TRI-STATE

September 22, 2022

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

RE: Colowyo Coal Company L.P.
Permit No. C-1981-019
Technical Revision 156 (TR-156)
Exhibit 23, Item 4

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 156 (TR-156) to Permit No. C-1981-019.

TR-156 proposes to include a geotechnical report addendum (Exhibit 23, Item 4) into the permit to address the requirement from Exhibit 23, Item 1 (Figure 4), for a geotextile fabric to placed over the underdrain in the Little Collom Gulch Valley Fill. Exhibit 23, Item 4 demonstrates that through the natural sorting of material when underdrain of the excess valley fill was placed, that a geotextile fabric is not required to ensure the long-term stability of the underdrain in the Little Collom Gulch Valley Fill.

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) 824-1232 or at ttennyson@tristategt.org.

Sincerely,

DocuSigned by:
Chris Gilbreath
D250C711D0BF450...

Chris Gilbreath
Senior Manager
Remediation and Reclamation

CG:TT:der

Enclosure

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DENVER, CO 80233-0695
303-452-6111
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cc: Foster Beckett (BLM-LSFO)
Tony Tennyson (via email)
File: C. F. 1.1.2.143 - G471-11.3(21)d

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

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

Date: **September 22, 2022** Revision Description: **TR-156 Exhibit 23 Item 4 Addendum**

Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
1					No Change
2A					No Change
2B					No Change
2C					No Change
2D					No Change
2E					No Change
3					No Change
4					No Change
5A					No Change
5B					No Change
6					No Change
7					No Change
8					No Change
9					No Change
10					No Change
12					No Change
13					No Change
14					No Change
15	List of Exhibits page x (1 page)		List of Exhibits page x (1 page)		List of Exhibits has been updated.
16					No Change
17					No Change
18A					No Change
18B					No Change
18C					No Change
18D					No Change
19					No Change

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

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Date: **September 22, 2022**
Revision Description: **TR-156 Exhibit 23 Item 4 Addendum**

Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
20	Volume 20 List of Exhibit (2 pages)		Volume 20 List of Exhibit (2 pages)		Volume 20 List of Exhibits has been udpated.
20			Exhibit 23, Item 4 (7 pages)		Exhibit 23, Item 4 has been inserted into the permit.
21					No Change
22					No Change

LIST OF EXHIBITS

LIST OF EXHIBITS – VOLUME 20

Exhibit 10, Item 6	Proposed Collom Coal Mine Project Baseline Vegetation Survey, May 2006, Cedar Creek Associates, Inc.
Exhibit 10, Item 7	Wetlands and Waters of the US Delineation for Collom Project, May 2006, Cedar Creek Associates, Inc.
Exhibit 11, Item 1	Wildlife Survey Report for the Collom Permit Study Area, August 25, 2006, Cedar Creek Associates, Inc.
Exhibit 11, Item 2	2007 Wildlife Monitoring Report for the Collom Permit Study Area, December 20, 2007, Cedar Creek Associates, Inc.
Exhibit 13C	Cumulative Bond Collom Haul Road and Facilities
Exhibit 14, Item 7	Pre-Blast Survey – Structures within ½ Mile of Collom Mining Area (Pending)
Exhibit 14, Item 8	Pre-Blast Survey – Offering Letters Pre-Blast Structure Locations Drawing
Exhibit 23, Item 1	Geotechnical Report for the Temporary Spoil Pile
Exhibit 23, Item 2	Addendum to Geotechnical Analysis
Exhibit 23, Item 3	Geotechnical Report for the Collom out of Pit Dump and Final Reclaimed Surface
Exhibit 23, Item 4	The Adequacy of the Natural Sorted Spoil Material for the Purpose of a Rock Drain in Little Collom Draw
Exhibit 25 Item 1	Groundwater Monitoring Well Information
Exhibit 26, Item 1	Alluvial Groundwater Monitoring Well Information
Exhibit 27, Item 1	Collom Haul Road Geotechnical Drilling
Exhibit 27, Item 2	Wilson Reservoir Geotechnical Drilling
Exhibit 27, Item 3	Collom In Pit Drilling
Exhibit 27, Item 4	Collom Topsoil Depth Testing
Exhibit 27, Item 5	Collom Facilities Geotechnical Drilling

Exhibit 27, Item 6	Collom Highwall Mining Geotechnical Design and Operational Considerations
Exhibit 27, Item 7	Addendum Collom and South Taylor Highwall Mining Geotechnical Design and Operational Considerations

EXHIBIT 23, ITEM 4

THE ADEQUACY OF THE NATURAL SORTED SPOIL MATERIAL FOR THE PURPOSE OF A ROCK DRAIN IN LITTLE COLLOM DRAW

The following report by Agapito Associates, Inc. provides an addendum to the geotechnical report presented in Exhibit 23, Item 1.

Agapito Associates, Inc.
ENGINEERS & GEOLOGISTS

www.agapito.com

September 22, 2022 227-27

Mr. Lee Sampson, P.E.
Senior Mining Engineer
Colowyo Coal Company
5731 State Hwy 13
Meeker, CO 81641-9119

Re: **The Adequacy of the Natural Sorted Spoil Material for the Purpose of a Rock Drain in Little Collom Draw**

Dear Mr. Sampson:

This letter report provides an assessment of the adequacy of the natural sorted spoil material for the purpose of a rock drain and a natural filter for the underdrain in Little Collom Draw. The location of the assessment area is showing in Figure 1. This assessment draws on the results of previous analyses conducted at the mine, photographs of the active spoil end dumping in Little Collom Draw, and site observations made during a September 13, 2022, site visit by Ry Stone of Agapito Associates, Inc (Agapito).

Colowyo Mine has indicated that prior to dumping spoil in the Little Collom Draw, the southernmost 820 feet (ft) of the draw had a 24-ft-wide rock drain constructed in 2021 (see Figure 1). The constructed drain was filled with large sandstone rock sorted on-site from existing spoil dumps. The sorted rock was placed in the drain with loaders and dozers. Following construction of the rock drain, excess spoil was end dumped into the draw and over the drain. This resulted in a dump height of approximately 130 ft above the valley floor at the north end of the draw.

Immediately north of the constructed rock drain, natural sorting from end dumping of the spoil material was utilized to create a rock drain for an additional 1,500 ft down the draw (see Figure 1). The cumulative volume of spoil dumped in the draw to date is estimated to be in the order of 4,200,000 cubic yards.

Following re-evaluation of the planned life of the mine, Colowyo have indicated that no additional spoil would be dumped in the draw and that the existing valley fill would be permitted as “Post Mine Topography”. Agapito understands that this will result in a change in classification of the valley fill from temporary to permanent. Section 4.09.02, Part 2 from the Department of Natural Resources, Division of Reclamation, Mining and Safety (DRMS) Code of Colorado Regulations stipulates that a subdrainage system for the valley fill shall be constructed for permanent conditions. This assessment will therefore demonstrate that the natural sorting of the spoil material from end dumping will be sufficient for facilitating a free-draining environment in the valley fill in Little Collom Draw.

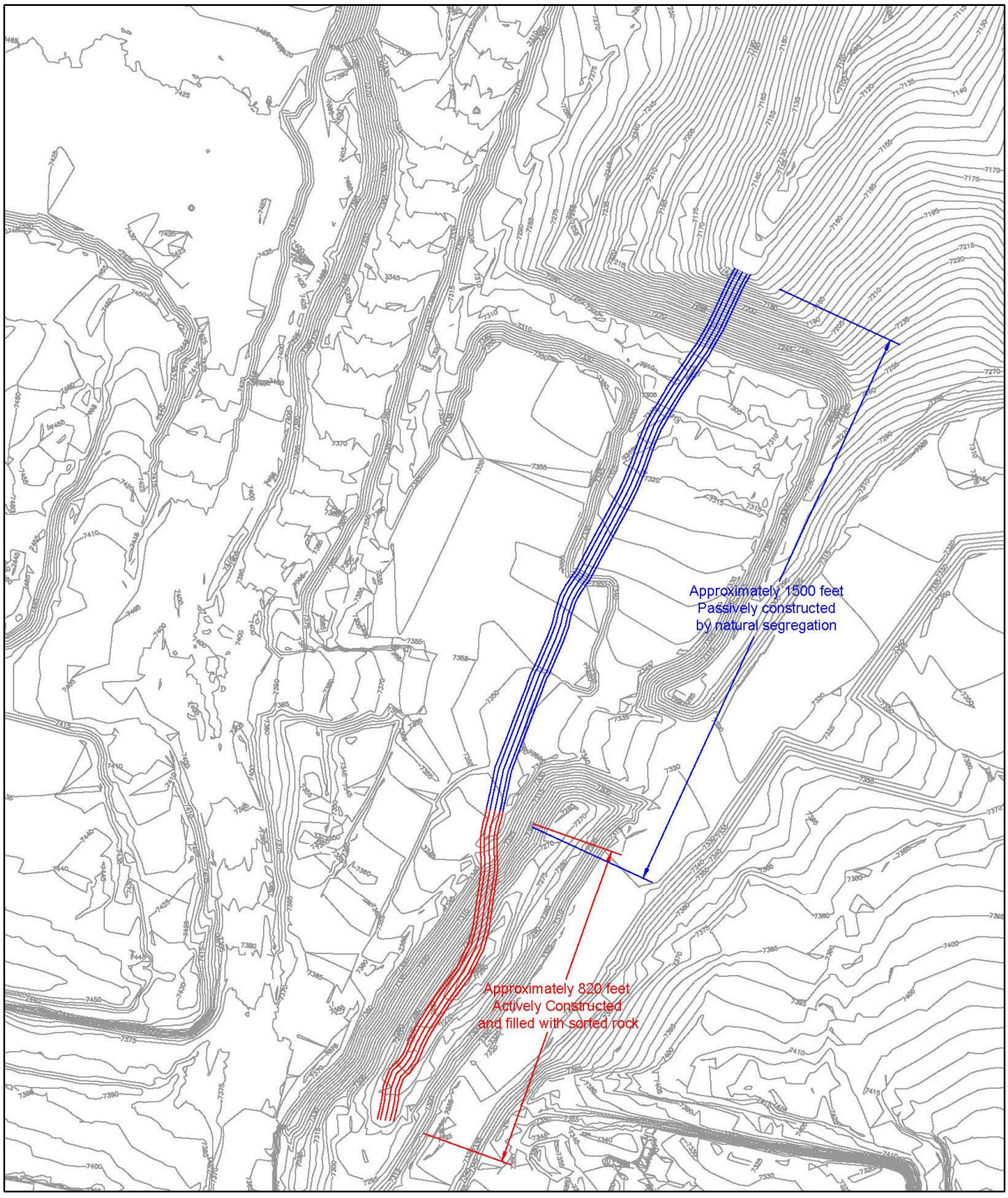


Figure 1. Drawing Showing the Location of the Valley Fill in Little Collom Draw Including the Constructed Underdrain and the Natural Sorted Rock Drain (Colowyo, August 8, 2022)

PREVIOUS OBSERVATIONS OF NATURAL SORTING OF SPOIL AT COLOWYO MINE

Previous work carried out by Shannon and Wilson in 2009[1] concluded that a constructed underdrain extending the length of the valley fill in Little Collom Draw was not required for either temporary or permanent conditions. The assessment stated the following:

> *In our opinion, a drain extending the full distance from the downstream toe to the upstream toe is not required, particularly for a temporary spoil fill. Our experience and observations indicate that the spoil and placement methods at Colowyo produce a relatively free draining layer at the base of each lift of spoil.*

The natural sorting of the spoil after it is end dumped over the crest of each lift has been studied and cataloged extensively at the mine. Shannon and Wilson in 2009[1] made the following observations:

> *The gradational characteristics of spoil vary due to sorting as the spoil is end dumped over the crest of each lift. The relatively high lift thicknesses (30 to 100 feet) and end-dumping over the edge of the lift produce significant sorting of the spoil*.

The natural sorting process results in boulder-sized sandstone blocks at the base of each lift. Shannon and Wilson in 2009[1] made the following observations:

> *Very coarse spoil (median grain size D_{50} of 10-inches or more) is typically present at the base of each lift of spoil.*

Agapito has also made several observations of natural sorting of spoil material from end dumping at the mine. At dump heights of greater than 100 ft, the toe of the slope is comprised of sandstone and siltstone cobbles (3 to 12 inches in diameter) and boulders (>12 inches in diameter), while the upper slope is dominated by finer sand and gravel material. The most recent example observed is shown in Figure 2, a photograph of active end dumping of spoil into West Pit at a height of greater than 100 ft.

CHARACTERISTICS OF THE DUMPED SPOIL IN LITTLE COLLOM DRAW

The spoil placed into Little Collom Draw consists of excavated bedrock composed of sandstone, siltstone, and mudstone from the Williams Fork Formation. Through the process of natural sorting, as shown in Figure 3, the base of the fill consists of sandstone and siltstone cobbles (3 to 12 inches in diameter) and boulders (>12 inches in diameter). Figure 4 shows the sorted spoil material at the northernmost end of the valley observed during the site inspection.

[1] Shannon & Wilson, Inc (2009), "Geotechnical Study Collom Temporary Soil Fill, KCCC – Colowyo Mine," Report Revision PR-03, August 5th.

Figure 2. Photograph Taken during the September 13, 2022, Site Visit Showing Natural Sorting of Spoil Material from End Dumping into West Pit

Figure 3. Photographs Taken during September 13, 2022, Site Visit Showing the Cobbles and Boulders Located along the Toe of the Lower Slope in Little Collom Draw

As the spoil has been end dumped from the crest of the fill, a height of greater than 100 ft, the natural sorting extends entirely across the valley floor, which would encompass any lateral drains present in the valley. This is shown in Figure 4, a photograph taken of the north end of the dump during the September 13, 2022, site inspection. Previous photos taken by the mine, see Figure 5, indicate that the natural sorting has taken place along the entire length of the valley fill in the draw.

The unsorted spoil at the mine has previously been estimated to have the following gradational characteristics[2]:

- Cobbles and boulders 50%
- Gravel 28%
- Sand 2%
- Fines (No. 200 sieve) 20%

On this basis, it is expected that above the base of the dump, the composition of the spoil is dominated by gravel, sand, and fines. This is consistent with visual and tactile observations made during the September 13, 2022, site inspection.

Figure 4. Photograph Taken during September 13, 2022, Site Visit Showing Natural Sorting from End Dumping in Little Collom Draw

[2] CTL/Thompson, Inc. (1992a), "Underdrain Filter Requirements, West Pit and Section 16 Pit Excess Spoil Fills," Letter Report prepared by CTL/Thompson, Inc., Job No. 18,683, for Colowyo Coal Company, Meeker, CO, April 27.

Figure 5. Photograph Taken during January 27, 2021, by Colowyo Showing the Constructed Underdrain and the Natural Sorting of Spoil Material Following End Dumping

THE ADEQUACY OF THE ROCK DRAIN IN LITTLE COLLOM DRAW

Waste dump construction experts[3] suggest that there are two basic methods of constructing rock drains for permanent valley dump fills. Depending on the availability of sufficient quantities of suitable rock to convey the design flow, the ideal method involves good-quality spoil end dumped from the top of the valley slopes, where the underdrain is formed by segregation of coarse particles at the toe of the dump. Furthermore, it is generally accepted that adequate segregation will typically occur for repose dump heights of greater than 65 ft[4]. Where the source rock material is generally coarse and competent (as in this case), rock drain development via natural segregation is generally the preferred method of construction in permanent valley fills.

Where waste rock is coarse and competent (as in this case), a single end dumped lift will generally create a superior rock drain than pre-construction of a drain with selected material. The total dump height should include the depth required for segregation plus the required depth of drain material[4]. For the Little Collom Draw valley fill, this would equate to 65 ft plus 16 ft (the required height of a rock drain for fills greater than 1,000,000 cubic yards). Therefore, the minimum height of the dump pile required to promote adequate segregation for a rock drain is 81 ft.

[3] Lighthall, P.C., C.D. Sellers and W.D. Burton (1985), "Design of Waste Dumps with Flow Through Rock Drains," *Proceedings of the 9th Annual British Columbia Mine Reclamation Symposium,* Kamloops, BC, The Technical and Research Committee on Reclamation.

[4] Hawley M. and Cunning J. (2017), "Guidelines for Mine Waste Dump and Stockpile Design," CSIRO Publishing.

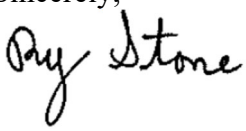
Furthermore, observations[5] of water draining through waste dumps at other surface coal mines indicate that blockage by sediment does not occur in a free-draining dump. Provided that adequate entrance capacity is constructed, flow-through drains should therefore be suitable for permanent abandonment. Moreover, a rock drain developed through segregation of relatively well graded waste rock (as in this case) is also naturally filtered through the segregation process[4]. A filter zone should only be placed on top of the rock drain in the cases where the waste rock is expected to be poor quality, or where the dump heights are less than that required for natural segregation[4].

Considering the favorable quality of the spoil material, particularly the height of the dump pile and the well graded nature of the material in conjunction with previous research and studies conducted elsewhere and at the mine, it is Agapito's view that the spoil end dumped in Little Collom Draw will permit a free-draining environment.

Additionally, the well graded nature of the overlying spoil should prohibit excessive infiltration of fines into the underlying cobbles and boulders, which could otherwise result in plugging of the rock drain. Therefore, it is Agapito's conlcusion that a manufactured filter fabric is not required to mainitain a free-draining environment in the Little Collom Draw valley fill.

If you have any questions, please feel free to contact me.

Sincerely,



Ry Stone, CPEng.
Senior Associate

RS:kah
Transmitted in PDF format via email to lsampson@tristate.org

[5] Nichols, R.S. and A.L. Rutledge (1982), "Water Drainage Through Waste Dumps at Fording Coal Ltd.," CIM Bulletin, 75(44):74–77.