

**APPENDIX M: INTERIM ROLLOVER OBJECTIVE (IRO)
FOR ALTERNATIVE C**

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INTRODUCTION

This appendix includes two documents:

- **Proposed Interim Rollover Objective for the Continental Divide-Creston Natural Gas Project Environmental Impact Statement and Record of Decision (February 25, 2011).** This document was developed by the CD-C Reclamation Work Group, an ad hoc group focused on improving reclamation in the CD-C project area. The document was intended to provide flexibility for industry, while maintaining healthy, desirable vegetation within the project area. The group, including representatives of industry, state agencies, the University of Wyoming, local governments, and the BLM, worked for two years to develop the document. The document provided the framework in which the *BLM Rollover Criteria, Continental Divide–Creston EIS* (description follows) was developed.
- **BLM Rollover Criteria, Continental Divide–Creston EIS.** The criteria described in this document are formally incorporated as an element of *Alternative C: Surface Disturbance Cap—High and Low Density Development Areas*. For the purposes of the CD-C EIS, the standards and guidance contained in the Rawlins RMP Appendix 36 and the Wyoming State Reclamation Policy, IM-WY-2012-032, apply to the Proposed Action and the other action alternatives. However, a specific exception is made with regard to *rollover* credits involved with *Alternative C*. *Rollover* credits exist in the context of a cap on the amount of surface disturbance generated by natural gas development. They refer to the process by which acreage that counted against a surface disturbance cap when natural gas facilities were initially constructed could be successfully reclaimed and *rolled over*, meaning counted again as undisturbed acreage. When a natural gas well pad and its associated road and pipeline are constructed, the initial disturbance is much larger than what is needed for the long term. After the well has been completed, the area that was initially disturbed but is no longer needed, perhaps 60 percent of the total, undergoes *interim reclamation*.¹ With a surface disturbance cap in place, this portion of the initial disturbance acreage can be *rolled over* when the BLM determines that it has been successfully reclaimed.

In some cases, for example in the neighboring Atlantic Rim Natural Gas Project, the success criteria applied for rollover credits are the same as the final reclamation standard, in other words, the RMP Appendix 36 performance criteria: establishment of 80 percent of pre-disturbance ground cover; 90 percent dominant species; no noxious weeds; and erosion features equal to or less than surrounding area. For the CD-C Alternative C, however, the RFO has defined *Reclamation Rollover Criteria* as follows:

- The area is re-vegetated with a stable, approved plant community;
- Vegetative cover is sufficient to maintain a healthy, biologically active topsoil;
- Erosion is controlled;
- Habitat, visual and forage loss is minimized; and
- No noxious weeds are present.

¹ As defined in IM WYD- 03-2011-02, “*interim reclamation* is used to restore vegetation, and scenic and habitat resources while a well continues to produce energy. With interim reclamation, all areas not needed for the production of oil and gas are reclaimed, that is, reshaped, covered with topsoil, and reseeded with native plants. Interim reclamation also refers to the stabilization of soil by revegetation on sites that will likely be further disturbed in the future. This includes sites where recontouring is needed where periodic disturbance may occur due to operation and maintenance activities.” *Interim reclamation* can be contrasted with *final reclamation*, which is “reclamation of an area that is not planned for further disturbance including recontouring, stabilization of soil by re-vegetation and restoring the ecosystem function originally found at the site.” It normally occurs after a well is plugged and abandoned.

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There is no requirement that pre-disturbance ground cover or the dominant species match a specified percentage. Once these criteria have been satisfied in the judgment of the RFO, the affected acreage would be *rolled over* and the cap would increased by that amount.

The 2015 Approved Resource Management Plan Amendment for Greater Sage-Grouse (ARMPA, BLM 2015b) calls for separate reclamation guidance in Priority Habitat Management Areas (PHMAs). Reclamation in the 160,000-acre PHMA within the CD-C project area under Alternative C, the Proposed Action, and the other alternatives will be guided by the Reclamation Plan found in Appendix M of the ARMPA. It can be accessed at: https://eplanning.blm.gov/epl-front-office/projects/lup/9153/63202/68444/015_Wyoming_ARMPA_Appendix_M_Reclamation-Plan.pdf

**Proposed Interim Rollover Objective for the
Continental Divide-Creston Natural Gas Project
Environmental Impact Statement and Record of Decision**

February 25, 2011

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PROPOSED INTERIM ROLLOVER OBJECTIVE FOR THE CONTINENTAL DIVIDE-CRESTON NATURAL GAS PROJECT ENVIRONMENTAL IMPACT STATEMENT AND RECORD OF DECISION

There were numerous industry/state agency conversations concerning some type of phased or consolidated development for the Continental Divide-Creston (CD-C) Environmental Impact Statement (EIS). Unfortunately the complexity of the lease pattern and the number of leases made this effort extremely challenging. Conversations led to trying to create language for authorizations, waivers, modifications and exceptions to the Bureau of Land Management (BLM) Rawlins Resource Management Plan (RMP) to provide rollover criteria that would contain more flexibility for industry, while maintaining healthy, desirable vegetation within the field.

An ad hoc group came together to see if such an opportunity for additional rollover criteria might exist. The following outlines the framework for the discussion:

1. Provide a scientifically sound framework to minimize initial disturbance and return disturbed areas as quickly and effectively as possible to an ecologically stable or to pre-disturbance condition(s).
2. Identify important interim reclamation practices that are required to ensure initial and continuing interim rollover objectives (IRO).

The group is recommending that the rollover criteria as outlined below be considered as an alternative to the current RMP rollover criteria, provided that all the pre and post disturbance activities as outlined in Sections A through D are implemented.

Proposed IRO reclamation rollover criteria

The current Rawlins RMP Criteria for Reclamation Success are based in part on pre-disturbance surveys or surveys of adjacent undisturbed natural ground cover and species composition or eighty percent of pre-disturbance ground cover and ninety percent dominant species.

Notwithstanding the provisions of the RMP, it is our recommendation to provide an alternative to the above language and have revegetation cover be 70 percent of reference area cover to meet interim reclamation criteria. All of this 70 percent must be desirable perennial species as represented by the seed mix or background species. Items A, B, C, and D would also need to be completed as part of the interim reclamation criteria.

The group understands that the BLM will require a comprehensive reclamation and weed management plan within the CD-C project boundary as well as site-specific reclamation plans. It is understood that many of the items we are recommending may appear duplicative to the existing Wyoming BLM Reclamation Instructional Memorandum or other Field Office reclamation policy. As part of the more flexible rollover criteria outlined below, we recommend that many of these duplicative practices should be required as part of the rollover criteria and not be optional.

A. PRE-PLANNING AND INVENTORY

Pre-disturbance inventories are used for two main purposes. The first purpose is to use site-specific information (soil inventory and species identification) to develop a site-specific reclamation plan. The second purpose is to identify any issues, such as saline soils, steep topography, or invasive species that will impact successful interim and/or final reclamation. Below are the elements that should be required for a more flexible rollover criteria.

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1. Identify significant landscape features and climate issues

- a. Climate and physical characteristics of the site are important factors to consider in development of a reclamation plan, particularly in identifying possible problems. For example, a site on a south-facing slope may indicate that more drought tolerant plants should be selected than if the site is on a north-facing slope. Topography (slope and aspect), climate (including postulated microclimate), and parent materials (geological substrates) are additional considerations in site selection and reclamation plan development.
- b. Steep topography: Steep slopes greater than 25 percent would often result in site instability and should be avoided.
- c. Poor or erodible parent materials, or a rocky surface, or marine shales, clay/siltstone, or selenium-bearing geological substrates at the surface may result in difficult reclamation conditions. Identification of these areas might indicate the need for additional site planning.

2. Conduct a suitable soil inventory

- a. Soil characteristics strongly influence reclamation efforts. Fundamental characterization of soils ahead of disturbance can identify potential problems, so they can be addressed during disturbance, soil stockpiling and reclamation.
- b. The phrase “suitable soil” is used herein mainly because of confusion over the definition of topsoil. Soil depth, pH, electrical conductivity, texture, surface features (e.g. barren, rocky, crusty, plant litter), and organic matter content are characteristics that may be used to determine if a soil is suitable. Other information may be needed. See “Successful restoration of severely disturbed lands: Overview of critical components,” B-1202, (and available for free at <http://ces.uwyo.edu/PUBS/B1202.pdf>).
- c. Soil characteristics that may signal reclamation problems include: pH, electrical conductivity, soil texture, surface/subsurface features, sodium adsorption ratio, and soil compaction. These are detailed below and will be addressed by the Operator in the site-specific reclamation plan in the APD (application to drill) approved by the BLM:
 - i. Soils with pH 8.4 and higher.
 - ii. Depth: No suitable soil available or very shallow, less than 75 mm (3 inches).
 - iii. Soil solutions with an electrical conductivity greater than eight (8) dS/m.
 - iv. Sodium Adsorption Ratio (SAR) of 13 or higher when pH is greater than 8.4 and EC is greater than 4.0ds/m.
 - v. Soils having textures of clay, sand or loamy sand.
 - vi. Surface and subsurface soil in and through the root zone dominated by coarse material greater than 2 mm in diameter and greater than 40 percent in the soil profile.

3. Conduct a vegetation inventory

- a. Gathering vegetation data before a site has been cleared for drilling documents pre-disturbance site conditions and in turn guides reclamation decisions. Seed mixes should be based on desired vegetation that has historically grown on-site and return of cover should be gauged by comparison with actual pre-disturbance site conditions and/or reference areas.

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- b. The following vegetation characteristics can signal a high probability of reclamation problems:
 - i. The presence of Halophytes: e.g. Saltbush
 - ii. The presence of Alkali Halophytes: e.g. Greasewood, Halogeton
 - iii. The presence of noxious or invasive species: e.g. Cheatgrass, Russian thistle, Russian knapweed, Alyssum, Canadian thistle.
- c. The methodologies to be used to determine the information for the vegetation inventory are as follows:

BLM guidelines for vegetation sampling: Sampling Vegetation Attributes, Interagency Technical Reference (1996) Revised in 1997 and 1999. BLM/RS/ST-96/002+1730. 171 pages. URL for Sampling Vegetation Attributes: <http://www.blm.gov/nstc/library/pdf/samplveg.pdf>. All BLM technical references: <http://www.blm.gov/nstc/library/techref.htm>.

4. Select a reference site

- a. A reference site is a land unit which is representative, in terms of physiography, soils, vegetation and land use history, of an area to be disturbed. Reclaimed sites are compared to reference sites to determine successful interim and final reclamation.
- b. In Wyoming, a site may be composed of multiple ecological communities (e.g. dunes, alkali flats, and sagebrush). Ecological variation at a given site can make it difficult to evaluate which adjacent area should serve as a reference. A reference site should be chosen based upon the pre-disturbance assessment and the identified dominant community on the site. This measure ensures that initial efforts to establish vegetation are consistent with species that naturally occur at that location. A reference site located adjacent to the site to be disturbed, with similar soils, vegetation, and aspect of the site to be disturbed should be chosen.

B. DEVELOP A SITE-SPECIFIC INVASIVE/NOXIOUS (INVASIVE) PLANT MANAGEMENT PLAN FOR CONSTRUCTION AND RECLAMATION ACTIVITIES:

Disturbed sites can provide ideal opportunities for invasive plant species to propagate. An integrated site-specific invasive plant management plan should be developed. The plan should include:

1. Assessment activities for invasive plant species before initiating surface disturbing activities (pre-disturbance), during disturbance (annual monitoring), during interim and final reclamation, and after reclamation is completed.
2. Describe treatments to control invasive plants.
3. Monitor invasive plant species at least annually to evaluate success of invasive plant control treatments and determine if continued invasive plant control is necessary.

C. DEVELOP A SITE-SPECIFIC RECLAMATION PLAN:

Reclamation planning provides a detailed strategy for returning a disturbed site back to a functioning pre-disturbance condition. The site-specific reclamation plan will be made part of the APD by the Operator and BLM and includes the following:

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1. **Identify and address any vegetation, climate, landscape or soil issues found in the pre-disturbance inventory.**
2. **Site preparation, storm water, surface stability, and soil management for interim reclamation.**

Site preparation activities ready a site for revegetation activities and in general include replacement of stockpiled suitable and unsuitable soils, reestablishing a stable subsurface environment, recontouring (reconstruction of landscape), incorporation of soil amendments and primary tillage/ripping to relieve soil compaction prior to spreading suitable soil and secondary tillage.

- a. Proper soil management prevents loss from erosion and preserves its ability to support a productive plant community, the soil biota and their habitat as well as its physical and chemical properties.
- b. The Storm Water Pollution Prevention Plan (SWPPP) as required by Department of Environmental Quality (DEQ) should be followed.
- c. Surface Stability: The following describes considerations for how the Operator could achieve surface stability:
 - i. Redistribute soil materials in a manner to optimize revegetation potential.
 - ii. Relieve compaction of the redistributed soil (suitable and unsuitable) to an appropriate depth just prior to seeding to accommodate desired plant species germination and sustained growth.
 - iii. Preparation of the seedbed includes but not limited to:
 - a. Seedbed preparation methods should establish surface conditions to enhance development of diverse, stable, and self-generating vegetation. The methods selected should optimize surface stability and surface roughness using techniques such as furrowing on the contour or surface pitting.
 - b. Re-establish slope stability and surface stability.
 - c. Reconstruct the landscape to the approximate original contour or a contour consistent with the land use plan.
 - d. Maximize geomorphic stability and topographic diversity of the reclaimed topography.
 - e. Eliminate high walls, cut slopes, and/or topographic depressions on site, unless otherwise approved.
 - f. Reconstruct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.
 - g. Reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.
 - h. Minimize wind, sheet and rill erosion on/or adjacent to the reclaimed area.
 - i. There should be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area. Site selection is the favorable method to avoid these issues.

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- j. Protect seed and seedling establishment (e.g. erosion control matting, mulching, hydro-seeding, surface roughening, fencing, etc.)

3. Describe soil amendments

- a. Soil amendment(s) may be used in reclamation if the soil is lacking the necessary chemical, biological, physical and /or organic materials to support sustaining growth of suitable plant materials.
- b. The Operator should state what applying soil amendments is intended to accomplish. Soil amendment plans should be provided, including what amendments will be applied, method of application, and timing relative to other reclamation activities (i.e. stockpiling, seeding, ripping).
- c. Soil amendments should be selected based on the undisturbed and/or existing soil characteristics (see A. 2. c. iii) and scientific recommendations so as to provide the most cost efficient and best assurances for successful reclamation.
- d. Soil amendments include but are not limited to the following: Certified weed free grass, hay, wood chips or other certified weed free cellulosic materials, gypsum, elemental sulfur, and fertilizers.

4. Describe seeding methods

- a. Different plant species may require different conditions (e.g. seeding depth, seed scarification, mixing, and timing) for optimal germination success. Seeding methods should match germination characteristics of species in the seed mix and consider timing of planting to maximize germination and establishment of all reclamation species.
- b. The Operator will describe when seeding will occur and specify the methods they will use for seeding, including differential handling for different species (e.g. broadcast, drilling, imprinting), and seeding depth in the site-specific reclamation plan of the APD. Reseeding may need to occur if invasive and/or noxious weeds prevent establishment of the species in the seed mix. See Attachment A for references.

5. Seed mixes

- a. Providing multifunctional and sustainable seed mixes for interim and final reclamation is driven by a desire to increase potential for successful and timely revegetation and site stability. Plant diversity and habitat functionality are directly impacted by the seed choices applied to an area slated to be reclaimed or restored. To maintain as much stability and ecological function, this section makes recommendations to specifically aid an operator's selection process. Please see Attachment A for references.
 - i. Select appropriate native plant materials based on the pre-disturbance plant community composition, site characteristics, and/or ecological site description. Seeds may be obtained from commercial sources of certified weed free seed mixes. Alternatively, local collections may be used provided they are collected in an area without invasive species. Reclamation should succeed using native species if soils are properly managed, precipitation is near average for the region, seed mixes are carefully selected and seeded areas protected from grazing.
 - ii. Perennial naturalized species may be used when attempts to reclaim using native plants have not succeeded for a minimum of two full growing seasons.

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- iii. Based upon site-specific conditions, a decision may be made to use naturalized species sooner than identified above and will be used in only unique conditions defined in the site-specific reclamation plan in the APD.

6. Describe if and how irrigation techniques will be used in the reclamation plan.

- a. Revegetation success is highly dependent on timing and amounts of precipitation. However, variable weather in Wyoming can limit or delay successful germination and establishment of plants. Irrigation can supplement natural precipitation to insure success of newly seeded sites during the initial growth period of the plant. Irrigation practices should be used carefully and conservatively. Irrigation can be cost prohibitive and should not be a requirement for reclamation but used as a tool to enhance vegetation establishment.
- b. Both soil and water samples should be tested before application and water source should meet appropriate limits for SAR and EC. Special consideration of soil chemistry and amendments will be a determining factor for the use of the source water.
- c. Water must be utilized from permitted sources (State Engineer's Office) and from sources permitted for irrigation. Produced water, (e.g. coal bed natural gas wells) must adhere to discharge permit requirements.

7. Describe best management practices

- a. Best Management Practices (BMPs) are techniques that can be applied to surface disturbance and reclamation actions to aid in reclamation success. Identify the appropriate BMPs during planning and they can guide the surface disturbance and reclamation process. Additionally, documenting BMPs provides opportunities to evaluate success, so BMPs can be modified for future use in similar conditions. Please see Attachment A for recommended BLM and other Best Management Practices.

8. Description of monitoring and reporting protocols for interim reclamation objective.

The purpose of the Interim Reclamation Objective (IRO) is to reconstruct and revegetate the portion of the disturbed land unused for long term production and establish the vegetation cover sufficient to maintain a healthy, biologically active topsoil; control erosion; and minimize habitat, visual and forage loss during the life of the well and/or facilities.

The long-term Final Reclamation Objective (FRO) is to return the land to a condition that which existed prior to disturbance with allowances for an improved and/or stable ecological condition, if possible.

- a. Site monitoring is conducted to observe and keep track of environmental conditions on the reclaimed site. Specifically, monitoring is done to document development of the reseeded plant community, identification of problem species, soil stability and assess ecosystem function. Continued characterization after disturbance and during interim reclamation is appropriate for monitoring site maturation and stability, particularly when problematic soil conditions or invasive weeds are identified.
- b. Vegetation monitoring and disturbed site evaluation for any component of the reclamation plan applicable to the APD takes place at intervals agreed to by the BLM and the Operator. Generally the intervals for monitoring and reporting will be set annually unless otherwise agreed to as a condition to the reclamation plan. Achievement of the IRO by the Operator may reduce the time of mandatory monitoring and reporting. These changes to monitoring and reporting will be added to the reclamation plan by the BLM. Once the disturbed site achieves the approved IRO, the site will still be subject to all applicable requirements of the reclamation plan until the FRO is achieved by the Operator and approved by the BLM.

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- c. Monitoring should be designed and implemented by the Operator to document continuing successful reclamation rollover using methodologies approved by BLM.
 - i. Once the IRO is achieved and reclamation rollover granted by BLM, the Operator will continue to monitor the condition of the reclamation, document that the revegetation continues to meet IRO.
 - ii. During monitoring, the Operator will identify potential problems and recommend appropriate mitigation measures that can be implemented through BLM's adaptive management process.
- d. The required elements of monitoring to assess IRO and FRO will be identified and addressed by the Operator in the site-specific reclamation plan. Please see Attachment A for additional information.

D. INDICATORS FOR SUCCESSFUL ACHIEVEMENT FOR THE IRO RESULTING IN RECLAMATION ROLLOVER

1. **Beginning Monitoring.** Monitoring should begin in the first growing season. Rollover evaluation is possible after a minimum of two full growing seasons.
2. **Irrigation and monitoring.** If irrigation is used initially, then the reclamation may be evaluated for interim reclamation success two (2) full growing seasons (or the third growing season) after irrigation ceases to assure that the vegetation can survive without supplemental water.
3. **Monitoring results must be from a standardized cover/species protocol approved by BLM.**
4. **Invasive Plants.** No invasive weeds will be allowed. Invasive species cover no greater than adjacent invasive species cover will be allowed. All other undesirable perennial or annual plants as defined in the site-specific APD should be controlled or eradicated on the disturbed area.
5. **Undesirable/annual plants.** For purposes of successful IRO achievement, the amount of invasive plant species should comply with the site-specific reclamation plan.
6. **Vegetation trend.** If the vegetation trend towards the IRO achievement is not positive within 3 full growing seasons without irrigation or 2 years after irrigation (third growing season) ceases, the BLM and Operator will determine the needs for the disturbed site.
7. **Erosion.** Erosion indicators should be equal to or less than the adjacent reference area.

E. RECLAMATION MONITORING REPORTING DATA RECOMMENDED TO BE OBTAINED AND FILED BY THE OPERATOR (ADAPTED FROM APPENDIX 36 OF THE RAWLINS RMP)

General

WYW# (Oil and Gas Lease or Right-of-Way (ROW))

Project Name:

Project Type (e.g. Well, Access Road, Pipeline, Facility, Wind)

Qtr/Qtr Sec, T, R, County, State (or Lat/Long)

Pre-Disturbance

Location of reference area

Date of reference area inventory/monitoring

Date of pre-disturbance inventory of disturbed site

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Name of contractor conducting reference and pre-disturbance inventory/monitoring

Disturbance

Disturbance Dates
Start –End dates of monitoring
Reclamation Type (Interim/Final)
Name of contractor

Reclamation

Earthwork Contractor Name
Earthwork Completion Date
Soil Preparation method and Depth (prior to re-spreading suitable soil)
Soil Amendments Used (Describe)
Area (Acres or Square Feet)
Seeding Contractor Name
Seeding Date
Seedbed/Compaction Release Preparation Methods (Describe -Rip, Disc, Harrow, Parabolic) and Depths
Seeding Method (Drill, Broadcast, Imprint, Depths)
Copy of Seed Tag (Species percent, Purity percent, Germination percent)
Actual Seeding Rate (Pure live seed (PLS) Lbs/Acre of each species)
Area Seeded (Acres or Square Feet)

Noxious/Invasive Plants

Species Treated
Contractor Name
Contractor License #
Treatment Date
Treatment Type (Chemical, Mechanical)
Chemicals Used and Rates Applied
Area Treated (Acres or Square Feet) (GIS Extent and Location)

Monitoring

Inspector’s Name and affiliation
Inspection Date
Time after Seeding (which Growing season)
Seedlings/Square Feet or Linear Foot Growing
Percent and Extent of Bare Soil (Describe)
Percent Ground Cover (Describe)
Percent Desirable Species (Describe)
Percent Noxious/Invasive Weeds (Describe)
Describe erosion indicators
Evidence of Livestock Grazing (Describe)
IRO objectives met (Yes/No)
Reference Photos
Close-Up Photos
On-site Photos
Reseeding yes/no, If yes all the above reporting requirements to be filled out.

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Reporting

Completed Spreadsheet or Database as defined by BLM
GIS Layer with Attribute Table with Site Data as Detailed
Detail Disturbance Extent and Location
Permanent Photo Reference Point –Describe
Conclusions/Summary

- Weed Control Needed - yes/no and explanation
- Erosion control Needed - yes/no and explanation
- Grazing/Predation Issues - yes/no and explanation
- Other Cultural or Mechanical Needs - yes/no and explanation

Other

Mulching/Erosion Netting/Tackifier used – yes/no and describe
Fenced Location yes/no
Snow Fencing yes/no

ATTACHMENT A

This attachment is designed to provide a very general description of stockpiling suitable soil, irrigation of reclamation sites and monitoring vegetation and soils after reclamation. These are not hard and fast prescriptions but rather they are best management practices that might best be considered as an outline of issues to be considered during reclamation efforts.

A. Suggestions on Stockpiling Suitable and Unsuitable Soils to Maintain Soil Quality

Stockpiled suitable soil should not be piled too deeply or too shallowly. Areas of the site to be covered by stockpiles of unsuitable soils will be stripped of suitable soil prior to their use. The taller or deeper the piles, the more soil is subjected to increasing pressure resulting in compaction. Soil buried deep in the pile also has little exposure to oxygen resulting in anaerobiosis; deeply buried soil also has no organic matter input. Both of these reduce soil quality.

Shallow or small suitable soil stockpiles have large footprints on the land surface with the disadvantage of covering greater areas of undisturbed soil which will, in turn, require revegetation, resulting in a greater overall amount of disturbed soil. Smaller or shallow stockpiles also have a greater surface area per volume of soil stored. This increases exposure of the stockpiled soil to wind and water erosion. The surface of soil stockpiles should always be vegetated to minimize erosion losses.

1. Salvaged stockpiles of suitable soil should normally be no deeper than 4 meters (13 ft) and should be less where possible.
2. Stockpile slopes should not exceed 3:1 angles (20 percent slopes) to allow for seeding and to minimize erosion.
3. Suitable soil stockpiles should be located in areas well enough protected to prevent their disturbance and contamination by well pad activities. They should not be placed in streambeds or ephemeral drainages where they may be washed away. They should be protected from wind erosion. Suitable soil should be put on areas that were not skinned. Unsuitable soil should be put on areas that were 'skinned'.
4. Consider a perimeter ditch/berm/fencing or other techniques around the stockpile for topsoil conservation and sediment control.
5. All suitable soil stockpiles should be seeded with appropriate vegetation (native locally sourced is preferred) to provide cover and protect them from water and wind erosion. Before seeding, the stockpile may be scarified along contours to minimize wind and water erosion.
6. If soil horizons or layers are to be stratified during soil salvage (stripping) operations, soil maps should be made of the well pad area to identify depths of soil horizons and surface slope. The pad area to be cleared of soils should then be divided into strips the size of the blades or equipment being used for soil removal. The depth of soil removal from each swath should be clearly marked so that equipment operators are removing a uniform layer from each strip. After the suitable soil is removed from the area in this manner, the subsoil can then be removed in the same fashion, strip by strip, each strip at a uniform depth.

B. Suggestions on Supplemental Irrigation

Supplemental irrigation should be scientifically calculated and applied in the initial four to six week period of growth of the seedling plants and then ended. Such determination could be the application of an amount of irrigation water equivalent to the average or average plus 25 percent of the precipitation expected during a given interval.

C. Suggestions on Vegetation and Soil Monitoring

Examples of monitoring components are listed below:

1. Reference: <http://agriculture.wy.gov/images/stories/pdf/forms/natres/rangelandmonitoring.pdf>
2. Operators should use the same locations and methods used at baseline for repeat photography. Additional locations may be selected to document progress of reclaimed area to demonstrate interim and final reclamation success, and to monitor any identified problems such as erosion. The site should be photographed once every year normally during the same time period, from the same locations and direction so that photographs are repeated through time. Photographs should be taken during the growing season.
3. Weed assessment: Disturbed and reclaimed areas should be evaluated for noxious and invasive plants at least annually. Weed control should be promptly implemented by the Operator once weed species and infestations are identified. Weed control applied at planned chemical rates at times the weed is emerging can have positive impacts in minimizing weed growth through-out the year as well as promoting the growth of grass species. The timing of the control should be determined by the growth habits of the weed species and when they are most effectively assessed. If weeds persist, reseeding the site could be considered as well as the species of grass, forb or shrub.
4. Erosion control/soil stability: The reclaimed area should be evaluated for any signs of erosion problems annually and when the site is subject to erosional events. Identified erosion features should be monitored using repeat photography. Absence of erosion features is a positive indication that the soil is stabilizing.
5. Cover and composition data should be used to document that the plant community continues to trend toward the requirements to achieve interim and final reclamation targets. The data should be used to evaluate if species composition and cover are increasing. These factors should be considered relative to the number of species in the seed mix, the selected reference area, and offsite responses to seasonal growing conditions.
6. Plant community cover and composition measurements: The Operator should start collecting cover and composition data beginning in the first (1st) growing season after disturbance. Data should be collected using repeatable methods approved by the appropriate regulatory authority (BLM) and should be the same methods that were used to describe vegetation for baseline (or reference areas). The same methods should be used each time the vegetation is monitored.
7. Soils should be monitored if reclamation problems suggest that soils might be the problem. Such problems include but are not limited to salt crusts, clay crusts, wind and/or water erosion and rapid changes in pH (up or down). Recommended soil monitoring would include sampling soils and analysis of soil characteristics as described in the main body of Part A, 2 ii. Suitable soil inventory.

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D. Web Links

Government Documents

2006 Gold Book:

http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html

BLM engineering drawings, roads & fences: <http://www.blm.gov/nstc/eng/draw.html>

BLM Integrated Vegetation Handbook, 1740-2 is at page:

http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/blm_handbooks.html

BLM VRM: http://www.blm.gov/wo/st/en/prog/Recreation/recreation_national/RMS.html

BLM New Onshore Order #1, May 7-07:

http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/Onshore_Order_no1.html

BLM NSTC: <http://www.blm.gov/nstc/>

EPA: <http://www.epa.gov/owow/nps/> and <http://www.blm.gov/bmp/>

USDA Monitoring Manual for Grasslands, Shrublands and Savanna Ecosystems (quantitative Protocols):

http://usda-ars.nmsu.edu/monit_assess/monmanual_main.php

Wyoming BLM requirements: http://www.blm.gov/wy/st/en/programs/energy/Oil_and_Gas.html

Wyoming Climate Atlas: http://www.wrds.uwyo.edu/sco/climate_office.html

WY DEQ: <http://deq.state.wy.us/wqd/watershed/nps/npspg.htm>

NRCS fotog: <http://efotg.nrcs.usda.gov/treemenuFS.aspx>

Journals

American Society of Mining and Reclamation: <http://www.asmr.us/>

Global Restoration Network: www.globalrestorationnetwork.org

Journal Range Management archives: <http://jrm.library.arizona.edu/jrm/>

National Roadside Vegetation Management Association: <http://www.nrvma.org>

Society for Ecological Restoration (SER): <http://www.ser.org/>

USFS Rocky Mountain Research Station publications: <http://www.treearch.fs.fed.us/pubs/rmrs/>

Wyoming Native Plant Society: http://uwadmnweb.uwyo.edu/wyndd/wnps/plant_id.htm

MAPS/GIS

Topo & aerial photos: <http://www.usgs.gov/pubprod/aerial.html>

NRCS National Water and Climate Center: <http://www.wcc.nrcs.usda.gov/wcc.html>

Water Erosion Prediction project: <http://octagon.nserl.purdue.edu/weppV1/>

Wyoming Geographic Information Science Center: <http://www.wygisc.uwyo.edu/>

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Mycorrhizae (Biological Soil Crusts)

<http://mycorrhiza.ag.utk.edu/default.html>

<http://invam.caf.wvu.edu/index.html>

<http://www.ars.usda.gov/is/pr/2003/030205.htm>

<http://soilcrust.org>

OIL/GAS

Completion and workover wastes: <http://www.epa.gov/wastes/nonhaz/industrial/special/oil/wc.pdf>

Dust suppression: http://www.oznet.ksu.edu/Stevenson/Dust_percent20Manual_percent20percent20102704.pdf

Hydraulic Fracturing (Fracking or Frac Job):

http://test.earthworksaction.org/index.php/issues/detail/hydraulic_fracturing_101

http://www.epa.gov/hfstudy/HF_Study_Plan_110211_FINAL_508.pdf

National LTAP & TTAP Rural Roads: <http://www.ltap.org/>

Oil & Gas Production wastes: <http://www.epa.gov/wastes/nonhaz/industrial/special/oil/>

Power lines: <http://www.aplic.org/>

Produced water: <http://www.iogcc.state.ok.us/Websites/iogcc/producedwater/popup.htm>

The T²/LTAP Center University of Wyoming: <http://www.eng.uwyo.edu/wyt2/>

Western Governors CBM BMPs: <http://www.westgov.org/wga/initiatives/coalbed/CoalBedMethane.pdf>

Wyoming Oil and Gas Commission requirements: <http://wogcc.state.wy.us/>

Restoration Handbooks

Bags Quiet Presence NRCS: http://www.wy.nrcs.usda.gov/Plant/tech_notices.html

Dryland pastures: <http://msuextension.org/publications/AgandNaturalResources/EB0019.pdf>

Handbook of Western Reclamation Techniques:

<http://www.techtransfer.osmre.gov/NTTMainSite/Library/hbmanual/westrecl/front-matter.pdf>

Restoring Western Ranges and Wild lands: http://www.fs.fed.us/rm/pubs/rmrs_gtr136_3.pdf

Solid Minerals reclamation handbook: <http://www.blm.gov/nhp/efoia/wo/fy01/ib2001-081attach.pdf>

Scientific Literature

An Introduction to using native plants in Restoration:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub>

Geology and Plant life:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub>

Managing Arid and semi-arid watersheds: <http://www.wy.blm.gov/botany/wyspecies.htm>

http://water.epa.gov/lawsregs/lawsguidance/cwa/wetlands/laws_index.cfm

Revegetation Abstracts:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub>

Sagebrush: <http://sagemap.wr.usgs.gov/SagebrushAssessment.aspx>

Salt tolerant plants: <http://www.ussl.ars.usda.gov/pls/caliche/Halophyte.query>

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USDA Plant database: <http://plants.usda.gov/>

Wyoming Natural Diversity Database: <http://uwadmnweb.uwyo.edu/wyndd/>

Wyoming Plant Materials Technical notes:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub>

Wyoming Reclamation and Restoration Center: <http://uwadmnweb.uwyo.edu/WRRC/>

Educational Opportunities and Workshops

Wyoming Reclamation and Restoration Center: <http://uwadmnweb.uwyo.edu/WRRC/>

Seed sources

Guidebook to Great Basin seeds:

http://www.blm.gov/id/st/en/info/publications/technical_bulletins/TB05-4.html

Native Plant Propagation Protocols: <http://nativeplants.for.uidaho.edu/network/>

Native Seed Network: <http://www.nativeseednetwork.org/index>

Oregon state Seed Lab: quality testing of native seed: <http://seedlab.oregonstate.edu/u>

Seed testing protocols: <http://www.aosaseed.com/publications.htm>

Wyoming State Seed Lab: <http://uwacadweb.uwyo.edu/seedlab/default.htm>

Soil

Glossary of Soil Science Terms: <http://soils.usda.gov/technical/>

NCSS Web Soil Survey:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/plants/techpub>

<http://www.nrcs.usda.gov/>

<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

NRCS Soil Quality Publications: <http://soils.usda.gov/technical/>

Soil series name search: <http://soils.usda.gov/technical/classification/>

Weeds

Halogeton: <http://www.ars.usda.gov/Services/docs.htm?docid=9937>

Weed Science Society of America: <http://www.wssa.net>

TNC Invasive species (weeds): <http://tncinvasives.ucdavis.edu/>

Wildlife

Important Wildlife Habitats: <http://wgfd.wyo.gov/web2011/wildlife-1000426.aspx>

Sage grouse range wide forum links: <http://sagegrouse.ecr.gov/?link=110>

Recommendations for Development of Oil and Gas Resources within Crucial and Important Habitats:

http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/HABITAT_OILGASRECOMMENDATIO NS0000333.pdf

List of Participants

This document has been two years in the making and meetings included training sessions and visits to field sites in the general vicinity of the CD-C. The contributors of this document were members of an *ad hoc* committee that varied in size from meeting to meeting. This ad hoc group was created through the efforts of the Governor Freudenthal's Planning Office. Some of the participants were advisory only (AO) but others were involved in the writing, review and synthesis (WRS) of the final project. One member of the committee acted as the Chair.

Considerable review, both formal and informal, of this document was provided by the committee and an intensive external review was provided by an anonymous consultant.

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BLM Rollover Criteria for Alternative C Continental Divide-Creston Environmental Impact Statement

INTRODUCTION

It is reasonable to anticipate that successful reclamation activities within the Continental Divide-Creston project area will be difficult. This can be observed by reviewing **Map 3.3-5** which shows an estimated 75 percent of the area with “poor” reclamation potential. Reclamation potential of soils in the CD-C project area is limited by saline/sodic soil conditions and either clayey or sandy soil textures (**Table 3.3-1**). In addition to these soil limitations, low annual precipitation of 6–10 inches in conjunction with erosion by wind and water will make successful reclamation difficult to attain quickly. Periodic droughts and extreme climatic conditions further complicate successful reclamation.

RECLAMATION PERFORMANCE MONITORING

Monitoring should include both qualitative data collection techniques and quantitative data collection. Qualitative evaluation of the interim reclamation can include the evaluation of soil movement (rills, sheet flow, petal-stilling, etc.), vegetative components (presence/absence of species, estimation of population and the population’s condition), as well as visual contrast. The quantitative data collection should include both aerial and basal cover. The data should note the species during the evaluation. It is important to use the same methods for qualitative and quantitative data collection during each site evaluation to show a trend and display that the Interim Rollover Objective (IRO) has been met.

DISTINCTION BETWEEN INTERIM AND FINAL RECLAMATION

Two types of reclamation will occur within the CD-C area. Final reclamation occurs when all facilities are removed (e.g. when a natural gas well is plugged and abandoned), the site is re-contoured back to its original topography, and adequate native vegetation communities similar to those originally disturbed are established including, in part, weed control and stable soils. When completed and accepted, the company’s bond is released and the site returns to BLM control. High desert sites, such as those found at CD-C, are slow to return to their original vegetative states, often requiring decades of time even with successful reclamation.

Interim reclamation occurs within the next growing season on any disturbance not needing to be continuously disturbed by ongoing operational activities. The existing pipelines, roadsides, and portions of well pads not needed for operations are examples of short-term disturbance which require interim reclamation. Areas with interim reclamation may be disturbed again by new construction or operational activities that may occur. Those areas will be reclaimed after any disturbance to maintain interim reclamation. Areas of a well pad might also remain undisturbed until final reclamation is achieved. Circumstances will vary site-by-site over the course of the project.

PURPOSE OF A DISTURBANCE CAP

A disturbance cap is a limit on the extent of surface disturbance that can occur within a given area. A disturbance cap that has potential to limit development activities within an area creates a direct incentive for developers to conduct successful reclamation on disturbed lands. Once the disturbance cap is reached further development is constrained until the disturbance acreage is reduced as a result of attaining the IRO.

ROLLOVER CONCEPT

Surface disturbance that has been reclaimed to the IRO standard will be classified as successful interim reclamation and this acreage can then be deducted from the number of acres counted as surface disturbance (or rolled over) for the area, and further disturbance could occur under the disturbance cap. The conditions under which interim reclamation can be considered acceptable for “rollover” are crucial for managing disturbance and the effects thereof on the natural resources BLM manages.

OBJECTIVES FOR INTERIM RECLAMATION

Work conducted in part by the State of Wyoming, local Conservation Districts, the University of Wyoming, participating leaseholders, oil and gas developers, and the BLM led to the development of several objectives for interim reclamation. It was agreed that the purpose of the IRO is to identify when reconstruction and re-vegetation activities on disturbed lands is adequate for rollover credit for the companies. Rollover credit could not be applied to the portion of the disturbed surface used for long-term production and continuous disturbance.

The IRO is to establish vegetation cover sufficient to maintain a healthy, biologically active topsoil; control erosion; and minimize habitat, visual, and forage loss during the life of the disturbed area. In addition, it was determined that the elimination of noxious weeds and the control of invasive non-native weeds must have occurred for successful attainment of IRO.

RECLAMATION ROLLOVER CRITERIA

The reclamation success standards listed below are the measures that would be used to evaluate whether the interim reclamation is successful:

- The area is revegetated with a stable, approved plant community.
- Vegetative cover is sufficient to maintain a healthy, biologically active topsoil.
- Erosion is controlled.
- Habitat, visual, and forage loss is minimized.
- No noxious weeds are present.

ACCOUNTING FOR DISTURBANCE TRACKING

Once a proposal for surface disturbance is approved and constructed the company will record the as-built disturbance using a GPS system compatible with the BLM’s system. The extent of all disturbance from the approved proposal will be determined. The company will maintain a record of the extent of disturbance, generally by aliquot section, Township and Range, or by lease as applicable.

When further disturbance within an area is proposed the company will submit its existing disturbance records for the area in question to the BLM along with the rest of its plan of development. The BLM will review the existing extent of disturbance.

If the disturbance extent meets or exceeds the applicable disturbance cap, then the BLM will request from the Company why further disturbance should be approved. Based on the response from the company, the BLM will consider the proposal in the site-specific NEPA document, tiered to the CD-C Record of Decision (ROD).

If the new disturbance extent proposed does not meet or exceed the disturbance cap for the area in question, the BLM will evaluate the proposal with a site-specific NEPA document and determine what, if any, disturbance will be approved. Once construction activities are completed the company will supply

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the BLM with the new as-built surface disturbance extent as provided above. The new disturbance information will be added to the existing data to determine the current disturbance figure.

Reclamation of the disturbed surface by the companies will be monitored by the companies at least annually as provided in the reclamation monitoring provisions of the Reclamation Plan. When the company feels disturbed sites have attained the IRO described above, the company may propose to the BLM to withdraw the acreage meeting the IRO from the surface disturbance acreage estimate. The BLM will reduce the disturbance figure when it is determined by the BLM that the IRO has been met, from data supplied by the company. The BLM may consult with cooperating agencies in its assessment of the data but the BLM is the final decision-maker on whether the IRO has been attained.

In the event areas meeting the IRO that have been removed from the disturbance are in turn re-disturbed, the acreage re-disturbed will be added back into the surface disturbance acreage estimate.

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