TRI-STATE

June 29, 2022

Mr. Zach Trujillo
Environmental Protection Specialist
Colorado Division of Reclamation, Mining & Safety
Department of Natural Resources
1313 Sherman Street, Room 215
Denver, CO 80203

RE: Colowyo Coal Company L.P.
Permit No. C-1981-019
Technical Revision No. 154 (TR-154)
Adequacy Response

Dear Mr. Trujillo,

Tri-State Generation and Transmission Association Inc. (Tri-State), is the parent company to Axial Basin Coal Company, which is the general partner to Colowyo Coal Company L.P. (Colowyo). Therefore, Tri-State on behalf of Colowyo is submitting this adequacy response for technical revision 154 (TR-154) to Permit No. C-1981-019.

Tri-State received the two adequacy letters from the Division dated June 10 and June 24, 2022 respectively, and has the following responses to the Division's concerns:

1. *When reviewing the proposed Volume 20, Exhibit 23, Item 3 (Item 3) conducted by Agapito Associates, Inc. (AA), it appears to the Division that this exhibit is an addendum to Exhibit 23, Item 2 (Item 2) which is an updated iteration of the Collom Spoil Pile from Exhibit 23, Item 1 (Item 1). Under Item 2, an update to the location of the underdrain(s) occurred with Drain A and Drain B while maintaining the specifications of the underdrain approved under Item 1. In the initial discussion of Item 3 AA states, "[t]he report does not consider any underdrain or surface-water control requirements for either the temporary dump or the final reclaimed surface." It is unclear to the Division whether design specifications approved under Item 1 and the location of Drain A and Drain B from Item 2 are still valid and applicable for the proposed design of the permanent Collom Spoil Pile and Valley Fill. Please provide the Division with additional clarification and discussion on the design specification and location(s) of the underdrain to ensure Rules 4.09 and 4.10 are satisfied for the proposed Colom Permanent Spoil Pile and Valley Fill.*

   Response: The design configurations (not locations) for Drain A and B from Exhibit 23, Item 1 were utilized to construct the underdrain under the proposed Little Collom Valley Fill. A

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description of the construction of the drain under the proposed Little Collom Valley Fill was included in the TR-154 application materials in Volume 15, Section 4.09, Construction Plan for the Division's review. A figure has been created and included in this adequacy response in Volume 15 to demonstrate the location of the drain under the proposed Little Collom Valley Fill for the Division, and some clarifying language has also been included in Volume 15, Section 4.09.

2. *Based on the proposed Volume 15, Rule 4, Section 4.09, the maximum volume of the Collom Spoil Pile will reach approximately 28 million CY, with approximately 17.3 million CY remaining permanent as the Collom Permanent Spoil Pile and approximately 4.1 million CY remaining permanent as the Collom Valley Fill. The remaining amount is proposed to be hauled as final backfill for the Collom Pit reclamation. The Division understands that these volumes and proposed permanent Collom Spoil Pile and Valley Fill are based on the operations of the full life of mine for the Collom Pit which doesn't reflect the current spoil volumes and approved on-the ground disturbance under the cumulative bond schedule for the Collom Pit under Exhibit 13C as it shouldn't. It's the Division's understanding that as mining progresses in the Collom Pit, future spoil will be used as immediate backfill. Based on Collom's cumulative bond schedule, these disturbances have not yet been approved yet which would currently require the majority of the spoil be removed from the approved Temporary Spoil Pile to backfill the Collom Pit. At this time, it is unclear if the currently approved Exhibit 13C accurately reflects current reclamation operations based on the current on-the-ground disturbances with the addition of the Collom Permanent Spoil Pile and Valley Fill if the Division were to perform the reclamation. Please review Exhibit 13C to ensure all disturbances are reflected accurately based on current reclamation volumes and activities as well as the addition of the Permanent Spoil Pile and Valley Fill. Based on the complexity of this topic, the Division would like to suggest a meeting with Colowyo to help clarify any comments, concerns and questions each party may have.*

   Response: As discussed with the Division on June 21 and 28, 2022, Exhibit 13C provides reclamation cost items (specifically the Collom out of pit stockpile), a volume of material that is available and bonded for reclamation of the Collom Pit. This volume of material currently in the Exhibit 13C is greater than what is proposed to be left as permanent excess spoil under TR-154.

   The Division has indicated that it would be acceptable to update Exhibit 13C to demonstrate how much material would be needed to backfill the Collom Pit in relation to the permanent excess spoil (out of pit) that is proposed under TR-154, or at given points in time during the advancement of the Collom Pit. At this time, Tri-State believes that would be a tedious exercise and by bonding for the entire excess spoil (up to 28 million cubic yards eventually) the Division will be holding more than appropriate amount of bond to ensure reclamation of the Collom Pit.

Finally, under TR-154, the mine plan proposes to reduce the total box cut depth and utilize a dragline in the upper seam of a sizable portion of the Collom Pit. Tri-State understands that Exhibit 13C will have to be updated and appropriate bonding be in place and approved by the Division prior to using a dragline to conduct mining activities in the Collom Pit. Tri-State views this similar to other activities (e.g., topsoil removal to support advancement of mining or additional material to be place in the temporary spoil pile) that is approved for Collom Pit under the current mine plan but may not be included to the cumulative bond schedule to date.

3. *The Division is currently reviewing all surface hydrology related items associated with TR-154. The Division will provide any related adequacy comments and/or questions in a future adequacy letter.*

Response: Please see responses below to items 1 – 3 for sediment control review from June 24, 2022 adequacy letter.

1. *The figures with watersheds during mining (Figure 7-23B-1 and Figure 7-23C-1) do not indicate channels and ponds, which are very important for understanding the respective SEDCAD models. Please add the channels and ponds to the figures.*

   Response: A layer that was turned off on Figures 7-23B-1 and 723C-1 has been restored showing the temporary channels and sediment ponds locations.

2. *No SEDCAD output pages were provided for Exhibit 7, Item 23, Part I (Section 25 Pond, post-mining condition). Please provide these pages.*

   Response: SEDCAD output pages for Exhibit 7, Item 23, Part I have been provided.

3. *On page Exhibit 7-23J-2, the text states that the 25-year event in the Section 26 Pond peaks at an elevation of 6,985.5 feet. However, in the associated SEDCAD model the peak elevation is 6,984.44 feet for this structure. Please explain this apparent discrepancy, and adjust the text or model, as necessary.*

   Response: The peak storm elevation for the 25-year, 24-hour storm event in Exhibit 7, Item 23, Part J has been revised to 6,9844.4 as noted.

If you should have any additional questions or concerns, please feel free to contact Tony Tennyson at (970) 824-1232 at your convenience.

Sincerely,

DocuSigned by:
Chris Gilbreath
D250C711D0BF450...

Chris Gilbreath
Senior Manager,
Remediation and Reclamation

CG:TT:der

cc: Tony Tennyson (via email)
File: C. F. 1.1.2.139 - G471-11.3(21)b

LIST OF FIGURES

mine topography shown on Map 19C. The final configuration of the fill is designed to minimize erosion. The final outslope will not exceed 3h:1v. A geotechnical evaluation of the stability of the permanent out of pit excess overburden is provided in Volume 20 Exhibt 23, Item 3.

Two terrace ditches will be constructed on the face of the Little Collom Valley Fill. Please refer to Volume 18B Exhibit 7, Iem 23, Part I for the location and design configuration of the terrace ditches. Both terrace ditches will be backsloped to direct runoff against the face to prevent flows from overflowing the edge of the ditch. These terrace ditches will direct surface runoff perpendicular to the face into a permanent drainage channel designed to pass safely the runoff from a 100-year, 24 hour precipitation event.

CONSTRUCTION PLAN

All available topsoil will be removed for the Little Collom Valley Fill and either stockpiled for later use or direct hauled to a reclaimed area.

The Little Collom Valley Fill drain has been constructed to the design configuations (not locations) presented in Volume 20 Exhibit 23, Item 1. Given the smaller footprint of the temporary and final out of pit stockpile materials than is shown in Volume 20 Exhibit 23, Item 1, Figure 4.09-1 presents the adjusted location of the constructed rock drain and the as constructed dimensions of the drain under the Little Collom Valley Fill. The rock drain was constructed as follows.

Prior to overburden placement, an 820 feet long by 24 feet wide rock drain was constructed. This rock drain was constructed from large sandstone rock sorted on-site from existing excess spoil areas, and the sorted rock was placed with loaders and dozers. Once the rock drain was completed, excess spoil was placed over the rock drain, rising in approximately 50-foot-high lifts until reaching a final height of 130 feet above the valley floor at the north edge of the rock drain.

North of the constructed rock drain, natural dump sorting was used to create the remaining excess spoil rock drain. When material is placed at heights over 100 feet, the larger boulders and rock roll down the slope effectively sorting the material and making a natural drain at the toe of the spoil. This method has been implmented at Colowyo for many years and is further described in Volume 20 Exhibit 23 Item 1 report. This report states in Section 8.2, “In our opinion, a drain extending the full distance from the downstream toe to the upstream toe is not required, particularly for a temporary spoil fill. Our experience and observations indicate that the spoil and placement methods at Colowyo produce a relatively free draining layer at the base of each lift of spoil.” Once a suitable height that allowed for natural dump sorting was achieved, the Little Collom Valley Fill construction progressed towards the northern limits of its overall footprint.

INSPECTION PLAN

During construction of the Little Collom Valley Fill, Colowyo will provide certified reports as required by Rule 4.09.1(11). Inspections will be conducted at quarterly during the construction period, final grading, and revegetation.

Each inspection report will be provided to the Division within two weeks after the end of each quarter of the year, and the report will be certified by a professional engineer. Each report will certify that the fill has been constructed as specified in the minimum design approved by the Division. The reports will include a description of any appearances of instability, structural weakness and other hazardous conditions observed during the inspection.

Section 25 Pond
Effluent Demonstration

10-Year 24-Hour Storm Event

Post-Mining Condition

Tony Tennyson

General Information

Storm Information:

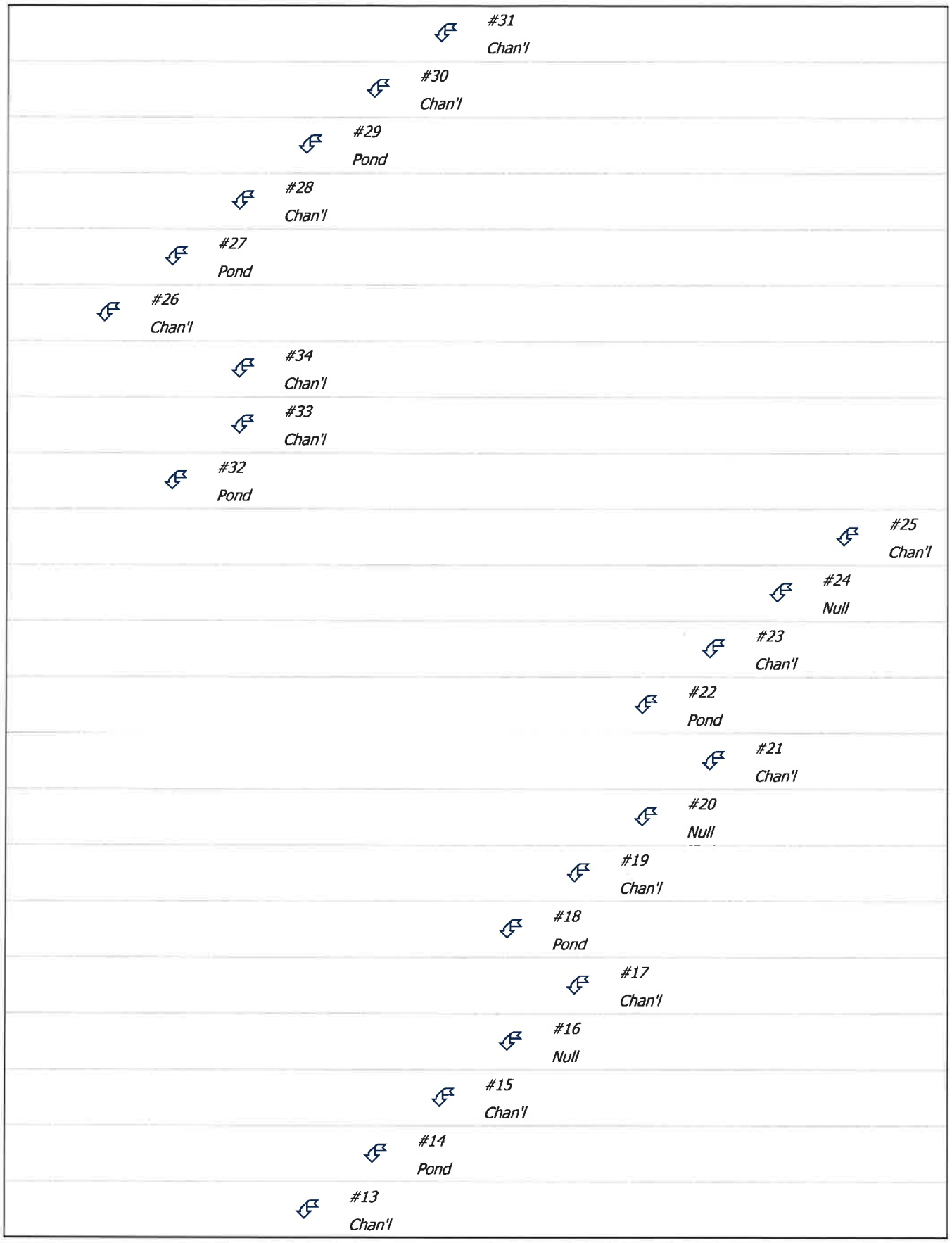
Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	1.800 inches

Particle Size Distribution:

Size (mm)	Colowyo Particle Size
4.7500	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Null Below Section 25 Pond
Pond	#2	==>	#1	0.000	0.000	Section 25 Pond
Channel	#3	==>	#2	0.000	0.000	Little Collom Gulch Natural Channel
Null	#4	==>	#3	0.000	0.000	Null at Confluence with D-3 Ditch
Channel	#5	==>	#4	0.000	0.000	D-3 Ditch
Channel	#6	==>	#3	0.000	0.000	Little Collom Gulch 0+00 to LCG-1
Null	#7	==>	#6	0.000	0.000	Null at Confluence Lower Terrace Ditch
Channel	#8	==>	#7	0.000	0.000	Lower Terrace Ditch
Null	#10	==>	#6	0.000	0.000	Null at Confluence Upper Terrace Ditch
Channel	#11	==>	#10	0.000	0.000	Upper Terrace Ditch
Pond	#12	==>	#6	0.000	0.000	LCG-1 Stockpond
Channel	#13	==>	#12	0.000	0.000	Little Collom Gulch LCG-1 to LCG-2
Pond	#14	==>	#13	0.000	0.000	LCG-2 Stockpond
Channel	#15	==>	#14	0.000	0.000	Little Collom Gulch LCG-2 to LCG-3
Null	#16	==>	#15	0.000	0.000	Null at Confluence with Sage Draw
Channel	#17	==>	#16	0.000	0.000	Sage Draw
Pond	#18	==>	#15	0.000	0.000	LCG-3 Stockpond
Channel	#19	==>	#18	0.000	0.000	Little Collom Gulch LCG-3 to LCG-4
Null	#20	==>	#19	0.000	0.000	Null at Confluence with Grouse Draw
Channel	#21	==>	#20	0.000	0.000	Grouse Draw
Pond	#22	==>	#19	0.000	0.000	LCG-4 Stockpond
Channel	#23	==>	#22	0.000	0.000	Little Collom Gulch LCG-4 to 102+79
Null	#24	==>	#23	0.000	0.000	Null at Confluence with Sharpie Draw
Channel	#25	==>	#24	0.000	0.000	Sharpie Draw
Channel	#26	==>	#2	0.000	0.000	Natural Channel Middle Pond to Section 25 Pond
Pond	#27	==>	#26	0.000	0.000	Middle Pond
Channel	#28	==>	#27	0.000	0.000	Natural Channel Middle Pond to Section 36 Pond
Pond	#29	==>	#28	0.000	0.000	Section 36 Pond
Channel	#30	==>	#29	0.000	0.000	Natural Channel Section 36 Pond to Upper Bobcat Draw
Channel	#31	==>	#30	0.000	0.000	Upper Bobcat Draw 0+00 to 21+33
Pond	#32	==>	#3	0.000	0.000	Coal Stockpile Pond
Channel	#33	==>	#32	0.000	0.000	D-5 Ditch
Channel	#34	==>	#32	0.000	0.000	D-7 Ditch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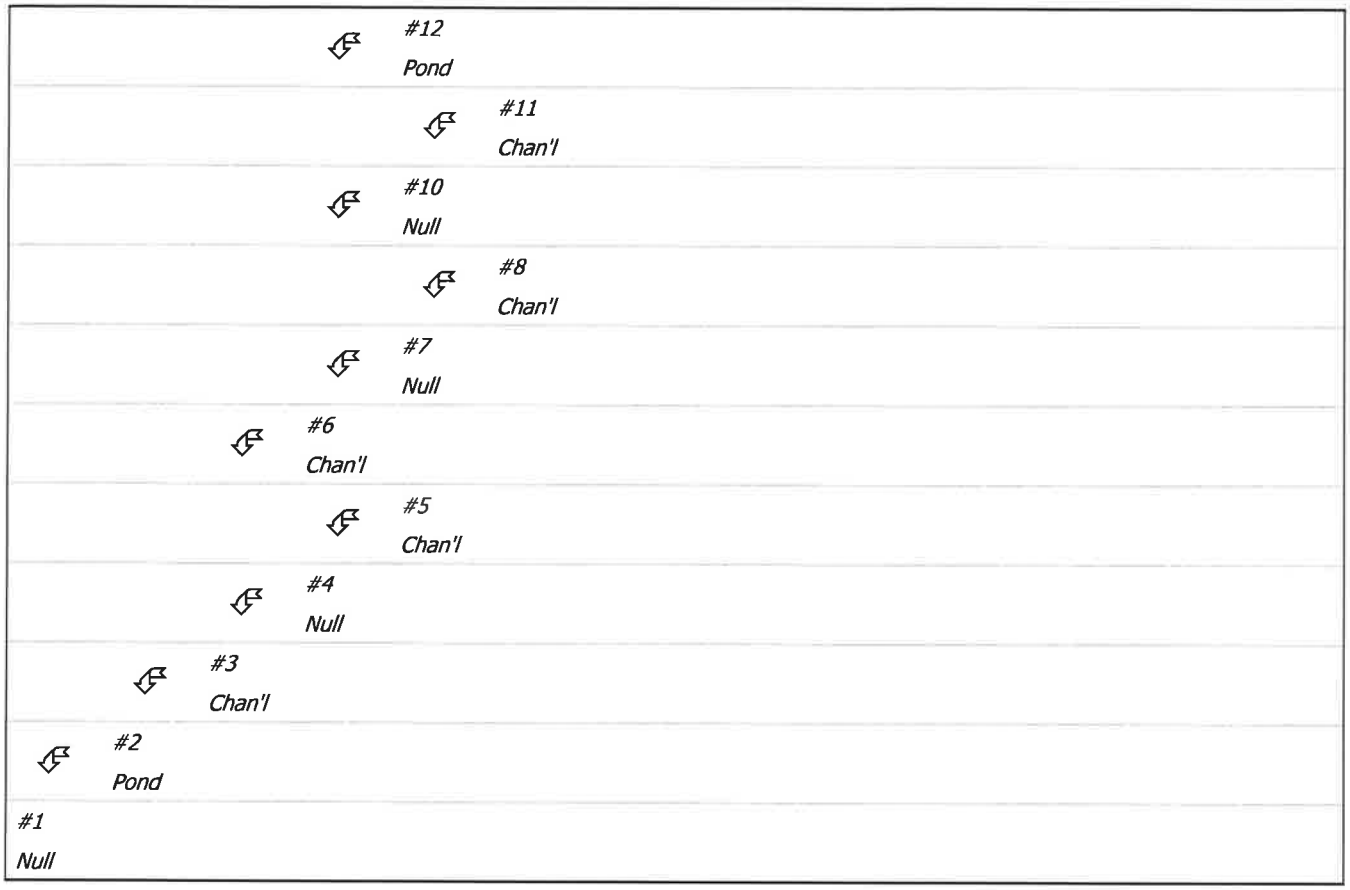
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Pond
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Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#31		163.300	163.300	22.75	2.66	168.5	94,141	47.61	22.99
#30		24.800	188.100	23.20	2.82	170.8	92,571	46.90	22.04
#29	In	0.000	188.100	23.20	2.82	170.8	92,571	46.90	22.04
	Out			8.95	2.81	45.9	14,013	0.19	0.17
#28		19.600	207.700	8.95	2.81	45.9	14,008	0.19	0.17
#27	In	0.000	207.700	8.95	2.81	45.9	14,008	0.19	0.17
	Out			3.55	2.79	36.7	11,320	0.00	0.00
#26		75.400	283.100	3.55	2.79	36.7	11,316	0.00	0.00
#34		69.600	69.600	8.10	1.43	5.3	4,997	2.05	1.11
#33		96.600	96.600	28.17	2.77	190.1	102,973	55.10	26.27
#32	In	0.000	166.200	30.61	4.20	195.4	92,488	49.18	17.80
	Out			0.00	0.00	195.4	0	0.00	0.00
#25		22.900	22.900	2.33	0.17	4.0	41,824	23.84	9.82
#24		0.000	22.900	2.33	0.17	4.0	41,824	23.84	9.82
#23		204.600	227.500	11.80	1.09	22.7	45,468	25.88	8.64
#22	In	0.000	227.500	11.80	1.09	22.7	45,468	25.88	8.64
	Out			0.00	0.00	22.7	0	0.00	0.00
#21		44.200	44.200	13.21	0.96	29.0	53,065	30.25	12.48
#20		0.000	44.200	13.21	0.96	29.0	53,065	30.25	12.48
#19		132.800	404.500	22.50	2.59	82.4	43,600	26.64	10.25
#18	In	0.000	404.500	22.50	2.59	82.4	43,600	26.64	10.25
	Out			0.76	0.51	0.0	0	0.00	0.00
#17		163.400	163.400	0.78	0.54	0.4	718	0.36	0.30
#16		0.000	163.400	0.78	0.54	0.4	718	0.36	0.30
#15		162.100	730.000	17.63	3.45	29.1	19,088	9.09	3.17
#14	In	0.000	730.000	17.63	3.45	29.1	19,088	9.09	3.17
	Out			1.76	1.37	0.0	0	0.00	0.00
#13		109.300	839.300	19.81	3.56	337.2	324,745	184.29	45.14
#12	In	0.000	839.300	19.81	3.56	337.2	324,745	184.29	45.14
	Out			1.30	1.45	0.0	0	0.00	0.00
#11		37.000	37.000	3.40	0.35	14.2	89,272	50.87	16.87
#10		0.000	37.000	3.40	0.35	14.2	89,272	50.87	16.87
#8		14.500	14.500	1.75	0.16	10.3	123,862	70.58	25.71
#7		0.000	14.500	1.75	0.16	10.3	123,862	70.58	25.71
#6		15.300	906.100	12.47	2.49	125.6	204,953	116.81	38.50
#5		14.800	14.800	0.02	0.01	0.1	4,152	2.37	1.57
#4		0.000	14.800	0.02	0.01	0.1	4,152	2.37	1.57

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#3		196.500	1,283.600	12.47	2.59	321.1	204,953	145.50	44.41
#2	In	0.000	1,566.700	12.49	5.39	357.8	204,680	130.40	15.01
	Out			1.42	2.83	7.7	2,236	0.00	0.00
#1		0.000	1,566.700	1.42	2.83	7.7	2,235	0.00	0.00

Particle Size Distribution(s) at Each Structure

Structure #31 (Upper Bobcat Draw 0+00 to 21+33):

Size (mm)	In/Out
4.7500	100.000%
0.0750	93.417%
0.0400	42.229%
0.0010	25.594%

Structure #30 (Natural Channel Section 36 Pond to Upper Bobcat Draw):

Size (mm)	In/Out
4.7500	100.000%
0.0750	93.145%
0.0400	42.107%
0.0010	25.519%

Structure #29 (Section 36 Pond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	93.145%	100.000%
0.0400	42.107%	100.000%
0.0010	25.519%	94.918%

Structure #28 (Natural Channel Middle Pond to Section 36 Pond):

Size (mm)	In/Out
4.7500	100.000%
0.0750	100.000%
0.0400	100.000%
0.0010	94.918%

Structure #27 (Middle Pond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	100.000%	100.000%
0.0400	100.000%	100.000%
0.0010	94.918%	100.000%

Structure #26 (Natural Channel Middle Pond to Section 25 Pond):

Size (mm)	In/Out
4.7500	100.000%
0.0750	100.000%
0.0400	100.000%
0.0010	100.000%

Structure #34 (D-7 Ditch):

Size (mm)	In/Out
4.7500	100.000%
0.0750	100.000%
0.0400	55.949%
0.0010	33.908%

Structure #33 (D-5 Ditch):

Size (mm)	In/Out
4.7500	100.000%
0.0750	84.067%
0.0400	38.003%
0.0010	23.032%

Structure #32 (Coal Stockpile Pond):

Size (mm)	In	Out
4.7500	100.000%	0.000%
0.0750	84.496%	0.000%
0.0400	38.486%	0.000%
0.0010	23.325%	0.000%

Structure #25 (Sharpie Draw):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

Structure #24 (Null at Confluence with Sharpie Draw):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

Structure #23 (Little Collom Gulch LCG-4 to 102+79):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.261%
0.0400	33.118%
0.0010	20.071%

Structure #22 (LCG-4 Stockpond):

Size (mm)	In	Out
4.7500	100.000%	0.000%
0.0750	73.261%	0.000%
0.0400	33.118%	0.000%
0.0010	20.071%	0.000%

Structure #21 (Grouse Draw):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

Structure #20 (Null at Confluence with Grouse Draw):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

Structure #19 (Little Collom Gulch LCG-3 to LCG-4):

Size (mm)	In/Out
4.7500	72.392%
0.0750	59.958%
0.0400	27.104%
0.0010	16.427%

Structure #18 (LCG-3 Stockpond):

Size (mm)	In	Out
4.7500	72.392%	100.000%
0.0750	59.958%	100.000%
0.0400	27.104%	100.000%
0.0010	16.427%	100.000%

Structure #17 (Sage Draw):

Size (mm)	In/Out
4.7500	100.000%
0.0750	94.202%
0.0400	42.585%
0.0010	25.809%

Structure #16 (Null at Confluence with Sage Draw):

Size (mm)	In/Out
4.7500	100.000%
0.0750	94.202%
0.0400	42.585%
0.0010	25.809%

Structure #15 (Little Collom Gulch LCG-2 to LCG-3):

Size (mm)	In/Out
4.7500	100.000%
0.0750	99.882%
0.0400	46.474%
0.0010	28.166%

Structure #14 (LCG-2 Stockpond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	99.882%	100.000%
0.0400	46.474%	100.000%
0.0010	28.166%	100.000%

Structure #13 (Little Collom Gulch LCG-1 to LCG-2):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.704%
0.0400	33.354%
0.0010	20.215%

Structure #12 (LCG-1 Stockpond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	73.704%	100.000%
0.0400	33.354%	100.000%
0.0010	20.215%	100.000%

Structure #11 (Upper Terrace Ditch):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.044%
0.0400	33.020%
0.0010	20.012%

Structure #10 (Null at Confluence Upper Terrace Ditch):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.044%
0.0400	33.020%
0.0010	20.012%

Structure #8 (Lower Terrace Ditch):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.037%
0.0400	33.017%
0.0010	20.010%

Structure #7 (Null at Confluence Lower Terrace Ditch):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.037%
0.0400	33.017%
0.0010	20.010%

Structure #6 (Little Collom Gulch 0+00 to LCG-1):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.008%
0.0400	33.004%
0.0010	20.002%

Structure #5 (D-3 Ditch):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

Structure #4 (Null at Confluence with D-3 Ditch):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

Structure #3 (Little Collom Gulch Natural Channel):

Size (mm)	In/Out
4.7500	39.155%
0.0750	28.589%
0.0400	12.924%
0.0010	7.833%

Structure #2 (Section 25 Pond):

Size (mm)	In	Out
4.7500	45.395%	100.000%
0.0750	35.913%	100.000%
0.0400	21.854%	100.000%
0.0010	17.285%	100.000%

Structure #1:

Size (mm)	In/Out
4.7500	100.000%
0.0750	100.000%
0.0400	100.000%
0.0010	100.000%

Structure Detail:

Structure #31 (Riprap Channel)

Upper Bobcat Draw 0+00 to 21+33

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	8.3	3.76		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	22.75 cfs	
Depth:	0.24 ft	4.00 ft
Top Width:	11.43 ft	33.99 ft
Velocity*:		
X-Section Area:	2.55 sq ft	
Hydraulic Radius:	0.222 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #30 (Vegetated Channel)

Natural Channel Section 36 Pond to Upper Bobcat Draw

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	12.9	D, B				5.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	23.20 cfs		23.20 cfs	
Depth:	0.52 ft		0.81 ft	
Top Width:	7.08 ft		8.24 ft	
Velocity:	7.40 fps		4.33 fps	
X-Section Area:	3.13 sq ft		5.35 sq ft	
Hydraulic Radius:	0.428 ft		0.621 ft	
Froude Number:	1.96		0.95	
Roughness Coefficient:	0.0410		0.0898	

Structure #29 (Pond)

Section 36 Pond

Pond Inputs:

Initial Pool Elev:	7,116.00 ft
Initial Pool:	0.97 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
18.00	11.00	18.00	170.00	3.00	0.0150	7,118.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,125.00	46.00	3.00:1	3.00:1	30.00

Pond Results:

Peak Elevation:	7,119.12 ft
H'graph Detention Time:	3.35 hrs
Pond Model:	CSTRS
Dewater Time:	0.95 days
Trap Efficiency:	73.11 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
7,105.00	0.000	0.000	0.000		Top of Sed. Storage
7,106.00	0.010	0.003	0.000		
7,107.00	0.025	0.020	0.000		
7,108.00	0.038	0.052	0.000		
7,109.00	0.053	0.097	0.000		
7,110.00	0.075	0.161	0.000		
7,111.00	0.093	0.244	0.000		
7,112.00	0.112	0.347	0.000		
7,113.00	0.132	0.469	0.000		
7,114.00	0.154	0.611	0.000		
7,115.00	0.178	0.777	0.000		
7,116.00	0.205	0.969	0.000		Low hole SPW #1
7,117.00	0.235	1.188	0.473	5.63*	
7,118.00	0.267	1.439	0.669	5.40	Spillway #1
7,119.00	0.301	1.723	8.509	11.50	
7,119.12	0.308	1.763	8.948	0.25	Peak Stage
7,120.00	0.340	2.043	12.033		
7,121.00	0.387	2.407	14.738		
7,122.00	0.433	2.816	17.018		
7,123.00	0.485	3.275	19.026		
7,124.00	0.538	3.786	20.842		
7,125.00	0.599	4.355	22.512		Spillway #2
7,126.00	0.664	4.986	82.907		
7,127.00	0.732	5.684	248.131		
7,128.00	0.813	6.456	490.139		
7,129.00	0.915	7.319	829.643		
7,130.00	1.043	8.298	1,243.042		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,105.00	0.000	0.000	0.000
7,106.00	0.000	0.000	0.000
7,107.00	0.000	0.000	0.000
7,108.00	0.000	0.000	0.000

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,109.00	0.000	0.000	0.000
7,110.00	0.000	0.000	0.000
7,111.00	0.000	0.000	0.000
7,112.00	0.000	0.000	0.000
7,113.00	0.000	0.000	0.000
7,114.00	0.000	0.000	0.000
7,115.00	0.000	0.000	0.000
7,116.00	3.00>0.000	0.000	0.000
7,117.00	0.473	0.000	0.473
7,118.00	0.669	0.000	0.669
7,119.00	8.509	0.000	8.509
7,120.00	12.033	0.000	12.033
7,121.00	14.738	0.000	14.738
7,122.00	17.018	0.000	17.018
7,123.00	19.026	0.000	19.026
7,124.00	20.842	0.000	20.842
7,125.00	22.512	0.000	22.512
7,126.00	24.066	58.841	82.907
7,127.00	25.526	222.604	248.131
7,128.00	26.907	463.232	490.139
7,129.00	28.220	801.423	829.643
7,130.00	29.205	1,213.837	1,243.042

Structure #28 (Vegetated Channel)

Natural Channel Middle Pond to Section 36 Pond

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.4	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	8.95 cfs		8.95 cfs	
Depth:	0.43 ft		0.76 ft	

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Top Width:	6.72 ft		8.03 ft	
Velocity:	3.55 fps		1.81 fps	
X-Section Area:	2.52 sq ft		4.94 sq ft	
Hydraulic Radius:	0.364 ft		0.589 ft	
Froude Number:	1.02		0.41	
Roughness Coefficient:	0.0539		0.1461	

Structure #27 (Pond)

Middle Pond

Pond Inputs:

Initial Pool Elev:	7,057.00 ft
Initial Pool:	0.53 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
18.00	10.00	18.00	198.00	5.00	0.0150	7,061.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,066.00	38.00	3.00:1	3.00:1	24.00

Pond Results:

Peak Elevation:	7,061.34 ft
H'graph Detention Time:	5.92 hrs
Pond Model:	CSTRS
Dewater Time:	1.27 days
Trap Efficiency:	20.09 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
7,048.00	0.000	0.000	0.000		Top of Sed. Storage
7,049.00	0.009	0.003	0.000		
7,050.00	0.021	0.018	0.000		
7,051.00	0.035	0.045	0.000		
7,052.00	0.050	0.088	0.000		
7,053.00	0.063	0.144	0.000		
7,054.00	0.078	0.214	0.000		
7,055.00	0.095	0.301	0.000		
7,056.00	0.113	0.405	0.000		
7,057.00	0.132	0.527	0.000		Low hole SPW #1
7,058.00	0.158	0.672	0.473	3.71*	
7,059.00	0.183	0.842	0.669	4.40	
7,060.00	0.210	1.038	0.819	4.60	
7,061.00	0.248	1.267	0.945	7.55	Spillway #1
7,061.34	0.260	1.359	3.554	10.15	Peak Stage
7,062.00	0.284	1.533	8.509		
7,063.00	0.327	1.838	12.033		
7,064.00	0.371	2.187	14.738		
7,065.00	0.417	2.581	17.018		
7,066.00	0.465	3.022	19.026		Spillway #2
7,067.00	0.522	3.515	71.605		
7,068.00	0.576	4.064	211.288		
7,069.00	0.628	4.665	418.987		
7,070.00	0.685	5.322	716.430		
7,071.00	0.760	6.044	1,074.454		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,048.00	0.000	0.000	0.000
7,049.00	0.000	0.000	0.000
7,050.00	0.000	0.000	0.000
7,051.00	0.000	0.000	0.000
7,052.00	0.000	0.000	0.000
7,053.00	0.000	0.000	0.000
7,054.00	0.000	0.000	0.000

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,055.00	0.000	0.000	0.000
7,056.00	0.000	0.000	0.000
7,057.00	3.00>0.000	0.000	0.000
7,058.00	0.473	0.000	0.473
7,059.00	0.669	0.000	0.669
7,060.00	0.819	0.000	0.819
7,061.00	0.945	0.000	0.945
7,062.00	8.509	0.000	8.509
7,063.00	12.033	0.000	12.033
7,064.00	14.738	0.000	14.738
7,065.00	17.018	0.000	17.018
7,066.00	19.026	0.000	19.026
7,067.00	20.842	50.763	71.605
7,068.00	22.512	188.776	211.288
7,069.00	24.066	394.921	418.987
7,070.00	25.526	690.903	716.430
7,071.00	26.907	1,047.547	1,074.454

Structure #26 (Vegetated Channel)

Natural Channel Middle Pond to Section 25 Pond

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.4	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	3.55 cfs		3.55 cfs	
Depth:	0.29 ft		0.57 ft	
Top Width:	6.16 ft		7.30 ft	
Velocity:	2.19 fps		1.01 fps	
X-Section Area:	1.62 sq ft		3.53 sq ft	
Hydraulic Radius:	0.258 ft		0.466 ft	
Froude Number:	0.75		0.26	

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Roughness Coefficient:	0.0694		0.2250	

Structure #34 (Vegetated Channel)

D-7 Ditch

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.0	D, B	2.25			6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	8.10 cfs		8.10 cfs	
Depth:	0.42 ft	2.67 ft	0.75 ft	3.00 ft
Top Width:	6.68 ft	15.68 ft	8.00 ft	17.00 ft
Velocity:	3.30 fps		1.66 fps	
X-Section Area:	2.45 sq ft		4.88 sq ft	
Hydraulic Radius:	0.357 ft		0.584 ft	
Froude Number:	0.96		0.37	
Roughness Coefficient:	0.0555		0.1537	

Structure #33 (Riprap Channel)

D-5 Ditch

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	2.0	3.69		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	28.17 cfs	
Depth:	0.31 ft	4.00 ft
Top Width:	13.22 ft	27.98 ft
Velocity*:		
X-Section Area:	3.85 sq ft	
Hydraulic Radius:	0.288 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #32 (Pond)

Coal Stockpile Pond

Pond Inputs:

Initial Pool Elev:	7,213.00 ft
Initial Pool:	2.70 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**No sediment capacity defined*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,217.00	25.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	7,216.58 ft
H'graph Detention Time:	0.00 hrs
Pond Model:	CSTRS
Dewater Time:	0.00 days
Trap Efficiency:	0.00 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
7,210.00	0.779	0.000	0.000		Top of Sed. Storage
7,211.00	0.860	0.819	0.000		
7,212.00	0.928	1.713	0.000		
7,213.00	1.049	2.701	0.000		
7,214.00	1.090	3.770	0.000		
7,215.00	1.175	4.903	0.000		
7,216.00	1.268	6.124	0.000		
7,216.58	1.345	6.896	0.000	0.00	Peak Stage
7,217.00	1.390	7.452	0.000		Spillway #1
7,218.00	1.513	8.903	47.313		
7,219.00	1.632	10.475	170.230		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,210.00	0.000	0.000
7,211.00	0.000	0.000
7,212.00	0.000	0.000
7,213.00	0.000	0.000
7,214.00	0.000	0.000
7,215.00	0.000	0.000
7,216.00	0.000	0.000
7,217.00	0.000	0.000
7,218.00	47.313	47.313
7,219.00	170.230	170.230

Structure #25 (Riprap Channel)

Sharpie Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	22.0	2.95		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.33 cfs	
Depth:	0.03 ft	2.98 ft
Top Width:	10.17 ft	27.87 ft
Velocity*:		
X-Section Area:	0.28 sq ft	
Hydraulic Radius:	0.028 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #24 (Null)

Null at Confluence with Sharpie Draw

Structure #23 (Riprap Channel)

Little Collom Gulch LCG-4 to 102+79

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	7.4	3.80		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	11.80 cfs	
Depth:	0.14 ft	3.94 ft
Top Width:	10.87 ft	33.67 ft
Velocity*:		
X-Section Area:	1.51 sq ft	
Hydraulic Radius:	0.139 ft	
Froude Number*:		
Manning's n*:		
Dmin:	1.00 in	

	w/o Freeboard	w/ Freeboard
D50:	3.00 in	
Dmax:	3.75 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #22 (Pond)

LCG-4 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	20.00	2.00:1	2.00:1	15.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	103.71 ft
H'graph Detention Time:	0.00 hrs
Pond Model:	CSTRS
Dewater Time:	0.00 days
Trap Efficiency:	0.00 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		Top of Sed. Storage
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
103.71	0.707	1.428	0.000	0.00	Peak Stage
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
106.00	0.872	3.273	2.094		
107.00	0.872	4.145	4.414		Spillway #1
108.00	0.872	5.017	42.121		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094
107.00	0.000	(5)>4.414	4.414
108.00	36.939	(6)>5.182	42.121

Structure #21 (Riprap Channel)

Grouse Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	16.8	3.90		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	13.21 cfs	
Depth:	0.13 ft	4.03 ft
Top Width:	10.76 ft	34.16 ft
Velocity*:		
X-Section Area:	1.32 sq ft	
Hydraulic Radius:	0.122 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #20 (Null)

Null at Confluence with Grouse Draw

Structure #19 (Riprap Channel)

Little Collom Gulch LCG-3 to LCG-4

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	7.8	3.76		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	22.50 cfs	
Depth:	0.24 ft	4.00 ft
Top Width:	11.42 ft	33.98 ft
Velocity*:		
X-Section Area:	2.53 sq ft	
Hydraulic Radius:	0.220 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #18 (Pond)

LCG-3 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	20.00	2.00:1	2.00:1	15.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	105.36 ft
H'graph Detention Time:	10.91 hrs
Pond Model:	CSTRS
Dewater Time:	1.04 days
Trap Efficiency:	100.00 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		Top of Sed. Storage
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
105.36	0.828	2.726	0.756	25.00	Peak Stage
106.00	0.872	3.273	2.094		
107.00	0.872	4.145	4.414		Spillway #1
108.00	0.872	5.017	42.121		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094
107.00	0.000	(5)>4.414	4.414
108.00	36.939	(6)>5.182	42.121

Structure #17 (Riprap Channel)

Sage Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	3.0:1	3.0:1	2.1	2.89		

Riprap Channel Results:

Simons/OSM Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.78 cfs	
Depth:	0.11 ft	3.00 ft
Top Width:	5.68 ft	23.02 ft
Velocity:	1.29 fps	

	w/o Freeboard	w/ Freeboard
X-Section Area:	0.61 sq ft	
Hydraulic Radius:	0.106 ft	
Froude Number:	0.69	
Manning's n:	0.0377	
Dmin:	2.00 in	
D50:	9.00 in	
Dmax:	12.00 in	

Structure #16 (Null)

Null at Confluence with Sage Draw

Structure #15 (Riprap Channel)

Little Collom Gulch LCG-2 to LCG-3

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	4.7	3.77		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	17.63 cfs	
Depth:	0.19 ft	3.96 ft
Top Width:	11.17 ft	33.79 ft
Velocity*:		
X-Section Area:	2.06 sq ft	
Hydraulic Radius:	0.184 ft	
Froude Number*:		
Manning's n*:		
Dmin:	1.00 in	
D50:	3.00 in	
Dmax:	3.75 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #14 (Pond)

LCG-2 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	30.00	2.00:1	2.00:1	20.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
18.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	105.56 ft
H'graph Detention Time:	8.64 hrs
Pond Model:	CSTRS
Dewater Time:	1.21 days
Trap Efficiency:	100.00 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		Top of Sed. Storage
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
105.56	0.842	2.898	1.764	25.75	Peak Stage
106.00	0.872	3.273	3.142		
107.00	0.872	4.145	8.425		Spillway #1
108.00	0.872	5.017	56.073		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>3.142	3.142
107.00	0.000	(5)>8.425	8.425
108.00	43.900	(5)>12.173	56.073

Structure #13 (Riprap Channel)

Little Collom Gulch LCG-1 to LCG-2

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	4.9	3.72		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	19.81 cfs	
Depth:	0.21 ft	3.93 ft
Top Width:	11.28 ft	33.60 ft
Velocity*:		
X-Section Area:	2.28 sq ft	
Hydraulic Radius:	0.201 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #12 (Pond)

LCG-1 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	30.00	2.00:1	2.00:1	20.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	105.62 ft
H'graph Detention Time:	11.33 hrs
Pond Model:	CSTRS
Dewater Time:	1.20 days
Trap Efficiency:	100.00 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		Top of Sed. Storage
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
105.62	0.846	2.949	1.303	23.90	Peak Stage
106.00	0.872	3.273	2.094		
107.00	0.872	4.145	4.414		Spillway #1
108.00	0.872	5.017	49.083		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094
107.00	0.000	(5)>4.414	4.414
108.00	43.900	(6)>5.182	49.083

Structure #11 (Vegetated Channel)

Upper Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	2.0	D, B	1.55			7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	3.40 cfs		3.40 cfs	
Depth:	0.90 ft	2.45 ft	1.45 ft	3.00 ft

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Top Width:	4.07 ft	11.05 ft	6.53 ft	13.51 ft
Velocity:	1.85 fps		0.72 fps	
X-Section Area:	1.84 sq ft		4.74 sq ft	
Hydraulic Radius:	0.413 ft		0.663 ft	
Froude Number:	0.48		0.15	
Roughness Coefficient:	0.0633		0.2235	

Structure #10 (Null)

Null at Confluence Upper Terrace Ditch

Structure #8 (Vegetated Channel)

Lower Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	2.0	D, B				7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	1.75 cfs		1.75 cfs	
Depth:	0.74 ft		1.25 ft	
Top Width:	3.35 ft		5.64 ft	
Velocity:	1.40 fps		0.50 fps	
X-Section Area:	1.25 sq ft		3.54 sq ft	
Hydraulic Radius:	0.340 ft		0.573 ft	
Froude Number:	0.41		0.11	
Roughness Coefficient:	0.0731		0.2934	

Structure #7 (Null)

Null at Confluence Lower Terrace Ditch

Structure #6 (Riprap Channel)

Little Collom Gulch 0+00 to LCG-1

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
15.00	3.0:1	3.0:1	16.6	3.94		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	12.47 cfs	
Depth:	0.06 ft	4.00 ft
Top Width:	15.39 ft	39.03 ft
Velocity*:		
X-Section Area:	0.99 sq ft	
Hydraulic Radius:	0.064 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #5 (Riprap Channel)

D-3 Ditch

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	16.1	2.98		

Riprap Channel Results:

Simons/OSM Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.02 cfs	
Depth:	0.02 ft	3.00 ft
Top Width:	12.07 ft	23.99 ft

	w/o Freeboard	w/ Freeboard
Velocity:	0.11 fps	
X-Section Area:	0.21 sq ft	
Hydraulic Radius:	0.017 ft	
Froude Number:	0.15	
Manning's n:	0.0322	
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	9.00 in	

Structure #4 (Null)

Null at Confluence with D-3 Ditch

Structure #3 (Vegetated Channel)

Little Collom Gulch Natural Channel

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	5.7	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	12.47 cfs		12.47 cfs	
Depth:	0.51 ft		0.87 ft	
Top Width:	7.05 ft		8.48 ft	
Velocity:	4.04 fps		2.13 fps	
X-Section Area:	3.08 sq ft		5.86 sq ft	
Hydraulic Radius:	0.423 ft		0.660 ft	
Froude Number:	1.08		0.45	
Roughness Coefficient:	0.0495		0.1265	

Structure #2 (Pond)

Section 25 Pond

Pond Inputs:

Initial Pool Elev:	6,868.00 ft
Initial Pool:	4.36 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
18.00	16.00	18.00	182.00	5.00	0.0150	6,872.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,875.00	45.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	6,872.06 ft
H'graph Detention Time:	8.69 hrs
Pond Model:	CSTRS
Dewater Time:	2.41 days
Trap Efficiency:	97.85 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
6,855.00	0.047	0.000	0.000		Top of Sed. Storage
6,856.00	0.102	0.073	0.000		
6,857.00	0.156	0.201	0.000		
6,858.00	0.191	0.374	0.000		
6,859.00	0.228	0.583	0.000		
6,860.00	0.266	0.830	0.000		
6,861.00	0.306	1.116	0.000		
6,862.00	0.348	1.443	0.000		
6,863.00	0.391	1.812	0.000		
6,864.00	0.436	2.225	0.000		
6,865.00	0.483	2.684	0.000		
6,866.00	0.532	3.192	0.000		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
6,867.00	0.582	3.749	0.000		
6,868.00	0.635	4.357	0.000		Low hole SPW #1
6,869.00	0.689	5.019	0.473	16.94*	
6,870.00	0.746	5.736	0.669	12.98*	
6,871.00	0.804	6.511	0.819	11.45*	
6,872.00	0.864	7.345	0.945	10.67*	Spillway #1
6,872.06	0.869	7.401	1.424	5.85	Peak Stage
6,873.00	0.927	8.240	8.509		
6,874.00	0.991	9.199	12.033		
6,875.00	1.060	10.224	14.738		Spillway #2
6,876.00	1.125	11.316	56.584		
6,877.00	1.187	12.472	168.142		
6,878.00	1.250	13.691	330.639		
6,879.00	1.318	14.974	558.801		
6,880.00	1.386	16.326	834.822		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,855.00	0.000	0.000	0.000
6,856.00	0.000	0.000	0.000
6,857.00	0.000	0.000	0.000
6,858.00	0.000	0.000	0.000
6,859.00	0.000	0.000	0.000
6,860.00	0.000	0.000	0.000
6,861.00	0.000	0.000	0.000
6,862.00	0.000	0.000	0.000
6,863.00	0.000	0.000	0.000
6,864.00	0.000	0.000	0.000
6,865.00	0.000	0.000	0.000
6,866.00	0.000	0.000	0.000
6,867.00	0.000	0.000	0.000
6,868.00	3.00>0.000	0.000	0.000
6,869.00	0.473	0.000	0.473
6,870.00	0.669	0.000	0.669
6,871.00	0.819	0.000	0.819

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,872.00	0.945	0.000	0.945
6,873.00	8.509	0.000	8.509
6,874.00	12.033	0.000	12.033
6,875.00	14.738	0.000	14.738
6,876.00	17.018	39.567	56.584
6,877.00	19.026	149.116	168.142
6,878.00	20.842	309.797	330.639
6,879.00	22.512	536.289	558.801
6,880.00	24.066	810.756	834.822

Structure #1 (Null)

Null Below Section 25 Pond

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#31	1	29.000	0.087	0.000	0.000	62.000	M	0.22	0.118
	2	68.200	0.303	0.000	0.000	80.000	F	22.34	2.379
	3	38.800	0.277	0.000	0.000	47.000	S	0.00	0.000
	4	1.100	0.032	0.000	0.000	47.000	S	0.00	0.000
	5	4.000	0.055	0.000	0.000	62.000	M	0.03	0.016
	6	18.300	0.110	0.000	0.000	47.000	S	0.00	0.000
	7	3.900	0.075	0.000	0.000	80.000	F	2.01	0.144
	Σ	**163.300**						**22.75**	**2.658**
#30	1	19.400	0.122	0.000	0.000	47.000	S	0.00	0.000
	2	4.300	0.123	0.000	0.000	80.000	F	2.22	0.159
	3	1.100	0.053	0.000	0.000	62.000	M	0.00	0.000
	Σ	**188.100**						**23.20**	**2.817**
#29	**Σ**	**188.100**						**23.20**	**2.817**
#28	1	19.600	0.122	0.000	0.000	47.000	S	0.00	0.000
	Σ	**207.700**						**8.95**	**2.811**
#27	**Σ**	**207.700**						**8.95**	**2.811**
#26	1	75.400	0.381	0.000	0.000	47.000	S	0.00	0.000
	Σ	**283.100**						**3.55**	**2.791**
#34	1	69.600	0.574	0.000	0.000	74.000	F	8.10	1.426
	Σ	**69.600**						**8.10**	**1.426**
#33	1	1.800	0.024	0.000	0.000	47.000	S	0.00	0.000
	2	65.100	0.181	0.000	0.000	80.000	F	25.39	2.315
	3	15.600	0.063	0.000	0.000	47.000	S	0.00	0.000
	4	0.900	0.043	0.000	0.000	47.000	S	0.00	0.000
	5	11.100	0.059	0.000	0.000	80.000	F	5.72	0.411
	6	2.100	0.064	0.000	0.000	74.000	F	0.63	0.046
	Σ	**96.600**						**28.17**	**2.771**
#32	**Σ**	**166.200**						**30.61**	**4.197**
#25	1	7.800	0.050	0.000	0.000	74.000	F	2.33	0.169
	2	15.100	0.117	0.000	0.000	47.000	S	0.00	0.000
	Σ	**22.900**						**2.33**	**0.169**
#24	**Σ**	**22.900**						**2.33**	**0.169**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#23	1	32.600	0.025	0.000	0.000	62.000	M	0.25	0.133
	2	137.700	0.339	0.000	0.000	57.000	M	0.17	0.099
	3	31.700	0.054	0.000	0.000	74.000	F	9.47	0.689
	4	2.600	0.107	0.000	0.000	47.000	S	0.00	0.000
	Σ	**227.500**						**11.80**	**1.091**
#22	**Σ**	**227.500**						**11.80**	**1.091**
#21	1	44.200	0.101	0.000	0.000	74.000	F	13.21	0.960
	Σ	**44.200**						**13.21**	**0.960**
#20	**Σ**	**44.200**						**13.21**	**0.960**
#19	1	64.500	0.092	0.000	0.000	62.000	M	0.49	0.263
	2	65.600	0.187	0.000	0.000	74.000	F	12.91	1.363
	3	2.700	0.038	0.000	0.000	47.000	S	0.00	0.000
	Σ	**404.500**						**22.50**	**2.587**
#18	**Σ**	**404.500**						**22.50**	**2.587**
#17	1	163.400	0.197	0.000	0.000	62.000	M	0.78	0.536
	Σ	**163.400**						**0.78**	**0.536**
#16	**Σ**	**163.400**						**0.78**	**0.536**
#15	1	5.200	0.062	0.000	0.000	62.000	M	0.04	0.021
	2	47.800	0.189	0.000	0.000	62.000	M	0.23	0.158
	3	109.100	0.301	0.000	0.000	74.000	F	17.63	2.233
	Σ	**730.000**						**17.63**	**3.454**
#14	**Σ**	**730.000**						**17.63**	**3.454**
#13	1	27.700	0.095	0.000	0.000	62.000	M	0.21	0.113
	2	32.900	0.045	0.000	0.000	80.000	F	16.95	1.218
	3	42.000	0.302	0.000	0.000	74.000	F	6.78	0.860
	4	6.700	0.096	0.000	0.000	47.000	S	0.00	0.000
	Σ	**839.300**						**19.81**	**3.562**
#12	**Σ**	**839.300**						**19.81**	**3.562**
#11	1	30.400	0.137	0.000	0.000	62.000	M	0.15	0.101
	2	6.600	0.033	0.000	0.000	80.000	F	3.40	0.244
	Σ	**37.000**						**3.40**	**0.345**
#10	**Σ**	**37.000**						**3.40**	**0.345**
#8	1	11.100	0.133	0.000	0.000	62.000	M	0.05	0.037
	2	3.400	0.011	0.000	0.000	80.000	F	1.75	0.126

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	Σ	**14.500**						**1.75**	**0.163**
#7	Σ	**14.500**						**1.75**	**0.163**
#6	1	14.200	0.050	0.000	0.000	80.000	F	7.32	0.526
	2	1.100	0.013	0.000	0.000	62.000	M	0.00	0.000
	Σ	**906.100**						**12.47**	**2.489**
#5	1	14.800	0.083	0.000	0.000	57.000	F	0.02	0.013
	Σ	**14.800**						**0.02**	**0.013**
#4	Σ	**14.800**						**0.02**	**0.013**
#3	1	27.800	0.146	0.000	0.000	62.000	M	0.14	0.093
	2	168.700	0.579	0.000	0.000	47.000	S	0.00	0.000
	Σ	**1,283.600**						**12.47**	**2.594**
#2	Σ	**1,566.700**						**12.49**	**5.385**
#1	Σ	**1,566.700**						**1.42**	**2.828**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#31	1	0.300	200.00	11.60	0.0100	0.3800	1	0.0	303	0.17	0.13
	2	0.300	400.00	8.10	0.8000	0.3800	1	163.3	95,354	48.03	24.76
	3	0.300	400.00	7.10	0.0310	0.9000	1	0.0	1	0.00	0.00
	4	0.300	75.00	8.90	0.0310	0.9000	1	0.0	1	0.00	0.00
	5	0.300	100.00	10.00	0.0100	0.3800	1	0.0	124	0.07	0.05
	6	0.300	300.00	10.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	7	0.300	200.00	7.00	0.8000	0.3800	1	5.2	56,291	32.08	14.93
	Σ							**168.5**	**94,141**	**47.61**	**22.99**
#30	1	0.300	300.00	7.70	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	200.00	3.20	0.8000	0.3800	1	2.3	22,546	12.85	5.95
	3	0.300	75.00	3.10	0.0100	0.3800	1	0.0	1	0.00	0.00
	Σ							**170.8**	**92,571**	**46.90**	**22.04**
#29	Σ							**170.8**	**92,571**	**46.90**	**22.04**
#28	1	0.300	400.00	10.80	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**45.9**	**14,008**	**0.19**	**0.17**

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#27	Σ							**45.9**	**14,008**	**0.19**	**0.17**
#26	1	0.300	400.00	9.60	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**36.7**	**11,316**	**0.00**	**0.00**
#34	1	0.300	400.00	7.00	0.0700	0.3800	1	5.3	4,997	2.05	1.11
	Σ							**5.3**	**4,997**	**2.05**	**1.11**
#33	1	0.300	25.00	2.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	400.00	8.10	0.8000	0.3800	1	170.9	106,542	56.60	28.01
	3	0.300	200.00	11.90	0.0310	0.9000	1	0.0	1	0.00	0.00
	4	0.300	100.00	4.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	5	0.300	200.00	8.00	0.8000	0.3800	1	19.1	72,075	41.08	19.16
	6	0.300	100.00	6.00	0.0700	0.3800	1	0.1	2,999	1.71	0.70
	Σ							**190.1**	**102,973**	**55.10**	**26.27**
#32	Σ							**195.4**	**92,488**	**49.18**	**17.80**
#25	1	0.300	200.00	33.00	0.0700	0.3800	1	4.0	41,824	23.84	9.82
	2	0.300	400.00	14.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**4.0**	**41,824**	**23.84**	**9.82**
#24	Σ							**4.0**	**41,824**	**23.84**	**9.82**
#23	1	0.300	100.00	31.00	0.0100	0.3800	1	0.1	643	0.37	0.28
	2	0.300	400.00	14.00	0.0850	0.3800	1	0.5	4,580	2.45	2.15
	3	0.300	200.00	31.00	0.0700	0.3800	1	18.1	46,363	26.43	10.89
	4	0.300	100.00	4.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**22.7**	**45,468**	**25.88**	**8.64**
#22	Σ							**22.7**	**45,468**	**25.88**	**8.64**
#21	1	0.300	400.00	23.00	0.0700	0.3800	1	29.0	53,065	30.25	12.48
	Σ							**29.0**	**53,065**	**30.25**	**12.48**
#20	Σ							**29.0**	**53,065**	**30.25**	**12.48**
#19	1	0.300	400.00	15.00	0.0100	0.3800	1	0.2	706	0.40	0.30
	2	0.300	400.00	20.00	0.0700	0.3800	1	30.5	35,312	17.99	8.30
	3	0.300	20.00	2.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**82.4**	**43,600**	**26.64**	**10.25**
#18	Σ							**82.4**	**43,600**	**26.64**	**10.25**
#17	1	0.300	400.00	15.60	0.0100	0.3800	1	0.4	718	0.36	0.30
	Σ							**0.4**	**718**	**0.36**	**0.30**

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#16	Σ							**0.4**	**718**	**0.36**	**0.30**
#15	1	0.300	200.00	12.00	0.0100	0.3800	1	0.0	258	0.15	0.11
	2	0.300	400.00	16.00	0.0100	0.3800	1	0.1	639	0.32	0.27
	3	0.300	400.00	13.00	0.0700	0.3800	1	28.5	19,088	9.08	4.44
	Σ							**29.1**	**19,088**	**9.09**	**3.17**
#14	Σ							**29.1**	**19,088**	**9.09**	**3.17**
#13	1	0.300	200.00	11.00	0.0100	0.3800	1	0.0	280	0.16	0.12
	2	0.300	400.00	18.00	0.8000	0.3800	1	328.4	366,518	208.90	101.80
	3	0.300	400.00	12.00	0.0700	0.3800	1	8.8	15,308	7.28	3.56
	4	0.300	200.00	9.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**337.2**	**324,745**	**184.29**	**45.14**
#12	Σ							**337.2**	**324,745**	**184.29**	**45.14**
#11	1	0.300	400.00	10.00	0.0100	0.3800	1	0.0	276	0.14	0.12
	2	0.300	100.00	12.00	0.8000	0.3800	1	14.2	89,272	50.88	23.79
	Σ							**14.2**	**89,272**	**50.87**	**16.87**
#10	Σ							**14.2**	**89,272**	**50.87**	**16.87**
#8	1	0.300	400.00	14.00	0.0100	0.3800	1	0.0	458	0.23	0.20
	2	0.300	50.00	24.00	0.8000	0.3800	1	10.3	123,862	70.60	33.17
	Σ							**10.3**	**123,862**	**70.58**	**25.71**
#7	Σ							**10.3**	**123,862**	**70.58**	**25.71**
#6	1	0.300	200.00	21.00	0.8000	0.3800	1	101.1	272,821	155.50	74.68
	2	0.300	50.00	26.00	0.0100	0.3800	1	0.0	1	0.00	0.00
	Σ							**125.6**	**204,953**	**116.81**	**38.50**
#5	1	0.300	400.00	19.00	0.0310	0.9000	1	0.1	4,152	2.37	1.57
	Σ							**0.1**	**4,152**	**2.37**	**1.57**
#4	Σ							**0.1**	**4,152**	**2.37**	**1.57**
#3	1	0.300	400.00	12.00	0.0100	0.3800	1	0.0	418	0.21	0.18
	2	0.300	400.00	8.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**321.1**	**204,953**	**145.50**	**44.41**
#2	Σ							**357.8**	**204,680**	**130.40**	**15.01**
#1	Σ							**7.7**	**2,235**	**0.00**	**0.00**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	1	3. Short grass pasture	12.00	175.72	1,464.33	2.770	0.146
#3	**1**	**Time of Concentration:**					**0.146**
#3	2	3. Short grass pasture	8.00	377.06	4,713.25	2.260	0.579
#3	**2**	**Time of Concentration:**					**0.579**
#5	1	3. Short grass pasture	19.00	199.94	1,052.31	3.480	0.083
#5	**1**	**Time of Concentration:**					**0.083**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	21.00	174.93	833.00	4.580	0.050
#6	**1**	**Time of Concentration:**					**0.050**
#6	2	3. Short grass pasture	26.00	50.05	192.50	4.070	0.013
#6	**2**	**Time of Concentration:**					**0.013**
#8	1	3. Short grass pasture	14.00	200.44	1,431.71	2.990	0.133
#8	**1**	**Time of Concentration:**					**0.133**
#8	2	5. Nearly bare and untilled, and alluvial valley fans	24.00	49.92	208.00	4.890	0.011
#8	**2**	**Time of Concentration:**					**0.011**
#11	1	3. Short grass pasture	10.00	124.64	1,246.40	2.520	0.137
#11	**1**	**Time of Concentration:**					**0.137**
#11	2	5. Nearly bare and untilled, and alluvial valley fans	12.00	49.91	415.91	3.460	0.033
#11	**2**	**Time of Concentration:**					**0.033**
#13	1	3. Short grass pasture	11.00	99.97	908.81	2.650	0.095
#13	**1**	**Time of Concentration:**					**0.095**
#13	2	5. Nearly bare and untilled, and alluvial valley fans	18.00	124.68	692.66	4.240	0.045
#13	**2**	**Time of Concentration:**					**0.045**
#13	3	3. Short grass pasture	12.00	362.28	3,019.00	2.770	0.302
#13	**3**	**Time of Concentration:**					**0.302**
#13	4	3. Short grass pasture	9.00	75.29	836.55	2.400	0.096
#13	**4**	**Time of Concentration:**					**0.096**
#15	1	3. Short grass pasture	12.00	75.11	625.91	2.770	0.062
#15	**1**	**Time of Concentration:**					**0.062**
#15	2	3. Short grass pasture	16.00	349.80	2,186.25	3.200	0.189
#15	**2**	**Time of Concentration:**					**0.189**
#15	3	3. Short grass pasture	13.00	406.64	3,128.00	2.880	0.301
#15	**3**	**Time of Concentration:**					**0.301**
#17	1	3. Short grass pasture	15.60	349.44	2,240.00	3.150	0.197
#17	**1**	**Time of Concentration:**					**0.197**
#19	1	3. Short grass pasture	15.00	154.05	1,027.00	3.090	0.092
#19	**1**	**Time of Concentration:**					**0.092**
#19	2	3. Short grass pasture	20.00	481.40	2,407.00	3.570	0.187
#19	**2**	**Time of Concentration:**					**0.187**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#19	3	3. Short grass pasture	2.00	3.16	158.00	1.130	0.038
#19	**3**	**Time of Concentration:**					**0.038**
#21	1	3. Short grass pasture	23.00	320.85	1,395.00	3.830	0.101
#21	**1**	**Time of Concentration:**					**0.101**
#23	1	3. Short grass pasture	31.00	125.24	404.00	4.450	0.025
#23	**1**	**Time of Concentration:**					**0.025**
#23	2	3. Short grass pasture	14.00	511.84	3,656.00	2.990	0.339
#23	**2**	**Time of Concentration:**					**0.339**
#23	3	3. Short grass pasture	31.00	272.18	878.00	4.450	0.054
#23	**3**	**Time of Concentration:**					**0.054**
#23	4	3. Short grass pasture	4.00	24.88	622.00	1.600	0.107
#23	**4**	**Time of Concentration:**					**0.107**
#25	1	3. Short grass pasture	33.00	275.22	834.00	4.590	0.050
#25	**1**	**Time of Concentration:**					**0.050**
#25	2	3. Short grass pasture	14.00	176.68	1,262.00	2.990	0.117
#25	**2**	**Time of Concentration:**					**0.117**
#26	1	3. Short grass pasture	9.60	325.53	3,391.00	2.470	0.381
#26	**1**	**Time of Concentration:**					**0.381**
#28	1	3. Short grass pasture	10.80	124.52	1,153.00	2.620	0.122
#28	**1**	**Time of Concentration:**					**0.122**
#30	1	3. Short grass pasture	7.70	74.92	973.00	2.210	0.122
#30	**1**	**Time of Concentration:**					**0.122**
#30	2	5. Nearly bare and untilled, and alluvial valley fans	3.20	25.28	790.00	1.780	0.123
#30	**2**	**Time of Concentration:**					**0.123**
#30	3	3. Short grass pasture	3.10	8.30	268.00	1.400	0.053
#30	**3**	**Time of Concentration:**					**0.053**
#31	1	3. Short grass pasture	11.60	99.64	859.00	2.720	0.087
#31	**1**	**Time of Concentration:**					**0.087**
#31	2	5. Nearly bare and untilled, and alluvial valley fans	8.10	251.18	3,101.00	2.840	0.303
#31	**2**	**Time of Concentration:**					**0.303**
#31	3	3. Short grass pasture	7.10	150.87	2,125.00	2.130	0.277
#31	**3**	**Time of Concentration:**					**0.277**
#31	4	3. Short grass pasture	8.90	25.00	281.00	2.380	0.032
#31	**4**	**Time of Concentration:**					**0.032**
#31	5	3. Short grass pasture	10.00	50.00	500.00	2.520	0.055
#31	**5**	**Time of Concentration:**					**0.055**
#31	6	3. Short grass pasture	10.00	100.30	1,003.00	2.520	0.110
#31	**6**	**Time of Concentration:**					**0.110**
#31	7	5. Nearly bare and untilled, and alluvial valley fans	7.00	49.91	713.00	2.640	0.075
#31	**7**	**Time of Concentration:**					**0.075**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#33	1	3. Short grass pasture	2.00	2.00	100.00	1.130	0.024
#33	**1**	**Time of Concentration:**					**0.024**
#33	2	5. Nearly bare and untilled, and alluvial valley fans	8.10	150.01	1,852.00	2.840	0.181
#33	**2**	**Time of Concentration:**					**0.181**
#33	3	3. Short grass pasture	11.90	74.85	629.00	2.750	0.063
#33	**3**	**Time of Concentration:**					**0.063**
#33	4	5. Nearly bare and untilled, and alluvial valley fans	5.90	75.10	1,273.00	2.420	0.146
#33	**4**	**Time of Concentration:**					**0.043**
#33	5	5. Nearly bare and untilled, and alluvial valley fans	8.00	48.64	608.00	2.820	0.059
#33	**5**	**Time of Concentration:**					**0.059**
#33	6	3. Short grass pasture	6.00	27.06	451.00	1.950	0.064
#33	**6**	**Time of Concentration:**					**0.064**
#34	1	3. Short grass pasture	7.00	305.62	4,366.00	2.110	0.574
#34	**1**	**Time of Concentration:**					**0.574**

Section 25 Pond
Emergency Spillway Demonstration

25-Year 24-Hour Storm Event

Post-Mining Condition

Tony Tennyson

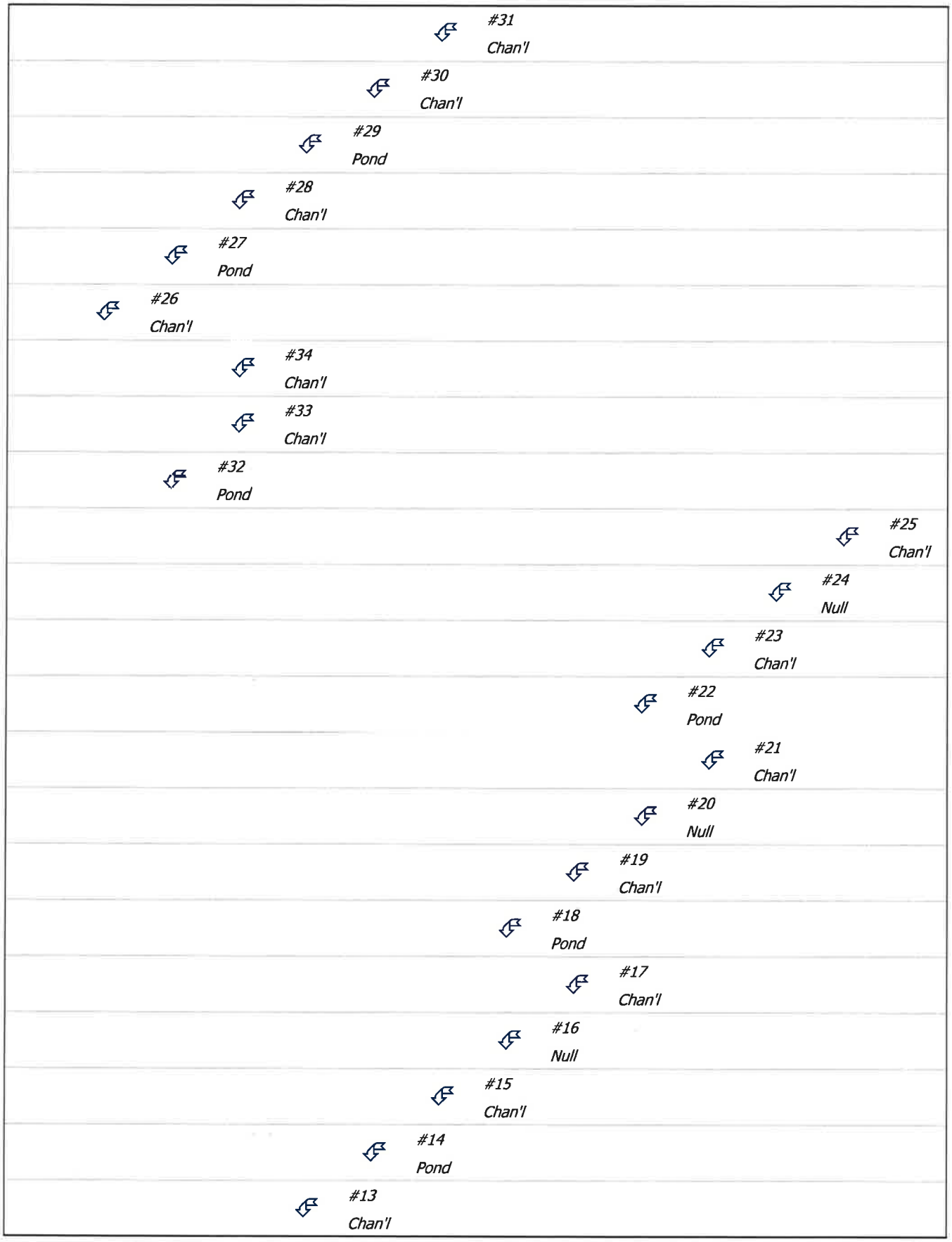
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	2.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Null Below Section 25 Pond
Pond	#2	==>	#1	0.000	0.000	Section 25 Pond
Channel	#3	==>	#2	0.000	0.000	Little Collom Gulch Natural Channel
Null	#4	==>	#3	0.000	0.000	Null at Confluence with D-3 Ditch
Channel	#5	==>	#4	0.000	0.000	D-3 Ditch
Channel	#6	==>	#3	0.000	0.000	Little Collom Gulch 0+00 to LCG-1
Null	#7	==>	#6	0.000	0.000	Null at Confluence Lower Terrace Ditch
Channel	#8	==>	#7	0.000	0.000	Lower Terrace Ditch
Null	#10	==>	#6	0.000	0.000	Null at Confluence Upper Terrace Ditch
Channel	#11	==>	#10	0.000	0.000	Upper Terrace Ditch
Pond	#12	==>	#6	0.000	0.000	LCG-1 Stockpond
Channel	#13	==>	#12	0.000	0.000	Little Collom Gulch LCG-1 to LCG-2
Pond	#14	==>	#13	0.000	0.000	LCG-2 Stockpond
Channel	#15	==>	#14	0.000	0.000	Little Collom Gulch LCG-2 to LCG-3
Null	#16	==>	#15	0.000	0.000	Null at Confluence with Sage Draw
Channel	#17	==>	#16	0.000	0.000	Sage Draw
Pond	#18	==>	#15	0.000	0.000	LCG-3 Stockpond
Channel	#19	==>	#18	0.000	0.000	Little Collom Gulch LCG-3 to LCG-4
Null	#20	==>	#19	0.000	0.000	Null at Confluence with Grouse Draw
Channel	#21	==>	#20	0.000	0.000	Grouse Draw
Pond	#22	==>	#19	0.000	0.000	LCG-4 Stockpond
Channel	#23	==>	#22	0.000	0.000	Little Collom Gulch LCG-4 to 102+79
Null	#24	==>	#23	0.000	0.000	Null at Confluence with Sharpie Draw
Channel	#25	==>	#24	0.000	0.000	Sharpie Draw
Channel	#26	==>	#2	0.000	0.000	Natural Channel Middle Pond to Section 25 Pond
Pond	#27	==>	#26	0.000	0.000	Middle Pond
Channel	#28	==>	#27	0.000	0.000	Natural Channel Middle Pond to Section 36 Pond
Pond	#29	==>	#28	0.000	0.000	Section 36 Pond
Channel	#30	==>	#29	0.000	0.000	Natural Channel Section 36 Pond to Upper Bobcat Draw
Channel	#31	==>	#30	0.000	0.000	Upper Bobcat Draw 0+00 to 21+33
Pond	#32	==>	#3	0.000	0.000	Coal Stockpile Pond
Channel	#33	==>	#32	0.000	0.000	D-5 Ditch
Channel	#34	==>	#32	0.000	0.000	D-7 Ditch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#30
Chan'l
#29
Pond
#28
Chan'l
#27
Pond
#26
Chan'l
#34
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Chan'l
#32
Pond
#25
Chan'l
#24
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#23
Chan'l
#22
Pond
#21
Chan'l
#20
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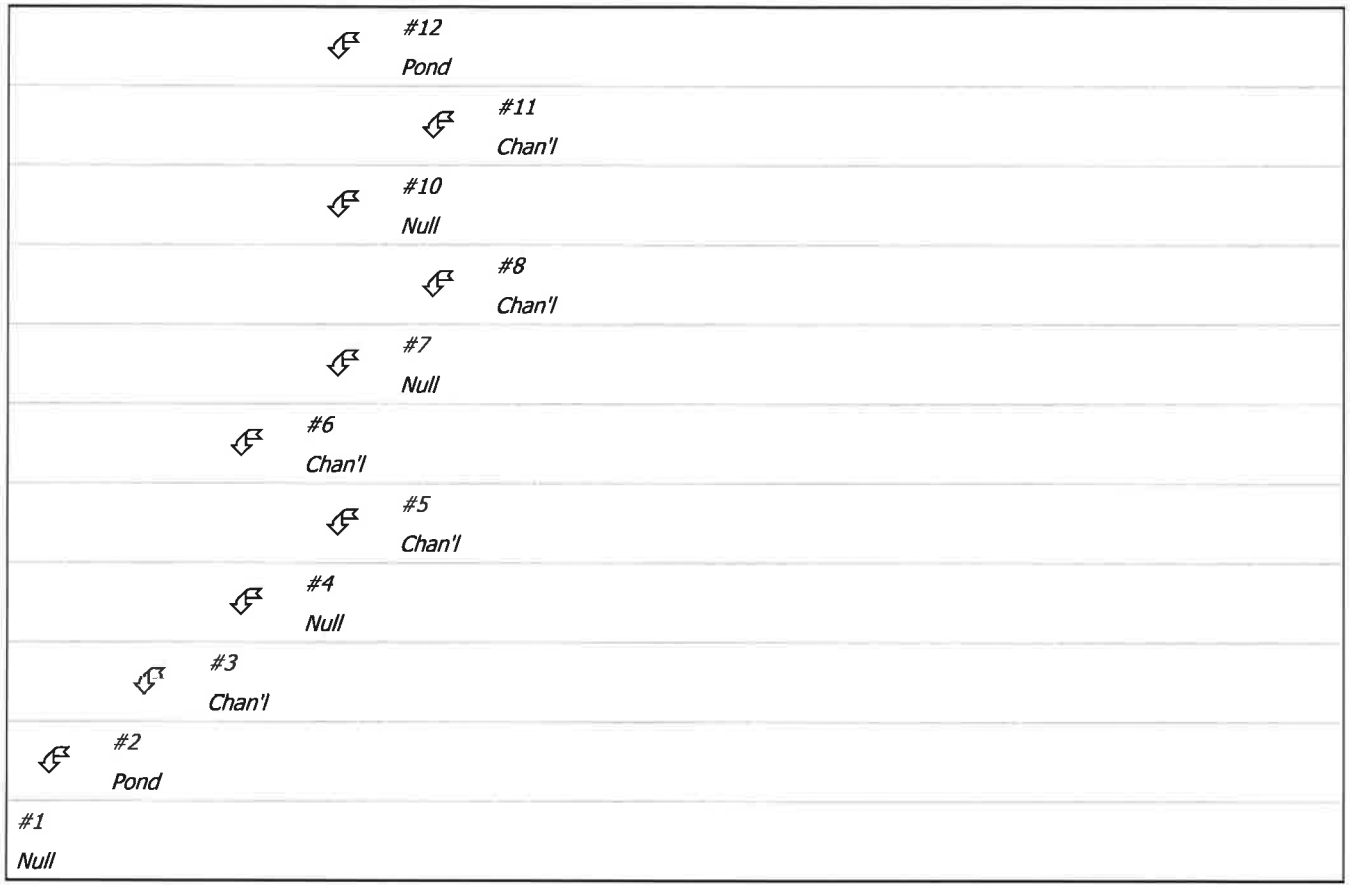
#14
Pond
#13
Chan'l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#11
Chan'l
#10
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#8
Chan'l
#7
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#6
Chan'l
#5
Chan'l
#4
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#3
Chan'l
#2
Pond
#1
Null

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#31		163.300	163.300	41.75	4.71
#30		24.800	188.100	42.52	4.99
#29	In	0.000	188.100	42.52	4.99
	Out			15.09	4.99
#28		19.600	207.700	15.09	4.99
#27	In	0.000	207.700	15.09	4.99
	Out			10.60	4.97
#26		75.400	283.100	10.60	4.97
#34		69.600	69.600	18.51	2.73
#33		96.600	96.600	50.74	4.70
#32	In	0.000	166.200	58.22	7.43
	Out			3.45	1.69
#25		22.900	22.900	4.53	0.32
#24		0.000	22.900	4.53	0.32
#23		204.600	227.500	27.45	2.76
#22	In	0.000	227.500	27.45	2.76
	Out			0.94	0.68
#21		44.200	44.200	25.68	1.84
#20		0.000	44.200	25.68	1.84
#19		132.800	404.500	57.81	5.98
#18	In	0.000	404.500	57.81	5.98
	Out			2.89	3.89
#17		163.400	163.400	7.93	1.75
#16		0.000	163.400	7.93	1.75
#15		162.100	730.000	49.22	10.49
#14	In	0.000	730.000	49.22	10.49
	Out			7.18	8.38
#13		109.300	839.300	41.37	12.46
#12	In	0.000	839.300	41.37	12.46
	Out			9.35	10.24
#11		37.000	37.000	5.95	0.74
#10		0.000	37.000	5.95	0.74
#8		14.500	14.500	3.02	0.33
#7		0.000	14.500	3.02	0.33
#6		15.300	906.100	21.23	12.22
#5		14.800	14.800	0.22	0.09
#4		0.000	14.800	0.22	0.09

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#3		196.500	1,283.600	21.53	14.31
#2	In	0.000	1,566.700	21.62	19.27
	Out			12.72	16.42
#1		0.000	1,566.700	12.72	16.42

Structure Detail:

Structure #31 (Riprap Channel)

Upper Bobcat Draw 0+00 to 21+33

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	8.3	3.62		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	41.75 cfs	
Depth:	0.38 ft	4.00 ft
Top Width:	12.30 ft	34.02 ft
Velocity*:		
X-Section Area:	4.27 sq ft	
Hydraulic Radius:	0.344 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #30 (Vegetated Channel)

Natural Channel Section 36 Pond to Upper Bobcat Draw

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	12.9	D, B				5.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	42.52 cfs		42.52 cfs	
Depth:	0.67 ft		0.97 ft	
Top Width:	7.68 ft		8.88 ft	
Velocity:	10.01 fps		6.32 fps	
X-Section Area:	4.25 sq ft		6.73 sq ft	
Hydraulic Radius:	0.531 ft		0.721 ft	
Froude Number:	2.37		1.28	
Roughness Coefficient:	0.0350		0.0681	

Structure #29 (Pond)

Section 36 Pond

Pond Inputs:

Initial Pool Elev:	7,116.00 ft
Initial Pool:	0.97 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
18.00	11.00	18.00	170.00	3.00	0.0150	7,118.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,125.00	46.00	3.00:1	3.00:1	30.00

Pond Results:

Peak Elevation:	7,121.16 ft
Dewater Time:	0.96 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
7,105.00	0.000	0.000	0.000		
7,106.00	0.010	0.003	0.000		
7,107.00	0.025	0.020	0.000		
7,108.00	0.038	0.052	0.000		
7,109.00	0.053	0.097	0.000		
7,110.00	0.075	0.161	0.000		
7,111.00	0.093	0.244	0.000		
7,112.00	0.112	0.347	0.000		
7,113.00	0.132	0.469	0.000		
7,114.00	0.154	0.611	0.000		
7,115.00	0.178	0.777	0.000		
7,116.00	0.205	0.969	0.000		Low hole SPW #1
7,117.00	0.235	1.188	0.473	5.63*	
7,118.00	0.267	1.439	0.669	5.35	Spillway #1
7,119.00	0.301	1.723	8.509	10.35	
7,120.00	0.340	2.043	12.033	0.75	
7,121.00	0.387	2.407	14.738	0.70	
7,121.16	0.394	2.470	15.091	0.20	Peak Stage
7,122.00	0.433	2.816	17.018		
7,123.00	0.485	3.275	19.026		
7,124.00	0.538	3.786	20.842		
7,125.00	0.599	4.355	22.512		Spillway #2
7,126.00	0.664	4.986	82.907		
7,127.00	0.732	5.684	248.131		
7,128.00	0.813	6.456	490.139		
7,129.00	0.915	7.319	829.643		
7,130.00	1.043	8.298	1,243.042		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,105.00	0.000	0.000	0.000
7,106.00	0.000	0.000	0.000
7,107.00	0.000	0.000	0.000
7,108.00	0.000	0.000	0.000
7,109.00	0.000	0.000	0.000

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,110.00	0.000	0.000	0.000
7,111.00	0.000	0.000	0.000
7,112.00	0.000	0.000	0.000
7,113.00	0.000	0.000	0.000
7,114.00	0.000	0.000	0.000
7,115.00	0.000	0.000	0.000
7,116.00	3.00>0.000	0.000	0.000
7,117.00	0.473	0.000	0.473
7,118.00	0.669	0.000	0.669
7,119.00	8.509	0.000	8.509
7,120.00	12.033	0.000	12.033
7,121.00	14.738	0.000	14.738
7,122.00	17.018	0.000	17.018
7,123.00	19.026	0.000	19.026
7,124.00	20.842	0.000	20.842
7,125.00	22.512	0.000	22.512
7,126.00	24.066	58.841	82.907
7,127.00	25.526	222.604	248.131
7,128.00	26.907	463.232	490.139
7,129.00	28.220	801.423	829.643
7,130.00	29.205	1,213.837	1,243.042

Structure #28 (Vegetated Channel)

Natural Channel Middle Pond to Section 36 Pond

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.4	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	15.09 cfs		15.09 cfs	
Depth:	0.54 ft		0.89 ft	
Top Width:	7.14 ft		8.55 ft	

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Velocity:	4.64 fps		2.51 fps	
X-Section Area:	3.25 sq ft		6.02 sq ft	
Hydraulic Radius:	0.440 ft		0.671 ft	
Froude Number:	1.21		0.53	
Roughness Coefficient:	0.0469		0.1150	

Structure #27 (Pond)

Middle Pond

Pond Inputs:

Initial Pool Elev:	7,057.00 ft
Initial Pool:	0.53 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
18.00	10.00	18.00	198.00	5.00	0.0150	7,061.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,066.00	38.00	3.00:1	3.00:1	24.00

Pond Results:

Peak Elevation:	7,062.59 ft
Dewater Time:	1.29 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
7,048.00	0.000	0.000	0.000	
7,049.00	0.009	0.003	0.000	
7,050.00	0.021	0.018	0.000	
7,051.00	0.035	0.045	0.000	
7,052.00	0.050	0.088	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
7,053.00	0.063	0.144	0.000		
7,054.00	0.078	0.214	0.000		
7,055.00	0.095	0.301	0.000		
7,056.00	0.113	0.405	0.000		
7,057.00	0.132	0.527	0.000		Low hole SPW #1
7,058.00	0.158	0.672	0.473	3.71*	
7,059.00	0.183	0.842	0.669	4.40	
7,060.00	0.210	1.038	0.819	4.55	
7,061.00	0.248	1.267	0.945	7.30	Spillway #1
7,062.00	0.284	1.533	8.509	10.00	
7,062.59	0.311	1.714	10.599	1.05	Peak Stage
7,063.00	0.327	1.838	12.033		
7,064.00	0.371	2.187	14.738		
7,065.00	0.417	2.581	17.018		
7,066.00	0.465	3.022	19.026		Spillway #2
7,067.00	0.522	3.515	71.605		
7,068.00	0.576	4.064	211.288		
7,069.00	0.628	4.665	418.987		
7,070.00	0.685	5.322	716.430		
7,071.00	0.760	6.044	1,074.454		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,048.00	0.000	0.000	0.000
7,049.00	0.000	0.000	0.000
7,050.00	0.000	0.000	0.000
7,051.00	0.000	0.000	0.000
7,052.00	0.000	0.000	0.000
7,053.00	0.000	0.000	0.000
7,054.00	0.000	0.000	0.000
7,055.00	0.000	0.000	0.000
7,056.00	0.000	0.000	0.000
7,057.00	3.00>0.000	0.000	0.000
7,058.00	0.473	0.000	0.473
7,059.00	0.669	0.000	0.669

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,060.00	0.819	0.000	0.819
7,061.00	0.945	0.000	0.945
7,062.00	8.509	0.000	8.509
7,063.00	12.033	0.000	12.033
7,064.00	14.738	0.000	14.738
7,065.00	17.018	0.000	17.018
7,066.00	19.026	0.000	19.026
7,067.00	20.842	50.763	71.605
7,068.00	22.512	188.776	211.288
7,069.00	24.066	394.921	418.987
7,070.00	25.526	690.903	716.430
7,071.00	26.907	1,047.547	1,074.454

Structure #26 (Vegetated Channel)

Natural Channel Middle Pond to Section 25 Pond

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.4	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	10.60 cfs		10.60 cfs	
Depth:	0.46 ft		0.80 ft	
Top Width:	6.84 ft		8.19 ft	
Velocity:	3.88 fps		2.01 fps	
X-Section Area:	2.73 sq ft		5.26 sq ft	
Hydraulic Radius:	0.387 ft		0.614 ft	
Froude Number:	1.08		0.44	
Roughness Coefficient:	0.0515		0.1352	

Structure #34 (Vegetated Channel)

D-7 Ditch

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.0	D, B	2.04			6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	18.51 cfs		18.51 cfs	
Depth:	0.59 ft	2.63 ft	0.96 ft	3.00 ft
Top Width:	7.38 ft	15.54 ft	8.85 ft	17.01 ft
Velocity:	5.03 fps		2.78 fps	
X-Section Area:	3.68 sq ft		6.67 sq ft	
Hydraulic Radius:	0.481 ft		0.717 ft	
Froude Number:	1.25		0.56	
Roughness Coefficient:	0.0445		0.1053	

Structure #33 (Riprap Channel)

D-5 Ditch

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	2.0	2.52		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	50.74 cfs	
Depth:	0.48 ft	3.00 ft
Top Width:	13.92 ft	24.00 ft
Velocity*:		
X-Section Area:	6.22 sq ft	
Hydraulic Radius:	0.440 ft	
Froude Number*:		

	w/o Freeboard	w/ Freeboard
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #32 (Pond)

Coal Stockpile Pond

Pond Inputs:

Initial Pool Elev:	7,212.00 ft
Initial Pool:	1.71 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,217.00	25.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	7,217.07 ft
Dewater Time:	0.37 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
7,210.00	0.779	0.000	0.000		
7,210.50	0.820	0.400	0.000		
7,211.00	0.860	0.819	0.000		
7,212.00	0.928	1.713	0.000		
7,213.00	1.049	2.701	0.000		
7,214.00	1.090	3.771	0.000		
7,215.00	1.175	4.903	0.000		
7,216.00	1.268	6.124	0.000		
7,217.00	1.390	7.452	0.000		Spillway #1
7,217.07	1.399	7.558	3.446	8.85	Peak Stage
7,218.00	1.513	8.904	47.313		
7,219.00	1.632	10.476	170.230		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,210.00	0.000	0.000
7,210.50	0.000	0.000
7,211.00	0.000	0.000
7,212.00	0.000	0.000
7,213.00	0.000	0.000
7,214.00	0.000	0.000
7,215.00	0.000	0.000
7,216.00	0.000	0.000
7,217.00	0.000	0.000
7,218.00	47.313	47.313
7,219.00	170.230	170.230

Structure #25 (Riprap Channel)

Sharpie Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	22.0	3.96		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.53 cfs	
Depth:	0.04 ft	4.00 ft
Top Width:	10.26 ft	34.02 ft
Velocity*:		
X-Section Area:	0.44 sq ft	
Hydraulic Radius:	0.043 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #24 (Null)

Null at Confluence with Sharpie Draw

Structure #23 (Riprap Channel)

Little Collom Gulch LCG-4 to 102+79

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	7.4	3.72		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	27.45 cfs	
Depth:	0.28 ft	4.00 ft
Top Width:	11.66 ft	33.98 ft
Velocity*:		
X-Section Area:	3.00 sq ft	
Hydraulic Radius:	0.255 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #22 (Pond)

LCG-4 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	20.00	2.00:1	2.00:1	15.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	105.45 ft
Dewater Time:	1.29 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
105.45	0.834	2.802	0.943	25.95	Peak Stage
106.00	0.872	3.273	2.094		
107.00	0.872	4.145	4.414		Spillway #1
108.00	0.872	5.017	42.121		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094
107.00	0.000	(5)>4.414	4.414
108.00	36.939	(6)>5.182	42.121

Structure #21 (Riprap Channel)

Grouse Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	16.8	3.90		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	25.68 cfs	
Depth:	0.21 ft	4.11 ft
Top Width:	11.27 ft	34.67 ft
Velocity*:		
X-Section Area:	2.26 sq ft	
Hydraulic Radius:	0.199 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #20 (Null)

Null at Confluence with Grouse Draw

Structure #19 (Riprap Channel)

Little Collom Gulch LCG-3 to LCG-4

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	7.8	3.50		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	57.81 cfs	
Depth:	0.50 ft	4.00 ft
Top Width:	12.97 ft	33.97 ft
Velocity*:		
X-Section Area:	5.69 sq ft	
Hydraulic Radius:	0.433 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #18 (Pond)

LCG-3 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	20.00	2.00:1	2.00:1	15.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	106.34 ft
Dewater Time:	0.55 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
106.00	0.872	3.273	2.094	4.95*	
106.34	0.862	3.573	2.892	8.35	Peak Stage
107.00	0.872	4.145	4.414		Spillway #1
108.00	0.872	5.017	42.121		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094
107.00	0.000	(5)>4.414	4.414
108.00	36.939	(6)>5.182	42.121

Structure #17 (Riprap Channel)

Sage Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	3.0:1	3.0:1	2.1	2.79		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	7.93 cfs	
Depth:	0.21 ft	3.00 ft
Top Width:	6.29 ft	23.03 ft
Velocity*:		
X-Section Area:	1.21 sq ft	
Hydraulic Radius:	0.190 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #16 (Null)

Null at Confluence with Sage Draw

Structure #15 (Riprap Channel)

Little Collom Gulch LCG-2 to LCG-3

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	4.7	3.55		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	49.22 cfs	
Depth:	0.45 ft	4.00 ft
Top Width:	12.70 ft	34.00 ft
Velocity*:		
X-Section Area:	5.10 sq ft	
Hydraulic Radius:	0.397 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #14 (Pond)

LCG-2 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	30.00	2.00:1	2.00:1	20.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
18.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	106.76 ft
Dewater Time:	0.53 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
106.00	0.872	3.273	3.142	3.30*	
106.76	0.869	3.939	7.175	9.50	Peak Stage
107.00	0.872	4.145	8.425		Spillway #1
108.00	0.872	5.017	56.073		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>3.142	3.142
107.00	0.000	(5)>8.425	8.425
108.00	43.900	(5)>12.173	56.073

Structure #13 (Riprap Channel)

Little Collom Gulch LCG-1 to LCG-2

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	4.9	3.61		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	41.37 cfs	
Depth:	0.39 ft	4.00 ft
Top Width:	12.35 ft	34.01 ft
Velocity*:		
X-Section Area:	4.37 sq ft	
Hydraulic Radius:	0.350 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #12 (Pond)

LCG-1 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	30.00	2.00:1	2.00:1	20.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	107.11 ft
Dewater Time:	0.94 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
106.00	0.872	3.273	2.094	4.95*	
107.00	0.872	4.145	4.414	9.35	Spillway #1
107.11	0.872	4.242	9.346	8.20	Peak Stage
108.00	0.872	5.017	49.083		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094
107.00	0.000	(5)>4.414	4.414
108.00	43.900	(6)>5.182	49.083

Structure #11 (Vegetated Channel)

Upper Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	2.0	D, B	1.36			7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	5.95 cfs		5.95 cfs	
Depth:	1.07 ft	2.43 ft	1.64 ft	3.00 ft
Top Width:	4.80 ft	10.92 ft	7.40 ft	13.52 ft
Velocity:	2.32 fps		0.98 fps	
X-Section Area:	2.56 sq ft		6.08 sq ft	
Hydraulic Radius:	0.488 ft		0.751 ft	
Froude Number:	0.56		0.19	
Roughness Coefficient:	0.0561		0.1778	

Structure #10 (Null)

Null at Confluence Upper Terrace Ditch

Structure #8 (Vegetated Channel)

Lower Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	2.0	D, B	1.59			7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	3.02 cfs		3.02 cfs	
Depth:	0.87 ft	2.46 ft	1.41 ft	3.00 ft
Top Width:	3.93 ft	11.09 ft	6.36 ft	13.52 ft
Velocity:	1.76 fps		0.67 fps	
X-Section Area:	1.72 sq ft		4.50 sq ft	
Hydraulic Radius:	0.399 ft		0.646 ft	
Froude Number:	0.47		0.14	
Roughness Coefficient:	0.0650		0.2348	

Structure #7 (Null)

Null at Confluence Lower Terrace Ditch

Structure #6 (Riprap Channel)

Little Collom Gulch 0+00 to LCG-1

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
15.00	3.0:1	3.0:1	16.6	3.89		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	21.23 cfs	
Depth:	0.11 ft	4.00 ft
Top Width:	15.68 ft	39.02 ft
Velocity*:		

	w/o Freeboard	w/ Freeboard
X-Section Area:	1.73 sq ft	
Hydraulic Radius:	0.110 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #5 (Riprap Channel)

D-3 Ditch

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	16.1	2.98		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.22 cfs	
Depth:	0.02 ft	3.00 ft
Top Width:	12.07 ft	23.99 ft
Velocity*:		
X-Section Area:	0.22 sq ft	
Hydraulic Radius:	0.019 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #4 (Null)

Null at Confluence with D-3 Ditch

Structure #3 (Vegetated Channel)

Little Collom Gulch Natural Channel

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	5.7	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	21.53 cfs		21.53 cfs	
Depth:	0.64 ft		1.02 ft	
Top Width:	7.58 ft		9.10 ft	
Velocity:	5.32 fps		2.98 fps	
X-Section Area:	4.05 sq ft		7.22 sq ft	
Hydraulic Radius:	0.514 ft		0.753 ft	
Froude Number:	1.28		0.59	
Roughness Coefficient:	0.0429		0.0987	

Structure #2 (Pond)

Section 25 Pond

Pond Inputs:

Initial Pool Elev:	6,868.00 ft
Initial Pool:	4.36 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
18.00	16.00	18.00	182.00	5.00	0.0150	6,872.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,875.00	45.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	6,874.25 ft
Dewater Time:	3.21 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
6,855.00	0.047	0.000	0.000		
6,856.00	0.102	0.073	0.000		
6,857.00	0.156	0.201	0.000		
6,858.00	0.191	0.374	0.000		
6,859.00	0.228	0.583	0.000		
6,860.00	0.266	0.830	0.000		
6,861.00	0.306	1.116	0.000		
6,862.00	0.348	1.443	0.000		
6,863.00	0.391	1.812	0.000		
6,864.00	0.436	2.225	0.000		
6,865.00	0.483	2.684	0.000		
6,866.00	0.532	3.192	0.000		
6,867.00	0.582	3.749	0.000		
6,868.00	0.635	4.357	0.000		Low hole SPW #1
6,869.00	0.689	5.019	0.473	16.94*	
6,870.00	0.746	5.736	0.669	12.98*	
6,871.00	0.804	6.511	0.819	11.45*	
6,872.00	0.864	7.345	0.945	10.67*	Spillway #1
6,873.00	0.927	8.240	8.509	18.55	
6,874.00	0.991	9.199	12.033	2.60	
6,874.25	1.010	9.459	12.719	3.80	Peak Stage
6,875.00	1.060	10.224	14.738		Spillway #2
6,876.00	1.125	11.316	56.584		
6,877.00	1.187	12.472	168.142		
6,878.00	1.250	13.691	330.639		
6,879.00	1.318	14.974	558.801		
6,880.00	1.386	16.326	834.822		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,855.00	0.000	0.000	0.000
6,856.00	0.000	0.000	0.000
6,857.00	0.000	0.000	0.000
6,858.00	0.000	0.000	0.000
6,859.00	0.000	0.000	0.000
6,860.00	0.000	0.000	0.000
6,861.00	0.000	0.000	0.000
6,862.00	0.000	0.000	0.000
6,863.00	0.000	0.000	0.000
6,864.00	0.000	0.000	0.000
6,865.00	0.000	0.000	0.000
6,866.00	0.000	0.000	0.000
6,867.00	0.000	0.000	0.000
6,868.00	3.00>0.000	0.000	0.000
6,869.00	0.473	0.000	0.473
6,870.00	0.669	0.000	0.669
6,871.00	0.819	0.000	0.819
6,872.00	0.945	0.000	0.945
6,873.00	8.509	0.000	8.509
6,874.00	12.033	0.000	12.033
6,875.00	14.738	0.000	14.738
6,876.00	17.018	39.567	56.584
6,877.00	19.026	149.116	168.142
6,878.00	20.842	309.797	330.639
6,879.00	22.512	536.289	558.801
6,880.00	24.066	810.756	834.822

Structure #1 (Null)

Null Below Section 25 Pond

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#31	1	29.000	0.087	0.000	0.000	62.000	M	4.00	0.386
	2	68.200	0.303	0.000	0.000	80.000	F	39.96	4.030
	3	38.800	0.277	0.000	0.000	47.000	S	0.00	0.000
	4	1.100	0.032	0.000	0.000	47.000	S	0.00	0.000
	5	4.000	0.055	0.000	0.000	62.000	M	0.55	0.053
	6	18.300	0.110	0.000	0.000	47.000	S	0.00	0.000
	7	3.900	0.075	0.000	0.000	80.000	F	3.33	0.245
	Σ	**163.300**						**41.75**	**4.714**
#30	1	19.400	0.122	0.000	0.000	47.000	S	0.00	0.000
	2	4.300	0.123	0.000	0.000	80.000	F	3.67	0.270
	3	1.100	0.053	0.000	0.000	62.000	M	0.15	0.011
	Σ	**188.100**						**42.52**	**4.994**
#29	**Σ**	**188.100**						**42.52**	**4.994**
#28	1	19.600	0.122	0.000	0.000	47.000	S	0.00	0.000
	Σ	**207.700**						**15.09**	**4.988**
#27	**Σ**	**207.700**						**15.09**	**4.988**
#26	1	75.400	0.381	0.000	0.000	47.000	S	0.01	0.000
	Σ	**283.100**						**10.60**	**4.968**
#34	1	69.600	0.574	0.000	0.000	74.000	F	18.51	2.726
	Σ	**69.600**						**18.51**	**2.726**
#33	1	1.800	0.024	0.000	0.000	47.000	S	0.00	0.000
	2	65.100	0.181	0.000	0.000	80.000	F	44.02	3.922
	3	15.600	0.063	0.000	0.000	47.000	S	0.00	0.000
	4	0.900	0.043	0.000	0.000	47.000	S	0.00	0.000
	5	11.100	0.059	0.000	0.000	80.000	F	9.47	0.696
	6	2.100	0.064	0.000	0.000	74.000	F	1.22	0.087
	Σ	**96.600**						**50.74**	**4.705**
#32	**Σ**	**166.200**						**58.22**	**7.431**
#25	1	7.800	0.050	0.000	0.000	74.000	F	4.53	0.324
	2	15.100	0.117	0.000	0.000	47.000	S	0.00	0.000
	Σ	**22.900**						**4.53**	**0.324**
#24	**Σ**	**22.900**						**4.53**	**0.324**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#23	1	32.600	0.025	0.000	0.000	62.000	M	4.50	0.434
	2	137.700	0.339	0.000	0.000	57.000	M	1.07	0.690
	3	31.700	0.054	0.000	0.000	74.000	F	18.42	1.317
	4	2.600	0.107	0.000	0.000	47.000	S	0.00	0.000
	Σ	**227.500**						**27.45**	**2.765**
#22	**Σ**	**227.500**						**27.45**	**2.765**
#21	1	44.200	0.101	0.000	0.000	74.000	F	25.68	1.836
	Σ	**44.200**						**25.68**	**1.836**
#20	**Σ**	**44.200**						**25.68**	**1.836**
#19	1	64.500	0.092	0.000	0.000	62.000	M	8.91	0.859
	2	65.600	0.187	0.000	0.000	74.000	F	27.80	2.606
	3	2.700	0.038	0.000	0.000	47.000	S	0.00	0.000
	Σ	**404.500**						**57.81**	**5.984**
#18	**Σ**	**404.500**						**57.81**	**5.984**
#17	1	163.400	0.197	0.000	0.000	62.000	M	7.93	1.746
	Σ	**163.400**						**7.93**	**1.746**
#16	**Σ**	**163.400**						**7.93**	**1.746**
#15	1	5.200	0.062	0.000	0.000	62.000	M	0.72	0.069
	2	47.800	0.189	0.000	0.000	62.000	M	2.38	0.514
	3	109.100	0.301	0.000	0.000	74.000	F	38.73	4.269
	Σ	**730.000**						**49.22**	**10.486**
#14	**Σ**	**730.000**						**49.22**	**10.486**
#13	1	27.700	0.095	0.000	0.000	62.000	M	3.82	0.369
	2	32.900	0.045	0.000	0.000	80.000	F	28.07	2.063
	3	42.000	0.302	0.000	0.000	74.000	F	14.90	1.644
	4	6.700	0.096	0.000	0.000	47.000	S	0.00	0.000
	Σ	**839.300**						**41.37**	**12.456**
#12	**Σ**	**839.300**						**41.37**	**12.456**
#11	1	30.400	0.137	0.000	0.000	62.000	M	1.62	0.330
	2	6.600	0.033	0.000	0.000	80.000	F	5.63	0.414
	Σ	**37.000**						**5.95**	**0.744**
#10	**Σ**	**37.000**						**5.95**	**0.744**
#8	1	11.100	0.133	0.000	0.000	62.000	M	0.59	0.120
	2	3.400	0.011	0.000	0.000	80.000	F	2.90	0.213

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	Σ	**14.500**						**3.02**	**0.334**
#7	Σ	**14.500**						**3.02**	**0.334**
#6	1	14.200	0.050	0.000	0.000	80.000	F	12.11	0.891
	2	1.100	0.013	0.000	0.000	62.000	M	0.15	0.011
	Σ	**906.100**						**21.23**	**12.222**
#5	1	14.800	0.083	0.000	0.000	57.000	F	0.22	0.092
	Σ	**14.800**						**0.22**	**0.092**
#4	Σ	**14.800**						**0.22**	**0.092**
#3	1	27.800	0.146	0.000	0.000	62.000	M	1.48	0.302
	2	168.700	0.579	0.000	0.000	47.000	S	0.01	0.001
	Σ	**1,283.600**						**21.53**	**14.306**
#2	Σ	**1,566.700**						**21.62**	**19.274**
#1	Σ	**1,566.700**						**12.72**	**16.418**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	1	3. Short grass pasture	12.00	175.72	1,464.33	2.770	0.146
#3	**1**	**Time of Concentration:**					**0.146**
#3	2	3. Short grass pasture	8.00	377.06	4,713.25	2.260	0.579
#3	**2**	**Time of Concentration:**					**0.579**
#5	1	3. Short grass pasture	19.00	199.94	1,052.31	3.480	0.083
#5	**1**	**Time of Concentration:**					**0.083**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	21.00	174.93	833.00	4.580	0.050
#6	**1**	**Time of Concentration:**					**0.050**
#6	2	3. Short grass pasture	26.00	50.05	192.50	4.070	0.013
#6	**2**	**Time of Concentration:**					**0.013**
#8	1	3. Short grass pasture	14.00	200.44	1,431.71	2.990	0.133
#8	**1**	**Time of Concentration:**					**0.133**
#8	2	5. Nearly bare and untilled, and alluvial valley fans	24.00	49.92	208.00	4.890	0.011
#8	**2**	**Time of Concentration:**					**0.011**
#11	1	3. Short grass pasture	10.00	124.64	1,246.40	2.520	0.137
#11	**1**	**Time of Concentration:**					**0.137**
#11	2	5. Nearly bare and untilled, and alluvial valley fans	12.00	49.91	415.91	3.460	0.033

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#11	**2**	**Time of Concentration:**					**0.033**
#13	1	3. Short grass pasture	11.00	99.97	908.81	2.650	0.095
#13	**1**	**Time of Concentration:**					**0.095**
#13	2	5. Nearly bare and untilled, and alluvial valley fans	18.00	124.68	692.66	4.240	0.045
#13	**2**	**Time of Concentration:**					**0.045**
#13	3	3. Short grass pasture	12.00	362.28	3,019.00	2.770	0.302
#13	**3**	**Time of Concentration:**					**0.302**
#13	4	3. Short grass pasture	9.00	75.29	836.55	2.400	0.096
#13	**4**	**Time of Concentration:**					**0.096**
#15	1	3. Short grass pasture	12.00	75.11	625.91	2.770	0.062
#15	**1**	**Time of Concentration:**					**0.062**
#15	2	3. Short grass pasture	16.00	349.80	2,186.25	3.200	0.189
#15	**2**	**Time of Concentration:**					**0.189**
#15	3	3. Short grass pasture	13.00	406.64	3,128.00	2.880	0.301
#15	**3**	**Time of Concentration:**					**0.301**
#17	1	3. Short grass pasture	15.60	349.44	2,240.00	3.150	0.197
#17	**1**	**Time of Concentration:**					**0.197**
#19	1	3. Short grass pasture	15.00	154.05	1,027.00	3.090	0.092
#19	**1**	**Time of Concentration:**					**0.092**
#19	2	3. Short grass pasture	20.00	481.40	2,407.00	3.570	0.187
#19	**2**	**Time of Concentration:**					**0.187**
#19	3	3. Short grass pasture	2.00	3.16	158.00	1.130	0.038
#19	**3**	**Time of Concentration:**					**0.038**
#21	1	3. Short grass pasture	23.00	320.85	1,395.00	3.830	0.101
#21	**1**	**Time of Concentration:**					**0.101**
#23	1	3. Short grass pasture	31.00	125.24	404.00	4.450	0.025
#23	**1**	**Time of Concentration:**					**0.025**
#23	2	3. Short grass pasture	14.00	511.84	3,656.00	2.990	0.339
#23	**2**	**Time of Concentration:**					**0.339**
#23	3	3. Short grass pasture	31.00	272.18	878.00	4.450	0.054
#23	**3**	**Time of Concentration:**					**0.054**
#23	4	3. Short grass pasture	4.00	24.88	622.00	1.600	0.107
#23	**4**	**Time of Concentration:**					**0.107**
#25	1	3. Short grass pasture	33.00	275.22	834.00	4.590	0.050
#25	**1**	**Time of Concentration:**					**0.050**
#25	2	3. Short grass pasture	14.00	176.68	1,262.00	2.990	0.117
#25	**2**	**Time of Concentration:**					**0.117**
#26	1	3. Short grass pasture	9.60	325.53	3,391.00	2.470	0.381
#26	**1**	**Time of Concentration:**					**0.381**
#28	1	3. Short grass pasture	10.80	124.52	1,153.00	2.620	0.122
#28	**1**	**Time of Concentration:**					**0.122**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#30	1	3. Short grass pasture	7.70	74.92	973.00	2.210	0.122
#30	**1**	**Time of Concentration:**					**0.122**
#30	2	5. Nearly bare and untilled, and alluvial valley fans	3.20	25.28	790.00	1.780	0.123
#30	**2**	**Time of Concentration:**					**0.123**
#30	3	3. Short grass pasture	3.10	8.30	268.00	1.400	0.053
#30	**3**	**Time of Concentration:**					**0.053**
#31	1	3. Short grass pasture	11.60	99.64	859.00	2.720	0.087
#31	**1**	**Time of Concentration:**					**0.087**
#31	2	5. Nearly bare and untilled, and alluvial valley fans	8.10	251.18	3,101.00	2.840	0.303
#31	**2**	**Time of Concentration:**					**0.303**
#31	3	3. Short grass pasture	7.10	150.87	2,125.00	2.130	0.277
#31	**3**	**Time of Concentration:**					**0.277**
#31	4	3. Short grass pasture	8.90	25.00	281.00	2.380	0.032
#31	**4**	**Time of Concentration:**					**0.032**
#31	5	3. Short grass pasture	10.00	50.00	500.00	2.520	0.055
#31	**5**	**Time of Concentration:**					**0.055**
#31	6	3. Short grass pasture	10.00	100.30	1,003.00	2.520	0.110
#31	**6**	**Time of Concentration:**					**0.110**
#31	7	5. Nearly bare and untilled, and alluvial valley fans	7.00	49.91	713.00	2.640	0.075
#31	**7**	**Time of Concentration:**					**0.075**
#33	1	3. Short grass pasture	2.00	2.00	100.00	1.130	0.024
#33	**1**	**Time of Concentration:**					**0.024**
#33	2	5. Nearly bare and untilled, and alluvial valley fans	8.10	150.01	1,852.00	2.840	0.181
#33	**2**	**Time of Concentration:**					**0.181**
#33	3	3. Short grass pasture	11.90	74.85	629.00	2.750	0.063
#33	**3**	**Time of Concentration:**					**0.063**
#33	4	5. Nearly bare and untilled, and alluvial valley fans	5.90	75.10	1,273.00	2.420	0.146
#33	**4**	**Time of Concentration:**					**0.043**
#33	5	5. Nearly bare and untilled, and alluvial valley fans	8.00	48.64	608.00	2.820	0.059
#33	**5**	**Time of Concentration:**					**0.059**
#33	6	3. Short grass pasture	6.00	27.06	451.00	1.950	0.064
#33	**6**	**Time of Concentration:**					**0.064**
#34	1	3. Short grass pasture	7.00	305.62	4,366.00	2.110	0.574
#34	**1**	**Time of Concentration:**					**0.574**

Little Collom Gulch
Post Mine Channel Configurations

100-Year 24-Hour Storm Event

Post-Mining Condition

Tony Tennyson

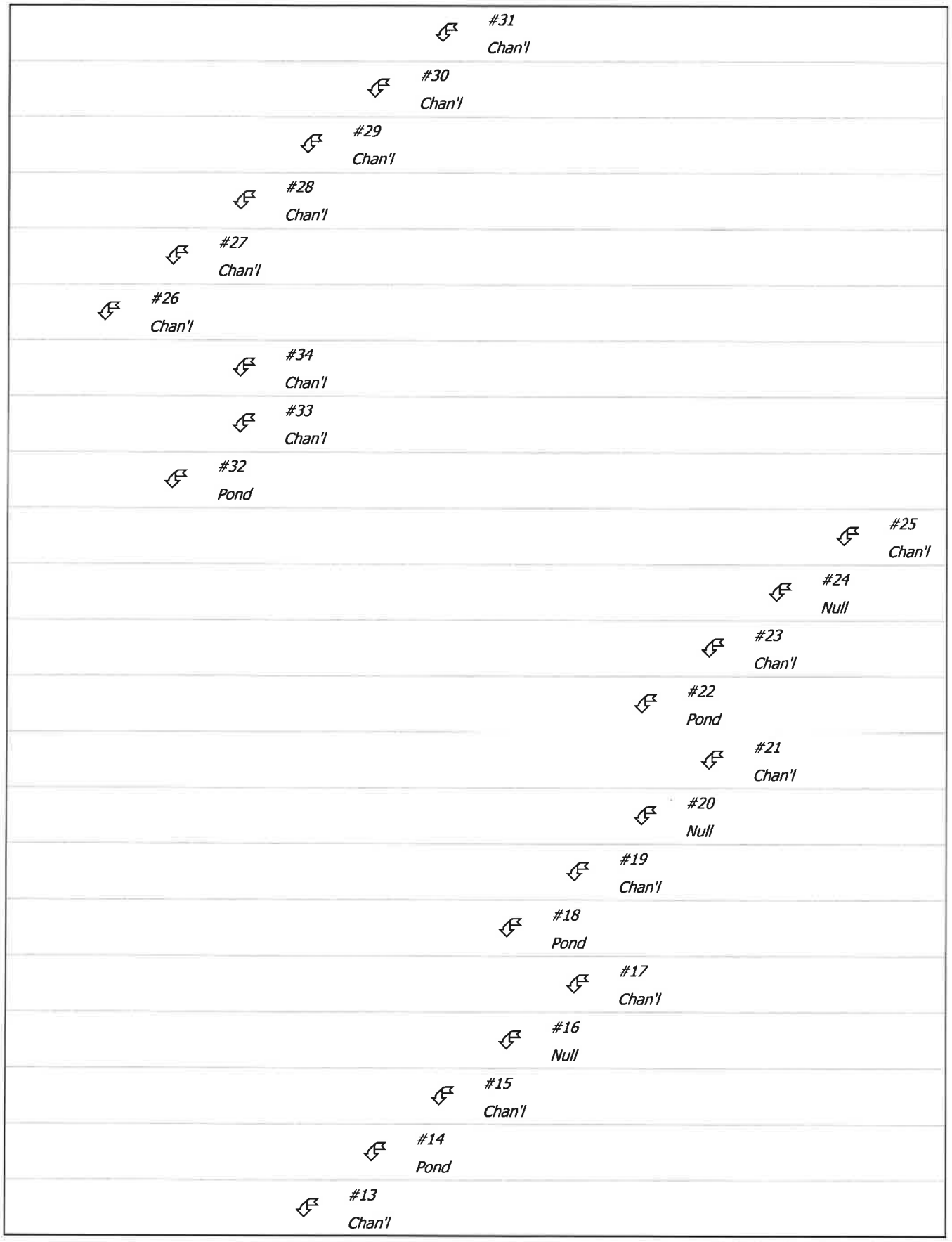
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.700 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Null Below Section 25 Pond
Pond	#2	==>	#1	0.000	0.000	Section 25 Pond
Channel	#3	==>	#2	0.000	0.000	Little Collom Gulch Natural Channel
Null	#4	==>	#3	0.000	0.000	Null at Confluence with D-3 Ditch
Channel	#5	==>	#4	0.000	0.000	D-3 Ditch
Channel	#6	==>	#3	0.000	0.000	Little Collom Gulch 0+00 to LCG-1
Null	#7	==>	#6	0.000	0.000	Null at Confluence Lower Terrace Ditch
Channel	#8	==>	#7	0.000	0.000	Lower Terrace Ditch
Null	#10	==>	#6	0.000	0.000	Null at Confluence Upper Terrace Ditch
Channel	#11	==>	#10	0.000	0.000	Upper Terrace Ditch
Pond	#12	==>	#6	0.000	0.000	LCG-1 Stockpond
Channel	#13	==>	#12	0.000	0.000	Little Collom Gulch LCG-1 to LCG-2
Pond	#14	==>	#13	0.000	0.000	LCG-2 Stockpond
Channel	#15	==>	#14	0.000	0.000	Little Collom Gulch LCG-2 to LCG-3
Null	#16	==>	#15	0.000	0.000	Null at Confluence with Sage Draw
Channel	#17	==>	#16	0.000	0.000	Sage Draw
Pond	#18	==>	#15	0.000	0.000	LCG-3 Stockpond
Channel	#19	==>	#18	0.000	0.000	Little Collom Gulch LCG-3 to LCG-4
Null	#20	==>	#19	0.000	0.000	Null at Confluence with Grouse Draw
Channel	#21	==>	#20	0.000	0.000	Grouse Draw
Pond	#22	==>	#19	0.000	0.000	LCG-4 Stockpond
Channel	#23	==>	#22	0.000	0.000	Little Collom Gulch LCG-4 to 102+79
Null	#24	==>	#23	0.000	0.000	Null at Confluence with Sharpie Draw
Channel	#25	==>	#24	0.000	0.000	Sharpie Draw
Channel	#26	==>	#2	0.000	0.000	Natural Channel Middle Pond to Section 25 Pond
Channel	#27	==>	#26	0.000	0.000	Lower Bobact Draw (Middle Pond)
Channel	#28	==>	#27	0.000	0.000	Natural Channel Middle Pond to Section 36 Pond
Channel	#29	==>	#28	0.000	0.000	Middle Bobcat Draw (Section 36 Pond)
Channel	#30	==>	#29	0.000	0.000	Natural Channel Section 36 Pond to Upper Bobcat Draw
Channel	#31	==>	#30	0.000	0.000	Upper Bobcat Draw 0+00 to 21+33
Pond	#32	==>	#3	0.000	0.000	Coal Stockpile Pond
Channel	#33	==>	#32	0.000	0.000	D-5 Ditch
Channel	#34	==>	#32	0.000	0.000	D-7 Ditch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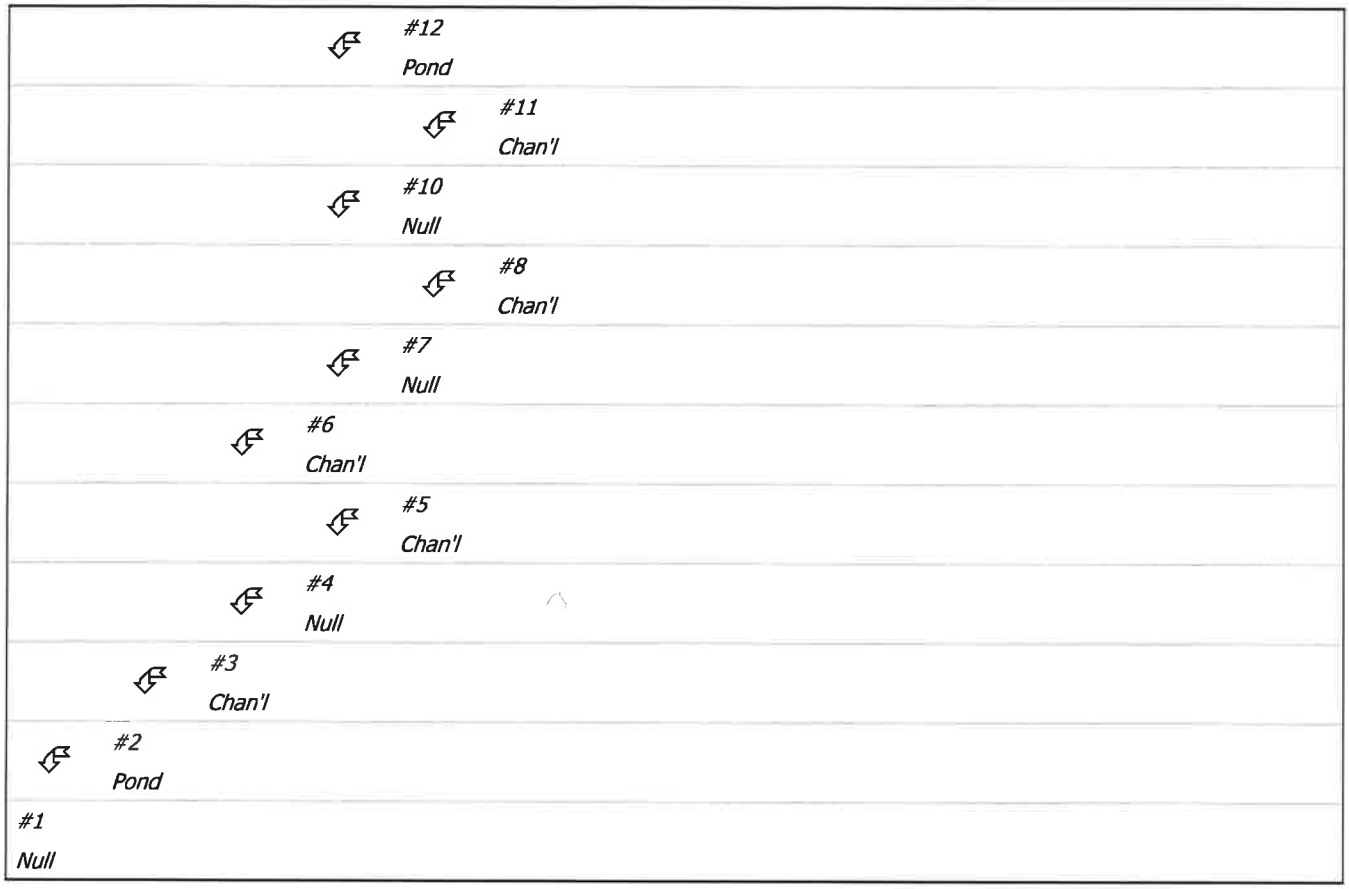
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Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#31		163.300	163.300	59.37	6.69
#30		24.800	188.100	64.62	7.11
#29		0.000	188.100	64.62	7.11
#28		19.600	207.700	64.62	7.14
#27		0.000	207.700	64.62	7.14
#26		75.400	283.100	64.62	7.21
#34		69.600	69.600	28.81	3.95
#33		96.600	96.600	70.65	6.46
#32	In	0.000	166.200	84.04	10.41
	Out			10.12	4.67
#25		22.900	22.900	6.51	0.49
#24		0.000	22.900	6.51	0.49
#23		204.600	227.500	43.19	4.67
#22	In	0.000	227.500	43.19	4.67
	Out			2.32	2.58
#21		44.200	44.200	36.89	2.66
#20		0.000	44.200	36.89	2.66
#19		132.800	404.500	93.23	10.56
#18	In	0.000	404.500	93.23	10.56
	Out			8.80	8.44
#17		163.400	163.400	21.46	3.12
#16		0.000	163.400	21.46	3.12
#15		162.100	730.000	88.39	18.79
#14	In	0.000	730.000	88.39	18.79
	Out			22.34	16.66
#13		109.300	839.300	62.39	22.53
#12	In	0.000	839.300	62.39	22.53
	Out			27.22	20.23
#11		37.000	37.000	9.78	1.15
#10		0.000	37.000	9.78	1.15
#8		14.500	14.500	4.70	0.51
#7		0.000	14.500	4.70	0.51
#6		15.300	906.100	31.06	23.14
#5		14.800	14.800	1.78	0.20
#4		0.000	14.800	1.78	0.20
#3		196.500	1,283.600	41.08	28.70

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#2	In	0.000	1,566.700	99.50	35.91
	Out			43.36	32.99
#1		0.000	1,566.700	43.36	32.99

Structure Detail:

Structure #31 (Riprap Channel)

Upper Bobcat Draw 0+00 to 21+33

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	8.3	3.50		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	59.37 cfs	
Depth:	0.50 ft	4.00 ft
Top Width:	13.02 ft	34.02 ft
Velocity*:		
X-Section Area:	5.79 sq ft	
Hydraulic Radius:	0.439 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #30 (Vegetated Channel)

Natural Channel Section 36 Pond to Upper Bobcat Draw

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	12.9	D, B				5.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	64.62 cfs		64.62 cfs	
Depth:	0.80 ft		1.10 ft	
Top Width:	8.19 ft		9.40 ft	
Velocity:	12.28 fps		8.16 fps	
X-Section Area:	5.26 sq ft		7.92 sq ft	
Hydraulic Radius:	0.614 ft		0.798 ft	
Froude Number:	2.70		1.57	
Roughness Coefficient:	0.0315		0.0564	

Structure #29 (Riprap Channel)

Middle Bobcat Draw (Section 36 Pond)

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	5.0	3.44		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	64.62 cfs	
Depth:	0.56 ft	4.00 ft
Top Width:	13.34 ft	33.98 ft
Velocity*:		
X-Section Area:	6.49 sq ft	
Hydraulic Radius:	0.480 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #28 (Vegetated Channel)

Natural Channel Middle Pond to Section 36 Pond

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.4	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	64.62 cfs		64.62 cfs	
Depth:	0.98 ft		1.37 ft	
Top Width:	8.94 ft		10.48 ft	
Velocity:	9.42 fps		6.09 fps	
X-Section Area:	6.86 sq ft		10.61 sq ft	
Hydraulic Radius:	0.729 ft		0.954 ft	
Froude Number:	1.90		1.07	
Roughness Coefficient:	0.0324		0.0599	

Structure #27 (Riprap Channel)

Lower Bobact Draw (Middle Pond)

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	6.4	3.45		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	64.62 cfs	
Depth:	0.55 ft	4.00 ft
Top Width:	13.29 ft	33.99 ft
Velocity*:		
X-Section Area:	6.38 sq ft	
Hydraulic Radius:	0.474 ft	

	w/o Freeboard	w/ Freeboard
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #26 (Vegetated Channel)

Natural Channel Middle Pond to Section 25 Pond

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.4	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	64.62 cfs		64.62 cfs	
Depth:	0.98 ft		1.37 ft	
Top Width:	8.94 ft		10.48 ft	
Velocity:	9.42 fps		6.09 fps	
X-Section Area:	6.86 sq ft		10.61 sq ft	
Hydraulic Radius:	0.729 ft		0.954 ft	
Froude Number:	1.90		1.07	
Roughness Coefficient:	0.0324		0.0599	

Structure #34 (Vegetated Channel)

D-7 Ditch

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	6.0	D, B	2.04			6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	28.81 cfs		28.81 cfs	
Depth:	0.72 ft	2.76 ft	1.10 ft	3.14 ft
Top Width:	7.87 ft	16.03 ft	9.40 ft	17.56 ft
Velocity:	6.25 fps		3.64 fps	
X-Section Area:	4.61 sq ft		7.92 sq ft	
Hydraulic Radius:	0.562 ft		0.798 ft	
Froude Number:	1.44		0.70	
Roughness Coefficient:	0.0397		0.0863	

Structure #33 (Riprap Channel)

D-5 Ditch

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	2.0	2.52		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	70.65 cfs	
Depth:	0.61 ft	3.13 ft
Top Width:	14.45 ft	24.53 ft
Velocity*:		
X-Section Area:	8.11 sq ft	
Hydraulic Radius:	0.550 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	

	w/o Freeboard	w/ Freeboard
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #32 (Pond)

Coal Stockpile Pond

Pond Inputs:

Initial Pool Elev:	7,212.00 ft
Initial Pool:	1.71 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,217.00	25.00	3.00:1	3.00:1	20.00

Pond Results:

Peak Elevation:	7,217.21 ft
Dewater Time:	0.54 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
7,210.00	0.779	0.000	0.000		
7,210.50	0.820	0.400	0.000		
7,211.00	0.860	0.819	0.000		
7,212.00	0.928	1.713	0.000		
7,213.00	1.049	2.701	0.000		
7,214.00	1.090	3.771	0.000		
7,215.00	1.175	4.903	0.000		
7,216.00	1.268	6.124	0.000		
7,217.00	1.390	7.452	0.000		Spillway #1
7,217.21	1.417	7.763	10.121	12.85	Peak Stage
7,218.00	1.513	8.904	47.313		
7,219.00	1.632	10.476	170.230		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,210.00	0.000	0.000
7,210.50	0.000	0.000
7,211.00	0.000	0.000
7,212.00	0.000	0.000
7,213.00	0.000	0.000
7,214.00	0.000	0.000
7,215.00	0.000	0.000
7,216.00	0.000	0.000
7,217.00	0.000	0.000
7,218.00	47.313	47.313
7,219.00	170.230	170.230

Structure #25 (Riprap Channel)

Sharpie Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	22.0	3.94		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	6.51 cfs	
Depth:	0.06 ft	4.00 ft
Top Width:	10.34 ft	33.98 ft
Velocity*:		
X-Section Area:	0.58 sq ft	
Hydraulic Radius:	0.056 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #24 (Null)

Null at Confluence with Sharpie Draw

Structure #23 (Riprap Channel)

Little Collom Gulch LCG-4 to 102+79

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	7.4	3.60		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	43.19 cfs	
Depth:	0.40 ft	4.00 ft
Top Width:	12.38 ft	33.98 ft
Velocity*:		
X-Section Area:	4.44 sq ft	
Hydraulic Radius:	0.355 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #22 (Pond)

LCG-4 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	20.00	2.00:1	2.00:1	15.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	106.10 ft
Dewater Time:	0.41 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
106.00	0.872	3.273	2.094	4.95*	
106.10	0.859	3.357	2.317	4.90	Peak Stage
107.00	0.872	4.145	4.414		Spillway #1
108.00	0.872	5.017	42.121		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
107.00	0.000	(5)>4.414	4.414
108.00	36.939	(6)>5.182	42.121

Structure #21 (Riprap Channel)

Grouse Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	16.8	3.72		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	36.89 cfs	
Depth:	0.28 ft	4.00 ft
Top Width:	11.69 ft	34.01 ft
Velocity*:		
X-Section Area:	3.05 sq ft	
Hydraulic Radius:	0.259 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #20 (Null)

Null at Confluence with Grouse Draw

Structure #19 (Riprap Channel)

Little Collom Gulch LCG-3 to LCG-4

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	7.8	3.30		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	93.23 cfs	
Depth:	0.70 ft	4.00 ft
Top Width:	14.22 ft	34.02 ft
Velocity*:		
X-Section Area:	8.52 sq ft	
Hydraulic Radius:	0.590 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #18 (Pond)

LCG-3 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	20.00	2.00:1	2.00:1	15.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	107.12 ft
Dewater Time:	0.88 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
106.00	0.872	3.273	2.094	4.95*	
107.00	0.872	4.145	4.414	5.70	Spillway #1
107.12	0.872	4.247	8.800	10.35	Peak Stage
108.00	0.872	5.017	42.121		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094
107.00	0.000	(5)>4.414	4.414
108.00	36.939	(6)>5.182	42.121

Structure #17 (Riprap Channel)

Sage Draw

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	3.0:1	3.0:1	2.1	3.61		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	21.46 cfs	
Depth:	0.39 ft	4.00 ft
Top Width:	7.36 ft	29.02 ft
Velocity*:		
X-Section Area:	2.43 sq ft	
Hydraulic Radius:	0.325 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #16 (Null)

Null at Confluence with Sage Draw

Structure #15 (Riprap Channel)

Little Collom Gulch LCG-2 to LCG-3

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	4.7	3.30		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	88.39 cfs	
Depth:	0.70 ft	4.00 ft
Top Width:	14.20 ft	34.00 ft

	w/o Freeboard	w/ Freeboard
Velocity*:		
X-Section Area:	8.48 sq ft	
Hydraulic Radius:	0.588 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #14 (Pond)

LCG-2 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	30.00	2.00:1	2.00:1	20.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
18.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	107.29 ft
Dewater Time:	0.80 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
106.00	0.872	3.273	3.142	3.30*	
107.00	0.872	4.145	8.425	5.40	Spillway #1
107.29	0.872	4.400	22.341	10.50	Peak Stage
108.00	0.872	5.017	56.073		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>3.142	3.142
107.00	0.000	(5)>8.425	8.425
108.00	43.900	(5)>12.173	56.073

Structure #13 (Riprap Channel)

Little Collom Gulch LCG-1 to LCG-2

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	3.0:1	3.0:1	4.9	3.46		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	62.39 cfs	
Depth:	0.54 ft	4.00 ft
Top Width:	13.25 ft	34.01 ft
Velocity*:		
X-Section Area:	6.29 sq ft	
Hydraulic Radius:	0.469 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #12 (Pond)

LCG-1 Stockpond

Pond Inputs:

Initial Pool Elev:	102.00 ft
Initial Pool:	0.34 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
107.00	30.00	2.00:1	2.00:1	20.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
12.00	100.00	2.00	0.0150	105.00	0.90	0.00

Pond Results:

Peak Elevation:	107.51 ft
Dewater Time:	1.22 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
100.00	0.016	0.000	0.000		
101.00	0.096	0.050	0.000		
102.00	0.539	0.338	0.000		
103.00	0.654	0.933	0.000		
104.00	0.735	1.628	0.000		
105.00	0.843	2.416	0.000		Spillway #2
106.00	0.872	3.273	2.094	4.95*	
107.00	0.872	4.145	4.414	10.40	Spillway #1
107.51	0.872	4.591	27.218	13.85	Peak Stage
108.00	0.872	5.017	49.083		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
100.00	0.000	0.000	0.000
101.00	0.000	0.000	0.000
102.00	0.000	0.000	0.000
103.00	0.000	0.000	0.000
104.00	0.000	0.000	0.000
105.00	0.000	0.000	0.000
106.00	0.000	(3)>2.094	2.094
107.00	0.000	(5)>4.414	4.414
108.00	43.900	(6)>5.182	49.083

Structure #11 (Vegetated Channel)

Upper Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	2.0	D, B	1.16			7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	9.78 cfs		9.78 cfs	
Depth:	1.24 ft	2.40 ft	1.84 ft	3.00 ft
Top Width:	5.56 ft	10.78 ft	8.26 ft	13.48 ft
Velocity:	2.85 fps		1.29 fps	
X-Section Area:	3.43 sq ft		7.58 sq ft	
Hydraulic Radius:	0.564 ft		0.838 ft	
Froude Number:	0.64		0.24	
Roughness Coefficient:	0.0504		0.1450	

Structure #10 (Null)

Null at Confluence Upper Terrace Ditch

Structure #8 (Vegetated Channel)

Lower Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	2.0	D, B	1.44			7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	4.70 cfs		4.70 cfs	
Depth:	1.00 ft	2.44 ft	1.56 ft	3.00 ft
Top Width:	4.48 ft	10.96 ft	7.02 ft	13.50 ft
Velocity:	2.11 fps		0.86 fps	
X-Section Area:	2.23 sq ft		5.48 sq ft	
Hydraulic Radius:	0.455 ft		0.713 ft	
Froude Number:	0.53		0.17	
Roughness Coefficient:	0.0591		0.1957	

Structure #7 (Null)

Null at Confluence Lower Terrace Ditch

Structure #6 (Riprap Channel)

Little Collom Gulch 0+00 to LCG-1

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
15.00	3.0:1	3.0:1	16.6	3.84		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	31.06 cfs	
Depth:	0.16 ft	4.00 ft
Top Width:	15.98 ft	39.02 ft
Velocity*:		
X-Section Area:	2.54 sq ft	
Hydraulic Radius:	0.158 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #5 (Riprap Channel)

D-3 Ditch

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	16.1	2.97		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.78 cfs	
Depth:	0.03 ft	3.00 ft
Top Width:	12.12 ft	24.00 ft
Velocity*:		
X-Section Area:	0.35 sq ft	
Hydraulic Radius:	0.029 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #4 (Null)

Null at Confluence with D-3 Ditch

Structure #3 (Vegetated Channel)

Little Collom Gulch Natural Channel

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	5.7	D, B				6.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	41.08 cfs		41.08 cfs	
Depth:	0.84 ft		1.24 ft	
Top Width:	8.38 ft		9.97 ft	
Velocity:	7.28 fps		4.42 fps	
X-Section Area:	5.64 sq ft		9.30 sq ft	
Hydraulic Radius:	0.643 ft		0.881 ft	
Froude Number:	1.56		0.81	
Roughness Coefficient:	0.0364		0.0739	

Structure #2 (Pond)

Section 25 Pond

Pond Inputs:

Initial Pool Elev:	6,868.00 ft
Initial Pool:	4.36 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
18.00	16.00	18.00	182.00	5.00	0.0150	6,872.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,875.00	45.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	6,875.68 ft
Dewater Time:	3.52 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
6,855.00	0.047	0.000	0.000		
6,856.00	0.102	0.073	0.000		
6,857.00	0.156	0.201	0.000		
6,858.00	0.191	0.374	0.000		
6,859.00	0.228	0.583	0.000		
6,860.00	0.266	0.830	0.000		
6,861.00	0.306	1.116	0.000		
6,862.00	0.348	1.443	0.000		
6,863.00	0.391	1.812	0.000		
6,864.00	0.436	2.225	0.000		
6,865.00	0.483	2.684	0.000		
6,866.00	0.532	3.192	0.000		
6,867.00	0.582	3.749	0.000		
6,868.00	0.635	4.357	0.000		Low hole SPW #1
6,869.00	0.689	5.019	0.473	16.94*	
6,870.00	0.746	5.736	0.669	12.98*	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
6,871.00	0.804	6.511	0.819	11.45*	
6,872.00	0.864	7.345	0.945	10.67*	Spillway #1
6,873.00	0.927	8.240	8.509	18.30	
6,874.00	0.991	9.199	12.033	2.15	
6,875.00	1.060	10.224	14.738	2.10	Spillway #2
6,875.68	1.104	10.971	43.357	9.95	Peak Stage
6,876.00	1.125	11.316	56.584		
6,877.00	1.187	12.472	168.142		
6,878.00	1.250	13.691	330.639		
6,879.00	1.318	14.974	558.801		
6,880.00	1.386	16.326	834.822		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,855.00	0.000	0.000	0.000
6,856.00	0.000	0.000	0.000
6,857.00	0.000	0.000	0.000
6,858.00	0.000	0.000	0.000
6,859.00	0.000	0.000	0.000
6,860.00	0.000	0.000	0.000
6,861.00	0.000	0.000	0.000
6,862.00	0.000	0.000	0.000
6,863.00	0.000	0.000	0.000
6,864.00	0.000	0.000	0.000
6,865.00	0.000	0.000	0.000
6,866.00	0.000	0.000	0.000
6,867.00	0.000	0.000	0.000
6,868.00	3.00>0.000	0.000	0.000
6,869.00	0.473	0.000	0.473
6,870.00	0.669	0.000	0.669
6,871.00	0.819	0.000	0.819
6,872.00	0.945	0.000	0.945
6,873.00	8.509	0.000	8.509
6,874.00	12.033	0.000	12.033
6,875.00	14.738	0.000	14.738

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,876.00	17.018	39.567	56.584
6,877.00	19.026	149.116	168.142
6,878.00	20.842	309.797	330.639
6,879.00	22.512	536.289	558.801
6,880.00	24.066	810.756	834.822

Structure #1 (Null)

Null Below Section 25 Pond

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#31	1	29.000	0.087	0.000	0.000	62.000	M	8.90	0.689
	2	68.200	0.303	0.000	0.000	80.000	F	55.49	5.508
	3	38.800	0.277	0.000	0.000	47.000	S	0.06	0.036
	4	1.100	0.032	0.000	0.000	47.000	S	0.00	0.000
	5	4.000	0.055	0.000	0.000	62.000	M	1.23	0.095
	6	18.300	0.110	0.000	0.000	47.000	S	0.04	0.025
	7	3.900	0.075	0.000	0.000	80.000	F	4.46	0.334
	Σ	**163.300**						**59.37**	**6.688**
#30	1	19.400	0.122	0.000	0.000	47.000	S	0.05	0.027
	2	4.300	0.123	0.000	0.000	80.000	F	4.92	0.368
	3	1.100	0.053	0.000	0.000	62.000	M	0.34	0.026
	Σ	**188.100**						**64.62**	**7.109**
#29	**Σ**	**188.100**						**64.62**	**7.109**
#28	1	19.600	0.122	0.000	0.000	47.000	S	0.05	0.027
	Σ	**207.700**						**64.62**	**7.137**
#27	**Σ**	**207.700**						**64.62**	**7.137**
#26	1	75.400	0.381	0.000	0.000	47.000	S	0.12	0.071
	Σ	**283.100**						**64.62**	**7.207**
#34	1	69.600	0.574	0.000	0.000	74.000	F	28.81	3.953
	Σ	**69.600**						**28.81**	**3.953**
#33	1	1.800	0.024	0.000	0.000	47.000	S	0.00	0.000
	2	65.100	0.181	0.000	0.000	80.000	F	60.68	5.360
	3	15.600	0.063	0.000	0.000	47.000	S	0.04	0.022
	4	0.900	0.043	0.000	0.000	47.000	S	0.00	0.000
	5	11.100	0.059	0.000	0.000	80.000	F	12.69	0.951
	6	2.100	0.064	0.000	0.000	74.000	F	1.75	0.126
	Σ	**96.600**						**70.65**	**6.459**
#32	**Σ**	**166.200**						**84.04**	**10.412**
#25	1	7.800	0.050	0.000	0.000	74.000	F	6.51	0.470
	2	15.100	0.117	0.000	0.000	47.000	S	0.04	0.021
	Σ	**22.900**						**6.51**	**0.491**
#24	**Σ**	**22.900**						**6.51**	**0.491**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#23	1	32.600	0.025	0.000	0.000	62.000	M	10.01	0.775
	2	137.700	0.339	0.000	0.000	57.000	M	3.91	1.492
	3	31.700	0.054	0.000	0.000	74.000	F	26.46	1.910
	4	2.600	0.107	0.000	0.000	47.000	S	0.00	0.000
	Σ	**227.500**						**43.19**	**4.667**
#22	**Σ**	**227.500**						**43.19**	**4.667**
#21	1	44.200	0.101	0.000	0.000	74.000	F	36.89	2.663
	Σ	**44.200**						**36.89**	**2.663**
#20	**Σ**	**44.200**						**36.89**	**2.663**
#19	1	64.500	0.092	0.000	0.000	62.000	M	19.80	1.533
	2	65.600	0.187	0.000	0.000	74.000	F	41.57	3.778
	3	2.700	0.038	0.000	0.000	47.000	S	0.00	0.000
	Σ	**404.500**						**93.23**	**10.558**
#18	**Σ**	**404.500**						**93.23**	**10.558**
#17	1	163.400	0.197	0.000	0.000	62.000	M	21.46	3.116
	Σ	**163.400**						**21.46**	**3.116**
#16	**Σ**	**163.400**						**21.46**	**3.116**
#15	1	5.200	0.062	0.000	0.000	62.000	M	1.60	0.124
	2	47.800	0.189	0.000	0.000	62.000	M	6.40	0.917
	3	109.100	0.301	0.000	0.000	74.000	F	59.44	6.191
	Σ	**730.000**						**88.39**	**18.791**
#14	**Σ**	**730.000**						**88.39**	**18.791**
#13	1	27.700	0.095	0.000	0.000	62.000	M	8.51	0.658
	2	32.900	0.045	0.000	0.000	80.000	F	37.62	2.820
	3	42.000	0.302	0.000	0.000	74.000	F	22.86	2.384
	4	6.700	0.096	0.000	0.000	47.000	S	0.02	0.009
	Σ	**839.300**						**62.39**	**22.532**
#12	**Σ**	**839.300**						**62.39**	**22.532**
#11	1	30.400	0.137	0.000	0.000	62.000	M	4.29	0.588
	2	6.600	0.033	0.000	0.000	80.000	F	7.55	0.566
	Σ	**37.000**						**9.78**	**1.154**
#10	**Σ**	**37.000**						**9.78**	**1.154**
#8	1	11.100	0.133	0.000	0.000	62.000	M	1.57	0.215
	2	3.400	0.011	0.000	0.000	80.000	F	3.89	0.291

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	Σ	**14.500**						**4.70**	**0.506**
#7	Σ	**14.500**						**4.70**	**0.506**
#6	1	14.200	0.050	0.000	0.000	80.000	F	16.24	1.217
	2	1.100	0.013	0.000	0.000	62.000	M	0.34	0.026
	Σ	**906.100**						**31.06**	**23.138**
#5	1	14.800	0.083	0.000	0.000	57.000	F	1.78	0.200
	Σ	**14.800**						**1.78**	**0.200**
#4	Σ	**14.800**						**1.78**	**0.200**
#3	1	27.800	0.146	0.000	0.000	62.000	M	3.93	0.538
	2	168.700	0.579	0.000	0.000	47.000	S	0.26	0.158
	Σ	**1,283.600**						**41.08**	**28.703**
#2	Σ	**1,566.700**						**99.50**	**35.911**
#1	Σ	**1,566.700**						**43.36**	**32.991**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	1	3. Short grass pasture	12.00	175.72	1,464.33	2.770	0.146
#3	**1**	**Time of Concentration:**					**0.146**
#3	2	3. Short grass pasture	8.00	377.06	4,713.25	2.260	0.579
#3	**2**	**Time of Concentration:**					**0.579**
#5	1	3. Short grass pasture	19.00	199.94	1,052.31	3.480	0.083
#5	**1**	**Time of Concentration:**					**0.083**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	21.00	174.93	833.00	4.580	0.050
#6	**1**	**Time of Concentration:**					**0.050**
#6	2	3. Short grass pasture	26.00	50.05	192.50	4.070	0.013
#6	**2**	**Time of Concentration:**					**0.013**
#8	1	3. Short grass pasture	14.00	200.44	1,431.71	2.990	0.133
#8	**1**	**Time of Concentration:**					**0.133**
#8	2	5. Nearly bare and untilled, and alluvial valley fans	24.00	49.92	208.00	4.890	0.011
#8	**2**	**Time of Concentration:**					**0.011**
#11	1	3. Short grass pasture	10.00	124.64	1,246.40	2.520	0.137
#11	**1**	**Time of Concentration:**					**0.137**
#11	2	5. Nearly bare and untilled, and alluvial valley fans	12.00	49.91	415.91	3.460	0.033

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#11	**2**	**Time of Concentration:**					**0.033**
#13	1	3. Short grass pasture	11.00	99.97	908.81	2.650	0.095
#13	**1**	**Time of Concentration:**					**0.095**
#13	2	5. Nearly bare and untilled, and alluvial valley fans	18.00	124.68	692.66	4.240	0.045
#13	**2**	**Time of Concentration:**					**0.045**
#13	3	3. Short grass pasture	12.00	362.28	3,019.00	2.770	0.302
#13	**3**	**Time of Concentration:**					**0.302**
#13	4	3. Short grass pasture	9.00	75.29	836.55	2.400	0.096
#13	**4**	**Time of Concentration:**					**0.096**
#15	1	3. Short grass pasture	12.00	75.11	625.91	2.770	0.062
#15	**1**	**Time of Concentration:**					**0.062**
#15	2	3. Short grass pasture	16.00	349.80	2,186.25	3.200	0.189
#15	**2**	**Time of Concentration:**					**0.189**
#15	3	3. Short grass pasture	13.00	406.64	3,128.00	2.880	0.301
#15	**3**	**Time of Concentration:**					**0.301**
#17	1	3. Short grass pasture	15.60	349.44	2,240.00	3.150	0.197
#17	**1**	**Time of Concentration:**					**0.197**
#19	1	3. Short grass pasture	15.00	154.05	1,027.00	3.090	0.092
#19	**1**	**Time of Concentration:**					**0.092**
#19	2	3. Short grass pasture	20.00	481.40	2,407.00	3.570	0.187
#19	**2**	**Time of Concentration:**					**0.187**
#19	3	3. Short grass pasture	2.00	3.16	158.00	1.130	0.038
#19	**3**	**Time of Concentration:**					**0.038**
#21	1	3. Short grass pasture	23.00	320.85	1,395.00	3.830	0.101
#21	**1**	**Time of Concentration:**					**0.101**
#23	1	3. Short grass pasture	31.00	125.24	404.00	4.450	0.025
#23	**1**	**Time of Concentration:**					**0.025**
#23	2	3. Short grass pasture	14.00	511.84	3,656.00	2.990	0.339
#23	**2**	**Time of Concentration:**					**0.339**
#23	3	3. Short grass pasture	31.00	272.18	878.00	4.450	0.054
#23	**3**	**Time of Concentration:**					**0.054**
#23	4	3. Short grass pasture	4.00	24.88	622.00	1.600	0.107
#23	**4**	**Time of Concentration:**					**0.107**
#25	1	3. Short grass pasture	33.00	275.22	834.00	4.590	0.050
#25	**1**	**Time of Concentration:**					**0.050**
#25	2	3. Short grass pasture	14.00	176.68	1,262.00	2.990	0.117
#25	**2**	**Time of Concentration:**					**0.117**
#26	1	3. Short grass pasture	9.60	325.53	3,391.00	2.470	0.381
#26	**1**	**Time of Concentration:**					**0.381**
#28	1	3. Short grass pasture	10.80	124.52	1,153.00	2.620	0.122
#28	**1**	**Time of Concentration:**					**0.122**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#30	1	3. Short grass pasture	7.70	74.92	973.00	2.210	0.122
#30	**1**	**Time of Concentration:**					**0.122**
#30	2	5. Nearly bare and untilled, and alluvial valley fans	3.20	25.28	790.00	1.780	0.123
#30	**2**	**Time of Concentration:**					**0.123**
#30	3	3. Short grass pasture	3.10	8.30	268.00	1.400	0.053
#30	**3**	**Time of Concentration:**					**0.053**
#31	1	3. Short grass pasture	11.60	99.64	859.00	2.720	0.087
#31	**1**	**Time of Concentration:**					**0.087**
#31	2	5. Nearly bare and untilled, and alluvial valley fans	8.10	251.18	3,101.00	2.840	0.303
#31	**2**	**Time of Concentration:**					**0.303**
#31	3	3. Short grass pasture	7.10	150.87	2,125.00	2.130	0.277
#31	**3**	**Time of Concentration:**					**0.277**
#31	4	3. Short grass pasture	8.90	25.00	281.00	2.380	0.032
#31	**4**	**Time of Concentration:**					**0.032**
#31	5	3. Short grass pasture	10.00	50.00	500.00	2.520	0.055
#31	**5**	**Time of Concentration:**					**0.055**
#31	6	3. Short grass pasture	10.00	100.30	1,003.00	2.520	0.110
#31	**6**	**Time of Concentration:**					**0.110**
#31	7	5. Nearly bare and untilled, and alluvial valley fans	7.00	49.91	713.00	2.640	0.075
#31	**7**	**Time of Concentration:**					**0.075**
#33	1	3. Short grass pasture	2.00	2.00	100.00	1.130	0.024
#33	**1**	**Time of Concentration:**					**0.024**
#33	2	5. Nearly bare and untilled, and alluvial valley fans	8.10	150.01	1,852.00	2.840	0.181
#33	**2**	**Time of Concentration:**					**0.181**
#33	3	3. Short grass pasture	11.90	74.85	629.00	2.750	0.063
#33	**3**	**Time of Concentration:**					**0.063**
#33	4	5. Nearly bare and untilled, and alluvial valley fans	5.90	75.10	1,273.00	2.420	0.146
#33	**4**	**Time of Concentration:**					**0.043**
#33	5	5. Nearly bare and untilled, and alluvial valley fans	8.00	48.64	608.00	2.820	0.059
#33	**5**	**Time of Concentration:**					**0.059**
#33	6	3. Short grass pasture	6.00	27.06	451.00	1.950	0.064
#33	**6**	**Time of Concentration:**					**0.064**
#34	1	3. Short grass pasture	7.00	305.62	4,366.00	2.110	0.574
#34	**1**	**Time of Concentration:**					**0.574**

The as-built configuration for the Section 26 Pond is presented on Figure 7-23J-1, and the as-built configuration for the Sidehill Pond is presented on Figure 7-23J-2. Figure 7-23J-3 provides the breakdown of drainage areas and hydrologic conditions for all areas in the watershed reporting to these two sediment ponds. The Sidehill Pond as part of the Section 26 Pond sediment control system is utilized to reduced peak flows and provide additional sediment storage if need. All discharges from the Sidehill Pond flow directly to the Section 26 Pond through the D-1 Ditch, and the Section 26 Pond is the final discharge location.

The following pages present the results of the SEDCAD^{TM} models for the post mining condition. At this stage all areas that have been disturbed by mining activities in the Section 26 watershed has been reclaimed with the newest or younger (topsoil and seeded) reclamation is in the central and northern areas of the Section 26 Pond watershed. The farthest northern portion of the watershed is relatively undisturbed.

The SEDCAD^{TM} model herein provides the results of the 10-year 24-hour design storm and demonstrates the Section 26 Pond will meet the applicable settleable solids standard under this modeled storm event. The second SEDCAD^{TM} model demonstrates that the Section 26 Pond emergency spillway elevation is capable of containing the 25-year 24-hour storm.

In summary, for the post mining case at the Section 26 Pond, the 10-year 24-hour storm produces 5.6 acre feet of runoff, and the peak settleable solids concentration is 0.00 ml/l. The 25-year 24-hour storm event peaks at the 6,984.4 elevation, which below the emergency spillway elevation of 6,986.0'

Section 26 Pond Temporary Post Mine Channels

One temporary channel is necessary during the reclamation of areas within the Section 26 Pond watershed. This temporary channel (D-6 Ditch) will route water from reclamation areas to the upper reaches of the permanent post mine channel Bear Draw as shown on Figure 7-23J-3. Once Phase II bond release has been achieved in the entire sub-watershed reporting to the D-6 Ditch, it will be reclaimed.

A SEDCAD^{TM} model (25 Year 24 Hour Channel Demonstration model) has been included which evaluates the peak flow for this temporary channel. The minimum channel configurations are summarized below

Name	Peak Flow (CFS)	Average Slope (%)	Channel Type	Side Slopes	Minimum Depth (Feet)	Erosion Protection
D-6 Ditch	12.09	6.0	Trapezoidal 5' bottom	2H:1V	3.0	Vegetation