

Reclamation Strategies and Suggestions

Energy Advisory Board Meeting

09/02/2010

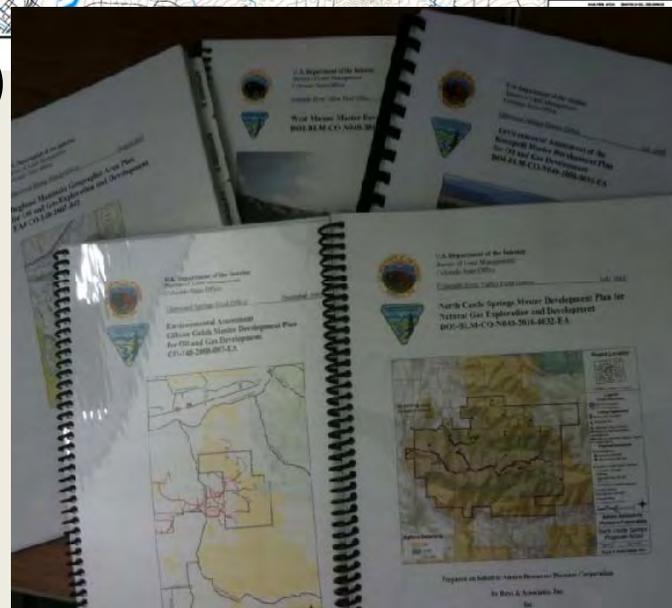
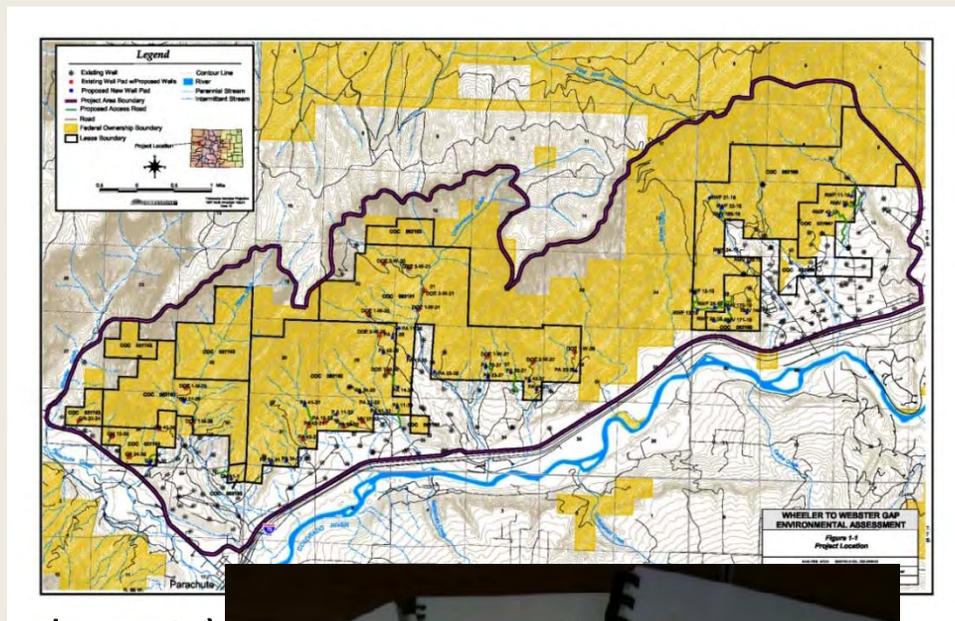


First thing first:

- Planning stage
 - Scope of project
 - » Group wells/pads in same general area under one project
 - » Utilize existing roads when possible
 - » Identify pipelines, existing and proposed
 - APD or NOS?
 - » Consult with BLM *prior* to filing
 - » NOS commands an onsite prior to APD filing, at which time resource concerns are addressed

Master Development Plans (Formerly GAPs)

- Plan for wells, production facilities, roads, and pipelines and mitigation
- One NEPA analysis vs. redundant processes and documents (MUCH faster than another EA.)
- Proposed wells approved without additional NEPA
- Additional wells approved using Statutory CX



A Dozen Rules for Reclamation

(Most Borrowed from: Marit Sawyer – State of WY)

1. Save **ALL** topsoil that supports any sprigs of vegetation, and protect it from wind, water, and careless drivers.

Windrow topsoil wherever possible (COA #19)

Do not store topsoil for the life of the well. Try to respread all topsoil within 6 months to keep it viable.



Topsoil



Topsoil



Topsoil in Road Construction



Topsoil in Pad Construction

Stormwater
Control and
Perimeter
Topsoil Storage
During Drilling
Phase



1. Stormwater run-on and runoff control prior to interim reclamation.
2. Shorter distance to push topsoil for full interim reclamation saves dirtwork \$\$\$.
3. Shorter push encourages increased topsoil salvage.

A Dozen Rules for Reclamation (cont'd)

2. Do not mix topsoil. Keep excess from mixing with topsoil. Keep good topsoil stored separately from bad topsoil (another reason to windrow).



A Dozen Rules for Reclamation

3. Rip all surfaces that had significant traffic or weight placed on them to relieve compaction. Rip to 2 feet.



A Dozen Rules for Reclamation

4. Spread topsoil around pad. Rough it up. Topsoil should not resemble a skating rink. Use a method that roughs up the surface. This will hold water in the soil and help prevent erosion.



A Dozen Rules for Reclamation

5. Use a mixture of seeds that are native and adapted to the local climate and soil type.

Sagebrush →



Crested wheatgrass

A Dozen Rules for Reclamation

6. Plant seed after first frost and before spring rains (October–April) for best germination and survival.



A Dozen Rules for Reclamation

7. Drilling and broadcast seeding: Drill seed to a depth of $\frac{1}{4}$ " to $\frac{1}{2}$ " on the contour. For broadcast seeding, double the drill seed application rate (and keep livestock off reclaimed areas.)



A Dozen Rules for Reclamation

8. Small-seeded shrubs, such as sagebrush, should be sown separately on the surface in low or sheltered areas that collect snow, soil and have little wind.



A Dozen Rules for Reclamation

9. Avoid running or storing trucks or equipment on fresh reclamation to avoid compaction.
 - **However**, interim reclamation is only interim. If you have to set equipment on reclaimed areas, ensure the soil is dry and any damage is repaired. If the soil is not dry, consider blading off the topsoil and vegetation and reclaiming the site after the necessary work is done.

A Dozen Rules for Reclamation

10. **MULCH MULCH MULCH.** Mulch holds in soil moisture and keeps drying winds at bay.

Use caution with irrigation. It can create shallow roots if not done properly, which do not withstand dry conditions as well once irrigation ceases.



A Dozen Rules for Reclamation

11. Control weeds throughout the life of the project. The BLM Weed Coordinator or county Weed and Pest Specialist can advise on noxious species and control methods.



A Dozen Rules for Reclamation

12. If your seeding is not successful in three growing seasons, begin the process at # 4 again.



Some Good Practices We're Seeing

Directional Drilling

- Multi-well locations
- Reduced well pad density
- Reduced road density
- Dual rig operations



Efficiency Drilling Rigs

- Smaller footprint
- 22 wells per pad
- 75 % reduction in surface disturbance
- Reduced habitat fragmentation
- Expanded gas recovery in extreme topography



Remote Frac/Centralized Production Tanks



- Fracing new wells from up to four miles away
- Use of temporary surface lines
- Centralized tanks serving 87 wells

Water Delivery Systems



- Temporary, poly water pipelines
- Delivers water for drilling and completions
- Eliminates water truck traffic and impacts

Clustered Development

- Compressor facility
- Two well locations
- 10 wells



Off-site Production Facilities



- Production facilities located off well location
- Provide immediate production while other wells drilled
- Minimize well pad foot print

Exhaust Stack Screens



- Migratory bird mitigation
- Prevents entry by birds
- Flat screens vs. cones
- Remote telemetry



Pit Netting

- Migratory bird mitigation
- Prevents bird entry
- More effective than flagging



CMP Containment “Berms”



- Metal containment areas
- Synthetic liners
- Leak proof/fail proof
- Load lines inside

Temporary Reclamation



- Quick cover species
- Use of sterile hybrids
- Mulching
- Areas not subject to interim reclamation first year
- Areas to be redisturbed

Pipelines

- Using downed trees for erosion control
- Using rocks for visual mitigation
- Following topography instead of straight up/down
- Boring pipeline underground



Some Real Thinking Outside the Box:

Camo Facility Paint

- Custom color patterns
- Minimize color contrast
- Maximize visual mitigation



Colorant

- Fired clay colorant
- Turf reinforcement mat
- Growth medium
- Water infiltration enhancer



Find the Well Pad:

Before Colorant:



After Colorant:



Find the Well Pad:

“Landforming”



Interim Reclamation

- Grading, shaping cuts and fills
- Topsoiling
- Revegetating areas not needed for production operations



What Happens without proper Interim Reclamation?



WITHOUT RECLAMATION

- **Hastened erosion of disturbed soils**
- **Loss of forage productivity**
- **Loss of wildlife habitat**
- **Spread of weeds**
- **Negative visual impacts**



Questions, Comments?