TRI-STATE

July 21, 2021

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

RE: Colowyo Coal Company L.P.
Permit No. C-1981-019
Minor Revision No. 235
Collom Wildland Fire

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 minor revision 235 (MR-235) to Permit No. C-1981-019.

MR-235 provides documentation of a wildland fire named the Collom Fire that occurred within Colowyo's mine permit boundary adjacent to the Collom Pit. The fire started on June 15, 2021 directly east of the Collom Pit, and burned east across Jubb Creek and into the Wilson Creek drainage. Fire crews from Bureau of Land Management, Colorado Division of Fire Prevention and Control, U.S. Forest Service, Moffat County Sheriff's Office Wildland Fire Division, and Craig Fire/Rescue contained and extinguished the fire on June 17, 2021. Mr. Tony Tennyson notified the Division per a voicemail to Mr. Trujillo at the commencement of the fire on June 15, 2021 at approximately 4:10 PM.

The Collom fire burned approximately 641 acres of sagebrush steppe, mountain shrub, and a small portion of junipers scrub. In addition to the acreage burned, an additional five acres of fire lines were cut in to help fight the fire. It is requested that the Division calculate the reclamation liability to reseed the five acres of disturbance that occurred from the construction of fire lines. Colowyo will roughen and/or smooth out the fire lines and reseed them with the approved seed mixture this fall, and report the areas reclaimed in the 2021 annual reclamation report.

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

Sincerely,

DocuSigned by:
Chris Gilbreath
D250C711D0BF450...

Chris Gilbreath
Senior Manager,
Remediation and Reclamation

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CG:TT:der

Enclosure

cc: Jennifer Maiolo (BLM-LSFO)
Tony Tennyson (via email)
Angela Aalbers (via email)
File: C. F. 1.1.1.216 - 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: **July 20, 2021**
Revision Description: **MR-235 Collom Wild Land Fire**

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 iii through v (3 pages)		Table of Contents Pages iii through v (3 pages)		Volume 1 Table of Contents has been updated.
1	List of Figures Page 8 (1 page)		List of Figures Page 8 (1 page)		List of Figures has been updated.
1	Figures Pages 37 through 44 (8 pages)		Figures Pages 37 through 45 (9 pages)		Figure 4.12-8 has been inserted which caused a pagination shift.
1	Page 4-34 through 4-56 (23 pages)		Page 4-34 through 4-56 (23 pages)		Section 4.12 has been updated which caused a pagination shift.
2A					No Change
2B					No Change
2C					No Change
2D					No Change
2E					No Change
3					No Change
4					No Change
5A					No Change
5B					No Change
6					No Change
7					No Change
8					No Change
9					No Change
10					No Change
12					No Change
13					No Change
14					No Change
15					No Change
16					No Change
15					No Change

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

Mine Company Name: **Colowyo Coal Company**
Permit Number: **C-1981-019**
Date: **July 20, 2021**
Revision Description: **MR-235 Collom Wild Land Fire**

Volume Number	Page, Map or other Permit Entry to be REMOVED		Page, Map or other Permit Entry to be ADDED		Description of Change
17					No Change
18A					No Change
18B					No Change
18C					No Change
18D					No Change
19					No Change
20					No Change
20					No Change
21					No Change
22	Map 19C		Map 19C		Map 19C has been updated.

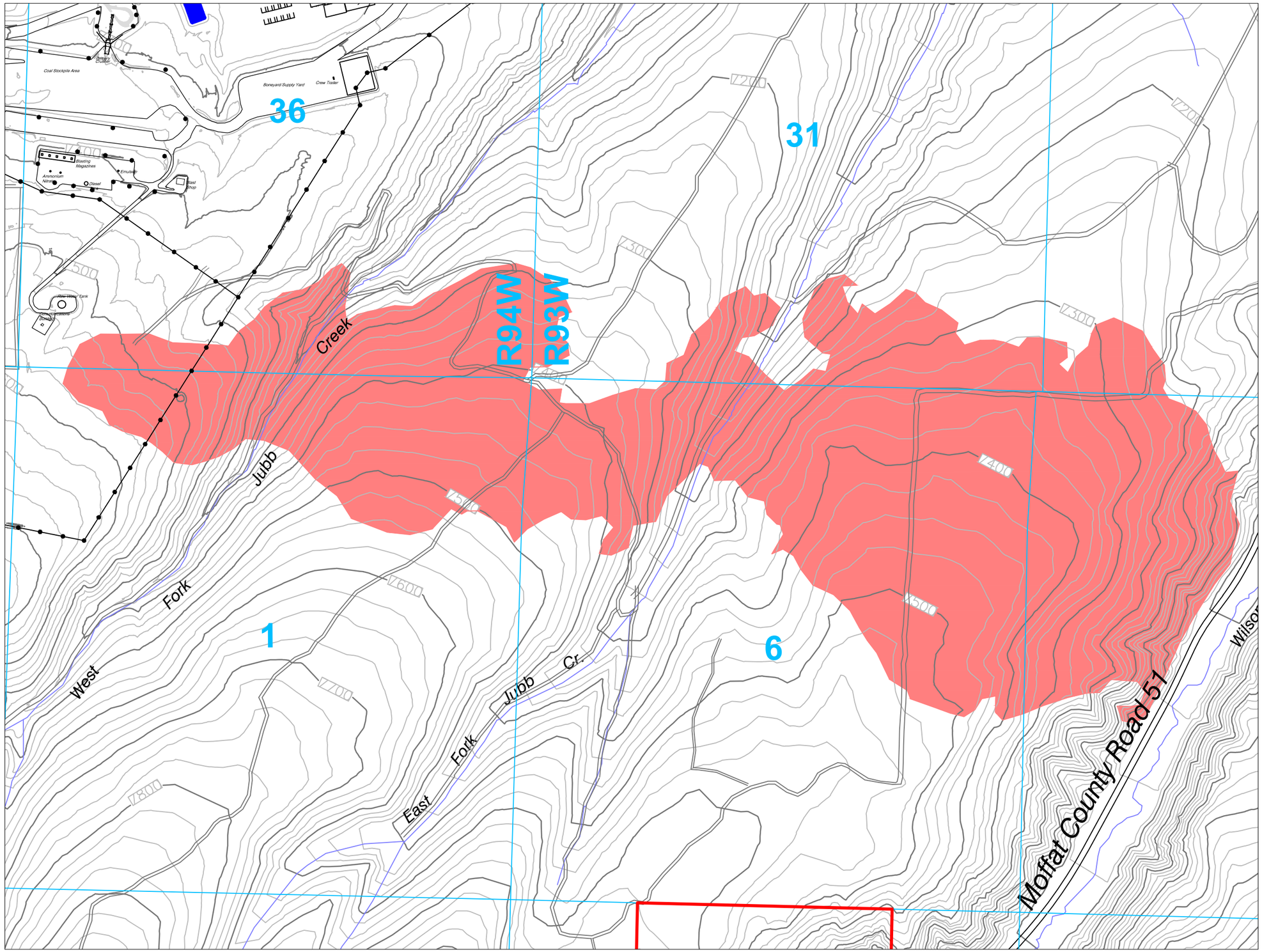
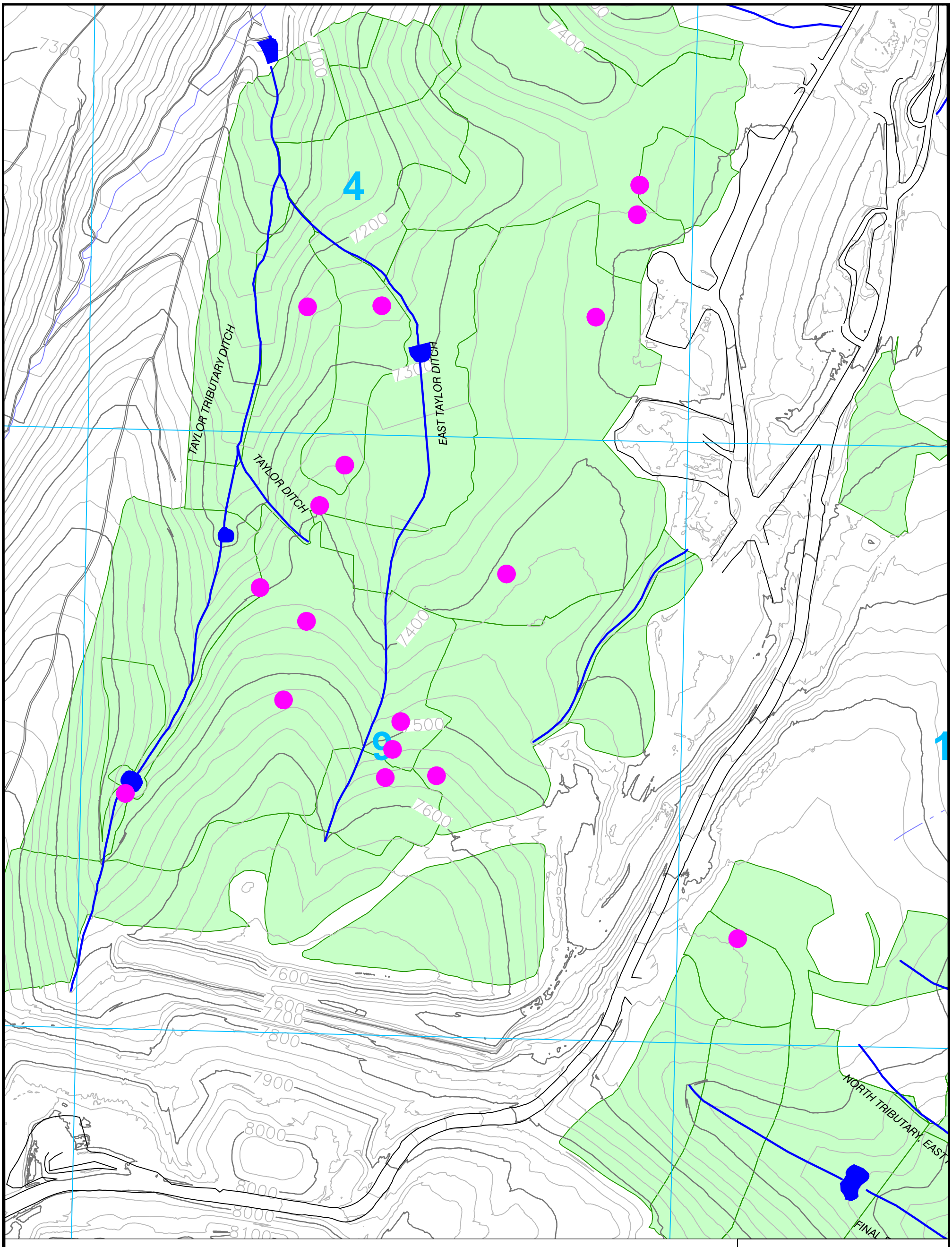


Figure 4.12-8
2021 Wild Land Fire Area

Colowyo Coal Company
8777 State Highway 13
Meeker, Colorado 81641

SCALE: 1" = 1000'
DATE: 7/20/21
DRWG. BY: TONY
APPROVED BY: AA
DRWG NO.

No.	REVISION	DATE	BY	CHK



LEGEND

- *PERMANENT CHANNELS (CONSTRUCTED TO DATE)*
- *SECTION LINE*
- *ROAD*
- *APPROXIMATE TALL SHRUB TEST PLOT LOCATION*
- *RECLAMATION AREA*

N W E S

500' 0 500' 1000'

CONTOUR INTERVAL 25 FT.
TOPO DATE JUNE 2020

Tall Shrub Test Plot Locations

COLOWYO COAL COMPANY

SCALE: 1" = 800'
DATE: 10/27/20
DRWG. BY: Tony
APPROVED BY: AA

DRWG NO. *Figure 4.15-1*

No.	REVISION	DATE	BY	CHK
MR-235	Revised Page Number	7/20/21	Tony	Tony

Figure 4.18-1 Raptor Protection Retrofitting of Existing Power Poles

Raptor Protection Retrofitting of Existing Power Poles

Assigned Pole Number	Primary Unit - Top	Proposed Improvents: Bushing Covers	Arrester Caps	Insulate Jumpers	Perch Guards	Bird Spikes	Pole-top Ground Molding	Remove or Gap Pole-top Ground	Refer to Figure Identified Below on Pages 4.18-5 Through 4.18-9	Year Planned For Retrofit	Quarter Planned For Retrofit
Administration Substation to North											
A1	C7 OSW			3					Refer to Figure 5	2005	Q3
A3	C9 OSW				2		1		Refer to Figure 4	2005	Q3
A4	C9 OSW				2	2	2		Refer to Figure 4	2005	Q3
A5	C9 OSW				2		1		Refer to Figure 4	2005	Q3
A12	C9 OSW				2		1		Refer to Figure 4	2005	Q3
A13	C9 OSW				2		1		Refer to Figure 4	2005	Q3
A15	C7 OSW			6					Refer to Figure 5	2005	Q3
A15-1A	C9-1 OSW				1		1		Refer to Figure 4	2005	Q3
A15-2A	C9-1 OSW				1		1		Refer to Figure 4	2005	Q3
A15-3A	C7 OSW	3	2	9		1			Refer to Figures 4 and 5	2005	Q3
A16	C9 OSW				2				Refer to Figure 4	2005	Q3
A17	C8 OSW			6					Refer to Figure 5	2005	Q3
A17-2L	C7		1	6					Refer to Figure 5	2005	Q3
A19	C7 OSW			6	2				Refer to Figures 4 and 5	2005	Q3
A20	C7 OSW	3		6					Refer to Figure 5	2005	Q3
A21	C9 OSW		1	9	2	1	1		Refer to Figures 4 and 5	2005	Q3
A22	C7 OSW			3			1		Refer to Figures 4 and 5	2005	Q3
A23	C7 OSW		2	6	2	1			Refer to Figures 4 and 5	2005	Q3
Administration Substation to South											
[Note: 69kV limited issue for avian electrocution; therefore 69kV not surveyed]											
H1	69kV				3				Refer to Figure 4	2005	Q4
H2	69kV		3	6	2				Refer to Figures 4 and 5	2005	Q4
H3	69kV			3	2	1			Refer to Figures 4 and 5	2005	Q4
H3-1R	C8-1				4				Refer to Figure 4	2005	Q4
H4	69kV	1	2	15	4				Refer to Figures 4 and 5	2005	Q4
H4-1L	69kV				4				Refer to Figure 4	2005	Q4
H4-2L	69kV				2				Refer to Figure 4	2005	Q4
H4-4L	C9 OSW				2				Refer to Figure 4	2005	Q4
H4-5L	C9-1 OSW				1				Refer to Figure 4	2005	Q4
H4-6L	C7 OSW	3	3	9		1			Refer to Figures 4 and 5	2005	Q4
H5	69kV				4				Refer to Figure 4	2005	Q4
H6	C8-1				4				Refer to Figure 4	2005	Q4
H7	C9				4				Refer to Figure 4	2005	Q4
H8	C9-1	1	1	1	2	1		1	Refer to Figures 1, 2, 4 and 5	2005	Q4
H9	C9-1				2			1	Refer to Figure 1, 2 and 4	2005	Q4
H10	C9-1				2				Refer to Figure 4	2006	Q3
H11	C7 NU			3	2	3			Refer to Figures 4 and 5	2006	Q3

Figure 4.18-1 (Continued) Raptor Protection Retrofitting of Existing Power Poles

Raptor Protection Retrofitting of Existing Power Poles (Continued)

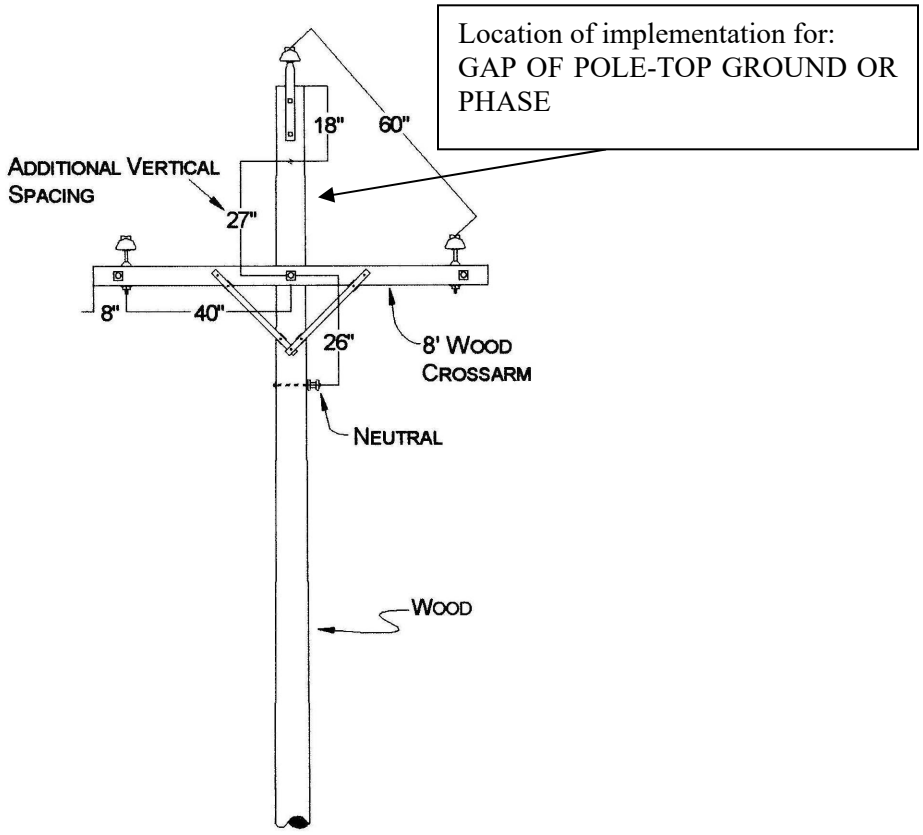
		Proposed Improvents									
Assigned Pole Number	Primary Unit - Top	Bushing Covers	Arrester Caps	Insulate Jumpers	Perch Guards	Bird Spikes	Pole-top Ground Molding	Remove or Gap Pole-top Ground	Refer to Figure Identified Below on Pages 4.18-5 Through 4.18-9	Year Planned For Retrofit	Quarter Planned For Retrofit
H12	69kV	2	0	6	2				Refer to Figures 4 and 5	2006	Q3
H13	69kV			6	6				Refer to Figures 4 and 5	2006	Q3
H13-1L	C7 NU			3	2	3			Refer to Figures 4 and 5	2006	Q3
H13-2L	C7 NU			3	4				Refer to Figures 4 and 5	2006	Q3
H13-3L	C7 NU			3	2	1			Refer to Figures 4 and 5	2006	Q3
H14	69kV				2				Refer to Figure 4	2006	Q3
H15	69kV				2		1		Refer to Figure 4	2006	Q3
H16	69kV				3	2			Refer to Figure 4	2006	Q3
H18	A5-1	1		1					Refer to Figure 5	2006	Q3
H14-1R	C8-1				3				Refer to Figure 4	2006	Q3
H14-2R	C9-1 OSW				1				Refer to Figure 4	2006	Q3
H14-3R	C9-1 OSW				1				Refer to Figure 4	2006	Q3
H14-4R	C7-1 OSW	1	0	9	2				Refer to Figures 4 and 5	2006	Q3

Abbreviations:

OSW: overhead static wire

NU: "neutral up" on crossarm

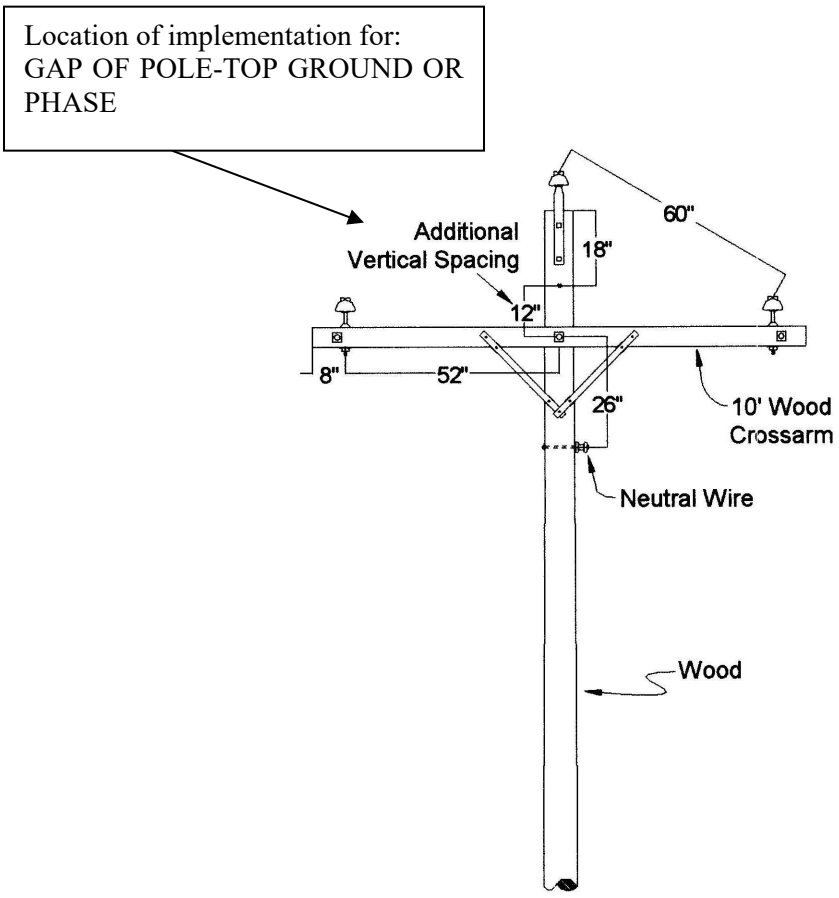
Figure 4.18-2 Typical Eagle-Safe Three-Phase Pole Configuration



Typical Eagle-Safe three-phase pole configuration using a dropped 8-foot crossarm creating a gap between the pole-top ground or phase and the phases on the crossarm.

New and/or existing three-phase tangent structures can be framed to provide an additional 16 inches of clearance, bringing the total phase-to-phase separation to 60 inches as recommended in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996.* This additional clearance required for eagles can be obtained by lowering the crossarm 27 inches on poles with 8-foot crossarms.

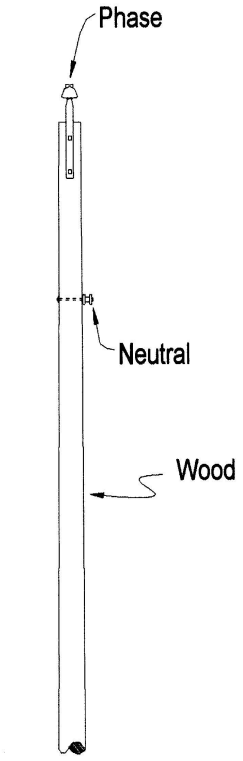
Figure 4.18-3 Typical Eagle-Safe Three-Phase Pole Configuration



Typical Eagle-Safe three-phase pole configuration using a dropped 10-foot crossarm creating a gap between the pole-top ground or phase and the phases on the crossarm.

Dropping a crossarm an additional 27 inches may require shorter spans or taller poles to maintain safety clearances, adding to the structures cost. A common alternative to dropping the arm is to use a 10-foot crossarm and lowering the arm only an additional 12 inches. This provides the recommended 60 inches of separation without using taller poles and is the most economical method to raptor-proof a structure.

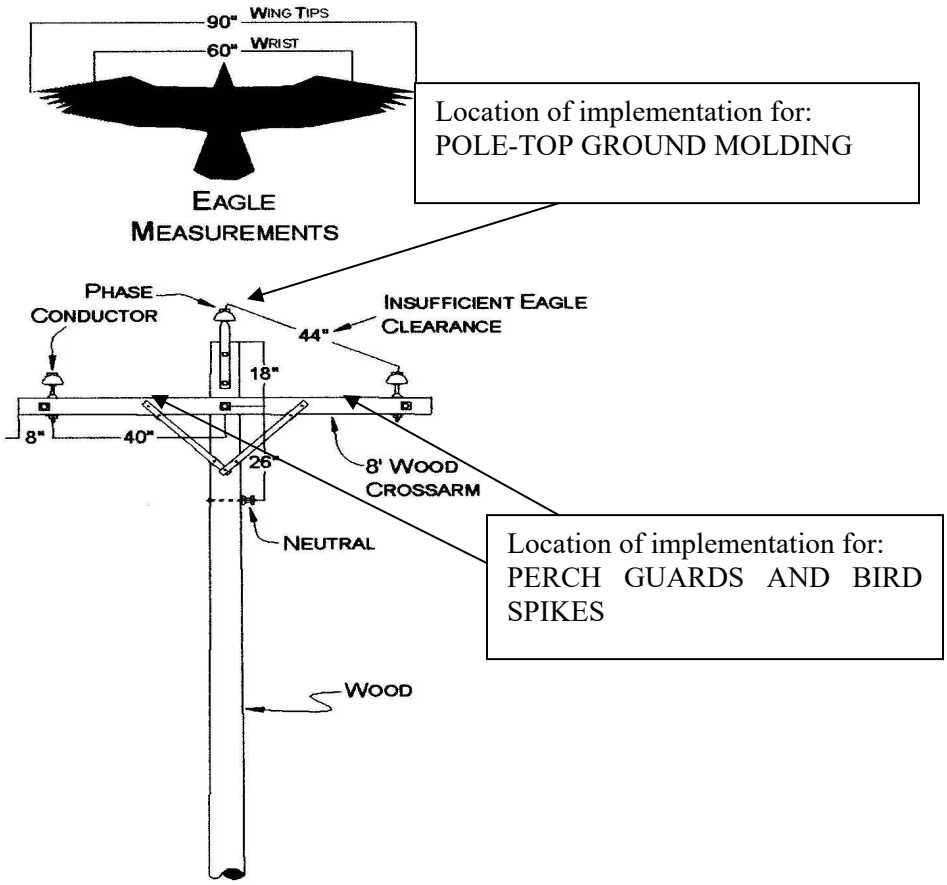
Figure 4.18-4 Typical Distribution Single-Phase Pole Configuration



Typical distribution single-phase pole Configuration.

Typical single-phase tangent structures are usually constructed without crossarms and support a single energized phase conductor on a pole-top insulator. Single-phase structures without pole-top grounds or pole-mounted equipment generally provide adequate separation for all animals.

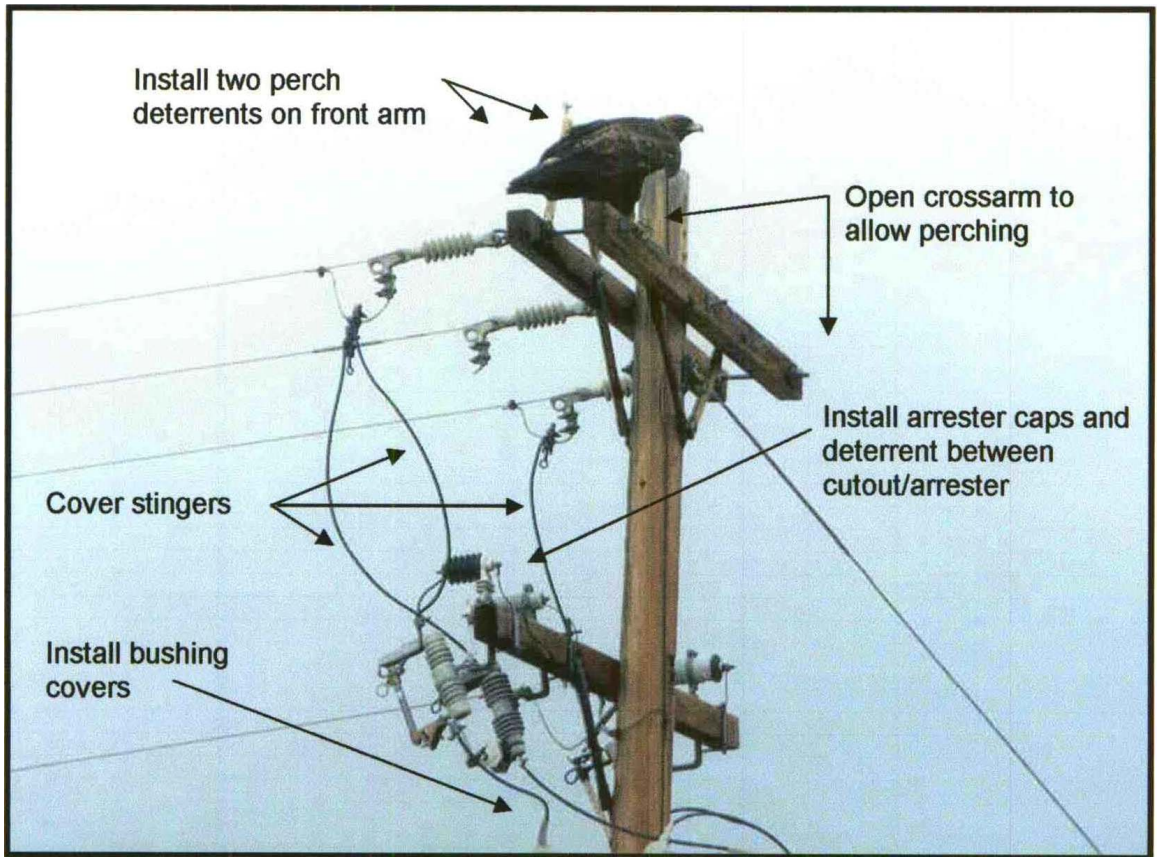
Figure 4.18-5 Typical Distribution Three-Phase Pole Configuration.



Typical distribution three-phase pole configuration.

Three-phase power lines are usually constructed with an 8-foot crossarm supporting two conductors. A single energized phase conductor typically sits on a pole-top insulator. Distribution three-phase tangent structures, without pole-top grounds or pole-top mounted equipment, generally provide adequate separation for all but the largest raptors since 44 inches of phase separation is provided. There is also a 20-degree angle between the outer and center phase wires. This separation is appropriate in areas where large raptors are less likely to occur. In areas where eagles use these poles as preferred perches, additional protection to minimize the electrocution risk would be required. A couple of different raptor protection device alternatives and their locations are shown above in Figure 4.

Figure 4.18-6: Typical Deadend Structure Pole Configuration.



Many deadend poles require insulated jumpers to allow safe perching. Where this is not practical and 60 inches of separation is lacking, perch management is an option. However, perch management is most successful when other parts of the structure are still safely accessible to birds. Shown above are various different types of raptor protection device alternatives and their approximate locations.

Perch guard devices can be placed on the crossarms to eliminate the possibility of raptors utilizing the structure or only allowing raptors to utilize safe portions of the structure.

Insulated Jumpers or covers can be used to protect raptors from electrocution by the phase stingers.

Bushing covers and arrester caps also eliminate the possibility of electrocution on exposed pole-mounted equipment.

In 2021, approximately 641 acres within Colowyo's permit boundary, directly adajencet to the east side of the Collom Pit, was affected by a wild land fire. The location of the wild land fire is shown on Figure 4.12-8. The area that was burned is mostly comprised of sagebrush. Additional surface disturbance within the permit boundary of approximately five acres was created to cut in a fire lines to control and fight the fire. The relatively low intensity nature of the fire does not appear to warrant or require supplemental seeding; however, the areas impacted by the fire lines will be roughened, seeded with the approved reclamation seed mix, and reported in the annual reclamation report.

4.13 CONTEMPORANEOUS RECLAMATION

All reclamation actives, including but not limited to backfilling, grading, topsoil, replacement and revegetation, will be carried out as contemporaneously as practicable with mining operations. Implementation of the reclamation plan, as described in Section 2.05.4, will assure that each step in the reclamation process is completed in a timely manner.

Because of the multi-seam nature of the mining operation described in Section 2.05, backfilling and grading cannot be completed within 180 days following the coal removal. Backfilling and grading will be completed in variance of the 180 day requirement in a manner previously approved and described below, and in Sections 2.05 and 4.14.1. A series of benches will be necessary in the operation to recover the lower coal seams, and an additional series of benches will be necessary to dump the shovel/truck overburden material in a configuration that achieves the topography shown on the post-mining Topography Map (Map 19). When multi-seams are mined, backfilling and rough grading cannot begin until the lower-most seam is mined. See Spoil Grading Map (Map 29), which shows the time frames in which grading will occur.

Topsoil will be removed prior to the mining disturbance according to the timetable established on the Topsoil Handling – South Map (Map 28). As can be observed from this map, the initial topsoil removed at the operation must be stockpiled; however, as the operation progresses, topsoil can be immediately redistributed rather than stockpiled.

Revegetation will commence as soon as the topsoil has been redistributed and prepared for seeding as described in Section 2.05.4. The area will be seeded with the seed mixture described in Section 2.05.4 as quickly as possible.

4.14 BACKFILLING AND GRADING

4.14.1 General Requirements

The mining operations of Colowyo will not employ the use of contour mining methods.

The following sample of calculations show that Colowyo does not have thin or thick overburden as defined in Subsection 4.14.4 or Subsection 4.14.5. These calculations represent the approximate conditions found in the field and show that there is always more than enough overburden to reestablish the original elevation. As explained in the 1983 Annual Report, Colowyo currently uses an average 20% swell factor for planning purposes. Dragline swell is estimated to be 23%, and truck/shovel swell is estimated to be 17%. Approximately 45% of the overburden is removed

by dragline, and 55% by truck/shovel. Since all mining at Colowyo was conducted by truck/shovel methods through 1979, the life-of-mine swell factor has continued to increase.

Example: 363 feet overburden, 47 feet coal, (these conditions are found along the western edge of the pit in 1988), 20% swell factor

363 feet	+	20% swell	=	final thickness =	1.06
363 feet	+	47 feet		initial thickness	

Example: 356 feet overburden, 49 feet coal (these conditions are found along the western edge of the pit in (1988), 20% swell factor

356 feet	+	20% swell	=	final thickness =	1.05
363 feet	+	49 feet		initial thickness	

The original permit application utilized at 17% swell factor to project the anticipated postmining topography.

During the initial permit review process the anticipated swell factor was subsequently revised to 23% to allow for sufficient pit development. At that time, excess swell was anticipated to raise the elevation of the postmining topography by about 5.3 feet, compared to the premining topography. As explained above, in 1984, as part of the 1983 Annual Report, Colowyo further refined its estimates based on measurements to date, and currently uses an overall 20% swell factor for estimating purposes. As indicated in the Annual Reports, the stripping accomplished by draglines can vary from 40% to 45% and from 55% to 60% for truck/shovel. Swell factor will continue to be monitored and the postmining topography adjusted, if necessary. Any adjustments will be minor, will be done gradually and will not affect the reclamation plan or postmining land use. Particularly, drainage channel gradients will not be changed; an entire drainage channel elevation could possibly be revised, but the gradient would remain as designed. If a change would be necessary, the dump plan elevations would be revised as appropriate.

The mining plan, as described in Section 2.05.3, was a soundly designed and engineered open pit mining plan, which maximized coal conservation and recovery while minimizing adverse environmental impacts. Because of the multi-seam mining configuration used by Colowyo, an exemption from the 180 day or four spoil ridge limitation was and still is necessary. The mining plan was designed as a continuously moving open pit operation with the mine advancing approximately parallel to the dip of the numerous coal seams. The mining operation progressed from a southward direction with shovels/trucks/ proceeding along the entire length of the mining area uncovering the upper coal seams and the draglines uncovering the lower coal seams. With the numerous benches used in an open pit operation, the mine area was opened for some time, and backfill and grading operations are occurring now in the West Pit.

As the mining operations remove coal seams (In the southward progression), the mining area must be left open until such time as the lower-most coal seam can be recovered. With the mining configuration, the time differences between mining the upper-most seam versus the lower-most

seam will obviously be greater than 180 days. As the operation advances, backfilling will be as contemporaneous as practical but not so as to interfere with removal of the lower-most coal seam. Colowyo will rough backfill and grade as shown on the Spoil Grading Map (Map 29) by methodically and actively dumping and backfilling overburden in the West and East pits very close to final contour so that minimal work will be needed to complete final re-grade of these areas in the future. All disturbed areas will be returned to the approximate original contour by grading and backfilling with the use of a dragline, trucks, dozers, scrapers and dozers assisting a dragline. Additional detail of the backfilling and grading for the mining operation is set forth in the discussion under Sections 2.05.3 and 2.05.4.

The area to be mined will be restored to a topography approximating premining grades. The outslopes of the completed fill in Streeter Draw and areas backfilled, as necessary, will utilize terraces and/or contour furrows for erosion control and stability. These terraces and contour furrows will be constructed according to the requirements outlined in Section 2.06.2. Where applicable, Colowyo will retain all overburden and spoil on the solid portion of existing benches. The final graded slopes will not exceed the approximate original premining slope grade as shown on the Postmining Topography Map (Map 19). Postmining surface drainage channels will be located to minimize erosion and to minimize slippage.

The final pit highwalls will be eliminated in Section 16 by backfilling X seam overburden materials from the West Pit mining area to achieve the final topography. Rehandle of the X seam overburden will be occur concurrently with the advance of the multiple-seam advance during the 2003-2010 period. Also, as mining advances into the final pit, the working area on the pit spoil side will decrease to a point where insufficient spoil room below the proposed postmining contours is available. When that point is reached, material will be temporarily placed above the proposed postmining topography. When the final pass of the West Pit is mined out, this temporarily-placed spoil will be rehandled concurrently with Section 16 virgin and rehandle material to fill and slope the pit to the configuration shown on Map 19 (Postmining Topography). Because the area will be redisturbed by the rehandle activities, that portion of the north end of Section 16 that is above final grade will not be topsoiled or otherwise reclaimed until final reclamation.

Final reclamation of the East Pit will take place via the sequence shown on Map 29 (Spoil Grading – South Area) with the reclamation blocks advancing from east to west or from the topographic bottom to the topographic top of the mining areas. Just as in the West Pit, all disturbed areas will be returned to approximate original contour by grading and backfilling with the use of draglines, trucks, dozers, scrapers and dozers assisiting a dragline. As reclamation of the East Pit progresses, all non-reclaimed areas will be contained so that any residual runoff from these areas will be isolated within the remainder of the East Pit. All methods of erosion control and stability such as contour ditches, contour furrows, internal ditches and internal sumps will be established on an as-needed basis to ensure the integrity of the Prospect Pond and the surrounding areas include the final East Pit Ditch. Closure of the East Pit is dependent on the final reclamation and closure of the West Pit as the western most portion of the East Pit will tie-in with the West Pit in this area.

A haulroad corridor from the Administration/Shop area to the South Taylor Pit will remain in place until final reclamation is completed in that area. The corridor is sufficient in width to provide a material balance as the corridor is regraded to the post mine topography. The

administration/shop/facilities area will be the last area to be reclaimed. A light duty road intended for post mining use may be left as a postmining feature in this corridor with land owner consent.

In addition, Colowyo controls additional coal reserves west and south of Section 9 and 16, outside of Permit C-81-019, that may be considered for future mine expansion. It is possible that the final plans for Section 16 and Section 9 could change to provide for such expansion, with any plan changes being addressed through an appropriate permit revision.

4.14.2 General Grading Requirements

The final graded slopes at the mining operation will not exceed the approximate original premining slope grade as shown on the Postmining Topography Map (Map 19). Colowyo will retain all overburden and spoil material on solid portions of existing or new benches. The final highwall at the operation will be eliminated by backfilling overburden into the final pit area.

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.