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TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

December 22, 2020

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

RE: Colowyo Coal Company L.P.
Permit No. C-1981-019
Technical Revision No. 143
Adequacy Response

Dear Mr. Trujillo,

Tri-State Generation and Transmission Association Inc. (Tri-State), is the parent company to Axial Basin Coal Company, which is the general partner to Colowyo Coal Company L.P. (Colowyo). Therefore, Tri-State on behalf of Colowyo is submitting this adequacy response for technical revision 143 (TR-143) to Permit No. C-1981-019.

Tri-State received two adequacy letters from the Division dated December 4 and December 14, 2020 respectively. Tri-State is providing the following responses to the Division's concerns:

December 4, 2020 Adequacy Letter

1. *On proposed Volume 1, Rule 2, page 2.05-18 on the third paragraph, it refers to the appropriate cross sections for the Colowyo Mine on Map 20B. Map 20B only shows the cross sections for the South Taylor Pit. Please include references for cross sections associated with the East, West and CollomPit.*

   Response: Citations to Maps 20 and 20A have been inserted as noted.

2. *On proposed Volume 1, Rule 4, page 4-38, it appears that there is a pagination error with the currently approved Rule 4, page 4-37. Currently approved page 4-37 was last approved with MR-222 and transitions into the currently approved 4-38 with the second paragraph under Section 4.14.6 – Regrading or Stabilizing Rills and Gullies. Please provide an updated Volume 1, Rule 4, page 4-38 that flows properly with the currently approved page 4-37.*

   Response: The pagination issued noted on page 4-37 has been corrected.

3. *On proposed Volume 15, Rule 2, page 85, it appears that there is a pagination error with*

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the currently approved Rule 2, page 84. Proposed page 85 starts with Section 2.05.4(1) while on the currently approved Section 2.05.4(1) of Volume 15 begins on page 81. Please provide an updated Volume 15, Rule 2 as necessary to ensure pagination flows properly.

Response: Rule 2, Page 60 to the end of Rule 2 section has been resubmitted to ensure the pagination issue was corrected. Also, please see response to comment 7, on the December 14, 2020 responses.

The following comments were received by the Division from the Bureau of Land Management (BLM) on November 30, 2020. With their comments, BLM notes that they are aware most of the surface in TR-143 is privately owned. The correspondence between the agencies can be found through the Division's online database Laserfiche.

4. Table 2.05-7

[BLM] would recommend the use of Utah Sweetvetch (Hedysarum boreale) instead of Cicer Milkvetch (Astragalus cicer). The native nitrogen-fixer is preferred to the introduced species which is competitive. A. cicer can outcompete the seed native grass species impacting seeding success.

The substation of Great Basin Wildrye (Leymus cinereus) for Orchagd grass (Dactylis glomerata) is an interesting approach .The structure of great basin wildrye is preferred over orchard grass. The larger stature of basin wildrye reduces drifting and increases snow retention. This can increase soil moisture and enhance shrub species establishment over time.

Response: Under TR-143, Tri-State has not proposed any changes to the reclamation plan seed mixtures currently approved and implemented at Colowyo. Therefore, no changes will be made to the reclamation seed mixtures as noted in this comment or the following comments. Further, the reclamation seed mixtures currently employed at Colowyo were agreed up by the Division, BLM, CPW, and Colowyo during previous reclamation plan changes. Since there are not any proposed changes to the reclamation seed mixtures under TR-143, and all parties have previously agreed to the reclamation seed mixtures used, there is not a need to reopen this topic.

5. Table 2.05-8

Any seed application method that includes the use of a cultipacker would increase sagebrush seed establishment.

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Response: Please see response to comment 4.

6. *Table 2.05-9*
Small burnet (Sanguisorba minor) is an introduced species that is not known to occur in Moffat County. Rocky Mountain Bee Plant (Cleome serrulata) might be an alternative to consider.

General comment: Letterman's needlegrass (Achnatherum lettermanii), junegrass (Koeleria machantha), and needledandthread (Hesperostipa comata) would all be appropriate for the range site, but were not included in seed mix or on the list of contingency substitutions.

Response: Please see response to comment 4.

7. *2.05.4 Reclamation Plan, Rule 2 (Page 2.05-20)*
"The lone introduced taxon included in both species (cicer milkvetch)…" In regard to this statement, the potential use of small burnet should also be discussed since it would also be an introduced species. If not in this section then under the Contingency Seed Substation section on page 2.05-21.

Response: Please see response to comment 4.

8. *4.15.2 Use of Introduced Species, Rule 4 Performance Standards (page 4-39)*
For nitrogen fixation, alfalfa would be preferred over A. cicer for the desired post-mining vegetative community since alfalfa is a short lived perennial.

Response: Please see response to comment 4.

9. *4.15.11 Revegetation Sampling Methods and Statistical Demonstrations for Revegetation Success Revegetation (Page 4-46)*
Identifiaction of nomenclature of plant species should follow Acherfield's Flora of Colorado instead of Weber and Wittman. Acherfield is based on the most recent group study of plant DNA (APG IV) that came out o in 2016.

Response: Please see response to comment 4.

December 14, 2020 Adequacy Letter

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1. *Section 4.15.6 Field trial. The proposed TR143 text summarizes the tall shrub/aspen test plots. Although the trial had unfavorable results, The Division contends that there may be value in maintaining the details of the X-Pod field trial in the permit. The previously approved Section 4.15.6 may be appropriate to retain in a historic appendix.*

   Response: The results of the X-Pod field trial are maintained in Colowyo's onsite files. and data from the trial was provided in annual reclamation reports should it be needed. There is zero benefit for a permit to contain a large narrative on a failed trial, and it is not required by Rule 4.15.6 to be retained in the permit.

2. *With Colowyo proposing a New Field Trial and the plots being being fenced during the first few years, please provide more detail regarding the fencing. What kind of fencing is planned? Will the fencing be designed to exclude elk? Will the fencing exclude rabbit and other small herbivores? How long will the fencing be maintained? What is the plan for fencing removal?*

   Response: Additional details on fencing have been included in Section 4.15.6 as requested.

3. *Colowyo states that the operator will collect native soil and inoculate test site with soil for mychorrhizae. The Division wants to encourage this practice as we have observed positive results from mychorrhzae inoculation of shrub seedlings at other mine sites in Colorado. Please provide detail on how mychorrhizal inoculation will occur. For example, Seneca sent soil to greenhouse and the tubelings were inoculated with the soil. Will mixing soil into the replaced soil plots have the same impact? Does Colowyo have any detail on this part of the plan?*

   Response: Section 4.15.6 has been updated further describing how locally source soils will be used in the tall shrub trials.

4. *Colowyo states that weed guard will be put in place around the shrub seedlings. Will weed annuals that come up in the weed guard during the first growing season when water resource is limited by the tubelings root system? Additionally, will dead plantings be replaced?*

   Response: Annuals will not be controlled as Colowyo is planning to minimize the weed guard fabric openings needed to plant the tubelings to assist in limiting competition for moisture. Additionally, dead plantings will not be replaced. The whole purpose of these new trials are to have success out of the gate. These trials

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are being approached in that manner. Please see revised text in Section 4.15.6.

5. *In section 4.17, Colowyo had previously committed to establishing 450 acres Sagebrush steppe habitat development. Has Colowyo met the 450 acres during previously approved bond releases? Was the 450 acres of Sagebrush Steppe habitat a commitment required by CPW? If this commitment was previously required by CPW, does CPW accept the elimination of this commitment?*

   Response: Colowyo has not tracked the total acres of sagebrush steppe habitat released to date, as the commitment was a mine wide standard for post-2008 reclamation that had to be met at the completed reclamation of the entire Colowyo Mine site (excluding Collom) on post-2008 parcels. Most post-2008 reclamation parcels have not achieve or been applied for Phase III release to date. The development and history of this previous standard is unknown to Tri-State as it was made under the previous owner of the Colowyo Mine. Tri-State does not agree a mine wide standard is a viable approach in gauging reclamation success on a smaller scale, which Phase III bond release packages are submitted for individual parcels not the entire mine site. In addition, the Division sent a letter notifying CPW of the pending TR-143 application on November 6, 2020. Tri-State is unaware if CPW has provided any comments on TR-143 to date.

6. *Under Reclamation Success Standards, Colowyo commits to establishing wildlife habitat, of both low and high density areas, on approximately 20% of the acres in each bond release evaluation. At least half of the 20% acres will meet the high density standard. High density shrub standard shall be 375 live plants per acre. At least half will be comprised of sagebrush species. In low-density areas, the standard shall be 200 live plants per acre. Please define live plants as live woody plant species.*

   Response: As requested live plants have been defined as live woody plants in Section 4.15.8 – Woody Plant Density.

7. *With the approval of Colowyo MR-226, please provide an updated Volume 15, Rule 2 to include the additional changes to the Colowyo PAP with TR-143.*

   Response: The pages from the recently approved MR-226 materials have been included Rule 2 to ensure correct pagination as requested.

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

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Sincerely,

DocuSigned by:
Daniel Casiraro
B70D69F114324DE...

Daniel J. Casiraro
Senior Manager
Environmental Services

Enclosure

cc: Chris Gilbreath (via email)
Tony Tennyson (via email)
Angela Aalbers (via email)
File: C. F. 1.1.2.127 - 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: **October 27, 2020** Revision Description: **TR-143 Reclamation Plan**

Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
1	Table of Contents Pages iv and v (2 pages)		Table of Contents Pages iv and v (2 pages)		Table of Contents for Rule 4 have been updated.
1	Page 2.05-18 (1 page)		Page 2.05-18 (1 page)		Citations to appropriate maps have been inserted.
1	Rule 4 Page 37 through Rule 4 Page 56 (20 pages)		Rule 4 Page 37 through Rule 4 Page 56 (20 pages)		Section 4.14.6 pagination issue was corrected which caused a pagination shift through the rest of Rule 4.
2A					No Change
2B					No Change
2C					No Change
2D					No Change
2E					No Change
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	Tables of Contents pages i and ii (2 pages)		Tables of Contents pages i and ii (2 pages)		Volume 15 Tables of Contents for Rule 2 have been updated.

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

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

Date: **October 27, 2020** Revision Description: **TR-143 Reclamation Plan**

Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
15	Pages Rule 2, Page 60 through Rule 2, Page 128 (69 pages)		Pages Rule 2, Page 60 through Rule 2, Page 109 (50 pages)		MR-226 items have been inserted. Also, pagination issues have been corrected and essentially all pages from Rule 2, Page 60 to the end of the section have been provided to correc this issue.
16					No Change
17					No Change
18A					No Change
18B					No Change
18C					No Change
18D					No Change
19					No Change
20					No Change
21					No Change
22					No Change

spoil will be ripped with a dozer to minimize compaction, assure stability, and minimize slippage after topsoil replacement. Where possible, development of concave landforms (to encourage snow entrapment) will be developed.

Where necessary, the overburden surface will be roughened by ripping or discing etc., to ensure a bond between the topsoil and spoil to reduce slippage. To date there is no evidence of topsoil slippage on reclaimed areas. A few small tension cracks resulting from settling of fill along tie in locations with highwall have occurred in a few areas. However these areas within a year or two after reclamation, soon stabilize and begin to fill in.

The final post mine surfaces are shown on Map 19, 19A, and 19B. Appropriate cross sections that show the anticipated final surface configuration of the reclaimed area, in conjunction with the existing pre-mining topography are shown Maps 20, 20A and 20B.

Topsoil Redistribution Plan

As discussed in Section 2.05.3, prior to any mining-related disturbances, all available topsoil will be removed from the site to be disturbed, and will be redistributed or stockpiled as necessary to satisfy the needs of the reclamation timetable described herein. The topsoil redistrubtion plan is also broken into three distinct timeframes which are pre-2005, 2005 to 2009, and post-2010. Each plan is described in more detail below.

Pre-2005 and 2005-2009 Topsoil Redistribution Plan
Prior to 2005, essentially all reclamation units were covered with an average of 18 inches of topsoil. From 2005 through 2009, reclamation areas received an approximate average of 8 inches of topsoil. Most of these reclamation areas have been Phase III released to date, and the remaining units on schedule for a near future Phase III bond release application.

Post-2010 Topsoil Redistribution Plan
Variable topsoil replacement depth has been utilized at Colowyo since 2010. Post-2010 topsoil replacement is directly tied to the post mine land uses presented in Section 2.05.5, targeting two rangeland components consisting of grazingland and wildlife habitiat (sagebrush steppe).

In grazingland targeted areas (areas with slopes greater than 10%), topsoil will be redistributed utilizing variable replacement depths. Thinner topsoil (approximately six inches) will be replaced on ridge tops, and topsoil replacement depth will gradually thicken moving down the slopes toward the drainage bottoms. This gradation in topsoil depth on slopes recreates native edaphic conditions and mimics soil development on local landforms. Lower-lying areas (relative to the surrounding landscape), such as natural swales, depressions, and subtle drainageways that tend to catch more snow will also receive deeper topsoil replacement depths. These areas should store greater quantities of moisture, which will increase overall productivity, while providing enhanced opportunities for growth and development of the mountain shrub and snowberry communities (seed is a component of the grazingland seed mix). Even in areas where these shrub species do not initially germinate, the deeper soils systems with increased water holding capacity and altered hydrologic function of localized areas with increased snow capture will mimic the native conditions for mountain shrub and snowberry communities, setting the foundation for succession

Small depressions of a holding capacity slightly greater than one cubic yard of water may be used to create a moist micro climate to aid in shrub establishment. See Section 2.05.4, Planting and Seedings Methods for further information regarding these small depressions. Also, several stock watering ponds will be constructed to compliment the postmining land use. Providing a supply of water is an integral part of the grazing postmining land use. Colowyo will not be mining on any slopes above 20° as shown on the Premining Topography Map (Map 18).

Final grading before topsoil placement will be conducted in a manner that minimizes erosion and provides a surface for the topsoil that minimizes slippage. Final grading will be accomplished so that overall grades will not exceed lv:3h. The plan for backfilling and grading is shown graphically on the Spoil Grading Map (Map 29).

4.14.3 Covering Coal and Acid and Toxic Forming Materials

Colowyo will not have any exposed coal seams remaining at the end of mining and reclamation. Colowyo does not have any acid forming materials at the mine. For discussion on acid- and toxic-forming materials, refer to Section 2.04.6. For disposal of noncoal wastes or materials constituting a fire hazard, refer to Section 4.11.4.

4.14.4 Thin Overburden

Colowyo does not have a thin overburden situation as explained in Section 4.14.1.

4.14.5 Thick Overburden

Colowyo does not have a thick overburden situation as explained in Section 4.14.1.

4.14.6 Regrading or Stabilizing Rills and Gullies

The implementation of soil stabilizing practices outlined under Section 4.15.4 will lessen the possibility that erosion can become a serious problem. Colowyo plans to continue using surface manipulation techniques such as chisel plowing to reduce compaction and contour ditches/furrows to minimize overland flow over any long, uninterrupted slope. These methods have been shown to be highly successful in controlling erosion at Colowyo.

Rills and gullies which form in areas that have been regraded and topsoiled and which either (1) disrupt the approved postmining land use or the reestablishment of the vegetative covers or (2) cause or contribute to a violation of water quality standards for receiving streams will be identified during the spring of each year. Regraded and topsoiled areas will be visually inspected and rills and gullies identify. Colowyo will submit a report which provides a general description of the identified rills and gullies, activities undertaken to remediate these areas, time frames of repair, a description of any re-topsoiling and re-seeding activities, and a map idenfying the problem areas on a scale of 1-inch equals 500-feet. This report will be submitted annually no later than June 15 of each year.

As rill or gully features are identified for remediation Colowyo will utilize appropriate manpower and equipment depending on the ground conditions and the extent of the erosion. This shall include but is not limited to small track dozers, blades, and small rubber tired farm tractors. Repairs will take place within three months of the visual inpsecitons being completed. If ground conditions are such where soil conditions are not favorable, repair will commence as soon as ground conditions allow equipment to access the area without creating additional disturbance. As soon as any repair takes place the area shall be seeded with the appropriate seed mixture. Generally, remediation work will commence when soil conditions are suitable each year.

During repair of any rill or gully Colowyo will first identify and salvage any topsoil that may have been repositioned by erosion. This topsoil will be salvaged, stockpile in a location that is easily accessible by equipment making repairs, and re-applied after the repair of a rill or gully is complete. Once repairs are complete, topsoil will be re-applied to the disturbed area and re-seeded to the appropriate seed mixture. Colowyo is committed to preserving the topsoil resources and utilizing it appropriately through approved reclamation practices.

Remediated areas will be monitored for one year following repair, and should the area appear to be stabilized monitoring will be discontinued for that area. Areas that continue to exhibit unstable conditions will be remediated again and monitored for another year.

4.15 REVEGETATION REQUIREMENTS

4.15.1 General Requirements

Colowyo will establish on all affected lands within the mining area an appropriate post mining vegetation community. Please see Section 2.05.4 for a detailed description of the reclamation plan and Section 2.05.5 for a description of the post mine land use targets that will be implemented to achieve revegetation success. Outlined in this section are the revegetation metrics that will be used to demonstrate successful reclamation has been achieved that supports the post mining land use of rangeland with the two corresponding subcomponents of grazingland and wildlife habitat.

4.15.1(4) Vegetation Monitoring

The monitoring plan will evaluate the success of shrub and herbaceous vegetation establishment, and track progress toward achieving reclamation goals in the following manner:

1. Sampling of herbaceous vegetation will take place during the peak of the growing season when the vegetation reaches the mature stages and is most easily identified. This period of time is generally from late June to late August.

2. Unlike sampling for bond release purposes, sampling is for informational purposes and will not be required to meet statistical adequacy.

3. During the second and fourth growing seasons, herbaceous cover and woody plant density information will be gathered to the species level, and will consider the effectiveness of the seed mixture and volunteer species. Seven year and older monitoring

will utilize ground cover and density sampling, and will include a modest current annual production sampling.

4. The data and an assessment of the monitoring results for that year will be submitted in the Annual Reclamation Report.

4.15.2 Use of Introduced Species

For pre-2008 revegetation (especially pre-2002 revegetation), the rangeland seed mixture used at that time included some introduced species, including Intermediate Wheatgrass (*Agropyron intermedium*), Siberian Wheatgrass (*Agropyron sibericum*), Pubescent Wheatgrass (*Agropyron trichophorum*), Smooth Brome (*Bromus inermus*), Orchard Grass (*Dactylus glomerata*), Vinall Russian Wildrye (*Elymus junceus*), Durar Hard Fescue (*Festuca ovina duriscula*), Timothy (*Phleum pratense*), Kentucky Bluegrass (*Poa pratensis*), Lutana Cicer Milkvetch (*Astragalus cicer*) and Alfalfa (*Medicago sativa*).

Of the thirty-one species in the pre-2008 seed mixtures, twenty-one species were native, which on a seed-weight basis accounts for 65% of the planted seeds. Studies and experience have demonstrates some beneficial uses for introduced species considering erosion control and forage for livestock and wildlife, but are no longer a component of the desired post-mining vegetation communities.

For post-2008 revegetation, the seed mixes (please see Tables 2.05.4-7 through 2.05.4-9) are comprised entirely of native species, except with the inclusion of modest quantities of small burnett or nitrogen fixing legumes such as cicer milkvetch or alfalfa as supplemental forage for wildlife.

4.15.3 Seeding and Planting

Please refer to the reclamation plan found in Section 2.05.4

4.15.4 Mulching and Other Soil Stabilizing Practices

As addressed in Section 2.05.4, Colowyo currently does not mulch, chisel plow, or terrace, because experience demonstrates sufficient surface roughness survives the topsoil laydown process to maintain favorable seed-bed conditions. If conditions warrant additional topsoil manipulation, Colowyo will utilize an appropriate practice specific to the circumstance. Best management practices, such as minimizing topsoil handling and manipulation, ripping along the contour, disking, or cross ripping will be implemented and are further discussed in Section 2.05.4.

4.15.5 Grazing

All the lands reclaimed by Colowyo will not be grazed by livestock for a period of at least three years after seeding or planting and will be managed to promote the postmining land use.

Grazing by livestock will not commence until Colowyo has demonstrated to the satisfaction of the Division that the vegetation on the reclaimed surface is adequately established and can be expected

to withstand grazing pressures. Any grazing studies undertaken by Colowyo will not preclude or interfere with postmining vegetation sampling as required in section 4.15.8.

4.15.6 Field Trials

As a result of previous consultations with CPW and DRMS, Colowyo implemented three field trials. The field trials were meant to provide information to the appropriate expectations for success/failure of establishing these habitat types at Colowyo in the context of a ten-year bond clock, to provide some baseline information that can be used to modify practices, and the plant materials used to meet the current expectations.

The study was comprised of three test scenarios designed to explore different species and habitat requisites necessary for tall shrub survival. The first treatment was to establish an overstory of quaking aspen (*Populus tremuloides*) trees that are planted into deep topsoil (48 inches). The second treatment was serviceberry (*Amelanchier alnifolia*) and chokecherry (*Prunus virginiana*) shrubs planted into deep topsoil (48 inches). The third and final treatment was serviceberry and mountain mahogany (*Cercocarpus montanus*) shrubs planted into shallow topsoil (4 inches). The aspen trees and/or tall shrubs were planted in ten-220-foot long rows per treatment, for a total of 550 plants per treatment. The initial planting consisted of 550 quaking aspen tubelings in the first treatment, 276 serviceberry and 274 chokecherry tubelings in the second treatment, and 276 serviceberry and 274 mountain mahogany tubelings in the third treatment.

The status of each tree or shrub was evaluated in 2012 through 2016. Trees and shrubs that "were observed to be dead" during the evaluation effort in August 2012 needed to be replaced (one-time replacement). Replacement of dead plants occurred in November 2012. During the final evaluation in 2016, no quaking aspen trees in Treatment 1 were observed to be alive. In Treatment 2, no serviceberry and 42 individuals of the chokecherry (15%) were observed to be alive in 2016. In Treatment 3, 143 individuals of the serviceberry (52%) and 147 individuals of the mountain mahogany (54%) were observed to be alive in 2016. The unfavorable results of the aspen and tall shrub trials (documented in annual reporting to the Division) have prompted Colowyo to undertake additional efforts as outlined below.

As a result of these unsuccessful test plots, Colowyo intends to design and implement new field trials which draw upon success at Trapper and Seneca IIW. Cedar Creek Associates, Inc. (Cedar Creek) has conducted a literature review to support Colowyo in achieving revegetation success criteria pertaining to tall shrub establishment. This literature review aimed to optimize success at Colowyo by synthesizing the successes and challenges of other efforts both at Colowyo and in the region.

Based on these findings, Colowyo identified areas of snow accumulation during the winter (November 2019 – February 2020). These seventeen test areas are scattered throughout recently reclaimed areas in East and West Pit and will be implemented in a manner to optimize successful tall shrub establishment. Please see Figure 4.15-1 for approximate tall shrub test plot locations. For the most part, these are small (~0.1 acres) areas which accumulate snow in the winter months and as a result improve seasonal plant available water through snow-capture. Final siting of the tall shrub test plots will be based on additional snow drift data yet to be acquired.

The first step will be to create some topsoil mounding for additional structure for preceipation retention. The test areas will then be planted wtih containerized Planting / tubelings as establishing tall shrubs from seed was not successful at either Colowyo or Trapper. Since the test sites are located in upland areas the following species will be considered for planting:

- Alderleaf Mountain Mahogany (*Cercocarpus montanus*)
- Chokecherry (*Padus virginiana* ssp. *melanocarpa*)
- Skunkbrush sumac (*Rhus trilobata*)
- Saskatoon serviceberry (*Amelanchier alnifolia*)
- Snowberry (*Symphoricarpos sp.*)

The planting of tubelings will not occur in the middle of winter or summer and will not exceed one tubeling per ten square feet. Fencing will be used to decrease herbivory, which will likely be crucial, at least during the first few years while tall shrubs are establishing. The fencing employed will be at least six feet in height, and will be of a type to ensure large mammals such as deer and elk cannot enter the trial area. Fencing will be removed once the tall shrubs are mature enough to handle browsing, or fencing may be retained at the discretion of the landowner. At a minimum, it will be removed prior to Phase III release of a particular reclamation area.

Native soil, collected from the locally source ecosystems on or directly adjacent to Colowyo Mine exhibiting similar tall shrubs species as being implemented in the trial, will be used to inoculate the test sites with beneficial mycorrhizae. Mycorrhizae are symbiotic relationships that form between fungi and plants. The fungi colonize the root system of a host plant, providing increased water and nutrient absorption capabilities while the plant provides the fungus with carbohydrates formed from photosynthesis. Once the mounding is completed and prior to installation of weed guard fabric, locally sourced soils (containing local mycorrhizae) will be scattered at random on the mounded surface. Care will be taken to ensure these soils are place around where the tubling will be planted and under the weed guard fabric.

Weed guard fabric will also be placed around the tubelings, with limited opening size in the weed guard fabric to plant the tubeling. This should help assist in limiting competition from moisture from other plants. The final step will be to broadcast seed the entire trial area with the seed mixture presented on Table 2.05-8. No other manipulation of the trial area will occur post construction to limit annuals, but if necessary noxious weeds will be controlled during the entire trial period.

Colowyo will monitor the survival of planted tall shrubs annually for three years following planting. The primary purpose of this approach to test plots is to identify areas that already exhibit favorable conditions to establish tall shrubs, rather than try to replicate those conditions.

4.15.7 Determining Revegetation Success: General Requirements and Standards

Three reference areas have been selected to represent the three major vegetative communities to be disturbed, sagebrush, mountain shrub, and aspen. The locations of these reference areas are shown on Map 4. Detailed vegetative sampling was performed on these reference areas as described in Section 2.04.10.

The reference areas were sampled for herbaceous cover, herbaceous production and woody plant density. Species diversity was determined utilizing herbaceous cover data from the premining inventory of the sagebrush, mountain shrub, and aspen communities. The reference areas are each approximately seven acres in size.

Statistical tests were performed on the vegetative data from the reference areas to prove that they were comparable to the premined area. The parameters compared were herbaceous cover and herbaceous production. Revegetation success will be determined by comparisons of weighted averages between reference areas and revegetated areas in accordance with Rule 4.15.7(4) (b).

For demonstration of revegetation success, vegetation cover, herbaceous production, and in certain circumstances woody plant density will be sampled to statistical adequacy (where necessary), and compared to the revegetation metrics described in Section 4.15.8 below. Sampling methodologies and statistical testing utilized for bond release evaluations are described in Section 4.15.11.

To summarize, there are three reference areas, the Mountain Shrub reference area, Sagebrush reference area, and Collom Aspen reference area that are utilized to evaluate revegetation success at Colowyo. The comparison between the reclamation area and the reference area will occur as follows:

- West and East Pit Reclamation Areas
    - Reclaimed areas shall be compared to weighted parameters from the Mountain Shrub reference area (55% weight) and the Sagebrush reference area (45% weight) in accordance with Rule 4.15.7(4)(b).
- South Taylor Pit Reclamation Areas
    - Areas reclaimed to grazing land shall be compared to weighted parameters from the Mountain Shrub reference area (52% weight), the Sagebrush reference area (25% weight), and the Collom Aspen reference area (23% weight) in accordance with Rule 4.15.7(4)(b).
- Collom Reclamation Areas
    - Areas reclaimed to grazing land shall be compared to weighted parameters from the Mountain Shrub reference area (39% weight), the Sagebrush reference area (47% weight), and the Grassland reference area (14% weight) in accordance with Rule 4.15.7(4)(b).

4.15.8 Revegetation Success Criteria

Colowyo will meet the requirements to ensure that the post-mining vegetation will be adequate for final bond release. As described in Section 4.15.7, Colowyo will utilize the reference areas for comparisons between reclaimed areas and appropriate native reference areas for the variables of ground cover and production. For the variables of woody plant density and species diversity, Colowyo shall compare revegetated areas against defined standards (detailed later in this section). Data to be used in these comparisons must be from statistically adequate sampling (where necessary) as indicated in Rule 4.15.11.

Herbaceous Cover

For revegetation targeting (and achieving) the rangeland land use subcomponents of grazingland and wildlife habitat, herbaceous cover of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous cover as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means, as described in Rule 4.15.8 (3) (a).

Herbaceous Production

For revegetation targeting the rangeland land use subcomponents of grazingland and wildlife habitat, herbaceous production of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous production, as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means, as described in Rule 4.15.8 (4).

Woody Plant Density

Where shrubs establish to form wildlife habitat, they will be segregated into low and high-density areas, each with a separate woody plant density success criterion. On high-density areas (areas of shrub concentration), the standard shall be 375 live woody plants per acre. At least one-half of these totals shall be sagebrush species. In low-density areas, the standard shall be 200 plants per acre. Furthermore, Colowyo will establish wildlife habitat areas, comprised of both low and high-density areas, on approximately 20% of the acres in each bond release evaluation, with at least 50% of those acres representing high-density areas. The grazingland acres will not be subject to woody plant density standards.

Tall Shrubs and Aspens

For the South Taylor reclamation areas, as part of the revegetation success criteria for those areas, Colowyo will establish 18.5 acres of aspens and 12.0 acres of tall shrubs. This will be accomplished through large singular plots or various small plots that add up the acres noted previously. Tall shrubs plots will consist of, but may not contain all, of the following species to be considered successful.

- Alderleaf Mountain Mahogany (*Cercocarpus montanus*)
- Chokecherry (*Padus virginiana* ssp. *melanocarpa*)
- Skunkbrush sumac (*Rhus trilobata*)
- Saskatoon serviceberry (*Amelanchier alnifolia*)
- Snowberry (*Symphoricarpos sp.*)

For the Collom reclamation areas, at the request of CPW, Colowyo will incorporate approximately 750 small size exclosures into Collom reclamation areas on 150 acres at a density of approximately five exclosures per acre to meet their expectations for establishing tall shrub species.

Diversity

The revegetation objective for diversity will be to establish at least four native* perennial species, each more than 3% composition, minimum of two of which are grasses and a minimum of one which is a forb, with the following caveat;

If no single forb species exceeds 3% composition, the forb requirement can be met if:
a) at least two native* perennial forbs combined comprise at least 2% composition, or;
b) at least four native* perennial forbs combined comprise at least 1% composition.

The dominant species will contribute to the appropriate structure and stability of the post-mining vegetative community to insure that the post-mining land use as addressed in Section 2.05.5.

4.15.9 Revegetation Success Criteria: Cropland

Colowyo does not impact any cropland areas; therefore, the requirements of this rule are not applicable to Colowyo.

4.15.10 Revegetation Success Criteria: Previously Mined Areas: Areas to be Developed for Industrial or Residential Use

Colowyo does not plan to develop any areas to industrial or residential use; therefore, the requirements of this rule are not applicable to Colowyo.

4.15.11 Revegetation Sampling Methods and Statistical Demonstrations for Revegetation Success Revegetation

During monitoring of revegetated units, developing shrub patches will be identified and as necessary delineated to facilitate mapping that in turn will represent the juxtaposition (stratification) of developing communities. As indicated previously, delineated shrub patches will be classified as either low or high density areas depending on apparent density of developing shrub populations.

Sample Layout

The sample layout protocol for revegetation monitoring and bond release evaluations shall be a systematic procedure designed to better account for the heterogeneous expression of seedings within reclaimed areas while precluding bias in the sample site selection process. By design, the procedure is initiated randomly, and thereafter, samples are located in a systematic manner, along grid coordinates spaced at fixed distances (e.g. 200 ft). In this manner, representation from across the target reclamation unit is forced rather than risking the chance that significant pockets are entirely missed, or overemphasized as often occurs with simple random sampling.

Older reclaimed units (e.g., 7+ years) shall receive a minimum of 20 ground cover transects and co-located shrub density belts. Production for monitoring purposes shall be collected from a representative five of these 20 sample points. For bond release efforts, production will be collected from a statistically adequate sample as defined below. Monitoring efforts for younger reclaimed units (e.g., 2 to 4 years) shall receive 15 transects and co-located woody density belts (as necessary) but no production sampling. First year units will receive one cluster of five emergent density quadrats spread in a representative manner for approximately every two acres of reclamation. For units 50 acres or larger, a five-quadrat cluster should be collected from every 4 acres of reclamation. With regard to any two-year old or older reclamation unit that is smaller than about 3 acres, the number of samples (for monitoring) shall be limited to five.

The systematic procedure for sample location in revegetated units shall occur in the following stepwise manner. First, a fixed point of reference (e.g., fence corner) will be selected for the target unit to facilitate location of the systematic grid in the field. Second, a systematic grid of appropriate dimensions will be selected to provide a reasonable number of coordinate intersections (e.g., 5, 15, 20, etc.) that would then be used for the set of sample sites. Third, a scaled representation of the grid will be overlain on a computer-generated map of the target unit extending along north/south and east/west lines. Fourth, the initial placement of this grid will be implemented by selection of two random numbers (an X and Y distance) to be used for locating a systematic coordinate from the fixed point of reference, thereby making the effort unbiased. Fifth, where an excess number of potential sample points (grid intersections) is indicated by overlain maps, the excess may be randomly chosen for elimination. (If later determined that additional samples are needed, the eliminated potential sample sites would be added back in reverse order until enough samples can be collected.) Sixth, using a handheld compass and pacing techniques, or a hand-held GPS, sample points will be located in the field.

Once a selected grid (sample) point is located in the field, sampling metrics will be utilized in a consistent and uniform manner. In this regard, ground cover sampling transects will always be oriented in the direction of the next site to be physically sampled to further limit any potential bias while facilitating sampling efficiency. Depending on logistics, timing, and access points to a target sampling area, the field crew may occasionally layout a set of points along coordinates in one direction and then sample them in reverse order. However, orientation protocol will always be maintained (i.e. in the direction of the next point to be physically sampled). If the boundary of an area is encountered before reaching the full length of a transect, the transect orientation will be turned 90° in the appropriate direction so the transect will be completed within the target unit. In this manner, edge transects will be retained entirely within the target unit by "bouncing" off the boundaries. Production quadrats will always be oriented 90° to the right (clockwise) of the ground cover transect and placed one meter from the starting point so as to avoid any trampled vegetation. Woody plant density belts (for monitoring efforts) will be extended parallel to the ground cover transects for a distance of 50 meters and width of 2 meters. (If the grid distance is less than 50 meters, density belts will be reconfigured to be 4 m X 25 m or similar configuration, but always totaling 100 m^2.)

Determination of Ground Cover

Ground cover at each sampling site will be determined utilizing the point-intercept methodology. This methodology will be applied as follows: First, a transect 10 meters in length will be extended from the starting point of each sample site toward the direction of the next site to be sampled. Then, at each one-meter interval along the transect, a "laser point bar", "optical point bar" or 10-point frame will be situated vertically above the ground surface, and a set of 10 readings recorded as to hits on vegetation (by species), litter, rock (>2mm), or bare soil. Hits will be determined at each meter interval as follows:

1. When a laser point bar is used, a battery of 10 specialized lasers situated along the bar at 10-centimeter intervals will be activated and the variable intercepted by each of the narrow (0.02") focused beams will be recorded;

2. If an optical point bar is used, intercepts will be recorded based on the item intercepted by fine crosshairs situated within each of 10 optical scopes located at 10-centimeter intervals.

3. If a 10-point frame is used, sharpened pins will be used to determine intercepts at 10-centimeter intervals. Care will be taken to NOT record "side touches" on the pins as this will result in a significant overestimation error.

The following sampling rules should apply during data collection. Intercepts will be recorded for the first (typically highest) current annual (alive during the current growing season) plant part intercepted without regard to underlying intercepts or attachment to a living base except when multiple strata are present. In this circumstance, multiple live hits may be recorded, but only one hit per stratum with the second live hit being recorded separately and not used to calculate total ground cover. Otherwise, the intercept will be litter, rock or bare soil. Rock intercepts are based on a particle size of 2 mm or larger (NRCS definition), otherwise it would be classified as bare soil. To distinguish between current year senescent plant material and litter (including standing dead), the following rule should apply: 1) if the material is gray or faded tan it should be considered litter; and 2) if the material is bright yellow or beige it should be considered current annual (alive) and recorded by species. On occasion, experience with non-conforming taxa may override this rule.

When using laser or optic instruments during windy field conditions, the observer should consistently utilize one of the following techniques for determining a hit: 1) record the first item focused upon that is intercepted by the narrow laser beam or cross-hair; 2) wait a few moments and record the item intercepted for the longest time, or 3) block the wind and record the intercept. When using a pin frame, the observer must wait for the wind to subside.

With regard to gaps in the overstory, the point-intercept procedure naturally corrects for overestimations created by 2-dimensional areal (quadrat) or 1-dimensional linear (line-intercept) techniques. In this regard, the 0-dimensional point is extended along a line-of-sight until it intercepts something that is then recorded. Frequently points simply pass through overstory gaps until a lower plant part, litter, rock or bare soil is encountered.

Regardless of instrument, a total of 100 intercepts per transect will be recorded resulting in 1 percent cover per intercept. This methodology and instrumentation (excepting the 10-point frame) facilitates the collection of the most unbiased, repeatable, precise, and cost-effective ground cover data possible. Identification and nomenclature of plant species should follow Weber and Wittman (1996) Colorado Flora: Western Slope or newer text.

Determination of Production

Where production samples are to be collected (7+ year-old units or bond release units) current annual herbaceous production will be collected from a $^1/_2$ m^2 quadrat frame placed one meter and 90° to the right (clockwise) of the ground cover transect to facilitate avoidance of vegetation trampled by investigators during sample site location. If more production samples are necessary than cover samples (typical case for bond release efforts), orientation protocol will be maintained except that no ground cover data will be collected. From within each quadrat, all above ground

current annual herbaceous vegetation within the vertical boundaries of the frame will be clipped and bagged separately by life form as follows:

Perennial Grass	*Perennial Forb*
Annual Grass	*Annual Forb*
Subshrub	*Noxious Weeds (if found)*

All production samples will be returned to the lab for drying and weighing. Drying will occur at 105° C until a stable weight is achieved (24 hours). Samples will then be re-weighed to the nearest 0.1 gram.

Determination of Woody Plant Density

Two sampling methods may be employed for monitoring woody plant density within Colowyo's revegetated units. The first method, belt transects, may be employed when the size of the monitoring unit exceeds one to two acres. At each sample site in such areas, a 2-meter wide by 50-meter long belt transect (or alternately 4 x 25 meter transect) should be established parallel to the ground cover transect and in the direction of the next sampling point. All woody plants (shrubs and trees) within each belt will be enumerated by species. Determination of whether or not a plant may be counted is dependent upon the location of its main stem or root collar where it exits the ground surface with regard to belt limits. A total of 5 or 15 belt transects may be sampled for each monitoring unit.

For bond release sampling with belts, sufficient samples must be collected to insure adequacy of the effort (to facilitate valid testing) in accordance with one of the three methods under either Rule 4.15.11 (2), or Rule 4.15.11 (3). Depending on the selected protocol, care must be taken to collect at least the minimum number of samples indicated.

The second method, total enumeration, may be employed for monitoring when the size of a unit is less than approximately one to two acres in size. Total enumeration shall be the typical method utilized for bond release purposes unless shrub patches are too large (e.g., greater than 10 to 15 acres) to practically utilize this technique (in which case belts will be utilized). This method involves total counts of woody plant populations as opposed to estimates of mean densities through statistical sampling. Implementation of the total count technique would involve circumscribing the boundaries of a target polygon with hip chain thread or similar visible designation. Once a unit is circumscribed in this manner, a team of two or more biologists walking shoulder-to-shoulder traverse the plot enumerating each plant by species. The person farthest inside the line of observers trails hip chain thread, or other means, to mark their path to prevent missing or double counting specimens on subsequent passes. The distance between observers should be 15 to 20 feet or less depending on the height of grasses and the presence of low growing taxa such as rose or snowberry. Each internal observer should also "zigzag" as the team progresses, occasionally turning to view the area just passed to ensure visual coverage of the entire survey path. Constant communication among crew members precludes double counting or missing of plants located along the margins of observed paths. Results from total enumeration efforts can be compared directly with success criteria without statistical testing.

Sample Adequacy Determination

Sampling within each unit under consideration for bond release shall start with a minimum of 15 (reference area) or 20 samples (revegetated area) and continue until a statistically adequate sample has been obtained in accordance with Rule 4.15.11 (2). Woody plant density success comparisons can be obtained utilizing Rule 4.15.11(2) or Rule 4.15.11 (3). For woody plant density adequacy determinations utilizing Rule 4.15.11 (2)(a), the estimate is to within 15% of the true mean. Where sampling is for managerial (monitoring) information, adequacy is not necessary and is calculated for informational purposes only.

Success Evaluation

To summarize, success evaluations involve either a direct or a statistical *t*-test comparison of appropriate parameters for each variable of interest (cover, production, diversity, or woody plant density). Ground cover and production comparisons shall be made against reference area data of the same year. Diversity and woody plant density variables shall be compared against the standards defined above.

For bond release efforts, direct comparisons are made when the revegetated area mean value for a given variable is greater than either 90% of the standard or the reference area mean assuming that a statistically adequate sample has been collected in accordance with Rule 4.15.11(2)(a). If a statistically adequate sample cannot be obtained, a "reverse-null" hypothesis test may be employed as detailed in Rule 4.15.11(2)(c). If an adequate sample is obtained for a particular variable, but the mean is less than 90% of the reference area mean or success criteria outline in Section 4.15.8, a standard-null hypothesis *t*-test may be used in accordance with Rule 4.15.11(2)(b).

If adequacy for woody plant density cannot be achieved utilizing the formulation in Rule 4.15.11 (2)(a), additional sample adequacy and success evaluation options are described under Rule 4.15.11(3).

4.16 POSTMINING LAND USE

4.16.1 General

Implementation of the detailed reclamation plan as presented in Section 2.05.5 will result in a landscape and vegetative cover that is equal to or better than the premining condition for rangeland use that currently exists in the area.

4.16.2 Determining Use of Land

The premining land uses for the mine plan and adjacent areas are shown on the Land Use Map (Map 17). The narrative describing the land use of the permit area is presented under Section 2.04.3. The proposed postmining land use will involve the restoration of the premining land use of rangeland, as described in Section 2.05.5.

4.16.3 Prior to Release of Lands from the Permit Area in Accordance with 3.03.1 (2) (c)

The land use of rangeland will be restored in a timely manner as outlined in Section 2.05.4. Implementation of the timetables contained therein will assure a contemporaneous reclamation

program. No alternative land uses will be implemented in the reclamation plan set forth under Section 2.05.4.

4.17 AIR RESOURCES PROTECTION

Colowyo employs fugitive dust control measures in all phases of the mining and reclamation activities. The control measures currently used are set forth in detail in Section 2.05.6.

The operations at Colowyo are presently regulated under numerous emission permits issued by the Colorado Department of Health, Air Pollution Control Division. Section 2.03.10 identifies the various permits under which Colowyo currently operates. The permits are set forth in Exhibit 8, Air Quality Information.

4.18 PROTECTION OF FISH, WILDLIFE, AND RELATED ENVIRONMENTAL VALUES

As described in Section 2.04.11, no threatened or endangered species have been identified within the active mining operation. Also, no critical habitat for any species is known to exist. Golden Eagle nesting complexes, which are located within the permit area but outside the area to be mined, are described in Section 2.04.11.

Electric power lines and other transmission facilities in the permit area will be constructed in accordance with the guidelines set forth in the environmental criteria for Electric Transmission System by the United States Department of Interior (USDI) and the United States Department of Agriculture (USDA) 1970. Distribution power lines are to be constructed by guidelines set forth in the Rural Electrification Administration (i.e., Rural Utilities Service) 1979 Bulletin 61-10 and will suffice for Rural Utilities Service's current construction guidelines for raptor-safe power line structures. Colowyo's design criteria has been developed in association with the Avian Power Line Interaction Committee's (APLIC) *Suggested Practices for Raptor Protection on Power Lines: "The State of the Art in 1996" (APLIC 1996).* Please refer to the Figure 4.18-1 - Raptor Protection Retrofitting of Existing Power Poles. For structure configurations and retrofitting locations, please refer to Figure 4.18-2 through 4.18-6, and Maps 22A and 22B. The following schedule will be used to update existing power poles with adequate raptor protection in accordance to the guidelines.

As part of Colowyo's Avian Protection Plan effort, EDM examined the distribution structures in July 2002 to identify pole configurations that present a risk to perching raptors and other large birds. EDM also conducted a reconnaissance of the 69kV power lines to record the overall structure configurations and determine if any of these configurations present an electrocution risk to area raptors. Additional transmission and distribution power lines located in and adjacent to the Colowyo Coal Mine are owned and operated by White River Rural Electric Association, Tri-State Generation and Transmission, and Western Area Power Administration. The operation of these lines fall under the jurisdiction of each of these respective utilities and agencies.

Distribution lines (less than 69 kilovolts {kV}) are of lower voltages than transmission lines and, therefore, have reduced hardware and equipment clearances. Depending on the pole configuration,

perching on distribution line poles (particularly by juvenile birds) increases the potential of a bird connecting phase-to-phase or phase-to-ground, which typically results in bird mortalities and often leads to increased power outages. Although most of the 69kV structures examined during the July 2002 field survey were of sufficient clearance for eagles and other raptors, thereby minimizing any electrocution risk, a few 69kV structure configurations were identified that could represent an increased hazard. Two such configurations recorded included Gang Operated Air Brake Switches (GOABS) where the center phase switch was located less than 60 inches from the pole-top ground wire. The second 69kV configuration of concern included structures where the center phase jumper was placed on a crossarm insulator in close proximity to the pole-top ground wire.

Colowyo is responsible for several miles of additional distribution lines on the mine that were not surveyed as part of the July 2002 study. However, these lines are currently de-energized, and the structures are scheduled for long-term removal as the mining operation expands and areas are reclaimed. In addition, a portion of the existing 4160 volt line located along the Taylor Creek drainage traveling south of the Taylor Pump Holding Pond were previously retrofitted to address the potential risk of raptor electrocution.

As described in Section 2.05.6, all disturbed acreage, including roads, has been kept to a minimum by proper planning to reduce impacts to all environmental resources, including impacts on wildlife.

Colowyo's objective of returning the post-mining land use to a rangeland condition capable of supporting the diverse wildlife populations is being approached in several ways. As described in Section 2.04.11, Colowyo initiated efforts to restore wildlife habitats during premine planning and early mining, by conducting an extensive four-year study to assist in determination of the best techniques for revegetating disturbed areas with native species to enhance wildlife habitat.

A habitat improvement program, as described in Section 2.05.6, was initiated in 1975 to offset temporary habitat loss during mining. As described in Section 2.05.4, the reestablishment of herbaceous species, topographic relief, impoundments and limited reestablishment of a shrub component form the integral elements of the reclamation plan.

To date these efforts have proven successful. Herds of Deer and Elk are regularly seen grazing on the reclaimed areas. Rodent and small game populations have reestablished on the reclaimed areas providing a readily available food source for local raptor populations and other predators.

4.19 PROTECTION OF UNDERGROUND MINING

Colowyo will not conduct coal mining closer than 500 feet to any point of either an active or abandoned underground mine. Underground coal mines have been operated in the past as discussed in Section 2.04.4, but their locations were on the-northern side of Streeter Draw well over 500 feet from present Colowyo mining.

The surface mining activities of Colowyo have been designed so as not to endanger any present or future operations of either surface or underground mining operations. As discussed in Section 2.05.3, Colowyo has engineered its mining plan to maximize recovery of coal by current economical surface mining methods.

4.20 SUBSIDENCE CONTROL

Colowyo is conducting a surface coal mining operation. Therefore, the requirements of 4.20 are not applicable to the Colowyo operation.

4.21 COAL EXPLORATION

4.21.1 Scope

This section sets forth performance standards and design requirements for coal exploration, which substantially disturbs the natural land surface.

4.21.2 General Responsibility of Persons Conducting Coal Exploration

Colowyo will comply with the minimum environmental protection performance standards under this Section as discussed below and in Section 2.02.

Colowyo plans to conduct coal exploration which may affect the natural land surface and during which less than 250 tons of coal will be removed. As stated in Section 2.02, Colowyo will not conduct coal exploration during which more than 250 tons of coal are removed.

4.21.3 Required Documents

As stated in Section 2.02, Colowyo will not conduct coal exploration during which more than 250 tons of coal are removed.

4.21.4 Performance Standards

No habitats of unique value for fish, wildlife, and other related environmental values and areas were identified in Section 2.05.6(2)(b), which could be affected by coal exploration work.

During any coal exploration, Colowyo will obtain any supportive information that might be necessary for proper mining, reclamation and environmental control.

All vehicular traffic will be limited to established, graded roads at all times, except in cases where limited off road travel will be less damaging to vegetation and the ground surface than the construction of a new road. Travel will be confined to graded surface roads during periods when excessive damage to vegetation or rutting of the land surface could occur.

Any new road to be built for the exploration project will be utilized for less than six months and thus will be constructed as a light use road according to the provisions of Section 4.03.3.

Any existing roads in the area will be altered for exploration purposes only so far as they may be widened or smoothed to accommodate exploration equipment and in accordance with all applicable Federal, State and local requirements. Water bars and ditches will be added where

appropriate. All existing roads to be used during the exploration program will be left in the condition that is superior to their pre-exploration condition.

Any drill sites that are no longer needed for exploration or environmental monitoring (such as piezometer wells) will be returned to their approximate original contour promptly after all coal exploration activities are completed.

Topsoil will be removed prior to construction of any drill site when necessary. After the site is recontoured, topsoil will be redistributed over the surface in a manner that will provide for successful reclamation. If any exploration drilling is to be conducted in an area directly ahead of the mining operations where topsoil has been removed, the site will be mined through and reclaimed in accordance with Section 2.05.4.

Revegetation of drill sites and roads will be performed by drill or by broadcast seeding with a variety of native and introduced species during the late fall or early spring to produce a satisfactory vegetative cover capable of stabilizing the soil surface. The affected areas will be seeded according to the mixture described in Section 2.02.

In no case will any ephemeral, intermittent or perennial stream be diverted during the exploration activities. Overland flow will be diverted, if necessary, so that erosion is controlled by ditches, water bars, sedimentation ponds or other methods capable of controlling erosion and minimizing additional contributions of suspended solids in the stream flow outside the exploration area. Such diversions will be done in a manner that complies with all other applicable Federal and State requirements.

Upon completion of the hole, cuttings from the drill hole will be placed in the drill hole and the site reclaimed. Some holes maybe left open and completed with piezometers, if they are needed for ground water monitoring. The requirements of Section 4.07 will be met for each exploration hole. See Section 2.04.4, Sealing of Exploration and Mine Holes, for further information concerning reclamation of exploration holes.

With the exception of possible piezometers to be installed in some of the drill holes for groundwater quality and quantity monitoring, all equipment related to the exploration program will be removed from the exploration area when it is no longer needed for exploration.

During the exploration program, minimization of surface disturbance and prompt reclamation practices will be utilized to eliminate sedimentation problems and any disturbance of the present hydrologic balance. Water bars and ditches will be built wherever needed. In addition, water from drilling operations will be contained on the drill site and allowed to evaporate thus eliminating any off-site disturbance.

As discussed under Section 2.04.6, no acid-forming materials have been found to exist within the mine plan or adjacent area.

A compilation of 1989-1997 Permit Area Coal Resource Confirmation/Exploration/Monitor wells and Transfer of Permit Area Exploration Liability to NOI-X-95-109-05 status can be found in Exhibit 6, Geological Information an Item #5.

Exploration taking place inside and outside of the permit area will be handled through the Notice of Intent (NOI) procedures. Se the appropriate NOI for details for each program.

With the approval of Technical revision 50, all exploration holes located within the permit boundary are transferred to NOI X-95-109-5 and are managed under Coal Exploration procedures.

Wells drilled as an integral part of water monitoring plans identified in the PAP (Permit C-81-019) and water supply wells (for mining purposes) are managed under this Permit C-81-019.

4.21.5 Requirements for a Permit

No coal will be removed or extracted by the proposed coal exploration other than occasional spot coring. No coal will be removed or extracted for commercial sale during coal exploration.

4.22 CONCURRENT SURFACE AND UNDERGROUND MINING

Colowyo does not currently plan to have concurrent surface or underground mining activities; therefore, the requirements of this Section are not applicable to this permit application.

4.23 AUGER AND HIGHWALL MINING

4.23.1 Scope

This Section establishes environmental protection performance standards in addition to those applicable performance standards in Rule 4, to prevent any unnecessary loss of coal reserves and to prevent adverse environmental effects from auger mining incident to surface mining activities.

4.23.3 Performance Standards

4.23.4 Maximize Recoverability of Mineral Reserves

Colowyo maximize recoverability of the mineral resources through highwall mining in the East, West, and Section 16 Pits. Please see Map 23 for the historically mined areas. Also please see Section 4.23.2 in Volume 12 and 15 for additional information pertaining to the South Taylor and Collom Pit.

4.23.5 Undisturbed Areas of Coal Shall Be Left in Unmined Sections

As for the CDRMS Rules (Rules) requirement for leaving undisturbed areas of coal in unmined sections, Colowyo contends that this application of the Rules does not apply since the seams to be highwall mined are being accessed from active surface pits that by this Permit and other applicable sections of the Rules are required to be backfilled and fully reclaimed. Hence should undisturbed

barrier areas of coal be left for some future access, these potential portal areas would be inaccessible for future generations because they would be buried under the pit backfill. Additionally and importantly, as discussed above, due to the many geological reasons, there is not economical coal to be recovered from "behind" the areas slated to be highwall mined.

4.23.6 Abandoned or Active Underground Mine Workings

To Colowyo's knowledge, no abandoned or active underground mine workings have ever existed or currently exist in any of the coal seams in the areas proposed to be highwall mined. No highwall mining will be allowed to take place within 500 feet of any abandoned or active underground mining operation.

4.23.7 Surface Mining Activities and Highwall Mining

The highwall mining shall follow the surface coal mining activities in a contemporaneous manner consistent with the applicable requirements of CDRMS Rule 4. Due to active pit progressions and sequencing of mining (in addition to meeting the Permit requirements for contemporaneous reclamation), it is required that highwall mining occurs timely if not immediately following conclusion of pit mining activities. Also, as described more fully in 2.06.9(2), the need to backfill, i.e., contemporaneously reclaim the pits, is mandatory for Colowyo in order to build the pit floor from which to work from to mine the successively higher (in the geologic column) coal seam. Hence successful highwall mining is in part dependent upon timely and successful contemporaneous reclamation of the pits.

4.23.8 Prevent Pollution of Surface and Groundwater and to Reduce Fire Hazards

Ground water in the pit or highwall mining holes will not be problematic being that the Colowyo pits are essentially dry (minor perched aquifers with limited seasonal flows) and are located above the first regional aquifer (Trout Creek) by a substantial distance. Ground water flow regimes and the negligible impact that Colowyo's surface mining activities have on ground water as a result of mining these target coal seams/rock interburdens are detailed extensively in Permit Section 2.04.7(1). From this extensive body of data and from experiences to date with mining activities, no toxic forming or acid forming water discharge is anticipated from any of the highwall openings. Should toxic forming or acid forming water discharges be encountered, the opening exhibiting the discharge will be backfilled within 72 hours of completion.

Colowyo will backfill each highwall miner entrance hole within 30 days following coal extraction. All highwall miner entrance holes will be further buried by pit backfill during the normal backfill sequence for the pits to remain in compliance with Rules 4.05.1 and 4.05.2. Ground water hydrologic regimes will be re-established in the backfilled pits with no anticipated detrimental effects from the highwall miner holes.

4.23.9 Division shall prohibit Auger (Highwall Mining) Mining

There is no probable reason to prohibit the highwall mining in light of no anticipated adverse impacts to water quality, fill stability, pit backfilling, increased resource recovery, and highwall

mining is designed for zero subsidence to prevent disturbance or damage to powerlines, buildings, or other surface facilities.

4.23.10 Backfill and Grading Requirements

Highwall mining will be conducted in accordance with the backfilling and grading requirements of 4.14.

4.23.11 Highwall Shall be Eliminated

Highwall mining is proposed to occur in areas previously mined with adequate material on hand to backfill the pits with proper static safety factors for stability to the approved postmining topography thereby eliminating all highwalls. Any minimal spoil material generated by the highwall mining operation will be buried at depth in the pit backfill. All coal seams mined will be adequately covered by pit backfilling in conformance with the permitted PMT and reclamation plan. No remnant highwalls will be left at conclusion of the reclamation activities and no spoil material will be place on any outslopes.

4.24 Operations in Alluvial Valley Floors

The field investigation described in Section 2.04.7 and 2.06.8 resulted in no identification of alluvial valley floors in the general area, which would be adversely affected by mining operations. Therefore, no special performance standards for operations in the alluvial valley floors are applicable to this mining permit application and no protection or remedial measures are proposed for compliance to this Section.

4.25 Operations on Prime Farmlands

Since a negative determination of prime farmland was arrived at using the eligibility requirements established for prime farmland under Section 2.04.12, these performance standards do not apply to the permit application.

4.26 Mountaintop Removal

No mountaintop removal will be conducted by Colowyo.

4.27 Operations on Steep Slopes

No operations at Colowyo will be conducted on steep slopes as defined in this section.

4.28 Coal Processing Plants and Support Facilities not Located at or Near the Mine Site or not Within the Permit Area for the Mine

Colowyo will not use any coal processing plants or support facilities not located at or near the mine sites therefore, this section is not applicable to the permit application.

4.29 In-Situ Processing

Colowyo will conduct no in-situ processing; therefore, this Section is not applicable to the permit application.

4.30 Cessation of Operations

4.30.1 Temporary

If, for any unforeseeable circumstances, temporary cessation of mining and reclamation operations at the Colowyo operation becomes necessary for a period of thirty (30) days or more, Colowyo will submit to the Division a notice of intention to temporarily cease or abandon mining and reclamation activities. This notice will include a statement of the exact number of acres which will have been affected in the permit area prior to temporary cessation, the accomplished, an identification of back filling, regarding, Revegetation, environmental monitoring, and water treatment activities that will continue during temporary cessation.

4.30.2 Permanent

At the permanent conclusion of surface mining operations, Colowyo will close, backfill, or otherwise permanently reclaim all affected areas. The reclamation plans are set forth in Section 2.05.5. The projected postmining topography is set forth on the Postmining Topography Map (Map 19).

Colowyo will remove any equipment, structures, or other facilities at the conclusion of mining activities and will reclaim the affected land.

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2.04.11(1-3) Fish and Wildlife Resources Information

The objectives of this section are to use the most current existing information pertaining to the Collom permit expansion area to:

1) Characterize the fish and wildlife resources and associated habitat types in the Collom permit expansion area, and

2) Assess the potential for impacts to special status fish and wildlife species, including Federally and State Threatened and Endangered species, and State and BLM species of special concern.

These objectives comply with Rule 2.04.11 of the Division's regulations, which is the basis for this section. In addition, the information provided in this section provides a foundation for determining any fish and wildlife mitigation measures that may be necessary for inclusion under Rule 2.05.

Specific tasks that will be addressed in order to meet the objectives of this section include:

- Identify the fish and wildlife species known to occur or potentially occur in the Collom permit expansion area, and describe the general habitat types available in the area;

- Estimate numbers of wildlife species of high interest in or near the expansion area, including mule deer, elk, raptors, Greater Sage-Grouse, and Columbian sharp-tailed grouse;

- Identify and discuss habitat for wildlife species of high interest, including unique habitat features of high value (e.g., water features, cliffs, trees), important seasonal ranges, and migration corridors;

- Evaluate the potential for occurrences of special status species and determine if designated critical habitats exist in the Collom permit expansion area;

- Assess the potential distribution of special status fish and wildlife species and other species of high interest.

The sources used to compile the information in this section on fish and wildlife resources are provided in Section 2.03.3(7).

Volume 1 presents the Colowyo permit information on fish and wildlife resources relative to the existing mine area and surrounding areas. The region around the original Colowyo permit area was surveyed for big game (e.g., elk, mule deer), small mammals, and breeding birds to provide both site-specific and regional information on these resources. Volume 1 provides the results of these surveys, as well as a list of all the fish and wildlife species known to occur or that may potentially occur in the area.

A general assessment of potential wildlife species and their habitat associations in the Collom permit expansion area is given below. Any available GIS data depicting wildlife habitat were acquired from the Colorado Division Park's and Wildlife (CPW) Natural Diversity Information Source (NDIS) website.

In addition to these general assessments, data from surveys conducted for wildlife species of high interest within the Collom permit expansion area are also summarized below. The most current information on mule deer and elk populations in the region was acquired from Jon Wangnild and Darby Finley, biologists at the Meeker office of CPW. In addition, Colowyo's wildlife surveys from 2006 to 2008, and results from the 2006, 2007 surveys are discussed below. The original reports is presented as Exhibit 11 Item 1

and Exhibit 11 Item 2. Colowyo had informal communications with Division staff in 2005, and they deffered to the CPW to evaluate any scope of work for collecting appropriate baseline wildlife monitoring data for this permitting effort. The CPW was consulted early in the process and provided guidance to Colowyo's consultanat Cedar Creek Associates, Inc. with respect to the specific data to be collected, timing and accepted methodologies for data collection, which is how Exhibit 11, Item 2 is presented.

The Cedar Creek surveys focused on species of high interest, and included inventories and monitoring of raptor nests, Greater Sage-Grouse leks, and Columbian sharp-tailed grouse leks. The Wildlife Study Area used by Cedar Creek includes the Collom permit expansion area plus a 2-mile buffer. This area extends from the Axial Basin in the north into the Danforth Hills to the south, with the eastern boundary falling between Wilson Creek and Good Spring Creek, and the western boundary reaching Red Littleton Canyon and Morgan Gulch.

As a result of their review of the Collom Expansion Area Package, as approved under PR-03, CPW drafted a letter on February 15, 2011 and provided input regarding the anticipated impact to the Greater Sage-Grouse, Columbian Sharp-tail grouse, Elk and Deer populations in this area. This information can be found at the end of this section.

Habitat Types and Associated Wildlife Species

Approximately 75 percent of the Collom Vegetation Study Area is composed of two dominant shrubland communities: sagebrush and mountain shrub (Cedar Creek 2006). Other common habitat types include aspen woodland, grassland, juniper scrub, and bottomland types found in drainages and basins. Minor habitat types that encompass 0.5 percent or less of the Vegetation Study Area include disturbed areas, cultivated land, improved pasture, and wetland.

There are many generalist species that may use any of the habitat types within the Collom permit expansion area. These include mammalian predators, such as coyote and red fox, and prey species such as ermine, deer mouse, least chipmunk, long-tailed weasel, desert cottontail, mountain cottontail, porcupine, and striped skunk. The western small-footed myotis may also occur in any of the habitat types in the Collom permit expansion area. Generalist avian species include red-tailed hawk and dusky flycatcher. Sagebrush lizard, western rattlesnake, and midget faded rattlesnake may occur in sagebrush, grasslands, and pinyon-juniper types.

In addition to these generalist species, there are other wildlife species that are predominantly associated with a single habitat type. The following paragraphs discuss potential for species' occurrences within specific habitat types in the Collom expansion area. This assessment primarily focused on birds and mammals of greatest conservation need identified in the Colorado Comprehensive Wildlife Conservation Strategy and Wildlife Action Plans (CWCS/WAP), and on priority bird species identified by Colorado Partners in Flight (PIF).

The sagebrush habitat type supports various species, including species that are sagebrush obligates. In addition to the CWCS/WAP and PIF plans, the Colorado Sagebrush Conservation Assessment and Strategy document was reviewed for additional species known to occur in sagebrush shrublands. Avian species that use sagebrush and occur (or may occur) in the Collom expansion area include songbirds (Brewer's sparrow, brown-headed cowbird, chipping sparrow, horned lark, lark sparrow, loggerhead shrike, mountain bluebird, sage sparrow, sage thrasher) and upland game birds (Columbian sharp-tailed grouse, Greater Sage-Grouse, mourning dove). Sagebrush also provides potential foraging habitat for raptors, such as golden eagle, great horned owl, northern harrier, rough-legged hawk (winter), Swainson's hawk, and turkey vulture. Known or possible mammals in this habitat type include American badger, Merriam's shrew, sagebrush vole, white-tailed jackrabbit, golden-mantled ground squirrel, northern

pocket gopher, and white-tailed prairie dog. In addition, sagebrush provides important winter habitat for elk and mule deer. Pronghorn antelope also use sagebrush, and CPW has delineated pronghorn habitat just to the north of the Collom permit expansion area, in the lower elevations of the Axial Basin. Pronghorn have also been observed within the Colowyo existing permit area.

Mountain shrub habitat in the Collom permit expansion area is dominated by mountain snowberry, bluegrass, and Gambel oak. Other woody plants in this type include chokecherry, serviceberry, and big sagebrush. Avian species that may use mountain shrub habitat in the Collom expansion area include songbirds (American robin, black-capped chickadee, dark-eyed junco, green-tailed towhee, house wren, lazuli bunting, orange-crowned warbler, Stellar's jay, Virginia's warbler), upland game birds (Columbian sharp-tailed grouse), and raptors (Cooper's hawk, sharp-shinned hawk). Possible mammals include little brown myotis and predators such as mountain lion and black bear. Mountain shrub habitat is also important to mule deer for foraging and security cover.

Aspen habitat within the Collom permit expansion area potentially supports avian species such as American robin, black-capped chickadee, hermit thrush, house wren, northern flicker, violet-green swallow, warbling vireo, blue grouse, MacGillivray's warbler, and orange-crowned warbler. Various forest raptor species such as northern goshawk, Cooper's hawks, and sharp-shinned hawk may breed in this habitat type. In addition, aspen forests provide important thermal cover, security cover, and foraging habitat for both elk and mule deer. Potential predators in this habitat include mountain lion, black bear, and bobcat. Other possible mammal species include silver-haired bat and long-tailed vole.

In addition to the CWCS/WAP and PIF plans, the Conservation Plan for Grassland Species in Colorado was reviewed for wildlife species known to occur in grasslands of western Colorado. Avian species that may be found in grasslands in the area include black rosy-finch (winter), bobolink, brown-headed cowbird, horned lark, loggerhead shrike, mountain bluebird, mountain plover, vesper sparrow, Columbian sharp-tailed grouse, and mourning dove. Grasslands also provide potential foraging and/or breeding habitat for many open-country raptor species, such as American kestrel, ferruginous hawk, golden eagle, great horned owl, northern harrier, prairie falcon, rough-legged hawk (winter), short-eared owl, Swainson's hawk, and turkey vulture. Known or possible mammal species include American badger, white-tailed jackrabbit, thirteen-lined ground squirrel, northern pocket gopher, and white-tailed prairie dog. Elk and deer heavily use grasslands for foraging. A few pronghorn antelope have also been observed in the grasslands.

Pinyon-juniper woodlands occupy a portion of the Collom permit expansion area. Avian species of interest that may occur in this habitat type include black-throated gray warbler, chipping sparrow, dark-eyed junco, gray flycatcher, gray vireo, hermit thrush, Lewis's woodpecker, orange-crowned warbler, pinyon jay, and Virginia's warbler. Mammal species potentially include little brown myotis and predators such as mountain lion and bobcat. Like the aspen habitat, this type provides security habitat for elk and deer.

The bottomland type is an aggregate of various vegetation sub-types that occur in deep soils and mesic conditions within drainages (Cedar Creek 2006). Density of vegetation is greater in bottomland communities than surrounding uplands, even where the vegetation species are the same. Because bottomlands encompass various vegetation sub-types, wildlife species are described only for the wetland subtype since this type has not been described above.

There are limited wetlands in the Collom permit expansion area and they primarily occur along streams. The vegetation ranges from wet meadows within the alluvial deposition areas to heavily vegetated herbaceous strips along the stream banks (Cedar Creek 2006). These areas provide potential habitat for amphibian species, such as western chorus frog and northern leopard frog. Reptile species, such as

western terrestrial garter snake, may occur in and near drainages, and western yellowbelly racer has recently been observed in drainages (Cedar Creek 2006). Mammals, including western jumping mouse and raccoon, may also use drainages. Killdeer and long-billed curlew (migration) are avian species that may use grassy wetlands. Other avian species that may use drainages with woody vegetation include Abert's towhee, American robin, Bell's vireo, black swift, black-throated gray warbler, broad-tailed hummingbird, Gambel's quail, Lewis's woodpecker, Lucy's warbler, MacGillivray's warbler, and yellow warbler. However, it is unlikely the vegetation in the drainages is extensive enough to provide breeding habitat for riparian obligates, such as the yellow-billed cuckoo. Raptors, such as long-eared owl, sharp-shinned hawk, and Cooper's hawk have been documented nesting in box elder trees in these drainages.

There are numerous stock ponds within the Collom permit expansion area that potentially provide open water habitat for waterfowl, wading birds, and shorebirds; however, due to the lack of suitable cover in the majority of these areas, the ponds are not likely used for nesting.

Big Game

Big game is abundant in the Danforth Hills and Axial Basin. Aerial surveys for elk and mule deer are conducted annually by CPW. The results from the most recent surveys are summarized below, in addition to descriptions of seasonal big game habitat within the Collom permit expansion area.

Elk - Elk within the Collom permit expansion area are part of the White River herd as defined by CPW. The total herd population was estimated as 38,000 animals in 2005, and represents the largest elk herd in Colorado (GSGWG 2008). The population of the White River elk herd has grown steadily beginning in the early 1980s, and CPW has been attempting to reduce the herd size. As a result, the herd exhibited a declining trend from 2001 to 2005, though the population remained well within the management goal of 32,000 to 39,000 animals in 2005 (GSGWG 2008).

A five-year average of annual aerial winter counts (January 2004 to January 2008) resulted in a population estimate of approximately 500 elk located specifically in the Collom Gulch area (D.Finley, CDOW, personal communication). This average includes counts from both severe and mild winters, and should not be considered a total count of the elk that winter in the area at any specific time. Elk abundance and distribution in this region can vary dramatically depending on the severity of the winter.

Elk seasonal ranges shown on Map 13B (Sheet 1) include winter concentration areas, production areas, and areas that resident elk may use year-round. The 2008 GIS data from CPW indicate that the Colowyo revised permit area (i.e., existing permit plus Collom expansion) is both summer and winter range for elk (not shown on the map because the entire area is included at the 1:2000 scale). Resident range is located on the west side of the Colowyo revised permit area. Elk production areas are also located in the western portion as well as in a small area in the southern portion of the Colowyo revised permit area. There were no summer concentration areas mapped by CPW but there are areas of winter concentrations in the northern portion in the Colowyo revised permit area. Seasonal use of the Collom permit expansion area would be dependent on snow levels, which vary from year to year. The larger geographic region from the Danforth Hills to the Axial Basin is considered an elk migration area. Various migration pathways are also shown on Map 13B (Sheet 1). GIS data indicate Highway 13 is considered an elk highway crossing by CDOW.

Mining activities in the Collom permit expansion area are not expected to limit habitat due to the relatively small area of impact and the abundance of suitable existing and reclaimed habitat in the surrounding area. Elk are known to heavily use areas of the existing mine that have been reclaimed as grasslands, particularly in the spring. Cedar Creek (2006) noted elk wallows in most of the dense aspen

stands in the area. For further detail on elk habitat use and browse use, see the original Colowyo permit document (Volume 1).

Mule Deer - Mule deer within the Collom permit expansion area are part of the White River mule deer herd, which is the largest mule deer herd in Colorado. The total herd population was estimated as 106,000 animals in 2005 (GSGWG 2008). The herd population exhibited an increasing trend from 2001 to 2005, and was well above the management goal of 67,500 animals.

A five-year average of annual aerial winter counts (December 2003 to December 2007) resulted in a population estimate of approximately 300 mule deer located specifically in the Collom Gulch area (D.Finley, CDOW, personal communication). This average includes counts from both severe and mild winters, and should not be considered a total count of the deer that winter in the area at any specific time. Based on the CPW estimates, fewer mule deer winter in the area compared to elk. However, like elk, deer abundance and distribution in this region can vary dramatically year-to-year depending on the severity of the winter.

Four types of mule deer range occur within the Colowyo revised permit area (i.e., Colowyo existing permit area plus the Collom expansion area), as described below. All of the Colowyo revised permit area is mule deer summer range with portions of the area also being important areas for winter range. Mule deer seasonal ranges shown on Map 13B (Sheet 2) include areas delineated as various winter habitats - general winter range as well as critical and severe winter range. The 2008 GIS data from CPW indicate that the Colowyo revised permit area is summer habitat for mule deer (not shown on the map because the entire area is included at the 1:2000 scale). Mule deer critical winter range is located on the northern portion of the Colowyo revised permit area and severe winter range occurs across the eastern portion of the Colowyo revised permit area. CPW considers the eastern edge of the Colowyo revised permit area to be severe winter range. Seasonal use of the Collom permit expansion area would be dependent on snow levels, which vary from year to year. There are no major mule deer migration corridors in the Colowyo revised permit area, but there is one area to the northeast. Unlike elk, mule deer do not concentrate in particular areas when fawning; therefore no production habitat is delineated. GIS data indicate Highway 13 is considered a deer highway crossing by CPW.

Mule deer use the area in and around the existing Colowyo permit area and the Collom expansion area year-round, though use of sites in winter is dependent on snow depths. South-facing slopes with sagebrush are more likely to be used in winter. Deer are known to heavily use previously mined areas that have been reclaimed as grasslands. For further detail on habitat use and browse use, see the original Colowyo permit document Volume 1.

Birds

Cedar Creek conducted baseline avian surveys in and around the Collom permit expansion area. The avian surveys were focused on raptors, Greater Sage-Grouse, and Columbian sharp-tailed grouse. The results from these surveys are summarized below.

Raptors – Based on two years of field surveys conducted in spring and summer seasons, seven raptor species have been documented nesting within the Wildlife Study Area. These include long-eared owl, great horned owl, Cooper's hawk, golden eagle, red-tailed hawk, sharp-shinned hawk, and turkey vulture (Cedar Creek 2006 and 2007). In addition, prairie falcon and Swainson's hawk are suspected to have historically nested in the area based on nest site characteristics, though no birds were observed.

Surveys in 2006 and 2007 documented 68 possible raptor nest sites within the Collom Wildlife Study Area (Table 2.04.11-16). There were 77 individual nests (i.e., one nest site may have multiple nests).

The majority of nest sites were known or suspected to have been built by golden eagle and red-tailed hawk. The majority of nest sites were inactive in both years of surveys, with only 15 out of 68 sites being occupied in at least one year (Table 2.04.11-17). Twelve nest sites were active in 2006, four of which were used by golden eagles, four by long-eared owls, and one each by great horned owl, Cooper's hawk, red-tailed hawk, and turkey vulture. Six nest sites were active in 2007, three of which were used by golden eagles, two by red-tailed hawks, and one by a long-eared owl. Four nest sites (three golden eagle and one red-tailed hawk) were active in both years.

Raptor nesting in the Wildlife Study Area occurred in rock outcrop and trees along drainages (Map 15B Sheet 1 and Table 2.04.11-17). The aspen forest in the higher elevations of the Wildlife Study Area (approximately the southern one-third of the study area) could also support nesting by forest dwelling raptors. However, due to snow conditions these areas were not surveyed in the spring seasons. Furthermore, summer surveys in the aspen forest may not have adequately identified nests due to the decreased ability to detect nests when trees have their leaves.

Thirty-six nest sites were located within the Collom permit expansion area. Eleven of these nests were active in 2006 and/or 2007, including one golden eagle nest (Table 2.04.11-17). Eight nest sites within Little Collom Gulch would be north of the temporaty spoil pile and sediment ponds (Map 15B Sheet 1). Two of these were occupied in at least one year: Nest 33 used by Cooper's hawk in 2006 but not 2007, and Nest 51 used by Long-eared owl in 2006 but not 2007. Both nests were located in box elder trees.

Greater Sage-Grouse – The largest number of Greater Sage-Grouse in Colorado occur in the northwestern portion of the state, with Moffat County supporting the majority of breeding populations within the region (Northwest Colorado Greater Sage-Grouse Working Group [GSGWG] 2008). The population in northwest Colorado exhibited an increasing trend from 1997-2005. Overall, sage grouse populations in Colorado have been increasing and there has been no dramatic decline since the 1960s. Braun (1995) determined that sage grouse populations in Moffat and Rio Blanco counties are secure. In general, sage grouse use of reclaimed mine areas in Colorado has been slow to develop because of the species reliance on big sagebrush, which is difficult to establish in reclamation efforts (GSGWG 2008).

GIS data (CDOW 2008) indicate Greater Sage-Grouse production areas across the northern two-thirds of the Colowyo revised permit area (i.e., existing permit area plus Collom expansion), and brooding habitat occurs in the northwest portion of the area and a small area in the northeastern corner (Map 15B Sheet 2). Winter sage grouse range occurs across the northern and northwestern portion of the Colowyo revised permit area, and severe winter range is delineated to the north.

Nine Greater Sage-Grouse leks have been documented in the Collom Wildlife Study Area (Map 15B Sheet 2). Three of these leks were active (i.e., at least one sage-grouse present) in both 2006 and 2007, including SG7, Morgan 2A, and Morgan 3. Abundance of grouse at these leks was substantially higher compared to the other leks that were surveyed. Two sage-grouse leks were active only in 2007 and abundance was low (five or fewer grouse). Four leks were inactive both years (Cedar Creek 2006, 2007).

In 2006, abundance at active leks ranged from one sage-grouse (one male, no females) at the Morgan-3 lek, up to 31 sage-grouse (25 males, six females) at the SG7 lek (Table 2.04.11-18). In 2007, abundance at active leks ranged from two sage-grouse (2 males, no females) at the SG4 and SG8-Upper Morgan leks, up to 45 sage-grouse (42 males, 3 females) at the Morgan-2A lek. Abundance appeared to fluctuate among years; however, only one site visit was made each year. Therefore, this variation in counts could be due to sampling variation rather than actual changes in abundance.

Four sage grouse leks were located within the Collom permit expansion area (2 were active) (Table 2.04.11-18). Leks SG3 and SG4 would be approximately 0.6 miles or greater from mining disturbances

(Map 15B Sheet 2). SG3 was inactive in both 2006 and 2007. No grouse were observed at SG4 in 2006, and two males were observed at SG4 in 2007.

Columbian Sharp-tailed Grouse – Columbian sharp-tailed grouse populations in Colorado are healthy compared to other portions of their range. Revegetation and reclamation of mining disturbance may increase attractiveness to sharp-tailed grouse. For example, in Routt County, numbers of sharp-tailed grouse have increased in areas of mine reclamation due to the use of diverse seed mixtures containing grasses, forbs, and shrubs (GSGWG 2008).
GIS data (CDOW 2008) indicate that Columbian sharp-tailed grouse production areas occur in the central and western portion of the Colowyo revised permit area (i.e., existing permit area plus Collom expansion) (Map 15B Sheet 3). Except for the southern tips, most of the Colowyo revised permit area is sharp-tailed grouse winter habitat.

Ten Columbian sharp-tailed grouse leks have been documented in the Collom Wildlife Study Area. Five of these leks were active in both 2006 and 2007, two were active only in 2006, one was active only in 2007, and two were inactive in both years (Cedar Creek 2006, 2007). In 2006, abundance at active leks ranged from three sharp-tailed grouse at STLek1 (one male, two unknown sex) and STLek2 (two males, one unknown sex) up to 37 at the Burn lek. In 2007, abundance at active leks ranged from five sharp-tailed grouse (five males, no females) at STLek3 up to 14 sharp-tailed grouse (12 males, two females) at the Burn lek. Abundance appeared to fluctuate among years; however, only one site visit was made each year. Therefore, this variation in counts could be due to sampling variation rather than actual changes in abundance.

Seven sharp-tailed grouse leks were within the Collom permit expansion area (Table 2.04.11-18). Leks ST1 and ST2 would be within or near mining disturbance at Little Collom X (Map 15B Sheet 3). These leks were active in 2006 with three grouse observed at each lek; however, neither was active in 2007.

Fish

Fish in the area would be limited to Wilson Creek. Collom Gulch and Jubb Creek flows, also perenneial streams, tend to be low flows expect during precipitation events and are not a likely to support a fishery. The CPW has not classified Wilson Creek for fisheries, but it is expected to contain similar fish species as Good Spring Creek located to the east of the expansion area. Good Spring Creek has been classified by the CDOW as a non-fishery stream.

Surface mining of the Collom expansion area may result in minor water depletions from the Yampa River, which would have the potential to impact habitat for endangered fish in the Colorado River Basin. The extent of expected water depletions is described in the following section. As the estimated additional depletion resulting from mining activities in the Collom expansion area is less than 100 acre-feet, initiation of consultation with the U.S. Fish and Wildlife Service would not be needed to determine any necessary mitigation measures.

Specific input from CDOW February 15, 2011 letter regarding Greater Sage-Grouse, Columbian Sharp-tail grouse, Elk and Deer populations in the Collom Expansion Area. This is presented as historical information from PR-03, as additional mitigation measures have been deemed necessary by CPW. Please see Section 2.05.6(2) for additional information.

Greater Sage-Grouse (GSG): Currently, the Axial Basin (including the Collom Pit Area) is mapped as core range for sage grouse. Greater sage grouse use a much larger area for their life cycle and will be adversely affected by this action. The birds that are utilizing the established leks on the open ridge tops spend the spring, summer and fall there and migrate to the lower elevations of the basin for winter. Many

birds that strut and nest in the basin utilize the open ridge tops for the summer and fall. Therefore, there is significant movement of GSG to and from the open ridge tops located within the permit and disturbance boundary during the spring, summer and fall months. A majority of the birds leave the ridge tops during the winter months and spend that time in the basin. The Collom expansion will encompass 4 mapped sage grouse leks with two of those leks located within the disturbance boundary. The disturbance boundary will physically displace a significant portion of the GSG population as the traditional summer habitat is removed. There will also be spatial displacement in the areas adjacent to the disturbance area due to continuous activity (noise generation, lights, etc.) of the mining operation.

Actual acreage impact to GSG in the disturbance boundary:
-Core range: 2132.74
-Lek areas: 511.36
-Production areas: 2132.74

Actual acreage impact to GSG within the permit boundary:
-Core range: 14860.30 acres
-Lek areas: 1777.59 acres
-Production areas: 16747.12 acres

Columbian Sharp-tail grouse (CSG): Although less in number to GSG, there is a healthy population of CSG in this area. Columbian sharp-tail grouse spend their entire life cycle within the Collom permit area. CSG breed and raise young within the sagebrush and grassland habitats found on the open ridges on the north slope of the Danforth Hills, including the Collom boundary. In the winter, CSG move up in elevation and utilize the mountain shrub and (to a lesser extent) aspen vegetation communities the loss of habitat, as well as the ancillary disturbance associated with mining, will have an adverse affect and displace these birds.

Actual acreage impact to CSG in the disturbance boundary:
-Core range: 0 acres
-Lek areas: 169.84 acres
-Production areas: 1420.47

Actual acreage impact to CSG in the permit boundary:
-Core range: 0 acres
-Lek areas: 2474.81 acres
-Production areas: 8031.43

Elk: A significant number of elk utilize this entire region. The Collom expansion is within an elk migration corridor and elk production area. Thousands of elk migrate through this area from summer ranges across the White River National Forest to winter ranges in the Axial Basin, Crooked Wash, and Maybell areas. Approximately 500-1500 elk utilize this area in the Danforth Hills as a production area and to raise their calves through the summer. The number of elk wintering in this area varies depending on winter conditions; however, thousands of elk consistently migrate through this area on an annual basis.

Actual acreage impact to elk in the disturbance boundary:
-Production area: 562.38 acres
-Winter Concentration area: 1006.81 acres

Actual acreage impact to elk in the permit boundary:
-Production area: 3602.17 acres
-Winter Concentration area: 11386.43 acres

-Migration Corridor: 17.56 acres

Mule Deer: The Collom expansion is mapped mule deer critical winter range. Wintering deer rely heavily upon the browse species like sage brush, serviceberry, and oakbrush found on the open, south facing slopes as well as the ridge tops and bottoms. Deer are typically not as adaptable to disturbances as elk and therefore will be more adversely impacted by this action.

Actual acreage impact to mule deer in the disturbance boundary:
-Winter concentration area: 1167.66 acres

Actual acreage impact to mule deer in the permit boundary:
-Migration corridor: 1861.68 acres
-Winter Concentration area: 16170.37

2.04.11(4)Threatened and Endangered Wildlife Species

Please see Section 2.04.11 in Volume 1 for threaten and endangered wildlife species discussion.

2.04.11 (5)Threatened and Endangered Plant Species

Please see Section 2.04.11 in Volume 1 for threaten and endangered plant species discussion.

2.04.12 Prime Farmland Investigation

In order to determine the presence of potential prime farmlands within the permit area, a reconnaissance inspection was conducted to determine if any prime farmland was present in those areas to be disturbed by surface operations or facilities. Results of the investigation indicate that all of the area to be disturbed by surface operations or facilities can be excluded as prime farmland, since the land has not historically been used as cropland. This conclusion is based upon consultation with the local USDA/NRCS office. Based also on soil-survey information supplied by the Soil Conservation Service, no soil series encountered on the area have been designated as soil mapping units applicable as prime farmland. Please refer to the materials located in Volume 19, Exhibit 9, Item 9 for copies of the relevant correspondence.

Based upon the soil survey conducted by the U.S. Soil Conservation Service, subsequent interpretation of that survey by the SCS, and the PR-03 findings document produced by the Division, a negative determination for the prime farmland within the permit area has been made.

2.04.13 Annual Reclamation Report

Please see Section 2.04.13 in Volume 1.

2.05 OPERATION AND RECLAMATION PLANS

2.05.1 Objectives

The planned operations and reclamation will be similar to those presented in Volume 1, Section 2.05. Operational changes and information specific to the Collom Pit within the Collom mining area are described in the following sections of this permit revision application.

2.05.2 Operation Plan - Estimated Area for Life of Operation

Information regarding the permit term is delineated in Section 2.01.5. Information for the operation plan is delineated in Section 2.05.3. Likewise, for purposes of this application, the permit area identifies the area for the life of the mine

Colowyo will employ detailed and current engineering designs for all surface mining activities in order to maximize coal recovery. The open pit mining technique minimizes or eliminates coal rib losses and coal fenders. The mining operations described in Section 2.05.3 are designed for maximum coal recovery.

2.05.3 (1) Operation Plan – Production Methods

Colowyo has selected its mining procedures on the basis of information from numerous exploration drill holes which penetrated the overburden, the interburden, and the coal seams. Each phase of mining has been carefully scheduled so that all equipment can be operated in situations suitable to their design capabilities. The overall operation plan is designed to flow logically from topsoil removal through reclamation. The plan is designed to maximize coal recovery and minimize environmental disturbances. Colowyo's existing operation plan is described in detail within Volume 1, Section 2.05.3.

The locations of the areas to be mined are shown on the Mine Plan – Collom Map (Map 23B). Topsoil removal schedules and stockpile locations are delineated on the Topsoil Handling – Collom Map, (Map 28C). The amounts of topsoil to be removed and replaced are included in Table 2.04.9-16, Topsoil Mass Balance – Collom Mine Area. Topsoil will be removed from an area primarily during the summer and fall months to allow for one year of mining advance. A buffer zone, with topsoil removed, will be left between the undisturbed area and the crest of the pit. Additional information on topsoil handling is presented in Section 2.05.3 (5).

The area to be mined within the Collom Pit covers an area of two long ridge lines at about 7900 feet in elevation which is bisected by a 100 to 200 feet deep valley formed by the stream channel of Little Collom Gulch. Ultimately the Collom Pit will cover 880 acres and will be 600 feet deep in places.

Seams to be mined in the Collom Pit include the Y, X, A, B, C, E, F, and G. The lowermost seam planned for development is the G_{ab}. As shown on the geologic cross-sections presented in Figure 2.04.6, all of the coal seams to be mined are dipping at approximately 8 percent to the northeast. Cross section locations are shown on Map 11B.

Coal production from the Collom Pit will build from about 1.4 million tons in 2016 up to about 4.8 million tons in 2021 and will remain around 5 millions tons per year thereafter. A total overburden/interburden volume of 548,357,000 bank cubic yards (bcy) and coal tonnage of 76,461,100 tons estimated to be generated and produced, respectively, from the Collom Pit. Overall strip ratio for the Collom Pit is approximately 7 bcy per ton. Normal bench dimensions and heights as described in the ground control plan will be used. Table 2.05.2-3 presents the estimated yearly production.

A general description of the initiation of mining activities in the Collom Pit is described below:

Sediment Control System Construction:

To begin with, Colowyo will construct some temporary sediment control measures (please see Exhibit 23, Item 7, Part H), while construction of the downstream sediment control ponds and perimeter ditches around the temporary spoil pile are being constructed in order to establish sediment control in the area. (See drawings Exh. 7-23, Figure C4 and Exh. 7-23, Figure C9 for location and layout of the sediment control ponds.)

Collom Pit and Temporary Spoil Pile:

Topsoil stripping will commence for the initial box cut area and temporary spoil pile once the temporary sediment control measure area constructed. These areas are depicted on Map 23B. Construction of the temporary spoil pile underdrain will then commence in the valley bottom progressing upstream from the southernmost limit of the temporary spoil pile and progressing downstream toward the final toe of the temporaroy spoil pile. (See profile A-A' on Map 29C). Initial construction of the toe of the temporary spoil pile (northern extent) will commence concurrently with boxcut development.

For development of the intial box cut of the Collom Pit, Colowyo will utilize truck/shovel techniques. Mining will be conducted in an up-dip direction. (north to south). Please refer to Table 2.05.6-5 for specific volumetric information on overburden and coal including swell factor effects.

Please refer to Volume 1, Section 2.05.3 for blasting procedures and sequencing information applicable to the Collom expansion area activities. Please also refer to Section 4.08 of this package for additional information.

Once the overburden is sufficiently fragmented to allow for efficient removal and loading, overburden will be loaded and transported to the temporary out-of-pit spoil stockpile or to adjoining mined-out areas within the pit. After removal of the overburden, the coal seams will be exposed. As the coal seams are exposed, they will be cleaned using auxiliary equipment, then either drilled and shot with explosives, or ripped to prepare the coal for loading and removal.

When explosives are needed, the drilling will be performed by an auger drill. The drill hole pattern is generally spaced approximately 12 feet by 12 feet, though dependent upon the actual coal seam thickness. Drill holes will be loaded with either ANFO or a waterproof explosive (if the holes are wet).

Once the coal has been prepared for loading by blasting or ripping, a rubber-tired front-end loader or excavator will load the coal into haulage trucks. Following loading, these haulage trucks will transport the coal along in pit haulage routes to the primary crusher located just outside of the pit, as shown on Map 25D (Collom Haul Roads). Coal from the primary crusher will be loaded into trucks and transported on a paved haulage road (See Map 25E – Collom Haul Road, Sheets 1-4) to the coal crushing and load-out facility at the Colowyo permit area as shown on the Structures and Facilities Map (Volume 8, Map 22). Details of the coal crushing and load-out facilities are included in Volume 1, Section 2.05.3 under the heading of Mine Facilities.

As the temporary overburden stockpile is constructed, best management practices to reduce sediment production and excess dust impacts to adjoining areas will be implemented. Interim reclamation and/or dust suppression chemcials maybe utilized to impacts, if determined to be necessary.

As soon as possible after the coal is removed from the mining area and sufficient room is available for back-filling, reclamation begins. In general, rough backfilling is completed by the overburden trucks and bulldozers. Final grading will be performed to recreate a post mining topographic expression that is similar to the pre-mining topography. Moderation of some existing topographical expressions is anticipated to facilitate the stability of the reclaimed land surface; however, this is not anticipated to significantly alter the pre-mining topographical expression. Topsoil placement will be done in a manner that reduces erosion and provides a surface for topsoil that minimizes slippage. At the completion of the final grading, topsoil will be redistributed over the regraded spoil and revegetated in accordance with Section 2.05.4. Typically, after completion of topsoil replacement on 3H:1V (horizontal to vertical) slopes, a dozer will construct a drainage control bench or contour furrows, where necessary, to slow water flow on the longer slopes and minimize erosion.

Other surface treatments are also described in Section 2.05.4. A list of the equipment anticipated to be used by Colowyo in the Collom permit expansion area to perform the day-to-day operation of coal mining is shown in Table 2.05.3 in Volume 1.

2.05.3 (2) Operation Description

A detailed narrative description of the land to be affected within the Collom area is provided above under the heading Production Methods. The mining plan for Collom is graphically portrayed on the Mine Plan Map (Map 23B).

2.05.3 (3) Mine Facilities

Existing buildings, structures, utility corridors, loadout, other facilities that will support the Collom area are shown in Volume 8, Maps 21 and 22 and are discussed in Volume 1, Section 2.05.03. These facilities will continue to be used on an as needed basis. Development of Collom will require the construction of new facilities closer to the Collom Pit (Map 22B). Development of the Collom permit expansion area anticipates the need for power line, utility lines, water lines, in-pit haulage routes, crusher, and support facilities including an office, maintenance shop, and warehouse. Two haul roads (currently identified on Map 25D as West and East Haul Roads) will lead out of the Collom Pit and lead to temporaory spoil pile and the primary crusher. Coal will be loaded at the primary crusher into haul trucks designed for use on conventional roads and will be transported on a single haul road to the Gossard loadout. This haul road runs northeast out the mining area along the West Fork of Jubb Creek (See Map 25E – Collom Haul Road, Sheets 1-4).

Main Office

An office for the Collom operation is located in Section 36, Township 4 North, Range 94 West. The office will house Colowyo's administration, engineering, environmental, accounting, and payroll departments as mining transitions from the current facilities to Collom. Refer to the Facilities Detail on Map 22B.

Shops, Warehouse Facility

Colowyo will maintain a warehouse, welding shop, wash bay, maintenance shop and fuel storage area at the Collom area located in Section 36, Township 4 North, Range 94 West. Refer to the Plant Facilities Detail on Map 22B.

Mechanical repair work on the mobile mining equipment fleet will be performed at the shop facility and in the field. A welding facility and tire bay is also a part of the shop facility. The warehouse contains an

inventory of equipment parts for use in the comprehensive maintenance program. The warehouse yard (outside fenced storage) also provides storage of the larger parts due to limited covered building space. Employees will have a designated area (before and after their shift) to change either into their work clothes or back into their street clothing. Shower facilities are provided in the complex. Additional structures in the complex include a diesel fueling and gasoline fueling station for both the large mobile mine equipment and the mine pickup truck fleet and a tank farm building. Mobile equipment and employee parking areas are also provided at the complex. A coal stockpile areas shown on Map 22B near the truck dump and retaining wall provide for temporary storage of the coal.

Anaylsis Laboratory, Emergency Vehicle Garage

Coal analysis will be performed in the- laboratory portion of the structure. The remainder of the structure is used for storage of the emergency response vehicles.

Crushing and Loadout Facilities

The coal crushing and loadout facilities include two separate facilities: (1) primary crusher; (2) secondary crusher and train loadout; upon completion of coal production from the South Taylor pit the secondary crusher at the Gossard loadout may be removed.

The primary crusher facility will be located in Section 36, Township 4 North, Range 94 West, as shown on Map 22B. Included in the primary crusher facility are a raw coal stockpile area, a truck dump, a primary crusher, a covered conveyor, a storage bin, and a truck load-out.

Coal will typically be hauled from the pit in rear dump haulage trucks to the primary crusher site. The coal is then dumped directly into the truck dump hopper, or stockpiled. The truck dump hopper will be equipped with dust control spray bars. The coal from the stockpile can also be fed into the hopper by front-end loaders taking from the stockpile. Feeders at the bottom of the truck dump hopper discharge the coal into the primary crusher. Following primary crushing, the coal is discharged onto a conveyor belt which transports the coal to a storage bin. The coal is then gravity discharged into highway trucks and hauled to the secondary crusher facility.

The secondary crusher and train load-out facility is known as the Gossard Loadout and is located in Section 22, Township 4 North, Range 93 West, and is described in Section 2.05.3 in Volume 1.

Explosives Storage Area

The Collom area explosives storage facilities are scheduled to be constructed near the western perimeter of the Facilities area (See Map 22B) and will meet or exceed all MSHA and BATFE regulations. Overall volume of high explosives used by Colowyo collectively while mining activities transition over time from the existing operation to the Collom area exlusively logically dictates the number, capacity and configuration of the Collom facility magazines be similar existing facility to ensure sufficient magazine capacity is available at the time peak utilization of high explosives in the Collom area will occur. This logical approach is also applied to the ammonium nitrate, emulsion and Type V magazine storage area also identified on Map 22B. As these structures contain blasting materials and not high explosives, specific requirements governing their management are different and as such are separated by location from the high explosives storage area.

Loadout

Colowyo's loadout, the Gossard Loadout, is located at the end of the Colowyo's rail line. The only segment of the spur within the permit area is shown on Map 22A, Existing Structures North.

Power Lines

Because Colowyo utilizes electric-powered mining machines power lines will be located in the permit area to supply electricity to the equipment and facilties. The location of the supporting power lines within the Colowyo existing permit area is included in Volume 8, Map 22A. Power lines for the Collom expansion area are shown on the Structures and Facilities map (Map 22B). The 69kV power line that is routed through the permit boundary to the Collomfacilities area will be owned, operated, maintained by White River Electric Assoication (WREA) not Colowyo, and will remain in place to service the area post-mining. Colowyo is the surface landowner that the power line will be routed upon, and for ground disturbances related to WREA's 69 kV power line to the Collom facilties area please see Volume 1 Section 4.12.

Electrical power lines located in the permit area will be constructed in accordance with requirement of Section 4.18 to minimize potential electrical hazards to large raptors.

The major pieces of equipment that will be powered by electricity in the Collom area are shovel(s) and dragline(s). Therefore, during the life of the mine it is necessary to periodically move the existing power line loop to accommodate the advancement of the pit.

Temporary Facitilities Area (Jubb Creek)

During the construction of the primary sediment control structures, Collom haul road and the main Collom facilities area described above, a temporary facitlies area will be constructed at the Jubb Creek entrance directly off of Moffat County Road 32. This temporary facilties area will contain temporary trailers and possibily buildings for construction management and a laydown yard for incoming supplies and materials that will be utilized during construction of the Collom haul road, sediment ponds, and main facilties area. Any trailer or building will be temporary in nature and once this area is no longer necessary to support initial mine development these structures will be removed from the site and reclamation will commence in accordance with Section 2.05.4(1). The sediment control plan for this area can be found in Exhibit 7, Item 23, Part K.

Haul and Access Roads

A haul road was constructed to facilitate mine traffic from the Collom primary crusher to the Gossard load out facility located northeast of the Collom Pit. This approximate 6-mile long haul road was constructed to meet the specifications and standards set forth in Rule 4.03.1 (See Map 25E, Sheets 1-4). The haul road was constructed with a crown, and constructed upon the most stable available slope to minimize erosion. An elevated haul road crossing was installed at Moffat County Road 51 at the request of Moffat County (See Map 25F). This elevated crossing ensures the general public traffic is separated from the mine haul road traffic, and takes Moffat County Road 51 over the top of the Collom Haul Road. An equipment crossing adjacent to the elevated crossing will allow large equipment movement from the Collom mine to the existing operations (See Map 25F).

Overall grade of the Collom Haul Road does not exceed 10H:1V with a horizontal alignment consistent with the existing topography. Ditches, erosion controls, and culverts are used to minimize impacts to

surrounding areas, and all culverts are designed to safely pass peak runoff from a 10 year, 24 hour precipitation event (Please see Exhibit 24, Item 1 –Culverts).

The Collom Haul Road has constructed to meet the applicable haul road regulations as well as internal road design guidelines while minimizing additional disturbed area and preventing environmental damage. The as-built configuration can be found on Map 25E Sheets 1 through 4. The Collom Haul Road has an overall width of approximately 100 feet, with a 28-foot asphalt-running surface as shown on (Map 25E Sheet 1).

Asphalt pavement specifications were based on a 30 year design life with an 18" thick base course (gravel) and 7.0" asphalt thickness. The asphalt installed will support a 50 ton coal haul trucks with axle loads of about 81 psi. Cut slopes have been completed at 0.25H: 1V or less when completed in competent rock. Elsewhere, cut slopes in unconsolidated materials were typically laid back at 2H:1V; however some areas are steeper or shallower based on field conditions encountered during construction (please see Map 25E Sheet 3).

There are two main haul roads that will be built to haul overburden materials from the pit to the temporary overburden stockpile. These are shown on Map 25D and are designated as the East and West Haul Roads. Please see section 4.03.1 for details pertaining to these two haul roads and haul roads that will be constructed within the mining area.

Several access roads have been constructed to support mining operations at the Collom mine. Two access roads were constructed to the Section 25 and 26 sediment ponds, an access road was constructed to access the Collom Haul Road from the Jubb Creek entrance off of Moffat County Road 32, and several temporary access roads were established to support intial mining operations. The locations and as-built configurations for these access roads are provided in Volume 18B, Exhibit 7-23, Part D, Figures D1 through Figure D4.

2.05.3 (4) Operation Plan – Ponds, Impoundments, and Diversions

To control runoff, and protect surface and ground water quality, Colowyo will construct several new sedimentation structures and diversion ditches. All ponds, impoundments, and diversions are designed to meet or exceed the requirements of 2.05.3(4) and 4.05.6. All sediment ponds will be constructed and maintained in accordance with the parameters mentioned in Volume 1, Section 2.05. Impoundments will be inspected quarterly as discussed in Section 4.05.6. Please see Exhibit 23, Item 1 – Geotechnical Report Collom Temporary Spoil Pile and Pond and Exhibit 23, Item 2. Also refer to Exhibit 7, Item 25 – Collom Post Mine Channel Design; Exhibit 7, Item 23, Part C – Collom Pond Design Maps; and Exhibit 7, Item 23 (for information pertaining to diversion channels during mining) for specific designs and locations of these structures.

During the initial facitlites development a stage development of the Section 36, Middle Pond, and Section 25 Pond will occur to avoid the brooding and lekking season for Greater Sage Grouse. This plan can be seen in Exhibit 7, Item 23, Part J.

The sediment ponds will remain in place until such time as the entire disturbance footprint area reporting to these structures is reclaimed and the requirements of Rule 4.05.2(2) are met. The best case scenario for this would be a minimum of 2 years after the last seeding occurs within the affected contributing watershed. Therefore, the earliest anticipated removal of these structures is approxiamtely 2035.

One containment pond (Wilson Storage Pond) is utilized to store water during the initial construction of the Collom Haul Road and Collom Facilities Area. Water is pumped or trucked in from an exisisting

Colowyo held water right and is stored in the Wilson Storage Pond and utilized for dust suppression and other water needs during construction. It is estimated that the Wilson Storage Pond will only be needed for a short period of time (2-3 years) and then it will be reclaimed. The design for this storage pond can be found in Exibit 7, Item 23, Part L.

2.05.3 (5) Topsoil

Prior to any mining related disturbances, topsoil will be removed from planned disturbance areas as discussed in Section 2.05 (*Topsoil Redistribution Plan*) and Section 4.06 (Topsoil) and redistributed or stockpiled as necessary to satisfy the needs of the reclamation timetable.

Topsoil will be removed by bulldozers, loaders or scrapers as described in Section 2.05.3, Production Methods and Equipment.

Topsoil stockpile locations and extent of stripping is presented in Topsoil Handling Map (Map 28C). Topsoil stripping will occur in advance of mining and can be anticipated to occur within the mine plan blocks depicted on Map 23B. The overall life-of-mine topsoil balance is estimated in Table 2.04.9-16. It should be stressed that these yearly figures are estimates and can only be useful as a general guide to topsoil removal or replacement during any given year.

The stockpiling of topsoil will continue until all pit development has progressed to its maximum extent. Areas available for final reclamation prior to mine closure consist primarily of backfilled pit areas. Topsoil to cover these areas will either be direct placed from areas of topsoil removal activities or topsoil will be hauled from the topsoil stockpiles. Direct placement of topsoil will be the preferred method, however, the stockpiled material will be utilized if equipment schedules, weather conditions or other operational factors make direct placement less desirable or less cost effective. After mining and regrading operations have ceased, all stockpiled topsoil will be used to reclaim the remaining pit and other disturbance areas.

Topsoil will be stored in topsoil stockpiles as shown on Map 28C. Stockpiles will be constructed with outside slopes no steeper than 3H:1V. Stockpiles are specifically located to avoid erosion from wind and water and additional compaction or contamination. As can be determined from the Topsoil Handling Map (Map 28C), all stockpiles are located within stable areas. The piles will be protected from wind erosion by planting a perennial mixture as explained in Section 4.06.3 as soon as conditions allow. Proper seasons of planting will be early spring or late fall. In addition to the planted material, a considerable amount of volunteer growth can be expected to grow on all stockpiled topsoil.

External erosion will be controlled through proper location of the stockpiles. No topsoil stockpiles will be placed in a drainage bottom where external erosion might pose a potential threat.

Unnecessary compaction will be avoided by keeping all but essential traffic off the stockpiled areas. In accordance with Rule 4.02.7, topsoil signs will identify topsoil stockpiles. Contamination of the stockpiles will be eliminated by the careful selection of sites that are distant from the areas where actual mining activities are occurring. Drainage ways and areas near spoiling and blasting will be avoided where possible.

2.05.3 (6) Overburden

Additional description of the removal, handling and storage of overburden material within the permit area is described in Section 2.05.3(1). The spoil handling monitoring plan parameters for the operation can be found below.

Overburden Monitoring Program

As discussed in Volume 1, as long as the total percentage does not exceed 15% of the total truck/shovel sequence for each drill hole, suitability should not be an issue based upon the upper overburden seam quality and the expected dilution of lower overburden materials (more likely to exhibit elevated parameter levels) through mixing as part of the logical mining sequencing of overburden and coal removal in the Collom area.

In the following analysis, Colowyo demonstrates the likelihood spoil material placed near the surface of final regraded overburden areas will be unsuitable is low. This demonstration was completed by showing the total percentage of unsuitable material as it relates to the drill hole data shown in Volume 17, Exhibit 6 Item 9 for the sources of the majority of overburden to be generated in the area. A review of the analysis spreadsheet for drill hole C-04-04 shows that the source of all elevated SAR levels (> 15.0) originates from the bottom 121 feet of overburden from the bore hole. Normal overburden haulage and sequencing will ensure this material will not contribute to elevated SAR levels on the reclaimed surface post-mining in the Collom expansion area.

Drill Hole C-04-14

Unsuitability range in feet:

SAR > 15 = 27.6 feet
Se > 0.3 = 7.3 feet
B > 5.0 = 0 feet
Sat <25 or >80 = 45.35 feet
Mo > 1.0 = 0 feet

Total Drill Hole Depth = 354.3 feet

Total Percentage of unsuitable material:

SAR = 27.6 feet/354.3 feet = 7.7900084674%
Se = 7.3 feet/354.3 feet = 2.0606007903%
B = N/A
Sat = 45.35 feet/354.3 feet = 12.799887101%
Mo = N/A

Drill Hole C-04-25

Unsuitability range in feet:

SAR > 15 = 69.6 feet
Se > 0.3 = 15.15 feet
B > 5.0 = 0 feet
Sat <25 or >80 = 83.8 feet
Mo > 1.0 = 0 feet

Total Drill Hole Depth = 639.7 feet

Total Percentage of unsuitable material:

SAR = 69.6 feet/639.7 feet = 10.880100047%
Se = 15.15 feet/639.7 feet = 2.3682976395%
B = N/A
Sat = 83.8 feet/639.7 feet = 13.099890574%
Mo = N/A

Drill Hole C-04-04

Unsuitability range in feet:
SAR > 15 = 111.2 feet
Se > 0.3 = 0 feet
B > 5.0 = 0 feet
Sat <25 or >80 = 68.3 feet
Mo > 1.0 = 0 feet
Total Drill Hole Depth = 663.3 feet

Total Percentage of unsuitable material:
SAR = 111.2 feet/663.3 feet = 16.764661541%
Se = N/A
B = N/A
Sat = 68.3 feet/663.3 feet = 10.296999849%
Mo = N/A

Drill Hole C-04-36

Unsuitability range in feet:
SAR > 15 = 19.9 feet
Se > 0.3 = 5.15 feet
B > 5.0 = 0 feet
Sat <25 or >80 = 85.6 feet
Mo > 1.0 = 0 feet
Total Drill Hole Depth = 610.6 feet

Total Percentage of unsuitable material:
SAR = 19.9 feet/610.6 feet = 3.2590894202%
Se = 5.15 feet/610.6 feet = 0.84343268916%
B = N/A
Sat = 85.6 feet/610.6 feet = 14.018997707%
Mo = N/A

No Special Handling Procedures will be required for the overburden in the Collom Area (please see Section 2.04.6 – Exploration Test Boring Results Summary). It was discussed between the Division of Reclamation, Mining and Safety (DRMS) and Colowyo that suspect levels of the Sodium Adsorption Ration (SAR), Selenium (Se), Boron (B), Saturation % (Sat), and Molybdenum (Mo) need to be addressed in more detail to determine that Special Handling Procedures, that are outside the normal pit operational procedures, will not be needed in the Collom expansion area. Review of the analysis spreadsheets in Exhibit 6, Item 9 demonstrate minimal instances of analyses for pH, electrical conductivity, nitrate as N and Acid-Base potential being outside of the suitable range for the four drill holes analyzed above.

Based on similarities between overburden suitability analysis results in the Colowyo existing permit area and the Collom permit expansion area, and on previous discussions between the Division and Colowyo, suspect levels of Sodium Adsorption Ratio (SAR), Selenium (Se), Boron (B), Saturation percent (Sat), and Molybdenum (Mo) will not need to be addressed in more detail to determine if Special Handling Procedures, that are outside the normal pit operational procedures, will be needed in the Collom area.

Historically, beginning around 1983, Colowyo initiated overburden monitoring in both the pit (truck/shovel materials) and on regraded overburden. See Exhibit 6, Item 4 as described in the associated January 4, 1983 Colowyo memo to Dan Mathews (Divisoin staff at that time), for an overview of this initial program. Starting in 1990, Colowyo eliminated the in-pit sampling program. Sufficient data had

been collected to indicate that all weathered overburden material (ie within ~ 50 feet of the ground surface) was suitable for replacement onto the reclaimed surface prior to topsoil replacement. Three revisions were submitted to the Division and approved on January 24, 1984, August 17, 1983, April 24, 1990, and PR-02 respectively. The following summarizes the requirements of the current regraded overburden (backfill) sampling program and supersedes all previous commitments. It is based on the following limitations of the earlier program.

1. Placing weathered overburden material onto reclamation areas prior to final regarding, and
2. Sampling regraded overburden at a density of one composite surface sample per 5 acres of regraded spoil.

The regrading of overburden is an event that takes place sporadically during the year. Once backfill areas are regraded, but prior to topsoil replacement, the new locations are identified and sampled. A life-of-mine sampling grid has been established on 500-foot centers, and each sample location on the grid corresponds to a letter/number combination as established on the sampling map. Using this grid interval, each sample location represents an area of about 5.7 acres in size. A hand shovel is used to take small, representative surface samples of spoil across the sample area.

Regraded Overburden Suspect Levels:

Parameter	Suspect Level
pH	Less than 5 or greater than 9 standard units
Electrical Conductivity	Greater than 12 millimhos/cm
Sodium Absorption Ratio	Greater than 15

The laboratory results are kept at the mine site. Results of the sampling program are provided in the appropriate Annual Reclamation Report.
The mining sequence for the planned operation is shown on the Mine Plan Map (Map 23B). Cross sections showing the post mining pit backfill are presented on the Pre-Mining and Post-Mining Cross Sections (Map 20C). The temporary overburden stockpile location is presented on Map 23B. The map depicting spoil grading is presented as Map 29B.

The spoil suitability and special handling procedures are described in detail in section 2.05.3(1) of Volume 15. The initial development of the stockpile is anticipated to begin during the year 2018 with the excavation of the initial box cuts and continue over the next five years of operation dependent on production rates. Following this period, mine pit advancement will allow for placement of mined spoil into the original box cut area.

The temporary spoil pile will be used to fill and recontour the final pit sequence in the final three years of mining activities (See Map 29C – Temporary Spoil Pile Design). Out of pit stored spoils will be used in the construction of the post mine topography. Approximately 168 million cubic yards of storage capacity for the temporary spoil stockpile will be needed.

The toe of the fill will be placed at the bottom of the Little Collom Gulch Drainage and the stockpile will eventually extend upward about 600 feet in thickness to an elevation of 7000. The stockpile will remain in place until the last few years of mining and will have a life equal to the mine plan (Map 23B) depending on production rates. As such, the lower portions of the stockpile will be completed and stabilized before the top is completed. To ensure that a phreatic water surface does not develop during the life of the stockpile, a rock drain will be installed at the base of the fill along its entire length. The

spoilpile will be confined by the valley slopes on both sides. Volume 20, Exhibit 23, Item 1 and Item 2 provide the geotechnical report for the temporary spoil pile.

The temporary overburden stockpile will be constructed in 50 to 100 foot lifts by use of trucks, dozers and loaders. Each lift will be dumped at angle of repose. Maintenance techniques will consist of blading of roads and ramps, along with the use of dust control during active times of operation. During construction a dozer will be used develop and spread the end-dumps created by the trucks, this will be the primary method used to build the temporary overburden stockpile. Sediment control will be implemented to ensure adequate containment of potential runoff throughout the life of the operation.

The area that was disturbed in conjunction with this stockpile will be reclaimed in accordance the procedures outlined in the reclamation plan.

2.05.3 (7) Coal Handling Structures

Please Refer to Volume 1, Section 2.05, Coal Handling Structures and Map 22B.

2.05.3 (8) Coal Mine Waste and Non-Coal Processing Waste

Not applicable. Colowyo uses dry crushing facility for coal preparation; no coal processing waste, as defined in Rule 1.04 “Definitions”, is produced from any part of the mining operations.

2.05.3 (9) Return of Coal Mine Waste to Abandoned Workings

No coal processing waste or coal mine waste as defined in Rule 1.04 “Definitions” is produced from any part of the Colowyo mining operations. Therefore, this section is not applicable.

2.05.4 (1) Reclamation Plan

Please see Volume 1 Section 2.05.4 for a detailed description of the reclamation plan that will be implemented in the Collom area.

2.05.4 (2)(a) Reclamation Timetable

The sequence for reclamation following the mining process is shown on Map 29B (Spoil Grading – Collom). Final reclamation of the Collom Pits will continue through 2033. A large, temporary out of pit stockpile of approximately 168 million cubic yards will be needed during the initial years of mining. As activities progress, a sufficient volume of backfill void will be created, and the Collom Pit should reach a steady state of operation where the advancing overburden face moves southward at the same rate as the advancing backfilling benches. This should occur approximately five years after mining is initiated. At that time, spoil regrading and subsequent reclamation activities will accelerate. The temporary out of pit stockpile is expected to remain in place until the final two years of mining activities. At that time, this material will be needed to fill the final pit void.

2.05.4 (2)(b) Reclamation Costs

The estimate of the cost of reclamation of the operations required to be covered by the performance bond will be found under Rule 3.

2.05.4 (2)(c) Backfilling Plan

Initially a temporary out of pit spoil pile will be created to the north of the Collom Pit and will remain in place until the end of mine life. Then, as mining progresses to the south, overburden material from each successive cut will be backfilled into the previously mined out area and the additional spoil will continue to buildup in previously mined areas. Table 2.05.6-5 presents a mine wide volumetric calculation in support of post mining topography and illustrates that permanent out of pit spoil will not be needed.

The backfilled mining areas will be graded to establish a stable post mine topography that blends into the undisturbed areas outside the mining limits. Please refer to Map 19C. Colowyo will grade all final slopes so that overall grades do not exceed 3H:1 as shown on Map 20C. The final surface as shown on Map 19C will approximate the overall pre-mining character and grades.

Please see Volume 1 Section 2.05.4 for additional information pertaining to backilling operations at Colowyo.

2.05.4 (2)(d) Topsoil Salvage

Prior to any mining-related disturbances in the Collom area, all available topsoil will be removed from the site to be disturbed as discussed in Section 2.05.3, and will be redistributed or stockpiled as necessary to satisfy the needs of the reclamation timetable as described herein.

Topsoil Redistribution Plan

Please see Volume 1 Section 2.05.4 for a detailed discussion on topsoil redistribution plans for the Collom area.

2.05.4 (2)(e) Reclamation Revegetation

Please see Volume 1 Section 2.05.4 for a description of the revegetation process that will be utilized for the Collom area.

2.05.4 (2)(f-h) Disposal, Mine Openings, Water and Air Control

Acid-Forming and Toxic-Forming Materials

No significant acid-forming materials exist within the overburden soil or coal seams to be mined. Therefore, Colowyo will not undertake special handling procedures as described in Section 2:05.3. A detailed description of the chemical characteristics of soils and overburden materials is presented under Sections 2.04.6 and 2.04.9.

For a detailed description of the special handling of spoil material and sampling programs, refer to the Production Methods and Equipment Segment of this section.

Flammable liquids, such as oil and fuel, will be protected from spilling into other areas by earthen, concrete or HDPE lined structures surrounding each storage facility. A spill containment control plan protects against spills and will be available to the Division to review as requested.

All major equipment on the Collom area mine operation will be equipped with portable fire extinguishers or automatic fire suppression systems. The water trucks used for dust suppression at this location could also be used to control most fires.

Sealing of Exploration and In-Pit Mine Drill Holes

Exploration and in-pit mine drill holes which remain open for use as a water supply well or for use as a groundwater monitoring well will be completed following the guidelines of the Colorado Division of Water Resources Water Well Construction Rules (2 CCR402-2, Eff. Date January 1, 2005).When the groundwater monitoring wells are no longer needed or required for any purpose, each well will be eliminated by plugging plugged and/or sealed following the before mention guidelines of the Colorado Duivision of Water Resources.
Plugging procedures utilized for exploration drill holes that will not be mined through during the current Permit term are as follows:

1. Drill holes drilled deeper than the stripping limit (450-500 feet) will be plugged by pumping cement or heavy solids bentonite Plug Gel or chips through the drill stem from the bottom up to within 3 feet of the ground surface.
2. Drill holes shallower than stripping limits (450-500 feet) may be plugged with the ready-mix concrete method instead the method in #1 to within 3 feet of the ground surface.
3. Drill holes with no water or coal zones may be plugged by backfilling with cuttings, and placing a plug ten feet below the ground surface to support a cement plug or bentonite chips to within 3 feet of the ground surface.

For safety considerations, exploration drill holes that will eventually be mined through during the present Permit term need only be covered with wood, plastic or other such material or otherwise bermed to prevent access.

Those holes completed in continuous water bearing zones will be sealed entirely with cement or other suitable sealant to within 3 feet of the ground surface.

Where possible, the sealed holes will be marked. At times reclamation operations will cover up the sealed drill holes and marking of holes will not be possible.

Within 60 days of the abandonment of a drill hole, approved drilling program or when requested by the Division, the following information will be submitted:

a) Location of drill hole as plotted accurately on a topographic map.
b) Depth of drill hole.
c) Surface elevation of drill hole.
d) Intervals where water was encountered during drilling activities.
e) Diameter of drill hole
f) Type of amount of cement or other sealant used.
g) Name of drilling contractor and license number of rig.
h) How the hole was worked.

Exploration taking place inside and outside of the permit area will be handled through the Notice of Intent (NOI) procedures. See the appropriate NOI for details for each program.

Water and Air Quality Control Techniques

Steps to be taken to comply with the Clean Water Act and other applicable water quality laws and regulations and health and safety standards include a comprehensive drainage and sediment control plan described in Section 2.05.3 and Sections 4.05.1 through 4.05.18. With respect to compliance with the Clean Water Act, Colowyo has a discharge permit from the Colorado State Department of Health under the National Pollutant and Discharge Elimination System (NPDES) that will include all new discharge structures constructed for the Collom area expansion. Compliance with this permit will serve to effect compliance with the Clean Water Act and the Colorado Water Quality Control Act.

Colowyo, likewise, operates under several emission permits from the Colorado Department of Health, Air Pollution Control Division. Fugitive dust control measures will be employed as an integral part of the mining and reclamation operations.

Colowyo conducts air quality monitoring at the site in accordance with the requirements of emission permits approved by the Colorado Air Pollution Control Division.

Details of pollution control measures are discussed in section 2.05.6.

2.05.5 Post-Mining Land Uses

Historically, the Collom area has been managed utilizing the principles of multiple-use and can be most accurately described as rangeland and wildlife habitat. Map 17 serves to identify both the pre and post-mine land use designations. The land management staff of Colowyo, the BLM and the Colorado State Land Board fully support Colowyo's approach to the re-establishment and enhancement of multiple-use Rangeland with subcompoents of grazing land and wildlife habitat for the Collom aera. Copies of the correspondence confirming these views have been included in this package and are identified as Figures 2.05.5-1, 2.05.5-2 and 2.05.5-3 respectively. Much of the lower portions of the Collom area receive light to moderate grazing pressure primarily from cattle but also some use by sheep herds. These lower elevations also provide seasonal transition (migratory) habitat for big game, but more importantly offer breeding and brooding habitat to indigenous sage grouse and sharp-tailed grouse populations. The higher elevations receive slight to light grazing pressure from cattle, but more typically light to moderate grazing

pressure from sheep herds. These higher elevations also provide spring and summer habitat for big game, especially local elk herds (Exhibit 10 Item 6).

The post-mine land uses of rangeland with the subcomponents of grazing lands and wildlife habitat for the reclaimed areas in Collom is identical to the pre-mining land use found in the area. No change in land use is expected in the land use categories. Therefore, the post mine land use will be consistent with the historic land use on lands within the Collom area. Please see Section 2.04.3 for additional information regarding the pre-mine land uses in the Collom area.

2.05.6 Mitigation of Impacts of Mining Operations

2.05.6 (1) Air Pollution Contol Plan

Air quality will be protected in accordance with the procedures outlined in Volume 1, Section 2.05.6. Air quality information including the CDPHE air permits are available onsite and can be reviewed by request.

2.05.6 (2) Fish and Wildlife Plan

Procedures specified in the permit document starting in Volume 1, Section 2.05.6 will be followed by Colowyo to ensure minimal impacts to fish and wildlife in the mining area. At the conclusion of mining activities in the Collom area, disturbed lands will be restored in accordance with the reclamation plan. Colowyo is continuously working with the regulatory community to improve habitat restoration practices and minimize disturbances to fish and wildlife. As discussed, the Collom Mining area should not impact any species currently listed as threatened or endangered. Big game animals endemic to this area utilize habitat regionally and reclamation efforts will not target them specifically as multiple off-site habitat improvement initiatives are on-going in cooperation with CPW to improve big game animal habitat. As impacts to sagegrouse habitat are going to be an area of high interest for the foreseeable future, it is prudent and appropriate to manage reclamation activities to mitigate impacts to this species specifically, if not exclusively. Efforts to increase the diversity and forage productivity of reclamation units in both the existing operation and Collom area should provide a great benefit to all species impacted by by the physical disturbance of mining related activites. Livestock grazing and hunting activities will be reinitiated after full bond release has been granted in the future. These tools will assist in further development of an already diverse reclamation landscape post-mining.

Impacts of Mining Operations on Wildlife Resources Within the Mine Plan Area

Impacts to wildlife in the Collom expansion area can be found in Volume 1, Section 2.05.6

Range and Wildlife Management Programs

Range and wildlife management programs are described in Volume 1, Section 2.05.6.

Disturbed Areas

Please refer to Volume 1, Section 2.05.4 for a further description of disturbed acreages within the permit boundary.

Habitat Improvement Program

Please refer to Volume 1, Section 2.05.4 for detailed information on historical habitat improvement programs previously undertaken at Colowyo Mine.

Many individual habitat improvement initiatives have been completed through the efforts of the CPW and the Morgan Creek Ranching for Wildlife operation. These efforts will be continued into the future. The Collom area reclamation plan (collectively Volume 15, Section 2.05.4 and 4.15 and referenced sections from the existing Coloywo permit) specifically target improved shrub establishment over all future reclamation units and focus on the creation of sagegrouse brood rearing habitat that will improve habitat availability and value for other sagebrush obligate species as well.

Sagegrouse Mitigation

During permitting activites for the South Taylor Mining area, regulatory developments convinced Colowyo, CPW and the Colorado Division of Reclamation, Mining and Safety to target sagegrouse brood rearing habitat for future reclamation planning efforts and overall improvement in shrub establishment on reclaimed lands at Colowyo. The result of these efforts rewrote the existing reclamation plan and performance criteria for bond release This plan was developed specifically to create sagegrouse brood rearing habitat, while promoting improved shrub establishment on all reclamation areas. This effort and focus will continue into the future with Collom expansion area reclamation, as the reclamation plan developed for Collom mirrors the principles and innovations applied to the existing mining area.

As stated previously, Colowyo will focus on sagebrush steppe establishment as a function of sagegrouse habitat creation. Sagebrush oblitgate species will also benefit from these efforts as a result. Again, please refer to Map 44 for the location of (potentially impacted) pre-mine sagegrouse lek areas and stockponds that will add value for sagegrouse habitat.

The reclamation plan focus, reclamation seed mixes, bond release criteria, interim revegetation monitoring program and pre-planning of disturbance to avoidance high value habitat (leks) where practical, was initiated in large part to specificically mitigate potential impacts to area sagegrouse populations from mining activity. Consideration was given to all endemic wildlife populations during the creation of the reclamation plan and seed mixes in order to balance multiple uses among different wildlife species, not only on the sagebrush steppe areas, but areas targeted for grassland as well. Justification for the use of specific plant materials for the sagebrush steppe and grassland areas may be found under Section 2.05.4.

Electric power lines located in the permit area will be constructed in accordance with the requirements of Section 4.18 to minimize potential electrical hazards to large raptors.

Vehicle use within the Collom area will be limited to the active mining area and the various support facilities. Off-road vehicle use is kept to a minimum and is usually only authorized for surveying, environmental data collection and monitoring, security, etc. Travel by foot, which causes much more disturbance to wildlife than vehicle traffic, is highly unlikely outside active mining areas.

With regard to sage grouse populations, Colowyo believes that the revegetation metrics presented within this submittal address the concern for negative impacts to area populations and brooding habitat. It is anticipated that sage grouse use of reclaimed lands will return to pre-mining levels, or perhaps return to elevated levels as has been experienced at certain Wyoming mining operations.

Additional Mitigation Measures Recommended By CPW

During the PR-03 permitting process, Colowyo provided the Division with copies of the communications between CPW and Colowyo that identified additional mitigation strategies Colowyo will implemented in order to further offset disturbance in the Collom Expansion Area. The Division received a letter from CPW dated February 15, 2011 regarding wildlife mitigation suggestions based on the disturbance area in

the Collom Expansion Area. Colowyo management staff met with CPW staff on April 29, 2011 to discuss the specific mitigation issues raised by CPW's February 15, 2011 letter to the Division. Colowyo subsequently drafted a letter to CPW on May 4, 2011 clarifying points of agreement and providing specific proposals for additional wildlife mitigation measures. CPW responded to Colowyo's May 4, 2011 letter on May 17, 2011 in a letter further refining their recommendations. Colowyo has agreed to accommodate and is specifically identifying the the following recommendations of Colowyo's May 4, 2011 letter to CPW and CPW May 17, 2011 letter to Colowyo that are not already incorporated/required by Colowyo's revised reclamation plan or other process or statute below:

Greater Sage Grouse:

- Colowyo has offered to evaluate current livestock grazing management practices and multiple stakeholder agreements in the Axial Basin and Morgan Creek Ranching for Wildlife areas for identification of additional opportunities to minimize impacts to and enhancement of habitat of Greater Sage Grouse in the area. Input from CPW will be a helpful component of these evaluations.
- Colowyo will incorporate the utilization of marking flags on perimeter fences in the Collom Expansion area to minimize incidents of Greater Sage Grouse mortality through grouse/fence collisions. CPW provided a letter dated July 30, 2014 which outlines the locations that Colowyo will demarcate fences to minimize Greater Sage Grouse impacts. Please see Figure 2.05.6-3.
- Colowyo will treat NPDES discharge ponds for mosquitos to reduce the potential of West Nile Virus transmission to local grouse populations if this treatment is not specifically precluded by CDPHE regulation of Colowyo's discharge ponds.

During a series of meetings since the approval of PR-03 between CPW, BLM, USFWS, Tri-State, and Colowyo it was determined that there would potentially be direct impacts to approximately 2,133 acres of mapped Preliminary Priority Habitat (PPH) for Greater Sage Grouse (GSG) from the mining plan approved under PR-03. In addition to the direct impacts, consultation with CPW, BLM and USFWS biologists determined that indirect impacts would potentially occur up to 900 meters (2,953 feet) from the edge of disturbance. This distance was determined using several years of monitoring data from the Axial Basin where existing operations have been occurring and a number of years of recorded GSG locations near the existing mining operations obtained through radio telemetry by CPW in cooperation with Colowyo. It was also determined that mining of the Little Collom X Pit (approved under PR-03) would cause a significant impact GSG lek adjacent to the pit. Therefore, Colowyo agreed to relinguish mining of the Little Collom X Pit and redesigned the temporoary overburden spoil pile location to significantly reduce the potential impacts to GSG.

Based on the 900 meter distance, it was determined that there would be 2,180 acres of PPH potentially indirectly impacted. In total, there would be 4,313 acres of PPH potentially impacted both directly and indirectly by the mine plan disturbance under PR-04. To offset both the direct and indirect potential impacts to GSG PPH, Colowyo has agreed reduce the mining plan by not mining the Little Collom X Pit, redesign the temporaory spoil pile and relocate to create a larger buffer from an active GSG lek, and also to implement the following GSG mitigation measures:

- Colowyo will donate a total of 4,543 acres of Colowyo privately owned surface within PPH but outside of the permitted mine boundary in five non-contiguous parcels to CPW. This land will be managed by CPW for the preservation and maintenance of GSG habitat in the Axial Basin in perpetuity. The land donation will become effective and CPW would assume management of these areas prior to any land disturbance activities at the Collom Pit or temporary spoil pile area. A Land Donation Agreement will be signed between Tri-State/Colowyo and CPW, and will include details for the land donation along with a legal description of the area.

- Under the Land Donation Agreement with CPW, Colowyo will transfer all grazing and mineral rights held by Colowyo on those parcels to CPW, as well as the water rights to any stock watering structures located on those parcel
- Construct all sediment control structures outside of the GSG lekking and brook rearing seasons (March 15 – May 15 and May 15 to July 15, respectively.
- Colowyo will make a one-time cash donation of $150,000 to CPW to preserve and protect the GSG and to fund on-going research monitoring of the GSG.

Columbian Sharp-Tail Grouse:

- Mitigation efforts identified for Greater Sage Grouse will also benefit Columbian Sharp-Tail Grouse. No specific mitigation efforts have been requested by CPW beyond the efforts to be undertaken for Greater Sage Grouse, Mule Deer and Elk.

Mule Deer and Elk:

- Colowyo will incorporate CPW recommended guidance for wildlife friendly fencing when construcing new fences in the Collom Expansion Area.

2.05.6 (3)(a) Protection of the Hydrologic Balance

Surface Water

Surface water will be protected in the mining areas by stormwater management as described in Section 2.05.3(4) of this permit revision application and in the Stormwater Management Plan portion of the Stormwater Discharge Permit and as shown in Exhibit 7, Item 23. Protection includes the use of diversion ditches to route surface water around the mining impact areas.

Current surface water rights will not be impacted by mining operations at Collom Pit. There is no expected long-term measurable impact to the quantity of surface water in Collom Gulch, Little Collom Gulch, Jubb Creek, or any of their tributaries. Surface water amounts that will be used in mining operations will be within the water rights owned by Colowyo.

Surface water quality of the three creeks is calculated to only be marginally impacted by mining activities. This marginal impact, described in the Probable Hydrologic Consequences section (Section 2.05.6 (3)(b)(iii) below), will be due to meteoric water being captured in and evaporated from the mine pit during operations, and meteoric water contacting an increased surface area of soil in the vadose zone and thereby theoretically increasing the mass of dissolved solids entering shallow groundwater. These dissolved solids in shallow groundwater may eventually enter the surface water system, with a theoretical increase in dissolved solids in the surface water. This increase is calculated to be small enough to have no impact on the current or projected surface water uses in the Collom Gulch, Little Collom Gulch, and Jubb Creek drainages.

Groundwater

Groundwater in the vicinity of the Collom mining areas occurs in perched (unconfined) and confined water bearing zones of limited areal extent within bedrock of the Williams Fork Formation, the Trout Creek Sandstone (a bedrock aquifer of regional extent), and valley-fill aquifers as described in Section 2.04.7. The Williams Fork Formation water beaering zones have no beneficial use owing to their limited extent and minimal water production. Based on studies in the Collom area, the saturated water table/piezometric surface is at approximately 7150 feet. This level means that the area in and around the Collom Pit outline is under static hydrologic conditions with the water level at approximately 7150 feet.

Due to this static condition, Colowyo may dewater this zone to allow mining of the coals below this elevation in the northern cut(s) of the pit.

The Trout Creek Sandstone is a sandstone unit underlying most of the permit area and extending across much of northwestern Colorado. It contains water of useable quantity and quality as demonstrated by beneficial-use wells near the permit area. The Trout Creek Sandstone is stratigraphically several hundred feet below the rock units to be mined and is separated from those strata by low-permeability layers within the Williams Fork Formation, particularly the KM layer, a regionally-continuous clay layer (see Section 2.04.5 and 2.04.6). Additionally, the Trout Creek Sandstone was removed by erosion and structural uplifts north and south of the mining area and so is isolated from the regional perspective. Based on this information, mining is anticipated to have no impact on the Trout Creek Sandstone aquifer.

Groundwater in the shallow valley-fill aquifers of the drainages crossing the permit modification area is calculated to be marginally impacted by surface mining activities, as described in the Probable Hydrologic Consequences section.

There are no registered beneficial-use wells other than monitoring wells in the Colorado Division of Water Resources well database within at least one mile downgradient of the mining area (Map 11C). In Section 2.03.4, Identification of Interests, the legal or equitable owners of record of the property to be mined or affected by surface operations and facilities incidental thereto within the Collom permit expansion area are:

Colowyo Coal Company L.P.
State of Colorado
U.S. Bureau of Land Management

No other private individual or group owns or controls any land in the Collom permit expansion area. Thus, any well within the limits of the Collom permit expansion is controlled by Colowyo. This includes the Dudek and Sweeney wells. Table 2.04.7-44 and Map 11C reflect the location and ownership and control status of these wells.

2.05.6 (3)(b)(i & ii) Hydrologic Controls

Rule 2.05.6(3)(b)(iii) requires determination of probable hydrologic consequences for the mining operations. This rule indicates that these consequences must be defined for both the permit area and adjacent areas, for quantity and quality of surface water and groundwater. Baseline conditions must be established, and possible impacts from the activities must be anticipated.

Summary of Probable Hydrologic Consequences

An evaluation was made of potential hydrologic impacts of the Collom mine to determine if the potential impacts are likely to occur and if they would be significant. Based on the assessment of potential impacts, the probable hydrologic consequences of the Collom Project are:

- Two springs mapped within the pit footprint and facilities area will be eliminated by mining. Springs near the Collom pit might experience decreased flows during mining. Three additional springs located in Little Collom Gulch north of the mine and spoil footprint area may have reduced flows as a result of the mine dewatering activities. Significant impacts to other springs are not anticipated.

- Dewatering of the Collom pit is needed to achieve stable pit slopes for safe operating conditions and will cause a drawdown in bedrock groundwater levels in the vicinity of the pit. Groundwater levels are expected to recover after mining but may be at different levels than the pre-mining groundwater. It is unlikely that the groundwater level in the pit backfill will reach a high enough elevation to cause the discharge of spoil backfill groundwater at ground surface in Little Collom Gulch. If this were to occur, it would not have a significant impact on the quantity or quality of surface and subsurface flow in Little Collom Gulch.
- The hydraulic conductivity within the backfilled pit is anticipated to be more uniform and higher than the hydraulic conductivity of the individual geologic units in the adjacent unmined areas. This will result in alternation of the bedrock groundwater flow gradient in the mine footprint area and the immediate area surrounding the footprint. In general, the higher permeability of the spoil backfill will result in a flatter groundwater gradient. Groundwater flow conditions in the areas north of the pit are expected to be similar to the pre-mining groundwater flow conditions after re-saturation of the spoil backfill.
- No other statistically significant changes to surface water and groundwater quality or quantity are anticipated.

The potential impacts that were evaluated and the resulting hydrologic consequences are discussed in the following subsections.

Potential Impacts to Springs and Seeps

Springs in the Colowyo Mine area result from three general sources: 1) typified by a relatively deep soil accumulation immediately upslope and shallow bedrock downslope of the point of discharge, 2) discharge within valley bottom deposits, and 3) from sheer bedrock faces on hillsides (CDM 1985b). The first two of these sources may mask or contribute to bedrock sources of the springs. The seeps and low volume springs flow generally in response to snowpack accumulation and subsequent melting resulting in seasonal flows.

The majority of the springs with bedrock sources appear to be contact springs. A contact spring results from the infiltration of water from the surface to a porous zone (such as sandstone) above a horizontal hydrologic barrier (such as shale) where the water preferentially flows along the contact to the exposure. This type of spring is common in areas where alternating sequences of lithologies exist that exhibit differential hydraulic conductivities, such as the Williams Fork Formation.

Table 2.05.6-4 lists the springs and seeps found in the vicinity of the mining area. The locations of the investigated springs and seeps are presented on Map 10B. Data collected for the springs and seeps were previously summarized in Table 2.04.7-49.

The potential impacts to springs and seeps listed below are evaluated for each of the three surface drainage areas that will be affected by the mine:

- Elimination of springs and seeps
- Changes in flow
- Formation of new springs and seeps

<u>Little Collom Gulch Area</u>

Two springs (SPRLC-01 and SPRLC-02) maintained flow during July and August 2005 in Little Collom Gulch, and produced a total of 0.30 cfs during spring runoff in June 2005, and 0.045 cfs during August

2005 base flow. (Table 2.04.7-49) Spring/seep SPRLC-03 produced a minor flow of 0.009 cfs in December 2004, and produced no measurable flow for any other sampling event. Springs/seeps V11 and V29 produced no measurable flow for any sampling event. All Little Collom Gulch spring and seep flows subsequently infiltrated into the valley fill or were captured by stock ponds. Streamflow monitoring point LLCG located near the mouth of Little Collom Gulch was dry throughout the 18 month sampling period.

Spring SPRLC-01 (V24) is located at an elevation of about 7270 ft in Little Collom Gulch within the pit footprint area and will be eliminated by the mining operations. The bedrock groundwater elevation in this area is about 7150 ft so the source of this spring is probably from perched groundwater. Spring V11 was mapped in the Little Collom Gulch drainage area at an elevation of about 7230 ft in the footprint area of the facilities but had no measurable flow during the 2005 and 2006 monitoring events. It may reflect localized discharge from snowmelt but is not a significant spring. It likely will be eliminated by the facility construction.

Spring SPRLC-02 (V30) is located at an elevation of about 6926 ft in Little Collom Gulch near the toe of the temporary spoil pile and in the area of the southeast of the Section 25Pond. Construction of the sediment pond may affect the discharge zone of this spring. Also, the mine dewatering operations may intercept groundwater that normally discharges at the spring and placement of the temporary spoil may intercept local recharge sources for the spring. As a result, spring flow may decrease during mining operations. Springs SPRLC-03 (V31) and V29 are located at elevations of about 6691 ft and 6845 ft, respectively, in Little Collom Gulch north of the temporary spoil pile and the Section 25 Pond. Similar to SPRLC-02, they may experience reduced flows as a result of the dewatering operations and placement of the temporary spoil over potential recharge areas. Neither of these springs is a significant feature and V29 was dry during the 2005 and 2006 monitoring events.

In Little Collom Gulch, the springs potentially affected by mining operations produced a combined average flow of about 0.16 cfs with a maximum flow of about 0.30 cfs and a minimum flow of about 0.015 cfs during the baseline monitoring period.

As discussed below, there is a slight chance for a spring to develop in Little Collom Gulch during the post-mining period if the pit backfill re-saturates up to the elevation that the northern pit highwall daylights in Little Collom Gulch. This spring would discharge groundwater from the mine backfill material. Further evaluation is provided under the discussion of potential impacts to groundwater.

West Fork Jubb Creek Area

There are no mapped springs in the West Fork of Jubb Creek drainage that will be directly eliminated by the mining activities.

As indicated in Table 2.05.6-4, spring V1 is not a naturally occurring feature. It is a flowing well (Well Permit No 175218) located in the stream valley at about elevation 7170 ft and is completed at a depth of at least 600 ft below ground surface. Based on the data fromavailable drill logs in the area the well is completed in the Trout Creek Sandstone. The Trout Creek Sandstone aquifer will not be affected by mining so the flow in this well would not be impacted.

Springs V10, and V32 are located at elevations 7295 ft and 7600 ft, respectively, along the West Fork of Jubb Creek and on the west side of the stream channel. However, the spring elevations are generally above the bedrock groundwater elevations and are likely sourced locally so impacts from dewatering the bedrock groundwater system are unlikely. Spring V2 is located at about elevation 6860 ft on the west side of the West Fork of Jubb Creek. It is north of the mine area and is likely sourced from local recharge.

It is located within the Collom Haul Road corridor and will likely be impacted to some degree during the construction of the road.

Springs V3, V9a and V9b are also located well north of the mine area at elevations 6820 ft, 6895 ft and 6886 ft, respectively, along the east side of the stream channel. These springs are sourced from areas to the east of the stream and are not expected to be impacted by the mining activities. Two springs potentially affected by mining operations (V10, and V32) produced a combined average flow of about 0.013 cfs, a maximum flow of about 0.022 cfs and a minimum flow of about 0.004 cfs during the baseline monitoring period.

It is not expected that new springs will develop in the West Fork of Jubb Creek during the post-mining period.

Collom Gulch Area

There are no mapped springs in the Collom Gulch drainage that will be directly affected by the mining activities.

Springs SPRC-02 (V8), V27, V28 and SPRC-04 (V7) are located at elevations 6807 ft, 6701 ft, 6696 ft and 6601 ft, respectively, along the east side of Collom Gulch north of the mine area. There is a small chance for the flow in these springs to be reduced as a result of the mine dewatering activities intercepting bedrock groundwater flow that may feed the springs. However, they are more likely sourced from local groundwater that will not be affected by mining.

Springs SPRC-03 (V26), V20, V21 and V25 are located at elevations 6753 ft, 7074 ft, 7076 ft and 6785 ft, respectively, along the west side of Collom Gulch. These springs are sourced from areas to the west of Collom Gulch and are not expected to be impacted by the mining activities. Other springs listed in Table 2.05.6-4 are located up-gradient of the mine and are likely sourced from shallow groundwater and are not expected to be impacted by the mining activities.

In Collom Gulch, the springs potentially affected by mining operations (V27, V28, SPRC-02 and SPRC-04) produced a combined average flow of about 0.057 cfs, a maximum flow of about 0.13 cfs and a minimum flow of about 0.002 cfs during the baseline monitoring period.

It is not expected that new springs will develop in Collom Gulch during the post mining period.

Potential Impacts to Streams

The three streams potentially affected by mining include Little Collom Gulch, the West Fork of Jubb Creek and Collom Gulch. An evaluation of each stream was made for the following potential impacts from mining operations:

- Changes in direct surface runoff to streams from storm flow and snowmelt
- Changes in stream base flow amounts
- Changes in surface water and groundwater interactions
- Effects from discharge of water from settling ponds
- Effects from discharge of excess dewatering well flows

Little Collom Gulch

Little Collom Gulch is an ephemeral stream throughout its entire length, has a drainage area of about 2.9 square miles (WMC, 2005) and flows south to north through the center of the mine footprint. The area of Little Collom Gulch within the pit footprint is about 0.74 square miles and the area within the spoil pile footprint is about 0.59 square miles for a total area of about 1.33 square miles. Thus, the disturbance is about 46% of the total watershed area. Several clean water diversion structures are planned in Little Collom Gulch upstream of the pit to intercept and safely reroute storm flows around the mine area. The water collected in these structures will come from undisturbed areas.

As described in Section 2.04.7 (2) no flow was observed in Little Collom Gulch during any of the sampling events.

The direct surface runoff from 25% of the drainage area of Little Collom Gulch will be intercepted by the pit and will be either lost to evaporation or be utilized for dust control within the pit. The surface runoff from 20% of the drainage area of Little Collom Gulch will be incident upon the out of pit spoil pile. This runoff will be captured by one of the five sediment ponds (See Map 41B) and will either be lost to surficial evaporation or be discharged according to CPDES requirements to Little Collom Gulch or Collom Gulch. Another 8% (0.24 square miles) of the watershed will be disturbed by the facilities area and report ultimately to the Section 25 Pond and will be lost either to evaporation or discharged to Little Collom Gulch. The runoff intercepted by the Little Collom Gulch clean water diversion structures upstream of the mine pit (0.78 square miles of drainage) will be redirected to either Collom Gulch or the West Fork of Jubb Creek and not be impacted by mining activities. Surface water flows in Little Collom Gulch have not been observed so impacts to direct runoff in Little Collom Gulch are expected to be minimal. Since Little Collom Gulch does not normally contribute to the direct surface water runoff in Collom Gulch, the overall effects on the streamflow in Collom Gulch are expected to be insignificant. During the post-mining period, the Little Collom Gulch surface drainage pattern will be re-established to pre-mine density.

There is currently a small amount of recharge to the shallow valley fill groundwater that occurs from precipitation and surface runoff in Little Collom Gulch. This source of recharge will be eliminated during mining by the pit and the spoil pile. There may also be some discharge of perched groundwater from the upper bedrock units to the Little Collom Gulch valley fill that could be affected (e.g., springs SPRLC-01, SPRLC-02). The potential impacts on spring flow are discussed above and impacts to groundwater are discussed in a following section.

There may be periodic releases of water from the Section 25 sediment pond located in Little Collom Gulch near the toe of the spoil pile. This water will be released to Little Collom Gulch and will either infiltrate into the valley fill or contribute to surface flows in Little Collom Gulch. It is possible that some surface flow may make it to Collom Gulch during the higher flow periods.

There are no plans to release any flows from the dewatering system to Little Collom Gulch.

West Fork Jubb Creek

The West Fork of Jubb Creek is an intermittent stream. It joins the East Fork of Jubb Creek to the northeast of the mine area to form Jubb Creek. The total drainage area of Jubb Creek above the USGS gaging station is about 7.53 square miles, including both the East and West Forks (WMC, 2005). The area of the West Fork of Jubb Creek within the pit footprint is about 0.21 square miles and no areas are within the spoil pile footprint. Thus, the mine disturbance affects is less than 3% of the total watershed area of Jubb Creek.

As described in Section 2.04.7 (2), the West Fork of Jubb Creek produced flow from May through August with a peak flow of about 0.30 cfs in June. It remained dry during late summer, fall and winter. As described above, there is flowing well in the West Fork of Jubb Creek at the location mapped as spring V1. This well contributes water to a small stock pond. Water from the pond infiltrates into the stream valley fill deposits and contributes to shallow ground water flow.

The lower portion of Jubb Creek below the confluence of the East and West Forks typically produces flow for much of the year except during the winter months. Based on USGS stream gaging data from 1976 to 1981 on the lower reach of Jubb Creek (WMC, 2005), the annual flow volume is highly variable, ranging from less than 2 to over 300 acre-ft per year with an average of 81 acre-ft per year.

The direct surface runoff from about 3% of the drainage area of the Jubb Creek watershed will be intercepted by the excavation of the Collom Pit. This minor amount of disturbance is not expected to have a significant impact on the amount of direct surface runoff in Jubb Creek.

Collom Gulch

Collom Gulch is an intermittent stream in its upper reaches but generally has perennial flow in its lower reach. It has a drainage area of about 5.05 square miles above its confluence with Little Collom Gulch. The watershed area of Collom Gulch within the pit footprint is about 0.41 square miles and the area within the spoil pile footprint is about 0.39 square miles for a total area of about 0.80 square miles. Thus, the mine disturbance is about 16% of the total watershed area above the Little Collom Gulch confluence.

As described in Section 2.04.7 (2), the lower Collom Gulch monitoring location had a maximum flow of about 3.5 cfs during the spring runoff period with a base flow of between 0.03 and 0.04 cfs during the summer and winter periods, respectively. Based on WMC (2005) the upper portion of Collom Gulch flows during the spring runoff period and this streamflow contributes groundwater recharge to the valley fill along the stream channel. During the summer and winter base flow periods, the upper portion of the stream typically does not flow so stream base flow in the lower reach of Collom Gulch is maintained by discharge of groundwater from the valley fill to the stream.

The direct surface runoff from 8% of the drainage area of Collom Creek above the confluence with Little Collom Gulch will be intercepted by the pit. The direct surface runoff from 8% of the drainage area which is associated with the temporary spoil pile will be routed to the Sidehill Pond and West Pond sediment ponds. It will either be stored for on-site use or discharged using CDPHE criteria to Collom Gulch downstream of the Collom Pit. Therefore, the reduction of the amount of direct surface runoff in Collom Gulch caused by the mine is probably less than 16% and more likely in the range of 8 to 16%.

As described in Section 2.04.7 (2) the upper reach of Collom Gulch is generally intermittent with measured base flow in the range of 0.004 cfs and periods when the stream goes dry. The lower reach of Collom Gulch generally has perennial flow that is maintained during the summer and fall by discharge of groundwater from the valley fill. Most of the groundwater recharge to the valley fill comes from the flow in the upstream reach of Collom Gulch during the spring runoff season, which will not be affected by the mine. Therefore, the impacts of the mine on stream base flow are expected to be insignificant.

Flow in springs SPRC-02, V27, V28 and SPRC-04 may be reduced by mine dewatering operations as described above. These springs make up less than 5 % of the measured surface flows in Collom Gulch so the potential impact of reduced flows on Collom Gulch is not considered significant.

There may be periodic releases of water from the Section 26 Pond located in the Collom Gulch watershed at the toe of the spoil pile. This water will be released to Collom Gulch via a surface channel and will either infiltrate into the valley fill or contribute to surface flows in Collom Gulch, depending on the time of year.

If deemed necessary, water may be discharge to Collom Gulch from the dewatering well systems.

Potential Impacts to Groundwater

Drilling of exploration and monitoring wells by Colowyo and other parties in the Collom pit area as discussed in Section 2.04.7 identified very limited perched water in the shallow coal beds and interburden and saturated conditions in the lower third of the sequence to be mined. There are no continuous non-coal aquifers in the saturated section of the pit to be mined.

This subsection provides a discussion of the following potential impacts to groundwater:

- Changes in groundwater levels during mining
- Potential interactions with springs and seeps
- Potential interactions with valley fill aquifers and streams
- Effect on existing groundwater users in the area
- Effect on the Trout Creek Sandstone aquifer
- Effect of mining on the groundwater flow system
- Re-saturation of the pit backfill during the post-mining period

<u>Changes in groundwater levels during mining</u>

The Collom Pit will be excavated to a depth below the groundwater table and dewatering is needed to achieve stable pit slopes and safe mining conditions. Groundwater levels in the bedrock units within the pit footprint and in the immediate vicinity of the pit will be lowered ahead of mining by pumping from dewatering wells.

Colowyo will submit to the Colorado Division of Water Resources (CDWR) dewatering well/system application(s) to install dewatering wells and remove the groundwater to facilitate the mining. The Colowyo permit area is not in a designated groundwater basin as defined by the CDWR.

A dewatering well system is planned to intercept groundwater before it enters the pit and to achieve the depressurization necessary to maintain stable pit slopes. Based on the field work and computer modeling performed by Agapito Associates (2017) and presented in Exhibit 7, Item 22B, dewatering wells will be installed to dewater the rock strata from below the F_{ab} coal seam, with a projected depth to about 100 ft below the bottom of the G_{ab} seam.

The dewatering plan includes 10 or 11 perimeter wells around the initial box cut. The drawdown of the groundwater will be monitored by up to five monitoring holes that will include wire piezometers to acquire data to truth the model.

The dewatering system is designed to include up to 11 dewatering wells, and each well is expected to pump between about 10 to 15 gpm. It is estimated that the dewatering system will not need to be operational until the third year of mining of the Collom Pit.

The groundwater removed during dewatering will be used in the daily operation of the Collom mine. Water produced from the mine dewatering well system will be pumped via pipeline to storage tank located in the facility area. The water will not be used for potable use. A properly permitted commercial well will be drilled, and with a permitted treatment system, be used for potable water.

At times there may be an excess of water produced from the mine dewatering system. The excess water will be discharged to Collom Gulch and the West Fork Jubb Creek with an approve CDPHE permit. It is unknown but may at times equal 300 gpm, divided between both drainages. If each drainage receives 150 gpm at times, then the increase flow to the drainages will be a maximum of 0.3 cfs (effects to surface water on Collom Gulch and West Fork Jubb Creek discussed previously in this section).

AAI (2017) developed a hydrogeological model of the Collom area. This model was calibrated to existing groundwater conditions and the transient response observed during a 30 day pumping test performed by WMC (2005) in the bedrock units that will be mined. Based on the modeling of the groundwater response to mining and dewatering, the groundwater level drawdown from mine dewatering potentially will extend some distance to the south of the mine but is unlikely to extend further than the drainage divide in the southern portion of the Collom area. Drawdown effects may extend laterally in bedrock units below the Collom Creek on the west side of the mine, but are unlikely to affect those below the West Fork of Jubb Creek on the east side of the mine. Groundwater drawdown experienced by strata below the Collom Gulch is unlikely to significantly impact the surface streamflow along Collom Gulch.

During AAI's field visit during summer 2016, the streamflows along different segments of the Collom Gulch were observed to be approximately 2.5 cfs (1,122 gpm) in the East Fork and 5 cfs (2,224 gpm) downstream of the confluence point with the West Fork. The observed flow rates were likely close to the annual peak levels experienced by the stream as a result of snowmelt; however, the flow along Collom Gulch had been reported by WMC (2005) to have reduced to zero at several time periods (notably in wintertime) during their study. Except during those no-flow periods, the surface flow rates along Collom Gulch are significantly higher than the design pumping rate (15-gpm) of each dewatering well and are unlikely to be impacted appreciably by the pit dewatering.

Groundwater levels in the bedrock will recover after mining but may vary from the pre-mining conditions. Potential changes in the final groundwater levels are discussed below in the section on pit backfill re-saturation.

Potential interactions with springs and seeps

The drawdown in groundwater levels caused by the mine dewatering activities may affect springs and seeps that are fed by groundwater discharge. The area where springs and seeps are affected will probably be bounded by the southern extent of the pit footprint to the south, the West Fork of Jubb Creek to the east, Collom Gulch to the west, and one to two miles north of the pit highwall. The springs that are potentially affected by the dewatering operations are discussed in the section on springs and seeps above.

Potential interactions with valley fill and streams

There is some groundwater flow in the valley fill deposits associated with Little Collom Gulch that eventually enters Collom Gulch at the confluence between Little Collom Gulch and Collom Gulch. Recharge to shallow groundwater in the Little Collom Gulch valley fill will be reduced because the recharge area for valley fill groundwater south of the pit highwall will be eliminated during mining. This may result in an approximate 50% reduction in shallow groundwater flow in the Little Collom Gulch during mining.

The amount of groundwater flow in the Little Collom Gulch valley fill is estimated to be about 2,060 ft^3/d (17 ac-ft/yr). This estimate is based on a hydraulic conductivity of the valley fill that averages 33 ft/d (WMC, 2005), a gradient of 0.025 ft/ft, a saturated thickness of valley fill of 25 ft (based on the measurements in valley fill monitoring well MLC-04-1 located near the mouth of Little Collom Gulch), and an estimated lateral extent of the saturated valley fill of 100 ft.

WMC (2006) estimates that the total valley fill groundwater flow is about 18,850 ft^3/d to the north in Collom Gulch below the confluence with Little Collom Gulch. Of this amount, about 12,000 ft^3/d is flowing in valley fill aquifer and an additional 6,900 ft^3/d is groundwater flow that discharges to the stream as base flow. Thus, if the valley fill groundwater inflow from Little Collom Gulch is reduced by 50% from 2,060 to 1,030 ft^3/d, this would only reduce the total groundwater flow out of Collom Gulch by about 5%.

The valley fill groundwater system in the West Fork of Jubb Creek is not anticipated to be affected by mining. The Jubb Creek area disturbed by mining is small, less than 3% of the total watershed area, and most of the recharge to the valley fill groundwater system will come from spring runoff from the higher elevation portions of the watershed. No measureable impacts to stream base flow are anticipated.

Dewatering water entering the valley fill groundwater system will not add asignificant amount to the total system compared with the total amount of groundwater currently in the system.

Potential effect on existing groundwater users in the area

The Collom mine area and the surrounding land is predominantly owned and/or controlled by Colowyo Coal Company and/or its subsidiaries. There are numerous monitoring wells on these lands which are registered by Colowyo as wells under Colorado State Engineer's rules and regulations. Thus, any well within the limits of the Collom permit expansion is owned and controlled by Colowyo and the only impact from any dewatering will be on Colowyo itself. Table 2.04.7-44 and Map 11C reflect the location, ownership and control status of these wells.

The closest known and registered/permitted non-Colowyo owned domestic or commercial wells are located approximately two miles southeast of the initial Collom boxcut area. These wells are located in the SW1/4, Section 7, T.3N., R.93W and are completed below the base of the Williams Fork formation, in the Iles Formation, or in valley fill material along Wilson Creek. This can be verified by comparing the Geology map (Map 7A) with the well location map (Map 11C). Thus, no impacts to these wells from any dewatering activities in the Collom pit are anticipated.

There are no beneficial use wells (other than those owned and/or controlled by Colowyo) within a two mile radius of the northern pit limit of Collom. Therefore, there will be no impact on any non-Colowyo well caused by the mine dewatering operations,

There is a lack of groundwater communication in the vicinity of the Collom pit with any beneficial use well located in Wilson Creek. The KM layer (an aquiclude) precludes any impact of the dewatering on the upgradient wells in Wilson Creek. In addition, the dip of the KM bed and the Trout Creek sandstone top is to the north and any groundwater flow would be down dip away from Wilson Creek. An examination of the cross section illustrated in Exhibit 7 Item 23B, demonstrates that the cone of influence of the dewatering wells on the north side of the Collom Pit will be several miles from Wilson Creek and any of the beneficial use wells near Wilson Creek. With, the cone of influence not extending much past the Collom Pit to the north, the KM layer acting as an aquiclude, and the dip of the KM bed away form Wilson Creek limits any potential impacts of dewatering to any benefical use wells on Wilson Creek.

Potential effect on the Trout Creek Sandstone aquifer

No impacts are anticipated to the quantity of groundwater in the Williams Fork Formation or the Trout Creek Sandstone of the Iles Formation. The Williams Fork Formation is not a significant water supply source in the Danforth Hills. It is not used as a source of water where the valley-fill aquifers and surface waters are accessible.

The Trout Creek Sandstone aquifer is separated from the lowest coal seam to be mined by approximately 400 feet in the Collom pit area. Between this coal seam and the Trout Creek Sandstone is a mudstone/shale, sandstone, siltstone, and coal sequence of the Williams Fork Formation. About 200 feet above the Trout Creek Sandstone, a laterally continuous, smectite clay layer known as the KM bed exists. This layer has very low permeability and, therefore, is an effective barrier to vertical groundwater flow.

No impacts from mining or mine dewatering activities are anticipated to the quantity of groundwater in the Williams Fork Formation or the Trout Creek Sandstone of the Iles Formation.

Potential effect of mining on the groundwater flow system

The bedrock groundwater system intersected by the Collom Pit will be affected by mining and backfilling activities. The existing bedrock groundwater system is highly anisotropic because of the alternating layers in the bedrock that have permeabilities varying over many orders of magnitude. The coal seams generally comprise the higher permeability layers, the sandstones have a lower permeability and the siltstone and mudstone units have a very low permeability. The hydraulic conductivity values of the bedrock units are reported to average about 0.14 ft/d for the coal seams and about 0.006 ft/d for the sandstone units. The hydraulic conductivity value for the mudstone and siltstone units is expected to be less than 0.0001 ft/d (WMC, 2005). Mining will displace these layers within the mine footprint and replace them with a more uniform and isotropic backfill material.

The permeability of the backfill will be higher than the bedrock units and will be more similar the permeability of an valley fill material. The hydraulic conductivity of the backfill is expected to be in the range of 1 to 200 ft/d. The geometric mean value of hydraulic conductivity for valley fill is about 33 ft/d (WMC, 2005) so this value is considered a reasonable estimate of the hydraulic conductivity of the backfill.

The capacity of the backfill to transmit groundwater will be much greater than the capacity of the un-mined bedrock as a result of the higher hydraulic conductivity. This means that the saturated thickness of the spoil backfill necessary to provide the same quantity of groundwater flow under a similar hydraulic gradient will be much less than the saturated thickness of the un-mined bedrock. Thus, it is likely that the groundwater level in most parts of the backfilled pit area will be lower than the current groundwater level in the bedrock. Conceptually, this means that the groundwater levels in bedrock around the backfilled areas up-dip of the highwall will re-adjust to lower groundwater levels in the backfill itself. The exception will be near the north highwall of the pit where the quantity of groundwater flow to the north from the backfill will be limited by the permeability of the bedrock units to the north. In this area, groundwater levels are expected to re-establish to the pre-mining elevation of about 7150 ft or higher.

Re-saturation of the pit backfill during the post-mining period

During mining the Collom pit will be progressively backfilled with spoil material once the initial boxcut is established. The mine advances from north to the south, which is the up-dip direction for the bedrock layers, so as the deeper portions of the pit are backfilled with spoil, water accumulating in the pit can flow down-dip along the pit bottom into the backfill. The mining activity will not cause any decrease in the

hydraulic conductivity or transmissivity of the un-mined bedrock units located down-dip (north) of the pit, and the capacity of the bedrock units to transmit groundwater will not diminish. Consequently, the recharge and upgradient inflow entering the pit area will re-enter the bedrock units on the down dip side of the pit. While the highwall dewatering wells to the north of the boxcut are operating, they will collect this seepage. Once they are turned off, the seepage will continue to flow to the north in the bedrock groundwater system in the same way that groundwater flow occurs prior to mining.

Some of the seepage from the pit into the backfill may accumulate against the highwall of the pit since the permeability of the unmined bedrock units is expected to be lower than that of the backfilled spoil material. The amount of water that accumulates will depend on the quantity of water available in the pit and the rate that the bedrock groundwater system recovers after dewatering wells are progressively turned off as mining advances up-dip from north to south. Once wells are turned off, groundwater inflow to the pit backfill may occur from lateral inflow from the bedrock units that are directly intersected by the mine and from limited upward vertical flow from underlying bedrock units.

Once mining is completed the Collom pit will have a reclaimed surface area of approximately 825 acres and a pit bottom that dips predominantly toward the north. The low point in the reclaimed pit surface topography will be at its intersection with Little Collom Gulch at an elevation of approximately 7,300 feet amsl. During the post-mining period, re-saturation of the reclaimed pit backfill will occur from bedrock groundwater inflow from the pit walls, infiltration of direct precipitation on the backfill area, seepage of surface water flowing over the backfill area, and groundwater inflow from the bedrock units underlying the backfilled pit. The groundwater level will recover in the backfill until pre-mine water levels of 7100 to 7150 ft amsl are reached. These elevations would be below the Little Collom Gulch channel elevation of 7,300 ft amsl. Outflow will occur as bedrock groundwater flow in a down-dip direction to the north. Post mining backfill static water levels may be elevated at times above pre-mine levels due to the higher transmissivity of the backfill and infiltration of surface water runoff. It is highly unlikely that backfill water levels would rise sufficiently to reach a level where a spring would emanate into Little Collom Gulch.

The pre-mining bedrock groundwater elevation in the northern portion of the pit is in the range of 7100 to 7150 ft based on WMC (2005). This is likely the minimum groundwater level that will be re-established in the backfill in the northernmost part of the pit. As described above, some re-saturation of the backfill may occur during mining.

The pre-mining rate of groundwater flow from south to north through the bedrock units in the northern part of the pit can be estimated based on the measured transmissivity in the bedrock, the hydraulic gradient and the width of the flow zone, taken to be the east-west distance between the West Fork of Jubb Creek and Collom Gulch. The long-term pumping test reported in WMC (2005) measured a transmissivity in this area of about 15 ft^2/d, with about 10 ft^2/d attributed to the F/G sequence and 5 ft^2/d to the bedrock units above the F_{ab} coal. This transmissivity value represents a saturated thickness of bedrock in the range of 200 ft (from elevation 6950 to 7150 ft). The hydraulic gradient in this area is measured from wells and piezometers to be about 0.04 ft/ft. The width of the zone is about 10,000 ft. This results in a pre-mining groundwater flow rate from south to north at the northern pit highwall of about 50 acre-ft per year.

The hydraulic head in the backfill at the northern wall of the pit should re-establish itself to at least elevation 7150 ft once equilibrium conditions are reached. At this hydraulic head, the post mining rate of groundwater flow from south to north out of the backfill will be about equal to the pre-mining flow rate and the post-mining groundwater flow system down-gradient of the mine will be essentially the same as the pre-mining system.

The time for the pit backfill to re-saturate to the 7150 ft elevation at the north highwall is estimated based on the volume of backfill in the pit up to the 7150 elevation and the estimated recharge rate to the backfill. The bottom of the pit dips upward to the south at about 250 ft vertical distance per 2,000 ft horizontal distance or at slope of about 0.125 ft/ft. The width of the pit is about 4,500 ft. This results in a backfill volume of about 1.44 billion cubic feet. At a 20% porosity in the backfill, the volume of water needed to saturate the backfill up to an elevation of 7150 ft is about 288 million cubic feet or about 6,610 acre ft. At the estimated pre-mining groundwater flow rate through the pit area of 50 ac-ft/yr, this would require about 130 years to re-saturate assuming no flow to the north out of the pit backfill.

The infiltration rate into the mine backfill may be higher than under pre-mining conditions because of the substitution of the highly stratified pre-mine bedrock aquifers with the homogenous backfill aquifer. The pre-mining groundwater recharge rate from infiltration in the Collom area is estimated to range from about 0.11 in/yr in the southern portion of the area to about 1.1 in/yr in the northern areas where bedrock units outcrop (WMC, 2006). The backfill area is expected to cover about 825 acres. If infiltration into the backfill increases to 3 in/yr (about 20% of precipitation) then an additional amount of groundwater recharge will be available to saturate the pit backfill. Under this condition, it is estimated that the total amount of recharge to groundwater would be about 230 ac-ft per year and the time to re-saturate the backfill would decrease to about 30 years, again assuming no outflow of groundwater to the north.

Groundwater will flow down-dip in the bedrock units to the north from the pit backfill as the backfill re-saturates. If it is assumed that the flow rate out of the backfill at the north pit wall is equal to the pre-mining flow rate at this location, then there will be an annual average groundwater flow of about 50 ac-ft per year. At the higher groundwater recharge rate into the backfill of about 230 ac-ft/yr as described above, this would result in a time to re-saturate of about 40 yrs. Lower infiltration rates into the backfill would increase the time to re-saturate the backfill. The estimated range of times to re-saturate the backfill up to the 7150 ft elevation varies from about 30 to 130 years.

Potential for development of springs from pit backfill

If the saturated thickness of the backfilled area of the pit increases as described above, then the groundwater flow rate to the north potentially will be higher than the natural groundwater flow rate because of the higher hydraulic head. This may result in a groundwater elevation in the highwall area of the pit backfill that is higher than the pre-mining groundwater level elevation of about 7150 ft.

Little Collom Gulch intersects the north wall of the pit at about elevation 7300ft. If the water level in the backfill increases to the 7300 ft elevation, then a spring could develop in Little Collom Gulch where it intersects the pit highwall. An evaluation of the time that would be needed to re-saturate the backfill to the elevation and the potential spring flow quantity is made based on the information in WMC (2005, 2006) and the information presented above.

The time re-saturate the backfill up to the 7300 ft elevation will largely depend on the infiltration rate into the backfill. It is expected to be about 40 years for the maximum infiltration rate of 3 in/yr into the backfill considered above.

The likelihood of a spoil spring developing is considered to be low. Based on the estimates described above, an infiltration rate of less than about 2.5 in/yr into the backfill would not result in a saturation level in the backfill high enough to form a spring. It is unlikely that the effective infiltration rate will be greater than 2.5 in/yr. It is more likely to be in the range of 1 to 1.5 in/yr, which is similar to the value of 1.1 in/yr estimated for the upper portion of the watershed in the regional groundwater model (WMC, 2006).

If a spring develops at this location, the flow will likely re-infiltrate into the valley fill in Little Collom Gulch and not flow down the stream channel as a surface flow. There is a significant thickness of unsaturated valley fill in lower portion of Little Collom Gulch. The water level in well MLC-04-01 near the mouth of Little Collom Gulch is at 46 ft below ground surface. Therefore, it is unlikely that a spoil spring would result in surface water flow down Little Collom Gulch.

Potential Impacts to Water Quality

The quality of surface water, springs and seeps and groundwater is described in Sections 2.04.7 (1) and 2.04.7 (2). This section evaluates potential impacts of mining to water quality including:

- Potential effect on stream water quality
- Potential effect on spring and seep water quality
- Potential effect on groundwater quality

Potential effect on stream water quality

As described above, Little Collom Gulch is ephemeral, and showed no evidence of surface flow during 18 months of baseline monitoring. As a result, no water quality samples are available.

There may be periodic releases of water to Little Collom Gulch from the Section 25 pond. Most of the water released from the pond will probably infiltrate into the valley fill in the Gulch and will result in little if any direct surface flow down to the mouth of Little Collom Gulch. Adequate settling time will be provided in the pond to meet Colorado Point Discharge Elimination System (CPDES) permitted discharge criteria. The water quality from any pond discharge is anticipated to be of higher quality than the surface water quality seen in the lower reaches of the streams in the Collom area. No surface water quality impacts to Little Collom Gulch or to Collom Gulch as a result of surface water flow from Little Collom Gulch are anticipated.

Periodic releases of water to Collom Gulch from the Section 26 sediment pond may occur. This section of Collom Gulch is intermittent so some of this discharge may continue down the stream as surface water flow. Adequate settling time will be provided in the pond to meet CPDES permitted discharge criteria. The quality is anticipated to be of higher quality than the surface water quality seen in the lower portions of the streams in the Collom area. Periodic discharge of water may occur from the Little Collom Gulch diversion structures to Collom Gulch and the West Fork of Jubb Creek. This water will be surface runoff from undisturbed areas and will have a good water quality. No surface water quality impacts to Collom Gulch or to the West Fork of Jubb Creek from these potential releases are anticipated.

Any dewatering water entering the surface water system tends to have better water quality than the surface water. This is based on a comparison of the ground water quality from C-04-16B (16B) versus water quality data from Jubb Creek (JC) and Collom Gulch (CG), as detailed in the WMC report, 2005. The water quality sample from 16B was collected after 500,00 gallons of water were pumped from the welland is therefore a good example of the water that would be coming from the dewatering wells with time.

In C-04-16B, the pH is approximately 7.2, while the pH is greater than 7.5 in JC and CG. The total dissolved solids (TDS) are 710 ppm in 16B, while in the CG, the mean was 838 and in JC the mean was 1663. All water samples were high in bicarbonate, while the groundwater from 16B had higher sodium than calcium, while the surface water had higher calcium than sodium. No heavy metals were detected in the 16B water sample while the surface water samples from both streams had low levels of selenium and

manganese (approximately 0.10 ppm for both metals). Thus, except for adding excess sodium tho the surface water, all other qualities are better.

Thus, the water quality will be improved for a short distance until it intermixes with any surface water.

Potential effect on spring and seep water quality

Based on data presented in WMC (2005) springs and seeps have variable water quality with TDS concentrations ranging from 390 to 1,780 mg/l. This variable water quality reflects the source waters for the springs. Springs sourced from local infiltration and shallow groundwater will generally have lower TDS concentrations and springs sourced from the deeper bedrock groundwater will have higher TDS concentrations.

No significant impacts to spring and seep water quality are anticipated. Springs lying outside of the mine footprint that are sourced from local infiltration and shallow groundwater will not be affected by mining and no changes in the water quality are expected.

Spring SPRLC-01 lies within the pit footprint and will be eliminated by mining. However, it has a relatively high TDS concentration of 1,720 mg/l which is likely representative of the deeper bedrock groundwater quality. In the unlikely event that a spoil seep develops after the mine backfill re-saturates, the water quality of the spoil groundwater is expected to be similar to that of the deeper bedrock so TDS concentrations will be similar. Springs SPRLC-02 and SPRLC-03 are located north of the pit and spoil pile and their TDS values are in the range of 390 to 770 mg/l, probably reflecting a relatively shallow water source. During mining, potential seepage through the spoil pile up-gradient of the source areas of these springs may result in somewhat higher TDS values. Once mining is completed, the spoil pile will be removed from the Little Collom Gulch drainage as part of the mine reclamation and the Section 25 Pond will be removed following bond release. The source areas for these two springs should be re-established and no long-term changes to water quality at these two springs are expected.

There is some potential that flow from several of the springs and seeps in the West Fork of Jubb Creek and Collom Gulch drainages may be affected while the mine dewatering system is operating. The TDS concentration of the discharge from these springs is generally in the range of 700 to 1,100 mg/l, indicating a shallow or intermediate depth source. Once the mine dewatering system is turned off, groundwater flow eventually should be re-established to pre-mining conditions. It is not anticipated that there will be significant water quality impacts to these springs since they lie well outside of the mine area and are unlikely to be affected by the reclaimed pit.

Potential effect on groundwater quality

The main impact to pre-mining groundwater quality would be caused by flow out of the re-saturated pit backfill. The water quality of the groundwater at the Collom site is summarized in WMC (2005). The bedrock groundwater generally has TDS concentrations of 500 to 1,000 mg/l, a pH between 7.6 to 8.3 and low concentrations of dissolved metals. The valley fill groundwater has TDS concentrations of 400 to 1,500 mg/l, a pH between 7.6 to 8.1 and low dissolved metals concentrations. The springs and seeps, which reflect discharge from groundwater, have TDS concentrations of 390 to 1,780 mg/l, a pH between 7.8 and 8.3 and low dissolved metals concentrations.

With respect to spoil water quality, current water, rock, and soil quality analyses at the Colowyo Mine predominantly show a basic environment with a pH above 7.0. This chemical environment has been present in this area since quality testing was initiated. Some adverse chemical conditions have been

identified in the soils and overburden analyses; however, these have been discussed in the application and have been adequately handled by Colowyo in the past.

The mine backfill will be comprised of spoil material that is not geologically or chemically different from the surrounding bedrock units that currently comprise the bedrock groundwater system. The water quality of the groundwater that will be contained in the mine backfill after it re-saturates is expected to be similar to the measured quality of groundwater in the bedrock and valley fill and the water quality of the spring discharges. Since there will be a mixing of various geologic units in the mine backfill, the average groundwater quality in the backfill may reflect the higher end of the measured groundwater quality, in the range of 1,500 mg/l TDS. No significant changes in bedrock or valley fill groundwater quality are anticipated as a result of mining.

The dewatering water quality is better than or equivalent to the valley fill water quality so there will be no impacts on the valley fill water quality, based on the WMC report, 2005. This is based on a comparison of the ground water quality from C-04-16B (16B) versus water quality data from Jubb Creek (JC) and Collom Gulch (CG), as detailed in the WMC report, 2005. The water quality sample from 16B was collected after 500,00 gallons of water were pumped from the welland is therefore a good example of the water that would be coming from the dewatering wells with time.

For valley fill ground water, comparing 16B water quality with the downsteam water quality on JC and CG, all values except for metals are comparable. However, while the valley fill wells did contain low levels of iron, manganese and selenium, these metals were not detected in the sample from 16B.

Other Potential Impacts

Flooding and stream flow regimes in the Colowyo Mine area do not appear to have been affected by past mining operations or reclamation, nor are they anticipated to be affected by the Collom mining. Groundwater availability in the area may potentially be enhanced with the storage of water in the reclaimed pits. Colowyo owns significant water rights within the affected drainages. Any potential diminishment of flow that impacts other adjudicated water rights will be compensated for by reduced use by Colowyo. There is sufficient capacity for Colowyo to reduce their use of adjudicated water to compensate for potential diminishment of flow, allowing downstream users full access to their water rights.

With respect to alluvial valley floors (AVFs), lower portions of Collom Gulch have been studied prior to and after the release of the 1985 OSM Alluvial Valley Floor (AVF) Reconnaissance map. The reconnaissance by OSM was compiled on 1:100,000-scale maps and was meant to represent a reconnaissance level effort to identify areas which are likely to meet the AVF definition (from Introduction to OSM report accompanying this study). Thus, any areas identified on the OSM maps are potential AVFs. It was recognized in this study that future studies may more conclusively prove or disprove the AVF findings in the report.

Colowyo and other companies in this area performed AVF studies to more conclusively prove or disprove the existence of AVFs in this potential coal mining area of the Danforth Hills. For the Collom area, there have been significant studies to date examining the Collom Gulch area and the potential for an AVF possibly affected by mining activities in the Collom area.

Alluvial sediments are present in the valley bottoms of the Collom Gulch drainages but are intermixed with significant fractions of colluvium and sheetwash from adjacent slopes. This can be seen in the geologic description of the monitoring well (MC-04-02) in the lower portion of Collom Gulch in Section 24, T. 3 N., R. 93 W. The cuttings obtained from the drill hole are predominantly silty clays, with minor

amounts of sand and gravel (<25%). Based on depth to groundwater in this drill hole (10 feet below ground surface), it is doubtful that sub irrigation of any plant crop is possible. Further to the north, near the confluence of Collom Gulch and Little Collom Gulch, monitoring well MLC-04-01, has a groundwater level of between 40 and 50 feet below ground surface.

In addition, active erosion in the Collom Gulch channel is causing further incision, which is lowering the unconfined groundwater table found in the valley. The incision in Collom Gulch is at least two feet and in excess of 20 feet in sections before that flow of Collom Gulch exits through the 'hogback' and flows onto the Mancos Shale located in the Axial Basin to the north. The incision is also widening due to the down cutting and erosion of the supporting banks during periods of higher flow (normally occurring during the spring). With the low surface water flow rates and the reduced flood frequency, this has reduced the ability of the valley bottoms to support any agricultural use other than rangeland.

Local and regional agricultural economics are prohibitive to developing irrigation projects within these valley bottoms, and such practices are in decline locally, especially on such a small scale as would be required by the narrow and fragmented nature of irrigable bottomlands within the subject drainages.

The narrow width and fragmented nature of the minimal flat land, depth to groundwater, and impracticality of economically irrigating or mechanically farming the valley bottoms within Collom Gulch indicate that those drainages do not qualify as alluvial valley floors.

In conclusion, no adverse impact to the water environment downstream of the reclaimed Collom Pit is projected.

2.05.6 (4) Protection of Public Parks and Historic Places

No public parks are located within the permit or adjacent areas; therefore, no public parks will be affected by the mining operations. The mining operations are anticipated to affect specific sites and areas listed or eligible for listing in the National Register of Historic Places. These sites are discussed in further detail in Sec 2.04.4. A treatment plan has been prepared for some of the sites expected to experience impacts from the development of this mine. This treatment plan will identify specific mitigation processes needed to develop in and around these sensitive locations.

2.05.6 (5-6) Surface Mining near Underground Mining; Subsidence Control

No surface mining activities will be conducted within 500 feet of an underground mine. Therefore, there is no subsidence control plan for operations.

2.06 PERMIT REQUIREMENTS - SPECIAL MINING CATEGORIES

2.06.1-3 Scope, Experimental Mining, and Mountain Top Removal

There will be no experimental mining practices at the Collom Pit.

2.06.4 Steep Slope Mining

Colowyo may request a variance for mining and reclamation for steep slope mining as specified in Rules 2.06.4(2) and 4.27.

2.06.5 Variance from Approximate Original Contour Restoration Requirements

The Collom mining area will include non-mountaintop removal steep slope surface coal mining and reclamation operations. Colowyo is not currently requesting a variance from approximate original contour in the post-mining topography (PMT), but maintains the option to pursue this in the future as an amendment to the permit. The PMT as presented reflects the pre-mining topography generally, with drainages and drainage divides remaining in their approximate current locations. Some minor moderation in topography is expected due to limitations associated with reclamation equipment. Post-mining topography is shown on Map 19C. Table 2.05.6-5 presents the mine-wide volumetric calculation in support of the PMT. The PMT is designed based on the Division's rules for Operations on Steep Slopes as discussed in Section 4.27 of this document.

2.06.6 Prime Farmlands

Prime farmlands do not exist within the Collom permit revision boundary (see Section 2.04.12).

2.06.7 Reclamation Variance

There will be no delay in contemporaneous reclamation due to underground mining activities; therefore, this section is not applicable.

2.06.8 Alluvial Valley Floor (AVF)

General

The geologic and hydrologic conditions of the Collom Mine Expansion area have been studied since at least 1980 by Colowyo and other potential interests. These studies have included the examination of the valley bottoms for the possible presence of alluvial valley floors. These studies include the 1985 Office of Surface Mining Reclamation and Enforcement (OSMRE) Alluvial Valley Floor (AVF) Reconnaissance report and map of northwest Colorado. The reconnaissance by OSMRE was compiled on 1:100,000-scale maps and was meant to represent a reconnaissance level effort to identify areas which are likely to meet the AVF definition (from Introduction to OSMRE report). Thus, any area identified on the OSMRE maps is only potential AVFs. It was recognized in the OSMRE study that future studies may more conclusively prove or disprove the AVF findings in the report.

In examining the land of the Collom Mine Expansion area and the surrounding area, the landforms are controlled by two distinct geologic features. One is the Collom syncline/Danforth Hills and the other is the Axial Basin (these have been described previously in section 2.04.6 - Geology Description). The area of the Collom Syncline has sloping topography to the north until the Collom Syncline axis is reached and then a hogback formed by the uplift of the Iles formation is present. Proceeding north, the open area of the Axial Basin is then encountered.

All drainages in the Collom Mine Expansion area form on the southern portion of the Collom syncline/Danforth Hills. These drainages all flow northward toward and cross the Iles formation and then flow into the Axial Basin. The drainages tend to be narrow, confined drainages until the drainages exit to the Axial Basin.

AVF Specific Study-Collom Mine Area

In 2005, Tetra Tech, doing business as Maxim Technologies, conducted a preliminary field investigation and technical evaluation of the Collom permit expansion area located in the Collom syncline area to determine the presence of alluvial valley floors. The drainages examined include Collom Gulch, Little Collom Gulch, and Jubb Creek (including the West Fork of Jubb Creek). The investigation was conducted in accordance with Section 2.06.8 of the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining and OSMRE Technical Guideline. The results of the investigation concluded that no alluvial valley floors exist in the areas to be mined. The findings were submitted to CDRMS on September 23, 2005 in a letter, a copy of which is included in Volume 18A, Exhibit 7, Item 22. These findings are also discussed further in appropriate sections below.

The mined area is located within Little Collom Gulch, and the Collom Pit and temporary spoil pil will occupy much of the Little Collom Gulch valley bottom during the mining operation. Portions of the Collom Pit will lie within the adjacent watersheds of Collom Gulch and the West Fork of Jubb Creek, but will not encroach on the valley bottoms (Map 23B). Groundwater in the general area occurs in valley fill material associated with the stream valleys and in the permeable and semi-permeable bedrock strata (CDM, 1985a). As discussed in Section 2.04.7, the existence of groundwater in the permit expansion area is limited to perched systems that primarily discharge small amounts of water in the canyon walls near the mine on a seasonal basis, and in some of the unconsolidated valley fill. Little Collom Gulch is ephemeral, and did not produce any measurable flow during the baseline hydrologic monitoring efforts described in Section 2.04.7. Very little groundwater is found in the current active mine; and, based on existing geological and hydrological evidence, the area to be mined provides no or only minor amounts of recharge to local surface water features.

Geomorphic Characteristics

Tetra Tech's 2005 investigation included mapping unconsolidated valley deposits in the Collom permit expansion area, using published and unpublished geologic maps and ground reconnaissance. The results are shown in Figure 1 of Exhibit 7, Item 24. Much of the mapped valley deposits contained substantial proportions of colluvium and/or sheetwash materials. The source material for the valley fills was primarily erosion and deposition of loess, leading to a loamy soil texture which supports more lush vegetation than adjacent uplands, even absent sub-irrigation.

In addition, valley bottoms within the permit expansion area were very narrow and historically uncultivated. Most floodplains in the area are generally extremely narrow (less than 20 feet), have been severely down-cut, and/or contain too much topographic relief in the form of slopes to be considered capable of being irrigated. Due to downcutting, flooding does not extend beyond the limits of the incised channel.

Flood Irrigation and Agricultural Activities

Section 2.04.3 contains a description and map of agricultural activities in the permit and adjacent area. The Premining and Postmining Land Use Map (Map 17) shows that the historic pre-mining land use of the area has been generally undeveloped rangeland. Exceptions to undeveloped range land in the permit area include the presence of equipment staging areas, small structures, reservoirs, roads, and stream crossings. However, documentation exists indicating several small parcels along the West Fork of Jubb Creek, totaling approximately 24 acres, were historically used for hay production. No evidence of any irrigation for these parcels was found.

Historically, there has not been a developed water supply for agricultural activities in the potentially-affected drainages. In addition, based on field investigations, there is no evidence of historical flood irrigation in the Collom permit expansion area.

Subirrigation

Depths to groundwater in the valley fill materials in the Collom Mine Expansion area have been recorded as between 9 feet below ground surface (bgs) along West Fork Jubb Creek (near a small pond), to greater than 47 feet bgs within Little Collom Gulch. Further information on groundwater occurrence is provided in Section 2.04.7.

The effects of the mass-wasting event of 1983-1984 downcut the valley fill throughout this area as much as 20 to 30 feet below the former surface in some locations. The resulting lowering of the valley fill groundwater table was noted by Tetra Tech as having caused drying of former wetlands and colonization of the land by upland plant species. Remaining wetlands in the valley bottoms are generally associated with springs and seeps issuing from perched water in bedrock along the valley wall. Examination of non-wetland soil profiles next to drainages revealed very few soils with mottles, shallow rooting depth, or other characteristics indicative of subirrigation.

Suitability for Flood Irrigation

Since 1974, Colowyo and other private and governmental groups have collected samples of water flows and water quality in the area. Water of sufficient quality and quantity for seasonal flood irrigation does exist in some areas (WMC 2005). However, the cost to develop such an irrigation system would be prohibitive given the remote location and limited area available for irrigation (Dames and Moore 1980,

Walsh 1984). New irrigation projects are very rare in local agricultural practice, and would incorporate sprinkler irrigation rather than inefficient flood irrigation.

Conclusion

Tetra Tech's 2005 report presented the following findings regarding the presence of alluvial valley floors in the Collom permit expansion area:

- Alluvial materials are present in the valley bottoms of the Collom Gulch, Little Collom Gulch, and Jubb Creek drainages, but the materials are intermixed with significant fractions of colluvium and sheetwash from adjacent slopes.
- Based on depth to groundwater, subirrigation within these valley bottoms is very limited.
- Active erosion in the stream channels is causing further incision, lowering of the groundwater table, and reduced flood frequency, reducing the ability of the valley bottoms to support any agricultural use other than rangeland.
- Local and regional agricultural economics are prohibitive to developing irrigation projects within these valley bottoms, and such practices are in decline locally, especially on such a small scale as would be required by the narrow and fragmented nature of irrigable bottomlands within the subject drainages.

The narrow width and fragmented nature of the minimal flat land, depth to ground water, and impracticality of economically irrigating or mechanically farming the valley bottoms within Collom Gulch, Little Collom Gulch, and West Fork of Jubb Creek of the Collom Mine Expansion area indicate that those drainages do not qualify as alluvial valley floors.

Specific discussion of the Collom Gulch Valley

As noted in the previous text, alluvial materials are present in the valley bottoms of the Collom Gulch drainages but the materials are intermixed with significant fractions of colluvium and sheetwash from adjacent slopes. This can be seen in the geologic description of the monitoring well (MC-04-02) in the lower portion of Collom Gulch in Section 24, T. 3 N., R. 93 W. The cuttings obtained from the drill hole are predominantly silty clays, with minor amounts of sand and gravel (<25%).

Based on depth to groundwater in this drill hole (10 feet below ground surface), it is doubtful that subirrigation of any plant crop is possible. Further to the north, near the confluence of Collom Gulch and Little Collom Gulch, monitoring well MLC-04-01 has a ground water level of between 40 and 50 feet below ground water surface.

In addition, active erosion in the Collom Gulch channel is causing further incision, which is lowering the unconfined groundwater table found in the valley. The incision in Collom Gulch is at least two feet and in excess of 20 feet in sections before that flow of Collom Gulch exits through the 'Iles formation hogback' and flows onto the Mancos Shale located in the Axial Basin to the north. The incision is also widening due to the downcutting and erosion of the supporting banks during periods of higher flow (normally occurring during the spring). With the low surface water flow rates and the reduced flood frequency, this has reduced the ability of the valley bottoms to support any agricultural use other than rangeland.

Local and regional agricultural economics are prohibitive to developing irrigation projects within these valley bottoms, and such practices are in decline locally, especially on such a small scale as would be required by the narrow and fragmented nature of irrigable bottomlands within the subject drainages.

The narrow width and fragmented nature of the minimal flat land, depth to ground water, and impracticality of economically irrigating or mechanically farming the valley bottoms within Collom Gulch indicate that these drainages do not qualify as alluvial valley floors.

AVF Studies- Gossard Loadout and surrounding areas

All the streams/creeks that exit the Collom syncline/Iles formation hogback still exhibit the deep downcutting that originates in the Collom Syncline lands. This downcutting is easily visible in all streams/creeks exiting the hogback and continues for several miles downstream. This downcutting was due to the 1983/1984 mass-wasting event discussed above. The two streams that will be affected by the Collom Mine Expansion are Jubb Creek and Wilson Creek, near the Gossard Loadout.

The possibility of any AVF in Jubb Creek was discussed above. As noted, there is no AVF in the Jubb Creek valley north of the hogback. With respect to Wilson Creek, after the creek exits the hogback, a broad valley filled with valley fill materials is encountered. In the area where the Collom haul road crosses from the Collom Pit to the Gossard loadout, Wilson Creek is at least 20 feet deep. The banks show some undercutting and blocks of valley fill material coming off the sides. The vegetation on the land on both sides of the creek in this area is predominantly upland vegetation. The vegetation is old growth due to the size of the brush in this area. The deep valley of the creek and vegetation continues along the length of Wilson Creek to the north of the loadout and for several miles north of the loadout.

Groundwater is this area is at least 20 feet below ground surface (bgs) in the shallow monitoring wells, Gossard Well and MW-95-02. The Gossard Well is located northeast of the Gossard Loadout in the field and MW-95-02 is located on the east bank of Wilson Creek, southwest of the loadout. The historical average depth to water at the Gossard Well is approximately 21 feet (2009 Annual Reclamation Report). Tetra Tech (2005) concluded that such depths to groundwater are too great to allow for agriculturally significant subirrigation. MW-95-02 had a water level of 25.1 feet bgs in November 2016. (Further information on groundwater occurrence is provided in Section 2.04.7).

In September of 2015, four geotechnical holes were drilled on both sides of Wilson Creek where the crossing for the haul road leading from the Collom pit to the loadout is to be located. Groundwater was detected in these geotechnical test hole at approximately 25 feet bgs. There are no visible seeps on the sidewalls of the valley in the crossing area and both upstream and downstream of the crossing area. This new data provides additional information to the conclusion that groundwater in the area is too deep for any subirrigation.

The near surface valley fill materials in the area of the Collom haul road crossing over Wilson Creek were found to be predominantly clay, based on the four geotechnical test holes. The clays do contain minor amounts of gravel, sand and silt and were gray to dark brown in color. The thickness of the clays are at least 10 feet thick and are stiff to hard. The materials present do not appear to meet the definition of alluvial material for alluvial valley floors.

No evidence of flood irrigation was found for the fields surrounding the Gossard loadout. However, some limited flood irrigation was conducted in the floodplain of Wilson Creek, north of and outside the permit boundary (north of County Road 17). The ditch constructed for this irrigation is now heavily overgrown with upland vegetation. The gate for this water diversion sets several feet above the Wilson Creek channel and cannot be reached by current water flow from Wilson Creek. The area of concern surrounding the Gossard Loadout facility was bypassed for flood irrigation historically in order to apply irrigation water downstream to lands outside the current permit boundary.

Irrigation diversion points, irrigation ditches, and topography are shown on Map 10B. These areas are well outside the subject drainages of Collom Gulch, Little Collom Gulch, and Jubb Creek.

Thus, the same conclusions as those previously presented for the creeks in the Collom syncline area may be reached for the area of disturbance for construction of the Collom Haul Road in the vicinity of the Gossard Loadout facility (Map 25E Sheet 1 of 4):

- Alluvial materials are present in the valley bottom of the Gossard Loadout complex, and the lower reaches of the Lower Wilson Creek drainage, but the materials are intermixed with significant fractions of colluvium and sheetwash from adjacent slopes and the mass wasting event experienced in 1983-1984.
- Based on an average depth to groundwater of at least 20 feet , coupled with data from monitoring wells and geotechnical test holes in the Wilson Creek area drilled in 2015,subirrigation within this valley bottom is very limited in extent (outside and north of the permit area) or non-existent. Active erosion in the stream channels is causing further incision and reduced flood frequency, reducing the ability of this valley bottom to support any agricultural use other than rangeland or dryland agriculture. There is no evidence of "modern terracing" in the area that will be disturbed near the Gossard Loadout facilities.
- Local and regional agricultural economics are prohibitive to developing irrigation projects within this valley bottoms, and such practices are in decline locally.
- Historical irrigation activities associated with the "diversion structure and ditch" located on Wilson Creek; divert water around the existing grain fields, under County Road 17, outside the current permit boundary to the fields northeast of County Road 17. This activity is still performed when water is available to the diversion structure as the mass wasting events (1983-1984) limited the function of this system.

Colowyo contends that based on the descriptions and defining characteristics needed to classify an area as a functioning alluvial valley floor, the area to be disturbed that is associated with the Collom Haul Road within the Lower Wilson Drainage does not qualify as an alluvial valley floor. Thus, no material damage assessment, water monitoring program, etc., is required due to the fact the area is not a functional alluvial valley floor. Colowyo does plan to return the area of disturbance to pre-disturbance condition at the cessation of mining activities.

2.06.9 – 2.06.11 Augering, Processing Plants, In-Situ Processing

In the Collom Pit, specifically the endwall and low walls of the box cut, highwall mining will target the X3/X4, B2/B3, C3/C5, D1/D2, E2, F5/F6, F_A/F_B, G8/G9 and G_B seams. Please see Map 23B for the overall extent of the highwall mining plan for the Collom Pit. All seams will be developed in a top-down sequence following the Collom box cut down as it is driven. The planned highwall mining sequencing will begin with the X3/X4 seam, and once mining is completed the highwall mining will continue down to the next available seam in the sequence following right behind pre-strip surface mining operations. For additional detail on the highwall mining technique that will be utilized please see Volume 1, Section 2.06.9.

Please see Volume 1 for Sections 2.06.10 and 2.06.11.

2.06.12.1 Coal Refuse Piles

Coal refuse piles do not exist on the Colowyo property. Thus, this section is not applicable.

2.07 – 2.10 VARIOUS

Information required by these sections is included in Volume 1.