TRI-STATE

February 5, 2024

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 162 (TR-162)**
**Mine Plan and PMT Revision**

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 162 (TR-162) to Permit No. C-1981-019.

TR-162 proposes a new channel (GD-3) to route surface water runoff from the intersection area of Haul Road A and the Collom Haul Road to the Gossard Pond. It is requested that the Division calculate the reclamation liability also with the addition of the channel.

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. 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
4BE980BE59E442F...

Chris Gilbreath
Senior Manager
Remediation and Reclamation

CG:TT

Enclosure

cc: Foster Beckett (BLM-LSFO)
Tony Tennyson (via email)
File: C. F. 1.1.2.150

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

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

Date: **February 1, 2024** Revision Description: **TR-162 GD-3 Channel**

| 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 | Gossard Pond Pages 1 and 2 (2 pages), Figures 1 and 2 (2 pages), 100-Year SEDCAD Model (12 pages) | | Apendix Exh. 7-14G Pages 1 and 2 (2 pages),Figures Exh 7-14G-1 and 2 (2 pages) 100-Year SEDCAD Model (14 pages), | | Appendix Exh. 7-14G has been updated with the GD-3 Channel. |
| 2E | | | | | No Change |
| 3 | | | | | No Change |
| 4 | | | | | No Change |
| 5A | | | | | No Change |
| 5B | | | | | No Change |
| 6 | | | | | No Change |
| 7 | Map 19A | | Map 19A | | Map 19A has been updated. |
| 8 | Map 28A | | Map 28A | | Map 28A has been updated. |
| 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 |

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

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

Date: **February 1, 2024** Revision Description: **TR-162 GD-3 Channel**

| 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 | Exhibit 13C Pages 5 and 7 (2 pages) | | Exhibit 13C Pages 5 and 7 (2 pages) | | Exhibit 13C has been updated with the GD-3 Channel. |
| 20 | Map 13C-1 Sheet 2 | | Map 13C-1 Sheet 2 | | Map 13C-1 Sheet 2 has been updated with GD-3 Channel. |
| 21 | | | | | No Change |
| 22 | | | | | No Change |

**Appendix Exh. 7-14G**
**Gossard Pond**

This sediment control plan addresses the watershed tributary to the Gossard Pond. The Gossard Pond receives water from the Gossard Loadout area, including several subwatersheds including the coal stockpiles and coal preparation areas, and some direct inflow from water used during wash down of the Gossard crushing facility, and from a ditch routing water from a small portion of Haul Road A. The Gossard Pond is a non-discharging structure that is designed to contain the 100-year, 24-hour storm event as demonstrated herein.

Please see Volume 2D, Exhibit 7 for the methodologies and assumptions utilized in the Gossard Pond SEDCAD model and the basis for utilization of the curve numbers in the models. A curve number of 74 was selected for the majority of the contributing subwatersheds. This is believe to be a more representative curve number than a disturbed curve number of 85 since the Gossard Loadout area subwatershed are broken up including ever changing loose unconsolidated coal stockpiles due to the shipping of coal. The subwatershed and corresponding acreages used in this SEDCAD model are presented on Figure 1, and Figure 2 provides the as-built configuration of the Gossard Pond.

Colowyo washes down the Gossard primary crusher on an as-needed basis. The water that is used during wash down is routed down to two concrete structures that capture the coal fines, and once full of water, discharge the water from the concrete structures directly into the pond. SEDCAD does not have the ability to model this additional inflow directly; therefore, the methodology suggested by SEDCAD's primary author, Pam Schwab, is to model the impact of a constant inflow into the Gossard Pond through a dummy structure.

In the current version of SEDCAD, a fixed flow can only be inputted by inserting a "dummy" upstream pond 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 pond. A flow of 0.223 cfs (100 gpm) was conservatively utilized, which is a volume of water well in excess of any wash down inflows that may be encountered in the Gossard Pond. The synthesized 100 gpm inflow was then dropped directly into Gossard Pond in the SEDCAD model. Further, Colowyo does not wash down the Gossard primary crusher daily, so the 100 gpm is very conservative estimate compared to actual activities occurring.

SEDCAD also allows the user to override the customary starting pool. In this case for the 100 year storm event, the starting pool is assumed to be at 6,388, to account for the 100 gpm already being in the pond when the storm event would commence.

The volume of the pond was inputted into the SEDCAD model, along with its spillway details. The model watersheds were inputted as a series of sub-watersheds, each with its own acreage, its own flow response parameters (slope, distance, time of concentration), and the specific runoff curve numbers noted above. The 100 year, 24 hour storm was then applied to the composite watershed, and routed down to the sediment pond.

The results of the runoff calculations and synthesized constant inflow are presented in the attached SEDCAD model outputs. As noted, the storm does not peak in the modeled storm event and the entire event is contained within the Gossard Pond. ,.

**Temporary Channels**

Three temporary channels assist in routing water to the Gossard Pond. The design criteria for these three channels are as follows:

| Channel | Station | Peak Flow (CFS) | Average Slope (%) | Channel Type | Side Slopes | Erosion Protection |
|---|---|---|---|---|---|---|
| GD-1 | Not applicable | 7.3 | 6 | Trapezoidal 7' bottom | 2:1 | None |
| GD-2 | Not applicable | 7.86 | 4.5 | Trapezoidal 2' bottom | 2:1 | None |
| GD-3 | 0+00 to 24+92 | 18.1 | 1.5 | Trapezoidal 5' bottom | 2:1 | None |

# Gossard Pond

***100 Year 24 Hour Storm Event***

***Full Containment Demonstration***

***with 100 GPM Inflow***

Tony Tennyson

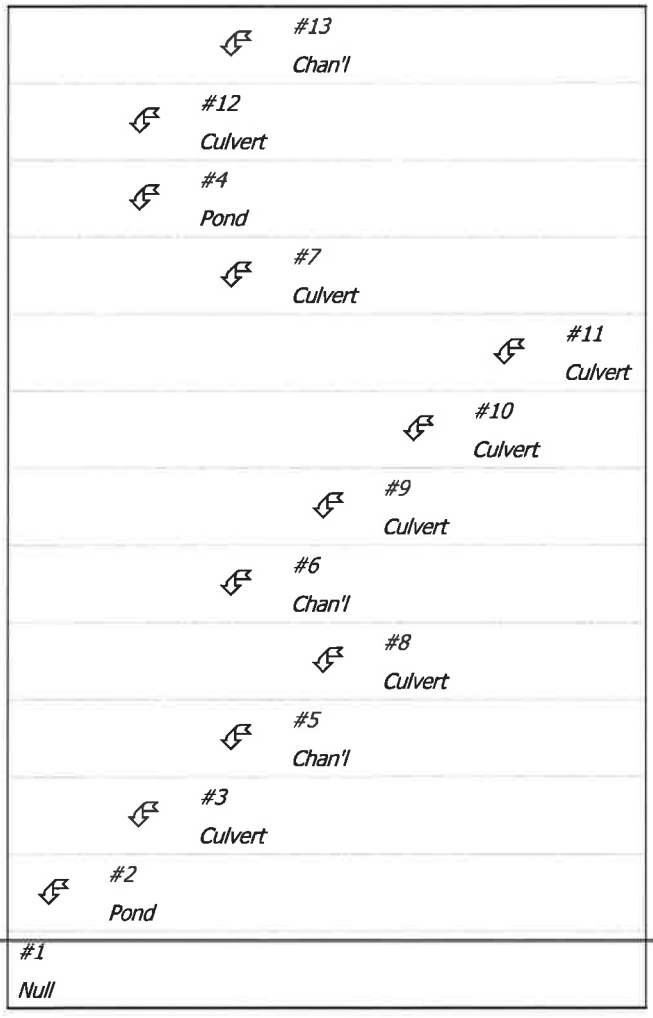
# *General Information*

## *Storm Information:*

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

## *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | Null Below Gossard Pond |
| Pond | #2 | ==> | #1 | 0.000 | 0.000 | Gossard Pond |
| Culvert | #3 | ==> | #2 | 0.000 | 0.000 | C-1 Culvert |
| Pond | #4 | ==> | #2 | 0.000 | 0.000 | Simulated 100 gpm inflow |
| Channel | #5 | ==> | #3 | 0.000 | 0.000 | GD-1 Ditch |
| Channel | #6 | ==> | #3 | 0.000 | 0.000 | GD-2 Ditch |
| Culvert | #7 | ==> | #3 | 0.000 | 0.000 | C-2 Culvert |
| Culvert | #8 | ==> | #5 | 0.000 | 0.000 | C-3 Culvert |
| Culvert | #9 | ==> | #6 | 0.000 | 0.000 | C-4 Culvert |
| Culvert | #10 | ==> | #9 | 0.000 | 0.000 | C-5 Culvert |
| Culvert | #11 | ==> | #10 | 0.000 | 0.000 | C-6 Culvert |
| Culvert | #12 | ==> | #2 | 0.000 | 0.000 | C-7 Culvert |
| Channel | #13 | ==> | #12 | 0.000 | 0.000 | GD-3 |



## *Structure Summary:*

| | | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|---|
| #13 | | 22.300 | 22.300 | 18.06 | 1.67 |
| #12 | | 0.000 | 22.300 | 18.06 | 1.67 |
| #4 | In | 8.000 | 8.000 | 6.68 | 0.48 |
| | Out | | | 0.22 | 0.48 |
| #7 | | 1.500 | 1.500 | 1.25 | 0.09 |
| #11 | | 0.700 | 0.700 | 0.58 | 0.04 |
| #10 | | 1.000 | 1.700 | 1.18 | 0.10 |
| #9 | | 7.200 | 8.900 | 7.19 | 0.54 |
| #6 | | 0.800 | 9.700 | 7.86 | 0.58 |
| #8 | | 7.200 | 7.200 | 6.01 | 0.43 |
| #5 | | 1.200 | 8.400 | 7.13 | 0.51 |
| #3 | | 0.000 | 19.600 | 16.24 | 1.19 |
| #2 | In | 5.200 | 55.100 | 36.32 | 3.59 |
| | Out | | | 0.00 | 0.00 |
| #1 | | 0.000 | 55.100 | 0.00 | 0.00 |

# *Structure Detail:*

## *Structure #13 (Erodible Channel)*

*GD-3*

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) |
|---|---|---|---|---|---|---|---|---|
| 5.00 | 2.0:1 | 2.0:1 | 1.5 | 0.0250 | 2.37 | | | 6.0 |

Erodible Channel Results:

| | w/o Freeboard | w/ Freeboard |
|---|---|---|
| Design Discharge: | 18.06 cfs | |
| Depth: | 0.63 ft | 3.00 ft |
| Top Width: | 7.51 ft | 16.99 ft |
| Velocity: | 4.61 fps | |
| X-Section Area: | 3.92 sq ft | |
| Hydraulic Radius: | 0.502 ft | |
| Froude Number: | 1.12 | |

## *Structure #12 (Culvert)*

*C-7 Culvert*

Culvert Inputs:

| Length (ft) | Slope (%) | Manning's n | Max. Headwater (ft) | Tailwater (ft) | Entrance Loss Coef. (Ke) |
|---|---|---|---|---|---|
| 100.00 | 2.00 | 0.0150 | 3.00 | 0.00 | 0.90 |

Culvert Results:

Design Discharge = 18.06 cfs

Minimum pipe diameter: 1 - 24 inch pipe(s) required

## *Structure #4 (Pond)*

*Simulated 100 gpm inflow*

Pond Inputs:

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

Pond Results:

| | |
|---|---|
| Peak Elevation: | 92.27 ft |
| Dewater Time: | 0.67 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 | 0.051 | 0.001 | 0.000 | | |
| 91.00 | 0.110 | 0.078 | 0.223 | | |
| 92.00 | 0.190 | 0.226 | 0.223 | | |
| 92.27 | 0.205 | 0.286 | 0.223 | 16.00 | Peak Stage |
| 93.00 | 0.260 | 0.450 | 0.223 | | |
| 94.00 | 0.350 | 0.754 | 0.223 | | |
| 95.00 | 0.440 | 1.148 | 0.223 | | |
| 96.00 | 0.540 | 1.638 | 0.223 | | |
| 97.00 | 0.650 | 2.232 | 0.223 | | |
| 98.00 | 0.760 | 2.936 | 0.223 | | |
| 99.00 | 0.880 | 3.755 | 0.223 | | |
| 100.00 | 1.200 | 4.791 | 0.223 | | |
| 101.00 | 1.240 | 6.011 | 0.223 | | |
| 102.00 | 1.400 | 7.330 | 0.223 | | |
| 103.00 | 1.600 | 8.829 | 0.223 | | |

## 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 | 0.223 | 0.223 |
| 92.00 | 0.223 | 0.223 |
| 93.00 | 0.223 | 0.223 |
| 94.00 | 0.223 | 0.223 |
| 95.00 | 0.223 | 0.223 |
| 96.00 | 0.223 | 0.223 |
| 97.00 | 0.223 | 0.223 |
| 98.00 | 0.223 | 0.223 |
| 99.00 | 0.223 | 0.223 |
| 100.00 | 0.223 | 0.223 |

| Elevation (ft) | User-input discharge (cfs) | Combined Total Discharge (cfs) |
|---|---|---|
| 101.00 | 0.223 | 0.223 |
| 102.00 | 0.223 | 0.223 |
| 103.00 | 0.223 | 0.223 |

*Structure #7 (Culvert)*

*C-2 Culvert*

Culvert Inputs:

| Length (ft) | Slope (%) | Manning's n | Max. Headwater (ft) | Tailwater (ft) | Entrance Loss Coef. (Ke) |
|---|---|---|---|---|---|
| 75.00 | 3.00 | 0.0150 | 1.00 | 0.00 | 0.90 |

Culvert Results:

Design Discharge = 1.25 cfs

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

*Structure #11 (Culvert)*

*C-6 Culvert*

Culvert Inputs:

| Length (ft) | Slope (%) | Manning's n | Max. Headwater (ft) | Tailwater (ft) | Entrance Loss Coef. (Ke) |
|---|---|---|---|---|---|
| 50.00 | 1.50 | 0.0150 | 1.00 | 1.00 | 0.90 |

Culvert Results:

Design Discharge = 0.58 cfs

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

*Structure #10 (Culvert)*

*C-5 Culvert*

Culvert Inputs:

| Length (ft) | Slope (%) | Manning's n | Max. Headwater (ft) | Tailwater (ft) | Entrance Loss Coef. (Ke) |
|---|---|---|---|---|---|
| 50.00 | 1.50 | 0.0150 | 1.00 | 0.00 | 0.90 |

Culvert Results:

Design Discharge = 1.18 cfs

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

## *Structure #9 (Culvert)*

### *C-4 Culvert*

Culvert Inputs:

| Length (ft) | Slope (%) | Manning's n | Max. Headwater (ft) | Tailwater (ft) | Entrance Loss Coef. (Ke) |
|---|---|---|---|---|---|
| 100.00 | 1.00 | 0.0150 | 2.00 | 0.00 | 0.90 |

Culvert Results:

Design Discharge = 7.19 cfs

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

## *Structure #6 (Vegetated Channel)*

### *GD-2 Ditch*

Triangular Vegetated Channel Inputs:

Material: Shales and hardpans

| Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|---|---|---|---|---|---|---|---|
| 2.0:1 | 2.0:1 | 4.5 | 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: | 7.86 cfs | | 7.86 cfs | |
| Depth: | 1.02 ft | | 1.50 ft | |
| Top Width: | 4.08 ft | | 6.01 ft | |
| Velocity: | 3.78 fps | | 1.74 fps | |
| X-Section Area: | 2.08 sq ft | | 4.52 sq ft | |
| Hydraulic Radius: | 0.456 ft | | 0.672 ft | |
| Froude Number: | 0.93 | | 0.35 | |
| Roughness Coefficient: | 0.0494 | | 0.1392 | |

## *Structure #8 (Culvert)*

### *C-3 Culvert*

Culvert Inputs:

| Length (ft) | Slope (%) | Manning's n | Max. Headwater (ft) | Tailwater (ft) | Entrance Loss Coef. (Ke) |
|---|---|---|---|---|---|
| 300.00 | 1.50 | 0.0150 | 2.00 | 0.00 | 0.90 |

Culvert Results:

Design Discharge = 6.01 cfs

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

*Structure #5 (Vegetated Channel)*

*GD-1 Ditch*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| 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) |
|---|---|---|---|---|---|---|---|---|
| 7.00 | 2.0:1 | 2.0:1 | 6.0 | 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: | 7.13 cfs | | 7.13 cfs | |
| Depth: | 0.34 ft | | 0.64 ft | |
| Top Width: | 8.37 ft | | 9.56 ft | |
| Velocity: | 2.70 fps | | 1.34 fps | |
| X-Section Area: | 2.64 sq ft | | 5.31 sq ft | |
| Hydraulic Radius: | 0.309 ft | | 0.538 ft | |
| Froude Number: | 0.85 | | 0.32 | |
| Roughness Coefficient: | 0.0616 | | 0.1794 | |

*Structure #3 (Culvert)*

*C-1 Culvert*

Culvert Inputs:

| Length (ft) | Slope (%) | Manning's n | Max. Headwater (ft) | Tailwater (ft) | Entrance Loss Coef. (Ke) |
|---|---|---|---|---|---|
| 100.00 | 1.50 | 0.0150 | 2.00 | 0.00 | 0.90 |

Culvert Results:

Design Discharge = 16.24 cfs

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

*Structure #2 (Pond)*

*Gossard Pond*

Pond Inputs:

| | |
|---|---|
| Initial Pool Elev: | 6,387.00 ft |
| Initial Pool: | 1.18 ac-ft |

Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|---|---|---|---|---|---|---|
| 30.00 | 200.00 | 4.00 | 0.0150 | 6,392.70 | 0.90 | 0.00 |

Pond Results:

| | |
|---|---|
| Peak Elevation: | 6,392.13 ft |
| Dewater Time: | 0.00 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) | |
|---|---|---|---|---|---|
| 6,384.00 | 0.195 | 0.000 | 0.000 | | |
| 6,385.00 | 0.338 | 0.263 | 0.000 | | |
| 6,386.00 | 0.458 | 0.660 | 0.000 | | |
| 6,387.00 | 0.580 | 1.178 | 0.000 | | |
| 6,387.50 | 0.609 | 1.475 | 0.000 | | |
| 6,388.00 | 0.638 | 1.786 | 0.000 | | |
| 6,389.00 | 0.690 | 2.450 | 0.000 | | |
| 6,390.00 | 0.724 | 3.157 | 0.000 | | |
| 6,391.00 | 0.752 | 3.895 | 0.000 | | |
| 6,392.00 | 0.778 | 4.660 | 0.000 | | |
| 6,392.13 | 0.782 | 4.765 | 0.000 | 0.00 | Peak Stage |
| 6,392.70 | 0.797 | 5.212 | 0.000 | | Spillway #1 |
| 6,393.00 | 0.805 | 5.452 | 0.872 | | |
| 6,394.00 | 0.831 | 6.270 | 7.760 | | |
| 6,395.00 | 0.859 | 7.115 | 18.262 | | |
| 6,396.00 | 0.887 | 7.988 | 29.895 | | |
| 6,397.00 | 0.917 | 8.889 | 38.615 | | |
| 6,398.00 | 0.949 | 9.822 | 45.680 | | |
| 6,399.00 | 0.982 | 10.788 | 51.799 | | |
| 6,400.00 | 1.061 | 11.809 | 57.269 | | |

## Detailed Discharge Table

| Elevation (ft) | Straight Pipe (cfs) | Combined Total Discharge (cfs) |
|---|---|---|
| 6,384.00 | 0.000 | 0.000 |
| 6,385.00 | 0.000 | 0.000 |
| 6,386.00 | 0.000 | 0.000 |
| 6,387.00 | 0.000 | 0.000 |
| 6,387.50 | 0.000 | 0.000 |
| 6,388.00 | 0.000 | 0.000 |
| 6,389.00 | 0.000 | 0.000 |
| 6,390.00 | 0.000 | 0.000 |
| 6,391.00 | 0.000 | 0.000 |
| 6,392.00 | 0.000 | 0.000 |
| 6,392.70 | 0.000 | 0.000 |
| 6,393.00 | (3)>0.872 | 0.872 |
| 6,394.00 | (3)>7.760 | 7.760 |
| 6,395.00 | (3)>18.262 | 18.262 |
| 6,396.00 | (5)>29.895 | 29.895 |
| 6,397.00 | (5)>38.615 | 38.615 |
| 6,398.00 | (5)>45.680 | 45.680 |
| 6,399.00 | (5)>51.799 | 51.799 |
| 6,400.00 | (5)>57.269 | 57.269 |

*Structure #1 (Null)*

*Null Below Gossard 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) |
|---|---|---|---|---|---|---|---|---|---|
| #13 | 1 | 7.600 | 0.097 | 0.000 | 0.000 | 47.000 | S | 0.02 | 0.010 |
| | 2 | 3.100 | 0.003 | 0.000 | 0.000 | 85.000 | F | 4.40 | 0.346 |
| | 3 | 7.600 | 0.151 | 0.000 | 0.000 | 95.000 | F | 13.92 | 1.316 |
| | 4 | 4.000 | 0.313 | 0.000 | 0.000 | 47.000 | S | 0.01 | 0.000 |
| | **Σ** | **22.300** | | | | | | **18.06** | **1.672** |
| **#12** | **Σ** | **22.300** | | | | | | **18.06** | **1.672** |
| #4 | 1 | 8.000 | 0.000 | 0.000 | 0.000 | 74.000 | M | 6.68 | 0.482 |
| | **Σ** | **8.000** | | | | | | **6.68** | **0.482** |
| #7 | 1 | 1.500 | 0.069 | 0.004 | 0.430 | 74.000 | M | 1.25 | 0.090 |
| | **Σ** | **1.500** | | | | | | **1.25** | **0.090** |
| #11 | 1 | 0.700 | 0.024 | 0.027 | 0.227 | 74.000 | M | 0.58 | 0.042 |
| | **Σ** | **0.700** | | | | | | **0.58** | **0.042** |
| #10 | 1 | 1.000 | 0.062 | 0.180 | 0.156 | 74.000 | M | 0.83 | 0.060 |
| | **Σ** | **1.700** | | | | | | **1.18** | **0.102** |
| #9 | 1 | 7.200 | 0.112 | 0.028 | 0.395 | 74.000 | M | 6.01 | 0.434 |
| | **Σ** | **8.900** | | | | | | **7.19** | **0.536** |
| #6 | 1 | 0.800 | 0.001 | 0.000 | 0.000 | 74.000 | M | 0.67 | 0.048 |
| | **Σ** | **9.700** | | | | | | **7.86** | **0.584** |
| #8 | 1 | 0.600 | 0.046 | 0.000 | 0.000 | 74.000 | M | 0.50 | 0.036 |
| | 2 | 6.600 | 0.097 | 0.000 | 0.000 | 74.000 | M | 5.51 | 0.398 |
| | **Σ** | **7.200** | | | | | | **6.01** | **0.434** |
| #5 | 1 | 1.000 | 0.002 | 0.000 | 0.000 | 74.000 | M | 0.83 | 0.060 |
| | 2 | 0.200 | 0.033 | 0.000 | 0.000 | 85.000 | M | 0.28 | 0.018 |
| | **Σ** | **8.400** | | | | | | **7.13** | **0.512** |
| **#3** | **Σ** | **19.600** | | | | | | **16.24** | **1.186** |
| #2 | 1 | 5.200 | 0.269 | 0.000 | 0.000 | 74.000 | M | 2.24 | 0.251 |
| | **Σ** | **55.100** | | | | | | **36.32** | **3.589** |
| **#1** | **Σ** | **55.100** | | | | | | **0.00** | **0.000** |

## *Subwatershed Time of Concentration Details:*

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #2 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 0.20 | 0.85 | 427.00 | 0.440 | 0.269 |
| **#2** | **1** | **Time of Concentration:** | | | | | **0.269** |
| #5 | 1 | 3. Short grass pasture | 58.00 | 37.70 | 65.00 | 6.090 | 0.002 |
| **#5** | **1** | **Time of Concentration:** | | | | | **0.002** |
| #5 | 2 | 7. Paved area and small upland gullies | 0.50 | 0.86 | 173.00 | 1.420 | 0.033 |
| **#5** | **2** | **Time of Concentration:** | | | | | **0.033** |
| #6 | 1 | 3. Short grass pasture | 71.00 | 21.30 | 30.00 | 6.740 | 0.001 |
| **#6** | **1** | **Time of Concentration:** | | | | | **0.001** |
| #7 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 1.10 | 2.86 | 260.00 | 1.040 | 0.069 |
| **#7** | **1** | **Time of Concentration:** | | | | | **0.069** |
| #8 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 0.70 | 0.97 | 140.00 | 0.830 | 0.046 |
| **#8** | **1** | **Time of Concentration:** | | | | | **0.046** |
| #8 | 2 | 5. Nearly bare and untilled, and alluvial valley fans | 3.60 | 23.90 | 664.00 | 1.890 | 0.097 |
| **#8** | **2** | **Time of Concentration:** | | | | | **0.097** |
| #9 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 1.30 | 5.97 | 460.00 | 1.140 | 0.112 |
| **#9** | **1** | **Time of Concentration:** | | | | | **0.112** |
| #10 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 2.10 | 6.84 | 326.00 | 1.440 | 0.062 |
| **#10** | **1** | **Time of Concentration:** | | | | | **0.062** |
| #11 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 13.00 | 5.20 | 40.00 | 3.600 | 0.003 |
| | | 8. Large gullies, diversions, and low flowing streams | 1.00 | 2.35 | 236.00 | 3.000 | 0.021 |
| **#11** | **1** | **Time of Concentration:** | | | | | **0.024** |
| #13 | 1 | 3. Short grass pasture | 11.00 | 102.19 | 929.00 | 2.650 | 0.097 |
| **#13** | **1** | **Time of Concentration:** | | | | | **0.097** |
| #13 | 2 | 5. Nearly bare and untilled, and alluvial valley fans | 36.00 | 24.48 | 68.00 | 6.000 | 0.003 |
| **#13** | **2** | **Time of Concentration:** | | | | | **0.003** |
| #13 | 3 | 7. Paved area and small upland gullies | 1.50 | 20.11 | 1,341.00 | 2.460 | 0.151 |
| **#13** | **3** | **Time of Concentration:** | | | | | **0.151** |
| #13 | 4 | 3. Short grass pasture | 2.00 | 25.53 | 1,276.50 | 1.130 | 0.313 |
| **#13** | **4** | **Time of Concentration:** | | | | | **0.313** |

## *Subwatershed Muskingum Routing Details:*

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #7 | 1 | 8. Large gullies, diversions, and low flowing streams | 12.00 | 22.20 | 185.00 | 10.390 | 0.004 |
| **#7** | **1** | **Muskingum K:** | | | | | **0.004** |

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #9 | 1 | 8. Large gullies, diversions, and low flowing streams | 4.50 | 29.70 | 660.00 | 6.360 | 0.028 |
| **#9** | **1** | **Muskingum K:** | | | | | **0.028** |
| #10 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 0.60 | 3.00 | 500.00 | 0.770 | 0.180 |
| **#10** | **1** | **Muskingum K:** | | | | | **0.180** |
| #11 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 2.00 | 2.80 | 140.00 | 1.410 | 0.027 |
| **#11** | **1** | **Muskingum K:** | | | | | **0.027** |

**Table 13C-3 List of Culverts for the Collom Haul Road & Jubb Creek Access Road**

| Culvert Name | Length (ft) | Diameter (in.) |
|---|---|---|
| **1** | 197 | 36 |
| **2** | 164 | 36 |
| **5** | 217 | 144 |
| **6** | 74 | 24 |
| **6A** | 97 | 36 |
| **7** | 70 | 36 |
| **8** | 154 | 2 at 24 |
| **10** | 214 | 36 |
| **11** | 162 | 2 at 24 |
| **12** | 49 | 24 |
| **12A** | 49 | 24 |
| **12B** | 60 | 24 |
| **12C** | 111 | 24 |
| **13** | 338 | 60 |
| **16** | 143 | 36 |
| **20 (Abandoned)** | 201 | 36 |
| **24** | 193 | 36 |
| **26** | 167 | 36 |
| **28** | 200 | 36 |
| **30** | 158 | 36 |
| **32 (Abandoned)** | 199 | 36 |
| **34** | 286 | 36 |
| **34A** | | 36” Half Culvert |
| **35** | 269 | 36 |
| **36** | 244 | 36 |
| **36A** | | 36” Half Culvert |
| **38** | 193 | 36 |
| **40 (Abandoned)** | 327 | 36 |
| **40A** | 281 | 36” Half Culvert |
| **44A** | 291 | 60 |
| **47** | 95 | 36 |
| **51** | 97 | 36 |
| **52** | 164 | 36 |
| **GD-3 Ditch Culvert** | 75 | 24 |

**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 | 3.6 |
| **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 | 1.7 |
| **C-11** | 484 | 0 | 1.4 |
| **C-12 & C-13** | 3,227 | 0 | 10.5 |
| **C-14** | 3,549 | 0 | 4.5 |
| **C-15** | 1,613 | 0 | 1.0 |
| **GD-3** | 1,210 | 0 | 3.2 |