Appendix C

Required Design Features and Best Management Practices

APPENDIX C
REQUIRED DESIGN FEATURES AND BEST MANAGEMENT PRACTICES

REQUIRED DESIGN FEATURES

Required Design Features (RDFs) are required for certain activities in all GRSG habitat. RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. However, the applicability and overall effectiveness of each RDF cannot be fully assessed until the project level when the project location and design are known. Because of site-specific circumstances, some RDFs may not apply to some projects (e.g., a resource is not present on a given site) and/or may require slight variations (e.g., a larger or smaller protective area). All variations in RDFs would require that at least one of the following be demonstrated in the NEPA analysis associated with the project/activity:

- A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable;
- An alternative RDF is determined to provide equal or better protection for GRSG or its habitat;
- A specific RDF will provide no additional protection to GRSG or its habitat.

The RDFs are applicable to PHMA and GHMA unless otherwise indicated for Alternatives B, C, D, and F, and the Proposed Plan in this RMPA/EIS.

Common to All

1. Cluster disturbances, operations and facilities.

2. Minimize authorizations to reduce disturbance to sagebrush habitats.
3. Restrict the construction of fences and tall structures to the minimum number and amount needed. Tall structures are any man-made structure that has the potential to disrupt lekking or nesting birds by creating perching/nesting opportunities for predators (e.g., raptors, ravens) or decrease the use of an area by sage-grouse. This includes but is not limited to communication towers, meteorological towers, electrical transmission or distribution towers, power poles, wind turbines, and associated structures.
4. Design or site permanent structures that create movement (e.g. a pump jack) to minimize impacts on sage-grouse.
5. Construct new ROW, tanks, and other structures with perch deterrents or other anti-perching devices, and with structures or devices that discourage nesting of raptors and corvids.
6. Refer to the model by Bryan Stevens (2011) to identify fences that pose a threat to sage-grouse. Remove any unneeded or unused fences and mark needed fences with anti-strike markers if the fence poses a threat to the sage-grouse. Remove or mark fences within 1.2 mile of newly discovered leks that were not included in the model. Update the model when new leks are found (PHMA only).
7. Place new utility developments (power lines, pipelines, etc.) and transportation routes in existing utility or transportation corridors.
8. Clean up refuse and eliminate subsidized food sources for Greater Sage-grouse predators.
9. Provide training to all personnel and contractors on greater sage-grouse biology, habitat requirements, and identification of local areas used by the birds.
10. Locate on-site work/project camps and staging areas outside of priority habitat (PHMA only).
11. Powerwash all vehicles and equipment involved in land and resource management activities prior to entering the project area to minimize the introduction and spread of invasive plant species.
12. Use native plant species; locally sourced where available, recognizing that use of non-native species may be necessary depending on the availability of native seed and prevailing site conditions.
13. Ensure proposed sagebrush treatments are planned with interdisciplinary input from BLM and /or state wildlife agency biologist and promote use by sage-grouse.
14. Reduce encroaching conifer cover to zero within one mile of all occupied or pending leks and to less than 5% within 4 miles of such

leks. Retain all trees that originated prior to 1850 (old trees), culturally significant, and trees in active use by special status species (e.g. nest, den, and roost trees) and all old growth stands of juniper within 4.0 miles of occupied or pending leks. See OSU Technical Bulletin 152, or its successor, for the key characteristics of old trees. Old growth stands are those where the dominant trees in the stand meet the key characteristics for old trees.

15. Focus restoration outward from existing intact habitat.
16. Consider using available organic material or mats to reduce vegetation disturbance for activities and for roads between closely spaced authorizations to reduce soil compaction and maintain soil structure for increasing the likelihood of vegetation reestablishment. Remove or incorporate cover at the decommissioning stage of the project or authorized use period.
17. Cover (e.g., fine mesh netting or use other effective techniques) all pits and tanks regardless of size to reduce sage-grouse mortality.
18. Minimize unnecessary cross-country vehicle travel during field and fire operations in sage-grouse habitat.
19. There will be no disruptive activities two hours before sunset to two hours after sunrise from March 1 through June 30 within 1.0 miles of the perimeter of occupied leks, unless brief occupancy is essential for routine ranch activities (e.g., herding or trailing livestock into or out of an area at the beginning or end of the grazing season). Disruptive activities are those that are likely to alter sage-grouse behavior or displace birds such that reproductive success is negatively affected or an individual's physiological ability to cope with environmental stress is compromised. Examples of disruptive activities may include noise, human foot or vehicle traffic, or other human presence.
20. Remove all branches on cut juniper stumps to prevent regrowth. Remove branches on cut trees that extend more than four feet above the ground or more than one foot above the general height of the sagebrush to eliminate potential perch sites for Greater Sage-grouse predators.

Roads

1. Construct road crossings at a right angle to ephemeral drainages and any stream crossings.
2. Utilize existing roads, or realignments of existing roads to the extent possible.
3. Coordinate road construction and use among ROW holders.

4. Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.
5. Locate and build new roads to avoid important areas and habitats.
6. Restrict vehicle traffic on newly constructed project access routes to only authorized users (e.g. through use signing and gates)(PHMA only).
7. Use dust abatement practices on roads and pads when authorizing activities where dust abatement is necessary.
8. Eliminate parallel roads travelling to the same destination when the destination can be accessed from the same direction and topography.

Reclamation

1. Maximize the area of interim reclamation on long-term access roads and other disturbances including reshaping, topsoiling, and revegetating cut and fill slopes.
2. Restore disturbed areas at final reclamation and duplicate roads to the pre-disturbance landforms and desired plant community.
3. Irrigate sites during interim reclamation, if necessary, for the purpose of establishing seedlings more quickly.
4. Utilize mulching techniques to expedite reclamation and to protect soils.
5. Include restoration objectives to meet sage-grouse habitat needs during reclamation (Pyke, 2011). Address post-reclamation management in reclamation plan so that clear goals and objectives are known to enhance or restore sage-grouse habitat.

Lands and Realty

1. Bury distribution power lines and communication lines, preferably within existing disturbance (PHMA only).

Fluid Minerals Development

1. Establish trip restrictions (Lyon and Anderson 2003) or minimization through use of telemetry and remote well control (e.g., Supervisory Control and Data Acquisition).
2. Use directional and horizontal drilling to reduce surface disturbance.
3. Apply a phased development approach with concurrent reclamation.
4. Use remote monitoring techniques for production facilities and develop a plan to reduce the frequency of vehicle use.
5. Use only closed-loop systems for drilling operations and no reserve pits.

6. Remove or re-inject produced water to reduce habitat for mosquitoes that vector West Nile Virus. If surface disposal of produced water continues, refer to the West Nile Virus RDFs.
7. Place pipelines, transmission lines, or other infrastructure under or immediately adjacent to a road or other infrastructure first, before locating with other ROWs.

Fire, Fuels and Vegetation

Vegetation and Fuels Management

1. Where applicable, design treatment objectives to protect existing sagebrush ecosystems, modify fire behavior, restore native plants, and create landscape patterns which most benefit sage-grouse habitat.
2. When treating dense sagebrush with prescribed fire:
    a. Design burn prescriptions to limit fire spread.
    b. Target individual sagebrush plants or small patches of sagebrush with at least 50 percent dead crown.
    c. Ensure burn patches are well-distributed through the treatment block.
    d. In warm-dry sagebrush do not count burn patches of <0.25 acres towards the maximum allowed stand-replacement area.
    e. In cool-moist sagebrush do not count burn patches of <0.5 acres towards the maximum allowed stand-replacement area.
3. Use burning prescriptions that minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable perennial plant species and reduce risk of annual grass invasion by retaining biological crusts).
4. Use native plant species; locally sourced where available, recognizing that use of non-native species may be necessary to achieve site-specific management objectives.
5. Fuel Breaks:
    a. Incorporate roads and natural fuel breaks into fuel break design, where applicable.
    b. Design fuel breaks in areas of high fire frequency to facilitate firefighter safety, reduce the potential acres burned, and reduce the fire risk to sage-grouse habitat.

c. Develop maps of existing fuel breaks in relation to sage-grouse habitat to assist wildfire response activities.

d. Use perennial vegetation (e.g., green-strips) paralleling road rights-of-way.

e. Incorporate key habitats or important restoration areas (such as where investments in restoration have already been made) in fuel break design.

Fire Operations

1. Compile District level greater sage-grouse information into state-wide tool boxes. Tool boxes will contain maps, listing of resource advisors, contact information, local guidance, and other relevant information for each District, which will be aggregated into a state-wide document.

2. Assign a resource advisor with sage-grouse expertise, or who has access to sage-grouse expertise, to all extended attack fires in or near sage-grouse habitat. Prior to the fire season, provide training to sage-grouse resource advisors on wildfire suppression organization, objectives, tactics, and procedures to develop a cadre of qualified individuals. Involve ODFW in fire operations through:

    a. Instructing resource advisors during preseason trainings;

    b. Qualification as resource advisors;

    c. Coordination with resource advisors during fire incidents;

    d. Contributing to incident planning with information such as habitat features or other key data useful in fire decision making.

3. On critical fire weather days, pre-position additional fire suppression resources to optimize a quick and efficient response in sage-grouse habitat areas.

4. Use existing fuel breaks, such as roads or discrete changes in fuel type, as control lines in order to minimize fire spread.

5. During periods of multiple fires, ensure line officers are involved in setting priorities.

6. Minimize burnout operations in key sage-grouse habitat areas by constructing direct fireline whenever safe and practical to do so.

7. Utilize retardant, mechanized equipment, and other available resources to minimize burned acreage.

8. When safe, maintain and protect areas of unburned islands and fingers of sagebrush and treat these areas as a highly valued resource to be protected. Safe and risk based use of aircraft and

mechanized equipment should be considered in order to keep fire from burning out these islands.

9. On all fires, clearly document the following as they apply:
    a. Locations and sizes of burnout operations
    b. Locations of mechanical firelines
    c. Locations of retardant drops
    d. Interagency coordination concerning the strategy and tactics used
    e. Resource advisors used (name and whether GRSG "qualified", see RDF #2 under Fire Operations)
    f. Summaries of weather and fire behavior, particularly during major growth events
    g. Whether ES&R is anticipated to occur.
10. Coordinate with Rangeland Fire Protection Associations (RFPAs) and Rural Fire Protection Districts (RFPDs) to increase initial attack and extended attack capability and effectiveness.
    a. Establish minimum requirements for personal protective equipment (PPE), training, experience and qualifications, physical fitness levels, and currency standards for wildland fire positions which all participating agencies agree to meet (NWCG 310-1)
    b. Assist RFPAs and RFPDs in meeting agreed upon minimum standards by providing joint training and development opportunities.
    c. Develop interagency training exercises with local, state, and federal agencies to enhance safety, coordination, communication, and effectiveness during fire management operations.
    d. Utilize interagency "closest available forces" protocol for dispatching qualified firefighting resources to initial attack fires within 5 years.
11. Locate wildfire suppression facilities (i.e., base camps, spike camps, drop points, staging areas, helicopter landing areas) in areas where physical disturbance to sage-grouse habitat can be minimized. These include disturbed areas, grasslands, near roads/trails or in other areas where there is existing disturbance or minimal sagebrush cover.

Livestock Grazing

1. Do not place salt or mineral supplements within 1.2 miles of the perimeter of an occupied lek.
2. Do not concentrate livestock in nesting habitat or leks from March 1 through June 30. The timing and location of livestock turnout and trailing should not contribute to livestock concentrations on leks during the sage-grouse breeding season.
3. Locate new and/or relocate livestock water developments within sage-grouse habitat to maintain or enhance habitat quality.
4. Spring developments should be constructed or modified to maintain their free-flowing, natural, and wet meadow characteristics.
5. Fence wetlands (e.g., springs, seeps, wet meadows and/or riparian areas) where appropriate, to maintain or foster progress toward Proper Functioning Condition and to facilitate management of sage-grouse habitat objectives. Where constructing fences or exclosures to improve riparian and/or upland management, incorporate fence marking or other BMPs/RDFs as appropriate.
6. Ensure wildlife accessibility to water and install escape ramps in all new and existing water troughs.
7. Construct new livestock facilities (livestock troughs, fences, corrals, handling facilities, "dusting bags," etc.) at least 1.2 miles from leks or other important areas of sage-grouse habitat (i.e., wintering and brood-rearing areas) to avoid concentration of livestock, collision hazards to flying birds, or avian predator perches.
8. Place new, taller structures, including corrals, loading facilities, water storage tanks, windmills, out of line of sight or at least 1.2 miles from occupied leks, where such structures would increase the risk of avian predation.

Noise (RDFs apply to all activities)

1. Limit noise at the perimeter of occupied or pending leks from 2 hours before to 2 hours after sunrise and sunset during the breeding season to less than 10 decibels above ambient sound levels.
2. Require noise shields for noise creating authorizations (e.g. drilling).
3. Locate new compressor stations and other noise creating authorizations outside priority habitats and design them to reduce noise that may be directed towards priority habitat.

West Nile Virus

1. Restrict pit and impoundment construction to reduce or eliminate threats from West Nile virus (Doherty 2007).

2. Use the following steps for reservoir design to limit favorable mosquito habitat:
    a. Overbuild size of ponds for muddy and non-vegetated shorelines.
    b. Build steep shorelines to decrease vegetation and increase wave actions.
    c. Avoid flooding terrestrial vegetation in flat terrain or low lying areas.
    d. Construct dams or impoundments that restrict down slope seepage or overflow.
    e. Line the channel where discharge water flows into the pond with crushed rock.
    f. Construct spillway with steep sides and line it with crushed rock.
    g. In areas experiencing a West Nile Virus outbreak, treat waters with larvicides to reduce mosquito production where water occurs on the surface.

Locatable Minerals Development (RDFs apply to locatable minerals to the extent consistent with applicable law)

Roads

1. Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.
2. Locate and build new roads to avoid important areas and habitats.
3. Coordinate road construction and use among ROW holders.
4. Construct road crossing at right angles to ephemeral drainages and any stream crossings.
5. Restrict vehicle traffic on newly constructed project access routes to only authorized users (e.g. through use signing and gates) (PHMA only)
6. Use dust abatement practices on roads and pads when authorizing activities where dust abatement is necessary.
7. Eliminate parallel roads travelling to the same destination when the destination can be accessed from the same direction and topography.

Operations

1. Cluster disturbances, operations, and facilities.

2. Place pipelines, transmission lines, or other infrastructure under or immediately adjacent to a road or other infrastructure first, before locating with other ROWs.
3. Restrict the construction of fences and tall facilities to the minimum number and amount needed. Tall structures are any man-made structure that has the potential to disrupt lekking or nesting birds by creating perching/nesting opportunities for predators (e.g., raptors, ravens) or decrease the use of an area by sage-grouse. This includes but is not limited to communication towers, meteorological towers, electrical transmission or distribution towers, power poles, wind turbines, and associated structures.
4. Minimize authorizations to reduce disturbance to sagebrush habitats.
5. Place new utility developments (power lines, pipelines, etc.) and transportation routes in existing utility or transportation corridors.
6. Bury distribution power and communication lines, preferably within existing disturbance (PHMA only).
7. Cover (e.g., fine mesh netting or use other effective techniques) all pits (mining-related water filled impoundment) and tanks regardless of size to reduce sage-grouse mortality.
8. Construct new ROW, tanks, and other structures with perch deterrents or other anti-perching devices, and with structures or devices that discourage nesting of raptors and corvids.
9. Use native plant species; locally sourced where available, recognizing that use of non-native species may be necessary depending on the availability of native seed and prevailing site conditions.
10. Restrict pit and impoundment construction to reduce or eliminate threats from West Nile virus (Doherty 2007).
11. Remove or re-inject produced water to reduce habitat for mosquitoes that vector West Nile virus. If surface disposal of produced water continues, use the following steps for reservoir design to limit favorable mosquito habitat:
    a. Overbuild size of ponds for muddy and non-vegetated shorelines.
    b. Build steep shorelines to decrease vegetation and increase wave actions.
    c. Avoid flooding terrestrial vegetation in flat terrain or low lying areas.
    d. Construct dams or impoundments that restrict down slope seepage or overflow.

e. Line the channel where discharge water flows into the pond with crushed rock.

f. Construct spillway with steep sides and line it with crushed rock.

g. Treat waters with larvicides to reduce mosquito production where water occurs on the surface.

12. Require sage-grouse-safe fences around sumps.
13. Clean up refuse and eliminate subsidized food sources for Greater Sage-grouse predators.
14. Locate on-site work/project camps outside of priority sage-grouse habitats (PHMA only).

Reclamation

1. Include restoration objectives to meet sage-grouse habitat needs during reclamation. Address post-reclamation management in reclamation plan so that goals and objectives are to enhance and restore sage-grouse habitat.
2. Maximize the area of interim reclamation on long-term access roads and well pads including reshaping, topsoiling and revegetating cut and fill slopes.
3. Restore disturbed areas at final reclamation to pre-disturbance landform and desired plant community.
4. Irrigate sites during interim reclamation, if necessary, for the purpose of establishing seedlings more quickly.
5. Utilize mulching techniques to expedite reclamation and protect soils.

BEST MANAGEMENT PRACTICES

The majority of management actions and practices specifically applicable to greater sage-grouse and the purpose and need of this document are addressed in the Required Design Feature portion of this appendix. The following best management practices (BMPs) are additional management actions and practices. They were developed from the National Technical Team (NTT) Report and other sources and are also BMPs for Alternatives B, C, D, and F, and the Proposed Plan in this RMPA/EIS.

The BMPs are applicable to PHMA and GHMA unless otherwise indicated.

Post Fire and Restoration Seeding

1. Use ecological site descriptions to determine appropriate seed mixes. Seed mixes should include a diversity of forbs that maximize blooming times when pollinators are most active and include nectar and pollen-producing plants.

2. When using locally collected seed, handle and store seed properly to maintain maximum viability.
3. When using non-native grasses, do not mix crested wheatgrass (*Agropyron cristatum* or *A. desertorum*) with native perennial grass species. If crested wheatgrass is needed to compete with invasive annual grasses, use a non-native grass mix.
4. Prefer minimum-till and standard drill seeding to aerial or broadcast seeding, particularly to control invasive annual grasses. Where possible, prefer minimum-till drill seeding to standard drill seeding.
5. Where live Sandberg bluegrass (*Poa secunda*) is well distributed post-fire or after vegetation treatment, do not drill seed as drill seeding reduces surviving Sandberg bluegrass with little concomitant establishment of seeded grass species.
6. In areas where average annual precipitation is less than 10-12 inches, test alternative and experimental methods, such as use of coated seed, to establish perennial grasses, particularly when using native species. Limit seeding to priority areas within these low precipitation zones to meet vegetation objectives and favor drought-tolerant forbs and grasses.
7. Prefer planting sagebrush and other shrubs to aerial or drill seeding until alternative methods for seeding are developed. Plant on microsites with a higher probability of success, such as at higher elevation, on northerly aspects, higher precipitation zones, or in deeper soils to create sagebrush patches rather than uniform spacing of individuals.
8. In large burn areas or similar settings, where nearly all or all sagebrush has been lost and where annual grass dominance is considered unlikely, plant sagebrush as scattered islands. Exclude such areas from grazing by domestic livestock and wild horses and burros until sagebrush establishment objectives are met.
9. Focus seeding treatments within 4 miles of occupied and pending leks and lek complexes with designated PHMA a higher priority than designated GHMA. Within PHMA, higher priority areas to treat are leks or lek complexes with a higher number of birds, on average, and leks or lek complexes with stable or increasing greater sage-grouse populations.
10. Perennial grass should be seeded at no more than 3-5 lb/ac PLS[1] if big sagebrush establishment is one of the treatment objectives.
11. Limit forage kochia use to fuel breaks, road edges, under powerlines and other areas expected to see regular disturbance, such as

[1] Pure live seed

mowing, as part of the maintenance needed to maintain the function of the site. Forage kochia may be used in other areas on a case-by-case basis; document the rationale for why forage kochia is needed and why a native species cannot be used instead.

12. Rest seeded and planted areas from grazing by livestock for at least two growing seasons. When possible, exclude seeded or planted areas from wild horses and burros as well. Grazing should not resume until vegetation objectives have been met. Plans must clearly describe the vegetation objectives and how attainment will be measured and determined.

West Nile Virus

1. Fence pond site to restrict access by livestock and other wild ungulates that trample and disturb shorelines, enrich sediments with manure and create hoof print pockets of water that are attractive to breeding mosquitoes.

Livestock Grazing

1. Off-trail vehicle use, where authorized, should be restricted to areas >2 miles from leks during the breeding season unless travel is essential for routine ranch activities (including but not limited to: repairing fence, "doctoring" livestock, finding lost livestock).

Travel Management

1. Allow primitive roads to reclaim naturally, and where necessary, use pitting, water bars, vertical mulch, to create physical structures that accelerate native vegetation growth.
2. If possible, attempt to disguise road entrances to discourage use, by using vertical mulch, native seeding, and natural barriers that blend in with the natural surroundings.
3. Inspect closed roads to ensure that vegetational stabilization measures are operating as planned, drainage structures are operational, and noxious weeds are not providing erosion control. Conduct vegetation treatments and drainage structure maintenance as needed.
4. Fully decommission or obliterate temporary roads upon completion of use.
5. Consider decommissioning or fully decommissioning low volume permanent roads not needed for future resource management located in, or draining into wetlands, riparian management areas, floodplains or waters of the state.
6. Prevent use of vehicular traffic using methods such as gates, guard rails, earth/log barricades, to reduce or eliminate erosion and sedimentation due to traffic on roads when possible.

7. Convert existing drainage structures such as ditches and cross drain culverts to a long-term maintenance free drainage configuration such as outsloped road surface and waterbars.
8. Remove stream crossing culverts and entire in-channel fill material during ODFW instream work period.
9. Place excavated material from removed stream crossings on stable ground outside of wetlands, riparian management areas, floodplains and waters of the state. In some cases material could be used for recontouring old road cuts or be spread across roadbed and treated to prevent erosion.
10. Reestablish stream crossings to the natural stream gradient. Excavate sideslopes back to the natural bank profile. Reestablish natural channel width and floodplain.
11. On each side of a stream crossing, construct waterbars or cross ditches that will remain maintenance free.
12. Following culvert removal and prior to the wet season, apply erosion control and sediment trapping measures (e.g., seeding, mulching, straw bales, jute netting, native vegetative cuttings) where sediment can be delivered into wetlands, riparian management areas, floodplains and waters of the state. Note: Be aware that some desert soils do better with no decompaction, such as aridisoils. These soils often have near surface layers that retain water, while physical treatments such as ripping may disturb those layers, always consult your soils scientist. Implement decompaction measures, including ripping or subsoiling to an effective depth. Treat compacted areas including the roadbed, landings, construction areas, and spoils sites.
13. After decompacting the road surface, pull back unstable road fill and either end-haul or recontour to the natural slopes.
14. On active haul roads, during the wet season, use durable rock surfacing and sufficient surface depth to resist rutting or development of sediment on road surfaces that drain directly to wetlands, floodplains and waters of the state.
15. Prior to winter hauling activities, implement structural road treatments such as: increasing the frequency of cross drains, installing sediment barriers or catch basins, applying gravel lifts or asphalt road surfacing at stream crossing approaches, and cleaning and armoring ditchlines.
16. Suspend commercial use where the road surface is deeply rutted or covered by a layer of mud or when runoff from the road surface is causing a visible increase in stream turbidity in the receiving stream.