DESIGN REPORT

Permanent Impoundment

N7-D

Kayenta Mine

Navajo County, Arizona

For

PEABODY WESTERN COAL COMPANY

AUG 10 2001

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SITE DESCRIPTION

LAND USE

Structure N7-D has a 756-acre tributary drainage area of the Yellow Water Canyon Wash and is located in the N-7/N-8 reclamation area at the Kayenta Mine. The watershed is classified as 55% post-law reclaimed and 45% undisturbed.

DESIGN ANALYSES

GENERAL

Structure N7-D was designed under the supervision of a Registered Professional Engineer from Peabody Western Coal Company. The design was performed in accordance with applicable 30 CFR 780 and 816 regulations of the United States Department of Interior, Office of Surface Mining (OSM) and included a review of available project files. The most current information contained in the Peabody Western Coal Company files includes topographic maps developed from aerial photography flown in 1989 for Peabody Western Coal Company and was used in the analyses of the structure.

STABILITY

Structure N7-D is completely incised and does not incorporate an embankment. All re-graded (incised) slopes are equal to or flatter than 4.0:1(horizontal to vertical). Given that the graded side slopes are equal to or flatter than the recommended final reclamation slopes, the slopes will be stable.

WATER PERSISTENCE

Pond N7-D is an existing impoundment located in the N-7/8 reclamation area of the Kayenta mine. The watershed draining to the impoundment is completely reclaimed or undisturbed. The area draining to the impoundment is 756 acres and, therefore, has resulted in standing water occurring in the pond during all years of average precipitation. PWCC and/or OSM personnel have documented

water persistence and/or water levels for the last 11 years. The presences of water, water depths or levels are presented in the quarterly reports and annual hydrology reports, (AHR's) to OSM.

To determine water persistence for Structure N7-D, run-off volume calculated from average annual precipitation was compared to annual evaporation and infiltration. This comparison was performed on a monthly basis. The analysis was performed beginning on the first month of the year (January) with the pond assumed to be empty. Runoff for each month was determined using the NRCS Curve Number Method and the mean monthly precipitation. To simulate conservative runoff and water persistence conditions, a curve number of 77 was used in the analysis. The curve number was determined in the following manner. Precipitation occurs at the site under antecedent I and antecedent II conditions. Antecedent I represents a condition when the soils and subsoils are dry, and antecedent II represents average conditions. It was assumed that antecedent I conditions occur 1/4 of the time, and antecedent II conditions occurs 3/4 of the time. Using a curve number of 82 for antecedent II (see Appendix A) and a curve number 64 for antecedent I, a weighted average results in a curve number of 77. The run-off volume was calculated for each month and added to the pond. A water elevation and resulting surface area for each month was determined from the pond Stage Storage curve (see Appendix C). Total evaporation and infiltration rates were calculated based on the monthly pond surface areas. The calculated evaporation and infiltration values were subtracted from the total runoff to determined the water volume increase or decrease to the pond. The pond volume calculated for the first month (January) was used as the starting volume for the next month (February). The same steps were repeated for each month. This analysis was conducted for 8 years. The inputs and results are shown in Appendix B in graphical and tabular format. As shown in Appendix C, the final surface water elevation of the pond should stabilize between an elevation of 6566.5 (low seasonal mark) and 6568 (high seasonal mark). The final pond surface water elevation corresponds to a volume of between 32 ac-ft and 41 ac-ft. The spreadsheet model indicates that on a typical year that the pond water level will be at its lowest in June of each year and then begin to collect water until reaching its maximum volume in December-January (refer to Appendix C).

WATER QUALITY

Water contained in the proposed N7-D impoundment will originate from surface water run-off from reclaimed spoil areas. Given that neither the spoils or replaced topsoil in the reclaimed area contain material which could adversely impact surface water run-off, Peabody Western Coal Company does not anticipate any problems with water quality in the N7-D impoundment. Ten full suite water quality analyses have been performed on water samples collected from the N7-D to substantiate the aforementioned statement. A statistical analysis of the water quality parameters analyzed is presented in Table 1. In addition, a comparison of the chemical concentrations versus livestock drinking water standards is presented in Table 2. None of the livestock standards for any toxic chemical constituent were exceeded. One pH measurement (6.4) at impoundment N7-D was slightly less than the standard of 6.5 and one SO4 measurement (3482 mg/l) was over the recommended standard of 3000 mg/l. Some total recoverable aluminum measurements exceeded the standard of 5 mg/l. Because none of the dissolved aluminum measurements were over 5 mg/l, it is clear the total recoverable exceedences were caused by sediment entrained with the water samples. Aluminum is soluble in an acid pH and is pulled off the sediment and dissolved during the total recoverable acid digestion. Based on the above-referenced chemical analyses, the water in the impoundment is quite well suited for its intended use as livestock and wildlife drinking water.

DIMINUTION OF ADJACENT WATER QUANTITY AND QUALITY

Peabody believes sufficient information has been submitted and evaluated by OSM in Hydrology Reports, Permits and other documents to demonstrate that this impoundment will not result in the diminution of the quantity and quality of water utilized by adjacent or surrounding landowners. Chapter 17 (Protection of the Hydrologic Balance) of the AZ-0001D Permit presents detailed descriptions of pre-existing water sources within the leasehold, including those proximate to the N-7/N-8 reclamation area. No pre-existing ponds or wells have been documented adjacent or immediately downstream of the N7-D impoundment. Plans for mitigation or replacement of pre-existing water sources that have been or may be affected by mining are presented in Chapter 17.

There is no potential for Permanent Impoundment N7-D to directly impact the adjacent downgradient water quality because it is a permanent internal impoundment and is designed to contain the 6-hour PMP with adequate freeboard. The pond has never discharged and based on the PMP analysis is never expected to discharge.

The Pond N7-D watershed of 756 acres represents approximately 2.7% of the drainage area of the encompassing watershed which drains this portion of Yellow Water Canyon Wash. If the watershed areas of N7-D and N7-E are combined, they only represent 3.6% of the Yellow Water Canyon watershed to this portion of the drainage. Based on this, any water quantity diminution due to Permanent Impoundments N7-D and E is negligible. Water levels in alluvial wells (see Appendix D, Figures 1-3) adjacent and immediately downgradient in the alluvium from the pond show normal fluctuations in response to low and high stream flow years. There is no evidence of persistent diminished recharge to the alluvium from runoff, which could be potentially attributed to the loss of watershed area associated with Pond N7-D. In addition, Peabody has no evidence that flood irrigation has been practiced along this reach of Yellow Water Canyon Wash below the N7-D impoundment. Monitoring of stream flows in the main channels on Black Mesa since 1980 has shown extremely high sediment concentrations, which would preclude flood irrigation practices due to high maintenance costs.

Chapter 18 (Probable Hydrologic Consequences) of the AZ-0001D Permit presents analyses of the potential impacts of the mining operation, including a section that discusses the effects of dams, sediment ponds and permanent impoundments on downstream users. Although some localized decreases in receiving stream runoff may result after mining areas are reclaimed, these localized decreases will become less pronounced and unmeasurable further downstream, as lateral inflows from undisturbed basins will provide additional contributions to downstream runoff volumes. Channel transmission losses, evapotranspiration and other losses in the main channels to the Little Colorado River would completely mask any runoff reductions from the smaller reclaimed areas on the leasehold.

OSM's Cumulative Hydrologic Impact Assessment (CHIA) and Environmental Impact Statement (EIS) which was written for the Black Mesa PAP in 1990, concluded that short- and long-term impacts from proposed permanent impoundments would be minor. Short- and long-term impacts of mining proposed in the PAP on the surface water quantity at Moenkopi Wash will be negligible. Based on the above summaries, Peabody maintains this impoundment will not result in the diminution of the quantity or quality of water utilized by adjacent or surrounding landowners.

HYDROLOGY

The hydrologic analysis was completed using the computer program SEDCAD4 (see Appendix B). Structure N7-D is classified as a low hazard structure (see Drawing No. 85408). In addition, the Kayenta mine area is sparsely populated with no people living in the downstream flood plain. The Pond contains no embankment. Since the structure is completely incised and is designed without an emergency spillway, it has been conservatively designed to contain the runoff volume from the General 6 Hour PMP (See calculation for 6-hour PMP, Appendix B) plus several years of sediment yield.

The following parameters were used in the hydrologic analysis, (see Appendix A):

		General 6-Hour PMP	
1.	Water Course length, L	1.962	mi.
2.	Elevation Difference, H	760	ft.
3.	Time of Concentration, T_c	0.440	hr.
4.	NRCS Curve Number	82	
5.	General 6-Hour PMP Storm Rainfall Depth	5.96	in.
6.	Pond Watershed Area	756	ac.

HYDRAULICS

The SEDCAD4 computer program was used to evaluate inflow to Structure N7-D 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 Appendix B).

Initial Reservoir Volume Condition	Units	General 6 Hr. PMP
Inflow		
Peak Flow	cfs	2,945
Volume	ac-ft	249
Starting Volume (estimated high water mark)	ac-ft	41
Starting Elevation	msl	6567'
Peak Volume (high water mark + PMP)	ac-ft	290
Peak Elevation	msl	6590.5'
Pond Crest Elevation	msl	6604'
Freeboard	ft	13.5

INLET CHANNEL

There is one inlet channel to Pond N7-D. The channel is designated as N7D-1c and is shown on the N7/N8 Drainages and Permanent Facilities map. This channel is designed for the 100-year, 6-hour storm event and all input parameters, design, and hydrology printouts are shown in the N-7 and N-8 Reclamation Areas, Reclaimed Channels, Downdrains, and Terraces, Design Report.

EMERGENCY SPILLWAY and OUTFLOW CHANNEL

Pond N7-D is designed to contain the entire runoff from the General 6-hour PMP, therefore, no emergency spillway or outflow channel is required.

STORAGE CAPACITY

The impoundment stage-capacity table (see Appendix B) is based on the existing topography for N7-D and lowering the crest of the embankment from approximately 6611 elevation to the 6604 elevation. This will reduce the existing capacity by approximately 186 ac.-ft, but still maintain adequate storage capacity. The calculations for the sediment load entering structure N7-D were made utilizing the Revised Universal Soil Loss Equation (RUSLE) using the following parameters, (see Appendix A):

1.	Rainfall Factor, R	40
2.	Soil Erodibility Factor, K	0.29
3.	Slope Factor, LS	8.44
4.	Cover Factor, C	0.21
5.	Erosion Control Factor, P	0.89

The storage capacity for structure N7-D is shown in Appendix B and the results of the runoff and sediment inflow analysis are summarized in the following table.

N7-D STORAGE

Total Storage Volume	559	ac-ft
High Water Mark Volume	41	ac-ft
Volume of General 6-hour PMP	249	ac-ft
Available Sediment Capacity	269	ac-ft
Sediment Inflow Rate	6.14	ac-ft/yr.
Sediment Storage Life	43.8	years

See Appendix A for sediment inflow calculations.

* * *

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

Appendix A - Hydrology and Sedimentology Calculations

Appendix B - SEDCAD4 (Input and Output), 6-Hour PMP Calculation

Appendix C - Water Persistence Calculation

Exhibit #1 - N7-D Permanent Impoundment Design

Table 1

Peabody Western - Black Mesa Complex
Paradox Hydrology System
Water Quality Statistics

Sample Point : N7-D-P PERM IMPOUND N7-D
Location:
Elevation:

	Uncensored Data				Censored Data				
	No of Obs	Mean	StDv	Min	Max	No of Obs		Min		Max
Field Parameters										
Field Ph S.U.	7	8.07		7.34	8.84	1	<	7.96	<	7.96
Temperature C	8	14.91	9.61	1.00	28.50					
Conductivity UMHOS/CM	8	1124.00	1544.81	211.00	4870.00					
Field Salinity 0/00	6	.70	1.00	.10	2.70	1	<	.10	<	.10
Laboratory Parameters										
Acidity MG/L	5	0.00		0.00	0.00					
Alk As CaCO3, Ph 4.5 MG/L	10	74.00	24.96	51.00	128.00					
Alk, Bicarb As CaCO3 MG/L	5	66.20	13.74	51.00	81.00					
Alk, Carb As CaCO3 MG/L						5	<	2.00	<	2.00
Alk, Hydrox As CaCO3 MG/L						5	<	2.00	<	2.00
Aluminum, Dissolved MG/L						5	<	.05	<	.05
Antimony, Dissolved UG/L	1	1.00		1.00	1.00	4	<	1.00	<	5.00
Arsenic, Dissolved UG/L						5	<	1.00	<	1.00
Barium, Dissolved UG/L	5	42.00	16.43	20.00	60.00					
Boron, Dissolved UG/L	9	56.67	26.69	20.00	140.00	1	<	20.00	<	20.00
Cadmium, Dissolved UG/L						5	<	5.00	<	10.00
Calcium, Dissolved MG/L	10	154.79	214.10	30.20	749.00					
C.O.D. MG/L	5	30.00	11.73	20.00	45.00					
Chloride MG/L	9	20.00	33.51	3.00	109.00	1	<	1.00	<	1.00
Chromium, Dissolved UG/L						5	<	10.00	<	10.00
Conductivity UMS/CM2	10	1036.20	1232.34	237.00	4420.00					
Copper, Dissolved UG/L						5	<	10.00	<	10.00
Fluoride MG/L	10	.62	.20	.30	1.10					
Hardness As CaCO3 MG/L	10	617.30	932.40	108.00	3221.00					
Iron, Total MG/L	10	1.71	2.60	.17	8.79					
Iron, Dissolved MG/L	4	.08	.03	.05	.12	6	<	.01	<	.02
Lead, Dissolved UG/L						5	<	20.00	<	20.00
Magnesium, Dissolved MG/L	10	56.16	97.13	6.30	329.00					
Manganese, Total MG/L	10	.07	.04	.01	.19					
Manganese, Dissolved MG/L	7	.05	.05	.01	.16	3	<	.01	<	.01
Mercury, Dissolved UG/L						5	<	.10	<	.20

Conditions: From: 01/01/1986...To: 12/20/2000...Sites: N7-D-P OR N7-E-P

Peabody We Black Mesa Complex
Parado. . ydrology System
Water Quality Statistics

Sample Point : N7-D-P PERM IMPOUND N7-D
Location:
Elevation:

	Uncensored Data				Censored Data		
	No of Obs	Mean	StDv	Min	Max	No of Obs	Min	Max
Laboratory Parameters								
Molybdenum, Dissolved UG/L	2	3.00	1.41	2.00	4.00	3 <	1.00 <	1.00
Nickel, Dissolved UG/L						5 <	20.00 <	20.00
Ammonia Nitrogen_N MG/L	3	.33	.25	.10	.59	2 <	.05 <	.05
Nitrate Nitrogen_N MG/L	9	1.09	1.45	.05	4.73	1 <	.02 <	.02
Nitrite Nitrogen_N MG/L	7	.08	.12	.01	.35	3 <	.01 <	.01
NO3_NO2 Nitrogen_N MG/L	9	1.11	1.44	.06	4.73	1 <	.02 <	.02
Ph At 25 Deg. Cent. S.U.	10	7.57		6.40	8.40			
Phosphorus, Orthophos MG/L	1	.01		.01	.01	4 <	.01 <	.01
Potassium, Dissolved MG/L	10	14.54	12.14	5.90	47.00			
Selenium, Dissolved UG/L	1	3.00		3.00	3.00	4 <	1.00 <	5.00
Silica, Dissolved MG/L	10	4.76	4.46	.10	14.60			
Silver, Dissolved UG/L						5 <	10.00 <	10.00
Sodium, Dissolved MG/L	10	40.83	77.30	4.80	259.00			
Solids, Dissolved MG/L	10	939.00	1422.57	140.00	4904.00			
Solids, Suspended MG/L	10	56.80	76.77	2.00	228.00			
Sulfate MG/L	10	595.10	1030.43	60.00	3482.00			
Vanadium, Dissolved UG/L						5 <	10.00 <	10.00
Zinc, Dissolved MG/L	2	.02	.01	.01	.02	3 <	.01 <	.01
Bicarbonate As HCO3 MG/L	10	90.10	30.41	62.00	156.00			
Carbonate As CO3 MG/L	5	0.00		0.00	0.00	5 <	2.00 <	2.00
Hydroxide As OH MG/L						5 <	2.00 <	2.00
Phosphate As PO4 MG/L						5 <	.10 <	.10
Cation_Anion Balance PERCENT	10	.73	1.86	-2.00	3.60			
SAR RATIO	10	.55	.54	.18	2.01			
Solids, Diss. (Calc) MG/L	10	921.42	1457.66	158.15	5005.00			
Sum Of Anions MEQ/L	5	5.22	3.97	2.50	12.10			
Sum Of Cations MEQ/L	5	5.44	4.30	2.50	12.90			
Total Recoverable Al MG/L	10	2.55	5.17	.08	17.00			
Total Recoverable As UG/L	5	1.80		1.00	4.00	5 <	1.00 <	1.00
Total Recoverable Ba UG/L	5	54.00	25.10	20.00	90.00			
Total Recoverable Cd UG/L						10 <	3.00 <	5.00
Total Recoverable Cr UG/L	1	10.00		10.00	10.00	9 <	10.00 <	10.00

Conditions: From: 01/01/1986...To: 12/20/2000...Sites: N7-D-P OR N7-E-P...

Table 1. (cont.)

Peabody Western - Black Mesa Complex
Paradox Hydrology System
Water Quality Statistics

Sample Point : N7-D-P PERM IMPOUND N7-D
Location:
Elevation:

	Uncensored Data				Censored Data				
	No of Obs	Mean	StDv	Min	Max	No of Obs		Min	Max
Laboratory Parameters									
Total Recoverable Cu UG/L	1	10.00		10.00	10.00	9	<	10.00 <	20.00
Total Recoverable Fe MG/L	5	.49	.53	.06	1.38				
Total Recoverable Pb UG/L						10	<	20.00 <	40.00
Total Recoverable Mn MG/L	5	.07	.06	.02	.18				
Total Recoverable Hg UG/L						10	<	.10 <	.20
Total Recoverable Mo UG/L	3	2.67	1.15	2.00	4.00	2	<	1.00 <	1.00
Total Recoverable Ni UG/L						5	<	20.00 <	20.00
Total Recoverable Se UG/L	4	4.00	4.04	1.00	10.00	6	<	1.00 <	1.00
Total Recoverable Ag UG/L						5	<	10.00 <	10.00
Total Recoverable Zn MG/L	7	.02		.01	.04	3	<	.01 <	.01
TDS Ratio ANAL/CALC	10	1.05	.09	.89	1.20				
Total Recoverable Sb UG/L	1	3.00		3.00	3.00	4	<	1.00 <	10.00
Total Recoverable V UG/L	2	21.00	22.07	5.00	37.00	8	<	5.00 <	10.00

Conditions: From: 01/01/1986...To: 12/20/2000...Sites: N7-D-P OR N7-E-P

Tab

---- Excursion Summary Repor

Analyte	Standard	No. Sites	Sites	Frequency	Exceedence Date Range	Exceedence Value Range	Exceedence Median
Aluminum, Dissolved	0.0000 - 5.0000	0	none				
Arsenic, Dissolved	0.0000 - 200.0000	0	none				
Boron, Dissolved	0.0000 - 5000.0000	0	none				
Cadmium, Dissolved	0.0000 - 50.0000	0	none				
Chloride	0.0000 - 2000.0000	0	none				
Chromium, Dissolved	0.0000 - 1000.0000	0	none				
Copper, Dissolved	0.0000 - 500.0000	0	none				
Fluoride	0.0000 - 2.0000	0	none				
Lead, Dissolved	0.0000 - 100.0000	0	none				
Mercury, Dissolved	0.0000 - 10.0000	0	none				
Nickel, Dissolved	0.0000 - 1000.0000	0	none				
Nitrate Nitrogen_N	0.0000 - 100.0000	0	none				
Nitrite Nitrogen_N	0.0000 - 10.0000	0	none				
Ph At 25 Deg. Cent.	6.5000 - 8.5000	1	N7-D-P	1/8	03/04/98-03/04/98	6.4000 - 6.4000	6.4000
Selenium, Dissolved	0.0000 - 50.0000	0	none				
Solids, Dissolved	0.0000 - 5000.0000	0	none				
Sulfate	0.0000 - 3000.0000	1	N7-D-P	1/8	12/09/92-12/09/92	3482.0000 - 3482.0000	3482.0000
Total Recoverable Al	0.0000 - 5.0000	2	N7-D-P N7-E-P	1/8 6/11	09/01/99-09/01/99 09/02/93-07/10/99	17.0000 - 17.0000 5.8500 - 49.9000	17.0000 11.1800
Total Recoverable As	0.0000 - 200.0000	0	none				
Total Recoverable Cd	0.0000 - 50.0000	0	none				
Total Recoverable Cr	0.0000 - 1000.0000	0	none				
Total Recoverable Cu	0.0000 - 500.0000	0	none				
Total Recoverable Hg	0.0000 - 10.0000	0	none				
Total Recoverable Ni	0.0000 - 1000.0000	0	none				
Total Recoverable Pb	0.0000 - 100.0000	1	N7-E-P*	2/11	08/05/97-07/10/99	200.0000 - 400.0000	300.0000
Total Recoverable Se	0.0000 - 50.0000	0	none				
Total Recoverable V	0.0000 - 100.0000	0	none				

Table 2. (cont.)

Total Recoverable Zn	0.0000 -	25.0000	0	none
Vanadium, Dissolved	0.0000 -	100.0000	0	none
Zinc, Dissolved	0.0000 -	25.0000	0	none

* = Sample below detection limit and detection limit greater than standard.

Fig

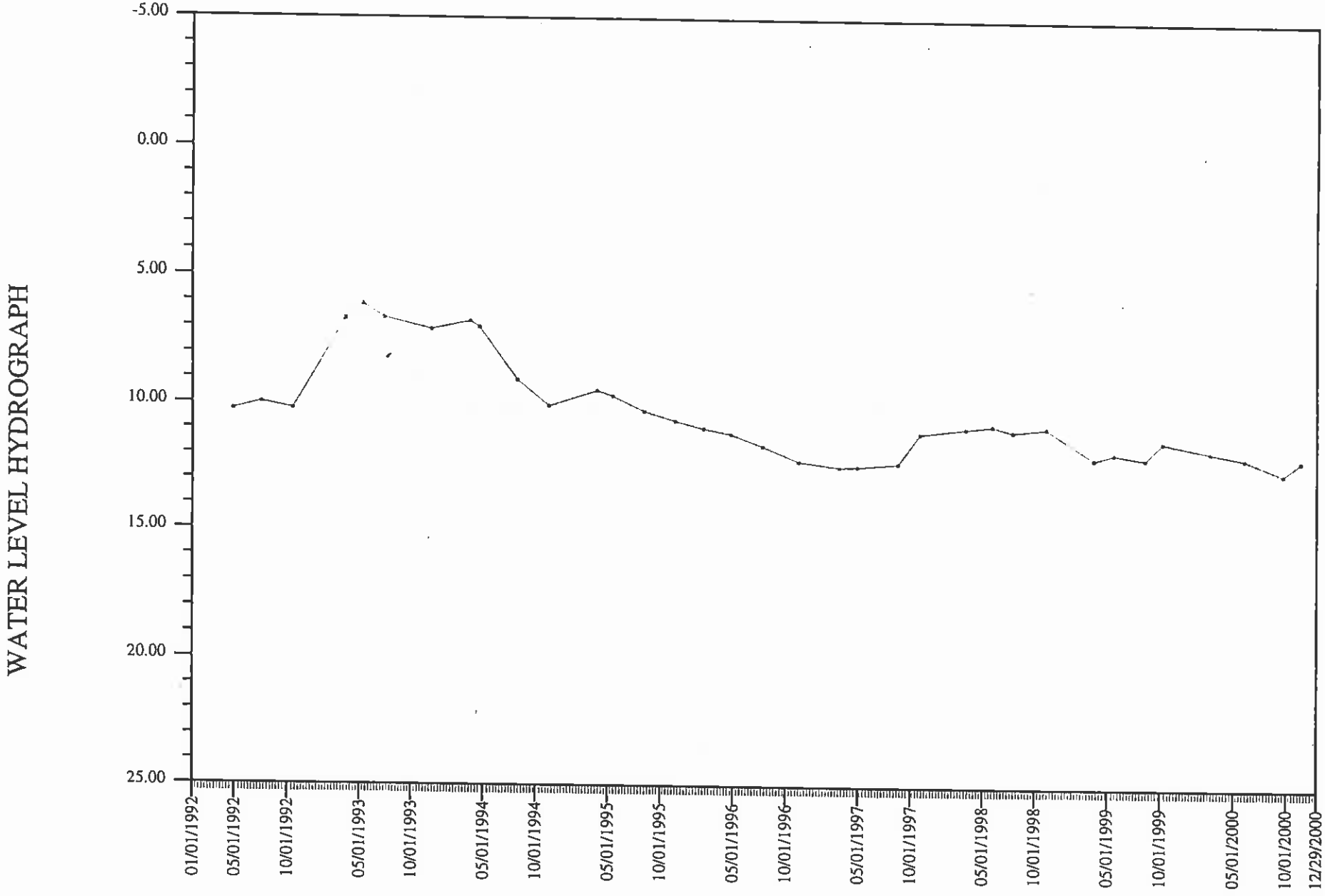
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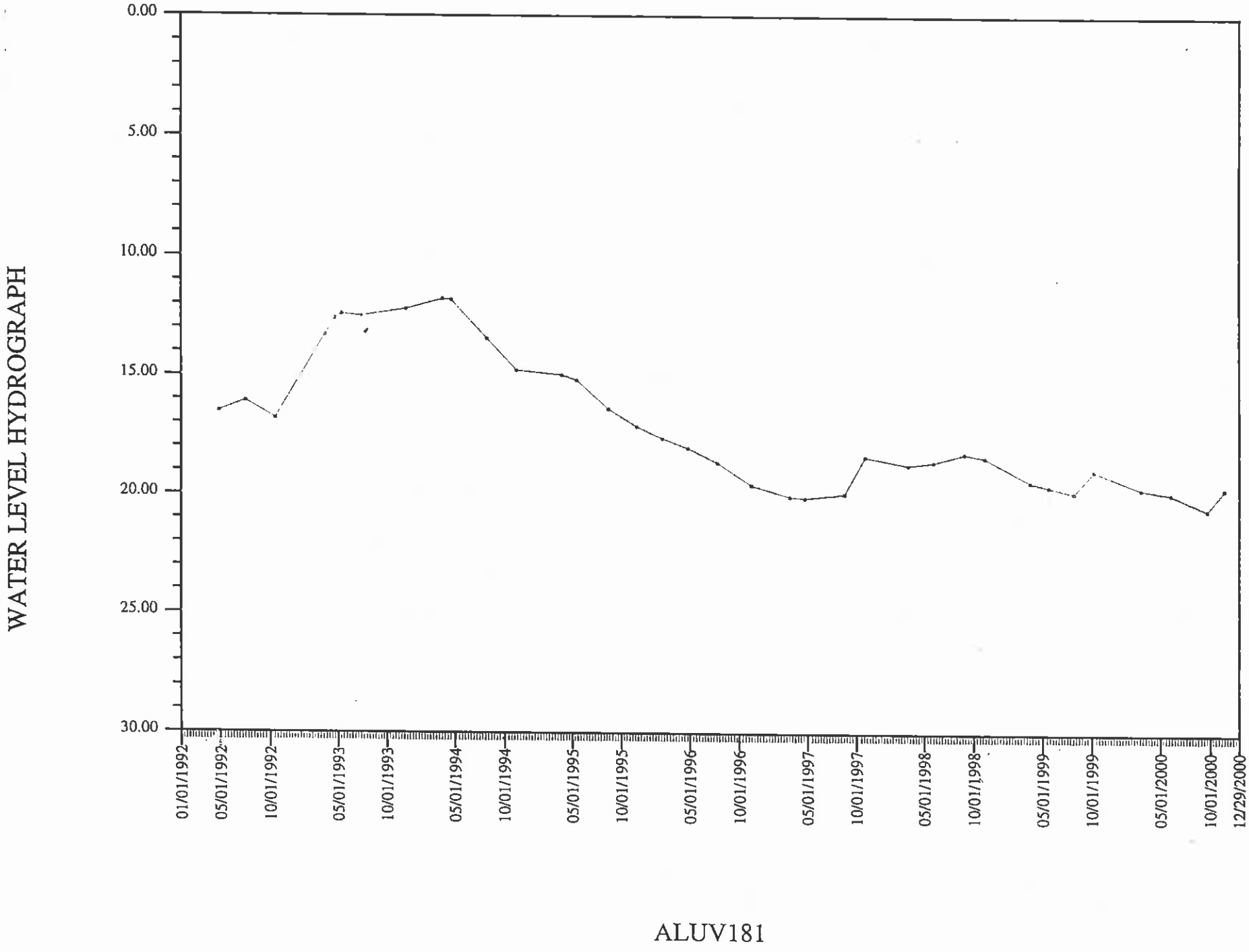
Figure 2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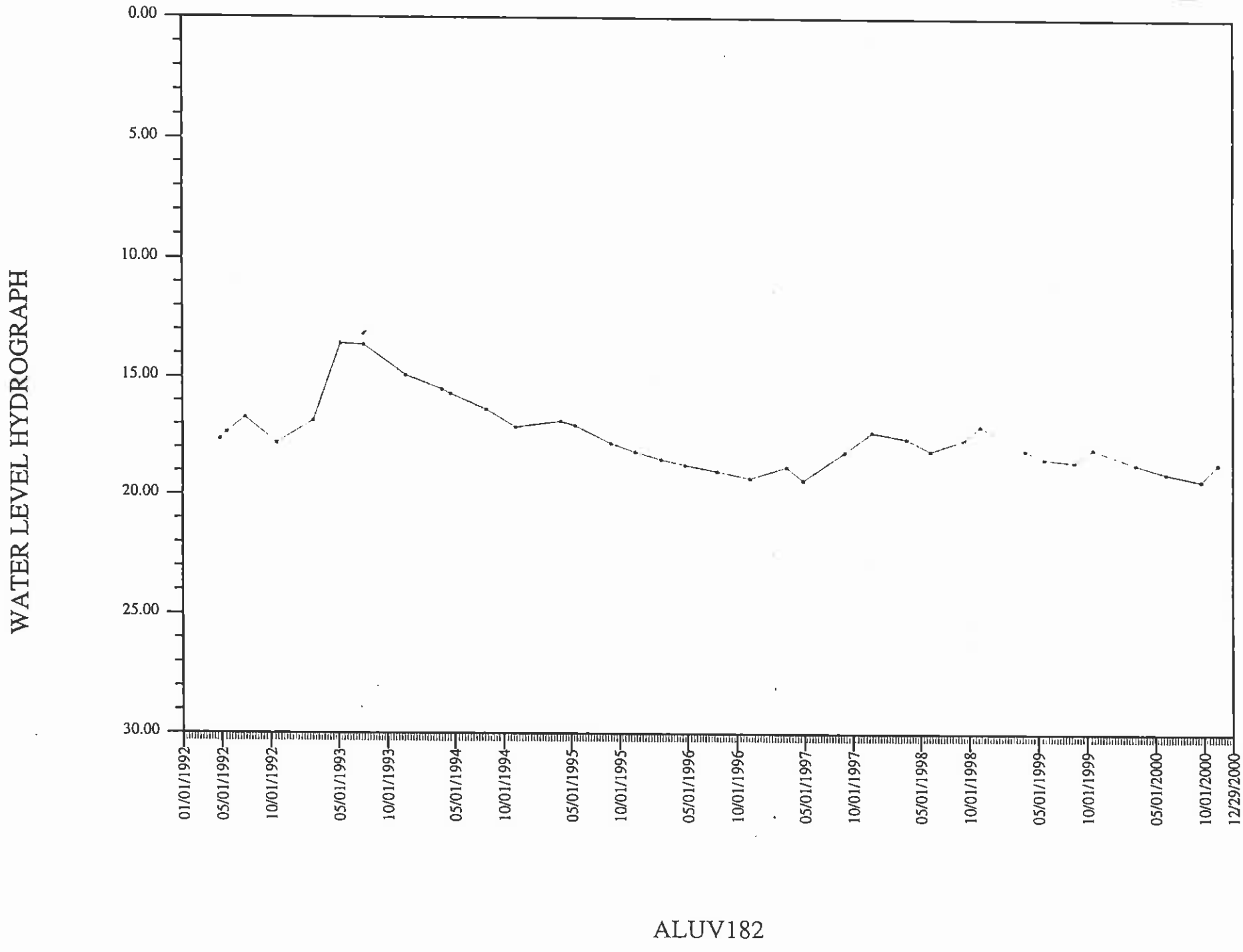
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ALUV182

APPENDIX A

Hydrology and Sedimentation Calculations

PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA

PROJECT: N7/N8 AREA

STRUCTURE: N7-D Pond

TIME OF CONCENTRATION:

Start Elevation (ft) =	7320
End Elevation (ft) =	6560
Elevation Difference, E (ft) =	760
Watercourse Length (ft) =	10360
Watercourse Length, L (mi) =	1.962

Tc = (11.9L^3/E)^0.385 = 0.440 hours

ROUTING PARAMETERS:

Between structure routing parameters were calculated using the SCS Upland Method In SEDCAD4. Input and output parameters are shown on the SEDCAD4 printouts in Appendices C.

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Reclaimed	C	81	418.4	33890.4
Undisturbed-Pinon Juniper	D	83	337.6	28020.8
TOTAL:			756	61911.2

Weighted CN = Total CN*Area/ Total Area = 82

DRAINAGE BASIN AREA:

756.0 Acres

RAINFALL FACTOR:

R = 40

U S Dept. of Commerce
NOAA
Hydrometeorological Report No. 49

10/18/2000
DJK

Table 6.1.--General-storm PMP computations for the Colorado River and Great basin

Drainage Red Peak Valley Wash 110° 19' 52" Area 6.2 (mi²) (km²)

Latitude 36°26'13", Longitude ___ of basin center

Month August

Step		Duration (hrs) 6	12	18	24	48	72
A.	Convergence PMP						
1.	Drainage average value from one of figures 2.5 to 2.16	12.5 in. (mm)					
2.	Reduction for barrier-elevation [fig. 2.18]	45%					
3.	Barrier-elevation reduced PMP [step 1 X step 2]	5.625 in. (mm)					
4.	Durational variation [figs. 2.25 to 2.27 and table 2.7].	72					%
5.	Convergence PMP for indicated durations [steps 3 X 4]	4.05					in. (mm)
6.	Incremental 10 mi² (26 km²) PMP [successive subtraction in step 5] Fig. 4.9	4.05					in. (mm)
7.	Areal reduction [select from figs. 2.28 and 2.29]	100					%
8.	Areally reduced PMP [step 6 X step 7]	4.05					in. (mm)
9.	Drainage average PMP [accumulated values of step 8]	4.05					in. (mm)
B.	Orographic PMP						
1.	Drainage average orographic index from figure 3.11a to d.	(revised) 5.8 in. (mm)					
2.	Areal reduction [figure 3.20]	100%					
3.	Adjustment for month [one of figs. 3.12 to 3.17]	100%					
4.	Areally and seasonally adjusted PMP [steps 1 X 2 X 3]	5.8 in. (mm)					
5.	Durational variation [table ~~3.9~~ 3.9]	33					%
6.	Orographic PMP for given durations [steps 4 X 5]	1.91					in. (mm)
C.	Total PMP						
1.	Add steps A9 and B6	5.96					in. (mm)
2.	PMP for other durations from ~~smooth curve~~ fitted to plot of computed data.						
3.	Comparison with local-storm PMP (see sec. 6.3).						

General PMP = 5.96 in

" " PMP = 7.99 in

PEABODY WESTERN COAL COMPANY
CALCULATED SEDIMENTOLOGY DATA

PROJECT: N7-D Pond

SOIL ERODIBILITY FACTOR:

Soil Type	Erodibility Factor, K	Area (acres)	K*Area
35	0.38	473.6	179.97
30	0.18	255.3	45.95
42	0.16	82.3	13.17
TOTAL:		811.2	239.09

Weighted K = Total K*Area/ Total Area = 0.29

SLOPE FACTOR:

Length (ft)	Elevation Change (ft)	Slope (%)	m	Slope Angle (deg)	LS Factor
490	60	12.2%	0.6	7.0	4.85
510	90	17.6%	0.6	10.0	7.79
240	30	12.5%	0.6	7.1	3.25
570	80	14.0%	0.6	8.0	6.32
680	130	19.1%	0.6	10.8	10.16
770	120	15.6%	0.6	8.9	8.61
300	90	30.0%	0.6	16.7	10.14
520	140	26.9%	0.6	15.1	12.60
620	170	27.4%	0.6	15.3	14.28
360	110	30.6%	0.6	17.0	11.52
330	50	15.2%	0.6	8.6	5.00
470	50	10.6%	0.6	6.1	3.92
540	140	25.9%	0.6	14.5	12.39
700	100	14.3%	0.6	8.1	7.31

Average LS = 8.44

The LS Factor was calculated by:

LS = (Slope Length/72.6)^m(10.8*sin(slope angle) + 0.03) for Slopes < 9%*

LS = (Slope Length/72.6)^m(16.8*sin(slope angle) - 0.5) for Slopes > 9%*

Where:

Slope < 3% *m = 0.3*
Slope = 4% *m = 0.4*
5% > Slope < 10% *m = 0.5*
Slope > 10% *m = 0.6*

COVER AND PRACTICE FACTORS:

Cover Type	Cover (%)	Canopy (%)	Area (acres)	Cover Factor, C	C*Area	Practice Factor, P	P*Area
Reclaimed (Post-Law)	40%	0%	418.4	0.20	83.68	0.80	334.72
Undist. Pinon Juniper	35%	25%	337.6	0.22	74.27	1.00	337.60
TOTAL:			756		157.95		672.32

Weighted C = Total C*Area/ Total Area = 0.209

Weighted P = Total P*Area/ Total Area = 0.889

PEABODY WESTERN COAL COMPANY
CALCULATED SEDIMENT YIELD

PROJECT: N7-D POND

The following spreadsheet calculates the predicted sediment yield for the project area. The gross sediment yie is determined according to the Revised Universal Soil Loss Equation.

PARAMETER DESCRIPTION	VALUE	
Annual Rainfall Factor	40.00	
Soil Erodibility Factor	0.29	
Length Slope Factor	8.44	
Cover Factor	0.21	
Practice Factor	0.89	
Gross Annual Sediment Yield	18.48	tons/acre/year
Sediment Density	94.00	pcf
Gross Annual Sediment Yield	0.0090	acre-feet/acre/year
Sediment Delivery Ratio	90%	
Estimated Annual Sediment Yield	0.0081	acre-feet/acre/year
Watershed Area	756	acres
Watershed Annual Sediment Yield	6.14	acre-feet/year
Number of years	1	years
Calculated Sediment Volume	6.14	acre-feet

APPENDIX B

SEDCAD4 (Input and Output)

General 6-Hour PMP Calculation

PEABODY WESTERN KAYENTA MINE POND N7-D

General 6 Hour PMP

DJK

Montgomery Watson
165 S. Union Blvd.
Suite 410
Lakewood, Co. 80228

Phone: 303 763-5140

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100000 yr - 6 hr
Rainfall Depth:	5.960 inches

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	756.000	756.000	2,945.21	248.87

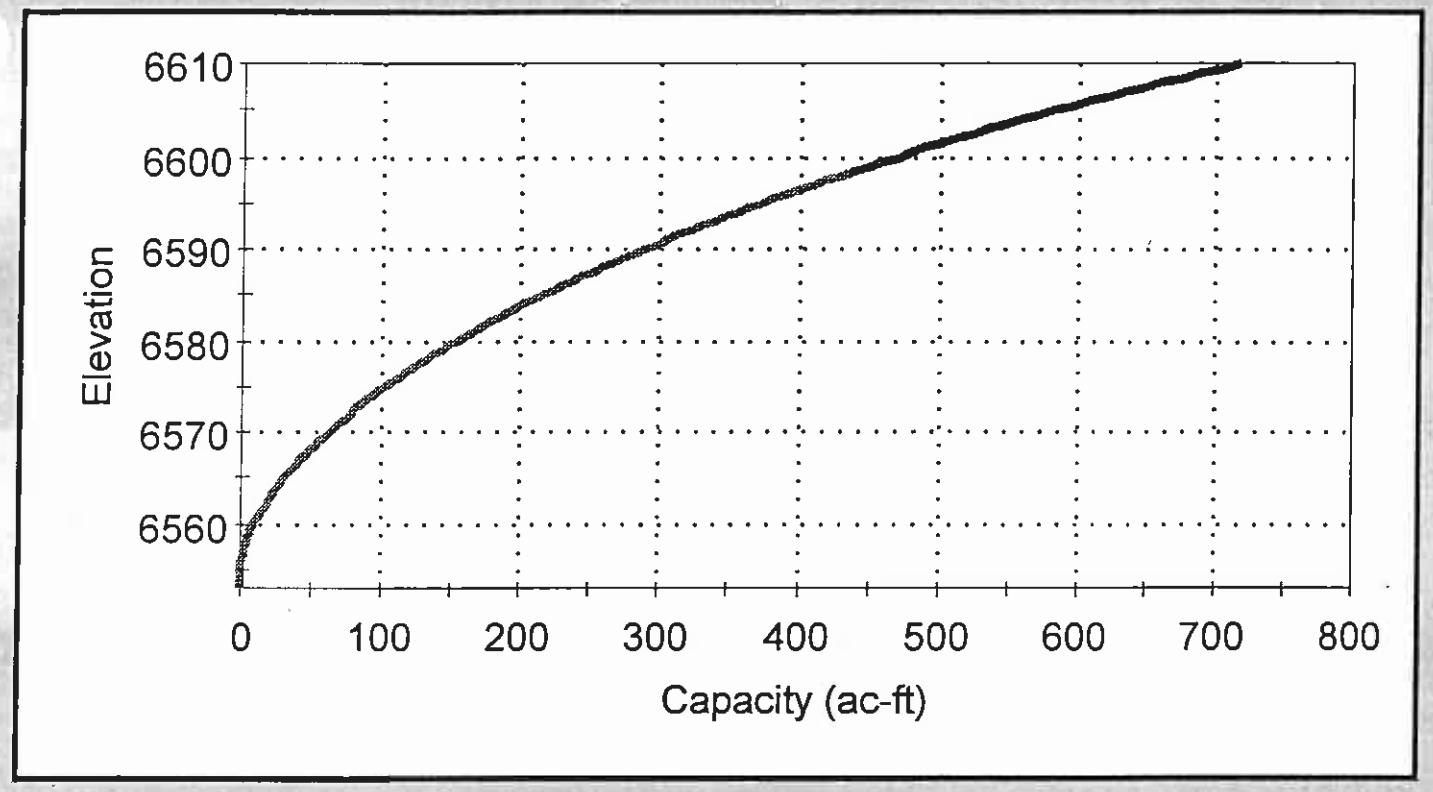
Subwatershed Hydrology Detail:

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	756.000	0.440	0.000	0.000	82.000	F	2,945.21	248.871
	$\sum$	**756.000**						**2,945.21**	**248.871**

APPENDIX C

Water Persistence

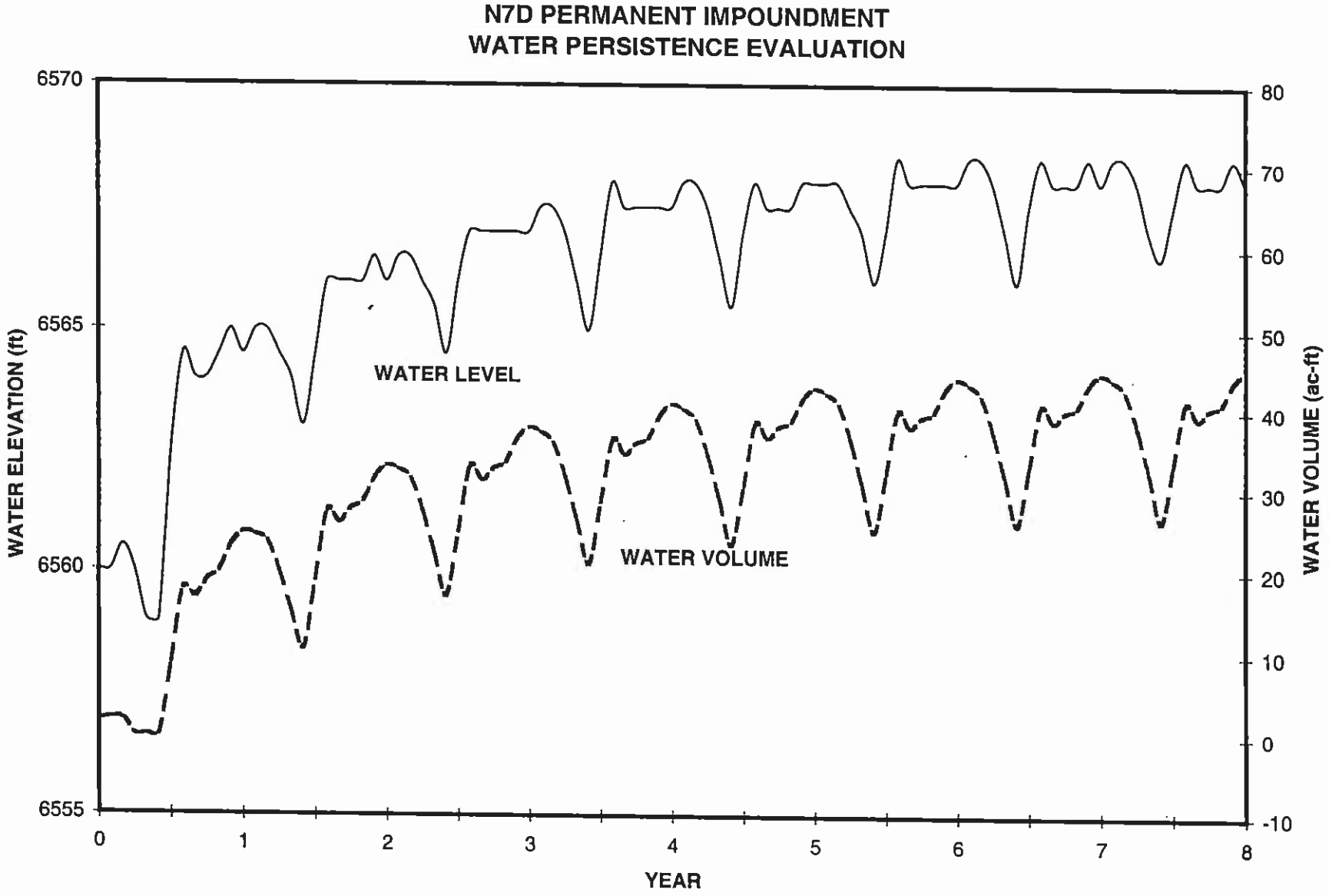
PERMANENT IMPOUNDMENT N7-D



Elevation-Area-Capacity Table

Elevation	Area (ac)	Capacity (ac-ft)
6,553.00	0.010	0.000
6,554.00	0.128	0.058
6,555.00	0.375	0.299
6,556.00	0.749	0.850
6,557.00	1.255	1.841
6,558.00	1.892	3.404
6,559.00	2.657	5.668
6,560.00	3.550	8.761
6,561.00	3.864	12.466
6,562.00	4.190	16.492
6,563.00	4.530	20.852
6,564.00	4.884	25.558
6,565.00	5.249	30.623
6,566.00	5.630	36.061
6,567.00	6.022	41.886
6,568.00	6.428	48.110
6,569.00	6.848	54.747
6,570.00	7.280	61.810
6,571.00	7.644	69.272
6,572.00	8.017	77.102
6,573.00	8.399	85.309
6,574.00	8.790	93.903
6,575.00	9.189	102.892
6,576.00	9.598	112.284
6,577.00	10.015	122.090
6,578.00	10.441	132.317
6,579.00	10.876	142.976
6,580.00	11.320	154.073
6,581.00	11.719	165.592
6,582.00	12.125	177.514
6,583.00	12.538	189.844
6,584.00	12.957	202.591
6,585.00	13.384	215.761
6,586.00	13.817	229.361
6,587.00	14.258	243.398
6,588.00	14.705	257.879
6,589.00	15.159	272.810
6,590.00	15.620	288.200
6,591.00	16.106	304.062
6,592.00	16.599	320.414

Elevation	Area (ac)	Capacity (ac-ft)
6,593.00	17.099	337.262
6,594.00	17.607	354.615
6,595.00	18.122	372.479
6,596.00	18.645	390.862
6,597.00	19.175	409.771
6,598.00	19.713	429.214
6,599.00	20.258	449.199
6,600.00	20.810	469.733
6,601.00	21.576	490.924
6,602.00	22.354	512.888
6,603.00	23.146	535.637
6,604.00	23.953	559.185
6,605.00	24.772	583.547
6,606.00	25.607	608.736
6,607.00	26.454	634.765
6,608.00	27.316	661.649
6,609.00	28.192	689.402
6,610.00	29.080	718.037


N7D PERMANENT IMPOUNDMENT
WATER PERSISTENCE EVALUATION
WATER ELEVATION (ft)
6570
6565
6560
6555
WATER VOLUME (ac-ft)
80
70
60
50
40
30
20
10
0
-10
WATER LEVEL
WATER VOLUME
0
1
2
3
4
5
6
7
8
YEAR

PEABODY WESTERN COAL COMPANY
N7D PERMANENT IMPOUNDMENT POND WATER PERSISTENC

0

0

	January	February	March	April	May	June	July	August	September	October
Average Precipitation (inch)	0.95	0.86	0.89	0.58	0.45	0.46	1.49	1.49	0.95	1.09
Area (acres)	756.0	756.0	756.0	756.0	756.0	756.0	756.0	756.0	756.0	756.0
Curve Number	77	77	77	77	77	77	77	77	77	77
S	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99
Run-Off (inches)	0.04	0.02	0.03	0.00	0.00	0.00	0.21	0.21	0.04	0.07
Run-Off (ac-ft)	2.35	1.34	1.64	0.00	0.00	0.00	12.94	12.94	2.35	4.39
Starting Pond Volume (ac-ft)	0	1.78	2.05	1.92	0.00	0.00	0.00	8.89	17.78	16.80
Pond Volume + Runoff (ac-ft)	2.35	3.11	3.70	1.92	0.00	0.00	12.94	21.83	20.12	21.19
Water Elevation (ft)	6560	6560	6560.5	6560	6559	6559	6562.5	6564.5	6564	6564
Water Surface Area (acres)	3.55	3.55	3.72	3.55	0.00	0.00	4.41	5.10	4.93	4.93
Evaporation Rate (inches/month)	0.87	2.63	4.68	7.38	10.54	10.77	9.95	8.49	7.08	4.68
Evaporation (ac-ft)	0.26	0.78	1.45	2.18	0.00	0.00	3.66	3.61	2.91	1.92
Infiltration Rate (inches/month)	1.054	0.952	1.054	1.02	1.054	1.02	1.054	1.054	1.02	1.054
Infiltration (ac-ft)	0 31	0.28	0.33	0.30	0.00	0.00	0.39	0.45	0.42	0.43
Total Water Loss (ac-ft)	0.57	1.06	1.78	2.49	0.00	0.00	4.04	4.05	3.33	2.35
Total Water Change (ac-ft)	1.78	0.28	-0.13	-2.49	0.00	0.00	8.89	8.88	-0.98	2.04
Ending Pond Volume	1.78	2.05	1.92	0.00	0.00	0.00	8.89	17.78	16.80	18.84

Notes:

1) Run-off volumes based on SCS Runoff Curve Number method: $Q = (P-0.2S)^2/(P+0.8S)$

P= Accumulative Precipitation
S= (1000/CN)-10

2) Evaporation and Infiltration rates based on data presented in the report entitled " Hydrologic and Engineering Studies at the Peabody