United States Department of the Interior

FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE
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WEST VALLEY CITY, UTAH 84119

August 10, 2006

In Reply Refer To
FWS/R6
ES/UT
FA-0382
ER 06/696

Mary Erickson
Forest Supervisor
U.S. Department of Agriculture
Forest Service
Fishlake National Forest
115 East 900 North
Richfield, UT 84701

Subject: Fishlake National Forest Notice of Intent to Conduct and Environmental Analysis for Oil and Gas Leasing

Dear Ms. Erickson:

The U.S. Fish and Wildlife Service (Service) has received your letter of June 30, 2006 announcing your intent to prepare an EIS on Oil and Gas Leasing for the Fishlake National Forest (Forest), Millar, Juab, Sevier, Piute, Wayne Beaver, and Iron Counties, Utah. We appreciate the early coordination by your office, including the meeting on August 2, 2006, during which Forest staff provided an overview of the proposal and invited comments and recommendations from staff from our office and representatives from the Utah Division of Wildlife Resources. The purpose of the action by the Forest is to make leasing decisions, including identification of stipulations for oil and gas activities on the Forest.

Pursuant to the Migratory Bird Treaty Act (MBTA)(16 U.S.C. ' 703), our responsibilities to States under section 6 of the Endangered Species Act of 1973 16 U.S.C. ' 1535, responsibilities to Executive Order (E.O.) 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), under section 7 of the ESA of 1973, 16 U.S.C. ' 1536, and the Fish and Wildlife Act of 1956 (16 U.S.C. '' 742a – 742j), we are identifying issues that should be addressed relative to fish and wildlife resources for this project. These comments are general, and we will be providing additional comments at a later date. In particular, we wish to work with the Forest to develop specific measures to reduce habitat fragmentation and its impacts.

NEPA regulation 40 CFR ' 1503.1(a)(1) states that the action agency shall obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Appendix II of the NEPA Implementation Procedures (49 Fed. Reg. 49750, December 21, 1984), notes that the Service is an agency with special expertise regarding effects from numerous environmental quality issues to endangered species and their critical habitat and to other fish and wildlife resources in general. These issues include, but are not limited to: air quality; water quality; waste disposal on land; noise; watershed protection and soil conservation; water resources development and regulation; forest, range, and vegetative resources; Federal land management; and energy development activities. Our comments, in part, are intended to meet our responsibility as an agency with special expertise.

Species-specific recommendations:

As discussed during our August 2 meeting, and as per your request, we are providing you with some species-specific lease notifications for listed and sensitive species, to be applied where species and their habitats are known to occur, and which are available at the lease sale stage. For example, the Gooseberry area and Teasdale District of the Forest may contain habitat for the Utah prairie dog, a federally listed, threatened species. In coordination with the Utah BLM State Office, we have developed a lease notification for the Utah prairie dog (Attachment 1), which is being applied to every parcel which contains historic, currently occupied, or suitable habitat. Additional notifications which should be considered include those for the bald eagle and listed plant species (Attachments 2 & 3).

The Wonderland Alice Flower, northern goshawk, Bonneville cutthroat trout, Colorado cutthroat trout, bluehead sucker, and flannelmouth sucker, which occur on the Forest, are Conservation Agreement species in Utah. In addition, a Conservation Agreement for the Central Utah Navajo Sandstone Endemic Five Plants is currently being developed, and should be included in your EIS. Conservation Agreements are voluntary cooperative plans among resource agencies that identify threats to a species and implement conservation measures to pro-actively conserve and protect species in decline. Threats that warrant a species listing as a sensitive species by state and Federal agencies and as threatened or endangered under the Endangered Species Act should be significantly reduced or eliminated through implementation of the Conservation Agreement. Leasing stipulations should be developed to meet the goals and objectives of the Conservation Agreements.

You should analyze for impacts to and provide conservation measures, including consideration of a No Surface Occupancy Stipulation, for narrow endemic plants which may occur on the Forest. These include plants associated with the Arapien Shale Formation: Ward beardtongue, Arapien stickleaf, and Utah phacelia. We also recommend you also determine if you have habitat for and individuals or populations of Rabbit valley gilia and Harrison's daisy, providing conservation measures if habitat/occupancy are confirmed.

The EIS should specifically evaluate and plan mitigation for potential project impacts to migratory birds. For example it should evaluate for: noise, visual, and light effects from project activities; habitat fragmentation; and whether habitat enhancement efforts may minimize displacement impacts for some species. Habitat impacts for species on the Service=s 2002 list of

Birds of Conservation Concern (BCC) and Partners in Flight Priority Species should be evaluated in the EIS. The BCC List identifies those migratory and non-migratory avian species that, without additional conservation actions, are likely to become candidates for listing under the ESA. To help meet responsibilities under E. O. 13186, the Forest should include provisions which: recommend ground-disturbing activities occur outside critical breeding seasons for migratory birds; minimize temporary and long-term habitat losses; and require mitigation for unavoidable habitat losses, particularly at the field development stage. Mitigation should include the option for offsite, in kind habitat compensation.

If breeding, nesting, brood-rearing, and/or wintering habitats for the Greater sage grouse are unknown or poorly documented, surveys should be completed to identify these habitats, which should then be conserved (avoided). New Rights-of-Way should not be routed through sage grouse habitat. There should be No Surface Occupancy within ½ mile of any sage grouse lek, and no new structures should be constructed that would allow for raptor perches within ¼ mile of any lek. Seasonal closures for construction and maintenance activities should be employed for lekking/nesting/brood rearing (½ -2 miles buffer from lek). The Forest should also include provisions to avoid or minimize disturbance in high use areas. To minimize the potential for West Nile virus infection and mortality, no reserve pits or evaporation ponds should be located in Greater sage grouse habitat. Use of closed loop drilling technology is also recommended, and injection or other removal of produced water from the habitat.

Contaminant-related recommendations:

Oil Storage and Risks to Wildlife

Please specify if the proposed facility will contain evaporation ponds, open topped tanks or open pits for storing recycled oil. Also, it is not clear if the proposed facility will receive oil field produced water which would involve the separation of oil from the water. Typically, evaporation ponds are used in oil field wastewater disposal facilities in Utah for storage and disposal of the water. Inefficient management of evaporation ponds usually results in oil or visible sheens on the surface of the ponds which results in the mortality of migratory birds and other wildlife.

We are concerned about the potential for migratory bird mortality in evaporation ponds containing concentrated brine solutions. Birds entering these pits can ingest the brine and die from sodium toxicity. Salt toxicosis has been reported in ponds with sodium concentrations over 17,000 mg/L (Windingstad et al. 1987). Ingestion of water containing high sodium levels can chronically affect aquatic birds, especially if a source of freshwater is not available nearby. Aquatic birds ingesting hypersaline water can be more susceptible to avian botulism (Cooch 1964). During cooler temperatures, sodium in the hypersaline water can crystallize on the feathers of birds landing in these water bodies (Wobeser and Howard 1987). The sodium crystals destroy the feathers' thermoregulatory and buoyancy functions causing the bird to die of hypothermia or drowning.

The water quality of produced water in impoundments should be monitored semi-annually to determine if salts or trace elements are increasing to levels considered hazardous to fish and wildlife. The water quality analysis should also include at the very least the following

constituents: arsenic, barium, cadmium, chromium, copper, iron, manganese, selenium, zinc, total petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene (BTEX). If salts or trace elements become a hazard to migratory birds landing in the produced water impoundments or if oil is present on the surface of the impoundments, effective and proven wildlife deterrents or exclusionary devices should be deployed at the impoundments to prevent migratory bird mortality. Netting appears to be the most effective method of keeping birds from entering waste pits. Flagging is not an effective deterrent.

If the Forest thinks that there may be a water quality issue, we recommend chemical analysis to characterize impounded produced water from oil and gas wells in your planning area. The analysis should include at a minimum the following trace elements: arsenic, barium, cadmium, chromium, copper, iron, manganese, selenium, zinc, and hydrocarbons including benzene, toluene, ethylbenzene, and xylene (BTEX). If large quantities of water are produced at a specific location, there may be an additional concern in creating a saline seep.

The Migratory Bird Treaty Act (MBTA),16 United States Code Sections 703 707, prohibits any "take" of migratory birds. The definition of take includes the killing, possessing, or collecting of migratory birds. Migratory birds are listed in the Code of Federal Regulations, Part 50, Section 10.13. Most birds found in Utah are listed as migratory birds with the exception of English sparrows, European starlings, rock doves (common pigeons), and birds commonly referred to as upland game birds such as pheasants, chukkers, and grouse. Upland game birds are managed by the UDWR. However, some native game species such as the Greater sage grouse are USFWS Birds of Conservation Concern or Partners in Flight Priority Species. Therefore, they are considered Species of Concern under E.O. 13186, and you have federal responsibilities for their conservation and protection.

All migratory birds killed as a result of contact with exposed oil, or other hazardous materials constitute violations of the MBTA. The Forest should provide measures so that operators always ensure that no surface oil is present on pits, tanks, etc. Exposed oil or other hazardous material (even as the result of an oversight or equipment malfunction) places the company at risk of violating the MBTA should migratory bird mortalities occur.

To prevent violations of the MBTA, the Forest should require companies to take proactive steps to ensure that migratory birds do not come in contact with oil, sheens or hazardous materials. Examples of effective steps proven to prevent bird mortality include the installation of physical barriers such as netting or using closed containers that prevent birds from coming into contact with the oil. A study of bird mortality in oil pits in Wyoming conducted by Brent J. Esmoil for the University of Wyoming (Esmoil 1995) demonstrated that deterrents such as flagging, strobe lights, metal reflectors and noise makers were not effective at preventing bird mortalities from occurring in these pits. Service personnel have also documented bird mortalities in oil pits with flagging. Esmoil (1995) did not find any mortality in pits completely covered with netting.

Birds, including hawks, owls, and songbirds, are attracted to oil production skim pits and wastewater evaporation ponds by mistaking them for natural bodies of water. Oil production skim pits and wastewater evaporation ponds also can attract bats, insects, small mammals, and big game. Songbirds and mammals may approach oil-covered pits and ponds to drink, and can

fall into the pits, or they can become entrapped if the banks of the pits are oiled. Insects entrapped in the oil can also attract songbirds, bats, and small mammals. Hawks and owls in turn become victims when they are attracted by struggling birds or small mammals. The sticky nature of oil entraps birds in the pits and they die from exposure and exhaustion. Birds that do manage to escape can die from starvation or the toxic effects of oil ingested during preening. Birds ingesting sublethal doses of oil can experience impaired reproduction. Light sheens of oil on the surface can also coat the birds feathers and cause mortality from exposure or from the ingestion of the oil during preening. It is critical to avoid the presence of any visible sheens on the surface of evaporation ponds, particularly during the breeding season as female aquatic birds returning to their nests with oil on their feathers can inadvertently apply the oil to the eggs. Microliter amounts of oil applied externally to eggs are extremely toxic to bird embryos.

In 1997, the Service estimated that 2 million migratory birds were lost each year to oil pits throughout the United States. Since 1997, many oil operators have taken measures to prevent migratory bird and other wildlife mortality in oil field waste pits. We recommend protecting and conserving wildlife resources by implementing the following measures:

- **Use Closed Containment Systems -** Closed containment systems should be used to store oil at the proposed facility. Closed containment systems require little or no maintenance and the system can be moved to a new site when the facility is closed. Closed containment systems eliminate soil contamination and remediation expense.

- **Eliminate Pits or Keep Oil Off Open Pits or Ponds –** If evaporation ponds for water disposal will be part of the proposed facility, the facility should be designed to prevent oil from entering the pond. Additionally, a contingency plan should be developed for the facility to ensure immediate clean up of oil discharged into the evaporation pond to prevent wildlife mortalities.

- **Use Effective & Proven Wildlife Deterrents or Exclusionary Devices –** If open-topped tanks or pits will be used to store oil at the proposed facility, effective wildlife exclusionary devices should be installed to prevent wildlife mortality. Netting appears to be the most effective method of keeping birds from entering wastewater evaporation ponds and oil production skim pits. Flagging is not an effective deterrent.

- **Implement Engineering Controls to Prevent Oil Discharge to Pond –** If evaporation ponds for water disposal will be part of the proposed facility, engineering controls should be designed and implemented to prevent the discharge of wastewater containing oil into the evaporation pond.

- **Dispose of Oil Field Wastewater by Deep Well Injection –** If the facility will receive oil field produced water for disposal, deep well injection of oil field wastewater would eliminate the need for evaporation ponds and thus eliminate the risk to migratory birds and other wildlife from exposed oil and hypersaline conditions which could result in mortality.

We recommend you incorporate as standards one or more of the measures described in this letter

to protect migratory birds on the Forest. If requested, the Service can provide its technical expertise to assist with identification of alternatives to prevent migratory bird deaths in oil field pits. Please visit our web site at: http://mountain prairie.fws.gov/contaminants/oilpits.htm for more information on migratory bird mortality in oil field waste pits.

General recommendations:

The Forest should include measures to avoid or minimize increased access to previously remote areas which contain sensitive species and their habitat. To the extent possible, the Forest should reduce noise and traffic by requiring remote telemetry. Additional, practical, measures for minimizing increased access to sensitive species habitat should be developed. When appropriate, signage, interim reclamation, or gating may be employed. Monitoring for increased unauthorized access should be mandated to identify areas requiring remedial measures.

The EIS should also identify the amount, location, and timeframe of temporary disturbance as well as permanent facilities that could result from the proposed action. Displacement of wildlife across a large area during critical times, such as breeding, could prove a significant impact. If wildlife are displaced, it is likely that the area to which they move is inhabited by other wildlife or disturbed by other ongoing activities. Depending on the season and species, displacement could lead to nest abandonment, inter- and intra-specific competition, reproductive failure, and possible mortality. In addition, the cumulative effects of other projects in the area may limit the availability of alternative sites for displaced wildlife. The analysis should not be limited to the estimated disturbance footprint of the Reasonably Foreseeable Development Scenario, but include visual, auditory, and fugitive dust analyses of impacts which will likely occur adjacent to the footprint. Analysis should also address the risk from transportation of produced hydrocarbons and provide protective measures.

Because the Forest contains significant wetlands and riparian areas, we recommend stipulations be developed to avoid any wetland losses in accordance with Section 404 of the Clean Water Act, Executive Order 11990 (wetland protection) and Executive Order 11988 (floodplain management) as well as the goal of "no net loss of wetlands." Riparian areas are the single most productive wildlife habitat type in North America. Riparian vegetation plays an important role in protecting streams, reducing erosion and sedimentation as well as improving water quality, maintaining the water table, controlling flooding, and providing shade and cover. In view of their importance and relative scarcity, impacts to riparian areas should be avoided. Since the Fish Lake Plateau contained a plateau ice cap during the Pleistocene (Flint 1957), it may also retain peatland remnants of the glacial epochs. Peatlands are irreplaceable; thus impacts to peatlands are not mitigable. Therefore, we recommend you determine whether the Fish Lake Plateau contains remnant peatlands, map any found, and apply standards to preserve them. In addition, stipulations should be developed to ensure placement of well pads, roads, pipelines, tank batteries, and other infrastructure avoids ephemeral washes prone to flash flood events. To reduce the risk of contaminants or their by-products reaching rivers with Conservation Agreement species, we recommend you implement the Hydraulic Considerations for Pipeline Crossings of Stream Channels from BLM National Science and Technology Center (Attachment 4).

We recommend use of the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin and Muck, January 2002) which were developed in part to provide consistent application of raptor protection measures statewide and provide full compliance with environmental laws regarding raptor protection. Raptor surveys and mitigation measures are provided in the Raptor Guidelines as recommendations to ensure that proposed projects will avoid adverse impacts to raptors, including the peregrine falcon.

We recommend the EIS include information regarding the design for the power line(s) associated with energy exploration and development. Raptor-safe construction of power lines would ensure compliance with the Migratory Bird Treaty Act (MBTA)(16 U.S.C. § 703-712) which is a strict liability law that makes it unlawful to take, kill, or possess raptors and other migratory birds, their parts, nests, or eggs.

Remedying lethal power line designs involves modifying problem structures or using new construction designs with proper spacing of design elements. Important design components for raptor protection include providing adequate separation between conductors and/or grounded hardware, or insulating hardware or conductors against simultaneous contact if such separation is not possible. Perch guards may also be used to prevent larger raptors from landing on the power poles. Specific guidelines are provided in *Avian Power Line Interaction Committee. 1996. Suggested practices for raptor protection on power lines. Edison Electric Institute/Raptor Research Foundation. Washington, D.C.* Ordering information is available at http://www.eei.org/products_and_services/descriptions_and_access/suggested_pract.htm

Reduced lighting on drilling rigs may present a human safety issue. Therefore, to minimize impacts to nocturnally migrating avifauna and bats while ensuring human safety, we recommend lighting at all facilities be directed to the area of human activity as much as possible, and lighting at compressor stations be kept to the minimum safely permissible. Measures to avoid and minimize impacts should be considered during design, and include measures such as downward-directed lighting on non-FAA-regulated structures, eliminating guy wires, restricting height of drilling apparatus to less than 200 feet, and installing minimum lighting with use of white strobe lights rather than red lights. We recommend you use the U.S. Fish and Wildlife Service interim guidelines for communication towers that provide the best available information for avoiding bird strikes. These guidelines and a tower site evaluation form are available at http://migratorybirds.fws.gov/issues/towers/comtow.html, and should be implemented where feasible.

As with all projects that will create surface disturbance, there is potential for introduction and spread of invasive and noxious plant species. All possible measures should be taken to prevent their introduction. For rehabilitation and restoration, we recommend you follow the National Forest Service Guidelines regarding use of native plants indigenous to the area. Monitoring and control efforts should be implemented following disturbance. Seed mixes should, to the extent practicable, contain native plants or non-natives that will not naturalize, and plants that can successfully compete with invasive and noxious weeds.

Impacts associated with this proposal may lead to heightened erosion and degradation of fish and

wildlife resources. We recommend you discuss the potential for erosion as well as any measures that will be taken to minimize the effects.

The Forest should develop stipulations to ensure that all mitigation efforts are monitored using established thresholds to indicate the need for remedial action. Success criteria should be applied that address sensitive periods, species of concern, and desired vegetation communities. 'Triggers' or thresholds that require remedial action should be developed in coordination with the UDWR and USFWS.

Cumulative impacts recommendations:

The cumulative impacts discussion should, at a minimum, include evaluations within the region of influence of the proposal for: air quality impacts from increased fossil fuel extraction and power plants; potential for additional projects due to increased access; impacts from increased habitat fragmentation; displacement of wildlife; fire regime and vegetation treatments and their influence on loss of native plant species and native wildlife habitat; and increased direct mortality due to increased road traffic associated with other energy or recreational activities.

If we can be of further assistance, or if you have any questions, please feel free to contact Diana Whittington of our office at (801) 975-3330 extension 128.

Sincerely,

Larry Crist
Acting Utah Field Supervisor

cc: BAP&HC (ERT) - U.S. Fish and Wildlife Service, Division of Habitat and Resource Conservation, (Attention: Stephanie Nash), 4401 North Fairfax Drive, Suite 400, Arlington, Virginia 22203

OEPC - Office of Environmental Policy and Compliance, (Attention: Robert F. Stewart), Denver Region, P.O. Box 25007 (D-108), Denver Federal Center, Denver, CO 80225-0007
RO – Attention: Connie Young-Dubovsky
UDWR – SLC and Cedar City
BLM – SO (Attention: Ron Bolander), Fillmore and Richfield Field Offices

bcc: Project file
Reading file

DMW/jm:8/10/06
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Windingstad, R.M., F.X. Kartch, R.K. Stroud, and M.R. Smith. 1987. *Salt toxicosis in waterfowl in North Dakota* . Jour. Wildlife Diseases 23(3):443-446.

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Attachment 1: Lease Notice – Utah Prairie Dog

The lessee/operator is given notice that lands in this lease may contain historic and/or occupied Utah prairie dog habitat, a threatened species under the Endangered Species Act. Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend whether the action is temporary or permanent, and whether it occurs when prairie dogs are active or hibernating. A temporary action is completed prior to the following active season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one activity/hibernation season and/or causes a loss of Utah prairie dog habitat or displaces prairie dogs through disturbances, i.e. creation of a permanent structure. The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of, and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of Endangered Species Act, Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s).
2. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in prairie dog habitat.
4. Surface occupancy or other surface disturbing activity will be avoided within 0.5 mile of active prairie dog colonies.
5. Permanent surface disturbance or facilities will be avoided within 0.5 mile of potentially suitable, unoccupied prairie dog habitat, identified and mapped by Utah Division of Wildlife Resources since 1976.
6. The lessee/operator should consider if fencing infrastructure on well pad, e.g., drill pads, tank batteries, and compressors, would be needed to protect equipment from burrowing activities. In addition, the operator should consider if future surface disturbing activities would be required at the site.
7. Within occupied habitat, set a 25 mph speed limit on operator-created and maintained roads.
8. Limit disturbances to and within suitable habitat by staying on designated routes.
9. Limit new access routes created by the project.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the ESA.

Attachment 2: Lease Notice – Bald Eagle

The Lessee/Operator is given notice that the lands in this parcel contains nesting/winter roost habitat for the bald eagle, a federally listed species. Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs within or outside the bald eagle breeding or roosting season. A temporary action is completed prior to the following breeding or roosting season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding or roosting season and/or causes a loss of eagle habitat or displaces eagles through disturbances, i.e. creation of a permanent structure. The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of, and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of Endangered Species Act, Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

4. Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s), and be conducted according to protocol.
5. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
6. Water production will be managed to ensure maintenance or enhancement of riparian habitat.
7. Temporary activities within 1.0 mile of nest sites will not occur during the breeding season of January 1 to August 31, unless the area has been surveyed according to protocol and determined to be unoccupied.
5. Temporary activities within 0.5 miles of winter roost areas, e.g., cottonwood galleries, will not occur during the winter roost season of November 1 to March 31, unless the area has been surveyed according to protocol and determined to be unoccupied.
6. No permanent infrastructure will be placed within 1.0 mile of nest sites.
7. No permanent infrastructure will be placed within 0.5 miles of winter roost areas.
8. Remove big game carrion to 100 feet from on lease roadways occurring within bald eagle foraging range.
9. Avoid loss or disturbance to large cottonwood gallery riparian habitats.
10. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable habitat Utilize directional drilling to avoid direct impacts to large cottonwood gallery riparian habitats. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.
11. All areas of surface disturbance within riparian areas and/or adjacent uplands should be re-vegetated with native species.

Additional measures may also be employed to avoid or minimize effects to the species between the lease sale stage and lease development stage. These additional measures will be developed

and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the Endangered Species Act.

Attachment 3: Lease Notice – Listed Plant Species

The Lessee/Operator is given notice that the lands in this parcel contain suitable habitat for federally listed plant species under the Endangered Species Act. The following avoidance and minimization measures have been developed to facilitate review and analysis of any submitted permits under the authority of this lease

8. Site inventories:
    a. Must be conducted to determine habitat suitability,
    b. Are required in known or potential habitat for all areas proposed for surface disturbance prior to initiation of project activities, at a time when the plant can be detected, and during appropriate flowering periods,
    c. Documentation should include, but not be limited to individual plant locations and suitable habitat distributions, and
    d. All surveys must be conducted by qualified individuals.
9. Lease activities will require monitoring throughout the duration of the project. To endure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
10. Project activities must be designed to avoid direct disturbance to populations and to individual plants:
    a. Designs will avoid concentrating water flows or sediments into plant occupied habitat.
    b. Construction will occur down slope of plants and populations where feasible; if well pads and roads must be sited upslope, buffers of 100 feet minimum between surface disturbances and plants and populations will be incorporated.
    c. Where populations occur within 200 ft. of well pads, establish a buffer or fence the individuals or groups of individuals during and post-construction.
    d. Areas for avoidance will be visually identifiable in the field, e.g., flagging, temporary fencing, rebar, etc.
    e. For surface pipelines, use a 10 foot buffer from any plant locations:
        i. If on a slope, use stabilizing construction techniques to ensure the pipelines don't move towards the population.
11. For riparian/wetland-associated species, e.g. Ute ladies-tresses, avoid loss or disturbance of riparian habitats:
    a. Ensure that water extraction or disposal practices do not result in change of hydrologic regime.
12. Limit disturbances to and within suitable habitat by staying on designated routes.
13. Limit new access routes created by the project.
14. Place signing to limit ATV travel in sensitive areas.
15. Implement dust abatement practices near occupied plant habitat.
16. All disturbed areas will be re-vegetated with native species comprised of species indigenous to the area.
17. Post construction monitoring for invasive species will be required.
18. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in plant habitat. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.

19. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the ESA.

Attachment 4

HYDRAULIC CONSIDERATIONS FOR PIPELINE CROSSINGS OF STREAM CHANNELS

Pipeline crossings of perennial, intermittent, and ephemeral stream channels should be constructed to withstand floods of extreme magnitude to prevent breakage and subsequent accidental contamination of runoff during high flow events. Surface crossings must be constructed high enough to remain above the highest possible stream flows at each crossing, and subsurface crossings must be buried deep enough to remain undisturbed by scour throughout passage of the peak flow. To avoid repeated maintenance of such crossings, hydraulic analysis should be completed in the design phase to eliminate costly repair and potential environmental degradation associated with pipeline breaks at stream crossings.

Surface Crossings

Pipelines that cross stream channels on the surface should be located above all possible flood flows that may occur at the site. At a minimum, pipelines must be located above the 100-year flood elevation, and preferably above the 500-year flood elevation. Procedures for estimating 100-year and 500-year flood magnitudes are described in the U.S. Geological Survey's National Flood Frequency Program (Jennings, et al. 1994). Two sets of relationships for estimating flood frequencies at ungauged sites in Utah are included in the NFF program: Thomas and Lindskov (1983) use drainage basin area and mean basin elevation for flood estimates for six Utah regions stratified by location and basin elevation. Thomas et al (1997) also use drainage area and mean basin elevation to estimate magnitude and frequency of floods throughout the southwestern U.S., including five regions that cover the entire state of Utah. Results from both sets of equations should be examined to estimate the 100- and 500-year floods, since either of the relations may provide questionable results if the stream crossing drains an area near the boundary of a flood region or if the data for the crossing approach or exceed the limits of the data set used to develop the equations.

Estimating the depth of flow, or conversely the elevation of the pipeline at the crossing, may be approached a number of ways. The simplest procedure would be based solely on a field reconnaissance of the site, using basic geomorphic principles. Identification of the bankfull elevation and the active floodplain (i.e., floodplain formed by the present flow regime) provides inadequate conveyance for extreme flood events. Past floodplains/present terraces also must be identified, since these represent extreme floods in the present flow regime, especially in arid and semi-arid environments. Pipeline crossings should be constructed to elevate the pipeline above the level of the highest and outermost terrace at the crossing. This level represents the geomorphic surface likely to be associated with the maximum probable flood. Since this method is entirely based on a geomorphic reconnaissance of the site, no flood-frequency analysis is required and no recurrence interval is assigned to the design elevation. While this is the simplest approach to design of the crossing, it likely will result in the most conservative estimate (i.e., highest elevation) for suspension of the pipeline.

A slightly more intensive approach to crossing design is based on the Physiographic Method described by Thomas and Lindskov (1983) for estimating flood depths at ungauged sites. The

procedure utilizes regional regression equations (similar to the flood-frequency equations described above) to estimate depth of flow associated with a specified recurrence-interval flood. Flood depth is then added to a longitudinal survey of the stream channel in the vicinity of the crossing, resulting in a longitudinal profile of the specified flood. Elevation of the flood profile at the point of pipeline crossing is the elevation above which the pipeline must be suspended. While this procedure requires a field survey and calculation of actual flood depths, it may result in a lower crossing elevation (and possibly lower costs) for the pipeline. Also, since the regional regression equations estimate flood depth for specified recurrence-interval floods, it is possible to place a recurrence interval on the crossing design for risk calculations.

It may be possible to reduce pipeline construction costs associated with channel crossings even further with a water-surface-profile model of flow through the crossing site. The water-surface-profile model requires a detailed survey of both the longitudinal channel profile and several cross sections along the stream. Design flows (e.g., 100-year and 500-year floods) are calculated for the channel at the crossing (with the regional regression equations described above) and routed through the surveyed channel reach utilizing a step-backwater analysis. The step-backwater analysis uses the principles of conservation of mass and conservation of energy to calculate water-surface elevations at each surveyed cross section. Since the computation utilizes a detailed channel survey, it is probably the most accurate method to use; however, it is likely the most expensive method for the same reason. The step-backwater computations require an estimate of the Manning n-value as an indicator of resistance to flow, and assume fairly stable channel boundaries. Estimates of the n-value for ungauged sites are a matter of engineering judgment, but n-values typically are a function of slope, depth of flow, bed-material particle size, and bedforms present during the passage of the flood wave. Guidance is available in many hydraulic references (e.g., Chow 1959). The assumption of fairly stable channel boundaries is not always met with sand-bed channels, and is an issue of considerable importance for designing subsurface pipeline crossings as well (see below).

Subsurface (Buried) Crossings

Since many of the pipelines are small and most of the channels are ephemeral, it is commonplace to bury the pipelines rather than suspending them above the streams. The practice of burying pipelines at channel crossings likely is both cheaper and easier than suspending them above all flood flows; however, an analysis of channel degradation and scour should be completed to ensure the lines are not exposed and broken during extreme runoff events. Without such an analysis, pipeline crossings should be excavated to bedrock and placed beneath all alluvial material.

Buried pipelines may be exposed by stream bed lowering resulting from channel degradation, channel scour, or a combination of the two. Channel degradation occurs over a long stream reach or larger geographic area, and is generally associated with the overall lowering of the landscape. Degradation also may be associated with changes in upstream watershed or channel conditions impacting the water and sediment yield of the basin. Channel scour is a local phenomenon associated with passage of one or more flood events and/or site-specific hydraulic conditions that may be natural or man-caused in origin. Either process can expose buried pipelines to excessive forces associated with extreme flow events, and an analysis of each is

required to ensure integrity of the crossing.

Detection of long-term channel degradation must be attempted, even if there is no indication of local scour. Plotting bed elevations against time permits evaluation of bed-level adjustment and indicates whether a major phase of channel incision has passed or is ongoing. However, comparative channel survey data are rarely available for the proposed location of a pipeline crossing. In instances where a gauging station is operated at or near the crossing, it's usually possible to determine long-term aggradation or degradation by plotting the change in stage through time for one or more selected discharges. The procedure is called a specific gauge analysis and is described in detail in the Stream Corridor Restoration manual published by the Federal Interagency Stream Restoration Working Group (1998). When there is no gauging station near the proposed pipeline crossing, nearby locations on the same stream or in the same river basin may provide a regional perspective on long-term channel adjustments. However, specific gauge records indicate only the conditions in the vicinity of the particular gauging station and do not necessarily reflect river response farther upstream or downstream of the gauge. Therefore, it is advisable to investigate other data in order to make predictions about potential channel degradation at a site.

Other sources of information include the biannual bridge inspection reports required in all states for bridge maintenance. In most states, these reports include channel cross sections or bed elevations under the bridge, and a procedure similar to specific gauge analysis may be attempted. Simon (1989, 1992) presents mathematical functions for describing bed level adjustments through time, fitting elevation data at a site to either a power function or an exponential function of time. Successive cross sections from a series of bridges in a basin also may be used to construct a longitudinal profile of the channel network; sequential profiles so constructed may be used to document channel adjustments through time.

In the absence of channel surveys, gauging stations, and bridge inspection reports (or other records of structural repairs along a channel), it may be necessary to investigate channel aggradation and degradation using quantitative techniques described in Richardson et al. (2001) and Lagasse et al. (2001). Techniques for assessing vertical stability of the channel include incipient motion analysis, analysis of armoring potential, equilibrium slope analysis, and sediment continuity analysis. Geomorphic indicators of recent channel incision (e.g., obligate and facultative riparian species on present-day stream terraces elevated above the water table) also may be helpful for diagnosing channel conditions.

In addition to long-term channel degradation at the pipeline crossing, local scour of the crossing must be addressed for pipeline safety. Local scour occurs when sediment transport through a stream reach is greater than the sediment load being supplied from upstream and is usually associated with changes in the channel cross section. Local scour can occur in natural channels wherever a pipeline crosses a constriction in the channel cross section (contraction scour). Equations for calculating contraction scour generally fall into two categories, depending on the inflow of bed-material sediment from upstream. In situations where there is little to no bed-material transport from upstream (generally coarse-bed streams with gravel and larger bed materials), contraction scour should be estimated using clear-water scour equations. In situations where there is considerable bed-material transport into the constricted section (i.e., for

most sand-bed streams), contraction scour should be estimated using live-bed scour equations. Live-bed and clear-water scour equations can be found in many hydraulic references (e.g., Richardson and Davis 2001). In either case, estimates of local scour in the vicinity of the pipeline crossing must be added to the assessment of channel degradation for estimating the depth of burial for the crossing.

Even in the absence of contraction scour, local scour will still occur in most sand-bed channels during the passage of major floods. Since sand is easily eroded and transported, interaction between the flow of water and the sand bed results in different configurations of the stream bed with varying conditions of flow. The average height of dune bedforms is roughly one-third to one-half the mean flow depth, and maximum height of dunes may nearly equal the mean flow depth. Thus, if the mean depth of flow in a channel was 5 feet, maximum dune height could also approach 5 feet, half of which would be below the mean elevation of the stream bed (Lagasse et al. 2001). Similarly, Simons, Li and Associates (1982) present equations for antidune height as a function of mean velocity, but limit maximum antidune height to mean flow depth. Consequently, formation of antidunes during high flows not only increases mean water-surface elevation by one-half the wave height, it also reduces the mean bed elevation by one-half the wave height. Richardson and Davis (2001) report maximum local scour of one to two times the average flow depth where two channels come together in a braided stream.

Pipeline crossings that are buried rather than suspended above all major flow events should address all of the components of degradation, scour, and channel-lowering due to bedforms described above. In complex situations or where consequences of pipeline failure are significant, consideration should be given to modeling the mobile-bed hydraulics with a numerical model such as HEC-6 (U.S. Army Corps of Engineers 1993) or BRI-STARS (Molinas 1990). The Federal Interagency Stream Corridor Restoration manual (FISRWG 1998) summarizes the capabilities of these and other models, and provides references for model operation and user guides where available.

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