RECLAMATION PLAN, QUESTAR LEASES, PINEDALE ANTICLINE PROJECT AREA

Prepared for

Bureau of Land Management

Pinedale Field Office
Pinedale, Wyoming

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ACRONYMS AND ABBREVIATIONS

APD	Application for Permit to Drill
BLM	Bureau of Land Management
ERRP	Erosion Control, Revegetation, and Restoration Plan
EIS	Environmental impact statement
LOF	Life of Field
LOP	Life of Project
PAPA	Pinedale Anticline Project Area
POD	Plan of Development
PLS	Pure Live Seed
Questar	Questar Exploration and Production Company
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-way
SPCCP	Spill Prevention, Control, and Countermeasure Plan
SUP	Surface Use Plan
SWPPP	Storm Water Pollution Prevention Plan

1.0 INTRODUCTION

This reclamation plan is designed to be used by Questar Exploration and Production Company (Questar) on their leaseholds on the Pinedale Anticline Project Area (PAPA) as guidance to achieve successful reclamation on federal lands within the PAPA. Alternate reclamation procedures may be implemented on private and state lands or on federal lands as directed by the Bureau of Land Management (BLM) during site-specific review processes for Applications for Permit to Drill (APDs), Right-of-way (ROW) applications, Sundry Notices, and potentially accompanying Erosion Control, Revegetation, and Restoration Plans (ERRPs).

This Reclamation Plan complies with BLM reclamation and management directives specified in the Pinedale Field Office Resource Management Plan (RMP) (BLM 1987a, 1987b, 1988), the Record of Decision (ROD) for the Pinedale Anticline Oil and Gas Development Project Environmental Impact Statement (EIS) (BLM 2000), and various Decision Records associated with the Questar Year-Round Drilling Proposal (BLM 2004, 2005a, and 2005b). The plan is also based on *Executive Orders* 11990 (protection of wetlands) and 13112 (invasive species) and limited on-site evaluations of reclamation status on selected areas of the PAPA and nearby areas.

2.0 RECLAMATION REQUIREMENTS AND SUCCESS STANDARDS

2.1 Reclamation Requirements

BLM's reclamation requirements include the following major goals.

- Isolate and/or remove all undesirable materials (e.g., contaminated soils, potentially hazardous materials) to protect the reclaimed landscape from contamination.
- Recontour the land surface and implement other soil conservation, surface manipulation, and water management techniques to establish stable slopes, watercourses, and drainage features to minimize erosion and sedimentation (also protecting surface water and groundwater resources).
- Revegetate regraded areas to establish self-perpetuating native plant communities capable of supporting existing and future land uses.
- Minimize visual contrasts.
- Minimize number and size of disturbance areas.

The reclamation success objectives provided in Section 2.2 are the measures that can be used to show whether or not these goals are being met.

2.2 Reclamation Success Objectives

The following reclamation success standards are the measures that would be used to assess whether BLM's reclamation requirements are being met. The procedures presented below are designed to achieve successful reclamation and, in doing so, to meet BLM's requirements. Reclamation would be implemented, managed, and monitored by Questar. Alternatives to all or portions of this reclamation plan may be implemented.

No contaminated materials will occur at or near the surface, all buried oil-based cuttings would be encapsulated in impermeable material, water-based cuttings may be encapsulated, and all cuttings would be covered with at least 4 feet of spoil.

1) The subsurface would be stabile—no indications of subsidence, slumping, and/or significant downward movement of surface soil materials would be visible.
2) Sites would be free of trash.
3) Reclaimed areas would be stable and would not exhibit evidence of active sheet flow, rills or gullies greater than 2 inches wide or deep or actively eroding, perceptible soil movement or head cutting in drainages, and/or slope instability on or adjacent to the reclaimed area.
4) Soil surfaces would have adequate surface roughness to reduce runoff and to capture rainfall and snow melt.
5) Revegetated areas would exhibit vegetative reproduction, either spreading by rhizomatous species or seed production, and be free of noxious and non-native/invasive species; non-native species may be present only with BLM approval.
6) Vegetative canopy cover, production, and species diversity of desirable species would approximate the surrounding undisturbed areas. Vegetation would help stabilize the site, would support post-disturbance land uses, and would be self-sustaining.

Questar would work to achieve the following specific objectives for revegetation success (item 6 above). Unless otherwise indicated, these standards apply only to desirable species. Desirable species are generally considered those species present in the seed mix and/or perennial species present in the surrounding undisturbed landscape.

Within 2 years of seeding (in addition to objectives 1-5):

a) Vegetative canopy cover would be at least 35% of the cover found on adjacent undisturbed areas and the area would have notable seedling establishment.
b) At least 20% of the total vegetation cover would be by the species contained in the seed mix and/or present on adjacent areas.
c) Invasive, non-native species (weeds) or other undesirable species would not dominate the reclaimed area.

Within 5 years of the initiation of reclamation (in addition to objectives 1–5):

a) Vegetative canopy cover would be at least 50% of the indigenous vegetative cover found on adjacent areas and at least 50% of vegetative cover would be by species contained in the seed mix and/or present on adjacent undisturbed areas. Species composition would maintain soil stability and provide nutritional value, palatability, and vegetative structure.
b) No single species would account for more than 50% of total vegetative cover unless it comprises greater than 50% of the total vegetative cover on adjacent undisturbed areas.
c) Invasive, non-native species or other undesirable species (e.g., weeds) would comprise no more than 15% of total vegetative cover.

Within 8 years of the initiation of reclamation (in addition to objectives 1–5):

d) Vegetative canopy cover would be at least 80% of the indigenous vegetative cover found on adjacent areas and at least 80% of vegetative cover would be by species contained in the seed mix and/or present on adjacent undisturbed areas. Species composition would maintain soil stability and provide nutritional value, palatability, and vegetative structure (i.e., habitat function).
e) No single species would account for more than 30% of total vegetative cover unless it comprises greater than 30% of the total vegetative cover on adjacent undisturbed areas.
f) Invasive, non-native species or other undesirable species (e.g., weeds) would comprise no more than 5 percent of total vegetative cover.

7) The reclaimed landscape would have characteristics that approximate the visual quality of adjacent areas with regard to location, scale (e.g., line, form, and texture), contour, color, and orientation of major landscape features and would support post-disturbance land uses.

Permanent revegetation would be considered successful when objectives 1–5, 6d, 6e, 6f, and 7 have been achieved.

3.0 AFFECTED COMMUNITIES

Questar lease holdings on the PAPA are generally dominated by the Wyoming big sagebrush/grassland vegetation type with small inclusions of mountain big sagebrush, rabbitbrush, conifer, and rock outcrop types.

While no delineated wetlands are known to occur on the lease holdings, the ephemeral drainage channel generally located in the SE1/4 Section 31, T32N, R109W, four of the approximately 12 ephemeral stock ponds, and isolated segments along other ephemeral stream channels in the area may exhibit some wetland characteristics (vegetation, soils, and hydrology).

Soils on the leasehold are predominantly terrace soils (on the top of the Mesa) with some areas on the Mesa flanks having pediment and alluvial fan soils. Reclamation potential on these soils within the leasehold is anticipated to be moderate to high since there are few soil limiting or sensitive characteristics. Site-specific limiting characteristics include shallow soils, weather conditions (high winds, drought, short growing seasons), steep slopes, and livestock and wildlife use. Soils on steep slopes have a high runoff potential that limits effective moisture/water holding capacity.

4.0 RECLAMATION PLAN

The reclamation process will consist of the following steps (Figure 4.1):

- predisturbance planning and site preparation,
- some temporary reclamation,
- permanent reclamation, and
- reclamation success monitoring.

4.1 Predisturbance Planning and Site Preparation

Predisturbance planning minimizes the amount of reclamation at a site by reducing land disturbance. In addition, preparing the site for construction while planning for reclamation (e.g., salvaging and stockpiling topsoil and spoil, separately; locating facilities away from cut-and-fill slopes; minimizing the area[s] occupied by facilities) would facilitate achieving reclamation success.

4.1.1 Predisturbance Planning

During selection of drill site, road, pipeline, and ancillary facility locations, Questar would avoid the following areas, where practical:

- areas with high erosion potential (e.g., rugged topography, steep slopes [>25%], drainage channels, floodplains);
- areas with saturated soils;
- areas within 500 feet of wetland or riparian areas (e.g., open water areas); and
- areas within 100 feet of ephemeral and intermittent channels.

Prior to disturbance, Questar would conduct on-site inspections with the BLM of each proposed disturbance area to determine the suitability of proposed facility locations and/or corridors with regard to the above-listed avoidance areas. Proposed locations would be located to reduce habitat fragmentation for sagebrush-obligate species to the extent feasible. In addition, Questar would submit for BLM approval Surface Use Plans (SUPs) and/or Plans of Development (PODs) for each proposed surface disturbance area or corridor, and those plans would reference this reclamation plan.

In addition to SUPs and PODs, Storm Water Pollution Prevention Plans (SWPPPs) would be prepared for all project activities requiring greater than 5 acres of disturbance to ensure that stormwater runoff would not cause surface water pollution. The SWPPP would include provisions for periodic inspection of stormwater pollution prevention devices and practices. A Notice of Intent would be submitted to the Wyoming Department of Environmental Quality. Copies of the SWPPP and inspection reports would be filed in the Questar Pinedale office.

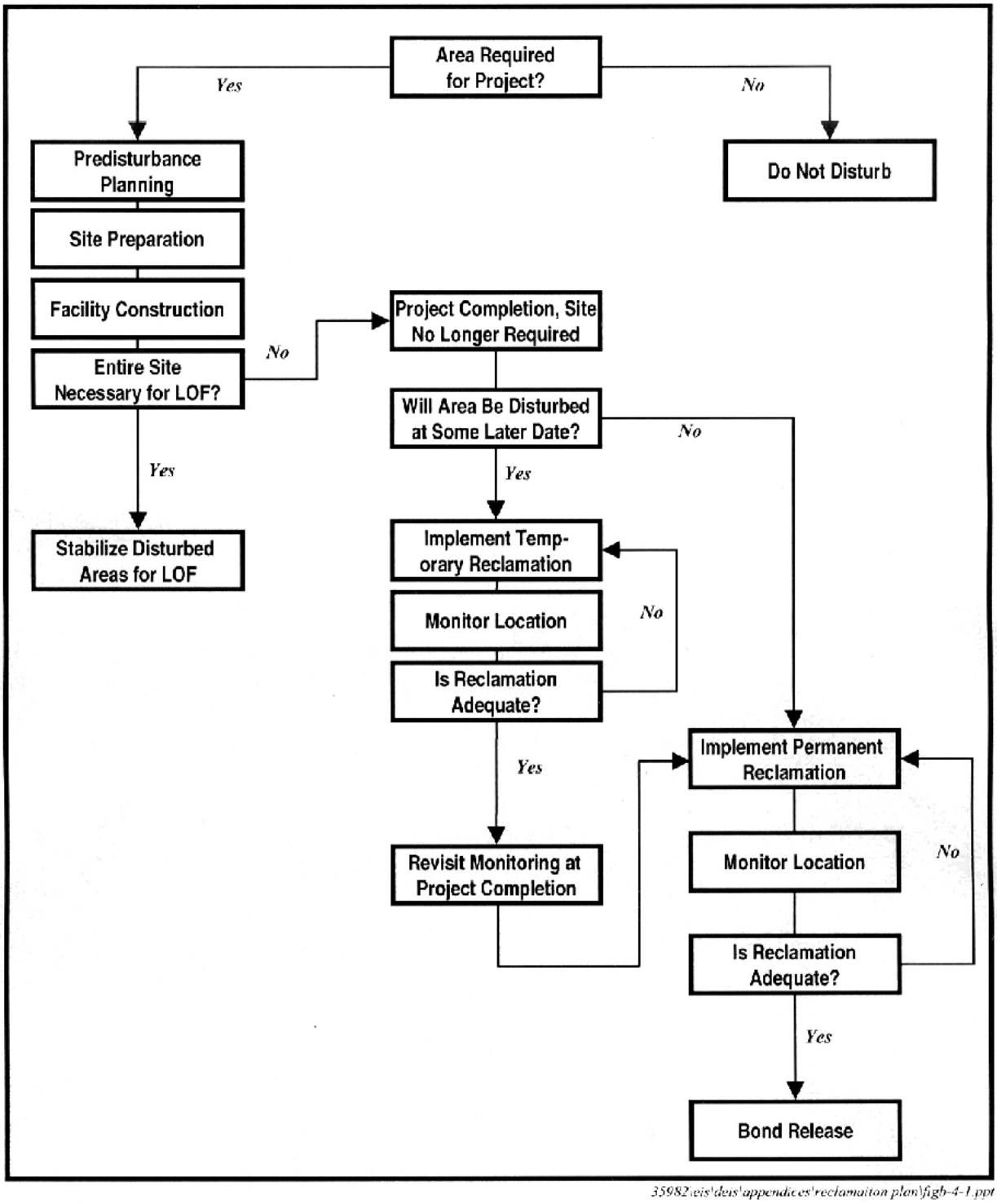

Figure 4.1. Reclamation Process, Questar Leaseholds, Pinedale Anticline, Sublette County, Wyoming.

4.1.2 Site Preparation

4.1.2.1 Trash and Spills

Trash removal would occur routinely throughout field development and operation. Trash would be picked up by field personnel and disposed of at on-site trash receptacles. These receptacles would be serviced by a licensed solid waste contractor.

Spills would be handled in accordance with Questar's Spill Prevention, Control, and Countermeasure Plans (SPCCPs) for the field.

Because trash and spilled materials would be routinely disposed of, removal of these materials is included in the operation plan rather than in this reclamation plan. However, topsoil would not be placed on contaminated materials, and the absence of contaminated materials at or near the ground surface is a reclamation requirement and a reclamation success criterion.

4.1.2.2 Topsoil and Spoil Handling

Topsoil would be salvaged from all proposed disturbance areas and stockpiled, unless the BLM deems that leaving topsoil in place would facilitate better reclamation. Vegetation would be salvaged and stockpiled with topsoil to incorporate native seeds and organic matter.

Appropriate soil salvage depths for each specific disturbance site would be specified in SUPs and PODs. It is anticipated that at least 6 inches of topsoil/suitable soil material would be salvaged from most disturbance sites; however, if less than 6 inches of topsoil are available, topsoil could be mixed with suitable spoil, with BLM approval, so that a minimum of 6 inches of plant growth material is available for use during reclamation. No unsuitable materials would be used. Alternatively, Questar would identify other topsoil stockpile(s) from which topsoil would be obtained for reclamation. For example, if Location A has less than 6 inches of topsoil but 24 inches were salvaged from neighboring Location B, Questar may identify the neighboring location as the source of additional surface soil material. The SUP or POD for both locations would note that a specific volume of topsoil from Location B is slated for use at Location A.

Where cut-and-fill construction is required, Questar would, to the extent possible in areas of difficult topography, balance the volumes of cut versus fill material to minimize the volume of spoil stockpiled. Spoil would be salvaged and stockpiled separately from topsoil.

For pipelines and access roads constructed on slopes of less than 15 percent, topsoil would be salvaged from all areas to be disturbed and stockpiled in windrows within the construction ROW by sidecasting with a grader. Where pipelines and roads are to be constructed on slopes greater than 15 percent, topsoil would be transported to more level terrain for storage.

Topsoil and spoil stockpiles would be designed to minimize the surface area occupied and would be constructed to remain stable until they are used for reclamation. Whenever possible, topsoil would be used immediately. All stockpiles will be located so as not to affect existing drainages. Temporary reclamation (see Section 4.2) would be implemented immediately on all topsoil and spoil stockpiles that would be in place for more than 2 years.

Topsoil and spoil stockpiles would be clearly marked and noted on site maps.

4.2 Temporary Reclamation

The objectives of temporary reclamation are to meet success standards 1–5 above (see Section 2.2). Additionally, vegetation on temporary reclamation would help stabilize soils.

Temporary reclamation would be conducted on areas that would be redisturbed (e.g., topsoil and spoil stockpiles, well pads where future well drilling is anticipated) prior to project abandonment. For operating well pad cut-and-fill slopes, Questar may elect to conduct either temporary or permanent reclamation. Temporary reclamation would not be used as a means to delay permanent reclamation on areas that would not be redisturbed.

Temporary reclamation areas would be graded and contoured. Graded surfaces would be ripped, if necessary, to eliminate soil compaction. Surfaces would then be disced to loosen surface material.

Topsoil would not be replaced on all temporary reclamation areas for the following reasons. First, much of the temporary reclamation would occur on topsoil stockpiles. Second, topsoil should not be mixed with spoil except as described in Section 4.1.2.2), so placing topsoil on spoil stockpiles would not occur. Finally, replacing and then re-disturbing topsoil on temporary reclamation areas would increase the potential for topsoil loss while it is being handled, stockpiled, and replaced a second time; topsoil handling would be minimized.

After discing, the area would be seeded using the seed mixture for temporary reclamation (Table 4.2) or one of the seed mixtures for permanent reclamation (see Tables 4.3 and 4.4, below). Questar would determine the appropriate mixture to use based on seed availability, cost, or other operational considerations.

Table 4.2. Example Seed Mixture for Temporary Reclamation[1]

Species	Approximate Seeding Rate (PLS/acre)[2]
Western wheatgrass (*Elymus smithii*)	2.0
Thickspike wheatgrass (*Elymus lanceolatus var. lanceolatus*)	2.0
Winter wheat (*Triticum aestivum*)[3]	10.0
Total	14.0

1 It is anticipated that this seed mixture primarily would be used on topsoil and subsoil stockpiles designated for long-term storage. Questar may submit for approval alternative site-specific seed mixtures.
2 PLS/acre = pounds of pure live seed per acre; alternate seeding rates may be applied in some areas as deemed appropriately by BLM and specified in approved SUPs and/or PODs.
3 A sterile hybrid would be seeded as a cover crop; cover crops would be used only in areas where rapid site stabilization is desired and where further disturbance and reseeding efforts likely would be conducted.

Table 4.3. Example Permanent Reclamation Seed Mixture for Sagebrush-dominated Communities with Sandy Soils[1]

Species	Drill Seeding Rate (PLS/acre)[2]
Grasses	
Thickspike wheatgrass (*Elymus lanceolatus* var. *lanceolatus*)	2.00
Western wheatgrass (*Elymus smithii*)	2.00
Bluebunch wheatgrass (*Elymus spicatum*)	2.00
Indian ricegrass (*Oryzopsis hymenoides*)	3.00
Needle-and-thread (*Stipa comata*)	3.00
Forbs (select one or more of the following forb species)	
Desert Indian paintbrush (*Castilleja chromosa*)	1.00
Scarlet globemallow (*Sphaeralcea coccinea*)	1.00
Shrubs (select 2 or more of the following shrub species)	
Wyoming big sagebrush (*Artemisia tridentata wyomingensis*)	0.25
Common winterfat (*Krascheninnikovia lanata*)[3]	1.00
Four-wing saltbush (*Atriplex canescens*)	3.00
Antelope bitterbrush (*Purshia tridentata*)	1.00

1 Questar may submit for approval alternative site-specific seed mixtures.
2 PLS/acre = pounds of pure live seed per acre. Seeding rates would be doubled if seed is to be broadcast.
3 Winterfat seed would be broadcast simultaneously with drill-seeding other species.

Table 4.4. Example Permanent Reclamation Seed Mixture for Sagebrush-dominated Communities with Alkaline Soils[1]

Species	Approximate Seeding Rate (PLS/acre)[2]
Grasses	
Western wheatgrass (*Elymus smithii*)	3.00
Thickspike wheatgrass (*Elymus lanceolatus* var. *lanceolatus*)	3.00
Alkaligrass (*Puccinellia distans*)	3.00
Alkali sacaton (*Sporobolus airoides*)	3.00
Forbs (select one or more of the following forb species)	
Scarlet globemallow (*Sphaeralcea coccinea*)	1.00
Evening primrose (*Oenothera* sp.)	1.00
Shrubs (select two or more of the following shrub species)	
Wyoming big sagebrush (*Artemisia tridentata wyomingensis*)	0.25
Common winterfat (*Krascheninnikovia lanata*) [3]	1.00
Four-wing saltbush (*Atriplex canescens*)	3.00
Gardner saltbush (*Atriplex gardneri*)	1.00

[1] Questar may submit for approval alternative site-specific seed mixtures.
[2] PLS/acre = pounds of pure live seed per acre. Seeding rates would be doubled if seed is to be broadcast.
[3] Winterfat seed would be broadcast simultaneously with drill-seeding other species.

Questar may elect to plant a cover crop of winter wheat or other sterile hybrid and then interseed with the other three species in the mixture for temporary reclamation or with a mixture for permanent reclamation. Cover crops provide rapid site stabilization and protect surfaces from wind and water erosion, and plant root structures improve soil permeability.

4.3 Permanent Reclamation

Permanent reclamation would be conducted on all disturbed areas no longer required for field operations (e.g., portions or all of well pads after development and throughout the well's production period, road outslopes, and pipeline corridors). Permanent reclamation would be conducted on pads and roads for non-producing wells and on pads for wells that have reached the end of their productive life (includes facility removal and complete well pad and access road reclamation). Because permanent reclamation would occur throughout the Life-of-Project (LOP), this plan does not differentiate between "interim" and "final" reclamation. All permanent reclamation is considered final unless monitoring shows that it needs to be repeated. Questar would completely reclaim all portions of well pads and access roads not required for operations. Once all wells on a pad are placed into production, the lease road will be converted to a two-track road to the extent such conversion is possible considering safety, topography and soil stability. Pits, if approved, would be completely reclaimed in the first spring or fall after draining. If reclamation involves facility removal (Section 4.3.1), regrading and reseeding would occur in the first fall or spring following facility removal.

4.3.1 Facility Removal

Some facilities would reach the end of their operational life during the LOP, whereas others would remain in use until field production is complete. When Questar determines that a well or other facility is no longer needed, it would be removed and the area would be permanently reclaimed.

All gas wells and generally all water wells would be abandoned according to BLM and/or Wyoming Oil and Gas Conservation Commission regulations. Some water wells may be retained for other uses after the LOP. Aboveground well pad, pipeline, and water disposal facilities, including buildings, tanks, pits, and associated hardware, would be dismantled, removed from BLM lands, and salvaged and re-used or disposed of at approved sites. Underground pipelines would be purged of gas or liquid, plugged, and abandoned in place.

Liquid or solid wastes remaining at well locations would be tested and properly disposed of according to state and federal regulations. Pit liners would be disposed of at state-approved sites or buried on-site. Concrete foundations, pads, or footings would be broken-up and removed or buried on-site. Aggregate used for well pad, road, and other facility construction also would be removed or buried on-site.

Road reclamation would include the removal of bridges, culverts, cattleguards, sediment control structures, and signs. Drainage-crossing sideslopes would be reduced to no more than 4:1 to reduce bank erosion and produce stable sideslopes. Barriers would be used to discourage travel on the reclaimed roads and pipelines until permanent reclamation is deemed successful.

4.3.2 Surface Preparation

4.3.2.1 Backfilling and Grading

Backfilling would occur prior to grading. Areas to be backfilled include pits, cut slopes, pipeline trenches, borrow ditches, and facility foundations. Pipeline trenches would be backfilled so that the soil berm is less than 3 inches high. Spoil for backfill would be obtained from fill material and spoil stockpiles.

Areas to be reclaimed would be graded to approximate original contours and to blend in with adjacent topography. Area-wide drainage would be restored so that surface runoff flows and gradients are returned to the conditions present prior to development. Graded surfaces would be suitable for the replacement of a uniform depth of topsoil, would promote cohesion between subsoil and topsoil layers, would reduce wind erosion, and would facilitate moisture capture.

Specialized grading techniques would be applied at Questar's discretion and may include slope rounding, bench grading, stair-step grading, and/or contour furrowing.

Dozers, loaders, scrapers, and motor graders are typically used for backfilling and grading.

4.3.2.2 Ripping and Discing

Compacted areas such as roads and well pads would be ripped to a depth of approximately 1 foot to improve soil aeration, water infiltration, and root penetration. Ripped areas would be disced, if

necessary, to fill in deep furrows (where topsoil would be lost) and break up large clods (to which topsoil would not adhere).

Motor graders or tractors equipped with ripping shanks are typically used for ripping. Ripper shanks would be set approximately 1–2 feet apart. Discing is typically accomplished using a tractor-drawn disc set 2–6 inches deep.

4.3.3 Seedbed Preparation

Seedbed preparation maximizes seeding efficiency and improves reclamation success. It includes topsoil replacement (with amendments, where appropriate) and discing. Surface roughening procedures (e.g., pitting, gouging) also may be applied at Questar's discretion.

4.3.3.1 Topsoil Replacement

Waterbars and erosion control devices would be installed on reclaimed areas prior to topsoil replacement, as necessary, to control topsoil erosion (see Section 4.4.2).

Between 6 and 24 inches of stockpiled topsoil would be redistributed uniformly on areas to be reclaimed. If the stockpile for a given location contains insufficient topsoil to meet the required 6-inch minimum, topsoil would be mixed with suitable spoil or imported from another location as described in Section 4.1.2.2. Topsoil would not be replaced on contaminated material—all contaminated material would be removed or otherwise handled in accordance with the SPCCPs.

Topsoil is typically replaced using scrapers, dozers, and/or motorgraders.

Once topsoil is replaced, seeding would occur generally between September 15 and November 14 unless the ground is wet or frozen. In this circumstance, seeding would be delayed until the ground dries or thaws to the point where soils are friable. An early frost would not delay seeding until the following spring if subsequent fall conditions are appropriate for seeding.

If Year 5 reclamation success standards are not met, soil tests may be implemented to determine the need for fertilizers or other soil amendments.

4.3.3.2 Discing

After topsoil replacement, newly topsoiled areas would be disced or harrowed to reduce soil compaction, to break up soil clods, to improve root and water penetration, and to provide a friable but firm seedbed. The surface would be rough to reduce wind and water erosion and to promote moisture capture.

If the surface is roughened during discing, other moisture-capture techniques are probably not needed. However, Questar may implement techniques such as pitting and gouging to concentrate water in pits and gouges. If Year 5 reclamation success standards are not met, Questar may implement these kinds of techniques.

Discing and harrowing are typically accomplished using a tractor-drawn disc or harrow set 2–6 inches deep.

4.3.4 Revegetation

4.3.4.1 Seeding

Reclaimed areas generally would be seeded using seed mixtures similar to those presented in Tables 4.3 and 4.4. These mixtures were developed based on the following criteria: general conditions within the analysis area, species adaptations to site conditions, usefulness of the species for rapid site stabilization, species success in past revegetation efforts, seed costs and availability, and compliance with *Executive Order 11987* and *BLM Manual* Section 1745 (i.e., use of native species).

Alternative species and seeding rates may be used at Questar's discretion with BLM approval, if warranted by site-specific conditions or seed availability, provided that the alternative species/seeding rates facilitate achieving reclamation success and all modifications are documented as described in Section 2.2.

Seed mixtures would be certified weed-free.

Questar would determine which seed mixture to use and which substitute species may be appropriate to include in the mixture in consultation with BLM. Questar may also elect to use interseeding techniques if Year 5 reclamation is not successful.

Questar has the discretion to inoculate selected seed mixtures with soil microorganisms to facilitate germination and growth. If Year 5 reclamation success standards are not met, Questar may require seed mixture inoculation.

Seeding would be conducted in the fall between September 15 and freeze-up. If fall seeding is not feasible, seeding may occur between spring thaw and May 15. Seeds would be planted along contour using a rangeland drill equipped with an agitator and depth bands to mix seed and ensure proper seeding depths. Seeds would be planted 0.25 to 0.50 inch deep. Fluffy seeds (e.g., winterfat) would be broadcast simultaneously with drilled seeding. Broadcast seeding may be used, at Questar's discretion, for other shrub and forb species, utilizing either hand or specialized broadcast seeders.

When drill-seeding is not practical due to steep slopes, rocky surfaces, or wet soil conditions, seeding rates would be doubled, seeds would be broadcast, and the area would be raked or chained to cover seeds. Questar may elect to broadcast seed after applying and crimping 2 tons/acre of certified weed-free mulch.

4.3.4.2 Mulching

Where mulching is deemed appropriate by Questar, the reclaimed area would be uniformly mulched (75 percent minimum cover) with certified weed-free native grass, hay, small grain straw, wood fiber, and/or live mulch, at a rate of 2 tons/acre. Alternatively, cotton, jute, or synthetic netting may be applied. Mulch would be crimped into the soil, tackified, or incorporated into erosion control blankets to prevent it from blowing or washing away and from entering waterways. Mulch would protect the soil from wind and water erosion, raindrop impact, and surface runoff and would help hold seeds in place.

On steep slopes where it is unsafe to operate equipment, at sites where soils have 35 percent or more surface rock content, or on notably unstable areas, hydromulch, biodegradable erosion control netting, or matting would be firmly attached to the soil surface.

4.4 Erosion Control

4.4.1 Construction- and Operation-Phase Erosion Control

Standard culverts, road ditches, and road design would be used in accordance with typical engineering practices to minimize erosion along active roads. Culverts would be sized to pass expected flows without causing erosion above, below, or around the culvert. Culvert entrances and exits would be protected with energy dissipaters such as riprap or rock aprons as necessary. Road ditches would be sized to collect runoff from roads and surrounding areas; energy dissipating structures such as straw bales anchored with rebar would be used to prevent ditch erosion. Roads would be designed to enable head-on traffic to pass without leaving the surfaced travelway. If turnouts are used for this purpose, Questar would instruct field personnel to use turnouts to avoid traveling on roadside ditches. Water discharged from culverts, roadside ditches, and turnouts would be directed either into undisturbed vegetation or natural drainages.

Interceptor ditches would be installed above all cut slopes. Interceptor ditches would be V-shaped—1 foot deep and 3 feet wide with gently sloping sides—and would empty onto native, undisturbed vegetation. Alternatively, energy-dispersing devices (e.g., rock aprons) would be placed at each end of the interceptor ditch.

Sediment control devices would be placed at the base of all fill slopes and stockpiles, as necessary.

Where road or pipeline construction occurs on slopes of 3:1 or more, temporary sediment barriers such as silt fences and/or staked weed-free straw bales may be installed along contour below the road/pipeline corridor. Silt fences or other sediment filtering devices would also be installed wherever road or pipeline construction occurs within 100 feet of a drainage. Temporary sediment barriers would remain in place until the surfaces are stable and reclamation success standards are met (see Section 2.2). Sediment filtering devices would be cleaned out and maintained in functional condition throughout the LOP.

Trench plugs would be used during pipeline construction at nonflumed drainage crossings to prevent diversion of flows into upland portions of pipeline trenches. Instream protection devices (e.g., drop structures) also may be used to prevent erosion in drainages crossed by pipelines. In drainages, clean gravel would be used for the upper 1 foot of backfill in pipeline trenches. Application of riprap to channel banks would be limited to areas where flow conditions prevent stabilization by vegetation. Riprap installation would comply with U.S. Army Corps of Engineers' permit requirements. Pipeline trenches would be dewatered so no construction-related silty water flows into drainage channels.

Where roads and pipelines cross a waterbody (i.e., drainages), topsoil and spoil would be placed at least 10 feet from the edge of the waterbody, and sediment control structures would be placed between the topsoil/spoil and the waterbody. Dirt and brush riprap would not be used to stabilize the ROWs at waterbody crossings.

4.4.2 Reclamation-Phase Erosion Control

All reclaimed surfaces would be left rough and may be mulched, as described in Section 4.3.4.2, to reduce wind and water erosion. Erosion and sediment control structures would be installed on reclaimed areas where monitoring demonstrates that erosion control structures are needed.

Runoff from reclaimed areas, where monitoring suggests that it is warranted, would be controlled using standard structures including, but not necessarily limited to, waterbars, silt fences, geotextile, and energy dissipaters. Waterbars would be installed in accordance with standard BLM specifications and would drain into undisturbed vegetation. Waterbars generally will be 12–18 inches in height with a 2 percent grade. Waterbars would be installed after ripping and prior to topsoil placement. Silt fences would be placed downhill from reclaimed areas where erosion may impact a waterbody and would be installed according to manufacturers' instructions. Energy dissipaters would be used wherever water is channelized (e.g., by a waterbar or an interceptor ditch) to slow flows.

All runoff and erosion control structures would be inspected, maintained, and cleaned-out by Questar on a regular basis throughout the LOP. Inspections would occur after runoff events (e.g., spring runoff, storm events). Sites and sources of soil movement would be addressed in a timely manner and recorded in a way that would allow for erosion pattern tracking.

4.5 Weed Control

Questar would be responsible for noxious, non-native, and invasive weed control from all project activities for the LOP, and would use mechanical or chemical weed control as deemed appropriate. If use of herbicides (chemical pesticide control) is deemed necessary by Questar, a Pesticide Use Permit would be submitted for approval to the BLM. All herbicides would be used only in the season or growth stage during which they are most effective. Herbicides would be applied only by certified personnel using approved precautions and application procedures in compliance with all applicable federal, state, and local regulations. Herbicides would not be used within 100 feet of open water or during extremely windy conditions. Aerial application of herbicides would be prohibited within 0.25 mile of known special status plant species locations (i.e., federally listed or BLM-sensitive species) and hand application of herbicides would not occur within 500 feet of such occurrences. Certified weed-free seed mixtures and mulches would be used, thereby minimizing the potential for noxious weed introduction.

4.6 Dust Control

Questar will use water or magnesium chloride applications or other treatments (e.g., gravel, paving) as necessary to reduce the amount of fugitive dust caused by construction and use of lease and resource roads on its leasehold.

5.0 RECLAMATION SUCCESS MONITORING

This monitoring plan was developed with two primary objectives: 1) to document the condition of reclaimed areas relative to the revegetation success criteria provided in Section 2.2, and 2) to provide an expeditious means for monitoring all reclamation sites to document reclamation progress.

5.1 Monitoring Responsibilities

Questar would be responsible for the following:

- monitoring,
- determining if reclamation success standards are being met,
- developing and implementing remedial actions if success standards are not being met, and
- reporting monitoring results to BLM annually.

Questar would submit annual reclamation evaluation reports to BLM by December 31 of each year.

5.2 Monitoring Approach

Monitoring would be largely qualitative because it is reasonably accurate to document the condition of a site in the field with a few basic notes and color photographs. The Monitoring Form provided as Table 5.1 is designed to collect the appropriate data. The approach described herein is designed to allow reclamation inspectors a tool for evaluating reclamation status throughout the leasehold during a short period in the growing season, which would enable Questar to obtain a field-wide record on the status of reclamation. This record, then, would be used to make informed decisions on what actions are needed to obtain field-wide reclamation success, decisions that might range from a high-level action such as revising this Reclamation Plan to a simple remedial action such as installing a silt fence. The record would be key to tracking reclamation progress and initiating appropriate remedial actions for the LOP.

Field-wide monitoring would include existing and proposed facilities authorized under previous National Environmental Policy Act of 1969 documents for the Questar leasehold, as well as all operations that may be authorized in the future.

Table 5.1. Monitoring Form

QUESTAR LEASEHOLD
RECLAMATION MONITORING FORM

Well Pad Name/Number _____ **Monitoring Date** _____

Well Spud Date _____ **Inspector** _____

Circle 1 – Well Pad, Access Road, Pipeline, Other Facility

Reclamation Data

Date Backfilled _____

Date Topsoiled _____

Topsoil Depth Replaced _____

Date Seeded _____

Seed Mixture _____

Other Reclamation Techniques Used _____

Table 5.1 (Continued)

Monitoring Data

Answer Questions 1 - 8 to evaluate temporary reclamation and sites reclaimed less than 5 years ago.
Answer Questions 1 - 11 to evaluate reclamation on sites that were reclaimed 5 or more years ago.
Answer Questions 1 - 6 and 12 - 18 to evaluate reclamation on sites that were reclaimed 8 or more years ago or where permanent reclamation success is to be documented.

Questions		Data		
		Yes	No	Comments (include photograph information)
1	Is the area free of undesirable materials (construction materials, trash, potentially hazardous materials)?			
2	Is the subsurface apparently stable, with no indications of subsidence, slumping, and/or significant downward movement of surface soil materials?			
3	Does the area appear stable (absence of rills or gullies that are actively eroding or greater than 2 inches wide/deep, perceptible soil movement, sheet flow, or head cutting in drainages and/or slope instability on or adjacent to reclaimed area)?			
4	Are soil surfaces adequately rough to reduce runoff and capture rainfall and snowmelt?			
5	Is vegetation helping to stabilize the site?			
6	Are weeds or other undesirable species adequately controlled?			
7	Is vegetative canopy cover at least 35% of the adjacent native undisturbed vegetative cover?			
8	Is there evidence of vegetative reproduction (either spreading by rhizomatous species or seed production)?			
9	Is vegetative cover at least 50% by species contained in the seed mix and/or present on adjacent areas?			
10	Does no single species account for more that 50% of total vegetative cover, or if so, does it make up more than 50% of total vegetative cover in adjacent undisturbed areas?			
11	Invasive, non-native species (weeds) or other undesirable species do not comprise more than 15% of total vegetative cover?			

Table 5.1 (Continued)

Questions		Data		
		Yes	No	Comments (include photograph information)
12	Is vegetative canopy cover at least 80% of cover on adjacent native undisturbed vegetation?			
13	Is there evidence of vegetative reproduction (either spreading by rhizomatous species or seed production)?			
14	Is vegetative cover at least 80% by species contained in the seed mix, present on surrounding native vegetation, and/or by other desirable species?			
15	Does no single species account for more than 30% of total vegetative cover, or if so, does it make up more than 30% of total vegetative cover in adjacent undisturbed vegetation?			
16	Invasive, non-native species (weeds) or other undesirable species do not comprise more than 5% of total vegetative cover?			
17	Does the reclaimed landscape have characteristics that approximate the visual quality of the adjacent area?			
18	Does the reclaimed landscape support desired post-disturbance land uses?			

Use this worksheet to obtain data to answer questions 7-16.

Attribute	Reclaimed Area	Native Undisturbed Vegetation
Vegetative cover (%) by desirable species (note any species that comprises more than 25–50% of cover).		
Vegetative cover (%) by undesirable species		
Species list		
Description of evidence of reproduction by desirable species		Not Applicable

Table 5.1 (Continued)

Additional Field Notes _____

Table 5.1 (Continued)

Photographs of Reclaimed Area (attach additional sheets if needed).

Photograph 1

Photograph 2

The qualitative evaluation may be supported by quantitative sampling such as the use of quadrants or transects to estimate vegetative cover. Quantitative or statistical sampling would only be conducted if it is deemed appropriate by Questar. Using a qualitative approach will enable monitoring to be conducted at all reclamation areas within a reasonable time frame and at a reasonable cost, while providing valuable data on the status of reclamation at each location. Thus, the determination of success, or lack thereof, would be based largely on the judgment of a suitable professional and would be supported by monitoring forms and color photographs.

The form presented in Table 5.1 requires the revegetation success inspector to answer a series of questions about the site. The form provides for the monitoring of temporary reclamation, of sites where reclamation is 5 or more years old where only partial reclamation success is anticipated, and of sites where reclamation is 8 or more years old or for which permanent reclamation success is to be documented and monitoring discontinued. Monitoring permanent revegetation would commence during Year 2 because the desirable perennials typically would begin to dominate these reclaimed areas 1–3 years following reclamation, and any erosion problems would be detected early. Monitoring Form questions are derived from the revegetation success objectives described in Section 2.2.

5.3 Monitoring Temporary Reclamation

Temporary reclamation would be monitored annually.

Temporary reclamation monitoring would include visual inspection for undesirable materials, soil stability, the effectiveness of erosion control practices, vegetation establishment, and weed invasion. Monitoring results would be documented on the Monitoring Form (Table 5.1) and color photographs would be taken. Where success objectives 1–6 (see Section 2.2) are not met (i.e., if any of Table 5.1 questions 1–6 are answered "no"), Questar would develop problem resolution protocol and work to correct the problem.

5.4 Monitoring Permanent Reclamation

For permanent reclamation, reclamation success objectives 1–6 (see Section 2.2) would be monitored qualitatively. Monitoring would include visual inspection for undesirable materials, soil stability, effectiveness of erosion control practices, and weed invasion. Monitoring results would be documented on the Monitoring Form (Table 5.1) and color photographs would be taken. Where success criteria 1–6 are not met (i.e., if any of Table 5.1 questions 1–8 are answered "no"), Questar would develop problem resolution protocol and work to correct the problem.

Permanent revegetation monitoring (success objectives 6a–6f; see Section 2.2) would occur in Year 2 and annually thereafter until permanent reclamation success objectives are achieved (standards 1–5, 6d, 6e, 6f, and 7). Questar may elect to conduct additional monitoring.

Permanent revegetation monitoring would include a visual inspection of the site to estimate percent cover by desirable and undesirable species and to compare vegetative canopy cover on the reclaimed area with that present on adjacent native vegetation. Quadrants or transects may be used to assist with cover estimates; if so, representative,

rather than random, samples would be obtained. The inspector would note whether the desirable plants on the site appear to be reproducing. A list of the species present on reclaimed and adjacent vegetation would be developed and compared. These data would be recorded on the Monitoring Data Form (see Table 5.1), and color photographs would be taken.

If any Monitoring Data Form questions 7–11 or 12–18 are answered "no" (i.e., revegetated areas do not meet all standards), additional treatments (e.g., discing and reseeding, addition of soil amendments, irrigation, herbicide application) may be applied, and a treatment schedule developed and implemented.

This process will be reiterated as shown in Figure 4.1.

6.0 REFERENCES

Bureau of Land Management. 1987a. Pinedale Resource Area Draft Resource Management Plan/Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Rock Springs District, Rock Springs, Wyoming, and Pinedale Resource Area, Pinedale, Wyoming.

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