

DESIGN REPORT
Sedimentation Structure
N5-F
Kayenta Mine
Navajo County, Arizona
for
PEABODY COAL COMPANY



Dames & Moore
10139-011-22

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INTRODUCTION

Sedimentation Structure N5-F 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 Kayenta Mine. The location of Structure N5-F is shown on Plate 1, Site Plan.

This design report contains information specific to Structure N5-F. 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 N5-F 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.

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 N5-F 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 N5-F 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 N5-F was analyzed using the 10-year, 24-hour storm.

The following parameters were used in the hydrologic analysis:

1. Water Course length, L	0.544	mi
2. Elevation Difference, H	162	ft
3. Time of Concentration, T_c	0.181	h
4. Lag time, $0.6T_c$	0.109	h
5. SCS Curve Number	86	
6. Rainfall Depth, 10-year, 24-hour storm .	2.1	in.
25-year, 6-hour storm. .	1.9	in.
7. Drainage Area	34.9	acres

N5-F 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	50	60
Volume acre-ft	2.65	2.12
Storage		
Peak Stage ft	6488.70	—
Spillway Elevation . . ft	6491.00	--
Peak Storage acre-ft	2.67	—
Storage Capacity . . . acre-ft	4.15	--
Outflow		
Peak Flow cfs	0	23
Embankment Crest		
Elevation ft	--	6494.00
Peak Stage ft	--	6492.25
Freeboard ft	--	1.75
Spillway Channel		
Flow Depth ft	--	1.25
Critical Velocity . . . fps	--	3.5
Manning's "n"	--	0.040
Outflow Channel		
Slope %	—	5
Normal Velocity fps	--	4.0
Normal Depth ft	--	0.36
Manning's "n"	--	0.040

STORAGE CAPACITY

The impoundment volume-elevation curve shown on Plate 2, Volume-Elevation Curve, N5-F is based on site specific topographic data developed for Peabody Coal Company in 1985, and 1985 site specific surveys, where available.

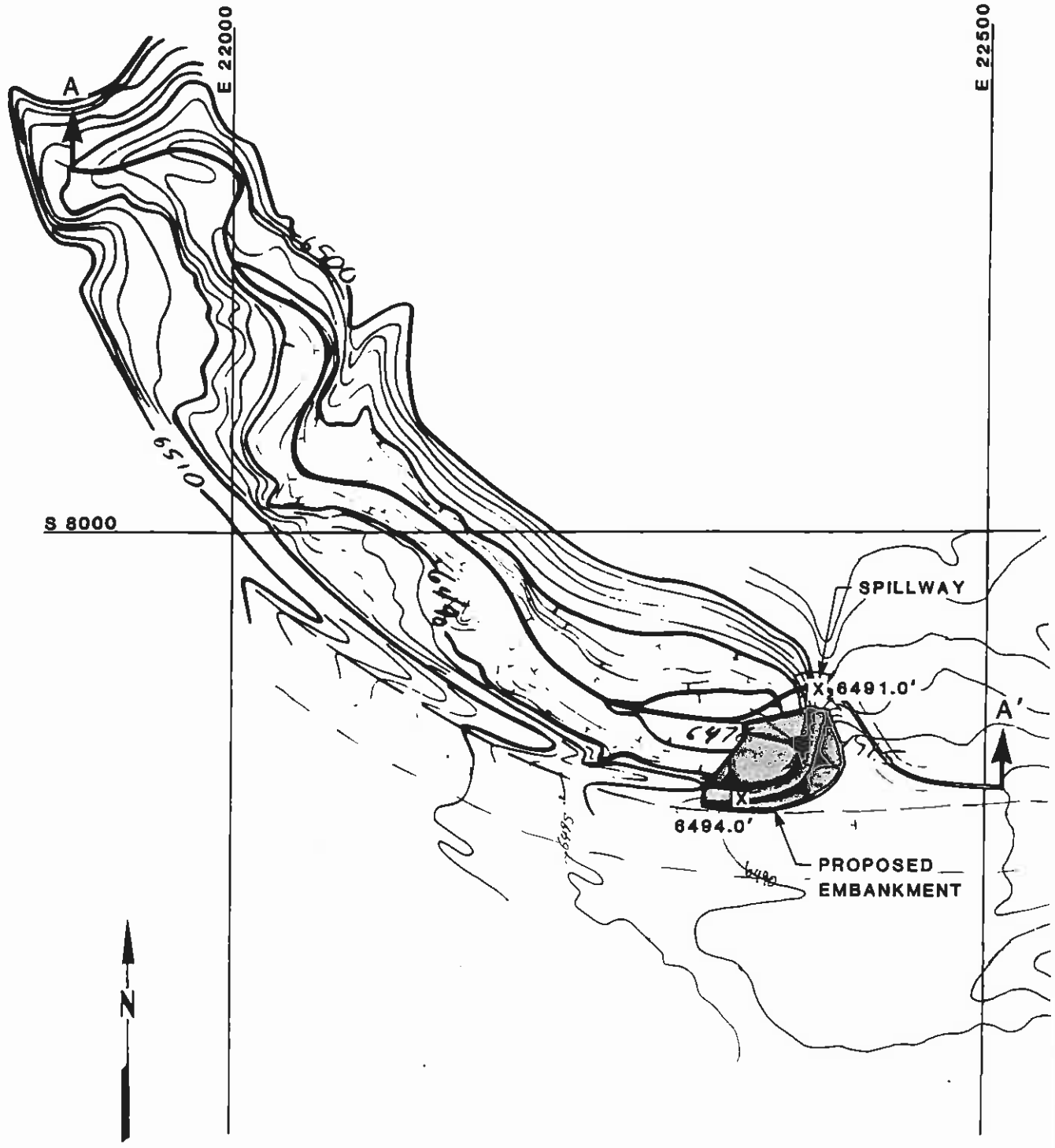
The calculations for the sediment load entering Structure N5-F were made utilizing the Universal Soil Loss Equation with the following parameters:

- 1. Rainfall Factor, R 40
- 2. Soil Erodibility Factor, K 0.35
- 3. Slope Factor, LS 3.60
- 4. Cover Factor, C 0.143
- 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 N5-F is shown on Plate 2, Volume-Elevation Curve, N5-F, and the results of the sediment inflow analysis are summarized in the following table.

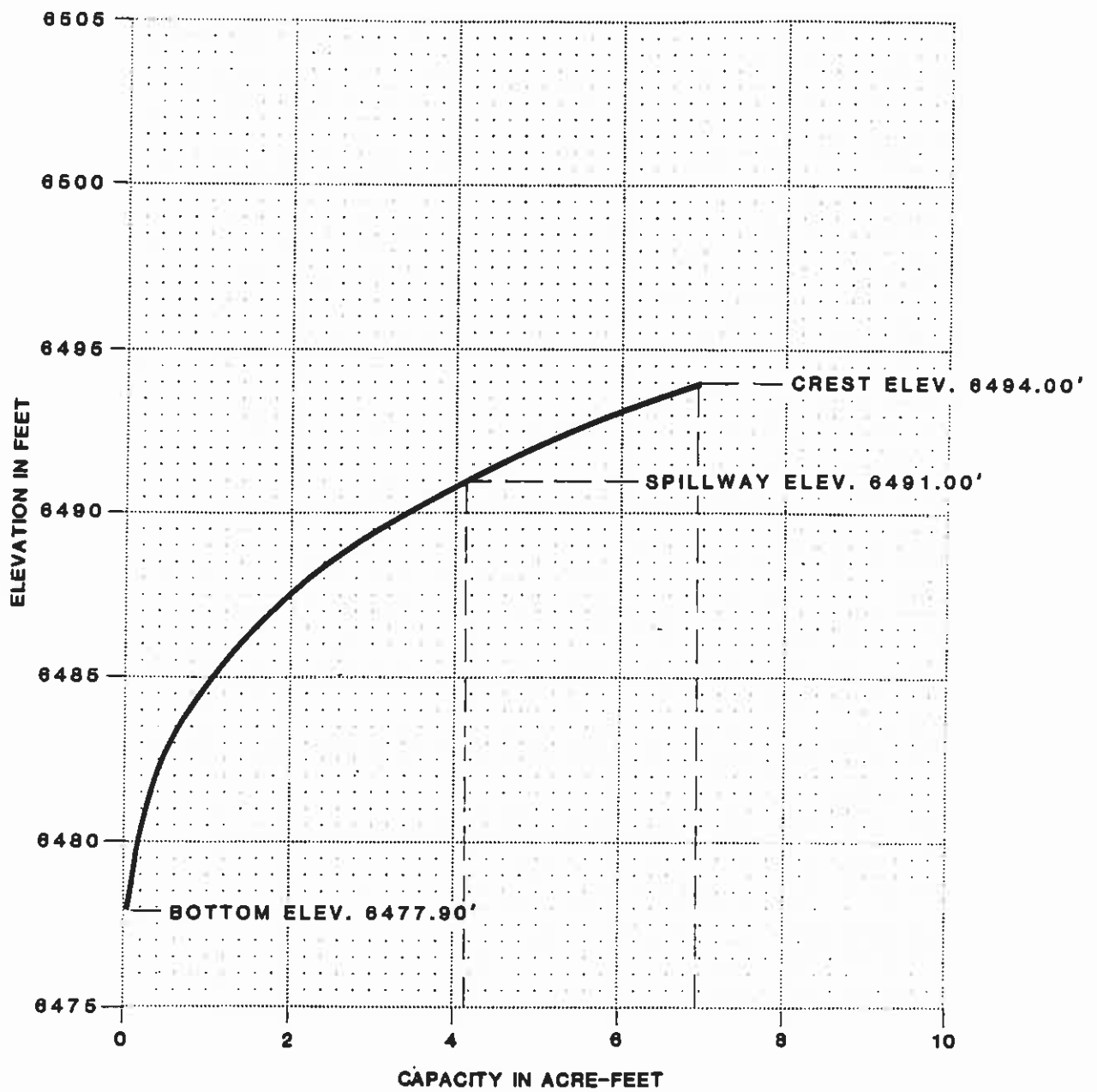
N5-F STORAGE

Total Storage Capacity	4.15	acre-ft
10-year, 24-hour Storm Inflow	2.65	acre-ft
Available Sediment Storage Capacity	1.48	acre-ft
Sediment Inflow Rate	0.117	acre-ft/yr
Sediment Storage Life	13	yrs

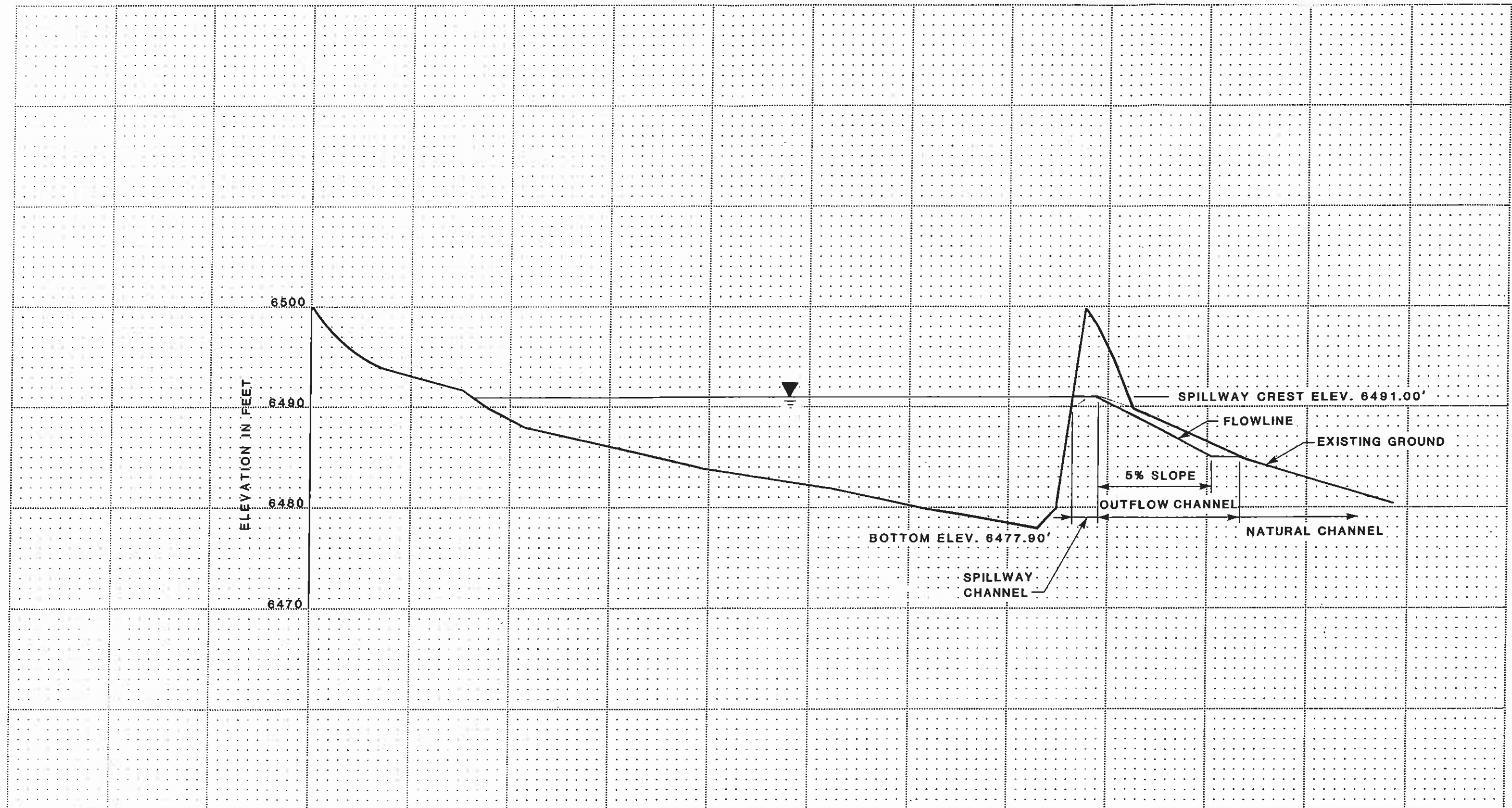


**SITE PLAN
N5-F**





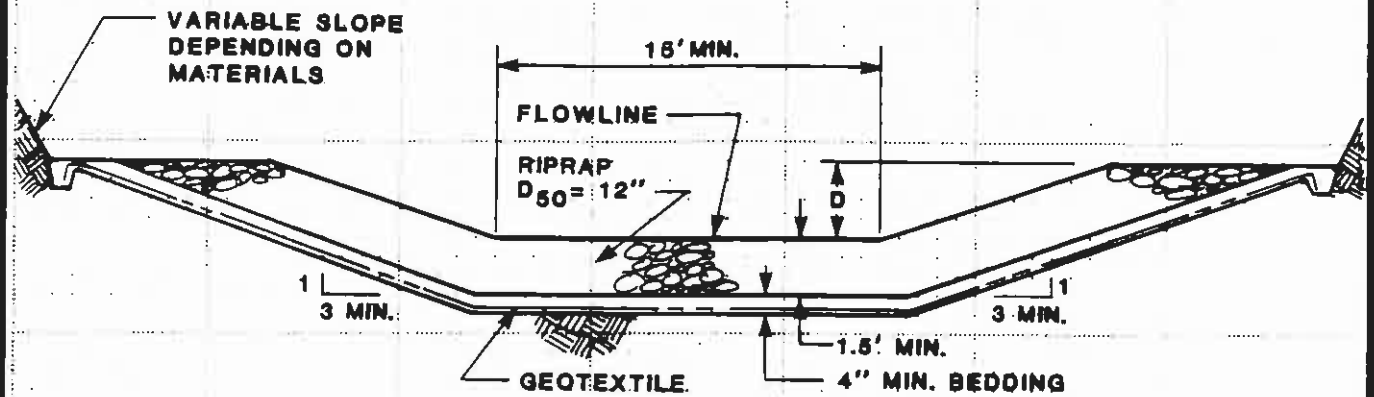
VOLUME-ELEVATION
CURVE
N5-F



CHANNEL PROFILE A-A'
N5-F



FOR LOCATION SEE PLATE 1



SPILLWAY CHANNEL

D = 2.3'

LENGTH = 30'

FLOWLINE ELEV. = 6491.00'

OUTFLOW CHANNEL

D = 1.5'

SPILLWAY AND
OUTFLOW CHANNEL
CROSS SECTION
N5-F

APPENDIX A
HYDROLOGY AND HYDRAULIC CALCULATIONS

TIME OF CONCENTRATION

ELEVATION DIFFERENCE = $6647 - 6485 = 162'$
 WATER COURSE LENGTH = $2872 = .514 \text{ mi}$
 $T_c = 0.181 \text{ hr}$
 LAG TIME = $0.6T_c = 0.109 \text{ hr}$

SCS CURVE NUMBER

DRAINAGE AREA (ac)	COVER TYPE	HYDROLOGIC CONDITION	SOIL TYPE	WEIGHTED CURVE NUMBER
124	grass	good	D	83 (.35)
225	pasture (pre-1915)	poor	—	37 (.35)
				85.6

use 36

DRAINAGE BASIN AREA

34.7 ACRES 0.055 SQ MILE

REVISIONS
 BY _____ DATE _____ TO EO _____
 BY _____ DATE _____ TO EO _____

BY _____ DATE _____
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UNIVERSAL SOIL LOSS EQUATION

RAINFALL FACTOR

$R = 40$

SOIL ERODIBILITY FACTOR

SOIL TYPE = EH # 35 (.65), .65 (.42)
 # 25 (.35), .35 (.22)
 $\frac{.65(.42) + .35(.22)}{.35} \checkmark$

$K = 0.35$

SLOPE FACTOR

LENGTH (ft.)	Δ ELEV (ft.)	SLOPE (%)	LS
500	65	13.	4.0 (.33) ✓
500	55	11.	3.57 (.33) ✓
500	45	9.	2.0 (.30) ✓
			<u>3.60</u>

COVER FACTOR

AREA (ac)	COVER TYPE	% COVER	CANOPY (%)	WEIGHTED C
35%	P-J	40	75	(.13)(.35)
65%	vegetation			(.15)(.05)
				<u>.143</u> ✓

EROSION CONTROL FACTOR

$P = 1.0$

SEDIMENT INFLOW

$A = 40(.35)(3.60)(.143)(1.0) = 7.21$ ton/acre/yr ✓

$L = 7.21 \left(\frac{1}{1042} \right) (3.17)(.95) = 0.117$ acre-feet/yr ✓

REVISIONS
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