TRI-STATE

September 19, 2023

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 160 (TR-160)
Collom Haul Road Storm Water Runoff Control Structures

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 technical revision 160 (TR-160) to Permit No. C-1981-019.

TR-160 proposes six small channels and three sediment sumps to manage storm water runoff from the Collom Haul Road. Some of the proposed channels will route stormwater runoff to existing sediment control structures and others are proposed to be routed to existing sumps or newly proposed sumps.

Included in this technical revision is a change of index sheet to ease incorporation of this revision into the permit document, and a public notice for the Division's review. Finally, it is requested that the Division calculate the revised reclamation liability proposed under this technical revision. If you should have any additional questions or concerns, please feel free to contact Tony Tennyson at (970) 824-1232 or at ttennyson@tristategt.org.

Sincerely,

DocuSigned by:
Chris Gilbreath
D250C711D0BF450...

Chris Gilbreath
Senior Manager
Remediation and Reclamation

CG:TT:der

Enclosure

cc: Foster Beckett (BLM-LSFO)

P.O. BOX 33695
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Tony Tennyson (via email)
File: C. F. 1.1.2.144 - G471-11.3(21)d

CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: **Colowyo Coal Company L.P.** Permit Number: **C-1981-019**

Date: **September 18, 2023** Revision Description: **TR-160 Collom Haul Road Channels**

Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
1					No Change
2A					No Change
2B					No Change
2C					No Change
2D					No Change
2E					No Change
3					No Change
4					No Change
5A					No Change
5B					No Change
6					No Change
7					No Change
8					No Change
9					No Change
10					No Change
12					No Change
13					No Change
14					No Change
15					No Change
16					No Change
17					No Change
18A					No Change
18B	Pages Exh. 7-23B-1 through 3 (3 pages)		Pages Exh. 7-23B-1 through 3 (3 pages)		Exhibit 7, Item 23, Part B has been updated.
18B	Figure 7-23B-1 (1 page)		Figure 7-23B-1 (1 page)		Figure 7-23B-1 has been updated.

CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: **Colowyo Coal Company L.P.** Permit Number: **C-1981-019**

Date: **September 18, 2023** Revision Description: **TR-160 Collom Haul Road Channels**

Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
18B	Exhibit 7 Item 23 Part B 10-Yr 24 Hour SEDCAD Outputs (38 pages)		Exhibit 7 Item 23 Part B 10-Yr 24 Hour SEDCAD Outputs (42 pages)		Section 25 Pond 10-Yr 24 Hour SEDCAD has been updated.
18B	Exhibit 7 Item 23 Part B 25-Yr 24 Hour SEDCAD Outputs (27 pages)		Exhibit 7 Item 23 Part B 25-Yr 24 Hour SEDCAD Outputs (31 pages)		Section 25 Pond 25-Yr 24 Hour SEDCAD has been updated.
18B			Exhibit 7 Item 23 B SEDCAD for Culverts (1 page)		Exhibit 7 Item 23 B SEDCAD for Culverts has been inserted.
18C	Pages Exh. 7-25E-1 and Exh. 7-25E-2 (2 pages)		Pages Exh. 7-25E-1 and Exh. 7-25E-2 (2 pages)		Exhibit 7 Item 25E has been updated.
18C	Figure Exh. 7-25E-1		Figure Exh. 7-25E-1		Figure Exh. 7-25E-1 has been updated.
18C			Figure Exh. 7-25E-6		Figure Exh. 7-25E-6 has been inserted into the permit.
18C			Figure Exh. 7-25E-7		Figure Exh. 7-25E-7 has been inserted into the permit.
18C			Figure Exh. 7-25E-8		Figure Exh. 7-25E-8 has been inserted into the permit.
18C	C-1 Channel SEDCAD Output (7 pages)		C-1, 12, 13 Channel SEDCAD Outputs (22 pages)		C-1, 12, 13 SEDCAD has been updated.
18C			C-2 Channel SEDCAD Outputs (6 pages)		C-2 Channel SEDCAD outputs have been inserted into the permit.
18C			C-10 Channel SEDCAD Outputs (6 pages)		C-10 Channel SEDCAD outputs have been inserted into the permit.
18C			C-11 Channel SEDCAD Outputs (7 pages)		C-11 Channel SEDCAD outputs have been inserted into the permit.
18D					No Change
19					No Change
20	Exhibit 13C Pages 7 and 8 (2 pages)		Exhibit 13C Pages 7 and 8 (2 pages)		Tables 13C-6C and 13C-8 have been updated.
20	Map 13C-1 Sheet 1		Map 13C-1 Sheet 1		Map 13C-1 Sheet 1 has been updated.
20	Map 13C-1 Sheet 2		Map 13C-1 Sheet 2		Map 13C-1 Sheet 2 has been updated.
21					No Change
22	Map 25E Sheet 1		Map 25E Sheet 1		Map 25E Sheet 1 has been updated.

CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: **Colowyo Coal Company L.P.**
Permit Number: **C-1981-019**
Date: **September 18, 2023**
Revision Description: **TR-160 Collom Haul Road Channels**

Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
22	Map 28C Sheet 1		Map 28C Sheet 1		Map 28C Sheet 1 has been updated.
22	Map 28C Sheet 2		Map 28C Sheet 2		Map 28C Sheet 2 has been updated.
22	Map 41B		Map 41B		Map 41B has been updated.

Exhibit 7, Item 23, PART B
Section 25 Pond Sediment Control During Mining

Introduction

Exhibit 7, Item 14 in Volume 2D describes the hydrologic methodology used in sediment pond, permanent post-mine channels, and temporary conveyance channel demonstrations. Runoff curve numbers assigned to the undisturbed and/or reclaimed lands in various stages of mining and reclamation have been selected in accordance with Table 1 in the Introductory Text for Exhibit 7 in Volume 2D or as further described below. For channels protected by a riprap liner, selection of minimum riprap size is done using the Simons/OSM method in SEDCAD^{TM}. For channels to be protected by a vegetative liner, the permissible velocities are also determined using SEDCAD^{TM} routines.

SEDCAD^{TM} demonstrations with two distinct time frames have been evaluated in detail for the Section 25 Pond. Exhibit 7, Item 23, Parts I addresses sediment control for the Section 25 Pond during the post mining timeframe including post mine drainage channels.

This exhibit (Exhibit 7, Item 23, Part B) address sediment control during the mining timeframe for the Section 25 Pond and provides a demonstration for a temporary channel configurations. The assumed condition during mining is the temporary spoil pile is constructed to its maximum configuration and the entire area from the temporary spoil pile and native areas below are reporting to the Section 25 Pond.

Based on recommendations provided in a February 2015 telephone conversation with Dr. Richard Warner of the University of Kentucky Biosystems and Agricultural Engineering Department, and a coauthor of the SEDCAD^{TM} Design Manual and User's Guide, the "Cover Factor" appropriate for loose dumped spoil is between 0.40 and 0.45. The higher value was conservatively selected for use in this analysis. When advised that we are using curve number of 74 for runoff from loose dumped spoils, as per the approved Introductory Text of Volume 2D, Dr. Warner pointed out that a value of 74 is probably an overly conservative number, and a value on the order of 65 would be more appropriate based on his experience and measurements made over the years at numerous coal mines. A curve number of 74 was nevertheless used for spoil piles in the SEDCAD^{TM} modeling included in this submittal.

Selection of SEDCAD^{TM} input parameters L and S which are needed for sediment generation in the sedimentation evaluation analysis are selected on a case basis for each subwatershed. The MUSLE (Modified Soil Loss Equation) is used to estimate sediment generation at the source. Selection of the parameters R, K, LS C and P is described in the literature. LS is derived via an equation that includes a "length" parameter "L", and a "slope" parameter "S". However, LS is not the simple product of those two terms. Both "L" and "S" are based on the topography of the subwatershed in question with certain limitations provided in the literature as well as SEDCAD^{TM} users' training courses. First a representative slope is determined from the topography, and this sets the parameter "S". The "length" parameter "L" is more complicated as it represents the longest slope that water will have to flow before encountering a concentration point, such as a rivulet of a distinct slope change. SEDCAD^{TM} instructors advise that regardless of the topography, "L" can ever practicably exceed about 200 feet.

The selection of "L" and "S" for input into the SEDCAD™ model for the near repose angle slopes of a benched spoil pile is also complex. The values of 145 feet for "L" and 31% for "S" were selected for the dumped spoil pile lifts to approximate the combined LS factor that would apply to a compound slope, in this case a concave slope with a very steep (repose angle) upper part and a very flat lower part (bench). SEDCAD™ cannot handle a compound slope directly, but a method to do so is described in Chapter 5 of "Hydrology and Sedimentology for Disturbed Areas" by Barfield, Warner and Haan, 1981. The method uses the original 1965 Wischmeier and Smith USDA Handbook No. 282 formula, then adjusts each segment with a factor, and finally provides a weighted average for the compound slope.

The above-described method was applied to a 65 foot upper segment at repose angle (77%) followed by an 85 foot flat bench at 1%, resulting in a weighted average LS of 9.0. Several possible combinations of a single L and a single S were then examined for input into SEDCAD™ to arrive at a similar LS factor. It was found that a single line with L of 145 feet with a drop of 45 feet, producing a S of 31% produces a LS of 10.1, which is slightly higher than the calculated value of 9.0 for the actual compound slope. That line also happens to be close to a simple straight line from the crest of one bench to the crest of the next one lower down the face, so it has some physical relevance to the actual spoil pile face. The L and S of 145 feet and 31%, producing a LS factor about 12% greater than the actual compound concave slope calculated were then conservatively used in the modeling of all spoil pile faces.

Section 25 Pond – During Mining

The location of the Section 25 Pond and its watershed is presented on Map 41B. The temporary channel (D-3 Ditch) that might route water to the Section 25 Pond is presented on 41B.

The as-built configuration for the Middle Pond is presented on Figure 7-23I-1, the as-built configuration for the Section 36 Pond is presented on Figure 7-23I-2, and as-built configuration for the Section 25 Pond is presented on Figure 7-23I-3. Figure 7-23B-1 provides the breakdown of drainage areas and hydrologic conditions for all areas in the watershed reporting to these three sediment ponds during mining. The Middle and Section 36 Ponds are part of the Section 25 Pond sediment control system and are utilized to reduced peak flows and provide additional sediment storage if need. All discharges from the Middle and Section 36 Ponds flow directly to the Section 25 Pond through natural channels, and the Section 25 Pond is the final discharge location.

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

In summary, for the mining case at the Section 25 Pond, the 10-year 24-hour storm produces 9.1 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 6,875.05.04 elevation, which is right at the emergency spillway elevation of 6,875.0’

Temporary Channels

The Section 25 Pond watershed is comprised of three temporary channels the D-3 Ditch, C-14, and C-15 channels respectively. The configuration for these channels are include in the Section 25 Pond 10-Year, 24-Hour During Mining Storm Event Demonstration and are further outlined as described in the following table:

Ditch Name	Flow, Q	Slope, %	Type	Specified Depth	Bottom Width	Side Slope, H:1V	Rip Rap, D50, in
D-3 Ditch	0.02	16.1%	Riprap	4.0	12.0	2.0	6.0
C-14	3.19	3.0	Erodible	3.0	3.0	2.0	NA
C-15	1.91	3.0	Erodible	3.0	3.0	2.0	NA

The C-14 and C-15 channels will both have culverts installed where the Section 25 Pond Access Road cross both channels. The culvert sizing was based on the largest flow from the C-14 channel at 3.19 cfs. Given this flow, a 12-inch culvert will suffice for both channels. The culvert demonstration can be found in the attached SEDCAD™ demonstration.

Section 25 Pond Effluent Demonstration During Mining

10-Year 24-Hour Storm Event

Tony Tennyson

General Information

Storm Information:

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

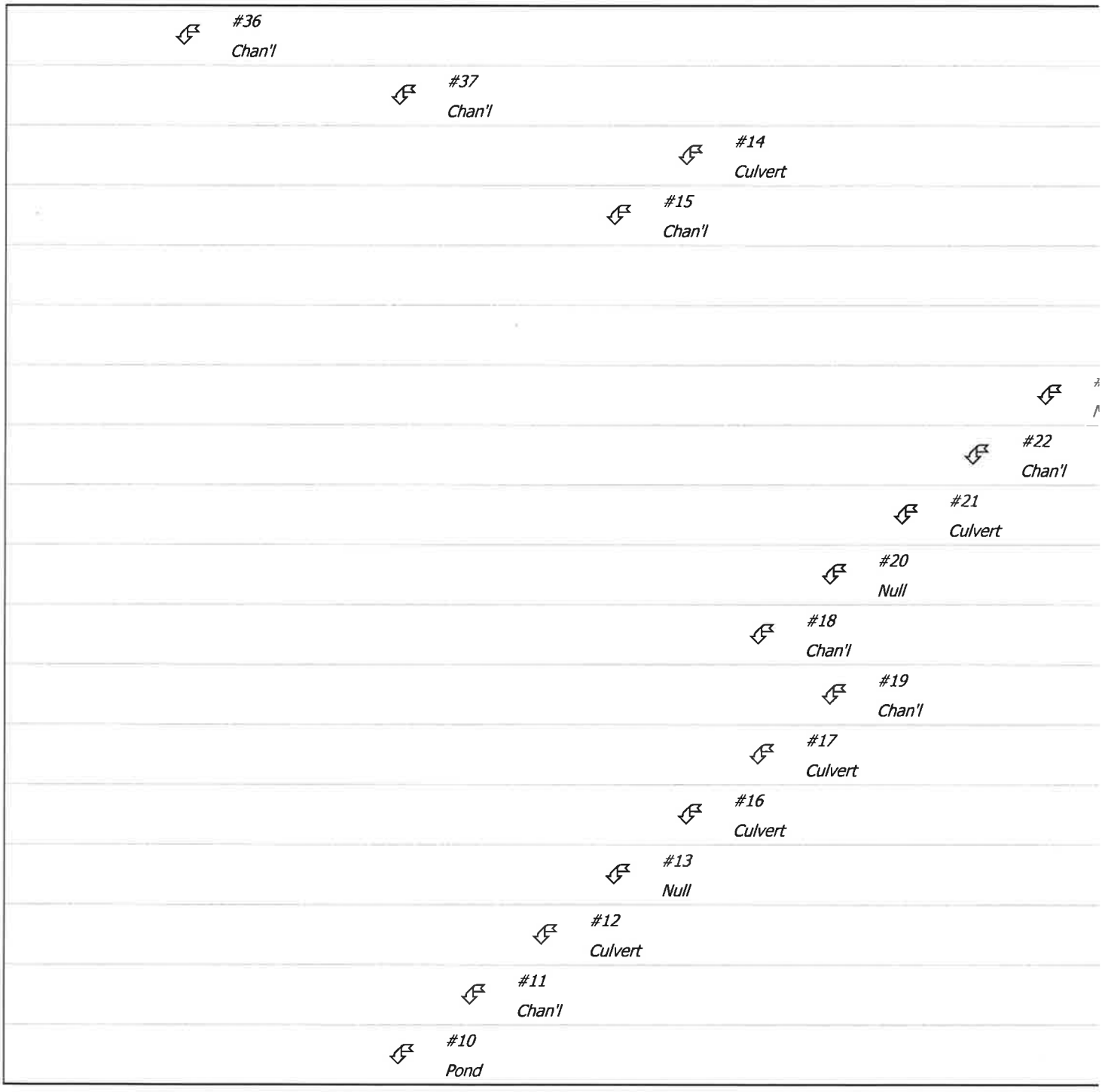
Particle Size Distribution:

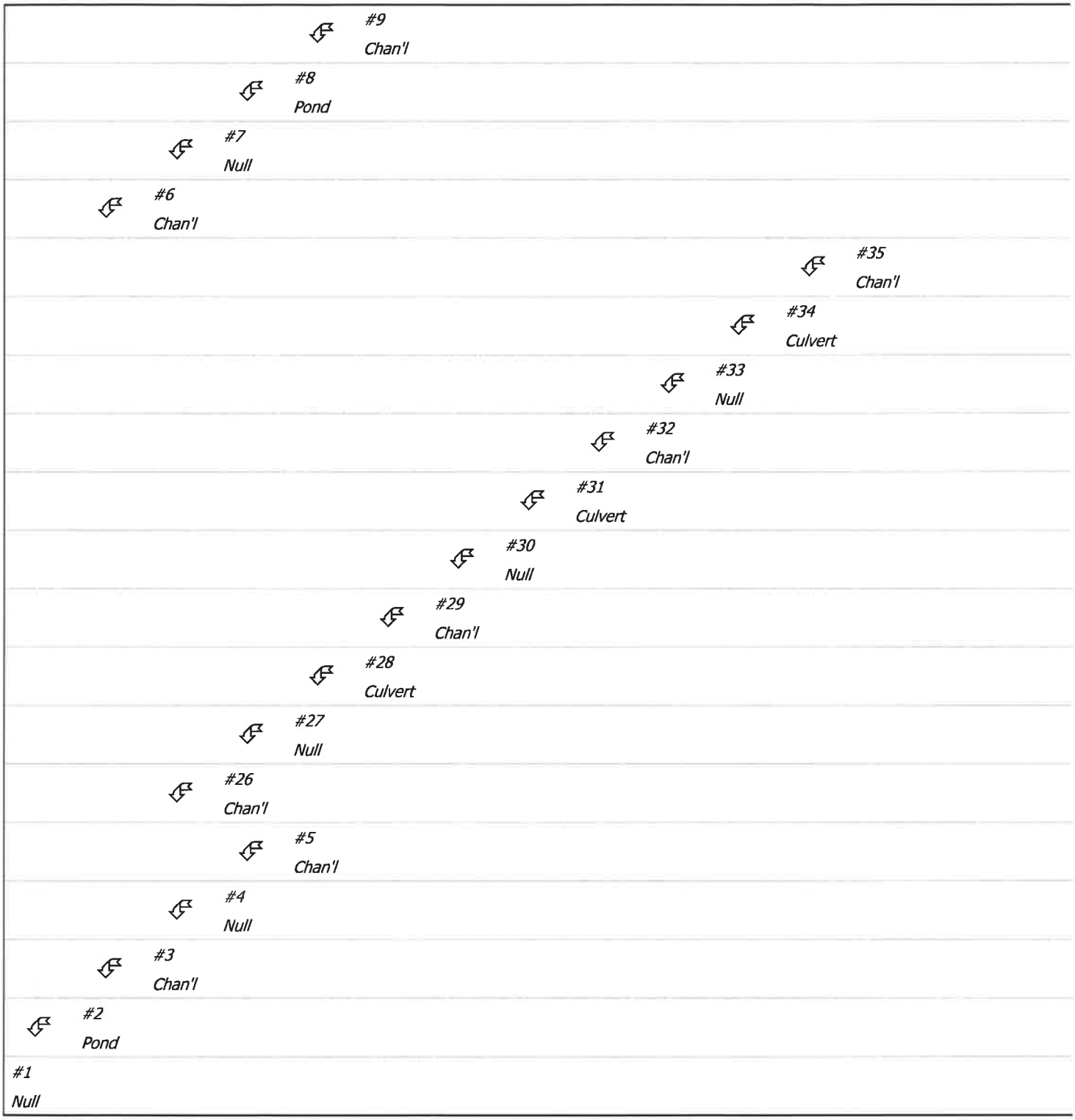
Size (mm)	Colowyo Particle Size
4.7500	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

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 Confluecne D-3 Ditch and Little Collom Gulch
Channel	#5	==>	#4	0.000	0.000	D-3 Ditch
Channel	#6	==>	#2	0.000	0.000	Natural Channel Below Middle Pond
Null	#7	==>	#6	0.000	0.000	Null at Outlet of Middle Pond
Pond	#8	==>	#7	0.000	0.000	Middle Pond
Channel	#9	==>	#8	0.000	0.000	Natural Channel Middle Pond to Section 36 Pond
Pond	#10	==>	#9	0.000	0.000	Section 36 Pond
Channel	#11	==>	#10	0.000	0.000	Natural Channel Section 36 Pond to Culvert 44A
Culvert	#12	==>	#11	0.000	0.000	Culvert 44A
Null	#13	==>	#12	0.000	0.000	Null at Confluence of Culverts 62 and 63
Culvert	#14	==>	#15	0.000	0.000	Culvert 62
Channel	#15	==>	#12	0.000	0.000	Natural Channel within Disturbed Area to Culvert 44A
Culvert	#16	==>	#13	0.000	0.000	Culvert 63
Culvert	#17	==>	#16	0.000	0.000	Culvert 66
Channel	#18	==>	#16	0.000	0.000	Road Ditch from Culvert 66 to Culvert 63
Channel	#19	==>	#17	0.000	0.000	Road Ditch to Culvert 66
Null	#20	==>	#18	0.000	0.000	Null out Outlet of Culvert 65
Culvert	#21	==>	#20	0.000	0.000	Culvert 65
Channel	#22	==>	#21	0.000	0.000	Road Ditch to Culvert 65
Null	#23	==>	#22	0.000	0.000	Null Below Culvert 67
Culvert	#24	==>	#23	0.000	0.000	Culvert 67
Channel	#25	==>	#24	0.000	0.000	Road Ditch to Culvert 67
Channel	#26	==>	#3	0.000	0.000	Natural Sorted Ditch at Toe of Temp Spoil Pile
Null	#27	==>	#26	0.000	0.000	Null Below Culvert 70
Culvert	#28	==>	#27	0.000	0.000	Culvert 70
Channel	#29	==>	#28	0.000	0.000	Haul Road Ditch to Culvert 70
Null	#30	==>	#29	0.000	0.000	Null below Culvert 69
Culvert	#31	==>	#30	0.000	0.000	Culvert 69
Channel	#32	==>	#31	0.000	0.000	Road Ditch to Culvert 69
Null	#33	==>	#32	0.000	0.000	Null below Culvert 68
Culvert	#34	==>	#33	0.000	0.000	Culvert 68

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#35	==>	#34	0.000	0.000	Natural Channel to Culvert 68
Channel	#36	==>	#6	0.000	0.000	C-14 Temporary Channel
Channel	#37	==>	#9	0.000	0.000	C-15 Temporary Channel




#9
Chan'l
#8
Pond
#7
Null
#6
Chan'l
#35
Chan'l
#34
Culvert
#33
Null
#32
Chan'l
#31
Culvert
#30
Null
#29
Chan'l
#28
Culvert
#27
Null
#26
Chan'l
#5
Chan'l
#4
Null
#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)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#36		82.300	82.300	3.19	0.35	0.2	740	0.40	0.21
#37		23.500	23.500	1.91	0.16	0.1	505	0.29	0.15
#14		50.700	50.700	1.39	0.12	27.1	334,377	190.58	86.31
#15		66.800	117.500	35.99	3.24	566.1	224,596	122.31	65.42
#25		4.400	4.400	3.21	0.24	37.1	208,518	118.85	61.15
#24		0.000	4.400	3.21	0.24	37.1	208,518	118.85	61.15
#23		0.000	4.400	3.21	0.24	37.1	208,518	118.85	61.15
#22		24.800	29.200	12.47	1.05	122.8	166,701	92.07	45.22
#21		0.000	29.200	12.47	1.05	122.8	166,701	92.07	45.22
#20		0.000	29.200	12.47	1.05	122.8	166,701	92.07	45.22
#18		4.200	33.400	15.53	1.28	151.5	160,691	89.29	46.13
#19		13.000	13.000	4.41	0.39	68.9	228,801	123.69	65.52
#17		0.000	13.000	4.41	0.39	68.9	228,801	123.69	65.52
#16		0.000	46.400	19.60	1.67	220.4	184,350	101.57	50.73
#13		0.000	46.400	19.60	1.67	220.4	184,350	101.57	50.73
#12		0.000	163.900	53.77	4.91	786.5	214,135	117.00	60.47
#11		27.700	191.600	57.08	5.19	788.8	211,652	115.66	57.56
#10	In	0.000	191.600	57.08	5.19	788.8	211,652	115.66	57.56
	Out			16.48	5.18	229.2	38,867	2.49	2.11
#9		0.000	215.100	16.87	5.34	229.2	38,487	2.47	2.08
#8	In	14.500	229.600	16.87	5.34	229.2	38,487	2.47	2.08
	Out			11.85	5.32	194.1	32,340	0.88	0.78
#7		0.000	229.600	11.85	5.32	194.1	32,329	0.88	0.78
#6		78.600	390.500	12.31	5.94	199.4	30,998	1.28	1.15
#35		7.800	7.800	1.68	0.12	14.6	160,804	91.65	46.91
#34		0.000	7.800	1.68	0.12	14.6	160,804	91.65	46.91
#33		0.000	7.800	1.68	0.12	14.6	160,804	91.65	46.91
#32		9.900	17.700	4.74	0.35	49.2	188,940	107.69	55.29
#31		0.000	17.700	4.74	0.35	49.2	188,940	107.69	55.29
#30		0.000	17.700	4.74	0.35	49.2	188,940	107.69	55.29
#29		6.900	24.600	7.80	0.58	91.6	211,642	120.63	62.10
#28		0.000	24.600	7.80	0.58	91.6	211,642	120.63	62.10
#27		0.000	24.600	7.80	0.58	91.6	211,642	120.63	62.10
#26		96.900	121.500	44.20	3.25	2,079.8	753,468	429.45	215.36
#5		14.800	14.800	0.02	0.01	0.1	4,228	2.41	1.60
#4		0.000	14.800	0.02	0.01	0.1	4,228	2.41	1.60
#3		186.300	322.600	49.70	3.66	2,089.4	695,730	396.54	195.64

		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)
#2	In	0.000	713.100	56.72	9.60	2,288.8	632,316	331.29	86.97
	Out			9.44	7.33	433.6	45,215	0.00	0.00
#1		0.000	713.100	9.44	7.33	433.6	45,199	0.00	0.00

Particle Size Distribution(s) at Each Structure

Structure #36 (C-14 Temporary Channel):

Size (mm)	In/Out
4.7500	100.000%
0.0750	80.165%
0.0400	36.239%
0.0010	21.963%

Structure #37 (C-15 Temporary Channel):

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

Structure #14 (Culvert 62):

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

Structure #15 (Natural Channel within Disturbed Area to Culvert 44A):

Size (mm)	In/Out
4.7500	100.000%
0.0750	81.062%
0.0400	36.645%
0.0010	22.209%

Structure #25 (Road Ditch to Culvert 67):

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

Structure #24 (Culvert 67):

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

Structure #23 (Null Below Culvert 67):

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

Structure #22 (Road Ditch to Culvert 65):

Size (mm)	In/Out
4.7500	100.000%
0.0750	78.603%
0.0400	35.533%
0.0010	21.535%

Structure #21 (Culvert 65):

Size (mm)	In/Out
4.7500	100.000%
0.0750	78.603%
0.0400	35.533%
0.0010	21.535%

Structure #20 (Null out Outlet of Culvert 65):

Size (mm)	In/Out
4.7500	100.000%
0.0750	78.603%
0.0400	35.533%
0.0010	21.535%

Structure #18 (Road Ditch from Culvert 66 to Culvert 63):

Size (mm)	In/Out
4.7500	100.000%
0.0750	77.541%
0.0400	35.053%
0.0010	21.244%

Structure #19 (Road Ditch to Culvert 66):

Size (mm)	In/Out
4.7500	100.000%
0.0750	82.323%
0.0400	37.215%
0.0010	22.554%

Structure #17 (Culvert 66):

Size (mm)	In/Out
4.7500	100.000%
0.0750	82.323%
0.0400	37.215%
0.0010	22.554%

Structure #16 (Culvert 63):

Size (mm)	In/Out
4.7500	100.000%
0.0750	79.037%
0.0400	35.729%
0.0010	21.654%

Structure #13 (Null at Confluence of Culverts 62 and 63):

Size (mm)	In/Out
4.7500	100.000%
0.0750	79.037%
0.0400	35.729%
0.0010	21.654%

Structure #12 (Culvert 44A):

Size (mm)	In/Out
4.7500	100.000%
0.0750	80.495%
0.0400	36.388%
0.0010	22.053%

Structure #11 (Natural Channel Section 36 Pond to Culvert 44A):

Size (mm)	In/Out
4.7500	100.000%
0.0750	80.472%
0.0400	36.378%
0.0010	22.047%

Structure #10 (Section 36 Pond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	80.472%	100.000%
0.0400	36.378%	100.000%
0.0010	22.047%	75.883%

Structure #9 (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	75.869%

Structure #8 (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	75.869%	89.594%

Structure #7 (Null at Outlet of Middle Pond):

Size (mm)	In/Out
4.7500	100.000%
0.0750	100.000%
0.0400	100.000%
0.0010	89.594%

Structure #6 (Natural Channel Below Middle Pond):

Size (mm)	In/Out
4.7500	100.000%
0.0750	99.296%
0.0400	98.239%
0.0010	87.764%

Structure #35 (Natural Channel to Culvert 68):

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

Structure #34 (Culvert 68):

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

Structure #33 (Null below Culvert 68):

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

Structure #32 (Road Ditch to Culvert 69):

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

Structure #31 (Culvert 69):

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

Structure #30 (Null below Culvert 69):

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

Structure #29 (Haul Road Ditch to Culvert 70):

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

Structure #28 (Culvert 70):

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

Structure #27 (Null Below Culvert 70):

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

Structure #26 (Natural Sorted Ditch at Toe of Temp Spoil Pile):

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

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 Confluecne D-3 Ditch and Little Collom Gulch):

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	100.000%
0.0750	73.000%
0.0400	33.000%
0.0010	20.000%

Structure #2 (Section 25 Pond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	75.291%	100.000%
0.0400	38.683%	100.000%
0.0010	25.903%	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 #36 (Erodible Channel)

C-14 Temporary Channel

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	2.0:1	2.0:1	3.0	0.0250	2.75			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	3.19 cfs	
Depth:	0.25 ft	3.00 ft
Top Width:	3.99 ft	14.99 ft
Velocity:	3.66 fps	
X-Section Area:	0.87 sq ft	
Hydraulic Radius:	0.212 ft	
Froude Number:	1.38	

Structure #37 (Erodible Channel)

C-15 Temporary Channel

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	2.0:1	2.0:1	3.0	0.0250	2.82			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.91 cfs	
Depth:	0.18 ft	3.00 ft
Top Width:	3.74 ft	15.02 ft
Velocity:	3.08 fps	
X-Section Area:	0.62 sq ft	

	w/o Freeboard	w/ Freeboard
Hydraulic Radius:	0.163 ft	
Froude Number:	1.33	

Structure #14 (Culvert)

Culvert 62

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
220.00	1.50	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 1.39 cfs

Minimum pipe diameter: 1 - 8 inch pipe(s) required

Structure #15 (Erodible Channel)

Natural Channel within Disturbed Area to Culvert 44A

Parabolic Erodible Channel Inputs:

Material: Shales and hardpans

Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
8.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	35.99 cfs	
Depth:	1.06 ft	
Top Width:	4.23 ft	
Velocity:	12.05 fps	
X-Section Area:	2.99 sq ft	
Hydraulic Radius:	0.605 ft	
Froude Number:	2.53	

Structure #25 (Erodible Channel)

Road Ditch to Culvert 67

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	8.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	3.21 cfs	
Depth:	0.57 ft	
Top Width:	1.72 ft	
Velocity:	6.48 fps	
X-Section Area:	0.49 sq ft	
Hydraulic Radius:	0.239 ft	
Froude Number:	2.13	

Structure #24 (Culvert)

Culvert 67

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 3.21 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Structure #23 (Null)

Null Below Culvert 67

Structure #22 (Erodible Channel)

Road Ditch to Culvert 65

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	6.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	12.47 cfs	
Depth:	1.01 ft	
Top Width:	3.02 ft	
Velocity:	8.18 fps	
X-Section Area:	1.52 sq ft	
Hydraulic Radius:	0.419 ft	
Froude Number:	2.03	

Structure #21 (Culvert)

Culvert 65

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 12.47 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Structure #20 (Null)

Null out Outlet of Culvert 65

Structure #18 (Erodible Channel)

Road Ditch from Culvert 66 to Culvert 63

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	7.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	15.53 cfs	
Depth:	1.06 ft	
Top Width:	3.19 ft	
Velocity:	9.16 fps	
X-Section Area:	1.70 sq ft	
Hydraulic Radius:	0.442 ft	
Froude Number:	2.21	

Structure #19 (Erodible Channel)

Road Ditch to Culvert 66

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	8.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.41 cfs	
Depth:	0.65 ft	
Top Width:	1.94 ft	
Velocity:	7.03 fps	
X-Section Area:	0.63 sq ft	
Hydraulic Radius:	0.269 ft	
Froude Number:	2.18	

Structure #17 (Culvert)

Culvert 66

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 4.41 cfs

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Structure #16 (Culvert)

Culvert 63

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
180.00	1.50	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 19.60 cfs

Minimum pipe diameter: 1 - 21 inch pipe(s) required

Structure #13 (Null)

Null at Confluence of Culverts 62 and 63

Structure #12 (Culvert)

Culvert 44A

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
300.00	1.50	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 53.77 cfs

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Structure #11 (Vegetated Channel)

Natural Channel Section 36 Pond to Culvert 44A

Parabolic Vegetated Channel Inputs:

Material: Tall fescue

Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
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:	57.08 cfs		57.08 cfs	
Depth:	1.21 ft		1.49 ft	
Top Width:	4.85 ft		5.96 ft	
Velocity:	14.55 fps		9.63 fps	
X-Section Area:	3.92 sq ft		5.93 sq ft	
Hydraulic Radius:	0.693 ft		0.852 ft	
Froude Number:	2.85		1.70	
Roughness Coefficient:	0.0288		0.0499	

Structure #10 (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:	7,121.77 ft
H'graph Detention Time:	2.23 hrs
Pond Model:	CSTRS
Dewater Time:	0.96 days
Trap Efficiency:	70.95 %

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	5.35	Spillway #1
7,119.00	0.301	1.723	8.509	10.15	
7,120.00	0.340	2.043	12.033	0.70	
7,121.00	0.387	2.407	14.738	0.60	
7,121.77	0.422	2.720	16.483	0.65	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

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 #9 (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:	16.87 cfs		16.87 cfs	
Depth:	0.56 ft		0.92 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:	7.24 ft		8.67 ft	
Velocity:	4.91 fps		2.69 fps	
X-Section Area:	3.43 sq ft		6.28 sq ft	
Hydraulic Radius:	0.457 ft		0.689 ft	
Froude Number:	1.26		0.56	
Roughness Coefficient:	0.0455		0.1093	

Structure #8 (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:	7,062.95 ft
H'graph Detention Time:	3.47 hrs
Pond Model:	CSTRS
Dewater Time:	1.29 days
Trap Efficiency:	15.32 %

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	4.55	
7,061.00	0.248	1.267	0.945	7.30	Spillway #1
7,062.00	0.284	1.533	8.509	9.70	
7,062.95	0.325	1.822	11.848	1.30	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	0.552	3.529	71.605		
7,068.00	0.576	4.093	211.288		
7,069.00	0.628	4.695	418.987		
7,070.00	0.685	5.351	716.430		
7,071.00	0.760	6.074	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 #7 (Null)

Null at Outlet of Middle Pond

Structure #6 (Vegetated Channel)

Natural Channel Below Middle 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	9.7	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:	12.31 cfs		12.31 cfs	
Depth:	0.43 ft		0.73 ft	
Top Width:	6.73 ft		7.93 ft	
Velocity:	4.85 fps		2.60 fps	

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
X-Section Area:	2.54 sq ft		4.73 sq ft	
Hydraulic Radius:	0.366 ft		0.572 ft	
Froude Number:	1.39		0.59	
Roughness Coefficient:	0.0489		0.1227	

Structure #35 (Vegetated Channel)

Natural Channel to Culvert 68

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)
20.00	5.0:1	5.0:1	10.0	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:	1.68 cfs		1.68 cfs	
Depth:	0.10 ft		0.26 ft	
Top Width:	21.03 ft		22.57 ft	
Velocity:	0.79 fps		0.31 fps	
X-Section Area:	2.11 sq ft		5.47 sq ft	
Hydraulic Radius:	0.100 ft		0.242 ft	
Froude Number:	0.44		0.11	
Roughness Coefficient:	0.1263		0.5945	

Structure #34 (Culvert)

Culvert 68

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
380.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 1.68 cfs

Minimum pipe diameter: 1 - 8 inch pipe(s) required

Structure #33 (Null)

Null below Culvert 68

Structure #32 (Erodible Channel)

Road Ditch to Culvert 69

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	9.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.74 cfs	
Depth:	0.65 ft	
Top Width:	1.95 ft	
Velocity:	7.48 fps	
X-Section Area:	0.63 sq ft	
Hydraulic Radius:	0.270 ft	
Froude Number:	2.31	

Structure #31 (Culvert)

Culvert 69

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
170.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 4.74 cfs

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Structure #30 (Null)

Null below Culvert 69

Structure #29 (Erodible Channel)

Haul Road Ditch to Culvert 70

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	1.5	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	7.80 cfs	
Depth:	1.10 ft	
Top Width:	3.29 ft	
Velocity:	4.33 fps	
X-Section Area:	1.80 sq ft	
Hydraulic Radius:	0.456 ft	
Froude Number:	1.03	

Structure #28 (Culvert)

Culvert 70

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
170.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 7.80 cfs

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Structure #27 (Null)

Null Below Culvert 70

Structure #26 (Erodible Channel)

Natural Sorted Ditch at Toe of Temp Spoil Pile

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	12.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	44.20 cfs	
Depth:	1.42 ft	
Top Width:	4.27 ft	
Velocity:	14.56 fps	
X-Section Area:	3.04 sq ft	
Hydraulic Radius:	0.592 ft	
Froude Number:	3.04	

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
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 Confluecne D-3 Ditch and Little Collom Gulch

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:	49.70 cfs		49.70 cfs	
Depth:	0.91 ft		1.32 ft	
Top Width:	8.65 ft		10.26 ft	
Velocity:	7.97 fps		4.95 fps	
X-Section Area:	6.23 sq ft		10.03 sq ft	
Hydraulic Radius:	0.686 ft		0.922 ft	
Froude Number:	1.66		0.88	
Roughness Coefficient:	0.0347		0.0680	

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:	20.00 %

**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:	6,873.26 ft
H'graph Detention Time:	5.54 hrs
Pond Model:	CSTRS
Dewater Time:	2.75 days
Trap Efficiency:	81.06 %

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
6,855.01	0.048	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	12.70	
6,873.26	0.944	8.492	9.435	1.35	Peak Stage
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		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,877.00	1.187	12.472	168.142	
6,878.00	1.250	13.691	330.639	
6,879.00	1.318	14.975	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
6,855.01	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)
#36	1	79.500	0.826	0.000	0.000	47.000	S	0.00	0.000
	2	2.800	0.329	0.000	0.000	98.000	F	3.19	0.348
	Σ	**82.300**						**3.19**	**0.348**
#37	1	21.300	0.244	0.000	0.000	47.000	S	0.00	0.000
	2	0.500	0.005	0.000	0.000	98.000	F	0.67	0.064
	3	1.700	0.011	0.000	0.000	85.000	F	1.24	0.092
	Σ	**23.500**						**1.91**	**0.156**
#14	1	1.900	0.009	0.000	0.000	85.000	F	1.39	0.103
	2	18.800	0.156	0.000	0.000	47.000	M	0.00	0.000
	3	4.000	0.025	0.000	0.000	62.000	M	0.03	0.016
	4	26.000	0.148	0.000	0.000	47.000	M	0.00	0.000
	Σ	**50.700**						**1.39**	**0.119**
#15	1	59.600	0.149	0.000	0.000	85.000	F	35.72	3.120
	2	7.200	0.051	0.000	0.000	47.000	M	0.00	0.000
	Σ	**117.500**						**35.99**	**3.239**
#25	1	4.400	0.118	0.000	0.000	85.000	F	3.21	0.239
	Σ	**4.400**						**3.21**	**0.239**
#24	**Σ**	**4.400**						**3.21**	**0.239**
#23	**Σ**	**4.400**						**3.21**	**0.239**
#22	1	11.000	0.129	0.000	0.000	85.000	F	6.59	0.576
	2	9.400	0.096	0.000	0.000	47.000	M	0.00	0.000
	3	4.400	0.056	0.000	0.000	85.000	F	3.21	0.239
	Σ	**29.200**						**12.47**	**1.053**
#21	**Σ**	**29.200**						**12.47**	**1.053**
#20	**Σ**	**29.200**						**12.47**	**1.053**
#18	1	4.200	0.061	0.000	0.000	85.000	F	3.06	0.228
	Σ	**33.400**						**15.53**	**1.281**
#19	1	5.500	0.062	0.000	0.000	47.000	M	0.00	0.000
	2	7.500	0.181	0.000	0.000	85.000	F	4.41	0.391
	Σ	**13.000**						**4.41**	**0.391**
#17	**Σ**	**13.000**						**4.41**	**0.391**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#16	**Σ**	**46.400**						**19.60**	**1.672**
#13	**Σ**	**46.400**						**19.60**	**1.672**
#12	**Σ**	**163.900**						**53.77**	**4.911**
#11	1	24.000	1.445	0.000	0.000	47.000	M	0.00	0.000
	2	2.700	0.034	0.000	0.000	85.000	F	1.97	0.146
	3	1.000	0.003	0.000	0.000	98.000	F	1.35	0.130
	Σ	**191.600**						**57.08**	**5.187**
#10	**Σ**	**191.600**						**57.08**	**5.187**
#9	**Σ**	**215.100**						**16.87**	**5.337**
#8	1	14.500	0.108	0.000	0.000	47.000	M	0.00	0.000
	Σ	**229.600**						**16.87**	**5.337**
#7	**Σ**	**229.600**						**11.85**	**5.317**
#6	1	74.600	0.401	0.000	0.000	47.000	M	0.00	0.000
	2	3.200	0.068	0.000	0.000	85.000	F	2.33	0.174
	3	0.800	0.006	0.000	0.000	98.000	F	1.08	0.104
	Σ	**390.500**						**12.31**	**5.943**
#35	1	2.300	0.065	0.000	0.000	85.000	F	1.68	0.125
	2	5.500	0.079	0.000	0.000	47.000	M	0.00	0.000
	Σ	**7.800**						**1.68**	**0.125**
#34	**Σ**	**7.800**						**1.68**	**0.125**
#33	**Σ**	**7.800**						**1.68**	**0.125**
#32	1	4.200	0.053	0.000	0.000	85.000	F	3.06	0.228
	2	5.700	0.095	0.000	0.000	47.000	M	0.00	0.000
	Σ	**17.700**						**4.74**	**0.353**
#31	**Σ**	**17.700**						**4.74**	**0.353**
#30	**Σ**	**17.700**						**4.74**	**0.353**
#29	1	2.700	0.031	0.000	0.000	47.000	M	0.00	0.000
	2	4.200	0.045	0.000	0.000	85.000	F	3.06	0.228
	Σ	**24.600**						**7.80**	**0.580**
#28	**Σ**	**24.600**						**7.80**	**0.580**
#27	**Σ**	**24.600**						**7.80**	**0.580**
#26	1	79.600	0.009	0.000	0.000	74.000	F	23.78	1.729

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	2	17.300	0.036	0.000	0.000	85.000	F	12.61	0.939
	Σ	**121.500**						**44.20**	**3.248**
#5	1	14.800	0.082	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	167.900	0.156	0.000	0.000	47.000	M	0.00	0.000
	2	18.400	0.057	0.000	0.000	74.000	F	5.50	0.400
	Σ	**322.600**						**49.70**	**3.661**
#2	**Σ**	**713.100**						**56.72**	**9.603**
#1	**Σ**	**713.100**						**9.44**	**7.334**

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)
#36	1	0.300	400.00	2.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	400.00	1.00	0.0310	0.9000	1	0.2	740	0.40	0.21
	Σ							**0.2**	**740**	**0.40**	**0.21**
#37	1	0.300	400.00	4.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	20.00	1.50	0.0310	0.9000	1	0.0	341	0.19	0.11
	3	0.300	50.00	1.50	0.0310	0.9000	1	0.0	594	0.34	0.17
	Σ							**0.1**	**505**	**0.29**	**0.15**
#14	1	0.300	50.00	27.00	1.0000	0.9000	1	27.1	334,377	190.58	99.77
	2	0.300	400.00	9.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	3	0.300	75.00	10.00	0.0100	0.3800	1	0.0	107	0.06	0.05
	4	0.300	400.00	7.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**27.1**	**334,377**	**190.58**	**86.31**
#15	1	0.300	400.00	6.00	1.0000	0.9000	1	539.0	225,073	122.28	64.57
	2	0.300	200.00	10.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**566.1**	**224,596**	**122.31**	**65.42**
#25	1	0.300	300.00	8.00	1.0000	0.9000	1	37.1	208,518	118.85	61.15
	Σ							**37.1**	**208,518**	**118.85**	**61.15**
#24	**Σ**							**37.1**	**208,518**	**118.85**	**61.15**

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)
#23	Σ							**37.1**	**208,518**	**118.85**	**61.15**
#22	1	0.300	400.00	6.00	1.0000	0.9000	1	81.2	186,855	101.52	53.34
	2	0.300	300.00	9.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	3	0.300	50.00	2.00	1.0000	0.9000	1	4.5	27,248	15.53	7.82
	Σ							**122.8**	**166,701**	**92.07**	**45.22**
#21	Σ							**122.8**	**166,701**	**92.07**	**45.22**
#20	Σ							**122.8**	**166,701**	**92.07**	**45.22**
#18	1	0.300	200.00	8.00	1.0000	0.9000	1	28.7	172,007	98.04	50.21
	Σ							**151.5**	**160,691**	**89.29**	**46.13**
#19	1	0.300	200.00	9.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	400.00	8.00	1.0000	0.9000	1	68.9	228,801	123.69	65.52
	Σ							**68.9**	**228,801**	**123.69**	**65.52**
#17	Σ							**68.9**	**228,801**	**123.69**	**65.52**
#16	Σ							**220.4**	**184,350**	**101.57**	**50.73**
#13	Σ							**220.4**	**184,350**	**101.57**	**50.73**
#12	Σ							**786.5**	**214,135**	**117.00**	**60.47**
#11	1	0.300	300.00	8.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	25.00	1.50	1.0000	0.9000	1	1.6	16,349	9.32	4.69
	3	0.300	10.00	1.00	1.0000	0.9000	1	0.7	6,917	3.94	2.19
	Σ							**788.8**	**211,652**	**115.66**	**57.56**
#10	Σ							**788.8**	**211,652**	**115.66**	**57.56**
#9	Σ							**229.2**	**38,487**	**2.47**	**2.08**
#8	1	0.300	300.00	10.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**229.2**	**38,487**	**2.47**	**2.08**
#7	Σ							**194.1**	**32,329**	**0.88**	**0.78**
#6	1	0.300	400.00	10.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	150.00	2.00	1.0000	0.9000	1	4.4	36,332	20.71	10.43
	3	0.300	25.00	1.00	1.0000	0.9000	1	0.7	8,861	5.05	2.81
	Σ							**199.4**	**30,998**	**1.28**	**1.15**
#35	1	0.300	200.00	8.00	1.0000	0.9000	1	14.6	160,804	91.65	46.91
	2	0.300	200.00	10.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**14.6**	**160,804**	**91.65**	**46.91**

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)
#34	Σ							**14.6**	**160,804**	**91.65**	**46.91**
#33	Σ							**14.6**	**160,804**	**91.65**	**46.91**
#32	1	0.300	200.00	9.00	1.0000	0.9000	1	34.5	204,063	116.31	59.81
	2	0.300	200.00	9.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							**49.2**	**188,940**	**107.69**	**55.29**
#31	Σ							**49.2**	**188,940**	**107.69**	**55.29**
#30	Σ							**49.2**	**188,940**	**107.69**	**55.29**
#29	1	0.300	50.00	10.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	100.00	13.00	1.0000	0.9000	1	42.4	245,909	140.16	72.46
	Σ							**91.6**	**211,642**	**120.63**	**62.10**
#28	Σ							**91.6**	**211,642**	**120.63**	**62.10**
#27	Σ							**91.6**	**211,642**	**120.63**	**62.10**
#26	1	0.300	400.00	17.00	1.0000	0.9000	1	1,336.4	892,757	508.84	249.04
	2	0.300	200.00	24.00	1.0000	0.9000	1	651.8	723,218	412.21	227.99
	Σ							**2,079.8**	**753,468**	**429.45**	**215.36**
#5	1	0.300	400.00	19.30	0.0310	0.9000	1	0.1	4,228	2.41	1.60
	Σ							**0.1**	**4,228**	**2.41**	**1.60**
#4	Σ							**0.1**	**4,228**	**2.41**	**1.60**
#3	1	0.300	400.00	7.90	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	300.00	23.00	0.0310	0.9000	1	9.6	42,344	24.13	9.94
	Σ							**2,089.4**	**695,730**	**396.54**	**195.64**
#2	Σ							**2,288.8**	**632,316**	**331.29**	**86.97**
#1	Σ							**433.6**	**45,199**	**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	11.50	175.72	1,528.00	2.710	0.156
#3	**1**	**Time of Concentration:**					**0.156**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	23.00	227.24	988.00	4.790	0.057
#3	**2**	**Time of Concentration:**					**0.057**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#5	1	3. Short grass pasture	19.00	196.84	1,036.00	3.480	0.082
#5	**1**	**Time of Concentration:**					**0.082**
#6	1	3. Short grass pasture	10.00	364.30	3,643.00	2.520	0.401
#6	**1**	**Time of Concentration:**					**0.401**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	2.00	7.00	350.00	1.410	0.068
#6	**2**	**Time of Concentration:**					**0.068**
#6	3	7. Paved area and small upland gullies	1.00	0.50	50.00	2.010	0.006
#6	**3**	**Time of Concentration:**					**0.006**
#8	1	3. Short grass pasture	10.00	98.40	984.00	2.520	0.108
#8	**1**	**Time of Concentration:**					**0.108**
#11	1	3. Short grass pasture	8.00	941.00	11,762.50	2.260	1.445
#11	**1**	**Time of Concentration:**					**1.445**
#11	2	5. Nearly bare and untilled, and alluvial valley fans	1.50	2.25	150.00	1.220	0.034
#11	**2**	**Time of Concentration:**					**0.034**
#11	3	7. Paved area and small upland gullies	1.00	0.24	24.00	2.010	0.003
#11	**3**	**Time of Concentration:**					**0.003**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	27.00	49.14	182.00	5.190	0.009
#14	**1**	**Time of Concentration:**					**0.009**
#14	2	3. Short grass pasture	9.00	121.68	1,352.00	2.400	0.156
#14	**2**	**Time of Concentration:**					**0.156**
#14	3	3. Short grass pasture	10.00	23.40	234.00	2.520	0.025
#14	**3**	**Time of Concentration:**					**0.025**
#14	4	3. Short grass pasture	7.00	78.89	1,127.00	2.110	0.148
#14	**4**	**Time of Concentration:**					**0.148**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	6.00	78.54	1,309.00	2.440	0.149
#15	**1**	**Time of Concentration:**					**0.149**
#15	2	3. Short grass pasture	10.00	47.00	470.00	2.520	0.051
#15	**2**	**Time of Concentration:**					**0.051**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	49.60	620.00	2.820	0.061
#18	**1**	**Time of Concentration:**					**0.061**
#19	1	3. Short grass pasture	9.00	48.51	539.00	2.400	0.062
#19	**1**	**Time of Concentration:**					**0.062**
#19	2	5. Nearly bare and untilled, and alluvial valley fans	8.00	147.03	1,838.00	2.820	0.181
#19	**2**	**Time of Concentration:**					**0.181**
#22	1	5. Nearly bare and untilled, and alluvial valley fans	6.00	68.40	1,140.00	2.440	0.129
#22	**1**	**Time of Concentration:**					**0.129**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#22	2	3. Short grass pasture	9.00	75.42	838.00	2.400	0.096
#22	**2**	**Time of Concentration:**					**0.096**
#22	3	5. Nearly bare and untilled, and alluvial valley fans	2.00	5.70	285.00	1.410	0.056
#22	**3**	**Time of Concentration:**					**0.056**
#25	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	96.00	1,200.00	2.820	0.118
#25	**1**	**Time of Concentration:**					**0.118**
#26	1	3. Short grass pasture	31.00	44.95	145.00	4.450	0.009
#26	**1**	**Time of Concentration:**					**0.009**
#26	2	5. Nearly bare and untilled, and alluvial valley fans	24.00	152.64	636.00	4.890	0.036
#26	**2**	**Time of Concentration:**					**0.036**
#29	1	3. Short grass pasture	9.00	24.30	270.00	2.400	0.031
#29	**1**	**Time of Concentration:**					**0.031**
#29	2	5. Nearly bare and untilled, and alluvial valley fans	13.00	76.96	592.00	3.600	0.045
#29	**2**	**Time of Concentration:**					**0.045**
#32	1	5. Nearly bare and untilled, and alluvial valley fans	9.00	51.66	574.00	3.000	0.053
#32	**1**	**Time of Concentration:**					**0.053**
#32	2	3. Short grass pasture	9.00	73.89	821.00	2.400	0.095
#32	**2**	**Time of Concentration:**					**0.095**
#35	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	52.87	661.00	2.820	0.065
#35	**1**	**Time of Concentration:**					**0.065**
#35	2	3. Short grass pasture	10.00	71.90	719.00	2.520	0.079
#35	**2**	**Time of Concentration:**					**0.079**
#36	1	3. Short grass pasture	2.00	67.28	3,364.00	1.130	0.826
#36	**1**	**Time of Concentration:**					**0.826**
#36	2	7. Paved area and small upland gullies	1.00	23.85	2,386.00	2.010	0.329
#36	**2**	**Time of Concentration:**					**0.329**
#37	1	3. Short grass pasture	4.00	56.40	1,410.00	1.600	0.244
#37	**1**	**Time of Concentration:**					**0.244**
#37	2	7. Paved area and small upland gullies	1.50	0.75	50.00	2.460	0.005
#37	**2**	**Time of Concentration:**					**0.005**
#37	3	5. Nearly bare and untilled, and alluvial valley fans	1.50	0.75	50.00	1.220	0.011
#37	**3**	**Time of Concentration:**					**0.011**

Section 25 Pond

Emergency Spillway Demonstration During Mining

25-Year 24-Hour Storm Event

Tony Tennyson

General Information

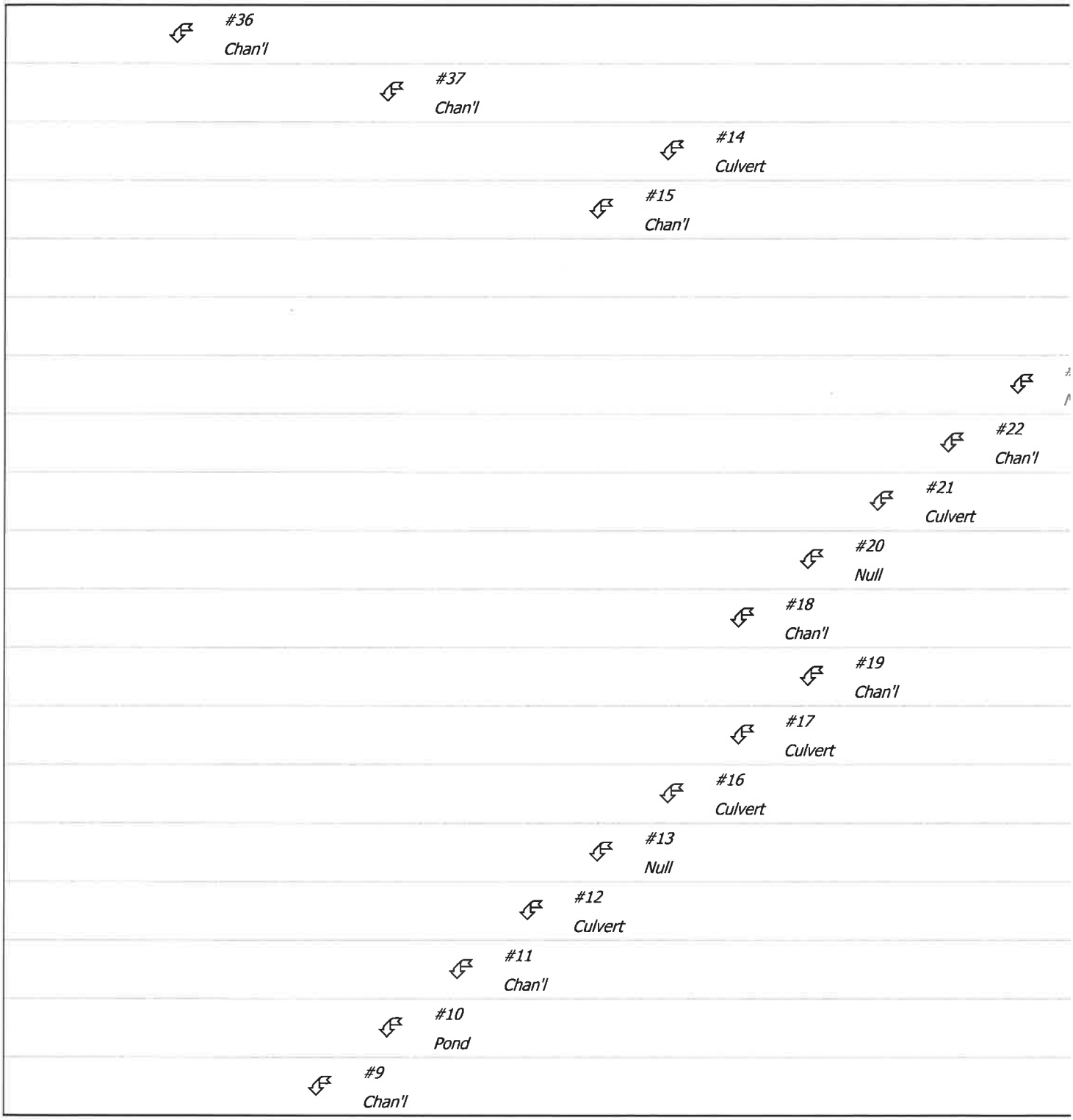
Storm Information:

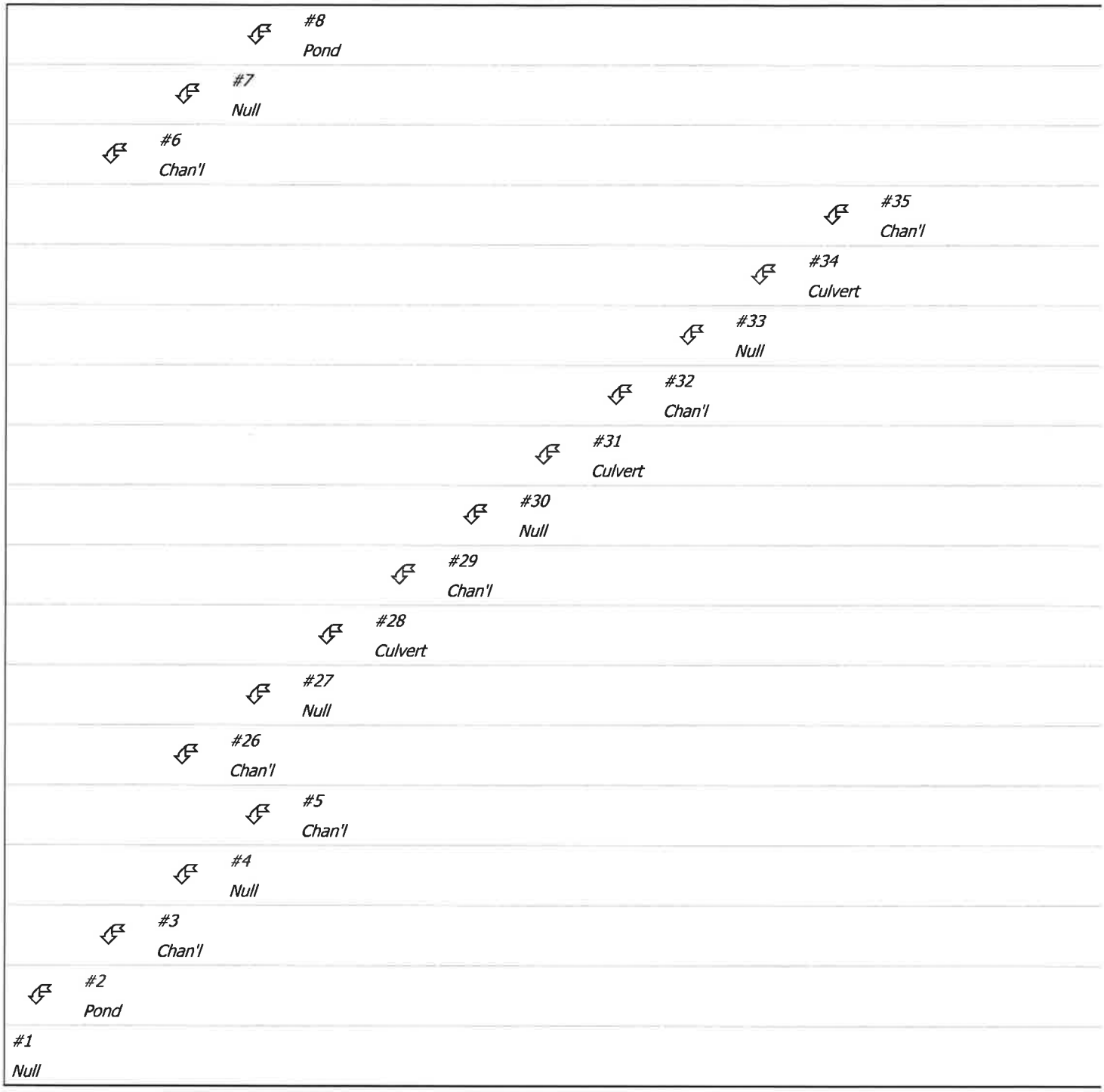
Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	2.300 inches

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 Confluecne D-3 Ditch and Little Collom Gulch
Channel	#5	==>	#4	0.000	0.000	D-3 Ditch
Channel	#6	==>	#2	0.000	0.000	Natural Channel Below Middle Pond
Null	#7	==>	#6	0.000	0.000	Null at Outlet of Middle Pond
Pond	#8	==>	#7	0.000	0.000	Middle Pond
Channel	#9	==>	#8	0.000	0.000	Natural Channel Middle Pond to Section 36 Pond
Pond	#10	==>	#9	0.000	0.000	Section 36 Pond
Channel	#11	==>	#10	0.000	0.000	Natural Channel Section 36 Pond to Culvert 44A
Culvert	#12	==>	#11	0.000	0.000	Culvert 44A
Null	#13	==>	#12	0.000	0.000	Null at Confluence of Culverts 62 and 63
Culvert	#14	==>	#15	0.000	0.000	Culvert 62
Channel	#15	==>	#12	0.000	0.000	Natural Channel within Disturbed Area to Culvert 44A
Culvert	#16	==>	#13	0.000	0.000	Culvert 63
Culvert	#17	==>	#16	0.000	0.000	Culvert 66
Channel	#18	==>	#16	0.000	0.000	Road Ditch from Culvert 66 to Culvert 63
Channel	#19	==>	#17	0.000	0.000	Road Ditch to Culvert 66
Null	#20	==>	#18	0.000	0.000	Null out Outlet of Culvert 65
Culvert	#21	==>	#20	0.000	0.000	Culvert 65
Channel	#22	==>	#21	0.000	0.000	Road Ditch to Culvert 65
Null	#23	==>	#22	0.000	0.000	Null Below Culvert 67
Culvert	#24	==>	#23	0.000	0.000	Culvert 67
Channel	#25	==>	#24	0.000	0.000	Road Ditch to Culvert 67
Channel	#26	==>	#3	0.000	0.000	Natural Sorted Ditch at Toe of Temp Spoil Pile
Null	#27	==>	#26	0.000	0.000	Null Below Culvert 70
Culvert	#28	==>	#27	0.000	0.000	Culvert 70
Channel	#29	==>	#28	0.000	0.000	Haul Road Ditch to Culvert 70
Null	#30	==>	#29	0.000	0.000	Null below Culvert 69
Culvert	#31	==>	#30	0.000	0.000	Culvert 69
Channel	#32	==>	#31	0.000	0.000	Road Ditch to Culvert 69
Null	#33	==>	#32	0.000	0.000	Null below Culvert 68
Culvert	#34	==>	#33	0.000	0.000	Culvert 68
Channel	#35	==>	#34	0.000	0.000	Natural Channel to Culvert 68

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#36	==>	#6	0.000	0.000	C-14 Temporary Channel
Channel	#37	==>	#9	0.000	0.000	C-15 Temporary Channel




#8
Pond
#7
Null
#6
Chan'l
#35
Chan'l
#34
Culvert
#33
Null
#32
Chan'l
#31
Culvert
#30
Null
#29
Chan'l
#28
Culvert
#27
Null
#26
Chan'l
#5
Chan'l
#4
Null
#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)
#36		82.300	82.300	4.13	0.46
#37		23.500	23.500	2.75	0.23
#14		50.700	50.700	2.65	0.21
#15		66.800	117.500	56.57	5.10
#25		4.400	4.400	4.87	0.37
#24		0.000	4.400	4.87	0.37
#23		0.000	4.400	4.87	0.37
#22		24.800	29.200	19.45	1.65
#21		0.000	29.200	19.45	1.65
#20		0.000	29.200	19.45	1.65
#18		4.200	33.400	24.10	2.01
#19		13.000	13.000	6.97	0.61
#17		0.000	13.000	6.97	0.61
#16		0.000	46.400	30.63	2.62
#13		0.000	46.400	30.63	2.62
#12		0.000	163.900	85.94	7.72
#11		27.700	191.600	90.66	8.12
#10	In	0.000	191.600	90.66	8.12
	Out			21.59	8.12
#9		0.000	215.100	22.14	8.35
#8	In	14.500	229.600	22.14	8.35
	Out			16.05	8.33
#7		0.000	229.600	16.05	8.33
#6		78.600	390.500	16.55	9.19
#35		7.800	7.800	2.54	0.20
#34		0.000	7.800	2.54	0.20
#33		0.000	7.800	2.54	0.20
#32		9.900	17.700	7.19	0.55
#31		0.000	17.700	7.19	0.55
#30		0.000	17.700	7.19	0.55
#29		6.900	24.600	11.84	0.91
#28		0.000	24.600	11.84	0.91
#27		0.000	24.600	11.84	0.91
#26		96.900	121.500	77.22	5.69
#5		14.800	14.800	0.22	0.09
#4		0.000	14.800	0.22	0.09
#3		186.300	322.600	87.92	6.55

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#2	In	0.000	713.100	97.59	15.74
	Out			17.03	12.84
#1		0.000	713.100	17.03	12.84

Structure Detail:

Structure #36 (Erodible Channel)

C-14 Temporary Channel

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	2.0:1	2.0:1	3.0	0.0250	2.75			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.13 cfs	
Depth:	0.29 ft	3.04 ft
Top Width:	4.16 ft	15.16 ft
Velocity:	4.00 fps	
X-Section Area:	1.03 sq ft	
Hydraulic Radius:	0.241 ft	
Froude Number:	1.41	

Structure #37 (Erodible Channel)

C-15 Temporary Channel

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	2.0:1	2.0:1	3.0	0.0250	2.82			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.75 cfs	
Depth:	0.23 ft	3.05 ft
Top Width:	3.91 ft	15.19 ft
Velocity:	3.49 fps	
X-Section Area:	0.79 sq ft	

	w/o Freeboard	w/ Freeboard
Hydraulic Radius:	0.196 ft	
Froude Number:	1.37	

Structure #14 (Culvert)

Culvert 62

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
220.00	1.50	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 2.65 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Structure #15 (Erodible Channel)

Natural Channel within Disturbed Area to Culvert 44A

Parabolic Erodible Channel Inputs:

Material: Shales and hardpans

Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
8.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	56.57 cfs	
Depth:	1.25 ft	
Top Width:	5.01 ft	
Velocity:	13.50 fps	
X-Section Area:	4.19 sq ft	
Hydraulic Radius:	0.716 ft	
Froude Number:	2.60	

Structure #25 (Erodible Channel)

Road Ditch to Culvert 67

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	8.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.87 cfs	
Depth:	0.67 ft	
Top Width:	2.01 ft	
Velocity:	7.20 fps	
X-Section Area:	0.68 sq ft	
Hydraulic Radius:	0.279 ft	
Froude Number:	2.19	

Structure #24 (Culvert)

Culvert 67

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 4.87 cfs

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Structure #23 (Null)

Null Below Culvert 67

Structure #22 (Erodible Channel)

Road Ditch to Culvert 65

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	6.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	19.45 cfs	
Depth:	1.19 ft	
Top Width:	3.57 ft	
Velocity:	9.14 fps	
X-Section Area:	2.13 sq ft	
Hydraulic Radius:	0.495 ft	
Froude Number:	2.09	

Structure #21 (Culvert)

Culvert 65

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 19.45 cfs

Minimum pipe diameter: 1 - 21 inch pipe(s) required

Structure #20 (Null)

Null out Outlet of Culvert 65

Structure #18 (Erodible Channel)

Road Ditch from Culvert 66 to Culvert 63

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	7.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	24.10 cfs	
Depth:	1.25 ft	
Top Width:	3.76 ft	
Velocity:	10.22 fps	
X-Section Area:	2.36 sq ft	
Hydraulic Radius:	0.522 ft	
Froude Number:	2.27	

Structure #19 (Erodible Channel)

Road Ditch to Culvert 66

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	8.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	6.97 cfs	
Depth:	0.77 ft	
Top Width:	2.30 ft	
Velocity:	7.88 fps	
X-Section Area:	0.88 sq ft	
Hydraulic Radius:	0.319 ft	
Froude Number:	2.24	

Structure #17 (Culvert)

Culvert 66

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 6.97 cfs

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Structure #16 (Culvert)

Culvert 63

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
180.00	1.50	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 30.63 cfs

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Structure #13 (Null)

Null at Confluence of Culverts 62 and 63

Structure #12 (Culvert)

Culvert 44A

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
300.00	1.50	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 85.94 cfs

Minimum pipe diameter: 1 - 48 inch pipe(s) required

Structure #11 (Vegetated Channel)

Natural Channel Section 36 Pond to Culvert 44A

Parabolic Vegetated Channel Inputs:

Material: Tall fescue

Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
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:	90.66 cfs		90.66 cfs	
Depth:	1.39 ft		1.65 ft	
Top Width:	5.56 ft		6.61 ft	
Velocity:	17.60 fps		12.46 fps	
X-Section Area:	5.15 sq ft		7.28 sq ft	
Hydraulic Radius:	0.794 ft		0.944 ft	
Froude Number:	3.22		2.09	
Roughness Coefficient:	0.0261		0.0413	

Structure #10 (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:	7,124.45 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	8.90	
7,120.00	0.340	2.043	12.033	0.65	
7,121.00	0.387	2.407	14.738	0.55	
7,122.00	0.433	2.816	17.018	0.50	
7,123.00	0.485	3.275	19.026	0.50	
7,124.00	0.538	3.786	20.842	0.60	
7,124.45	0.568	4.043	21.595	0.45	Peak Stage
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 #9 (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:	22.14 cfs		22.14 cfs	
Depth:	0.63 ft		1.00 ft	
Top Width:	7.52 ft		8.98 ft	

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Velocity:	5.63 fps		3.18 fps	
X-Section Area:	3.94 sq ft		6.96 sq ft	
Hydraulic Radius:	0.504 ft		0.737 ft	
Froude Number:	1.37		0.64	
Roughness Coefficient:	0.0424		0.0966	

Structure #8 (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:	7,064.57 ft
Dewater Time:	1.28 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	4.50	
7,061.00	0.248	1.267	0.945	7.25	Spillway #1
7,062.00	0.284	1.533	8.509	8.15	
7,063.00	0.327	1.838	12.033	0.70	
7,064.00	0.371	2.187	14.738	0.80	
7,064.57	0.398	2.413	16.047	1.10	Peak Stage
7,065.00	0.417	2.581	17.018		
7,066.00	0.465	3.022	19.026		Spillway #2
7,067.00	0.552	3.529	71.605		
7,068.00	0.576	4.093	211.288		
7,069.00	0.628	4.695	418.987		
7,070.00	0.685	5.351	716.430		
7,071.00	0.760	6.074	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 #7 (Null)

Null at Outlet of Middle Pond

Structure #6 (Vegetated Channel)

Natural Channel Below Middle 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	9.7	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:	16.55 cfs		16.55 cfs	
Depth:	0.49 ft		0.80 ft	
Top Width:	6.96 ft		8.20 ft	
Velocity:	5.63 fps		3.13 fps	
X-Section Area:	2.94 sq ft		5.28 sq ft	
Hydraulic Radius:	0.408 ft		0.616 ft	
Froude Number:	1.53		0.69	
Roughness Coefficient:	0.0452		0.1070	

Structure #35 (Vegetated Channel)

Natural Channel to Culvert 68

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)
20.00	5.0:1	5.0:1	10.0	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:	2.54 cfs		2.54 cfs	
Depth:	0.12 ft		0.29 ft	
Top Width:	21.22 ft		22.90 ft	
Velocity:	1.01 fps		0.41 fps	
X-Section Area:	2.51 sq ft		6.22 sq ft	
Hydraulic Radius:	0.118 ft		0.271 ft	
Froude Number:	0.52		0.14	
Roughness Coefficient:	0.1115		0.4811	

Structure #34 (Culvert)

Culvert 68

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
380.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 2.54 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Structure #33 (Null)

Null below Culvert 68

Structure #32 (Erodible Channel)

Road Ditch to Culvert 69

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	9.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	7.19 cfs	
Depth:	0.76 ft	
Top Width:	2.28 ft	
Velocity:	8.30 fps	
X-Section Area:	0.87 sq ft	
Hydraulic Radius:	0.316 ft	
Froude Number:	2.37	

Structure #31 (Culvert)

Culvert 69

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
170.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 7.19 cfs

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Structure #30 (Null)

Null below Culvert 69

Structure #29 (Erodible Channel)

Haul Road Ditch to Culvert 70

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	1.5	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	11.84 cfs	
Depth:	1.28 ft	
Top Width:	3.85 ft	
Velocity:	4.80 fps	
X-Section Area:	2.47 sq ft	
Hydraulic Radius:	0.533 ft	
Froude Number:	1.06	

Structure #28 (Culvert)

Culvert 70

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
170.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 11.84 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Structure #27 (Null)

Null Below Culvert 70

Structure #26 (Erodible Channel)

Natural Sorted Ditch at Toe of Temp Spoil Pile

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	1.5:1	12.0	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	77.22 cfs	
Depth:	1.75 ft	
Top Width:	5.26 ft	
Velocity:	16.73 fps	
X-Section Area:	4.61 sq ft	
Hydraulic Radius:	0.730 ft	
Froude Number:	3.15	

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 Confluecne D-3 Ditch and Little Collom Gulch

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:	87.92 cfs		87.92 cfs	
Depth:	1.15 ft		1.56 ft	
Top Width:	9.62 ft		11.22 ft	
Velocity:	10.41 fps		6.97 fps	
X-Section Area:	8.44 sq ft		12.62 sq ft	
Hydraulic Radius:	0.831 ft		1.056 ft	
Froude Number:	1.96		1.16	
Roughness Coefficient:	0.0302		0.0529	

Structure #2 (Pond)

Section 25 Pond

Pond Inputs:

Initial Pool Elev:	6,867.00 ft
Initial Pool:	3.75 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:	6,875.05 ft
Dewater Time:	2.76 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		
6,855.01	0.048	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	9.00	
6,874.00	0.991	9.199	12.033	2.25	
6,875.00	1.060	10.224	14.738	2.25	Spillway #2
6,875.05	1.062	10.284	17.029	0.70	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	14.975	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
6,855.01	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)
#36	1	79.500	0.826	0.000	0.000	47.000	S	0.01	0.001
	2	2.800	0.329	0.000	0.000	98.000	F	4.13	0.458
	Σ	**82.300**						**4.13**	**0.458**
#37	1	21.300	0.244	0.000	0.000	47.000	S	0.00	0.000
	2	0.500	0.005	0.000	0.000	98.000	F	0.87	0.085
	3	1.700	0.011	0.000	0.000	85.000	F	1.88	0.144
	Σ	**23.500**						**2.75**	**0.229**
#14	1	1.900	0.009	0.000	0.000	85.000	F	2.10	0.161
	2	18.800	0.156	0.000	0.000	47.000	M	0.00	0.000
	3	4.000	0.025	0.000	0.000	62.000	M	0.55	0.053
	4	26.000	0.148	0.000	0.000	47.000	M	0.00	0.000
	Σ	**50.700**						**2.65**	**0.215**
#15	1	59.600	0.149	0.000	0.000	85.000	F	56.04	4.887
	2	7.200	0.051	0.000	0.000	47.000	M	0.00	0.000
	Σ	**117.500**						**56.57**	**5.102**
#25	1	4.400	0.118	0.000	0.000	85.000	F	4.87	0.374
	Σ	**4.400**						**4.87**	**0.374**
#24	**Σ**	**4.400**						**4.87**	**0.374**
#23	**Σ**	**4.400**						**4.87**	**0.374**
#22	1	11.000	0.129	0.000	0.000	85.000	F	10.34	0.902
	2	9.400	0.096	0.000	0.000	47.000	M	0.00	0.000
	3	4.400	0.056	0.000	0.000	85.000	F	4.87	0.374
	Σ	**29.200**						**19.45**	**1.650**
#21	**Σ**	**29.200**						**19.45**	**1.650**
#20	**Σ**	**29.200**						**19.45**	**1.650**
#18	1	4.200	0.061	0.000	0.000	85.000	F	4.65	0.357
	Σ	**33.400**						**24.10**	**2.007**
#19	1	5.500	0.062	0.000	0.000	47.000	M	0.00	0.000
	2	7.500	0.181	0.000	0.000	85.000	F	6.97	0.612
	Σ	**13.000**						**6.97**	**0.612**
#17	**Σ**	**13.000**						**6.97**	**0.612**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#16	**Σ**	**46.400**						**30.63**	**2.619**
#13	**Σ**	**46.400**						**30.63**	**2.619**
#12	**Σ**	**163.900**						**85.94**	**7.721**
#11	1	24.000	1.445	0.000	0.000	47.000	M	0.00	0.000
	2	2.700	0.034	0.000	0.000	85.000	F	2.99	0.229
	3	1.000	0.003	0.000	0.000	98.000	F	1.73	0.172
	Σ	**191.600**						**90.66**	**8.123**
#10	**Σ**	**191.600**						**90.66**	**8.123**
#9	**Σ**	**215.100**						**22.14**	**8.346**
#8	1	14.500	0.108	0.000	0.000	47.000	M	0.00	0.000
	Σ	**229.600**						**22.14**	**8.346**
#7	**Σ**	**229.600**						**16.05**	**8.325**
#6	1	74.600	0.401	0.000	0.000	47.000	M	0.01	0.000
	2	3.200	0.068	0.000	0.000	85.000	F	3.54	0.272
	3	0.800	0.006	0.000	0.000	98.000	F	1.39	0.137
	Σ	**390.500**						**16.55**	**9.193**
#35	1	2.300	0.065	0.000	0.000	85.000	F	2.54	0.195
	2	5.500	0.079	0.000	0.000	47.000	M	0.00	0.000
	Σ	**7.800**						**2.54**	**0.195**
#34	**Σ**	**7.800**						**2.54**	**0.195**
#33	**Σ**	**7.800**						**2.54**	**0.195**
#32	1	4.200	0.053	0.000	0.000	85.000	F	4.65	0.357
	2	5.700	0.095	0.000	0.000	47.000	M	0.00	0.000
	Σ	**17.700**						**7.19**	**0.552**
#31	**Σ**	**17.700**						**7.19**	**0.552**
#30	**Σ**	**17.700**						**7.19**	**0.552**
#29	1	2.700	0.031	0.000	0.000	47.000	M	0.00	0.000
	2	4.200	0.045	0.000	0.000	85.000	F	4.65	0.357
	Σ	**24.600**						**11.84**	**0.909**
#28	**Σ**	**24.600**						**11.84**	**0.909**
#27	**Σ**	**24.600**						**11.84**	**0.909**
#26	1	79.600	0.009	0.000	0.000	74.000	F	46.25	3.307

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	2	17.300	0.036	0.000	0.000	85.000	F	19.14	1.471
	Σ	**121.500**						**77.22**	**5.687**
#5	1	14.800	0.082	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	167.900	0.156	0.000	0.000	47.000	M	0.03	0.002
	2	18.400	0.057	0.000	0.000	74.000	F	10.69	0.764
	Σ	**322.600**						**87.92**	**6.545**
#2	**Σ**	**713.100**						**97.59**	**15.738**
#1	**Σ**	**713.100**						**17.03**	**12.844**

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	11.50	175.72	1,528.00	2.710	0.156
#3	**1**	**Time of Concentration:**					**0.156**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	23.00	227.24	988.00	4.790	0.057
#3	**2**	**Time of Concentration:**					**0.057**
#5	1	3. Short grass pasture	19.00	196.84	1,036.00	3.480	0.082
#5	**1**	**Time of Concentration:**					**0.082**
#6	1	3. Short grass pasture	10.00	364.30	3,643.00	2.520	0.401
#6	**1**	**Time of Concentration:**					**0.401**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	2.00	7.00	350.00	1.410	0.068
#6	**2**	**Time of Concentration:**					**0.068**
#6	3	7. Paved area and small upland gullies	1.00	0.50	50.00	2.010	0.006
#6	**3**	**Time of Concentration:**					**0.006**
#8	1	3. Short grass pasture	10.00	98.40	984.00	2.520	0.108
#8	**1**	**Time of Concentration:**					**0.108**
#11	1	3. Short grass pasture	8.00	941.00	11,762.50	2.260	1.445
#11	**1**	**Time of Concentration:**					**1.445**
#11	2	5. Nearly bare and untilled, and alluvial valley fans	1.50	2.25	150.00	1.220	0.034
#11	**2**	**Time of Concentration:**					**0.034**
#11	3	7. Paved area and small upland gullies	1.00	0.24	24.00	2.010	0.003

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#11	**3**	**Time of Concentration:**					**0.003**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	27.00	49.14	182.00	5.190	0.009
#14	**1**	**Time of Concentration:**					**0.009**
#14	2	3. Short grass pasture	9.00	121.68	1,352.00	2.400	0.156
#14	**2**	**Time of Concentration:**					**0.156**
#14	3	3. Short grass pasture	10.00	23.40	234.00	2.520	0.025
#14	**3**	**Time of Concentration:**					**0.025**
#14	4	3. Short grass pasture	7.00	78.89	1,127.00	2.110	0.148
#14	**4**	**Time of Concentration:**					**0.148**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	6.00	78.54	1,309.00	2.440	0.149
#15	**1**	**Time of Concentration:**					**0.149**
#15	2	3. Short grass pasture	10.00	47.00	470.00	2.520	0.051
#15	**2**	**Time of Concentration:**					**0.051**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	49.60	620.00	2.820	0.061
#18	**1**	**Time of Concentration:**					**0.061**
#19	1	3. Short grass pasture	9.00	48.51	539.00	2.400	0.062
#19	**1**	**Time of Concentration:**					**0.062**
#19	2	5. Nearly bare and untilled, and alluvial valley fans	8.00	147.03	1,838.00	2.820	0.181
#19	**2**	**Time of Concentration:**					**0.181**
#22	1	5. Nearly bare and untilled, and alluvial valley fans	6.00	68.40	1,140.00	2.440	0.129
#22	**1**	**Time of Concentration:**					**0.129**
#22	2	3. Short grass pasture	9.00	75.42	838.00	2.400	0.096
#22	**2**	**Time of Concentration:**					**0.096**
#22	3	5. Nearly bare and untilled, and alluvial valley fans	2.00	5.70	285.00	1.410	0.056
#22	**3**	**Time of Concentration:**					**0.056**
#25	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	96.00	1,200.00	2.820	0.118
#25	**1**	**Time of Concentration:**					**0.118**
#26	1	3. Short grass pasture	31.00	44.95	145.00	4.450	0.009
#26	**1**	**Time of Concentration:**					**0.009**
#26	2	5. Nearly bare and untilled, and alluvial valley fans	24.00	152.64	636.00	4.890	0.036
#26	**2**	**Time of Concentration:**					**0.036**
#29	1	3. Short grass pasture	9.00	24.30	270.00	2.400	0.031
#29	**1**	**Time of Concentration:**					**0.031**
#29	2	5. Nearly bare and untilled, and alluvial valley fans	13.00	76.96	592.00	3.600	0.045
#29	**2**	**Time of Concentration:**					**0.045**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#32	1	5. Nearly bare and untilled, and alluvial valley fans	9.00	51.66	574.00	3.000	0.053
#32	**1**	**Time of Concentration:**					**0.053**
#32	2	3. Short grass pasture	9.00	73.89	821.00	2.400	0.095
#32	**2**	**Time of Concentration:**					**0.095**
#35	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	52.87	661.00	2.820	0.065
#35	**1**	**Time of Concentration:**					**0.065**
#35	2	3. Short grass pasture	10.00	71.90	719.00	2.520	0.079
#35	**2**	**Time of Concentration:**					**0.079**
#36	1	3. Short grass pasture	2.00	67.28	3,364.00	1.130	0.826
#36	**1**	**Time of Concentration:**					**0.826**
#36	2	7. Paved area and small upland gullies	1.00	23.85	2,386.00	2.010	0.329
#36	**2**	**Time of Concentration:**					**0.329**
#37	1	3. Short grass pasture	4.00	56.40	1,410.00	1.600	0.244
#37	**1**	**Time of Concentration:**					**0.244**
#37	2	7. Paved area and small upland gullies	1.50	0.75	50.00	2.460	0.005
#37	**2**	**Time of Concentration:**					**0.005**
#37	3	5. Nearly bare and untilled, and alluvial valley fans	1.50	0.75	50.00	1.220	0.011
#37	**3**	**Time of Concentration:**					**0.011**

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
50.00	1.50	0.0150	2.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 3.19 cfs

Maximum Headwater = 2.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (10 in)	**Discharge (cfs) (12 in)**	Discharge (cfs) (15 in)
0.20	0.16	**0.19**	0.24
0.40	0.44	**0.53**	0.68
0.60	0.82	**0.98**	1.22
0.80	1.26	**1.50**	1.88
1.00	1.70	**2.10**	2.62
1.20	2.09	**2.70**	3.44
1.40	2.42	**3.21**	4.34
1.60	2.62	**3.66**	5.10
1.80	2.77	**4.04**	5.79
2.00	2.92	**4.32**	6.40
2.20	3.06	**4.57**	6.96
2.40	3.19	**4.78**	7.48
2.60	3.32	**4.99**	7.96
2.80	3.45	**5.18**	8.35
3.00	3.57	**5.37**	8.69

Exhibit 7, Item 25E
Collom Haul Road Channel Configurations

Several channels will be utilized to manage storm water runoff from undisturbed and disturbed areas on and along the Collom Haul Road. These channels will route water from culvert outlets and road cutouts to small sumps (best management practice structures for storm water) or to sediment ponds, to allow sediment to settle out and to decrease peak flows prior to discharge. This section addresses the configuration of these channels along the Collom Haul Road.

Exhibit 7, Item 14 in Volume 2D describes the hydrologic methodology used for channel assumptions. Runoff curve numbers assigned to the undisturbed and disturbed lands have been selected in accordance with Table 1 in the Introductory Text for Exhibit 7 in Volume 2D. For channels protected by a riprap liner, selection of minimum riprap size is done using the Simons/OSM method in SEDCAD™.

The following pages present the results of the SEDCAD™ models for channels C-1 through C-13. Information for channels C-14 and C-15 can be found in Volume 18B Exhibit 7 Item 23 Part B.

Location, contributing watersheds, and on the ground hydrologic conditions for these channels are reflected on Figures Exh. 7-25E-1 through Exh. 7-25E-8 and specifically denoted by channel on the table below. The dimensions, lining type, and flow characteristics all the channel configurations are included in the SEDCAD™ attached outputs for each specific channel. A summary of the channel configurations and minimum construction specifications are summarized on the table below.

Channel	Figure Number	Lining Type	Specified Depth	Bottom Width	Side Slope, 1H:1V	Minimum Rip Rap, D50 (in)
C-1	Figure Exh. 7-25E-1	Riprap	3.0	10.0	2:1	6.0
C-2	Figure Exh. 7-25E-8	Erodbile	3.0	3.0	2:1	NA
C-3	Figure Exh. 7-25E-2	Riprap	3.0	5.0	2:1	9.0
C-4	Figure Exh. 7-25E-2	Riprap	3.0	5.0	2:1	3.0
C-5	Figure Exh. 7-25E-3	Riprap	3.0	5.0	2:1	6.0
C-6	Figure Exh. 7-25E-3	Riprap	3.0	5.0	2:1	3.0
C-7	Figure Exh. 7-25E-4	Erodible	3.0	2.0	2:1	NA
C-8	Figure Exh. 7-25E-5	Erodible	3.0	Triangular	2:1	NA
C-9	Figure Exh. 7-25E-5	Erodible	3.0	Triangular	2:1	NA
C-10	Figure Exh. 7-25E-6	Erodible	3.0	Triangular	2:1	NA
C-11	Figure Exh. 7-25E-7	Erodible	3.0	Triangular	2:1	NA
C-12	Figure Exh. 7-25E-1	Erodible	3.0	Triangular	2:1	NA
C-13	Figure Exh. 7-25E-1	Erodible	3.0	Triangular	2:1	NA

C-1, C-12, and C-13 Channel Configurations

10-Year 24-Hour Storm Event

Tony Tennyson

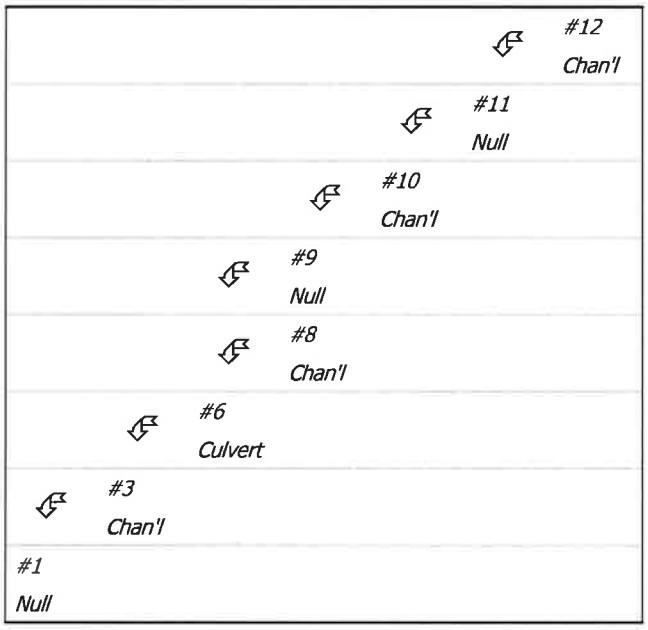
General Information

Storm Information:

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

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Null At End of C-1 Ditch
Channel	#3	==>	#1	0.000	0.000	C-1 Channel
Culvert	#6	==>	#3	0.000	0.000	Culvert 40A - Half Culvert
Channel	#8	==>	#6	0.000	0.000	Collom Haul Road Ditch South
Null	#9	==>	#6	0.000	0.000	Null at Confluence with Culvert 40A and C-12 Channel
Channel	#10	==>	#9	0.000	0.000	C-12 Channel
Null	#11	==>	#10	0.000	0.000	Null at Confluence with C-12 and C-13 Channel
Channel	#12	==>	#11	0.000	0.000	C-13 Channel



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#12	3.600	3.600	1.00	0.10
#11	0.000	3.600	1.00	0.10
#10	17.300	20.900	1.87	0.20
#9	0.000	20.900	1.87	0.20
#8	7.100	7.100	6.55	0.51
#6	0.000	28.000	7.95	0.71
#3	4.600	32.600	8.75	0.77
#1	0.000	32.600	8.75	0.77

Structure Detail:

Structure #12 (Erodible Channel)

C-13 Channel

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.00	2.0:1	2.0:1	10.0	0.0250	2.89			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.00 cfs	
Depth:	0.11 ft	3.00 ft
Top Width:	2.44 ft	14.00 ft
Velocity:	4.03 fps	
X-Section Area:	0.25 sq ft	
Hydraulic Radius:	0.099 ft	
Froude Number:	2.23	

Structure #11 (Null)

Null at Confluence with C-12 and C-13 Channel

Structure #10 (Erodible Channel)

C-12 Channel

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	2.0:1	2.0:1	5.0	0.0250	2.84			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.87 cfs	
Depth:	0.16 ft	3.00 ft
Top Width:	3.63 ft	14.99 ft

	w/o Freeboard	w/ Freeboard
Velocity:	3.60 fps	
X-Section Area:	0.52 sq ft	
Hydraulic Radius:	0.140 ft	
Froude Number:	1.68	

Structure #9 (Null)

Null at Confluence with Culvert 40A and C-12 Channel

Structure #8 (Erodible Channel)

Collom Haul Road Ditch South

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
7.0:1	1.5:1	5.9	0.0250				6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	6.55 cfs	
Depth:	0.52 ft	
Top Width:	4.39 ft	
Velocity:	5.77 fps	
X-Section Area:	1.13 sq ft	
Hydraulic Radius:	0.251 ft	
Froude Number:	2.00	

Structure #6 (Culvert)

Culvert 40A - Half Culvert

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
300.00	52.00	0.0150	2.00	0.00	0.90

Culvert Results:

Design Discharge = 7.95 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Structure #3 (Riprap Channel)

C-1 Channel

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	2.0:1	2.0:1	10.0	2.87		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	8.75 cfs	
Depth:	0.12 ft	2.99 ft
Top Width:	10.49 ft	21.97 ft
Velocity*:		
X-Section Area:	1.26 sq ft	
Hydraulic Radius:	0.119 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 #1 (Null)

Null At End of C-1 Ditch

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)
#12	1	0.700	0.012	0.000	0.000	47.000	S	0.00	0.000
	2	2.900	0.266	0.000	0.000	80.000	F	1.00	0.102
	Σ	**3.600**						**1.00**	**0.102**
#11	**Σ**	**3.600**						**1.00**	**0.102**
#10	1	12.000	0.187	0.000	0.000	47.000	S	0.00	0.000
	2	2.600	0.024	0.000	0.000	47.000	S	0.00	0.000
	3	2.700	0.309	0.000	0.000	80.000	F	0.88	0.094
	Σ	**20.900**						**1.87**	**0.196**
#9	**Σ**	**20.900**						**1.87**	**0.196**
#8	1	7.100	0.121	0.000	0.000	89.000	F	6.55	0.511
	Σ	**7.100**						**6.55**	**0.511**
#6	**Σ**	**28.000**						**7.95**	**0.707**
#3	1	1.100	0.005	0.000	0.000	85.000	F	0.80	0.059
	2	1.400	0.024	0.000	0.000	47.000	S	0.00	0.000
	3	2.100	0.044	0.000	0.000	47.000	S	0.00	0.000
	Σ	**32.600**						**8.75**	**0.767**
#1	**Σ**	**32.600**						**8.75**	**0.767**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	1	5. Nearly bare and untilled, and alluvial valley fans	52.00	74.36	143.00	7.210	0.005
#3	**1**	**Time of Concentration:**					**0.005**
#3	2	3. Short grass pasture	22.00	71.94	327.00	3.750	0.024
#3	**2**	**Time of Concentration:**					**0.024**
#3	3	3. Short grass pasture	11.00	46.97	427.00	2.650	0.044
#3	**3**	**Time of Concentration:**					**0.044**
#8	1	7. Paved area and small upland gullies	5.90	125.72	2,131.00	4.880	0.121
#8	**1**	**Time of Concentration:**					**0.121**
#10	1	3. Short grass pasture	8.00	122.32	1,529.00	2.260	0.187
#10	**1**	**Time of Concentration:**					**0.187**
#10	2	3. Short grass pasture	11.00	25.63	233.00	2.650	0.024
#10	**2**	**Time of Concentration:**					**0.024**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#10	3	5. Nearly bare and untilled, and alluvial valley fans	1.70	24.61	1,448.00	1.300	0.309
#10	**3**	**Time of Concentration:**					**0.309**
#12	1	3. Short grass pasture	17.00	24.48	144.00	3.290	0.012
#12	**1**	**Time of Concentration:**					**0.012**
#12	2	5. Nearly bare and untilled, and alluvial valley fans	1.90	24.98	1,315.00	1.370	0.266
#12	**2**	**Time of Concentration:**					**0.266**

C-2 Channel Configuration

10-Year 24-Hour Storm Event

Tony Tennyson

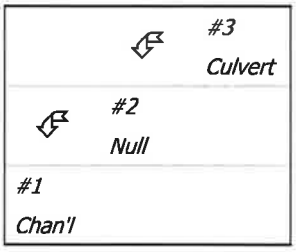
General Information

Storm Information:

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

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	End	0.000	0.000	C-2 Channel
Null	#2	==>	#1	0.000	0.000	Null at Outlet of Culvert 38
Culvert	#3	==>	#2	0.000	0.000	Culvert 38



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#3	2.900	2.900	2.11	0.16
#2	0.000	2.900	2.11	0.16
#1	5.900	8.800	2.11	0.16

Structure Detail:

Structure #3 (Culvert)

Culvert 38

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
200.00	3.00	0.0150	2.00	0.00	0.90

Culvert Results:

Design Discharge = 2.11 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Structure #2 (Null)

Null at Outlet of Culvert 38

Structure #1 (Erodible Channel)

C-2 Channel

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	2.0:1	2.0:1	2.0	0.0250	2.78			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.11 cfs	
Depth:	0.22 ft	3.00 ft
Top Width:	3.88 ft	15.00 ft
Velocity:	2.79 fps	
X-Section Area:	0.76 sq ft	
Hydraulic Radius:	0.190 ft	
Froude Number:	1.11	

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)
#3	1	2.900	0.066	0.000	0.000	85.000	F	2.11	0.157
	Σ	**2.900**						**2.11**	**0.157**
#2	Σ	**2.900**						**2.11**	**0.157**
#1	1	5.900	0.109	0.000	0.000	47.000	S	0.00	0.000
	Σ	**8.800**						**2.11**	**0.157**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	6.30	49.77	790.00	2.000	0.109
#1	**1**	**Time of Concentration:**					**0.109**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	10.00	75.30	753.00	3.160	0.066
#3	**1**	**Time of Concentration:**					**0.066**

C-10 Channel Design

10-Year 24-Hour Storm Event

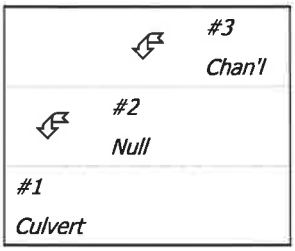
General Information

Storm Information:

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

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	Culvert 11
Null	#2	==>	#1	0.000	0.000	Null at Outlet of Culvert 11
Channel	#3	==>	#2	0.000	0.000	C-10 Ditch



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#3	2.700	2.700	0.03	0.01
#2	0.000	2.700	0.03	0.01
#1	11.600	14.300	4.45	0.34

Structure Detail:

Structure #3 (Erodible Channel)

C-10 Ditch

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.00	2.0:1	2.0:1	3.0	0.0250	2.98			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.03 cfs	
Depth:	0.02 ft	3.00 ft
Top Width:	2.07 ft	13.99 ft
Velocity:	0.71 fps	
X-Section Area:	0.04 sq ft	
Hydraulic Radius:	0.018 ft	
Froude Number:	0.93	

Structure #2 (Null)

Null at Outlet of Culvert 11

Structure #1 (Culvert)

Culvert 11

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
150.00	1.50	0.0150	2.00	0.00	0.90

Culvert Results:

Design Discharge = 4.45 cfs

Minimum pipe diameter: 1 - 15 inch pipe(s) required

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)
#3	1	2.700	0.059	0.000	0.000	63.000	S	0.03	0.012
	Σ	**2.700**						**0.03**	**0.012**
#2	Σ	**2.700**						**0.03**	**0.012**
#1	1	5.500	0.081	0.000	0.000	47.000	S	0.00	0.000
	2	6.100	0.024	0.000	0.000	85.000	F	4.45	0.331
	Σ	**14.300**						**4.45**	**0.343**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	14.00	122.08	872.00	2.990	0.081
#1	**1**	**Time of Concentration:**					**0.081**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	15.00	50.25	335.00	3.870	0.024
#1	**2**	**Time of Concentration:**					**0.024**
#3	1	3. Short grass pasture	2.50	6.70	268.00	1.260	0.059
#3	**1**	**Time of Concentration:**					**0.059**

C-11 Channel Design

10-Year 24-Hour Storm Event

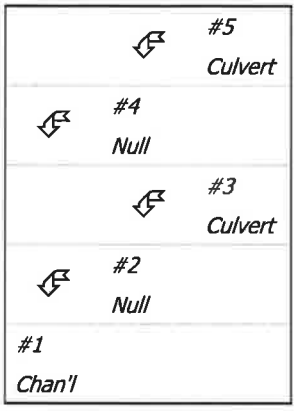
General Information

Storm Information:

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

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	End	0.000	0.000	C-11 Ditch
Null	#2	==>	#1	0.000	0.000	Null at Outlet of Culvert 1
Culvert	#3	==>	#2	0.000	0.000	Culvert 11
Null	#4	==>	#1	0.000	0.000	Null at Outlet of Culvert 2
Culvert	#5	==>	#4	0.000	0.000	Culvert 12



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#5	6.700	6.700	0.68	0.06
#4	0.000	6.700	0.68	0.06
#3	78.900	78.900	2.11	0.15
#2	0.000	78.900	2.11	0.15
#1	0.000	85.600	2.69	0.21

Structure Detail:

Structure #5 (Culvert)

Culvert 12

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
255.00	2.00	0.0150	2.00	0.00	0.90

Culvert Results:

Design Discharge = 0.68 cfs

Minimum pipe diameter: 1 - 6 inch pipe(s) required

Structure #4 (Null)

Null at Outlet of Culvert 2

Structure #3 (Culvert)

Culvert 11

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
149.00	2.00	0.0150	2.00	0.00	0.90

Culvert Results:

Design Discharge = 2.11 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Structure #2 (Null)

Null at Outlet of Culvert 1

Structure #1 (Erodible Channel)

C-11 Ditch

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.00	2.0:1	2.0:1	2.0	0.0250	2.69			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.69 cfs	
Depth:	0.31 ft	3.00 ft
Top Width:	3.25 ft	14.01 ft
Velocity:	3.27 fps	
X-Section Area:	0.82 sq ft	
Hydraulic Radius:	0.242 ft	
Froude Number:	1.15	

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)
#5	1	5.000	0.053	0.000	0.000	47.000	S	0.00	0.000
	2	1.700	0.144	0.000	0.000	80.000	F	0.68	0.061
	Σ	**6.700**						**0.68**	**0.061**
#4	Σ	**6.700**						**0.68**	**0.061**
#3	1	74.800	0.397	0.000	0.000	47.000	S	0.00	0.000
	2	4.100	0.093	0.000	0.000	80.000	F	2.11	0.152
	Σ	**78.900**						**2.11**	**0.152**
#2	Σ	**78.900**						**2.11**	**0.152**
#1	Σ	**85.600**						**2.69**	**0.212**

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	10.00	361.00	3,610.00	2.520	0.397
#3	**1**	**Time of Concentration:**					**0.397**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	6.00	49.26	821.00	2.440	0.093
#3	**2**	**Time of Concentration:**					**0.093**
#5	1	3. Short grass pasture	16.00	99.36	621.00	3.200	0.053
#5	**1**	**Time of Concentration:**					**0.053**
#5	2	5. Nearly bare and untilled, and alluvial valley fans	1.00	5.20	520.00	1.000	0.144
#5	**2**	**Time of Concentration:**					**0.144**

Table 13C-6A Demolition of Country Road 51 Crossing

Structure Name	Dimensions
County Road 51 Haul Road Crossing (Circular Area)	48'x24'217'

Note: Regrade requirements for this structure are contained in Table 13C-4 (stations 0+00 to 208+00). Topsoil requirements for this structure are contained in Table 13C-5 (stations 0+00 to 149+00), and revegetation requirements are contain in Table 13C-6.

Table 13C-6B Collom Haul Road Lighting

Task	
Remove Power Lines	9,617 Feet

Table 13C-6C Collom Haul Road Channels

Name	Topsoil (Cubic Yards)	Riprap (Cubic Yards)	Revegetation (Acres)
C-1	1606	121	1.2
C-2	968	10	0.6
C-3	268	61	0.2
C-4	1,339	28	1.0
C-5	67	39	0.05
C-6	254	15	0.2
C-7	241	0	0.2
C-8	803	0	0.3
C-9	0	0	0.3
C-10	807	0	0.5
C-11	484	0	0.3
C-12 & C-13	3,227	0	2.0
C-14	3,549	0	2.2
C-15	1,613	0	1.0

Collom Facilities Area

Tables 13C-7 through 13C-12 present required information to reclaim and/or demolish items associated with the Collom facilities area. Map 22B shows the areas and structures that will be present for the Collom Mine. Table 13C-10 presents the specific facilities that will be constructed under this cumulative bond schedule.

Table 13C-7 Regrade Volumes for the Collom Facilities Area

Area	Cut (Cubic Yards)	Fill (Cubic Yards)
Collom Facilities Area	1,484,400	1,467,700

Table 13C-8 List of Culverts for the Collom Facilities

Culvert Number	Size (inches)	Length (ft)
56	36	150
57	36	260
58	36	140
59	36	145
60	36	56
61	36	71
62	36	75
63	36	326
64	36	150
65	36	415
66	36	130
67	36	183
68	2 culverts – 12”	80
D2 Ditch Culvert	36	160
71	12	50
72	12	50

Table 13C-9 Topsoil Volumes for the Collom Facilities Area

From	To	Avg. Haul Distance (ft)	Avg. Grade (%)	Volume (Cubic Yards)
Topsoil Stockpile 25A	Collom Facilities Area	6,500	5.0	327,278

Note: Includes the Section 26 Pond, Sidehill Pond and West Side Access Road.