

ATTACHMENT AA

N-14 East
Ephemeral Reclaimed Channel
Diversion Design Report
(See Drawing No. 85352, Sheets M-7 and M-8)



Revised 05/15/97

N-14 East - Ephemeral Reclaimed
Channel Design Summary

Purpose: To divert runoff from approximately 1440.4 acres of natural undisturbed watershed and 47.2 acres of reclaimed watershed area through and around the east side of the N-14 East mining area (see Drawing No. 85352, Sheets M-7 and M-8 for location) directly upstream of the N14-H Dam.

Permanent Reclaimed Channel Design: (Trapezoidal Channel)

100-year, 6-hour precipitation	=	2.40 inches
Area	=	1487.6 ac.
CN	=	78 to 81
Time of concentration	=	(see SEDCAD printout)
Peak discharge	=	531.1 cfs
Critical slope	=	1.1 %
Minimum design width	=	40 ft.
Minimum design depth w/freeboard	=	3.2 ft.
Side slopes	=	3:1 or flatter

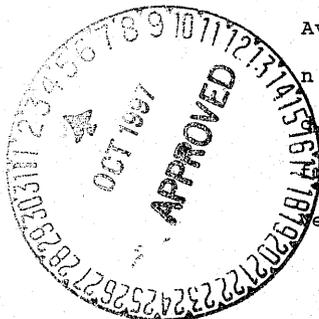
To allow construction of a reclaimed channel which will safely handle the flow over the reclaimed topography, two alternative trapezoidal channel designs (i.e., Design A or Design B) are recommended:

Design A: Earth-lined trapezoidal channel (subcritical flow, apply this design to channel reaches which have a 0.5% to 1.1% slope)

Average slope	=	0.5 %
n	=	0.03
d _m (min) w/ freeboard	=	3.2 ft.
Velocity	=	5.3 fps

Design B: Riprap-lined or bedrock-lined trapezoidal channel (supercritical flow, apply this design to channel reaches which have a 1.1% to 12.0% slope)

Average slope	=	12 %
n	=	0.056
d _m (min) w/ freeboard	=	2.3 ft.
Velocity	=	9.9 fps



Riprap D_{max} = 11.25 in

Riprap D_{50} = 9.0 in

- Note:
- Design selection will be field-fitted based on the slope of the constructed channel.
 - If bedrock is encountered during excavation, Design B will not require the installation of riprap.
 - Minimum 20 ft. length of riprapped channel as a transitional channel between the two alternative designs.
 - See Chapter 26 for construction specifications.
 - The above two alternative channel designs will be able to handle the design storm at slopes from 0.5% to 12% while still being stable.



Revised 05/15/97

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

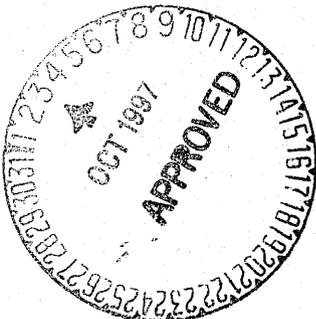
N-14 EAST RECLAIMED DRAINAGE CHANNEL, 100-YR., 6-HR. STORM

by

Name: JGS

Company Name: PEABODY WESTERN COAL COMPANY
File Name: C:\SEDCAD3\KMINE\N14E

Date: 05-18-1997



Company Name: PEABODY WESTERN COAL COMPANY
 Filename: C:\SEDCAD3\KMINE\N14E User: JGS
 Date: 05-18-1997 Time: 13:49:23
 N-14 EAST RECLAIMED DRAINAGE CHANNEL, 100-YR., 6-HR. STORM
 Storm: 2.40 inches, 100 year- 6 hour, SCS Type II
 Hydrograph Convolution Interval: 0.1 hr

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 SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE
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-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base- Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)		
111	1	1360.00	78	M	0.944	0.000	0.000	0.0	82.04	483.24		
					Type: Null		Label: N14-E1					
111	Structure	1360.00									82.04	

111	Total IN/OUT	1360.00									82.04	483.24
=====												
112	1	80.40	78	M	0.200	0.000	0.000	0.0	4.85	65.06		
112	2	47.20	81	F	0.378	0.000	0.000	0.0	3.43	43.26		
					Type: Null		Label: N14-E2					
1	Structure	127.60									90.31	

112	Total IN/OUT	1487.60									90.31	531.11
=====												
111 to 112 Routing						0.000	0.000					
=====												



**PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA**

PROJECT: N14-E1 Watershed

TIME OF CONCENTRATION:

Start Elevation (ft) = 7160
 End Elevation (ft) = 6775
 Elevation Difference, E (ft) = 385

Watercourse Length (ft) = 16000
 Watercourse Length, L (mi) = 3.030

$T_c = (11.9L^3/E)^{0.385} = \underline{\underline{0.944 \text{ hours}}}$

ROUTING PARAMETERS:

Between structure routing parameters were calculated using the SCS Upland Method in SEDCAD+. Input and output parameters are shown on the SEDCAD+ printouts in Appendices B and C.

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Undisturbed	C	78	1360.0	106080
TOTAL:			1360	106080

Weighted CN = Total CN*Area/ Total Area = 78

DRAINAGE BASIN AREA:

1360.0 Acres



**PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA**

PROJECT: N14-E2 Watershed

TIME OF CONCENTRATION:

Start Elevation (ft) = 6990
 End Elevation (ft) = 6715
 Elevation Difference, E (ft) = 275

Watercourse Length (ft) = 3730
 Watercourse Length, L (mi) = 0.706

$T_c = (11.9L^3/E)^{0.385} = \underline{\underline{0.200 \text{ hours}}}$

ROUTING PARAMETERS:

Between structure routing parameters were calculated using the SCS Upland Method in SEDCAD+. Input and output parameters are shown on the SEDCAD+ printouts in Appendices B and C.

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Undisturbed	C	78	80.4	6271.2
TOTAL:			80.4	6271.2

Weighted CN = Total CN*Area/ Total Area = 78

DRAINAGE BASIN AREA:

80.4 Acres



**PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA**

PROJECT: N14-E3 Watershed

TIME OF CONCENTRATION:

Start Elevation (ft) = 6885
 End Elevation (ft) = 6715
 Elevation Difference, E (ft) = 170

Watercourse Length (ft) = 5520
 Watercourse Length, L (mi) = 1.045

$T_c = (11.9L^{.3}/E)^{.385} =$ 0.378 hours

ROUTING PARAMETERS:

Between structure routing parameters were calculated using the SCS Upland Method in SEDCAD+. Input and output parameters are shown on the SEDCAD+ printouts in Appendices B and C.

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Reclaimed	C	81	47.2	3823.2
TOTAL:			47.2	3823.2

Weighted CN = Total CN*Area/ Total Area = 81

DRAINAGE BASIN AREA:

47.2 Acres



TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION

May 18, 1997
N-14 EAST RECLAIMED DRAINAGE CHANNEL
100-YR., 6-HR. STORM
PWCC

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	531.1
Manning's Roughness Coefficient (n-value).....	0.0300
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)...	3.00
Channel Bottom Width (feet).....	40.0

PROGRAM RESULTS:

DESCRIPTION	VALUE
Critical Depth (feet).....	1.69
Critical Slope (feet per foot).....	0.0116
Flow Velocity (feet per second).....	6.99
Froude Number.....	1.000
Velocity Head (feet).....	0.76
Energy Head (feet).....	2.44
Cross-Sectional Area of Flow (square feet).....	76.01
Top Width of Flow (feet).....	50.12

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.



SEDCAD+ NONERODIBLE CHANNEL DESIGN

N-14 EAST RECLAIMED DRAINAGE CHANNEL

INPUT VALUES:

Shape	TRAPEZOIDAL	
Discharge	531.11 cfs	
Slope	0.50 %	
Sideslopes	3.00:1 (L)	3.00:1 (R)
Bottom Width	40.00 ft	
Manning's n	0.030	
Material	OTHER	
Freeboard	1 ft	

RESULTS:

Depth	2.15 ft
with Freeboard	3.15 ft
Top Width	52.90 ft
with Freeboard	58.90 ft
Velocity	5.32 fps
Cross Sectional Area	99.87 sq ft
Hydraulic Radius	1.86 ft
Froude Number	0.68



SEDCAD+ RIPRAP CHANNEL DESIGN

N-14 EAST RECLAIMED DRAINAGE CHANNEL

INPUT VALUES:

Shape	TRAPEZOIDAL	
Discharge	531.11 cfs	
Slope	12.00 %	
Sideslopes (L and R)	3.00:1	3.00:1
Bottom Width	40.00 feet	
Freeboard	1 ft	

RESULTS:

Steep Slope Design - PADER Method

Depth	1.22 ft
with Freeboard	2.22 ft
Top Width	47.34 ft
with Freeboard	53.34 ft
Velocity	9.94 fps
Cross Sectional Area	53.45 sq ft
Hydraulic Radius	1.12 ft
Manning's n	0.056
Froude Number	1.65
Dmax	0.938 ft (11.25 in)
D50	0.750 ft (9.00 in)
D10	0.250 ft (3.00 in)



ATTACHMENT AE

J21-J TEMPORARY DIVERSION

(See Drawing No. 85400, Sheet M-10)



Revised 01/07/98



J21-J TEMPORARY DIVERSION
DESIGN SUMMARY

Purpose: To divert runoff from the J-19 highwall affected lands to the J21-J Pond until construction can be completed on Ponds J21-K and J21-K1 (see Drawing No. 85210, Sheet 4 of 4 and 85400, Sheet M-10). The watershed area is relatively small and a typical gradient terrace design (see Chapter 26, Attachment B, Figure 7) can be utilized to control runoff from potential affected lands.

Temporary Diversion Design (V-ditch Channel)

10-year, 6-hour precipitation	=	1.60 inches
Area	=	41 ac.
CN	=	91
Time of concentration	=	0.268 hrs
Peak discharge	=	41.14 cfs
Critical slope	=	1.5%
Minimum design depth/w freeboard	=	3.5 feet
Side slopes	=	2:1 or flatter

To allow construction of a diversion ditch which will safely handle the flow over the existing topography, two alternative V-ditch designs (i.e., Design A or Design B) are recommended:

Design A: Earth-lined V-ditch (subcritical flow, 0.5% to 1.5% slope)

Minimum Slope	=	0.5%
n	=	0.025
d_n (min) (w/freeboard)	=	3.5 ft
Velocity	=	4.19 fps

Design B: Riprap-lined or bedrock-lined V-ditch (supercritical flow, 1.5% to 13.0% slope)

Maximum slope	=	13%
n	=	0.045
d_n (min) (w/freeboard)	=	2.5 ft
Velocity	=	9.15 fps
Riprap D_{max}	=	11.25 in
Riprap D_{50}	=	9.0 in



Note:

- Design selection will be field-fitted based on the slope of the constructed channel.
- If bedrock is encountered during excavation, Design B will not require the installation of riprap.
- Minimum 20 ft. length of riprapped ditch as a transitional channel between the two alternative designs.
- See Chapter 26 for construction specifications.
- The above two alternative ditch designs will be able to handle the design storm at slopes from 0.5% to 13% while still being stable.



Time of Concentration:

Elevation Difference = 7006-6925 = 81 ft.
Watercourse Length = 3200 ft = 0.606 mi
 $t_c = [11.9 (W.L.)^3 / (E.D.)]^{0.385} = 0.268 \text{ hr}$

SCS Curve Number

<u>Cover Type</u>	<u>Hydro Cond.</u>	<u>Soil Type</u>	<u>CN</u>	<u>Area (ac)</u>	<u>CN Area</u>
Graded Area	--	C	91	41.0	3731

Weighted CN = Use 91

Drainage Basin Area

41 Acres 0.064 sq. miles





CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

J21-J DIVERSION, 10-YEAR, 6-HOUR STORM

by

Name: JGS

Company Name: PEABODY WESTERN COAL COMPANY
File Name: C:\SEDCAD3\BMC\J21JDIV

Date: 01-05-1998





Civil Software Design -- SEDCAD+ Version 3.1
 Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: PEABODY WESTERN COAL COMPANY
 Filename: C:\SEDCAD3\BMC\J21JDIV User: JGS
 Date: 01-05-1998 Time: 19:15:27
 J21-J DIVERSION, 10-YEAR, 6-HOUR STORM
 Storm: 1.60 inches, 10 year- 6 hour, SCS Type II
 Hydrograph Convolution Interval: 0.1 hr

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SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

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-Hydrology-

JBS SWS	Area (ac)	CN UHS	Tc (hrs)	K (hrs)	X	Base- Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111 1	41.00	91 F	0.268	0.000	0.000	0.0	2.81	41.14
		Type: Null	Label: J21-J DIVERSION				2.81	
111 Structure	41.00						2.81	
111 Total IN/OUT	41.00						2.81	41.14



TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION

January 6, 1998
J21-J DIVERSION
10-YR., 6-HR. STORM

PROGRAM INPUT DATA:
DESCRIPTION

	VALUE
Flow Rate (cubic feet per second).....	41.1
Manning's Roughness Coefficient (n-value).....	0.0300
Channel Side Slope - Left Side (horizontal/vertical)....	2.00
Channel Side Slope - Right Side (horizontal/vertical)...	2.00
Channel Bottom Width (feet).....	0.0

PROGRAM RESULTS:
DESCRIPTION

	VALUE
Critical Depth (feet).....	1.92
Critical Slope (feet per foot).....	0.0154
Flow Velocity (feet per second).....	5.56
Froude Number.....	1.000
Velocity Head (feet).....	0.48
Energy Head (feet).....	2.40
Cross-Sectional Area of Flow (square feet).....	7.39
Top Width of Flow (feet).....	7.69

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

SEDCAD+ ERODIBLE CHANNEL DESIGN

J21-J DIVERSION

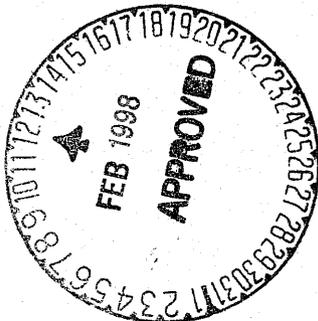
Limiting Velocity Technique
Sediment-laden Water

INPUT VALUES:

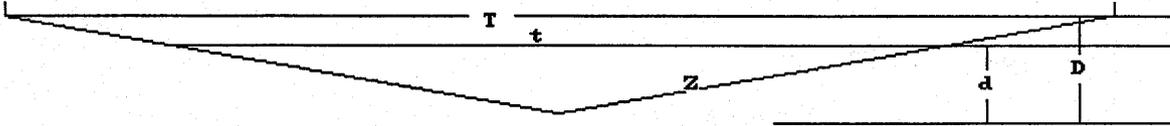
Shape	TRIANGULAR	
Discharge	41.14 cfs	
Slope	0.50 %	
Sideslopes	2.00:1 (L)	2.00:1 (R)
Manning's n	0.025	
Max. Velocity	6.00 fps	
Material	SHALES AND HARDPANS	
Freeboard	1 ft	

RESULTS:

Actual Discharge	41.14 cfs
Depth	2.22 ft
with Freeboard	3.22 ft
Top Width	8.86 ft
with Freeboard	12.86 ft
Velocity	4.19 fps
Cross Sectional Area	9.82 sq ft
Hydraulic Radius	0.99 ft
Froude Number	0.70



SEDCAD+ CHANNEL DESIGN
J21-J DIVERSION



MATERIAL: SHALES AND HARDPANS
Limiting Variable: Velocity = 6.000 fps
Sediment-laden Water

Discharge	=	41.14 cfs	Depth (d)	=	2.22 (W/D)	Freeboard:	
Side slopes (Z)	=	2.0:1(L) 2.0:1(R)	Top width (t)	=	8.86 (T)	12.00	ft
Bed Slope	=	0.50 %	Velocity	=	4.19 fps	12.00	ft
Manning's n	=	0.025	Hydraulic Radius	=	0.99 ft		
			Froude number	=	0.70		

SEDCAD+ RIPRAP CHANNEL DESIGN

J21-J DIVERSION

INPUT VALUES:

Shape	TRIANGULAR	
Discharge	41.14 cfs	
Slope	13.00 %	
Sideslopes (L and R)	2.00:1	2.00:1
Freeboard	1 ft	

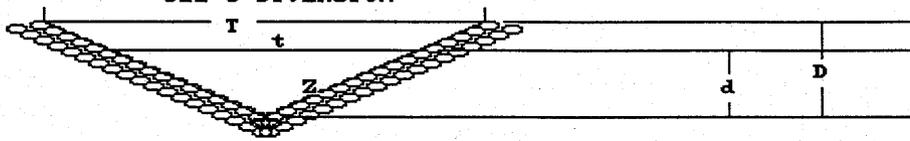
RESULTS:

Steep Slope Design - PADER Method

Depth	1.50 ft
with Freeboard	2.50 ft
Top Width	6.00 ft
with Freeboard	10.00 ft
Velocity	9.15 fps
Cross Sectional Area	4.50 sq ft
Hydraulic Radius	0.67 ft
Manning's n	0.045
Froude Number	1.86
Dmax	0.938 ft (11.25 in)
D50	0.750 ft (9.00 in)
D10	0.250 ft (3.00 in)



SEDCAD+ CHANNEL DESIGN
J21-J DIVERSION



Riprap - Steep Slope Design - PADER Method

Discharge	=	41.14 cfs	Depth (d)	=	1.50 (D/Freeboard)	ft
Side slopes (Z)	=	2.0:1(L) 2.0:1(R)	Top width (t)	=	6.00 (T)	ft
Bed Slope	=	13.00 %	Velocity	=	9.15 (V)	ft/s
Manning's n	=	0.045	Hydraulic Radius	=	0.67 (R)	ft
			Froude number	=	1.61	
			D _{max}	=	0.94 ft (11.25 in)	
			D ₅₀	=	0.75 ft (9.00 in)	
			D ₁₀	=	0.25 ft (3.00 in)	

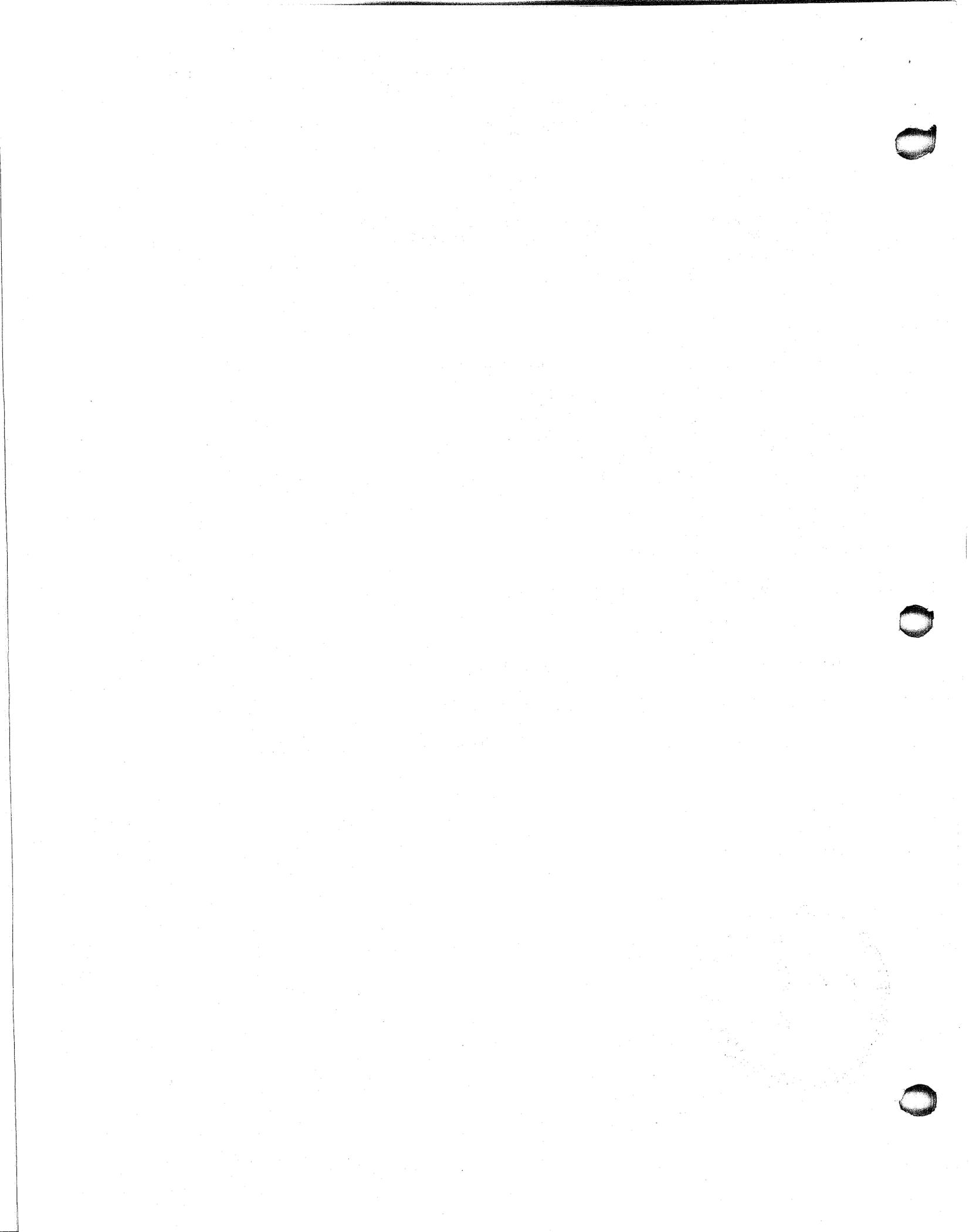
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3.2 POND J7-DAM.....	5

APPENDICES

- Appendix A Design Reports for BM-FWP
- Appendix B Design Reports for BM-TW
- Appendix C Design Reports for J7-I
- Appendix D Design Reports for J7-J
- Appendix E Design Reports for J7-M
- Appendix F Design Reports for KM-B
- Appendix G Design Reports for N12-C
- Appendix H 100-Year, 6-Hour Storm Event for J-7 Dam
- Appendix I 100-Year, 6-Hour Storm Event for KM-FWP
- Appendix J Bureau of Indian Affairs – January 15,1999 “Dam Classification Criteria” Letter





1.0 INTRODUCTION

This report responds to OSM's concerns regarding existing ponds that utilize culverts for emergency spillways. According to 30 CFR 816.49(a)(9), an impoundment can have a single spillway only if it is an open channel spillway not a culvert; however, 30 CFR 816.49(c)(2) allows approval of structures that relies primarily on storage to control the runoff from the design precipitation event. All of Peabody's impoundment structures are considered temporary structures until approximately two years prior to Peabody requesting Bond or Reclamation Liability Release. At that time and in consultation with the Tribal agencies and local entities, Peabody will determine which impoundment structures will be permitted as permanent impoundment structures. When this future permit request is submitted for approval, the structure's design will include either removing the existing culverts for a spillway and constructing an open channel spillway, or designing and constructing an additional open channel with the culvert(s) for the impoundment's spillway or exploring other available options with the regulatory agency at this future date.

Nine existing impoundments that utilize only a single culvert spillway were evaluated and includes the following structures: BM-FWP, BM-TW, J7-I, J7-J, J7-M, KM-B, N12-C, J7-Dam, and KM-FWP (see Drawing No. 85406 – "Design Spillway Type" and Chapter 6, Volume 1). All of these existing impoundment structures have been previously submitted to OSM in the AZ-0001 and/or AZ-0001D Permits. In addition to this evaluation, following is the location in the AZ-0001D Permit or in

pending permit revisions where additional design information can be found:

-BM-FWP (Pending Permit Revision, Attachment H, Volume 2)

-BM-TW (Pending Permit Revision, Attachment H, Volume 2)

-J7-I (Attachment H, Volume 3)

-J7-J (Attachment H, Volume 3)

-J7-M (Attachment H, Volume 3)

-KM-B (Attachment H, Volume 4)

-N12-C (Pending Permit Revision, Attachment H, Volume 6a)

-J-7 Dam (Chapter 6: MSHA-Size Structures, Volume 1)

-KM-FWP (Chapter 6: MSHA-Size Structures, Volume 1)

In addition, the following Impoundments: J7-O, J7-P and J27-B Ponds have only culverts for





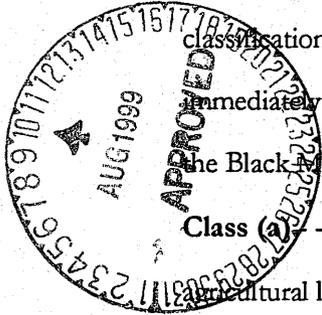
spillways; however, all three of these structures have pending OSM permit revisions or approved permit revisions to reclaim these structures. Evaluations of these three impoundments are not included in this report and all three of these structures are assumed to be reclaimed in 1999. The locations of all of the above structures are shown on Drawing No. 85405.

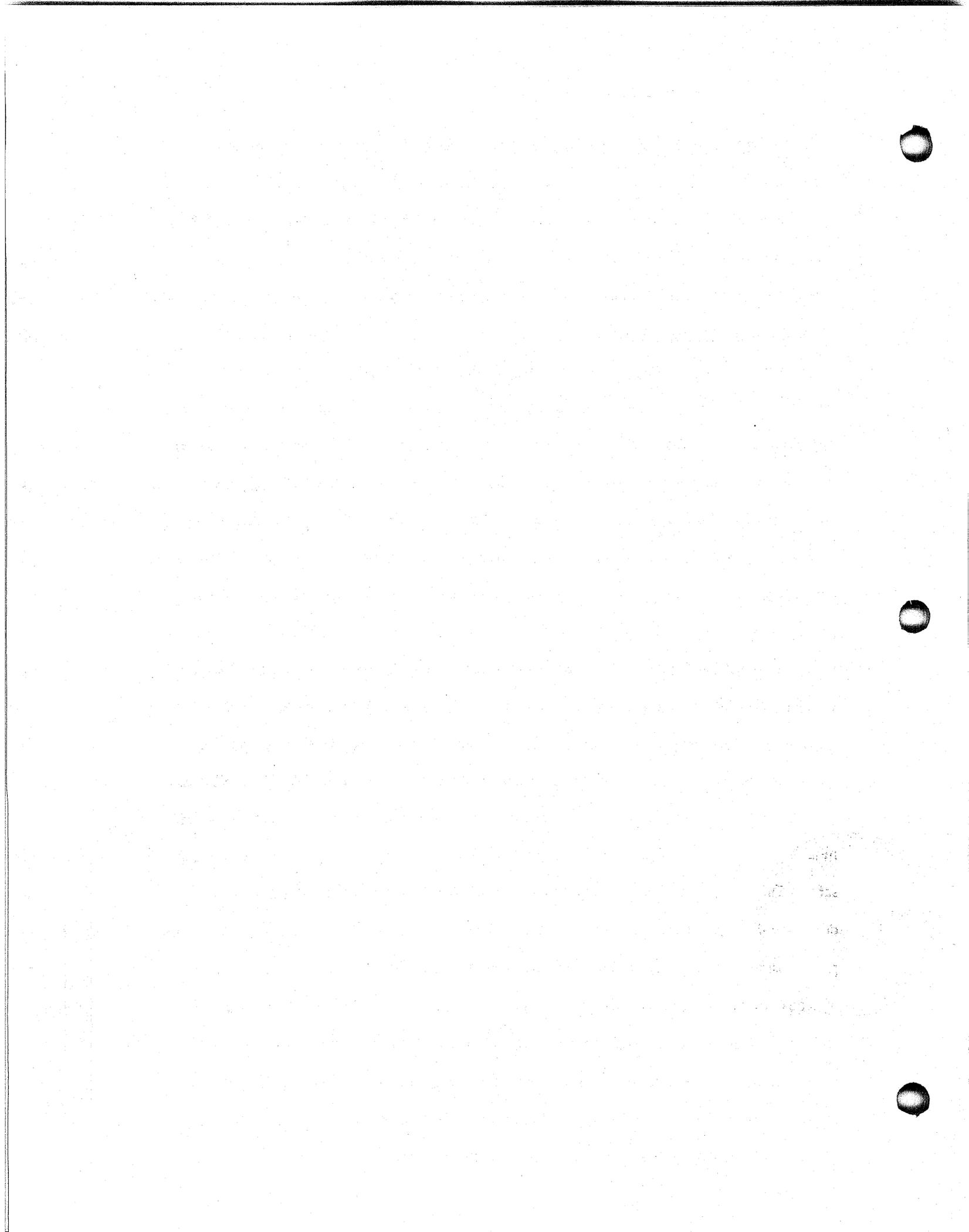
For all nine of the existing impoundments evaluated, Peabody is proposing to provide "control primarily through storage" by establishing a maximum operating elevation in the ponding area. Peabody will dewater each of these structures below the maximum operating elevation in accordance with Peabody's approved OSM dewatering plan and Peabody's NPDES Permit. Therefore, the design event will be safely controlled and the water in the ponding area will be safely removed using current prudent engineering practices. In December 1998 Peabody contacted Mr. Chuck Nixon supervisor of the Bureau of Indian Affairs (BIA) - Navajo Area Office, Dam Safety Program to discuss the hazard classification of ponds and dams on the Navajo Indian Reservation. Mr. Nixon was supplied with a copy of the NRCS TR-60 dam classification criteria to review. BIA utilizes the Bureau of Reclamation and USCOE dam classification; however, Mr. Nixon stated the hazard classification criteria appeared to be similar between the above agencies. Mr. Nixon also stated, the BIA equivalent of the NRCS Class (a) dam classification criteria only includes roads that are dirt or gravel and a downstream road will have to have enough traffic volume or jurisdiction classification to be required to be a paved road before the impounding structure will be classified equivalent to a Class (b) or Class (c) structure. Therefore, based on Mr. Nixon's discussion; the following NRCS TR-60 dam

classification criteria; and the lack of any Class (b) or Class (c) structures, facilities or situation immediately downstream in the floodplain area, all Non-MSHA and all MSHA size structures within the Black Mesa permit area are classified as Class (a) structures:

Class (a) - Dams located in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.

In conclusion, all of the impoundment structures within the Black Mesa permit area are not located where failure would be expected to cause loss of life or serious property damage nor do the impoundment structures meet the NRCS TR-60 Class (b) or (c) criteria. Based on this evaluation, the appropriate design storage event was evaluated for each structure.



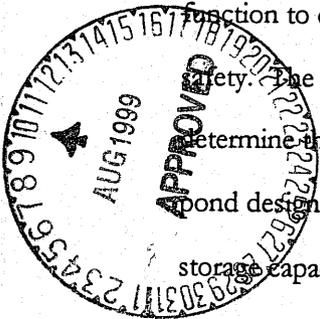


2.0 NON-MSHA IMPOUNDMENT SPILLWAY DESIGN EVALUATION

Structures BM-FWP, BM-TW, J7-I, J7-J, J7-M, KM-B and N12-C are classified as low-hazard Class (a) structures (see Drawing No. 85408). In addition, the mine area is sparsely populated, with no one living in the downstream floodplains of these structures. The structures impound less than 20 acre-feet and are less than 20 vertical feet in height from the upstream toe of the embankment of the natural stream elevation to the spillway invert elevation.

To replace the existing spillways with an open channel spillway will not be practical because the existing spillway culverts are installed under existing access or haul roads. In order to comply with the applicable OSM regulations while reflecting the practical site-specific considerations, PWCC proposes to maintain adequate storage in these impoundments to contain the storm runoff from the 25-year, 6-hour storm event while maintaining a minimum of one foot of freeboard. For ponds in-series with upstream ponds and the combined storage volume is greater than 20 acre-feet (see the design report), the 100-year, 6-hour storm event was utilized. Required containment volumes have been determined assuming the culverts do not exist. Using this methodology demonstrates that the ponds have the capacity to contain the 25-year, 6-hour or 100-year, 6-hour storm event, as required, and do not require an emergency spillway. The existing culverts are, therefore, not required for the ponds to function adequately and in compliance with the law. If however, the culverts remain, they will

function to dewater the ponds after any major storm event and thus will provide an added measure of safety. The required storage volumes for each pond are shown in Table 1. The calculations to determine the required storage volumes are found in the individual design reports for each pond. The pond design reports are included in Appendices A to G. To assure that adequate design stormwater storage capacity is available; the maximum operating water levels in the impoundments will be maintained at or below the elevations shown on Table 1. As required, the existing culverts or pumping will control water levels. During the fall of 1998, this design methodology and resulting compliance with applicable regulatory requirements were verified through discussions with OSM's personnel.



**Table 1
REQUIRED STORAGE CAPACITY**

Pond	Runoff Volume 25-yr, 6-hr (ac-ft) (2)	Peak Stage (ft) (1)	Maximum Operating Water Level (ft)	Ponding Area Design Storage Volume (ac-ft)
KM-B	1.35	6504.8	6502.9	1.35
J7-M	5.07	6381.5	6378.5	5.07
J7-J	0.81	6362.2	6459.5	0.81
J7-I*	10.54	6346.6	6343.4	10.54
N12-C*	34.20	6595.9	6589.1	34.20
BM-TW	0.49	6490.1	6486.5	0.49
BM-FWP	0.28	6611.2	6611.0	0.28

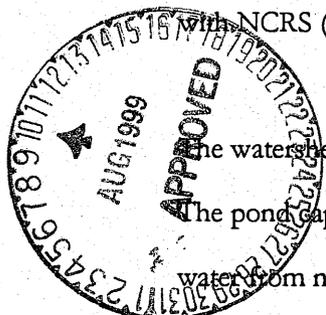
Notes: 1. Peak stage is one foot below the embankment crest.
*2. The runoff volume for J7-I is for the 100-year, 6-hour event because the pond is in series with pond J7-H. The runoff volume was determined assuming J7-H was reclaimed.
The runoff volume for N12-C is for the 100-year, 6-hour event because the pond is in series with pond N12-C1 and N12-C2. The runoff volume was determined assuming N12-C1 and N12-C2 were reclaimed.

3.0 MSHA IMPOUNDMENT SPILLWAY DESIGN EVALUATION

3.1 POND KM-FWP

Impoundment KM-FWP is used to store water as part of Peabody's water system. The embankment is classified as an MSHA structure based on its capacity. The impoundment is located in an area which is sparsely populated, with no one living in the downstream floodplain, therefore, in accordance with NCRS (formerly SCS) TR-60, the embankment is classified as a Class (a) embankment structure.

The watershed for KM-FWP consists of the pond and a small area surrounding the pond (4.3 acres). The pond capacity at the invert of the principal spillway is 21.7 ac-ft. The pond receives and stores water from nearby Navajo aquifer wells. Well water discharges to the pond through buried pipelines, which empty into the impoundment through a riser. Any overflow water from KM-FWP will discharge through the principal spillway to Pond KM-E downstream. The invert elevation of the principal spillway is 6615.6.



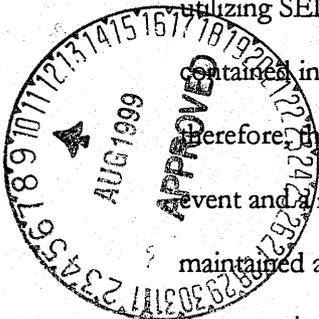


Pond KM-FWP does not incorporate an emergency spillway, instead the peak runoff from the 100-year, 6-hour event will be contained. The total runoff from the 100-year, 6-hour event is 0.86 ac-ft. The runoff volume was determined using SEDCAD4. All inputs and results are shown on the SEDCAD4 computer printouts contained in Appendix I. The top of the embankment is approximately 6620.0; therefore, the peak stage is 6619.0. To maintain adequate capacity to contain the 100-year, 6-hour event and a minimum of one foot of freeboard, the maximum operational water elevation will be maintained at or below elevation 6618.6. As required, the existing culvert and pumping will control the operational water level.

3.2 POND J-7 DAM

Pond J-7 Dam is an MSHA-size impoundment that collects runoff from a 9,157-acre watershed. The watershed is predominately undisturbed. The pond is used for sediment control, to store water for dust suppression on the existing mine haul roads and as a backup water supply. The pond has existing capacity of 448.52 ac-ft at the invert of the spillway. The embankment is classified as an MSHA structure based on its height and capacity. The impoundment is located in an area which is sparsely populated, with no one living in the downstream floodplain, therefore, in accordance with NCRS (formerly SCS) TR-60, the embankment is classified as a Class (a) embankment structure.

The total runoff from the 100-year, 6-hour event is 517.7 ac-ft. The runoff volume was determined utilizing SEDCAD4. All inputs and results are shown on the SEDCAD4 computer printouts contained in Appendix H. The top of the embankment is at approximately elevation 6375.4; therefore, the peak stage is 6374.4. To maintain adequate capacity to contain the 100-year, 6-hour event and a minimum of one foot of freeboard, the maximum operational water elevation will be maintained at or below elevation 6364.7. As required, the existing culverts and pumping will control the operation water level.





The following appendices are attached and complete this evaluation report:

- Appendix A Design Reports for BM-FWP
- Appendix B Design Reports for BM-TW
- Appendix C Design Reports for J7-I
- Appendix D Design Reports for J7-J
- Appendix E Design Reports for J7-M
- Appendix F Design Reports for KM-B
- Appendix G Design Reports for N12-C
- Appendix H 100-Year, 6-Hour SEDCAD4 Runs for J-7 Dam
- Appendix I 100-Year, 6-Hour SEDCAD4 Runs for KM-FWP

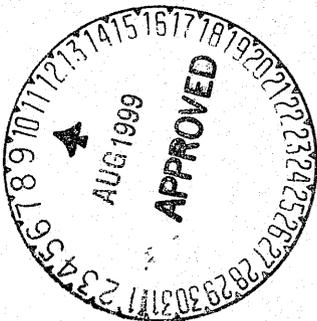




Appendix A

Design Report for BM-FWP

(See Chapter 6, Attachment H, Volume 2 for the Complete Certified Report and Drawings)





DESIGN REPORT

Temporary Impoundment Structure

BM-FWP

Black Mesa Mine

Navajo County, Arizona

For

PEABODY WESTERN COAL COMPANY

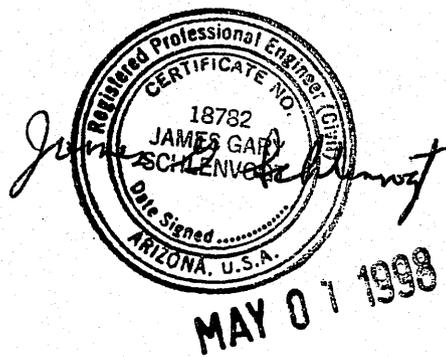


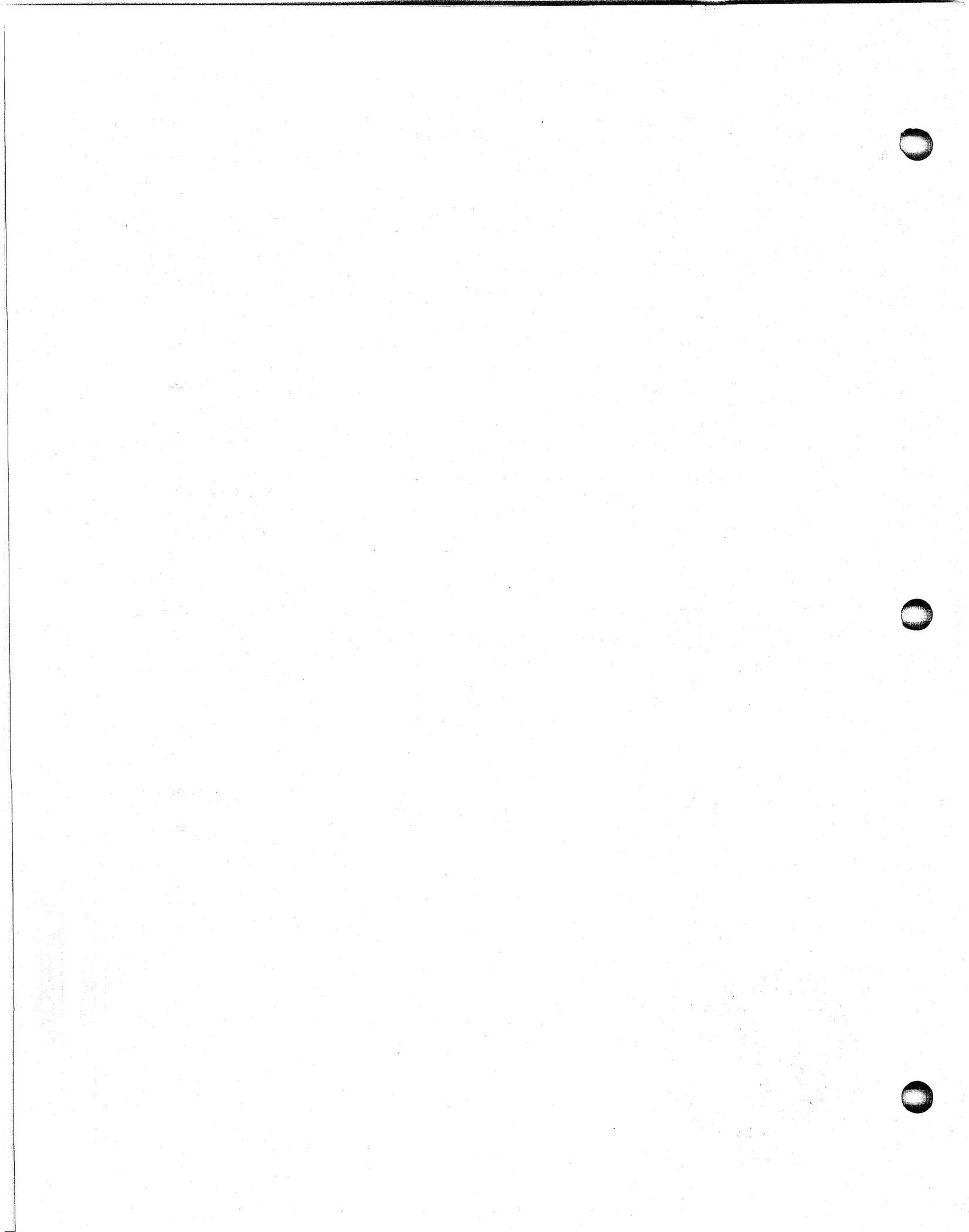


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APPENDIX A	Hydrology Calculations
APPENDIX B	SEDCAD+ (Input and Output) 25-Year, 6-Hour Storm Event
EXHIBIT #1	BM-FWP Temporary Impoundment Design





INTRODUCTION

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

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

INSPECTION

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



SITE DESCRIPTION

LAND USE

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

DESIGN ANALYSES

GENERAL

Structure BM-FWP was designed under the supervision of a Registered Professional Engineer from Peabody Western Coal Company. The design was performed in accordance with applicable 30 CFR 780 and 816 regulations of the United States Department of Interior, Office of Surface Mining (OSM) and included a review of available project files. The most current information contained in the Peabody Western Coal Company files includes topographic maps developed from aerial photography flown in 1990 for Peabody Western Coal Company and was used in the analyses of the structure.

STABILITY

Structure BM-FWP is completely incised impoundment. The incised slopes are approximately 5.5:1 (horizontal to vertical). Based on the total pond depth of approximately 10 feet, these slopes are equal to or flatter than the recommended "worst case" embankment/foundation condition slopes in Table 3-6, Attachment D, Chapter 6; therefore, the basin slopes will be stable.



HYDROLOGY

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

The following parameters were used in the hydrologic analysis:

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



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

BM-FWP POND HYDROLOGY TABLE

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

Notes: The Storage Capacity figure reflects available pond storage up to the defined Operational Elevation.

The Peak Storage figure reflects available pond storage up to the Peak Stage elevation and includes

Storage Capacity plus stormwater inflow volume (7.93 + 0.28).



INLET AND OUTLET STRUCTURES

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

* * *

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

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

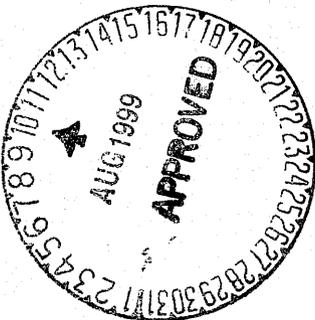




Appendix B

Design Report for BM-TW

(See Chapter 6, Attachment H, Volume 2 for the Complete Certified Report and Drawings)





DESIGN REPORT

Temporary Impoundment Structure

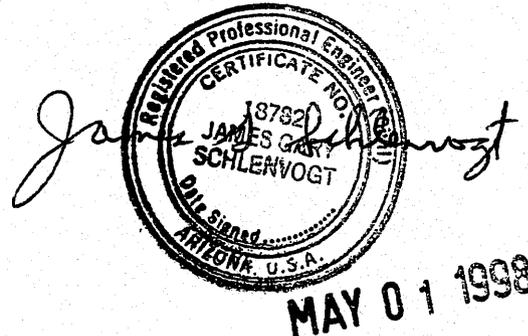
BM-TW

Black Mesa Mine

Navajo County, Arizona

For

PEABODY WESTERN COAL COMPANY



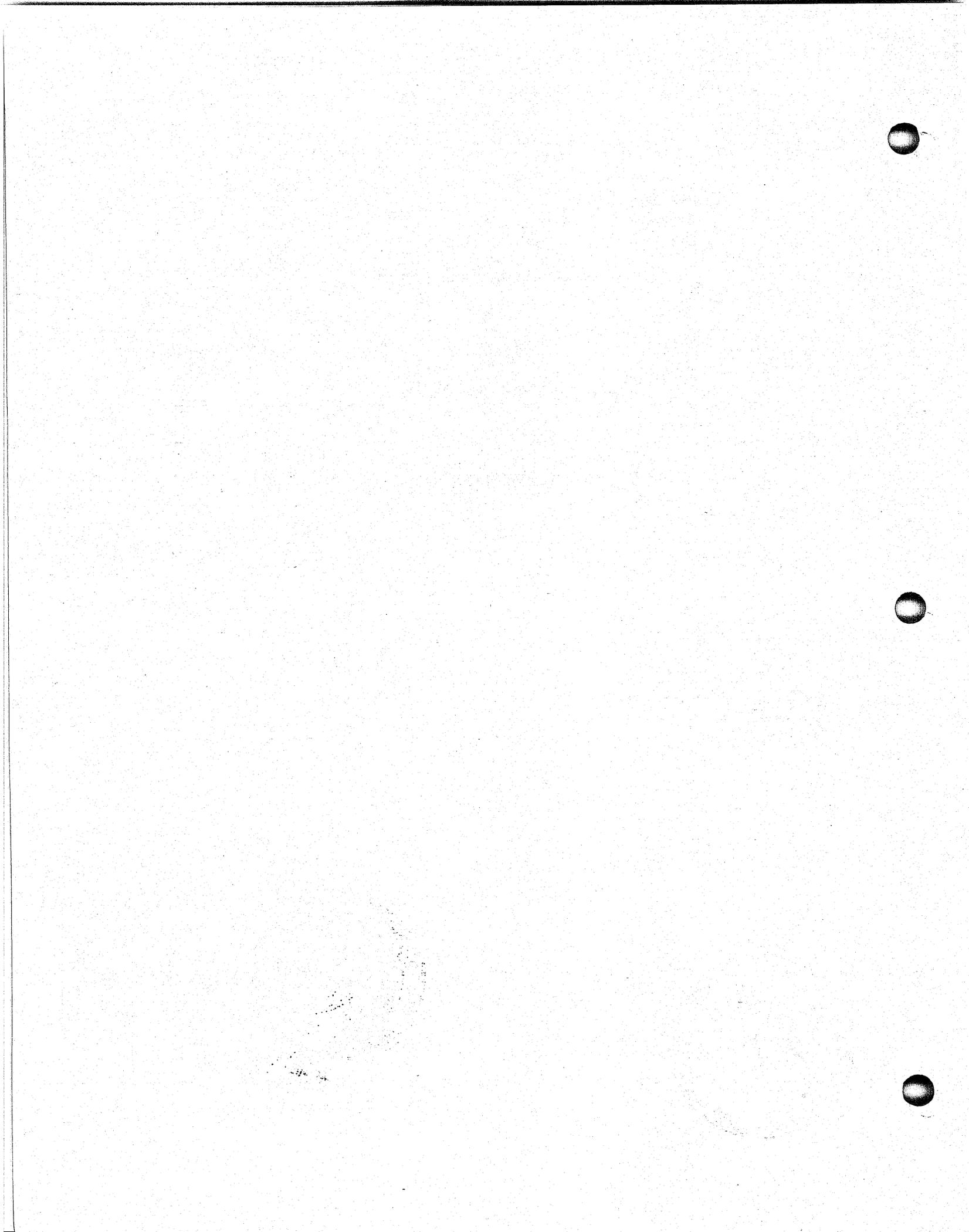


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- APPENDIX A Hydrology Calculations
- APPENDIX B SEDCAD+ (Input and Output) 25-Year, 6-Hour Storm Event
- EXHIBIT #1 BM-TW Temporary Impoundment Design





INTRODUCTION

Impoundment Structure BM-TW is an earthen embankment, designed and constructed by Peabody Western Coal Company as a temporary impoundment structure to collect runoff from portions of the facilities area at the Black Mesa Mine. BM-TW was constructed to collect runoff and wash water from the truck wash area as secondary control after the truck wash sump. BM-TW is not designed as a sediment control structure. The sediment control for the BM-TW watershed is incorporated into the designs for downstream sediment structure BM-SS assuming BM-TW is non-existent. The location of Structure BM-TW and its watershed boundary are shown on Drawing No. 85400 (Sheet K-10) and Drawing No. 85405. The site-specific general construction plans are shown on the attached Exhibit 1.

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

INSPECTION

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



SITE DESCRIPTION

LAND USE

Structure BM-TW has a 5.5-acre tributary area and is located upstream of sediment structure BM-SS. The watershed is classified as 100% disturbed.

DESIGN ANALYSES

GENERAL

Structure BM-TW was designed under the supervision of a Registered Professional Engineer from Peabody Western Coal Company. The design was performed in accordance with applicable 30 CFR 780 and 816 regulations of the United States Department of Interior, Office of Surface Mining (OSM) and included a review of available project files. The most current information contained in the Peabody Western Coal Company files includes topographic maps developed from aerial photography flown in 1990 for Peabody Western Coal Company and was used in the analyses of the structure.

STABILITY

Structure BM-TW is a Category A-5 embankment. A homogeneous earthen embankment, compacted in lifts to design specifications, and approximately 10 feet wide on top was constructed. An upstream slope of a minimum 1.75:1 (horizontal to vertical) and a downstream slope of 3.25:1 was utilized. Based on the total embankment height of approximately 13 feet, these slopes are equal to or flatter than the recommended "worst case" embankment/foundation condition slopes in Table 3-6, Attachment D, Chapter 6; therefore, the embankment will be stable.



HYDROLOGY

The hydrologic analysis was completed using the computer program SEDCAD+ (see Appendices A and B). Structure BM-TW is classified as a low hazard structure (see Drawing No. 85408). In addition, the mine area is sparsely populated with no one living in the downstream floodplain. The structure will impound less than 20 acre-feet and be less than 20 vertical feet in height from the upstream toe of the embankment of the natural stream elevation to the spillway invert elevation.

BM-TW has an 18-inch diameter culvert spillway. Adequate storage capacity, however, will be maintained in the impoundment above the normal operating level and below the spillway invert to contain the storm runoff from the 25-year, 6-hour storm event with no discharge through the spillway. To assure that adequate storm water storage capacity is available, the operating water level in the impoundment will be maintained at or below elevation 6486.5. Water level will be controlled and excess stormwater runoff accumulations will be removed by pumping (see Chapter 6 dewatering discussion), as required. This design methodology and compliance with applicable regulatory requirements were verified through discussions with OSM personnel.

The following parameters were used in the hydrologic analysis:

	<u>25-yr.6-hr Storm</u>
1. Water Course length, L	0.171 mi.
2. Elevation Difference, H	37 ft
Time of Concentration, T _c	0.084 hr
SCS Curve Number	91
5. Rainfall Depth, 25-year, 6-hour storm	1.9 in
Drainage Area	5.5 acres

HYDRAULICS

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

BM-TW POND HYDRAULICS TABLE

	Units	25-Yr, 6-Hr Storm
Initial Reservoir Volume Condition		Full to emergency spillway
Inflow		
Peak Flow	cfs	8.75
Volume	ac-ft	0.49
Storage		
Spillway Invert	msl	6488.0
Peak Stage	msl	6488.0
Operational Elev.	msl	6486.5
Peak Storage	ac-ft	2.38
Storage Capacity	ac-ft	1.89
Top of Impoundment	msl	6491.1
Freeboard	ft	3.1

Notes: The Storage Capacity figure reflects available pond storage up to the defined Operational Elevation.

The Peak Storage figure reflects available pond storage up to the Peak Stage elevation and includes

Storage Capacity plus stormwater inflow volume (1.89 + 0.49).



SPILLWAY

The existing spillway for BM-TW is a corrugated metal pipe with dimensions listed below. The alignment and dimensions are shown on Exhibit 1. As designed, operating water levels will be maintained at or below 6486.5 elevation such that peak stage for the 25-year, 6-hour storm is at or below the spillway invert.

Pipe Diameter	(Spillway)	1.5	ft
Pipe Length	(Spillway)	40	ft
Average Slope	(Spillway)	0.1	%
Spillway Elevation		6488	ft

* * *

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

- Appendix A - Hydrology Calculations
- Appendix B - SEDCAD+ (Input and Output) 100-Year, 6-Hour Storm Event
- Exhibit # 1 - BM-TW Temporary Impoundment Design





Appendix C

Design Report for J7-I

(See Chapter 6, Attachment H, Volume 3 for the Complete Certified Report and Drawings)





INSPECTION REPORT
Sedimentation Structure
J7-I
Black Mesa Mine
Navajo County, Arizona
for
PEABODY COAL COMPANY

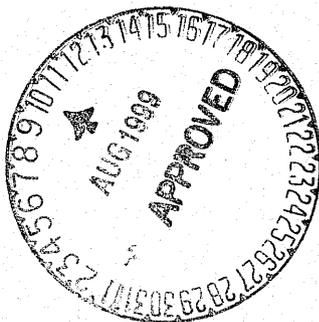


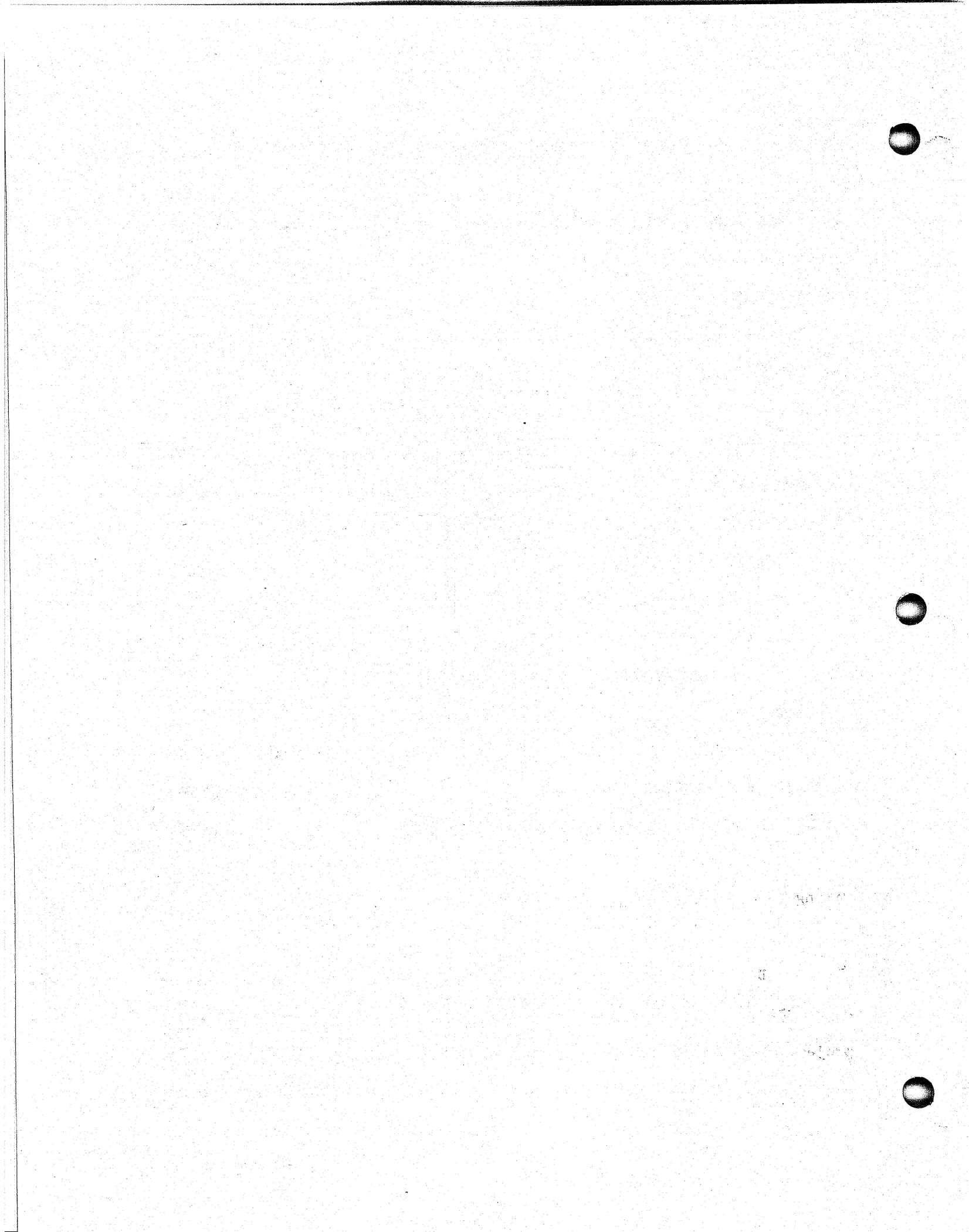
Dames & Moore
10139-011-22



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INTRODUCTION

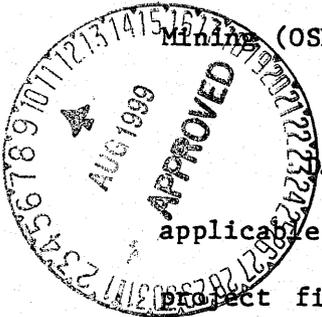
Sedimentation Structure J7-I is an earthen embankment, designed and constructed in 1983 by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from the disturbed mining areas of the Black Mesa Mine. The location of Structure J7-I is shown on Plate 1, Site Plan.

This inspection report contains information specific to Structure J7-I. 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 J7-I was inspected on September 2, 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 J7-I 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

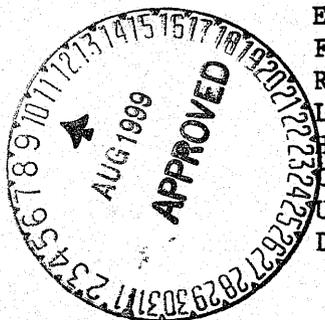
Structure J7-I has a 117.1-acre tributary drainage area and is located near Yucca Flats Wash at the Black Mesa Mine. The watershed is classified as 66% disturbed, 31% Sagebrush, and 3% reclaimed.

EMBANKMENT

Structure J7-I is a homogeneous earthen embankment classified as a roadway embankment. Physical characteristics of the embankment are listed in the following table:

Structure J7-I

Embankment	Residual Sandstone/Shale Soils
Foundation	Sandstone
Right Abutment	Residual Shale Soils
Left Abutment	Residual Shale Soils
Height	13.7 ft
Crest Width	30 ft
Upstream Slope	3.75 H : 1 V
Downstream Slope	3.75 H : 1 V



A cross-section of the embankment is shown on Plate 2, Existing Maximum Cross Section J7-I, A-A'. Grass provides erosion protection on the upstream and downstream slopes of the embankment.

ANALYSES

STABILITY

Structure J7-I is a category A-5 embankment. A standard category A-5 embankment has static and seismic factors of safety of 1.5 and 1.2, respectively, under the following conditions:

1. Maximum height = 30 ft
2. Maximum upstream slope = 2.0 H : 1 V
3. Maximum downstream slope = 4.25 H : 1 V
4. Normal pool with steady seepage saturation conditions

The upstream slope is lower in height and has a flatter slope than the category standard. 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 J7-I is located downstream from Structure J7-H. The two structures have a combined storage capacity that is greater than 20 acre-feet. Therefore, the spillway for J7-I was analyzed using the 100-year, 6-hour storm. The storage capacity of Structure J7-I was analyzed using the 10-year, 24-hour storm.



The following parameters were used in the hydrologic analysis:

1. Water Course length, L 0.473 mi
2. Elevation Difference, H 135 ft
3. Time of Concentration in hours, T_c 0.166 h
4. Lag time, $0.6T_c$ 0.099 h
5. SCS Curve Number 85
6. Rainfall Depth, 10-year, 24-hour storm 2.1 in.
100-year, 6-hour storm 2.4 in.
7. Drainage Area, 10-year, 24-hour storm 117.1 acres
100-year, 6-hour storm 150.1 acres

HYDRAULICS

The HEC-1 program was utilized to evaluate inflow, reservoir response and outflow from the sedimentation structure. The initial conditions and results of the analysis are summarized in the following table.



J7-I HYDRAULICS

	Units	10-year 24-hour Storm	100-year 6-hour Storm
Initial Reservoir Volume			
Condition		Empty	Full to the spillway elevation
Inflow			
Peak Flow	cfs	162	362
Volume	acre-ft	8.59	10.54
Storage			
Peak Stage	ft	6335.76	6343.19
Spillway Elevation	ft	6340.00	—
Peak Storage	acre-ft	8.57	—
Storage Capacity	acre-ft	16.8	—
Outflow			
Peak Flow	cfs	0	80
Embankment Crest Elevation	ft	—	6347.60
Peak Storage	ft	—	6343.19
Freeboard	ft	—	3.19
Spillway			
Pipe Exit Velocity	fps	—	10.3
Mannings "n"		—	0.024
Outflow Channel			
Slope	%	—	<u>Section I</u> <u>Section II</u> 14 5
Normal Velocity	fps	—	8.7 6.2
Normal Depth	ft	—	0.74 0.55
Manning's "n"		—	0.040 0.040



Spillway

The existing spillway for J7-I consists of two corrugated metal pipes (CMP) with the following dimensions:

Pipe Diameter 36 in.
Pipe length 89 ft
Upstream invert elevation 6340.0 ft
Approximate slope 3.9 percent

Outflow Channel

The existing outflow channel for J7-I has a trapezoidal channel with the following dimensions:

Channel depth 2 ft
Channel width 15 ft
Channel length 100 ft
Side slopes (horizontal to vertical). . 2:1
Average exit slope 10 percent

The first 50 feet of the channel is riprapped with rock.

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, J7-I.



The calculations for the sediment load entering Structure J7-I were made utilizing the Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.192
3. Slope Factor, LS 1.0
4. Cover Factor, C 0.673
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 J7-I is shown on Plate 3, Volume-Elevation Curve, J7-I, and the results of the analysis are summarized in the following table.

J7-I STORAGE

Total Storage Capacity	16.8	acre-ft
10-year, 24-hour Storm Inflow	8.59	acre-ft
Available Sediment Storage Capacity	8.23	acre-ft
Sediment Inflow Rate	0.27	acre-ft/yr
Sediment Storage Life	30	yrs

REMEDIAL COMPLIANCE PLAN



The inspection of Structure J7-I indicated that the geotechnical problems consist of rill erosion on the upstream slopes; a large gully on downstream slope; heavy erosion at the downstream toe of the embankment and gullies on the right abutment; and a steep downstream slope. Correction of erosion is considered a periodic maintenance task and does not require

remedial action. The downstream slope should be flattened to 4.25 horizontal to 1 vertical to meet stability requirements. Evidence of seepage was noted below the downstream toe of embankment through the sandstone bedrock. Remedial action for this condition is not required at the present time, however, future inspections should check for changes.

HYDRAULICS

The storage capacity and spillway capacity of Structure J7-I are adequate; however, the spillway does not have an adequate outflow channel or adequate erosion protection. A trapezoidal outflow channel and a stilling basin should be constructed along the alignment B-B' shown in Plate 1. The channel and stilling basin profile is shown in Plate 4 and the required dimensions are shown in Plate 5 and Plate 6. The outflow channel, and stilling basin should be protected against erosion using geotextile and riprap as shown in Plate 5. A trashrack should be installed on the inlet of the CMP to prevent clogging of the spillway.



* * *

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

- Plate 1 - Site Plan J7-I
- Plate 2 - Existing Maximum Cross Section J7-I, A-A'
- Plate 3 - Volume-Elevation Curve J7-I
- Plate 4 - Channel Profile J7-I, B-B'
- Plate 5 - Spillway and Outflow Channel Cross Section J7-I
- Plate 6 - Spillway Stilling Basin Plan J7-I
- Appendix A - Inspection Check List
- Appendix B - Hydrology and Hydraulic Calculations

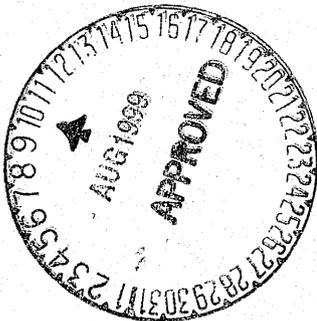




Appendix D

Design Report for J7-J

(See Chapter 6, Attachment H, Volume 3 for the Complete Certified Report and Drawings)





INSPECTION REPORT

Sedimentation Structure

J7-J

Black Mesa Mine

Navajo County, Arizona

for

PEABODY COAL COMPANY



Dames & Moore
10139-011-22



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INTRODUCTION

Sedimentation Structure J7-J is an earthen embankment, designed and constructed in 1983 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 J7-J is shown on Plate 1, Site Plan.

This inspection report contains information specific to Structure J7-J. 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 J7-J was inspected on August 31, 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 J7-J 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 J7-J has a 9.14-acre tributary drainage area and is located near Yucca Flats Wash at the Black Mesa Mine. The watershed is classified as 100% disturbed.

EMBANKMENT

Structure J7-J is a homogeneous earthen embankment classified as a roadway embankment. Physical characteristics of the embankment are listed in the following table:

Structure J7-J

Embankment	Residual Shale Soils
Foundation	Sandstone
Right Abutment	Residual Shale Soils
Left Abutment	Residual Shale Soils
Height	10.8 ft
Crest Width	30 ft
Upstream Slope	3.3 H : 1 V
Downstream Slope	2.9 H : 1 V



A cross-section of the embankment is shown on Plate 2, Existing Maximum Cross Section J7-J, A-A'. Grass provides erosion protection on the upstream and downstream slopes of the embankment.

ANALYSES

STABILITY

Structure J7-J is a category B-5 embankment. A standard category B-5 embankment has static and seismic factors of safety of 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 = 2.5 H : 1 V
4. Normal pool with steady seepage saturation conditions

The J7-J embankment is lower in height and has flatter slopes than the category standard; therefore, the embankment has factors of safety greater 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 J7-J 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 J7-J was analyzed using the 10-year, 24-hour storm.

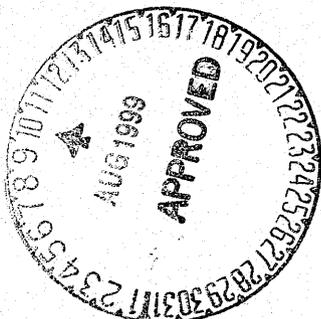


The following parameters were used in the hydrologic analysis:

1. Water Course length, L 0.142 mi
2. Elevation Difference, H 62 ft
3. Time of Concentration in hours, T_c 0.0556 h
4. Lag time, $0.6T_c$ 0.0333 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 9.14 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.



J7-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	24	30
Volume	acre-ft	0.96	0.81
Storage			
Peak Stage	ft	6357.16	6361.73
Spillway Elevation . .	ft	6360.31	—
Peak Storage	acre-ft	0.94	—
Storage Capacity . . .	acre-ft	1.72	—
Outflow			
Peak Flow	cfs	0	8
Embankment Crest			
Elevation	ft	—	6363.20
Peak Stage	ft	—	6361.73
Freeboard	ft	—	1.47
Spillway			
Pipe Exit Velocity . .	fps	—	7.7
Mannings "n"		—	0.024
Outflow Channel			
Slope	%	—	<u>Section I</u> <u>Section II</u> 8 35
Normal Velocity	fps	—	3.2 5.0
Normal Depth	ft	—	0.17 0.11
Manning's "n"		—	0.040 0.040



Spillway

The existing spillway for J7-J is a corrugated metal pipe (CMP) with the following dimensions:

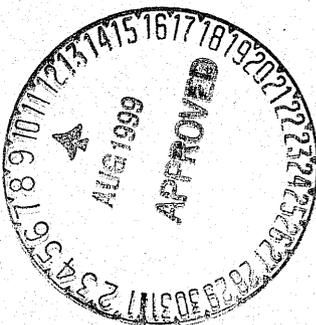
Pipe diameter	24	in.
Pipe length	108	ft
Upstream invert elevation	6360.31	ft
Downstream invert elevation	6356.11	ft
Slope	5.2	percent

Outflow Channel

The structure presently has no outflow 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, J7-J.



The calculations for the sediment load entering Structure J7-J were made utilizing the Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.21
3. Slope Factor, LS 2.77
4. Cover Factor, C 1.0
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 J7-J is shown on Plate 3, Volume-Elevation Curve, J7-J, and the results of the analysis are summarized in the following table.

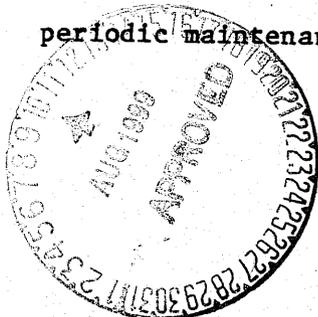
J7-J STORAGE

Total Storage Capacity	1.72	acre-ft
10-year, 24-hour Storm Inflow	0.96	acre-ft
Available Sediment Storage Capacity	0.78	acre-ft
Sediment Inflow Rate	0.099	acre-ft/yr
Sediment Storage Life	8	yrs

REMEDIAL COMPLIANCE PLAN

GEOTECHNICS

The inspection of Structure J7-J indicated that the only geotechnical problem is rill erosion on the upstream and downstream slopes; and a steep downstream slope. Correction of erosion is considered a periodic maintenance task and does not require remedial action.



HYDRAULICS

The storage capacity and spillway capacity of Structure J7-J are adequate; however, the spillway does not have an outflow channel. A trapezoidal outflow channel should be constructed along the alignment B-B' shown in Plate 1. The channel profile is shown in Plate 4 and the required dimensions are shown in Plate 5. The outflow channel should be protected against erosion using geotextile and riprap as shown in Plate 5. A trash-rack should be installed on the inlet of the CMP to prevent clogging of the spillway.

* * *

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

- Plate 1 - Site Plan J7-J
- Plate 2 - Existing Maximum Cross Section J7-J, A-A'
- Plate 3 - Volume-Elevation Curve J7-J
- Plate 4 - Channel Profile J7-J, B-B'
- Plate 5 - Outflow Channel Cross Section J7-J
- Appendix A - Inspection Check List
- Appendix B - Hydrology and Hydraulic Calculations



Appendix E

Design Report for J7-M

(See Chapter 6, Attachment H, Volume 3 for the Complete Certified Report and Drawings)





INSPECTION REPORT
Sedimentation Structure
J7-M
Black Mesa Mine
Navajo County, Arizona
for
PEABODY COAL COMPANY



Dames & Moore
10139-011-22

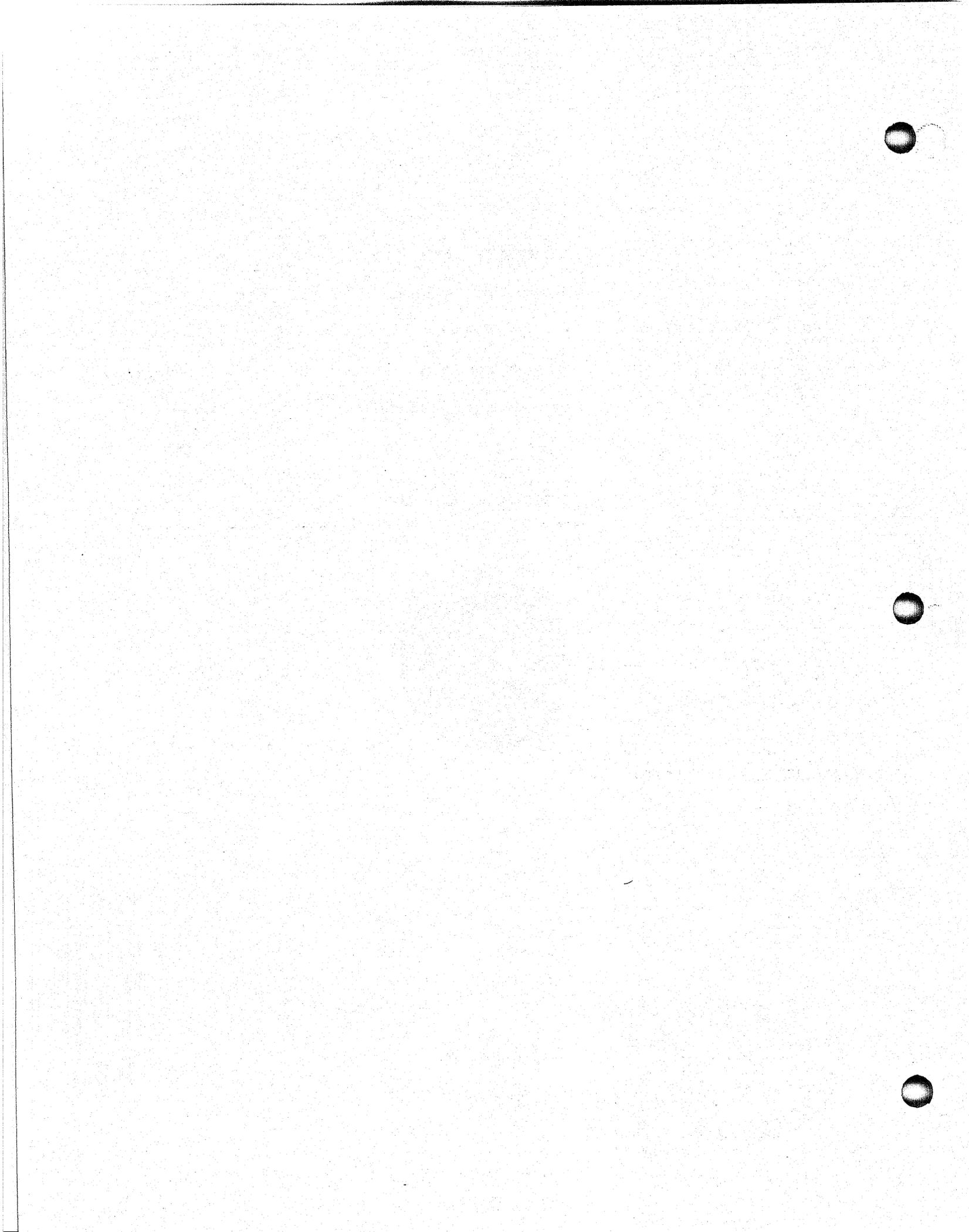


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INTRODUCTION

Sedimentation Structure J7-M is an earthen embankment, designed and constructed in 1983 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 J7-M is shown on Plate 1, Site Plan.

This inspection report contains information specific to Structure J7-M. 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 J7-M was inspected on August 31, 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 J7-M 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 J7-M has a 52.0-acre tributary drainage area and is located near Sagebrush Wash at the Black Mesa Mine. The watershed is classified as 100% disturbed.

EMBANKMENT

Structure J7-M is a homogeneous earthen embankment classified as a roadway embankment. Physical characteristics of the embankment are listed in the following table:

Structure J7-M

Embankment	Residual Sandstone Soils
Foundation	Residual Sandstone Soils
Right Abutment	Residual Sandstone Soils/Sandstone
Left Abutment	Residual Sandstone Soils/Sandstone
Height	13.9 ft
Crest Width	30 ft
Upstream Slope	3.3 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 J7-M, A-A'. Grass provides erosion protection on the upstream and downstream slopes of the embankment.

ANALYSES

STABILITY

Structure J7-M is a category A-1 embankment. A standard category A-1 embankment has static and seismic factors of safety of 1.5 and 1.2, respectively, under the following conditions:

1. Maximum height = 20 ft
2. Maximum upstream slope = 2.0 H : 1 V
3. Maximum downstream slope = 4.0 H : 1 V
4. Normal pool with steady seepage saturation conditions

The J7-M 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 J7-M is located downstream from Structure J7-N. The two structures have a combined storage capacity that is less than 20 acre-feet. Therefore, the spillway for J7-M was analyzed using the 25-year, 6-hour storm. The storage capacity of Structure J7-M was analyzed using the 10-year, 24-hour storm.



The following parameters were used in the hydrologic analysis:

1. Water Course length, L 0.540 mi
2. Elevation Difference, H 98 ft
3. Time of Concentration, T_c 0.218 h
4. Lag time, $0.6T_c$ 0.131 h
5. SCS Curve Number 92
6. Rainfall Depth, 10-year, 24-hour storm . 2.1 in.
25-year, 6-hour storm . 1.9 in.
7. Drainage Area 52.0 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. Both the 10-year and 25-year storms were routed through Structure J7-N located upstream and into Structure J7-M. The initial conditions and results of the analysis are summarized in the following table.



J7-M 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	100	127
Volume	acre-ft	5.91	5.07
Storage			
Peak Stage	ft	6373.69	—
Spillway Elevation . .	ft	6377.40	—
Peak Storage	acre-ft	5.91	—
Storage Capacity . . .	acre-ft	10.4	—
Outflow			
Peak Flow	cfs	0	49
Embankment Crest			
Elevation	ft	—	6382.40
Peak Stage	ft	—	6379.61
Freeboard	ft	—	2.79
Spillway			
Pipe Exit Velocity (36" CMP)	fps	—	11.8
Pipe Exit Velocity (48" CMP)	fps	—	7.2
Mannings "n"		—	0.024
Outflow Channel			
Slope	%	—	9
Normal Velocity	fps	—	6.4
Normal Depth	ft	—	0.47
Manning's "n"		—	0.040



Spillway Channel

The existing spillway for J7-M consists of two corrugated metal pipes (CMP) with the following dimensions:

Pipe diameters 36, 48 in.
Pipe lengths 60 ft
Approximate slope 1-2 percent
Upstream invert elevation 6377.40 ft

Outflow Channel

The existing outflow channel for J7-M is a U-shaped channel with the following dimensions:

Channel width 8 ft
Channel length 30 ft
Average exit slope 3 percent

Rock provides 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, J7-M.



The calculations for the sediment load entering Structure J7-M were made utilizing the Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.203
3. Slope Factor, LS 2.6
4. Cover Factor, C 1.0
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 J7-M and the results of the sediment inflow analysis are summarized in the following table.

J7-M STORAGE

Total Storage Capacity	10.4	acre-ft
10-year, 24-hour Storm Inflow	5.91	acre-ft
Available Sediment Storage Capacity	4.49	acre-ft
Sediment Inflow Rate	0.509	acre-ft/yr
Sediment Storage Life	9	yrs

REMEDIAL COMPLIANCE PLAN

GEOTECHNICS

The inspection of Structure J7-M indicated that the geotechnical problems consist of rills on the upstream and downstream slopes and gullies in the right and left abutments; and a steep downstream slope. Correction of erosion is considered a periodic maintenance task and does not require



remedial action. The downstream slope should be flattened to 4.0 horizontal to 1 vertical to meet stability requirements.

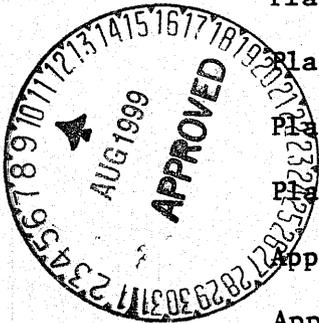
HYDRAULICS

The storage capacity and spillway capacity of Structure J7-M are adequate; however, the spillway does not have an adequate outflow channel. A trapezoidal outflow channel should be constructed along the alignment B-B' shown in Plate 1. The channel profile is shown in Plate 4 and the required dimensions are shown in Plate 5. The outflow channel should be protected against erosion using geotextile and riprap as shown in Plate 5. A trash-rack should be installed on the inlet of the CMP to prevent clogging of the spillway.

* * *

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

- Plate 1 - Site Plan J7-M
- Plate 2 - Existing Maximum Cross Section J7-M, A-A'
- Plate 3 - Volume-Elevation Curve J7-M
- Plate 4 - Channel Profile J7-M, B-B'
- Plate 5 - Outflow Channel Cross Section J7-M
- Appendix A - Inspection Check List
- Appendix B - Hydrology and Hydraulic Calculations



Appendix F

Design Report for KM-B

(See Chapter 6, Attachment H, Volume 4 for the Complete Certified Report and Drawings)





INSPECTION REPORT
Sedimentation Structure
KM-B
Kayenta Mine
Navajo County, Arizona
for
PEABODY COAL COMPANY



Dames & Moore
10139-011-22

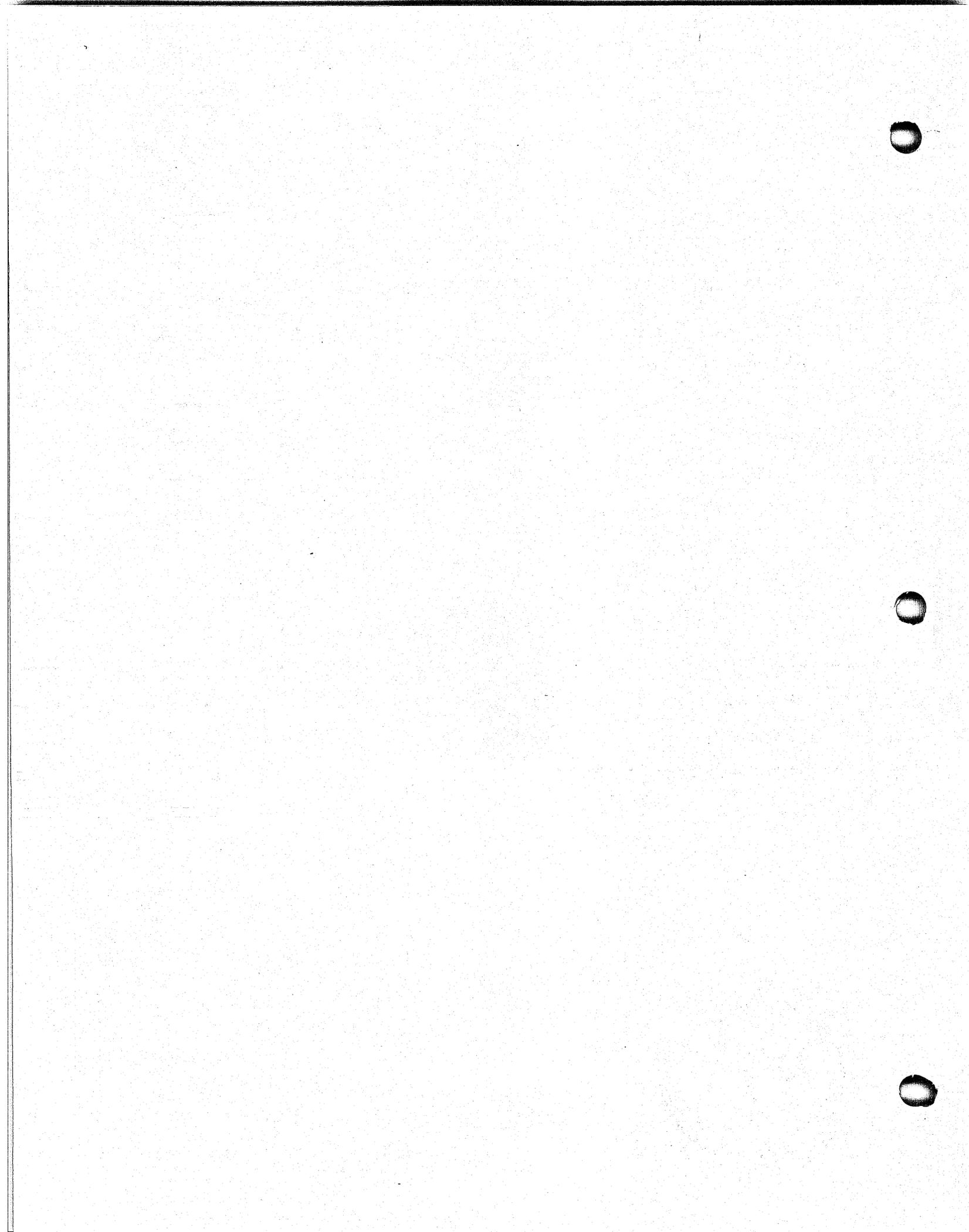


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INTRODUCTION

Sedimentation Structure KM-B is an earthen embankment, designed and constructed in 1983 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 KM-B is shown on Plate 1, Site Plan.

This inspection report contains information specific to Structure KM-B. 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 KM-B was inspected on September 5, 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 KM-B 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 KM-B has a 22.5-acre tributary drainage area and is located near the Yellow Water Canyon at the Kayenta Mine. The watershed is classified as 75% Pinion/Juniper and 25% disturbed.

EMBANKMENT

Structure KM-B is a homogeneous earthen embankment classified as a roadway embankment. Physical characteristics of the embankment are listed in the following table:

Structure KM-B

Embankment	Residual Shale Soils
Foundation	Alluvium
Right Abutment	Shale
Left Abutment	Shale
Height	12.4 ft
Crest Width	21 ft
Upstream Slope	1.9 H : 1 V
Downstream Slope	3.3 H : 1 V



A cross-section of the embankment is shown on Plate 2, Existing Maximum Cross Section KM-B, A-A'. Grass provides erosion protection on the upstream and downstream slopes of the embankment.

ANALYSES

STABILITY

Structure KM-B is a category B-3 embankment. A standard category B-3 embankment has static and seismic factors of safety of 1.5 and 1.2, respectively, under the following conditions:

1. Maximum height = 20 ft
2. Maximum upstream slope = 2.0 H : 1 V
3. Maximum downstream slope = 2.5 H : 1 V
4. Normal pool with steady seepage saturation conditions

The KM-B embankment is lower in height; however, the upstream 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 KM-B 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 KM-B was analyzed using the 10-year, 24-hour storm.



The following parameters were used in the hydrologic analysis:

1. Water Course length, L 0.303 mi
2. Elevation Difference, H 106 ft
3. Time of Concentration, T_c 0.109 h
4. Lag time, $0.6T_c$ 0.065 h
5. SCS Curve Number 85
6. Rainfall Depth, 10-year, 24-hour storm . 2.1 in.
25-year, 6-hour storm. . 1.9 in.
7. Drainage Area 22.5 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.



KM-B 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	34	44
Volume	acre-ft	1.66	1.35
Storage			
Peak Stage	ft	6497.58	6505.42
Spillway Elevation . .	ft	6504.10	—
Peak Storage	acre-ft	1.66	—
Storage Capacity . . .	acre-ft	4.40	—
Outflow			
Peak Flow	cfs	0	7
Embankment Crest			
Elevation	ft	—	6507.10
Peak Stage	ft	—	6505.42
Freeboard	ft	—	1.68
Spillway			
Pipe Exit Velocity . .	fps	—	7.3
Mannings "n"		—	0.024
Outflow Channel			
Slope	%	—	<u>Section I</u> <u>Section II</u> 8 43
Normal Velocity. . . .	fps	—	2.9 4.8
Normal Depth	ft	—	0.15 0.09
Manning's "n"		—	0.040 0.040



Spillway

The existing spillway for KM-B is a 24-inch corrugated metal pipe (CMP).

Pipe length	42	ft
Pipe Invert Elevation Upstream	6504.10	ft
Pipe Invert Elevation Downstream	6502.00	ft
Pipe slope	5	percent

Outflow Channel

The existing outflow channel for KM-B has a U-shaped channel with the following dimensions:

Channel width	8	ft
Channel length	50	ft
Side slopes (horizontal to vertical)	2:1	
Average exit slope	5	percent

There is presently no 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, KM-B.



The calculations for the sediment load entering Structure KM-B 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 19.42
4. Cover Factor, C 0.355
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 KM-B and the results of the sediment inflow analysis are summarized in the following table.

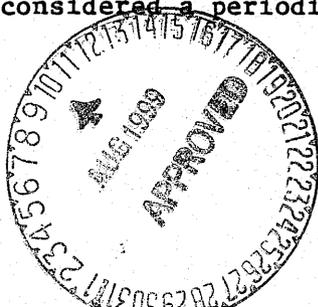
KM-B STORAGE

Total Storage Capacity	4.40 acre-ft
10-year, 24-hour Storm Inflow	1.66 acre-ft
Available Sediment Storage Capacity	2.74 acre-ft
Sediment Inflow Rate	0.46 acre-ft/yr
Sediment Storage Life	6 yrs

REMEDIAL COMPLIANCE PLAN

GEOTECHNICS

The inspection of Structure KM-B indicated that the only geotechnical problem is rill and gully erosion on the upstream and downstream slope and the right and left abutments. Correction of erosion is considered a periodic maintenance task and does not require remedial action.



The upstream slope should be flattened to 2.0 horizontal to 1 vertical to meet stability requirements.

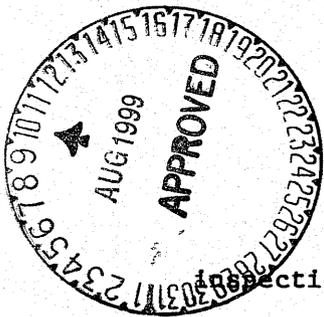
HYDRAULICS

The storage capacity and spillway capacity of Structure KM-B are adequate; however, the spillway does not have an adequate outflow channel or adequate erosion protection. There is no suitable location for an improved outflow channel along the existing alignment. Therefore, a new pipe spillway and outflow channel should be constructed along the alignment B-B' shown in Plate 1. The existing spillway should be abandoned. The spillway and outflow channel profile is shown in Plate 4 and the required dimensions are shown in Plate 5. The outflow channel should be protected against erosion using geotextile and riprap as shown in Plate 5. A trashrack should be installed on the inlet of the CMP to prevent clogging of the spillway.

* * *

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

- Plate 1 - Site Plan KM-B
- Plate 2 - Existing Maximum Cross Section KM-B, A-A'
- Plate 3 - Volume-Elevation Curve KM-B
- Plate 4 - Channel Profile KM-B, B-B'
- Plate 5 - Outflow Channel Cross Section KM-B
- Appendix A - Inspection Check List
- Appendix B - Hydrology and Hydraulic Calculations

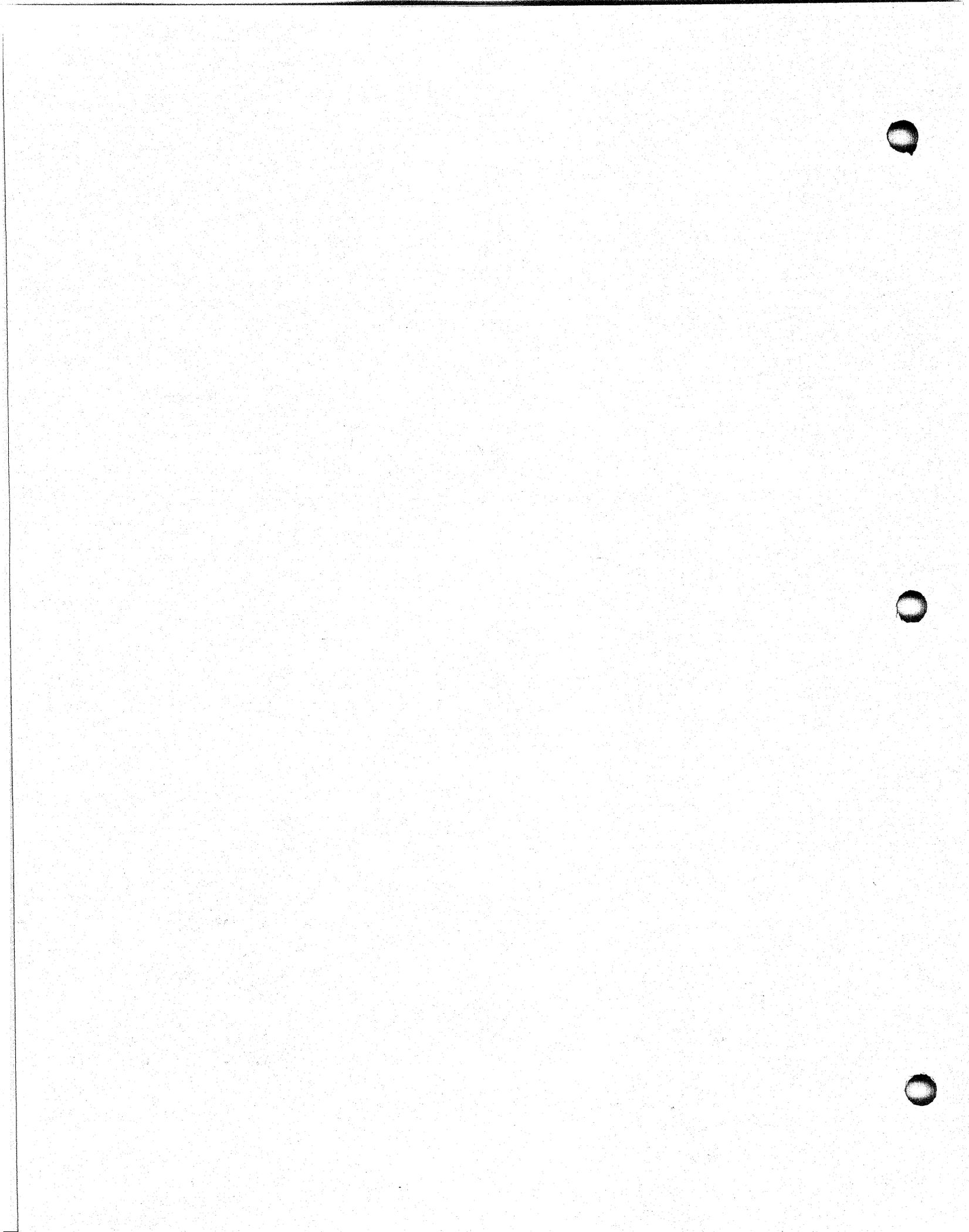


Appendix G

Design Report for N12-C

(See Chapter 6, Attachment H, Volume 6a for the Complete Certified Report and Drawings)





INSPECTION REPORT

Sedimentation Structure

N12-C

Kayenta Mine

Navajo County, Arizona

For

PEABODY WESTERN COAL COMPANY

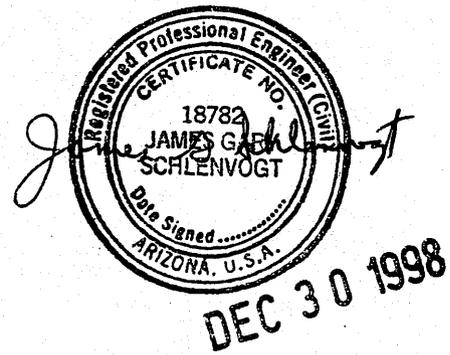
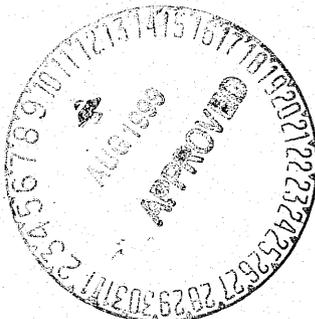


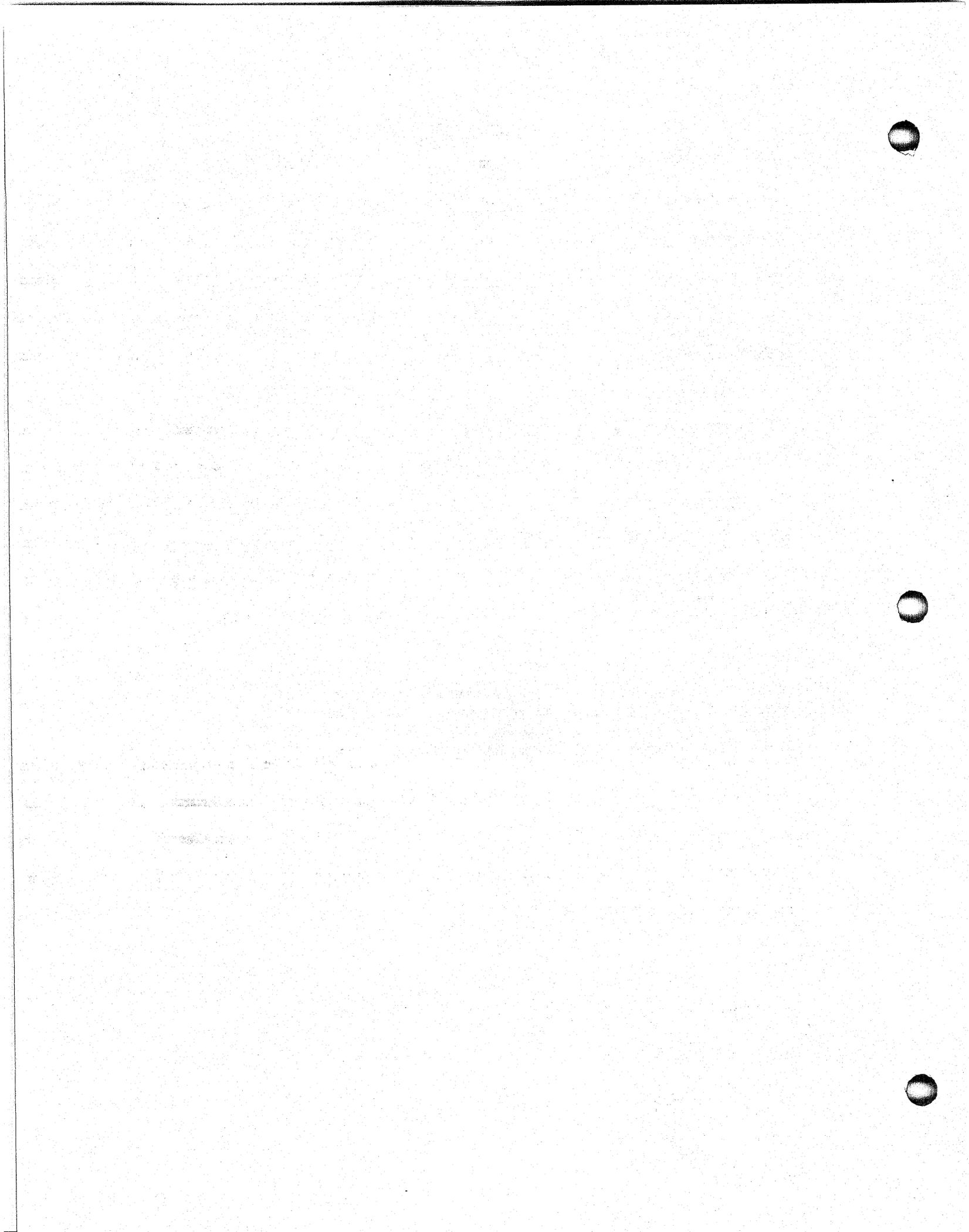


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INTRODUCTION

Sedimentation Structure N12-C is a partially incised structure with an earthen embankment, designed and reconstructed in 1994 by Peabody Western Coal Company as a sedimentation structure to control runoff and sediment from portions of the disturbed mining area at the Black Mesa and Kayenta Mines. The location of Structure N12-C and its watershed boundary are shown on Drawing No. 85400 (Sheets L-7 and L-8) and Drawing No. 85405. The site-specific 1994 as-built plans are shown on the attached Exhibit 1. With this revised design evaluation, the N12-C structure will not require any field modifications.

This inspection report contains information specific to Structure N12-C, which is in series with Sedimentation Structures N12-C1 and N12-C2. Mine-wide design, construction, and reclamation information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona, for Peabody Western Coal Company", December, 1985 (PAP), Chapter 6, Attachment D, Volume 2, along with the methods and results of analyses used for slope stability, hydrology, and hydraulics, and in Chapter 6, Pages 11 to 42, "Sediment and Water Control Facility Plan".

INSPECTION

Existing Structure N12-C was inspected by a Registered Professional Engineer from Peabody Western Coal Company, to assure that the existing structure is stable and no adverse conditions exist. A detailed geotechnical investigation was not performed, rather, the information in Chapter 6, Attachment D was utilized for embankment design and during construction to assure that the as-built embankment configuration would be stable.



SITE DESCRIPTION

LAND USE

The N12-C, N12-C1 and N12-C2 Structures have a combined watershed of 473.0 acres and are located near Coal Mine Wash at the Kayenta Mine. The 80.5 acre watershed that contributes directly to structure N12-C is classified as, 34% pinion/juniper, 30% disturbed, and 36% sagebrush/grass.

DESIGN ANALYSES

GENERAL

Structure N12-C was designed under the supervision of a Registered Professional Engineer from Peabody Western Coal Company. The design was performed in accordance with applicable 30 CFR 780 and 816 regulations of the United States Department of Interior, Office of Surface Mining (OSM) and included a review of available project files. The most current information contained in the Peabody Western Coal Company files includes topographic maps developed from aerial photography flown in 1998 for Peabody Western Coal Company and was used in the analyses of the structure.

STABILITY

Structure N12-C is a Category A-1 embankment with a homogeneous earthen embankment, compacted in lifts to design specifications and approximately 22 feet wide on top. An upstream slope of 3:1 (horizontal to vertical) and a downstream slope of 4:1 was constructed. Based on the total embankment height of approximately 19.4 feet, these slopes are equal to or flatter than the recommended "worst case" embankment/foundation condition slopes in Table 3-6, Attachment D, Chapter 6; therefore, the embankment will be stable. The embankment incorporates a 48-inch diameter corrugated metal pipe for an emergency spillway.

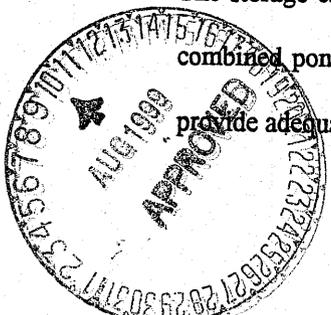


HYDROLOGY

The hydrologic analysis was completed using the computer program SEDCAD 4 (see Appendices A, B, and C). Structure N12-C was constructed in series with Structures N12-C1 and N12-C2. Structure N12-C is classified as a low hazard structure (see Drawing No. 85408). In addition, the mine area is sparsely populated with no one living in the downstream floodplain. The structure will impound 26.41 acre-feet, however, 6.71 acre-feet are incised. The embankment is also less than 20 vertical feet in height from the upstream toe of the embankment at the natural stream elevation to the spillway invert elevation.

The N12-C structure is in series with the N12-C1 and N12-C2 structures and the combined storage capacity is greater than 20 acre-feet; therefore, the spillway was analyzed using the 100-year, 6-hour storm event assuming structures N12-C1 and N12C-2 are reclaimed. The N12-C structure contains a 48-inch culvert. According to 30 CFR 816.49(a)(9), an impoundment can have a single spillway only if it is an open channel spillway and not a culvert. To replace the existing spillway with an open channel spillway would not be practical because the spillway runs under an existing access road. In order to comply with the applicable OSM regulations including 30 CFR 816.49(c)(2) while reflecting the practical site-specific considerations, PWCC proposes to maintain adequate storage in this impoundment to contain the storm run-off from the 100-year, 6-hour storm event while maintaining a minimum of one foot of freeboard. Required containment volumes have been determined assuming the culvert does not exist. The existing culvert is, therefore, not required for the pond to function adequately and in compliance with the law. If, however, the culvert remains, it will function to dewater the pond after any major storm event and thus will provide an added measure of safety, (see Chapter 6, Attachment AF for additional discussions).

The storage capacity of structure N12-C was analyzed using the 10-year, 24-hour storm event. The combined ponds in series were verified to completely contain the 10-year, 24-hour storm event, and provide adequate sediment storage volume, without discharging.



The following parameters were used in the hydrologic analysis:

1.	Water Course length, L	0.744 mi.
2.	Elevation Difference, H	224 ft
3.	Time of Concentration, T _c	0.229 hr
4.	SCS Curve Number	80
5.	Rainfall Depth, 10-year, 24-hour storm	2.1 in
	100-year, 6-hour storm	2.4 in
6.	Drainage Area	80.5 acres

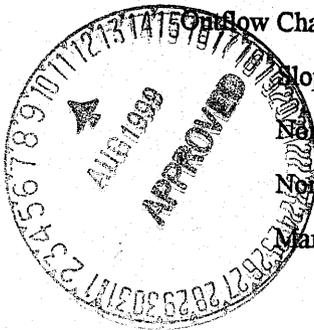
HYDRAULICS

The SEDCAD 4 and Flow Master computer programs were used to evaluate inflow to the sedimentation structure, and the resulting water surface elevations. The initial conditions and results of the analysis are summarized in the following table (supporting calculations are presented in Appendices A, B, and C).



N12-C SEDIMENTATION POND HYDRAULICS TABLE

	Units	10-Yr, 24-Hr Storm	100-Yr, 6-Hr Storm
Initial Reservoir Volume Condition		Empty	Full to the Spillway Elevation
Inflow			
Peak Flow	Cfs	44.8	410.5
Volume	ac-ft	3.63	34.2
Storage			
Peak Stage	Msl	N/A	6595.9
Max. Operating Elev.	Msl	N/A	6589.1
Spillway Elev.	Msl	6584.6	6584.6
Storage Capacity	ac-ft	26.4	N/A
Embankment Crest Elev.	Msl	6596.9	6596.9
Freeboard	Ft	--	1.0
Outflow			
Peak Flow	Cfs	N/A	85.9
Embankment Crest Elev.	ft	N/A	6596.9
Spillway Elevation	ft	N/A	6584.6
Peak Stage	ft	N/A	6589.4
Freeboard	ft	N/A	7.5
Spillway Pipe			
Design Headwater	Ft	N/A	4.8
Pipe Diameter	Ft	N/A	4.0
Manning's "n"		N/A	0.024
Outflow Channel			
Slope	%	N/A	27
Normal Velocity	fps	N/A	20.7
Normal Depth	ft	N/A	0.27
Manning's "n"		N/A	0.015



SPILLWAY AND OUTFLOW CHANNEL

The existing spillway for N12-C is a corrugated metal pipe with dimensions as listed below. The culvert alignment and dimensions are shown on Exhibit 1.

Pipe Diameter	4.0	ft
Pipe Length	72	ft
Average Slope	15	%
Spillway Elevation	6584.6	ft

The existing outflow channel for N12-C has a trapezoidal channel with the following dimensions:

Channel Bottom Width	15	ft
Channel Length	60	ft
Side Slopes	2:1	
Average Exit Slope	27	%

The outflow channel is protected against erosion with fabriform and was constructed beyond the toe of the embankment as a transition into the downstream channel.

STORAGE CAPACITY

The impoundment stage-capacity table (see Exhibit 1) is based on the 1994 aerial topographic mapping conducted for Peabody Western Coal Company. Structure N12-C is designed to contain approximately 26.4 acre-feet.

The calculations for the sediment load entering structure N12-C were made utilizing the Revised

Universal Soil Loss Equation with the following parameters:

Rainfall Factor, R	40
Soil Erodibility Factor, K	0.27
Slope Factor, LS	6.65



- 4. Cover Factor, C 0.392
- 5. Erosion Control Factor, P 0.941

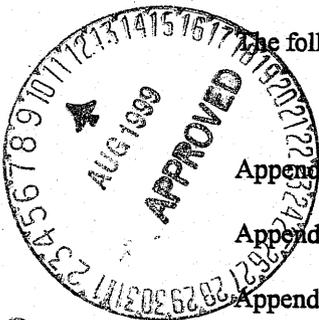
The hydrologic analysis gives the storage volume required to contain the 10-year, 24-hour storm, and the remaining storage volume available for storing sediment. Structure N12-C has sufficient available storage capacity to contain the 10-year, 24-hour storm with adequate excess capacity to store additional flows from structures N12-C2 and N12-C1. The combined sediment storage capacity was determined for the structures in series and the results of the analysis are presented in the following table.

Combined Storage for Structures N12-C2, N12-C1 and N12-C

	<u>N12-C2</u>	<u>N12-C1</u>	<u>N12-C</u>	<u>Combined</u>
Total Storage Capacity	18.95	18.38	26.41	63.74 acre-ft
10-Year, 24-Hour Storm Inflow	20.15	2.46	3.63	26.24 acre-ft
Available Sediment Storage Capacity	--	--	--	37.50 acre-ft
Sediment Inflow Rate/Year	3.30	0.52	0.95	4.77 acre-ft
Sediment Storage Life	--	--	--	7.9 years

* * *

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



- Appendix A - Hydrology, Hydraulic, and Sedimentation Calculations
- Appendix B - SEDCAD4 (Input and Output) 10-Year, 24-Hour Storm Event
- Appendix C - SEDCAD4 (Input and Output) 100-Year, 6-Hour Storm Event
- Exhibit #1 - Proposed N12-C Sedimentation Pond Design



Appendix H

100-Year, 6-Hour Storm Event for J7-Dam

(See Chapter 6: MSHA-Size Structures, Volume 1 for Addition Information)





**PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA**

PROJECT: J-7 Pond (Dam #1211-AZ-9-0003)

STRUCTURE: J7

TIME OF CONCENTRATION:

Start Elevation (ft) = 7120
 End Elevation (ft) = 6350
 Elevation Difference, E (ft) = 770

Watercourse Length (ft) = 41500
 Watercourse Length, L (mi) = 7.860

$T_c = (11.9L^3/E)^{0.385} = \underline{\underline{2.173 \text{ hours}}}$

ROUTING PARAMETERS:

Between structure routing parameters were calculated using the SCS Upland Method in SEDCAD+. Input and output parameters are shown on the SEDCAD+ printouts in Appendices B and C.

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Pinyon Juniper	B	65	635.0	41275.0
Pinyon Juniper	C	78	628.8	49046.4
Pinyon Juniper	D	83	5238.0	434754.0
Sagebrush	B	60	1350.3	81018.0
Sagebrush	C	73	742.7	54217.1
Sagebrush	D	79	67.0	5293.0
Disturbed	C	87	495.3	43094.6
TOTAL:			9157.1	708698.1

Weighted CN = Total CN*Area/ Total Area = 77

DRAINAGE BASIN AREA:

9157.0 Acres





J-7 Pond

Pond Capacity Assessment

100-Year, 6-Hour Storm

KCK

Montgomery Watson Americas, Inc.
165 S. Union Blvd., Suite 460
Lakewood, CO 80228

Phone: (303)763-5140
Email: kevin.kammerzell@us.mw.com





General Information

Storm Information:

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





Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	J-7 Pond

#1
Null

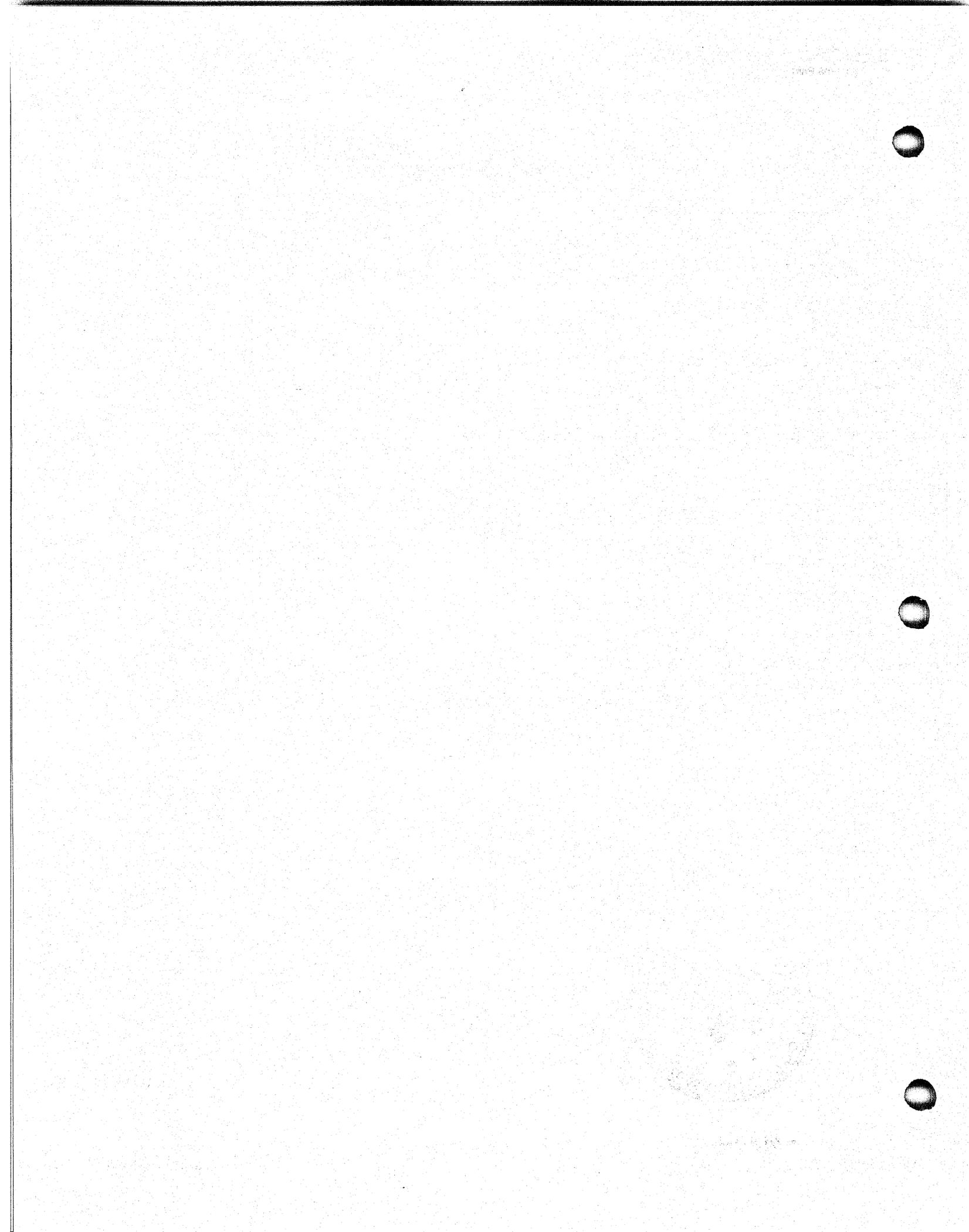




Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	9,157.000	9,157.000	1,564.97	517.69

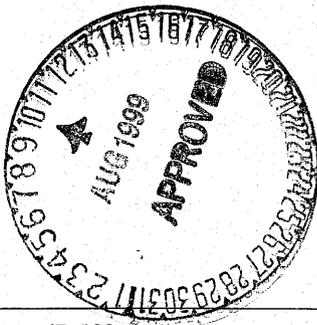




Structure Detail:

Structure #1 (Null)

J-7 Pond





Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	9,157.000	2.173	0.000	0.000	77.000	M	1,564.97	517.69
	Σ	9,157.000						1,564.97	517.69

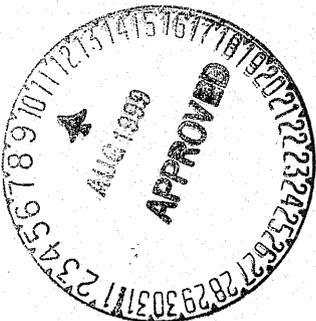




Appendix I

100-Year, 6-Hour Storm Event for KM-FWP

(See Chapter 6: MSHA-Size Structures, Volume 1 for Addition Information)





Peabody Western Coal Co. Impoundment KM-FWP

DGG





General Information

Storm Information:

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

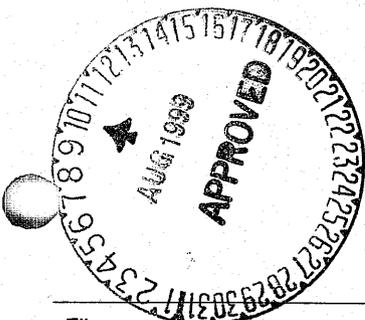




Structure Networking:

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

#1
Null





Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	4.300	4.300	11.19	0.86





Structure Detail:

Structure #1 (Null)

Pond KM-FWP

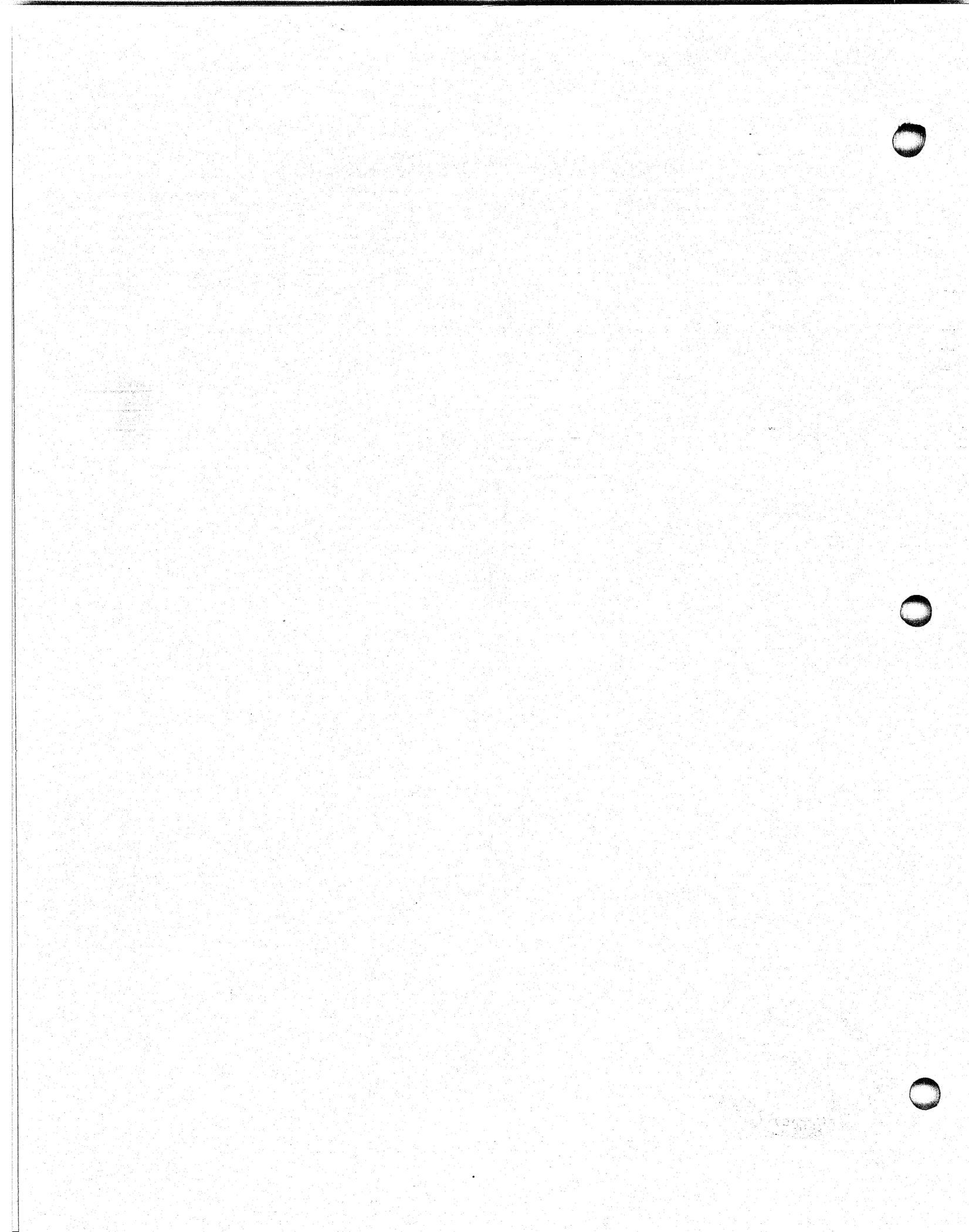




Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	4.300	0.001		0.000	100.000	F	11.19	0.86
	Σ	4.300						11.19	0.86





Revised 10/86

KM-FWP POND STAGE CAPACITY TABLE

Elevation (ft-msl)	Stage (ft)	Area (acres)	Capacity (ac-ft)	Total Capacity (ac-ft)	DESCRIPTION
6598	0	0.168			
6600	2	0.459	0.627	0.63	
6602	4	0.756	1.215	1.84	
6604	6	1.023	1.779	3.62	
6606	8	1.245	2.268	5.89	
6608	10	1.423	2.668	8.56	
6610	12	1.574	2.997	11.55	
6612	14	1.74	3.314	14.87	
6614	16	1.899	3.639	18.51	
6615.6	17.6	2.099	3.1984	21.71	PRINCIPAL SPILLWAY
6616	18	2.104	0.8406	22.55	
6618	20	2.239	4.343	26.89	
6619	21	2.313	2.276	29.17	
6620	22	2.387	2.35	31.52	TOP OF EMBANKMENT





Appendix J

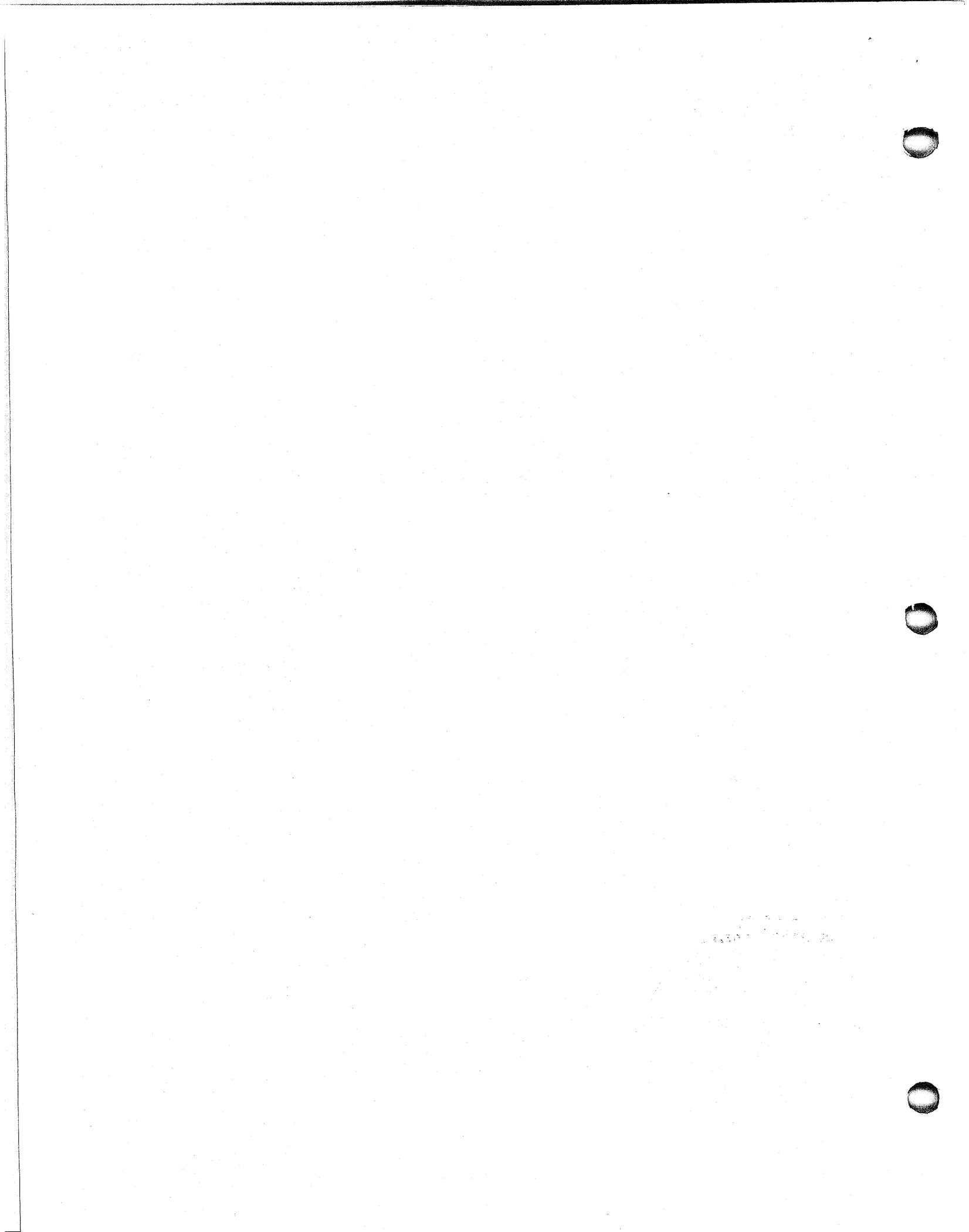
Bureau of Indian Affairs

January 15, 1999

"Dam Classification Criteria" Letter



Revised January 29, 1999





United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
Navajo Area Office
P.O. Box 1060
Gallup, New Mexico 87305-1060

IN REPLY REFER TO:
Nat. Res./400

JAN 15 1999

Mr. Jim Schlenvogt
Peabody Western Coal Company
P.O. Box 625
Kayenta, AZ 86033

Dear Mr. Schlenvogt:

We have reviewed the Natural Resource Conservation Service (NRCS) Technical Release No. 60, "Dam Classification Criteria," as provided by your office. The Department of Interior (DOI) classifies dams, for safety of dams purposes, into these three categories:

1. **LOW** - There is no identified population at risk in the event of a dam failure, and no paved roads that would be significantly damaged.
2. **SIGNIFICANT** - One to five lives is at serious risk in the event of dam failure (usually means there is one home in the path of flooding) or there is a paved road that would be washed out.
3. **HIGH** - More than five lives are at serious risk in the event of dam failure (usually means there are two or more homes in the path of flooding).

Any dam that meets or may meet the requirements of either SIGNIFICANT or HIGH downstream hazard classification, and falls under the jurisdiction of Navajo Area, needs to be reported to the Bureau of Indian Affairs Safety of Dams program. For jurisdiction purposes, this means any dam that is located within the boundaries of the Navajo Reservation, including Navajo Partitioned Lands or dam that presents a risk of flooding to areas within the Navajo Reservation.

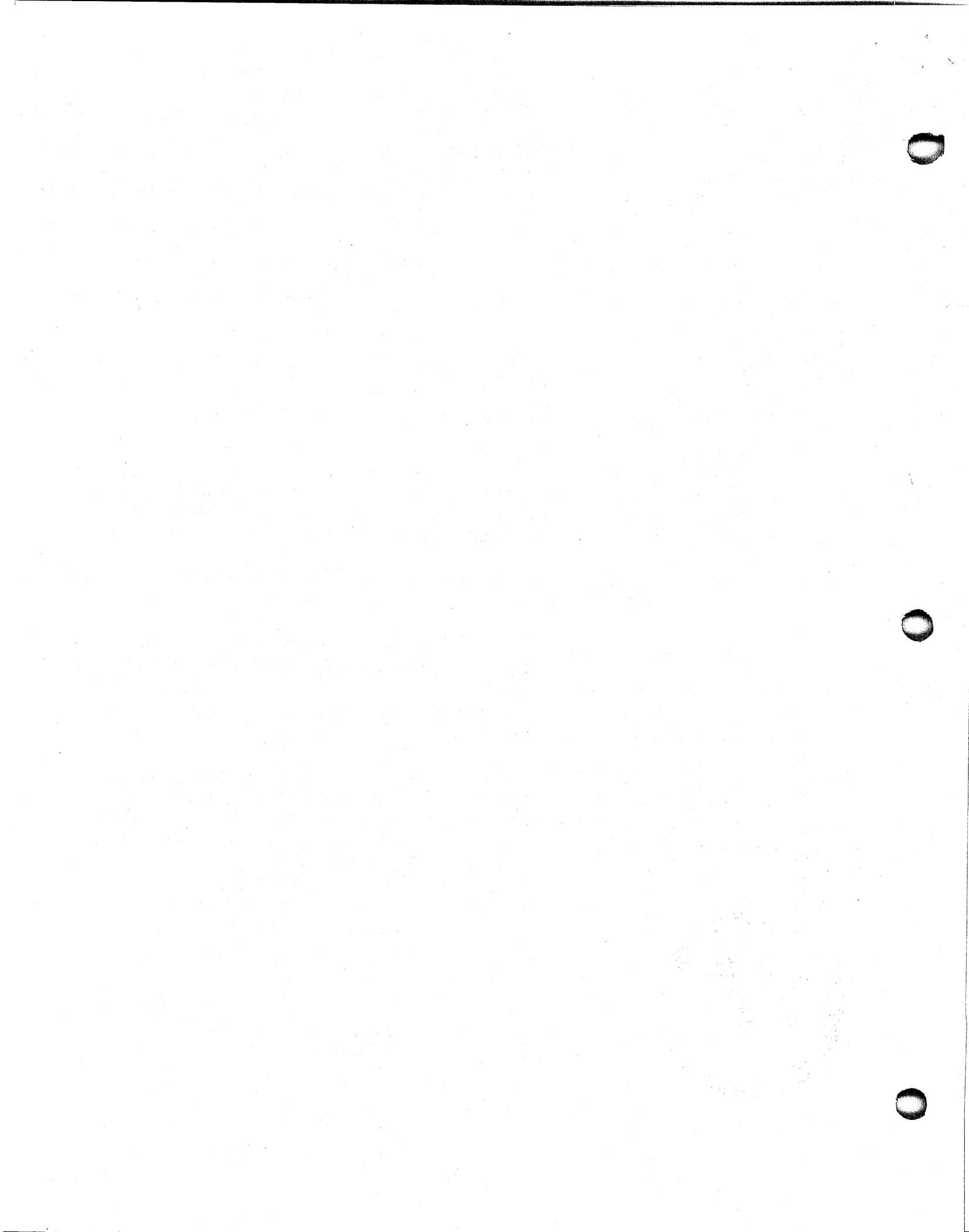
Enclosed is a breakdown of the standards for NRCS and the criteria for the DOI for your information. If you need further information, please contact Charles Nixon at 520/729-7357.

Sincerely,

ACTING Area Director



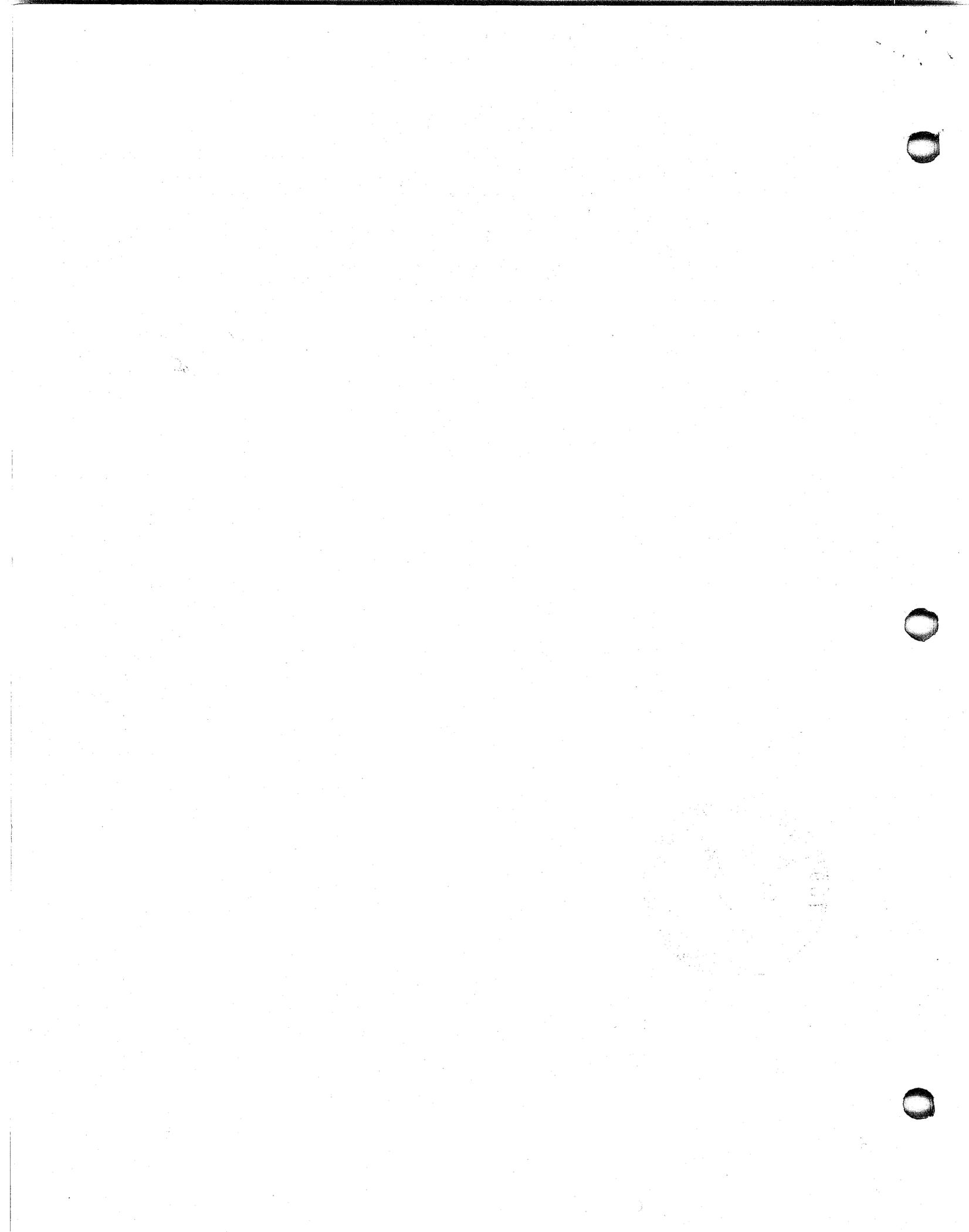
Enclosure



NRCS Standards and DOI Criteria

NRCS Dam Classification	DOI Downstream Hazard Classification
Class (a)	LOW
Class (b)	SIGNIFICANT
Class (c)	HIGH





ATTACHMENT AG

MONTHLY MSHA DAM INSPECTION JUSTIFICATION



Revised 04/23/99



Peabody Western Coal Company

February 3, 1999

District Manager
Coal Mine Safety and
Health Administration - District 9
P.O. Box 25367, DFC
Denver, Colorado 80225-0367
(303) 231-5462

Re: Peabody Western Coal Company - Black Mesa and Kayenta Mines, Request for Reduction in MSHA Dam Inspection Frequency

Dear District Manager:

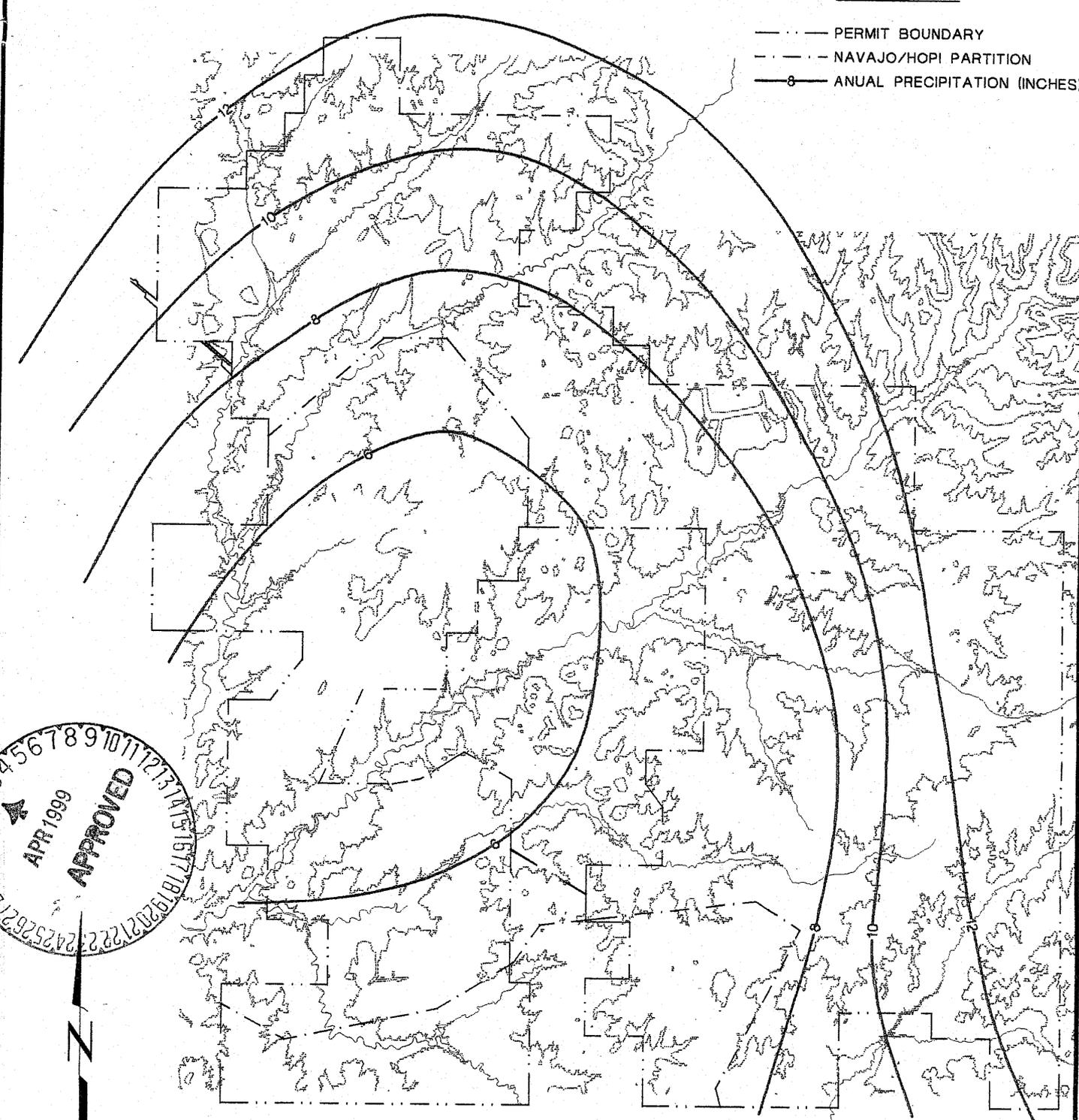
Peabody Western Coal Company (Peabody) currently maintains and operates ten surface water impoundments that are classified as MSHA Dams under applicable provisions of 30CFR77.216 in conjunction with Peabody's ongoing Kayenta/Black Mesa mining operations. Pursuant to 30CFR77.216-3(a)(3), Mandatory Inspection Frequency for MSHA Regulated Impoundments or Impounding Structures, as revised, Peabody respectfully submits this request for approval to reduce the monitoring frequency for the following MSHA Dam structures from a weekly to a monthly schedule.

<u>Structure ID</u>	<u>MSHA I.D. No.</u>	<u>Construction Date</u>
Black Mesa Mine		
J-2A, Wild Ram Valley Dam	1211-AZ-09-00533-02	1986
J-7 Dam	1211-AZ-09-00533-01	1973
Kayenta Mine		
I16-A Dam	1211-AZ-09-01195-07	1982
I16-B Dam	1211-AZ-09-01195-08	1984
KM - Fresh Water Pond	1211-AZ-09-01195-01	1972
N14-D Dam	1211-AZ-09-01195-02	1982
N14-E Dam	1211-AZ-09-01195-03	1982
N14-F Dam	1211-AZ-09-01195-04	1982
N14-G Dam	1211-AZ-09-01195-05	1982
N14-H Dam	1211-AZ-09-01195-06	1985

The impounding structures are located within the Peabody Black Mesa/Kayenta Mine permit areas in a rural area of the Navajo Indian Reservation in the northeastern corner of Arizona as shown by Drawing No. 85402, MSHA Dam Location Map. Flat-topped mesas and plateaus, isolated buttes, and desert valleys characterize the Black Mesa region. The climate of the permit areas is arid to semi-arid, with an average annual precipitation of only approximately ten (10) inches. The typical annual precipitation pattern for this area is illustrated by Figure 1, Annual Precipitation. Long periods with little or no precipitation are common. Much of the precipitation occurs during the summer months, in the form of afternoon thundershowers. Showers and thunderstorms are characterized by brief, intense rainfall and are often preceded by strong, gusty winds. It is common to experience widely differing amounts of precipitation over the mine area and at the various impoundments during the same period. Variations in precipitation amounts appear to be related primarily to topographic features and elevation. The "NOAA Atlas 2, Precipitation Frequency Atlas of the Western United States, Volume VIII, Arizona" indicates storm event yields of 1.6 inches of precipitation for the 10-year, 6-hour storm event and 2.1 inches for the 10 year, 24 hour event.

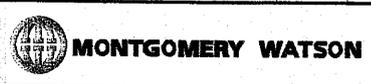
LEGEND

- · — · — PERMIT BOUNDARY
- - - - - NAVAJO/HOPI PARTITION
- 8 — ANNUAL PRECIPITATION (INCHES)



KAYENTA AND BLACK MESA MINES

0	Issued for Report	1/5/99	J.James	T.Smith	J.James
REV. No.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY



PROJECT No: 1342861.0190100
 AutoCAD FILE: PRECIP.DWG
 SCALE: AS NOTED
 FIGURE No: 1

ANNUAL PRECIPITATION

All of the MSHA Dams are classified as having a low hazard potential. Most of the drainage channels or washes in the mine permit areas, including those associated with the subject impoundment structures, are classified as ephemeral, with minor reaches exhibiting an intermittent flow pattern. No residences, public buildings, or other facilities are located downstream in the vicinity of the dam embankments or spillways or in the downstream floodplain. All active mine pits, spoil piles, and associated major facilities are located upstream of the dam sites. The Maximum Probable Earthquake (MPE) for the two groups of faults identified in the permit areas is projected at magnitude 6.5, with a corresponding recurrence interval of 100,000 years (Morrison et. al., 1981). The estimate is based on empirical relationships between potential surface rupture lengths and corresponding earthquake magnitudes (Slemmons, 1977). For the empirically-derived earthquake magnitude, effective peak horizontal ground accelerations of <0.05 g to 0.08 g were estimated from attenuation curves developed by Schnabel and Seed (1973). The designed pond embankments will withstand this range of ground accelerations without failure or significant permanent deformation.

All of the identified MSHA Dams have been constructed in accordance with approved designs and specifications, have been in place and operational for at least twelve years, and have a demonstrated history of safety and stability, performing as designed. All of the MSHA impoundments are equipped with principal and/or emergency spillway structures consistent with applicable design requirements. Spillways and associated outlet channels are designed to safely pass the design flows while maintaining adequate freeboard and minimizing the potential for erosion of pond embankments, discharge points, or downstream channel areas. Based on MSHA Dam Inspection Reports, as provided for the past three years in Appendix A, all spillways are functioning in accordance with the approved designs and there is no evidence of significant erosion or damage associated with spillway discharges to date.

Any design, construction, or material defects would normally have become evident during initial filling or the first few years of pond operation. In addition, initial embankment settlement has already occurred and has been minimal, with no significant changes in embankment heights or stability. Review of recent annual MSHA Dam Inspection Reports for these structures (refer to Appendix A) confirms that no defects have been identified and no significant changes in the dam embankments or problems have occurred.

The following sections provide additional specific relevant information for each of the impoundments currently classified as MSHA Dam structures

J2-A Dam - The J2-A embankment is located in the SE $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 32, T36N, R18E as shown on Drawing No. 85402, MSHA Dam Location Map. Design information for the J2-A Dam was provided to OSM and MSHA in May 1985. Approval was received and the embankment was completed in 1986. J2-A impoundment has a watershed of approximately 2,761 acres and has a total storage capacity of about 182 acre-feet. The dam's primary purpose is to control runoff from mining areas. The dam is a zoned embankment extending to bedrock. More detailed information can be found in the Sergent, Hauskins and Beckwith (SHB), *Geotechnical Investigation and Design Development Report* (5/14/85) included with the 1985 design submittal.

J-7 Dam - The J-7 embankment is located in the E $\frac{1}{2}$ NW $\frac{1}{4}$ of Section 22, T35N, R18E as shown on Drawing No. 85402, MSHA Dam Location Map. The J-7 Dam was constructed in 1973 and approved by MSHA in May 1980. J-7 impoundment has a watershed of approximately 9,217 acres and presently has a total storage capacity of about 448 acre-feet. The embankment is utilized as a haul road, for sediment control, to impound water for dust suppression, and as an emergency water supply for the Black Mesa Pipeline Company's coal slurry transportation system. The embankment consists of a 60-foot wide compacted clay core. More detailed design information can be found in the Sergent, Hauskins and Beckwith (SHB), *Geotechnical Investigation Report* (8/27/76) previously provided to MSHA.

J16-A Dam - The J16-A embankment is located in the W $\frac{1}{2}$ NW $\frac{1}{4}$ of Section 28, T36N, R19E as shown on Drawing No. 85402, MSHA Dam Location Map. The J16-A Dam was constructed and approved by MSHA in 1982. The J16-A impoundment has a watershed of approximately 2,415 acres and total present storage capacity of about 261 acre-feet. The dam's primary purpose is to control runoff from mining areas. The dam is a zoned rock-filled embankment. More detailed design information can be found in the Sergent, Hauskins and Beckwith (SHB), *Geotechnical Investigation Report* (1982) previously provided to MSHA.

J16-L Dam - The J16-L embankment is located in the E $\frac{1}{2}$ SW $\frac{1}{4}$ of Section 32, T36N, R19E as shown on Drawing No. 85402, MSHA Dam Location Map. The J16-L Dam design was submitted to MSHA and approved in December of 1982. The dam was constructed in 1984 as a zoned earth embankment to control runoff from mining areas. In 1996, Peabody determined that enough silt had accumulated to require an

increase in pond capacity. A design was developed, submitted, and approved to increase the height of the spillway and the top of the embankment. J16-L impoundment currently has a watershed of approximately 7,873 acres with a total storage capacity of about 398 acre-feet. More detailed design information can be found in Rollins, Brown and Gunnell, *Reed Valley Dam, Final Design Report (8/26/82)* previously provided to MSHA.

KM Fresh Water Pond (KM-FWP) - The Kayenta Mine Fresh Water Pond is located in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ of Section 17, T36N, R18E as shown on Drawing No. 85402, MSHA Dam Location Map. The Kayenta Mine Fresh Water Pond was constructed in 1972 as a surge pond to provide water for mine facilities, dust suppression, and to supply the Black Mesa Pipeline Company's coal slurry transportation system. The embankment was constructed using locally available materials, predominately clays, silts and clayey sand material with a PVC liner installed over the impoundment area. The pond collects runoff only from the adjacent access road (approximately 1.0-acre) and has a total storage capacity of about 21.7 acre-feet. More detailed design information can be found in the Sergeant, Hauskins and Beckwith (SHB), *Geotechnical Investigation Report, Dam No. 1 (8/16/76)* previously provided to MSHA.

N14-D Dam - The N14-D embankment is located in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 29, T36N, R19E as shown on Drawing No. 85402, MSHA Dam Location Map. The N14-D Dam design was approved by MSHA on 10/15/81 and the dam was constructed in 1982 to control runoff from mining areas and as part of the Kayenta Mine Road and Peabody's overland conveyor system. The dam is a multi-zoned earth embankment. The N14-D impoundment has a watershed of approximately 1,836 acres and a total storage capacity of about 541 acre-feet. More detailed design information can be found in the Sergeant, Hauskins and Beckwith (SHB), *Geotechnical Investigation Report (6/30/1981)* previously provided to MSHA.

N14-E Dam - The N14-E embankment is located in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ and the NW $\frac{1}{4}$ NE $\frac{1}{4}$ of Section 29, T36N, R19E as shown on Drawing No. 85402, MSHA Dam Location Map. The N14-E Dam design was approved by MSHA on 12/8/81. The N14-E Dam is a multi-zoned earth embankment constructed in 1982 to control runoff from mining areas and as part of Peabody's overland conveyor system. The N14-E impoundment has a watershed of approximately 157 acres with a total storage capacity of about 68 acre-feet. More detailed design information can be found in the Sergeant, Hauskins and Beckwith (SHB), *Geotechnical Investigation Report (7/24/1981)* previously provided to MSHA.

N14-F Dam - The N14-F embankment is located in the NW $\frac{1}{4}$ SW $\frac{1}{4}$ of Section 21, T36N, R19E as shown on Drawing No. 85402, MSHA Dam Location Map. The N14-F Dam design was approved by MSHA on 5/21/82 and the dam was constructed in 1982. The dam is a multi-zoned earth embankment used to control runoff from mining areas and as part of the N14 East haul road. The N14-F impoundment has a watershed of approximately 367 acres and has a current total storage capacity of about 58 acre-feet. More detailed design information can be found in the Sergeant, Hauskins and Beckwith (SHB), *Geotechnical Investigation Report (1982)* previously provided to MSHA.

N14-G Dam - The N14-G embankment is located in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ of Section 21, T36N, R19E as shown on Drawing No. 85402, MSHA Dam Location Map. The N14-G Dam design was approved by MSHA on 5/21/82. The N14-G Dam is a multi-zoned earth embankment constructed in 1982 to control runoff from mining areas and as part of N14 East haul road. The N14-G impoundment has a watershed of approximately 1,479 acres with a total storage capacity of about 181 acre-feet. More detailed design information can be found in the Sergeant, Hauskins and Beckwith (SHB), *Geotechnical Investigation Report (2/30/1981)* previously provided to MSHA.

N14-H Dam - The N14-H embankment is located in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 22, T36N, R19E as shown on Drawing No. 85402, MSHA Dam Location Map. The N14-H Dam design was approved by MSHA on 3/9/84. The N14-H Dam is a multi-zoned earth embankment constructed in 1985 to control runoff from the mining area. The N14-H impoundment has a watershed of approximately 1,615 acres with a total storage capacity of about 222 acre-feet. More detailed design information can be found in the Sergeant, Hauskins and Beckwith (SHB), *Geotechnical Investigation Report (1984)* previously provided to MSHA.

Based on the information summarized above and the historical performance of the designated MSHA dam structures, as evidenced in the previous MSHA Annual Dam Inspection Reports, Peabody requests that the inspection frequency be reduced from the current weekly (7-day) schedule to a monthly (not to exceed 30-days) schedule. In conjunction with this request, Peabody proposes to conduct an immediate inspection and to temporarily resume inspections on a weekly schedule for any given pond(s) if, for the subject pond(s):

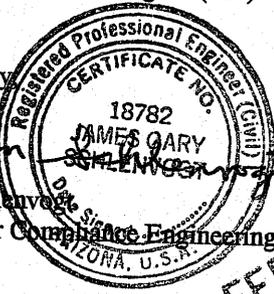
- Any unusual condition is observed or reported that could affect the stability or safety of the embankment
- A significant rainfall event occurs (i.e. a 10-year, 6-hour storm = 1.6 inches of rainfall or greater)
- A significant seismic event (magnitude greater than 4.0) occurs in or in the immediate vicinity of the mine permit area

If an unusual condition is observed or reported or if any repair or modification of the embankment is necessary as a result of the initial inspection, weekly inspections will continue for a period of at least one month following the initial inspection or completion of any necessary repair or modification. If the weekly inspections indicate no change in the embankment structure, inspection frequency will return to the monthly schedule after the fourth week. In the event of a significant rainfall or seismic event, if the initial inspection indicates no significant change in the embankment structure, weekly confirmation inspections will continue for a period of two weeks before returning to the monthly inspection schedule. In addition to the standard information provided in the MSHA Dam Inspection Reports, the reports will include an estimate of the remaining freeboard at the time of the inspection and rainfall records will continue to be collected and will be available for review by authorized MSHA personnel at the minesite.

Thank you for your consideration and prompt action on this request. If there are any questions or comments, please contact Jim Schlenvogt at (520) 677-5089.

Sincerely,

Jim Schlenvogt
 Jim Schlenvogt
 Manager Compliance Engineering



FEB 03 1999

Enc.

- cc: B. Bippus (PWCC)
 B. Dunfee (PWCC)
 G. Wendt (PWCC)



APPENDIX A

1996 ANNUAL MSHA DAM INSPECTION REPORT

1997 ANNUAL MSHA DAM INSPECTION REPORT

1998 ANNUAL MSHA DAM INSPECTION REPORT



U. S. Department of Labor

Mine Safety and Health Administration
P.O. Box 25367
Denver, Colorado 80225-0367



Coal Mine Safety and Health
District 9

OCT - 1 1996

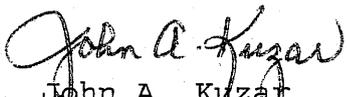
Buck Woodward
Production Manager
Peabody Western Coal Company
P. O. Box 605
Kayenta, AZ 86033

RE: Black Mesa Mine, ID No. 02-00533
J-7 Dam, ID No. 1211-AZ-09-00533-01
J2-A Wild Ram Valley Dam,
ID No. 1211-AZ-09-00533-02
Annual Impoundment Reports

Dear Mr. Woodward:

This is in response to Peabody Coal Company's letter and annual reports dated September 3, 1996, for the referenced impounding structures for the subject mine. The reports have been reviewed and made part of the mine file.

Sincerely,


John A. Kuzar
District Manager



U. S. Department of Labor

Mine Safety and Health Administration
P.O. Box 25367
Denver, Colorado 80225-0367



OCT - 1 1996

Coal Mine Safety and Health
District 9

Robert Boone
Production Manager
Peabody Western Coal Company
P. O. Box 605
Kayenta, AZ 86033

RE: Kayenta Mine, ID No. 02-01195
Kayenta Fresh Water Pond,
ID No. 1211-AZ-09-01195-01
N14-D Dam, ID No. 1211-AZ-09-01195-02
N14-E Dam, ID No. 1211-AZ-09-01195-03
N14-F Dam, ID No. 1211-AZ-09-01195-04
N14-G Dam, ID No. 1211-AZ-09-01195-05
N14-H Dam, ID No. 1211-AZ-09-01195-06
J16-A Dam, ID No. 1211-AZ-09-01195-07
J16-L Dam, ID No. 1211-AZ-09-01195-08
Annual Impoundment Reports

Dear Mr. Boone:

This is in response to Peabody Coal Company's letter and annual reports dated September 3, 1996, for the referenced impounding structures for the subject mine. The reports have been reviewed and made part of the mine file.

Sincerely,

John A. Kuzar
John A. Kuzar
District Manager





Peabody Western Coal Company

September 3, 1996

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Peabody Western Coal Company's Kayenta and Black Mesa Mines Annual M.S.H.A. Dam Inspection Report.

Dear Sir:

Pursuant to the 30 CFR 77.261-4 regulations are the certified annual M.S.H.A. Dam Inspection Reports for the following dams:

Black Mesa Mine

J-7 Dam	ID No. 1211-AZ-09-00533-01
J2-A Wild Ram Valley Dam	ID No. 1211-AZ-09-00533-02

Kayenta Mine

Kayenta Fresh Water Pond	ID No. 1211-AZ-09-01195-01
N14-D Dam	ID No. 1211-AZ-09-01195-02
N14-E Dam	ID No. 1211-AZ-09-01195-03
N14-F Dam	ID No. 1211-AZ-09-01195-04
N14-G Dam	ID No. 1211-AZ-09-01195-05
N14-H Dam	ID No. 1211-AZ-09-01195-06
J16-A Dam	ID No. 1211-AZ-09-01195-07
J16-L Dam	ID No. 1211-AZ-09-01195-08

Should you have any questions, do not hesitate to contact me.

Sincerely,

James G. Schlenvogt, P.E.
Compliance Engineering
Manager

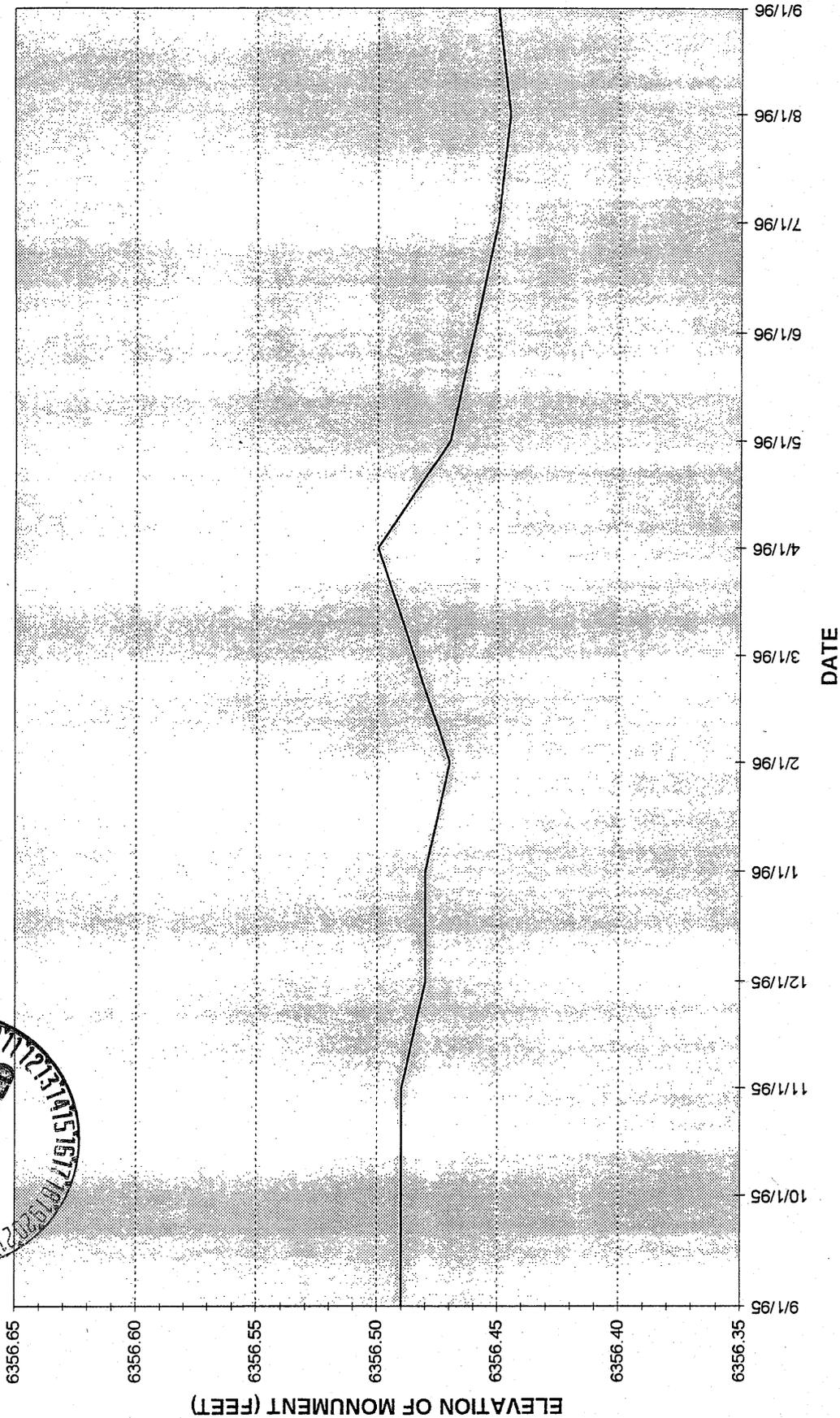


smm

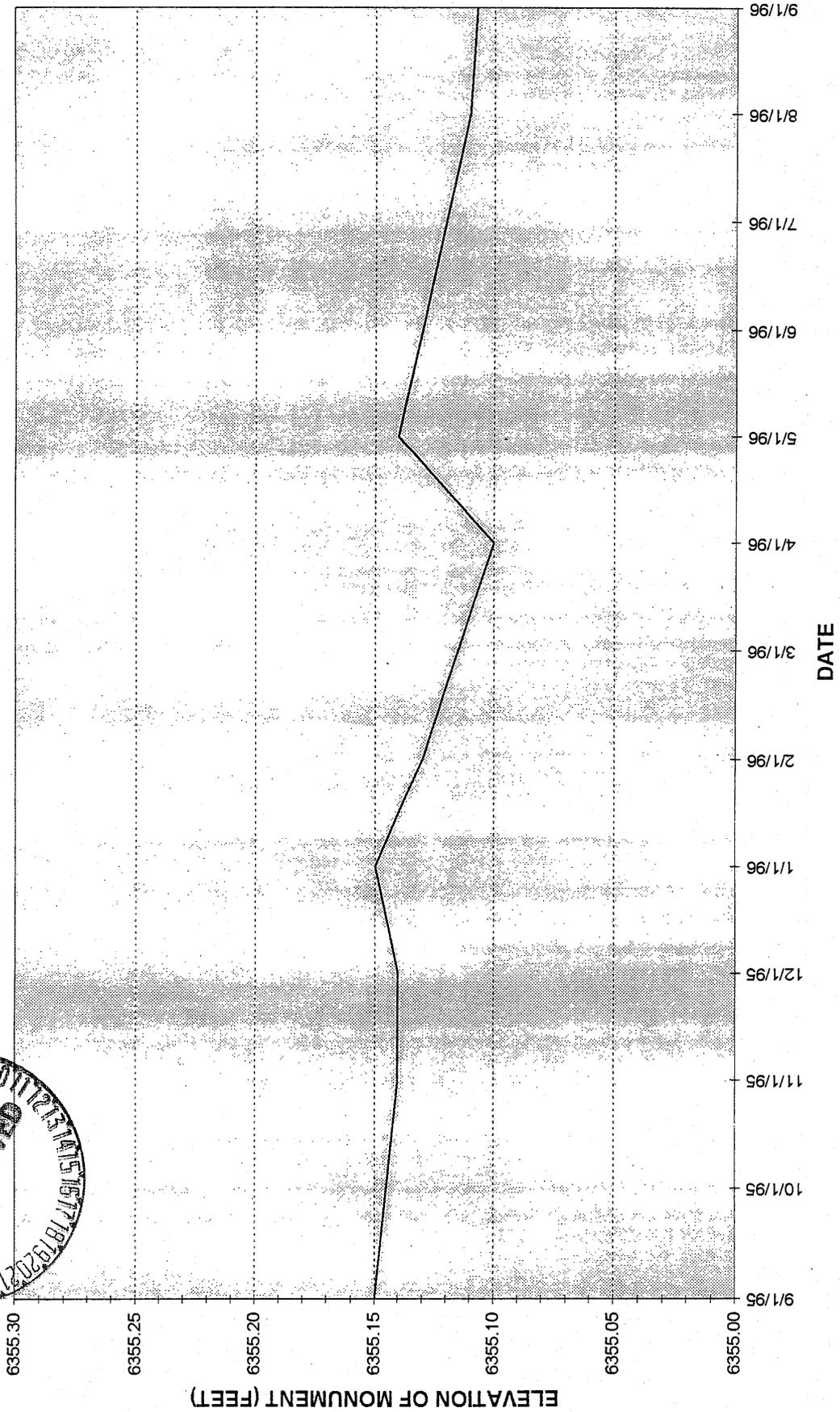
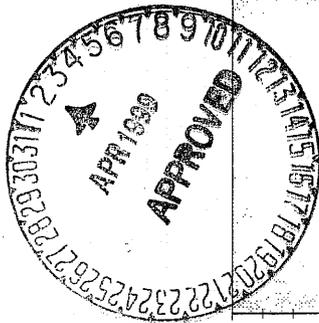
c: Bill Bippus
Brian Dunfee
Scott Williams

J2-A DAM SETTLEMENT MONUMENT #1

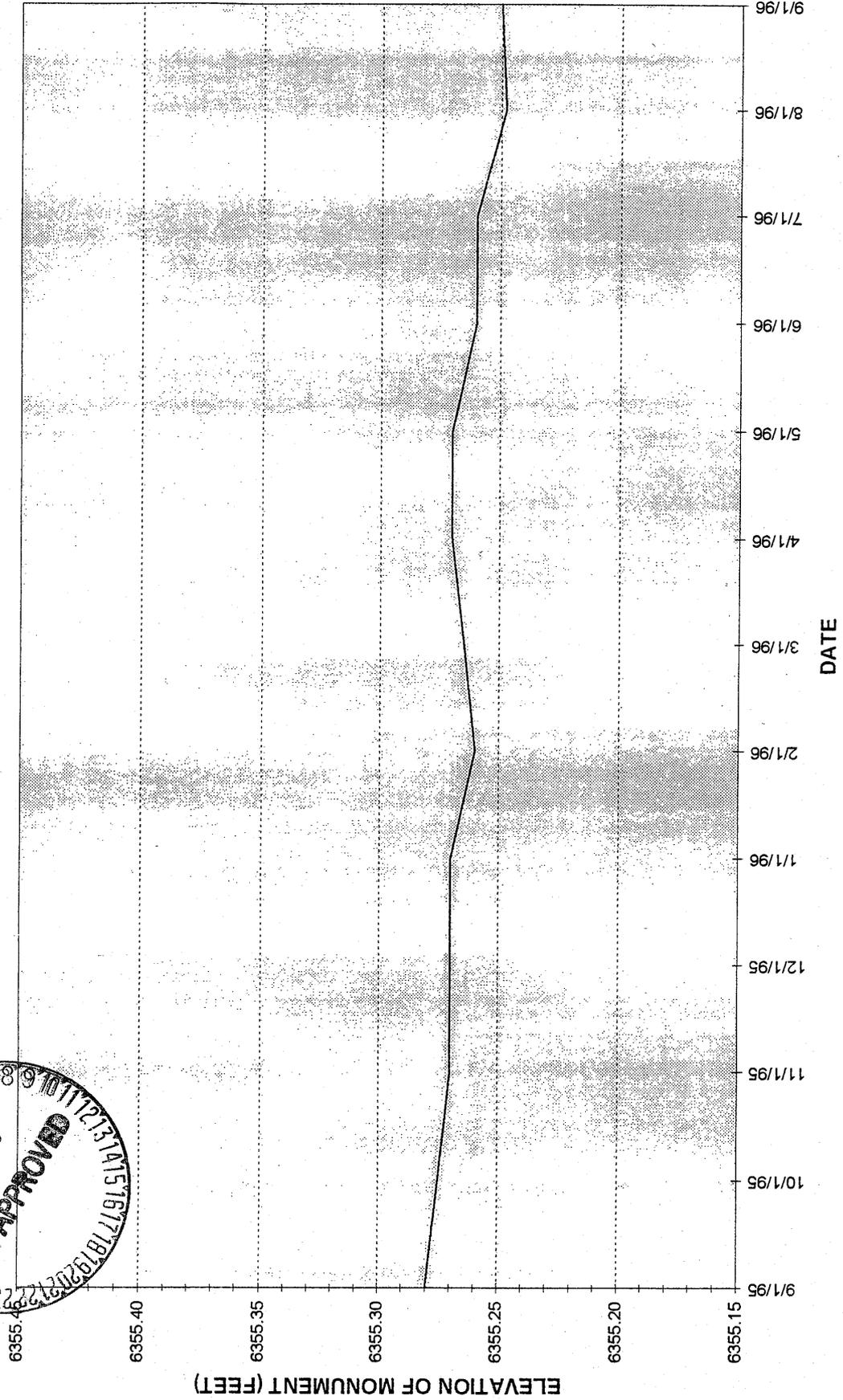
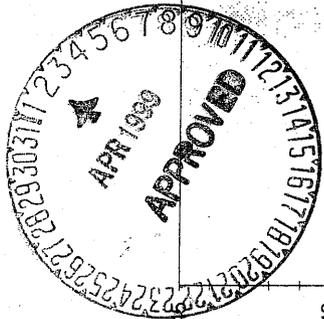
1995-1996



1995-1996 J2-A DAM SETTLEMENT MONUMENT #2



1995-1996 J2-A DAM SETTLEMENT MONUMENT #3



PEABODY WESTERN COAL COMPANY

1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 3, 1996

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-07
Other: J16-A Dam
Mine: Kayenta Mine

Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period August 31, 1995 to August 31, 1996 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>See Attachments</u>
3. Current Water Elevation	<u>6613.6</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Decrease per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6635.13</u>
8. Other	<u>Guardrails installed on top of embankment.</u>

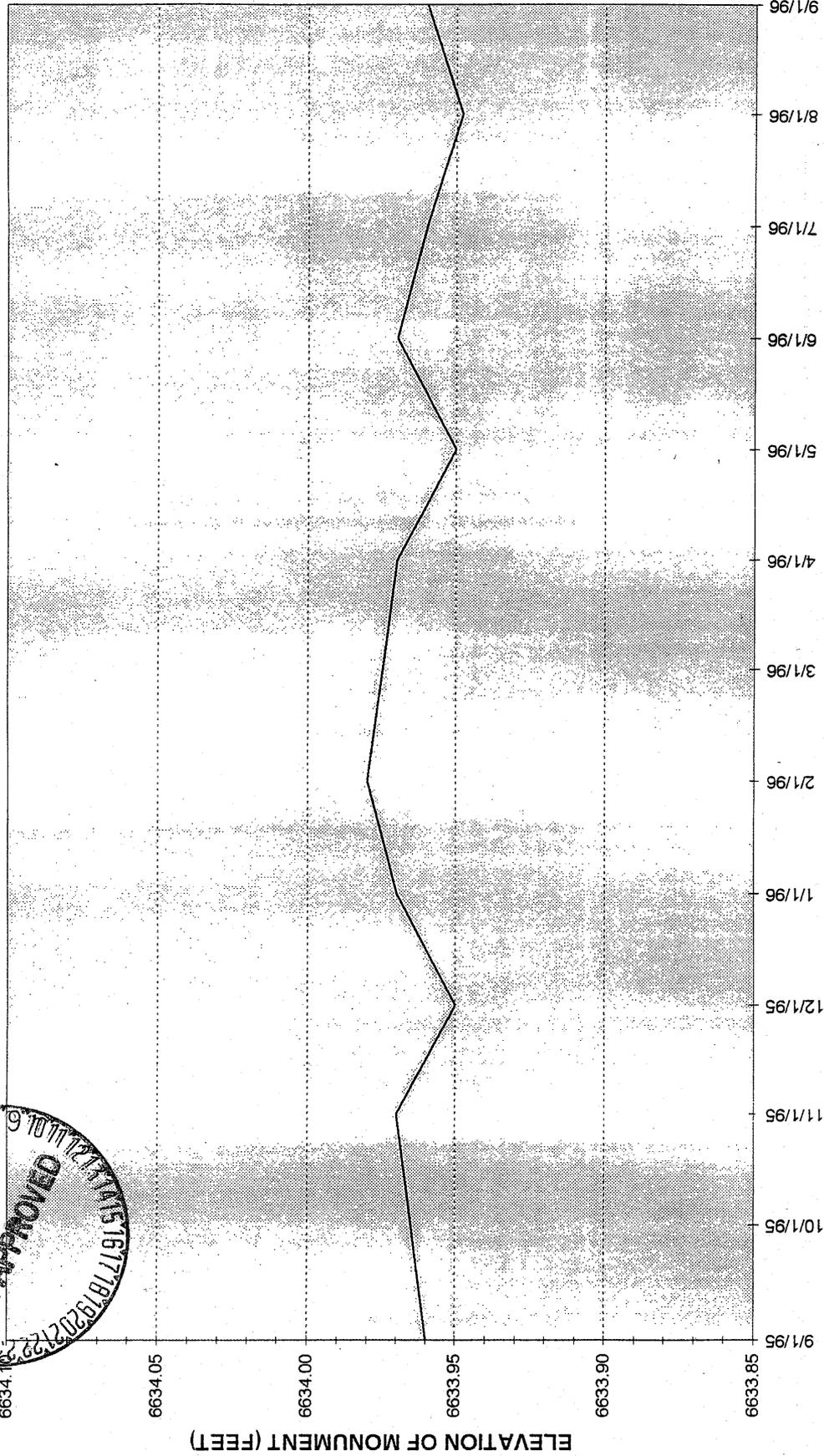
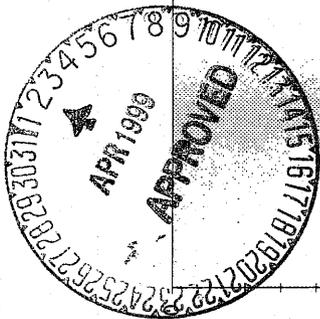
All work at the above site during the period August 31, 1995 to August 31, 1996 was performed in accordance with the approved plan to the best of my knowledge and belief.



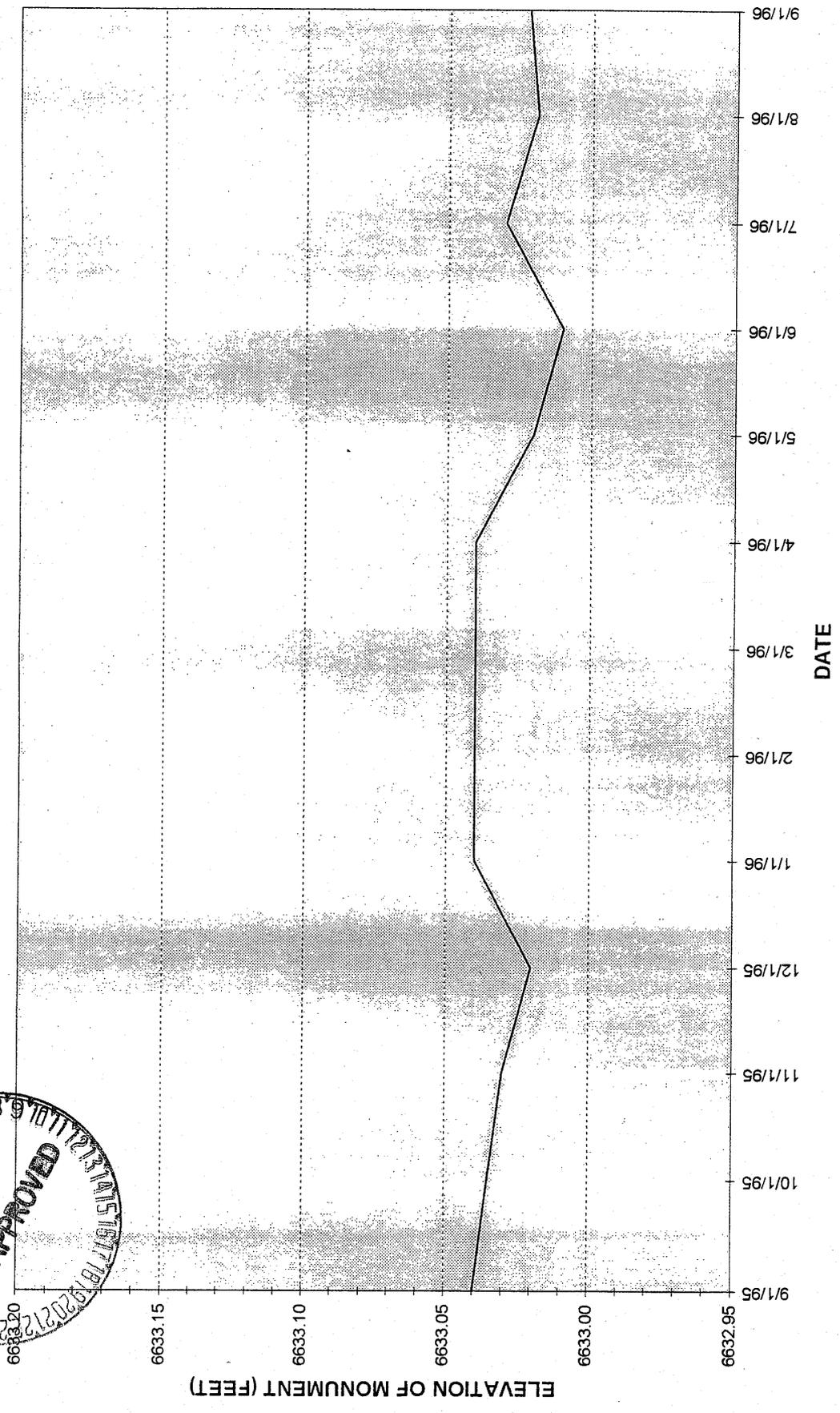
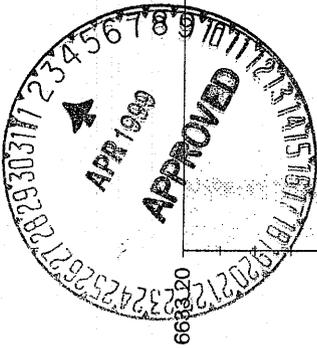
A circular professional engineer seal for James G. Schlenvogt, P.E. The seal contains the text "Registered Professional Engineer", "CERTIFICATE NO. 18782", "JAMES GARY SCHLENOVGT", and "ARIZONA, U.S.A.". A signature is written over the seal, and the date "SEP 03 1996" is stamped at the bottom.

James G. Schlenvogt, P.E.
Peabody Western Coal Company

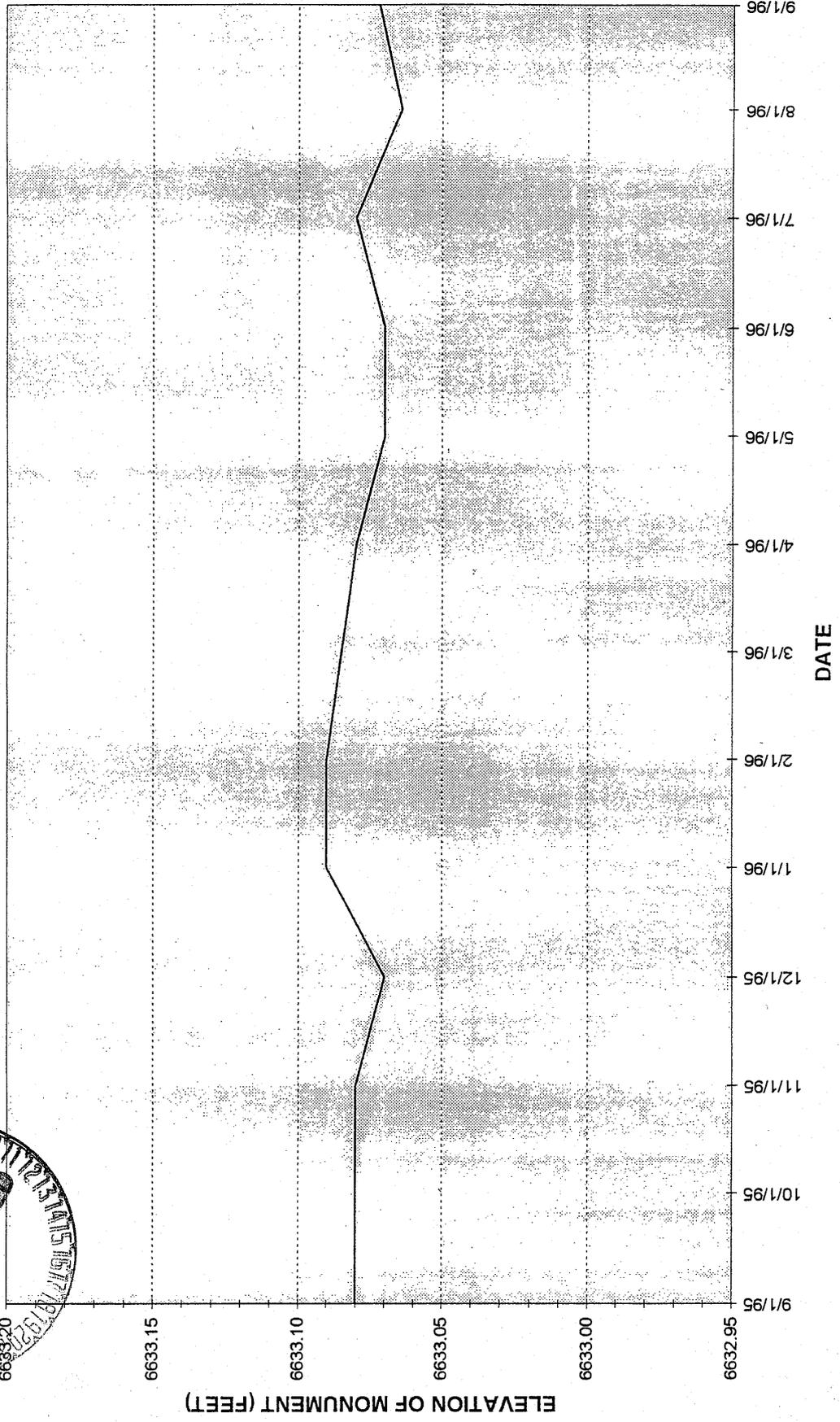
1995-1996 J16-A DAM SETTLEMENT MONUMENT #1



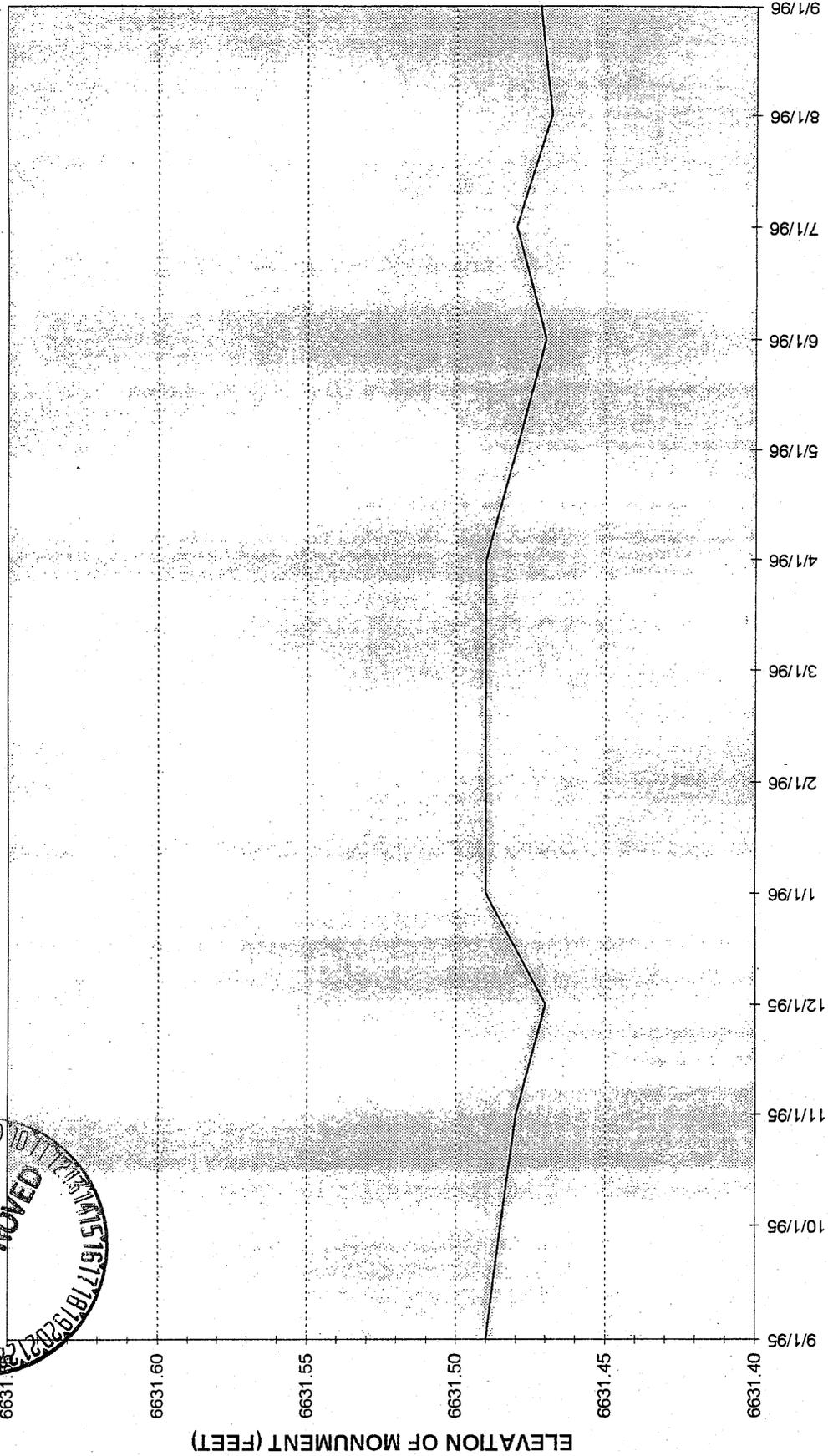
1995-1996 J16-A DAM SETTLEMENT MONUMENT #2



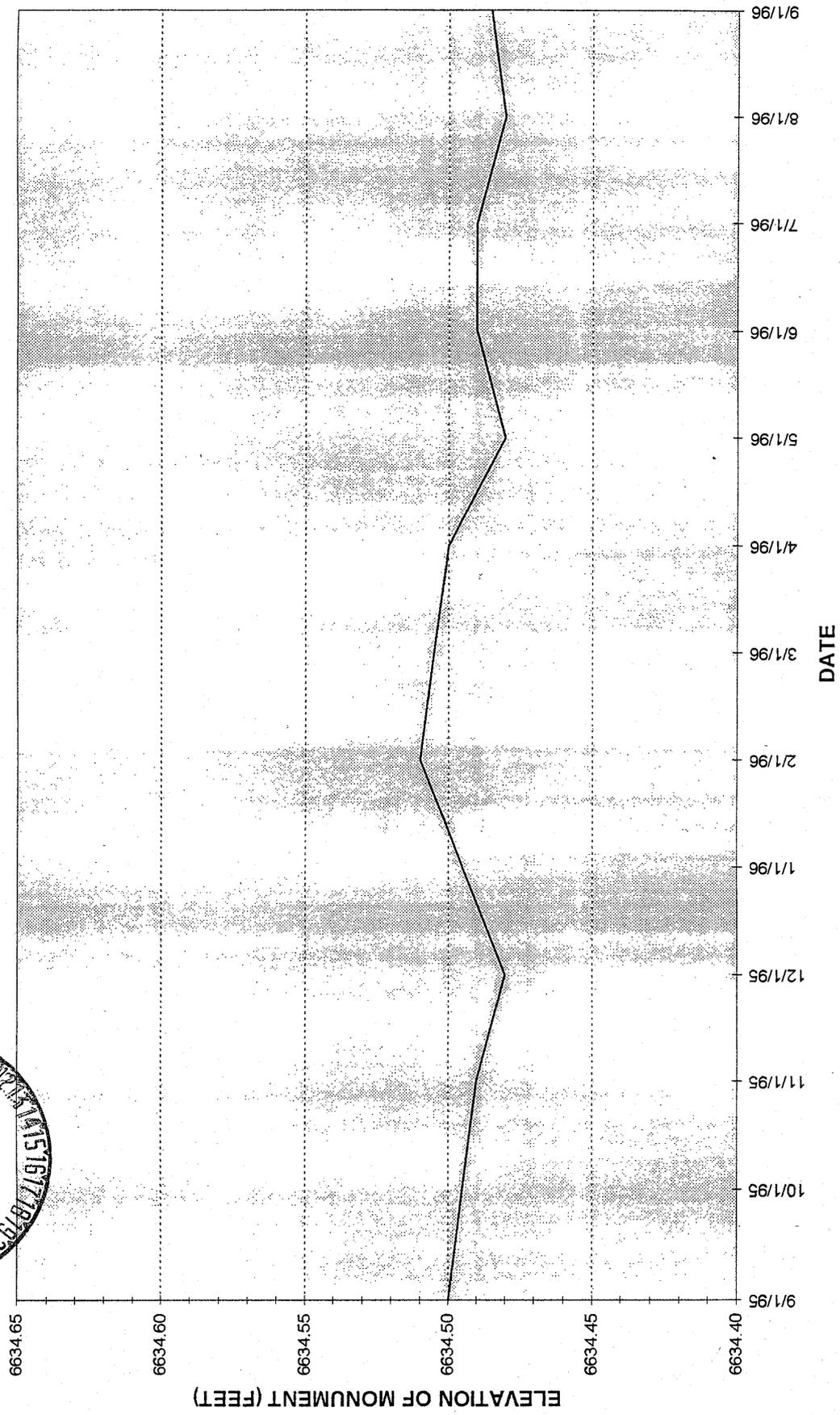
1995-1996 J16-A DAM SETTLEMENT MONUMENT #3



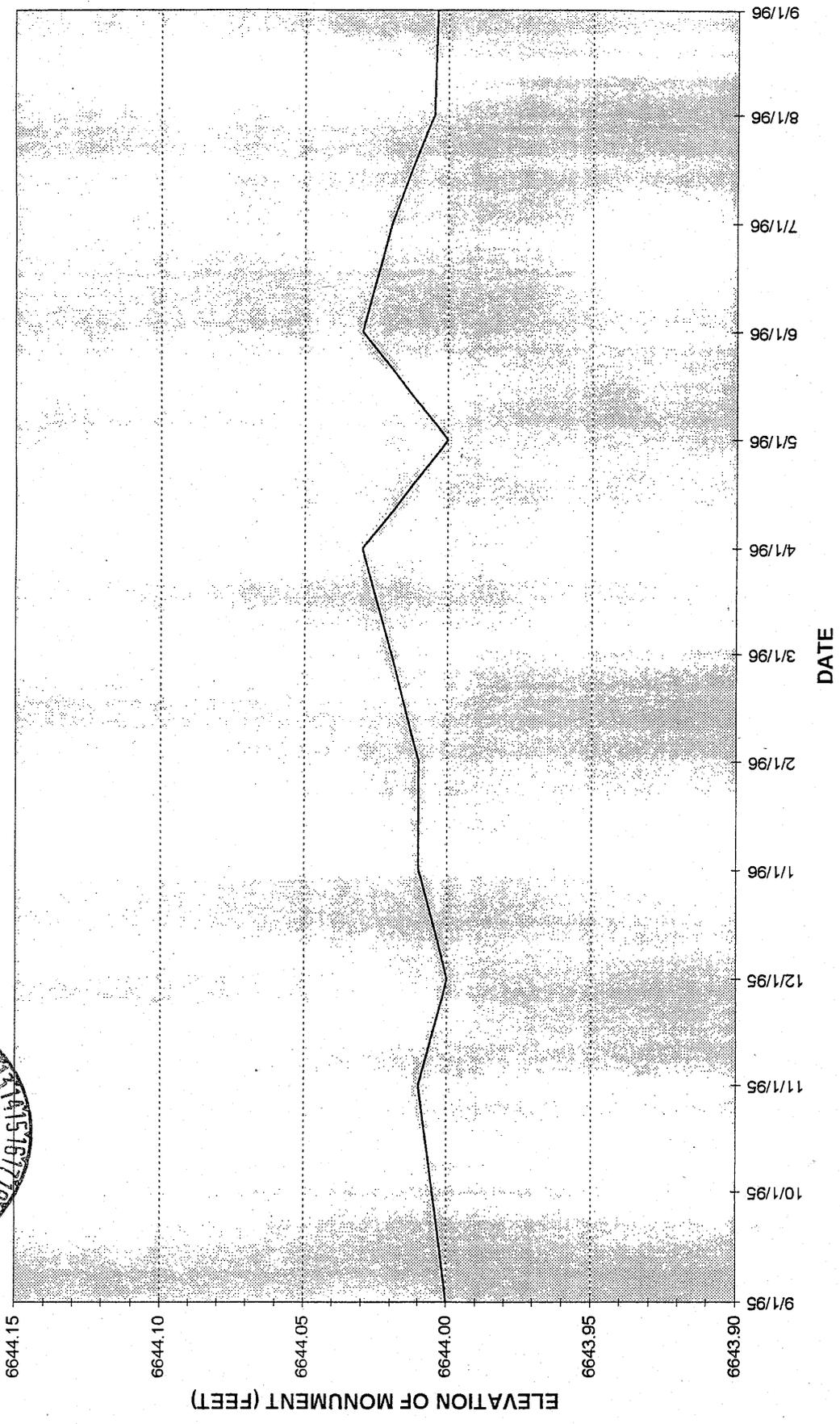
1995-1996 J16-A DAM SETTLEMENT MONUMENT #4



1995-1996 J16-A DAM SETTLEMENT MONUMENT #5



1995-1996 J16-A DAM SETTLEMENT MONUMENT #6



PEABODY WESTERN COAL COMPANY

1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 3, 1996

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-08
Other: J16-L Dam
Mine: Kayenta Mine

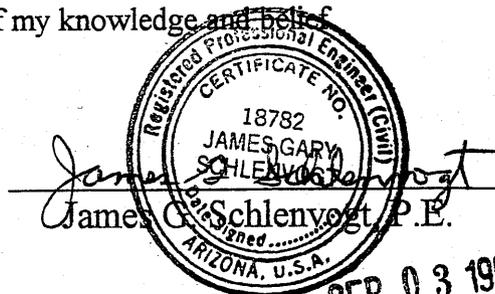
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period August 31, 1995 to August 31, 1996 is submitted:

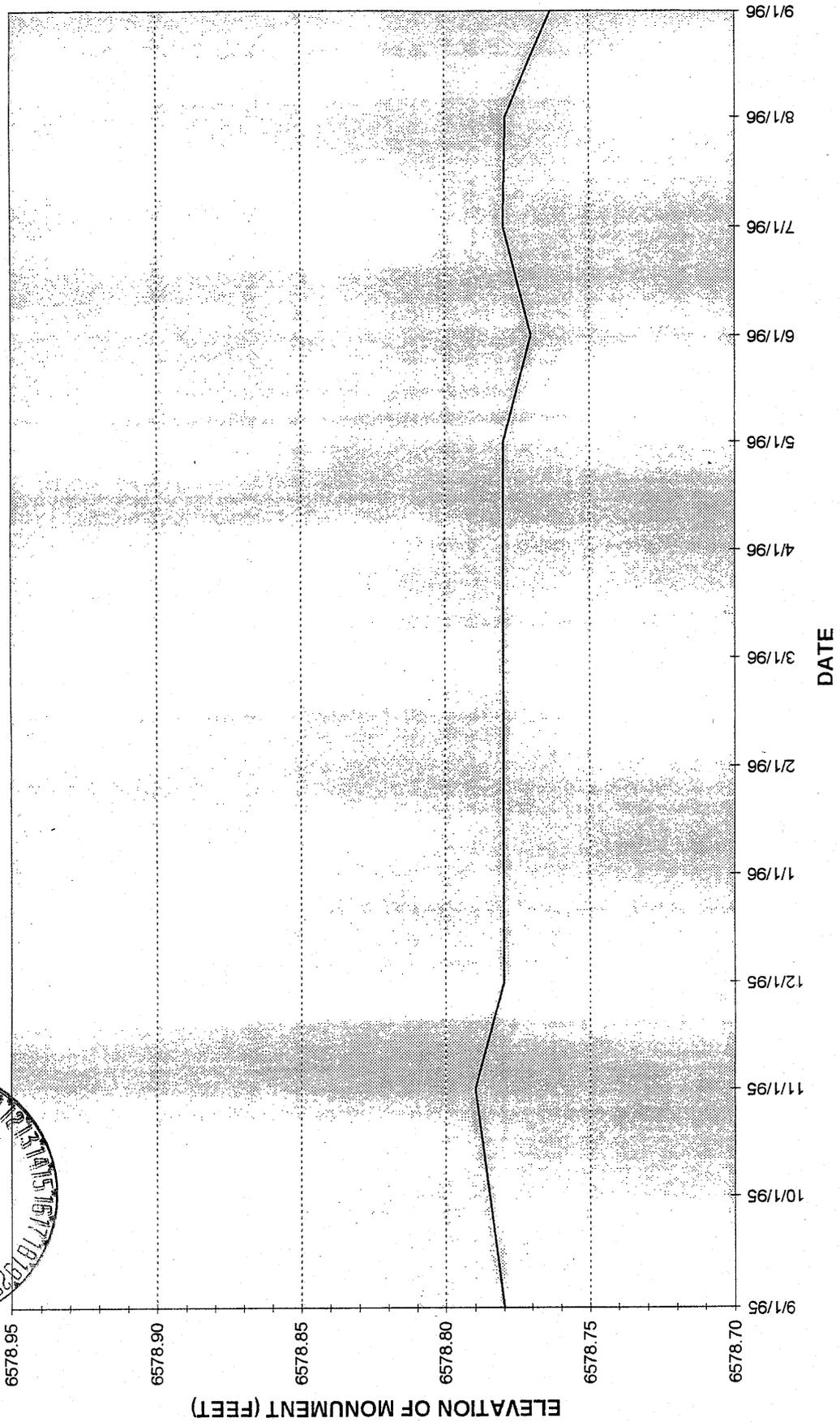
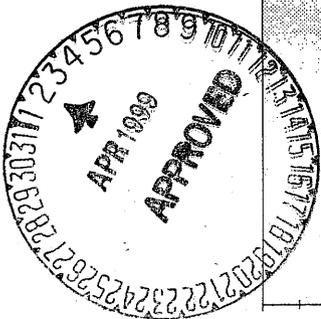
STATUS

- | | |
|----------------------------|--|
| 1. Geometry | <u>No Change</u> |
| 2. Instrumentation | <u>See Attachments</u> |
| 3. Current Water Elevation | <u>6556.4</u> |
| 4. Storage Capacity | <u>No Change</u> |
| 5. Water Volume | <u>Increase per water elevation</u> |
| 6. Stability | <u>No Change</u> |
| 7. Spillway Elevation | <u>6571.20</u> |
| 8. Other | <u>Revision submitted 8/22/96 to raise Spillway Elevation to 6573.0.</u> |

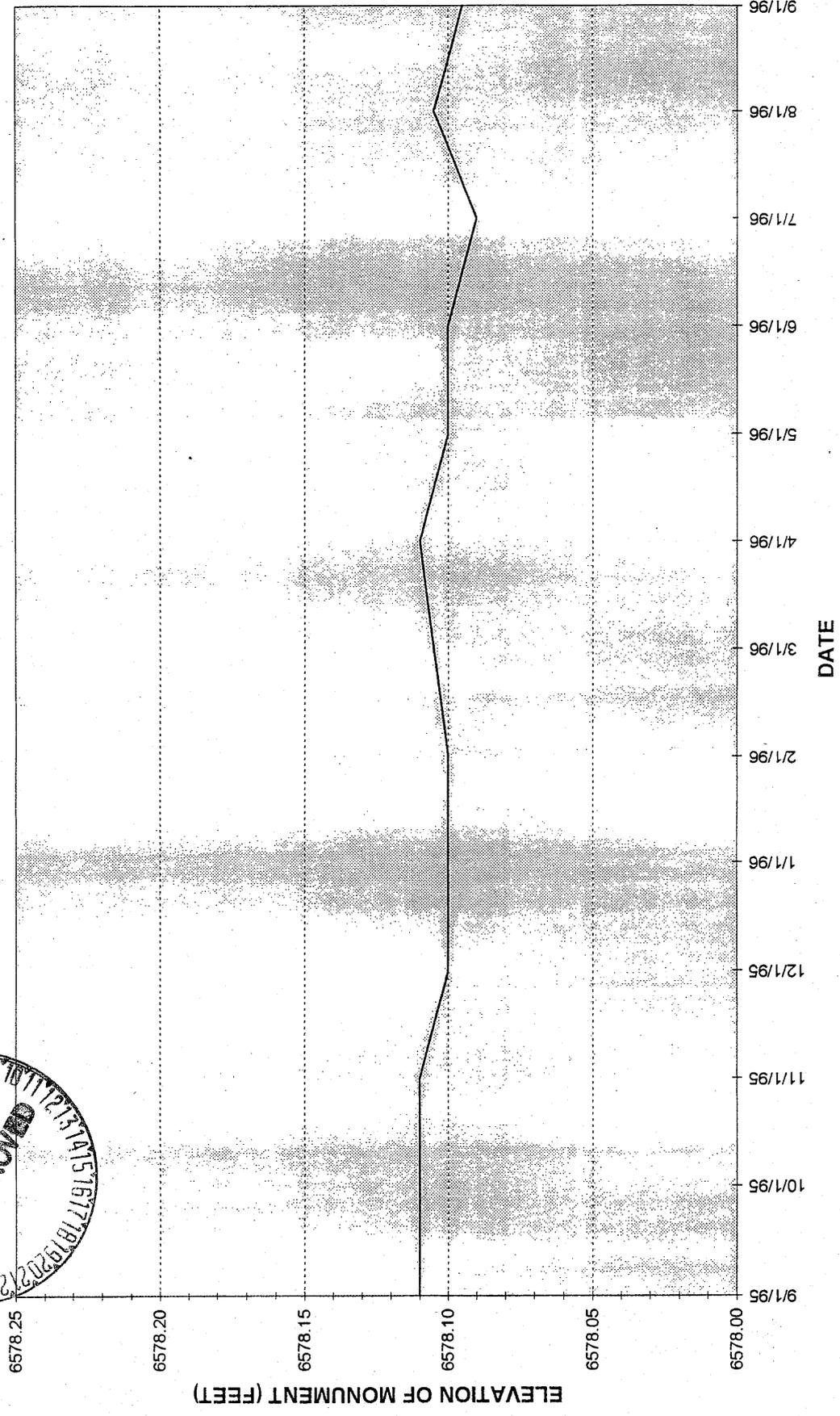
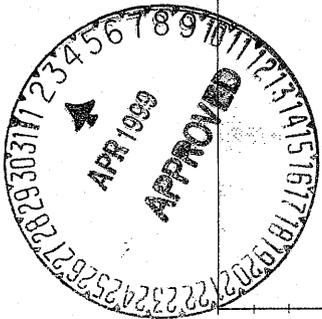
All work at the above site during the period August 31, 1995 to August 31, 1996 was performed in accordance with the approved plan to the best of my knowledge and belief.



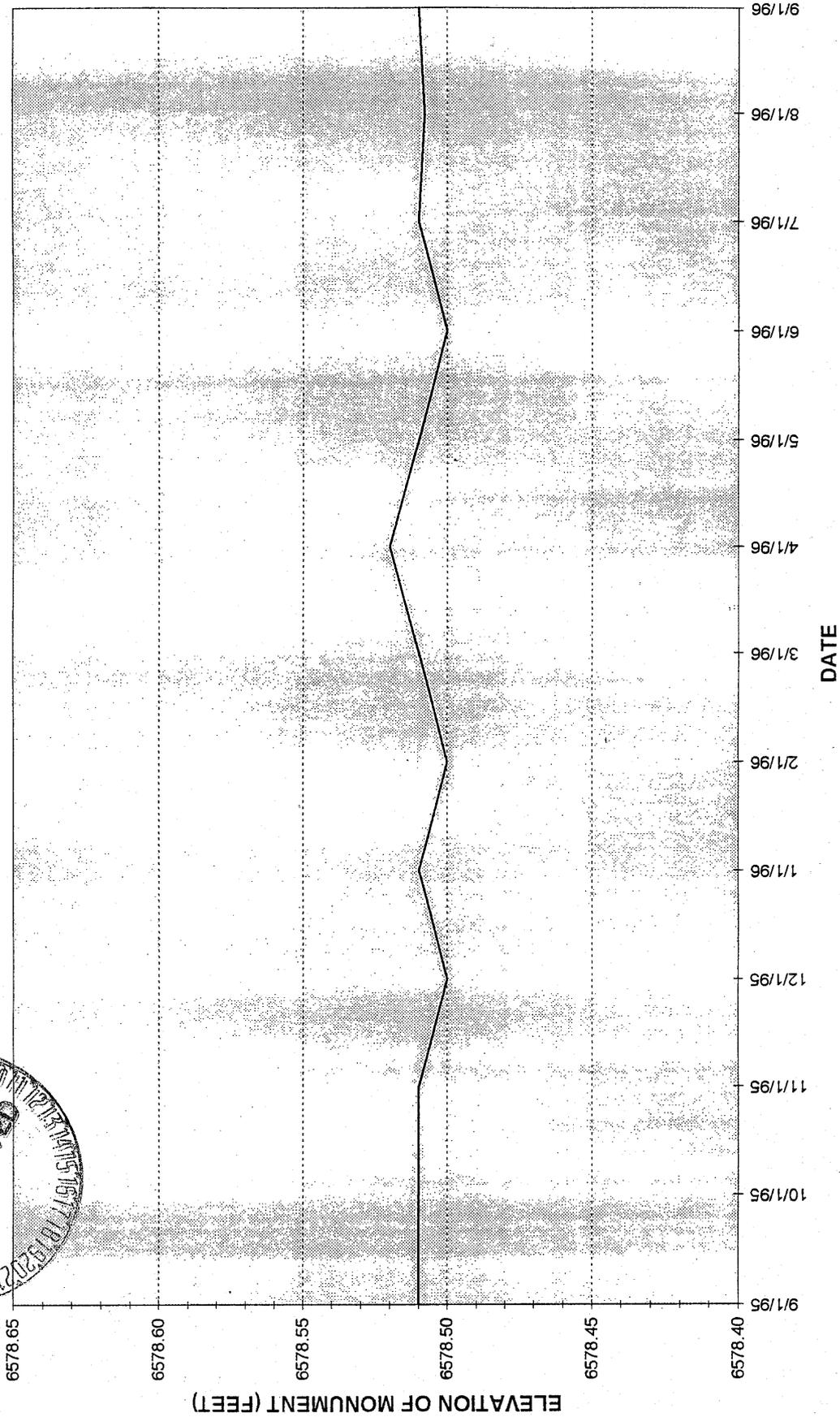
1995-1996 J16-L DAM SETTLEMENT MONUMENT #1



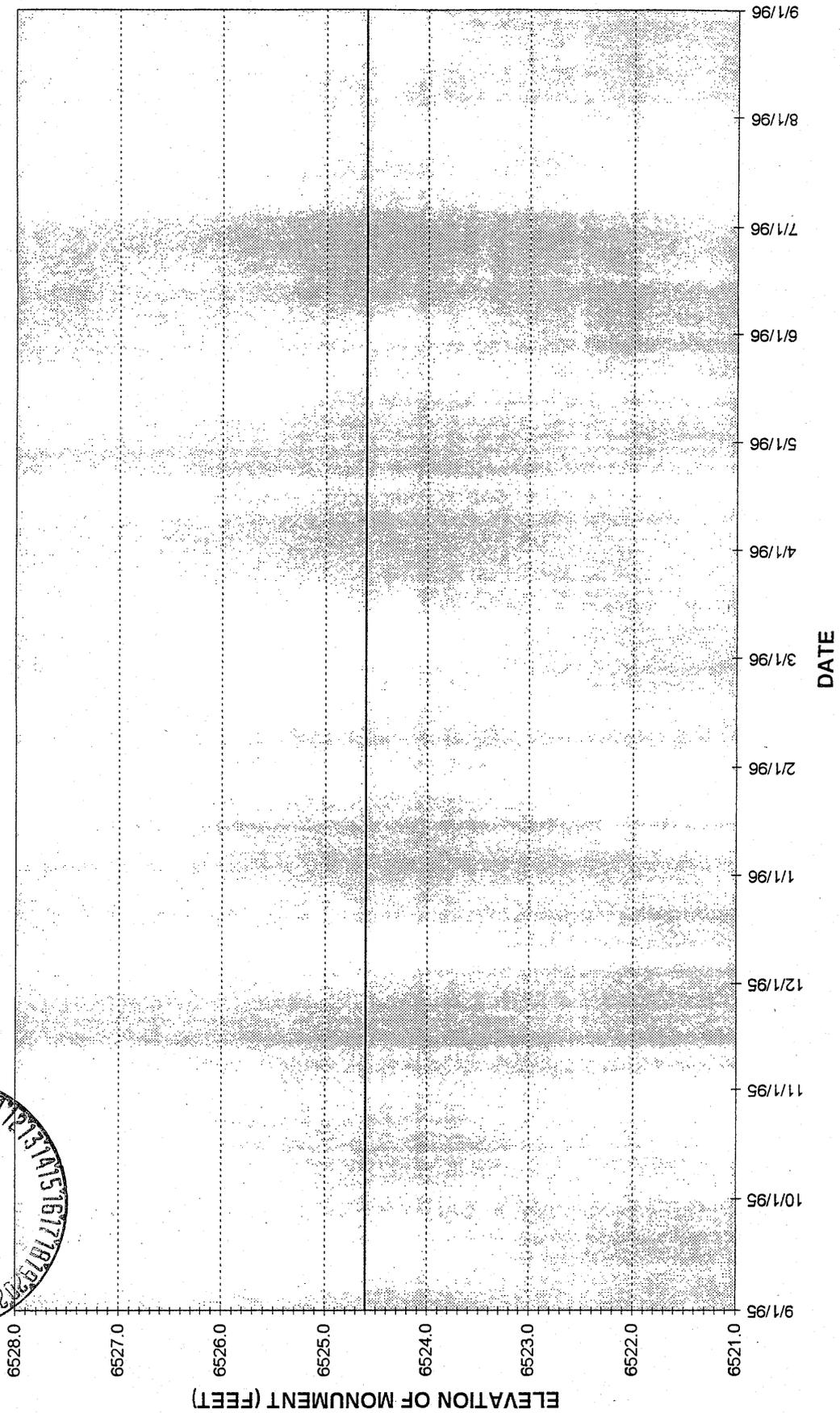
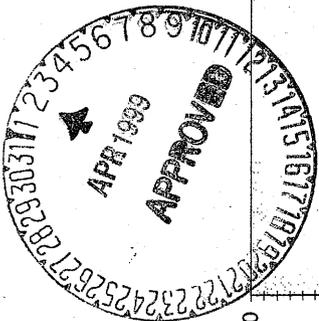
1995-1996 J16-L DAM SETTLEMENT MONUMENT #2



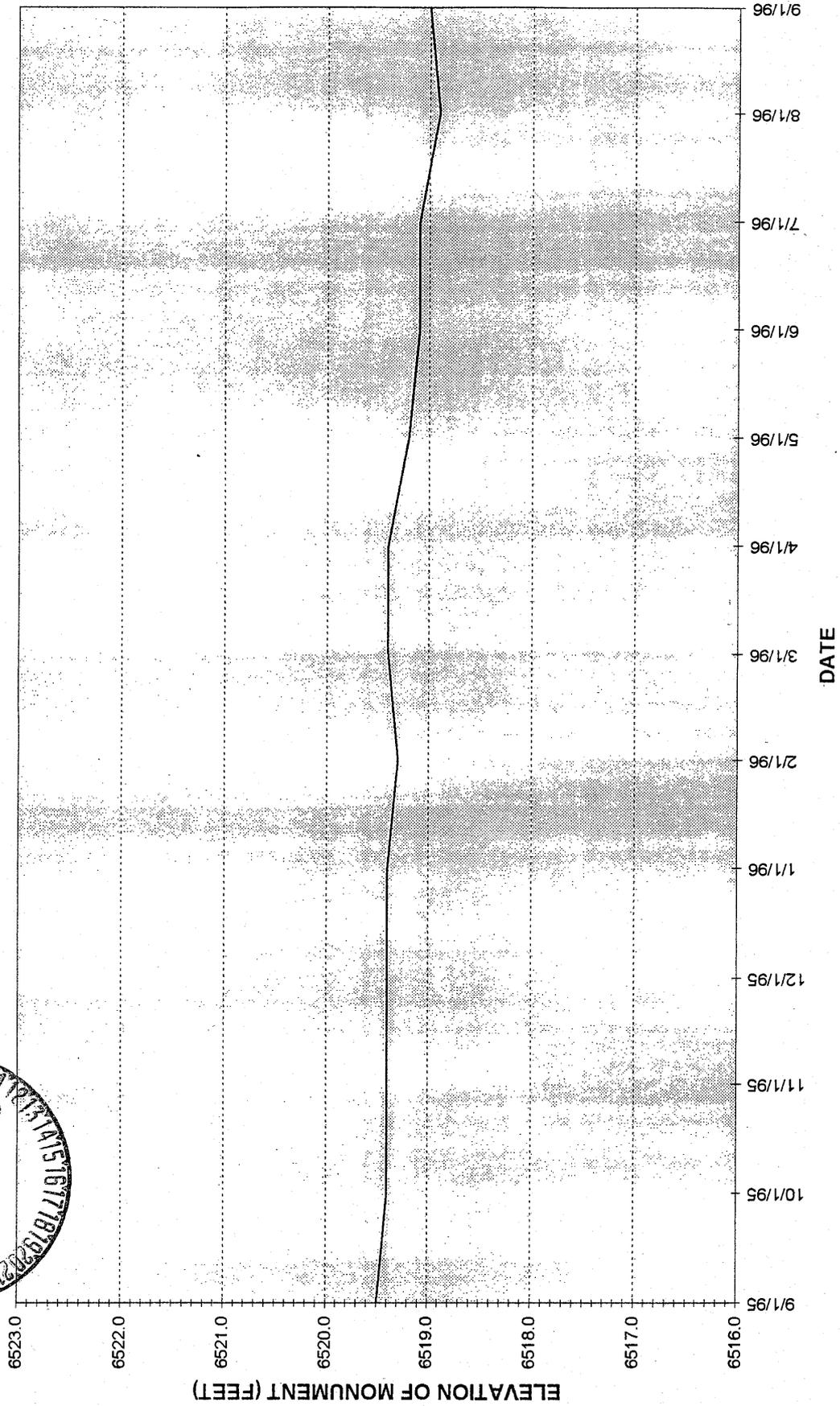
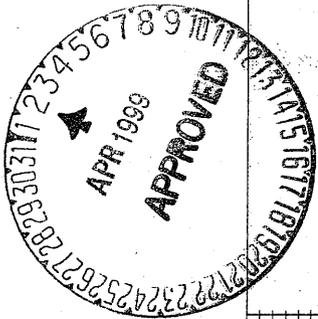
1995-1996 J16-L DAM SETTLEMENT MONUMENT #3



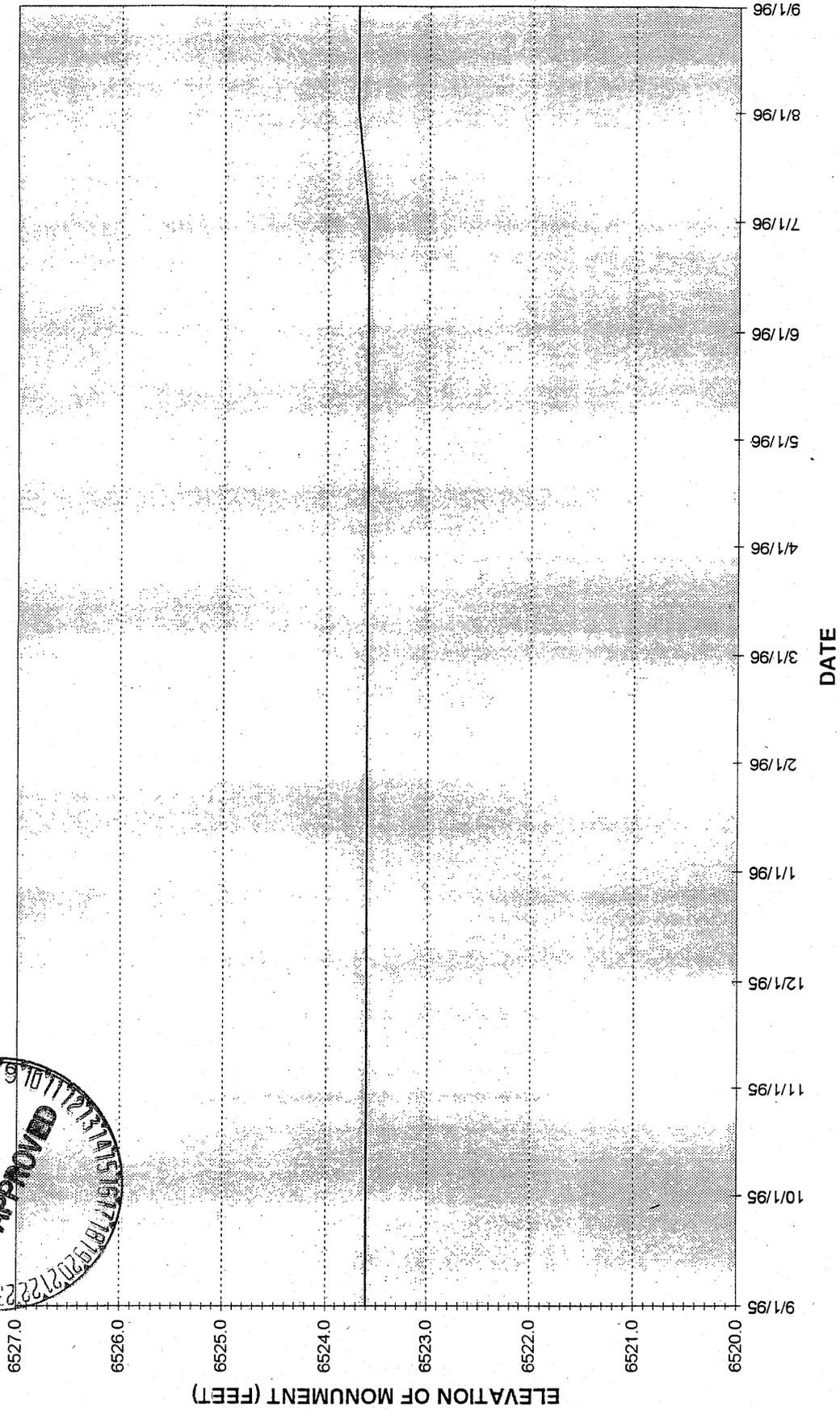
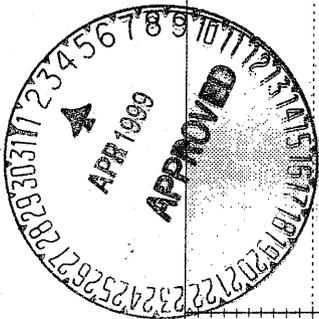
1995-1996 J16-L DAM WATER MONITORING WELL #1



1995-1996 J16-L DAM WATER MONITORING WELL #2

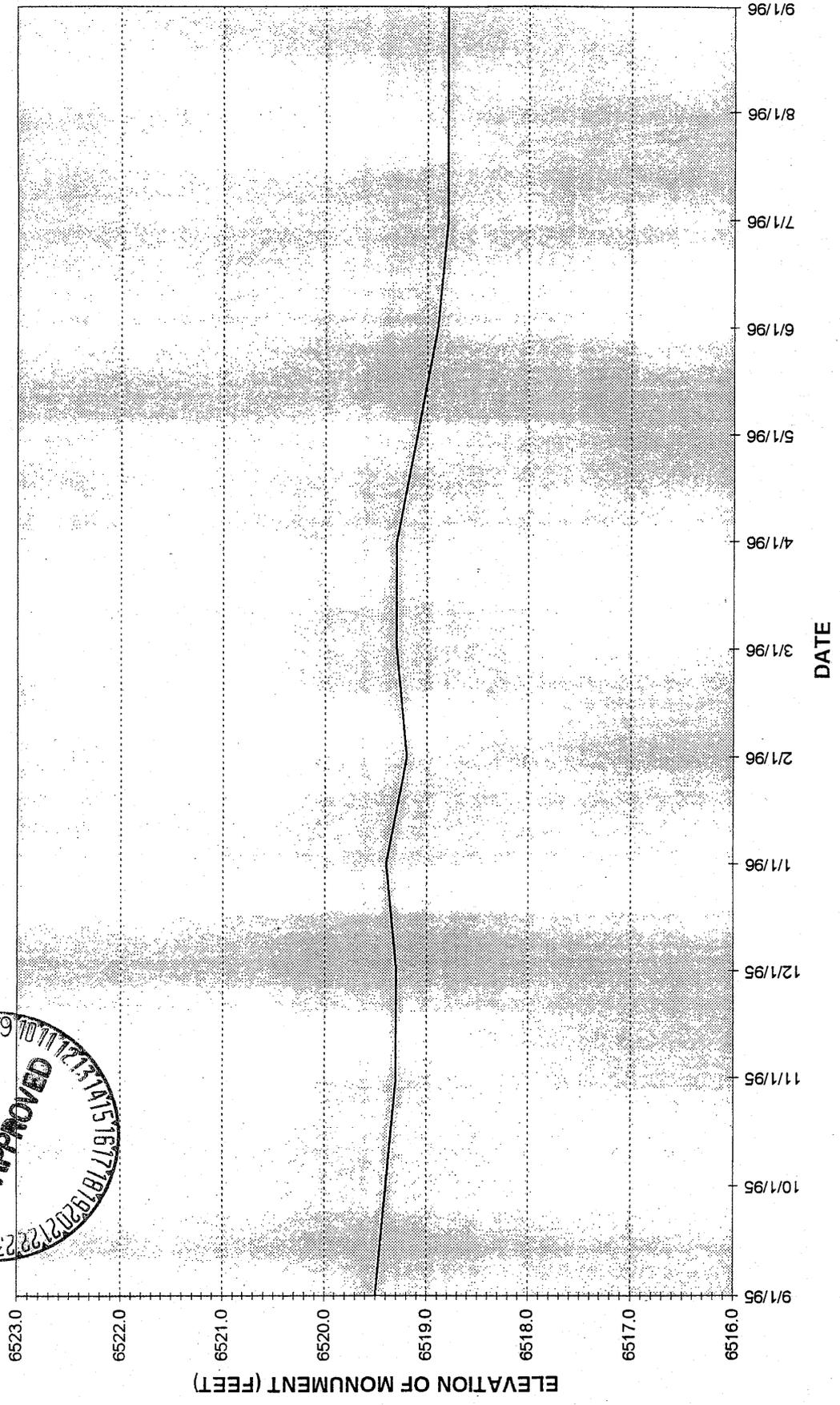


1995-1996 J16-L DAM WATER MONITORING WELL #3

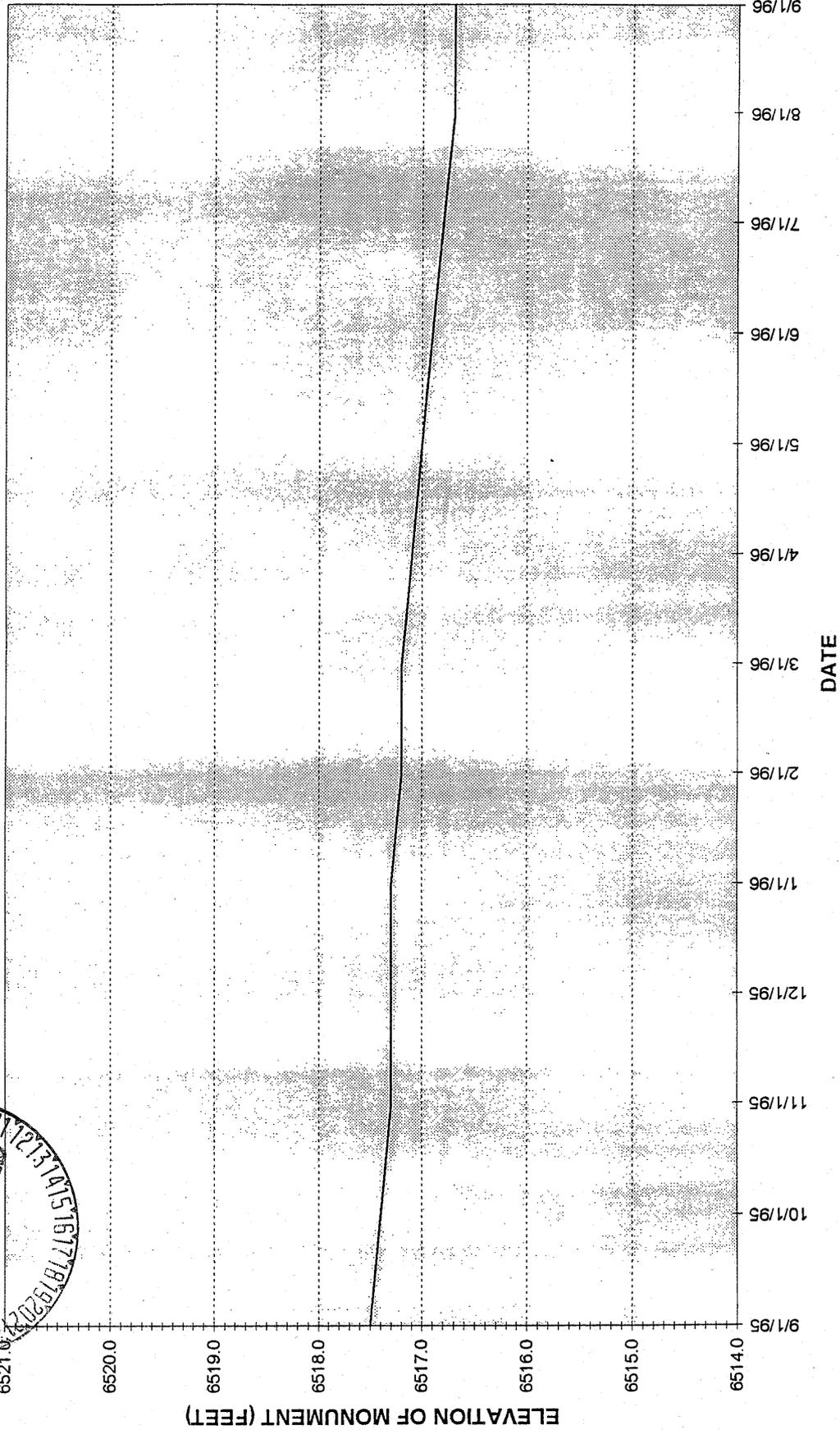
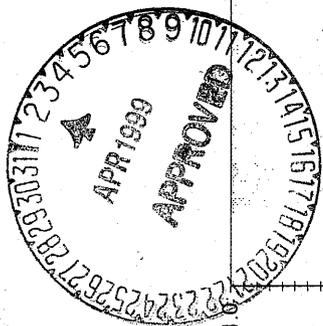


ELEVATION OF MONUMENT (FEET)

1995-1996 J16-L DAM WATER MONITORING WELL #4



1995-1996 J16-L DAM WATER MONITORING WELL #5



U. S. Department of Labor

Mine Safety and Health Administration
P.O. Box 25367
Denver, Colorado 80225-0367

Coal Mine Safety and Health
District 9



SEP 24 1997

Robert Boone
Production Manager
Peabody Western Coal Company
P. O. Box 605
Kayenta, AZ 86033



RE: Kayenta
Mine ID No. 02-01195
Annual Impoundment Report
Impoundments ID #1211-AZ-09-01195-01
ID #1211-AZ-09-01195-02
ID #1211-AZ-09-01195-03
ID #1211-AZ-09-01195-04
ID #1211-AZ-09-01195-05
ID #1211-AZ-09-01195-06
ID #1211-AZ-09-01195-07
ID #1211-AZ-09-01195-08

Dear Mr. Boone:

The annual impoundment reports for the above referenced structures, dated September 2, 1997, has been reviewed and will be made a part of the mine file.

Sincerely,

Archie Wigil
John A. Kuzar
District Manager





Peabody Western Coal Company

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Peabody Western Coal Company's Kayenta and Black Mesa Mines Annual M.S.H.A. Dam Inspection Report.

Dear Sir:

Pursuant to the 30 CFR 77.261-4 regulations, enclosed are the certified annual M.S.H.A. Dam Inspection Reports for the following dams:

Black Mesa Mine

J-7 Dam	ID No. 1211-AZ-09-00533-01
J2-A Wild Ram Valley Dam	ID No. 1211-AZ-09-00533-02

Kayenta Mine

Kayenta Fresh Water Pond	ID No. 1211-AZ-09-01195-01
N14-D Dam	ID No. 1211-AZ-09-01195-02
N14-E Dam	ID No. 1211-AZ-09-01195-03
N14-F Dam	ID No. 1211-AZ-09-01195-04
N14-G Dam	ID No. 1211-AZ-09-01195-05
N14-H Dam	ID No. 1211-AZ-09-01195-06
J16-A Dam	ID No. 1211-AZ-09-01195-07
J16-L Dam	ID No. 1211-AZ-09-01195-08

Should you have any questions, do not hesitate to contact me.

Sincerely,

James G. Schlenvogt, P.E.
Compliance Engineering
Manager



smm

c: Bill Bippus
Brian Dunfee
Scott Williams

PEABODY WESTERN COAL COMPANY
1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-00533-01
Other: J7 Dam
Mine: Black Mesa Mine

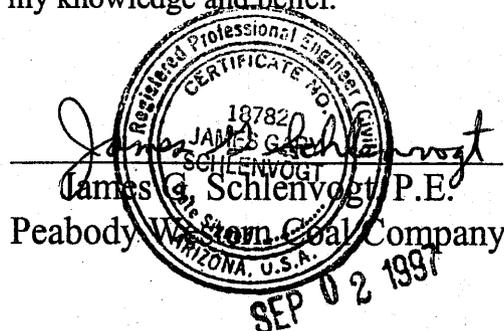
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6357.6</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Increase per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6368.5</u>
8. Other	

All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY
1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-00533-02
Other: J2-A Wild Ram Valley Dam
Mine: Black Mesa Mine

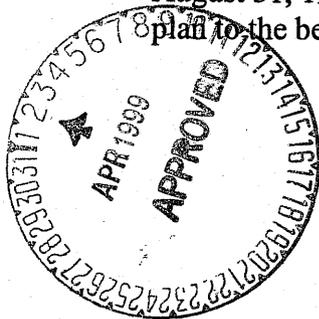
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>See Attachments</u>
3. Current Water Elevation	<u>6324.4</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Decrease per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6348.2</u>
8. Other	

All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.

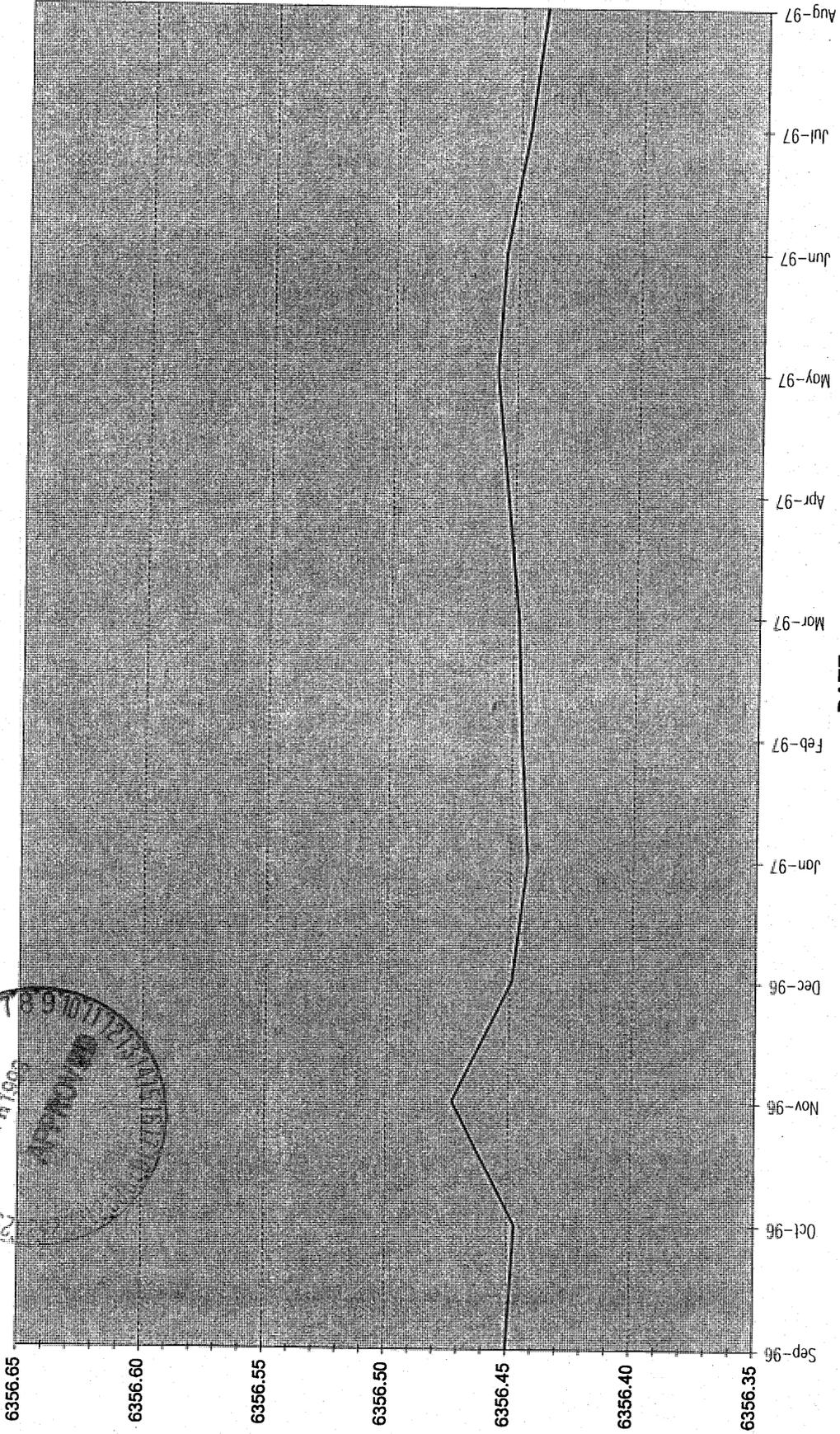
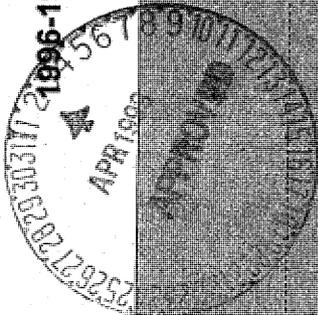



James G. Schlenvogt, P.E.
Peabody Western Coal Company
ARIZONA, U.S.A.

SEP 02 1997

J2-A DAM SETTLEMENT MONUMENT #1

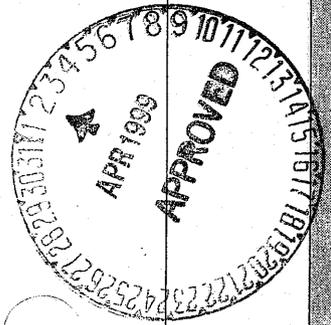
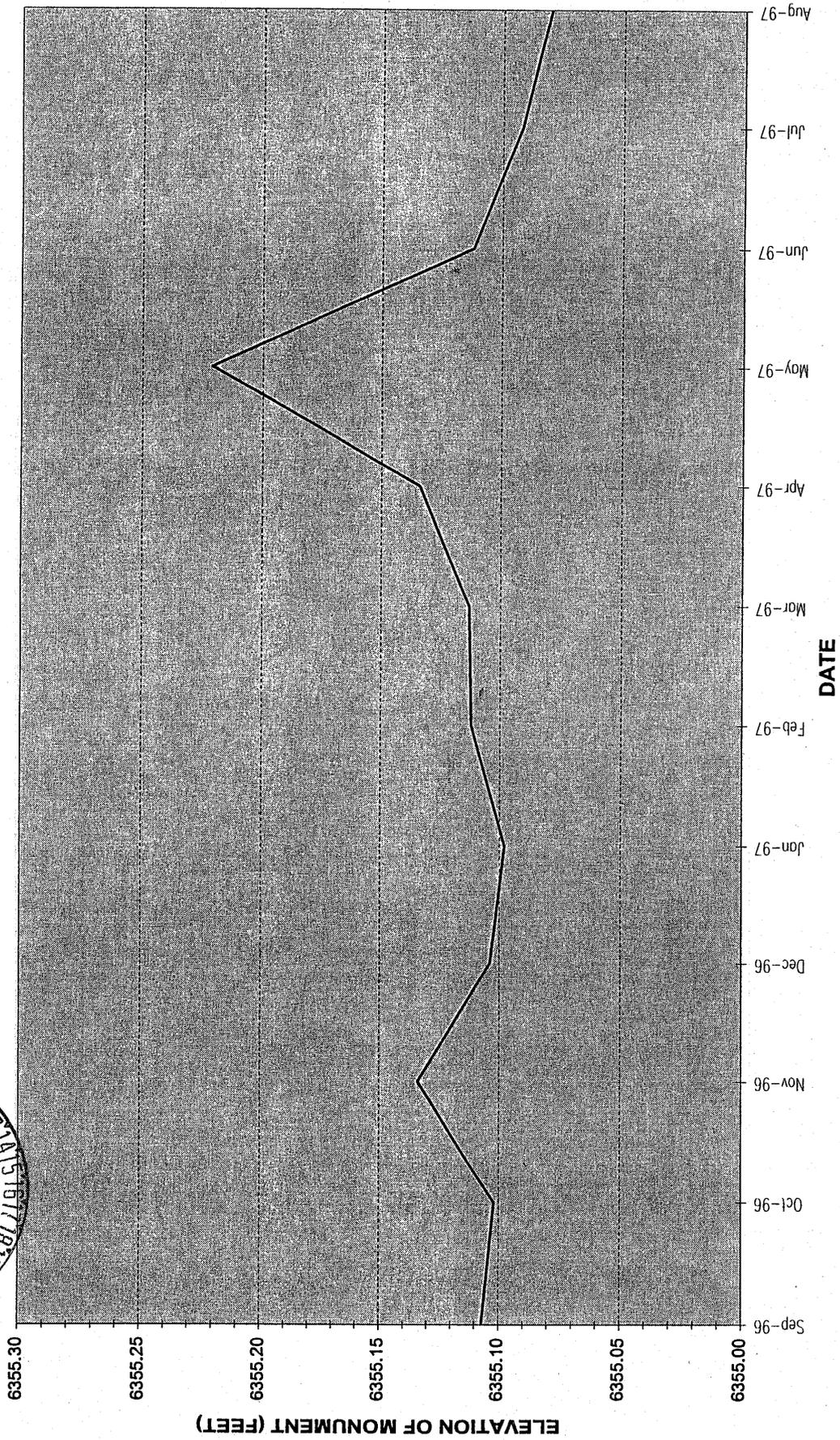
1996-1997



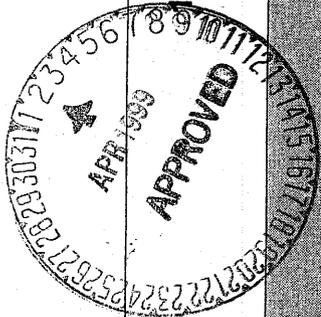
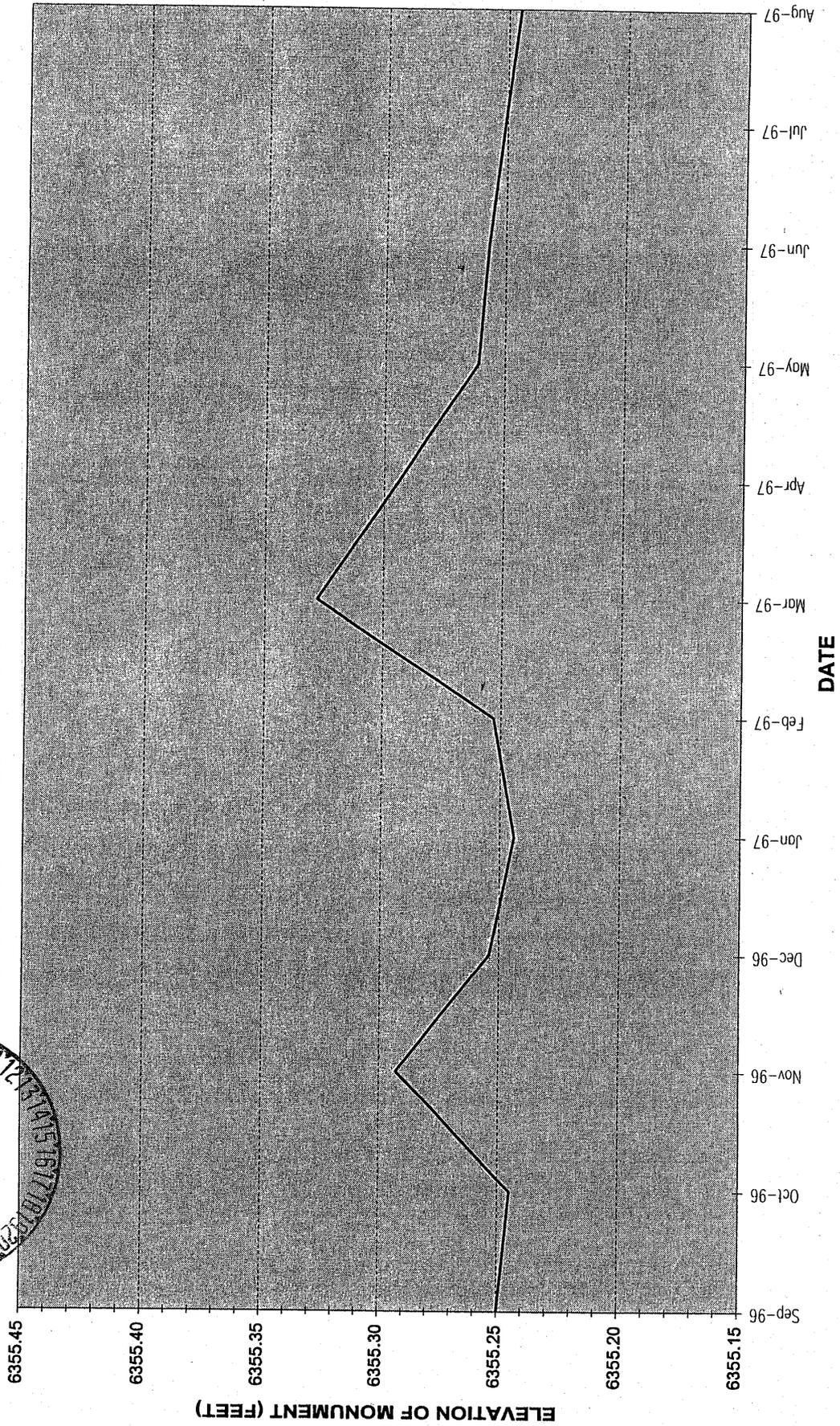
ELEVATION OF MONUMENT (FEET)

DATE

1996-1997 J2-A DAM SETTLEMENT MONUMENT #2



1996-1997 J2-A DAM SETTLEMENT MONUMENT #3



PEABODY WESTERN COAL COMPANY

1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-01
Other: Kayenta Fresh Water Pond
Mine: Kayenta Mine

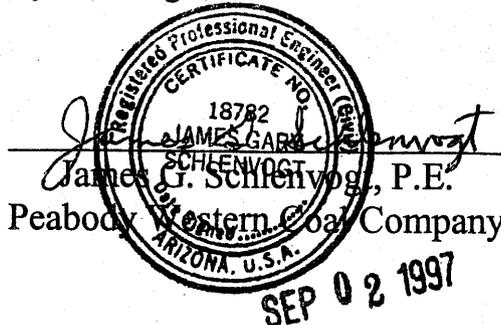
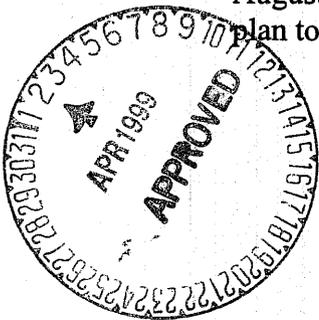
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6612.0</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Decrease per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6615.83</u>
8. Other	

All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY

1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-02
Other: N14-D Dam
Mine: Kayenta Mine

Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6618.5</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Increase per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6653.05</u>
8. Other	

All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY

1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-03
Other: N14-E Dam
Mine: Kayenta Mine

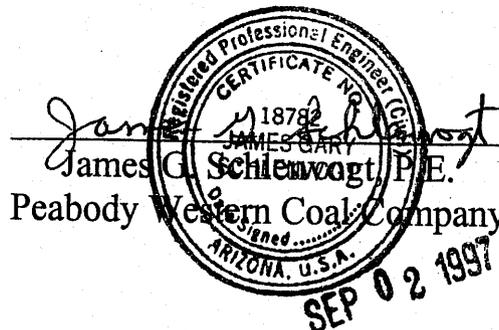
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6666.7</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Decrease per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6685.99</u>
8. Other	

All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY

1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-04
Other: N14-F Dam
Mine: Kayenta Mine

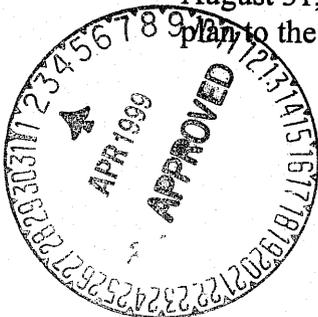
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6640.2</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Decrease per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6658.54</u>
8. Other	

All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.




James G. Schlemmer, P.E.
Peabody Western Coal Company
SEP 02 1997

PEABODY WESTERN COAL COMPANY
1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-05
Other: N14-G Dam
Mine: Kayenta Mine

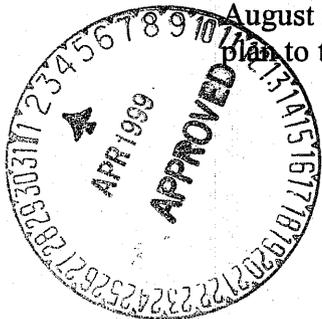
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6632.2</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Decrease per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6660.84</u>
8. Other	

All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY

1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

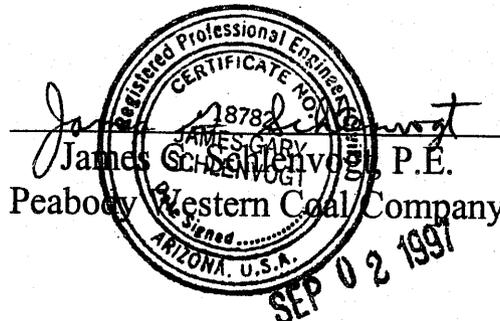
RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-06
Other: N14-H Dam
Mine: Kayenta Mine

Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

	<u>STATUS</u>
1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6696.6</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Increase per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6719.07</u>
8. Other	

All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY
1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

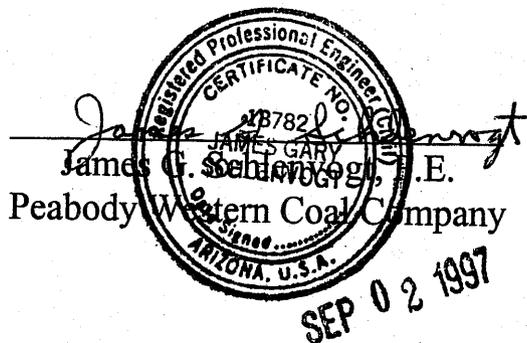
RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-07
Other: J16-A Dam
Mine: Kayenta Mine

Gentlemen:

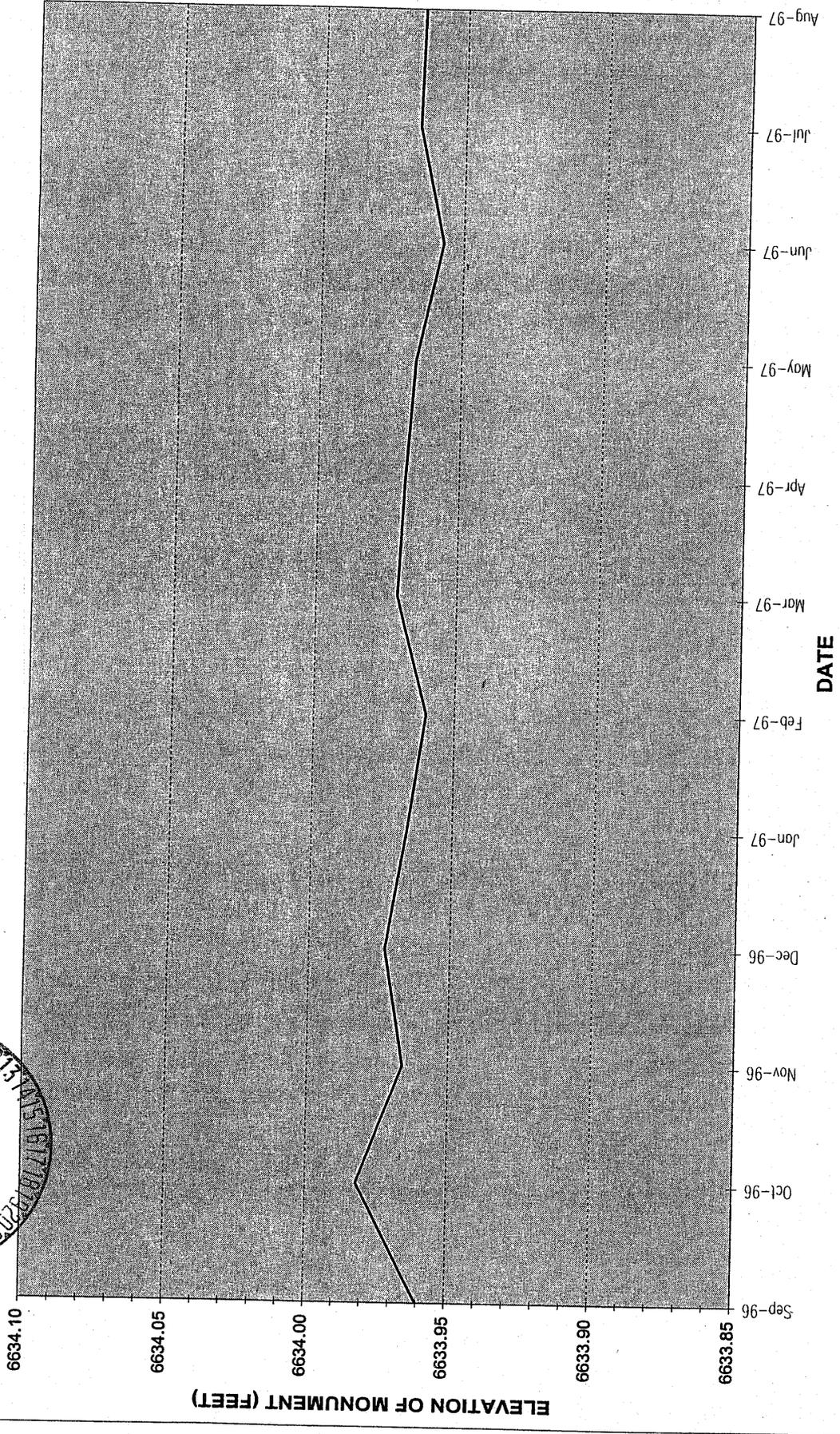
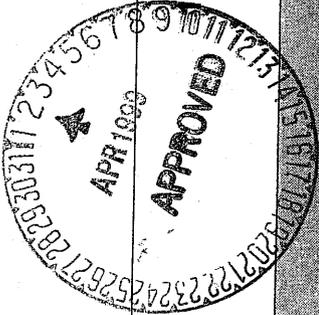
In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

	<u>STATUS</u>
1. Geometry	<u>No Change</u>
2. Instrumentation	<u>See Attachments</u>
3. Current Water Elevation	<u>6614.6</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Increase per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6635.13</u>
8. Other	

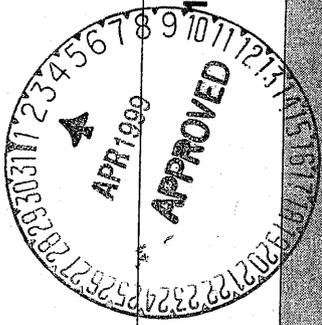
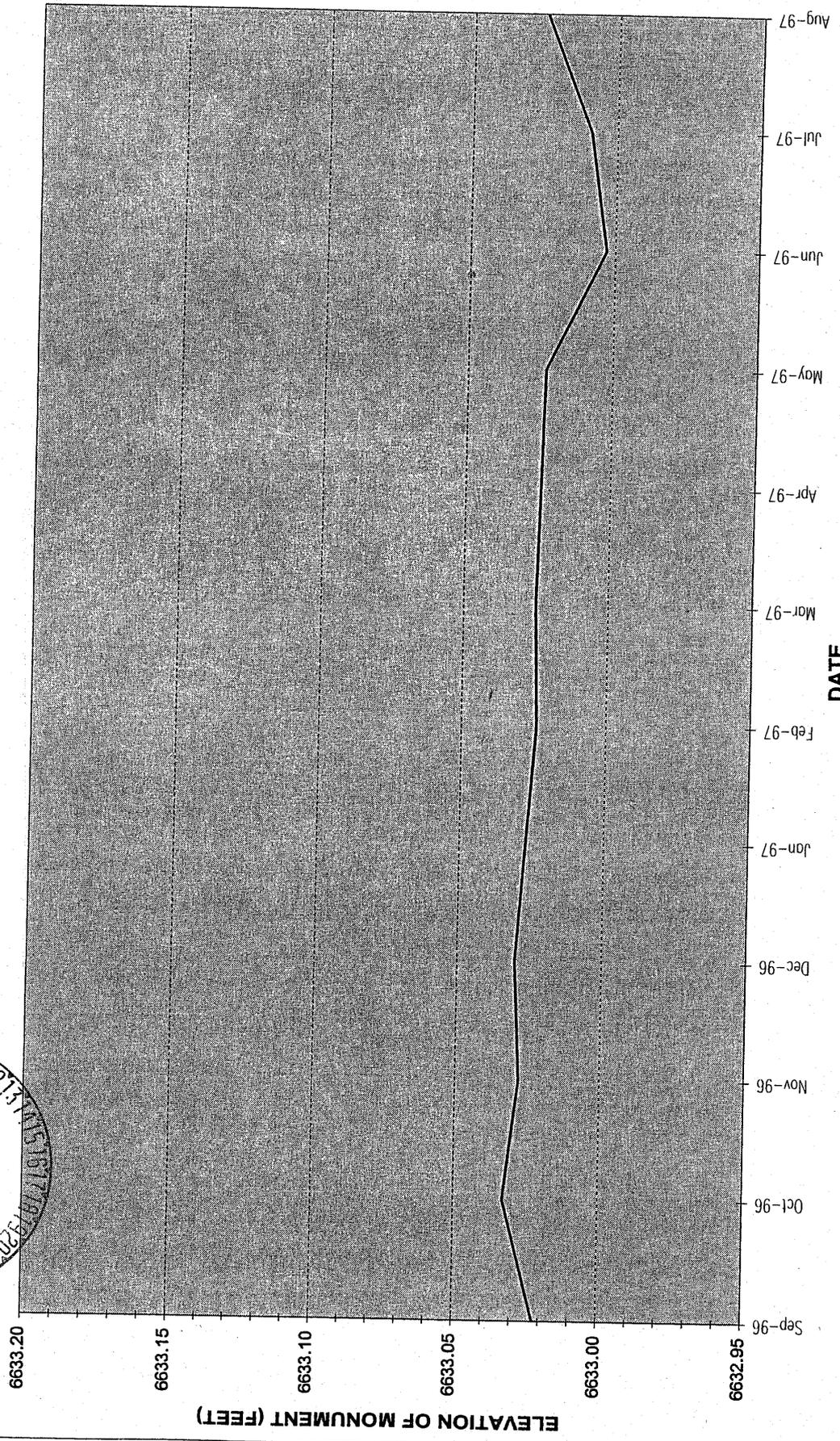
All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.



1996-1997 J16-A DAM SETTLEMENT MONUMENT #1

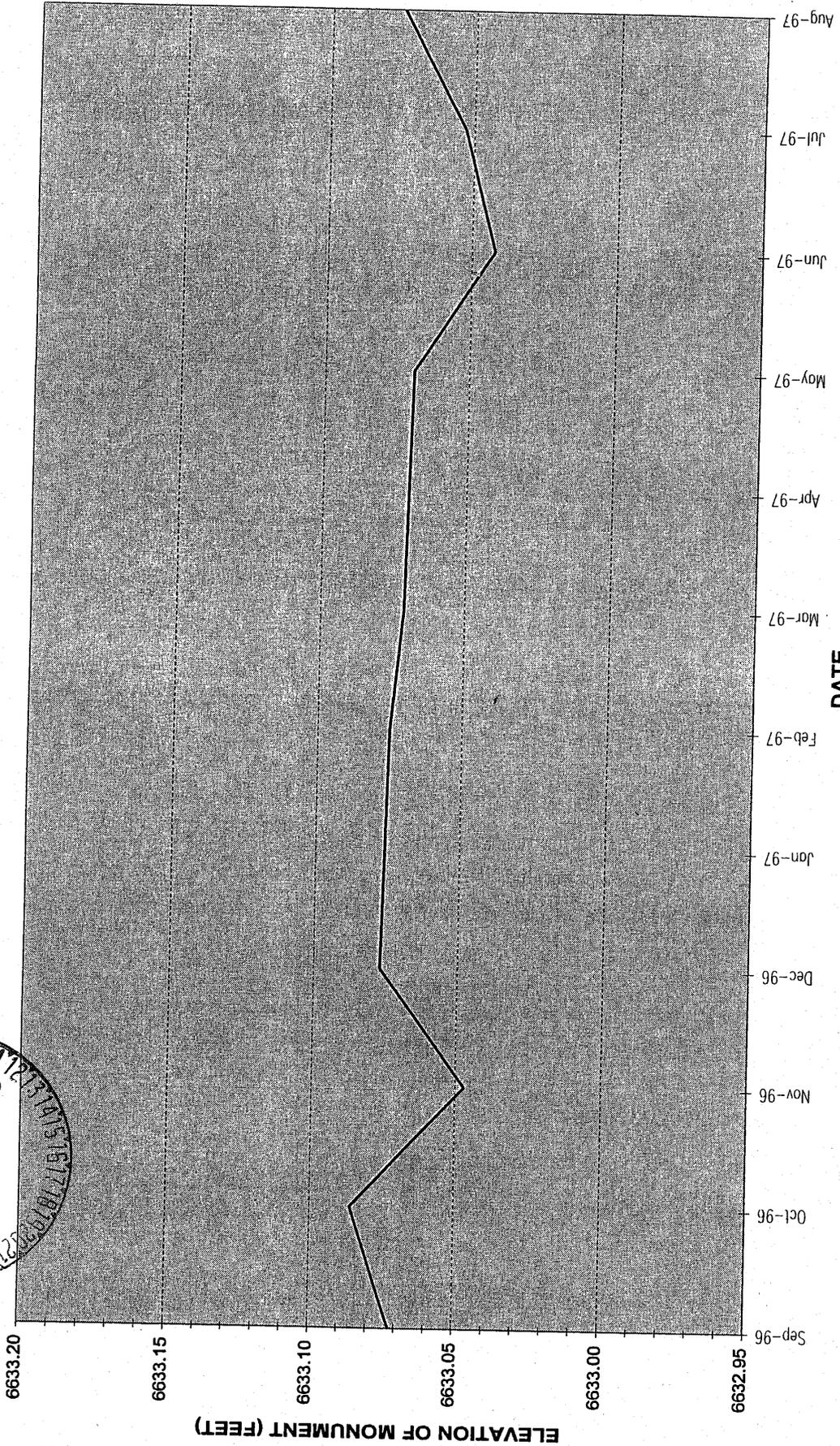
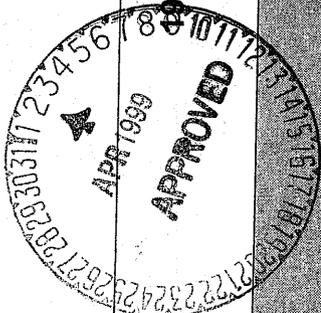


1996-1997 J16-A DAM SETTLEMENT MONUMENT #2

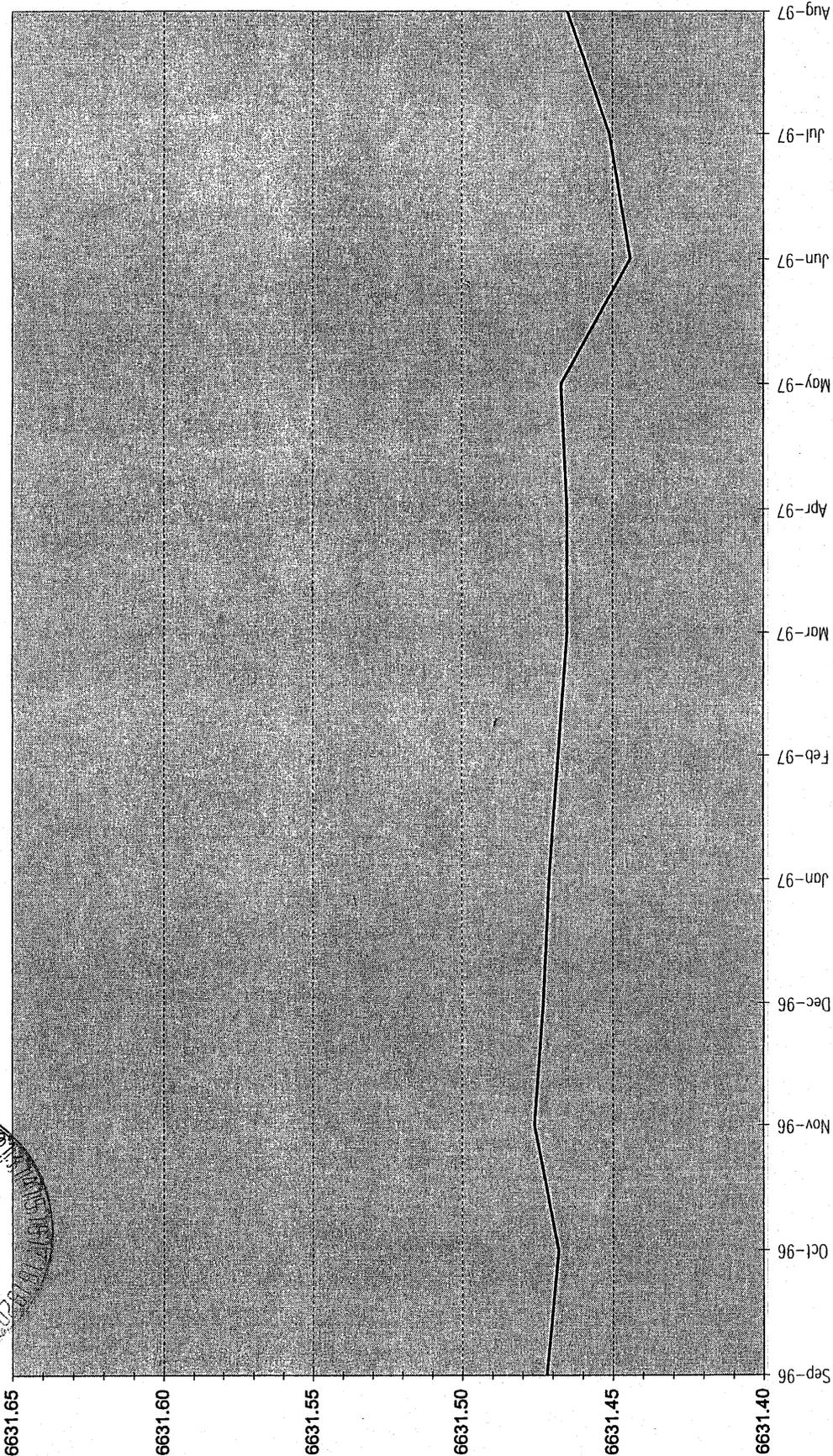


ELEVATION OF MONUMENT (FEET)

1996-1997 J16-A DAM SETTLEMENT MONUMENT #3

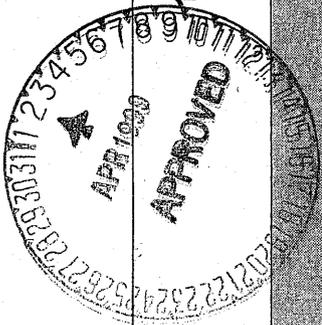


1996-1997 J16-A DAM SETTLEMENT MONUMENT #4



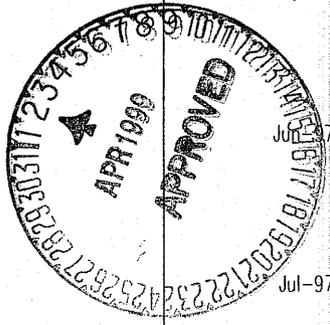
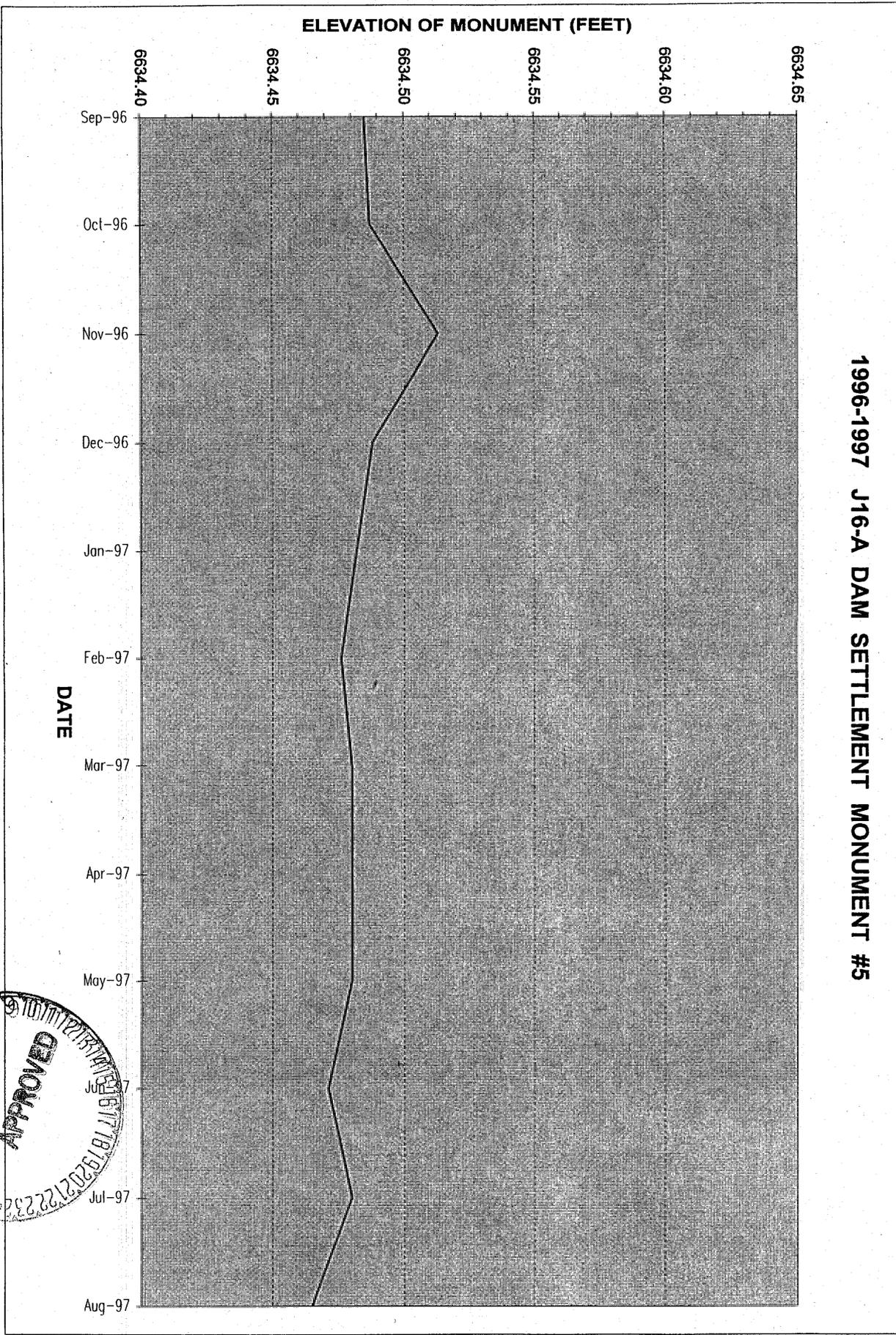
ELEVATION OF MONUMENT (FEET)

DATE

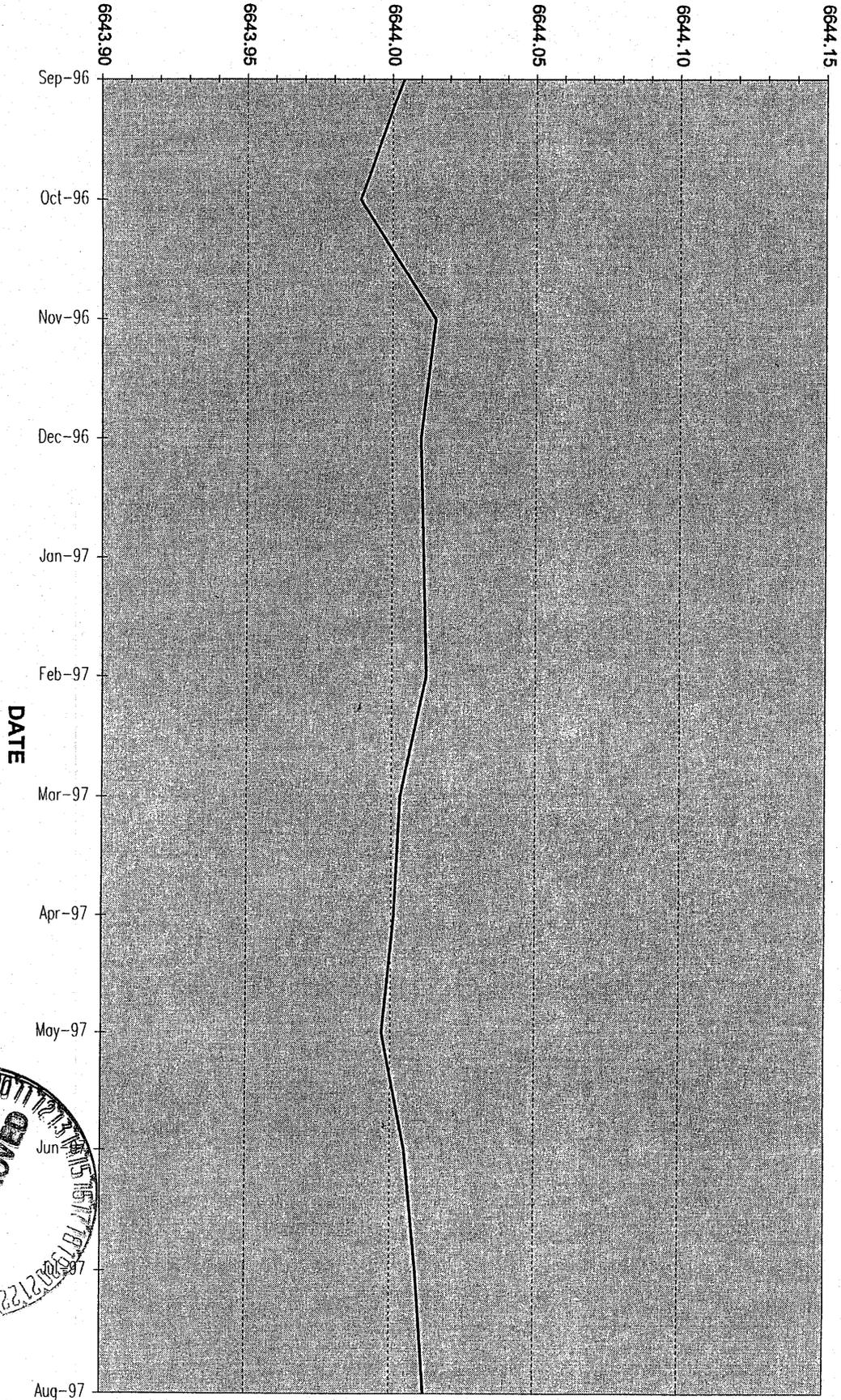


ELEVATION OF MONUMENT (FEET)

1996-1997 J16-A DAM SETTLEMENT MONUMENT #5



ELEVATION OF MONUMENT (FEET)



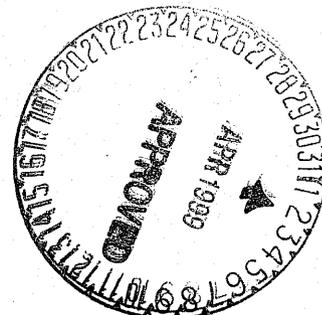
1996-1997 J16-A DAM SETTLEMENT MONUMENT #6



PEABODY WESTERN COAL COMPANY
1300 South Yale
Flagstaff, Arizona 86001
Telephone (520) 774-5253

September 2, 1997

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225



RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-08
Other: J16-L Dam
Mine: Kayenta Mine

Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1996 to August 31, 1997 is submitted:

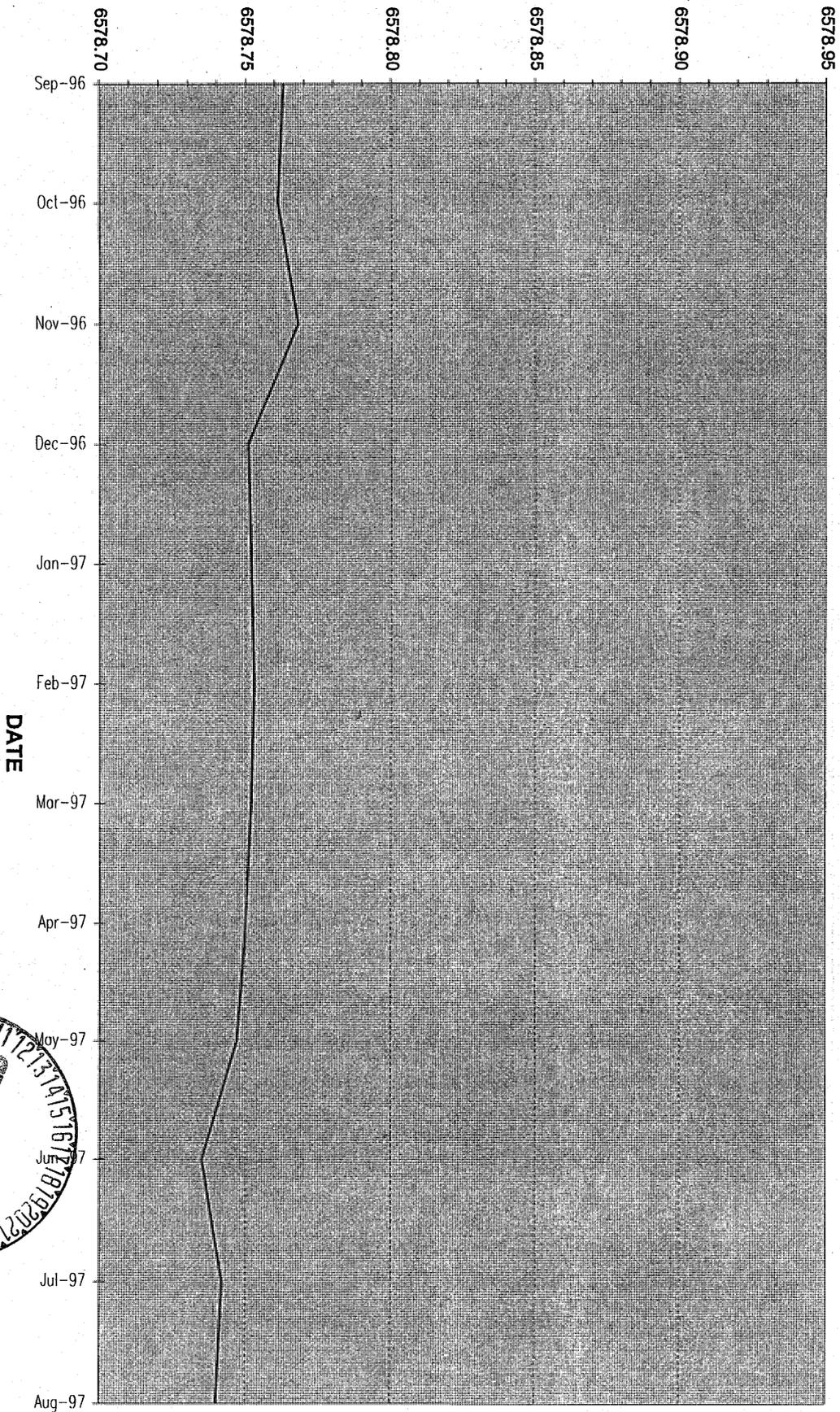
STATUS

- | | |
|----------------------------|---|
| 1. Geometry | <u>No Change</u> |
| 2. Instrumentation | <u>See Attachments</u> |
| 3. Current Water Elevation | <u>6556.5</u> |
| 4. Storage Capacity | <u>No Change</u> |
| 5. Water Volume | <u>Increase per water elevation</u> |
| 6. Stability | <u>No Change</u> |
| 7. Spillway Elevation | <u>6573.4</u> |
| 8. Other | <u>Remedial work performed; ESW and TOD raised; as-built submitted 6/9/97</u> |

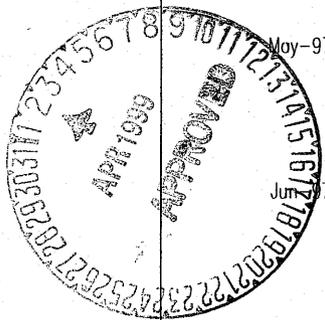
All work at the above site during the period September 1, 1996 to August 31, 1997 was performed in accordance with the approved plan to the best of my knowledge and belief.


James G. Schlenvogt, P.E.
Schlenvogt
Peabody Western Coal Company
SEP 02 1997

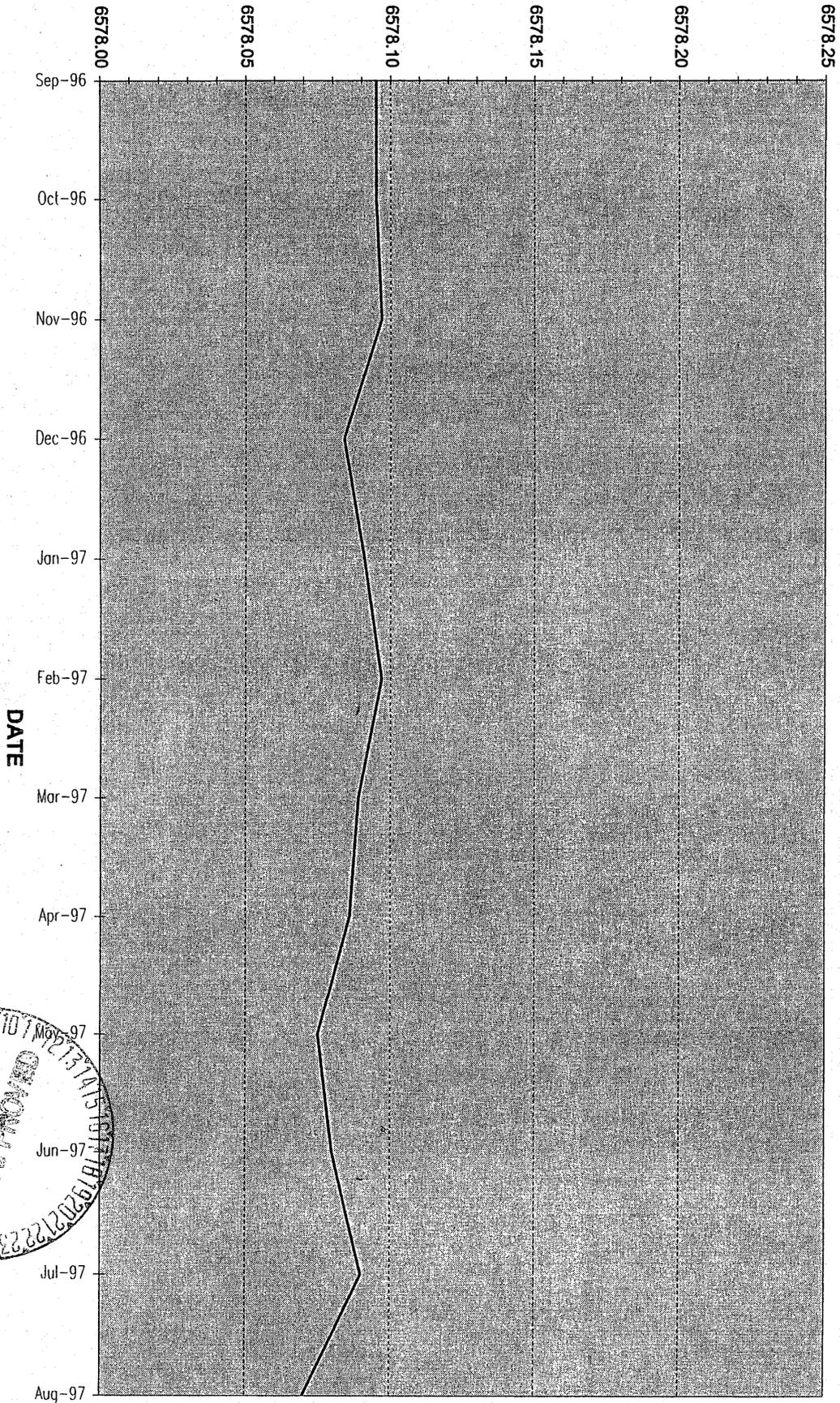
ELEVATION OF MONUMENT (FEET)



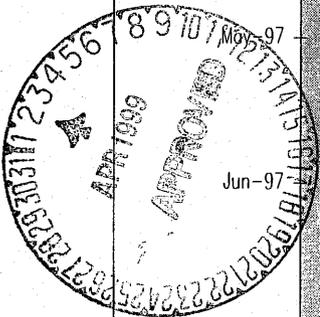
1996-1997 J16-L DAM SETTLEMENT MONUMENT #1



ELEVATION OF MONUMENT (FEET)

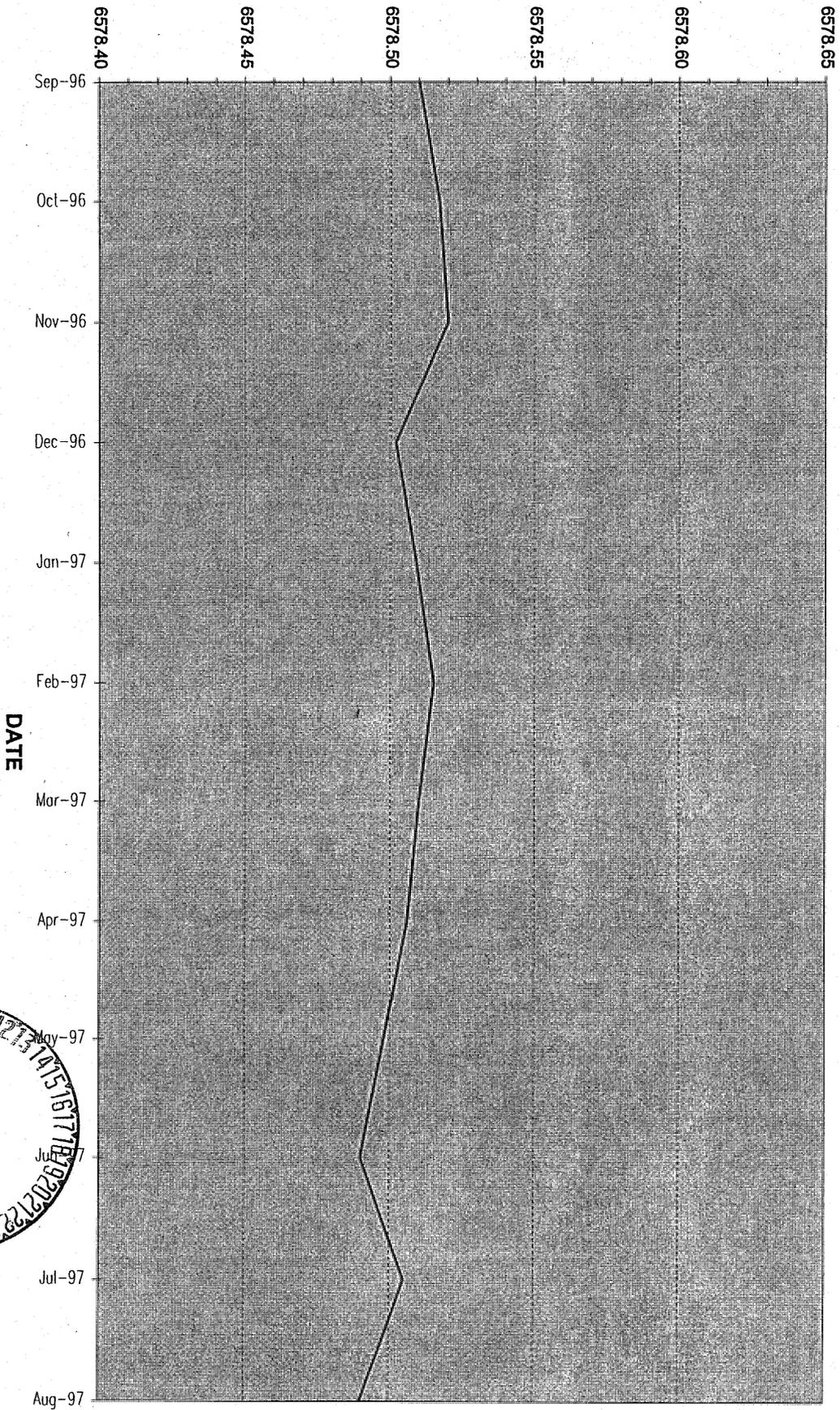


1996-1997 J16-L DAM SETTLEMENT MONUMENT #2

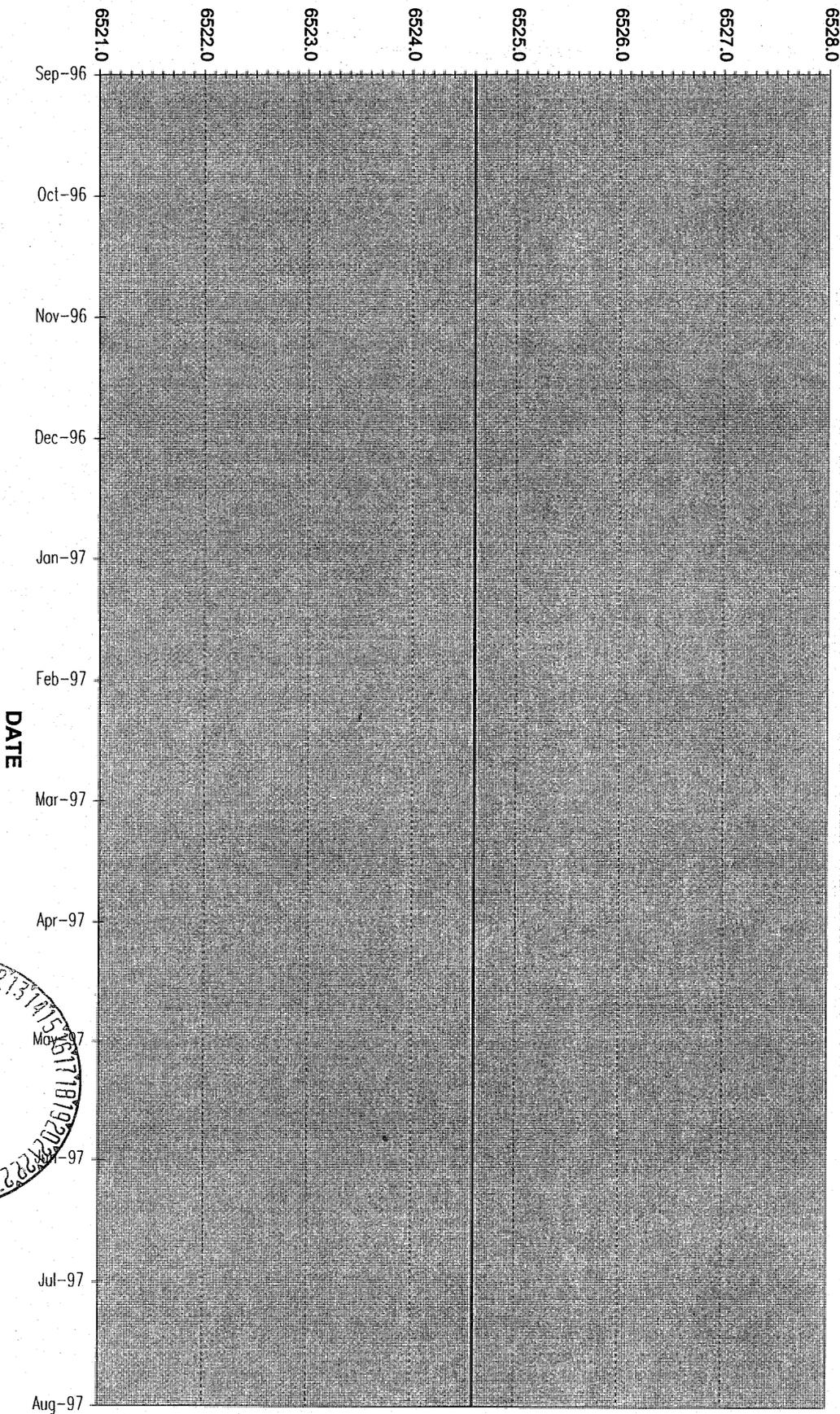


ELEVATION OF MONUMENT (FEET)

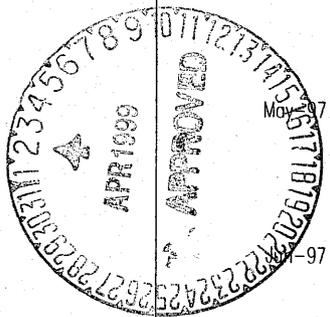
1996-1997 J16-L DAM SETTLEMENT MONUMENT #3



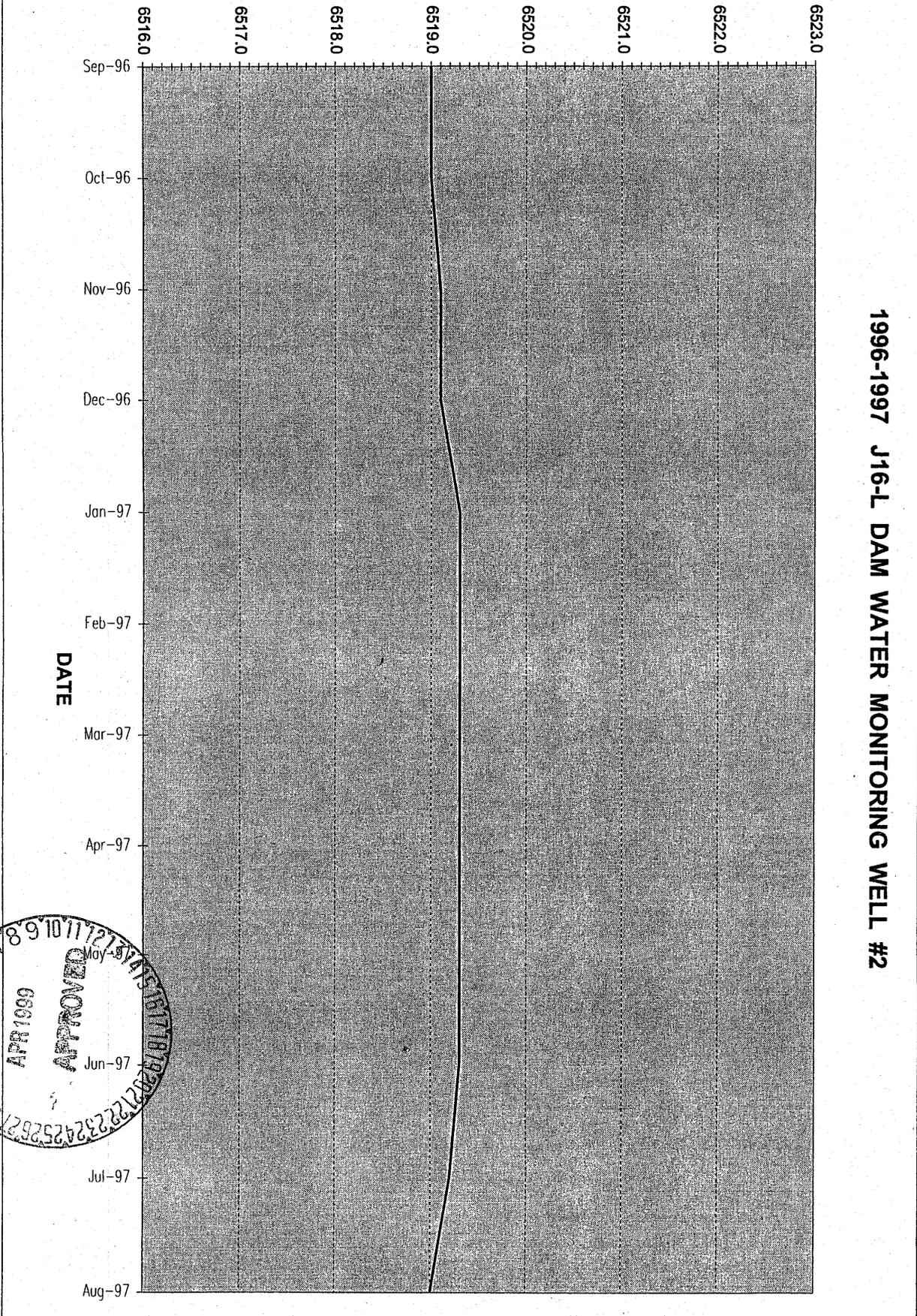
ELEVATION OF MONUMENT (FEET)



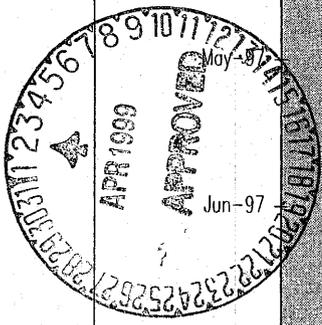
1996-1997 J16-L DAM WATER MONITORING WELL #1



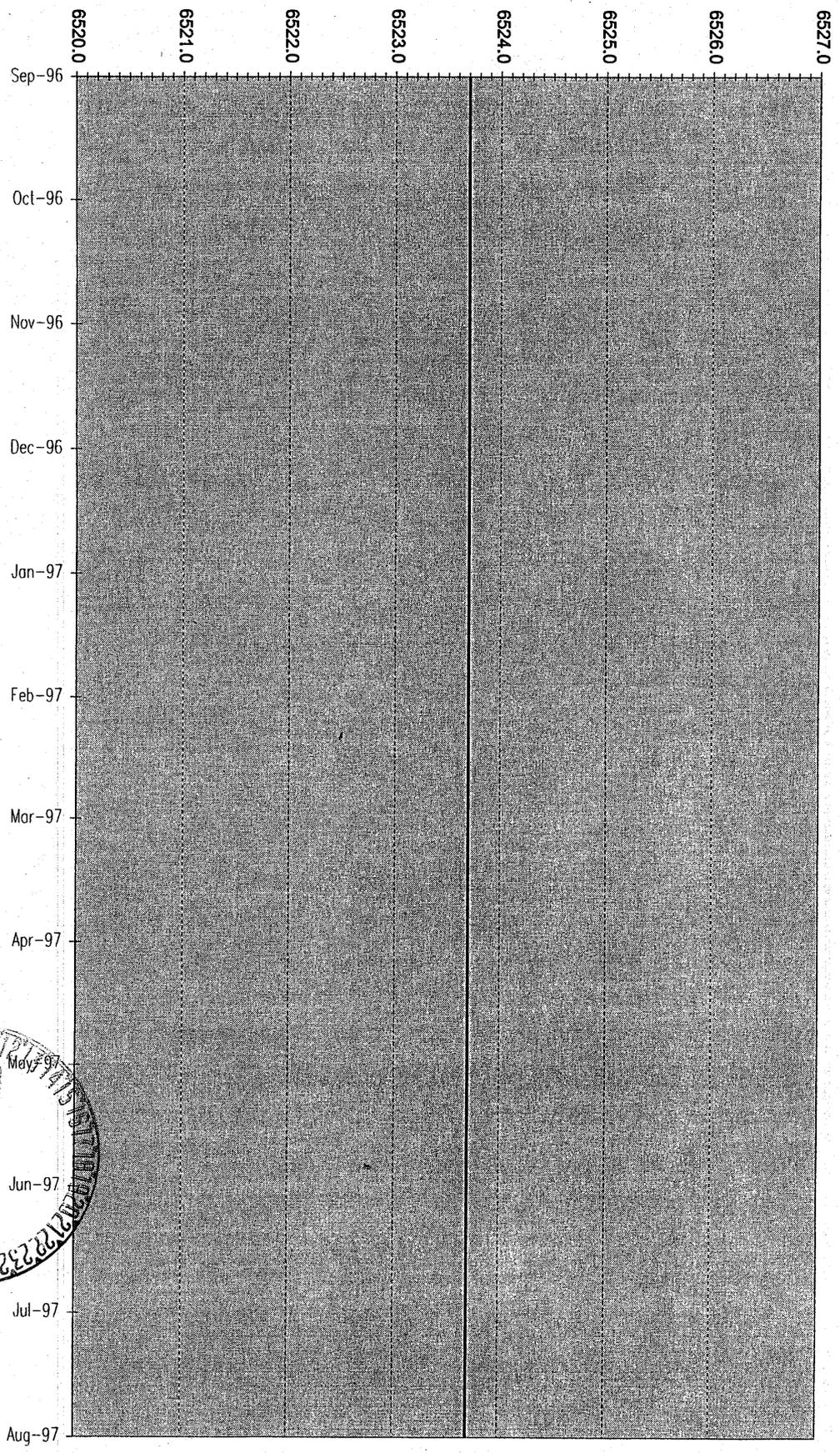
ELEVATION OF MONUMENT (FEET)



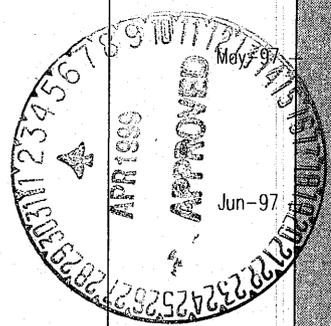
1996-1997 J16-L DAM WATER MONITORING WELL #2



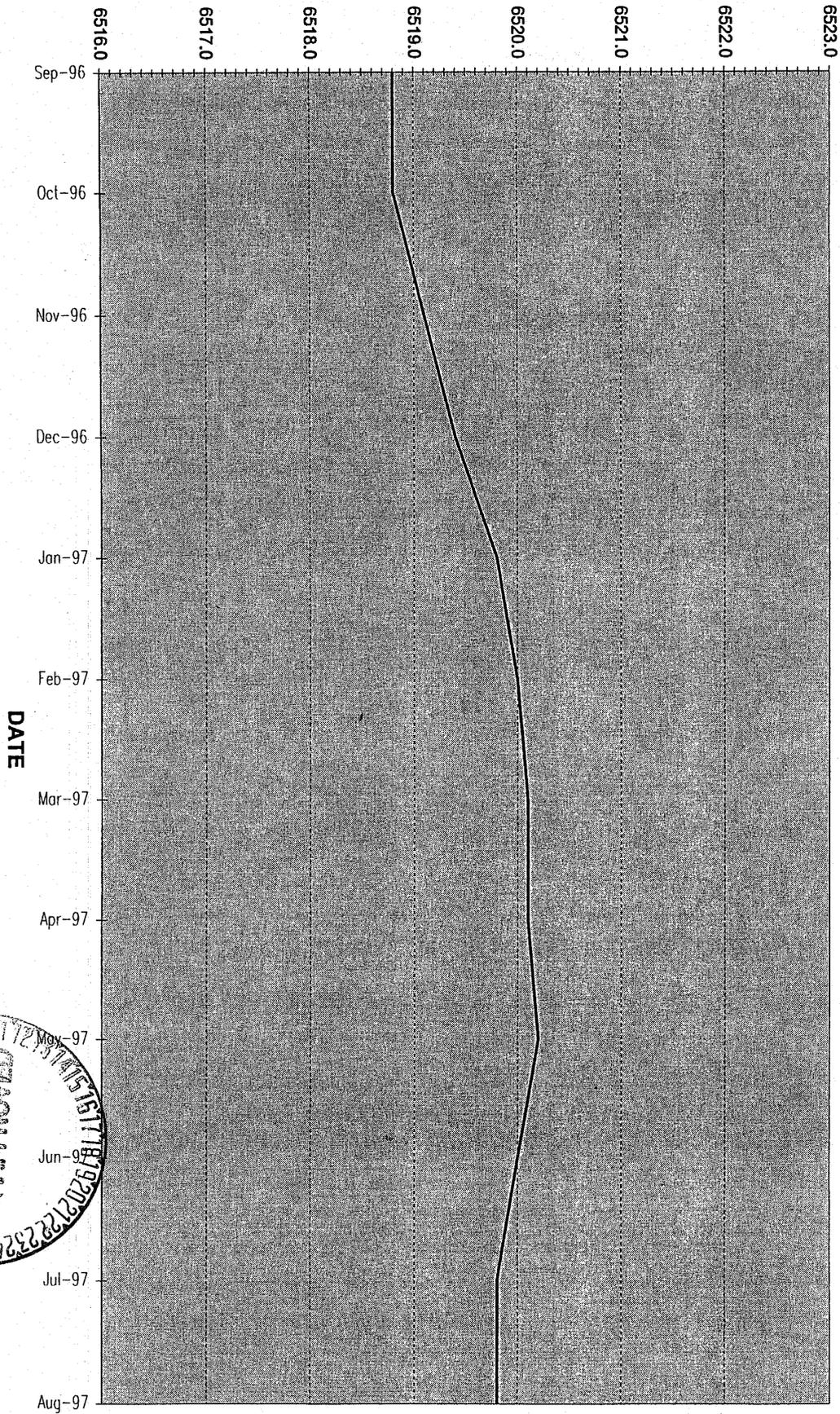
ELEVATION OF MONUMENT (FEET)



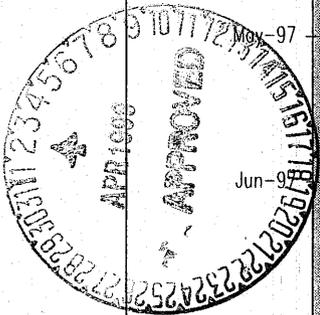
1996-1997 J16-L DAM WATER MONITORING WELL #3



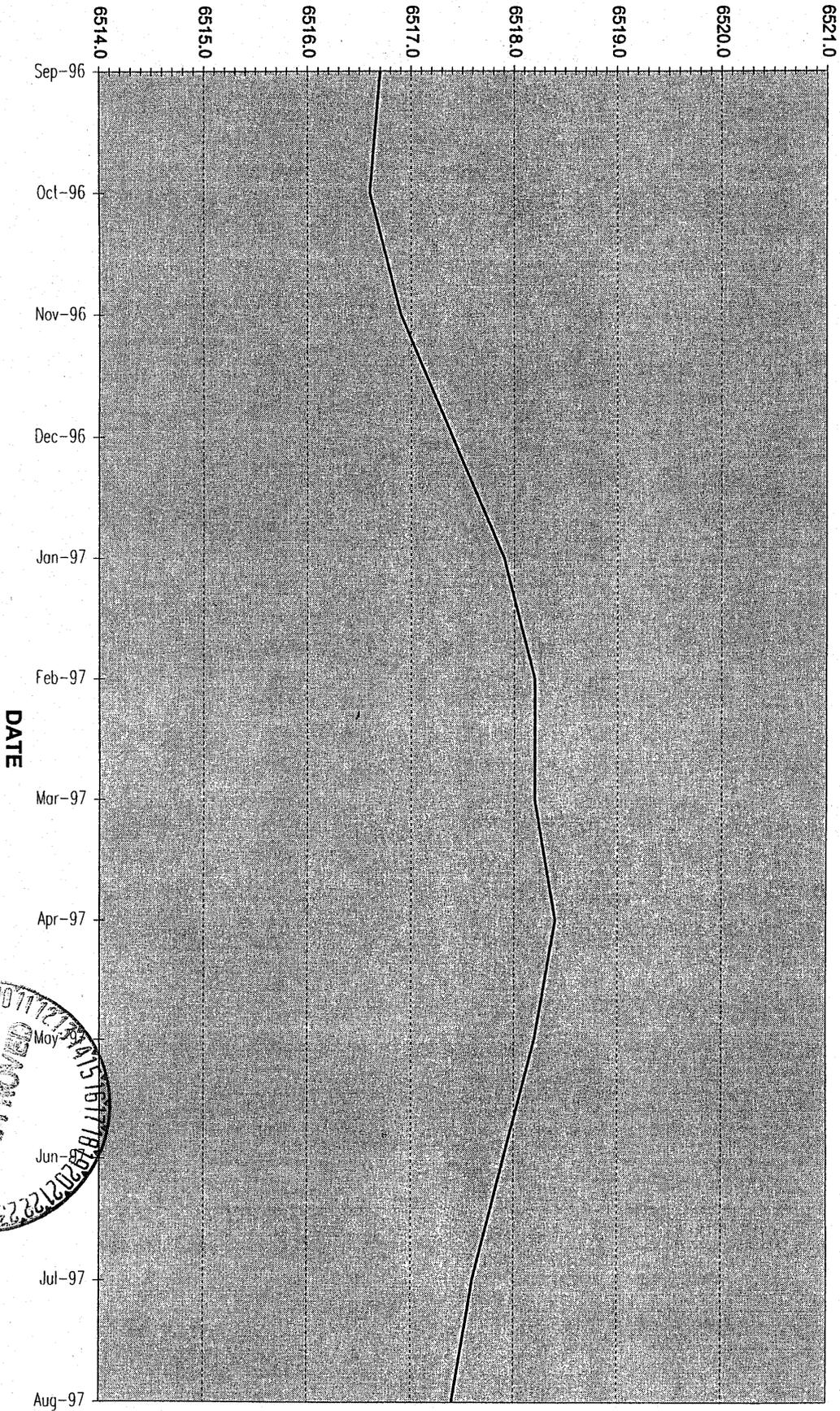
ELEVATION OF MONUMENT (FEET)



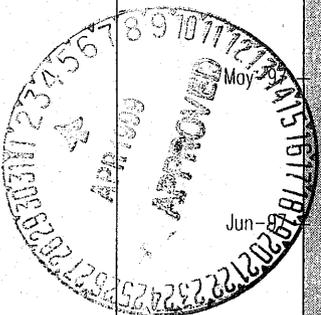
1996-1997 J16-L DAM WATER MONITORING WELL #4



ELEVATION OF MONUMENT (FEET)



1996-1997 J16-L DAM WATER MONITORING WELL #5



U. S. Department of Labor

Mine Safety and Health Administration
P.O. Box 25367
Denver, Colorado 80225-0367
Coal Mine Safety and Health
District 9



SEP 22 1998

Buck Woodward
Production Manager
Peabody Western Coal Company
P. O. Box 605
Kayenta, AZ 86033

RE: Black Mesa
Mine ID No. 02-00533
Annual Impoundment Report
Impoundment ID #1211-AZ-09-00533-01
#1211-AZ-09-00533-02

Dear Mr. Woodward:

The annual impoundment reports, dated September 10, 1998, for the above referenced structures, have been reviewed and will be made a part of the mine file.

Sincerely,

John A. Kuzar
John A. Kuzar
District Manager



U. S. Department of Labor

Mine Safety and Health Administration
P.O. Box 25367
Denver, Colorado 80225-0367
Coal Mine Safety and Health
District 9



SEP 22 1998

D. Scott Pearson
Mine Manager
Peabody Western Coal Company
P. O. Box 605
Kayenta, AZ 86033

RE: Kayenta
Mine ID No. 02-01195
Annual Impoundment Report
Impoundment ID #1211-AZ-09-01195-01
#1211-AZ-09-01195-02
#1211-AZ-09-01195-03
#1211-AZ-09-01195-04
#1211-AZ-09-01195-05
#1211-AZ-09-01195-06
#1211-AZ-09-01195-07
#1211-AZ-09-01195-08

Dear Mr. Pearson:

The annual impoundment reports, dated September 10, 1998, for the above referenced structures, have been reviewed and will be made a part of the mine file.

Sincerely,

John A. Kuzar
John A. Kuzar
District Manager





Peabody Western Coal Company

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Peabody Western Coal Company's Kayenta and Black Mesa Mines Annual M.S.H.A. Dam Inspection Report.

Dear Sir:

Pursuant to the 30 CFR 77.261-4 regulations are the certified annual M.S.H.A. Dam Inspection Reports for the following dams:

Black Mesa Mine

J-7 Dam ID No. 1211-AZ-09-00533-01
J2-A Wild Ram Valley Dam ID No. 1211-AZ-09-00533-02

Kayenta Mine

Kayenta Fresh Water Pond ID No. 1211-AZ-09-01195-01
N14-D Dam ID No. 1211-AZ-09-01195-02
N14-E Dam ID No. 1211-AZ-09-01195-03
N14-F Dam ID No. 1211-AZ-09-01195-04
N14-G Dam ID No. 1211-AZ-09-01195-05
N14-H Dam ID No. 1211-AZ-09-01195-06
J16-A Dam ID No. 1211-AZ-09-01195-07
J16-L Dam ID No. 1211-AZ-09-01195-08

Should you have any questions, do not hesitate to contact me.

Sincerely,

James G. Schlenvogt
James G. Schlenvogt, P.E.
Compliance Engineering
Manager



Js

C: Bill Bippus
Brian Dunfee
Scott Williams

PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-00533-01
Other: J-7 Dam
Mine: Black Mesa Mine

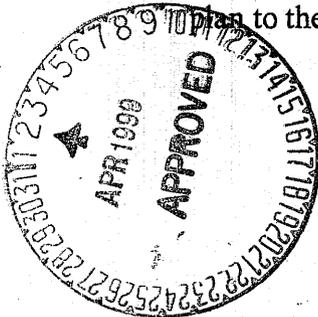
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

- | | |
|----------------------------|-------------------------------------|
| 1. Geometry | <u>No Change</u> |
| 2. Instrumentation | <u>No Change</u> |
| 3. Current Water Elevation | <u>6359.9</u> |
| 4. Storage Capacity | <u>No Change</u> |
| 5. Water Volume | <u>Increase per water elevation</u> |
| 6. Stability | <u>No Change</u> |
| 7. Spillway Elevation | <u>6368.5</u> |
| 8. Other | |

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.



A circular professional engineer seal for James G. Schlenvogt, P.E. The seal includes the text "Registered Professional Engineer (Civil)", "CERTIFICATE NO. 18782", "JAMES GARY SCHLENOVGT", "SCHLENOVGT", "James G. Schlenvogt, P.E.", and "Peabody Western Coal Company". The seal is stamped over a handwritten signature of James G. Schlenvogt. Below the seal is a date stamp "SEP 10 1998".
James G. Schlenvogt, P.E.
Peabody Western Coal Company
SEP 10 1998

PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-00533-02
Other: J2-A Wild Ram Valley Dam
Mine: Black Mesa Mine

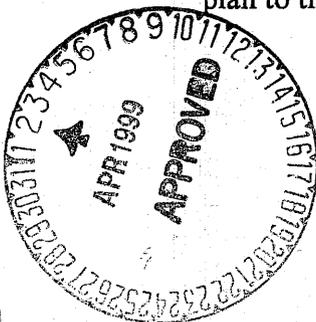
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

- | | |
|----------------------------|-------------------------------------|
| 1. Geometry | <u>No Change</u> |
| 2. Instrumentation | <u>See Attachments</u> |
| 3. Current Water Elevation | <u>6326.1</u> |
| 4. Storage Capacity | <u>No Change</u> |
| 5. Water Volume | <u>Increase per water elevation</u> |
| 6. Stability | <u>No Change</u> |
| 7. Spillway Elevation | <u>6348.2</u> |
| 8. Other | |

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.



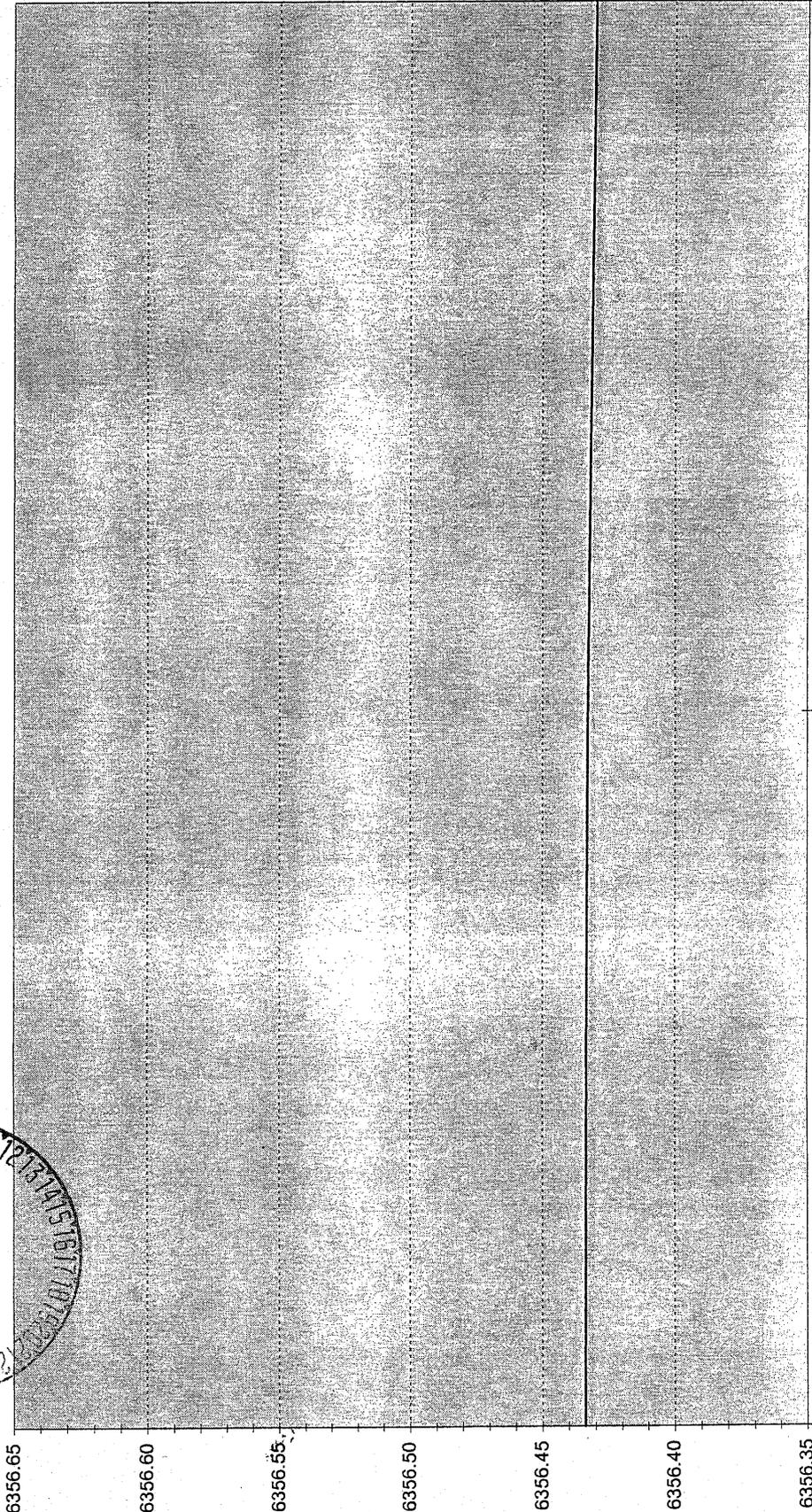
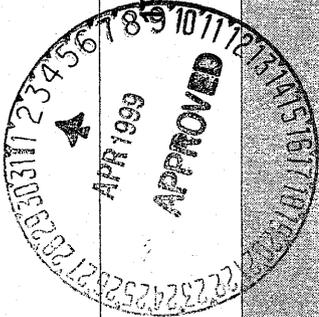
A circular professional engineer seal for James G. Schlenker, P.E. The seal includes the text "Registered Professional Engineer", "CERTIFICATE NO. 18782", "JAMES G. SCHLENKER, P.E.", "State of Arizona", and "ARIZONA, U.S.A.". A signature is written over the seal.

James G. Schlenker, P.E.
Peabody Western Coal Company

SEP 10 1998

J2-A DAM SETTLEMENT MONUMENT #1

1997-1998



6356.65
6356.60
6356.55
6356.50
6356.45
6356.40
6356.35

ELEVATION OF MONUMENT (FEET)

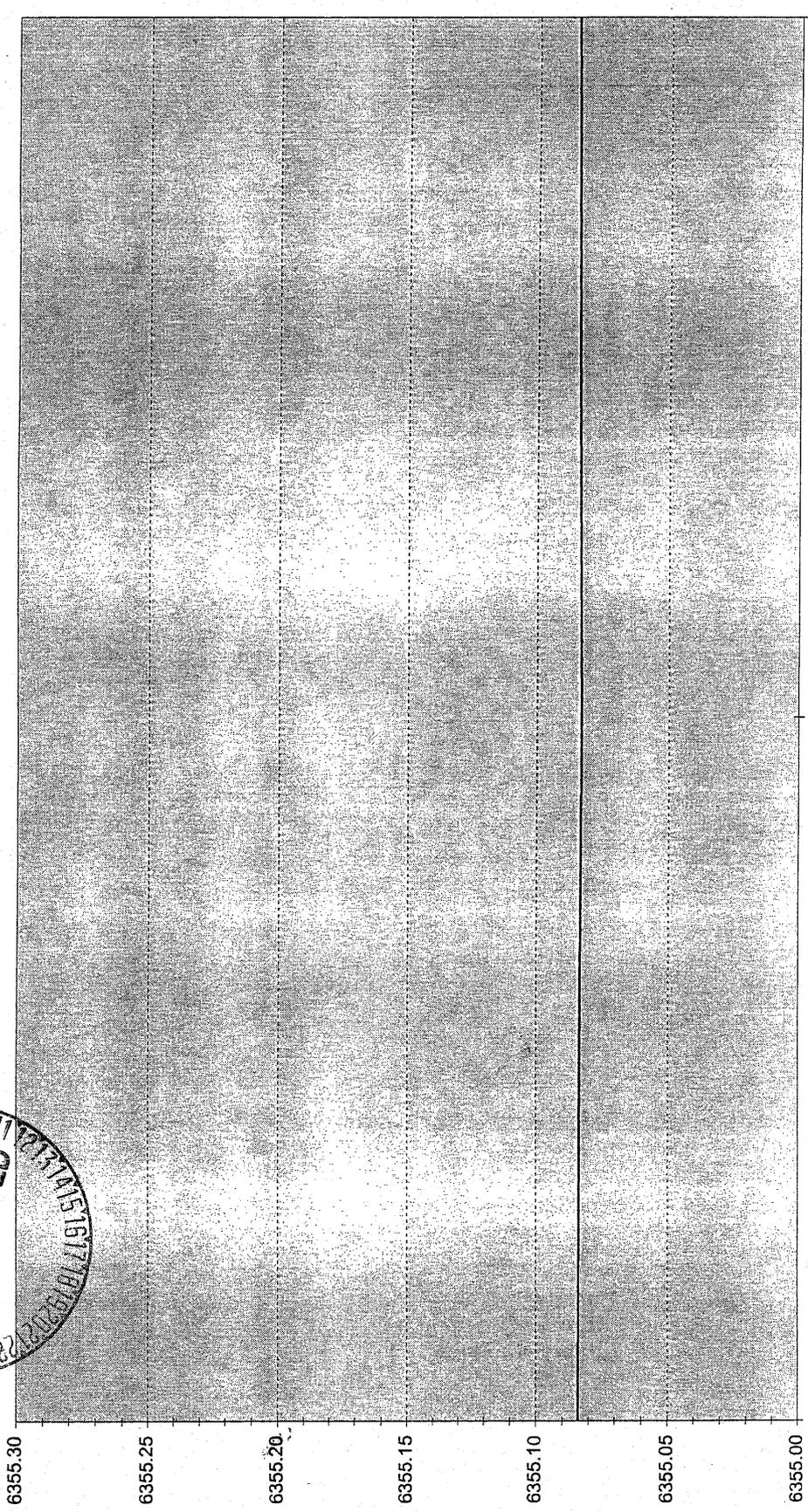
Aug-98

Nov-97

DATE

Sep-97

1997-1998 J2-A DAM SETTLEMENT MONUMENT #2



ELEVATION OF MONUMENT (FEET)

6355.30
6355.25
6355.20
6355.15
6355.10
6355.05
6355.00

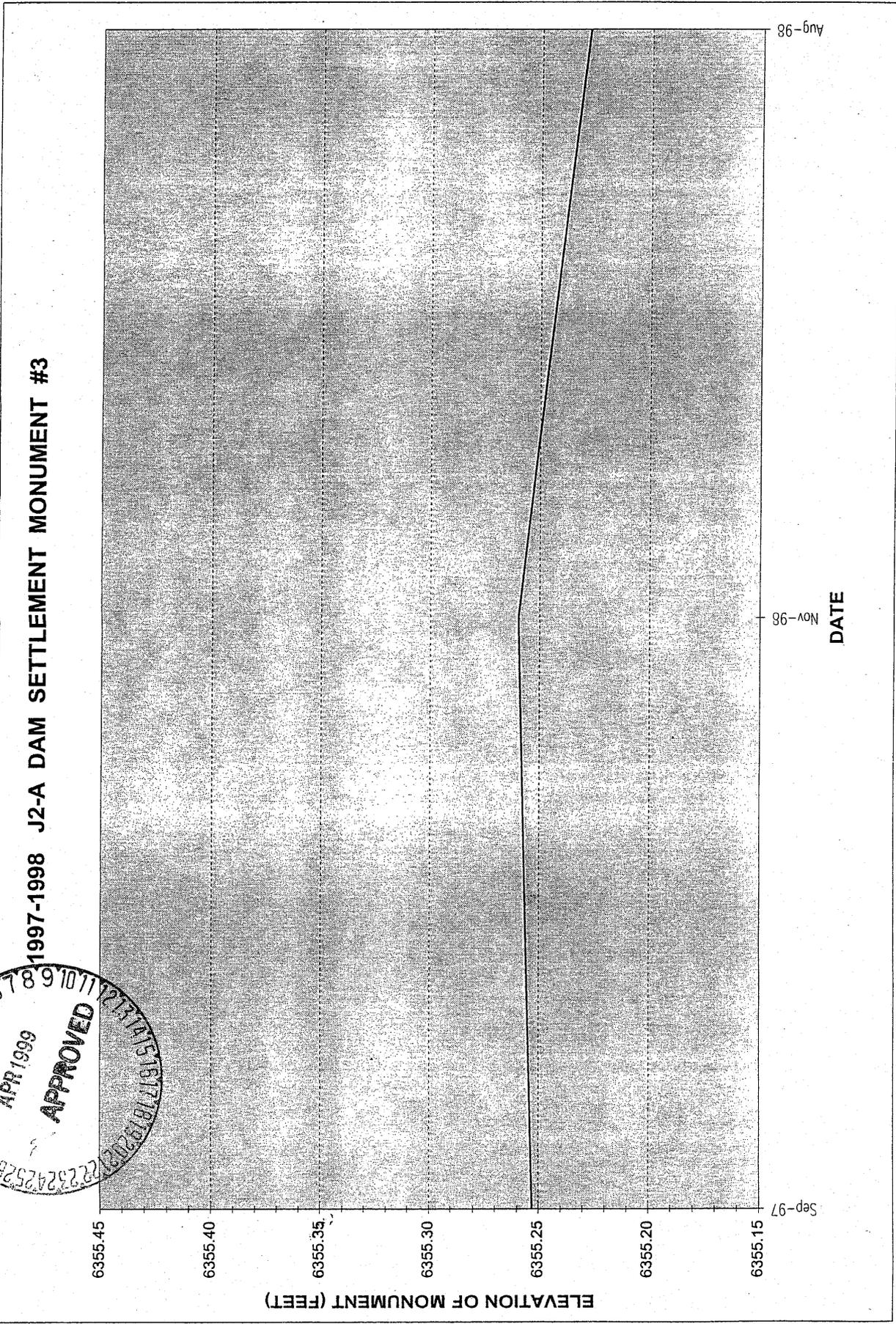
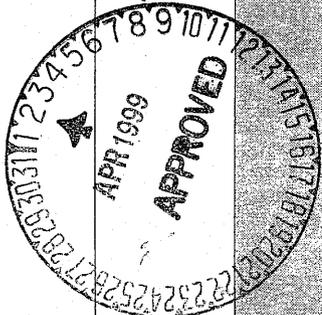
DATE

Sep-97

Nov-97

Aug-98

1997-1998 J2-A DAM SETTLEMENT MONUMENT #3



PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-01
Other: Kayenta Fresh Water Pond
Mine: Kayenta Mine

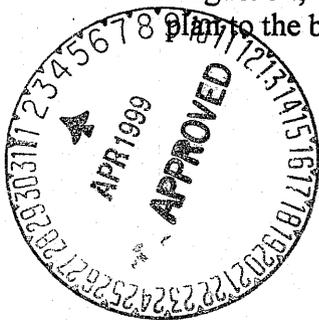
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6615.3</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Increase per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6615.8</u>
8. Other	

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.




James G. Schenck, P.E.
Peabody Western Coal Company
SEP 10 1998

PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-02
Other: N14-D Dam
Mine: Kayenta Mine

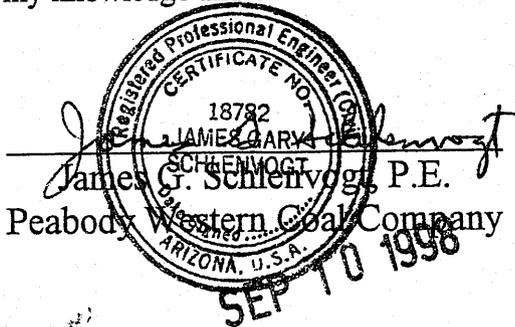
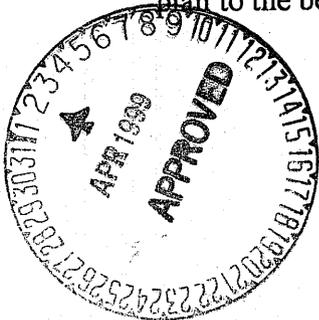
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

- | | |
|----------------------------|-------------------------------------|
| 1. Geometry | <u>No Change</u> |
| 2. Instrumentation | <u>No Change</u> |
| 3. Current Water Elevation | <u>6621.7</u> |
| 4. Storage Capacity | <u>No Change</u> |
| 5. Water Volume | <u>Increase per water elevation</u> |
| 6. Stability | <u>No Change</u> |
| 7. Spillway Elevation | <u>6653.1</u> |
| 8. Other | |

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-03
Other: N14-E Dam
Mine: Kayenta Mine

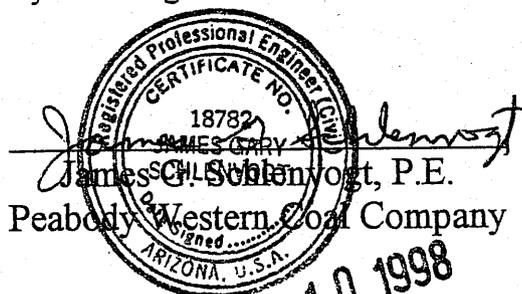
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

- | | |
|----------------------------|------------------|
| 1. Geometry | <u>No Change</u> |
| 2. Instrumentation | <u>No Change</u> |
| 3. Current Water Elevation | <u>Dry</u> |
| 4. Storage Capacity | <u>No Change</u> |
| 5. Water Volume | <u>Dry</u> |
| 6. Stability | <u>No Change</u> |
| 7. Spillway Elevation | <u>6686.0</u> |
| 8. Other | |

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.



SEP 10 1998

PEABODY WESTERN COAL COMPANY

P.O. Box 605

Kayenta, Arizona 86033

Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-04
Other: N14-F Dam
Mine: Kayenta Mine

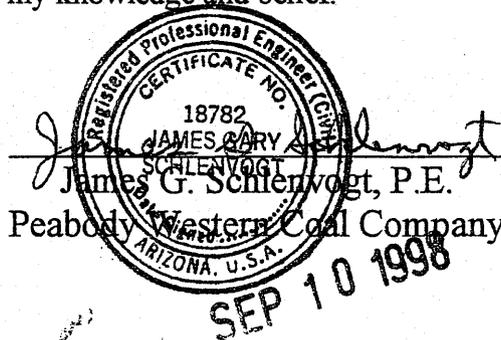
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6641.0</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Increase per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6658.5</u>
8. Other	

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-05
Other: N14-G Dam
Mine: Kayenta Mine

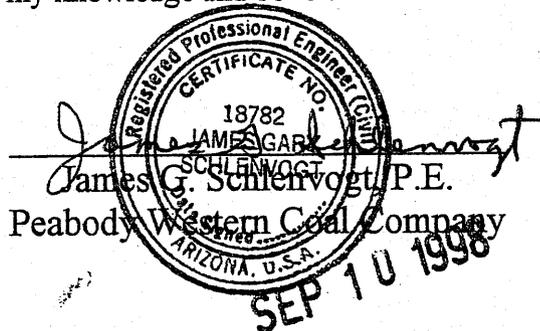
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

1. Geometry	<u>No Change</u>
2. Instrumentation	<u>No Change</u>
3. Current Water Elevation	<u>6640.1</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Increase per water elevation</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6660.8</u>
8. Other	

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-06
Other: N14-H Dam
Mine: Kayenta Mine

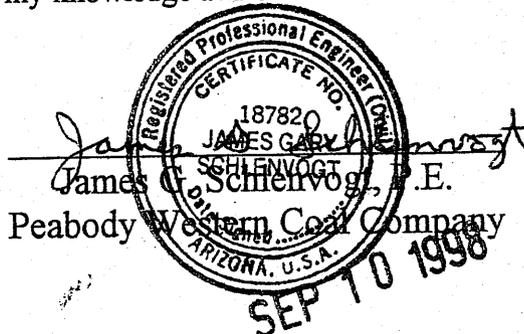
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

- | | |
|----------------------------|-------------------------------------|
| 1. Geometry | <u>No Change</u> |
| 2. Instrumentation | <u>No Change</u> |
| 3. Current Water Elevation | <u>6700.3</u> |
| 4. Storage Capacity | <u>No Change</u> |
| 5. Water Volume | <u>Increase per water elevation</u> |
| 6. Stability | <u>No Change</u> |
| 7. Spillway Elevation | <u>6719.1</u> |
| 8. Other | |

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.



PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-07
Other: J16-A Dam
Mine: Kayenta Mine

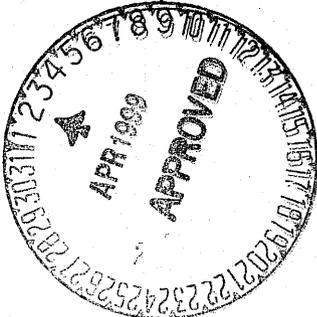
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

STATUS

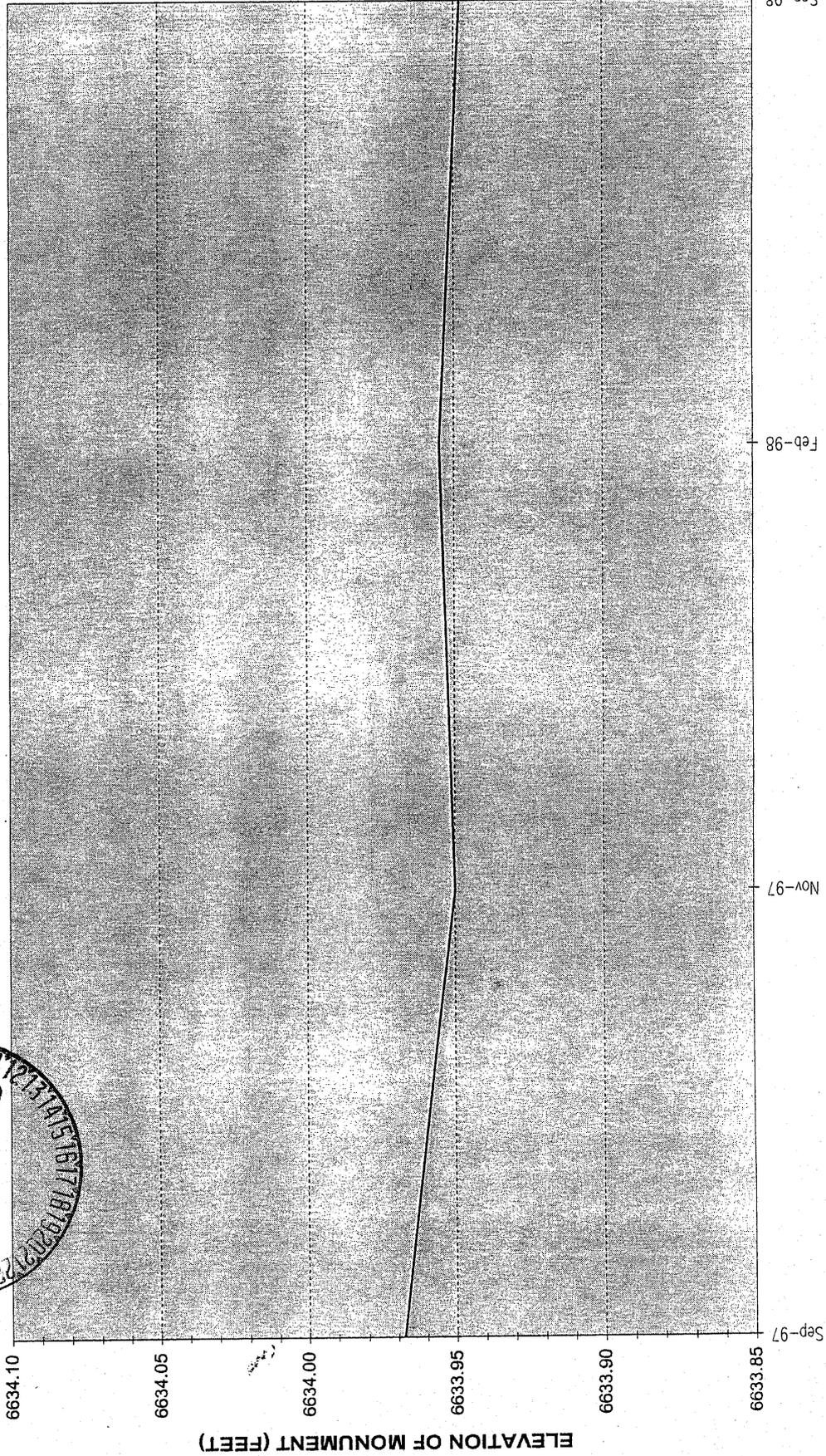
1. Geometry	<u>No Change</u>
2. Instrumentation	<u>See Attachments</u>
3. Current Water Elevation	<u>Dry</u>
4. Storage Capacity	<u>No Change</u>
5. Water Volume	<u>Dry</u>
6. Stability	<u>No Change</u>
7. Spillway Elevation	<u>6635.1</u>
8. Other	

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.

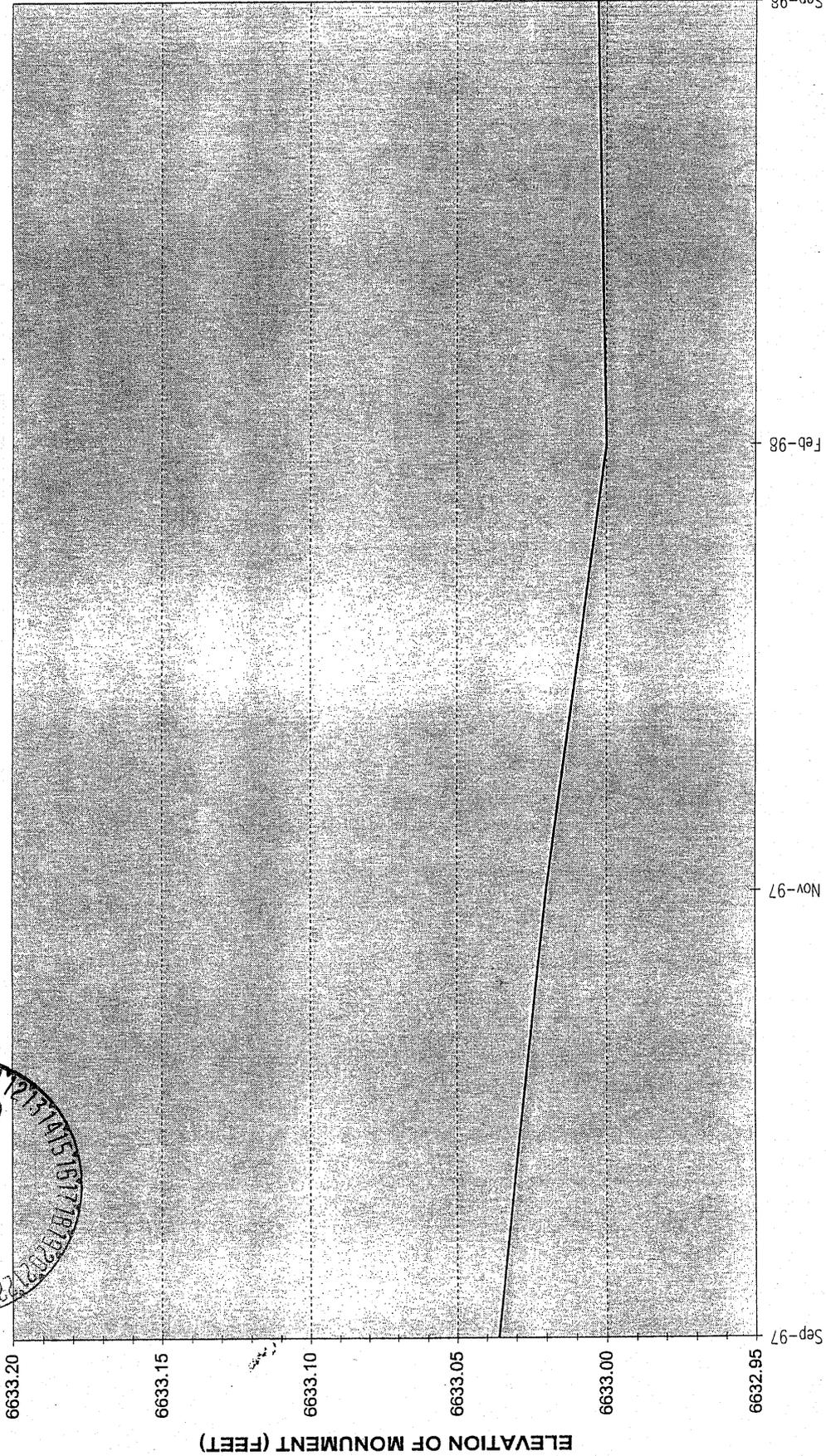



James G. Schlenvogt, P.E.
Peabody Western Coal Company
SEP 10 1998

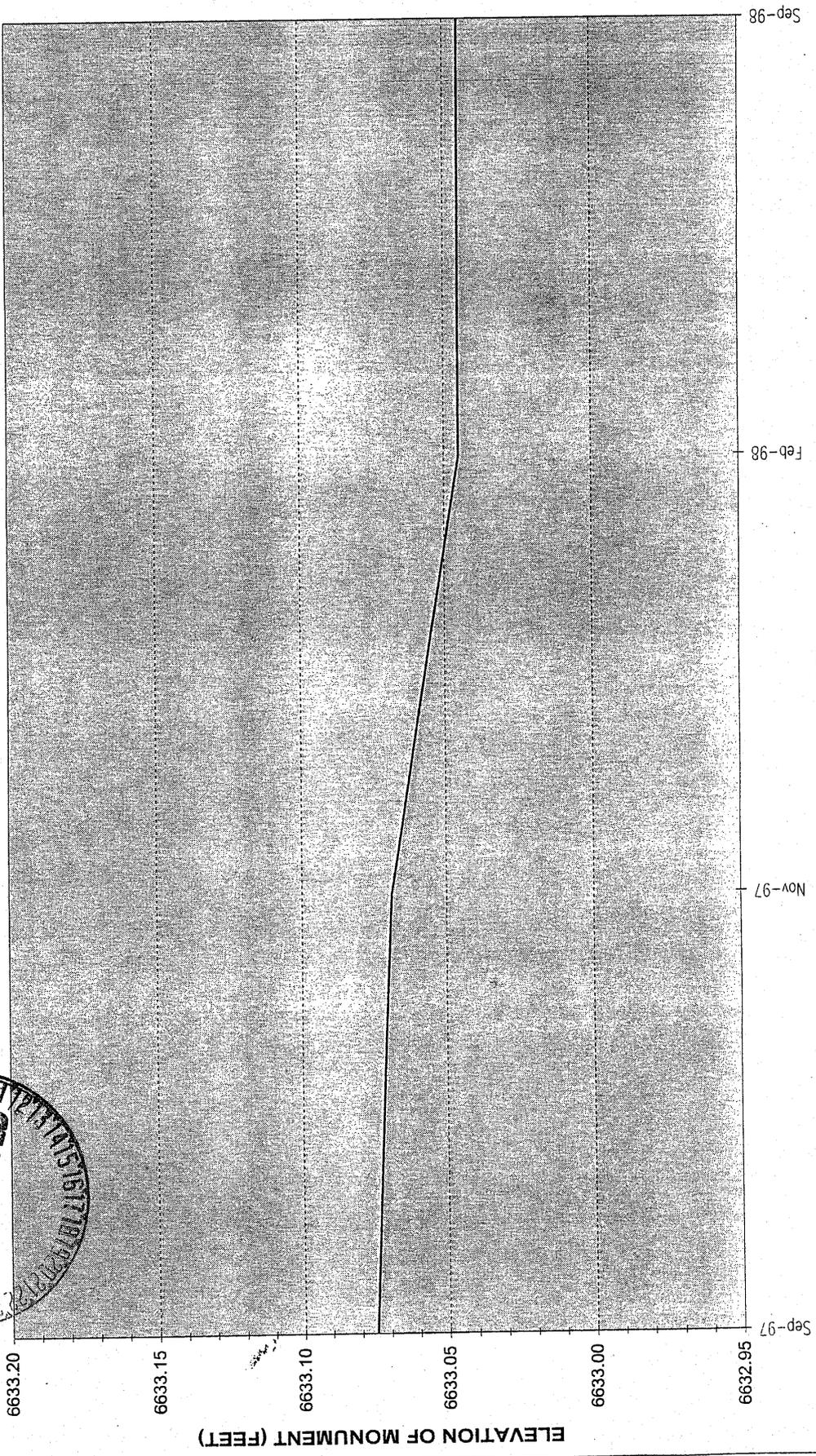
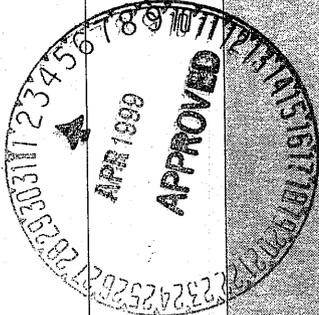
1997-1998 J16-A DAM SETTLEMENT MONUMENT #1



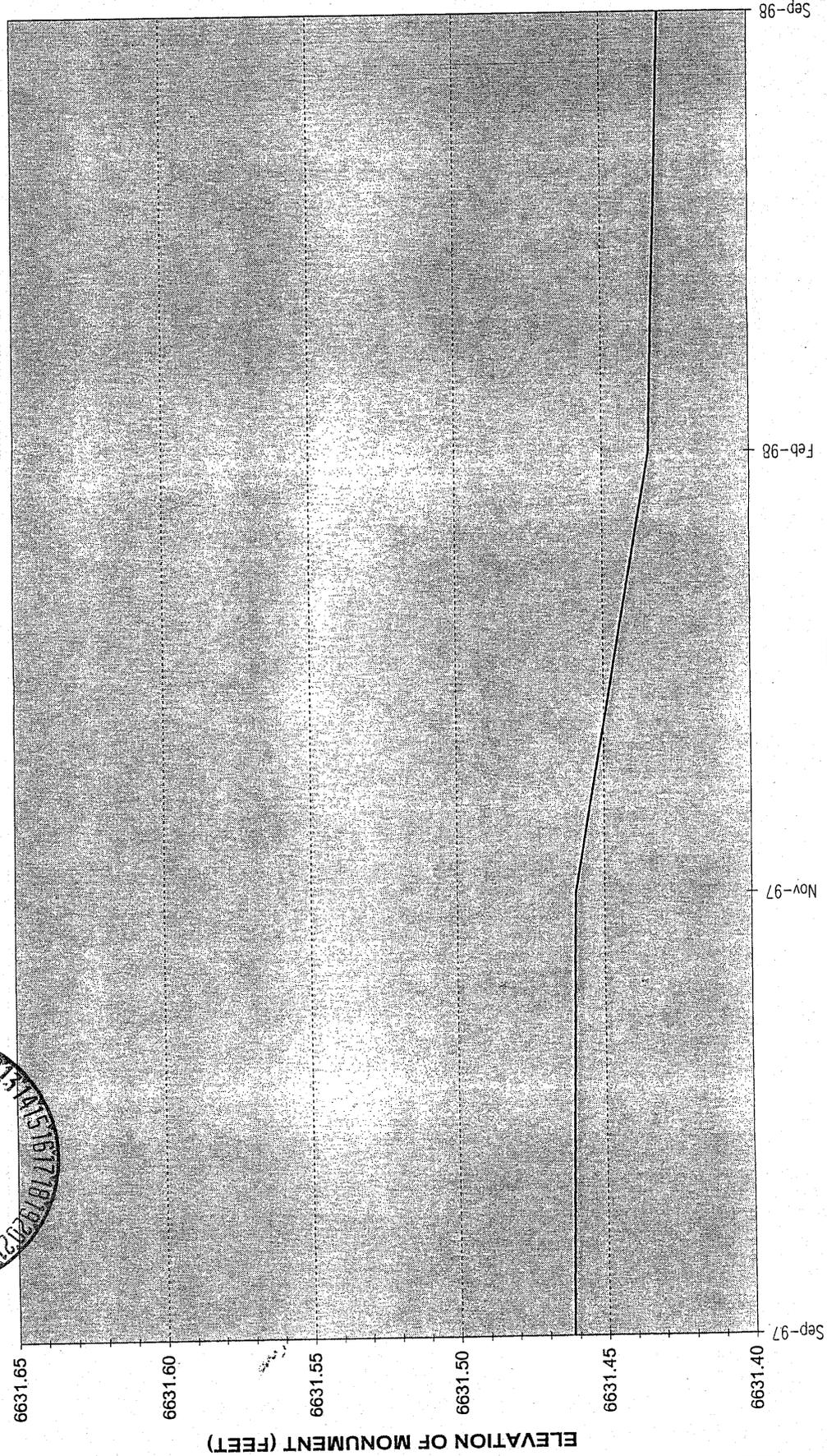
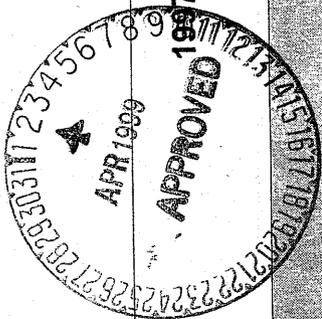
1997-1998 J16-A DAM SETTLEMENT MONUMENT #2



1997-1998 J16-A DAM SETTLEMENT MONUMENT #3



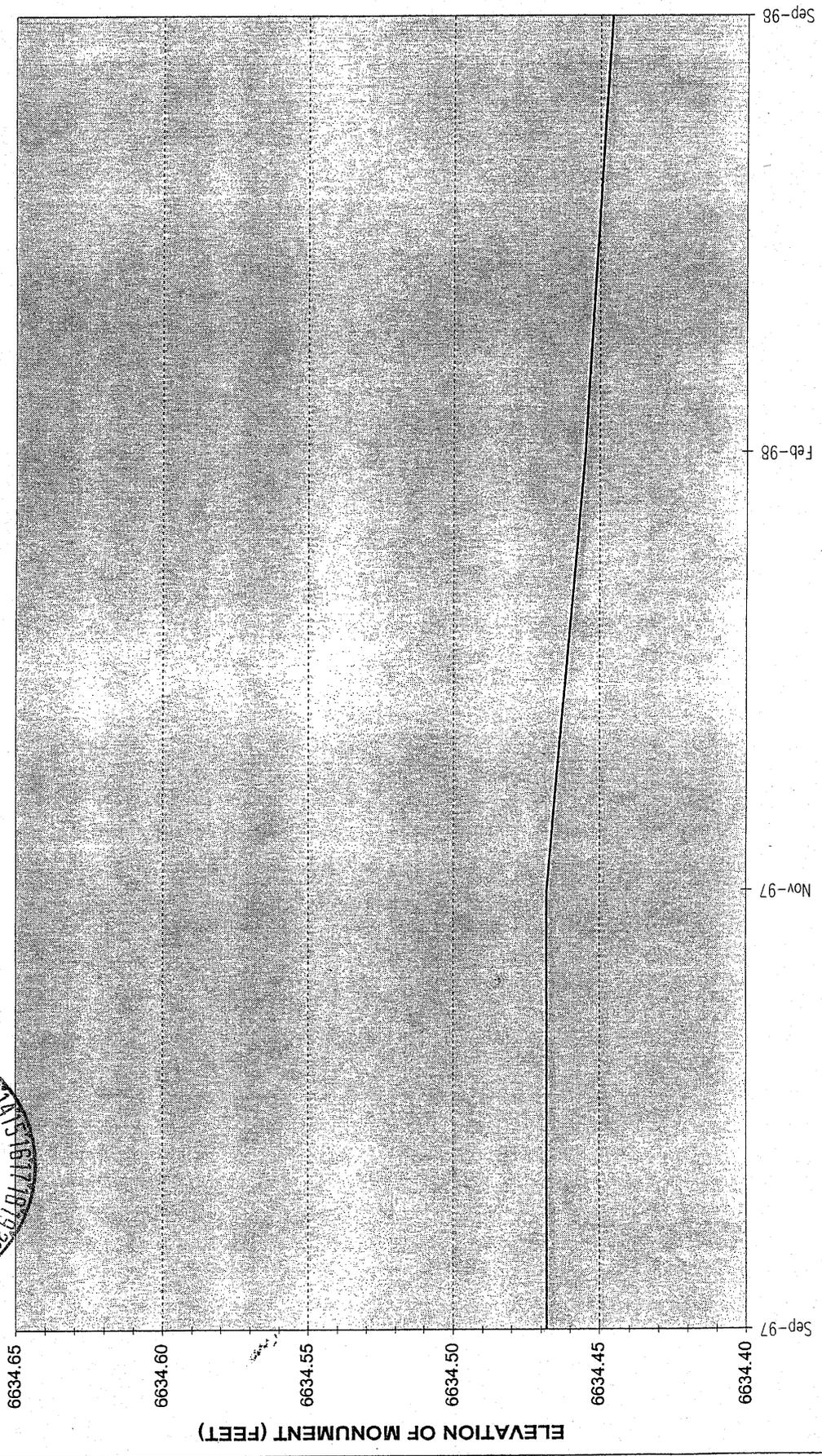
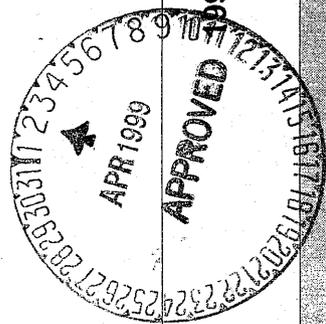
1997-1998 J16-A DAM SETTLEMENT MONUMENT #4



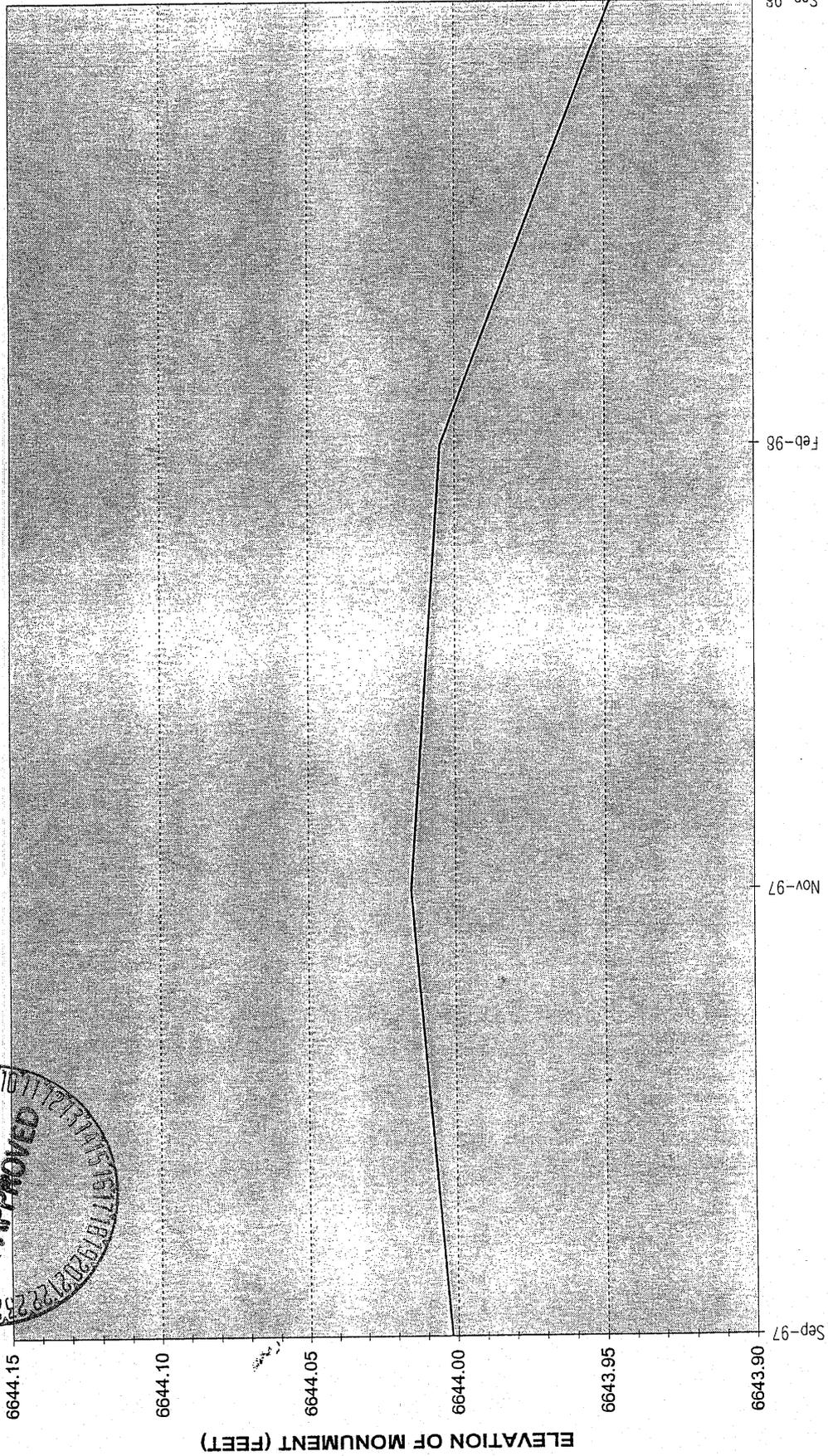
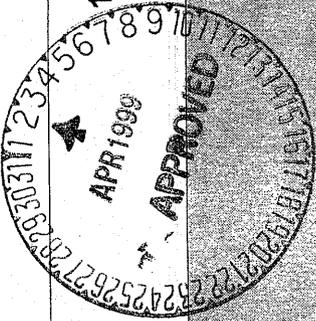
ELEVATION OF MONUMENT (FEET)

DATE

J16-A DAM SETTLEMENT MONUMENT #5



1997-1998 J16-A DAM SETTLEMENT MONUMENT #6



PEABODY WESTERN COAL COMPANY

P.O. Box 605
Kayenta, Arizona 86033
Telephone (520) 677-3201

September 10, 1998

District Manager
Mine Safety and Health Administration
Post Office Box 25367, DFC
Denver, Colorado 80225

RE: Annual Report per 30 CFR 77.216-4
ID No: 11211-AZ-09-01195-08
Other: J16-L Dam
Mine: Kayenta Mine

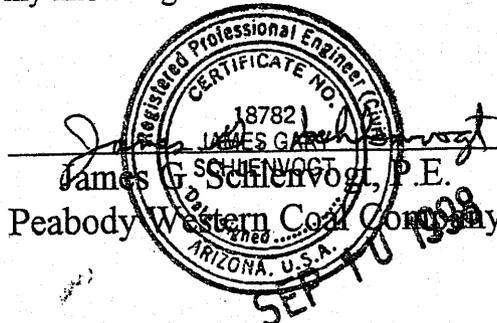
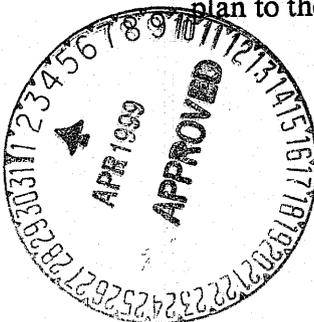
Gentlemen:

In accordance with 30 CFR 77.261-4, the following status report at the above site during the period September 1, 1997 to August 31, 1998 is submitted:

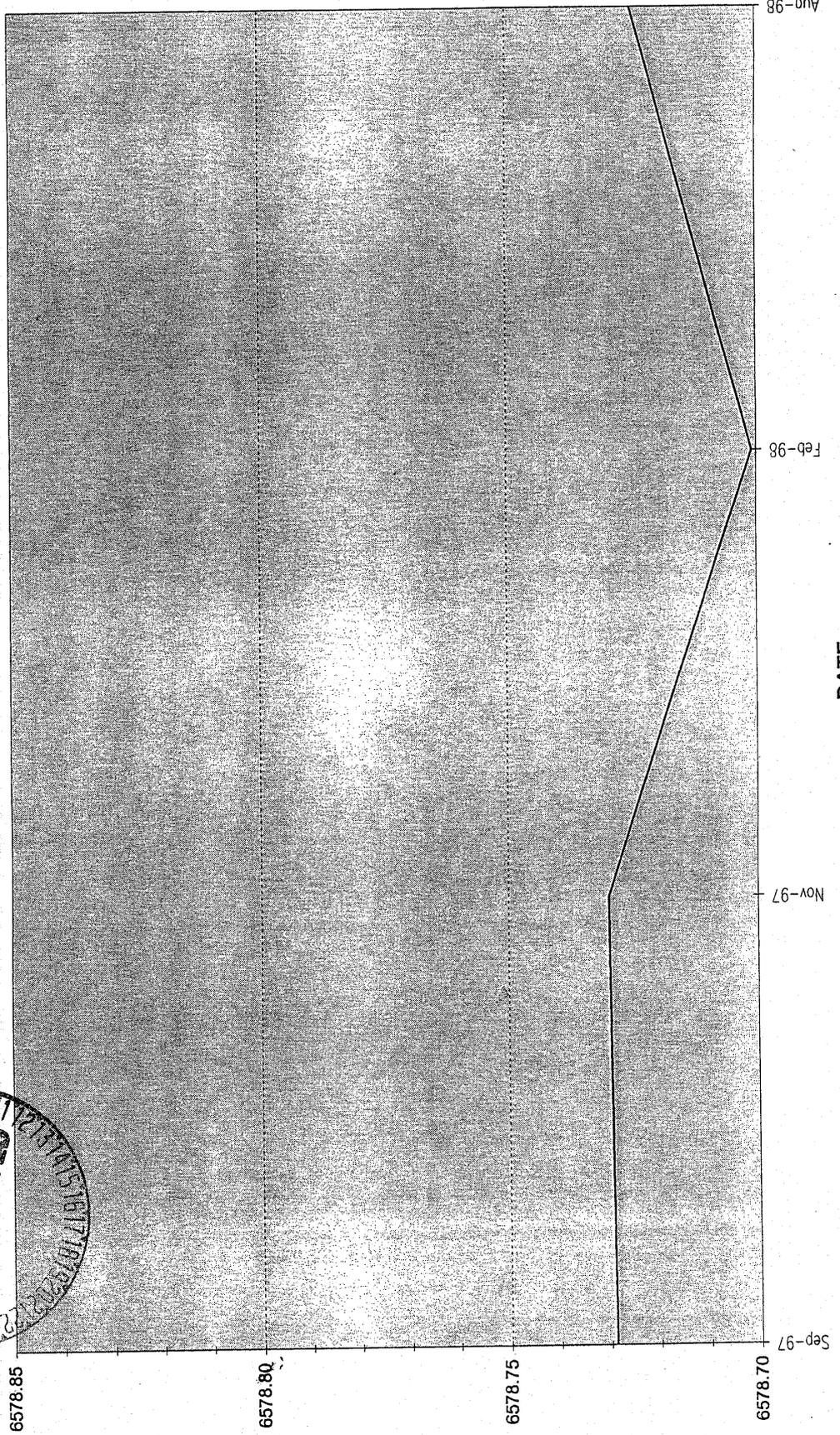
STATUS

- | | |
|----------------------------|-------------------------------------|
| 1. Geometry | <u>No Change</u> |
| 2. Instrumentation | <u>See Attachments</u> |
| 3. Current Water Elevation | <u>6557.3</u> |
| 4. Storage Capacity | <u>No Change</u> |
| 5. Water Volume | <u>Increase per water elevation</u> |
| 6. Stability | <u>No Change</u> |
| 7. Spillway Elevation | <u>6573.4</u> |
| 8. Other | |

All work at the above site during the period September 1, 1997 to August 31, 1998 was performed in accordance with the approved plan to the best of my knowledge and belief.



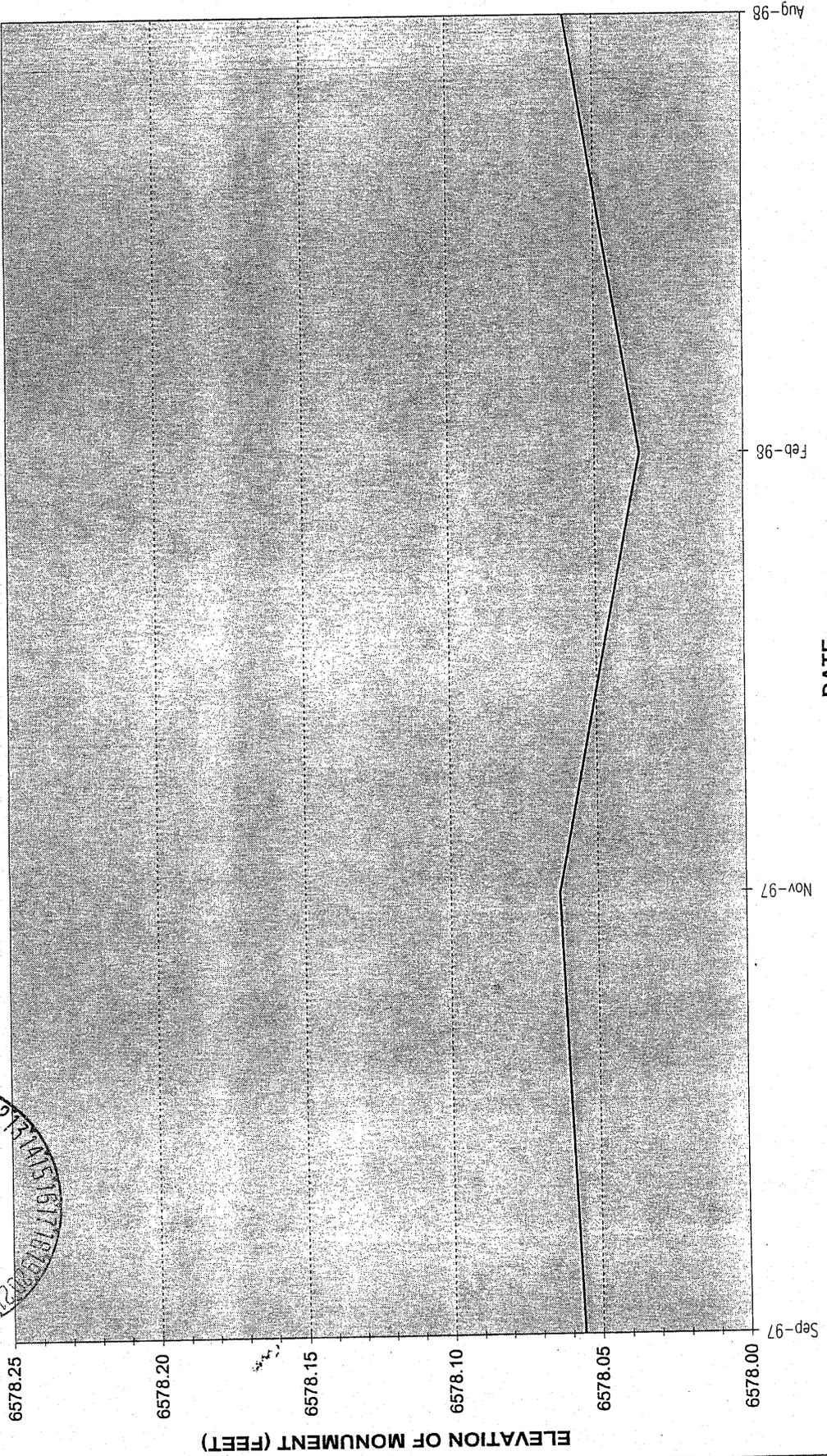
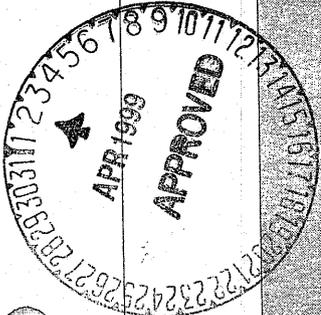
1997-1998 J16-L DAM SETTLEMENT MONUMENT #1



ELEVATION OF MONUMENT (FEET)

DATE

1997-1998 J16-L DAM SETTLEMENT MONUMENT #2



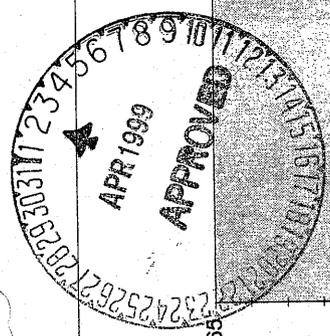
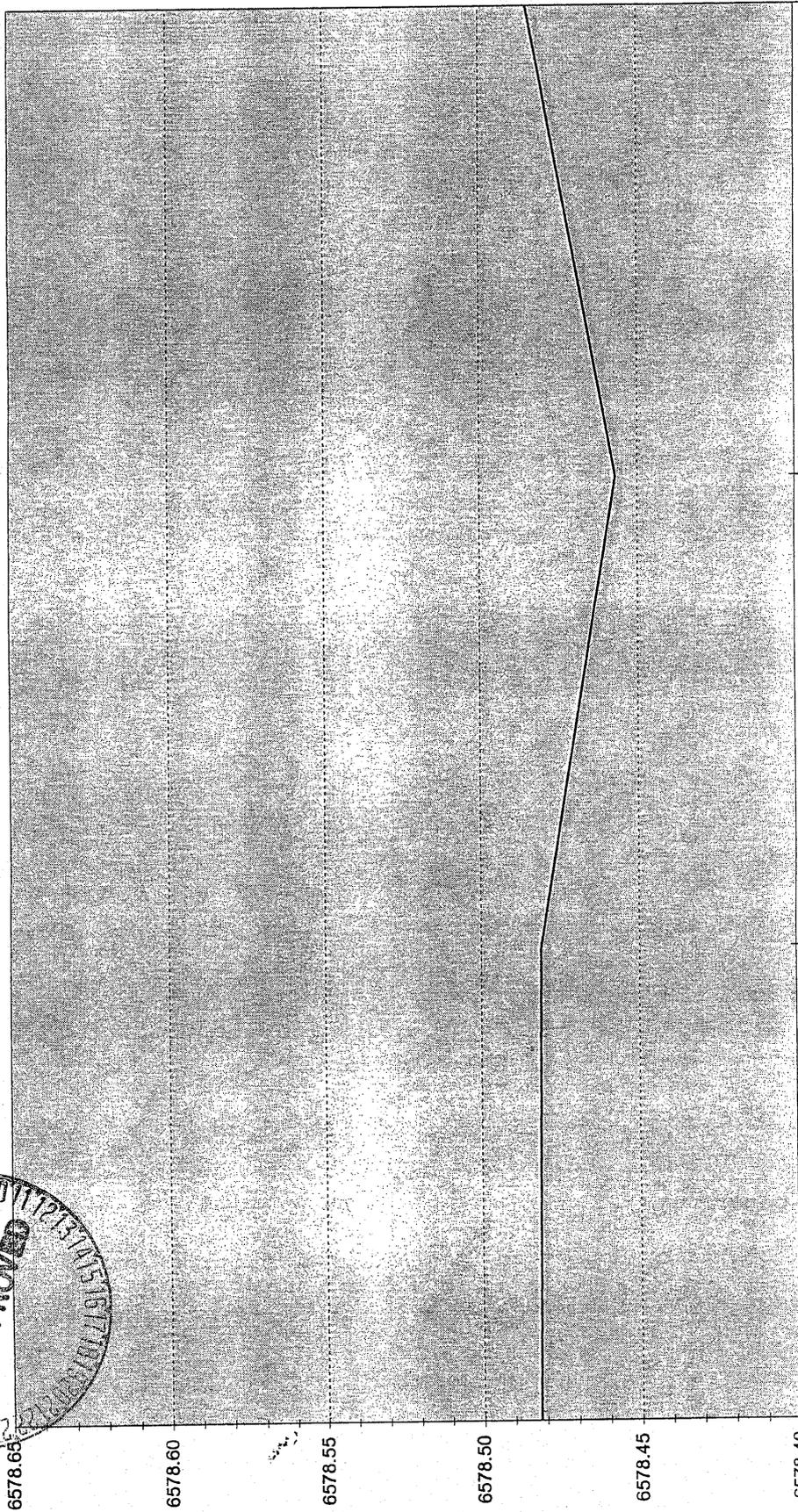
ELEVATION OF MONUMENT (FEET)

DATE

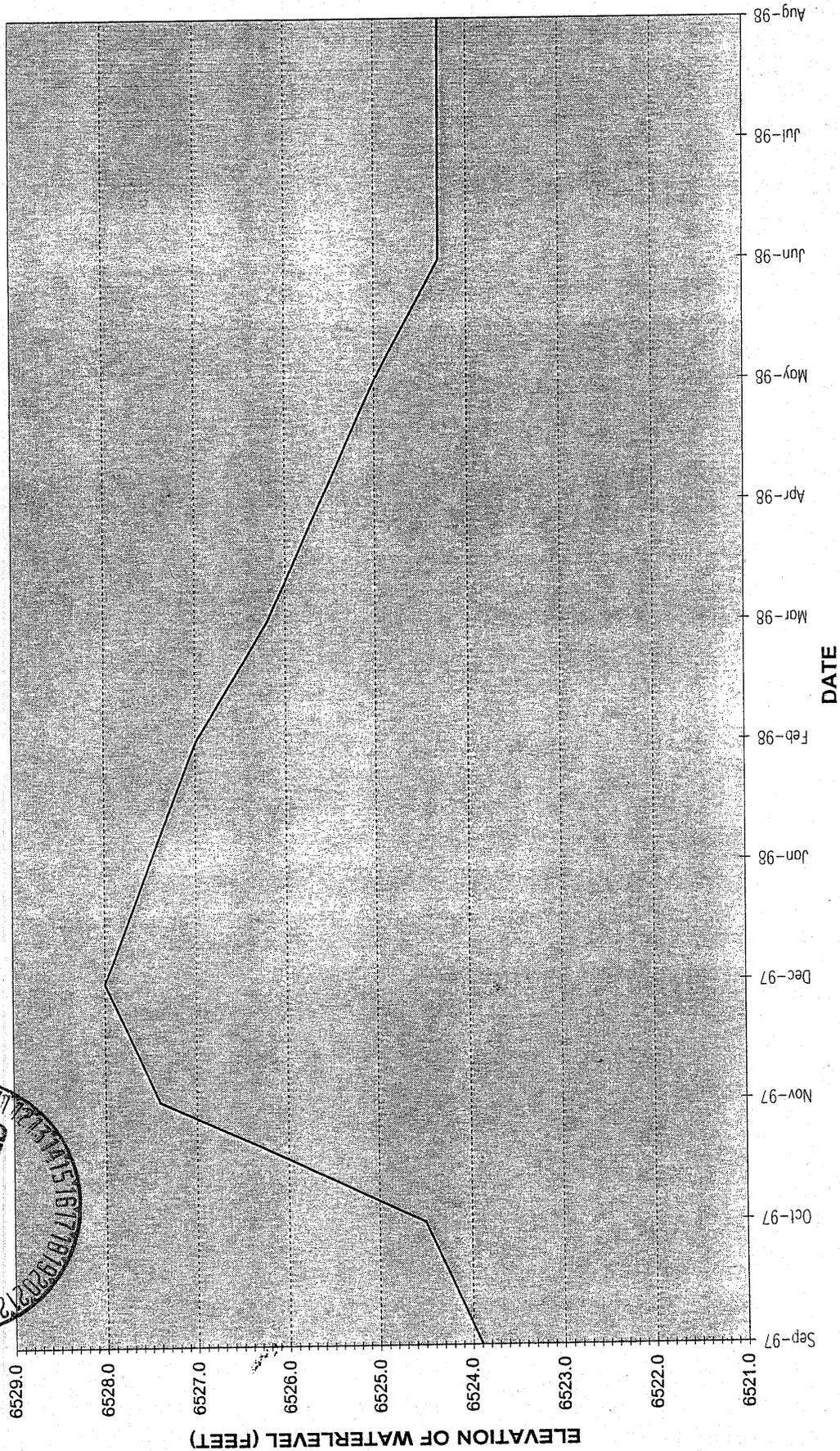
1997-1998 J16-L DAM SETTLEMENT MONUMENT #3

DATE

ELEVATION OF MONUMENT (FEET)

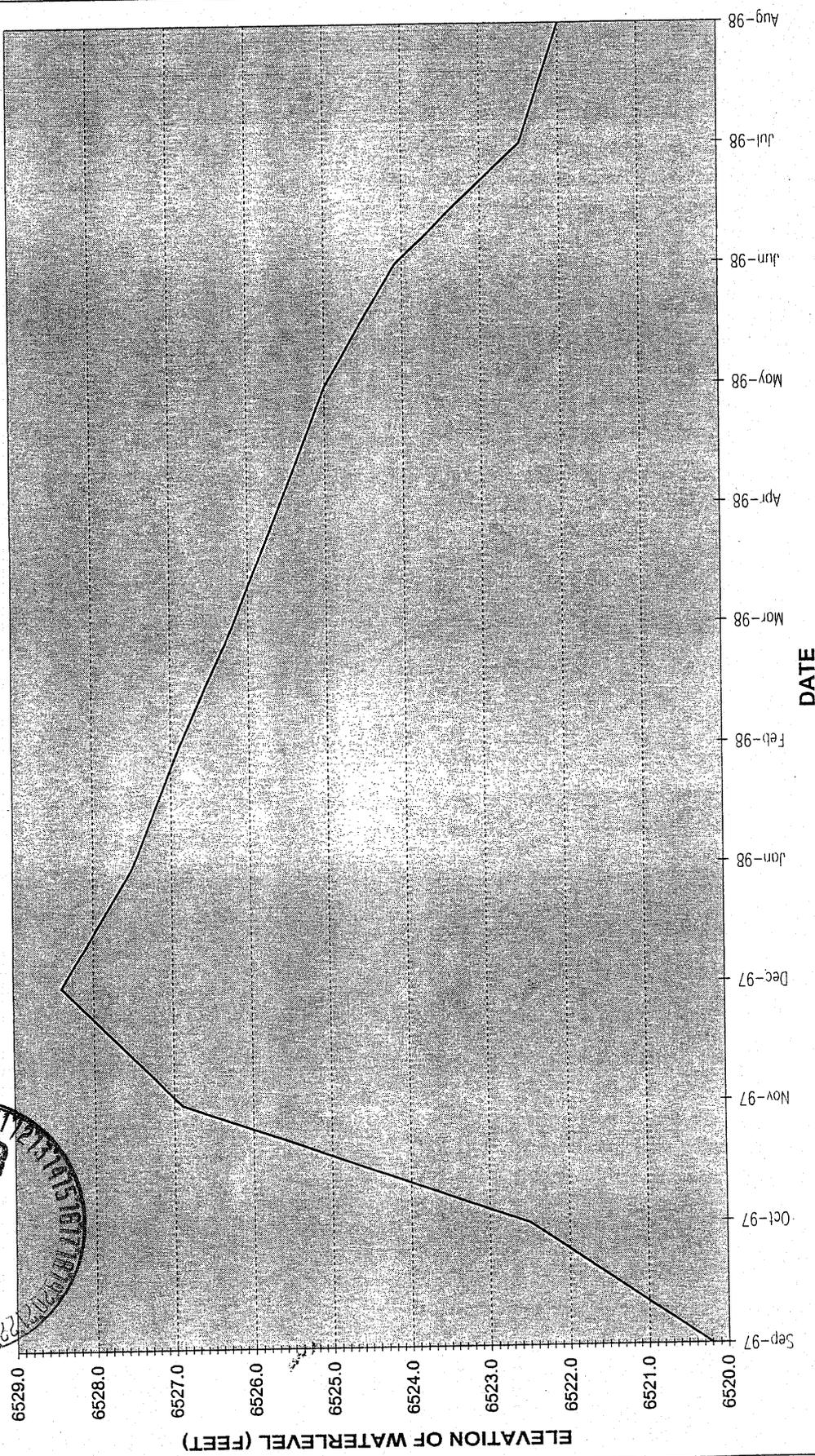


1997-1998 J16-L DAM WATER MONITORING WELL #1



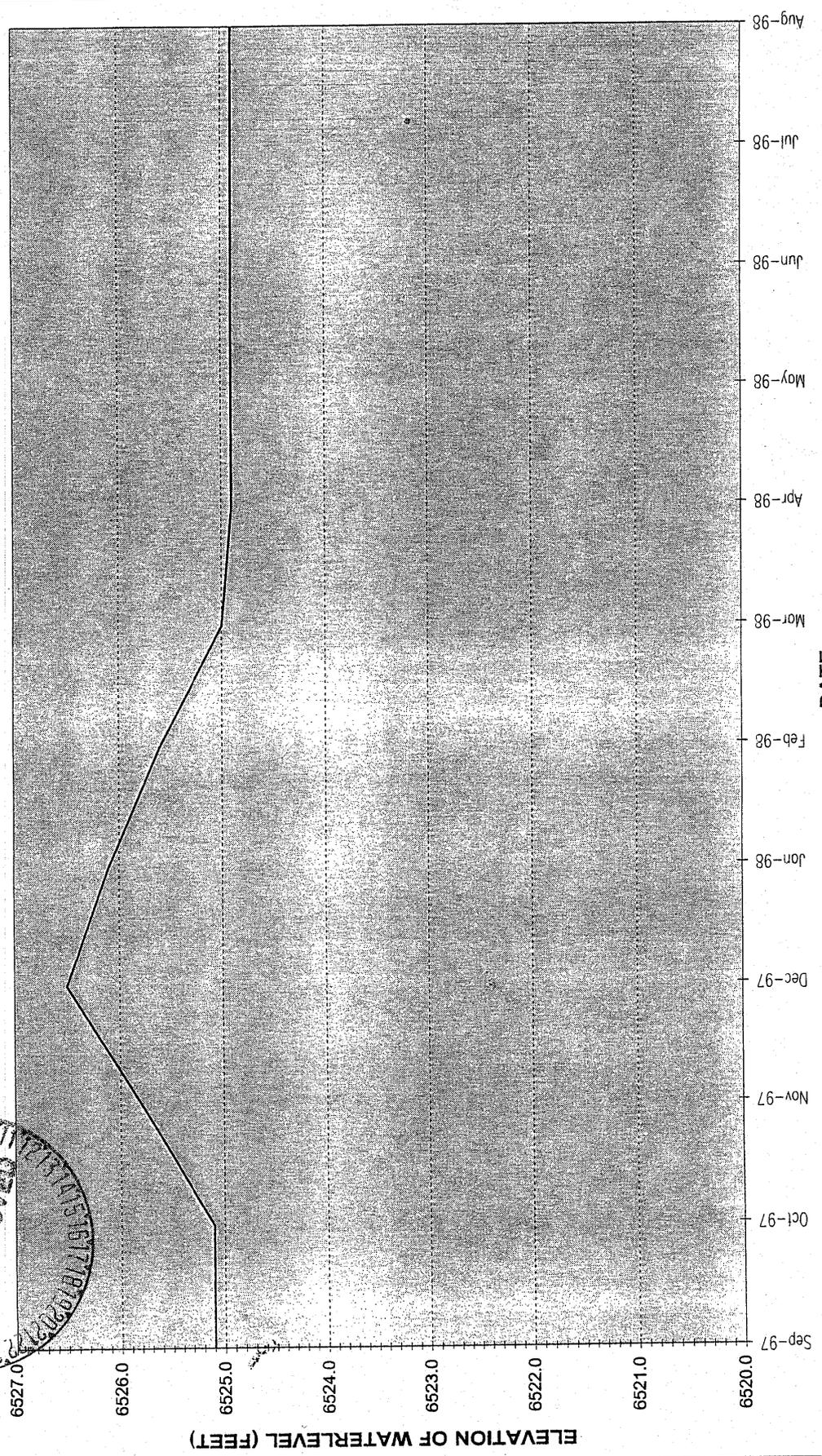
APR 1999
APPROVED

1997-1998 J16-L DAM WATER MONITORING WELL #2



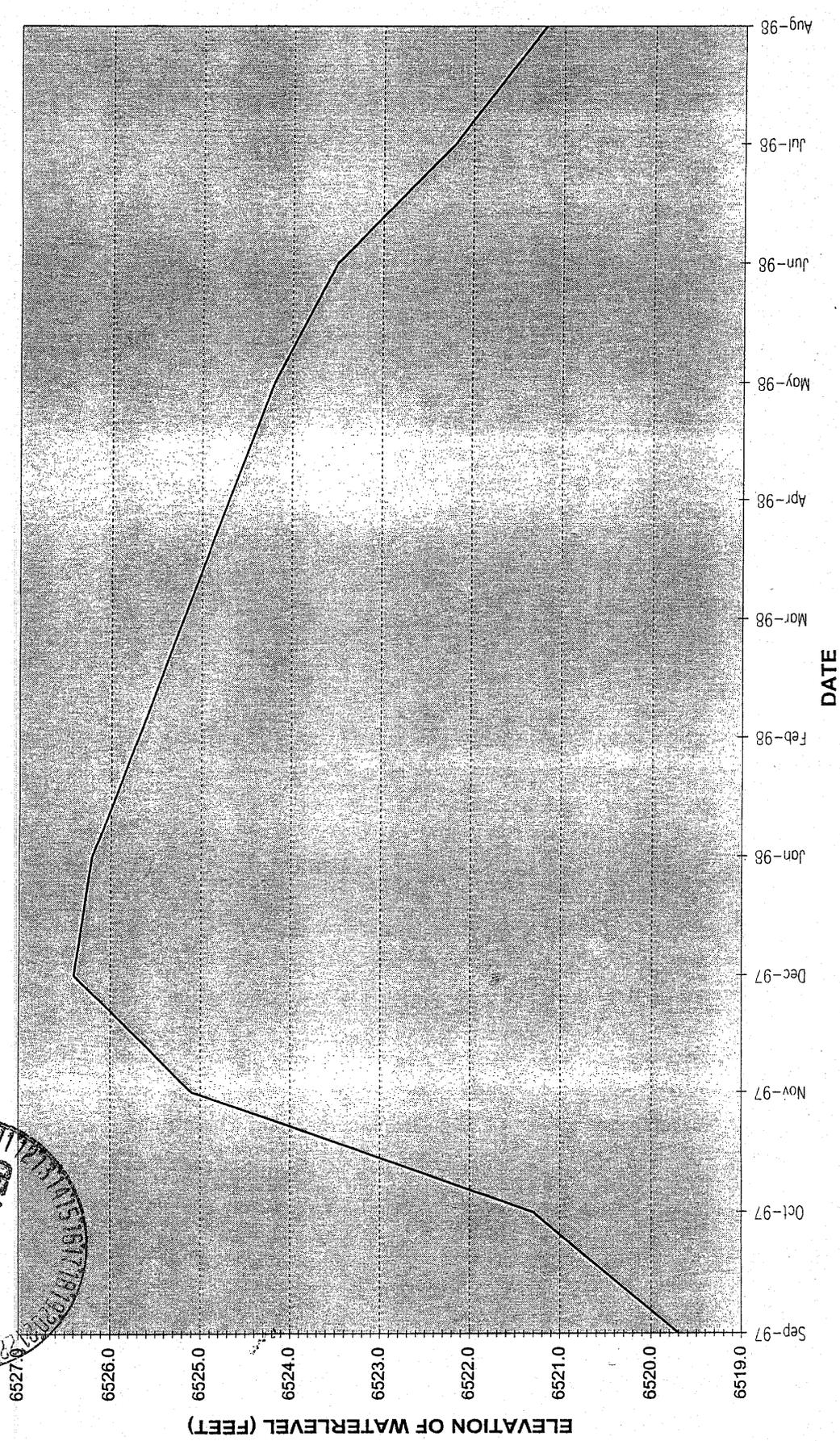
APR 1999
APPROVED

1997-1998 J16-L DAM WATER MONITORING WELL #3



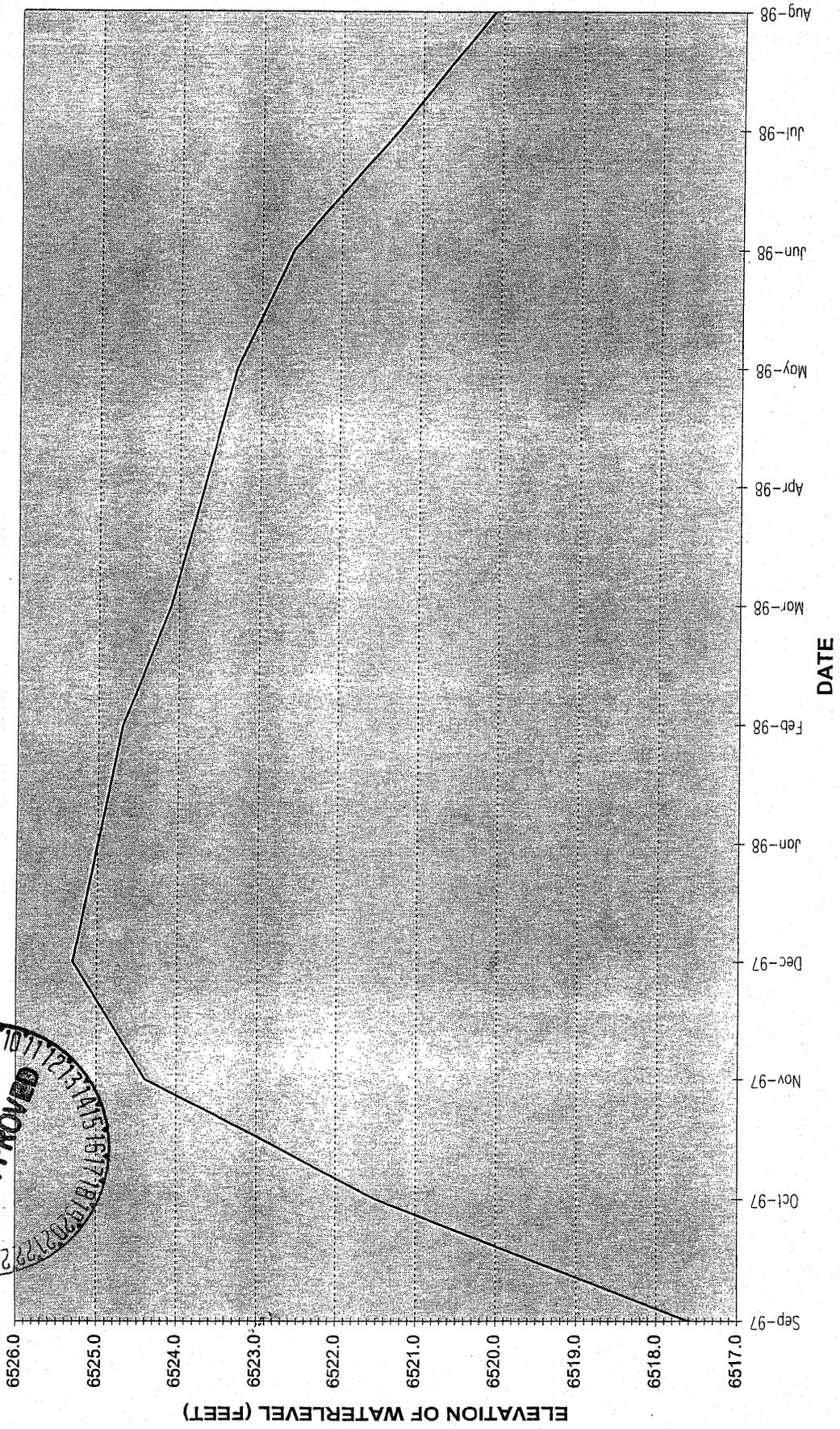
APR 1999
APPROVED

1997-1998 J16-L DAM WATER MONITORING WELL #4



APR 1999
APPROVED

1997-1998 J16-L DAM WATER MONITORING WELL #5

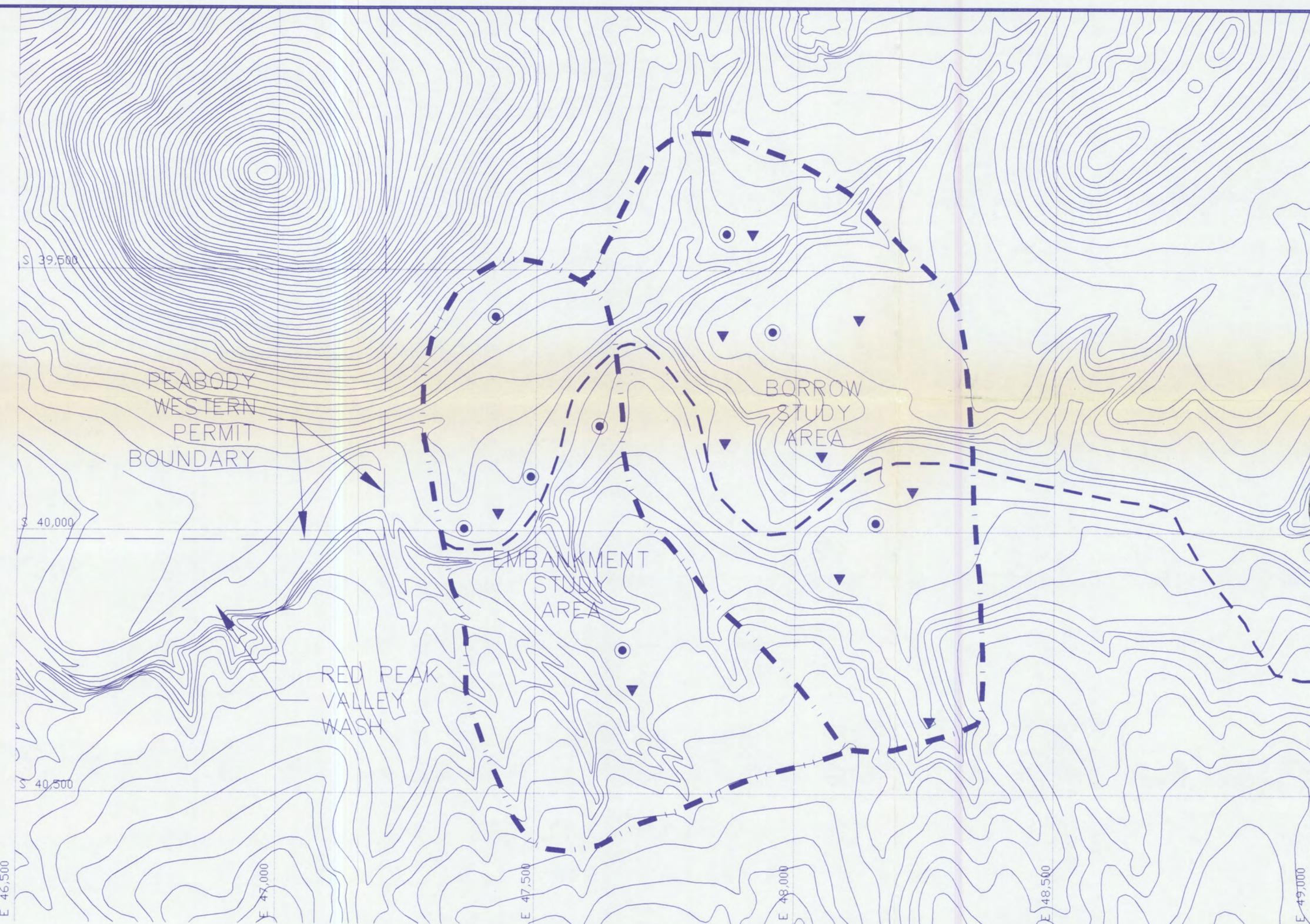


APR 1999
APPROVED

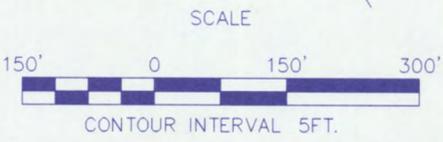
ATTACHMENT AH
NOTIFICATION OF PROPOSED GEOTECHNICAL
INVESTIGATION for the J7-JR DAM



Revised 09/15/99



NOTE: STUDY AREA AND NUMBER OF DRILL HOLES AND BACKHOE PITS ARE SUBJECT TO CHANGE BASED ON DECISIONS MADE BY THE FIELD ENGINEER.



LEGEND

- PROPOSED DRILL HOLE
- ▼ PROPOSED BACKHOE PIT
- ACCESS TO SITE

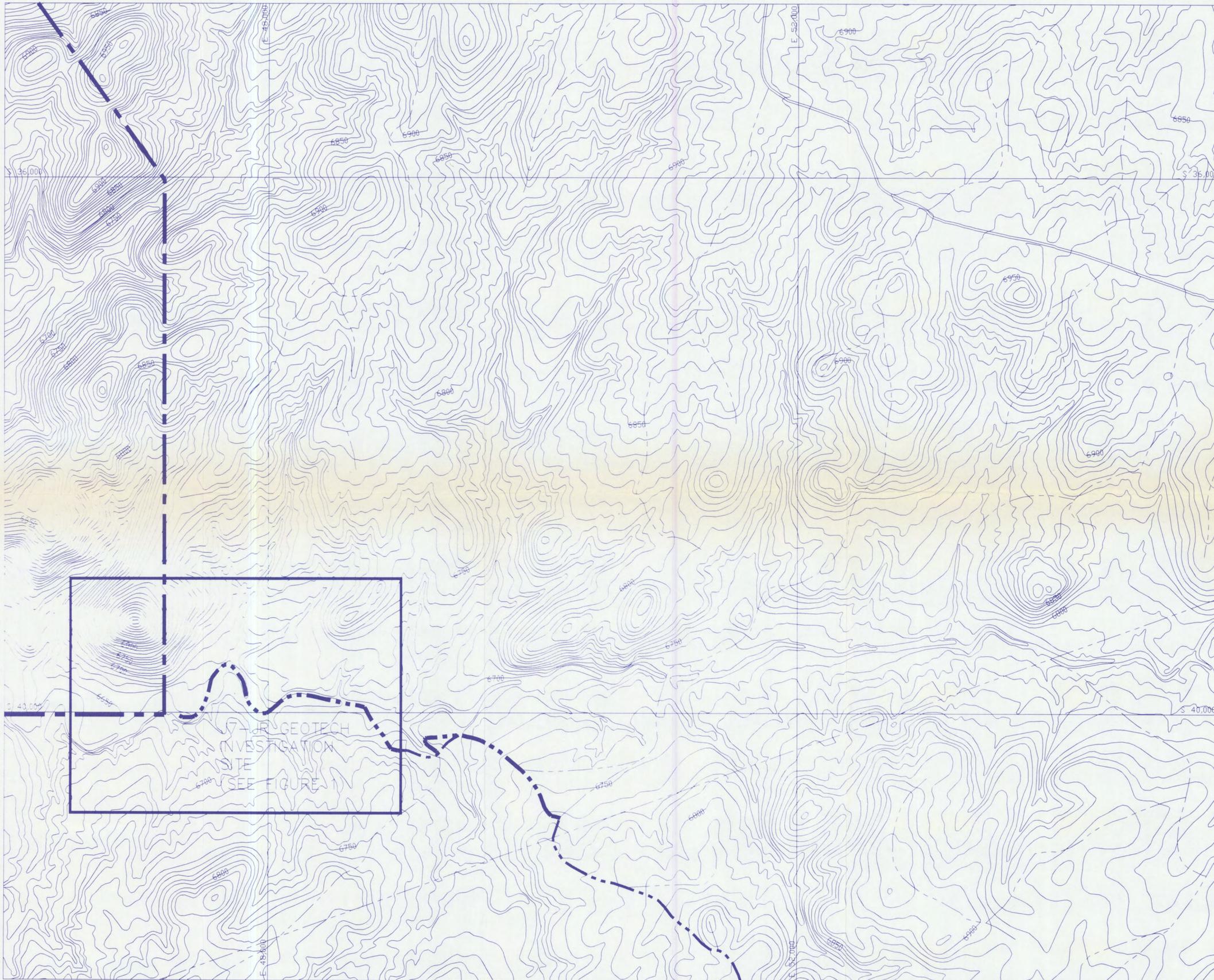
0	Issued for Report	8/99	Keuscher	Bever	Leidich
REV. No.	REVISIONS	DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY
PROJECT No.: 1342052			AutoCAD FILE: FIGURE1.DWG		
SCALE: As Shown			FIGURE No.: 1		



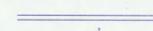
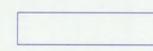
PEABODY WESTERN COAL

GEOTECH INVESTIGATION AREA
POND J7 JR

AutoCAD FILE: FIGURE1A.DWG PROJECT NUMBER: 1442052



LEGEND

-  PERMIT BOUNDARY
-  EXISTING ROAD
-  EXISTING DIRT ROAD
-  GEOTECH INVESTIGATION AREA (SEE FIGURE 1)

(see Drawing No. 85210, Sheet 4 of 4 for PWCC road locations)



0	DRAFT	9/99	Keuscher	Bever	Leidich
REV. No.	REVISIONS	DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY
PEABODY WESTERN COAL COMPANY					
PROJECT: KAYENTA MINE					
DRAWING TITLE: GEOTECH INVESTIGATION AREA ACCESS MAP					
 MONTGOMERY WATSON			Sheet 1 Of 1 Sheets		
SCALE: As Shown			FIGURE No. 2		

ATTACHMENT AI

KAYENTA MINE

J7-Jr MSHA DAM DESIGN REPORT

(SEE VOLUME 7.1 OF PERMIT AZ-0001D)



Revised 01/18/01

ATTACHMENT AJ
KAYENTA MINE
TRANSFER "C" CONVEYOR
BTCA DRAINAGE CONTROL PLAN



Revised 01/18/01

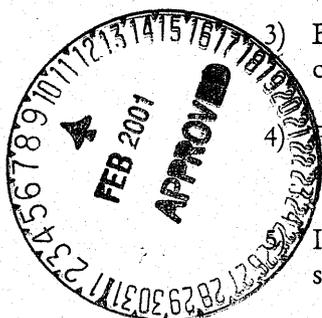
**PEABODY WESTERN COAL COMPANY
BTCA PLAN FOR MAINTENANCE AND DRAINAGE
CONTROL
CONVEYOR TRANSFER 'C'**

The downslope area northwest of Conveyor Transfer 'C' is permitted as a Small Area Exemption Area (SAE). After reviewing the site with the OSM Permit Team, Peabody is requesting approval of the BTCA, Best Management Practices implemented by Peabody at the site. Due to the steep terrain, limited access, desire to minimize additional disturbance, and occurrence of occasional minor coal spillage from the elevated overland conveyor in this area, the BTCA practices described below are the best and most rational approaches for protecting the environment and stabilizing the site.

The overland conveyor was constructed in the early 1970's, prior to implementation of SMCRA; however, because the structure has continued operating after 1977, the area is part of the AZ-0001D Permit. Practical operating, maintenance, and safety concerns preclude modification of the elevated conveyor to totally eliminate or contain spillage, so periodic maintenance and cleanup of the minor coal spillage from the subject area is necessary.

In order to address the need for both effective interim drainage and sediment control and ongoing site cleanup and maintenance, PWCC has developed site-specific operational drainage control and maintenance plans for this area incorporating the requirements of 30 CFR 815.45, Best Technology Currently Available (BTCA) methods and practices. These plans are summarized as follows and graphically illustrated by Drawing No. 1.

- 1) Route the natural drainage from the area upstream of the overland conveyor to the existing rock downdrains and linear filtering structures.
- 2) Maintain the stilling basin just beyond the end of the riprapped downdrain in the existing drainage to minimize, to the extent possible, additional contributions of sediment to runoff outside the permit area.
- 3) Broadcast seed the disturbed area within the right-of-way and establish a vegetative cover to act as a vegetative filter and reduce the offsite runoff of coal material.
- 4) Place native hay or straw mulch at a rate of 2-3 tons per acre on all surface disturbance areas.
- 5) Inspect the area at least semi-annually for evidence of coal accumulations or significant surface erosion.
- 6) As necessary, based on the periodic inspections, remove coal accumulations using a backhoe or small loader and dump truck, maintain the rock downdrains, repair any significant erosion, install straw bale dikes, and re-mulch any areas where the mulch has been removed during site maintenance work.



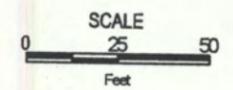
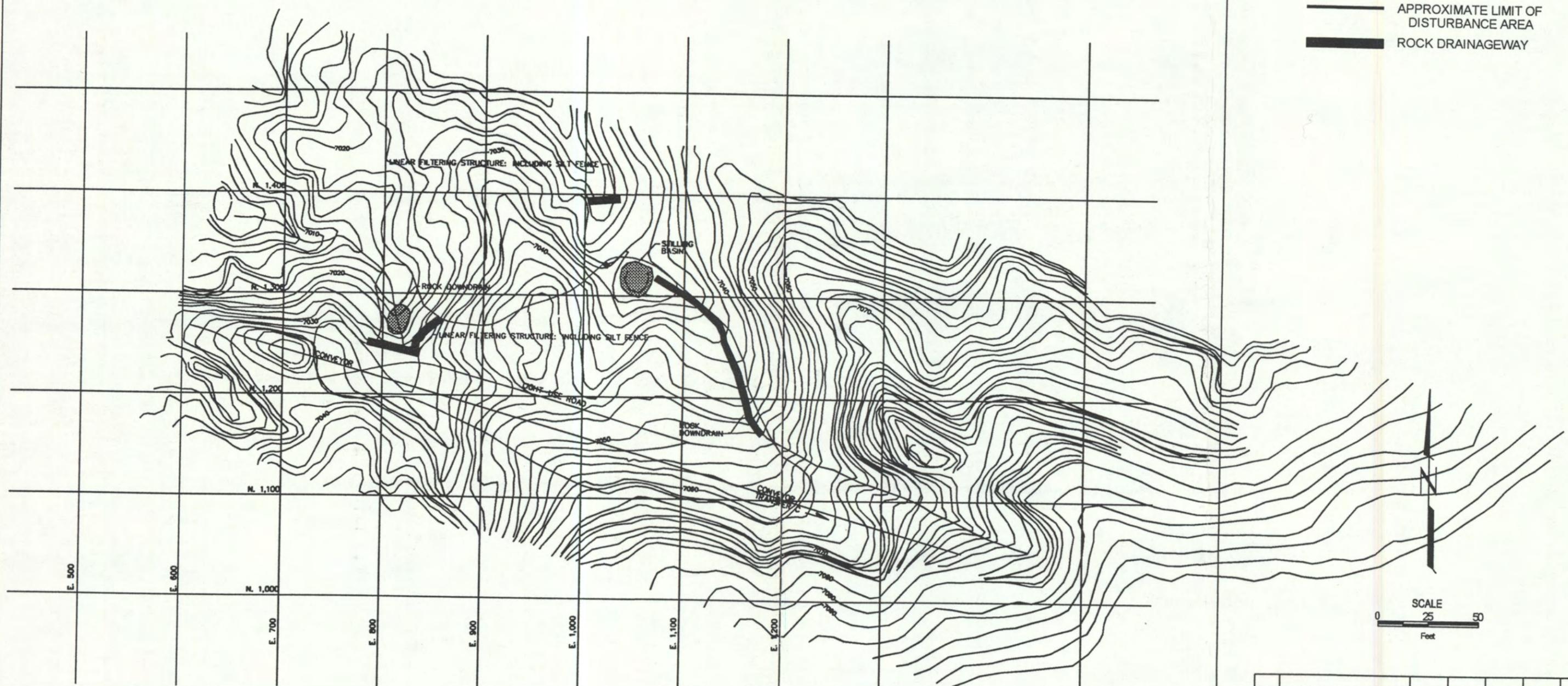
The subject disturbance area is small (approximately 1.7 acres) and located in extremely steep terrain with limited right-of-way area. Construction of conventional drainage and sediment control structures (i.e.: a sedimentation pond and associated ditches) is not practical and will

result in unnecessary additional surface disturbance and impacts. The proposed operational drainage control and maintenance plans represent BTCA for this area and should be effective both in controlling site drainage and providing for necessary ongoing site maintenance.

Revised 12/18/00

LEGEND

-  EPHEMERAL DRAINAGE
-  APPROXIMATE LIMIT OF DISTURBANCE AREA
-  ROCK DRAINAGEWAY



REV. NO.	REVISIONS	DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY
1	OSM REV.	12/18/00	J. G.S.	J.G.S	J.G.S
0	Transfer C - BTCA Plan	8/28/99	J.McNolan	K.Cavoth	J.McNolan

PEABODY WESTERN
 COAL COMPANY

PROJECT:
 CONVEYOR TRANSFER C

DRAWING TITLE:
 BTCA PLAN FOR MAINTENANCE
 AND DRAINAGE CONTROL

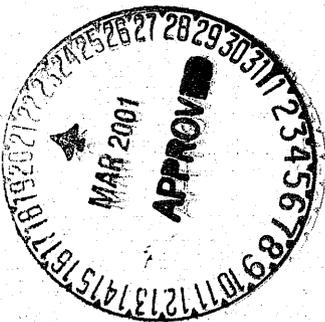
PROJECT NUMBER: 1547052
 AutoCAD FILE: 052411.dwg

ATTACHMENT AK

KAYENTA MINE

J-19, J-21, & J7-JR MSHA DAM CONSTRUCTION PROJECT

SUPPORT FACILITIES PERMIT REVISION



Revised 01/30/2001

J-19, J-21, & J7-Jr MSHA Dam Construction Project
Support Facilities Permit Revision

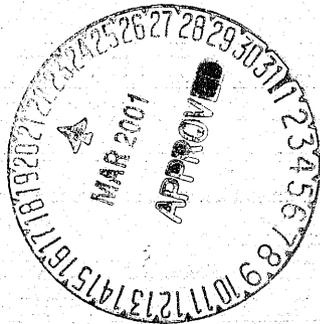
Purpose:

The purpose of this Permanent Program permit revision submittal is to permit: (1) the proposed topsoil stockpile (J7-JrXX); (2) the proposed scoria borrow area (J-19 West Scoria Pit) for riprap material for the upstream face, emergency spillway, and miscellaneous riprap requirements for the J7-Jr MSHA Dam Construction Project and in the J-19 area; (3) the additional "worst case" disturbance area (approximately 93 acres) around the J7-Jr MSHA Dam site for the Contractor's parking lot, borrow areas, topsoil stockpile footprint, and associated site disturbance area; (4) the approximately 2.5 miles of temporary ancillary road, connecting the Contractor's and mine traffic to the J7-Jr MSHA Dam site; (5) the location of approximately 4 miles of proposed waterline from the existing J-28 Water Tank to the Proposed J-19 Water Tank on the south end of J-19; and (6) the locations for linear topsoil stockpiles, (ID=J19-LP or J21-LP, etc.) in the J-19 and J-21 mining areas. The Contractor and Mine personnel will need to access the J7-Jr MSHA Dam site during the construction time period, and then after construction, every 7-30 days, PWCC personnel will need to perform the MSHA Dam inspections. Long term, these segments of road will be utilized on an infrequent basis; therefore, these road segments are ancillary roads. The location of these six items can be found on the enclosed Mine Plan Map, Drawing No. 85210, SE Sheet. The "worst case" anticipated affected lands is shown on the enclosed Jurisdictional Permit and Affected Lands Map, Drawing No. 85360, SE Sheet.

The J7-Jr MSHA Dam construction project is anticipated to begin in March, 2001. For erosion and sediment control, silt fence will be installed downstream of the J7-Jr MSHA Dam construction site and Best Management Practices (BMP's) as described in Chapter 6 and Chapter 26 will be utilized where appropriate within and downstream of the disturbance areas. The proposed J-19 West Scoria Pit is located on a hill within the future J-19 West mining and coal recovery area. The J-19 Waterline will be HPDE pipe installed on the surface to minimize surface disturbance, and for inspection and maintenance. The J-19 Water Tank will be the relocated existing N-14 Water Tank. All of the above support facilities and topsoil stockpiles are located within the J-19 and J-21 area and within areas included within PWCC's previous environmental studies area. All of the first five items identified above will be upstream of the J7-Jr MSHA Dam construction site. The linear topsoil stockpiles are located on graded spoil areas next to the active J-19 or J-21 pits. Bonding calculation is included in the enclosed Chapter 6, Attachment AK. PWCC will submit the appropriate additional bond upon approval. All reclamation will be in accordance with the approved reclamation plan in the AZ-0001D Permit.

Bonding Estimate:

The bonding estimate for this Permit Revision is approximately \$1,137,007, (see attached worksheets).



**Table 24-2-9
SCORIA PIT RECLAMATION
Black Mesa and Kayenta Mines**

Location	Area (ac)	Disturbed		Reclaimed		Undisturbed	
		%	acres	%	acres	%	acres
J-7N	153.2	0	0.0	0	0.0	100	153.2
J-27S	176.8	0	0.0	0	0.0	100	176.8
N-5	97.8	75	73.4	0	0.0	25	24.5
N-6 East	148.2	0	0.0	0	0.0	100	148.2
J-16	21.0	0	0.0	0	0.0	100	21.0
J-21N	151.0	75	113.3	0	0.0	25	37.8
N-10	4.0	100	4.0	0	0.0	0	0.0
N-14	16.0	100	16.0	0	0.0	0	0.0
N-14E	37.0	100	37.0	0	0.0	0	0.0
J-19W	70	100	70	0	0.0	0	0.0
Total	875		314		0		561

Reference: Bonding Map (Drawing 89800)



Revised 01/30/01

Table: 24-5-04a
 Mine Area: Kayenta
 Project: Surface Ripping: J7-Jr Dam
 Task: Dozer Ripping
 Equipment: D11R Dozer - Ripper Equipped

Earthmoving Activity

Rip 3' of subbase to aid in vegetation establishment.

Characterization of Dozer and Ripper Used:

D11R, three shank ripper, semi-u blade

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):

Rip depth (ft) 3
 Cut spacing (ft/pass) 6.4
 Cut length (ft) 300
 Speed (ft/min) 120

Quantity of Material to be Ripped
 450,200 cy

Cycle Time	=	$\frac{300}{\text{Cut Length}}$	/	$\frac{120}{\text{Speed Factor (fpm)}}$	+	$\frac{0.25}{\text{Turn Time}}$	=	2.8 min/pass		
Passes per hour	=	$\frac{60}{\text{min/hr}}$	/	$\frac{2.8}{\text{Cycle Time}}$	=	21.8 pass/hr				
Volume cut per pass	=	$\frac{3.00}{\text{Tool Penetration}}$	x	$\frac{6.4}{\text{Cut Spacing}}$	x	$\frac{300}{\text{Cut Length}}$	/	$\frac{27}{\text{cf/cy}}$	=	213 bank cy/pass

Ripping Production	=	$\frac{213}{\text{Volume cut per pass}}$	x	$\frac{21.8}{\text{Passes per hour}}$	=	4,655 hours		
Hours Required	=	$\frac{450,200}{\text{Volume to be Ripped}}$	/	$\frac{4,655}{\text{Ripping Production}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	133 hours

Reference: Cat Handbook, Ed. 28, Table 24-2-8.



Table: 24-5-05a
 Mine Area: Kayenta
 Project: Grade Facilities Areas: J7-Jr Dam
 Task: Facilities Area Grading
 Equipment: D11R Dozer

Earthmoving Activity

Grading the cut and fills to blend into the surrounding topography to drain, burial of road surface material a minimum of three feet.

Characterization of Dozer Used (type, size, etc):

D11R, three-shank ripper, U-blade
 Power shift transmission (1.0) yes

Description of Dozer Use

Average dozing distance (feet) 200
 Hourly production (from chart) 1,500
 Grade (in percent) 0
 Grade Correction 1
 Material Unit Weight (lb/lcy) 2,800
 Density Correction 0.82

Productivity Adjustment Factors

Operator Factor

Is operator excellent (1) no
 Is operator average (.75) yes
 Is operator poor (.6) no

Material Factor

Loose stockpile (1.2) no
 Hard to cut; frozen - with tilt cylinder (.8) no
 without tilt cylinder (.7) no
 Normal material (1) yes
 Hard to drift; (.8) no
 Rock, ripped or blasted (.75) no

Production Method/Blade Factor

Slot dozing (1.2) no
 Side by side dozing (1.2) no
 Normal dozing (1.0) yes

Poor Visibility

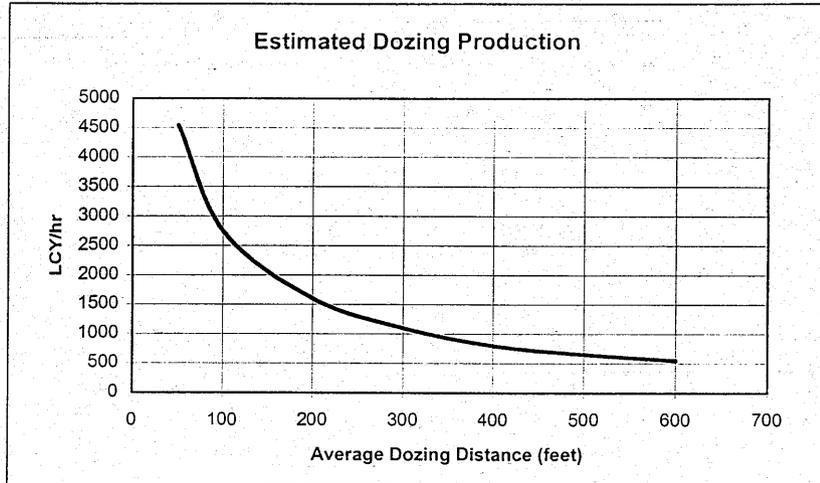
(i.e., dust, rain, snow, fog, or darkness) (0.8) no

Elevation Factor

<7,500 feet (1.0) yes

Quantity of Material to be Moved

450,200 cy



Productivity Adjustment = $\frac{0.75}{\text{Operator Factor}} \times \frac{1.0}{\text{Material Factor}} \times \frac{1.0}{\text{Grade Factor}} \times \frac{0.82}{\text{Density Correction}}$

$\times \frac{1.00}{\text{Production Method}} \times \frac{1.00}{\text{Visibility}} \times \frac{1.00}{\text{Elevation}} \times \frac{1.00}{\text{Direct Drive Trans}} = \mathbf{0.62}$

Net Hourly Production = $\frac{1,500}{\text{Normal Hourly Production}} \times \frac{0.62}{\text{Productivity Adjustment Factor}} = \mathbf{923 \text{ cy/hr}}$

(see graph above)

Hours Required = $\frac{450,200}{\text{Volume to be Moved}} \div \frac{923}{\text{Net Hourly Production}} \times \frac{1.371}{\text{Work Schedule Factor}} = \mathbf{669 \text{ Hours}}$

References: Cat Handbook, Ed. 28, Table 24-2-8



Table: 24-5-06a
 Mine Area: Kayenta
 Project: Topsoil Replacement: J7-Jr Dam
 Task: Haul and Place Topsoil
 Equipment: 637E P-P Scraper

Earthmoving Activity

Haul 1.6' of material to cover remaining parking/storage/disturbance areas.

Characterization of Scraper Used (type, capacity, etc)

637E P-P Scraper - capacity = 31 cy

Description of Scraper Route (haul distance, % grade, average rolling resistance for each segment, etc.)

Loaded Distance (ft) 500
 Loaded Grade (%) 0
 Loaded Effective Grade (%) 3

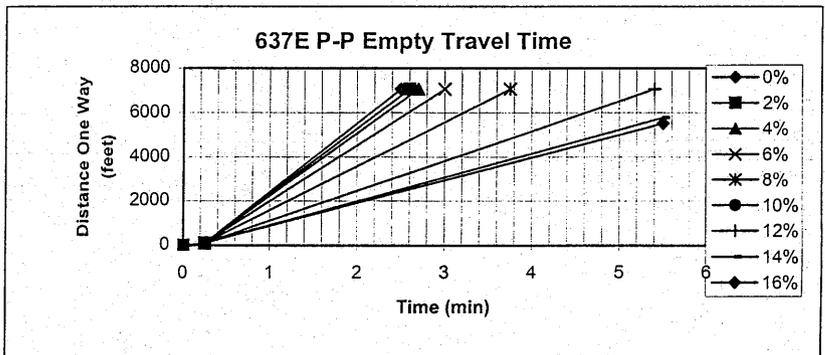
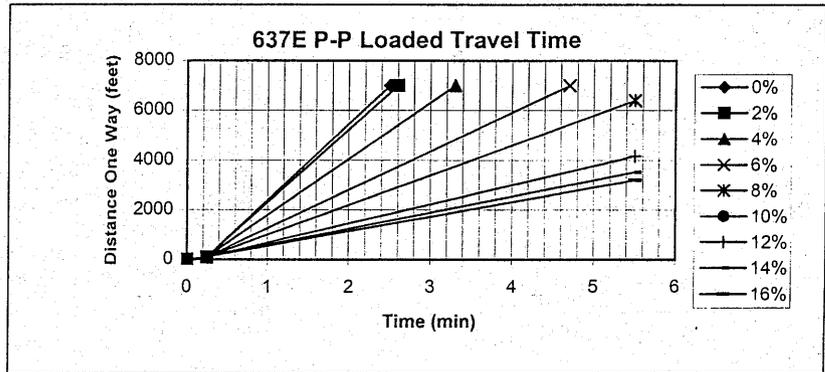
Empty Distance (ft) 500
 Empty Grade (%) 0
 Empty Effective Grade (%) 3

Production Times

Typical Load Time for 637E P-P 1.0
 Maneuver and spread or dump 0.6
 Loaded Travel Time (from chart) 0.4
 Empty Travel Time (from chart) 0.4

Quantity of Material to be Moved

240,100 cy



Cycle Time =	$\frac{1.0}{\text{Load Time}}$	+	$\frac{0.4}{\text{Loaded Trip Time}}$	+	$\frac{0.6}{\text{Maneuver and Spread Time}}$	+	$\frac{0.4}{\text{Empty Trip Time}}$	=	2.4 min
Cycles/Hour =	$\frac{60}{\text{min/hr}}$	/	$\frac{2.4}{\text{Cycle Time}}$	=	25 cycles/hr				
Hourly Production =	$\frac{31}{\text{Adjusted Load (cy)}}$	x	$\frac{25.00}{\text{Cycles/Hour}}$	=	775 cy/hr				

Hours Required =	$\frac{240,100}{\text{Volume}}$	/	$\frac{775}{\text{Hourly Production}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	425 hrs
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Table: 24-5-07a
 Mine Area: Kayenta
 Project: Revegetation: J7-Jr Dam
 Task: Revegetation
 Equipment: Miscellaneous

Revegetation Area Description
 Kayenta Mine major facilities

Revegetation Area

Area (acre) 93

Seeding, fertilizing, mulching and fencing costs (per acre) \$954.00

Tree and Shrub Costs (per acre) \$275.00

Reseeding Cost (per acre) \$807.00

Percent Failure 50%

$$\text{Revegetation Costs} = \frac{93}{\text{Acres}} * \left(\frac{\$954.00}{\$/\text{Acre for seeding, fertilizing, mulching and fencing}} + \frac{\$275.00}{\$/\text{Acre for planting trees and shrubs}} \right) = \$114,297$$

$$\text{Reseeding Costs} = \frac{93}{\text{Acres}} * \frac{0.5}{\text{Failure}} * \frac{\$807.00}{\text{Reseeding Cost}} = \$37,526$$

References: Table 24-1-3 and Table 24-2-8



Table: 24-5-10a
 Mine Area: Kayenta Scoria Pits
 Project: Surface Ripping - J19 West
 Task: Dozer Ripping
 Equipment: D11R Dozer - Ripper Equipped

Earthmoving Activity

Rip 3' of scoria pit prior to grading

Characterization of Dozer and Ripper Used:

D11R, three shank ripper, semi-u blade

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):

Rip depth (ft) 3
 Cut spacing (ft/pass) 6.4
 Cut length (ft) 300
 Speed (ft/min) 120

Quantity of Material to be Ripped
 338,800 cy

Cycle Time	=	$\frac{300}{\text{Cut Length}}$	/	$\frac{120}{\text{Speed Factor (fpm)}}$	+	$\frac{0.25}{\text{Turn Time}}$	=	2.8 min/pass	
Passes per hour	=	$\frac{60}{\text{min/hr}}$	/	$\frac{2.8}{\text{Cycle Time}}$	=	21.8 pass/hr			
Volume cut per pass	=	$\frac{3.00}{\text{Tool Penetration}}$	x	$\frac{6.4}{\text{Cut Spacing}}$	x	$\frac{300}{\text{Cut Length}}$	/	$\frac{27}{\text{cf/cy}}$	= 213 bank cy/pass

Ripping Production	=	$\frac{213}{\text{Volume cut per pass}}$	x	$\frac{21.8}{\text{Passes per hour}}$	=	4655 hours		
Hours Required	=	$\frac{338,800}{\text{Volume to be Ripped}}$	/	$\frac{4655}{\text{Ripping Production}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	100 hours

Reference: Cat Handbook, Ed. 28, Table 24-2-9.



Table: 24-5-11a
 Mine Area: Kayenta Scoria Pits
 Project: Grade Scoria Pit Area - J19 West
 Task: Scoria Pit Grading
 Equipment: D11R Dozer

Earthmoving Activity

Grade scoria pit to blend into surrounding area.

Characterization of Dozer Used (type, size, etc):

D11R, three-shank ripper, U-blade

Power shift transmission (1.0) yes

Description of Dozer Use

Average dozing distance (feet) 200
 Hourly production (from chart) 1500
 Grade (in percent) -10
 Grade Correction 1.2
 Material Unit Weight (lb/lcy) 2800
 Density Correction 0.82

Productivity Adjustment Factors

Operator Factor

Is operator excellent (1) no
 Is operator average (.75) yes
 Is operator poor (.6) no

Material Factor

Loose stockpile (1.2) no
 Hard to cut; frozen -
 with tilt cylinder (.8) no
 without tilt cylinder (.7) no
 Normal material (1) yes
 Hard to drift; (.8) no
 Rock, ripped or blasted (.75) no

Production Method/Blade Factor

Slot dozing (1.2) no
 Side by side dozing (1.2) no
 Normal dozing (1.0) yes

Poor Visibility

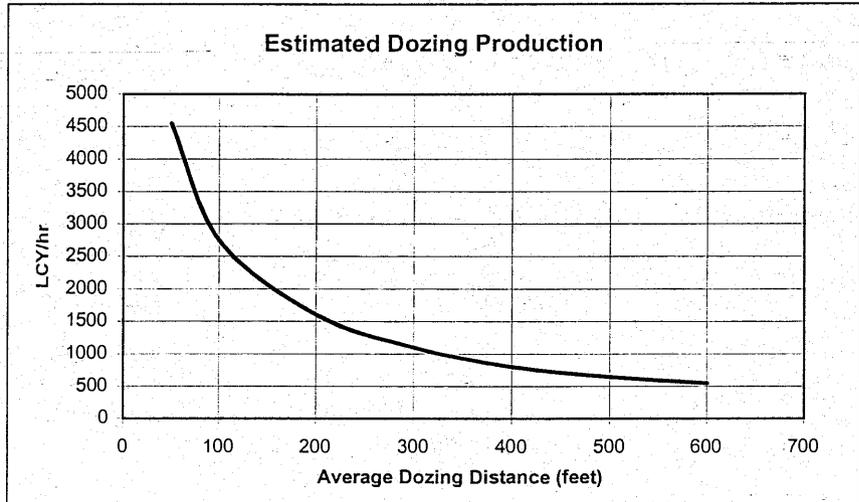
(i.e., dust, rain, snow, fog,
 or darkness) (0.8) no

Elevation Factor

<7,500 feet (1.0) yes

Quantity of Material to be Moved

338,800 cy



Productivity

$$\text{Adjustment Factor} = \frac{0.75}{\text{Operating Factor}} \times \frac{1.0}{\text{Material Factor}} \times \frac{1.2}{\text{Grade Factor}} \times \frac{0.82}{\text{Density Correction}}$$

$$\times \frac{1.00}{\text{Production Method}} \times \frac{1.00}{\text{Visibility}} \times \frac{1.00}{\text{Elevation}} \times \frac{1.00}{\text{Direct Drive Trans}} = \boxed{0.74}$$

$$\text{Net Hourly Production} = \frac{1,500}{\text{Normal Hourly Production}} \times \frac{0.74}{\text{Productivity Adjustment Factor}} = \boxed{1107 \text{ cy/hr}}$$

$$\text{Hours Required} = \frac{338,800}{\text{Volume to be Moved}} \div \frac{1107}{\text{Net Hourly Production}} \times \frac{1.371}{\text{Work Schedule Factor}} = \boxed{420 \text{ Hours}}$$

References: Cat Handbook, Ed. 28, Table 24-2-9



Table: 24-5-12a
 Mine Area: Kayenta Scoria Pits
 Project: Topsoil Replacement - J19 West
 Task: Haul and Place Topsoil
 Equipment: 637E P-P Scraper

Earthmoving Activity

Topsoil disturbance area around scoria pits

Characterization of Scraper Used (type, capacity, etc)

637E P-P Scraper - capacity = 31 cy

Description of Scraper Route (haul distance, % grade, average rolling resistance for each segment, etc.)

Loaded Distance (ft) 1500
 Loaded Grade (%) 0
 Loaded Effective Grade (%) 5

Empty Distance (ft) 1500
 Empty Grade (%) 0
 Empty Effective Grade (%) 5

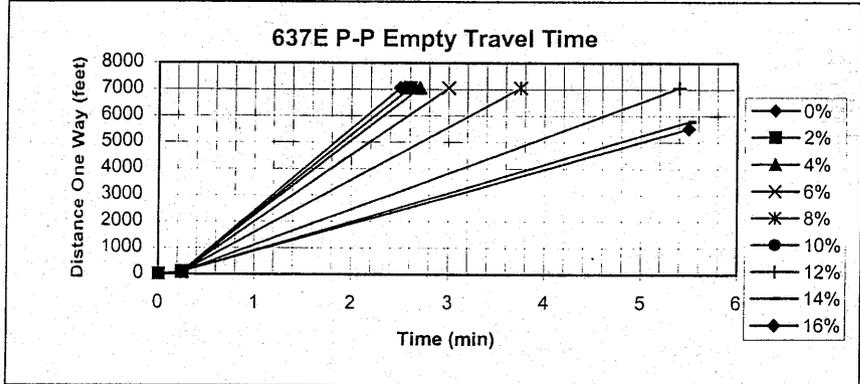
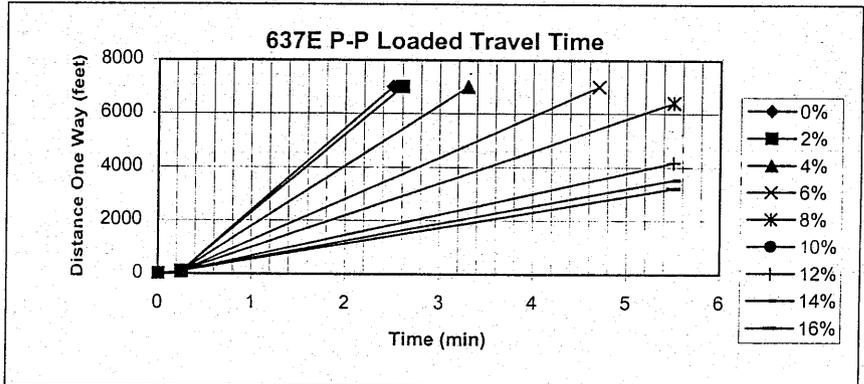
Production Times

Typical Load Time for 637E P-P 1.0
 Maneuver and spread or dump 0.6

Loaded Travel Time (from chart) 1.0
 Empty Travel Time (from chart) 0.8

Quantity of Material to be Moved

180,700 cy



Cycle Time	=	$\frac{1.0}{\text{Load Time}}$	+	$\frac{1.0}{\text{Loaded Trip Time}}$	+	$\frac{0.6}{\text{Maneuver and Spread Time}}$	+	$\frac{0.8}{\text{Empty Trip Time}}$	=	3.4 min
Cycles/Hour	=	$\frac{60}{\text{min/hr}}$	/	$\frac{3.4}{\text{Cycle Time}}$	=	18 cycles/hr				
Hourly Production	=	$\frac{31}{\text{Adjusted Load (cy)}}$	x	$\frac{17.65}{\text{Cycles/Hour}}$	=	547 cy/hr				

Hours Required	=	$\frac{180,700}{\text{Volume}}$	/	$\frac{547}{\text{Hourly Production}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	453 hrs
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Table: 24-5-13a
 Mine Area: Kayenta Scoria Pits
 Project: Revegetation - J19 West
 Task: Revegetation
 Equipment: Miscellaneous

Revegetation Area Description
 Kayenta Mine regraded scoria pits

Revegetation Area

Area (acre) 70

Seeding, fertilizing,
 mulching and fencing
 costs (per acre) \$954.00

Tree and Shrub Costs \$275.00
 (per acre)

Reseeding Cost \$807.00
 (per acre)¹

Percent Failure 50%

$$\text{Revegetation Costs} = \frac{70}{\text{Acres}} * \left(\frac{\$954.00}{\text{\$/Acre for seeding, fertilizing, mulching and fencing}} + \frac{\$275.00}{\text{\$/Acre for planting trees and shrubs}} \right) = \$86,030$$

$$\text{Reseeding Costs} = \frac{70}{\text{Acres}} * \frac{0.5}{\text{Failure}} * \frac{\$807.00}{\text{Reseeding Cost}} = \$28,245$$

References: Table 24-1-3 and Table 24-2-9

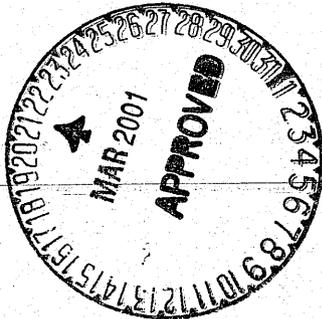


Table: 24-5-32a
 Mine Area: Kayenta Ancillary Roads
 Project: Culvert Removal - J19 West
 Task: Culvert Removal/Disposal
 Equipment: D11R Dozer

Earthmoving Activity:
 Remove and dispose of culvert embankment material and culverts.

Characterization of Dozer Used (type, size, etc):

D11R, three-shank ripper, U-blade
 Power shift transmission (1.0) yes

Description of Dozer Use

Average dozing distance (feet) 300
 Hourly production (from chart) 1100
 Grade (in percent) 0
 Grade Correction 1
 Material Unit Weight (lb/lcy) 2800
 Density Correction 0.82

Productivity Adjustment Factors

Operator Factor

Is operator excellent (1) no
 Is operator average (.75) yes
 Is operator poor (.6) no

Material Factor

Loose stockpile (1.2) no
 Hard to cut; frozen -
 with tilt cylinder (.8) no
 without tilt cylinder (.7) no
 Normal material (1) yes
 Hard to drift; (.8) no
 Rock, ripped or blasted (.75) no

Production Method/Blade Factor

Slot dozing (1.2) no
 Side by side dozing (1.2) no
 Normal dozing (1.0) yes

Poor Visibility

(I.e., dust, rain, snow, fog,
 or darkness) (0.8) no

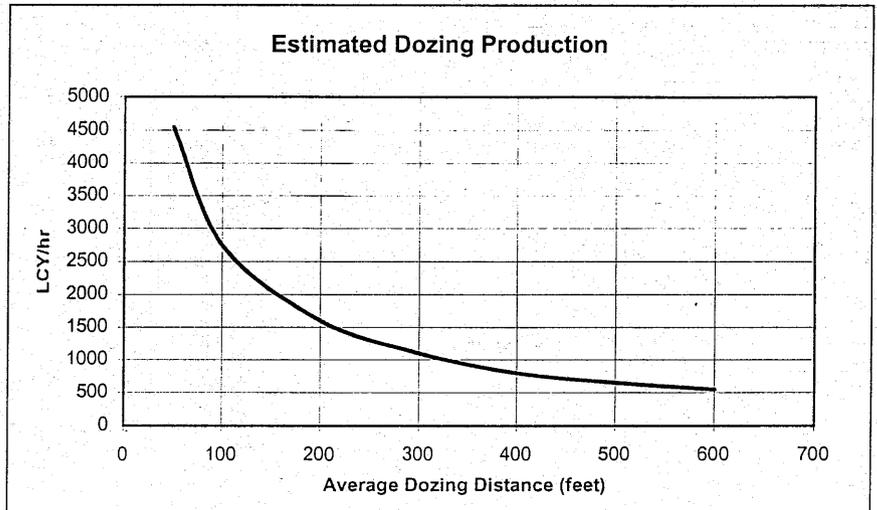
Elevation Factor

<7,500 feet (1.0) yes

Quantity of Material to be Moved

Total (cy) 30,027

Culvert (ft) 0
 Culvert Disposal Cost (at \$0.23/cf) \$0



$$\begin{aligned}
 \text{Productivity Adjustment Factor} &= \frac{0.75}{\text{Operating Factor}} \times \frac{1.0}{\text{Material Factor}} \times \frac{1.0}{\text{Grade Factor}} \times \frac{0.82}{\text{Density Correction}} \\
 &\times \frac{1.00}{\text{Production Method}} \times \frac{1.00}{\text{Visibility}} \times \frac{1.00}{\text{Elevation}} \times \frac{1.00}{\text{Direct Drive Trans}} = \boxed{0.62}
 \end{aligned}$$

$$\text{Net Hourly Production} = \frac{1,100}{\text{Normal Hourly Production}} \times \frac{0.62}{\text{Productivity Adjustment Factor}} = \boxed{676.5 \text{ cy/hr}}$$

$$\text{Hours Required} = \frac{30,027}{\text{Total (cy) Volume to be Moved}} \div \frac{676.5}{\text{Net Hourly Production}} \times \frac{1.371}{\text{Work Schedule Factor}} = \boxed{61 \text{ Hours}}$$



Note: Quantity of material and culvert are 60% of total for Kayenta portion of the cost

Table: 24-5-33a
 Mine Area: Kayenta Ancillary Roads
 Project: Surfacing Removal - J19 West
 Task: Surfacing Removal/Disposal
 Equipment: D11R Dozer

Earthmoving Activity:

Push one foot of gravel/scoria off the side of the road for burial

Characterization of Dozer Used (type, size, etc):

D11R, three-shank ripper, U-blade
 Power shift transmission (1.0) yes

Description of Dozer Use

Average dozing distance (feet) 50
 Hourly production (from chart) 4550
 Grade (in percent) 0
 Grade Correction 1
 Material Unit Weight (lb/lcy) 2800
 Density Correction 0.82

Productivity Adjustment Factors

Operator Factor

Is operator excellent (1) no
 Is operator average (.75) yes
 Is operator poor (.6) no

Material Factor

Loose stockpile (1.2) no
 Hard to cut; frozen -
 with tilt cylinder (.8) no
 without tilt cylinder (.7) no
 Normal material (1) no
 Hard to drift; (.8) yes
 Rock, ripped or blasted (.75) no

Production Method/Blade Factor

Slot dozing (1.2) no
 Side by side dozing (1.2) no
 Normal dozing (1.0) yes

Poor Visibility

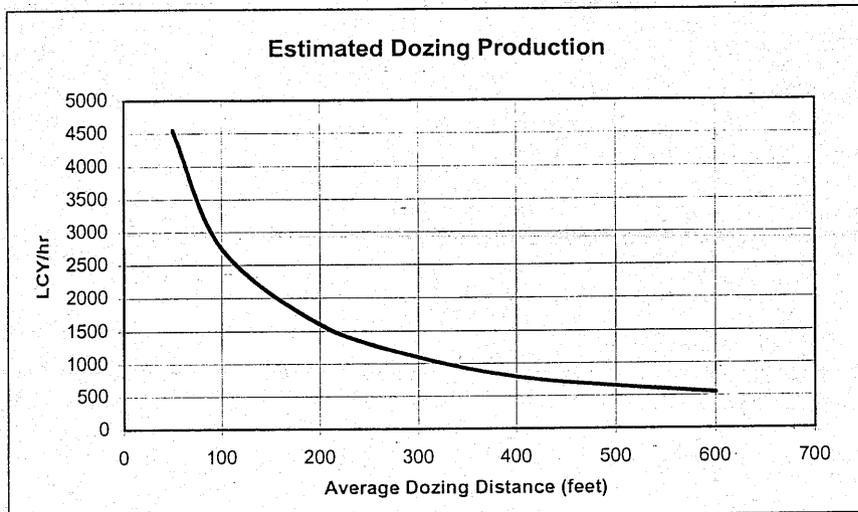
(I.e., dust, rain, snow, fog,
 or darkness) (0.8) no

Elevation Factor

<7,500 feet (1.0) yes

Quantity of Material to be Moved

Length (ft) 18,016
 Width (ft) 45
 Total (cy) 30,027



$$\begin{aligned}
 \text{Productivity Adjustment Factor} &= \frac{0.75}{\text{Operating Factor}} \times \frac{0.8}{\text{Material Factor}} \times \frac{1.0}{\text{Grade Factor}} \times \frac{0.82}{\text{Density Correction}} \\
 &\times \frac{1.00}{\text{Production Method}} \times \frac{1.00}{\text{Visibility}} \times \frac{1.00}{\text{Elevation}} \times \frac{1.00}{\text{Direct Drive Trans}} = \boxed{0.49}
 \end{aligned}$$

$$\text{Net Hourly Production} = \frac{4,550}{\text{Normal Hourly Production}} \times \frac{0.49}{\text{Productivity Adjustment Factor}} = \boxed{2238.6 \text{ cy/hr}}$$

$$\text{Hours Required} = \frac{30,027}{\text{Total (cy) to be Moved}} \div \frac{2238.6}{\text{Net Hourly Production}} \times \frac{1.371}{\text{Work Schedule Factor}} = \boxed{18 \text{ Hours}}$$

References: Cat Handbook, Ed. 28



Table: 24-5-34a
 Mine Area: Kayenta Ancillary Roads
 Project: Surface Ripping - J19 West
 Task: Dozer Ripping
 Equipment: D11R Dozer - Ripper Equipped

Earthmoving Activity

Rip 3' of subbase to aid in vegetation establishment.

Characterization of Dozer and Ripper Used:

D11R, three shank ripper, semi-u blade

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):

Rip depth (ft) 3
 Cut spacing (ft/pass) 6.4
 Cut length (ft) 300
 Speed (ft/min) 120

Quantity of Material to be Ripped

Length (ft) 18016
 Width (ft) 45
 Total (cy) 90080

Cycle Time	=	$\frac{300}{\text{Cut Length}}$	/	$\frac{120}{\text{Speed Factor (fpm)}}$	+	$\frac{0.25}{\text{Turn Time}}$	=	2.8 min/pass	
Passes per hour	=	$\frac{60}{\text{min/hr}}$	/	$\frac{2.8}{\text{Cycle Time}}$	=	21.8 pass/hr			
Volume cut per pass	=	$\frac{3.00}{\text{Tool Penetration}}$	x	$\frac{6.4}{\text{Cut Spacing}}$	x	$\frac{300}{\text{Cut Length}}$	/	$\frac{27}{\text{cf/cy}}$	= 213 bank cy/pass

Ripping Production	=	$\frac{213}{\text{Volume cut per pass}}$	x	$\frac{21.8}{\text{Passes per hour}}$	=	4655 hours		
Hours Required	=	$\frac{90,080}{\text{Volume to be Ripped}}$	/	$\frac{4655}{\text{Ripping Production}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	27 hours

Reference: Cat Handbook, Ed. 28



Table: 24-5-35a
 Mine Area: Kayenta Ancillary Roads
 Project: Grade Ripped Areas - J19 West
 Task: Grading
 Equipment: D11R Dozer

Earthmoving Activity

Grade the cut and fills to blend into surrounding topography and to drain and bury road surface material a minimum of 3'.

Characterization of Dozer Used (type, size, etc)

D11R, three shank ripper, U-blade

Production Rate (acres/shift) 1.0

Acres to be Graded

Length (ft) 18,016
 Width (ft) 100
 Total (acres) 41

Hours Required	=	$\frac{41}{\text{Area to be Graded (acres)}}$	/	$\frac{0.125}{\text{Net Hourly Production (acres/hr)}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	454 Hours
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Note: Production rate based on PWCC experience.



Table: 24-5-36a
 Mine Area: Kayenta Ancillary Roads
 Project: Topsoil Replacement - J19 West
 Task: Haul and Place Topsoil
 Equipment: 637E P-P Scraper

Earthmoving Activity

Haul and place 1.6' topsoil to cover graded area.

Characterization of Scraper Used (type, capacity, etc.)

637E P-P Scraper - capacity = 31 cy

Description of Scraper Route (haul distance, % grade, average rolling resistance for each segment, etc.)

Loaded Distance (ft) 3000
 Loaded Grade (%) 0
 Loaded Effective Grade (%) 5

Empty Distance (ft) 3000
 Empty Grade (%) 0
 Empty Effective Grade (%) 5

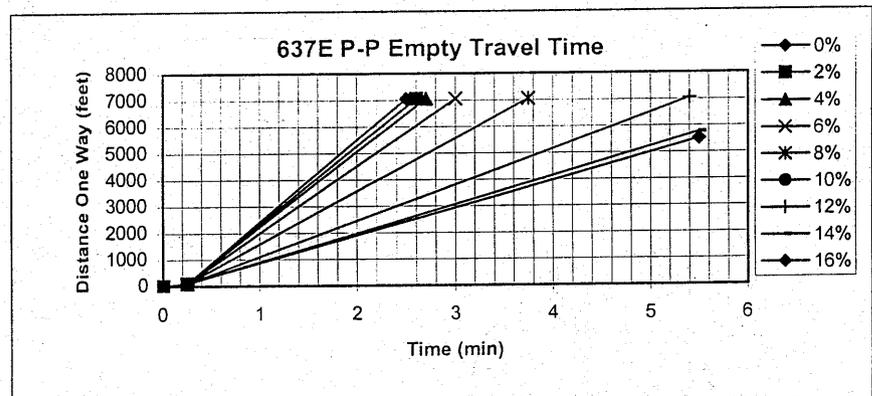
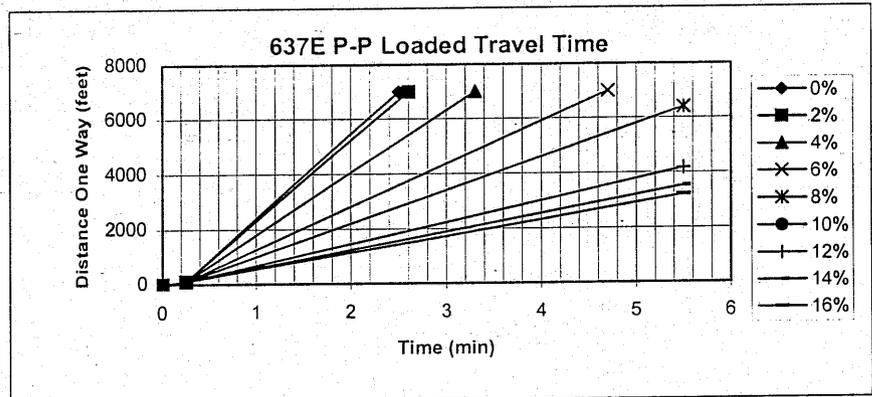
Production Times

Typical Load Time for 637E P-P 1.0
 Maneuver and spread or dump 0.6

Loaded Travel Time (from chart) 2.0
 Empty Travel Time (from chart) 1.5

Quantity of Material to be Moved

Length (ft) 18,016
 Width (ft) 100
 Total (cy) 106,761



$$\text{Cycle Time} = \frac{1.0}{\text{Load Time}} + \frac{2.0}{\text{Loaded Trip Time}} + \frac{0.6}{\text{Maneuver and Spread Time}} + \frac{1.5}{\text{Empty Trip Time}} = 5.1 \text{ min}$$

$$\text{Cycles/Hour} = \frac{60}{\text{min/hr}} \div \frac{5.1}{\text{Cycle Time}} = 12 \text{ cycles/hr}$$

$$\text{Hourly Production} = \frac{31}{\text{Adjusted Load (cy)}} \times \frac{11.76}{\text{Cycles/Hour}} = 365 \text{ cy/hr}$$

$$\text{Hours Required} = \frac{106,761}{\text{Volume}} \div \frac{365}{\text{Hourly Production}} \times \frac{1.371}{\text{Work Schedule Factor}} = 401 \text{ hrs}$$

Table: 24-5-37a
 Mine Area: Kayenta Ancillary Roads
 Project: Revegetation - J19 West
 Task: Revegetation
 Equipment: Miscellaneous

Revegetation Area Description
 Kayenta Mine ancillary roads

Revegetation Area

Area (acre) 41
 Seeding, fertilizing, mulching and fencing costs (per acre) \$954.00
 Tree and Shrub Costs (per acre) \$275.00
 Reseeding Cost (per acre)¹ \$807.00
 Percent Failure 50%

$$\text{Revegetation Costs} = \frac{41 \text{ Acres}}{\text{Acres}} * \left(\frac{\$954.00}{\text{\$/Acre for seeding, fertilizing, mulching and fencing}} + \frac{\$275.00}{\text{\$/Acre for planting trees and shrubs}} \right) = \$50,830$$

$$\text{Reseeding Costs} = \frac{41 \text{ Acres}}{\text{Acres}} * \frac{0.5 \text{ Failure}}{\text{Failure}} * \frac{\$807.00}{\text{Reseeding Cost}} = \$16,688$$

References: Table 24-1-3



ATTACHMENT AL

KAYENTA MINE

N-11 & N-14 Support Facilities

Permit Revision



Revised 02/02/2001

N-11 & N-14 Support Facilities Permit Revision

Purpose:

The purpose of this Permanent Program permit revision submittal is to permit: (1) approximately 1.7 miles of temporary ancillary road, connecting light use mine traffic to the interior and northern perimeter of the N-14 East reclamation area; and (2) show the locations for linear topsoil stockpiles, (ID=N11-LP, etc.) in the N-11 mining area. PWCC personnel will need to perform reclamation area inspections, will need access to PWCC's surveying control points and other mine related activities. These segments of road will be utilized on an infrequent basis; therefore, these road segments are ancillary roads. The location of these two items can be found on the enclosed Mine Plan Map, Drawing No. 85210, NE & NW Sheets and on the enclosed Jurisdictional Permit and Affected Lands Map, Drawing No. 85360, NE & NW Sheets.

All of the above support facilities and topsoil stockpiles are located within the N-11 and N-14 areas where reclamation and environmental studies have been conducted. The first item identified above will be upstream of the N14-G and N14-H MSHA Dams, which provide runoff and sediment control for this portion of the N-14 reclamation area. Where these segments of ancillary roads cross the reclaimed drainage in the N14-G and N14-H upstream main reclaimed drainage channels, PWCC will construct low-water road crossings in accordance with the approved Drawing No. 85432. As shown on Drawing No. 85642A, these reaches of the N14-G and H14-H channels have been disturbed and reclaimed under the AZ-0001 Initial Program Permit, and are not part of the Permanent Program stream buffer zone areas. The linear topsoil stockpiles are located on graded spoil areas next to the active N-11 pit. Bonding calculation is included in the enclosed Chapter 6, Attachment "AL". PWCC will submit the appropriate additional bond upon approval. All reclamation will be in accordance with the approved reclamation plan in the AZ-0001D Permit.

Bonding Estimate:

The bonding estimate for this Permit Revision is approximately \$117,930, (see attached worksheets).



KAYENTA MINE
 AZ-0001D Permit
 N-14 East Roads
 Bonding Estimate
 February 1, 2001

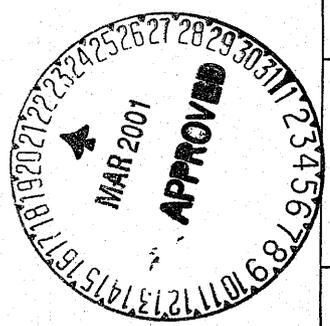


TABLE	AREA	PROJECT	TASK	EQUIPMENT	EQUIPMENT UNIT COST	HOURS	LABOR COST	QUANTITY	UNITS	HOURLY COST	TOTAL COST	UNIT COST
24-5-32b	Kayenta Ancillary Roads	(N-14 East Anc. Roads)										
24-5-33b	Kayenta Ancillary Roads	Culvert Removal	Culvert Removal/Disposal	D11R Dozer	\$194.56	17	\$24.39	8,333	cy	\$218.95	\$3,722	\$0.45
24-5-34b	Kayenta Ancillary Roads	Surface Removal	Surface Removal/Disposal	D11R Dozer	\$194.56	5	\$24.39	8,333	cy	\$218.95	\$1,095	\$0.13
24-5-35b	Kayenta Ancillary Roads	Surface Ripping	Dozer Ripping	D11R Dozer - Ripper Equipped	\$215.17	7	\$24.39	25,000	cy	\$239.56	\$1,677	\$0.07
24-5-36b	Kayenta Ancillary Roads	Grade Ripped Areas	Grading	D11R Dozer	\$194.56	181	\$24.39	17	acres	\$218.95	\$39,630	\$2,331.19
24-5-37b	Kayenta Ancillary Roads	Topsoil Replacement	Haul and Place Topsoil	637E P-P Scraper	\$150.82	180	\$24.39	42,667	cy	\$175.21	\$28,034	\$0.66
		Revegetation	Revegetation	Miscellaneous	-	-	-	17	acres	-	\$26,983	\$1,587.24
				Ancillary Roads Subtotal		370					\$101,141	

TOTAL DIRECT COST: \$ 101,141
 INDIRECT COST PERCENT: 16.6%
 TOTAL INDIRECT COST: \$ 16,789
 TOTAL ESTIMATED BONDING COST: \$ 117,930

Table: 24-5-32b
 Mine Area: Kayenta Ancillary Roads
 Project: Culvert Removal - N14 East
 Task: Culvert Removal/Disposal
 Equipment: D11R Dozer

Earthmoving Activity:
 Remove and dispose of culvert embankment material and culverts.

Characterization of Dozer Used (type, size, etc):

D11R, three-shank ripper, U-blade
 Power shift transmission (1.0) yes

Description of Dozer Use

Average dozing distance (feet) 300
 Hourly production (from chart) 1100
 Grade (in percent) 0
 Grade Correction 1
 Material Unit Weight (lb/lcy) 2800
 Density Correction 0.82

Productivity Adjustment Factors

Operator Factor
 Is operator excellent (1) no
 Is operator average (.75) yes
 Is operator poor (.6) no

Material Factor

Loose stockpile (1.2) no
 Hard to cut; frozen -
 with tilt cylinder (.8) no
 without tilt cylinder (.7) no
 Normal material (1) yes
 Hard to drift; (.8) no
 Rock, ripped or blasted (.75) no

Production Method/Blade Factor

Slot dozing (1.2) no
 Side by side dozing (1.2) no
 Normal dozing (1.0) yes

Poor Visibility

(i.e., dust, rain, snow, fog,
 or darkness) (0.8) no

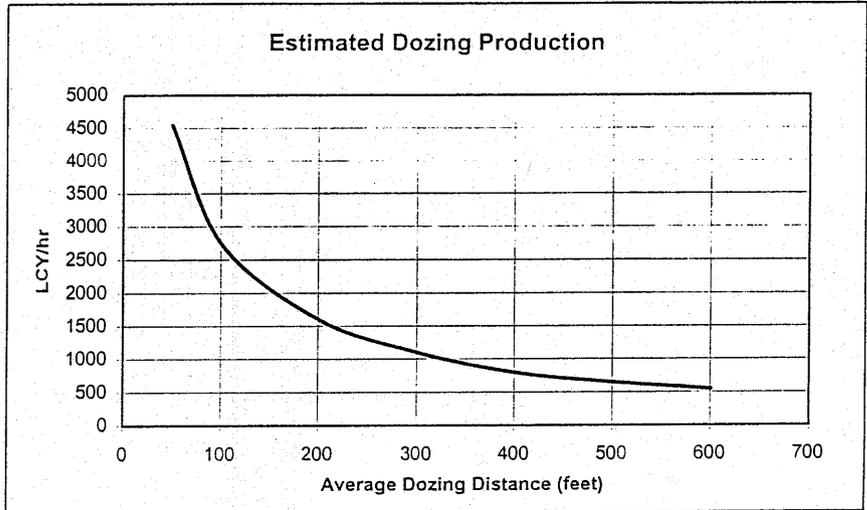
Elevation Factor

<7,500 feet (1.0) yes

Quantity of Material to be Moved

Total (cy) 8,333

Culvert (ft) 0
 Culvert Disposal Cost (at \$0.23/cf) \$0



Productivity Adjustment = $\frac{0.75}{\text{Operating Factor}} \times \frac{1.0}{\text{Material Factor}} \times \frac{1.0}{\text{Grade Factor}} \times \frac{0.82}{\text{Density Correction}}$
 $\times \frac{1.00}{\text{Production Method}} \times \frac{1.00}{\text{Visibility}} \times \frac{1.00}{\text{Elevation}} \times \frac{1.00}{\text{Direct Drive Trans}} = 0.62$

Net Hourly Production = $\frac{1,100}{\text{Normal Hourly Production}} \times \frac{0.62}{\text{Productivity Adjustment Factor}} = 676.5 \text{ cy/hr}$
 (see graph above)

Hours Required = $\frac{8,333}{\text{Total (cy) Volume to be Moved}} \div \frac{676.5}{\text{Net Hourly Production}} \times \frac{1.371}{\text{Work Schedule Factor}} = 17 \text{ Hours}$



Note: Quantity of material and culvert are 60% of total for Kayenta portion of the cost.

Table: 24-5-33b
 Mine Area: Kayenta Ancillary Roads
 Project: Surfacing Removal - N14 East
 Task: Surfacing Removal/Disposal
 Equipment: D11R Dozer

Earthmoving Activity:
 Push one foot of gravel/scoria off the side of the road for burial

Characterization of Dozer Used (type, size, etc):

D11R, three-shank ripper, U-blade
 Power shift transmission (1.0) yes

Description of Dozer Use

Average dozing distance (feet) 50
 Hourly production (from chart) 4550
 Grade (in percent) 0
 Grade Correction 1
 Material Unit Weight (lb/lcy) 2800
 Density Correction 0.82

Productivity Adjustment Factors

Operator Factor

Is operator excellent (1) no
 Is operator average (.75) yes
 Is operator poor (.6) no

Material Factor

Loose stockpile (1.2) no
 Hard to cut; frozen -
 with tilt cylinder (.8) no
 without tilt cylinder (.7) no
 Normal material (1) no
 Hard to drift; (.8) yes
 Rock, ripped or blasted (.75) no

Production Method/Blade Factor

Slot dozing (1.2) no
 Side by side dozing (1.2) no
 Normal dozing (1.0) yes

Poor Visibility

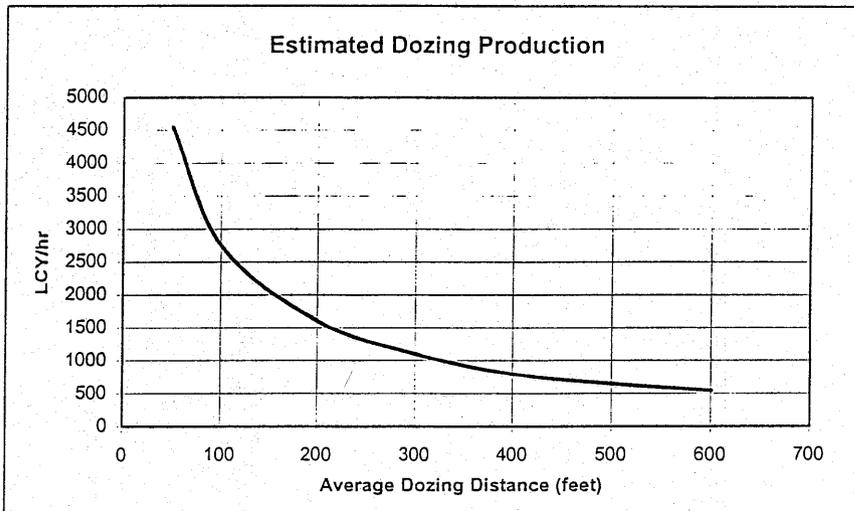
(i.e., dust, rain, snow, fog,
 or darkness) (0.8) no

Elevation Factor

<7,500 feet (1.0) yes

Quantity of Material to be Moved

Length (ft) 9,000
 Width (ft) 25
 Total (cy) 8,333



Productivity Adjustment = $\frac{0.75}{\text{Operating Factor}} \times \frac{0.8}{\text{Material Factor}} \times \frac{1.0}{\text{Grade Factor}} \times \frac{0.82}{\text{Density Correction}}$
 $\times \frac{1.00}{\text{Production Method}} \times \frac{1.00}{\text{Visibility}} \times \frac{1.00}{\text{Elevation}} \times \frac{1.00}{\text{Direct Drive Trans}} = \boxed{0.49}$

Net Hourly Production = $\frac{4,550}{\text{Normal Hourly Production}} \times \frac{0.49}{\text{Productivity Adjustment Factor}} = \boxed{2238.6 \text{ cy/hr}}$
 (see graph above)

Hours Required = $\frac{8,333}{\text{Total (cy) Volume to be Moved}} \div \frac{2238.6}{\text{Net Hourly Production}} \times \frac{1.371}{\text{Work Schedule Factor}} = \boxed{5 \text{ Hours}}$

References: Cat Handbook, Ed. 28



Table: 24-5-34b
 Mine Area: Kayenta Ancillary Roads
 Project: Surface Ripping - N14 East
 Task: Dozer Ripping
 Equipment: D11R Dozer - Ripper Equipped

Earthmoving Activity

Rip 3' of subbase to aid in vegetation establishment.

Characterization of Dozer and Ripper Used:

D11R, three shank ripper, semi-u blade

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):

Rip depth (ft) 3
 Cut spacing (ft/pass) 6.4
 Cut length (ft) 300
 Speed (ft/min) 120

Quantity of Material to be Ripped

Length (ft) 9000
 Width (ft) 25
 Total (cy) 25000

Cycle Time	=	$\frac{300}{\text{Cut Length}}$	/	$\frac{120}{\text{Speed Factor (fpm)}}$	+	$\frac{0.25}{\text{Turn Time}}$	=	2.8 min/pass	
Passes per hour	=	$\frac{60}{\text{min/hr}}$	/	$\frac{2.8}{\text{Cycle Time}}$	=	21.8 pass/hr			
Volume cut per pass	=	$\frac{3.00}{\text{Tool Penetration}}$	x	$\frac{6.4}{\text{Cut Spacing}}$	x	$\frac{300}{\text{Cut Length}}$	/	$\frac{27}{\text{cf/cy}}$	= 213 bank cy/pass

Ripping Production	=	$\frac{213}{\text{Volume cut per pass}}$	x	$\frac{21.8}{\text{Passes per hour}}$	=	4655 hours		
Hours Required	=	$\frac{25,000}{\text{Volume to be Ripped}}$	/	$\frac{4655}{\text{Ripping Production}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	7 hours

Reference: Cat Handbook, Ed. 28



Table: 24-5-35b
 Mine Area: Kayenta Ancillary Roads
 Project: Grade Ripped Areas - N14 East
 Task: Grading
 Equipment: D11R Dozer

Earthmoving Activity

Grade the cut and fills to blend into surrounding topography and to drain and bury road surface material a minimum of 3'.

Characterization of Dozer Used (type, size, etc)

D11R, three shank ripper, U-blade

Production Rate (acres/shift) 1.0

Acres to be Graded

Length (ft) 9,000
 Width (ft) 80
 Total (acres) 17

Hours Required	=	$\frac{17}{\text{Area to be Graded (acres)}}$	/	$\frac{0.125}{\text{Net Hourly Production (acres/hr)}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	181	Hours
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Note: Production rate based on PWCC experience.



Table: 24-5-36b
 Mine Area: Kayenta Ancillary Roads
 Project: Topsoil Replacement - N14 East
 Task: Haul and Place Topsoil
 Equipment: 637E P-P Scraper

Earthmoving Activity

Haul and place 1.6' topsoil to cover graded area.

Characterization of Scraper Used (type, capacity, etc)

637E P-P Scraper - capacity = 31 cy

Description of Scraper Route (haul distance, % grade, average rolling resistance for each segment, etc.)

Loaded Distance (ft) 3000
 Loaded Grade (%) 0
 Loaded Effective Grade (%) 5

Empty Distance (ft) 3000
 Empty Grade (%) 0
 Empty Effective Grade (%) 5

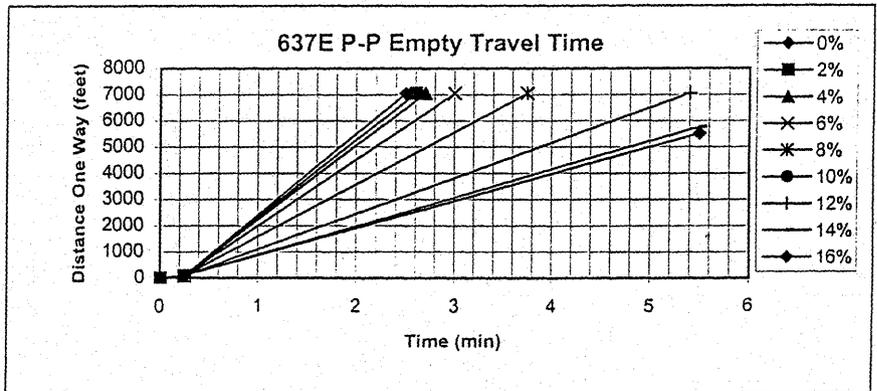
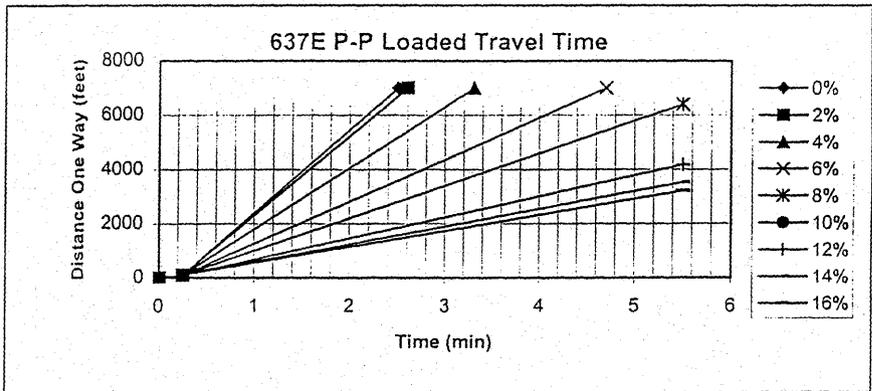
Production Times

Typical Load Time for 657E P-P 1.0
 Maneuver and spread or dump 0.6

Loaded Travel Time (from chart) 2.0
 Empty Travel Time (from chart) 1.5

Quantity of Material to be Moved

Length (ft) 9,000
 Width (ft) 80
 Total (cy) 42,667



Cycle Time =	$\frac{1.0}{\text{Load Time}}$	+	$\frac{2.0}{\text{Loaded Trip Time}}$	+	$\frac{0.6}{\text{Maneuver and Spread Time}}$	+	$\frac{1.5}{\text{Empty Trip Time}}$	=	5.1 min
Cycles/Hour =	$\frac{60}{\text{min/hr}}$	/	$\frac{5.1}{\text{Cycle Time}}$	=	12 cycles/hr				
Hourly Production =	$\frac{31}{\text{Adjusted Load (cy)}}$	x	$\frac{11.76}{\text{Cycles/Hour}}$	=	365 cy/hr				

Hours Required =	$\frac{42,667}{\text{Volume}}$	/	$\frac{365}{\text{Hourly Production}}$	x	$\frac{1.371}{\text{Work Schedule Factor}}$	=	160 hrs
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Table: 24-5-37b
 Mine Area: Kayenta Ancillary Roads
 Project: Revegetation - N14 East
 Task: Revegetation
 Equipment: Miscellaneous

Revegetation Area Description
 Kayenta Mine ancillary roads

Revegetation Area
 Area (acre) 17

Seeding, fertilizing,
 mulching and fencing
 costs (per acre) \$954.00

Tree and Shrub Costs \$275.00
 (per acre)

Reseeding Cost \$807.00
 (per acre)

Percent Failure 50%

$\text{Revegetation Costs} = \frac{17}{\text{Acres}} * \left(\frac{\$954.00}{\$/\text{Acre for seeding, fertilizing, mulching and fencing}} + \frac{\$275.00}{\$/\text{Acre for planting trees and shrubs}} \right) = \$20,314$
--

$\text{Reseeding Costs} = \frac{17}{\text{Acres}} * \frac{0.5}{\text{Failure}} * \frac{\$807.00}{\text{Reseeding Cost}} = \$6,669$
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References: Table 24-1-3

