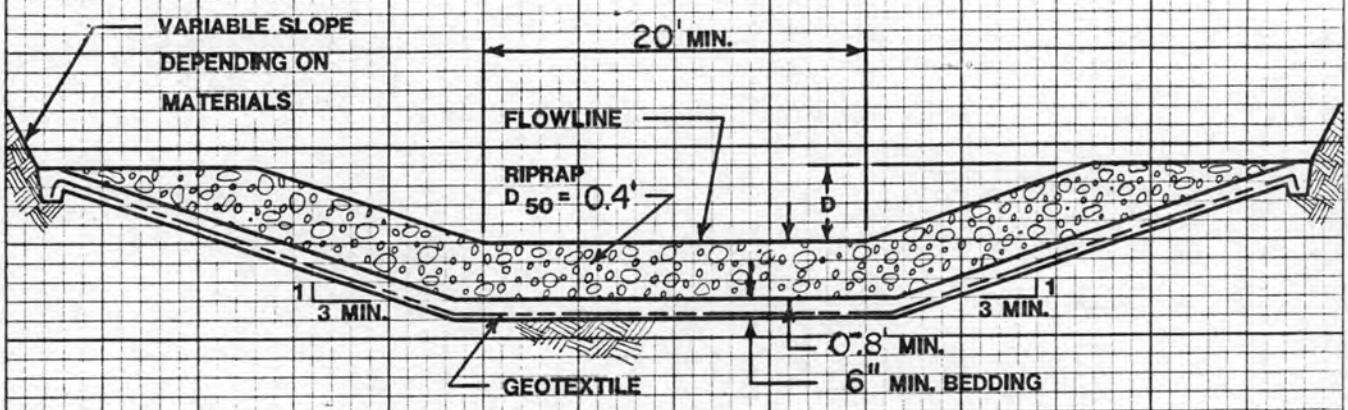


VOLUME-ELEVATION CURVE

N6-J

JAN 31 1989

BY **PEABODY COAL CO.** Plate 2



SPILLWAY CHANNEL

D = 2.0 ft

LENGTH = 29.0 ft

FLOWLINE ELEV. = 6518.0 ft-msl

OUTFLOW CHANNEL

D = 2.0 ft

SPILLWAY AND OUTFLOW CHANNEL CROSS SECTION

N6—J

BY **PEABODY COAL CO.** Plate 4

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APPENDIX A

HYDROLOGY AND HYDRAULIC CALCULATIONS N6-J

JAN 31 1989

N6-J

Hydrology and Hydraulic Calculations

Time of Concentration (T_c)

Overland Method (SEDCAD Utility)

Segment #1 = 880 ft. Horizontal
100 ft. Vertical

Near Bare, Overland, Land Use #5

Segment #2 - 800 ft. Horizontal
50 ft. Vertical

Upland Gullies, Land Use #7

T_c = 0.117 hrs.

USLE Calculation

$A = (R)(K)(LS)(C)(P)$

$R = 40$

$K = 0.36$

$LS = (L/72.6)^m(17.2 \sin \theta - 0.55)$

$= (660/72.6)^{0.5}(17.2 \sin(5.71\ ) - 0.55) = 3.50$

$C = 0.25$

$P = 1.00$

$A = (40)(0.36)(3.50)(0.25)(1.00) = 12.61$ tons/acre

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TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION
October 31, 1988

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	19.8
Manning's Roughness Coefficient (n-value).....	0.0340
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)...	3.00
Channel Bottom Width (feet).....	20.0

PROGRAM RESULTS:

DESCRIPTION	VALUE
Critical Depth (feet).....	0.31
Critical Slope (feet per foot).....	0.0255
Flow Velocity (feet per second).....	3.08
Froude Number.....	1.000
Velocity Head (feet).....	0.15
Energy Head (feet).....	0.45
Cross-Sectional Area of Flow (square feet).....	6.43
Top Width of Flow (feet).....	21.94

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

JAN 31 1989

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
October 31, 1988

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	19.8
Channel Bottom Slope (feet per foot).....	0.1100
Manning's Roughness Coefficient (n-value).....	0.0340
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)...	3.00
Channel Bottom Width (feet).....	20.0

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	0.20
Flow Velocity (feet per second).....	4.84
Froude Number (Flow is Super-Critical).....	1.940
Velocity Head (feet).....	0.36
Energy Head (feet).....	0.56
Cross-Sectional Area of Flow (square feet).....	4.09
Top Width of Flow (feet).....	21.19

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

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APPENDIX B

SEDCAD+ (Input and Output)
10-Year, 24-Hour Storm

JAN 31 1989

```
*****************************************************************************
*                                                                           *
*                              SEDCAD+(TM)                                  *
*          Sediment, Erosion, Discharge by Computer Aided Design            *
*                                                                           *
*                                  by                                       *
*                                                                           *
*                            Pamela J. Schwab                               *
*                          Civil Software Design                            *
*                             P.O. Box 11092                                *
*                        Lexington, Kentucky  40572                         *
*                                                                           *
*                        Version No. 2.15  (6/20/88)                        *
*                                                                           *
*    COPYRIGHT (c) 1987-1988 PAMELA J. SCHWAB.  ALL RIGHTS RESERVED.        *
*                                                                           *
*****************************************************************************
*                                                                           *
*    SEDCAD+(TM) Serial No. 194 has been Authorized and Released to:        *
*                                                                           *
*                 Peabody Coal Company                                      *
*                 1300 S. Yale                                              *
*                 Flagstaff, AZ  86001                                      *
*                 (602) 677-5289                                            *
*                                                                           *
*****************************************************************************
*                                                                           *
*   THE SEDCAD+ PROGRAM SYSTEM IS PROVIDED 'AS IS' WITHOUT WARRANTY OF ANY  *
*   KIND, EITHER EXPRESS OR IMPLIED.  IN NO EVENT SHALL THE AUTHORS OR      *
*   CIVIL SOFTWARE DESIGN BE LIABLE FOR INCIDENTAL DAMAGES, CONSEQUENTIAL   *
*   DAMAGE, LOST PROFITS, LOST SAVINGS, OR ANY OTHER DAMAGES ARISING OUT    *
*   OF THE USE OR INABILITY TO USE THIS PROGRAM SYSTEM.                     *
*                                                                           *
*****************************************************************************

*****************************************************************************
*                                                                           *
*   Current Date and Time:            10-31-1988   11:10:49                 *
*   Computed Date and Time:           10-31-1988   11:10:06                 *
*   File Created By:                  LGO                                   *
*   File Currently Being Printed:     C:N6-J                                *
*                                                                           *
*****************************************************************************

************************** WATERSHED IDENTIFICATION **************************
*                                                                           *
* N6-J                                                                      *
*                                                                           *
*****************************************************************************

********************************** STORM INPUT ***********************************
*                                                                           *
*                 Storm Type          SCS TYPE 2                            *
*                 Rainfall Depth       2.1 inches                           *
*                 Storm Duration      24.0 hours                            *
*                                                                           *
*****************************************************************************
```

<<< SEDCAD+ >>>

JAN 31 1989

WATERSHED NETWORK

JUNCTIONS	BRANCHES	STRUCTURES
1	1	1

SEDIMENTOLOGY INPUTS

Specific Gravity = 2.5

Submerged Bulk Specific Gravity = 1.25

PERCENT FINER DISTRIBUTIONS:

NO.	PARTICLE SIZE, (mm)	NO. 1
1	38.0000	100.00
2	4.7000	100.00
3	2.3800	100.00
4	1.1900	99.00
5	0.5900	98.00
6	0.2970	96.00
7	0.1490	90.00
8	0.0740	81.00
9	0.0370	69.00
10	0.0190	53.00
11	0.0090	44.00
12	0.0050	36.00
13	0.0020	26.00
14	0.0010	22.00
15	0.0001	0.00

BETWEEN STRUCTURE ROUTING PARAMETERS

J	B		TRAVEL TIME (hours)	MUSK. K (hours)	MUSK. X
1	1	Prior J or S to Structure 1	0.000	0.000	0.000

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<<< SEDCAD+ >>>

--- Peabody Coal Company ---

```
**********************************************
**********************************************
**                                          **
**  JUNCTION  1 , BRANCH  1 , STRUCTURE  1  **
**            POND STRUCTURE                **
**        N6-J                              **
**                                          **
**********************************************
**********************************************
```

```
*****************************************************************************
*                                                                           *
*                        SUBWATERSHED INFORMATION                           *
*                                                                           *
*****************************************************************************
*                                                                           *
*                        HYDRAULIC INPUT VALUES                             *
*                                                                           *
*        WATER   AREA    CURVE    TC     TT    ROUTING COEF'S  UNIT HYDRO   *
*        SHED   (acre)   NUMBER  (hr)   (hr)   K-(hr)    X      RESPONSE   *
*---------------------------------------------------------------------------*
*          1    36.00    83.00  0.117  0.000   0.000   0.000   INSTANT    *
*                                                                           *
*                          SEDIMENT INPUT VALUES                            *
*                                                                           *
*            WATER   SEG     SOIL   LENGTH  SLOPE    CP     PART           *
*            SHED    NUM      K     (feet)   (%)    VALUE   OPT            *
*---------------------------------------------------------------------------*
*              1      1      0.36   660.0    10.0   0.250    1   (RUSLE)   *
*                                                                           *
*                                                                           *
*              COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS                    *
*                                                                           *
*                      PEAK FLOW   RUNOFF   SEDIMENT    D50                 *
*          WATERSHED    (cfs)    (inches)   (tons)     (mm)                *
*---------------------------------------------------------------------------*
*              1       30.000    0.764     320.09    0.015                 *
*                                                                           *
*****************************************************************************
```

JAN 31 1989

<<< SEDCAD+ >>>

--- Peabody Coal Company ---

```
*****************************************************************************
*                                                                           *
*                    JUNCTION  1 , BRANCH  1 , STRUCTURE  1                 *
*                         N6-J                                              *
*                         POND STRUCTURE INFORMATION                        *
*                                                                           *
*****************************************************************************
*                                                                           *
*   Time Increment of the Routed Hydrograph =      0.10 hours              *
*   Dead Space of Permanent Pool =                40.00 %                  *
*   Number of Continuous Stirred Reactors =        0                       *
*                                                                           *
*                                                                           *
*                      RIPRAP EMERGENCY SPILLWAY INPUTS                     *
*                                                                           *
*   Crest stage of the Emergency Spillway =        8.000 feet              *
*   Crest Length =                                29.000 feet              *
*   Width =                                       20.000 feet              *
*   Outslope factors:                                                      *
*     Slope =                                     11.00  %                 *
*     Side Slope Ratio =                           3.00:1                  *
*     Safety Factor =                              1.20                    *
*                                                                           *
*****************************************************************************
```

JAN 31 1989

<<< SEDCAD+ >>>

--- Peabody Coal Company ---

RESULTS TO N6-J

Total Drainage Area to This Point = 36.000 acres

Basin Trap Efficiency = 100.000 %

EMERGENCY SPILLWAY OUTSLOPE DESIGN:

Design Discharge =	17.383 cfs
Velocity =	4.618 fps
Depth of Flow =	0.179 feet
Manning's n =	0.033
D50 Channel Bed =	0.362 feet
D50 Channel Bank =	0.325 feet

DETAILED STAGE-DISCHARGE INFORMATION

ELEVATION	STAGE (ft)	PSW #1 (cfs)	ESW (cfs)	TOTAL DISCHARGE (cfs)
6510.00	0.00	0.00	0.00	0.00
6510.50	0.50	0.00	0.00	0.00
6511.00	1.00	0.00	0.00	0.00
6511.50	1.50	0.00	0.00	0.00
6512.00	2.00	0.00	0.00	0.00
6512.50	2.50	0.00	0.00	0.00
6513.00	3.00	0.00	0.00	0.00
6513.50	3.50	0.00	0.00	0.00
6514.00	4.00	0.00	0.00	0.00
6514.50	4.50	0.00	0.00	0.00
6515.00	5.00	0.00	0.00	0.00
6515.50	5.50	0.00	0.00	0.00
6516.00	6.00	0.00	0.00	0.00
6516.50	6.50	0.00	0.00	0.00
6517.00	7.00	0.00	0.00	0.00
6517.50	7.50	0.00	0.00	0.00
6518.00	8.00	0.00	0.00	0.00
6518.70	8.70	0.00	23.16	23.16
6518.80	8.80	0.00	29.98	29.98
6518.90	8.90	0.00	37.36	37.36
6519.00	9.00	0.00	45.45	45.45
6519.50	9.50	0.00	100.23	100.23
6520.00	10.00	0.00	165.14	165.14

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RESULTS TO N6-J
(continued)

INPUT AND CALCULATED BASIN GEOMETRY

ELEV-ATION	STAGE (ft)	AREA (ac)	DIS-CHARGE (cfs)	AVG. DEPTH (ft)	CAPACITY (ac-ft)	
6510.0	0.0	0.30	0.00	0.00	0.00	
6510.5	0.5	0.33	0.00	0.49	0.16	
6511.0	1.0	0.36	0.00	0.96	0.33	
6511.5	1.5	0.39	0.00	1.43	0.52	
6512.0	2.0	0.42	0.00	1.88	0.72	
6512.5	2.5	0.46	0.00	2.33	0.94	
6513.0	3.0	0.49	0.00	2.76	1.18	
6513.5	3.5	0.52	0.00	3.19	1.43	
6514.0	4.0	0.55	0.00	3.61	1.70	
6514.5	4.5	0.58	0.00	4.02	1.98	
6515.0	5.0	0.61	0.00	4.43	2.28	
6515.5	5.5	0.66	0.00	4.83	2.59	
6516.0	6.0	0.71	0.00	5.21	2.93	
6516.5	6.5	0.75	0.00	5.57	3.30	
6517.0	7.0	0.80	0.00	5.93	3.69	
6517.5	7.5	0.85	0.00	6.28	4.10	
6518.0	8.0	0.90	0.00	6.63	4.54	EMERGENCY SPILLWAY
	8.5				5.03	PEAK STAGE
6518.7	8.7	0.97	23.16	7.11	5.19	
6518.8	8.8	0.97	29.98	7.17	5.29	
6518.9	8.9	0.98	37.36	7.24	5.38	
6519.0	9.0	0.99	45.45	7.31	5.48	
6519.5	9.5	1.04	100.23	7.65	5.99	
6520.0	10.0	1.09	165.14	7.98	6.53	

	RUNOFF VOLUME (ac-ft)	PEAK DISCHARGE (cfs)	PEAK SEDIMENT CONCENTRATION (mg/l)	PEAK SETTLEABLE CONCENTRATION (ml/l)	SEDIMENT YIELD (tons)
IN	2.293	30.000	187544.70	80.758	320.09
OUT	2.293	17.383	0.00	0.000	0.00

AVERAGE SETTLEABLE CONCENTRATION:

	TIME OF SIGNIFICANT CONCENTRATION (hrs)	VOLUME WEIGHTED DURING TIME OF SIGN. CONC. (ml/l)	VOLUME WEIGHTED DURING PEAK 24 HOUR (ml/l)	ARITHMETIC DURING TIME OF SIGN. CONC. (ml/l)	ARITHMETIC DURING PEAK 24 HOUR (ml/l)
IN	13.40	41.99	41.99	18.56	10.36
OUT	0.00	0.00	0.00	0.00	0.00

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JUNCTION 1 , BRANCH 1 , STRUCTURE 1

N6-J

HYDROGRAPH (AND SEDIMENTGRAPH) OUT OF THE STRUCTURE

HYDROGRAPH (AND SEDIMENTGRAPH)

Time (hr)	Discharge (cfs)	Sed Disch (mg/l)	Time (hr)	Discharge (cfs)	Sed Disch (mg/l)
0.00	0.000	0.000	0.10	0.000	0.000
0.20	0.000	0.000	0.30	0.000	0.000
0.40	0.000	0.000	0.50	0.000	0.000
0.60	0.000	0.000	0.70	0.000	0.000
0.80	0.000	0.000	0.90	0.000	0.000
1.00	0.000	0.000	1.10	0.000	0.000
1.20	0.000	0.000	1.30	0.000	0.000
1.40	0.000	0.000	1.50	0.000	0.000
1.60	0.000	0.000	1.70	0.000	0.000
1.80	0.000	0.000	1.90	0.000	0.000
2.00	0.000	0.000	2.10	0.000	0.000
2.20	0.000	0.000	2.30	0.000	0.000
2.40	0.000	0.000	2.50	0.000	0.000
2.60	0.000	0.000	2.70	0.000	0.000
2.80	0.000	0.000	2.90	0.000	0.000
3.00	0.000	0.000	3.10	0.000	0.000
3.20	0.000	0.000	3.30	0.000	0.000
3.40	0.000	0.000	3.50	0.000	0.000
3.60	0.000	0.000	3.70	0.000	0.000
3.80	0.000	0.000	3.90	0.000	0.000
4.00	0.000	0.000	4.10	0.000	0.000
4.20	0.000	0.000	4.30	0.000	0.000
4.40	0.000	0.000	4.50	0.000	0.000
4.60	0.000	0.000	4.70	0.000	0.000
4.80	0.000	0.000	4.90	0.000	0.000
5.00	0.000	0.000	5.10	0.000	0.000
5.20	0.000	0.000	5.30	0.000	0.000
5.40	0.000	0.000	5.50	0.000	0.000
5.60	0.000	0.000	5.70	0.000	0.000
5.80	0.000	0.000	5.90	0.000	0.000
6.00	0.000	0.000	6.10	0.000	0.000
6.20	0.000	0.000	6.30	0.000	0.000
6.40	0.000	0.000	6.50	0.000	0.000
6.60	0.000	0.000	6.70	0.000	0.000
6.80	0.000	0.000	6.90	0.000	0.000
7.00	0.000	0.000	7.10	0.000	0.000
7.20	0.000	0.000	7.30	0.000	0.000
7.40	0.000	0.000	7.50	0.000	0.000
7.60	0.000	0.000	7.70	0.000	0.000
7.80	0.000	0.000	7.90	0.000	0.000
8.00	0.000	0.000	8.10	0.000	0.000
8.20	0.000	0.000	8.30	0.000	0.000
8.40	0.000	0.000	8.50	0.000	0.000
8.60	0.000	0.000	8.70	0.000	0.000

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* 8.80	0.000	0.000	8.90	0.000	0.000	*
* 9.00	0.000	0.000	9.10	0.000	0.000	*
* 9.20	0.000	0.000	9.30	0.000	0.000	*
* 9.40	0.000	0.000	9.50	0.000	0.000	*
* 9.60	0.000	0.000	9.70	0.000	0.000	*
* 9.80	0.000	0.000	9.90	0.000	0.000	*
* 10.00	0.000	0.000	10.10	0.000	0.000	*
* 10.20	0.000	0.000	10.30	0.000	0.000	*
* 10.40	0.002	0.000	10.50	0.009	0.000	*
* 10.60	0.028	0.000	10.70	0.057	0.000	*
* 10.80	0.094	0.000	10.90	0.135	0.000	*
* 11.00	0.180	0.000	11.10	0.257	0.000	*
* 11.20	0.368	0.000	11.30	0.482	0.000	*
* 11.40	0.597	0.000	11.50	0.712	0.000	*
* 11.60	2.262	0.000	11.70	5.593	0.000	*
* 11.80	9.398	0.000	11.90	13.328	0.000	*
* 12.00	17.171	0.000	12.10	17.383	0.000	*
* 12.20	14.485	0.000	12.30	12.354	0.000	*
* 12.40	10.791	0.000	12.50	9.652	0.000	*
* 12.60	8.422	0.000	12.70	7.118	0.000	*
* 12.80	6.153	0.000	12.90	5.441	0.000	*
* 13.00	4.916	0.000	13.10	4.413	0.000	*
* 13.20	3.924	0.000	13.30	3.562	0.000	*
* 13.40	3.297	0.000	13.50	3.101	0.000	*
* 13.60	2.886	0.000	13.70	2.656	0.000	*
* 13.80	2.486	0.000	13.90	2.362	0.000	*
* 14.00	2.270	0.000	14.10	2.130	0.000	*
* 14.20	1.954	0.000	14.30	1.823	0.000	*
* 14.40	1.727	0.000	14.50	1.656	0.000	*
* 14.60	1.604	0.000	14.70	1.566	0.000	*
* 14.80	1.538	0.000	14.90	1.519	0.000	*
* 15.00	1.505	0.000	15.10	1.495	0.000	*
* 15.20	1.489	0.000	15.30	1.485	0.000	*
* 15.40	1.483	0.000	15.50	1.482	0.000	*
* 15.60	1.482	0.000	15.70	1.483	0.000	*
* 15.80	1.484	0.000	15.90	1.486	0.000	*
* 16.00	1.488	0.000	16.10	1.414	0.000	*
* 16.20	1.282	0.000	16.30	1.184	0.000	*
* 16.40	1.112	0.000	16.50	1.058	0.000	*
* 16.60	1.019	0.000	16.70	0.989	0.000	*
* 16.80	0.968	0.000	16.90	0.952	0.000	*
* 17.00	0.941	0.000	17.10	0.932	0.000	*
* 17.20	0.926	0.000	17.30	0.922	0.000	*
* 17.40	0.919	0.000	17.50	0.918	0.000	*
* 17.60	0.916	0.000	17.70	0.916	0.000	*
* 17.80	0.916	0.000	17.90	0.916	0.000	*
* 18.00	0.916	0.000	18.10	0.917	0.000	*
* 18.20	0.917	0.000	18.30	0.918	0.000	*
* 18.40	0.919	0.000	18.50	0.919	0.000	*
* 18.60	0.920	0.000	18.70	0.921	0.000	*
* 18.80	0.922	0.000	18.90	0.923	0.000	*
* 19.00	0.924	0.000	19.10	0.925	0.000	*
* 19.20	0.926	0.000	19.30	0.927	0.000	*
* 19.40	0.928	0.000	19.50	0.929	0.000	*
* 19.60	0.929	0.000	19.70	0.930	0.000	*
* 19.80	0.931	0.000	19.90	0.932	0.000	*
* 20.00	0.933	0.000	20.10	0.894	0.000	*
* 20.20	0.825	0.000	20.30	0.774	0.000	*
* 20.40	0.736	0.000	20.50	0.708	0.000	*
* 20.60	0.687	0.000	20.70	0.672	0.000	*

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* 20.80	0.660	0.000	20.90	0.652	0.000	*
* 21.00	0.646	0.000	21.10	0.641	0.000	*
* 21.20	0.638	0.000	21.30	0.636	0.000	*
* 21.40	0.634	0.000	21.50	0.633	0.000	*
* 21.60	0.632	0.000	21.70	0.632	0.000	*
* 21.80	0.632	0.000	21.90	0.632	0.000	*
* 22.00	0.632	0.000	22.10	0.632	0.000	*
* 22.20	0.632	0.000	22.30	0.632	0.000	*
* 22.40	0.633	0.000	22.50	0.633	0.000	*
* 22.60	0.633	0.000	22.70	0.634	0.000	*
* 22.80	0.634	0.000	22.90	0.634	0.000	*
* 23.00	0.635	0.000	23.10	0.635	0.000	*
* 23.20	0.635	0.000	23.30	0.636	0.000	*
* 23.40	0.636	0.000	23.50	0.637	0.000	*
* 23.60	0.637	0.000	23.70	0.637	0.000	*
* 23.80	0.638	0.000	23.90	0.556	0.000	*
* 24.00	0.414	0.000	24.10	0.308	0.000	*
* 24.20	0.229	0.000	24.30	0.171	0.000	*
* 24.40	0.127	0.000	24.50	0.094	0.000	*
* 24.60	0.070	0.000	24.70	0.052	0.000	*
* 24.80	0.039	0.000	24.90	0.029	0.000	*
* 25.00	0.022	0.000	25.10	0.016	0.000	*
* 25.20	0.012	0.000	25.30	0.009	0.000	*
* 25.40	0.007	0.000	25.50	0.005	0.000	*
* 25.60	0.004	0.000	25.70	0.003	0.000	*
* 25.80	0.002	0.000	25.90	0.002	0.000	*
* 26.00	0.001	0.000	26.10	0.001	0.000	*
*						*

****

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*** RUN COMPLETED ***

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APPENDIX C

SEDCAD+ (Input and Output)

25-Year, 6-Hour Storm

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*****************************************************************************
*                                                                           *
*                              SEDCAD+(TM)                                  *
*          Sediment, Erosion, Discharge by Computer Aided Design            *
*                                                                           *
*                                  by                                       *
*                                                                           *
*                            Pamela J. Schwab                               *
*                           Civil Software Design                           *
*                              P.O. Box 11092                               *
*                         Lexington, Kentucky  40572                        *
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*****************************************************************************

*****************************************************************************
*                                                                           *
*    Current Date and Time:            10-31-1988   11:18:56               *
*    Computed Date and Time:           10-31-1988   11:10:19               *
*    File Created By:                  LGO                                 *
*    File Currently Being Printed:     C:N6-J                              *
*                                                                           *
*****************************************************************************

************************* WATERSHED IDENTIFICATION **************************
*                                                                           *
* N6-J                                                                      *
*                   (SECOND EMERGENCY SPILLWAY RUN)                         *
*                                                                           *
*****************************************************************************

******************************** STORM INPUT ********************************
*                                                                           *
*                  Storm Type          SCS TYPE 2                           *
*                  Rainfall Depth       1.9 inches                          *
*                  Storm Duration       6.0 hours                           *
*                                                                           *
*****************************************************************************
```

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**********WATERSHED NETWORK**********

JUNCTIONS	BRANCHES	STRUCTURES
1	1	1

**********SEDIMENTOLOGY INPUTS**********

Specific Gravity = 2.5

Submerged Bulk Specific Gravity = 1.25

PERCENT FINER DISTRIBUTIONS:

NO.	PARTICLE SIZE, (mm)	NO. 1
1	38.0000	100.00
2	4.7000	100.00
3	2.3800	100.00
4	1.1900	99.00
5	0.5900	98.00
6	0.2970	96.00
7	0.1490	90.00
8	0.0740	81.00
9	0.0370	69.00
10	0.0190	53.00
11	0.0090	44.00
12	0.0050	36.00
13	0.0020	26.00
14	0.0010	22.00
15	0.0001	0.00

**********BETWEEN STRUCTURE ROUTING PARAMETERS**********

J	B		TRAVEL TIME (hours)	MUSK. K (hours)	MUSK. X
1	1	Prior J or S to Structure 1	0.000	0.000	0.000

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**********************************************
**********************************************
**                                          **
**  JUNCTION  1 , BRANCH  1 , STRUCTURE  1  **
**            POND STRUCTURE                **
**        N6-J                              **
**                                          **
**********************************************
**********************************************
```

```
*****************************************************************************
*                                                                           *
*                      SUBWATERSHED INFORMATION                             *
*                                                                           *
*****************************************************************************
*                                                                           *
*                      HYDRAULIC INPUT VALUES                               *
*                                                                           *
*        WATER   AREA    CURVE    TC     TT    ROUTING COEF'S  UNIT HYDRO   *
*        SHED   (acre)   NUMBER  (hr)   (hr)   K-(hr)    X      RESPONSE   *
*---------------------------------------------------------------------------*
*          1    36.00    83.00  0.117   0.000    0.000   0.000   INSTANT   *
*                                                                           *
*                        SEDIMENT INPUT VALUES                              *
*                                                                           *
*            WATER   SEG     SOIL   LENGTH  SLOPE     CP     PART           *
*            SHED    NUM      K     (feet)   (%)     VALUE   OPT            *
*---------------------------------------------------------------------------*
*              1      1      0.36   660.0    10.0    0.250    1   (RUSLE)   *
*                                                                           *
*                                                                           *
*                COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS                  *
*                                                                           *
*                       PEAK FLOW   RUNOFF   SEDIMENT    D50                *
*           WATERSHED    (cfs)    (inches)   (tons)     (mm)               *
*---------------------------------------------------------------------------*
*              1        38.090    0.628     327.69    0.015                *
*                                                                           *
*****************************************************************************
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*****************************************************************************
*                                                                           *
*                    JUNCTION  1 , BRANCH  1 , STRUCTURE  1                 *
*                         N6-J                                              *
*                         POND STRUCTURE INFORMATION                        *
*                                                                           *
*****************************************************************************
*                                                                           *
*   Time Increment of the Routed Hydrograph =     0.10 hours                *
*   Dead Space of Permanent Pool =               40.00 %                    *
*   Number of Continuous Stirred Reactors =       0                         *
*                                                                           *
*                                                                           *
*                    RIPRAP EMERGENCY SPILLWAY INPUTS                       *
*                                                                           *
*   Crest stage of the Emergency Spillway =        8.000 feet               *
*   Crest Length =                                29.000 feet               *
*   Width =                                       20.000 feet               *
*   Outslope factors:                                                       *
*     Slope =                                     11.00  %                  *
*     Side Slope Ratio =                           3.00:1                   *
*     Safety Factor =                              1.20                     *
*                                                                           *
*****************************************************************************
```

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--- Peabody Coal Company ---

RESULTS TO N6-J

Total Drainage Area to This Point = 36.000 acres

Basin Trap Efficiency = 100.000 %

EMERGENCY SPILLWAY OUTSLOPE DESIGN:

Design Discharge =	19.750 cfs
Velocity =	4.809 fps
Depth of Flow =	0.195 feet
Manning's n =	0.034
D50 Channel Bed =	0.397 feet
D50 Channel Bank =	0.354 feet

DETAILED STAGE-DISCHARGE INFORMATION

ELEVATION	STAGE (ft)	PSW #1 (cfs)	ESW (cfs)	TOTAL DISCHARGE (cfs)
6510.00	0.00	0.00	0.00	0.00
6510.50	0.50	0.00	0.00	0.00
6511.00	1.00	0.00	0.00	0.00
6511.50	1.50	0.00	0.00	0.00
6512.00	2.00	0.00	0.00	0.00
6512.50	2.50	0.00	0.00	0.00
6513.00	3.00	0.00	0.00	0.00
6513.50	3.50	0.00	0.00	0.00
6514.00	4.00	0.00	0.00	0.00
6514.50	4.50	0.00	0.00	0.00
6515.00	5.00	0.00	0.00	0.00
6515.50	5.50	0.00	0.00	0.00
6516.00	6.00	0.00	0.00	0.00
6516.50	6.50	0.00	0.00	0.00
6517.00	7.00	0.00	0.00	0.00
6517.50	7.50	0.00	0.00	0.00
6518.00	8.00	0.00	0.00	0.00
6518.70	8.70	0.00	23.16	23.16
6518.80	8.80	0.00	29.98	29.98
6518.90	8.90	0.00	37.36	37.36
6519.00	9.00	0.00	45.45	45.45
6519.50	9.50	0.00	100.23	100.23
6520.00	10.00	0.00	165.14	165.14

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--- Peabody Coal Company ---

RESULTS TO N6-J
(continued)

INPUT AND CALCULATED BASIN GEOMETRY

ELEV-ATION	STAGE (ft)	AREA (ac)	DIS-CHARGE (cfs)	AVG. DEPTH (ft)	CAPACITY (ac-ft)	
6510.0	0.0	0.30	0.00	0.00	0.00	
6510.5	0.5	0.33	0.00	0.49	0.16	
6511.0	1.0	0.36	0.00	0.96	0.33	
6511.5	1.5	0.39	0.00	1.43	0.52	
6512.0	2.0	0.42	0.00	1.88	0.72	
6512.5	2.5	0.46	0.00	2.33	0.94	
6513.0	3.0	0.49	0.00	2.76	1.18	
6513.5	3.5	0.52	0.00	3.19	1.43	
6514.0	4.0	0.55	0.00	3.61	1.70	
6514.5	4.5	0.58	0.00	4.02	1.98	
6515.0	5.0	0.61	0.00	4.43	2.28	
6515.5	5.5	0.66	0.00	4.83	2.59	
6516.0	6.0	0.71	0.00	5.21	2.93	
6516.5	6.5	0.75	0.00	5.57	3.30	
6517.0	7.0	0.80	0.00	5.93	3.69	
6517.5	7.5	0.85	0.00	6.28	4.10	
6518.0	8.0	0.90	0.00	6.63	4.54	EMERGENCY SPILLWAY
	8.6				5.09	PEAK STAGE
6518.7	8.7	0.97	23.16	7.11	5.19	
6518.8	8.8	0.97	29.98	7.17	5.29	
6518.9	8.9	0.98	37.36	7.24	5.38	
6519.0	9.0	0.99	45.45	7.31	5.48	
6519.5	9.5	1.04	100.23	7.65	5.99	
6520.0	10.0	1.09	165.14	7.98	6.53	

	RUNOFF VOLUME (ac-ft)	PEAK DISCHARGE (cfs)	PEAK SEDIMENT CONCENTRATION (mg/l)	PEAK SETTLEABLE CONCENTRATION (ml/l)	SEDIMENT YIELD (tons)
IN	1.883	38.090	194269.41	83.654	327.69
OUT	1.883	19.750	0.00	0.000	0.00

AVERAGE SETTLEABLE CONCENTRATION:

	TIME OF SIGNIFICANT CONCENTRATION (hrs)	VOLUME WEIGHTED DURING TIME OF SIGN. CONC. (ml/l)	VOLUME WEIGHTED DURING PEAK 24 HOUR (ml/l)	ARITHMETIC DURING TIME OF SIGN. CONC. (ml/l)	ARITHMETIC DURING PEAK 24 HOUR (ml/l)
IN	3.20	52.74	52.74	33.61	4.48
OUT	0.00	0.00	0.00	0.00	0.00

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<<< SEDCAD+ >>>

--- Peabody Coal Company ---

JUNCTION 1 , BRANCH 1 , STRUCTURE 1

N6-J

HYDROGRAPH (AND SEDIMENTGRAPH) OUT OF THE STRUCTURE

HYDROGRAPH (AND SEDIMENTGRAPH)

Time (hr)	Discharge (cfs)	Sed Disch (mg/l)	Time (hr)	Discharge (cfs)	Sed Disch (mg/l)
0.00	0.000	0.000	0.10	0.000	0.000
0.20	0.000	0.000	0.30	0.000	0.000
0.40	0.000	0.000	0.50	0.000	0.000
0.60	0.000	0.000	0.70	0.000	0.000
0.80	0.000	0.000	0.90	0.000	0.000
1.00	0.000	0.000	1.10	0.000	0.000
1.20	0.000	0.000	1.30	0.000	0.000
1.40	0.000	0.000	1.50	0.000	0.000
1.60	0.000	0.000	1.70	0.000	0.000
1.80	0.000	0.000	1.90	0.000	0.000
2.00	0.000	0.000	2.10	0.000	0.000
2.20	0.000	0.000	2.30	0.000	0.000
2.40	0.000	0.000	2.50	0.000	0.000
2.60	0.560	0.000	2.70	3.029	0.000
2.80	7.529	0.000	2.90	12.968	0.000
3.00	18.661	0.000	3.10	19.750	0.000
3.20	16.703	0.000	3.30	14.476	0.000
3.40	12.857	0.000	3.50	11.689	0.000
3.60	10.325	0.000	3.70	8.802	0.000
3.80	7.677	0.000	3.90	6.848	0.000
4.00	6.241	0.000	4.10	5.640	0.000
4.20	5.043	0.000	4.30	4.603	0.000
4.40	4.280	0.000	4.50	4.044	0.000
4.60	3.776	0.000	4.70	3.484	0.000
4.80	3.269	0.000	4.90	3.112	0.000
5.00	2.997	0.000	5.10	2.816	0.000
5.20	2.585	0.000	5.30	2.415	0.000
5.40	2.289	0.000	5.50	2.197	0.000
5.60	2.129	0.000	5.70	2.080	0.000
5.80	2.045	0.000	5.90	1.771	0.000
6.00	1.318	0.000	6.10	0.980	0.000
6.20	0.730	0.000	6.30	0.543	0.000
6.40	0.404	0.000	6.50	0.301	0.000
6.60	0.224	0.000	6.70	0.166	0.000
6.80	0.124	0.000	6.90	0.092	0.000
7.00	0.069	0.000	7.10	0.051	0.000
7.20	0.038	0.000	7.30	0.028	0.000
7.40	0.021	0.000	7.50	0.016	0.000
7.60	0.012	0.000	7.70	0.009	0.000
7.80	0.006	0.000	7.90	0.005	0.000
8.00	0.004	0.000	8.10	0.003	0.000
8.20	0.002	0.000	8.30	0.001	0.000
8.40	0.001	0.000	8.50	0.001	0.000

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<<< SEDCAD+ >>>

--- Peabody Coal Company ---

*** RUN COMPLETED ***

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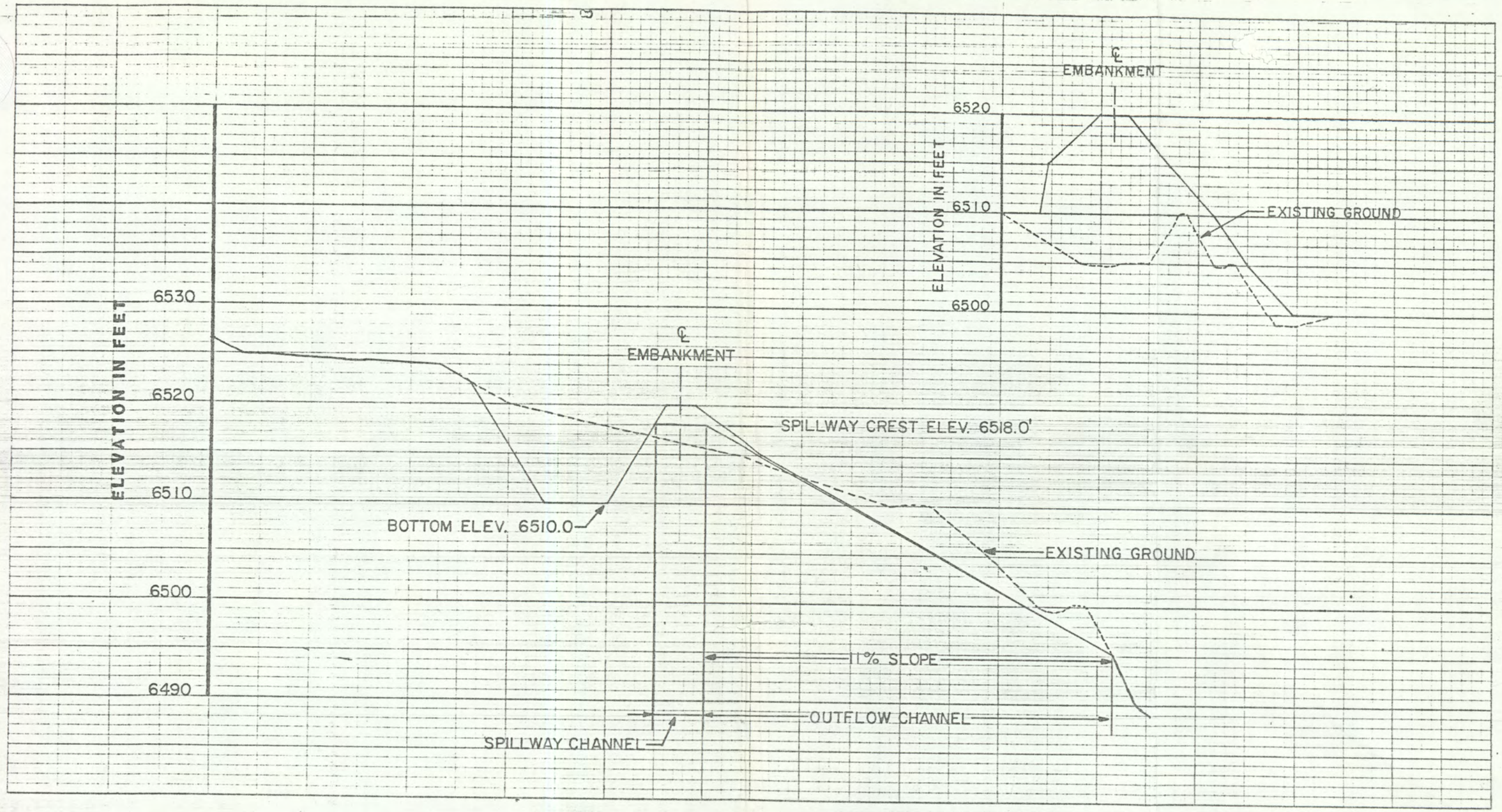

CHANNEL PROFILE A-A'
EMBANKMENT PROFILE B-B'
N6-J

Scale : 1" = 50'

SEE PLATE 1 FOR LOCATION

BY PEABODY COAL CO. Plate 3

JAN 31 1989