



November 9, 2021

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 151 (TR-151)
ETD-1 As-Built

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 150 (TR-150) to Permit No. C-1981-019.

TR-151 provides the as-built for the ETD-1 stock pond located in the West Pit reclamation. It also updates the surface water hydrology model for the East Taylor Pond watershed with the revised ETD-1 capacities from the as-built configuration of the stock pond.

Included in this technical revision is a change of index sheet to ease incorporation of this technical revision into the permit document, and a public notice for the Division's review. If you should have any additional questions or concerns, please feel free to contact Tony Tennyson at (970) 326-3560 at your convenience.

Sincerely,

DocuSigned by:
A handwritten signature in blue ink that reads "Chris Gilbreath".
D250C711D0BF450...

Chris Gilbreath
Senior Manager
Remediation and Reclamation

CG:TT:der

Enclosure

cc: Jennifer Maiolo (BLM-LSFO)
Tony Tennyson (via email)
Angela Aalbers (via email)
File: C. F. 1.1.2.140 - G471-11.3(21)d

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

Mine Company Name: Colowyo Coal Company

Permit Number: **C-1981-019**

Date: **November 8, 2021**

Revision Description: **TR-150 Salinity Study**

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	Pages Exh. 7-ET-3 and 7-ET-4 (2 pages)	Pages Exh. 7-ET-3 and 7-ET-4 (2 pages)	Narative changes have occurred for remodeling of the East Taylor watershed due to the as-built configuration of ETD-1.
2E	Figure Exh. 7-14ET-1	Figure Exh. 7-14ET-1	Figure Exh. 7-14ET-1 has been updated with the ETD-1 as-built.
2E	All East Taylor watershed SEDCAD Models (77 pages)	SEDCAD Models (77 pages)	SEDCAD models for East Taylor watershed have been updated with the ETD-1 as-built.
3			No Change
4			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			No Change

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Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
18C					No Change
18D					No Change
19					No Change
20					No Change
21					No Change
22					No Change

Modeling a constant inflow using SEDCAD™ is somewhat complex. The methodology suggested by SEDCAD™ primary author, Pam Schwab, was used to model the impact of a constant inflow. In the current version of SEDCAD™, a fixed flow can only be input by inserting a "dummy" upstream reservoir with a watershed large enough to produce a "tank" flow, and then setting the output of the dummy reservoir as a constant "User Defined" outflow curve, independent of pool elevation in the dummy reservoir. A flow of 0.56 cfs (250 gpm) was conservatively utilized to represent the flow from the East Taylor Seep, which in reality is lower based on the seasonable availability of water. The watershed, time of concentration, and curve number utilized for this simulated flow are theoretical in nature. The synthesized 250 gpm flow was then dropped directly into East Taylor Pond.

For the reclamation case at the East Taylor Pond, the 10 year 24 hour storm produces 3.4 acre feet of runoff, and the entire storm event is contained below the principal spillway elevation. The 25 year 24 hour storm event peaks at the 6,953.47 elevation which is below the emergency spill way elevation of 6,954.0'.

East Taylor Permanent Post Mine Channels

The East Taylor watershed is comprised of three post-mining channels. One channel, the Taylor Ditch, conveys all the post mining surface water flows to the East Taylor Pond, while the East Taylor Ditch and Taylor Trib Ditch are tributaries to the Taylor Ditch. The locations of all three channels are presented on Map 12 and Figure Exh. 7-14ET-2. The channel profiles are presented on Map 33.

Taylor Ditch

The area contributory to the Taylor Ditch in some locations is less than one square mile. However, portions of this channel pass over a permanent fill, and the lower portion below the confluence with the East Taylor Ditch is larger than one square mile so the modeled storm event required by rule is the 100 year 24 hour event. The entire length of the Taylor Ditch will be riprap lined. Two stock ponds TD-1 and TD-2 have been constructed inline in the channel to reduce peak flows from larger storm events, and provide a water source to support the post mine land use.

A SEDCAD™ model (100 Year 24 Hour Channel Demonstration model) has been included which evaluates the peak flow and total runoff volume for each of the channel segments for the 100 year, 24-hour storm event. The channel configurations for the 100 year, 24 hour storm for the Taylor Ditch summarized below.

Taylor Ditch

<u>Station</u>	<u>Peak Flow (CFS)</u>	<u>Average Slope (%)</u>	<u>Channel Type</u>	<u>Side Slopes</u>	<u>Minimum Depth (Feet)</u>	<u>Erosion Protection</u>
Station 0+00 to 10+00	140.44	6.9	Trapezoidal 12' bottom	3H:1V	4.0	Riprap, D50 = 12"
Station 10+00 to 35+00	94.81	7.1	Trapezoidal 12' bottom	3H:1V	4.0	Riprap, D50 = 9"
Station 35+00 to TD-1	87.47	10.7	Trapezoidal 12' bottom	3H:1V	4.0	Riprap, D50 = 9"
TD-1 to TD-2	103.11	6.8	Trapezoidal 12' bottom	3H:1V	4.0	Riprap, D50 = 9"
TD-2 to 117+58	131.44	9.8	Trapezoidal 12' bottom	3H:1V	4.0	Riprap, D50 = 12"

East Taylor Ditch

The East Taylor Ditch is a tributary channel to the Taylor Ditch. The area contributory to the East Taylor Ditch is less than one square mile. Therefore, the appropriate storm event for the design of this channel is the 10-year 24-hour event. The lower portion of the East Taylor Ditch from ETD-1 stock pond to the confluence with the Taylor Ditch is riprap lined.

A SEDCADTM model (10 Year 24 Hour Effluent Demonstration model) has been included which evaluates the peak flow and total runoff volume for each of the channel segments for the 10 year, 24-hour storm event. The channel configurations for the 10 year 24 hour storm for the East Taylor Ditch are summarized below.

East Taylor Ditch

<u>Station</u>	<u>Peak Flow (CFS)</u>	<u>Average Slope (%)</u>	<u>Channel Type</u>	<u>Side Slopes</u>	<u>Minimum Depth (Feet)</u>	<u>Erosion Protection</u>
Station 0+00 to ETD-1	12.22	11.8	Trapezoidal 12' bottom	3H:1V	4.0	Riprap, D50 = 6"
ETD-1 to 38+30	17.16	1.8	Trapezoidal 12' bottom	3H:1V	4.0	Vegetation
38+30 to 73+40	17.16	9.5	Trapezoidal 12' bottom	3H:1V	4.0	Riprap, D50 = 6"

Taylor Trib Ditch

The Taylor Trib Ditch is a tributary channel to the main Taylor Ditch. The area contributory to the Taylor Ditch is very small; therefore, the appropriate storm event for

East Taylor Pond **10 Year - 24 Hour Storm Event**

Effluent Demonstration
Post Mining

Tony Tennyson

Tri-State Generation & Transmission Association, Inc.
1100 West 116th Avenue
Westminster, CO 80234

Phone: 970-326-3560
Email: ttennyson@tristategr.org

General Information

Storm Information:

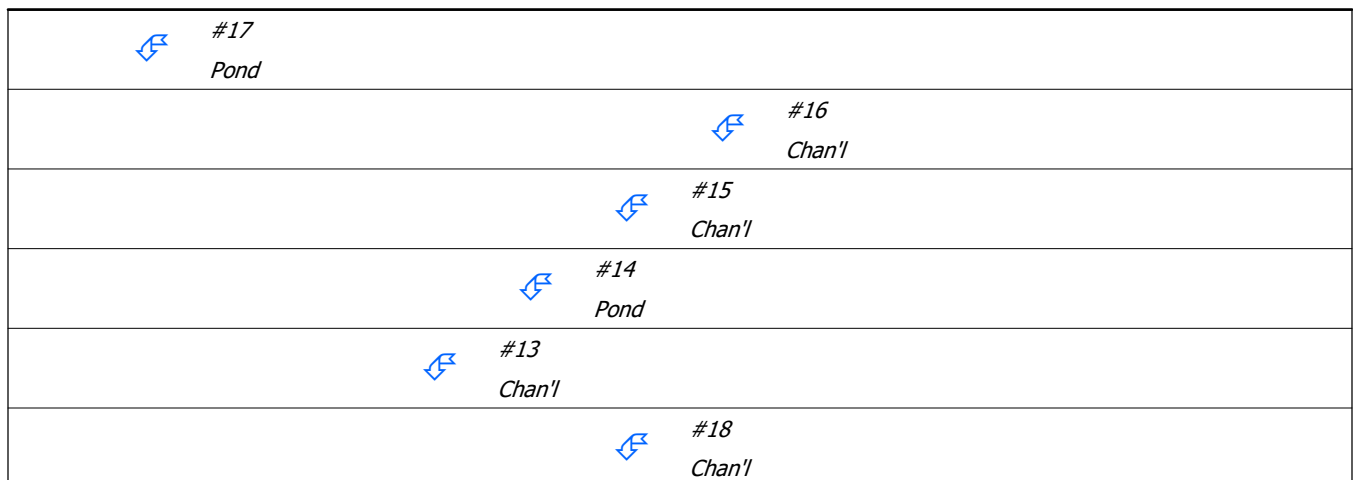
Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	1.800 inches

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 East Taylor Pond
Pond	#2	==>	#1	0.000	0.000	East Taylor Pond
Null	#3	==>	#2	0.000	0.000	Null Above East Taylor Pond
Channel	#4	==>	#3	0.000	0.000	Taylor Ditch 0+00 to 10+00
Null	#5	==>	#4	0.000	0.000	Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor
Channel	#6	==>	#5	0.000	0.000	Taylor Ditch 10+00 to 35+00
Null	#7	==>	#6	0.000	0.000	Null at Confluence of Taylor/Taylor Trib
Channel	#8	==>	#7	0.000	0.000	Taylor Ditch 35+00 to TD-1 Stockpond
Pond	#9	==>	#8	0.000	0.000	TD-1 Stockpond
Channel	#10	==>	#9	0.000	0.000	Taylor Ditch TD-1 to TD-2 Stockpond
Pond	#11	==>	#10	0.000	0.000	TD-2 Stockpond
Channel	#12	==>	#11	0.000	0.000	Taylor Ditch TD-2 Stockpond to 117+58
Channel	#13	==>	#5	0.000	0.000	East Taylor Ditch 0+00 to ETD-1
Pond	#14	==>	#13	0.000	0.000	ETD-1 Stock Pond
Channel	#15	==>	#14	0.000	0.000	East Taylor Ditch - Veg ETD-1 to 38+30
Channel	#16	==>	#15	0.000	0.000	East Taylor Ditch 38+30 to 73+40
Pond	#17	==>	#2	0.000	0.000	Simulated 250 GPM - East Taylor Seep
Channel	#18	==>	#7	0.000	0.000	Taylor Trib Ditch
Null	#19	==>	#12	0.000	0.000	Null At Confluence of 7700 Terrace Ditch
Channel	#20	==>	#19	0.000	0.000	7700 Terrace Ditch



		#20 Chan'l
		#19 Null
		#12 Chan'l
		#11 Pond
		#10 Chan'l
		#9 Pond
		#8 Chan'l
		#7 Null
		#6 Chan'l
		#5 Null
		#4 Chan'l
		#3 Null
	#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)
#17 In	5.000	5.000	4.86	0.39	0.9	3,094	1.76	0.94
#17 Out			0.56	0.39	0.2	658	0.02	0.01
#16	129.800	129.800	17.16	1.63	376.5	407,094	232.03	86.68
#15	100.200	230.000	17.16	1.96	376.6	407,094	232.02	72.17
#14 In	0.000	230.000	17.16	1.96	376.6	407,094	232.02	72.17
#14 Out			11.09	1.96	41.7	20,784	0.00	0.00
#13	84.900	314.900	12.22	2.31	42.4	19,435	0.17	0.16
#18	6.000	6.000	0.05	0.02	0.0	661	0.38	0.29
#20	7.300	7.300	3.76	0.27	27.5	152,307	86.81	40.95
#19	0.000	7.300	3.76	0.27	27.5	152,307	86.81	40.95
#12	183.900	191.200	43.18	3.42	771.5	341,992	194.92	85.90
#11 In	0.000	191.200	43.18	3.42	771.5	341,992	194.92	85.90
#11 Out			3.37	1.55	0.0	6	0.00	0.00
#10	123.000	314.200	3.91	1.95	0.3	660	0.35	0.06
#9 In	0.000	314.200	3.91	1.95	0.3	660	0.35	0.06
#9 Out			3.06	1.46	0.0	19	0.00	0.00
#8	21.600	335.800	3.13	1.51	0.1	654	0.24	0.01
#7	0.000	341.800	3.16	1.54	0.1	656	0.27	0.02
#6	82.000	423.800	3.45	1.77	0.2	581	0.28	0.04
#5	0.000	738.700	12.22	4.08	42.6	18,970	0.21	0.15
#4	145.900	884.600	16.29	4.82	52.8	18,508	2.20	1.51
#3	0.000	884.600	16.29	4.82	52.8	18,508	2.20	1.51
#2 In	10.900	900.500	16.85	5.24	53.0	17,618	2.09	0.88
#2 Out			1.29	3.41	17.5	4,388	0.00	0.00
#1	0.000	900.500	1.29	3.41	17.5	4,387	0.00	0.00

Particle Size Distribution(s) at Each Structure

Structure #17 (Simulated 250 GPM - East Taylor Seep):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	73.000%	100.000%
0.0400	33.000%	100.000%
0.0010	20.000%	86.439%

Structure #16 (East Taylor Ditch 38+30 to 73+40):

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

Structure #15 (East Taylor Ditch - Veg ETD-1 to 38+30):

Size (mm)	In/Out
4.7500	100.000%
0.0750	73.004%
0.0400	33.002%
0.0010	20.001%

Structure #14 (ETD-1 Stock Pond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	73.004%	100.000%
0.0400	33.002%	100.000%
0.0010	20.001%	100.000%

Structure #13 (East Taylor Ditch 0+00 to ETD-1):

Size (mm)	In/Out
4.7500	100.000%
0.0750	99.625%
0.0400	98.965%
0.0010	98.751%

Structure #18 (Taylor Trib Ditch):

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

Structure #20 (7700 Terrace Ditch):

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

Structure #19 (Null At Confluence of 7700 Terrace Ditch):

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

Structure #12 (Taylor Ditch TD-2 Stockpond to 117+58):

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

Structure #11 (TD-2 Stockpond):

Size (mm)	In	Out
4.7500	100.000%	100.000%

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

Structure #10 (Taylor Ditch TD-1 to TD-2 Stockpond):

Size (mm)	In/Out
4.7500	100.000%
0.0750	83.150%
0.0400	38.070%
0.0010	23.419%

Structure #9 (TD-1 Stockpond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	83.150%	100.000%
0.0400	38.070%	100.000%
0.0010	23.419%	100.000%

Structure #8 (Taylor Ditch 35+00 to TD-1 Stockpond):

Size (mm)	In/Out
4.7500	100.000%
0.0750	82.894%
0.0400	57.551%
0.0010	49.315%

Structure #7 (Null at Confluence of Taylor/Taylor Trib):

Size (mm)	In/Out
4.7500	100.000%
0.0750	80.774%
0.0400	52.290%
0.0010	43.033%

Structure #6 (Taylor Ditch 10+00 to 35+00):

Size (mm)	In/Out
4.7500	100.000%
0.0750	82.125%

Size (mm)	In/Out
0.0400	42.856%
0.0010	30.093%

Structure #5 (Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor):

Size (mm)	In/Out
4.7500	100.000%
0.0750	99.537%
0.0400	98.682%
0.0010	98.405%

Structure #4 (Taylor Ditch 0+00 to 10+00):

Size (mm)	In/Out
4.7500	100.000%
0.0750	94.522%
0.0400	86.058%
0.0010	83.307%

Structure #3 (Null Above East Taylor Pond):

Size (mm)	In/Out
4.7500	100.000%
0.0750	94.522%
0.0400	86.058%
0.0010	83.307%

Structure #2 (East Taylor Pond):

Size (mm)	In	Out
4.7500	100.000%	100.000%
0.0750	94.527%	100.000%
0.0400	86.070%	100.000%
0.0010	83.271%	100.000%

Structure #1:

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

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

Structure Detail:

Structure #17 (Pond)

Simulated 250 GPM - East Taylor Seep

Pond Inputs:

Initial Pool Elev:	90.01 ft
Initial Pool:	0.00 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Pond Results:

Peak Elevation:	92.05 ft
H'graph Detention Time:	2.21 hrs
Pond Model:	CSTRS
Dewater Time:	0.40 days
Trap Efficiency:	76.86 %

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)
90.00	0.050	0.000	0.000	Top of Sed. Storage
90.01	0.050	0.001	0.000	
91.00	0.051	0.050	0.560	
92.00	0.190	0.164	0.560	
92.05	0.161	0.174	0.560	9.70 Peak Stage
93.00	0.260	0.388	0.560	
94.00	0.350	0.692	0.560	
95.00	0.440	1.086	0.560	
96.00	0.540	1.575	0.560	
97.00	0.650	2.169	0.560	
98.00	0.760	2.873	0.560	
99.00	0.880	3.693	0.560	
100.00	1.200	4.728	0.560	
101.00	1.240	5.948	0.560	
102.00	1.414	7.275	0.560	
103.00	1.600	8.781	0.560	

Detailed Discharge Table

Elevation (ft)	User-input discharge (cfs)	Combined Total Discharge (cfs)
90.00	0.000	0.000
90.01	0.000	0.000
91.00	0.560	0.560
92.00	0.560	0.560
93.00	0.560	0.560
94.00	0.560	0.560
95.00	0.560	0.560
96.00	0.560	0.560
97.00	0.560	0.560
98.00	0.000	0.560
99.00	0.000	0.560
100.00	0.000	0.560
101.00	0.000	0.560
102.00	0.000	0.560
103.00	0.000	0.560

Structure #16 (Riprap Channel)

East Taylor Ditch 38+30 to 73+40

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	3.0:1	3.0:1	9.5			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	17.16 cfs	
Depth:	0.16 ft	
Top Width:	12.98 ft	
Velocity*:		
X-Section Area:	2.03 sq ft	
Hydraulic Radius:	0.156 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	

w/o Freeboard	w/ Freeboard
Dmax:	7.50 in

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

Structure #15 (Vegetated Channel)

East Taylor Ditch - Veg ETD-1 to 38+30

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)
12.00	3.0:1	3.0:1	1.8	D, B				7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	17.16 cfs		17.16 cfs	
Depth:	0.57 ft		1.01 ft	
Top Width:	15.40 ft		18.09 ft	
Velocity:	2.21 fps		1.12 fps	
X-Section Area:	7.75 sq ft		15.27 sq ft	
Hydraulic Radius:	0.498 ft		0.829 ft	
Froude Number:	0.55		0.22	
Roughness Coefficient:	0.0566		0.1569	

Structure #14 (Pond)

ETD-1 Stock Pond

Pond Inputs:

Initial Pool Elev:	7,290.00 ft
Initial Pool:	2.42 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**No sediment capacity defined*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,290.00	30.00	2.00:1	2.00:1	22.00

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,292.00	20.00	2.00:1	2.00:1	16.00

Pond Results:

Peak Elevation:	7,290.23 ft
H'graph Detention Time:	0.22 hrs
Pond Model:	CSTRS
Dewater Time:	0.56 days
Trap Efficiency:	88.93 %

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)
7,285.00	0.016	0.000	0.000	Top of Sed. Storage
7,286.00	0.096	0.050	0.000	
7,287.00	0.539	0.337	0.000	
7,288.00	0.654	0.933	0.000	
7,289.00	0.735	1.627	0.000	
7,290.00	0.843	2.415	0.000	Spillway #1
7,290.23	0.819	2.613	11.087	13.35 Peak Stage
7,291.00	0.872	3.273	48.073	
7,292.00	0.872	4.145	169.510	Spillway #2
7,293.00	0.872	5.017	391.148	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,285.00	0.000	0.000	0.000
7,286.00	0.000	0.000	0.000
7,287.00	0.000	0.000	0.000
7,288.00	0.000	0.000	0.000
7,289.00	0.000	0.000	0.000
7,290.00	0.000	0.000	0.000
7,291.00	48.073	0.000	48.073
7,292.00	169.510	0.000	169.510
7,293.00	351.917	39.231	391.148

Structure #13 (Riprap Channel)*East Taylor Ditch 0+00 to ETD-1*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	3.0:1	3.0:1	11.8			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	12.22 cfs	
Depth:	0.11 ft	
Top Width:	12.69 ft	
Velocity*:		
X-Section Area:	1.41 sq ft	
Hydraulic Radius:	0.111 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

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

Structure #18 (Riprap Channel)*Taylor Trib 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	3.0:1	3.0:1	17.0			

Riprap Channel Results:

Simons/OSM Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.05 cfs	
Depth:	0.02 ft	

	w/o Freeboard	w/ Freeboard
Top Width:	12.10 ft	
Velocity:	0.23 fps	
X-Section Area:	0.19 sq ft	
Hydraulic Radius:	0.016 ft	
Froude Number:	0.33	
Manning's n:	0.0324	
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	9.00 in	

Structure #20 (Vegetated Channel)

7700 Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	1.5	D, B	1.41			7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	3.76 cfs		3.76 cfs	
Depth:	0.99 ft	2.40 ft	1.59 ft	3.00 ft
Top Width:	4.46 ft	10.80 ft	7.15 ft	13.49 ft
Velocity:	1.70 fps		0.66 fps	
X-Section Area:	2.21 sq ft		5.67 sq ft	
Hydraulic Radius:	0.453 ft		0.726 ft	
Froude Number:	0.43		0.13	
Roughness Coefficient:	0.0631		0.2222	

Structure #19 (Null)

Null At Confluence of 7700 Terrace Ditch

Structure #12 (Riprap Channel)

Taylor Ditch TD-2 Stockpond to 117+58

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	3.0:1	3.0:1	9.8	3.67		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	43.18 cfs	
Depth:	0.34 ft	4.01 ft
Top Width:	14.03 ft	36.05 ft
Velocity*:		
X-Section Area:	4.41 sq ft	
Hydraulic Radius:	0.312 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 #11 (Pond)

TD-2 Stockpond

Pond Inputs:

Initial Pool Elev:	7,445.00 ft
Initial Pool:	0.09 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,454.00	30.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	7,454.08 ft
H'graph Detention Time:	3.20 hrs
Pond Model:	CSTRS
Dewater Time:	0.44 days

Trap Efficiency: 100.00 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
7,443.00	0.014	0.000	0.000	Top of Sed. Storage
7,444.00	0.050	0.030	0.000	
7,445.00	0.079	0.094	0.000	
7,446.00	0.106	0.186	0.000	
7,447.00	0.133	0.305	0.000	
7,448.00	0.161	0.452	0.000	
7,449.00	0.190	0.627	0.000	
7,450.00	0.219	0.831	0.000	
7,451.00	0.249	1.065	0.000	
7,452.00	0.280	1.329	0.000	
7,453.00	0.313	1.625	0.000	
7,454.00	0.348	1.955	0.000	Spillway #1
7,454.08	0.354	1.984	3.366	10.50 Peak Stage
7,455.00	0.389	2.324	43.900	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,443.00	0.000	0.000
7,444.00	0.000	0.000
7,445.00	0.000	0.000
7,446.00	0.000	0.000
7,447.00	0.000	0.000
7,448.00	0.000	0.000
7,449.00	0.000	0.000
7,450.00	0.000	0.000
7,451.00	0.000	0.000
7,452.00	0.000	0.000
7,453.00	0.000	0.000
7,454.00	0.000	0.000
7,455.00	0.000	43.900

Structure #10 (Riprap Channel)

Taylor Ditch TD-1 to TD-2 Stockpond

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	3.0:1	3.0:1	6.8			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	3.91 cfs	
Depth:	0.08 ft	
Top Width:	12.46 ft	
Velocity*:		
X-Section Area:	0.93 sq ft	
Hydraulic Radius:	0.074 ft	
Froude Number*:		
Manning's n*:		
Dmin:	1.00 in	
D50:	3.00 in	
Dmax:	3.75 in	

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

Structure #9 (Pond)

TD-1 Stockpond

Pond Inputs:

Initial Pool Elev:	7,283.01 ft
Initial Pool:	0.00 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	0.00 %

**No sediment capacity defined*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,287.00	20.00	2.00:1	2.00:1	30.00

Pond Results:

Peak Elevation:	7,287.04 ft
H'graph Detention Time:	1.27 hrs
Pond Model:	CSTRS

Dewater Time:	0.39 days
Trap Efficiency:	91.82 %

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)
7,283.00	0.001	0.000	0.000	Top of Sed. Storage
7,283.01	0.001	0.000	0.000	
7,284.00	0.059	0.023	0.000	
7,285.00	0.159	0.128	0.000	
7,286.00	0.182	0.298	0.000	
7,287.00	0.213	0.495	0.000	Spillway #1
7,287.04	0.216	0.505	3.062	9.40 Peak Stage
7,288.00	0.247	0.725	71.329	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,283.00	0.000	0.000
7,283.01	0.000	0.000
7,284.00	0.000	0.000
7,285.00	0.000	0.000
7,286.00	0.000	0.000
7,287.00	0.000	0.000
7,288.00	71.329	71.329

Structure #8 (Riprap Channel)

Taylor Ditch 35+00 to TD-1 Stockpond

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	3.0:1	3.0:1	10.7			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	3.13 cfs	
Depth:	0.05 ft	
Top Width:	12.30 ft	
Velocity*:		
X-Section Area:	0.60 sq ft	
Hydraulic Radius:	0.049 ft	
Froude Number*:		
Manning's n*:		
Dmin:	1.00 in	
D50:	3.00 in	
Dmax:	3.75 in	

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

Structure #7 (Null)

Null at Confluence of Taylor/Taylor Trib

Structure #6 (Riprap Channel)

Taylor Ditch 10+00 to 35+00

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	3.0:1	3.0:1	7.1			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	3.45 cfs	
Depth:	0.07 ft	
Top Width:	12.42 ft	
Velocity*:		
X-Section Area:	0.86 sq ft	
Hydraulic Radius:	0.069 ft	
Froude Number*:		
Manning's n*:		
Dmin:	1.00 in	
D50:	3.00 in	
Dmax:	3.75 in	

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

Structure #5 (Null)

Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor

Structure #4 (Riprap Channel)

Taylor Ditch 0+00 to 10+00

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	3.0:1	3.0:1	6.9			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	16.29 cfs	
Depth:	0.18 ft	
Top Width:	13.10 ft	
Velocity*:		
X-Section Area:	2.30 sq ft	
Hydraulic Radius:	0.175 ft	
Froude Number*:		
Manning's n*:		
Dmin:	1.00 in	
D50:	3.00 in	
Dmax:	3.75 in	

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

Structure #3 (Null)

Null Above East Taylor Pond

Structure #2 (Pond)

East Taylor Pond

Pond Inputs:

Initial Pool Elev:	6,944.00 ft
Initial Pool:	2.87 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	10.00	18.00	122.00	4.00	0.0150	6,952.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,954.00	20.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	6,951.41 ft
H'graph Detention Time:	13.90 hrs
Pond Model:	CSTRS
Dewater Time:	2.42 days
Trap Efficiency:	67.06 %

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)
6,930.00	0.001	0.000	0.000	Top of Sed. Storage
6,931.00	0.036	0.014	0.000	
6,932.00	0.076	0.069	0.000	
6,933.00	0.110	0.161	0.000	
6,934.00	0.134	0.283	0.000	
6,935.00	0.156	0.428	0.000	
6,936.00	0.178	0.595	0.000	
6,937.00	0.201	0.785	0.000	
6,938.00	0.226	0.998	0.000	
6,939.00	0.252	1.237	0.000	
6,940.00	0.280	1.504	0.000	
6,941.00	0.310	1.799	0.000	
6,942.00	0.340	2.123	0.000	
6,943.00	0.373	2.480	0.000	
6,944.00	0.409	2.871	0.000	Low hole SPW #1
6,945.00	0.446	3.298	0.473	10.94*
6,946.00	0.486	3.764	0.669	8.43*
6,947.00	0.527	4.270	0.819	7.48*
6,948.00	0.571	4.819	0.945	7.02*

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,949.00	0.615	5.412	1.057	7.15
6,950.00	0.660	6.049	1.158	6.95
6,951.00	0.706	6.732	1.251	6.90
6,951.41	0.726	7.030	1.286	3.10 Peak Stage
6,952.00	0.754	7.462	1.337	Spillway #1
6,953.00	0.804	8.241	8.509	
6,954.00	0.857	9.072	12.033	Spillway #2
6,955.00	0.975	9.987	63.138	
6,956.00	1.033	10.991	184.415	

**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)
6,930.00	0.000	0.000	0.000
6,931.00	0.000	0.000	0.000
6,932.00	0.000	0.000	0.000
6,933.00	0.000	0.000	0.000
6,934.00	0.000	0.000	0.000
6,935.00	0.000	0.000	0.000
6,936.00	0.000	0.000	0.000
6,937.00	0.000	0.000	0.000
6,938.00	0.000	0.000	0.000
6,939.00	0.000	0.000	0.000
6,940.00	0.000	0.000	0.000
6,941.00	0.000	0.000	0.000
6,942.00	0.000	0.000	0.000
6,943.00	0.000	0.000	0.000
6,944.00	3.00	0.000	0.000
6,945.00	0.473	0.000	0.473
6,946.00	0.669	0.000	0.669
6,947.00	0.819	0.000	0.819
6,948.00	0.945	0.000	0.945
6,949.00	1.057	0.000	1.057
6,950.00	1.158	0.000	1.158
6,951.00	1.251	0.000	1.251
6,952.00	1.337	0.000	1.337
6,953.00	8.509	0.000	8.509
6,954.00	12.033	0.000	12.033

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,955.00	14.738	48.400	63.138
6,956.00	17.018	167.398	184.415

*Structure #1 (Null)**Null Below East Taylor 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)
#17	1	5.000	0.005	0.000	0.000	90.000	S	4.86	0.385
	Σ	5.000						4.86	0.385
#16	1	96.500	0.069	0.000	0.000	62.000	M	0.73	0.394
	2	33.300	0.053	0.000	0.000	80.000	F	17.16	1.232
	Σ	129.800						17.16	1.627
#15	1	28.500	0.142	0.000	0.000	62.000	M	0.14	0.095
	2	71.700	0.230	0.000	0.000	62.000	M	0.34	0.236
	Σ	230.000						17.16	1.958
#14	Σ	230.000						17.16	1.958
#13	1	18.000	0.128	0.000	0.000	62.000	M	0.09	0.060
	2	64.700	0.349	0.000	0.000	62.000	M	0.30	0.212
	3	2.200	0.045	0.000	0.000	80.000	F	1.13	0.081
	Σ	314.900						12.22	2.311
#18	1	6.000	0.032	0.000	0.000	62.000	M	0.05	0.024
	Σ	6.000						0.05	0.024
#20	1	7.300	0.009	0.000	0.000	80.000	F	3.76	0.270
	Σ	7.300						3.76	0.270
#19	Σ	7.300						3.76	0.270
#12	1	25.800	0.125	0.000	0.000	47.000	S	0.00	0.000
	2	40.600	0.050	0.000	0.000	62.000	M	0.31	0.166
	3	36.000	0.052	0.000	0.000	62.000	M	0.27	0.147
	4	31.200	0.042	0.000	0.000	80.000	F	16.08	1.155
	5	2.300	0.008	0.000	0.000	80.000	F	1.19	0.085
	6	36.100	0.042	0.000	0.000	80.000	F	18.60	1.336
	7	8.900	0.052	0.000	0.000	74.000	F	2.66	0.193
	8	3.000	0.022	0.000	0.000	74.000	F	0.90	0.065
	Σ	191.200						43.18	3.417
#11	Σ	191.200						43.18	3.417
#10	1	13.000	0.019	0.000	0.000	47.000	S	0.00	0.000
	2	43.900	0.100	0.000	0.000	62.000	M	0.33	0.179
	3	66.100	0.229	0.000	0.000	62.000	M	0.32	0.218
	Σ	314.200						3.91	1.952
#9	Σ	314.200						3.91	1.952

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#8	1	7.500	0.044	0.000	0.000	47.000	S	0.00	0.000
	2	9.700	0.060	0.000	0.000	62.000	M	0.07	0.040
	3	4.400	0.048	0.000	0.000	62.000	M	0.03	0.018
	Σ	335.800						3.13	1.513
#7	Σ	341.800						3.16	1.538
#6	1	19.000	0.070	0.000	0.000	47.000	S	0.00	0.000
	2	26.400	0.105	0.000	0.000	62.000	M	0.20	0.108
	3	36.600	0.184	0.000	0.000	62.000	M	0.18	0.121
	Σ	423.800						3.45	1.767
#5	Σ	738.700						12.22	4.078
#4	1	7.900	0.053	0.000	0.000	80.000	F	4.07	0.292
	2	126.900	0.386	0.000	0.000	62.000	M	0.58	0.414
	3	8.500	0.041	0.000	0.000	62.000	M	0.06	0.035
	4	2.600	0.019	0.000	0.000	47.000	S	0.00	0.000
	Σ	884.600						16.29	4.819
#3	Σ	884.600						16.29	4.819
#2	1	0.700	0.006	0.000	0.000	61.000	S	0.00	0.000
	2	1.100	0.015	0.000	0.000	61.000	S	0.00	0.000
	3	9.100	0.104	0.000	0.000	62.000	M	0.07	0.037
	Σ	900.500						16.85	5.242
#1	Σ	900.500						1.29	3.412

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)
#17	1	0.300	10.00	1.00	0.8000	0.3800	1	0.9	3,094	1.76	0.94
	Σ							0.9	3,094	1.76	0.94
#16	1	0.300	300.00	11.00	0.0100	0.3800	1	0.2	414	0.24	0.18
	2	0.300	400.00	20.00	0.8000	0.3800	1	376.4	407,094	232.03	113.80
	Σ							376.5	407,094	232.03	86.68
#15	1	0.300	400.00	8.40	0.0100	0.3800	1	0.0	210	0.11	0.09
	2	0.300	400.00	8.00	0.0100	0.3800	1	0.1	213	0.11	0.09
	Σ							376.6	407,094	232.02	72.17
#14	Σ							376.6	407,094	232.02	72.17

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#13	1	0.300	400.00	12.00	0.0100	0.3800	1	0.0	396	0.20	0.17
	2	0.300	400.00	10.00	0.0100	0.3800	1	0.1	290	0.14	0.12
	3	0.300	100.00	2.00	0.8000	0.3800	1	0.6	11,109	6.33	2.93
	Σ							42.4	19,435	0.17	0.16
#18	1	0.300	200.00	26.00	0.0100	0.3800	1	0.0	661	0.38	0.29
	Σ							0.0	661	0.38	0.29
#20	1	0.300	50.00	27.00	0.8000	0.3800	1	27.5	152,307	86.81	40.95
	Σ							27.5	152,307	86.81	40.95
#19	Σ							27.5	152,307	86.81	40.95
#12	1	0.300	400.00	13.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	400.00	26.00	0.0100	0.3800	1	0.2	1,260	0.72	0.54
	3	0.300	400.00	16.00	0.0100	0.3800	1	0.1	713	0.41	0.31
	4	0.300	400.00	21.00	0.8000	0.3800	1	369.9	423,673	241.48	118.75
	5	0.300	50.00	19.00	0.8000	0.3800	1	5.1	91,993	52.43	24.52
	6	0.300	400.00	18.00	0.8000	0.3800	1	364.4	370,015	210.90	102.83
	7	0.300	200.00	10.00	0.0700	1.0000	1	2.7	24,419	13.92	5.72
	8	0.300	150.00	18.00	0.0700	1.0000	1	1.6	42,591	24.28	10.00
	Σ							771.5	341,992	194.92	85.90
#11	Σ							771.5	341,992	194.92	85.90
#10	1	0.300	100.00	20.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	400.00	17.00	0.0100	0.3800	1	0.1	786	0.45	0.34
	3	0.300	400.00	13.00	0.0100	0.3800	1	0.1	506	0.25	0.22
	Σ							0.3	660	0.35	0.06
#9	Σ							0.3	660	0.35	0.06
#8	1	0.300	200.00	21.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	250.00	24.00	0.0100	0.3800	1	0.0	734	0.42	0.32
	3	0.300	200.00	20.00	0.0100	0.3800	1	0.0	477	0.27	0.21
	Σ							0.1	654	0.24	0.01
#7	Σ							0.1	656	0.27	0.02
#6	1	0.300	400.00	18.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	2	0.300	400.00	15.00	0.0100	0.3800	1	0.1	634	0.36	0.27
	3	0.300	400.00	13.00	0.0100	0.3800	1	0.1	477	0.24	0.20
	Σ							0.2	581	0.28	0.04
#5	Σ							42.6	18,970	0.21	0.15
#4	1	0.300	200.00	6.00	0.8000	0.3800	1	9.9	52,945	30.18	14.03
	2	0.300	400.00	12.00	0.0100	0.3800	1	0.2	477	0.24	0.20

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)
	3	0.300	200.00	19.00	0.0100	0.3800	1	0.0	486	0.28	0.21
	4	0.300	100.00	20.00	0.0310	0.9000	1	0.0	1	0.00	0.00
	Σ							52.8	18,508	2.20	1.51
#3	Σ							52.8	18,508	2.20	1.51
#2	1	0.300	50.00	40.00	0.0800	0.9000	1	0.0	1	0.00	0.00
	2	0.300	100.00	48.00	0.0800	0.9000	1	0.0	1	0.00	0.00
	3	0.300	400.00	26.00	0.0100	0.3800	1	0.0	1,053	0.60	0.46
	Σ							53.0	17,618	2.09	0.88
#1	Σ							17.5	4,387	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)
#2	1	3. Short grass pasture	40.00	48.80	122.00	5.050	0.006
#2	1	Time of Concentration:					0.006
#2	2	3. Short grass pasture	48.00	150.23	313.00	5.540	0.015
#2	2	Time of Concentration:					0.015
#2	3	3. Short grass pasture	26.00	397.02	1,527.00	4.070	0.104
#2	3	Time of Concentration:					0.104
#4	1	4. Cultivated, straight row	6.00	25.38	423.00	2.180	0.053
#4	1	Time of Concentration:					0.053
#4	2	3. Short grass pasture	12.00	462.24	3,852.00	2.770	0.386
#4	2	Time of Concentration:					0.386
#4	3	3. Short grass pasture	19.00	99.37	523.00	3.480	0.041
#4	3	Time of Concentration:					0.041
#4	4	3. Short grass pasture	20.00	50.40	252.00	3.570	0.019
#4	4	Time of Concentration:					0.019
#6	1	3. Short grass pasture	18.00	154.08	856.00	3.390	0.070
#6	1	Time of Concentration:					0.070
#6	2	3. Short grass pasture	15.00	175.35	1,169.00	3.090	0.105
#6	2	Time of Concentration:					0.105
#6	3	3. Short grass pasture	13.00	248.04	1,908.00	2.880	0.184
#6	3	Time of Concentration:					0.184
#8	1	3. Short grass pasture	21.00	122.64	584.00	3.660	0.044
#8	1	Time of Concentration:					0.044
#8	2	3. Short grass pasture	24.00	204.48	852.00	3.910	0.060
#8	2	Time of Concentration:					0.060
#8	3	3. Short grass pasture	20.00	125.80	629.00	3.570	0.048
#8	3	Time of Concentration:					0.048

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#10	1	3. Short grass pasture	20.00	49.80	249.00	3.570	0.019
#10	1	Time of Concentration:					0.019
#10	2	3. Short grass pasture	17.00	202.98	1,194.00	3.290	0.100
#10	2	Time of Concentration:					0.100
#10	3	3. Short grass pasture	13.00	309.91	2,384.00	2.880	0.229
#10	3	Time of Concentration:					0.229
#12	1	3. Short grass pasture	9.00	97.38	1,082.00	2.400	0.125
#12	1	Time of Concentration:					0.125
#12	2	3. Short grass pasture	26.00	193.96	746.00	4.070	0.050
#12	2	Time of Concentration:					0.050
#12	3	3. Short grass pasture	16.00	97.43	609.00	3.200	0.052
#12	3	Time of Concentration:					0.052
#12	4	5. Nearly bare and untilled, and alluvial valley fans	21.00	146.78	698.95	4.580	0.042
#12	4	Time of Concentration:					0.042
#12	5	5. Nearly bare and untilled, and alluvial valley fans	19.00	24.13	127.00	4.350	0.008
#12	5	Time of Concentration:					0.008
#12	6	5. Nearly bare and untilled, and alluvial valley fans	19.00	126.73	667.00	4.350	0.042
#12	6	Time of Concentration:					0.042
#12	7	3. Short grass pasture	10.00	47.50	475.00	2.520	0.052
#12	7	Time of Concentration:					0.052
#12	8	3. Short grass pasture	18.00	48.60	270.00	3.390	0.022
#12	8	Time of Concentration:					0.022
#13	1	3. Short grass pasture	12.00	153.59	1,280.00	2.770	0.128
#13	1	Time of Concentration:					0.128
#13	2	3. Short grass pasture	10.00	317.10	3,171.00	2.520	0.349
#13	2	Time of Concentration:					0.349
#13	3	5. Nearly bare and untilled, and alluvial valley fans	2.00	4.64	232.00	1.410	0.045
#13	3	Time of Concentration:					0.045
#15	1	3. Short grass pasture	8.40	99.62	1,186.00	2.310	0.142
#15	1	Time of Concentration:					0.142
#15	2	3. Short grass pasture	8.00	150.23	1,878.00	2.260	0.230
#15	2	Time of Concentration:					0.230
#16	1	3. Short grass pasture	11.00	72.93	663.00	2.650	0.069
#16	1	Time of Concentration:					0.069
#16	2	5. Nearly bare and untilled, and alluvial valley fans	20.00	173.40	867.00	4.470	0.053
#16	2	Time of Concentration:					0.053
#17	1	5. Nearly bare and untilled, and alluvial valley fans	25.00	25.00	100.00	5.000	0.005
#17	1	Time of Concentration:					0.005
#18	1	3. Short grass pasture	26.00	124.53	479.00	4.070	0.032
#18	1	Time of Concentration:					0.032

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#20	1	5. Nearly bare and untilled, and alluvial valley fans	27.00	48.33	179.00	5.190	0.009
#20	1	Time of Concentration:					0.009

East Taylor Pond **25 Year - 24 Hour Storm Event**

Emergency Spillway Demonstration
Post Mining

Tony Tennyson

Tri-State Generation & Transmission Association, Inc.
1100 West 116th Avenue
Westminster, CO 80234

Phone: 970-326-3560
Email: ttennyson@tristategr.org

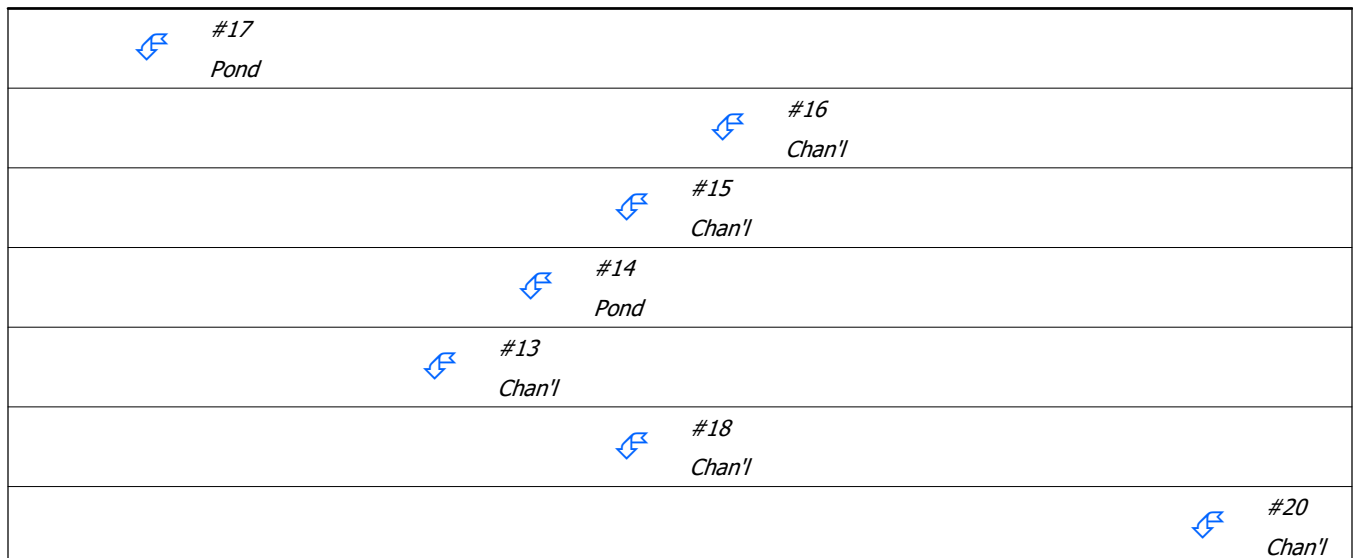
General Information

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 East Taylor Pond
Pond	#2	==>	#1	0.000	0.000	East Taylor Pond
Null	#3	==>	#2	0.000	0.000	Null Above East Taylor Pond
Channel	#4	==>	#3	0.000	0.000	Taylor Ditch 0+00 to 10+00
Null	#5	==>	#4	0.000	0.000	Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor
Channel	#6	==>	#5	0.000	0.000	Taylor Ditch 10+00 to 35+00
Null	#7	==>	#6	0.000	0.000	Null at Confluence of Taylor/Taylor Trib
Channel	#8	==>	#7	0.000	0.000	Taylor Ditch 35+00 to TD-1 Stockpond
Pond	#9	==>	#8	0.000	0.000	TD-1 Stockpond
Channel	#10	==>	#9	0.000	0.000	Taylor Ditch TD-1 to TD-2 Stockpond
Pond	#11	==>	#10	0.000	0.000	TD-2 Stockpond
Channel	#12	==>	#11	0.000	0.000	Taylor Ditch TD-2 Stockpond to 117+58
Channel	#13	==>	#5	0.000	0.000	East Taylor Ditch 0+00 to ETD-1
Pond	#14	==>	#13	0.000	0.000	ETD-1 Stock Pond
Channel	#15	==>	#14	0.000	0.000	East Taylor Ditch - Veg ETD-1 to 38+30
Channel	#16	==>	#15	0.000	0.000	East Taylor Ditch 38+30 to 73+40
Pond	#17	==>	#2	0.000	0.000	Simulated 250 GPM - East Taylor Seep
Channel	#18	==>	#7	0.000	0.000	Taylor Trib Ditch
Null	#19	==>	#12	0.000	0.000	Null At Confluence of 7700 Terrace Ditch
Channel	#20	==>	#19	0.000	0.000	7700 Terrace Ditch



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#19	Null
#12	Chan'l
#11	Pond
#10	Chan'l
#9	Pond
#8	Chan'l
#7	Null
#6	Chan'l
#5	Null
#4	Chan'l
#3	Null
#2	Pond
#1	Null

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#17 In	5.000	5.000	6.87	0.56
Out			0.56	0.56
#16	129.800	129.800	41.73	3.37
#15	100.200	230.000	42.35	4.45
#14 In	0.000	230.000	42.35	4.45
Out			4.58	2.37
#13	84.900	314.900	5.90	3.40
#18	6.000	6.000	0.83	0.08
#20	7.300	7.300	6.23	0.46
#19	0.000	7.300	6.23	0.46
#12	183.900	191.200	83.09	6.34
#11 In	0.000	191.200	83.09	6.34
Out			26.54	4.47
#10	123.000	314.200	28.78	5.77
#9 In	0.000	314.200	28.78	5.77
Out			22.16	5.27
#8	21.600	335.800	22.79	5.46
#7	0.000	341.800	23.06	5.54
#6	82.000	423.800	25.43	6.29
#5	0.000	738.700	28.34	9.68
#4	145.900	884.600	34.07	11.64
#3	0.000	884.600	34.07	11.64
#2 In	10.900	900.500	35.11	12.34
Out			10.17	10.03
#1	0.000	900.500	10.17	10.03

Structure Detail:

Structure #17 (Pond)

Simulated 250 GPM - East Taylor Seep

Pond Inputs:

Initial Pool Elev:	90.01 ft
Initial Pool:	0.00 ac-ft

Pond Results:

Peak Elevation:	92.54 ft
Dewater Time:	0.26 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)
90.00	0.050	0.000	0.000	
90.01	0.050	0.001	0.000	
91.00	0.051	0.050	0.560	
92.00	0.190	0.164	0.560	
92.54	0.212	0.285	0.560	6.20 Peak Stage
93.00	0.260	0.388	0.560	
94.00	0.350	0.692	0.560	
95.00	0.440	1.086	0.560	
96.00	0.540	1.575	0.560	
97.00	0.650	2.169	0.560	
98.00	0.760	2.873	0.560	
99.00	0.880	3.693	0.560	
100.00	1.200	4.728	0.560	
101.00	1.240	5.948	0.560	
102.00	1.414	7.275	0.560	
103.00	1.600	8.781	0.560	

Detailed Discharge Table

Elevation (ft)	User- input discharge (cfs)	Combined Total Discharge (cfs)
90.00	0.000	0.000
90.01	0.000	0.000
91.00	0.560	0.560
92.00	0.560	0.560
93.00	0.560	0.560
94.00	0.560	0.560
95.00	0.560	0.560
96.00	0.560	0.560
97.00	0.560	0.560
98.00	0.000	0.560
99.00	0.000	0.560
100.00	0.000	0.560
101.00	0.000	0.560
102.00	0.000	0.560
103.00	0.000	0.560

Structure #16 (Riprap Channel)

East Taylor Ditch 38+30 to 73+40

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	3.0:1	3.0:1	9.5			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	41.73 cfs	
Depth:	0.33 ft	
Top Width:	14.01 ft	
Velocity*:		
X-Section Area:	4.35 sq ft	
Hydraulic Radius:	0.308 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 #15 (Vegetated Channel)

East Taylor Ditch - Veg ETD-1 to 38+30

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)
12.00	3.0:1	3.0:1	1.8	D, B				7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	42.35 cfs		42.35 cfs	
Depth:	0.83 ft		1.33 ft	
Top Width:	16.96 ft		19.97 ft	
Velocity:	3.54 fps		1.99 fps	
X-Section Area:	11.98 sq ft		21.25 sq ft	
Hydraulic Radius:	0.695 ft		1.041 ft	
Froude Number:	0.74		0.34	
Roughness Coefficient:	0.0443		0.1030	

Structure #14 (Pond)

ETD-1 Stock Pond

Pond Inputs:

Initial Pool Elev:	7,287.01 ft
Initial Pool:	0.01 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,290.00	30.00	2.00:1	2.00:1	22.00

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,292.00	20.00	2.00:1	2.00:1	16.00

Pond Results:

Peak Elevation:	7,290.10 ft
Dewater Time:	0.47 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)
7,285.00	0.016	0.000	0.000	
7,286.00	0.096	0.050	0.000	
7,287.00	0.539	0.337	0.000	
7,288.00	0.654	0.933	0.000	
7,289.00	0.735	1.627	0.000	
7,290.00	0.843	2.415	0.000	Spillway #1
7,290.10	0.810	2.497	4.577	11.35 Peak Stage
7,291.00	0.872	3.273	48.073	
7,292.00	0.872	4.145	169.510	Spillway #2
7,293.00	0.872	5.017	391.148	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,285.00	0.000	0.000	0.000
7,286.00	0.000	0.000	0.000
7,287.00	0.000	0.000	0.000
7,288.00	0.000	0.000	0.000
7,289.00	0.000	0.000	0.000
7,290.00	0.000	0.000	0.000
7,291.00	48.073	0.000	48.073
7,292.00	169.510	0.000	169.510
7,293.00	351.917	39.231	391.148

Structure #13 (Riprap Channel)

East Taylor Ditch 0+00 to ETD-1

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	3.0:1	3.0:1	11.8			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	5.90 cfs	
Depth:	0.07 ft	
Top Width:	12.41 ft	
Velocity*:		
X-Section Area:	0.83 sq ft	
Hydraulic Radius:	0.067 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

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

Structure #18 (Riprap Channel)

Taylor Trib 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	3.0:1	3.0:1	17.0			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.83 cfs	
Depth:	0.02 ft	
Top Width:	12.13 ft	
Velocity*:		
X-Section Area:	0.26 sq ft	
Hydraulic Radius:	0.021 ft	
Froude Number*:		
Manning's n*:		

	w/o Freeboard	w/ Freeboard
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

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

Structure #20 (Vegetated Channel)

7700 Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	1.5	D, B	1.41			7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	6.23 cfs		6.23 cfs	
Depth:	1.15 ft	2.56 ft	1.78 ft	3.19 ft
Top Width:	5.17 ft	11.52 ft	7.99 ft	14.34 ft
Velocity:	2.10 fps		0.88 fps	
X-Section Area:	2.97 sq ft		7.10 sq ft	
Hydraulic Radius:	0.525 ft		0.811 ft	
Froude Number:	0.49		0.16	
Roughness Coefficient:	0.0566		0.1808	

Structure #19 (Null)

Null At Confluence of 7700 Terrace Ditch

Structure #12 (Riprap Channel)

Taylor Ditch TD-2 Stockpond to 117+58

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	3.0:1	3.0:1	9.8	3.67		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	83.09 cfs	
Depth:	0.57 ft	4.24 ft
Top Width:	15.42 ft	37.44 ft
Velocity*:		
X-Section Area:	7.82 sq ft	
Hydraulic Radius:	0.501 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

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

Structure #11 (Pond)

TD-2 Stockpond

Pond Inputs:

Initial Pool Elev:	7,445.00 ft
Initial Pool:	0.09 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,454.00	30.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	7,454.60 ft
Dewater Time:	0.52 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
7,443.00	0.014	0.000	0.000	
7,444.00	0.050	0.030	0.000	
7,445.00	0.079	0.094	0.000	
7,446.00	0.106	0.186	0.000	
7,447.00	0.133	0.305	0.000	
7,448.00	0.161	0.452	0.000	
7,449.00	0.190	0.627	0.000	
7,450.00	0.219	0.831	0.000	
7,451.00	0.249	1.065	0.000	
7,452.00	0.280	1.329	0.000	
7,453.00	0.313	1.625	0.000	
7,454.00	0.348	1.955	0.000	Spillway #1
7,454.60	0.374	2.178	26.543	12.50 Peak Stage
7,455.00	0.389	2.324	43.900	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,443.00	0.000	0.000
7,444.00	0.000	0.000
7,445.00	0.000	0.000
7,446.00	0.000	0.000
7,447.00	0.000	0.000
7,448.00	0.000	0.000
7,449.00	0.000	0.000
7,450.00	0.000	0.000
7,451.00	0.000	0.000
7,452.00	0.000	0.000
7,453.00	0.000	0.000
7,454.00	0.000	0.000
7,455.00	0.000	43.900

Structure #10 (Riprap Channel)

Taylor Ditch TD-1 to TD-2 Stockpond

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	3.0:1	3.0:1	6.8			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	28.78 cfs	
Depth:	0.29 ft	
Top Width:	13.71 ft	
Velocity*:		
X-Section Area:	3.66 sq ft	
Hydraulic Radius:	0.265 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 #9 (Pond)

TD-1 Stockpond

Pond Inputs:

Initial Pool Elev:	7,283.01 ft
Initial Pool:	0.00 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,287.00	20.00	2.00:1	2.00:1	30.00

Pond Results:

Peak Elevation:	7,287.31 ft
Dewater Time:	0.52 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
7,283.00	0.001	0.000	0.000	
7,283.01	0.001	0.000	0.000	
7,284.00	0.059	0.023	0.000	
7,285.00	0.159	0.128	0.000	
7,286.00	0.182	0.298	0.000	
7,287.00	0.213	0.495	0.000	Spillway #1
7,287.31	0.225	0.567	22.165	12.50 Peak Stage
7,288.00	0.247	0.725	71.329	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,283.00	0.000	0.000
7,283.01	0.000	0.000
7,284.00	0.000	0.000
7,285.00	0.000	0.000
7,286.00	0.000	0.000
7,287.00	0.000	0.000
7,288.00	71.329	71.329

Structure #8 (Riprap Channel)

Taylor Ditch 35+00 to TD-1 Stockpond

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	3.0:1	3.0:1	10.7			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	22.79 cfs	
Depth:	0.19 ft	
Top Width:	13.16 ft	
Velocity*:		
X-Section Area:	2.44 sq ft	

	w/o Freeboard	w/ Freeboard
Hydraulic Radius:	0.185 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 #7 (Null)

Null at Confluence of Taylor/Taylor Trib

Structure #6 (Riprap Channel)

Taylor Ditch 10+00 to 35+00

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	3.0:1	3.0:1	7.1			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	25.43 cfs	
Depth:	0.25 ft	
Top Width:	13.53 ft	
Velocity*:		
X-Section Area:	3.25 sq ft	
Hydraulic Radius:	0.239 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

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

Structure #5 (Null)

Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor

Structure #4 (Riprap Channel)

Taylor Ditch 0+00 to 10+00

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	3.0:1	3.0:1	6.9			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	34.07 cfs	
Depth:	0.32 ft	
Top Width:	13.94 ft	
Velocity*:		
X-Section Area:	4.20 sq ft	
Hydraulic Radius:	0.299 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 #3 (Null)

Null Above East Taylor Pond

Structure #2 (Pond)

East Taylor Pond

Pond Inputs:

Initial Pool Elev:	6,944.00 ft
Initial Pool:	2.87 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	122.00	4.00	0.0150	6,952.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,954.00	20.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	6,953.47 ft
Dewater Time:	2.91 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)
6,930.00	0.001	0.000	0.000	
6,931.00	0.036	0.014	0.000	
6,932.00	0.076	0.069	0.000	
6,933.00	0.110	0.161	0.000	
6,934.00	0.134	0.283	0.000	
6,935.00	0.156	0.428	0.000	
6,936.00	0.178	0.595	0.000	
6,937.00	0.201	0.785	0.000	
6,938.00	0.226	0.998	0.000	
6,939.00	0.252	1.237	0.000	
6,940.00	0.280	1.504	0.000	
6,941.00	0.310	1.799	0.000	
6,942.00	0.340	2.123	0.000	
6,943.00	0.373	2.480	0.000	
6,944.00	0.409	2.871	0.000	Low hole SPW #1
6,945.00	0.446	3.298	0.473	10.94*
6,946.00	0.486	3.764	0.669	8.43*
6,947.00	0.527	4.270	0.819	7.48*
6,948.00	0.571	4.819	0.945	7.02*
6,949.00	0.615	5.412	1.057	6.78*
6,950.00	0.660	6.049	1.158	6.95
6,951.00	0.706	6.732	1.251	6.90
6,952.00	0.754	7.462	1.337	6.85 Spillway #1
6,953.00	0.804	8.241	8.509	4.75
6,953.47	0.830	8.633	10.173	3.80 Peak Stage
6,954.00	0.857	9.072	12.033	Spillway #2
6,955.00	0.975	9.987	63.138	
6,956.00	1.033	10.991	184.415	

**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)
6,930.00	0.000	0.000	0.000
6,931.00	0.000	0.000	0.000
6,932.00	0.000	0.000	0.000
6,933.00	0.000	0.000	0.000
6,934.00	0.000	0.000	0.000
6,935.00	0.000	0.000	0.000
6,936.00	0.000	0.000	0.000
6,937.00	0.000	0.000	0.000
6,938.00	0.000	0.000	0.000
6,939.00	0.000	0.000	0.000
6,940.00	0.000	0.000	0.000
6,941.00	0.000	0.000	0.000
6,942.00	0.000	0.000	0.000
6,943.00	0.000	0.000	0.000
6,944.00	3.00>0.000	0.000	0.000
6,945.00	0.000	0.000	0.473
6,946.00	0.000	0.000	0.669
6,947.00	0.000	0.000	0.819
6,948.00	0.000	0.000	0.945
6,949.00	0.000	0.000	1.057
6,950.00	0.000	0.000	1.158
6,951.00	0.000	0.000	1.251
6,952.00	0.000	0.000	1.337
6,953.00	0.000	0.000	8.509
6,954.00	0.000	0.000	12.033
6,955.00	0.000	0.000	63.138
6,956.00	0.000	0.000	184.415

Structure #1 (Null)*Null Below East Taylor 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)
#17	1	5.000	0.005	0.000	0.000	90.000	S	6.87	0.563
	Σ	5.000						6.87	0.563
#16	1	96.500	0.069	0.000	0.000	62.000	M	13.32	1.285
	2	33.300	0.053	0.000	0.000	80.000	F	28.41	2.088
	Σ	129.800						41.73	3.374
#15	1	28.500	0.142	0.000	0.000	62.000	M	1.52	0.309
	2	71.700	0.230	0.000	0.000	62.000	M	3.20	0.769
	Σ	230.000						42.35	4.452
#14	Σ	230.000						42.35	4.452
#13	1	18.000	0.128	0.000	0.000	62.000	M	0.96	0.195
	2	64.700	0.349	0.000	0.000	62.000	M	2.26	0.691
	3	2.200	0.045	0.000	0.000	80.000	F	1.88	0.138
	Σ	314.900						5.90	3.397
#18	1	6.000	0.032	0.000	0.000	62.000	M	0.83	0.080
	Σ	6.000						0.83	0.080
#20	1	7.300	0.009	0.000	0.000	80.000	F	6.23	0.458
	Σ	7.300						6.23	0.458
#19	Σ	7.300						6.23	0.458
#12	1	25.800	0.125	0.000	0.000	47.000	S	0.00	0.000
	2	40.600	0.050	0.000	0.000	62.000	M	5.61	0.541
	3	36.000	0.052	0.000	0.000	62.000	M	4.97	0.479
	4	31.200	0.042	0.000	0.000	80.000	F	26.62	1.957
	5	2.300	0.008	0.000	0.000	80.000	F	1.96	0.144
	6	36.100	0.042	0.000	0.000	80.000	F	30.80	2.264
	7	8.900	0.052	0.000	0.000	74.000	F	5.17	0.370
	8	3.000	0.022	0.000	0.000	74.000	F	1.74	0.125
	Σ	191.200						83.09	6.337
#11	Σ	191.200						83.09	6.337
#10	1	13.000	0.019	0.000	0.000	47.000	S	0.00	0.000
	2	43.900	0.100	0.000	0.000	62.000	M	6.06	0.585
	3	66.100	0.229	0.000	0.000	62.000	M	2.95	0.709
	Σ	314.200						28.78	5.768
#9	Σ	314.200						28.78	5.768

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#8	1	7.500	0.044	0.000	0.000	47.000	S	0.00	0.000
	2	9.700	0.060	0.000	0.000	62.000	M	1.34	0.129
	3	4.400	0.048	0.000	0.000	62.000	M	0.61	0.059
	Σ	335.800						22.79	5.460
#7	Σ	341.800						23.06	5.540
#6	1	19.000	0.070	0.000	0.000	47.000	S	0.00	0.000
	2	26.400	0.105	0.000	0.000	62.000	M	3.65	0.352
	3	36.600	0.184	0.000	0.000	62.000	M	1.85	0.394
	Σ	423.800						25.43	6.286
#5	Σ	738.700						28.34	9.683
#4	1	7.900	0.053	0.000	0.000	80.000	F	6.74	0.495
	2	126.900	0.386	0.000	0.000	62.000	M	4.18	1.350
	3	8.500	0.041	0.000	0.000	62.000	M	1.17	0.113
	4	2.600	0.019	0.000	0.000	47.000	S	0.00	0.000
	Σ	884.600						34.07	11.642
#3	Σ	884.600						34.07	11.642
#2	1	0.700	0.006	0.000	0.000	61.000	S	0.07	0.003
	2	1.100	0.015	0.000	0.000	61.000	S	0.12	0.009
	3	9.100	0.104	0.000	0.000	62.000	M	1.26	0.121
	Σ	900.500						35.11	12.339
#1	Σ	900.500						10.17	10.029

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	3. Short grass pasture	40.00	48.80	122.00	5.050	0.006
#2	1	Time of Concentration:					0.006
#2	2	3. Short grass pasture	48.00	150.23	313.00	5.540	0.015
#2	2	Time of Concentration:					0.015
#2	3	3. Short grass pasture	26.00	397.02	1,527.00	4.070	0.104
#2	3	Time of Concentration:					0.104
#4	1	4. Cultivated, straight row	6.00	25.38	423.00	2.180	0.053
#4	1	Time of Concentration:					0.053
#4	2	3. Short grass pasture	12.00	462.24	3,852.00	2.770	0.386
#4	2	Time of Concentration:					0.386
#4	3	3. Short grass pasture	19.00	99.37	523.00	3.480	0.041
#4	3	Time of Concentration:					0.041
#4	4	3. Short grass pasture	20.00	50.40	252.00	3.570	0.019

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#4	4	Time of Concentration:					0.019
#6	1	3. Short grass pasture	18.00	154.08	856.00	3.390	0.070
#6	1	Time of Concentration:					0.070
#6	2	3. Short grass pasture	15.00	175.35	1,169.00	3.090	0.105
#6	2	Time of Concentration:					0.105
#6	3	3. Short grass pasture	13.00	248.04	1,908.00	2.880	0.184
#6	3	Time of Concentration:					0.184
#8	1	3. Short grass pasture	21.00	122.64	584.00	3.660	0.044
#8	1	Time of Concentration:					0.044
#8	2	3. Short grass pasture	24.00	204.48	852.00	3.910	0.060
#8	2	Time of Concentration:					0.060
#8	3	3. Short grass pasture	20.00	125.80	629.00	3.570	0.048
#8	3	Time of Concentration:					0.048
#10	1	3. Short grass pasture	20.00	49.80	249.00	3.570	0.019
#10	1	Time of Concentration:					0.019
#10	2	3. Short grass pasture	17.00	202.98	1,194.00	3.290	0.100
#10	2	Time of Concentration:					0.100
#10	3	3. Short grass pasture	13.00	309.91	2,384.00	2.880	0.229
#10	3	Time of Concentration:					0.229
#12	1	3. Short grass pasture	9.00	97.38	1,082.00	2.400	0.125
#12	1	Time of Concentration:					0.125
#12	2	3. Short grass pasture	26.00	193.96	746.00	4.070	0.050
#12	2	Time of Concentration:					0.050
#12	3	3. Short grass pasture	16.00	97.43	609.00	3.200	0.052
#12	3	Time of Concentration:					0.052
#12	4	5. Nearly bare and untilled, and alluvial valley fans	21.00	146.78	699.00	4.580	0.042
#12	4	Time of Concentration:					0.042
#12	5	5. Nearly bare and untilled, and alluvial valley fans	19.00	24.13	127.00	4.350	0.008
#12	5	Time of Concentration:					0.008
#12	6	5. Nearly bare and untilled, and alluvial valley fans	19.00	126.73	667.00	4.350	0.042
#12	6	Time of Concentration:					0.042
#12	7	3. Short grass pasture	10.00	47.50	475.00	2.520	0.052
#12	7	Time of Concentration:					0.052
#12	8	3. Short grass pasture	18.00	48.60	270.00	3.390	0.022
#12	8	Time of Concentration:					0.022
#13	1	3. Short grass pasture	12.00	153.59	1,280.00	2.770	0.128
#13	1	Time of Concentration:					0.128
#13	2	3. Short grass pasture	10.00	317.10	3,171.00	2.520	0.349
#13	2	Time of Concentration:					0.349
#13	3	5. Nearly bare and untilled, and alluvial valley fans	2.00	4.64	232.00	1.410	0.045
#13	3	Time of Concentration:					0.045

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#15	1	3. Short grass pasture	8.40	99.62	1,186.00	2.310	0.142
#15	1	Time of Concentration:					0.142
#15	2	3. Short grass pasture	8.00	150.23	1,878.00	2.260	0.230
#15	2	Time of Concentration:					0.230
#16	1	3. Short grass pasture	11.00	72.93	663.00	2.650	0.069
#16	1	Time of Concentration:					0.069
#16	2	5. Nearly bare and untilled, and alluvial valley fans	20.00	173.40	867.00	4.470	0.053
#16	2	Time of Concentration:					0.053
#17	1	5. Nearly bare and untilled, and alluvial valley fans	25.00	25.00	100.00	5.000	0.005
#17	1	Time of Concentration:					0.005
#18	1	3. Short grass pasture	26.00	124.53	479.00	4.070	0.032
#18	1	Time of Concentration:					0.032
#20	1	5. Nearly bare and untilled, and alluvial valley fans	27.00	48.33	179.00	5.190	0.009
#20	1	Time of Concentration:					0.009

Taylor Ditch **100 Year - 24 Hour Storm Event**

Post Mine Channel Size Demonstration

Tony Tennyson

Tri-State Generation & Transmission Association, Inc.
1100 West 116th Avenue
Westminster, CO 80234

Phone: 970-326-3560
Email: ttennyson@tristategr.org

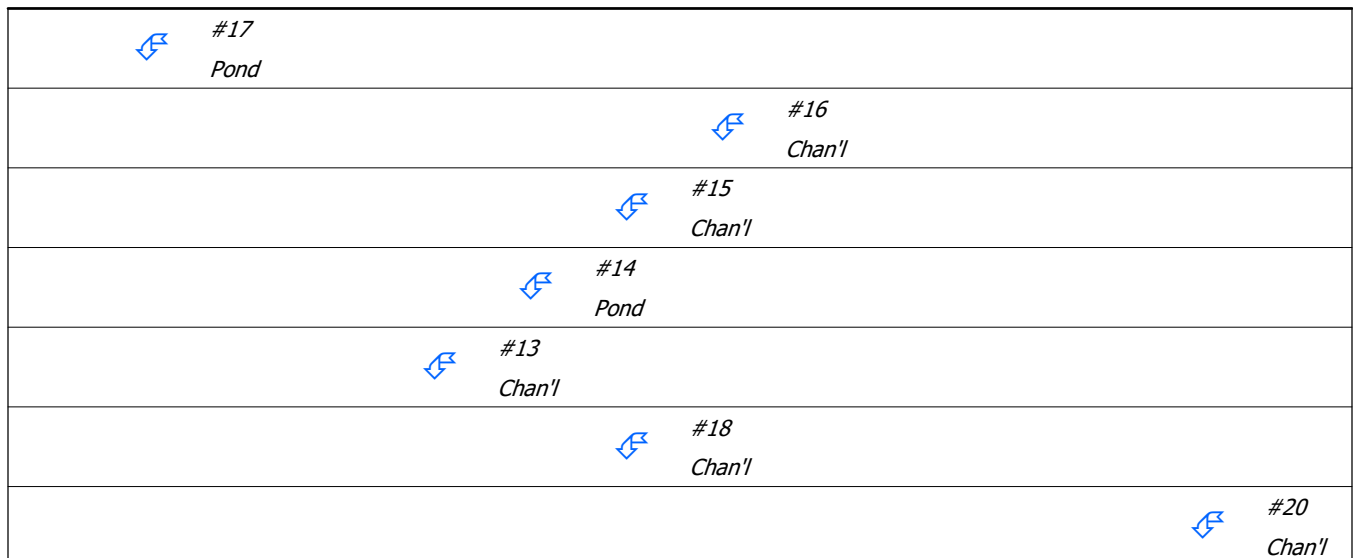
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Null Below East Taylor Pond
Pond	#2	==>	#1	0.000	0.000	East Taylor Pond
Null	#3	==>	#2	0.000	0.000	Null Above East Taylor Pond
Channel	#4	==>	#3	0.000	0.000	Taylor Ditch 0+00 to 10+00
Null	#5	==>	#4	0.000	0.000	Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor
Channel	#6	==>	#5	0.000	0.000	Taylor Ditch 10+00 to 35+00
Null	#7	==>	#6	0.000	0.000	Null at Confluence of Taylor/Taylor Trib
Channel	#8	==>	#7	0.000	0.000	Taylor Ditch 35+00 to TD-1 Stockpond
Pond	#9	==>	#8	0.000	0.000	TD-1 Stockpond
Channel	#10	==>	#9	0.000	0.000	Taylor Ditch TD-1 to TD-2 Stockpond
Pond	#11	==>	#10	0.000	0.000	TD-2 Stockpond
Channel	#12	==>	#11	0.000	0.000	Taylor Ditch TD-2 Stockpond to 117+58
Channel	#13	==>	#5	0.000	0.000	East Taylor Ditch 0+00 to ETD-1
Pond	#14	==>	#13	0.000	0.000	ETD-1 Stock Pond
Channel	#15	==>	#14	0.000	0.000	East Taylor Ditch - Veg ETD-1 to 38+30
Channel	#16	==>	#15	0.000	0.000	East Taylor Ditch 38+30 to 73+40
Pond	#17	==>	#2	0.000	0.000	Simulated 250 GPM - East Taylor Seep
Channel	#18	==>	#7	0.000	0.000	Taylor Trib Ditch
Null	#19	==>	#12	0.000	0.000	Null At Confluence of 7700 Terrace Ditch
Channel	#20	==>	#19	0.000	0.000	7700 Terrace Ditch



		#19 Null
		#12 Chan'l
		#11 Pond
		#10 Chan'l
		#9 Pond
		#8 Chan'l
		#7 Null
		#6 Chan'l
		#5 Null
		#4 Chan'l
		#3 Null
	#2 Pond	
#1 Null		

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#17 In	5.000	5.000	8.90	0.75
Out			0.56	0.75
#16	129.800	129.800	74.65	5.64
#15	100.200	230.000	81.51	7.80
#14 In	0.000	230.000	81.51	7.80
Out			21.03	5.72
#13	84.900	314.900	27.72	7.71
#18	6.000	6.000	2.12	0.16
#20	7.300	7.300	8.89	0.67
#19	0.000	7.300	8.89	0.67
#12	172.900	180.200	120.23	9.09
#11 In	0.000	180.200	120.23	9.09
Out			83.80	7.23
#10	123.000	303.200	103.11	9.85
#9 In	0.000	303.200	103.11	9.85
Out			86.44	9.36
#8	21.600	324.800	87.47	9.75
#7	0.000	330.800	87.91	9.91
#6	82.000	412.800	94.81	11.45
#5	0.000	727.700	101.83	19.15
#4	145.900	873.600	109.34	22.82
#3	0.000	873.600	109.34	22.82
#2 In	10.900	889.500	110.68	23.85
Out			48.76	22.10
#1	0.000	889.500	48.76	22.10

Structure Detail:***Structure #17 (Pond)****Simulated 250 GPM - East Taylor Seep*

Pond Inputs:

Initial Pool Elev:	90.01 ft
Initial Pool:	0.00 ac-ft

Pond Results:

Peak Elevation:	93.06 ft
Dewater Time:	0.21 days

*Dewatering time is calculated from peak stage to lowest spillway***Elevation-Capacity-Discharge Table**

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
90.00	0.050	0.000	0.000	
90.01	0.050	0.001	0.000	
91.00	0.051	0.050	0.560	
92.00	0.190	0.164	0.560	
93.00	0.260	0.388	0.560	
93.06	0.275	0.406	0.560	5.10 Peak Stage
94.00	0.350	0.692	0.560	
95.00	0.440	1.086	0.560	
96.00	0.540	1.575	0.560	
97.00	0.650	2.169	0.560	
98.00	0.760	2.873	0.560	
99.00	0.880	3.693	0.560	
100.00	1.200	4.728	0.560	
101.00	1.240	5.948	0.560	
102.00	1.414	7.275	0.560	
103.00	1.600	8.781	0.560	

Detailed Discharge Table

Elevation (ft)	User- input discharge (cfs)	Combined Total Discharge (cfs)
90.00	0.000	0.000
90.01	0.000	0.000
91.00	0.560	0.560
92.00	0.560	0.560
93.00	0.560	0.560
94.00	0.560	0.560
95.00	0.560	0.560
96.00	0.560	0.560
97.00	0.560	0.560
98.00	0.000	0.560
99.00	0.000	0.560
100.00	0.000	0.560
101.00	0.000	0.560
102.00	0.000	0.560
103.00	0.000	0.560

Structure #16 (Riprap Channel)

East Taylor Ditch 38+30 to 73+40

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	3.0:1	3.0:1	9.5			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	74.65 cfs	
Depth:	0.53 ft	
Top Width:	15.19 ft	
Velocity*:		
X-Section Area:	7.24 sq ft	
Hydraulic Radius:	0.471 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

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

Structure #15 (Vegetated Channel)

East Taylor Ditch - Veg ETD-1 to 38+30

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)
12.00	3.0:1	3.0:1	1.8	D, B				7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	81.51 cfs		81.51 cfs	
Depth:	1.09 ft		1.61 ft	
Top Width:	18.52 ft		21.68 ft	
Velocity:	4.91 fps		3.00 fps	
X-Section Area:	16.59 sq ft		27.18 sq ft	
Hydraulic Radius:	0.879 ft		1.224 ft	
Froude Number:	0.92		0.47	
Roughness Coefficient:	0.0373		0.0763	

Structure #14 (Pond)

ETD-1 Stock Pond

Pond Inputs:

Initial Pool Elev:	7,287.01 ft
Initial Pool:	0.01 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,290.00	30.00	2.00:1	2.00:1	22.00

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,292.00	20.00	2.00:1	2.00:1	16.00

Pond Results:

Peak Elevation:	7,290.44 ft
Dewater Time:	0.55 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
7,285.00	0.016	0.000	0.000	
7,286.00	0.096	0.050	0.000	
7,287.00	0.539	0.338	0.000	
7,288.00	0.654	0.933	0.000	
7,289.00	0.735	1.628	0.000	
7,290.00	0.843	2.416	0.000	Spillway #1
7,290.44	0.833	2.791	21.029	13.10 Peak Stage
7,291.00	0.872	3.273	48.073	
7,292.00	0.872	4.145	169.510	Spillway #2
7,293.00	0.872	5.017	391.148	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,285.00	0.000	0.000	0.000
7,286.00	0.000	0.000	0.000
7,287.00	0.000	0.000	0.000
7,288.00	0.000	0.000	0.000
7,289.00	0.000	0.000	0.000
7,290.00	0.000	0.000	0.000
7,291.00	48.073	0.000	48.073
7,292.00	169.510	0.000	169.510
7,293.00	351.917	39.231	391.148

Structure #13 (Riprap Channel)

East Taylor Ditch 0+00 to ETD-1

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	3.0:1	3.0:1	11.8			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	27.72 cfs	
Depth:	0.22 ft	
Top Width:	13.33 ft	
Velocity*:		
X-Section Area:	2.80 sq ft	
Hydraulic Radius:	0.209 ft	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

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

Structure #18 (Riprap Channel)

Taylor Trib 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	3.0:1	3.0:1	17.0			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.12 cfs	
Depth:	0.03 ft	
Top Width:	12.18 ft	
Velocity*:		
X-Section Area:	0.36 sq ft	
Hydraulic Radius:	0.030 ft	
Froude Number*:		
Manning's n*:		

	w/o Freeboard	w/ Freeboard
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

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

Structure #20 (Vegetated Channel)

7700 Terrace Ditch

Triangular Vegetated Channel Inputs:

Material: Tall fescue

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
1.5:1	3.0:1	1.5	D, B	1.41			7.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	8.89 cfs		8.89 cfs	
Depth:	1.28 ft	2.69 ft	1.92 ft	3.33 ft
Top Width:	5.74 ft	12.09 ft	8.64 ft	14.99 ft
Velocity:	2.43 fps		1.07 fps	
X-Section Area:	3.66 sq ft		8.30 sq ft	
Hydraulic Radius:	0.583 ft		0.878 ft	
Froude Number:	0.54		0.19	
Roughness Coefficient:	0.0524		0.1562	

Structure #19 (Null)

Null At Confluence of 7700 Terrace Ditch

Structure #12 (Riprap Channel)

Taylor Ditch TD-2 Stockpond to 117+58

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	3.0:1	3.0:1	9.8	3.67		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	120.23 cfs	
Depth:	0.75 ft	4.42 ft
Top Width:	16.49 ft	38.51 ft
Velocity*:		
X-Section Area:	10.65 sq ft	
Hydraulic Radius:	0.637 ft	
Froude Number*:		
Manning's n*:		
Dmin:	4.00 in	
D50:	12.00 in	
Dmax:	15.00 in	

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

Structure #11 (Pond)

TD-2 Stockpond

Pond Inputs:

Initial Pool Elev:	7,445.00 ft
Initial Pool:	0.09 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,454.00	30.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	7,455.91 ft
Dewater Time:	0.54 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
7,443.00	0.014	0.000	0.000	
7,444.00	0.050	0.030	0.000	
7,445.00	0.079	0.094	0.000	
7,446.00	0.106	0.186	0.000	
7,447.00	0.133	0.305	0.000	
7,448.00	0.161	0.452	0.000	
7,449.00	0.190	0.627	0.000	
7,450.00	0.219	0.831	0.000	
7,451.00	0.249	1.065	0.000	
7,452.00	0.280	1.329	0.000	
7,453.00	0.313	1.625	0.000	
7,454.00	0.348	1.955	0.000	Spillway #1
7,455.00	0.389	2.324	43.900	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,443.00	0.000	0.000
7,444.00	0.000	0.000
7,445.00	0.000	0.000
7,446.00	0.000	0.000
7,447.00	0.000	0.000
7,448.00	0.000	0.000
7,449.00	0.000	0.000
7,450.00	0.000	0.000
7,451.00	0.000	0.000
7,452.00	0.000	0.000
7,453.00	0.000	0.000
7,454.00	0.000	0.000
7,455.00	0.000	43.900

Structure #10 (Riprap Channel)

Taylor Ditch TD-1 to TD-2 Stockpond

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	3.0:1	3.0:1	6.8			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	103.11 cfs	
Depth:	0.75 ft	
Top Width:	16.49 ft	
Velocity*:		
X-Section Area:	10.67 sq ft	
Hydraulic Radius:	0.638 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

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

Structure #9 (Pond)

TD-1 Stockpond

Pond Inputs:

Initial Pool Elev:	7,283.01 ft
Initial Pool:	0.00 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
7,287.00	20.00	2.00:1	2.00:1	30.00

Pond Results:

Peak Elevation:	7,288.21 ft
Dewater Time:	0.55 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
7,283.00	0.001	0.000	0.000	
7,283.01	0.001	0.000	0.000	
7,284.00	0.059	0.023	0.000	
7,285.00	0.159	0.128	0.000	
7,286.00	0.182	0.298	0.000	
7,287.00	0.213	0.495	0.000	Spillway #1
7,288.00	0.247	0.725	71.329	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
7,283.00	0.000	0.000
7,283.01	0.000	0.000
7,284.00	0.000	0.000
7,285.00	0.000	0.000
7,286.00	0.000	0.000
7,287.00	0.000	0.000
7,288.00	71.329	71.329

Structure #8 (Riprap Channel)

Taylor Ditch 35+00 to TD-1 Stockpond

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	3.0:1	3.0:1	10.7			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	87.47 cfs	
Depth:	0.58 ft	
Top Width:	15.46 ft	
Velocity*:		
X-Section Area:	7.92 sq ft	
Hydraulic Radius:	0.506 ft	

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

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

Structure #7 (Null)

Null at Confluence of Taylor/Taylor Trib

Structure #6 (Riprap Channel)

Taylor Ditch 10+00 to 35+00

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	3.0:1	3.0:1	7.1			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	94.81 cfs	
Depth:	0.70 ft	
Top Width:	16.20 ft	
Velocity*:		
X-Section Area:	9.86 sq ft	
Hydraulic Radius:	0.600 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

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

Structure #5 (Null)

Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor

Structure #4 (Riprap Channel)

Taylor Ditch 0+00 to 10+00

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	3.0:1	3.0:1	6.9			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	109.34 cfs	
Depth:	0.78 ft	
Top Width:	16.66 ft	
Velocity*:		
X-Section Area:	11.13 sq ft	
Hydraulic Radius:	0.658 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

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

Structure #3 (Null)

Null Above East Taylor Pond

Structure #2 (Pond)

East Taylor Pond

Pond Inputs:

Initial Pool Elev:	6,944.00 ft
Initial Pool:	2.87 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	122.00	4.00	0.0150	6,952.00	2

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,954.00	20.00	2.00:1	2.00:1	20.00

Pond Results:

Peak Elevation:	6,954.72 ft
Dewater Time:	3.17 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)
6,930.00	0.001	0.000	0.000	
6,931.00	0.036	0.014	0.000	
6,932.00	0.076	0.069	0.000	
6,933.00	0.110	0.161	0.000	
6,934.00	0.134	0.283	0.000	
6,935.00	0.156	0.428	0.000	
6,936.00	0.178	0.595	0.000	
6,937.00	0.201	0.785	0.000	
6,938.00	0.226	0.998	0.000	
6,939.00	0.252	1.237	0.000	
6,940.00	0.280	1.504	0.000	
6,941.00	0.310	1.799	0.000	
6,942.00	0.340	2.123	0.000	
6,943.00	0.373	2.480	0.000	
6,944.00	0.409	2.871	0.000	Low hole SPW #1
6,945.00	0.446	3.298	0.473	10.94*
6,946.00	0.486	3.764	0.669	8.43*
6,947.00	0.527	4.270	0.819	7.48*
6,948.00	0.571	4.819	0.945	7.02*
6,949.00	0.615	5.412	1.057	6.78*
6,950.00	0.660	6.049	1.158	6.95
6,951.00	0.706	6.732	1.251	6.90
6,952.00	0.754	7.462	1.337	6.90 Spillway #1
6,953.00	0.804	8.241	8.509	2.65
6,954.00	0.857	9.072	12.033	4.85 Spillway #2
6,954.72	0.951	9.730	48.757	7.15 Peak Stage
6,955.00	0.975	9.987	63.138	
6,956.00	1.033	10.991	184.415	

Detailed Discharge Table

Elevation (ft)	Perf. Riser (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,930.00	0.000	0.000	0.000
6,931.00	0.000	0.000	0.000
6,932.00	0.000	0.000	0.000
6,933.00	0.000	0.000	0.000
6,934.00	0.000	0.000	0.000
6,935.00	0.000	0.000	0.000
6,936.00	0.000	0.000	0.000
6,937.00	0.000	0.000	0.000
6,938.00	0.000	0.000	0.000
6,939.00	0.000	0.000	0.000
6,940.00	0.000	0.000	0.000
6,941.00	0.000	0.000	0.000
6,942.00	0.000	0.000	0.000
6,943.00	0.000	0.000	0.000
6,944.00	3.00	0.000	0.000
6,945.00	0.000	0.000	0.473
6,946.00	0.000	0.000	0.669
6,947.00	0.000	0.000	0.819
6,948.00	0.000	0.000	0.945
6,949.00	0.000	0.000	1.057
6,950.00	0.000	0.000	1.158
6,951.00	0.000	0.000	1.251
6,952.00	0.000	0.000	1.337
6,953.00	0.000	0.000	8.509
6,954.00	0.000	0.000	12.033
6,955.00	0.000	0.000	63.138
6,956.00	0.000	0.000	184.415

Structure #1 (Null)

Null Below East Taylor 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)
#17	1	5.000	0.005	0.000	0.000	90.000	S	8.90	0.750
	Σ	5.000						8.90	0.750
#16	1	96.500	0.069	0.000	0.000	62.000	M	34.10	2.582
	2	33.300	0.053	0.000	0.000	80.000	F	40.55	3.055
	Σ	129.800						74.65	5.637
#15	1	28.500	0.142	0.000	0.000	62.000	M	4.78	0.621
	2	71.700	0.230	0.000	0.000	62.000	M	10.48	1.545
	Σ	230.000						81.51	7.803
#14	Σ	230.000						81.51	7.803
#13	1	18.000	0.128	0.000	0.000	62.000	M	3.02	0.392
	2	64.700	0.349	0.000	0.000	62.000	M	7.73	1.388
	3	2.200	0.045	0.000	0.000	80.000	F	2.68	0.202
	Σ	314.900						27.72	7.705
#18	1	6.000	0.032	0.000	0.000	62.000	M	2.12	0.161
	Σ	6.000						2.12	0.161
#20	1	7.300	0.009	0.000	0.000	80.000	F	8.89	0.670
	Σ	7.300						8.89	0.670
#19	Σ	7.300						8.89	0.670
#12	1	25.800	0.125	0.000	0.000	47.000	S	0.05	0.036
	2	40.600	0.050	0.000	0.000	62.000	M	14.34	1.086
	3	36.000	0.052	0.000	0.000	62.000	M	12.72	0.963
	4	34.000	0.042	0.000	0.000	80.000	F	41.41	3.119
	5	2.300	0.008	0.000	0.000	80.000	F	2.80	0.211
	6	29.200	0.043	0.000	0.000	80.000	F	35.56	2.679
	7	5.000	0.043	0.000	0.000	74.000	F	4.50	0.326
	Σ	180.200						120.23	9.090
#11	Σ	180.200						120.23	9.090
#10	1	13.000	0.019	0.000	0.000	47.000	S	0.04	0.027
	2	43.900	0.100	0.000	0.000	62.000	M	15.51	1.175
	3	66.100	0.229	0.000	0.000	62.000	M	9.68	1.424
	Σ	303.200						103.11	9.854
#9	Σ	303.200						103.11	9.854
#8	1	7.500	0.044	0.000	0.000	47.000	S	0.02	0.015

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	9.700	0.060	0.000	0.000	62.000	M	3.43	0.260
	3	4.400	0.048	0.000	0.000	62.000	M	1.55	0.118
	Σ	324.800						87.47	9.750
#7	Σ	330.800						87.91	9.911
#6	1	19.000	0.070	0.000	0.000	47.000	S	0.06	0.039
	2	26.400	0.105	0.000	0.000	62.000	M	9.33	0.706
	3	36.600	0.184	0.000	0.000	62.000	M	5.90	0.792
	Σ	412.800						94.81	11.449
#5	Σ	727.700						101.83	19.154
#4	1	7.900	0.053	0.000	0.000	80.000	F	9.62	0.725
	2	126.900	0.386	0.000	0.000	62.000	M	14.34	2.711
	3	8.500	0.041	0.000	0.000	62.000	M	3.00	0.227
	4	2.600	0.019	0.000	0.000	47.000	S	0.00	0.000
	Σ	873.600						109.34	22.817
#3	Σ	873.600						109.34	22.817
#2	1	0.700	0.006	0.000	0.000	61.000	S	0.22	0.013
	2	1.100	0.015	0.000	0.000	61.000	S	0.34	0.027
	3	9.100	0.104	0.000	0.000	62.000	M	3.22	0.243
	Σ	889.500						110.68	23.850
#1	Σ	889.500						48.76	22.103

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	3. Short grass pasture	40.00	48.80	122.00	5.050	0.006
#2	1	Time of Concentration:					0.006
#2	2	3. Short grass pasture	48.00	150.23	313.00	5.540	0.015
#2	2	Time of Concentration:					0.015
#2	3	3. Short grass pasture	26.00	397.02	1,527.00	4.070	0.104
#2	3	Time of Concentration:					0.104
#4	1	4. Cultivated, straight row	6.00	25.38	423.00	2.180	0.053
#4	1	Time of Concentration:					0.053
#4	2	3. Short grass pasture	12.00	462.24	3,852.00	2.770	0.386
#4	2	Time of Concentration:					0.386
#4	3	3. Short grass pasture	19.00	99.37	523.00	3.480	0.041
#4	3	Time of Concentration:					0.041
#4	4	3. Short grass pasture	20.00	50.40	252.00	3.570	0.019
#4	4	Time of Concentration:					0.019

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#6	1	3. Short grass pasture	18.00	154.08	856.00	3.390	0.070
#6	1	Time of Concentration:					0.070
#6	2	3. Short grass pasture	15.00	175.35	1,169.00	3.090	0.105
#6	2	Time of Concentration:					0.105
#6	3	3. Short grass pasture	13.00	248.04	1,908.00	2.880	0.184
#6	3	Time of Concentration:					0.184
#8	1	3. Short grass pasture	21.00	122.64	584.00	3.660	0.044
#8	1	Time of Concentration:					0.044
#8	2	3. Short grass pasture	24.00	204.48	852.00	3.910	0.060
#8	2	Time of Concentration:					0.060
#8	3	3. Short grass pasture	20.00	125.80	629.00	3.570	0.048
#8	3	Time of Concentration:					0.048
#10	1	3. Short grass pasture	20.00	49.80	249.00	3.570	0.019
#10	1	Time of Concentration:					0.019
#10	2	3. Short grass pasture	17.00	202.98	1,194.00	3.290	0.100
#10	2	Time of Concentration:					0.100
#10	3	3. Short grass pasture	13.00	309.91	2,384.00	2.880	0.229
#10	3	Time of Concentration:					0.229
#12	1	3. Short grass pasture	9.00	97.38	1,082.00	2.400	0.125
#12	1	Time of Concentration:					0.125
#12	2	3. Short grass pasture	26.00	193.96	746.00	4.070	0.050
#12	2	Time of Concentration:					0.050
#12	3	3. Short grass pasture	16.00	97.43	609.00	3.200	0.052
#12	3	Time of Concentration:					0.052
#12	4	5. Nearly bare and untilled, and alluvial valley fans	21.00	146.78	699.00	4.580	0.042
#12	4	Time of Concentration:					0.042
#12	5	5. Nearly bare and untilled, and alluvial valley fans	19.00	24.13	127.00	4.350	0.008
#12	5	Time of Concentration:					0.008
#12	6	5. Nearly bare and untilled, and alluvial valley fans	18.00	120.06	667.00	4.240	0.043
#12	6	Time of Concentration:					0.043
#12	7	3. Short grass pasture	15.00	71.85	479.00	3.090	0.043
#12	7	Time of Concentration:					0.043
#13	1	3. Short grass pasture	12.00	153.59	1,280.00	2.770	0.128
#13	1	Time of Concentration:					0.128
#13	2	3. Short grass pasture	10.00	317.10	3,171.00	2.520	0.349
#13	2	Time of Concentration:					0.349
#13	3	5. Nearly bare and untilled, and alluvial valley fans	2.00	4.64	232.00	1.410	0.045
#13	3	Time of Concentration:					0.045
#15	1	3. Short grass pasture	8.40	99.62	1,186.00	2.310	0.142
#15	1	Time of Concentration:					0.142
#15	2	3. Short grass pasture	8.00	150.23	1,878.00	2.260	0.230

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#15	2	Time of Concentration:					0.230
#16	1	3. Short grass pasture	11.00	72.93	663.00	2.650	0.069
#16	1	Time of Concentration:					0.069
#16	2	5. Nearly bare and untilled, and alluvial valley fans	20.00	173.40	867.00	4.470	0.053
#16	2	Time of Concentration:					0.053
#17	1	5. Nearly bare and untilled, and alluvial valley fans	25.00	25.00	100.00	5.000	0.005
#17	1	Time of Concentration:					0.005
#18	1	3. Short grass pasture	26.00	124.53	479.00	4.070	0.032
#18	1	Time of Concentration:					0.032
#20	1	5. Nearly bare and untilled, and alluvial valley fans	27.00	48.33	179.00	5.190	0.009
#20	1	Time of Concentration:					0.009