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DIVISION OF OIL
GAS & MINING PRICE UTAH

Compliance with:

Division Order, Sunnyside Coal Company, Sunnyside Mine, ACT/007/007-DO-91B, Folder #3, Carbon County, Utah

Sunnyside Mine
Impoundments, Sediment Structures, and Slurry Containment Ponds

Prepared for:

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINE
Sunnyside, UT 84539

Prepared by:

J. Michael Elder
JME Companies
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April 10, 1992

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April 10, 1992

Mr. Gary Gray
Chief Engineer
Sunnyside Mine
P.O. Box 99
Sunnyside, UT 84539

Re: Division Order, Sunnyside Coal Company

Certification

I prepared the attached compliance with **Division Order, Sunnyside Coal Company, Sunnyside Mine, ACT/007/007-DO-91B, Folder #3, Carbon County, Utah**. This document is based on information provided by Sunnyside Mine and the information provided to me is accepted as correct.

Several computer programs, notably STORM and FLOWMASTER, were used to develop the runoff amounts and flow capacities in determining the adequacy of the ponds and impoundments. Sediment load capacity adequacy is based on the Universal Soil Loss Equation. All calculations comprising the report were either performed by me or under my direction. The designs and drawings forming the basis for the calculations were reviewed by me and are accepted as correct.

I certify that the attached document is correct to my knowledge and belief.

COLORADO REGISTERED
J. MICHAEL ELDER
15803
April 10, 1992
PROFESSIONAL ENGINEER

J. Michael Elder, PE
Engineer

Compliance with:

Division Order, Sunnyside Coal Company, Sunnyside Mine, ACT/007/007-DO-91B, Folder #3, Carbon County, Utah

Sunnyside Mine
Impoundments, Sediment Structures, Slurry Containment Ponds

TwinShafts Mine Water Discharge Impoundment (001)
Old Whitmore Mine Water Impoundment (002A)
New Whitmore Mine Water Impoundment (002B)
Clear Water Pond Sediment Pond (004)
Manshaft Sediment Pond (006)
Railcut Sediment Pond (007)
Old Course Refuse Road Sediment Pond (008)
Pasture Sediment Pond (009)
Lower No. 2 Canyon Sediment Pond (010)
Upper No. 2 Canyon Sediment Pond (011)
No. 3 Hoist House Sediment Pond (013)
Slurry Cell No. 1 Sediment Pond
Slurry Cell No. 2 Sediment Pond
East Slurry Cell Containment Pond
West Slurry Cell Containment Pond

Twinshafts Mine Water Discharge Impoundment

The Twinshafts Mine Water Discharge impoundment with NPDES discharge point designation 001 is located in Whitmore Canyon, in the vicinity of the upper bathhouse. It is an off-channel, temporary impoundment with a total as-built contained volume of approximately 6.16 acre-feet. The structure captures water pumped from underground mine workings and continually discharges water after an appropriate retention time. The only surface water runoff captured by this impoundment is the direct precipitation into the impoundment and a small 3.2 acre watershed within an approved ASCA northeast of the impoundment.

The structure is a temporary impoundment as addressed in R645-301-733. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The impoundment meets the single-open channel spillway exemption of R645-301-743.132 by meeting the requirements of R645-301-742.225.2.

The impoundment is designed for 24-hour retention of mine water and when in use typically discharges 600 gpm. As constructed the structure utilizes a 24-inch CMP as the only spillway. The structure also contains a 2-inch decant pipe located approximately 2-inches above the outlet elevation of the 24-inch CMP.

The impoundment requires approximately 2.65 acre-feet of storage as a mine water impoundment. The impoundment is discharged through a 24-inch CMP culvert when the contained volume of the pond is approximately 3.42 acres (an as-built 0.77 acre-foot sediment volume and a 2.65 acre-foot storage volume). The impoundment has an additional capacity of 1.12 acre-feet above the discharge elevation and below the freeboard elevation. This area actively discharges when the impoundment is in use.

The 24-inch CMP has a full flow capacity of over 35 cfs. The CMP passes a 25-year, 6-hour precipitation peak discharge of 0.97 cfs plus a mine water discharge of 1.34 cfs discharge for a total of 2.31 cfs. The impoundment controls a 100-year, 6-hour event by capturing the 0.17 acre-foot event (0.14 ac-ft direct precipitation to the impoundment and 0.03 ac-ft from the watershed) within the 1.12 acre-feet of capacity between the outlet elevation and the free-board elevation while simultaneously discharging 2.57 cfs (precipitation event of 1.23 cfs and normal mine water discharge of 1.34 cfs).

The 24-inch culvert can sustain blockage exceeding 95% of the available capacity and still maintain proper flows. Based on a worst case scenario of total blockage of the 24-inch CMP while actively pumping mine water to the impoundment, a 100-year, 6-hour precipitation event will be contained within the excess capacity of the impoundment as will slightly more than 23 hours of mine water inflow.

The pond also contains a 2-inch decant pipe. The 2-inch decant pipe

is located approximately 2-inches above the bottom of the 24-inch CMP outlet. The 2-inch pipe has no significant use with the current pond design. The 2-inch pipe may be open or closed without any effect on the operation of the pond.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
TWINSHAFTS MINE WATER DISCHARGE IMPOUNDMENT
NPDES 001

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area I	3.17	660.0	36.0	5.5	61	Overland			ASCA area northeast of impoundment
Pond Surface	0.84	100.0	0.0	0.0	100	None			
Totals	4.01								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	6.16	
Capacity w/2' freeboard	4.54	Excludes capacity above freeboard
Temporary storage capacity	1.12	Capacity between outlet & freeboard
Sediment load capacity	0.77	Design sediment load capacity
Available Capacity	2.65	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	0.97 cfs	1.13 cfs	1.23 cfs
Discharge Volume	0.12 acre-feet	0.14 acre-feet	0.17 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	2.000 feet	0.167 feet	
Slope	0.085 ft/ft	0.085 ft/ft	
Manning's n	0.024	0.010	
Discharge	35.730 cfs	0.120 cfs	
Velocity	11.370 fps	5.200 fps	

SEDIMENT LOAD - Required (Uniform Soil Loss Equation)	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP
Area I	0.01	1.3	20	0.22	1.78	0.17
Pond Surface	0.00	0.0				
Totals	0.01					

Project Title = TwinShaft Mine Water Impoundment

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 61.0

Area = 3.2 acres

Hydraulic length = 660.00 Feet

Elevation change = 36.0 feet.

Concentration time = 0.11 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2

Curve number = 100.0

Area = 0.8 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 4.0 acres

-- Storm data

Total precipitation = 1.6 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 0.97 cfs

Discharge volume = 0.12 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.037
0.20	0.010	0.067	*	0.30	0.010	0.076
0.40	0.010	0.081	*	0.50	0.010	0.084
0.60	0.016	0.102	*	0.70	0.016	0.117
0.80	0.016	0.122	*	0.90	0.016	0.124
1.00	0.016	0.126	*	1.10	0.017	0.131
1.20	0.017	0.136	*	1.30	0.017	0.137
1.40	0.017	0.138	*	1.50	0.017	0.139
1.60	0.031	0.188	*	1.70	0.031	0.226
1.80	0.031	0.238	*	1.90	0.031	0.245
2.00	0.031	0.249	*	2.10	0.121	0.572
2.20	0.121	0.827	*	2.30	0.121	0.904
2.40	0.121	0.952	*	2.50	0.121	0.973
2.60	0.032	0.656	*	2.70	0.032	0.405
2.80	0.032	0.330	*	2.90	0.032	0.282
3.00	0.032	0.262	*	3.10	0.026	0.238
3.20	0.026	0.220	*	3.30	0.026	0.214
3.40	0.026	0.211	*	3.50	0.026	0.209
3.60	0.018	0.180	*	3.70	0.018	0.158
3.80	0.018	0.154	*	3.90	0.018	0.152
4.00	0.018	0.153	*	4.10	0.016	0.149

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.016	0.148				
4.20	0.016	0.145	*	4.30	0.016	0.145
4.40	0.016	0.147	*	4.50	0.016	0.148
4.60	0.013	0.138	*	4.70	0.013	0.130
4.80	0.013	0.129	*	4.90	0.013	0.128
5.00	0.013	0.129	*	5.10	0.012	0.124
5.20	0.012	0.121	*	5.30	0.012	0.121
5.40	0.012	0.121	*	5.50	0.012	0.122
5.60	0.013	0.130	*	5.70	0.013	0.136
5.80	0.013	0.139	*	5.90	0.013	0.141
6.00	0.013	0.143	*	6.10	0.000	0.075
6.20	0.000	0.027	*	6.30	0.000	0.012
6.40	0.000	0.003	*			

Project Title = TwinShaft Mine Water Impoundment

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Inflow into structure # 1

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Curve number = 61.0

Area = 3.2 acres

Hydraulic length = 660.00 Feet

Elevation change = 36.0 feet.

Concentration time = 0.11 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2

Curve number = 100.0

Area = 0.8 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 4.0 acres

-- Storm data

Total precipitation = 1.8 inches

Storm type = SCS Type 2 storm. 24 hour storm

Peak Discharge = 1.13 cfs

Discharge volume = 0.14 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.007
0.20	0.002	0.012	*	0.30	0.002	0.013
0.40	0.002	0.014	*	0.50	0.002	0.015
0.60	0.002	0.015	*	0.70	0.002	0.015
0.80	0.002	0.015	*	0.90	0.002	0.015
1.00	0.002	0.015	*	1.10	0.002	0.016
1.20	0.002	0.017	*	1.30	0.002	0.018
1.40	0.002	0.018	*	1.50	0.002	0.018
1.60	0.002	0.018	*	1.70	0.002	0.018
1.80	0.002	0.018	*	1.90	0.002	0.018
2.00	0.002	0.018	*	2.10	0.002	0.018
2.20	0.002	0.018	*	2.30	0.002	0.018
2.40	0.002	0.018	*	2.50	0.002	0.018
2.60	0.002	0.018	*	2.70	0.002	0.018
2.80	0.002	0.018	*	2.90	0.002	0.018
3.00	0.002	0.018	*	3.10	0.003	0.019
3.20	0.003	0.020	*	3.30	0.003	0.021
3.40	0.003	0.021	*	3.50	0.003	0.021
3.60	0.003	0.021	*	3.70	0.003	0.021
3.80	0.003	0.021	*	3.90	0.003	0.021
4.00	0.003	0.021	*	4.10	0.003	0.022

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.003	0.022				
4.20	0.003	0.023	*	4.30	0.003	0.023
4.40	0.003	0.024	*	4.50	0.003	0.024
4.60	0.003	0.024	*	4.70	0.003	0.024
4.80	0.003	0.024	*	4.90	0.003	0.024
5.00	0.003	0.024	*	5.10	0.003	0.024
5.20	0.003	0.024	*	5.30	0.003	0.024
5.40	0.003	0.024	*	5.50	0.003	0.024
5.60	0.003	0.024	*	5.70	0.003	0.024
5.80	0.003	0.024	*	5.90	0.003	0.024
6.00	0.003	0.024	*	6.10	0.004	0.026
6.20	0.004	0.029	*	6.30	0.004	0.029
6.40	0.004	0.030	*	6.50	0.004	0.030
6.60	0.004	0.030	*	6.70	0.004	0.030
6.80	0.004	0.030	*	6.90	0.004	0.030
7.00	0.004	0.030	*	7.10	0.004	0.030
7.20	0.004	0.030	*	7.30	0.004	0.030
7.40	0.004	0.030	*	7.50	0.004	0.030
7.60	0.004	0.030	*	7.70	0.004	0.030
7.80	0.004	0.030	*	7.90	0.004	0.030
8.00	0.004	0.030	*	8.10	0.005	0.034
8.20	0.005	0.037	*	8.30	0.005	0.038
8.40	0.005	0.038	*	8.50	0.005	0.039
8.60	0.005	0.040	*	8.70	0.005	0.041
8.80	0.005	0.041	*	8.90	0.005	0.042
9.00	0.005	0.042	*	9.10	0.006	0.044
9.20	0.006	0.046	*	9.30	0.006	0.047
9.40	0.006	0.047	*	9.50	0.006	0.048
9.60	0.007	0.050	*	9.70	0.007	0.052
9.80	0.007	0.053	*	9.90	0.007	0.053
10.00	0.007	0.053	*	10.10	0.008	0.060
10.20	0.008	0.065	*	10.30	0.008	0.067
10.40	0.008	0.068	*	10.50	0.008	0.068
10.60	0.011	0.079	*	10.70	0.011	0.087
10.80	0.011	0.090	*	10.90	0.011	0.091
11.00	0.011	0.092	*	11.10	0.018	0.115
11.20	0.018	0.132	*	11.30	0.018	0.138
11.40	0.018	0.141	*	11.50	0.018	0.143
11.60	0.140	0.583	*	11.70	0.140	0.931
11.80	0.140	1.034	*	11.90	0.140	1.101
12.00	0.140	1.129	*	12.10	0.026	0.721
12.20	0.026	0.398	*	12.30	0.026	0.303
12.40	0.026	0.246	*	12.50	0.026	0.225
12.60	0.014	0.179	*	12.70	0.014	0.143
12.80	0.014	0.133	*	12.90	0.014	0.128
13.00	0.014	0.126	*	13.10	0.010	0.112
13.20	0.010	0.101	*	13.30	0.010	0.098
13.40	0.010	0.097	*	13.50	0.010	0.097
13.60	0.008	0.088	*	13.70	0.008	0.081
13.80	0.008	0.079	*	13.90	0.008	0.078
14.00	0.008	0.078	*	14.10	0.006	0.068
14.20	0.006	0.061	*	14.30	0.006	0.059
14.40	0.006	0.058	*	14.50	0.006	0.057
14.60	0.006	0.058	*	14.70	0.006	0.058
14.80	0.006	0.058	*	14.90	0.006	0.058
15.00	0.006	0.059	*	15.10	0.006	0.059
15.20	0.006	0.059	*	15.30	0.006	0.059

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
15.30	0.006	0.059				
15.40	0.006	0.060	*	15.50	0.006	0.060
15.60	0.006	0.060	*	15.70	0.006	0.060
15.80	0.006	0.061	*	15.90	0.006	0.061
16.00	0.006	0.061	*	16.10	0.003	0.050
16.20	0.003	0.042	*	16.30	0.003	0.039
16.40	0.003	0.038	*	16.50	0.003	0.037
16.60	0.003	0.037	*	16.70	0.003	0.037
16.80	0.003	0.038	*	16.90	0.003	0.038
17.00	0.003	0.038	*	17.10	0.003	0.038
17.20	0.003	0.038	*	17.30	0.003	0.038
17.40	0.003	0.038	*	17.50	0.003	0.038
17.60	0.003	0.038	*	17.70	0.003	0.038
17.80	0.003	0.038	*	17.90	0.003	0.039
18.00	0.003	0.039	*	18.10	0.003	0.039
18.20	0.003	0.039	*	18.30	0.003	0.039
18.40	0.003	0.039	*	18.50	0.003	0.039
18.60	0.003	0.039	*	18.70	0.003	0.039
18.80	0.003	0.039	*	18.90	0.003	0.039
19.00	0.003	0.040	*	19.10	0.003	0.040
19.20	0.003	0.040	*	19.30	0.003	0.040
19.40	0.003	0.040	*	19.50	0.003	0.040
19.60	0.003	0.040	*	19.70	0.003	0.040
19.80	0.003	0.040	*	19.90	0.003	0.040
20.00	0.003	0.040	*	20.10	0.002	0.034
20.20	0.002	0.030	*	20.30	0.002	0.028
20.40	0.002	0.027	*	20.50	0.002	0.027
20.60	0.002	0.027	*	20.70	0.002	0.027
20.80	0.002	0.027	*	20.90	0.002	0.027
21.00	0.002	0.027	*	21.10	0.002	0.027
21.20	0.002	0.027	*	21.30	0.002	0.027
21.40	0.002	0.027	*	21.50	0.002	0.028
21.60	0.002	0.028	*	21.70	0.002	0.028
21.80	0.002	0.028	*	21.90	0.002	0.028
22.00	0.002	0.028	*	22.10	0.002	0.028
22.20	0.002	0.028	*	22.30	0.002	0.028
22.40	0.002	0.028	*	22.50	0.002	0.028
22.60	0.002	0.028	*	22.70	0.002	0.028
22.80	0.002	0.028	*	22.90	0.002	0.028
23.00	0.002	0.028	*	23.10	0.002	0.028
23.20	0.002	0.028	*	23.30	0.002	0.028
23.40	0.002	0.028	*	23.50	0.002	0.028
23.60	0.002	0.028	*	23.70	0.002	0.028
23.80	0.002	0.028	*	23.90	0.002	0.028
24.00	0.002	0.028	*	24.10	0.000	0.015
24.20	0.000	0.005	*	24.30	0.000	0.002
24.40	0.000	0.001	*			

Project Title = TwinShaft Mine Water Impoundment
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 61.0
Area = 3.2 acres
Hydraulic length = 660.00 Feet
Elevation change = 36.0 feet.
Concentration time = 0.11 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2
Curve number = 100.0
Area = 0.8 acres
Hydraulic length = 100.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.14 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 4.0 acres

-- Storm data
Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 1.23 cfs
Discharge volume = 0.17 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.047
0.20	0.013	0.085	*	0.30	0.013	0.096
0.40	0.013	0.103	*	0.50	0.013	0.106
0.60	0.020	0.130	*	0.70	0.020	0.148
0.80	0.020	0.154	*	0.90	0.020	0.157
1.00	0.020	0.159	*	1.10	0.022	0.166
1.20	0.022	0.172	*	1.30	0.022	0.174
1.40	0.022	0.175	*	1.50	0.022	0.175
1.60	0.039	0.237	*	1.70	0.039	0.287
1.80	0.039	0.301	*	1.90	0.039	0.310
2.00	0.039	0.314	*	2.10	0.153	0.724
2.20	0.153	1.047	*	2.30	0.153	1.144
2.40	0.153	1.205	*	2.50	0.153	1.231
2.60	0.041	0.830	*	2.70	0.041	0.515
2.80	0.041	0.431	*	2.90	0.041	0.384
3.00	0.041	0.373	*	3.10	0.033	0.351
3.20	0.033	0.336	*	3.30	0.033	0.338
3.40	0.033	0.342	*	3.50	0.033	0.349
3.60	0.023	0.304	*	3.70	0.023	0.272
3.80	0.023	0.265	*	3.90	0.023	0.262
4.00	0.023	0.264	*	4.10	0.020	0.253

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.020	0.253				
4.20	0.020	0.247	*	4.30	0.020	0.247
4.40	0.020	0.249	*	4.50	0.020	0.251
4.60	0.016	0.231	*	4.70	0.016	0.218
4.80	0.016	0.216	*	4.90	0.016	0.215
5.00	0.016	0.216	*	5.10	0.015	0.207
5.20	0.015	0.202	*	5.30	0.015	0.201
5.40	0.015	0.201	*	5.50	0.015	0.203
5.60	0.016	0.215	*	5.70	0.016	0.225
5.80	0.016	0.229	*	5.90	0.016	0.232
6.00	0.016	0.234	*	6.10	0.000	0.118
6.20	0.000	0.043	*	6.30	0.000	0.018
6.40	0.000	0.004	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: TwinShaft Mine Water

Comment: 24-inch CMP Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.0850 ft/ft
Manning's n.....	0.024
Discharge.....	35.73 cfs

Computed Results:

Full Flow Capacity.....	35.73 cfs
Full Flow Depth.....	2.00 ft
Velocity.....	11.37 fps
Flow Area.....	3.14 sf
Critical Depth....	1.93 ft
Critical Slope....	0.0743 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	35.73 cfs
QMAX 0.94D.....	38.43 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: TwinShaft Mine Water

Comment: 2-inch Victaulic Decant Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.17 ft
Slope.....	0.0850 ft/ft
Manning's n.....	0.010
Discharge.....	0.12 cfs

Computed Results:

Full Flow Capacity.....	0.12 cfs
Full Flow Depth.....	0.17 ft
Velocity.....	5.28 fps
Flow Area.....	0.02 sf
Critical Depth....	0.17 ft
Critical Slope....	0.0797 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	0.12 cfs
QMAX @.94D.....	0.13 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Whitmore Canyon Mine Water Discharge Impoundments

The Whitmore Canyon Mine Water Discharge impoundments (NPDES discharge point designations 002A and 002B), are located adjacent to each other in Whitmore Canyon just north of the entrance of Pole Canyon. Both structures are off-channel, temporary impoundments with a total as-built contained volume of approximately 3.12 acre-feet for discharge 002A and approximately 6.93 acre-feet for 002B. The structures capture water pumped from underground mine workings and continually discharge water after an appropriate retention time. There is no surface water runoff into either pond.

The structures are temporary impoundments as addressed in R645-301-733. The structures are not addressed by the MSHA criteria of 30 CFR 77.216(a). The impoundments meet the sedimentation pond criteria of R645-301-742.223 by containing primary outlets exceeding requirements for safely discharging a 25-year, 6-hour event and containing a shared secondary outlet that in combination with the primary outlet safely discharges a 25-year, 6-hour event. Also the impoundments clearly meet the single-open channel spillway exemption of R645-301-743.132 by meeting the requirements of R645-301-742.225.2.

Old Whitmore Canyon Mine Water Impoundment - NPDES 002A

Impoundment 002A was initially intended to contain an average mine water inflow of 600 gpm, but as-built the structure handles less with allowance for sediment volume and 24-hour retention time. The impoundment may receive mine water discharge water from an 8-inch inlet pipe, with either pond or both ponds in operation. No surface water runoff is diverted to either pond.

The 002A impoundment discharges through a 15-inch CMP culvert and can divert water to the adjacent pond through a valved 8-inch cross-tie pipe. The 15-inch CMP discharges at elevation 7007.7 when the contained volume of the pond is approximately 2.05 acre-feet. An additional 0.70 acre-feet of capacity is contained between the bottom of the 15-inch CMP culvert and the freeboard elevation of 7010 feet (1 foot beneath the top of the impoundment). The impoundment is cross-tied to the 002B impoundment with an 8-inch connection pipe at an outlet elevation of 7005.9 feet (separate from the 8-inch inlet pipe).

Impoundment 002A is capable of discharging 5.19 cfs through the 15-inch CMP. The 8-inch victaulic is capable of diverting 1.92 cfs to the adjacent impoundment. The 24-inch CMP or the 8-inch cross-tie pipe can each individually pass a 25-year, 6-hour storm precipitation peak discharge capacity of 0.45 cfs plus the maximum discharge of 1.34 cfs for a total storm discharge of 1.79 cfs. The impoundment controls a 100-year, 6-hour event by capturing the 0.07 acre-foot event within the 0.70 acre-feet of capacity between the outlet elevation and the free-board elevation while simultaneously discharging a maximum of 1.91 cfs.

The 15-inch CMP can sustain blockage exceeding 65% of the available capacity and still maintain proper flows. Based on a worst case scenario of total blockage of the 15-inch CMP and the 8-inch cross-tie pipe while actively pumping mine water (300 gpm) to the impoundment, a 100-year, 6-hour precipitation event will be contained within the excess capacity of the impoundment as will more than 18 hours of mine water inflow.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
OLD WHITMORE CANYON MINE WATER POND
NPDES 002A

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Pond Surface	0.39	100.0	0.0	0.0	100	None			No surface water runoff captured

POND CAPACITIES	Acre-Feet		
Total As-built Capacity	3.12		
Capacity w/1' freeboard	2.74		Excludes capacity above freeboard
Temporary storage capacity	0.70		Capacity between outlet & freeboard
Sediment load capacity	0.72		Design sediment load capacity
Available Capacity	1.33	(based on 300 gpm)	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	0.45 cfs	0.52 cfs	0.57 cfs
Discharge Volume	0.05 acre-feet	0.06 acre-feet	0.07 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	1.250 feet	0.667 feet	
Slope	0.022 ft/ft	0.015 ft/ft	
Manning's n	0.024	0.010	
Discharge	5.190 cfs	1.920 cfs	
Velocity	4.230 fps	5.440 fps	

SEDIMENT LOAD - Required (Uniform Soil Loss Equation)	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP
Pond Surface	0.00	0.0				

Project Title = Old Whitmore Canyon Mine Water 002A

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 0.4 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 0.4 acres

-- Storm data

Total precipitation = 1.6 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 0.45 cfs

Discharge volume = 0.05 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.017
0.20	0.010	0.031	*	0.30	0.010	0.035
0.40	0.010	0.038	*	0.50	0.010	0.039
0.60	0.016	0.049	*	0.70	0.016	0.054
0.80	0.016	0.056	*	0.90	0.016	0.058
1.00	0.016	0.059	*	1.10	0.017	0.061
1.20	0.017	0.063	*	1.30	0.017	0.064
1.40	0.017	0.064	*	1.50	0.017	0.064
1.60	0.031	0.087	*	1.70	0.031	0.105
1.80	0.031	0.110	*	1.90	0.031	0.114
2.00	0.031	0.115	*	2.10	0.121	0.265
2.20	0.121	0.384	*	2.30	0.121	0.420
2.40	0.121	0.442	*	2.50	0.121	0.452
2.60	0.032	0.304	*	2.70	0.032	0.188
2.80	0.032	0.153	*	2.90	0.032	0.131
3.00	0.032	0.121	*	3.10	0.026	0.111
3.20	0.026	0.102	*	3.30	0.026	0.099
3.40	0.026	0.098	*	3.50	0.026	0.097
3.60	0.018	0.084	*	3.70	0.018	0.073
3.80	0.018	0.070	*	3.90	0.018	0.069
4.00	0.018	0.067	*	4.10	0.016	0.064
4.20	0.016	0.061	*	4.30	0.016	0.060
4.40	0.016	0.060	*	4.50	0.016	0.060
4.60	0.013	0.055	*	4.70	0.013	0.051
4.80	0.013	0.050	*	4.90	0.013	0.049
5.00	0.012	0.049	*	5.10	0.012	0.046
5.20	0.012	0.045	*	5.30	0.012	0.044
5.40	0.012	0.044	*	5.50	0.012	0.044
5.60	0.013	0.046	*	5.70	0.013	0.048
5.80	0.013	0.048	*	5.90	0.013	0.048
6.00	0.013	0.049	*	6.10	0.000	0.027

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	0.027				
6.20	0.000	0.010	*	6.30	0.000	0.005
6.40	0.000	0.001	*			

Project Title = Old Whitmore Canyon Mine Water 002A

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 0.4 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 0.4 acres

-- Storm data

Total precipitation = 1.8 inches

Storm type = SCS Type 2 storm, 24 hour storm

Peak Discharge = 0.52 cfs

Discharge volume = 0.06 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.003
0.20	0.002	0.006	*	0.30	0.002	0.006
0.40	0.002	0.007	*	0.50	0.002	0.007
0.60	0.002	0.007	*	0.70	0.002	0.007
0.80	0.002	0.007	*	0.90	0.002	0.007
1.00	0.002	0.007	*	1.10	0.002	0.008
1.20	0.002	0.008	*	1.30	0.002	0.008
1.40	0.002	0.008	*	1.50	0.002	0.008
1.60	0.002	0.008	*	1.70	0.002	0.008
1.80	0.002	0.008	*	1.90	0.002	0.008
2.00	0.002	0.008	*	2.10	0.002	0.008
2.20	0.002	0.008	*	2.30	0.002	0.008
2.40	0.002	0.008	*	2.50	0.002	0.008
2.60	0.002	0.008	*	2.70	0.002	0.008
2.80	0.002	0.008	*	2.90	0.002	0.008
3.00	0.002	0.008	*	3.10	0.003	0.009
3.20	0.003	0.009	*	3.30	0.003	0.010
3.40	0.003	0.010	*	3.50	0.003	0.010
3.60	0.003	0.010	*	3.70	0.003	0.010
3.80	0.003	0.010	*	3.90	0.003	0.010
4.00	0.003	0.010	*	4.10	0.003	0.010
4.20	0.003	0.011	*	4.30	0.003	0.011
4.40	0.003	0.011	*	4.50	0.003	0.011
4.60	0.003	0.011	*	4.70	0.003	0.011
4.80	0.003	0.011	*	4.90	0.003	0.011
5.00	0.003	0.011	*	5.10	0.003	0.011
5.20	0.003	0.011	*	5.30	0.003	0.011
5.40	0.003	0.011	*	5.50	0.003	0.011
5.60	0.003	0.011	*	5.70	0.003	0.011
5.80	0.003	0.011	*	5.90	0.003	0.011
6.00	0.003	0.011	*	6.10	0.004	0.012

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.004	0.012				
6.20	0.004	0.013	*	6.30	0.004	0.014
6.40	0.004	0.014	*	6.50	0.004	0.014
6.60	0.004	0.014	*	6.70	0.004	0.014
6.80	0.004	0.014	*	6.90	0.004	0.014
7.00	0.004	0.014	*	7.10	0.004	0.014
7.20	0.004	0.014	*	7.30	0.004	0.014
7.40	0.004	0.014	*	7.50	0.004	0.014
7.60	0.004	0.014	*	7.70	0.004	0.014
7.80	0.004	0.014	*	7.90	0.004	0.014
8.00	0.004	0.014	*	8.10	0.005	0.016
8.20	0.005	0.017	*	8.30	0.005	0.018
8.40	0.005	0.018	*	8.50	0.005	0.018
8.60	0.005	0.019	*	8.70	0.005	0.019
8.80	0.005	0.019	*	8.90	0.005	0.019
9.00	0.005	0.019	*	9.10	0.006	0.021
9.20	0.006	0.022	*	9.30	0.006	0.022
9.40	0.006	0.022	*	9.50	0.006	0.022
9.60	0.007	0.023	*	9.70	0.007	0.024
9.80	0.007	0.025	*	9.90	0.007	0.025
10.00	0.007	0.025	*	10.10	0.008	0.028
10.20	0.008	0.030	*	10.30	0.008	0.031
10.40	0.008	0.032	*	10.50	0.009	0.032
10.60	0.011	0.037	*	10.70	0.011	0.041
10.80	0.011	0.042	*	10.90	0.011	0.042
11.00	0.011	0.043	*	11.10	0.018	0.053
11.20	0.018	0.061	*	11.30	0.018	0.064
11.40	0.018	0.066	*	11.50	0.018	0.066
11.60	0.140	0.271	*	11.70	0.140	0.432
11.80	0.140	0.480	*	11.90	0.140	0.511
12.00	0.140	0.524	*	12.10	0.026	0.335
12.20	0.026	0.185	*	12.30	0.026	0.140
12.40	0.026	0.112	*	12.50	0.026	0.099
12.60	0.014	0.078	*	12.70	0.014	0.061
12.80	0.014	0.056	*	12.90	0.014	0.052
13.00	0.014	0.051	*	13.10	0.010	0.045
13.20	0.010	0.040	*	13.30	0.010	0.039
13.40	0.010	0.038	*	13.50	0.010	0.037
13.60	0.009	0.034	*	13.70	0.008	0.031
13.80	0.008	0.030	*	13.90	0.008	0.029
14.00	0.008	0.029	*	14.10	0.006	0.025
14.20	0.006	0.022	*	14.30	0.006	0.021
14.40	0.006	0.021	*	14.50	0.006	0.021
14.60	0.006	0.021	*	14.70	0.006	0.021
14.80	0.006	0.021	*	14.90	0.006	0.021
15.00	0.006	0.021	*	15.10	0.006	0.021
15.20	0.006	0.021	*	15.30	0.006	0.021
15.40	0.006	0.021	*	15.50	0.006	0.021
15.60	0.006	0.021	*	15.70	0.006	0.021
15.80	0.006	0.021	*	15.90	0.006	0.021
16.00	0.006	0.021	*	16.10	0.003	0.017
16.20	0.003	0.014	*	16.30	0.003	0.013
16.40	0.003	0.013	*	16.50	0.003	0.012
16.60	0.003	0.012	*	16.70	0.003	0.012
16.80	0.003	0.012	*	16.90	0.003	0.012
17.00	0.003	0.012	*	17.10	0.003	0.012
17.20	0.003	0.012	*	17.30	0.003	0.012

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
17.30	0.003	0.012				
17.40	0.003	0.012	*	17.50	0.003	0.012
17.60	0.003	0.012	*	17.70	0.003	0.012
17.80	0.003	0.012	*	17.90	0.003	0.012
18.00	0.003	0.012	*	18.10	0.003	0.012
18.20	0.003	0.012	*	18.30	0.003	0.012
18.40	0.003	0.012	*	18.50	0.003	0.012
18.60	0.003	0.012	*	18.70	0.003	0.012
18.80	0.003	0.012	*	18.90	0.003	0.012
19.00	0.003	0.012	*	19.10	0.003	0.012
19.20	0.003	0.012	*	19.30	0.003	0.012
19.40	0.003	0.012	*	19.50	0.003	0.012
19.60	0.003	0.012	*	19.70	0.003	0.012
19.80	0.003	0.012	*	19.90	0.003	0.012
20.00	0.003	0.012	*	20.10	0.002	0.011
20.20	0.002	0.009	*	20.30	0.002	0.009
20.40	0.002	0.008	*	20.50	0.002	0.008
20.60	0.002	0.008	*	20.70	0.002	0.008
20.80	0.002	0.008	*	20.90	0.002	0.008
21.00	0.002	0.008	*	21.10	0.002	0.008
21.20	0.002	0.008	*	21.30	0.002	0.008
21.40	0.002	0.008	*	21.50	0.002	0.008
21.60	0.002	0.008	*	21.70	0.002	0.008
21.80	0.002	0.008	*	21.90	0.002	0.008
22.00	0.002	0.008	*	22.10	0.002	0.008
22.20	0.002	0.008	*	22.30	0.002	0.008
22.40	0.002	0.008	*	22.50	0.002	0.008
22.60	0.002	0.008	*	22.70	0.002	0.008
22.80	0.002	0.008	*	22.90	0.002	0.008
23.00	0.002	0.008	*	23.10	0.002	0.008
23.20	0.002	0.008	*	23.30	0.002	0.008
23.40	0.002	0.008	*	23.50	0.002	0.008
23.60	0.002	0.008	*	23.70	0.002	0.008
23.80	0.002	0.008	*	23.90	0.002	0.008
24.00	0.002	0.005	*	24.10	0.000	0.005
24.20	0.000	0.002	*	24.30	0.000	0.001
24.40	0.000	0.000	*			

Project Title = Old Whitmore Canyon Mine Water 002A

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 0.4 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 0.4 acres

-- Storm data

Total precipitation = 2.0 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 0.57 cfs

Discharge volume = 0.07 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.002	0.000	*	0.10	0.013	0.022
0.20	0.013	0.039	*	0.30	0.013	0.044
0.40	0.013	0.048	*	0.50	0.013	0.049
0.60	0.020	0.060	*	0.70	0.020	0.069
0.80	0.020	0.071	*	0.90	0.020	0.073
1.00	0.020	0.074	*	1.10	0.022	0.077
1.20	0.022	0.080	*	1.30	0.022	0.081
1.40	0.022	0.081	*	1.50	0.022	0.091
1.60	0.039	0.110	*	1.70	0.039	0.133
1.80	0.039	0.140	*	1.90	0.039	0.144
2.00	0.039	0.146	*	2.10	0.153	0.336
2.20	0.153	0.486	*	2.30	0.153	0.531
2.40	0.153	0.559	*	2.50	0.153	0.572
2.60	0.041	0.355	*	2.70	0.041	0.238
2.80	0.041	0.194	*	2.90	0.041	0.166
3.00	0.041	0.154	*	3.10	0.033	0.140
3.20	0.033	0.129	*	3.30	0.033	0.126
3.40	0.033	0.124	*	3.50	0.033	0.123
3.60	0.023	0.106	*	3.70	0.023	0.092
3.80	0.023	0.088	*	3.90	0.023	0.086
4.00	0.023	0.085	*	4.10	0.020	0.080
4.20	0.020	0.077	*	4.30	0.020	0.076
4.40	0.020	0.076	*	4.50	0.020	0.075
4.60	0.016	0.069	*	4.70	0.016	0.064
4.80	0.016	0.063	*	4.90	0.016	0.062
5.00	0.016	0.061	*	5.10	0.015	0.059
5.20	0.015	0.057	*	5.30	0.015	0.056
5.40	0.015	0.056	*	5.50	0.015	0.055
5.60	0.016	0.058	*	5.70	0.016	0.060
5.80	0.016	0.061	*	5.90	0.016	0.061
6.00	0.016	0.061	*	6.10	0.000	0.034

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	0.034				
6.20	0.000	0.012	*	6.30	0.000	0.006
6.40	0.000	0.002	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Whitmore Canyon 002A

Comment: 15-inch Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0220 ft/ft
Manning's n.....	0.024
Discharge.....	5.19 cfs

Computed Results:

Full Flow Capacity.....	5.19 cfs
Full Flow Depth.....	1.25 ft
Velocity.....	4.23 fps
Flow Area.....	1.23 sf
Critical Depth....	0.92 ft
Critical Slope....	0.0274 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	5.19 cfs
QMAX @ S&D.....	5.59 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Whitmore Canyon 002A

Comment: 8-inch Victaulic, X-tie to adjacent pond

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.67 ft
Slope.....	0.0145 ft/ft
Manning's n.....	0.010
Discharge.....	1.92 cfs

Computed Results:

Full Flow Capacity.....	1.92 cfs
Full Flow Depth.....	0.67 ft
Velocity.....	5.44 fps
Flow Area.....	0.35 sf
Critical Depth....	0.62 ft
Critical Slope....	0.0126 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	1.92 cfs
QMAX 0.94D.....	2.06 cfs
Froude Number.....	FULL

New Whitmore Canyon Mine Water Impoundment - NPDES 002B

Impoundment 002B sustains average mine water inflows of 600 gpm. The impoundment may receive mine water discharge water from an 8-inch inlet pipe, with either pond or both ponds in operation. No surface water runoff is diverted to either pond.

The 002B impoundment discharges through a 24-inch CMP and can divert water to the adjacent pond if the water elevation rises above the 24-inch outlet. The impoundment discharges through at elevation 7003.8 when the contained volume of the pond is approximately 4.12 acres. This volume allows 1.47 acre-feet sediment storage and 2.65 acre-feet water storage for a 24-hour retention period. An additional 2.21 acre-feet of capacity exists between the bottom of the 24-inch CMP outlet and elevation 7008 feet (1 foot of freeboard at the top of the impoundment). The 8-inch cross-tie pipe is at elevation 7001.8 feet, 2 feet below the 24-inch CMP outlet.

Impoundment 002B is capable of discharging 16.98 cfs through the 24-inch CMP and diverting flow back through the 8-inch pipe to the adjacent impoundment. The 24-inch CMP passes a 25-year, 6-hour storm precipitation peak discharge capacity of 0.72 cfs plus the maximum discharge of 1.34 cfs for a total storm discharge of 2.06 cfs. The impoundment controls a 100-year, 6-hour event by capturing the 0.11 acre-foot event within the 2.21 acre-feet of capacity between the outlet elevation and the free-board elevation while simultaneously discharging a maximum of 2.25 cfs.

The 24-inch CMP can sustain blockage exceeding 86% of the available capacity and still maintain proper flows. Based on a worst case scenario of total blockage of the 24-inch CMP and the 8-inch cross-tie pipe while actively pumping mine water (600 gpm) to the impoundment, a 100-year, 6-hour precipitation event will be contained within the excess capacity of the impoundment as will more than 24 hours of mine water inflow.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1

NEW WHITMORE CANYON MINE WATER POND

NPDES 002B

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Elev Length	Elev Change	COMMENTS
Pond Surface	0.62	100.0	0.0	0.0	100	None			No surface water runoff captured

POND CAPACITIES	Acre-Feet		
Total As-built Capacity	6.93		
Capacity w/1' freeboard	6.33		Excludes capacity above freeboard
Temporary storage capacity	2.21		Capacity between outlet & freeboard
Sediment load capacity	1.47		Design sediment load capacity
Available Capacity	2.65	[based on 600 gpm]	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	0.72 cfs	0.83 cfs	0.91 cfs
Discharge Volume	0.08 acre-feet	0.10 acre-feet	0.11 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	2.000 feet	0.667 feet	
Slope	0.017 ft/ft	(0.015)ft/ft	
Manning's n	0.024	0.013	
Discharge	15.980 cfs	1.920 cfs	
Velocity	5.090 fps	5.440 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP
Pond Surface	0.00	0.0				

Project Title = New Whitmore Canyon Mine Water 002E

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 0.6 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 0.6 acres

-- Storm data

Total precipitation = 1.6 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 0.72 cfs

Discharge volume = 0.08 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.029
0.20	0.010	0.049	*	0.30	0.010	0.056
0.40	0.010	0.060	*	0.50	0.010	0.062
0.60	0.016	0.076	*	0.70	0.016	0.086
0.80	0.016	0.090	*	0.90	0.016	0.092
1.00	0.016	0.093	*	1.10	0.017	0.097
1.20	0.017	0.100	*	1.30	0.017	0.101
1.40	0.017	0.102	*	1.50	0.017	0.102
1.60	0.031	0.139	*	1.70	0.031	0.167
1.80	0.031	0.176	*	1.90	0.031	0.181
2.00	0.031	0.183	*	2.10	0.121	0.422
2.20	0.121	0.611	*	2.30	0.121	0.667
2.40	0.121	0.703	*	2.50	0.121	0.718
2.60	0.032	0.494	*	2.70	0.032	0.299
2.80	0.032	0.243	*	2.90	0.032	0.209
3.00	0.032	0.193	*	3.10	0.026	0.176
3.20	0.026	0.162	*	3.30	0.026	0.158
3.40	0.026	0.156	*	3.50	0.026	0.154
3.60	0.018	0.133	*	3.70	0.018	0.116
3.80	0.018	0.111	*	3.90	0.018	0.108
4.00	0.018	0.106	*	4.10	0.016	0.101
4.20	0.016	0.097	*	4.30	0.016	0.096
4.40	0.016	0.095	*	4.50	0.016	0.095
4.60	0.013	0.087	*	4.70	0.013	0.081
4.80	0.013	0.079	*	4.90	0.013	0.078
5.00	0.013	0.077	*	5.10	0.012	0.074
5.20	0.012	0.071	*	5.30	0.012	0.070
5.40	0.012	0.070	*	5.50	0.012	0.070
5.60	0.013	0.073	*	5.70	0.013	0.076
5.80	0.013	0.076	*	5.90	0.013	0.077
6.00	0.013	0.077	*	6.10	0.000	0.043

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	0.043				
6.20	0.000	0.016	*	6.30	0.000	0.007
6.40	0.000	0.002	*			

Project Title = New Whitmore Canyon Mine Water 002B

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 0.6 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 0.6 acres

-- Storm data

Total precipitation = 1.8 inches

Storm type = SCS Type 2 storm. 24 hour storm

Peak Discharge = 0.83 cfs

Discharge volume = 0.10 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.005
0.20	0.002	0.009	*	0.30	0.002	0.010
0.40	0.002	0.011	*	0.50	0.002	0.011
0.60	0.002	0.011	*	0.70	0.002	0.011
0.80	0.002	0.011	*	0.90	0.002	0.011
1.00	0.002	0.011	*	1.10	0.002	0.012
1.20	0.002	0.013	*	1.30	0.002	0.013
1.40	0.002	0.013	*	1.50	0.002	0.013
1.60	0.002	0.013	*	1.70	0.002	0.013
1.80	0.002	0.013	*	1.90	0.002	0.013
2.00	0.002	0.013	*	2.10	0.002	0.013
2.20	0.002	0.013	*	2.30	0.002	0.013
2.40	0.002	0.013	*	2.50	0.002	0.013
2.60	0.002	0.013	*	2.70	0.002	0.013
2.80	0.002	0.013	*	2.90	0.002	0.013
3.00	0.002	0.013	*	3.10	0.003	0.014
3.20	0.003	0.015	*	3.30	0.003	0.015
3.40	0.003	0.015	*	3.50	0.003	0.015
3.60	0.003	0.015	*	3.70	0.003	0.015
3.80	0.003	0.015	*	3.90	0.003	0.015
4.00	0.003	0.015	*	4.10	0.003	0.016
4.20	0.003	0.017	*	4.30	0.003	0.017
4.40	0.003	0.017	*	4.50	0.003	0.018
4.60	0.003	0.018	*	4.70	0.003	0.018
4.80	0.003	0.018	*	4.90	0.003	0.018
5.00	0.003	0.018	*	5.10	0.003	0.018
5.20	0.003	0.018	*	5.30	0.003	0.018
5.40	0.003	0.018	*	5.50	0.003	0.018
5.60	0.003	0.018	*	5.70	0.003	0.018
5.80	0.003	0.018	*	5.90	0.003	0.018
6.00	0.003	0.018	*	6.10	0.004	0.020

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.004	0.020				
6.20	0.004	0.021	*	6.30	0.004	0.022
6.40	0.004	0.022	*	6.50	0.004	0.022
6.60	0.004	0.022	*	6.70	0.004	0.022
6.80	0.004	0.022	*	6.90	0.004	0.022
7.00	0.004	0.022	*	7.10	0.004	0.022
7.20	0.004	0.022	*	7.30	0.004	0.022
7.40	0.004	0.022	*	7.50	0.004	0.022
7.60	0.004	0.022	*	7.70	0.004	0.022
7.80	0.004	0.022	*	7.90	0.004	0.022
8.00	0.004	0.022	*	8.10	0.005	0.025
8.20	0.005	0.027	*	8.30	0.005	0.028
8.40	0.005	0.028	*	8.50	0.005	0.029
8.60	0.005	0.029	*	8.70	0.005	0.030
8.80	0.005	0.030	*	8.90	0.005	0.031
9.00	0.005	0.031	*	9.10	0.006	0.033
9.20	0.006	0.034	*	9.30	0.006	0.035
9.40	0.006	0.035	*	9.50	0.006	0.035
9.60	0.007	0.037	*	9.70	0.007	0.039
9.80	0.007	0.039	*	9.90	0.007	0.039
10.00	0.007	0.039	*	10.10	0.008	0.044
10.20	0.008	0.048	*	10.30	0.008	0.049
10.40	0.008	0.050	*	10.50	0.008	0.050
10.60	0.011	0.058	*	10.70	0.011	0.064
10.80	0.011	0.066	*	10.90	0.011	0.067
11.00	0.011	0.068	*	11.10	0.018	0.085
11.20	0.018	0.099	*	11.30	0.018	0.102
11.40	0.018	0.104	*	11.50	0.018	0.105
11.60	0.140	0.430	*	11.70	0.140	0.687
11.80	0.140	0.764	*	11.90	0.140	0.812
12.00	0.140	0.833	*	12.10	0.026	0.532
12.20	0.026	0.294	*	12.30	0.026	0.223
12.40	0.026	0.177	*	12.50	0.026	0.158
12.60	0.014	0.124	*	12.70	0.014	0.097
12.80	0.014	0.089	*	12.90	0.014	0.083
13.00	0.014	0.081	*	13.10	0.010	0.071
13.20	0.010	0.064	*	13.30	0.010	0.061
13.40	0.010	0.060	*	13.50	0.010	0.059
13.60	0.008	0.053	*	13.70	0.008	0.049
13.80	0.008	0.047	*	13.90	0.008	0.046
14.00	0.008	0.046	*	14.10	0.006	0.040
14.20	0.006	0.036	*	14.30	0.006	0.034
14.40	0.006	0.033	*	14.50	0.006	0.033
14.60	0.006	0.033	*	14.70	0.006	0.033
14.80	0.006	0.033	*	14.90	0.006	0.033
15.00	0.006	0.033	*	15.10	0.006	0.033
15.20	0.006	0.033	*	15.30	0.006	0.033
15.40	0.006	0.033	*	15.50	0.006	0.033
15.60	0.006	0.033	*	15.70	0.006	0.033
15.80	0.006	0.033	*	15.90	0.006	0.033
16.00	0.006	0.033	*	16.10	0.003	0.027
16.20	0.003	0.022	*	16.30	0.003	0.021
16.40	0.003	0.020	*	16.50	0.003	0.020
16.60	0.003	0.020	*	16.70	0.003	0.020
16.80	0.003	0.020	*	16.90	0.003	0.020
17.00	0.003	0.020	*	17.10	0.003	0.020
17.20	0.003	0.020	*	17.30	0.003	0.020

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
17.30	0.003	0.020				
17.40	0.003	0.020	*	17.50	0.003	0.020
17.60	0.003	0.020	*	17.70	0.003	0.020
17.80	0.003	0.020	*	17.90	0.003	0.020
18.00	0.003	0.020	*	18.10	0.003	0.020
18.20	0.003	0.020	*	18.30	0.003	0.020
18.40	0.003	0.020	*	18.50	0.003	0.020
18.60	0.003	0.020	*	18.70	0.003	0.020
18.80	0.003	0.020	*	18.90	0.003	0.020
19.00	0.003	0.020	*	19.10	0.003	0.020
19.20	0.003	0.020	*	19.30	0.003	0.020
19.40	0.003	0.020	*	19.50	0.003	0.020
19.60	0.003	0.020	*	19.70	0.003	0.020
19.80	0.003	0.020	*	19.90	0.003	0.020
20.00	0.003	0.020	*	20.10	0.002	0.017
20.20	0.002	0.014	*	20.30	0.002	0.014
20.40	0.002	0.013	*	20.50	0.002	0.013
20.60	0.002	0.013	*	20.70	0.002	0.013
20.80	0.002	0.013	*	20.90	0.002	0.013
21.00	0.002	0.013	*	21.10	0.002	0.013
21.20	0.002	0.013	*	21.30	0.002	0.013
21.40	0.002	0.013	*	21.50	0.002	0.013
21.60	0.002	0.013	*	21.70	0.002	0.013
21.80	0.002	0.013	*	21.90	0.002	0.013
22.00	0.002	0.013	*	22.10	0.002	0.013
22.20	0.002	0.013	*	22.30	0.002	0.013
22.40	0.002	0.013	*	22.50	0.002	0.013
22.60	0.002	0.013	*	22.70	0.002	0.013
22.80	0.002	0.013	*	22.90	0.002	0.013
23.00	0.002	0.013	*	23.10	0.002	0.013
23.20	0.002	0.013	*	23.30	0.002	0.013
23.40	0.002	0.013	*	23.50	0.002	0.013
23.60	0.002	0.013	*	23.70	0.002	0.013
23.80	0.002	0.013	*	23.90	0.002	0.013
24.00	0.002	0.013	*	24.10	0.000	0.007
24.20	0.000	0.003	*	24.30	0.000	0.001
24.40	0.000	0.000	*			

Project Title = New Whitmore Canyon Mine Water 002B

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 0.6 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 0.6 acres

-- Storm data

Total precipitation = 2.0 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 0.91 cfs

Discharge volume = 0.11 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.035
0.20	0.013	0.062	*	0.30	0.013	0.071
0.40	0.013	0.076	*	0.50	0.013	0.078
0.60	0.020	0.096	*	0.70	0.020	0.109
0.80	0.020	0.114	*	0.90	0.020	0.116
1.00	0.022	0.117	*	1.10	0.022	0.123
1.20	0.022	0.127	*	1.30	0.022	0.128
1.40	0.022	0.129	*	1.50	0.022	0.129
1.60	0.039	0.175	*	1.70	0.039	0.211
1.80	0.039	0.222	*	1.90	0.039	0.229
2.00	0.039	0.232	*	2.10	0.153	0.534
2.20	0.153	0.773	*	2.30	0.153	0.844
2.40	0.153	0.889	*	2.50	0.153	0.909
2.60	0.041	0.612	*	2.70	0.041	0.378
2.80	0.041	0.308	*	2.90	0.041	0.264
3.00	0.041	0.244	*	3.10	0.033	0.223
3.20	0.033	0.205	*	3.30	0.033	0.200
3.40	0.033	0.197	*	3.50	0.033	0.195
3.60	0.023	0.168	*	3.70	0.023	0.147
3.80	0.023	0.140	*	3.90	0.023	0.136
4.00	0.023	0.134	*	4.10	0.020	0.128
4.20	0.020	0.123	*	4.30	0.020	0.121
4.40	0.020	0.120	*	4.50	0.020	0.120
4.60	0.016	0.110	*	4.70	0.016	0.102
4.80	0.016	0.100	*	4.90	0.016	0.098
5.00	0.016	0.095	*	5.10	0.015	0.093
5.20	0.015	0.090	*	5.30	0.015	0.089
5.40	0.015	0.088	*	5.50	0.015	0.089
5.60	0.016	0.092	*	5.70	0.016	0.096
5.80	0.016	0.097	*	5.90	0.016	0.097
6.00	0.016	0.098	*	6.10	0.000	0.054

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	0.054				
6.20	0.000	0.020	*	6.30	0.000	0.009
6.40	0.000	0.003	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Whitmore Canyon 002B

Comment: 24-inch CMP Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.0170 ft/ft
Manning's n.....	0.024
Discharge.....	15.98 cfs

Computed Results:

Full Flow Capacity.....	15.98 cfs
Full Flow Depth.....	2.00 ft
Velocity.....	5.09 fps
Flow Area.....	3.14 sf
Critical Depth.....	1.44 ft
Critical Slope.....	0.0225 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	15.98 cfs
QWIT @ 94D.....	17.19 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Whitmore Canyon 002B

Comment: 8-inch Victaulic, X-tie to adjacent pond

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.67 ft
Slope.....	-0.0145 ft/ft
Manning's n.....	0.010
Discharge.....	1.92 cfs

Computed Results:

Worksheet does not have calculated results...

Clear Water Pond

The Clear Water pond (NPDES discharge point designation 004) is a water storage pond and final sediment pond located immediately adjacent to Slurry Cells No. 1 and 2. It is an off-channel, temporary impoundment pond with a total as-built contained volume of approximately 5.42 acre-feet. Fed by Slurry Pond No.1 and 2 through an 8-inch inlet pipe, the Clear Water pond is constructed to store approximately 1.13 acre feet of water. In addition, the pond captures runoff from a small area immediately surrounding the pond.

The structure is a temporary impoundment as addressed in R645-301-733. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The impoundment meets the single-open channel spillway exemption of R645-301-743.132 by meeting the requirements of R645-301-742.225.2.

The impoundment is designed for 24-hour retention of water from the Slurry Ponds and when in use typically discharges 30 gpm with maximum flows of 255 gpm. The structure continuously discharges through a perforated 8-inch standpipe. The 8-inch pipe is the only spillway.

The impoundment requires a maximum of 1.13 acre-feet of storage (based on 255 gpm) as an impoundment for the Slurry Ponds. The impoundment is discharged through an 8-inch perforated pipe when the contained volume of the pond is approximately 2.29 acre-feet (an as-built 1.16 acre-feet sediment volume plus a 1.13 acre-feet storage volume). The pond has an additional capacity of 2.44 acre-feet of temporary storage between the discharge elevation and the freeboard elevation. This temporary storage area simultaneously discharges when in use.

The 8-inch standpipe provides an emergency discharge 1 foot below the top of the pond, maintaining 1 foot of freeboard. The pipe has a full flow capacity of 3.16 cfs. At the freeboard elevation, the outlet pipe passes a 25-year, 6-hour precipitation peak discharge of 1.16 cfs plus a peak slurry pond water discharge of 0.57 cfs for a total of 1.73 cfs. Below the freeboard elevation, the impoundment contains the 25-year, 6-hour event within the available temporary storage capacity and simultaneously discharges at between 30 and 255 gpm (0.07 to 0.57 cfs) through the perforated pipe. The impoundment controls a 100-year, 6-hour event by capturing the 0.37 acre-foot event within the 2.44 acre-feet of capacity between the outlet elevation and the freeboard elevation while simultaneously discharging through the perforated portion of the standpipe.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
CLEAR WATER POND
NPDES 004

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Pond Surface	2.16	550.0	0.0	0.0	100	None			No surface water runoff captured

POND CAPACITIES	Acre-Feet		
Total As-built Capacity	5.42		
Capacity w/1' freeboard	4.73		Excludes capacity above freeboard
Temporary storage capacity	2.44		Capacity between outlet & freeboard
Sediment load capacity	1.16		Design sediment load capacity
Available Capacity	1.13	[based on 255 gpm]	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	1.16 cfs	1.17 cfs	1.47 cfs
Discharge Volume	0.29 acre-feet	0.33 acre-feet	0.37 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	feet	0.667 feet	
Slope	ft/ft	0.039 ft/ft	
Manning's n		0.010	
Discharge	cfs	3.160 cfs	
Velocity	fps	8.960 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP
Pond Surface	0.00	0.0				

Project Title = Clear Water Pond

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 2.2 acres

Hydraulic length = 550.00 Feet

Elevation change = 0.0 feet.

Concentration time = 1.78 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 2.2 acres

-- Storm data

Total precipitation = 1.6 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 1.16 cfs

Discharge volume = 0.29 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.001
0.20	0.010	0.004	*	0.30	0.010	0.009
0.40	0.010	0.014	*	0.50	0.010	0.020
0.60	0.016	0.029	*	0.70	0.016	0.040
0.80	0.016	0.053	*	0.90	0.016	0.069
1.00	0.016	0.085	*	1.10	0.017	0.104
1.20	0.017	0.123	*	1.30	0.017	0.143
1.40	0.017	0.162	*	1.50	0.017	0.180
1.60	0.031	0.201	*	1.70	0.031	0.222
1.80	0.031	0.243	*	1.90	0.031	0.265
2.00	0.031	0.287	*	2.10	0.121	0.321
2.20	0.121	0.367	*	2.30	0.121	0.426
2.40	0.121	0.497	*	2.50	0.121	0.580
2.60	0.032	0.665	*	2.70	0.032	0.748
2.80	0.032	0.830	*	2.90	0.032	0.910
3.00	0.032	0.989	*	3.10	0.026	1.065
3.20	0.026	1.121	*	3.30	0.026	1.154
3.40	0.026	1.164	*	3.50	0.026	1.150
3.60	0.018	1.112	*	3.70	0.018	1.066
3.80	0.018	1.018	*	3.90	0.018	0.967
4.00	0.018	0.914	*	4.10	0.016	0.858
4.20	0.016	0.802	*	4.30	0.016	0.747
4.40	0.016	0.701	*	4.50	0.016	0.663
4.60	0.013	0.631	*	4.70	0.013	0.607
4.80	0.013	0.587	*	4.90	0.013	0.568
5.00	0.013	0.549	*	5.10	0.012	0.531
5.20	0.012	0.513	*	5.30	0.012	0.497
5.40	0.012	0.480	*	5.50	0.012	0.464
5.60	0.013	0.449	*	5.70	0.013	0.434
5.80	0.013	0.420	*	5.90	0.013	0.407
6.00	0.013	0.394	*	6.10	0.000	0.380

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	0.380				
6.20	0.000	0.365	*	6.30	0.000	0.350
6.40	0.000	0.333	*	6.50	0.000	0.315
6.60	0.000	0.296	*	6.70	0.000	0.277
6.80	0.000	0.255	*	6.90	0.000	0.233
7.00	0.000	0.210	*	7.10	0.000	0.187
7.20	0.000	0.166	*	7.30	0.000	0.148
7.40	0.000	0.131	*	7.50	0.000	0.115
7.60	0.000	0.102	*	7.70	0.000	0.089
7.80	0.000	0.078	*	7.90	0.000	0.069
8.00	0.000	0.061	*	8.10	0.000	0.055
8.20	0.000	0.050	*	8.30	0.000	0.046
8.40	0.000	0.042	*	8.50	0.000	0.038
8.60	0.000	0.035	*	8.70	0.000	0.031
8.80	0.000	0.028	*	8.90	0.000	0.025
9.00	0.000	0.023	*	9.10	0.000	0.020
9.20	0.000	0.018	*	9.30	0.000	0.016
9.40	0.000	0.014	*	9.50	0.000	0.012
9.60	0.000	0.010	*	9.70	0.000	0.008
9.80	0.000	0.007	*	9.90	0.000	0.006
10.00	0.000	0.005	*	10.10	0.000	0.003
10.20	0.000	0.003	*	10.30	0.000	0.002
10.40	0.000	0.001	*	10.50	0.000	0.001
10.60	0.000	0.000	*	10.70	0.000	0.000
10.80	0.000	0.000	*			

Project Title = Clear Water Pond

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 2.2 acres

Hydraulic length = 550.00 Feet

Elevation change = 0.0 feet.

Concentration time = 1.78 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 2.2 acres

-- Storm data

Total precipitation = 1.8 inches

Storm type = SCS Type 2 storm, 24 hour storm

Peak Discharge = 1.17 cfs

Discharge volume = 0.33 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.003	0.000	*	0.10	0.002	0.000
0.20	0.002	0.001	*	0.30	0.002	0.001
0.40	0.002	0.002	*	0.50	0.002	0.004
0.60	0.002	0.005	*	0.70	0.002	0.007
0.80	0.002	0.009	*	0.90	0.002	0.011
1.00	0.002	0.013	*	1.10	0.002	0.016
1.20	0.002	0.019	*	1.30	0.002	0.021
1.40	0.002	0.023	*	1.50	0.002	0.026
1.60	0.002	0.028	*	1.70	0.002	0.030
1.80	0.002	0.031	*	1.90	0.002	0.033
2.00	0.002	0.034	*	2.10	0.002	0.036
2.20	0.002	0.037	*	2.30	0.002	0.038
2.40	0.002	0.039	*	2.50	0.002	0.040
2.60	0.002	0.040	*	2.70	0.002	0.041
2.80	0.002	0.042	*	2.90	0.002	0.043
3.00	0.002	0.043	*	3.10	0.003	0.044
3.20	0.003	0.044	*	3.30	0.003	0.045
3.40	0.003	0.045	*	3.50	0.003	0.046
3.60	0.003	0.047	*	3.70	0.003	0.047
3.80	0.003	0.048	*	3.90	0.003	0.049
4.00	0.003	0.049	*	4.10	0.003	0.050
4.20	0.003	0.051	*	4.30	0.003	0.052
4.40	0.003	0.053	*	4.50	0.003	0.053
4.60	0.003	0.054	*	4.70	0.003	0.055
4.80	0.003	0.056	*	4.90	0.003	0.056
5.00	0.003	0.057	*	5.10	0.003	0.058
5.20	0.003	0.058	*	5.30	0.003	0.059
5.40	0.003	0.059	*	5.50	0.003	0.060
5.60	0.003	0.060	*	5.70	0.003	0.061
5.80	0.003	0.061	*	5.90	0.003	0.061
6.00	0.003	0.062	*	6.10	0.004	0.062

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.004	0.062				
6.20	0.004	0.062	*	6.30	0.004	0.063
6.40	0.004	0.063	*	6.50	0.004	0.064
6.60	0.004	0.065	*	6.70	0.004	0.066
6.80	0.004	0.067	*	6.90	0.004	0.068
7.00	0.004	0.069	*	7.10	0.004	0.070
7.20	0.004	0.071	*	7.30	0.004	0.072
7.40	0.004	0.073	*	7.50	0.004	0.074
7.60	0.004	0.074	*	7.70	0.004	0.075
7.80	0.004	0.076	*	7.90	0.004	0.076
8.00	0.004	0.077	*	8.10	0.005	0.077
8.20	0.005	0.078	*	8.30	0.005	0.078
8.40	0.005	0.079	*	8.50	0.005	0.080
8.60	0.005	0.081	*	8.70	0.005	0.083
8.80	0.005	0.084	*	8.90	0.005	0.086
9.00	0.005	0.087	*	9.10	0.006	0.090
9.20	0.006	0.092	*	9.30	0.006	0.094
9.40	0.006	0.096	*	9.50	0.006	0.098
9.60	0.007	0.101	*	9.70	0.007	0.103
9.80	0.007	0.106	*	9.90	0.007	0.108
10.00	0.007	0.111	*	10.10	0.008	0.113
10.20	0.008	0.116	*	10.30	0.008	0.119
10.40	0.008	0.123	*	10.50	0.008	0.126
10.60	0.011	0.130	*	10.70	0.011	0.135
10.80	0.011	0.140	*	10.90	0.011	0.145
11.00	0.011	0.151	*	11.10	0.018	0.158
11.20	0.018	0.166	*	11.30	0.018	0.175
11.40	0.018	0.185	*	11.50	0.018	0.195
11.60	0.140	0.223	*	11.70	0.140	0.267
11.80	0.140	0.327	*	11.90	0.140	0.403
12.00	0.140	0.496	*	12.10	0.026	0.590
12.20	0.026	0.684	*	12.30	0.026	0.779
12.40	0.026	0.873	*	12.50	0.026	0.968
12.60	0.014	1.061	*	12.70	0.014	1.129
12.80	0.014	1.167	*	12.90	0.014	1.175
13.00	0.014	1.153	*	13.10	0.010	1.100
13.20	0.010	1.039	*	13.30	0.010	0.974
13.40	0.010	0.906	*	13.50	0.010	0.835
13.60	0.008	0.761	*	13.70	0.008	0.685
13.80	0.008	0.616	*	13.90	0.008	0.558
14.00	0.008	0.511	*	14.10	0.006	0.475
14.20	0.006	0.450	*	14.30	0.006	0.430
14.40	0.006	0.410	*	14.50	0.006	0.392
14.60	0.006	0.374	*	14.70	0.006	0.358
14.80	0.006	0.343	*	14.90	0.006	0.328
15.00	0.006	0.313	*	15.10	0.006	0.298
15.20	0.006	0.284	*	15.30	0.006	0.271
15.40	0.006	0.258	*	15.50	0.006	0.245
15.60	0.006	0.233	*	15.70	0.006	0.222
15.80	0.006	0.211	*	15.90	0.006	0.202
16.00	0.006	0.192	*	16.10	0.003	0.179
16.20	0.003	0.169	*	16.30	0.003	0.158
16.40	0.003	0.149	*	16.50	0.003	0.140
16.60	0.003	0.132	*			

Project Title = Clear Water Pond

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 100.0

Area = 2.2 acres

Hydraulic length = 550.00 Feet

Elevation change = 0.0 feet.

Concentration time = 1.78 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 2.2 acres

-- Storm data

Total precipitation = 2.0 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 1.47 cfs

Discharge volume = 0.37 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.002
0.20	0.013	0.005	*	0.30	0.013	0.010
0.40	0.013	0.017	*	0.50	0.013	0.026
0.60	0.020	0.037	*	0.70	0.020	0.051
0.80	0.020	0.067	*	0.90	0.020	0.086
1.00	0.020	0.107	*	1.10	0.022	0.131
1.20	0.022	0.156	*	1.30	0.022	0.180
1.40	0.022	0.204	*	1.50	0.022	0.228
1.60	0.039	0.254	*	1.70	0.039	0.281
1.80	0.039	0.309	*	1.90	0.039	0.325
2.00	0.039	0.363	*	2.10	0.153	0.407
2.20	0.153	0.465	*	2.30	0.153	0.538
2.40	0.153	0.628	*	2.50	0.153	0.734
2.60	0.041	0.842	*	2.70	0.041	0.947
2.80	0.041	1.050	*	2.90	0.041	1.152
3.00	0.041	1.251	*	3.10	0.033	1.347
3.20	0.033	1.419	*	3.30	0.033	1.460
3.40	0.033	1.473	*	3.50	0.033	1.455
3.60	0.023	1.407	*	3.70	0.023	1.349
3.80	0.023	1.288	*	3.90	0.023	1.224
4.00	0.023	1.156	*	4.10	0.020	1.085
4.20	0.020	1.013	*	4.30	0.020	0.946
4.40	0.020	0.887	*	4.50	0.020	0.838
4.60	0.016	0.798	*	4.70	0.016	0.769
4.80	0.016	0.743	*	4.90	0.016	0.719
5.00	0.016	0.695	*	5.10	0.015	0.672
5.20	0.015	0.650	*	5.30	0.015	0.628
5.40	0.015	0.607	*	5.50	0.015	0.587
5.60	0.016	0.567	*	5.70	0.016	0.549
5.80	0.016	0.532	*	5.90	0.016	0.515
6.00	0.016	0.499	*	6.10	0.000	0.481

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	0.481				
6.20	0.000	0.463	*	6.30	0.000	0.442
6.40	0.000	0.421	*	6.50	0.000	0.399
6.60	0.000	0.375	*	6.70	0.000	0.350
6.80	0.000	0.323	*	6.90	0.000	0.295
7.00	0.000	0.266	*	7.10	0.000	0.237
7.20	0.000	0.210	*	7.30	0.000	0.187
7.40	0.000	0.165	*	7.50	0.000	0.146
7.60	0.000	0.129	*	7.70	0.000	0.113
7.80	0.000	0.099	*	7.90	0.000	0.087
8.00	0.000	0.077	*	8.10	0.000	0.069
8.20	0.000	0.063	*	8.30	0.000	0.058
8.40	0.000	0.053	*	8.50	0.000	0.048
8.60	0.000	0.044	*	8.70	0.000	0.040
8.80	0.000	0.036	*	8.90	0.000	0.032
9.00	0.000	0.029	*	9.10	0.000	0.026
9.20	0.000	0.023	*	9.30	0.000	0.020
9.40	0.000	0.017	*	9.50	0.000	0.015
9.60	0.000	0.013	*	9.70	0.000	0.011
9.80	0.000	0.009	*	9.90	0.000	0.007
10.00	0.000	0.006	*	10.10	0.000	0.004
10.20	0.000	0.003	*	10.30	0.000	0.002
10.40	0.000	0.001	*	10.50	0.000	0.001
10.60	0.000	0.000	*	10.70	0.000	0.000
10.80	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: 8-inch perforated pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.67 ft
Slope.....	0.0394 ft/ft
Manning's n.....	0.010
Discharge.....	3.16 cfs

Computed Results:

Full Flow Capacity.....	3.16 cfs
Full Flow Depth.....	0.67 ft
Velocity.....	8.96 fps
Flow Area.....	0.35 sf
Critical Depth.....	0.66 ft
Critical Slope.....	0.0351 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	3.16 cfs
QMAX @.94D.....	3.40 cfs
Froude Number.....	FULL

Manshaft Sedimentation Pond

The Manshaft sediment pond (NPDES 006) is located in Whitmore Canyon immediately southeast of the manshaft, upper bathouse, manshaft hoist building, and parking lot. The Manshaft sediment pond is a small, off channel, temporary sediment control structure with a total as-built volume of approximately 1.54 acre-feet. Surface water runoff from three watersheds plus the ponds own disturbance, for a total watershed of approximately 30.07 acres, is captured by the pond.

The structure is a temporary sedimentation pond as addressed in R645-301-732.200. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The pond meets the single-open channel spillway exemption of R645-301-742.225.2.

The structure includes 0.65 acre-feet of sediment load capacity and a 0.46 acre-feet of storm capacity. The pond discharges through an 18-inch CMP culvert when the contained volume of the pond is 1.11 acre-feet. The pond has an additional 0.14 acre-feet of temporary capacity between the outlet elevation and the freeboard elevation. This additional capacity simultaneously discharges when utilized.

The 18-inch CMP has a full flow capacity of 10.64 cfs. The CMP passes a 25-year, 6-hour precipitation event of 0.87 cfs. The pond contains a 100-year, 6-hour event of 0.40 acre-feet within the existing 0.46 acre-feet of active storm capacity.

The 18-inch CMP can sustain a total blockage and the pond will contain the required precipitation events. The pond also contains a 2-inch decant pipe. The 2-inch decant pipe allows discharge of major storm events after appropriate settling times. The 2-inch pipe is normally closed.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
MANSHAFT SEDIMENTATION POND
NPDES 006

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area I	20.22	1,000.0	475.0	47.5	61	Ditch	3,060.0	130.0	Hillside above Manshaft
Area IIa	4.21	350.0	141.1	40.3	61	Ditch	352.2	6.3	Hillside below Ditch 1
Area IIb	4.21	350.0	141.1	40.3	61	Ditch	1,057.5	18.8	Hillside below Ditch 1
Area III	1.07	105.0	5.0	4.8	95	Ditch	2,520.0	60.0	Asphalt parking lot
Pond Surface	0.36	170.0	0.0	0.0	100	None			Pond Surface
Totals	30.07								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	1.54	
Capacity w/1' freeboard	1.25	Excludes capacity above freeboard
Temporary storage capacity	0.14	Capacity between outlet & freeboard
Sediment load capacity	0.65	Design sediment load capacity
Available Capacity	0.46	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	0.87 cfs	1.05 cfs	1.15 cfs
Discharge Volume	0.19 acre-feet	0.28 acre-feet	0.40 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	1.500 feet	0.167 feet	
Slope	0.035 ft/ft	0.010 ft/ft	
Manning's n	0.024	0.010	
Discharge	10.640 cfs	0.040 cfs	
Velocity	6.020 fps	1.810 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP	
Area I	0.54	20.7	20	0.22	52.27	0.09	Hillside above Manshaft
Area IIa	0.05	9.4	20	0.22	23.67	0.09	Hillside below Ditch 1
Area IIb	0.05	9.4	20	0.22	23.67	0.09	Hillside below Ditch 1
Area III	0.00	0.0	20	0.00	0.56	1.00	Asphalt parking lot
Pond Surface	0.00	0.0					
Totals	0.65						

```
Project Title          = Manshaft Sediment Pond
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.27
   Hydraulic length     = 3060.00 feet
   Elevation change     =   130.0 feet.
   Travel time          =    0.27 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    61.0
   Area                   =    20.2 acres
   Hydraulic length       = 1000.00 Feet
   Elevation change       =   475.0 feet.
   Concentration time     =    0.06 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.04
   Hydraulic length     =  352.50 feet
   Elevation change     =     6.3 feet.
   Travel time          =    0.04 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     4.2 acres
   Hydraulic length       =  350.00 Feet
   Elevation change       =   141.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.13
   Hydraulic length     = 1057.50 feet
   Elevation change     =    18.8 feet.
   Travel time          =    0.13 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     4.2 acres
   Hydraulic length       =  350.00 Feet
   Elevation change       =   141.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.27
   Hydraulic length     = 2520.00 feet
   Elevation change     =    60.0 feet.
   Travel time          =    0.27 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 4

Curve number = 95.0
Area = 1.1 acres
Hydraulic length = 105.00 Feet
Elevation change = 5.0 feet.
Concentration time = 0.01 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 5

Curve number = 100.0
Area = 0.4 acres
Hydraulic length = 170.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.31 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 30.1 acres

-- Storm data

Total precipitation = 1.6 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 0.87 cfs
Discharge volume = 0.19 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.002	*	0.10	0.010	0.005
0.20	0.010	0.016	*	0.30	0.010	0.025
0.40	0.012	0.030	*	0.50	0.010	0.032
0.60	0.016	0.037	*	0.70	0.015	0.043
0.80	0.016	0.049	*	0.90	0.016	0.052
1.00	0.016	0.053	*	1.10	0.017	0.056
1.20	0.017	0.060	*	1.30	0.017	0.066
1.40	0.017	0.072	*	1.50	0.017	0.077
1.60	0.031	0.089	*	1.70	0.031	0.109
1.80	0.031	0.137	*	1.90	0.031	0.159
2.00	0.031	0.174	*	2.10	0.120	0.232
2.20	0.120	0.354	*	2.30	0.120	0.576
2.40	0.121	0.746	*	2.50	0.120	0.849
2.60	0.032	0.873	*	2.70	0.032	0.801
2.80	0.032	0.579	*	2.90	0.032	0.425
3.00	0.032	0.351	*	3.10	0.026	0.311
3.20	0.026	0.282	*	3.30	0.026	0.253
3.40	0.026	0.236	*	3.50	0.026	0.230
3.60	0.018	0.223	*	3.70	0.018	0.212
3.80	0.018	0.193	*	3.90	0.018	0.189
4.00	0.018	0.199	*	4.10	0.016	0.215
4.20	0.016	0.232	*	4.30	0.016	0.244
4.40	0.016	0.259	*	4.50	0.016	0.275
4.60	0.013	0.289	*	4.70	0.013	0.298
4.80	0.013	0.294	*	4.90	0.013	0.295
5.00	0.012	0.302	*	5.10	0.012	0.309
5.20	0.012	0.314	*	5.30	0.012	0.314
5.40	0.012	0.317	*	5.50	0.012	0.324

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
5.50	0.012	0.324				
5.60	0.013	0.336	*	5.70	0.013	0.350
5.80	0.013	0.374	*	5.90	0.013	0.393
6.00	0.013	0.410	*	6.10	0.000	0.378
6.20	0.000	0.334	*	6.30	0.000	0.154
6.40	0.000	0.076	*	6.50	0.000	0.006
6.60	0.000	0.004	*	6.70	0.000	0.002
6.80	0.000	0.001	*	6.90	0.000	0.000
7.00	0.000	0.000	*			

```
Project Title        = Manshaft Sediment Pond
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.27
   Hydraulic length     = 3060.00 feet
   Elevation change     =   130.0 feet.
   Travel time          =    0.27 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    61.0
   Area                   =    20.2 acres
   Hydraulic length       = 1000.00 Feet
   Elevation change       =   475.0 feet.
   Concentration time     =    0.06 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.04
   Hydraulic length     =  352.50 feet
   Elevation change     =     6.3 feet.
   Travel time          =    0.04 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     4.2 acres
   Hydraulic length       =  350.00 Feet
   Elevation change       =   141.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.13
   Hydraulic length     = 1057.50 feet
   Elevation change     =    18.8 feet.
   Travel time          =    0.13 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     4.2 acres
   Hydraulic length       =  350.00 Feet
   Elevation change       =   141.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.27
   Hydraulic length     = 2520.00 feet
   Elevation change     =    60.0 feet.
   Travel time          =    0.27 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 4

Curve number = 95.0
Area = 1.1 acres
Hydraulic length = 105.00 Feet
Elevation change = 5.0 feet.
Concentration time = 0.01 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 5

Curve number = 100.0
Area = 0.4 acres
Hydraulic length = 170.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.31 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 39.1 acres

-- Storm data

Total precipitation = 1.8 inches
Storm type = SCS Type 2 storm, 24 hour storm
Peak Discharge = 1.05 cfs
Discharge volume = 0.28 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.002	0.000	*	0.10	0.002	0.001
0.20	0.002	0.003	*	0.30	0.002	0.004
0.40	0.002	0.005	*	0.50	0.002	0.006
0.60	0.002	0.006	*	0.70	0.002	0.006
0.80	0.002	0.006	*	0.90	0.002	0.007
1.00	0.002	0.007	*	1.10	0.002	0.007
1.20	0.002	0.007	*	1.30	0.002	0.007
1.40	0.002	0.008	*	1.50	0.002	0.008
1.60	0.002	0.008	*	1.70	0.002	0.008
1.80	0.002	0.008	*	1.90	0.002	0.008
2.00	0.002	0.008	*	2.10	0.002	0.008
2.20	0.002	0.008	*	2.30	0.002	0.008
2.40	0.002	0.008	*	2.50	0.002	0.008
2.60	0.002	0.008	*	2.70	0.002	0.008
2.80	0.002	0.008	*	2.90	0.002	0.008
3.00	0.002	0.008	*	3.10	0.003	0.008
3.20	0.003	0.008	*	3.30	0.003	0.009
3.40	0.003	0.009	*	3.50	0.003	0.009
3.60	0.003	0.009	*	3.70	0.003	0.009
3.80	0.003	0.009	*	3.90	0.003	0.009
4.00	0.003	0.009	*	4.10	0.003	0.009
4.20	0.003	0.010	*	4.30	0.003	0.010
4.40	0.003	0.010	*	4.50	0.003	0.010
4.60	0.003	0.010	*	4.70	0.003	0.010
4.80	0.003	0.011	*	4.90	0.003	0.011
5.00	0.003	0.011	*	5.10	0.003	0.011
5.20	0.003	0.011	*	5.30	0.003	0.011
5.40	0.003	0.011	*	5.50	0.003	0.012

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
5.50	0.003	0.012				
5.60	0.003	0.012	*	5.70	0.003	0.012
5.80	0.003	0.012	*	5.90	0.003	0.012
6.00	0.003	0.012	*	6.10	0.004	0.013
6.20	0.004	0.014	*	6.30	0.004	0.015
6.40	0.004	0.016	*	6.50	0.004	0.016
6.60	0.004	0.016	*	6.70	0.004	0.017
6.80	0.004	0.017	*	6.90	0.004	0.017
7.00	0.004	0.018	*	7.10	0.004	0.018
7.20	0.004	0.018	*	7.30	0.004	0.018
7.40	0.004	0.018	*	7.50	0.004	0.019
7.60	0.004	0.019	*	7.70	0.004	0.019
7.80	0.004	0.019	*	7.90	0.004	0.019
8.00	0.004	0.019	*	8.10	0.005	0.020
8.20	0.005	0.022	*	8.30	0.005	0.024
8.40	0.005	0.025	*	8.50	0.005	0.026
8.60	0.005	0.026	*	8.70	0.005	0.027
8.80	0.005	0.028	*	8.90	0.005	0.029
9.00	0.005	0.030	*	9.10	0.006	0.030
9.20	0.006	0.032	*	9.30	0.006	0.033
9.40	0.006	0.034	*	9.50	0.006	0.035
9.60	0.007	0.036	*	9.70	0.007	0.037
9.80	0.007	0.039	*	9.90	0.007	0.040
10.00	0.007	0.041	*	10.10	0.008	0.043
10.20	0.008	0.045	*	10.30	0.008	0.050
10.40	0.008	0.053	*	10.50	0.008	0.054
10.60	0.011	0.057	*	10.70	0.011	0.061
10.80	0.011	0.069	*	10.90	0.011	0.074
11.00	0.011	0.076	*	11.10	0.018	0.081
11.20	0.018	0.090	*	11.30	0.018	0.106
11.40	0.018	0.117	*	11.50	0.018	0.123
11.60	0.140	0.199	*	11.70	0.140	0.351
11.80	0.140	0.670	*	11.90	0.140	0.903
12.00	0.140	1.030	*	12.10	0.026	1.050
12.20	0.026	0.945	*	12.30	0.026	0.844
12.40	0.026	0.442	*	12.50	0.026	0.360
12.60	0.014	0.326	*	12.70	0.014	0.312
12.80	0.014	0.271	*	12.90	0.014	0.247
13.00	0.014	0.244	*	13.10	0.010	0.244
13.20	0.010	0.243	*	13.30	0.010	0.229
13.40	0.010	0.221	*	13.50	0.010	0.220
13.60	0.008	0.219	*	13.70	0.008	0.218
13.80	0.008	0.206	*	13.90	0.008	0.199
14.00	0.008	0.197	*	14.10	0.006	0.193
14.20	0.006	0.189	*	14.30	0.006	0.172
14.40	0.006	0.161	*	14.50	0.006	0.157
14.60	0.006	0.156	*	14.70	0.006	0.157
14.80	0.006	0.159	*	14.90	0.006	0.161
15.00	0.006	0.163	*	15.10	0.006	0.165
15.20	0.006	0.167	*	15.30	0.006	0.169
15.40	0.006	0.171	*	15.50	0.006	0.174
15.60	0.006	0.176	*	15.70	0.006	0.178
15.80	0.006	0.180	*	15.90	0.006	0.182
16.00	0.006	0.184	*	16.10	0.003	0.179
16.20	0.003	0.171	*	16.30	0.003	0.148
16.40	0.003	0.131	*	16.50	0.003	0.123
16.60	0.003	0.120	*	16.70	0.003	0.119

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
16.70	0.003	0.119				
16.80	0.003	0.119	*	16.90	0.003	0.119
17.00	0.003	0.120	*	17.10	0.003	0.121
17.20	0.003	0.121	*	17.30	0.003	0.122
17.40	0.003	0.123	*	17.50	0.003	0.124
17.60	0.003	0.124	*	17.70	0.003	0.125
17.80	0.003	0.126	*	17.90	0.003	0.127
18.00	0.003	0.127	*	18.10	0.003	0.128
18.20	0.003	0.129	*	18.30	0.003	0.130
18.40	0.003	0.130	*	18.50	0.003	0.131
18.60	0.003	0.132	*	18.70	0.003	0.133
18.80	0.003	0.133	*	18.90	0.003	0.134
19.00	0.003	0.135	*	19.10	0.003	0.136
19.20	0.003	0.136	*	19.30	0.003	0.137
19.40	0.003	0.138	*	19.50	0.003	0.139
19.60	0.003	0.139	*	19.70	0.003	0.140
19.80	0.003	0.141	*	19.90	0.003	0.142
20.00	0.003	0.142	*	20.10	0.002	0.138
20.20	0.002	0.133	*	20.30	0.002	0.118
20.40	0.002	0.107	*	20.50	0.002	0.101
20.60	0.002	0.099	*	20.70	0.002	0.099
20.80	0.002	0.098	*	20.90	0.002	0.098
21.00	0.002	0.099	*	21.10	0.002	0.099
21.20	0.002	0.099	*	21.30	0.002	0.100
21.40	0.002	0.100	*	21.50	0.002	0.100
21.60	0.002	0.100	*	21.70	0.002	0.101
21.80	0.002	0.101	*	21.90	0.002	0.101
22.00	0.002	0.102	*	22.10	0.002	0.102
22.20	0.002	0.102	*	22.30	0.002	0.103
22.40	0.002	0.103	*	22.50	0.002	0.103
22.60	0.002	0.104	*	22.70	0.002	0.104
22.80	0.002	0.104	*	22.90	0.002	0.105
23.00	0.002	0.105	*	23.10	0.002	0.105
23.20	0.002	0.106	*	23.30	0.002	0.106
23.40	0.002	0.106	*	23.50	0.002	0.106
23.60	0.002	0.107	*	23.70	0.002	0.107
23.80	0.002	0.107	*	23.90	0.002	0.108
24.00	0.002	0.108	*	24.10	0.000	0.097
24.20	0.000	0.084	*	24.30	0.000	0.041
24.40	0.000	0.001	*	24.50	0.000	0.001
24.60	0.000	0.001	*	24.70	0.000	0.000
24.80	0.000	0.000	*	24.90	0.000	0.000
25.00	0.000	0.000	*			

```
Project Title        = Manshaft Sediment Pond
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.27
   Hydraulic length     = 3060.00 feet
   Elevation change     =   130.0 feet.
   Travel time          =    0.27 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    61.0
   Area                   =    20.2 acres
   Hydraulic length       = 1000.00 Feet
   Elevation change       =   475.0 feet.
   Concentration time     =    0.06 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.04
   Hydraulic length     =  352.50 feet
   Elevation change     =     6.3 feet.
   Travel time          =    0.04 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     4.2 acres
   Hydraulic length       =  350.00 Feet
   Elevation change       =   141.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.13
   Hydraulic length     = 1057.50 feet
   Elevation change     =    18.8 feet.
   Travel time          =    0.13 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     4.2 acres
   Hydraulic length       =  350.00 Feet
   Elevation change       =   141.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.27
   Hydraulic length     = 2520.00 feet
   Elevation change     =    60.0 feet.
   Travel time          =    0.27 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 4

Curve number = 95.0
Area = 1.1 acres
Hydraulic length = 105.00 Feet
Elevation change = 5.0 feet.
Concentration time = 0.01 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 5

Curve number = 100.0
Area = 0.4 acres
Hydraulic length = 170.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.31 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 30.1 acres

-- Storm data

Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 1.15 cfs
Discharge volume = 0.40 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.007
0.20	0.013	0.020	*	0.30	0.013	0.031
0.40	0.013	0.038	*	0.50	0.013	0.041
0.60	0.020	0.046	*	0.70	0.020	0.055
0.80	0.020	0.062	*	0.90	0.020	0.066
1.00	0.020	0.070	*	1.10	0.022	0.077
1.20	0.022	0.086	*	1.30	0.022	0.095
1.40	0.022	0.104	*	1.50	0.022	0.111
1.60	0.039	0.126	*	1.70	0.039	0.152
1.80	0.039	0.192	*	1.90	0.039	0.222
2.00	0.039	0.242	*	2.10	0.153	0.315
2.20	0.153	0.474	*	2.30	0.153	0.774
2.40	0.153	1.000	*	2.50	0.153	1.129
2.60	0.041	1.154	*	2.70	0.041	1.060
2.80	0.041	0.785	*	2.90	0.041	0.624
3.00	0.041	0.610	*	3.10	0.033	0.651
3.20	0.033	0.716	*	3.30	0.033	0.753
3.40	0.033	0.802	*	3.50	0.033	0.868
3.60	0.023	0.904	*	3.70	0.023	0.929
3.80	0.023	0.877	*	3.90	0.023	0.847
4.00	0.023	0.847	*	4.10	0.020	0.856
4.20	0.020	0.870	*	4.30	0.020	0.866
4.40	0.020	0.871	*	4.50	0.020	0.886
4.60	0.016	0.889	*	4.70	0.016	0.890
4.80	0.016	0.854	*	4.90	0.016	0.833
5.00	0.016	0.830	*	5.10	0.015	0.829
5.20	0.015	0.831	*	5.30	0.015	0.817
5.40	0.015	0.811	*	5.50	0.015	0.813

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
5.50	0.015	0.813				
5.60	0.016	0.832	*	5.70	0.016	0.855
5.80	0.016	0.900	*	5.90	0.016	0.937
6.00	0.016	0.964	*	6.10	0.000	0.876
6.20	0.000	0.770	*	6.30	0.000	0.389
6.40	0.000	0.192	*	6.50	0.000	0.080
6.60	0.000	0.005	*	6.70	0.000	0.002
6.80	0.000	0.001	*	6.90	0.000	0.000
7.00	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Manshaft Sediment

Comment: 18-inch CMP Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0350 ft/ft
Manning's n.....	0.024
Discharge.....	10.64 cfs

Computed Results:

Full Flow Capacity.....	10.64 cfs
Full Flow Depth.....	1.50 ft
Velocity.....	6.02 fps
Flow Area.....	1.77 sf
Critical Depth....	1.25 ft
Critical Slope....	0.0339 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	10.64 cfs
QMAX @.94D.....	11.45 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Manshaft Sediment

Comment: 2-inch Victaulic Decant Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.17 ft
Slope.....	0.0100 ft/ft
Manning's n.....	0.010
Discharge.....	0.04 cfs

Computed Results:

Full Flow Capacity.....	0.04 cfs
Full Flow Depth.....	0.17 ft
Velocity.....	1.81 fps
Flow Area.....	0.02 sf
Critical Depth....	0.13 ft
Critical Slope....	0.0106 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	0.04 cfs
QMAX @.94D.....	0.04 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Railcut Sediment Pond

The Railcut sediment pond (NPDES 007) is located at the base of the Coarse Refuse Pile and captures the runoff from the coarse refuse pile area and the southern slopes of the East and West Slurry Cells. The pond is an off channel, temporary sediment control structure with a total as-built volume of approximately 15.01 acre-feet. Surface water runoff from three watersheds plus the ponds own disturbance, for a total watershed of approximately 59.41 acres, is captured by the pond.

The structure is a temporary sedimentation pond as addressed in R645-301-732.200. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The pond meets the single-open channel spillway exemption of R645-301-742.225.2.

The structure includes 1.04 acre-feet of sediment load capacity and a 5.62 acre-feet of storm capacity. The pond discharges through a 48-inch CMP culvert when the contained volume of the pond is 6.66 acre-feet. The pond has an additional 6.57 acre-feet of temporary capacity between the outlet elevation and the freeboard elevation. This additional capacity simultaneously discharges when utilized.

The 48-inch CMP has a full flow capacity of 124.49 cfs. The CMP passes a 25-year, 6-hour precipitation event of 16.01 cfs. The pond contains a 100-year, 6-hour event of 4.58 acre-feet within the existing 5.62 acre-feet of active storm capacity.

The 48-inch CMP can sustain a total blockage and the pond will contain the required precipitation events. The pond also contains a 2-inch decant pipe. The 2-inch decant pipe allows discharge of major storm events after appropriate settling times. The 2-inch pipe is normally closed.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
RAILCUT SEDIMENTATION POND
NPDES 007

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area Ia	10.00	1,000.0	85.0	8.5	86	Ditch	3,160.0	230.0	Coarse Refuse pile terraced outslope
Area Ib	21.43	1,120.0	220.0	19.6	86	Ditch	1,900.0	95.0	Coarse Refuse pile terraced outslope
Area II	8.98	420.0	140.0	33.3	86	Ditch	950.0	10.0	Below Coarse Refuse road
Area IIIa	5.70	200.0	115.0	57.5	86	Ditch	2,520.0	170.0	South embankment Coarse Refuse Pile
Area IIIb	5.70	250.0	90.0	36.0	86	Ditch	3,670.0	225.0	South embankment West Slurry Cell
Area IIIc	5.70	230.0	60.0	26.1	86	Ditch	4,680.0	260.0	South embankment East Slurry Cell
Pond Surface	1.90	550.0	0.0	0.0	100	None			Pond Surface
Totals	59.41								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	15.01	
Capacity w/1' freeboard	13.23	Excludes capacity above freeboard
Temporary storage capacity	6.57	Capacity between outlet & freeboard
Sediment load capacity	1.04	Design sediment load capacity
Available Capacity	5.62	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	16.01 cfs	23.69 cfs	26.11 cfs
Discharge Volume	3.00 acre-feet	3.79 acre-feet	4.58 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	4.000 feet	0.167 feet	
Slope	0.026 ft/ft	0.037 ft/ft	
Manning's n	0.024	0.010	
Discharge	124.490 cfs	0.080 cfs	
Velocity	9.910 fps	3.490 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP	
Area Ia	0.05	3.7	20	0.22	3.71	0.23	Terraced outslope P=.5 C=.45
Area Ib	0.39	14.0	20	0.22	14.13	0.23	Terraced outslope P=.5 C=.45
Area II	0.23	20.1	20	0.22	26.84	0.17	Undisturbed P=1
Area IIIa	0.18	24.5	20	0.22	32.74	0.17	Undisturbed P=1
Area IIIb	0.11	15.0	20	0.22	20.00	0.17	Undisturbed P=1
Area IIIc	0.07	9.4	20	0.22	12.57	0.17	Undisturbed P=1
Pond Surface	0.00	0.0					Pond Surface
Totals	1.04						

```
Project Title        = Railcut Sediment Pond
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.35 K=   1.25
   Hydraulic length     = 3160.00 feet
   Elevation change     =   230.0 feet.
   Travel time          =    1.25 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number            =    86.0
   Area                    =    10.0 acres
   Hydraulic length        = 1000.00 Feet
   Elevation change        =    85.0 feet.
   Concentration time      =    0.10 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   1.19
   Hydraulic length     = 1900.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    1.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number            =    86.0
   Area                    =    21.4 acres
   Hydraulic length        = 1120.00 Feet
   Elevation change        =   220.0 feet.
   Concentration time      =    0.07 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.23 K=   1.11
   Hydraulic length     =  950.00 feet
   Elevation change     =    10.0 feet.
   Travel time          =    1.11 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number            =    86.0
   Area                    =     9.0 acres
   Hydraulic length        =  420.00 Feet
   Elevation change        =   140.0 feet.
   Concentration time      =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.24
   Hydraulic length     = 2520.00 feet
   Elevation change     =   170.0 feet.
   Travel time          =    1.24 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number            =    86.0
   Area                    =     5.7 acres
   Hydraulic length        =  200.00 Feet
   Elevation change        =   115.0 feet.
   Concentration time      =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.33
   Hydraulic length     = 3670.00 feet
   Elevation change     =   225.0 feet.
   Travel time          =    1.33 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number            =    86.0
   Area                    =     5.7 acres
   Hydraulic length        =  250.00 Feet
   Elevation change        =    90.0 feet
   Concentration time      =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.41
   Hydraulic length     = 4520.00 feet
   Elevation change     =   260.0 feet.
   Travel time          =    1.41 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number            =    86.0
   Area                    =     5.7 acres
   Hydraulic length        =  230.00 Feet
   Elevation change        =    60.0 feet.
   Concentration time      =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed


-- Watershed data for watershed # 7
   Curve number            =   100.0
   Area                    =     1.9 acres
   Hydraulic length        =  550.00 Feet
   Elevation change        =     0.0 feet.
   Concentration time      =    1.78 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Total Area           =    59.4 acres

-- Storm data
   Total precipitation  =     1.6 inches
   Storm type           = SCS 6 hour design storm
   Peak Discharge       =   16.01 cfs
   Discharge volume     =    3.00 acre ft
```

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.001
0.20	0.010	0.004	*	0.30	0.010	0.007
0.40	0.010	0.012	*	0.50	0.010	0.018
0.60	0.016	0.026	*	0.70	0.015	0.035
0.80	0.016	0.046	*	0.90	0.016	0.060
1.00	0.016	0.074	*	1.10	0.017	0.091
1.20	0.017	0.108	*	1.30	0.017	0.125
1.40	0.017	0.142	*	1.50	0.017	0.159
1.60	0.031	0.177	*	1.70	0.031	0.195
1.80	0.031	0.214	*	1.90	0.031	0.233
2.00	0.031	0.253	*	2.10	0.120	0.283
2.20	0.120	0.323	*	2.30	0.120	0.374
2.40	0.121	0.437	*	2.50	0.120	0.512
2.60	0.032	0.593	*	2.70	0.032	0.692
2.80	0.032	0.853	*	2.90	0.032	1.176
3.00	0.032	1.854	*	3.10	0.026	3.152
3.20	0.026	5.262	*	3.30	0.026	8.139
3.40	0.026	11.366	*	3.50	0.026	14.207
3.60	0.018	15.882	*	3.70	0.018	15.012
3.80	0.018	14.879	*	3.90	0.018	13.172
4.00	0.018	11.516	*	4.10	0.016	10.213
4.20	0.016	9.297	*	4.30	0.016	8.654
4.40	0.016	8.211	*	4.50	0.016	7.951
4.60	0.013	7.519	*	4.70	0.013	7.143
4.80	0.013	6.746	*	4.90	0.013	6.378
5.00	0.013	6.078	*	5.10	0.012	5.845
5.20	0.012	5.665	*	5.30	0.012	5.520
5.40	0.012	5.395	*	5.50	0.012	5.277
5.60	0.013	5.147	*	5.70	0.013	4.997
5.80	0.013	4.934	*	5.90	0.013	4.681
6.00	0.013	4.549	*	6.10	0.003	4.435
6.20	0.003	4.334	*	6.30	0.002	4.246
6.40	0.002	4.179	*	6.50	0.000	4.145
6.60	0.002	4.147	*	6.70	0.002	4.176
6.80	0.002	4.199	*	6.90	0.000	4.155
7.00	0.002	3.954	*	7.10	0.000	3.551
7.20	0.000	2.910	*	7.30	0.000	2.142
7.40	0.000	1.399	*	7.50	0.000	0.742
7.60	0.000	0.247	*	7.70	0.000	0.100
7.80	0.000	0.069	*	7.90	0.000	0.061
8.00	0.000	0.054	*	8.10	0.000	0.048
8.20	0.000	0.044	*	8.30	0.000	0.040
8.40	0.000	0.037	*	8.50	0.000	0.034
8.60	0.000	0.031	*	8.70	0.000	0.028
8.80	0.000	0.025	*	8.90	0.000	0.022
9.00	0.000	0.020	*	9.10	0.000	0.018
9.20	0.000	0.016	*	9.30	0.000	0.014
9.40	0.000	0.012	*	9.50	0.000	0.010
9.60	0.000	0.009	*	9.70	0.000	0.007
9.80	0.000	0.005	*	9.90	0.000	0.005
10.00	0.000	0.004	*	10.10	0.000	0.003
10.20	0.000	0.002	*	10.30	0.000	0.002
10.40	0.000	0.001	*	10.50	0.000	0.001
10.60	0.000	0.000	*	10.70	0.000	0.000
10.80	0.000	0.000	*			

```
Project Title        = Railcut Sediment Pond
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.35 K=   1.25
   Hydraulic length     = 3160.00 feet
   Elevation change     =   230.0 feet.
   Travel time          =    1.25 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    86.0
   Area                   =    10.0 acres
   Hydraulic length       = 1000.00 Feet
   Elevation change       =    85.0 feet.
   Concentration time     =    0.10 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   1.19
   Hydraulic length     = 1900.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    1.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    86.0
   Area                   =    21.4 acres
   Hydraulic length       = 1120.00 Feet
   Elevation change       =   220.0 feet.
   Concentration time     =    0.07 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.23 K=   1.11
   Hydraulic length     =  953.00 feet
   Elevation change     =    10.0 feet.
   Travel time          =    1.11 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    86.0
   Area                   =     9.0 acres
   Hydraulic length       =  420.00 Feet
   Elevation change       =   140.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.24
   Hydraulic length     = 2520.00 feet
   Elevation change     =   170.0 feet.
   Travel time          =    1.24 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number            =    86.0
   Area                    =     5.7 acres
   Hydraulic length        =  200.00 Feet
   Elevation change        =   115.0 feet.
   Concentration time      =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.33
   Hydraulic length     = 3670.00 feet
   Elevation change     =   225.0 feet.
   Travel time          =    1.33 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number            =    86.0
   Area                    =     5.7 acres
   Hydraulic length        =  250.00 Feet
   Elevation change        =    90.0 feet.
   Concentration time      =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.41
   Hydraulic length     = 4580.00 feet
   Elevation change     =   260.0 feet.
   Travel time          =    1.41 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number            =    86.0
   Area                    =     5.7 acres
   Hydraulic length        =  230.00 Feet
   Elevation change        =    60.0 feet.
   Concentration time      =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed


-- Watershed data for watershed # 7
   Curve number            =   100.0
   Area                    =     1.9 acres
   Hydraulic length        =  550.00 Feet
   Elevation change        =     0.0 feet.
   Concentration time      =    1.78 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Total Area            =    59.4 acres

-- Storm data
   Total precipitation  =     1.8 inches
   Storm type           = SCS Type 2 storm. 24 hour storm
   Peak Discharge       =   23.69 cfs
   Discharge volume     =    3.79 acre ft
```

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.000
0.20	0.002	0.001	*	0.30	0.002	0.001
0.40	0.002	0.002	*	0.50	0.002	0.003
0.60	0.002	0.004	*	0.70	0.002	0.006
0.80	0.002	0.008	*	0.90	0.002	0.010
1.00	0.002	0.012	*	1.10	0.002	0.014
1.20	0.002	0.016	*	1.30	0.002	0.018
1.40	0.002	0.021	*	1.50	0.002	0.022
1.60	0.002	0.024	*	1.70	0.002	0.026
1.80	0.002	0.028	*	1.90	0.002	0.029
2.00	0.002	0.030	*	2.10	0.002	0.031
2.20	0.002	0.032	*	2.30	0.002	0.033
2.40	0.002	0.034	*	2.50	0.002	0.035
2.60	0.002	0.036	*	2.70	0.002	0.036
2.80	0.002	0.037	*	2.90	0.002	0.037
3.00	0.002	0.038	*	3.10	0.003	0.038
3.20	0.003	0.039	*	3.30	0.003	0.039
3.40	0.003	0.040	*	3.50	0.003	0.040
3.60	0.003	0.041	*	3.70	0.003	0.042
3.80	0.003	0.042	*	3.90	0.003	0.043
4.00	0.003	0.043	*	4.10	0.003	0.044
4.20	0.003	0.045	*	4.30	0.003	0.046
4.40	0.003	0.046	*	4.50	0.003	0.047
4.60	0.003	0.048	*	4.70	0.003	0.048
4.80	0.003	0.049	*	4.90	0.003	0.049
5.00	0.003	0.050	*	5.10	0.003	0.051
5.20	0.003	0.051	*	5.30	0.003	0.052
5.40	0.003	0.052	*	5.50	0.003	0.053
5.60	0.003	0.053	*	5.70	0.003	0.053
5.80	0.003	0.054	*	5.90	0.003	0.054
6.00	0.003	0.054	*	6.10	0.004	0.055
6.20	0.004	0.055	*	6.30	0.004	0.055
6.40	0.004	0.056	*	6.50	0.004	0.056
6.60	0.004	0.057	*	6.70	0.004	0.058
6.80	0.004	0.059	*	6.90	0.004	0.059
7.00	0.004	0.060	*	7.10	0.004	0.061
7.20	0.004	0.062	*	7.30	0.004	0.063
7.40	0.004	0.064	*	7.50	0.004	0.065
7.60	0.004	0.065	*	7.70	0.004	0.066
7.80	0.004	0.067	*	7.90	0.004	0.067
8.00	0.004	0.067	*	8.10	0.005	0.068
8.20	0.005	0.068	*	8.30	0.005	0.069
8.40	0.005	0.072	*	8.50	0.005	0.070
8.60	0.005	0.071	*	8.70	0.005	0.073
8.80	0.005	0.074	*	8.90	0.005	0.075
9.00	0.005	0.077	*	9.10	0.006	0.079
9.20	0.006	0.081	*	9.30	0.006	0.083
9.40	0.006	0.085	*	9.50	0.006	0.087
9.60	0.007	0.089	*	9.70	0.007	0.091
9.80	0.007	0.093	*	9.90	0.007	0.095
10.00	0.007	0.097	*	10.10	0.008	0.100
10.20	0.008	0.102	*	10.30	0.008	0.105
10.40	0.008	0.108	*	10.50	0.008	0.111
10.60	0.011	0.115	*	10.70	0.011	0.119
10.80	0.011	0.124	*	10.90	0.011	0.131
11.00	0.011	0.142	*	11.10	0.018	0.159

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
11.10	0.018	0.158				
11.20	0.018	0.183	*	11.30	0.018	0.215
11.40	0.018	0.257	*	11.50	0.018	0.307
11.60	0.140	0.381	*	11.70	0.140	0.479
11.80	0.140	0.602	*	11.90	0.140	0.750
12.00	0.140	0.930	*	12.10	0.026	1.142
12.20	0.026	1.414	*	12.30	0.026	1.819
12.40	0.026	2.526	*	12.50	0.026	3.857
12.60	0.014	6.213	*	12.70	0.014	9.783
12.80	0.014	14.273	*	12.90	0.014	18.839
13.00	0.014	22.374	*	13.10	0.010	23.692
13.20	0.010	22.614	*	13.30	0.010	19.718
13.40	0.010	16.164	*	13.50	0.010	12.901
13.60	0.008	10.323	*	13.70	0.008	8.409
13.80	0.008	7.010	*	13.90	0.008	6.002
14.00	0.008	5.287	*	14.10	0.006	4.772
14.20	0.006	4.393	*	14.30	0.006	4.069
14.40	0.006	3.914	*	14.50	0.006	3.604
14.60	0.006	3.422	*	14.70	0.006	3.252
14.80	0.006	3.089	*	14.90	0.006	2.938
15.00	0.006	2.797	*	15.10	0.006	2.656
15.20	0.006	2.507	*	15.30	0.006	2.359
15.40	0.006	2.226	*	15.50	0.006	2.124
15.60	0.006	2.054	*	15.70	0.006	2.011
15.80	0.006	1.986	*	15.90	0.006	1.970
16.00	0.005	1.961	*	16.10	0.003	1.953
16.20	0.003	1.947	*	16.30	0.003	1.941
16.40	0.003	1.936	*	16.50	0.003	1.931
16.60	0.003	1.927	*	16.70	0.003	1.922
16.80	0.003	1.916	*	16.90	0.003	1.897
17.00	0.003	1.856	*	17.10	0.003	1.780
17.20	0.003	1.669	*	17.30	0.003	1.540
17.40	0.003	1.418	*	17.50	0.003	1.321
17.60	0.003	1.256	*	17.70	0.003	1.219
17.80	0.003	1.197	*	17.90	0.003	1.188
18.00	0.003	1.184	*	18.10	0.003	1.182
18.20	0.003	1.183	*	18.30	0.003	1.182
18.40	0.003	1.183	*	18.50	0.003	1.183
18.60	0.003	1.183	*	18.70	0.003	1.184
18.80	0.003	1.184	*	18.90	0.003	1.185
19.00	0.003	1.185	*	19.10	0.003	1.186
19.20	0.003	1.187	*	19.30	0.003	1.189
19.40	0.003	1.189	*	19.50	0.003	1.189
19.60	0.003	1.190	*	19.70	0.003	1.191
19.80	0.003	1.192	*	19.90	0.003	1.193
20.00	0.003	1.193	*	20.10	0.002	1.194
20.20	0.002	1.195	*	20.30	0.002	1.195
20.40	0.002	1.196	*	20.50	0.002	1.196
20.60	0.002	1.196	*	20.70	0.002	1.195
20.80	0.002	1.192	*	20.90	0.002	1.182
21.00	0.002	1.161	*	21.10	0.002	1.122
21.20	0.002	1.064	*	21.30	0.002	0.987
21.40	0.002	0.934	*	21.50	0.002	0.884
21.60	0.002	0.850	*	21.70	0.002	0.830
21.80	0.002	0.820	*	21.90	0.002	0.815
22.00	0.002	0.813	*	22.10	0.002	0.812
22.20	0.002	0.812	*	22.30	0.002	0.812

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
22.30	0.002	0.812				
22.40	0.002	0.812	*	22.50	0.002	0.812
22.60	0.002	0.812	*	22.70	0.002	0.812
22.80	0.002	0.812	*	22.90	0.002	0.813
23.00	0.002	0.813	*	23.10	0.002	0.813
23.20	0.002	0.813	*	23.30	0.002	0.814
23.40	0.002	0.814	*	23.50	0.002	0.814
23.60	0.002	0.814	*	23.70	0.002	0.815
23.80	0.002	0.815	*	23.90	0.002	0.815
24.00	0.002	0.816	*	24.10	0.000	0.816
24.20	0.000	0.816	*	24.30	0.000	0.651
24.40	0.000	0.650	*	24.50	0.000	0.649
24.60	0.000	0.645	*	24.70	0.000	0.618
24.80	0.000	0.534	*	24.90	0.000	0.522
25.00	0.000	0.492	*	25.10	0.000	0.432
25.20	0.000	0.337	*	25.30	0.000	0.212
25.40	0.000	0.072	*	25.50	0.000	0.016
25.60	0.000	0.014	*	25.70	0.000	0.013
25.80	0.000	0.011	*	25.90	0.000	0.010
26.00	0.000	0.009	*	26.10	0.000	0.008
26.20	0.000	0.007	*	26.30	0.000	0.007
26.40	0.000	0.006	*	26.50	0.000	0.006
26.60	0.000	0.005	*	26.70	0.000	0.005
26.80	0.000	0.004	*	26.90	0.000	0.004
27.00	0.000	0.004	*	27.10	0.000	0.003
27.20	0.000	0.003	*	27.30	0.000	0.003
27.40	0.000	0.003	*	27.50	0.000	0.002
27.60	0.000	0.002	*	27.70	0.000	0.001
27.80	0.000	0.001	*	27.90	0.000	0.001
28.00	0.000	0.001	*	28.10	0.000	0.001
28.20	0.000	0.000	*	28.30	0.000	0.000
28.40	0.000	0.000	*	28.50	0.000	0.000
28.60	0.000	0.000	*	28.70	0.000	0.000
28.80	0.000	0.000	*			

```
Project Title        = Railcut Sediment Pond
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.35 K=   1.25
   Hydraulic length     = 3160.00 feet
   Elevation change     =   230.0 feet.
   Travel time          =    1.25 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    86.0
   Area                   =    10.0 acres
   Hydraulic length       = 1000.00 Feet
   Elevation change       =    85.0 feet.
   Concentration time     =    0.10 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   1.19
   Hydraulic length     = 1900.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    1.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    86.0
   Area                   =    21.4 acres
   Hydraulic length       = 1120.00 Feet
   Elevation change       =   220.0 feet.
   Concentration time     =    0.07 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.23 K=   1.11
   Hydraulic length     =  950.00 feet
   Elevation change     =    10.0 feet.
   Travel time          =    1.11 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    86.0
   Area                   =     9.0 acres
   Hydraulic length       =  420.00 Feet
   Elevation change       =   140.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.24
   Hydraulic length     = 2520.00 feet
   Elevation change     =   170.0 feet.
   Travel time          =    1.24 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =   86.0
   Area                   =    5.7 acres
   Hydraulic length       =  200.00 Feet
   Elevation change       =   115.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.33
   Hydraulic length     = 3670.00 feet
   Elevation change     =   225.0 feet.
   Travel time          =    1.33 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =   86.0
   Area                   =    5.7 acres
   Hydraulic length       =  250.00 Feet
   Elevation change       =   90.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   1.41
   Hydraulic length     = 4680.00 feet
   Elevation change     =   260.0 feet.
   Travel time          =    1.41 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =   86.0
   Area                   =    5.7 acres
   Hydraulic length       =  230.00 Feet
   Elevation change       =   60.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed


-- Watershed data for watershed # 7
   Curve number           =  100.0
   Area                   =    1.9 acres
   Hydraulic length       =  550.00 Feet
   Elevation change       =    0.0 feet.
   Concentration time     =    1.78 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Total Area          =   59.4 acres

-- Storm data
   Total precipitation =    2.0 inches
   Storm type          = SCS 6 hour design storm
   Peak Discharge      =  26.11 cfs
   Discharge volume    =   4.58 acre ft
```

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.002
0.20	0.013	0.005	*	0.30	0.013	0.009
0.40	0.013	0.015	*	0.50	0.013	0.023
0.60	0.020	0.032	*	0.70	0.020	0.044
0.80	0.020	0.059	*	0.90	0.020	0.075
1.00	0.020	0.094	*	1.10	0.022	0.116
1.20	0.022	0.137	*	1.30	0.022	0.159
1.40	0.022	0.180	*	1.50	0.022	0.201
1.60	0.039	0.224	*	1.70	0.039	0.247
1.80	0.039	0.271	*	1.90	0.039	0.295
2.00	0.039	0.320	*	2.10	0.153	0.358
2.20	0.153	0.409	*	2.30	0.153	0.475
2.40	0.153	0.559	*	2.50	0.153	0.667
2.60	0.041	0.810	*	2.70	0.041	1.033
2.80	0.041	1.441	*	2.90	0.041	2.229
3.00	0.041	3.713	*	3.10	0.033	6.269
3.20	0.033	10.087	*	3.30	0.033	14.919
3.40	0.033	19.966	*	3.50	0.033	24.064
3.60	0.023	26.113	*	3.70	0.023	25.701
3.80	0.023	23.394	*	3.90	0.023	20.331
4.00	0.023	17.484	*	4.10	0.020	15.291
4.20	0.020	13.756	*	4.30	0.020	12.716
4.40	0.020	11.994	*	4.50	0.020	11.432
4.60	0.016	10.895	*	4.70	0.016	10.317
4.80	0.016	9.714	*	4.90	0.016	9.157
5.00	0.016	8.703	*	5.10	0.015	8.353
5.20	0.015	8.080	*	5.30	0.015	7.858
5.40	0.015	7.669	*	5.50	0.015	7.491
5.60	0.016	7.296	*	5.70	0.016	7.072
5.80	0.016	6.833	*	5.90	0.016	6.607
6.00	0.016	6.413	*	6.10	0.000	6.246
6.20	0.000	6.098	*	6.30	0.000	5.969
6.40	0.000	5.870	*	6.50	0.000	5.817
6.60	0.000	5.817	*	6.70	0.000	5.854
6.80	0.000	5.884	*	6.90	0.000	5.821
7.00	0.000	5.553	*	7.10	0.000	4.975
7.20	0.000	4.084	*	7.30	0.000	3.016
7.40	0.000	1.969	*	7.50	0.000	1.088
7.60	0.000	0.501	*	7.70	0.000	0.190
7.80	0.000	0.087	*	7.90	0.000	0.077
8.00	0.000	0.068	*	8.10	0.000	0.061
8.20	0.000	0.056	*	8.30	0.000	0.051
8.40	0.000	0.047	*	8.50	0.000	0.043
8.60	0.000	0.039	*	8.70	0.000	0.035
8.80	0.000	0.032	*	8.90	0.000	0.028
9.00	0.000	0.025	*	9.10	0.000	0.023
9.20	0.000	0.020	*	9.30	0.000	0.017
9.40	0.000	0.015	*	9.50	0.000	0.013
9.60	0.000	0.011	*	9.70	0.000	0.009
9.80	0.000	0.008	*	9.90	0.000	0.006
10.00	0.000	0.005	*	10.10	0.000	0.004
10.20	0.000	0.003	*	10.30	0.000	0.002
10.40	0.000	0.001	*	10.50	0.000	0.001
10.60	0.000	0.000	*	10.70	0.000	0.000
10.80	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Railcut Sediment

Comment: 48-inch CMP Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	4.00 ft
Slope.....	0.0256 ft/ft
Manning's n.....	0.024
Discharge.....	124.49 cfs

Computed Results:

Full Flow Capacity.....	124.49 cfs
Full Flow Depth.....	4.00 ft
Velocity.....	9.91 fps
Flow Area.....	12.57 sf
Critical Depth....	3.35 ft
Critical Slope....	0.0247 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	124.49 cfs
QMAX @.94D.....	133.92 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Railcut Sediment

Comment: 2-inch Victaulic Decant Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.17 ft
Slope.....	0.0372 ft/ft
Manning's n.....	0.010
Discharge.....	0.08 cfs

Computed Results:

Full Flow Capacity.....	0.08 cfs
Full Flow Depth.....	0.17 ft
Velocity.....	3.49 fps
Flow Area.....	0.02 sf
Critical Depth....	0.16 ft
Critical Slope....	0.0327 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	0.08 cfs
QMAX @.94D.....	0.09 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Old Coarse Refuse Road Sediment Pond

The Old Coarse Refuse Road sediment pond (NPDES 008) is located south and at the base of the East Slurry Cell. The pond is an off channel, temporary sediment control structure with a total as-built volume of approximately 1.81 acre-feet. Surface water runoff from three watersheds plus the ponds own disturbance, for a total watershed of approximately 9.34 acres, is captured by the pond. The watersheds capture runoff from the Old Coarse Refuse area east of the East Slurry Cell and divert the runoff through ditches and a culvert to the sedimentation pond.

The structure is a temporary sedimentation pond as addressed in R645-301-732.200. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The pond meets the single-open channel spillway exemption of R645-301-742.225.2.

The structure includes 0.17 acre-feet (original design of 0.11 acre-feet) of sediment load capacity and a 0.96 acre-feet (original design of 1.02 acre-feet) of storm capacity. The pond discharges through a 18-inch CMP culvert when the contained volume of the pond is 1.13 acre-feet. The pond has an additional 0.39 acre-feet of temporary capacity between the outlet elevation and the freeboard elevation. This additional capacity simultaneously discharges when utilized.

The 18-inch CMP has a full flow capacity of 24.07 cfs. The CMP passes a 25-year, 6-hour precipitation event of 3.94 cfs. The pond contains a 100-year, 6-hour event of 0.63 acre-feet within the existing 0.96 acre-feet of active storm capacity.

The 18-inch CMP can sustain a total blockage and the pond will contain the required precipitation events. The pond also contains a 2-inch decant pipe. The 2-inch decant pipe allows discharge of major storm events after appropriate settling times. The 2-inch pipe is normally closed.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
OLD COARSE REFUSE ROAD SEDIMENTATION POND
NPDES 008

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area I	5.99	2,400.0	360.0	15.0	86	Ditch	570.0	102.5	Old coarse refuse pile
Area II	1.80	270.0	95.0	35.2	79	Ditch	570.0	102.5	Contributory area
Area III	1.25	200.0	85.0	42.5	79	Ditch	570.0	102.5	Contributory area
Pond Surface	0.30	230.0	0.0	0.0	100	None			Pond Surface
Totals	9.34								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	1.81	
Capacity w/1' freeboard	1.52	Excludes capacity above freeboard
Temporary storage capacity	0.39	Capacity between outlet & freeboard
Sediment load capacity	0.17	Design sediment load capacity
Available Capacity	0.96	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	3.94 cfs	5.72 cfs	6.25 cfs
Discharge Volume	0.41 acre-feet	0.52 acre-feet	0.63 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	1.500 feet	0.167 feet	
Slope	0.179 ft/ft	0.120 ft/ft	
Manning's n	0.024	0.010	
Discharge	24.070 cfs	0.140 cfs	
Velocity	13.620 fps	6.270 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP	
Area I	0.10	12.5	20	0.22	12.66	0.23	Contoured P=.5 C=0.45
Area II	0.04	16.4	20	0.22	21.91	0.17	Undisturbed P=1
Area III	0.03	18.8	20	0.22	25.20	0.17	Undisturbed P=1
Pond Surface	0.00	0.0					
Totals	0.17						

```
Project Title        = Old Course Refuse Rd
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.40 K=   0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    86.0
   Area                   =     6.0 acres
   Hydraulic length       = 2400.00 Feet
   Elevation change       =   360.0 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.40 K=   0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    79.0
   Area                   =     1.8 acres
   Hydraulic length       =  270.00 Feet
   Elevation change       =    95.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.40 K=   0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    79.0
   Area                   =     1.3 acres
   Hydraulic length       =  200.00 Feet
   Elevation change       =    85.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed


-- Watershed data for watershed # 4
   Curve number           =   100.0
   Area                   =     0.3 acres
   Hydraulic length       =  230.00 Feet
   Elevation change       =     0.0 feet.
   Concentration time     =    0.48 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed
```

-- Total Area = 9.3 acres

-- Storm data

Total precipitation = 1.6 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 3.94 cfs
Discharge volume = 0.41 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.002
0.20	0.010	0.006	*	0.30	0.010	0.012
0.40	0.010	0.018	*	0.50	0.010	0.023
0.60	0.016	0.026	*	0.70	0.015	0.030
0.80	0.016	0.034	*	0.90	0.016	0.038
1.00	0.016	0.041	*	1.10	0.017	0.043
1.20	0.017	0.045	*	1.30	0.017	0.047
1.40	0.017	0.048	*	1.50	0.017	0.049
1.60	0.031	0.053	*	1.70	0.031	0.059
1.80	0.031	0.067	*	1.90	0.031	0.080
2.00	0.031	0.128	*	2.10	0.120	0.724
2.20	0.120	1.521	*	2.30	0.120	2.419
2.40	0.121	3.245	*	2.50	0.120	3.940
2.60	0.032	2.079	*	2.70	0.032	1.690
2.80	0.032	1.485	*	2.90	0.032	1.417
3.00	0.032	1.421	*	3.10	0.026	1.238
3.20	0.026	1.207	*	3.30	0.026	1.200
3.40	0.026	1.199	*	3.50	0.026	1.207
3.60	0.018	0.951	*	3.70	0.018	0.895
3.80	0.018	0.873	*	3.90	0.018	0.865
4.00	0.018	0.868	*	4.10	0.016	0.807
4.20	0.016	0.797	*	4.30	0.016	0.791
4.40	0.016	0.795	*	4.50	0.016	0.800
4.60	0.013	0.697	*	4.70	0.013	0.680
4.80	0.013	0.672	*	4.90	0.013	0.667
5.00	0.013	0.672	*	5.10	0.012	0.624
5.20	0.012	0.619	*	5.30	0.012	0.616
5.40	0.012	0.613	*	5.50	0.012	0.618
5.60	0.013	0.669	*	5.70	0.013	0.680
5.80	0.013	0.691	*	5.90	0.013	0.693
6.00	0.013	0.699	*	6.10	0.000	0.204
6.20	0.000	0.091	*	6.30	0.000	0.037
6.40	0.000	0.016	*	6.50	0.000	0.010
6.60	0.000	0.007	*	6.70	0.000	0.006
6.80	0.000	0.004	*	6.90	0.000	0.003
7.00	0.000	0.002	*	7.10	0.000	0.001
7.20	0.000	0.001	*	7.30	0.000	0.000
7.40	0.000	0.000	*			

```
Project Title        = Old Course Refuse Rd
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.40 K=   0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    86.0
   Area                   =     6.0 acres
   Hydraulic length       = 2400.00 Feet
   Elevation change       =   360.0 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.40 K=   0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    79.0
   Area                   =     1.8 acres
   Hydraulic length       =  270.00 Feet
   Elevation change       =    95.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.40 K=   0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    79.0
   Area                   =     1.3 acres
   Hydraulic length       =  200.00 Feet
   Elevation change       =    85.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed


-- Watershed data for watershed # 4
   Curve number           =   100.0
   Area                   =     0.3 acres
   Hydraulic length       =  230.00 Feet
   Elevation change       =     0.0 feet.
   Concentration time     =    0.48 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed
```

-- Total Area = 9.3 acres

-- Storm data

Total precipitation = 1.8 inches
Storm type = SCS Type 2 storm, 24 hour storm
Peak Discharge = 5.72 cfs
Discharge volume = 0.52 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.000
0.20	0.002	0.001	*	0.30	0.002	0.002
0.40	0.002	0.003	*	0.50	0.002	0.004
0.60	0.002	0.004	*	0.70	0.002	0.005
0.80	0.002	0.005	*	0.90	0.002	0.005
1.00	0.002	0.005	*	1.10	0.002	0.005
1.20	0.002	0.006	*	1.30	0.002	0.006
1.40	0.002	0.006	*	1.50	0.002	0.006
1.60	0.002	0.006	*	1.70	0.002	0.006
1.80	0.002	0.006	*	1.90	0.002	0.007
2.00	0.002	0.007	*	2.10	0.002	0.007
2.20	0.002	0.007	*	2.30	0.002	0.007
2.40	0.002	0.007	*	2.50	0.002	0.007
2.60	0.002	0.007	*	2.70	0.002	0.007
2.80	0.002	0.007	*	2.90	0.002	0.007
3.00	0.002	0.007	*	3.10	0.003	0.007
3.20	0.003	0.007	*	3.30	0.003	0.007
3.40	0.003	0.007	*	3.50	0.003	0.007
3.60	0.003	0.008	*	3.70	0.003	0.008
3.80	0.003	0.008	*	3.90	0.003	0.008
4.00	0.003	0.008	*	4.10	0.003	0.008
4.20	0.003	0.008	*	4.30	0.003	0.008
4.40	0.003	0.008	*	4.50	0.003	0.009
4.60	0.003	0.009	*	4.70	0.003	0.009
4.80	0.003	0.009	*	4.90	0.003	0.009
5.00	0.003	0.009	*	5.10	0.003	0.009
5.20	0.003	0.009	*	5.30	0.003	0.009
5.40	0.003	0.009	*	5.50	0.003	0.009
5.60	0.003	0.009	*	5.70	0.003	0.009
5.80	0.003	0.009	*	5.90	0.003	0.009
6.00	0.003	0.009	*	6.10	0.004	0.009
6.20	0.004	0.009	*	6.30	0.004	0.010
6.40	0.004	0.010	*	6.50	0.004	0.010
6.60	0.004	0.011	*	6.70	0.004	0.011
6.80	0.004	0.011	*	6.90	0.004	0.011
7.00	0.004	0.011	*	7.10	0.004	0.011
7.20	0.004	0.011	*	7.30	0.004	0.011
7.40	0.004	0.011	*	7.50	0.004	0.011
7.60	0.004	0.011	*	7.70	0.004	0.011
7.80	0.004	0.011	*	7.90	0.004	0.011
8.00	0.004	0.011	*	8.10	0.005	0.011
8.20	0.005	0.012	*	8.30	0.005	0.012
8.40	0.005	0.013	*	8.50	0.005	0.013
8.60	0.005	0.014	*	8.70	0.005	0.014
8.80	0.005	0.014	*	8.90	0.005	0.015
9.00	0.005	0.015	*	9.10	0.006	0.015
9.20	0.006	0.016	*	9.30	0.006	0.016

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
9.30	0.006	0.016				
9.40	0.006	0.017	*	9.50	0.006	0.017
9.60	0.007	0.017	*	9.70	0.007	0.018
9.80	0.007	0.018	*	9.90	0.007	0.019
10.00	0.007	0.021	*	10.10	0.008	0.025
10.20	0.008	0.031	*	10.30	0.008	0.037
10.40	0.008	0.043	*	10.50	0.008	0.049
10.60	0.011	0.064	*	10.70	0.011	0.075
10.80	0.011	0.087	*	10.90	0.011	0.097
11.00	0.011	0.107	*	11.10	0.018	0.154
11.20	0.018	0.181	*	11.30	0.018	0.206
11.40	0.018	0.229	*	11.50	0.018	0.249
11.60	0.140	1.816	*	11.70	0.140	3.020
11.80	0.140	4.108	*	11.90	0.140	5.002
12.00	0.140	5.723	*	12.10	0.026	2.552
12.20	0.026	1.856	*	12.30	0.026	1.501
12.40	0.026	1.370	*	12.50	0.026	1.350
12.60	0.014	0.901	*	12.70	0.014	0.797
12.80	0.014	0.742	*	12.90	0.014	0.718
13.00	0.014	0.707	*	13.10	0.010	0.570
13.20	0.010	0.536	*	13.30	0.010	0.519
13.40	0.010	0.513	*	13.50	0.010	0.512
13.60	0.008	0.433	*	13.70	0.008	0.415
13.80	0.008	0.406	*	13.90	0.008	0.404
14.00	0.008	0.404	*	14.10	0.006	0.323
14.20	0.006	0.304	*	14.30	0.006	0.296
14.40	0.006	0.292	*	14.50	0.006	0.292
14.60	0.006	0.292	*	14.70	0.006	0.292
14.80	0.006	0.292	*	14.90	0.006	0.293
15.00	0.006	0.293	*	15.10	0.006	0.294
15.20	0.006	0.294	*	15.30	0.006	0.294
15.40	0.006	0.295	*	15.50	0.006	0.296
15.60	0.006	0.296	*	15.70	0.006	0.297
15.80	0.006	0.297	*	15.90	0.006	0.298
16.00	0.006	0.298	*	16.10	0.003	0.214
16.20	0.003	0.195	*	16.30	0.003	0.186
16.40	0.003	0.183	*	16.50	0.003	0.182
16.60	0.003	0.182	*	16.70	0.003	0.181
16.80	0.003	0.181	*	16.90	0.003	0.181
17.00	0.003	0.181	*	17.10	0.003	0.181
17.20	0.003	0.182	*	17.30	0.003	0.182
17.40	0.003	0.182	*	17.50	0.003	0.182
17.60	0.003	0.182	*	17.70	0.003	0.182
17.80	0.003	0.183	*	17.90	0.003	0.183
18.00	0.003	0.183	*	18.10	0.003	0.183
18.20	0.003	0.183	*	18.30	0.003	0.184
18.40	0.003	0.184	*	18.50	0.003	0.184
18.60	0.003	0.184	*	18.70	0.003	0.184
18.80	0.003	0.184	*	18.90	0.003	0.185
19.00	0.003	0.185	*	19.10	0.003	0.185
19.20	0.003	0.185	*	19.30	0.003	0.185
19.40	0.003	0.185	*	19.50	0.003	0.186
19.60	0.003	0.186	*	19.70	0.003	0.186
19.80	0.003	0.186	*	19.90	0.003	0.186
20.00	0.003	0.187	*	20.10	0.002	0.142
20.20	0.002	0.133	*	20.30	0.002	0.128
20.40	0.002	0.126	*	20.50	0.002	0.126

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
20.50	0.002	0.126				
20.60	0.002	0.125	*	20.70	0.002	0.125
20.80	0.002	0.125	*	20.90	0.002	0.125
21.00	0.002	0.125	*	21.10	0.002	0.125
21.20	0.002	0.125	*	21.30	0.002	0.125
21.40	0.002	0.125	*	21.50	0.002	0.126
21.60	0.002	0.126	*	21.70	0.002	0.126
21.80	0.002	0.126	*	21.90	0.002	0.126
22.00	0.002	0.126	*	22.10	0.002	0.126
22.20	0.002	0.126	*	22.30	0.002	0.126
22.40	0.002	0.126	*	22.50	0.002	0.126
22.60	0.002	0.126	*	22.70	0.002	0.126
22.80	0.002	0.127	*	22.90	0.002	0.127
23.00	0.002	0.127	*	23.10	0.002	0.127
23.20	0.002	0.127	*	23.30	0.002	0.127
23.40	0.002	0.127	*	23.50	0.002	0.127
23.60	0.002	0.127	*	23.70	0.002	0.127
23.80	0.002	0.127	*	23.90	0.002	0.127
24.00	0.002	0.127	*	24.10	0.000	0.037
24.20	0.000	0.016	*	24.30	0.000	0.006
24.40	0.000	0.003	*	24.50	0.000	0.002
24.60	0.000	0.001	*	24.70	0.000	0.001
24.80	0.000	0.001	*	24.90	0.000	0.001
25.00	0.000	0.000	*	25.10	0.000	0.000
25.20	0.000	0.000	*	25.30	0.000	0.000
25.40	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Old CR Road Sed

Comment: 18-inch CMP Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.1790 ft/ft
Manning's n.....	0.024
Discharge.....	24.07 cfs

Computed Results:

Full Flow Capacity.....	24.07 cfs
Full Flow Depth.....	1.50 ft
Velocity.....	13.62 fps
Flow Area.....	1.77 sf
Critical Depth....	1.48 ft
Critical Slope....	0.1646 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	24.07 cfs
QMAX @.94D.....	25.90 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Old CR Road Sed

Comment: 2-inch Victaulic Decant Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.17 ft
Slope.....	0.1200 ft/ft
Manning's n.....	0.010
Discharge.....	0.14 cfs

Computed Results:

Full Flow Capacity.....	0.14 cfs
Full Flow Depth.....	0.17 ft
Velocity.....	6.27 fps
Flow Area.....	0.02 sf
Critical Depth....	0.17 ft
Critical Slope....	0.1146 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	0.14 cfs
QMAX @.94D.....	0.15 cfs
Froude Number.....	FULL

-- Total Area = 9.3 acres

-- Storm data

Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 6.25 cfs
Discharge volume = 0.63 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.003
0.20	0.013	0.008	*	0.30	0.013	0.016
0.40	0.013	0.023	*	0.50	0.013	0.029
0.60	0.020	0.033	*	0.70	0.020	0.037
0.80	0.020	0.043	*	0.90	0.020	0.048
1.00	0.020	0.052	*	1.10	0.022	0.055
1.20	0.022	0.057	*	1.30	0.022	0.059
1.40	0.022	0.061	*	1.50	0.022	0.062
1.60	0.039	0.067	*	1.70	0.039	0.091
1.80	0.039	0.178	*	1.90	0.039	0.280
2.00	0.039	0.381	*	2.10	0.153	1.729
2.20	0.153	3.074	*	2.30	0.153	4.336
2.40	0.153	5.391	*	2.50	0.153	6.247
2.60	0.041	3.191	*	2.70	0.041	2.543
2.80	0.041	2.219	*	2.90	0.041	2.113
3.00	0.041	2.115	*	3.10	0.033	1.833
3.20	0.033	1.782	*	3.30	0.033	1.762
3.40	0.033	1.762	*	3.50	0.033	1.770
3.60	0.023	1.387	*	3.70	0.023	1.303
3.80	0.023	1.265	*	3.90	0.023	1.255
4.00	0.023	1.259	*	4.10	0.020	1.166
4.20	0.020	1.150	*	4.30	0.020	1.144
4.40	0.020	1.145	*	4.50	0.020	1.150
4.60	0.016	1.003	*	4.70	0.016	0.973
4.80	0.016	0.960	*	4.90	0.016	0.957
5.00	0.016	0.959	*	5.10	0.015	0.893
5.20	0.015	0.881	*	5.30	0.015	0.876
5.40	0.015	0.875	*	5.50	0.015	0.877
5.60	0.016	0.949	*	5.70	0.016	0.968
5.80	0.016	0.979	*	5.90	0.016	0.985
6.00	0.016	0.989	*	6.10	0.000	0.283
6.20	0.000	0.124	*	6.30	0.000	0.048
6.40	0.000	0.020	*	6.50	0.000	0.013
6.60	0.000	0.009	*	6.70	0.000	0.007
6.80	0.000	0.005	*	6.90	0.000	0.004
7.00	0.000	0.002	*	7.10	0.000	0.001
7.20	0.000	0.001	*	7.30	0.000	0.000
7.40	0.000	0.000	*			

```
Project Title        = Old Course Refuse Rd
WATERSHED HYDROGRAPH
    Inflow into structure # 1
    Structure type:        Null


-- Routed Watershed # 1 to sturcture # 1
   Muskingum routing parameters: X=  0.40 K=  0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    86.0
   Area                   =     6.0 acres
   Hydraulic length       = 2400.00 Feet
   Elevation change       =   360.0 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed # 2 to sturcture # 1
   Muskingum routing parameters: X=  0.40 K=  0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    79.0
   Area                   =     1.8 acres
   Hydraulic length       =  270.00 Feet
   Elevation change       =    95.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed # 3 to sturcture # 1
   Muskingum routing parameters: X=  0.40 K=  0.03
   Hydraulic length     =  570.00 feet
   Elevation change     =   102.5 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    79.0
   Area                   =     1.3 acres
   Hydraulic length       =  200.00 Feet
   Elevation change       =    85.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed


-- Watershed data for watershed # 4
   Curve number           =   100.0
   Area                   =     0.3 acres
   Hydraulic length       =  230.00 Feet
   Elevation change       =     0.0 feet.
   Concentration time     =    0.48 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed
```

Pasture Sediment Pond

The Pasture sediment pond (NPDES 009) is located north of the West Slurry Cell and west of the industrial waste dump. The pond is an off channel, temporary sediment control structure with a total as-built volume of approximately 0.78 acre-feet. Surface water runoff from the watershed plus the ponds own disturbance, for a total watershed of approximately 7.80 acres, is captured by the pond. The watershed captures runoff from the areas adjacent to the coarse refuse haul road north of the West Slurry Cell and diverts the runoff through ditches to the sedimentation pond.

The structure is a temporary sedimentation pond as addressed in R645-301-732.200. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The pond meets the single-open channel spillway exemption of R645-301-742.225.2.

The structure includes 0.02 acre-feet of sediment load capacity and a 0.45 acre-feet of storm capacity. The pond discharges through a 18-inch CMP culvert when the contained volume of the pond is 0.47 acre-feet. The pond has an additional 0.12 acre-feet of temporary capacity between the outlet elevation and the freeboard elevation. This additional capacity simultaneously discharges when utilized.

The 18-inch CMP has a full flow capacity of 14.51 cfs. The CMP passes a 25-year, 6-hour precipitation event of 0.72 cfs. The pond contains a 100-year, 6-hour event of 0.27 acre-feet within the existing 0.45 acre-feet of active storm capacity.

The 18-inch CMP can sustain a total blockage and the pond will contain the required precipitation events. The pond also contains a 2-inch decant pipe. The 2-inch decant pipe allows discharge of major storm events after appropriate settling times. The 2-inch pipe is normally closed.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
PASTURE SEDIMENTATION POND
NPDES 009

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area I	7.60	1,100.0	45.0	4.1	74	Ditch	120.0	16.7	Either side of coarse refuse road
Pond Surface	0.20	100.0	0.0	0.0	100	None			Pond Surface
Totals	7.80								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	0.78	
Capacity w/1' freeboard	0.59	Excludes capacity above freeboard
Temporary storage capacity	0.12	Capacity between outlet & freeboard
Sediment load capacity	0.02	Design sediment load capacity
Available Capacity	0.45	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	0.72 cfs	1.64 cfs	1.75 cfs
Discharge Volume	0.15 acre-feet	0.21 acre-feet	0.27 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	1.500 feet	0.167 feet	
Slope	0.065 ft/ft	0.007 ft/ft	
Manning's n	0.024	0.010	
Discharge	14.510 cfs	0.030 cfs	
Velocity	8.210 fps	1.510 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP	
Area I	0.02	1.7	20	0.22	1.08	0.36	Disturbed P=1 C=.36
Pond Surface	0.00	0.0					
Totals	0.02						

Project Title = Pasture Pond

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Routed Watershed # 1 to sturcture # 1

Muskingum routing parameters: X= 0.40 K= 0.01

Hydraulic length = 120.00 feet

Elevation change = 16.7 feet.

Travel time = 0.01 hours

Travel time type = SCS Upland Curves

-- Watershed data for watershed # 1

Curve number = 74.0

Area = 7.6 acres

Hydraulic length = 1100.00 Feet

Elevation change = 45.0 feet.

Concentration time = 0.22 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2

Curve number = 100.0

Area = 0.2 acres

Hydraulic length = 100.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.14 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 7.8 acres

-- Storm data

Total precipitation = 1.6 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 0.72 cfs

Discharge volume = 0.15 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.009
0.20	0.010	0.017	*	0.30	0.010	0.019
0.40	0.010	0.020	*	0.50	0.010	0.021
0.60	0.016	0.026	*	0.70	0.015	0.029
0.80	0.016	0.030	*	0.90	0.016	0.031
1.00	0.016	0.031	*	1.10	0.017	0.033
1.20	0.017	0.034	*	1.30	0.017	0.034
1.40	0.017	0.035	*	1.50	0.017	0.035
1.60	0.031	0.047	*	1.70	0.031	0.057
1.80	0.031	0.060	*	1.90	0.031	0.061
2.00	0.031	0.062	*	2.10	0.120	0.143
2.20	0.120	0.207	*	2.30	0.120	0.230
2.40	0.121	0.348	*	2.50	0.120	0.649
2.60	0.032	0.716	*	2.70	0.032	0.558
2.80	0.032	0.502	*	2.90	0.032	0.516

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
2.90	0.032	0.516				
3.00	0.032	0.531	*	3.10	0.026	0.517
3.20	0.026	0.491	*	3.30	0.026	0.493
3.40	0.026	0.507	*	3.50	0.026	0.521
3.60	0.018	0.491	*	3.70	0.018	0.438
3.80	0.018	0.417	*	3.90	0.018	0.415
4.00	0.018	0.414	*	4.10	0.016	0.405
4.20	0.016	0.393	*	4.30	0.016	0.391
4.40	0.016	0.394	*	4.50	0.016	0.398
4.60	0.013	0.384	*	4.70	0.013	0.360
4.80	0.013	0.351	*	4.90	0.013	0.349
5.00	0.013	0.349	*	5.10	0.012	0.342
5.20	0.012	0.331	*	5.30	0.012	0.328
5.40	0.012	0.328	*	5.50	0.012	0.329
5.60	0.013	0.341	*	5.70	0.013	0.358
5.80	0.013	0.368	*	5.90	0.013	0.374
6.00	0.013	0.380	*	6.10	0.000	0.288
6.20	0.000	0.141	*	6.30	0.000	0.068
6.40	0.000	0.040	*	6.50	0.000	0.019
6.60	0.000	0.006	*			

Project Title = Pasture Pond
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Routed Watershed # 1 to sturcture # 1
Muskingum routing parameters: X= 0.40 K= 0.01
Hydraulic length = 120.00 feet
Elevation change = 16.7 feet.
Travel time = 0.01 hours
Travel time type = SCS Upland Curves

-- Watershed data for watershed # 1
Curve number = 74.0
Area = 7.6 acres
Hydraulic length = 1100.00 Feet
Elevation change = 45.0 feet.
Concentration time = 0.22 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2
Curve number = 100.0
Area = 0.2 acres
Hydraulic length = 100.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.14 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 7.8 acres

-- Storm data
Total precipitation = 1.8 inches
Storm type = SCS Type 2 storm, 24 hour storm
Peak Discharge = 1.64 cfs
Discharge volume = 0.21 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.002
0.20	0.002	0.003	*	0.30	0.002	0.003
0.40	0.002	0.004	*	0.50	0.002	0.004
0.60	0.002	0.004	*	0.70	0.002	0.004
0.80	0.002	0.004	*	0.90	0.002	0.004
1.00	0.002	0.004	*	1.10	0.002	0.004
1.20	0.002	0.004	*	1.30	0.002	0.004
1.40	0.002	0.004	*	1.50	0.002	0.004
1.60	0.002	0.004	*	1.70	0.002	0.004
1.80	0.002	0.004	*	1.90	0.002	0.004
2.00	0.002	0.004	*	2.10	0.002	0.004
2.20	0.002	0.004	*	2.30	0.002	0.004
2.40	0.002	0.004	*	2.50	0.002	0.004
2.60	0.002	0.004	*	2.70	0.002	0.004
2.80	0.002	0.004	*	2.90	0.002	0.004

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
2.90	0.002	0.004				
3.00	0.002	0.004	*	3.10	0.003	0.005
3.20	0.003	0.005	*	3.30	0.003	0.005
3.40	0.003	0.005	*	3.50	0.003	0.005
3.60	0.003	0.005	*	3.70	0.003	0.005
3.80	0.003	0.005	*	3.90	0.003	0.005
4.00	0.003	0.005	*	4.10	0.003	0.006
4.20	0.003	0.006	*	4.30	0.003	0.006
4.40	0.003	0.006	*	4.50	0.003	0.006
4.60	0.003	0.006	*	4.70	0.003	0.006
4.80	0.003	0.006	*	4.90	0.003	0.006
5.00	0.003	0.006	*	5.10	0.003	0.006
5.20	0.003	0.006	*	5.30	0.003	0.006
5.40	0.003	0.006	*	5.50	0.003	0.006
5.60	0.003	0.006	*	5.70	0.003	0.006
5.80	0.003	0.006	*	5.90	0.003	0.006
6.00	0.003	0.006	*	6.10	0.004	0.007
6.20	0.004	0.007	*	6.30	0.004	0.007
6.40	0.004	0.007	*	6.50	0.004	0.007
6.60	0.004	0.007	*	6.70	0.004	0.007
6.80	0.004	0.007	*	6.90	0.004	0.007
7.00	0.004	0.007	*	7.10	0.004	0.007
7.20	0.004	0.007	*	7.30	0.004	0.007
7.40	0.004	0.007	*	7.50	0.004	0.007
7.60	0.004	0.007	*	7.70	0.004	0.007
7.80	0.004	0.007	*	7.90	0.004	0.007
8.00	0.004	0.007	*	8.10	0.005	0.008
8.20	0.005	0.009	*	8.30	0.005	0.009
8.40	0.005	0.010	*	8.50	0.005	0.010
8.60	0.005	0.010	*	8.70	0.005	0.010
8.80	0.005	0.010	*	8.90	0.005	0.010
9.00	0.005	0.010	*	9.10	0.006	0.011
9.20	0.006	0.012	*	9.30	0.006	0.012
9.40	0.006	0.012	*	9.50	0.006	0.012
9.60	0.007	0.013	*	9.70	0.007	0.013
9.80	0.007	0.013	*	9.90	0.007	0.013
10.00	0.007	0.013	*	10.10	0.008	0.015
10.20	0.008	0.016	*	10.30	0.008	0.017
10.40	0.008	0.017	*	10.50	0.008	0.017
10.60	0.011	0.020	*	10.70	0.011	0.022
10.80	0.011	0.022	*	10.90	0.011	0.023
11.00	0.011	0.023	*	11.10	0.018	0.029
11.20	0.018	0.033	*	11.30	0.018	0.034
11.40	0.018	0.035	*	11.50	0.018	0.036
11.60	0.140	0.146	*	11.70	0.140	0.280
11.80	0.140	0.556	*	11.90	0.140	1.057
12.00	0.140	1.636	*	12.10	0.026	1.561
12.20	0.026	1.033	*	12.30	0.026	0.792
12.40	0.026	0.729	*	12.50	0.026	0.674
12.60	0.014	0.559	*	12.70	0.014	0.427
12.80	0.014	0.378	*	12.90	0.014	0.362
13.00	0.014	0.351	*	13.10	0.010	0.322
13.20	0.010	0.286	*	13.30	0.010	0.271
13.40	0.010	0.267	*	13.50	0.010	0.265
13.60	0.008	0.249	*	13.70	0.008	0.227
13.80	0.008	0.218	*	13.90	0.008	0.215
14.00	0.008	0.213	*	14.10	0.006	0.197

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
14.10	0.006	0.197				
14.20	0.006	0.174	*	14.30	0.006	0.163
14.40	0.006	0.160	*	14.50	0.006	0.157
14.60	0.006	0.156	*	14.70	0.006	0.156
14.80	0.006	0.156	*	14.90	0.006	0.157
15.00	0.006	0.158	*	15.10	0.006	0.158
15.20	0.006	0.159	*	15.30	0.006	0.160
15.40	0.006	0.160	*	15.50	0.006	0.161
15.60	0.006	0.162	*	15.70	0.006	0.162
15.80	0.006	0.163	*	15.90	0.006	0.164
16.00	0.006	0.164	*	16.10	0.003	0.148
16.20	0.003	0.124	*	16.30	0.003	0.111
16.40	0.003	0.107	*	16.50	0.003	0.103
16.60	0.003	0.101	*	16.70	0.003	0.101
16.80	0.003	0.101	*	16.90	0.003	0.101
17.00	0.003	0.101	*	17.10	0.003	0.102
17.20	0.003	0.102	*	17.30	0.003	0.102
17.40	0.003	0.102	*	17.50	0.003	0.102
17.60	0.003	0.103	*	17.70	0.003	0.103
17.80	0.003	0.103	*	17.90	0.003	0.103
18.00	0.003	0.104	*	18.10	0.003	0.104
18.20	0.003	0.104	*	18.30	0.003	0.104
18.40	0.003	0.104	*	18.50	0.003	0.105
18.60	0.003	0.105	*	18.70	0.003	0.105
18.80	0.003	0.105	*	18.90	0.003	0.106
19.00	0.003	0.106	*	19.10	0.003	0.106
19.20	0.003	0.106	*	19.30	0.003	0.106
19.40	0.003	0.107	*	19.50	0.003	0.107
19.60	0.003	0.107	*	19.70	0.003	0.107
19.80	0.003	0.108	*	19.90	0.003	0.108
20.00	0.003	0.108	*	20.10	0.002	0.099
20.20	0.002	0.086	*	20.30	0.002	0.079
20.40	0.002	0.076	*	20.50	0.002	0.074
20.60	0.002	0.073	*	20.70	0.002	0.073
20.80	0.002	0.073	*	20.90	0.002	0.073
21.00	0.002	0.073	*	21.10	0.002	0.073
21.20	0.002	0.073	*	21.30	0.002	0.073
21.40	0.002	0.073	*	21.50	0.002	0.074
21.60	0.002	0.074	*	21.70	0.002	0.074
21.80	0.002	0.074	*	21.90	0.002	0.074
22.00	0.002	0.074	*	22.10	0.002	0.074
22.20	0.002	0.074	*	22.30	0.002	0.074
22.40	0.002	0.074	*	22.50	0.002	0.074
22.60	0.002	0.075	*	22.70	0.002	0.075
22.80	0.002	0.075	*	22.90	0.002	0.075
23.00	0.002	0.075	*	23.10	0.002	0.075
23.20	0.002	0.075	*	23.30	0.002	0.075
23.40	0.002	0.075	*	23.50	0.002	0.075
23.60	0.002	0.075	*	23.70	0.002	0.076
23.80	0.002	0.076	*	23.90	0.002	0.076
24.00	0.002	0.076	*	24.10	0.000	0.057
24.20	0.000	0.028	*	24.30	0.000	0.014
24.40	0.000	0.008	*	24.50	0.000	0.004
24.60	0.000	0.001	*			

Project Title = Pasture Pond
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Routed Watershed # 1 to sturcture # 1
Muskingum routing parameters: X= 0.40 K= 0.01
Hydraulic length = 120.00 feet
Elevation change = 16.7 feet.
Travel time = 0.01 hours
Travel time type = SCS Upland Curves

-- Watershed data for watershed # 1
Curve number = 74.0
Area = 7.6 acres
Hydraulic length = 1100.00 Feet
Elevation change = 45.0 feet.
Concentration time = 0.22 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2
Curve number = 100.0
Area = 0.2 acres
Hydraulic length = 100.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.14 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 7.8 acres

-- Storm data
Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 1.75 cfs
Discharge volume = 0.27 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.012
0.20	0.013	0.021	*	0.30	0.013	0.024
0.40	0.013	0.026	*	0.50	0.013	0.026
0.60	0.020	0.032	*	0.70	0.020	0.037
0.80	0.020	0.038	*	0.90	0.020	0.039
1.00	0.020	0.040	*	1.10	0.022	0.042
1.20	0.022	0.043	*	1.30	0.022	0.043
1.40	0.022	0.044	*	1.50	0.022	0.044
1.60	0.039	0.059	*	1.70	0.039	0.072
1.80	0.039	0.075	*	1.90	0.039	0.078
2.00	0.039	0.079	*	2.10	0.153	0.181
2.20	0.153	0.286	*	2.30	0.153	0.536
2.40	0.153	1.073	*	2.50	0.153	1.737
2.60	0.041	1.752	*	2.70	0.041	1.291
2.80	0.041	1.098	*	2.90	0.041	1.074

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
2.90	0.041	1.074				
3.00	0.041	1.052	*	3.10	0.033	0.988
3.20	0.033	0.915	*	3.30	0.033	0.905
3.40	0.033	0.917	*	3.50	0.033	0.931
3.60	0.023	0.872	*	3.70	0.023	0.772
3.80	0.023	0.729	*	3.90	0.023	0.718
4.00	0.023	0.714	*	4.10	0.020	0.694
4.20	0.020	0.670	*	4.30	0.020	0.663
4.40	0.020	0.666	*	4.50	0.020	0.669
4.60	0.016	0.643	*	4.70	0.016	0.601
4.80	0.016	0.583	*	4.90	0.016	0.579
5.00	0.016	0.577	*	5.10	0.015	0.563
5.20	0.015	0.544	*	5.30	0.015	0.537
5.40	0.015	0.536	*	5.50	0.015	0.537
5.60	0.016	0.554	*	5.70	0.016	0.580
5.80	0.016	0.596	*	5.90	0.016	0.605
6.00	0.016	0.613	*	6.10	0.000	0.465
6.20	0.000	0.229	*	6.30	0.000	0.111
6.40	0.000	0.064	*	6.50	0.000	0.030
6.60	0.000	0.009	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Pasture Sediment

Comment: 18-inch CMP Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0650 ft/ft
Manning's n.....	0.024
Discharge.....	14.51 cfs

Computed Results:

Full Flow Capacity.....	14.51 cfs
Full Flow Depth.....	1.50 ft
Velocity.....	8.21 fps
Flow Area.....	1.77 sf
Critical Depth....	1.39 ft
Critical Slope....	0.0562 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	14.51 cfs
QMAX @.94D.....	15.60 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Pasture Sediment

Comment: 2-inch Victaulic Decant Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.17 ft
Slope.....	0.0070 ft/ft
Manning's n.....	0.010
Discharge.....	0.03 cfs

Computed Results:

Full Flow Capacity.....	0.03 cfs
Full Flow Depth.....	0.17 ft
Velocity.....	1.51 fps
Flow Area.....	0.02 sf
Critical Depth....	0.12 ft
Critical Slope....	0.0090 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	0.03 cfs
QMAX @.94D.....	0.04 cfs
Froude Number.....	FULL

Lower No. 2 Canyon Sediment Pond

The Lower No. 2 Canyon sediment pond (NPDES 010) is located in Number Two Canyon west of several mine storage buildings and an equipment and supply storage yard. The pond is an off channel, temporary sediment control structure with a total as-built volume of approximately 0.84 acre-feet. Surface water runoff from the disturbed area plus the ponds own disturbance, for a total watershed of approximately 6.32 acres, is captured by the pond. The watershed captures runoff from a disturbed area adjacent to the mine storage buildings and from the storage yard below the Upper No. 2 Canyon sediment pond. The water flows overland to the sedimentation pond with the surface runoff controlled by berms.

The structure is a temporary sedimentation pond as addressed in R645-301-732.200. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The pond meets the single-open channel spillway exemption of R645-301-742.225.2.

The structure includes 0.07 acre-feet of sediment load capacity and a 0.50 acre-feet of storm capacity. The pond discharges through a 24-inch CMP culvert when the contained volume of the pond is 0.57 acre-feet. The pond has an additional 0.10 acre-feet of temporary capacity between the outlet elevation and the freeboard elevation. This additional capacity simultaneously discharges when utilized.

The 24-inch CMP has a full flow capacity of 42.80 cfs. The CMP passes a 25-year, 6-hour precipitation event of 1.79 cfs. The pond contains a 100-year, 6-hour event of 0.32 acre-feet within the existing 0.50 acre-feet of active storm capacity.

The 24-inch CMP can sustain a total blockage and the pond will contain the required precipitation events. The pond also contains a 2-inch decant pipe. The 2-inch decant pipe allows discharge of major storm events after appropriate settling times. The 2-inch pipe is normally closed.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
LOWER #2 CANYON SEDIMENTATION POND
NPDES 010

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area I	6.10	1,200.0	55.0	4.6	79	Overland			Storage areas, facilities
Pond Surface	0.22	120.0	0.0	0.0	100	None			Pond Surface
Totals	6.32								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	0.84	
Capacity w/1' freeboard	0.66	Excludes capacity above freeboard
Temporary storage capacity	0.10	Capacity between outlet & freeboard
Sediment load capacity	0.07	Design sediment load capacity
Available Capacity	0.50	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	1.79 cfs	3.01 cfs	3.28 cfs
Discharge Volume	0.19 acre-feet	0.25 acre-feet	0.32 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	2.000 feet	0.167 feet	
Slope	0.122 ft/ft	0.002 ft/ft	
Manning's n	0.024	0.010	
Discharge	42.800 cfs	0.020 cfs	
Velocity	13.620 fps	0.810 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP	
Area I	0.03	3.7	20	0.22	1.85	0.45	Disturbed Bare P=1 C=.45
Pond Surface	0.00	0.0					
Totals	0.03						

Project Title = Lower #2 Canyon Sediment Pond

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 79.0

Area = 6.1 acres

Hydraulic length = 1200.00 Feet

Elevation change = 55.0 feet.

Concentration time = 0.08 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2

Curve number = 100.0

Area = 0.2 acres

Hydraulic length = 120.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.18 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 6.3 acres

-- Storm data

Total precipitation = 1.6 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 1.79 cfs

Discharge volume = 0.19 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.006
0.20	0.010	0.014	*	0.30	0.010	0.017
0.40	0.010	0.018	*	0.50	0.010	0.019
0.60	0.016	0.023	*	0.70	0.015	0.027
0.80	0.016	0.028	*	0.90	0.016	0.029
1.00	0.016	0.030	*	1.10	0.017	0.031
1.20	0.017	0.032	*	1.30	0.017	0.032
1.40	0.017	0.033	*	1.50	0.017	0.033
1.60	0.031	0.041	*	1.70	0.031	0.051
1.80	0.031	0.055	*	1.90	0.031	0.057
2.00	0.031	0.058	*	2.10	0.120	0.113
2.20	0.120	0.286	*	2.30	0.120	0.767
2.40	0.121	1.289	*	2.50	0.120	1.790
2.60	0.032	0.960	*	2.70	0.032	0.781
2.80	0.032	0.692	*	2.90	0.032	0.693
3.00	0.032	0.712	*	3.10	0.026	0.625
3.20	0.026	0.619	*	3.30	0.026	0.624
3.40	0.026	0.636	*	3.50	0.026	0.651
3.60	0.018	0.513	*	3.70	0.018	0.486
3.80	0.018	0.477	*	3.90	0.018	0.479
4.00	0.018	0.485	*	4.10	0.016	0.453

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.016	0.453				
4.20	0.016	0.449	*	4.30	0.016	0.448
4.40	0.016	0.454	*	4.50	0.016	0.459
4.60	0.013	0.399	*	4.70	0.013	0.391
4.80	0.013	0.387	*	4.90	0.013	0.387
5.00	0.013	0.391	*	5.10	0.012	0.363
5.20	0.012	0.361	*	5.30	0.012	0.361
5.40	0.012	0.360	*	5.50	0.012	0.365
5.60	0.013	0.397	*	5.70	0.013	0.405
5.80	0.013	0.413	*	5.90	0.013	0.414
6.00	0.013	0.419	*	6.10	0.000	0.113
6.20	0.000	0.044	*	6.30	0.000	0.008
6.40	0.000	0.002	*	6.50	0.000	0.001
6.60	0.000	0.000	*			

Project Title = Lower #2 Canyon Sediment Pond
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 79.0
Area = 6.1 acres
Hydraulic length = 1200.00 Feet
Elevation change = 55.0 feet.
Concentration time = 0.08 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2
Curve number = 100.0
Area = 0.2 acres
Hydraulic length = 120.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.18 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 6.3 acres

-- Storm data
Total precipitation = 1.8 inches
Storm type = SCS Type 2 storm, 24 hour storm
Peak Discharge = 3.01 cfs
Discharge volume = 0.25 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.001
0.20	0.002	0.002	*	0.30	0.002	0.003
0.40	0.002	0.003	*	0.50	0.002	0.003
0.60	0.002	0.004	*	0.70	0.002	0.004
0.80	0.002	0.004	*	0.90	0.002	0.004
1.00	0.002	0.004	*	1.10	0.002	0.004
1.20	0.002	0.004	*	1.30	0.002	0.004
1.40	0.002	0.004	*	1.50	0.002	0.004
1.60	0.002	0.004	*	1.70	0.002	0.004
1.80	0.002	0.004	*	1.90	0.002	0.004
2.00	0.002	0.004	*	2.10	0.002	0.004
2.20	0.002	0.004	*	2.30	0.002	0.004
2.40	0.002	0.004	*	2.50	0.002	0.004
2.60	0.002	0.004	*	2.70	0.002	0.004
2.80	0.002	0.004	*	2.90	0.002	0.004
3.00	0.002	0.004	*	3.10	0.003	0.004
3.20	0.003	0.005	*	3.30	0.003	0.005
3.40	0.003	0.005	*	3.50	0.003	0.005
3.60	0.003	0.005	*	3.70	0.003	0.005
3.80	0.003	0.005	*	3.90	0.003	0.005
4.00	0.003	0.005	*	4.10	0.003	0.005

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.003	0.005				
4.20	0.003	0.005	*	4.30	0.003	0.006
4.40	0.003	0.006	*	4.50	0.003	0.006
4.60	0.003	0.006	*	4.70	0.003	0.006
4.80	0.003	0.006	*	4.90	0.003	0.006
5.00	0.003	0.006	*	5.10	0.003	0.006
5.20	0.003	0.006	*	5.30	0.003	0.006
5.40	0.003	0.006	*	5.50	0.003	0.006
5.60	0.003	0.006	*	5.70	0.003	0.006
5.80	0.003	0.006	*	5.90	0.003	0.006
6.00	0.003	0.006	*	6.10	0.004	0.006
6.20	0.004	0.007	*	6.30	0.004	0.007
6.40	0.004	0.007	*	6.50	0.004	0.007
6.60	0.004	0.007	*	6.70	0.004	0.007
6.80	0.004	0.007	*	6.90	0.004	0.007
7.00	0.004	0.007	*	7.10	0.004	0.007
7.20	0.004	0.007	*	7.30	0.004	0.007
7.40	0.004	0.007	*	7.50	0.004	0.007
7.60	0.004	0.007	*	7.70	0.004	0.007
7.80	0.004	0.007	*	7.90	0.004	0.007
8.00	0.004	0.007	*	8.10	0.005	0.008
8.20	0.005	0.009	*	8.30	0.005	0.009
8.40	0.005	0.009	*	8.50	0.005	0.009
8.60	0.005	0.009	*	8.70	0.005	0.010
8.80	0.005	0.010	*	8.90	0.005	0.010
9.00	0.005	0.010	*	9.10	0.006	0.010
9.20	0.006	0.011	*	9.30	0.006	0.011
9.40	0.006	0.011	*	9.50	0.006	0.011
9.60	0.007	0.012	*	9.70	0.007	0.012
9.80	0.007	0.012	*	9.90	0.007	0.013
10.00	0.007	0.013	*	10.10	0.008	0.014
10.20	0.008	0.015	*	10.30	0.008	0.016
10.40	0.008	0.016	*	10.50	0.008	0.016
10.60	0.011	0.018	*	10.70	0.011	0.020
10.80	0.011	0.021	*	10.90	0.011	0.021
11.00	0.011	0.022	*	11.10	0.018	0.026
11.20	0.018	0.030	*	11.30	0.018	0.032
11.40	0.018	0.033	*	11.50	0.018	0.034
11.60	0.140	0.385	*	11.70	0.140	1.125
11.80	0.140	1.821	*	11.90	0.140	2.456
12.00	0.140	3.012	*	12.10	0.026	1.323
12.20	0.026	0.947	*	12.30	0.026	0.747
12.40	0.026	0.718	*	12.50	0.026	0.722
12.60	0.014	0.470	*	12.70	0.014	0.416
12.80	0.014	0.390	*	12.90	0.014	0.388
13.00	0.014	0.391	*	13.10	0.010	0.316
13.20	0.010	0.300	*	13.30	0.010	0.293
13.40	0.010	0.294	*	13.50	0.010	0.295
13.60	0.008	0.248	*	13.70	0.008	0.239
13.80	0.008	0.234	*	13.90	0.008	0.234
14.00	0.008	0.235	*	14.10	0.006	0.187
14.20	0.006	0.176	*	14.30	0.006	0.171
14.40	0.006	0.171	*	14.50	0.006	0.171
14.60	0.006	0.171	*	14.70	0.006	0.172
14.80	0.006	0.172	*	14.90	0.006	0.173
15.00	0.006	0.174	*	15.10	0.006	0.174
15.20	0.006	0.175	*	15.30	0.006	0.175

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
15.30	0.006	0.175				
15.40	0.006	0.176	*	15.50	0.006	0.176
15.60	0.006	0.177	*	15.70	0.006	0.177
15.80	0.006	0.178	*	15.90	0.006	0.178
16.00	0.006	0.179	*	16.10	0.003	0.127
16.20	0.003	0.115	*	16.30	0.003	0.109
16.40	0.003	0.108	*	16.50	0.003	0.108
16.60	0.003	0.108	*	16.70	0.003	0.109
16.80	0.003	0.109	*	16.90	0.003	0.109
17.00	0.003	0.109	*	17.10	0.003	0.109
17.20	0.003	0.109	*	17.30	0.003	0.110
17.40	0.003	0.110	*	17.50	0.003	0.110
17.60	0.003	0.110	*	17.70	0.003	0.110
17.80	0.003	0.111	*	17.90	0.003	0.111
18.00	0.003	0.111	*	18.10	0.003	0.111
18.20	0.003	0.111	*	18.30	0.003	0.111
18.40	0.003	0.112	*	18.50	0.003	0.112
18.60	0.003	0.112	*	18.70	0.003	0.112
18.80	0.003	0.112	*	18.90	0.003	0.112
19.00	0.003	0.113	*	19.10	0.003	0.113
19.20	0.003	0.113	*	19.30	0.003	0.113
19.40	0.003	0.113	*	19.50	0.003	0.113
19.60	0.003	0.114	*	19.70	0.003	0.114
19.80	0.003	0.114	*	19.90	0.003	0.114
20.00	0.003	0.114	*	20.10	0.002	0.086
20.20	0.002	0.080	*	20.30	0.002	0.077
20.40	0.002	0.077	*	20.50	0.002	0.077
20.60	0.002	0.077	*	20.70	0.002	0.077
20.80	0.002	0.077	*	20.90	0.002	0.077
21.00	0.002	0.077	*	21.10	0.002	0.077
21.20	0.002	0.077	*	21.30	0.002	0.077
21.40	0.002	0.077	*	21.50	0.002	0.077
21.60	0.002	0.077	*	21.70	0.002	0.077
21.80	0.002	0.077	*	21.90	0.002	0.078
22.00	0.002	0.078	*	22.10	0.002	0.078
22.20	0.002	0.078	*	22.30	0.002	0.078
22.40	0.002	0.078	*	22.50	0.002	0.078
22.60	0.002	0.078	*	22.70	0.002	0.078
22.80	0.002	0.078	*	22.90	0.002	0.078
23.00	0.002	0.078	*	23.10	0.002	0.078
23.20	0.002	0.078	*	23.30	0.002	0.079
23.40	0.002	0.079	*	23.50	0.002	0.079
23.60	0.002	0.079	*	23.70	0.002	0.079
23.80	0.002	0.079	*	23.90	0.002	0.079
24.00	0.002	0.079	*	24.10	0.000	0.021
24.20	0.000	0.008	*	24.30	0.000	0.002
24.40	0.000	0.000	*	24.50	0.000	0.000
24.60	0.000	0.000	*			

Project Title = Lower #2 Canyon Sediment Pond
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 79.0
Area = 6.1 acres
Hydraulic length = 1200.00 Feet
Elevation change = 55.0 feet.
Concentration time = 0.08 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2
Curve number = 100.0
Area = 0.2 acres
Hydraulic length = 120.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.18 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 6.3 acres

-- Storm data
Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 3.28 cfs
Discharge volume = 0.32 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.008
0.20	0.013	0.018	*	0.30	0.013	0.021
0.40	0.013	0.023	*	0.50	0.013	0.025
0.60	0.020	0.029	*	0.70	0.020	0.034
0.80	0.020	0.036	*	0.90	0.020	0.037
1.00	0.020	0.037	*	1.10	0.022	0.039
1.20	0.022	0.041	*	1.30	0.022	0.041
1.40	0.022	0.041	*	1.50	0.022	0.042
1.60	0.039	0.052	*	1.70	0.039	0.065
1.80	0.039	0.070	*	1.90	0.039	0.072
2.00	0.039	0.074	*	2.10	0.153	0.275
2.20	0.153	1.053	*	2.30	0.153	1.861
2.40	0.153	2.617	*	2.50	0.153	3.279
2.60	0.041	1.670	*	2.70	0.041	1.332
2.80	0.041	1.158	*	2.90	0.041	1.150
3.00	0.041	1.173	*	3.10	0.033	1.022
3.20	0.033	1.005	*	3.30	0.033	1.005
3.40	0.033	1.020	*	3.50	0.033	1.038
3.60	0.023	0.812	*	3.70	0.023	0.768
3.80	0.023	0.749	*	3.90	0.023	0.752
4.00	0.023	0.759	*	4.10	0.020	0.705

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.020	0.705				
4.20	0.020	0.697	*	4.30	0.020	0.696
4.40	0.020	0.701	*	4.50	0.020	0.707
4.60	0.016	0.616	*	4.70	0.016	0.599
4.80	0.016	0.591	*	4.90	0.016	0.593
5.00	0.016	0.596	*	5.10	0.015	0.556
5.20	0.015	0.549	*	5.30	0.015	0.547
5.40	0.015	0.549	*	5.50	0.015	0.551
5.60	0.016	0.599	*	5.70	0.016	0.613
5.80	0.016	0.621	*	5.90	0.016	0.625
6.00	0.016	0.629	*	6.10	0.000	0.167
6.20	0.000	0.065	*	6.30	0.000	0.012
6.40	0.000	0.002	*	6.50	0.000	0.001
6.60	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Lower #2 Canyon

Comment: 24-inch CMP Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.1220 ft/ft
Manning's n.....	0.024
Discharge.....	42.80 cfs

Computed Results:

Full Flow Capacity.....	42.80 cfs
Full Flow Depth.....	2.00 ft
Velocity.....	13.62 fps
Flow Area.....	3.14 sf
Critical Depth....	1.96 ft
Critical Slope....	0.1097 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	42.80 cfs
QMAX @.94D.....	46.04 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Lower #2 Canyon

Comment: 2-inch Victaulic Decant Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.17 ft
Slope.....	0.0020 ft/ft
Manning's n.....	0.010
Discharge.....	0.02 cfs

Computed Results:

Full Flow Capacity.....	0.02 cfs
Full Flow Depth.....	0.17 ft
Velocity.....	0.81 fps
Flow Area.....	0.02 sf
Critical Depth....	0.09 ft
Critical Slope....	0.0067 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	0.02 cfs
QMAX @.94D.....	0.02 cfs
Froude Number.....	FULL

Upper No. 2 Canyon Sediment Pond

The Upper No. 2 Canyon sediment pond (NPDES 011) is located in Number Two Canyon east of several mine storage buildings and west of an equipment and supply storage yard. The pond is an off channel, temporary sediment control structure with a total as-built volume of approximately 0.35 acre-feet. Surface water runoff from the disturbed area plus the ponds own disturbance, for a total watershed of approximately 3.5 acres, is captured by the pond. The watershed captures runoff from a disturbed storage yard area above the Upper No. 2 Canyon sediment pond. The water flows overland to the sedimentation pond with the surface runoff controlled by berms.

The structure is a temporary sedimentation pond as addressed in R645-301-732.200. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The pond meets the single-open channel spillway exemption of R645-301-742.225.2.

The structure includes 0.07 acre-feet of sediment load capacity and a 0.23 acre-feet of storm capacity. The pond discharges through a 18-inch CMP culvert when the contained volume of the pond is 0.30 acre-feet. The pond has no temporary capacity between the outlet elevation and the freeboard elevation. The pond has 0.6 feet of freeboard above the discharge elevation.

The 18-inch CMP has a full flow capacity of 6.23 cfs. The CMP passes a 25-year, 6-hour precipitation event of 1.00 cfs. The pond contains a 100-year, 6-hour event of 0.18 acre-feet within the existing 0.23 acre-feet of active storm capacity.

The 18-inch CMP can sustain a total blockage and the pond will contain the required precipitation events. The pond also contains a 2-inch decant pipe. The 2-inch decant pipe allows discharge of major storm events after appropriate settling times. The 2-inch pipe is normally closed.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
UPPER #2 CANYON SEDIMENTATION POND
NPDES 011

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area I	3.50	1,070.0	53.0	5.0	79	Overland			Storage areas
Pond Surface	0.09	80.0	0.0	0.0	100	None			Pond Surface
Totals	3.59								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	0.35	
Capacity w/0.6' freeboard	0.30	Excludes capacity above freeboard
Temporary storage capacity	0.00	Capacity between outlet & freeboard
Sediment load capacity	0.07	Design sediment load capacity
Available Capacity	0.23	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	1.00 cfs	1.69 cfs	1.84 cfs
Discharge Volume	0.10 acre-feet	0.14 acre-feet	0.18 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	1.500 feet	0.167 feet	
Slope	0.012 ft/ft	0.009 ft/ft	
Manning's n	0.024	0.010	
Discharge	6.230 cfs	0.040 cfs	
Velocity	3.530 fps	1.720 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP	
Area I	0.02	3.7	20	0.22	1.85	0.45	Disturbed Bare P=1 C=.45
Pond Surface	0.00	0.0					
Totals	0.02						

Project Title = Upper #2 Canyon Sediment Pond

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 79.0

Area = 3.5 acres

Hydraulic length = 1070.00 Feet

Elevation change = 53.0 feet.

Concentration time = 0.07 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2

Curve number = 100.0

Area = 0.1 acres

Hydraulic length = 80.00 Feet

Elevation change = 0.0 feet.

Concentration time = 0.10 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 3.6 acres

-- Storm data

Total precipitation = 1.6 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 1.00 cfs

Discharge volume = 0.10 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.007
0.20	0.010	0.009	*	0.30	0.010	0.010
0.40	0.010	0.010	*	0.50	0.010	0.010
0.60	0.016	0.014	*	0.70	0.016	0.015
0.80	0.016	0.015	*	0.90	0.016	0.016
1.00	0.016	0.016	*	1.10	0.017	0.017
1.20	0.017	0.017	*	1.30	0.017	0.017
1.40	0.017	0.017	*	1.50	0.017	0.017
1.60	0.031	0.026	*	1.70	0.031	0.029
1.80	0.031	0.030	*	1.90	0.031	0.031
2.00	0.031	0.031	*	2.10	0.121	0.087
2.20	0.121	0.168	*	2.30	0.121	0.437
2.40	0.121	0.729	*	2.50	0.121	1.005
2.60	0.032	0.497	*	2.70	0.032	0.406
2.80	0.032	0.365	*	2.90	0.032	0.377
3.00	0.032	0.392	*	3.10	0.026	0.343
3.20	0.026	0.340	*	3.30	0.026	0.344
3.40	0.026	0.352	*	3.50	0.026	0.361
3.60	0.018	0.280	*	3.70	0.018	0.266
3.80	0.018	0.262	*	3.90	0.018	0.265
4.00	0.018	0.269	*	4.10	0.016	0.249

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.016	0.249				
4.20	0.016	0.248	*	4.30	0.016	0.248
4.40	0.016	0.251	*	4.50	0.016	0.254
4.60	0.013	0.220	*	4.70	0.013	0.215
4.80	0.013	0.213	*	4.90	0.013	0.215
5.00	0.013	0.216	*	5.10	0.012	0.201
5.20	0.012	0.199	*	5.30	0.012	0.199
5.40	0.012	0.200	*	5.50	0.012	0.202
5.60	0.013	0.220	*	5.70	0.013	0.225
5.80	0.013	0.229	*	5.90	0.013	0.230
6.00	0.013	0.232	*	6.10	0.000	0.054
6.20	0.000	0.018	*	6.30	0.000	0.001
6.40	0.000	0.000	*			

Project Title = Upper #2 Canyon Sediment Pond
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 79.0
Area = 3.5 acres
Hydraulic length = 1070.00 Feet
Elevation change = 53.0 feet.
Concentration time = 0.07 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2
Curve number = 100.0
Area = 0.1 acres
Hydraulic length = 80.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.10 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 3.6 acres

-- Storm data
Total precipitation = 1.8 inches
Storm type = SCS Type 2 storm, 24 hour storm
Peak Discharge = 1.69 cfs
Discharge volume = 0.14 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.001
0.20	0.002	0.002	*	0.30	0.002	0.002
0.40	0.002	0.002	*	0.50	0.002	0.002
0.60	0.002	0.002	*	0.70	0.002	0.002
0.80	0.002	0.002	*	0.90	0.002	0.002
1.00	0.002	0.002	*	1.10	0.002	0.002
1.20	0.002	0.002	*	1.30	0.002	0.002
1.40	0.002	0.002	*	1.50	0.002	0.002
1.60	0.002	0.002	*	1.70	0.002	0.002
1.80	0.002	0.002	*	1.90	0.002	0.002
2.00	0.002	0.002	*	2.10	0.002	0.002
2.20	0.002	0.002	*	2.30	0.002	0.002
2.40	0.002	0.002	*	2.50	0.002	0.002
2.60	0.002	0.002	*	2.70	0.002	0.002
2.80	0.002	0.002	*	2.90	0.002	0.002
3.00	0.002	0.002	*	3.10	0.003	0.002
3.20	0.003	0.003	*	3.30	0.003	0.003
3.40	0.003	0.003	*	3.50	0.003	0.003
3.60	0.003	0.003	*	3.70	0.003	0.003
3.80	0.003	0.003	*	3.90	0.003	0.003
4.00	0.003	0.003	*	4.10	0.003	0.003

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.003	0.003				
4.20	0.003	0.003	*	4.30	0.003	0.003
4.40	0.003	0.003	*	4.50	0.003	0.003
4.60	0.003	0.003	*	4.70	0.003	0.003
4.80	0.003	0.003	*	4.90	0.003	0.003
5.00	0.003	0.003	*	5.10	0.003	0.003
5.20	0.003	0.003	*	5.30	0.003	0.003
5.40	0.003	0.003	*	5.50	0.003	0.003
5.60	0.003	0.003	*	5.70	0.003	0.003
5.80	0.003	0.003	*	5.90	0.003	0.003
6.00	0.003	0.003	*	6.10	0.004	0.003
6.20	0.004	0.004	*	6.30	0.004	0.004
6.40	0.004	0.004	*	6.50	0.004	0.004
6.60	0.004	0.004	*	6.70	0.004	0.004
6.80	0.004	0.004	*	6.90	0.004	0.004
7.00	0.004	0.004	*	7.10	0.004	0.004
7.20	0.004	0.004	*	7.30	0.004	0.004
7.40	0.004	0.004	*	7.50	0.004	0.004
7.60	0.004	0.004	*	7.70	0.004	0.004
7.80	0.004	0.004	*	7.90	0.004	0.004
8.00	0.004	0.004	*	8.10	0.005	0.004
8.20	0.005	0.005	*	8.30	0.005	0.005
8.40	0.005	0.005	*	8.50	0.005	0.005
8.60	0.005	0.005	*	8.70	0.005	0.005
8.80	0.005	0.005	*	8.90	0.005	0.005
9.00	0.005	0.005	*	9.10	0.006	0.006
9.20	0.006	0.006	*	9.30	0.006	0.006
9.40	0.006	0.006	*	9.50	0.006	0.006
9.60	0.007	0.006	*	9.70	0.007	0.007
9.80	0.007	0.007	*	9.90	0.007	0.007
10.00	0.007	0.007	*	10.10	0.008	0.008
10.20	0.008	0.008	*	10.30	0.008	0.008
10.40	0.008	0.008	*	10.50	0.008	0.008
10.60	0.011	0.010	*	10.70	0.011	0.011
10.80	0.011	0.011	*	10.90	0.011	0.011
11.00	0.011	0.011	*	11.10	0.018	0.015
11.20	0.018	0.017	*	11.30	0.018	0.017
11.40	0.018	0.018	*	11.50	0.018	0.018
11.60	0.140	0.253	*	11.70	0.140	0.650
11.80	0.140	1.036	*	11.90	0.140	1.385
12.00	0.140	1.685	*	12.10	0.026	0.679
12.20	0.026	0.481	*	12.30	0.026	0.385
12.40	0.026	0.389	*	12.50	0.026	0.397
12.60	0.014	0.253	*	12.70	0.014	0.225
12.80	0.014	0.213	*	12.90	0.014	0.214
13.00	0.014	0.216	*	13.10	0.010	0.173
13.20	0.010	0.165	*	13.30	0.010	0.161
13.40	0.010	0.162	*	13.50	0.010	0.163
13.60	0.008	0.136	*	13.70	0.008	0.131
13.80	0.008	0.129	*	13.90	0.008	0.130
14.00	0.008	0.130	*	14.10	0.006	0.102
14.20	0.006	0.097	*	14.30	0.006	0.094
14.40	0.006	0.094	*	14.50	0.006	0.095
14.60	0.006	0.095	*	14.70	0.006	0.095
14.80	0.006	0.096	*	14.90	0.006	0.096
15.00	0.006	0.096	*	15.10	0.006	0.096
15.20	0.006	0.097	*	15.30	0.006	0.097

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
15.30	0.006	0.097				
15.40	0.006	0.097	*	15.50	0.006	0.098
15.60	0.006	0.098	*	15.70	0.006	0.098
15.80	0.006	0.098	*	15.90	0.006	0.099
16.00	0.006	0.099	*	16.10	0.003	0.069
16.20	0.003	0.063	*	16.30	0.003	0.060
16.40	0.003	0.060	*	16.50	0.003	0.060
16.60	0.003	0.060	*	16.70	0.003	0.060
16.80	0.003	0.060	*	16.90	0.003	0.060
17.00	0.003	0.060	*	17.10	0.003	0.061
17.20	0.003	0.061	*	17.30	0.003	0.061
17.40	0.003	0.061	*	17.50	0.003	0.061
17.60	0.003	0.061	*	17.70	0.003	0.061
17.80	0.003	0.061	*	17.90	0.003	0.061
18.00	0.003	0.061	*	18.10	0.003	0.062
18.20	0.003	0.062	*	18.30	0.003	0.062
18.40	0.003	0.062	*	18.50	0.003	0.062
18.60	0.003	0.062	*	18.70	0.003	0.062
18.80	0.003	0.062	*	18.90	0.003	0.062
19.00	0.003	0.062	*	19.10	0.003	0.062
19.20	0.003	0.063	*	19.30	0.003	0.063
19.40	0.003	0.063	*	19.50	0.003	0.063
19.60	0.003	0.063	*	19.70	0.003	0.063
19.80	0.003	0.063	*	19.90	0.003	0.063
20.00	0.003	0.063	*	20.10	0.002	0.047
20.20	0.002	0.044	*	20.30	0.002	0.042
20.40	0.002	0.042	*	20.50	0.002	0.042
20.60	0.002	0.042	*	20.70	0.002	0.043
20.80	0.002	0.043	*	20.90	0.002	0.043
21.00	0.002	0.043	*	21.10	0.002	0.043
21.20	0.002	0.043	*	21.30	0.002	0.043
21.40	0.002	0.043	*	21.50	0.002	0.043
21.60	0.002	0.043	*	21.70	0.002	0.043
21.80	0.002	0.043	*	21.90	0.002	0.043
22.00	0.002	0.043	*	22.10	0.002	0.043
22.20	0.002	0.043	*	22.30	0.002	0.043
22.40	0.002	0.043	*	22.50	0.002	0.043
22.60	0.002	0.043	*	22.70	0.002	0.043
22.80	0.002	0.043	*	22.90	0.002	0.043
23.00	0.002	0.043	*	23.10	0.002	0.043
23.20	0.002	0.043	*	23.30	0.002	0.044
23.40	0.002	0.044	*	23.50	0.002	0.044
23.60	0.002	0.044	*	23.70	0.002	0.044
23.80	0.002	0.044	*	23.90	0.002	0.044
24.00	0.002	0.044	*	24.10	0.000	0.010
24.20	0.000	0.003	*	24.30	0.000	0.000
24.40	0.000	0.000	*			

Project Title = Upper #2 Canyon Sediment Pond
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 79.0
Area = 3.5 acres
Hydraulic length = 1070.00 Feet
Elevation change = 53.0 feet.
Concentration time = 0.07 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 2
Curve number = 100.0
Area = 0.1 acres
Hydraulic length = 80.00 Feet
Elevation change = 0.0 feet.
Concentration time = 0.10 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 3.6 acres

-- Storm data
Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 1.84 cfs
Discharge volume = 0.18 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.008
0.20	0.013	0.011	*	0.30	0.013	0.013
0.40	0.013	0.013	*	0.50	0.013	0.013
0.60	0.020	0.017	*	0.70	0.020	0.019
0.80	0.020	0.019	*	0.90	0.020	0.020
1.00	0.020	0.020	*	1.10	0.022	0.021
1.20	0.022	0.021	*	1.30	0.022	0.022
1.40	0.022	0.022	*	1.50	0.022	0.022
1.60	0.039	0.033	*	1.70	0.039	0.037
1.80	0.039	0.038	*	1.90	0.039	0.039
2.00	0.039	0.039	*	2.10	0.153	0.186
2.20	0.153	0.607	*	2.30	0.153	1.058
2.40	0.153	1.477	*	2.50	0.153	1.836
2.60	0.041	0.875	*	2.70	0.041	0.696
2.80	0.041	0.614	*	2.90	0.041	0.629
3.00	0.041	0.648	*	3.10	0.033	0.562
3.20	0.033	0.553	*	3.30	0.033	0.555
3.40	0.033	0.565	*	3.50	0.033	0.576
3.60	0.023	0.444	*	3.70	0.023	0.421
3.80	0.023	0.412	*	3.90	0.023	0.416
4.00	0.023	0.421	*	4.10	0.020	0.389

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
4.10	0.020	0.389				
4.20	0.020	0.385	*	4.30	0.020	0.385
4.40	0.020	0.389	*	4.50	0.020	0.392
4.60	0.016	0.339	*	4.70	0.016	0.330
4.80	0.016	0.327	*	4.90	0.016	0.329
5.00	0.016	0.331	*	5.10	0.015	0.307
5.20	0.015	0.303	*	5.30	0.015	0.303
5.40	0.015	0.304	*	5.50	0.015	0.306
5.60	0.016	0.334	*	5.70	0.016	0.341
5.80	0.016	0.345	*	5.90	0.016	0.347
6.00	0.016	0.349	*	6.10	0.000	0.081
6.20	0.000	0.026	*	6.30	0.000	0.001
6.40	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Upper #2 Canyon

Comment: 18-inch CMP Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0120 ft/ft
Manning's n.....	0.024
Discharge.....	6.23 cfs

Computed Results:

Full Flow Capacity.....	6.23 cfs
Full Flow Depth.....	1.50 ft
Velocity.....	3.53 fps
Flow Area.....	1.77 sf
Critical Depth....	0.97 ft
Critical Slope....	0.0216 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	6.23 cfs
QMAX @.94D.....	6.70 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Upper #2 Canyon

Comment: 2-inch Victaulic Decant Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.17 ft
Slope.....	0.0090 ft/ft
Manning's n.....	0.010
Discharge.....	0.04 cfs

Computed Results:

Full Flow Capacity.....	0.04 cfs
Full Flow Depth.....	0.17 ft
Velocity.....	1.72 fps
Flow Area.....	0.02 sf
Critical Depth....	0.13 ft
Critical Slope....	0.0101 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	0.04 cfs
QMAX @.94D.....	0.04 cfs
Froude Number.....	FULL

No. 3 Hoisthouse Sediment Pond

The No. 3 Hoisthouse sediment pond (NPDES 013) is located in the mouth of Number Two Canyon west of Lower No. 2 Canyon sediment pond and adjacent to an equipment and supply storage yard. The pond is an off channel, temporary sediment control structure with a total as-built volume of approximately 1.10 acre-feet. Surface water runoff from four disturbed areas plus the ponds own disturbance, for a total watershed of approximately 4.94 acres, is captured by the pond. The watershed captures runoff from a disturbed storage yard area below the Lower No. 2 Canyon sediment pond and areas adjacent to the No. 3 Hoisthouse. The water flows overland to the sedimentation pond with the surface runoff controlled by berms.

The structure is a temporary sedimentation pond as addressed in R645-301-732.200. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The pond meets the single-open channel spillway exemption of R645-301-742.225.2.

The structure includes 0.13 acre-feet of sediment load capacity and a 0.45 acre-feet of storm capacity. The pond discharges through a vertical 12-inch CMP culvert that tees to a 36-inch CMP outlet when the contained volume of the pond is 0.58 acre-feet. The pond has 0.26 acre-feet of temporary capacity between the outlet elevation and the freeboard elevation. The pond has 1.0 feet of freeboard.

The 36-inch CMP limits the outlet and has a full flow capacity of 180.64 cfs. The CMP passes a 25-year, 6-hour precipitation event of 0.72 cfs. The pond contains a 100-year, 6-hour event of 0.21 acre-feet within the existing 0.45 acre-feet of active storm capacity.

The 12 and 36-inch CMP can sustain a total blockage and the pond will contain the required precipitation events. The pond also contains a 2-inch decant pipe. The 2-inch decant pipe allows discharge of major storm events after appropriate settling times. The 2-inch pipe is normally closed.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
NO. 3 HOISTHOUSE SEDIMENTATION POND
NPDES 013

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Elev Length	Elev Change	COMMENTS
Area 2	0.27	60.0	32.5	54.2	77	Overland			Hillside disturbance
Area 3	1.38	110.0	10.0	9.1	77	Overland			Storage area beside #3 Hoisthouse se
Area 5	1.34	950.0	30.4	3.2	77	Overland			Storage area below Lower #2 Can. sed
Area 6	1.83	870.0	27.8	3.2	77	Overland			Storage area below Lower #2 Can. sed
Pond Surface	0.12	180.0	0.0	0.0	100	None			Pond Surface
Totals	4.94								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	1.10	
Capacity w/1' freeboard	0.84	Excludes capacity above freeboard
Temporary storage capacity	0.26	Capacity between outlet & freeboard
Sediment load capacity	0.13	Design sediment load capacity
Available Capacity	0.45	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	0.72 cfs	1.41 cfs	1.52 cfs
Discharge Volume	0.12 acre-feet	0.16 acre-feet	0.21 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	3.000 feet	0.167 feet	
Slope	0.250 ft/ft	0.039 ft/ft	
Manning's n	0.024	0.010	
Discharge	180.640 cfs	0.080 cfs	
Velocity	25.560 fps	3.570 fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP	
Area 2	0.01	39.7	20	0.22	20.05	0.45	Disturbed bare P=1 C=.45
Area 3	0.01	2.8	20	0.22	1.43	0.45	Disturbed bare P=1 C=.45
Area 5	0.00	2.0	20	0.22	1.00	0.45	Disturbed bare P=1 C=.45
Area 6	0.00	2.0	20	0.22	1.00	0.45	Disturbed bare P=1 C=.45
Pond Surface	0.00	0.0					Pond Surface
Totals	0.03						

Project Title = No 3 Hoistbouse

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number	=	76.5
Area	=	0.3 acres
Hydraulic length	=	60.00 Feet
Elevation change	=	32.5 feet.
Concentration time	=	0.00 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Watershed data for watershed # 2

Curve number	=	77.0
Area	=	1.4 acres
Hydraulic length	=	110.00 Feet
Elevation change	=	10.0 feet.
Concentration time	=	0.01 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Watershed data for watershed # 3

Curve number	=	77.0
Area	=	1.3 acres
Hydraulic length	=	950.00 Feet
Elevation change	=	30.4 feet.
Concentration time	=	0.21 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Watershed data for watershed # 4

Curve number	=	77.0
Area	=	1.8 acres
Hydraulic length	=	870.00 Feet
Elevation change	=	27.8 feet.
Concentration time	=	0.19 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Watershed data for watershed # 5

Curve number	=	100.0
Area	=	0.1 acres
Hydraulic length	=	180.00 Feet
Elevation change	=	0.0 feet.
Concentration time	=	0.33 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Total Area = 5.0 acres

-- Storm data

Total precipitation = 1.6 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 0.72 cfs
Discharge volume = 0.12 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.002
0.20	0.010	0.005	*	0.30	0.010	0.008
0.40	0.010	0.010	*	0.50	0.010	0.010
0.60	0.016	0.012	*	0.70	0.015	0.014
0.80	0.016	0.016	*	0.90	0.016	0.017
1.00	0.016	0.017	*	1.10	0.017	0.018
1.20	0.017	0.019	*	1.30	0.017	0.019
1.40	0.017	0.020	*	1.50	0.017	0.020
1.60	0.031	0.022	*	1.70	0.031	0.026
1.80	0.031	0.030	*	1.90	0.031	0.033
2.00	0.031	0.034	*	2.10	0.120	0.048
2.20	0.120	0.075	*	2.30	0.120	0.198
2.40	0.121	0.437	*	2.50	0.120	0.721
2.60	0.032	0.629	*	2.70	0.032	0.485
2.80	0.032	0.433	*	2.90	0.032	0.423
3.00	0.032	0.419	*	3.10	0.026	0.386
3.20	0.026	0.365	*	3.30	0.026	0.363
3.40	0.026	0.367	*	3.50	0.026	0.373
3.60	0.018	0.334	*	3.70	0.018	0.301
3.80	0.018	0.290	*	3.90	0.018	0.287
4.00	0.018	0.286	*	4.10	0.016	0.276
4.20	0.016	0.269	*	4.30	0.016	0.267
4.40	0.016	0.268	*	4.50	0.016	0.271
4.60	0.013	0.253	*	4.70	0.013	0.239
4.80	0.013	0.235	*	4.90	0.013	0.234
5.00	0.013	0.234	*	5.10	0.012	0.225
5.20	0.012	0.219	*	5.30	0.012	0.218
5.40	0.012	0.217	*	5.50	0.012	0.218
5.60	0.013	0.229	*	5.70	0.013	0.239
5.80	0.013	0.244	*	5.90	0.013	0.247
6.00	0.013	0.250	*	6.10	0.000	0.153
6.20	0.000	0.071	*	6.30	0.000	0.036
6.40	0.000	0.020	*	6.50	0.000	0.009
6.60	0.000	0.003	*	6.70	0.000	0.001
6.80	0.000	0.000	*	6.90	0.000	0.000
7.00	0.000	0.000	*			

```
Project Title        = No 3 Hoisthouse
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Watershed data for watershed # 1
   Curve number           =    76.5
   Area                   =     0.3 acres
   Hydraulic length       =   60.00 Feet
   Elevation change       =    32.5 feet.
   Concentration time     =    0.00 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed


-- Watershed data for watershed # 2
   Curve number           =    77.0
   Area                   =     1.4 acres
   Hydraulic length       =  110.00 Feet
   Elevation change       =    10.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed


-- Watershed data for watershed # 3
   Curve number           =    77.0
   Area                   =     1.3 acres
   Hydraulic length       =  950.00 Feet
   Elevation change       =    30.4 feet.
   Concentration time     =    0.21 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed


-- Watershed data for watershed # 4
   Curve number           =    77.0
   Area                   =     1.8 acres
   Hydraulic length       =  870.00 Feet
   Elevation change       =    27.8 feet.
   Concentration time     =    0.19 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed


-- Watershed data for watershed # 5
   Curve number           =   100.0
   Area                   =     0.1 acres
   Hydraulic length       =  180.00 Feet
   Elevation change       =     0.0 feet.
   Concentration time     =    0.33 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Total Area          =     5.0 acres
```

-- Storm data

Total precipitation = 1.8 inches

Storm type = SCS Type 2 storm, 24 hour storm

Peak Discharge = 1.41 cfs

Discharge volume = 0.16 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.000
0.20	0.002	0.001	*	0.30	0.002	0.001
0.40	0.002	0.002	*	0.50	0.002	0.002
0.60	0.002	0.002	*	0.70	0.002	0.002
0.80	0.002	0.002	*	0.90	0.002	0.002
1.00	0.002	0.002	*	1.10	0.002	0.002
1.20	0.002	0.002	*	1.30	0.002	0.002
1.40	0.002	0.003	*	1.50	0.002	0.003
1.60	0.002	0.003	*	1.70	0.002	0.003
1.80	0.002	0.003	*	1.90	0.002	0.003
2.00	0.002	0.003	*	2.10	0.002	0.003
2.20	0.002	0.003	*	2.30	0.002	0.003
2.40	0.002	0.003	*	2.50	0.002	0.003
2.60	0.002	0.003	*	2.70	0.002	0.003
2.80	0.002	0.003	*	2.90	0.002	0.003
3.00	0.002	0.003	*	3.10	0.003	0.003
3.20	0.003	0.003	*	3.30	0.003	0.003
3.40	0.003	0.003	*	3.50	0.003	0.003
3.60	0.003	0.003	*	3.70	0.003	0.003
3.80	0.003	0.003	*	3.90	0.003	0.003
4.00	0.003	0.003	*	4.10	0.003	0.003
4.20	0.003	0.003	*	4.30	0.003	0.003
4.40	0.003	0.003	*	4.50	0.003	0.003
4.60	0.003	0.003	*	4.70	0.003	0.003
4.80	0.003	0.003	*	4.90	0.003	0.003
5.00	0.003	0.003	*	5.10	0.003	0.003
5.20	0.003	0.003	*	5.30	0.003	0.003
5.40	0.003	0.003	*	5.50	0.003	0.003
5.60	0.003	0.003	*	5.70	0.003	0.003
5.80	0.003	0.003	*	5.90	0.003	0.003
6.00	0.003	0.003	*	6.10	0.004	0.004
6.20	0.004	0.004	*	6.30	0.004	0.004
6.40	0.004	0.004	*	6.50	0.004	0.004
6.60	0.004	0.004	*	6.70	0.004	0.004
6.80	0.004	0.004	*	6.90	0.004	0.004
7.00	0.004	0.004	*	7.10	0.004	0.004
7.20	0.004	0.004	*	7.30	0.004	0.004
7.40	0.004	0.004	*	7.50	0.004	0.004
7.60	0.004	0.004	*	7.70	0.004	0.004
7.80	0.004	0.004	*	7.90	0.004	0.004
8.00	0.004	0.004	*	8.10	0.005	0.004
8.20	0.005	0.005	*	8.30	0.005	0.005
8.40	0.005	0.005	*	8.50	0.005	0.005
8.60	0.005	0.006	*	8.70	0.005	0.006
8.80	0.005	0.006	*	8.90	0.005	0.006
9.00	0.005	0.006	*	9.10	0.006	0.006
9.20	0.006	0.006	*	9.30	0.006	0.007
9.40	0.006	0.007	*	9.50	0.006	0.007
9.60	0.007	0.007	*	9.70	0.007	0.007
9.80	0.007	0.007	*	9.90	0.007	0.008
10.00	0.007	0.008	*	10.10	0.008	0.008

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
10.10	0.008	0.008				
10.20	0.008	0.009	*	10.30	0.008	0.009
10.40	0.008	0.010	*	10.50	0.008	0.010
10.60	0.011	0.010	*	10.70	0.011	0.011
10.80	0.011	0.012	*	10.90	0.011	0.013
11.00	0.011	0.013	*	11.10	0.018	0.014
11.20	0.018	0.016	*	11.30	0.018	0.018
11.40	0.018	0.019	*	11.50	0.018	0.020
11.60	0.140	0.059	*	11.70	0.140	0.287
11.80	0.140	0.656	*	11.90	0.140	1.047
12.00	0.140	1.414	*	12.10	0.026	1.078
12.20	0.026	0.718	*	12.30	0.026	0.571
12.40	0.026	0.511	*	12.50	0.026	0.471
12.60	0.014	0.363	*	12.70	0.014	0.287
12.80	0.014	0.257	*	12.90	0.014	0.245
13.00	0.014	0.238	*	13.10	0.010	0.210
13.20	0.010	0.190	*	13.30	0.010	0.182
13.40	0.010	0.179	*	13.50	0.010	0.177
13.60	0.008	0.162	*	13.70	0.008	0.149
13.80	0.008	0.144	*	13.90	0.008	0.143
14.00	0.008	0.142	*	14.10	0.006	0.126
14.20	0.006	0.113	*	14.30	0.006	0.107
14.40	0.006	0.105	*	14.50	0.006	0.104
14.60	0.006	0.103	*	14.70	0.006	0.103
14.80	0.006	0.104	*	14.90	0.006	0.104
15.00	0.006	0.104	*	15.10	0.006	0.105
15.20	0.006	0.105	*	15.30	0.006	0.105
15.40	0.006	0.106	*	15.50	0.006	0.106
15.60	0.006	0.106	*	15.70	0.006	0.107
15.80	0.006	0.107	*	15.90	0.006	0.107
16.00	0.006	0.108	*	16.10	0.003	0.091
16.20	0.003	0.077	*	16.30	0.003	0.071
16.40	0.003	0.069	*	16.50	0.003	0.067
16.60	0.003	0.066	*	16.70	0.003	0.066
16.80	0.003	0.066	*	16.90	0.003	0.066
17.00	0.003	0.066	*	17.10	0.003	0.066
17.20	0.003	0.066	*	17.30	0.003	0.066
17.40	0.003	0.067	*	17.50	0.003	0.067
17.60	0.003	0.067	*	17.70	0.003	0.067
17.80	0.003	0.067	*	17.90	0.003	0.067
18.00	0.003	0.067	*	18.10	0.003	0.067
18.20	0.003	0.068	*	18.30	0.003	0.068
18.40	0.003	0.068	*	18.50	0.003	0.068
18.60	0.003	0.068	*	18.70	0.003	0.068
18.80	0.003	0.068	*	18.90	0.003	0.068
19.00	0.003	0.068	*	19.10	0.003	0.069
19.20	0.003	0.069	*	19.30	0.003	0.069
19.40	0.003	0.069	*	19.50	0.003	0.069
19.60	0.003	0.069	*	19.70	0.003	0.069
19.80	0.003	0.069	*	19.90	0.003	0.070
20.00	0.003	0.070	*	20.10	0.002	0.061
20.20	0.002	0.053	*	20.30	0.002	0.050
20.40	0.002	0.048	*	20.50	0.002	0.048
20.60	0.002	0.047	*	20.70	0.002	0.047
20.80	0.002	0.047	*	20.90	0.002	0.047
21.00	0.002	0.047	*	21.10	0.002	0.047
21.20	0.002	0.047	*	21.30	0.002	0.047

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
21.30	0.002	0.047				
21.40	0.002	0.047	*	21.50	0.002	0.047
21.60	0.002	0.047	*	21.70	0.002	0.047
21.80	0.002	0.047	*	21.90	0.002	0.047
22.00	0.002	0.047	*	22.10	0.002	0.048
22.20	0.002	0.048	*	22.30	0.002	0.048
22.40	0.002	0.048	*	22.50	0.002	0.048
22.60	0.002	0.048	*	22.70	0.002	0.048
22.80	0.002	0.048	*	22.90	0.002	0.048
23.00	0.002	0.048	*	23.10	0.002	0.048
23.20	0.002	0.048	*	23.30	0.002	0.048
23.40	0.002	0.048	*	23.50	0.002	0.048
23.60	0.002	0.048	*	23.70	0.002	0.048
23.80	0.002	0.048	*	23.90	0.002	0.048
24.00	0.002	0.048	*	24.10	0.000	0.029
24.20	0.000	0.014	*	24.30	0.000	0.007
24.40	0.000	0.004	*	24.50	0.000	0.002
24.60	0.000	0.001	*	24.70	0.000	0.000
24.80	0.000	0.000	*	24.90	0.000	0.000
25.00	0.000	0.000	*			

```
Project Title        = No 3 Hoisthouse
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Watershed data for watershed # 1
   Curve number           =    76.5
   Area                   =     0.3 acres
   Hydraulic length       =   60.00 Feet
   Elevation change       =    32.5 feet.
   Concentration time     =    0.00 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed


-- Watershed data for watershed # 2
   Curve number           =    77.0
   Area                   =     1.4 acres
   Hydraulic length       =  110.00 Feet
   Elevation change       =    10.0 feet.
   Concentration time     =    0.01 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed


-- Watershed data for watershed # 3
   Curve number           =    77.0
   Area                   =     1.3 acres
   Hydraulic length       =  950.00 Feet
   Elevation change       =    30.4 feet.
   Concentration time     =    0.21 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed


-- Watershed data for watershed # 4
   Curve number           =    77.0
   Area                   =     1.8 acres
   Hydraulic length       =  870.00 Feet
   Elevation change       =    27.8 feet.
   Concentration time     =    0.19 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed


-- Watershed data for watershed # 5
   Curve number           =   100.0
   Area                   =     0.1 acres
   Hydraulic length       =  180.00 Feet
   Elevation change       =     0.0 feet.
   Concentration time     =    0.33 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Total Area          =     5.0 acres
```

-- Storm data

Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 1.52 cfs
Discharge volume = 0.21 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.002
0.20	0.013	0.006	*	0.30	0.013	0.010
0.40	0.013	0.012	*	0.50	0.013	0.013
0.60	0.020	0.015	*	0.70	0.020	0.017
0.80	0.020	0.020	*	0.90	0.020	0.021
1.00	0.020	0.022	*	1.10	0.022	0.023
1.20	0.022	0.024	*	1.30	0.022	0.024
1.40	0.022	0.025	*	1.50	0.022	0.025
1.60	0.039	0.028	*	1.70	0.039	0.033
1.80	0.039	0.038	*	1.90	0.039	0.042
2.00	0.039	0.043	*	2.10	0.153	0.063
2.20	0.153	0.257	*	2.30	0.153	0.644
2.40	0.153	1.092	*	2.50	0.153	1.522
2.60	0.041	1.238	*	2.70	0.041	0.915
2.80	0.041	0.794	*	2.90	0.041	0.754
3.00	0.041	0.730	*	3.10	0.033	0.662
3.20	0.033	0.620	*	3.30	0.033	0.611
3.40	0.033	0.614	*	3.50	0.033	0.621
3.60	0.023	0.551	*	3.70	0.023	0.494
3.80	0.023	0.473	*	3.90	0.023	0.467
4.00	0.023	0.464	*	4.10	0.020	0.445
4.20	0.020	0.431	*	4.30	0.020	0.428
4.40	0.020	0.429	*	4.50	0.020	0.431
4.60	0.016	0.402	*	4.70	0.016	0.379
4.80	0.016	0.371	*	4.90	0.016	0.368
5.00	0.016	0.368	*	5.10	0.015	0.354
5.20	0.015	0.343	*	5.30	0.015	0.340
5.40	0.015	0.340	*	5.50	0.015	0.340
5.60	0.016	0.356	*	5.70	0.016	0.371
5.80	0.016	0.378	*	5.90	0.016	0.383
6.00	0.016	0.387	*	6.10	0.000	0.235
6.20	0.000	0.108	*	6.30	0.000	0.054
6.40	0.000	0.030	*	6.50	0.000	0.014
6.60	0.000	0.004	*	6.70	0.000	0.001
6.80	0.000	0.001	*	6.90	0.000	0.000
7.00	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: No. 3 Hoisthouse

Comment: 12-inch CMP Standpipe Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.00 ft
Slope.....	99.0000 ft/ft
Manning's n.....	0.024
Discharge.....	192.02 cfs

Computed Results:

Full Flow Capacity.....	192.02 cfs
Full Flow Depth.....	1.00 ft
Velocity.....	244.48 fps
Flow Area.....	0.79 sf
Critical Depth....	1.00 ft
Critical Slope....	98.9822 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	192.02 cfs
QMAX @.94D.....	206.55 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: No. 3 Hoisthouse

Comment: 36-inch CMP Outlet Principal Spillway

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	3.00 ft
Slope.....	0.2500 ft/ft
Manning's n.....	0.024
Discharge.....	180.64 cfs

Computed Results:

Full Flow Capacity.....	180.64 cfs
Full Flow Depth.....	3.00 ft
Velocity.....	25.56 fps
Flow Area.....	7.07 sf
Critical Depth....	2.99 ft
Critical Slope....	0.2380 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	180.64 cfs
QMAX @.94D.....	194.32 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: No. 3 Hoisthouse

Comment: 2-inch Victaulic Decant Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.17 ft
Slope.....	0.0390 ft/ft
Manning's n.....	0.010
Discharge.....	0.08 cfs

Computed Results:

Full Flow Capacity.....	0.08 cfs
Full Flow Depth.....	0.17 ft
Velocity.....	3.57 fps
Flow Area.....	0.02 sf
Critical Depth....	0.17 ft
Critical Slope....	0.0344 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	0.08 cfs
QMAX @.94D.....	0.09 cfs
Froude Number.....	FULL

Slurry Pond No. 1

Slurry Ponds No. 1 and 2 receive fine refuse material from the coal preparation plant by way of an open slurry ditch. Located next to the Clear Water pond, the ponds are designed for dewatering, settling and filtration of the coal fines. Typically one pond is in use while the other has sediments removed. Occasionally both ponds require servicing and the East Slurry Cell receives the output from the slurry ditch until one of the ponds can be put back into operation.

Slurry Pond No. 1 is an off-channel, temporary impoundment pond with a total as-built contained volume of approximately 18.90 acre-feet. Both surface water runoff and coal preparation plant fines may reach the ponds during a storm. Slurry Pond No. 1 may see the drainage associated with the slurry ditch depending upon which structure is receiving the slurry during the time of the storm. Other than the drainage associated with the slurry ditch, the slurry pond captures the surface water associated with its own disturbance.

The structure is a temporary impoundment as addressed in R645-301-733. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The impoundment meets the single-open channel spillway exemption of R645-301-743.132 by meeting the requirements of R645-301-742.225.2.

The pond is built as a partitioned pond with a coarse refuse filter dike typically discharging 30 gpm and capable of discharging 255 gpm of water to an 8-inch outlet to the Clear Water Discharge Pond. The 8-inch outlet is the only outlet from the ponds.

Routine flow of coal fines is manually controlled. Sunnyside commits to maintaining 1.6 feet (1.0 foot of freeboard and 0.6 foot of storm capacity) of elevation below the top of the pond for Slurry Pond No. 1. A 100-year, 6-hour storm requires 0.99 acre-feet of capacity and 0.11 acre-feet of sediment load capacity. The impoundment contains a 100-year, 6-hour event by capturing the 1.10 acre-foot event within the allotted 1.6 feet of remaining pond capacity.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
SLURRY CELL NO. 1

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area 1	0.10	2,800.0	1,988.0	71.0	74	Ditch	2,260.0	85.0	West facing hillside
Area 2	5.00	470.0	20.2	4.3	61	Ditch	460.0	30.0	Lower loop area 1
Area 3	1.70	70.0	2.1	3.0	61	Ditch	900.0	30.0	Slurry area 2
Area 4	5.50	600.0	22.2	3.7	61	Ditch	1,120.0	65.0	Upper loop area 2
Area 5	15.00	700.0	35.0	5.0	61	Ditch	1,100.0	45.0	Upper loop area 1
Area 6	0.10	100.0	5.0	5.0	61	Ditch	1,100.0	45.0	West facing hillside collector
Area 7	11.00	700.0	30.1	4.3	61	Ditch	200.0	20.0	Lower loop area 2
Area 8	7.70	200.0	35.0	17.5	61	Ditch	2,070.0	45.0	Int. ditch hillside
Area 9	0.80	3,250.0	65.0	2.0	95				Slurry ditch area
Pond Surface	3.35	500.0	0.0	0.0	100	None			Pond Surface
Totals	50.25								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	18.90	
Capacity w/1' freeboard	16.95	Excludes capacity above freeboard
Temporary storage capacity	0.99	Storm capacity (100-yr, 6-hr)
Sediment load capacity	0.11	Storm sediment load capacity
Available Capacity	15.85	Slurry capacity

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	2.17 cfs	2.33 cfs	3.58 cfs
Discharge Volume	0.59 acre-feet	0.77 acre-feet	0.99 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	feet	0.667 feet	
Slope	ft/ft	0.005 ft/ft	
Manning's n		0.010	
Discharge	cfs	1.130 cfs	
Velocity	fps	3.190 fps	

Sunnyside Coal Company
SLURRY CELL NO. 1

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP		
Area 1	0.01	112.9	20	0.22	150.92	0.17	Undisturbed	P=1 C=.17
Area 2	0.01	0.9	20	0.22	1.19	0.17		P=1 C=.17
Area 3	0.00	0.4	20	0.22	0.26	0.36	Disturbed bare	P=1 C=.36
Area 4	0.00	0.6	20	0.22	0.81	0.17		P=1 C=.17
Area 5	0.02	1.1	20	0.22	1.41	0.17		P=1 C=.17
Area 6	0.00	0.4	20	0.22	0.53	0.17		P=1 C=.17
Area 7	0.02	1.1	20	0.22	1.41	0.17		P=1 C=.17
Area 8	0.04	4.3	20	0.22	5.76	0.17		P=1 C=.17
Area 9	0.00	1.1	20	0.22	0.55	0.45	Disturbed bare	P=1 C=.45
Pond Surface	0.00	0.0					Pond Surface	
Totals	0.11							

```
Project Title        = Slurry Pond #1
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.19
   Hydraulic length     = 2260.00 feet
   Elevation change     =    85.0 feet.
   Travel time          =    0.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.37 K=   0.03
   Hydraulic length     =  460.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.09
   Hydraulic length     =  900.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.36 K=   0.08
   Hydraulic length     = 1120.00 feet
   Elevation change     =    65.0 feet.
   Travel time          =    0.08 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.09
   Hydraulic length     = 1100.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.09
   Hydraulic length     = 1100.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.39 K=   0.01
   Hydraulic length     =  200.00 feet
   Elevation change     =    20.0 feet.
   Travel time          =    0.01 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.30 K=   0.26
   Hydraulic length     = 2070.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.26 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8

Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9

Curve number = 95.0
Area = 0.8 acres
Hydraulic length = 3250.00 Feet
Elevation change = 65.0 feet.
Concentration time = 0.32 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #10

Curve number = 100.0
Area = 3.3 acres
Hydraulic length = 500.00 Feet
Elevation change = 0.0 feet.
Concentration time = 1.54 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 50.2 acres

-- Storm data

Total precipitation = 1.6 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 2.17 cfs
Discharge volume = 0.59 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.003
0.20	0.010	0.008	*	0.30	0.010	0.017
0.40	0.010	0.028	*	0.50	0.010	0.041
0.60	0.016	0.059	*	0.70	0.015	0.081
0.80	0.016	0.108	*	0.90	0.016	0.138
1.00	0.016	0.172	*	1.10	0.017	0.208
1.20	0.017	0.245	*	1.30	0.017	0.283
1.40	0.017	0.320	*	1.50	0.017	0.356
1.60	0.031	0.398	*	1.70	0.031	0.446
1.80	0.031	0.496	*	1.90	0.031	0.545
2.00	0.031	0.593	*	2.10	0.120	0.720
2.20	0.120	0.938	*	2.30	0.120	1.192
2.40	0.121	1.437	*	2.50	0.120	1.669
2.60	0.032	1.814	*	2.70	0.032	1.865
2.80	0.032	1.904	*	2.90	0.032	1.988
3.00	0.032	2.101	*	3.10	0.026	2.162
3.20	0.026	2.174	*	3.30	0.026	2.144
3.40	0.026	2.077	*	3.50	0.026	1.983

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
3.50	0.026	1.983				
3.60	0.018	1.880	*	3.70	0.018	1.773
3.80	0.018	1.674	*	3.90	0.018	1.587
4.00	0.018	1.515	*	4.10	0.016	1.454
4.20	0.016	1.405	*	4.30	0.016	1.369
4.40	0.016	1.352	*	4.50	0.016	1.345
4.60	0.013	1.320	*	4.70	0.013	1.287
4.80	0.013	1.259	*	4.90	0.013	1.238
5.00	0.013	1.224	*	5.10	0.012	1.200
5.20	0.012	1.175	*	5.30	0.012	1.153
5.40	0.012	1.135	*	5.50	0.012	1.121
5.60	0.013	1.124	*	5.70	0.013	1.132
5.80	0.013	1.138	*	5.90	0.013	1.140
6.00	0.013	1.140	*	6.10	0.000	0.979
6.20	0.000	0.765	*	6.30	0.000	0.596
6.40	0.000	0.484	*	6.50	0.000	0.433
6.60	0.000	0.396	*	6.70	0.000	0.364
6.80	0.000	0.331	*	6.90	0.000	0.296
7.00	0.000	0.261	*	7.10	0.000	0.229
7.20	0.000	0.199	*	7.30	0.000	0.173
7.40	0.000	0.150	*	7.50	0.000	0.129
7.60	0.000	0.111	*	7.70	0.000	0.097
7.80	0.000	0.085	*	7.90	0.000	0.077
8.00	0.000	0.070	*	8.10	0.000	0.063
8.20	0.000	0.057	*	8.30	0.000	0.051
8.40	0.000	0.045	*	8.50	0.000	0.040
8.60	0.000	0.036	*	8.70	0.000	0.031
8.80	0.000	0.027	*	8.90	0.000	0.023
9.00	0.000	0.020	*	9.10	0.000	0.017
9.20	0.000	0.014	*	9.30	0.000	0.011
9.40	0.000	0.009	*	9.50	0.000	0.007
9.60	0.000	0.005	*	9.70	0.000	0.003
9.80	0.000	0.002	*	9.90	0.000	0.001
10.00	0.000	0.000	*	10.10	0.000	0.000
10.20	0.000	0.000	*			

```
Project Title        = Slurry Pond #1
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.19
   Hydraulic length     = 2260.00 feet
   Elevation change     =    85.0 feet.
   Travel time          =    0.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.37 K=   0.03
   Hydraulic length     =  460.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.09
   Hydraulic length     =  900.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.36 K=   0.08
   Hydraulic length     = 1120.00 feet
   Elevation change     =    65.0 feet.
   Travel time          =    0.08 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.09
   Hydraulic length     = 1100.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.09
   Hydraulic length     = 1100.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.39 K=   0.01
   Hydraulic length     =  200.00 feet
   Elevation change     =    20.0 feet.
   Travel time          =    0.01 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.30 K=   0.26
   Hydraulic length     = 2070.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.26 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8

Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9

Curve number = 95.0
Area = 0.8 acres
Hydraulic length = 3250.00 Feet
Elevation change = 65.0 feet.
Concentration time = 0.32 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #10

Curve number = 100.0
Area = 3.3 acres
Hydraulic length = 500.00 Feet
Elevation change = 0.0 feet.
Concentration time = 1.54 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 50.2 acres

-- Storm data

Total precipitation = 1.8 inches
Storm type = SCS Type 2 storm, 24 hour storm
Peak Discharge = 2.33 cfs
Discharge volume = 0.77 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.000
0.20	0.002	0.001	*	0.30	0.002	0.003
0.40	0.002	0.005	*	0.50	0.002	0.007
0.60	0.002	0.010	*	0.70	0.002	0.014
0.80	0.002	0.018	*	0.90	0.002	0.022
1.00	0.002	0.027	*	1.10	0.002	0.031
1.20	0.002	0.035	*	1.30	0.002	0.039
1.40	0.002	0.043	*	1.50	0.002	0.046
1.60	0.002	0.049	*	1.70	0.002	0.051
1.80	0.002	0.054	*	1.90	0.002	0.056
2.00	0.002	0.058	*	2.10	0.002	0.059
2.20	0.002	0.061	*	2.30	0.002	0.062
2.40	0.002	0.064	*	2.50	0.002	0.065
2.60	0.002	0.066	*	2.70	0.002	0.067
2.80	0.002	0.068	*	2.90	0.002	0.069
3.00	0.002	0.070	*	3.10	0.003	0.070
3.20	0.003	0.071	*	3.30	0.003	0.072
3.40	0.003	0.073	*	3.50	0.003	0.074

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
3.50	0.003	0.074				
3.60	0.003	0.075	*	3.70	0.003	0.076
3.80	0.003	0.077	*	3.90	0.003	0.078
4.00	0.003	0.079	*	4.10	0.003	0.080
4.20	0.003	0.081	*	4.30	0.003	0.082
4.40	0.003	0.084	*	4.50	0.003	0.085
4.60	0.003	0.086	*	4.70	0.003	0.087
4.80	0.003	0.088	*	4.90	0.003	0.089
5.00	0.003	0.091	*	5.10	0.003	0.092
5.20	0.003	0.093	*	5.30	0.003	0.094
5.40	0.003	0.095	*	5.50	0.003	0.096
5.60	0.003	0.097	*	5.70	0.003	0.098
5.80	0.003	0.098	*	5.90	0.003	0.099
6.00	0.003	0.099	*	6.10	0.004	0.100
6.20	0.004	0.101	*	6.30	0.004	0.102
6.40	0.004	0.104	*	6.50	0.004	0.105
6.60	0.004	0.107	*	6.70	0.004	0.109
6.80	0.004	0.111	*	6.90	0.004	0.113
7.00	0.004	0.115	*	7.10	0.004	0.117
7.20	0.004	0.119	*	7.30	0.004	0.121
7.40	0.004	0.123	*	7.50	0.004	0.124
7.60	0.004	0.125	*	7.70	0.004	0.126
7.80	0.004	0.127	*	7.90	0.004	0.128
8.00	0.004	0.129	*	8.10	0.005	0.130
8.20	0.005	0.132	*	8.30	0.005	0.134
8.40	0.005	0.136	*	8.50	0.005	0.138
8.60	0.005	0.141	*	8.70	0.005	0.144
8.80	0.005	0.148	*	8.90	0.005	0.152
9.00	0.005	0.156	*	9.10	0.006	0.160
9.20	0.006	0.164	*	9.30	0.006	0.169
9.40	0.006	0.173	*	9.50	0.006	0.178
9.60	0.007	0.182	*	9.70	0.007	0.187
9.80	0.007	0.192	*	9.90	0.007	0.197
10.00	0.007	0.202	*	10.10	0.008	0.208
10.20	0.008	0.215	*	10.30	0.008	0.222
10.40	0.008	0.230	*	10.50	0.008	0.237
10.60	0.011	0.246	*	10.70	0.011	0.259
10.80	0.011	0.271	*	10.90	0.011	0.284
11.00	0.011	0.296	*	11.10	0.018	0.314
11.20	0.018	0.338	*	11.30	0.018	0.363
11.40	0.018	0.387	*	11.50	0.018	0.410
11.60	0.140	0.553	*	11.70	0.140	0.826
11.80	0.140	1.139	*	11.90	0.140	1.427
12.00	0.140	1.690	*	12.10	0.026	1.843
12.20	0.026	1.874	*	12.30	0.026	1.902
12.40	0.026	2.025	*	12.50	0.026	2.217
12.60	0.014	2.317	*	12.70	0.014	2.333
12.80	0.014	2.293	*	12.90	0.014	2.213
13.00	0.014	2.104	*	13.10	0.010	1.973
13.20	0.010	1.827	*	13.30	0.010	1.679
13.40	0.010	1.534	*	13.50	0.010	1.401
13.60	0.008	1.277	*	13.70	0.008	1.169
13.80	0.008	1.088	*	13.90	0.008	1.036
14.00	0.008	1.001	*	14.10	0.006	0.951
14.20	0.006	0.896	*	14.30	0.006	0.849
14.40	0.006	0.812	*	14.50	0.006	0.782
14.60	0.006	0.754	*	14.70	0.006	0.728

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
14.70	0.006	0.728				
14.80	0.006	0.703	*	14.90	0.006	0.679
15.00	0.006	0.656	*	15.10	0.006	0.633
15.20	0.006	0.612	*	15.30	0.006	0.592
15.40	0.006	0.572	*	15.50	0.006	0.554
15.60	0.006	0.536	*	15.70	0.006	0.519
15.80	0.006	0.505	*	15.90	0.006	0.494
16.00	0.006	0.487	*	16.10	0.003	0.455
16.20	0.003	0.417	*	16.30	0.003	0.389
16.40	0.003	0.371	*	16.50	0.003	0.361
16.60	0.003	0.355	*	16.70	0.003	0.349
16.80	0.003	0.343	*	16.90	0.003	0.338
17.00	0.003	0.332	*	17.10	0.003	0.327
17.20	0.003	0.323	*	17.30	0.003	0.319
17.40	0.003	0.316	*	17.50	0.003	0.314
17.60	0.003	0.312	*	17.70	0.003	0.310
17.80	0.003	0.309	*	17.90	0.003	0.309
18.00	0.003	0.309	*	18.10	0.003	0.309
18.20	0.003	0.309	*	18.30	0.003	0.310
18.40	0.003	0.310	*	18.50	0.003	0.310
18.60	0.003	0.311	*	18.70	0.003	0.311
18.80	0.003	0.312	*	18.90	0.003	0.312
19.00	0.003	0.313	*	19.10	0.003	0.313
19.20	0.003	0.314	*	19.30	0.003	0.315
19.40	0.003	0.316	*	19.50	0.003	0.316
19.60	0.003	0.317	*	19.70	0.003	0.318
19.80	0.003	0.319	*	19.90	0.003	0.320
20.00	0.003	0.321	*	20.10	0.002	0.304
20.20	0.002	0.282	*	20.30	0.002	0.266
20.40	0.002	0.257	*	20.50	0.002	0.253
20.60	0.002	0.250	*	20.70	0.002	0.248
20.80	0.002	0.246	*	20.90	0.002	0.243
21.00	0.002	0.241	*	21.10	0.002	0.239
21.20	0.002	0.237	*	21.30	0.002	0.236
21.40	0.002	0.234	*	21.50	0.002	0.233
21.60	0.002	0.232	*	21.70	0.002	0.232
21.80	0.002	0.231	*	21.90	0.002	0.231
22.00	0.002	0.231	*	22.10	0.002	0.231
22.20	0.002	0.231	*	22.30	0.002	0.231
22.40	0.002	0.231	*	22.50	0.002	0.231
22.60	0.002	0.231	*	22.70	0.002	0.231
22.80	0.002	0.232	*	22.90	0.002	0.232
23.00	0.002	0.232	*	23.10	0.002	0.232
23.20	0.002	0.232	*	23.30	0.002	0.233
23.40	0.002	0.233	*	23.50	0.002	0.233
23.60	0.002	0.234	*	23.70	0.002	0.234
23.80	0.002	0.235	*	23.90	0.002	0.235
24.00	0.002	0.235	*	24.10	0.000	0.195
24.20	0.000	0.143	*	24.30	0.000	0.094
24.40	0.000	0.078	*	24.50	0.000	0.070
24.60	0.000	0.064	*	24.70	0.000	0.059
24.80	0.000	0.054	*	24.90	0.000	0.048
25.00	0.000	0.042	*	25.10	0.000	0.037
25.20	0.000	0.033	*	25.30	0.000	0.028
25.40	0.000	0.025	*	25.50	0.000	0.021
25.60	0.000	0.019	*	25.70	0.000	0.016
25.80	0.000	0.014	*	25.90	0.000	0.013

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
25.90	0.000	0.013				
26.00	0.000	0.012	*	26.10	0.000	0.011
26.20	0.000	0.010	*	26.30	0.000	0.009
26.40	0.000	0.008	*	26.50	0.000	0.007
26.60	0.000	0.006	*	26.70	0.000	0.006
26.80	0.000	0.005	*	26.90	0.000	0.004
27.00	0.000	0.003	*	27.10	0.000	0.003
27.20	0.000	0.002	*	27.30	0.000	0.002
27.40	0.000	0.002	*	27.50	0.000	0.001
27.60	0.000	0.001	*	27.70	0.000	0.001
27.80	0.000	0.000	*	27.90	0.000	0.000
28.00	0.000	0.000	*	28.10	0.000	0.000
28.20	0.000	0.000	*			

```
Project Title        = Slurry Pond #1
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.19
   Hydraulic length     = 2260.00 feet
   Elevation change     =    85.0 feet.
   Travel time          =    0.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.37 K=   0.03
   Hydraulic length     =  460.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.03 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.09
   Hydraulic length     =  900.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.36 K=   0.08
   Hydraulic length     = 1120.00 feet
   Elevation change     =    65.0 feet.
   Travel time          =    0.08 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.09
   Hydraulic length     = 1100.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.34 K=   0.09
   Hydraulic length     = 1100.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.09 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.39 K=   0.01
   Hydraulic length     =  200.00 feet
   Elevation change     =    20.0 feet.
   Travel time          =    0.01 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.30 K=   0.26
   Hydraulic length     = 2070.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.26 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8

Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9

Curve number = 95.0
Area = 0.8 acres
Hydraulic length = 3250.00 Feet
Elevation change = 65.0 feet.
Concentration time = 0.32 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #10

Curve number = 100.0
Area = 3.3 acres
Hydraulic length = 500.00 Feet
Elevation change = 0.0 feet.
Concentration time = 1.54 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 50.2 acres

-- Storm data

Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 3.58 cfs
Discharge volume = 0.99 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.003
0.20	0.013	0.010	*	0.30	0.013	0.021
0.40	0.013	0.035	*	0.50	0.013	0.052
0.60	0.020	0.075	*	0.70	0.020	0.103
0.80	0.020	0.137	*	0.90	0.020	0.178
1.00	0.020	0.225	*	1.10	0.022	0.274
1.20	0.022	0.323	*	1.30	0.022	0.372
1.40	0.022	0.421	*	1.50	0.022	0.467
1.60	0.039	0.522	*	1.70	0.039	0.587
1.80	0.039	0.654	*	1.90	0.039	0.717
2.00	0.039	0.777	*	2.10	0.153	0.948
2.20	0.153	1.239	*	2.30	0.153	1.573
2.40	0.153	1.888	*	2.50	0.153	2.181
2.60	0.041	2.359	*	2.70	0.041	2.430
2.80	0.041	2.546	*	2.90	0.041	2.788
3.00	0.041	3.109	*	3.10	0.033	3.329
3.20	0.033	3.463	*	3.30	0.033	3.539
3.40	0.033	3.573	*	3.50	0.033	3.577

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
3.50	0.033	3.577				
3.60	0.023	3.456	*	3.70	0.023	3.275
3.80	0.023	3.109	*	3.90	0.023	2.979
4.00	0.023	2.881	*	4.10	0.020	2.777
4.20	0.020	2.682	*	4.30	0.020	2.617
4.40	0.020	2.586	*	4.50	0.020	2.574
4.60	0.016	2.501	*	4.70	0.016	2.410
4.80	0.016	2.339	*	4.90	0.016	2.297
5.00	0.016	2.272	*	5.10	0.015	2.223
5.20	0.015	2.167	*	5.30	0.015	2.124
5.40	0.015	2.095	*	5.50	0.015	2.075
5.60	0.016	2.096	*	5.70	0.016	2.131
5.80	0.016	2.157	*	5.90	0.016	2.170
6.00	0.016	2.175	*	6.10	0.000	1.779
6.20	0.000	1.271	*	6.30	0.000	0.891
6.40	0.000	0.646	*	6.50	0.000	0.557
6.60	0.000	0.501	*	6.70	0.000	0.461
6.80	0.000	0.419	*	6.90	0.000	0.375
7.00	0.000	0.330	*	7.10	0.000	0.289
7.20	0.000	0.252	*	7.30	0.000	0.219
7.40	0.000	0.189	*	7.50	0.000	0.163
7.60	0.000	0.141	*	7.70	0.000	0.123
7.80	0.000	0.108	*	7.90	0.000	0.097
8.00	0.000	0.088	*	8.10	0.000	0.080
8.20	0.000	0.072	*	8.30	0.000	0.064
8.40	0.000	0.058	*	8.50	0.000	0.051
8.60	0.000	0.045	*	8.70	0.000	0.039
8.80	0.000	0.034	*	8.90	0.000	0.030
9.00	0.000	0.025	*	9.10	0.000	0.021
9.20	0.000	0.017	*	9.30	0.000	0.014
9.40	0.000	0.011	*	9.50	0.000	0.009
9.60	0.000	0.006	*	9.70	0.000	0.004
9.80	0.000	0.003	*	9.90	0.000	0.001
10.00	0.000	0.001	*	10.10	0.000	0.000
10.20	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Slurry Cell No. 1

Comment: 8-inch Principal Discharge Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.67 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.010
Discharge.....	1.13 cfs

Computed Results:

Full Flow Capacity.....	1.13 cfs
Full Flow Depth.....	0.67 ft
Velocity.....	3.19 fps
Flow Area.....	0.35 sf
Critical Depth....	0.50 ft
Critical Slope....	0.0060 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	1.13 cfs
QMAX @.94D.....	1.21 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Slurry Pond No. 2

Slurry Ponds No. 1 and 2 receive fine refuse material from the coal preparation plant by way of an open slurry ditch. Located next to the Clear Water pond, the ponds are designed for dewatering, settling and filtration of the coal fines. Typically one pond is in use while the other has sediments removed. Occasionally both ponds require servicing and the East Slurry Cell receives the output from the slurry ditch until one of the ponds can be put back into operation.

Slurry Pond No. 2 is an off-channel, temporary impoundment pond with a total as-built contained volume of approximately 12.60 acre-feet. Both surface water runoff and coal preparation plant fines may reach the ponds during a storm. Slurry Pond No. 2 may see the drainage associated with the slurry ditch depending upon which structure is receiving the slurry during the time of the storm. Other than the drainage associated with the slurry ditch, the slurry pond captures the surface water associated with its own disturbance.

The structure is a temporary impoundment as addressed in R645-301-733. The structure is not addressed by the MSHA criteria of 30 CFR 77.216(a). The impoundment meets the single-open channel spillway exemption of R645-301-743.132 by meeting the requirements of R645-301-742.225.2.

The pond is built as a partitioned pond with a coarse refuse filter dike typically discharging 30 gpm and capable of discharging 255 gpm of water to an 8-inch outlet to the Clear Water Discharge Pond. The 8-inch outlet is the only outlet from the ponds.

Routine flow of coal fines is manually controlled. Sunnyside commits to maintaining 1.75 feet (1.0 foot of freeboard and 0.75 foot of storm capacity) of elevation below the top of the pond for Slurry Pond No. 2. A 100-year, 6-hour storm requires 0.95 acre-feet of capacity and 0.11 acre-feet of sediment load capacity. The impoundment contains a 100-year, 6-hour event by capturing the 1.06 acre-foot event within the allotted 1.75 feet of remaining pond capacity.

Sunnyside Coal Company
SLURRY CELL NO. 2

DATA SUMMARY

File: Ponddata.wq1

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area 1	0.10	2,800.0	1,988.0	71.0	74	Ditch	3,120.0	85.0	West facing hillside
Area 2	5.00	470.0	20.2	4.3	61	Ditch	1,320.0	30.0	Lower loop area 1
Area 3	1.70	70.0	2.1	3.0	61	Ditch	1,760.0	30.0	Slurry area 2
Area 4	5.50	600.0	22.2	3.7	61	Ditch	1,980.0	65.0	Upper loop area 2
Area 5	15.00	700.0	35.0	5.0	61	Ditch	1,960.0	45.0	Upper loop area 1
Area 6	0.10	100.0	5.0	5.0	61	Ditch	1,960.0	45.0	West facing hillside collector
Area 7	11.00	700.0	30.1	4.3	61	Ditch	1,060.0	20.0	Lower loop area 2
Area 8	7.70	200.0	35.0	17.5	61	Ditch	2,930.0	45.0	Int. ditch hillside
Area 9	1.00	4,230.0	80.0	1.9	95				Slurry ditch area
Pond Surface	2.95	650.0	0.0	0.0	100	None			Pond Surface
Totals	50.05								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	12.60	
Capacity w/1' freeboard	11.04	Excludes capacity above freeboard
Temporary storage capacity	0.95	Storm capacity (100-yr, 6-hr)
Sediment load capacity	0.11	Storm sediment load capacity
Available Capacity	9.98	Slurry capacity

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches
Peak Discharge	1.61 cfs	1.70 cfs	3.09 cfs
Discharge Volume	0.56 acre-feet	0.74 acre-feet	0.95 acre-feet

OUTLET DATA	CMP	Pipe	Spillway
Diameter	feet	0.667 feet	
Slope	ft/ft	0.005 ft/ft	
Manning's n		0.010	
Discharge	cfs	1.130 cfs	
Velocity	fps	3.190 fps	

Sunnyside Coal Company
SLURRY CELL NO. 2

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP		
Area 1	0.01	112.9	20	0.22	150.92	0.17	Undisturbed	P=1 C=.17
Area 2	0.01	0.9	20	0.22	1.19	0.17		P=1 C=.17
Area 3	0.00	0.4	20	0.22	0.26	0.36	Disturbed bare	P=1 C=.36
Area 4	0.00	0.6	20	0.22	0.81	0.17		P=1 C=.17
Area 5	0.02	1.1	20	0.22	1.41	0.17		P=1 C=.17
Area 6	0.00	0.4	20	0.22	0.53	0.17		P=1 C=.17
Area 7	0.02	1.1	20	0.22	1.41	0.17		P=1 C=.17
Area 8	0.04	4.3	20	0.22	5.76	0.17		P=1 C=.17
Area 9	0.00	1.2	20	0.22	0.60	0.45	Disturbed bare	P=1 C=.45
Pond Surface	0.00	0.0					Pond Surface	
Totals	0.11							

```
Project Title        = Slurry Pond #2
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.30
   Hydraulic length     = 3120.00 feet
   Elevation change     =    85.0 feet.
   Travel time          =    0.30 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.13
   Hydraulic length     = 1320.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.13 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.30 K=   0.19
   Hydraulic length     = 1760.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.18
   Hydraulic length     = 1980.00 feet
   Elevation change     =    65.0 feet.
   Travel time          =    0.18 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.20
   Hydraulic length     = 1960.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.20 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.20
   Hydraulic length     = 1960.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.20 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.11
   Hydraulic length     = 1060.00 feet
   Elevation change     =    20.0 feet.
   Travel time          =    0.11 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.36
   Hydraulic length     = 2930.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.36 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8

Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9

Curve number = 95.0
Area = 1.0 acres
Hydraulic length = 4230.00 Feet
Elevation change = 80.0 feet.
Concentration time = 0.42 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #10

Curve number = 100.0
Area = 3.0 acres
Hydraulic length = 650.00 Feet
Elevation change = 0.0 feet.
Concentration time = 2.29 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 50.0 acres

-- Storm data

Total precipitation = 1.6 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 1.61 cfs
Discharge volume = 0.56 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.001
0.20	0.010	0.003	*	0.30	0.010	0.007
0.40	0.010	0.011	*	0.50	0.010	0.017
0.60	0.016	0.025	*	0.70	0.016	0.034
0.80	0.016	0.045	*	0.90	0.016	0.057
1.00	0.016	0.072	*	1.10	0.017	0.091
1.20	0.017	0.114	*	1.30	0.017	0.140
1.40	0.017	0.168	*	1.50	0.017	0.198
1.60	0.031	0.232	*	1.70	0.031	0.272
1.80	0.031	0.319	*	1.90	0.031	0.367
2.00	0.031	0.413	*	2.10	0.121	0.511
2.20	0.121	0.670	*	2.30	0.121	0.897
2.40	0.121	1.117	*	2.50	0.121	1.315
2.60	0.032	1.416	*	2.70	0.032	1.441
2.80	0.032	1.390	*	2.90	0.032	1.369
3.00	0.032	1.385	*	3.10	0.026	1.436
3.20	0.026	1.482	*	3.30	0.026	1.520
3.40	0.026	1.561	*	3.50	0.026	1.594

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
3.50	0.026	1.594				
3.60	0.018	1.608	*	3.70	0.018	1.602
3.80	0.018	1.581	*	3.90	0.018	1.557
4.00	0.018	1.540	*	4.10	0.016	1.529
4.20	0.016	1.512	*	4.30	0.016	1.490
4.40	0.016	1.467	*	4.50	0.016	1.444
4.60	0.013	1.419	*	4.70	0.013	1.374
4.80	0.013	1.323	*	4.90	0.013	1.279
5.00	0.013	1.246	*	5.10	0.012	1.224
5.20	0.012	1.199	*	5.30	0.012	1.180
5.40	0.012	1.168	*	5.50	0.012	1.160
5.60	0.013	1.156	*	5.70	0.013	1.169
5.80	0.013	1.185	*	5.90	0.013	1.198
6.00	0.013	1.209	*	6.10	0.000	1.204
6.20	0.000	1.030	*	6.30	0.000	0.841
6.40	0.000	0.698	*	6.50	0.000	0.585
6.60	0.000	0.523	*	6.70	0.000	0.498
6.80	0.000	0.473	*	6.90	0.000	0.448
7.00	0.000	0.423	*	7.10	0.000	0.397
7.20	0.000	0.371	*	7.30	0.000	0.345
7.40	0.000	0.318	*	7.50	0.000	0.291
7.60	0.000	0.265	*	7.70	0.000	0.241
7.80	0.000	0.218	*	7.90	0.000	0.196
8.00	0.000	0.176	*	8.10	0.000	0.156
8.20	0.000	0.138	*	8.30	0.000	0.123
8.40	0.000	0.109	*	8.50	0.000	0.098
8.60	0.000	0.088	*	8.70	0.000	0.081
8.80	0.000	0.075	*	8.90	0.000	0.069
9.00	0.000	0.064	*	9.10	0.000	0.059
9.20	0.000	0.055	*	9.30	0.000	0.051
9.40	0.000	0.047	*	9.50	0.000	0.043
9.60	0.000	0.039	*	9.70	0.000	0.036
9.80	0.000	0.033	*	9.90	0.000	0.030
10.00	0.000	0.027	*	10.10	0.000	0.024
10.20	0.000	0.022	*	10.30	0.000	0.020
10.40	0.000	0.017	*	10.50	0.000	0.015
10.60	0.000	0.014	*	10.70	0.000	0.012
10.80	0.000	0.010	*	10.90	0.000	0.009
11.00	0.000	0.007	*	11.10	0.000	0.006
11.20	0.000	0.005	*	11.30	0.000	0.004
11.40	0.000	0.003	*	11.50	0.000	0.002
11.60	0.000	0.002	*	11.70	0.000	0.001
11.80	0.000	0.001	*	11.90	0.000	0.000
12.00	0.000	0.000	*			

```
Project Title        = Slurry Pond #2
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.30
   Hydraulic length     = 3120.00 feet
   Elevation change     =    85.0 feet.
   Travel time          =    0.30 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.13
   Hydraulic length     = 1320.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.13 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.30 K=   0.19
   Hydraulic length     = 1760.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.18
   Hydraulic length     = 1980.00 feet
   Elevation change     =    65.0 feet.
   Travel time          =    0.18 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.20
   Hydraulic length     = 1960.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.20 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.20
   Hydraulic length     = 1960.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.20 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.11
   Hydraulic length     = 1060.00 feet
   Elevation change     =    20.0 feet.
   Travel time          =    0.11 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.36
   Hydraulic length     = 2930.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.36 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8

Curve number	=	61.0
Area	=	7.7 acres
Hydraulic length	=	200.00 Feet
Elevation change	=	35.0 feet.
Concentration time	=	0.02 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Watershed data for watershed # 9

Curve number	=	95.0
Area	=	1.0 acres
Hydraulic length	=	4230.00 Feet
Elevation change	=	80.0 feet.
Concentration time	=	0.42 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Watershed data for watershed #10

Curve number	=	100.0
Area	=	3.0 acres
Hydraulic length	=	650.00 Feet
Elevation change	=	0.0 feet.
Concentration time	=	2.29 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Total Area = 50.0 acres

-- Storm data

Total precipitation	=	1.8 inches
Storm type	=	SCS Type 2 storm, 24 hour storm
Peak Discharge	=	1.70 cfs
Discharge volume	=	0.74 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.000
0.20	0.002	0.001	*	0.30	0.002	0.001
0.40	0.002	0.002	*	0.50	0.002	0.003
0.60	0.002	0.004	*	0.70	0.002	0.006
0.80	0.002	0.007	*	0.90	0.002	0.009
1.00	0.002	0.011	*	1.10	0.002	0.013
1.20	0.002	0.016	*	1.30	0.002	0.019
1.40	0.002	0.022	*	1.50	0.002	0.025
1.60	0.002	0.028	*	1.70	0.002	0.030
1.80	0.002	0.033	*	1.90	0.002	0.035
2.00	0.002	0.038	*	2.10	0.002	0.040
2.20	0.002	0.042	*	2.30	0.002	0.044
2.40	0.002	0.046	*	2.50	0.002	0.048
2.60	0.002	0.049	*	2.70	0.002	0.050
2.80	0.002	0.051	*	2.90	0.002	0.052
3.00	0.002	0.053	*	3.10	0.003	0.054
3.20	0.003	0.055	*	3.30	0.003	0.056
3.40	0.003	0.057	*	3.50	0.003	0.058

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
3.50	0.003	0.058				
3.60	0.003	0.059	*	3.70	0.003	0.060
3.80	0.003	0.061	*	3.90	0.003	0.061
4.00	0.003	0.062	*	4.10	0.003	0.063
4.20	0.003	0.064	*	4.30	0.003	0.065
4.40	0.003	0.067	*	4.50	0.003	0.068
4.60	0.003	0.069	*	4.70	0.003	0.070
4.80	0.003	0.071	*	4.90	0.003	0.072
5.00	0.003	0.074	*	5.10	0.003	0.075
5.20	0.003	0.076	*	5.30	0.003	0.077
5.40	0.003	0.079	*	5.50	0.003	0.080
5.60	0.003	0.081	*	5.70	0.003	0.082
5.80	0.003	0.083	*	5.90	0.003	0.084
6.00	0.003	0.085	*	6.10	0.004	0.086
6.20	0.004	0.087	*	6.30	0.004	0.088
6.40	0.004	0.089	*	6.50	0.004	0.091
6.60	0.004	0.092	*	6.70	0.004	0.093
6.80	0.004	0.094	*	6.90	0.004	0.096
7.00	0.004	0.097	*	7.10	0.004	0.098
7.20	0.004	0.100	*	7.30	0.004	0.102
7.40	0.004	0.103	*	7.50	0.004	0.105
7.60	0.004	0.106	*	7.70	0.004	0.108
7.80	0.004	0.109	*	7.90	0.004	0.110
8.00	0.004	0.111	*	8.10	0.005	0.113
8.20	0.005	0.115	*	8.30	0.005	0.117
8.40	0.005	0.119	*	8.50	0.005	0.121
8.60	0.005	0.123	*	8.70	0.005	0.125
8.80	0.005	0.128	*	8.90	0.005	0.130
9.00	0.005	0.132	*	9.10	0.006	0.135
9.20	0.006	0.138	*	9.30	0.006	0.142
9.40	0.006	0.146	*	9.50	0.006	0.149
9.60	0.007	0.153	*	9.70	0.007	0.157
9.80	0.007	0.162	*	9.90	0.007	0.166
10.00	0.007	0.170	*	10.10	0.008	0.175
10.20	0.008	0.181	*	10.30	0.008	0.188
10.40	0.008	0.194	*	10.50	0.008	0.200
10.60	0.011	0.207	*	10.70	0.011	0.216
10.80	0.011	0.227	*	10.90	0.011	0.237
11.00	0.011	0.246	*	11.10	0.018	0.259
11.20	0.018	0.275	*	11.30	0.018	0.296
11.40	0.018	0.316	*	11.50	0.018	0.334
11.60	0.140	0.435	*	11.70	0.140	0.627
11.80	0.140	0.914	*	11.90	0.140	1.180
12.00	0.140	1.411	*	12.10	0.026	1.505
12.20	0.026	1.502	*	12.30	0.026	1.400
12.40	0.026	1.349	*	12.50	0.026	1.378
12.60	0.014	1.476	*	12.70	0.014	1.538
12.80	0.014	1.579	*	12.90	0.014	1.630
13.00	0.014	1.674	*	13.10	0.010	1.705
13.20	0.010	1.696	*	13.30	0.010	1.664
13.40	0.010	1.614	*	13.50	0.010	1.562
13.60	0.008	1.510	*	13.70	0.008	1.441
13.80	0.008	1.367	*	13.90	0.008	1.295
14.00	0.008	1.228	*	14.10	0.006	1.162
14.20	0.006	1.077	*	14.30	0.006	0.990
14.40	0.006	0.915	*	14.50	0.006	0.854
14.60	0.006	0.809	*	14.70	0.006	0.775

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
14.70	0.006	0.775				
14.80	0.006	0.753	*	14.90	0.006	0.736
15.00	0.006	0.720	*	15.10	0.006	0.706
15.20	0.006	0.693	*	15.30	0.006	0.682
15.40	0.006	0.671	*	15.50	0.006	0.660
15.60	0.006	0.651	*	15.70	0.006	0.642
15.80	0.006	0.633	*	15.90	0.006	0.625
16.00	0.006	0.618	*	16.10	0.003	0.608
16.20	0.003	0.571	*	16.30	0.003	0.531
16.40	0.003	0.501	*	16.50	0.003	0.477
16.60	0.003	0.461	*	16.70	0.003	0.448
16.80	0.003	0.437	*	16.90	0.003	0.426
17.00	0.003	0.416	*	17.10	0.003	0.405
17.20	0.003	0.395	*	17.30	0.003	0.384
17.40	0.003	0.374	*	17.50	0.003	0.364
17.60	0.003	0.354	*	17.70	0.003	0.344
17.80	0.003	0.337	*	17.90	0.003	0.330
18.00	0.003	0.325	*	18.10	0.003	0.322
18.20	0.003	0.320	*	18.30	0.003	0.318
18.40	0.003	0.316	*	18.50	0.003	0.315
18.60	0.003	0.314	*	18.70	0.003	0.314
18.80	0.003	0.314	*	18.90	0.003	0.314
19.00	0.003	0.314	*	19.10	0.003	0.314
19.20	0.003	0.314	*	19.30	0.003	0.315
19.40	0.003	0.315	*	19.50	0.003	0.315
19.60	0.003	0.316	*	19.70	0.003	0.317
19.80	0.003	0.317	*	19.90	0.003	0.318
20.00	0.003	0.319	*	20.10	0.002	0.318
20.20	0.002	0.299	*	20.30	0.002	0.279
20.40	0.002	0.265	*	20.50	0.002	0.255
20.60	0.002	0.250	*	20.70	0.002	0.248
20.80	0.002	0.246	*	20.90	0.002	0.244
21.00	0.002	0.243	*	21.10	0.002	0.242
21.20	0.002	0.241	*	21.30	0.002	0.239
21.40	0.002	0.238	*	21.50	0.002	0.237
21.60	0.002	0.236	*	21.70	0.002	0.235
21.80	0.002	0.234	*	21.90	0.002	0.233
22.00	0.002	0.232	*	22.10	0.002	0.232
22.20	0.002	0.231	*	22.30	0.002	0.231
22.40	0.002	0.231	*	22.50	0.002	0.230
22.60	0.002	0.230	*	22.70	0.002	0.230
22.80	0.002	0.230	*	22.90	0.002	0.231
23.00	0.002	0.231	*	23.10	0.002	0.231
23.20	0.002	0.231	*	23.30	0.002	0.231
23.40	0.002	0.232	*	23.50	0.002	0.232
23.60	0.002	0.232	*	23.70	0.002	0.232
23.80	0.002	0.233	*	23.90	0.002	0.233
24.00	0.002	0.233	*	24.10	0.000	0.231
24.20	0.000	0.186	*	24.30	0.000	0.121
24.40	0.000	0.095	*	24.50	0.000	0.078
24.60	0.000	0.065	*	24.70	0.000	0.062
24.80	0.000	0.059	*	24.90	0.000	0.056
25.00	0.000	0.053	*	25.10	0.000	0.050
25.20	0.000	0.047	*	25.30	0.000	0.044
25.40	0.000	0.040	*	25.50	0.000	0.037
25.60	0.000	0.034	*	25.70	0.000	0.031
25.80	0.000	0.028	*	25.90	0.000	0.026

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
25.90	0.000	0.026				
26.00	0.000	0.023	*	26.10	0.000	0.021
26.20	0.000	0.019	*	26.30	0.000	0.017
26.40	0.000	0.016	*	26.50	0.000	0.014
26.60	0.000	0.013	*	26.70	0.000	0.012
26.80	0.000	0.011	*	26.90	0.000	0.011
27.00	0.000	0.010	*	27.10	0.000	0.009
27.20	0.000	0.009	*	27.30	0.000	0.008
27.40	0.000	0.008	*	27.50	0.000	0.007
27.60	0.000	0.007	*			

```
Project Title        = Slurry Pond #2
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.30
   Hydraulic length     = 3120.00 feet
   Elevation change     =    85.0 feet.
   Travel time          =    0.30 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.13
   Hydraulic length     = 1320.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.13 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.30 K=   0.19
   Hydraulic length     = 1760.00 feet
   Elevation change     =    30.0 feet.
   Travel time          =    0.19 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.18
   Hydraulic length     = 1980.00 feet
   Elevation change     =    65.0 feet.
   Travel time          =    0.18 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.20
   Hydraulic length     = 1960.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.20 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.20
   Hydraulic length     = 1960.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.20 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.11
   Hydraulic length     = 1060.00 feet
   Elevation change     =    20.0 feet.
   Travel time          =    0.11 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.29 K=   0.36
   Hydraulic length     = 2930.00 feet
   Elevation change     =    45.0 feet.
   Travel time          =    0.36 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8

Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9

Curve number = 95.0
Area = 1.0 acres
Hydraulic length = 4230.00 Feet
Elevation change = 80.0 feet.
Concentration time = 0.42 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #10

Curve number = 100.0
Area = 3.0 acres
Hydraulic length = 650.00 Feet
Elevation change = 0.0 feet.
Concentration time = 2.29 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 50.0 acres

-- Storm data

Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 3.09 cfs
Discharge volume = 0.95 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.001
0.20	0.013	0.004	*	0.30	0.013	0.009
0.40	0.013	0.014	*	0.50	0.013	0.022
0.60	0.020	0.031	*	0.70	0.020	0.043
0.80	0.020	0.057	*	0.90	0.020	0.075
1.00	0.020	0.098	*	1.10	0.022	0.126
1.20	0.022	0.158	*	1.30	0.022	0.194
1.40	0.022	0.232	*	1.50	0.022	0.270
1.60	0.039	0.316	*	1.70	0.039	0.370
1.80	0.039	0.434	*	1.90	0.039	0.498
2.00	0.039	0.558	*	2.10	0.153	0.689
2.20	0.153	0.904	*	2.30	0.153	1.209
2.40	0.153	1.495	*	2.50	0.153	1.750
2.60	0.041	1.871	*	2.70	0.041	1.895
2.80	0.041	1.838	*	2.90	0.041	1.883
3.00	0.041	2.033	*	3.10	0.033	2.265
3.20	0.033	2.455	*	3.30	0.033	2.622
3.40	0.033	2.793	*	3.50	0.033	2.954

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
3.50	0.033	2.954				
3.60	0.023	3.092	*	3.70	0.023	3.079
3.80	0.023	3.022	*	3.90	0.023	2.966
4.00	0.023	2.926	*	4.10	0.020	2.904
4.20	0.020	2.850	*	4.30	0.020	2.794
4.40	0.020	2.746	*	4.50	0.020	2.706
4.60	0.016	2.671	*	4.70	0.016	2.567
4.80	0.016	2.458	*	4.90	0.016	2.373
5.00	0.016	2.313	*	5.10	0.015	2.276
5.20	0.015	2.221	*	5.30	0.015	2.177
5.40	0.015	2.148	*	5.50	0.015	2.129
5.60	0.016	2.121	*	5.70	0.016	2.158
5.80	0.016	2.199	*	5.90	0.016	2.231
6.00	0.016	2.254	*	6.10	0.000	2.253
6.20	0.000	1.823	*	6.30	0.000	1.366
6.40	0.000	1.048	*	6.50	0.000	0.792
6.60	0.000	0.662	*	6.70	0.000	0.630
6.80	0.000	0.599	*	6.90	0.000	0.567
7.00	0.000	0.535	*	7.10	0.000	0.503
7.20	0.000	0.470	*	7.30	0.000	0.437
7.40	0.000	0.402	*	7.50	0.000	0.368
7.60	0.000	0.336	*	7.70	0.000	0.305
7.80	0.000	0.276	*	7.90	0.000	0.248
8.00	0.000	0.222	*	8.10	0.000	0.198
8.20	0.000	0.175	*	8.30	0.000	0.155
8.40	0.000	0.138	*	8.50	0.000	0.123
8.60	0.000	0.112	*	8.70	0.000	0.102
8.80	0.000	0.094	*	8.90	0.000	0.088
9.00	0.000	0.081	*	9.10	0.000	0.075
9.20	0.000	0.069	*	9.30	0.000	0.064
9.40	0.000	0.059	*	9.50	0.000	0.054
9.60	0.000	0.050	*	9.70	0.000	0.045
9.80	0.000	0.042	*	9.90	0.000	0.038
10.00	0.000	0.034	*	10.10	0.000	0.031
10.20	0.000	0.028	*	10.30	0.000	0.025
10.40	0.000	0.022	*	10.50	0.000	0.020
10.60	0.000	0.017	*	10.70	0.000	0.015
10.80	0.000	0.013	*	10.90	0.000	0.011
11.00	0.000	0.009	*	11.10	0.000	0.008
11.20	0.000	0.006	*	11.30	0.000	0.005
11.40	0.000	0.004	*	11.50	0.000	0.003
11.60	0.000	0.002	*	11.70	0.000	0.001
11.80	0.000	0.001	*	11.90	0.000	0.000
12.00	0.000	0.000	*			

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Slurry Cell No. 2

Comment: 8-inch Principal Discharge Pipe

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	0.67 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.010
Discharge.....	1.13 cfs

Computed Results:

Full Flow Capacity.....	1.13 cfs
Full Flow Depth.....	0.67 ft
Velocity.....	3.19 fps
Flow Area.....	0.35 sf
Critical Depth....	0.50 ft
Critical Slope....	0.0060 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	1.13 cfs
QMAX @.94D.....	1.21 cfs
Froude Number.....	FULL

East Slurry Cell

The East Slurry Cell is an active slurry dewatering and settling pond. Currently in use while both Slurry Ponds No. 1 and 2 are being dried and cleaned, the East Slurry Cell was constructed in 1974 prior to the deactivation of the West Slurry Cell. The East cell remains the backup contingency cell at this time.

The East Slurry Cell is a temporary control structure with MSHA No. 1211-UT-09-01813-01. The structure is a temporary impoundment as addressed in R645-301-733. The structure is addressed by the MSHA criteria of 30 CFR 77.216(a). The impoundment meets the single-open channel spillway exemption of R645-301-743.132 by meeting the requirements of R645-301-742.225.1. The cell was designed and built as a totally containing structure. No outlet structures currently exist for this cell.

The East Cell, Slurry Pond No. 1 and 2 all may see the drainage associated with the slurry ditch depending upon which structure is receiving the slurry during the time of the storm. Other than the drainage associated with the slurry ditch, the East cell captures only the surface water associated with its own disturbance.

Routine flow of coal fines is manually controlled. Sunnyside commits to maintaining 7.5 feet (2.0 feet of freeboard and 5.5 feet of storm capacity) of elevation below the top of the pond for the East Slurry Cell. The probable maximum precipitation from a 6-hour storm requires 39.68 acre-feet of capacity and 0.14 acre-feet of sediment load capacity. The impoundment totally contains the probable maximum precipitation event by capturing the 39.82 acre-foot event within the allotted 7.5 feet of remaining pond capacity.

Sunnyside Coal Company
EAST SLURRY CELL
MSHA 1211-UT-09-01813-01

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP		
Area 1	0.01	112.9	20	0.22	150.92	0.17	Undisturbed	P=1 C=.17
Area 2	0.01	0.9	20	0.22	1.19	0.17		P=1 C=.17
Area 3	0.00	0.4	20	0.22	0.26	0.36	Disturbed bare	P=1 C=.36
Area 4	0.00	0.6	20	0.22	0.81	0.17		P=1 C=.17
Area 5	0.02	1.1	20	0.22	1.41	0.17		P=1 C=.17
Area 6	0.00	0.4	20	0.22	0.53	0.17		P=1 C=.17
Area 7	0.02	1.1	20	0.22	1.41	0.17		P=1 C=.17
Area 8	0.04	4.3	20	0.22	5.76	0.17		P=1 C=.17
Area 9	0.00	1.2	20	0.22	0.60	0.45	Disturbed bare	P=1 C=.45
Area 10	0.03	2.6	20	0.22	1.64	0.36	Disturbed bare	P=1 C=.36
Pond Surface	0.00	0.0					Pond Surface	
Totals	0.14							

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
EAST SLURRY CELL
MSHA 1211-UT-09-01813-01

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Area 1	0.10	2,800.0	1,988.0	71.0	74	Ditch	4,915.0	135.0	West facing hillside
Area 2	5.00	470.0	20.2	4.3	61	Ditch	3,115.0	80.0	Lower loop area 1
Area 3	1.70	70.0	2.1	3.0	61	Ditch	3,555.0	80.0	Slurry area 2
Area 4	5.50	600.0	22.2	3.7	61	Ditch	3,775.0	115.0	Upper loop area 2
Area 5	15.00	700.0	35.0	5.0	61	Ditch	3,775.0	95.0	Upper loop area 1
Area 6	0.10	100.0	5.0	5.0	61	Ditch	3,775.0	95.0	West facing hillside collector
Area 7	11.00	700.0	30.1	4.3	61	Ditch	2,855.0	70.0	Lower loop area 2
Area 8	7.70	200.0	35.0	17.5	61	Ditch	4,725.0	95.0	Int. ditch hillside
Area 9	1.40	6,150.0	135.0	2.2	95				Slurry ditch area
Area 10	9.50	600.0	34.8	5.8	79	Ditch	1,300.0	45.0	Slurry area 3
Pond Surface	12.00	1,200.0	0.0	0.0	100	None			Pond Surface
Totals	69.00								

POND CAPACITIES	Acre-Feet		
Total As-built Capacity	184.00	estimated @ impoundment top of 6532 feet	
Capacity w/2' freeboard	169.36		Excludes capacity above freeboard
Temporary storage capacity	39.68		Storm capacity (100-yr, 6-hr)
Sediment load capacity	0.14		Storm sediment load capacity
Available Capacity	129.54	estimated @ impoundment bottom of 6500 feet	Slurry capacity

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour	SCS 6-hr design PMP, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches	10.67 inches
Peak Discharge	4.37 cfs	5.49 cfs	6.40 cfs	222.22 cfs
Discharge Volume	2.07 acre-feet	2.51 acre-feet	2.99 acre-feet	39.68 acre-feet

OUTLET DATA	CMP		Pipe		Spillway
Diameter	none	feet	none	feet	none
Slope		ft/ft		ft/ft	
Manning's n					
Discharge		cfs		cfs	
Velocity		fps		fps	

```
Project Title        = East Slurry Cell
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.44
   Hydraulic length     = 4915.00 feet
   Elevation change     =   135.0 feet.
   Travel time          =    0.44 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.28
   Hydraulic length     = 3115.00 feet
   Elevation change     =    80.0 feet.
   Travel time          =    0.28 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.34
   Hydraulic length     = 3555.00 feet
   Elevation change     =    80.0 feet.
   Travel time          =    0.34 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.33
   Hydraulic length     = 3775.00 feet
   Elevation change     =   115.0 feet.
   Travel time          =    0.33 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.35
   Hydraulic length     = 3755.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.35 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.35
   Hydraulic length     = 3755.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.35 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.26
   Hydraulic length     = 2855.00 feet
   Elevation change     =    70.0 feet.
   Travel time          =    0.26 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.51
   Hydraulic length     = 4725.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.51 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8

Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9

Curve number = 95.0
Area = 1.4 acres
Hydraulic length = 6105.00 Feet
Elevation change = 135.0 feet.
Concentration time = 0.57 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Routed Watershed # 10 to sturcture # 1

Muskingum routing parameters: X= 0.34 K= 0.10
Hydraulic length = 1300.00 feet
Elevation change = 45.0 feet.
Travel time = 0.10 hours
Travel time type = SCS Upland Curves

-- Watershed data for watershed #10

Curve number = 79.0
Area = 9.5 acres
Hydraulic length = 600.00 Feet
Elevation change = 34.8 feet.
Concentration time = 0.10 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #11

Curve number = 100.0
Area = 12.0 acres
Hydraulic length = 1200.00 Feet
Elevation change = 0.0 feet.
Concentration time = 5.74 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 69.0 acres

-- Storm data

Total precipitation = 1.6 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 4.37 cfs
Discharge volume = 2.07 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.001
0.20	0.010	0.002	*	0.30	0.010	0.005

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.30	0.010	0.005				
0.40	0.010	0.008	*	0.50	0.010	0.012
0.60	0.016	0.017	*	0.70	0.015	0.023
0.80	0.016	0.030	*	0.90	0.016	0.039
1.00	0.016	0.049	*	1.10	0.017	0.062
1.20	0.017	0.078	*	1.30	0.017	0.098
1.40	0.017	0.121	*	1.50	0.017	0.146
1.60	0.031	0.178	*	1.70	0.031	0.215
1.80	0.031	0.260	*	1.90	0.031	0.311
2.00	0.031	0.365	*	2.10	0.120	0.465
2.20	0.120	0.650	*	2.30	0.120	1.078
2.40	0.121	1.912	*	2.50	0.120	2.891
2.60	0.032	3.459	*	2.70	0.032	3.036
2.80	0.032	2.745	*	2.90	0.032	2.569
3.00	0.032	2.513	*	3.10	0.026	2.518
3.20	0.026	2.496	*	3.30	0.026	2.540
3.40	0.026	2.607	*	3.50	0.026	2.688
3.60	0.018	2.731	*	3.70	0.018	2.677
3.80	0.018	2.681	*	3.90	0.018	2.727
4.00	0.018	2.807	*	4.10	0.016	2.902
4.20	0.016	2.989	*	4.30	0.016	3.095
4.40	0.016	3.206	*	4.50	0.016	3.325
4.60	0.013	3.426	*	4.70	0.013	3.486
4.80	0.013	3.562	*	4.90	0.013	3.642
5.00	0.013	3.728	*	5.10	0.012	3.810
5.20	0.012	3.874	*	5.30	0.012	3.947
5.40	0.012	4.018	*	5.50	0.012	4.089
5.60	0.013	4.161	*	5.70	0.013	4.240
5.80	0.013	4.300	*	5.90	0.013	4.346
6.00	0.013	4.372	*	6.10	0.000	4.297
6.20	0.000	4.002	*	6.30	0.000	3.744
6.40	0.000	3.493	*	6.50	0.000	3.269
6.60	0.000	3.074	*	6.70	0.000	3.000
6.80	0.000	2.952	*	6.90	0.000	2.901
7.00	0.000	2.848	*	7.10	0.000	2.793
7.20	0.000	2.737	*	7.30	0.000	2.680
7.40	0.000	2.621	*	7.50	0.000	2.562
7.60	0.000	2.502	*	7.70	0.000	2.442
7.80	0.000	2.380	*	7.90	0.000	2.317
8.00	0.000	2.252	*	8.10	0.000	2.187
8.20	0.000	2.121	*	8.30	0.000	2.054
8.40	0.000	1.986	*	8.50	0.000	1.918
8.60	0.000	1.850	*	8.70	0.000	1.781
8.80	0.000	1.713	*	8.90	0.000	1.645
9.00	0.000	1.578	*	9.10	0.000	1.515
9.20	0.000	1.458	*	9.30	0.000	1.404
9.40	0.000	1.356	*	9.50	0.000	1.311
9.60	0.000	1.269	*	9.70	0.000	1.227
9.80	0.000	1.188	*	9.90	0.000	1.151
10.00	0.000	1.115	*	10.10	0.000	1.080
10.20	0.000	1.047	*	10.30	0.000	1.015
10.40	0.000	0.985	*	10.50	0.000	0.955
10.60	0.000	0.927	*	10.70	0.000	0.900
10.80	0.000	0.874	*	10.90	0.000	0.848
11.00	0.000	0.824	*	11.10	0.000	0.800
11.20	0.000	0.778	*	11.30	0.000	0.756
11.40	0.000	0.735	*	11.50	0.000	0.715

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
11.50	0.000	0.715				
11.60	0.000	0.695	*	11.70	0.000	0.676
11.80	0.000	0.658	*	11.90	0.000	0.641
12.00	0.000	0.624	*	12.10	0.000	0.608
12.20	0.000	0.592	*	12.30	0.000	0.577
12.40	0.000	0.563	*	12.50	0.000	0.549
12.60	0.000	0.536	*	12.70	0.000	0.524
12.80	0.000	0.512	*	12.90	0.000	0.501
13.00	0.000	0.491	*	13.10	0.000	0.481
13.20	0.000	0.470	*	13.30	0.000	0.460
13.40	0.000	0.450	*	13.50	0.000	0.439
13.60	0.000	0.429	*	13.70	0.000	0.419
13.80	0.000	0.408	*	13.90	0.000	0.398
14.00	0.000	0.388	*	14.10	0.000	0.377
14.20	0.000	0.367	*	14.30	0.000	0.357
14.40	0.000	0.346	*	14.50	0.000	0.336
14.60	0.000	0.326	*	14.70	0.000	0.315
14.80	0.000	0.305	*	14.90	0.000	0.295
15.00	0.000	0.284	*	15.10	0.000	0.274
15.20	0.000	0.264	*	15.30	0.000	0.254
15.40	0.000	0.243	*	15.50	0.000	0.233
15.60	0.000	0.223	*	15.70	0.000	0.213
15.80	0.000	0.203	*	15.90	0.000	0.194
16.00	0.000	0.184	*	16.10	0.000	0.175
16.20	0.000	0.165	*	16.30	0.000	0.156
16.40	0.000	0.147	*	16.50	0.000	0.138
16.60	0.000	0.129	*	16.70	0.000	0.120
16.80	0.000	0.111	*	16.90	0.000	0.103
17.00	0.000	0.094	*	17.10	0.000	0.086
17.20	0.000	0.079	*	17.30	0.000	0.072
17.40	0.000	0.066	*	17.50	0.000	0.061
17.60	0.000	0.057	*	17.70	0.000	0.053
17.80	0.000	0.049	*	17.90	0.000	0.046
18.00	0.000	0.042	*	18.10	0.000	0.039
18.20	0.000	0.036	*	18.30	0.000	0.033
18.40	0.000	0.031	*	18.50	0.000	0.028
18.60	0.000	0.026	*	18.70	0.000	0.024
18.80	0.000	0.021	*	18.90	0.000	0.019
19.00	0.000	0.018	*	19.10	0.000	0.016
19.20	0.000	0.014	*	19.30	0.000	0.013
19.40	0.000	0.011	*	19.50	0.000	0.010
19.60	0.000	0.009	*	19.70	0.000	0.008
19.80	0.000	0.007	*	19.90	0.000	0.006
20.00	0.000	0.005	*	20.10	0.000	0.004
20.20	0.000	0.003	*	20.30	0.000	0.002
20.40	0.000	0.002	*	20.50	0.000	0.001
20.60	0.000	0.001	*	20.70	0.000	0.001
20.80	0.000	0.000	*	20.90	0.000	0.000
21.00	0.000	0.000	*			

```
Project Title        = East Slurry Cell
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
    Muskingum routing parameters: X=   0.32 K=   0.44
    Hydraulic length     = 4915.00 feet
    Elevation change     =   135.0 feet.
    Travel time          =    0.44 hours
    Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
    Curve number           =    74.0
    Area                   =     0.1 acres
    Hydraulic length       = 2800.00 Feet
    Elevation change       =  1988.0 feet.
    Concentration time     =    0.13 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
    Muskingum routing parameters: X=   0.32 K=   0.28
    Hydraulic length     = 3115.00 feet
    Elevation change     =    80.0 feet.
    Travel time          =    0.28 hours
    Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
    Curve number           =    61.0
    Area                   =     5.0 acres
    Hydraulic length       =  470.00 Feet
    Elevation change       =    20.2 feet.
    Concentration time     =    0.09 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
    Muskingum routing parameters: X=   0.32 K=   0.34
    Hydraulic length     = 3555.00 feet
    Elevation change     =    80.0 feet.
    Travel time          =    0.34 hours
    Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
    Curve number           =    61.0
    Area                   =     1.7 acres
    Hydraulic length       =   70.00 Feet
    Elevation change       =     2.1 feet.
    Concentration time     =    0.02 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
    Muskingum routing parameters: X=   0.33 K=   0.33
    Hydraulic length     = 3775.00 feet
    Elevation change     =   115.0 feet.
    Travel time          =    0.33 hours
    Travel time type     = SCS Upland Curves
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```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.35
   Hydraulic length     = 3755.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.35 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.35
   Hydraulic length     = 3755.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.35 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.26
   Hydraulic length     = 2855.00 feet
   Elevation change     =    70.0 feet.
   Travel time          =    0.26 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.51
   Hydraulic length     = 4725.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.51 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8
Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9
Curve number = 95.0
Area = 1.4 acres
Hydraulic length = 6105.00 Feet
Elevation change = 135.0 feet.
Concentration time = 0.57 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Routed Watershed # 10 to sturcture # 1
Muskingum routing parameters: X= 0.34 K= 0.10
Hydraulic length = 1300.00 feet
Elevation change = 45.0 feet.
Travel time = 0.10 hours
Travel time type = SCS Upland Curves

-- Watershed data for watershed #10
Curve number = 79.0
Area = 9.5 acres
Hydraulic length = 600.00 Feet
Elevation change = 34.8 feet.
Concentration time = 0.10 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #11
Curve number = 100.0
Area = 12.0 acres
Hydraulic length = 1200.00 Feet
Elevation change = 0.0 feet.
Concentration time = 5.74 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 69.0 acres

-- Storm data
Total precipitation = 1.8 inches
Storm type = SCS Type 2 storm, 24 hour storm
Peak Discharge = 5.49 cfs
Discharge volume = 2.51 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.000
0.20	0.002	0.000	*	0.30	0.002	0.001

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.30	0.002	0.001				
0.40	0.002	0.001	*	0.50	0.002	0.002
0.60	0.002	0.003	*	0.70	0.002	0.004
0.80	0.002	0.005	*	0.90	0.002	0.006
1.00	0.002	0.008	*	1.10	0.002	0.009
1.20	0.002	0.011	*	1.30	0.002	0.013
1.40	0.002	0.015	*	1.50	0.002	0.017
1.60	0.002	0.019	*	1.70	0.002	0.022
1.80	0.002	0.024	*	1.90	0.002	0.027
2.00	0.002	0.030	*	2.10	0.002	0.033
2.20	0.002	0.037	*	2.30	0.002	0.040
2.40	0.002	0.044	*	2.50	0.002	0.048
2.60	0.002	0.052	*	2.70	0.002	0.056
2.80	0.002	0.060	*	2.90	0.002	0.065
3.00	0.002	0.069	*	3.10	0.003	0.074
3.20	0.003	0.079	*	3.30	0.003	0.085
3.40	0.003	0.090	*	3.50	0.003	0.096
3.60	0.003	0.101	*	3.70	0.003	0.107
3.80	0.003	0.112	*	3.90	0.003	0.117
4.00	0.003	0.123	*	4.10	0.003	0.128
4.20	0.003	0.133	*	4.30	0.003	0.139
4.40	0.003	0.144	*	4.50	0.003	0.149
4.60	0.003	0.154	*	4.70	0.003	0.159
4.80	0.003	0.164	*	4.90	0.003	0.169
5.00	0.003	0.174	*	5.10	0.003	0.179
5.20	0.003	0.184	*	5.30	0.003	0.189
5.40	0.003	0.194	*	5.50	0.003	0.199
5.60	0.003	0.203	*	5.70	0.003	0.208
5.80	0.003	0.213	*	5.90	0.003	0.217
6.00	0.003	0.221	*	6.10	0.004	0.226
6.20	0.004	0.230	*	6.30	0.004	0.235
6.40	0.004	0.240	*	6.50	0.004	0.244
6.60	0.004	0.249	*	6.70	0.004	0.253
6.80	0.004	0.258	*	6.90	0.004	0.262
7.00	0.004	0.266	*	7.10	0.004	0.270
7.20	0.004	0.274	*	7.30	0.004	0.278
7.40	0.004	0.283	*	7.50	0.004	0.287
7.60	0.004	0.291	*	7.70	0.004	0.295
7.80	0.004	0.299	*	7.90	0.004	0.303
8.00	0.004	0.307	*	8.10	0.005	0.312
8.20	0.005	0.316	*	8.30	0.005	0.321
8.40	0.005	0.327	*	8.50	0.005	0.332
8.60	0.005	0.337	*	8.70	0.005	0.343
8.80	0.005	0.348	*	8.90	0.005	0.354
9.00	0.005	0.359	*	9.10	0.006	0.365
9.20	0.006	0.371	*	9.30	0.006	0.378
9.40	0.006	0.385	*	9.50	0.006	0.391
9.60	0.007	0.398	*	9.70	0.007	0.405
9.80	0.007	0.413	*	9.90	0.007	0.421
10.00	0.007	0.428	*	10.10	0.008	0.436
10.20	0.008	0.445	*	10.30	0.008	0.455
10.40	0.008	0.466	*	10.50	0.008	0.477
10.60	0.011	0.488	*	10.70	0.011	0.501
10.80	0.011	0.515	*	10.90	0.011	0.531
11.00	0.011	0.546	*	11.10	0.018	0.564
11.20	0.018	0.585	*	11.30	0.018	0.609
11.40	0.018	0.636	*	11.50	0.018	0.662

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
11.50	0.018	0.662				
11.60	0.140	0.844	*	11.70	0.140	1.434
11.80	0.140	2.517	*	11.90	0.140	3.802
12.00	0.140	5.040	*	12.10	0.026	5.487
12.20	0.026	4.282	*	12.30	0.026	3.508
12.40	0.026	3.053	*	12.50	0.026	2.845
12.60	0.014	2.741	*	12.70	0.014	2.555
12.80	0.014	2.503	*	12.90	0.014	2.497
13.00	0.014	2.523	*	13.10	0.010	2.547
13.20	0.010	2.529	*	13.30	0.010	2.543
13.40	0.010	2.573	*	13.50	0.010	2.621
13.60	0.008	2.670	*	13.70	0.008	2.698
13.80	0.008	2.741	*	13.90	0.008	2.792
14.00	0.008	2.850	*	14.10	0.006	2.901
14.20	0.006	2.923	*	14.30	0.006	2.959
14.40	0.006	2.999	*	14.50	0.006	3.046
14.60	0.006	3.101	*	14.70	0.006	3.160
14.80	0.006	3.222	*	14.90	0.006	3.284
15.00	0.006	3.344	*	15.10	0.006	3.386
15.20	0.006	3.411	*	15.30	0.006	3.417
15.40	0.006	3.406	*	15.50	0.006	3.378
15.60	0.006	3.347	*	15.70	0.006	3.314
15.80	0.006	3.277	*	15.90	0.006	3.238
16.00	0.006	3.196	*	16.10	0.003	3.137
16.20	0.003	3.041	*	16.30	0.003	2.951
16.40	0.003	2.862	*	16.50	0.003	2.781
16.60	0.003	2.710	*	16.70	0.003	2.647
16.80	0.003	2.588	*	16.90	0.003	2.532
17.00	0.003	2.476	*	17.10	0.003	2.420
17.20	0.003	2.364	*	17.30	0.003	2.308
17.40	0.003	2.252	*	17.50	0.003	2.196
17.60	0.003	2.139	*	17.70	0.003	2.084
17.80	0.003	2.028	*	17.90	0.003	1.972
18.00	0.003	1.917	*	18.10	0.003	1.862
18.20	0.003	1.807	*	18.30	0.003	1.753
18.40	0.003	1.700	*	18.50	0.003	1.648
18.60	0.003	1.603	*	18.70	0.003	1.564
18.80	0.003	1.533	*	18.90	0.003	1.509
19.00	0.003	1.491	*	19.10	0.003	1.473
19.20	0.003	1.457	*	19.30	0.003	1.442
19.40	0.003	1.427	*	19.50	0.003	1.413
19.60	0.003	1.400	*	19.70	0.003	1.387
19.80	0.003	1.375	*	19.90	0.003	1.364
20.00	0.003	1.353	*	20.10	0.002	1.334
20.20	0.002	1.295	*	20.30	0.002	1.260
20.40	0.002	1.225	*	20.50	0.002	1.195
20.60	0.002	1.172	*	20.70	0.002	1.155
20.80	0.002	1.141	*	20.90	0.002	1.129
21.00	0.002	1.119	*	21.10	0.002	1.109
21.20	0.002	1.099	*	21.30	0.002	1.089
21.40	0.002	1.079	*	21.50	0.002	1.069
21.60	0.002	1.059	*	21.70	0.002	1.050
21.80	0.002	1.040	*	21.90	0.002	1.031
22.00	0.002	1.022	*	22.10	0.002	1.012
22.20	0.002	1.003	*	22.30	0.002	0.993
22.40	0.002	0.984	*	22.50	0.002	0.975
22.60	0.002	0.966	*	22.70	0.002	0.957

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
22.70	0.002	0.957				
22.80	0.002	0.947	*	22.90	0.002	0.938
23.00	0.002	0.929	*	23.10	0.002	0.920
23.20	0.002	0.911	*	23.30	0.002	0.902
23.40	0.002	0.892	*	23.50	0.002	0.883
23.60	0.002	0.873	*	23.70	0.002	0.864
23.80	0.002	0.855	*	23.90	0.002	0.846
24.00	0.002	0.837	*	24.10	0.000	0.810
24.20	0.000	0.743	*	24.30	0.000	0.657
24.40	0.000	0.595	*	24.50	0.000	0.542
24.60	0.000	0.496	*	24.70	0.000	0.483
24.80	0.000	0.472	*	24.90	0.000	0.460
25.00	0.000	0.449	*	25.10	0.000	0.438
25.20	0.000	0.427	*	25.30	0.000	0.415
25.40	0.000	0.404	*	25.50	0.000	0.393
25.60	0.000	0.382	*	25.70	0.000	0.371
25.80	0.000	0.360	*	25.90	0.000	0.349
26.00	0.000	0.338	*	26.10	0.000	0.327
26.20	0.000	0.316	*	26.30	0.000	0.305
26.40	0.000	0.293	*	26.50	0.000	0.282
26.60	0.000	0.271	*	26.70	0.000	0.260
26.80	0.000	0.251	*	26.90	0.000	0.242
27.00	0.000	0.233	*	27.10	0.000	0.226
27.20	0.000	0.218	*	27.30	0.000	0.211
27.40	0.000	0.203	*	27.50	0.000	0.196
27.60	0.000	0.189	*	27.70	0.000	0.182
27.80	0.000	0.175	*	27.90	0.000	0.169
28.00	0.000	0.162	*	28.10	0.000	0.156
28.20	0.000	0.150	*	28.30	0.000	0.145
28.40	0.000	0.139	*	28.50	0.000	0.134
28.60	0.000	0.129	*	28.70	0.000	0.124
28.80	0.000	0.119	*	28.90	0.000	0.114
29.00	0.000	0.110	*	29.10	0.000	0.105
29.20	0.000	0.101	*	29.30	0.000	0.097
29.40	0.000	0.093	*	29.50	0.000	0.089
29.60	0.000	0.086	*	29.70	0.000	0.082
29.80	0.000	0.079	*	29.90	0.000	0.076
30.00	0.000	0.073	*	30.10	0.000	0.070
30.20	0.000	0.068	*	30.30	0.000	0.065
30.40	0.000	0.063	*	30.50	0.000	0.061
30.60	0.000	0.059	*	30.70	0.000	0.057
30.80	0.000	0.055	*	30.90	0.000	0.053
31.00	0.000	0.052	*	31.10	0.000	0.050
31.20	0.000	0.049	*	31.30	0.000	0.048
31.40	0.000	0.046	*	31.50	0.000	0.045
31.60	0.000	0.044	*	31.70	0.000	0.042
31.80	0.000	0.041	*	31.90	0.000	0.040
32.00	0.000	0.039	*	32.10	0.000	0.037
32.20	0.000	0.036	*	32.30	0.000	0.035
32.40	0.000	0.034	*	32.50	0.000	0.033
32.60	0.000	0.032	*	32.70	0.000	0.031
32.80	0.000	0.030	*	32.90	0.000	0.029
33.00	0.000	0.028	*	33.10	0.000	0.027
33.20	0.000	0.026	*	33.30	0.000	0.025
33.40	0.000	0.024	*	33.50	0.000	0.023
33.60	0.000	0.022	*	33.70	0.000	0.021
33.80	0.000	0.020	*	33.90	0.000	0.019

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
33.90	0.000	0.019				
34.00	0.000	0.019	*	34.10	0.000	0.018
34.20	0.000	0.017	*	34.30	0.000	0.016
34.40	0.000	0.016	*	34.50	0.000	0.015
34.60	0.000	0.014	*	34.70	0.000	0.014
34.80	0.000	0.013	*	34.90	0.000	0.012
35.00	0.000	0.012	*	35.10	0.000	0.011
35.20	0.000	0.011	*	35.30	0.000	0.010
35.40	0.000	0.010	*	35.50	0.000	0.009
35.60	0.000	0.009	*	35.70	0.000	0.008
35.80	0.000	0.008	*	35.90	0.000	0.007
36.00	0.000	0.007	*	36.10	0.000	0.006
36.20	0.000	0.006	*	36.30	0.000	0.005
36.40	0.000	0.005	*	36.50	0.000	0.005
36.60	0.000	0.004	*	36.70	0.000	0.004
36.80	0.000	0.004	*	36.90	0.000	0.003
37.00	0.000	0.003	*	37.10	0.000	0.003
37.20	0.000	0.002	*	37.30	0.000	0.002
37.40	0.000	0.002	*	37.50	0.000	0.002
37.60	0.000	0.002	*	37.70	0.000	0.001
37.80	0.000	0.001	*	37.90	0.000	0.001
38.00	0.000	0.001	*	38.10	0.000	0.001
38.20	0.000	0.001	*	38.30	0.000	0.000
38.40	0.000	0.000	*	38.50	0.000	0.000
38.60	0.000	0.000	*	38.70	0.000	0.000
38.80	0.000	0.000	*	38.90	0.000	0.000
39.00	0.000	0.000	*			

```
Project Title        = East Slurry Cell
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.44
   Hydraulic length     = 4915.00 feet
   Elevation change     =   135.0 feet.
   Travel time          =    0.44 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.28
   Hydraulic length     = 3115.00 feet
   Elevation change     =    80.0 feet.
   Travel time          =    0.28 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.34
   Hydraulic length     = 3555.00 feet
   Elevation change     =    80.0 feet.
   Travel time          =    0.34 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type   = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.33
   Hydraulic length     = 3775.00 feet
   Elevation change     =   115.0 feet.
   Travel time          =    0.33 hours
   Travel time type     = SCS Upland Curves
```

```
-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.35
   Hydraulic length     = 3755.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.35 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.35
   Hydraulic length     = 3755.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.35 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.26
   Hydraulic length     = 2855.00 feet
   Elevation change     =    70.0 feet.
   Travel time          =    0.26 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.51
   Hydraulic length     = 4725.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.51 hours
   Travel time type     = SCS Upland Curves
```

-- Watershed data for watershed # 8
Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9
Curve number = 95.0
Area = 1.4 acres
Hydraulic length = 6105.00 Feet
Elevation change = 135.0 feet.
Concentration time = 0.57 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Routed Watershed # 10 to sturcture # 1
Muskingum routing parameters: X= 0.34 K= 0.10
Hydraulic length = 1300.00 feet
Elevation change = 45.0 feet.
Travel time = 0.10 hours
Travel time type = SCS Upland Curves

-- Watershed data for watershed #10
Curve number = 79.0
Area = 9.5 acres
Hydraulic length = 600.00 Feet
Elevation change = 34.8 feet.
Concentration time = 0.10 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #11
Curve number = 100.0
Area = 12.0 acres
Hydraulic length = 1200.00 Feet
Elevation change = 0.0 feet.
Concentration time = 5.74 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 69.0 acres

-- Storm data
Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 6.40 cfs
Discharge volume = 2.99 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.001
0.20	0.013	0.003	*	0.30	0.013	0.006

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.30	0.013	0.006				
0.40	0.013	0.010	*	0.50	0.013	0.015
0.60	0.020	0.021	*	0.70	0.020	0.029
0.80	0.020	0.039	*	0.90	0.020	0.051
1.00	0.020	0.067	*	1.10	0.022	0.089
1.20	0.022	0.115	*	1.30	0.022	0.144
1.40	0.022	0.177	*	1.50	0.022	0.211
1.60	0.039	0.254	*	1.70	0.039	0.305
1.80	0.039	0.366	*	1.90	0.039	0.437
2.00	0.039	0.508	*	2.10	0.153	0.684
2.20	0.153	1.197	*	2.30	0.153	2.337
2.40	0.153	3.785	*	2.50	0.153	5.223
2.60	0.041	5.868	*	2.70	0.041	4.829
2.80	0.041	4.175	*	2.90	0.041	3.827
3.00	0.041	3.748	*	3.10	0.033	3.830
3.20	0.033	3.904	*	3.30	0.033	4.084
3.40	0.033	4.288	*	3.50	0.033	4.508
3.60	0.023	4.664	*	3.70	0.023	4.657
3.80	0.023	4.689	*	3.90	0.023	4.727
4.00	0.023	4.796	*	4.10	0.020	4.886
4.20	0.020	4.965	*	4.30	0.020	5.071
4.40	0.020	5.183	*	4.50	0.020	5.307
4.60	0.016	5.414	*	4.70	0.016	5.463
4.80	0.016	5.521	*	4.90	0.016	5.578
5.00	0.016	5.649	*	5.10	0.015	5.725
5.20	0.015	5.784	*	5.30	0.015	5.853
5.40	0.015	5.921	*	5.50	0.015	5.994
5.60	0.016	6.074	*	5.70	0.016	6.176
5.80	0.016	6.265	*	5.90	0.016	6.342
6.00	0.016	6.395	*	6.10	0.000	6.291
6.20	0.000	5.841	*	6.30	0.000	5.370
6.40	0.000	4.835	*	6.50	0.000	4.368
6.60	0.000	4.012	*	6.70	0.000	3.798
6.80	0.000	3.737	*	6.90	0.000	3.672
7.00	0.000	3.604	*	7.10	0.000	3.534
7.20	0.000	3.463	*	7.30	0.000	3.391
7.40	0.000	3.317	*	7.50	0.000	3.242
7.60	0.000	3.166	*	7.70	0.000	3.090
7.80	0.000	3.011	*	7.90	0.000	2.931
8.00	0.000	2.850	*	8.10	0.000	2.767
8.20	0.000	2.684	*	8.30	0.000	2.599
8.40	0.000	2.514	*	8.50	0.000	2.427
8.60	0.000	2.341	*	8.70	0.000	2.254
8.80	0.000	2.168	*	8.90	0.000	2.082
9.00	0.000	1.997	*	9.10	0.000	1.918
9.20	0.000	1.844	*	9.30	0.000	1.777
9.40	0.000	1.716	*	9.50	0.000	1.659
9.60	0.000	1.605	*	9.70	0.000	1.553
9.80	0.000	1.504	*	9.90	0.000	1.456
10.00	0.000	1.410	*	10.10	0.000	1.367
10.20	0.000	1.325	*	10.30	0.000	1.284
10.40	0.000	1.246	*	10.50	0.000	1.209
10.60	0.000	1.173	*	10.70	0.000	1.139
10.80	0.000	1.106	*	10.90	0.000	1.074
11.00	0.000	1.043	*	11.10	0.000	1.013
11.20	0.000	0.984	*	11.30	0.000	0.956
11.40	0.000	0.930	*	11.50	0.000	0.904

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
11.50	0.000	0.904				
11.60	0.000	0.880	*	11.70	0.000	0.856
11.80	0.000	0.833	*	11.90	0.000	0.811
12.00	0.000	0.789	*	12.10	0.000	0.769
12.20	0.000	0.749	*	12.30	0.000	0.730
12.40	0.000	0.712	*	12.50	0.000	0.695
12.60	0.000	0.679	*	12.70	0.000	0.663
12.80	0.000	0.648	*	12.90	0.000	0.635
13.00	0.000	0.622	*	13.10	0.000	0.608
13.20	0.000	0.595	*	13.30	0.000	0.582
13.40	0.000	0.569	*	13.50	0.000	0.556
13.60	0.000	0.543	*	13.70	0.000	0.530
13.80	0.000	0.517	*	13.90	0.000	0.504
14.00	0.000	0.491	*	14.10	0.000	0.478
14.20	0.000	0.465	*	14.30	0.000	0.451
14.40	0.000	0.438	*	14.50	0.000	0.425
14.60	0.000	0.412	*	14.70	0.000	0.399
14.80	0.000	0.386	*	14.90	0.000	0.373
15.00	0.000	0.360	*	15.10	0.000	0.347
15.20	0.000	0.334	*	15.30	0.000	0.321
15.40	0.000	0.308	*	15.50	0.000	0.295
15.60	0.000	0.283	*	15.70	0.000	0.270
15.80	0.000	0.258	*	15.90	0.000	0.245
16.00	0.000	0.233	*	16.10	0.000	0.221
16.20	0.000	0.209	*	16.30	0.000	0.197
16.40	0.000	0.186	*	16.50	0.000	0.174
16.60	0.000	0.163	*	16.70	0.000	0.151
16.80	0.000	0.141	*	16.90	0.000	0.130
17.00	0.000	0.119	*	17.10	0.000	0.109
17.20	0.000	0.100	*	17.30	0.000	0.091
17.40	0.000	0.084	*	17.50	0.000	0.077
17.60	0.000	0.072	*	17.70	0.000	0.067
17.80	0.000	0.062	*	17.90	0.000	0.058
18.00	0.000	0.053	*	18.10	0.000	0.049
18.20	0.000	0.046	*	18.30	0.000	0.042
18.40	0.000	0.039	*	18.50	0.000	0.035
18.60	0.000	0.033	*	18.70	0.000	0.030
18.80	0.000	0.027	*	18.90	0.000	0.025
19.00	0.000	0.022	*	19.10	0.000	0.020
19.20	0.000	0.018	*	19.30	0.000	0.016
19.40	0.000	0.014	*	19.50	0.000	0.013
19.60	0.000	0.011	*	19.70	0.000	0.010
19.80	0.000	0.008	*	19.90	0.000	0.007
20.00	0.000	0.006	*	20.10	0.000	0.005
20.20	0.000	0.004	*	20.30	0.000	0.003
20.40	0.000	0.002	*	20.50	0.000	0.002
20.60	0.000	0.001	*	20.70	0.000	0.001
20.80	0.000	0.000	*	20.90	0.000	0.000
21.00	0.000	0.000	*			

```
Project Title        = East Slurry Cell
WATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:        Null


-- Routed Watershed #  1  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.44
   Hydraulic length     = 4915.00 feet
   Elevation change     =   135.0 feet.
   Travel time          =    0.44 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 1
   Curve number           =    74.0
   Area                   =     0.1 acres
   Hydraulic length       = 2800.00 Feet
   Elevation change       =  1988.0 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  2  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.28
   Hydraulic length     = 3115.00 feet
   Elevation change     =    80.0 feet.
   Travel time          =    0.28 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 2
   Curve number           =    61.0
   Area                   =     5.0 acres
   Hydraulic length       =  470.00 Feet
   Elevation change       =    20.2 feet.
   Concentration time     =    0.09 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  3  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.34
   Hydraulic length     = 3555.00 feet
   Elevation change     =    80.0 feet.
   Travel time          =    0.34 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 3
   Curve number           =    61.0
   Area                   =     1.7 acres
   Hydraulic length       =   70.00 Feet
   Elevation change       =     2.1 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  4  to sturcture # 1
   Muskingum routing parameters: X=   0.33 K=   0.33
   Hydraulic length     = 3775.00 feet
   Elevation change     =   115.0 feet.
   Travel time          =    0.33 hours
   Travel time type     = SCS Upland Curves
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-- Watershed data for watershed # 4
   Curve number           =    61.0
   Area                   =     5.5 acres
   Hydraulic length       =  600.00 Feet
   Elevation change       =    22.2 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  5  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.35
   Hydraulic length     = 3755.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.35 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 5
   Curve number           =    61.0
   Area                   =    15.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    35.0 feet.
   Concentration time     =    0.12 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  6  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.35
   Hydraulic length     = 3755.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.35 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 6
   Curve number           =    61.0
   Area                   =     0.1 acres
   Hydraulic length       =  100.00 Feet
   Elevation change       =     5.0 feet.
   Concentration time     =    0.02 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  7  to sturcture # 1
   Muskingum routing parameters: X=   0.32 K=   0.26
   Hydraulic length     = 2855.00 feet
   Elevation change     =    70.0 feet.
   Travel time          =    0.26 hours
   Travel time type     = SCS Upland Curves

-- Watershed data for watershed # 7
   Curve number           =    61.0
   Area                   =    11.0 acres
   Hydraulic length       =  700.00 Feet
   Elevation change       =    30.1 feet.
   Concentration time     =    0.13 hours
   Concentration time type = SCS Upland Curves
   Unit hydrograph type    = Disturbed

-- Routed Watershed #  8  to sturcture # 1
   Muskingum routing parameters: X=   0.31 K=   0.51
   Hydraulic length     = 4725.00 feet
   Elevation change     =    95.0 feet.
   Travel time          =    0.51 hours
```

-- Watershed data for watershed # 8

Curve number = 61.0
Area = 7.7 acres
Hydraulic length = 200.00 Feet
Elevation change = 35.0 feet.
Concentration time = 0.02 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed # 9

Curve number = 95.0
Area = 1.4 acres
Hydraulic length = 6105.00 Feet
Elevation change = 135.0 feet.
Concentration time = 0.57 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Routed Watershed # 10 to sturcture # 1

Muskingum routing parameters: X= 0.34 K= 0.10
Hydraulic length = 1300.00 feet
Elevation change = 45.0 feet.
Travel time = 0.10 hours
Travel time type = SCS Upland Curves

-- Watershed data for watershed #10

Curve number = 79.0
Area = 9.5 acres
Hydraulic length = 600.00 Feet
Elevation change = 34.8 feet.
Concentration time = 0.10 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Watershed data for watershed #11

Curve number = 100.0
Area = 12.0 acres
Hydraulic length = 1200.00 Feet
Elevation change = 0.0 feet.
Concentration time = 5.74 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 69.0 acres

-- Storm data

Total precipitation = 10.7 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 222.22 cfs
Discharge volume = 39.68 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.068	0.005
0.20	0.068	0.016	*	0.30	0.068	0.043

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.30	0.068	0.043				
0.40	0.068	0.091	*	0.50	0.068	0.167
0.60	0.102	0.289	*	0.70	0.102	0.447
0.80	0.102	0.703	*	0.90	0.102	1.203
1.00	0.102	1.892	*	1.10	0.113	2.674
1.20	0.113	3.540	*	1.30	0.113	4.353
1.40	0.113	5.106	*	1.50	0.113	5.800
1.60	0.203	7.105	*	1.70	0.203	10.077
1.80	0.203	13.367	*	1.90	0.203	17.415
2.00	0.203	22.075	*	2.10	0.794	33.137
2.20	0.794	59.831	*	2.30	0.794	93.074
2.40	0.794	135.978	*	2.50	0.794	180.983
2.60	0.213	214.652	*	2.70	0.213	222.216
2.80	0.213	209.108	*	2.90	0.213	176.428
3.00	0.213	143.748	*	3.10	0.171	119.434
3.20	0.171	103.766	*	3.30	0.171	95.066
3.40	0.171	89.625	*	3.50	0.171	86.390
3.60	0.117	84.053	*	3.70	0.117	81.014
3.80	0.117	77.404	*	3.90	0.117	72.925
4.00	0.117	69.224	*	4.10	0.105	66.751
4.20	0.105	65.148	*	4.30	0.105	64.149
4.40	0.105	63.323	*	4.50	0.105	62.845
4.60	0.085	62.502	*	4.70	0.085	61.814
4.80	0.085	60.840	*	4.90	0.085	59.503
5.00	0.085	58.440	*	5.10	0.077	57.762
5.20	0.077	57.253	*	5.30	0.077	56.846
5.40	0.077	56.389	*	5.50	0.077	56.086
5.60	0.085	56.053	*	5.70	0.085	56.453
5.80	0.085	57.155	*	5.90	0.085	58.060
6.00	0.085	58.801	*	6.10	0.000	58.141
6.20	0.000	54.176	*	6.30	0.000	47.569
6.40	0.000	38.713	*	6.50	0.000	30.821
6.60	0.000	25.258	*	6.70	0.000	21.932
6.80	0.000	20.229	*	6.90	0.000	19.315
7.00	0.000	18.762	*	7.10	0.000	18.399
7.20	0.000	18.028	*	7.30	0.000	17.651
7.40	0.000	17.266	*	7.50	0.000	16.875
7.60	0.000	16.480	*	7.70	0.000	16.081
7.80	0.000	15.674	*	7.90	0.000	15.258
8.00	0.000	14.834	*	8.10	0.000	14.404
8.20	0.000	13.969	*	8.30	0.000	13.529
8.40	0.000	13.083	*	8.50	0.000	12.633
8.60	0.000	12.183	*	8.70	0.000	11.733
8.80	0.000	11.284	*	8.90	0.000	10.836
9.00	0.000	10.393	*	9.10	0.000	9.981
9.20	0.000	9.600	*	9.30	0.000	9.250
9.40	0.000	8.930	*	9.50	0.000	8.637
9.60	0.000	8.355	*	9.70	0.000	8.085
9.80	0.000	7.826	*	9.90	0.000	7.578
10.00	0.000	7.341	*	10.10	0.000	7.113
10.20	0.000	6.895	*	10.30	0.000	6.685
10.40	0.000	6.485	*	10.50	0.000	6.293
10.60	0.000	6.107	*	10.70	0.000	5.928
10.80	0.000	5.755	*	10.90	0.000	5.588
11.00	0.000	5.427	*	11.10	0.000	5.272
11.20	0.000	5.122	*	11.30	0.000	4.978
11.40	0.000	4.840	*	11.50	0.000	4.707

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
11.50	0.000	4.707				
11.60	0.000	4.578	*	11.70	0.000	4.454
11.80	0.000	4.335	*	11.90	0.000	4.220
12.00	0.000	4.109	*	12.10	0.000	4.003
12.20	0.000	3.900	*	12.30	0.000	3.802
12.40	0.000	3.708	*	12.50	0.000	3.618
12.60	0.000	3.532	*	12.70	0.000	3.451
12.80	0.000	3.375	*	12.90	0.000	3.303
13.00	0.000	3.235	*	13.10	0.000	3.167
13.20	0.000	3.099	*	13.30	0.000	3.031
13.40	0.000	2.963	*	13.50	0.000	2.895
13.60	0.000	2.826	*	13.70	0.000	2.758
13.80	0.000	2.690	*	13.90	0.000	2.622
14.00	0.000	2.554	*	14.10	0.000	2.486
14.20	0.000	2.418	*	14.30	0.000	2.350
14.40	0.000	2.282	*	14.50	0.000	2.214
14.60	0.000	2.146	*	14.70	0.000	2.077
14.80	0.000	2.009	*	14.90	0.000	1.941
15.00	0.000	1.873	*	15.10	0.000	1.805
15.20	0.000	1.737	*	15.30	0.000	1.670
15.40	0.000	1.603	*	15.50	0.000	1.537
15.60	0.000	1.471	*	15.70	0.000	1.405
15.80	0.000	1.340	*	15.90	0.000	1.276
16.00	0.000	1.213	*	16.10	0.000	1.150
16.20	0.000	1.088	*	16.30	0.000	1.026
16.40	0.000	0.966	*	16.50	0.000	0.906
16.60	0.000	0.846	*	16.70	0.000	0.788
16.80	0.000	0.731	*	16.90	0.000	0.676
17.00	0.000	0.622	*	17.10	0.000	0.569
17.20	0.000	0.520	*	17.30	0.000	0.476
17.40	0.000	0.437	*	17.50	0.000	0.403
17.60	0.000	0.375	*	17.70	0.000	0.348
17.80	0.000	0.323	*	17.90	0.000	0.300
18.00	0.000	0.278	*	18.10	0.000	0.257
18.20	0.000	0.237	*	18.30	0.000	0.219
18.40	0.000	0.201	*	18.50	0.000	0.185
18.60	0.000	0.169	*	18.70	0.000	0.155
18.80	0.000	0.141	*	18.90	0.000	0.128
19.00	0.000	0.116	*	19.10	0.000	0.105
19.20	0.000	0.094	*	19.30	0.000	0.084
19.40	0.000	0.074	*	19.50	0.000	0.066
19.60	0.000	0.058	*	19.70	0.000	0.050
19.80	0.000	0.043	*	19.90	0.000	0.037
20.00	0.000	0.031	*	20.10	0.000	0.025
20.20	0.000	0.021	*	20.30	0.000	0.016
20.40	0.000	0.012	*	20.50	0.000	0.009
20.60	0.000	0.006	*	20.70	0.000	0.004
20.80	0.000	0.002	*	20.90	0.000	0.001
21.00	0.000	0.000	*			

West Slurry Cell

The West Slurry Cell is an inactive slurry dewatering and settling pond. The cell is to be incorporated into the refuse pile as the next refuse lift is placed.

The West Slurry Cell is a temporary control structure with MSHA No.1211-UT-09-01813-01. Designed specifically to hold slurry, the cell was last used as a slurry cell in 1975. Since 1975, dry coal fines from other slurry cells have been placed in the cell. The cell was designed as a totally containing structure, and no outlet structures exist for the cell.

Use of the cell was suspended until the refuse pile reached an elevation ensuring a higher stability factor for the Cell. The refuse pile has attained this elevation. Sunnyside has no plans to use the Cell for slurry dewatering, but instead intends to use the area for additional coarse refuse disposal. Plans for incorporation of this area into the coarse refuse disposal area will be submitted to the Division.

Prior to and during filling of the area with coarse refuse, the structure is a temporary impoundment as addressed in R645-301-733. The structure is addressed by the MSHA criteria of 30 CFR 77.216(a). The impoundment meets the single-open channel spillway exemption of R645-301-743.132 by meeting the requirements of R645-301-742.225.1.

The West cell today captures only the surface water runoff from its own disturbance area. The total watershed area of the pond is conservatively approximated at 34.8 acres and the flat bottom of the pond is approximately 14.7 acres, resulting in a large flat area for storm water accumulation. Consequently, a 10-year, 24-hour storm event will leave less than 4-inches of water in the bottom of the cell; the 100-year, 24-hour storm approximately 5-inches. The impoundment totally contains the probable maximum precipitation requiring 29.18 acre-feet of storage within the 172 acre-feet of available capacity.

Sunnyside Coal Company DATA SUMMARY File: Ponddata.wq1
WEST SLURRY CELL
MSHA 1211-UT-09-01813-01

WATERSHED AREA	Acres	Slope Length	Elev Change	% Slope	CN	Routing Segment	Length	Elev Change	COMMENTS
Pond Surface	34.80	2,150.0	14.0	0.7	95	Overland			Pond
Totals	34.80								

POND CAPACITIES	Acre-Feet	
Total As-built Capacity	172.00	
Capacity w/2' freeboard	132.00	Excludes capacity above freeboard
Temporary storage capacity	0.00	Capacity between outlet & freeboard
Sediment load capacity	1.00	Design sediment load capacity
Available Capacity	131.00	Typ. capacity for 24-hr retention

STORM DATA	SCS 6-hr design 25-year, 6-hour	SCS Type II 10-year, 24-hour	SCS 6-hr design 100-year, 6-hour	SCS 6-hr design PMP, 6-hour
Precipitation	1.62 inches	1.84 inches	2.05 inches	10.67 inches
Peak Discharge	27.16 cfs	34.00 cfs	37.29 cfs	236.89 cfs
Discharge Volume	3.26 acre-feet	3.86 acre-feet	4.44 acre-feet	29.18 acre-feet

OUTLET DATA	CMP		Pipe		Spillway
Diameter	None	feet	None	feet	None
Slope		ft/ft		ft/ft	
Manning's n					
Discharge		cfs		cfs	
Velocity		fps		fps	

SEDIMENT LOAD - Required [Uniform Soil Loss Equation]	Sed Cap. Acre-feet	A = Tons/Ac	R	K	LS	CP	
Area I	0.03	0.6	20	0.22	0.31	0.45	Disturbed Bare P=1 C=.45
Totals	0.03						

Project Title = West Slurry Cell
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 95.0
Area = 34.8 acres
Hydraulic length = 2150.00 Feet
Elevation change = 14.0 feet.
Concentration time = 0.37 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 34.8 acres

-- Storm data
Total precipitation = 1.6 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 27.16 cfs
Discharge volume = 3.26 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.010	0.000
0.20	0.010	0.000	*	0.30	0.010	0.000
0.40	0.010	0.000	*	0.50	0.010	0.000
0.60	0.016	0.000	*	0.70	0.016	0.000
0.80	0.016	0.000	*	0.90	0.016	0.005
1.00	0.016	0.044	*	1.10	0.017	0.150
1.20	0.017	0.334	*	1.30	0.017	0.571
1.40	0.017	0.825	*	1.50	0.017	1.077
1.60	0.031	1.503	*	1.70	0.031	2.141
1.80	0.031	2.932	*	1.90	0.031	3.656
2.00	0.031	4.263	*	2.10	0.121	6.816
2.20	0.121	11.707	*	2.30	0.121	18.109
2.40	0.121	23.413	*	2.50	0.121	27.159
2.60	0.032	27.137	*	2.70	0.032	23.816
2.80	0.032	18.657	*	2.90	0.032	15.204
3.00	0.032	13.568	*	3.10	0.026	12.479
3.20	0.026	11.193	*	3.30	0.026	9.957
3.40	0.026	9.063	*	3.50	0.026	8.534
3.60	0.018	8.037	*	3.70	0.018	7.458
3.80	0.018	6.767	*	3.90	0.018	6.299
4.00	0.018	6.055	*	4.10	0.016	5.863
4.20	0.016	5.642	*	4.30	0.016	5.412
4.40	0.016	5.254	*	4.50	0.016	5.169
4.60	0.013	5.033	*	4.70	0.013	4.823
4.80	0.013	4.571	*	4.90	0.013	4.401
5.00	0.013	4.313	*	5.10	0.012	4.224
5.20	0.012	4.104	*	5.30	0.012	3.971
5.40	0.012	3.881	*	5.50	0.012	3.833
5.60	0.013	3.853	*	5.70	0.013	3.925
5.80	0.013	4.022	*	5.90	0.013	4.089
6.00	0.013	4.124	*	6.10	0.000	3.712

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	3.712				
6.20	0.000	2.864	*	6.30	0.000	1.806
6.40	0.000	1.090	*	6.50	0.000	0.718
6.60	0.000	0.508	*	6.70	0.000	0.332
6.80	0.000	0.193	*	6.90	0.000	0.092
7.00	0.000	0.027	*			

Project Title = West Slurry Cell
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 95.0
Area = 34.8 acres
Hydraulic length = 2150.00 Feet
Elevation change = 14.0 feet.
Concentration time = 0.37 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 34.8 acres

-- Storm data
Total precipitation = 1.8 inches
Storm type = SCS Type 2 storm, 24 hour storm
Peak Discharge = 34.00 cfs
Discharge volume = 3.86 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.002	0.000
0.20	0.002	0.000	*	0.30	0.002	0.000
0.40	0.002	0.000	*	0.50	0.002	0.000
0.60	0.002	0.000	*	0.70	0.002	0.000
0.80	0.002	0.000	*	0.90	0.002	0.000
1.00	0.002	0.000	*	1.10	0.002	0.000
1.20	0.002	0.000	*	1.30	0.002	0.000
1.40	0.002	0.000	*	1.50	0.002	0.000
1.60	0.002	0.000	*	1.70	0.002	0.000
1.80	0.002	0.000	*	1.90	0.002	0.000
2.00	0.002	0.000	*	2.10	0.002	0.000
2.20	0.002	0.000	*	2.30	0.002	0.000
2.40	0.002	0.000	*	2.50	0.002	0.000
2.60	0.002	0.000	*	2.70	0.002	0.000
2.80	0.002	0.000	*	2.90	0.002	0.000
3.00	0.002	0.000	*	3.10	0.003	0.000
3.20	0.003	0.000	*	3.30	0.003	0.000
3.40	0.003	0.000	*	3.50	0.002	0.000
3.60	0.003	0.000	*	3.70	0.003	0.000
3.80	0.003	0.000	*	3.90	0.002	0.000
4.00	0.003	0.000	*	4.10	0.003	0.000
4.20	0.003	0.000	*	4.30	0.003	0.000
4.40	0.003	0.000	*	4.50	0.003	0.000
4.60	0.003	0.000	*	4.70	0.003	0.001
4.80	0.003	0.004	*	4.90	0.003	0.009
5.00	0.003	0.017	*	5.10	0.003	0.026
5.20	0.003	0.035	*	5.30	0.003	0.045
5.40	0.003	0.055	*	5.50	0.003	0.065
5.60	0.003	0.075	*	5.70	0.003	0.086
5.80	0.003	0.096	*	5.90	0.003	0.106
6.00	0.003	0.115	*	6.10	0.004	0.129

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.004	0.129				
6.20	0.004	0.147	*	6.30	0.004	0.167
6.40	0.004	0.185	*	6.50	0.004	0.201
6.60	0.004	0.216	*	6.70	0.004	0.231
6.80	0.004	0.245	*	6.90	0.004	0.258
7.00	0.004	0.271	*	7.10	0.004	0.284
7.20	0.004	0.297	*	7.30	0.004	0.308
7.40	0.004	0.319	*	7.50	0.004	0.330
7.60	0.004	0.343	*	7.70	0.004	0.355
7.80	0.004	0.365	*	7.90	0.004	0.375
8.00	0.004	0.385	*	8.10	0.005	0.410
8.20	0.005	0.448	*	8.30	0.005	0.494
8.40	0.005	0.528	*	8.50	0.005	0.553
8.60	0.005	0.579	*	8.70	0.005	0.610
8.80	0.005	0.643	*	8.90	0.005	0.670
9.00	0.005	0.693	*	9.10	0.006	0.724
9.20	0.006	0.766	*	9.30	0.006	0.811
9.40	0.006	0.848	*	9.50	0.006	0.876
9.60	0.007	0.913	*			

Project Title = West Slurry Cell
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 95.0
Area = 34.8 acres
Hydraulic length = 2150.00 Feet
Elevation change = 14.0 feet.
Concentration time = 0.37 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 34.8 acres

-- Storm data
Total precipitation = 2.0 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 37.29 cfs
Discharge volume = 4.44 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.013	0.000
0.20	0.013	0.000	*	0.30	0.013	0.000
0.40	0.013	0.000	*	0.50	0.013	0.000
0.60	0.020	0.000	*	0.70	0.020	0.000
0.80	0.020	0.025	*	0.90	0.020	0.122
1.00	0.020	0.320	*	1.10	0.022	0.621
1.20	0.022	0.982	*	1.30	0.022	1.369
1.40	0.022	1.749	*	1.50	0.022	2.110
1.60	0.039	2.742	*	1.70	0.039	3.697
1.80	0.039	4.862	*	1.90	0.039	5.871
2.00	0.039	6.667	*	2.10	0.153	10.232
2.20	0.153	17.018	*	2.30	0.153	25.744
2.40	0.153	32.668	*	2.50	0.153	37.292
2.60	0.041	36.874	*	2.70	0.041	32.164
2.80	0.041	25.112	*	2.90	0.041	20.392
3.00	0.041	18.120	*	3.10	0.033	16.590
3.20	0.033	14.815	*	3.30	0.033	13.133
3.40	0.033	11.921	*	3.50	0.033	11.202
3.60	0.023	10.535	*	3.70	0.023	9.766
3.80	0.023	8.853	*	3.90	0.023	8.233
4.00	0.023	7.908	*	4.10	0.020	7.653
4.20	0.020	7.360	*	4.30	0.020	7.055
4.40	0.020	6.846	*	4.50	0.020	6.730
4.60	0.016	6.551	*	4.70	0.016	6.274
4.80	0.016	5.944	*	4.90	0.016	5.721
5.00	0.016	5.605	*	5.10	0.015	5.487
5.20	0.015	5.329	*	5.30	0.015	5.155
5.40	0.015	5.036	*	5.50	0.015	4.972
5.60	0.016	4.996	*	5.70	0.016	5.089
5.80	0.016	5.213	*	5.90	0.016	5.297
6.00	0.016	5.341	*	6.10	0.000	4.807

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	4.807				
6.20	0.000	3.709	*	6.30	0.000	2.338
6.40	0.000	1.412	*	6.50	0.000	0.930
6.60	0.000	0.658	*	6.70	0.000	0.430
6.80	0.000	0.250	*	6.90	0.000	0.119
7.00	0.000	0.035	*			

Project Title = West Slurry Cell

WATERSHED HYDROGRAPH

Inflow into structure # 1

Structure type: Null

-- Watershed data for watershed # 1

Curve number = 95.0

Area = 34.8 acres

Hydraulic length = 2150.00 Feet

Elevation change = 14.0 feet.

Concentration time = 0.37 hours

Concentration time type = SCS Upland Curves

Unit hydrograph type = Disturbed

-- Total Area = 34.8 acres

-- Storm data

Total precipitation = 10.7 inches

Storm type = SCS 6 hour design storm

Peak Discharge = 236.89 cfs

Discharge volume = 29.18 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.068	0.000
0.20	0.068	0.063	*	0.30	0.068	0.632
0.40	0.068	2.056	*	0.50	0.068	4.302
0.60	0.102	7.568	*	0.70	0.102	11.574
0.80	0.102	15.893	*	0.90	0.102	19.586
1.00	0.102	22.477	*	1.10	0.113	25.091
1.20	0.113	27.660	*	1.30	0.113	30.063
1.40	0.113	31.920	*	1.50	0.113	33.260
1.60	0.203	37.237	*	1.70	0.203	44.051
1.80	0.203	52.246	*	1.90	0.203	58.032
2.00	0.203	61.352	*	2.10	0.794	84.097
2.20	0.794	127.406	*	2.30	0.794	180.565
2.40	0.794	217.166	*	2.50	0.794	236.887
2.60	0.213	227.469	*	2.70	0.213	195.114
2.80	0.213	150.957	*	2.90	0.213	121.446
3.00	0.213	106.636	*	3.10	0.171	96.392
3.20	0.171	85.043	*	3.30	0.171	74.701
3.40	0.171	67.327	*	3.50	0.171	62.935
3.60	0.117	58.988	*	3.70	0.117	54.563
3.80	0.117	49.362	*	3.90	0.117	45.817
4.00	0.117	43.927	*	4.10	0.105	42.440
4.20	0.105	40.753	*	4.30	0.105	39.013
4.40	0.105	37.802	*	4.50	0.105	37.120
4.60	0.085	36.090	*	4.70	0.085	34.532
4.80	0.085	32.687	*	4.90	0.085	31.430
5.00	0.085	30.763	*	5.10	0.077	30.092
5.20	0.077	29.204	*	5.30	0.077	28.229
5.40	0.077	27.558	*	5.50	0.077	27.189
5.60	0.085	27.303	*	5.70	0.085	27.791
5.80	0.085	28.450	*	5.90	0.085	28.891
6.00	0.085	29.114	*	6.10	0.000	26.190

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	26.190				
6.20	0.000	20.202	*	6.30	0.000	12.737
6.40	0.000	7.691	*	6.50	0.000	5.064
6.60	0.000	3.581	*	6.70	0.000	2.341
6.80	0.000	1.363	*	6.90	0.000	0.647
7.00	0.000	0.192	*			