

Section 6

Issues, Impacts, Studies, and Plans

The Project would be designed and constructed utilizing standard design and construction procedures (SCPs) and operated and maintained using standard operating procedures (SOPs) that avoid or minimize adverse impacts on people and natural resources. The SCPs would include measures for controlling erosion, restoring vegetation, avoiding or restoring wetlands and riparian areas, protecting aquatic resources, avoiding springs and seeps, protecting wildlife and threatened, endangered and sensitive species and their habitats, restoring agricultural resources, protecting water quality, protecting cultural resources, protecting paleontological resources, minimizing impacts on visual resources, maintaining health and safety, minimizing impacts on transportation networks and utilities, protecting air quality, minimizing noise, and conserving energy. The SOPs would include monitoring and repairing revegetation and erosion control areas as necessary, maintaining air quality control measures, conserving energy, maintaining health and safety, and restoring existing land uses as appropriate over pipeline and penstock rights-of-way.

This section generally describes known or potential Project issues and impacts or impact mechanisms, on resources specified in Section 5. Identification of known or potential issues helps set the stage for identifying impacts that may be of concern, may require mitigation and may need to be evaluated in the licensing proceeding. The approach used in this PAD is to identify any potential impact, even though it may be obviated by application of the SCPs and SOPs during and construction and operation to protect environmental resources.

6.1 Geology and Soils

6.1.1 Geology

6.1.1.1 Preliminary Issues

Preliminary issues for geologic consideration include:

- Pipeline crossing of active faults
- Relative proportions of the pipeline excavation that would be accomplished by digging, by ripping, and by blasting
- Characteristics of the rocks and geologic structures at probable shaft and tunnel locations
- Groundwater infiltration into tunnels, shafts or excavation trenches
- Dewatering at tunnel, shaft and excavation trench locations to facilitate construction
- Mitigation for groundwater encountered during construction and/or operation
- Soil and rock strength characteristics for foundations at pump station and hydro station sites

Project sites and alignments have moderate to high risk of earthquake activity during construction and operations. The greatest risks occur at or near the crossing of active faults and on soils subject to liquefaction. Active faults crossed by Project pipeline include the Hurricane Fault, the Sevier Fault, and the Cockscomb Fault, as well as various smaller faults.

6.1.1.2 Known or Potential Project Impacts

Excavation for placing the pipeline, penstocks and for tunneling would require earthwork, blasting for approximately 15 miles of the alignment, ripping and excavating rock for approximately 41 miles, and would remove large quantities of rock from its natural position. This could create zones of instability, particularly at or near slopes, which may require engineering analysis to determine the necessary design, construction and mitigation. Rock would be encountered at shafts, tunnels and during excavation throughout most of the Project alignment where shallow soils or narrow cuts through canyons or roadcuts occur. Examples include the pipeline alignment beginning at the intake pump station, the passage parallel to Highway 89 through the Cockscomb, as well as tunnels and shafts for the Lake Powell intake pump station and Hurricane Cliffs hydro station.

Excavation for pipeline and penstock construction would generate spoil. Spoil would be used for pipe bedding and backfilling. Spoil materials would also be used at pump stations, hydro stations, etc. where fill is needed. Some spoil may require disposal. This could include rock removed during tunneling as well as rock excavated for pipe and penstock placement. No specific analyses have been performed to evaluate where disposal of waste material may result in spoil disposal impacts.

Project operation is not expected to affect geology of the region.

6.1.2 Soils

6.1.2.1 Preliminary Issues

Groundwater or surface water accumulation in areas of excavation or disturbance may contribute to dissolution of gypsiferous soils, which could lead to localized settling and subsidence.

6.1.2.2 Known or Potential Project Impacts

Excavation for trenches may cause unstable soil conditions. This may occur on flat ground (especially in certain soils) but would primarily be a risk for soil excavation on slopes, or soils on unexcavated slopes that may be undercut by excavation at or near the base. Preliminary evaluations have not identified any high risk locations; however, it is anticipated that soil excavation on steep slopes and in gypsiferous soils may cause soil instability.

Pipeline and penstock construction would require excavating large quantities of soil, some of which may be unsuitable as engineered backfill. Any unsuitable excavated soil would need to be disposed of in locations that could accommodate the anticipated volumes.

Shallow groundwater may be intercepted in tunnels and trenches may infiltrate into soils vertically and laterally and may create conditions that are not currently present, similar to conditions caused by seepage in porous or fractured rock. Seepage onto slope faces may weaken slopes, resulting in unstable conditions.

Migrating groundwater in tunnels and trenches into underlying soils high in gypsum may result in unstable conditions similar to those caused by seepage through rock that is high in gypsum content. This condition could occur where the pipeline and penstock intercept groundwater if it were within or closely overlying specific gypsiferous rock units of the Moenkopi Formation (outcrops occur at various locations between the Cockscomb area and the Hurricane Cliffs) or the Entrada and Carmel formations (outcrops occur between the Lake Powell intake area and the Cockscomb area).

6.1.3 Preliminary Studies and Information Gathering Needs

6.1.3.1 Geology

Studies will be performed to determine the engineering characteristics of bedrock along the pipeline and penstock alignment. Particular attention will be focused in the vicinity of slopes or sections of known or suspected geologic hazards (faults, rock slides, shallow groundwater, surface water crossings, and other potential hazards). These studies will determine rock competence and strength and identify potential failure mechanisms. The studies will allow for engineering design and construction practices that will prevent or avoid rock failure.

Characterization of geological, geotechnical and hydrogeologic conditions will require drilling of alluvial and/or rock boreholes and construction of some test wells at the proposed forebay and afterbay, shaft and tunnel locations. The boreholes and test wells are necessary to characterize hydrogeologic conditions and evaluate risks of seepage, piping, sinkholes and subsidence, and other potential conditions and associated risks. The subsurface characterization studies will include analysis for the presence of gypsum minerals in various bedrock formations.

The following potential studies are anticipated to be performed:

Lake Powell Intake Structure:

- Review geotechnical information and rock cores from investigation at the Navajo Generating Station, a similar facility located in Navajo Sandstone nearby on the east shore of Lake Powell
- Site-specific, detailed geologic and geomechanical mapping
- Rock core drilling and testing program at shaft and intake structures to characterize rock mechanical, mineral and hydrogeologic conditions

Hurricane Cliffs Hydro Site:

- Site-specific, detailed geologic, mineral and geomechanical field mapping at proposed Hurricane Cliffs hydro and pumped storage site
- Geotechnical, hydrogeologic, and mineral content drilling and testing at the proposed Hurricane Cliffs hydro and pumped storage site

A study will be performed to identify and evaluate rock disposal locations. The study will be focused on determining disposal site engineering characteristics (bearing capacity, slope, and other characteristics). The study will facilitate site selections and provide information for rock disposal design requirements and practices.

6.1.3.2 Soils

A study will be performed to determine the soil engineering characteristics along the pipeline and penstock alignment, with particular focus in the vicinity of slopes or sections of known or suspected geologic hazards (faults, rock slides, shallow groundwater, surface water crossings, and other potential hazards). The study will be focused on determining soil engineering characteristics and identifying potential failure mechanisms. This will allow for engineering design and construction practices that will prevent soil slope failure, liquefaction, and other geotechnical problems.

A study will be performed to identify and evaluate soil disposal locations. This study will be focused on determining the engineering characteristics of the soil disposal sites (bearing capacity, slope, and other characteristics). The study will facilitate disposal site selections and provide information for soil disposal design requirements and practices.

6.1.4 Potential Protection, Mitigation and Enhancement Measures

Excavated rock would be used to construct pipeline access roads as well as to provide needed fill at pipeline facilities and would be disposed within the right-of-way as appropriate. Excavated soil would be disposed within the right-of-way as appropriate and would be revegetated with appropriate vegetation species.

Impoundments associated with hydro stations may be lined to control or prevent seepage at locations where excessive seepage is determined to result in potential slope instabilities and/or foundation problems. Pipeline and penstock alignments and tunnel and shaft locations would be selected to minimize encounters with potentially unstable rock and soil. Standard engineering practices would be employed during design, construction, and operations to reduce risk of slope failure. Seismic design standards would be employed when placing pipelines and penstocks in soil or rock materials subject to liquefaction and when crossing potentially active faults. Shaft discharge tunnels, pipelines and penstocks would be specifically designed to cross active faults.

6.1.5 Relevant Resource Management Plans

6.1.5.1 Grand Staircase – Escalante National Monument Approved Management Plan

The Grand Staircase-Escalante National Monument (GSENM) Approved Management Plan's (BLM 2000) overall objectives with respect to geologic resources include a goal of managing uses to prevent damage to the geomorphologic features and managing uses to minimize activities in high-hazard areas. The Plan states that the BLM will allow utility rights-of-way in the designated Front-Country and Passage Zones (more readily accessible areas adjacent to roadways). By federal law, a utility corridor was designated along Highway 89 in Kane County that passes through the GSENM. The utility corridor extends 240 feet north from the center line of U.S. Highway 89, and 500 feet south from the center line of the highway. The Plan specifically states that this utility corridor may be a possible route for the Lake Powell Pipeline, subject to NEPA analysis.

6.1.5.2 Kanab Resource Management Plan

The Draft Resource Management Plan and Draft Environmental Impact Statement, Kanab Field Office (BLM 2007) includes the goal of reducing or minimizing water and wind erosion by improved management to stabilize soils and eroded stream channels and to maintain soil productivity. To accomplish this goal, the Plan calls for implementing management practices on highly erodible, frail soils to minimize soil loss and salinity of water runoff. These practices include, among other requirements, limiting mechanical land treatments in frail watershed areas, incorporating erosion control measures on disturbed areas and, specifically, allowing pipelines, powerlines, roads and industrial sites associated with proposed Rights-of-Way to be constructed on these areas with erosion control stipulations incorporated in the plans.

6.2 Water Resources

6.2.1 Water Supply

6.2.1.1 Preliminary Issues

Preliminary issues include long-term drought affecting the Colorado River water supply, Lake Powell Pipeline water affecting operation of existing Washington County reservoirs and long-term capacity of Sand Hollow Reservoir for recharge to groundwater.

6.2.1.2 Known or Potential Project Impacts

Transfer of about 90,000 acre-feet per year from the Colorado River (Lake Powell) into Sand Hollow Reservoir (Virgin River basin) and into the Cedar Valley (closed basin) for consumptive use would remove water from the Upper Colorado River basin. The water that would be pumped from Lake Powell is part of Utah's share of the Upper Colorado River Basin's allocation under the Colorado River Compact. By the terms of this compact, the Lake Powell water is available for water users in Utah. Some of this water could eventually return to the Virgin River by seepage of recharged groundwater from Sand Hollow Reservoir if sufficient recovery wells were not drilled.

Providing water into the Hurricane pressurized irrigation system could result in additional flow in the Virgin River during the irrigation season because the existing river diversion would not be operated to divert irrigation water into the system.

Upon completion, the Lake Powell Pipeline would convey approximately 10,000 acre-feet to the KCWCD for storage and use, 70,000 acre-feet to Sand Hollow Reservoir for storage, and 20,000 acre-feet to the Cedar Valley area for storage, treatment and distribution.

6.2.2 Water Quality

6.2.2.1 Preliminary Issues

Preliminary issues include potential groundwater quality impacts on groundwater recharged from Lake Powell water at Sand Hollow Reservoir, potential impacts on aquifer recharge associated with blending waters with different chemistries, disposal of groundwater encountered during excavation, short term impacts on surface water quality in Lake Powell, and balancing water use for electricity generation, consumption and environmental purposes.

6.2.2.2 Known or Potential Project Impacts

The Lake Powell water may change water quality in Sand Hollow Reservoir and the associated shallow aquifer which is recharged through infiltration from the reservoir.

Blending of Lake Powell water with groundwater in the aquifer underlying Sand Hollow Reservoir could result in chemical reactions depending on the chemistry. If these reactions resulted in precipitation of minerals within the reservoir, the recharge capacity could be altered. Similar reactions could occur in the groundwater in the underlying aquifer. This may change the aquifer recharge potential and permeability, particularly in the recharge area around Sand Hollow Reservoir.

Blending of Lake Powell water in Quail Creek Reservoir may change water quality in Quail Creek Reservoir and potentially affect water treatment plant operations. The water treatment plant supplied by Quail Creek Reservoir is designed for the range of current water quality conditions in the reservoir. Blending of Virgin River and Lake Powell water may change the effectiveness and efficiency of the water treatment plant and may require adjustment of treatment processes to make sure that drinking water standards are maintained.

6.2.3 Preliminary Studies and Information Gathering Needs

6.2.3.1 Water Resources

Studies of the long-term recharge potential from Sand Hollow Reservoir to the underlying shallow aquifer are ongoing. Existing studies (USGS 2005a; 2007d) may serve as a foundation for future investigations. The studies will investigate the potential geochemistry in groundwater as a result of mixing Lake Powell water with Navajo Sandstone aquifer groundwater and the current Virgin River water being recharged.

Studies will be performed to determine hydrogeologic conditions at the hydro system forebay and afterbay and at all shafts, tunnels, perennial stream crossings and specific sections of pipeline and penstock trench where groundwater may be encountered.

6.2.3.2 Water Quality

Detailed studies will be performed on the water quality effects of blending Lake Powell water with groundwater in the Navajo Sandstone aquifer under and around Sand Hollow Reservoir. The effects of mixing Lake Powell water with the groundwater in the underlying shallow aquifer should be evaluated with respect to water quality, including suitability for drinking water and impacts on aquifers. Water quality modeling of the effects of blending Lake Powell water with the existing groundwater will be performed to estimate how water quality parameters may be affected under recharge scenarios. Preliminary modeling suggests that the change from Virgin River water to Lake Powell water will result in minimal geochemical changes from present conditions. The effects of mixing Lake Powell water with Quail Creek Reservoir water on the water treatment plant operations will be evaluated. This evaluation will include impacts on processes as well as on treated water.

6.2.4 Potential Protection, Mitigation and Enhancement Measures

Connecting the Hurricane pressurized irrigation system to the Lake Powell Pipeline through the Cedar Valley Pipeline System would provide water low in suspended solids, compared to the current source from the Virgin River, which often contains extremely high concentrations of suspended solids. The sediment in the irrigation water settles into the pipeline system, requires excessive maintenance, and fouls the system. The flow of Project water into the pressurized irrigation system would provide a more favorable water quality that is low in suspended solids for secondary irrigation users. Additional measures will be developed after additional engineering evaluation, including the studies identified in Section 6.2.3.

The quality of water delivered through the pipeline would be enhanced by restricting intake of Lake Powell water to the top 100 feet or at most 150 feet of depth to capture the highest quality water from the lake. Replacement of Virgin River water in Sand Hollow Reservoir with higher-quality water from the upper 100 to 150 feet of Lake Powell water would reduce the TDS of water recharged to the aquifer.

6.2.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Grand Staircase – Escalante National Monument (GSENM) Approved Management Plan
- Draft Resource Management Plan and Draft Environmental Impact Statement, BLM Kanab Field Office
- Sand Hollow Recreation Area Recreation Master Plan
- Virgin River Watershed Management Plan
- Colorado River Management Plan
- Zion National Park General Management Plan
- Strategic Plan for Glen Canyon National Recreation Area Adaptive Management Program
- KCWCD Water Resource Management Plan

6.3 Fish and Aquatic Resources

6.3.1 Preliminary Issues

Preliminary issues include potential impacts on fish habitat and populations in Lake Powell, the Paria River, Sand Hollow Reservoir, the Virgin River, Quail Creek Reservoir, and various ephemeral drainages. Other preliminary issues include potential impacts on habitat and populations of aquatic resources (macroinvertebrates, amphibians, and other aquatic organisms) in these same surface waters.

6.3.2 Known or Potential Project Impacts

Some moderate, localized consequences on fish and aquatic resources may occur because of Project activities; however, disturbances that would substantially impact populations or sub-populations of species are unlikely. Some localized turbidity may occur for short durations during construction. The turbidity is anticipated to have minor to negligible impacts on fish and aquatic resources in potentially affected waters.

The Project alignment would cross several fluvial systems along the pipeline and penstock alignment. Construction of the pipeline and penstock by open-cut methods would cross perennial streams or active ephemeral or intermittent drainages. Construction would be performed during periods of no flow in intermittent drainages and streams to the greatest extent possible. Fish and aquatic wildlife species populations and their habitats within these fluvial systems may be affected by construction during periods of active flow.

Fish and aquatic resources are affected by discharge of sediments to streams, lakes and reservoirs. Sediment and turbidity-related releases may affect fish and aquatic species and their habitats at perennial stream crossing locations such as the Paria River. The Project crossing of the Paria River would be accomplished to avoid or minimize impacts on fish and aquatic life. Fish can be cleared within construction areas by qualified fish biologists.

The Kanab Creek penstock crossing would be open cut. The buried penstock would cross the creek in a reach that flows intermittently and is surrounded by riparian vegetation. Any fish can be cleared within construction areas by qualified fish biologists.

Other intermittent drainages such as Buckskin Gulch, Jacob Canyon and Short Creek would be crossed by the pipeline or penstock using open cut methods. Construction would likely occur during periods when the drainages are dry.

The Cedar Valley Pipeline would cross the Virgin River between Hurricane and LaVerkin. The pipeline crossing would be accomplished to avoid or minimize impacts on fish and aquatic life. Virgin River fishes can be cleared from the reach during construction.

Game and non-game fish in Lake Powell may potentially be entrained into the water intake tunnels at Lake Powell. Intake water velocities may attract some fish species toward the intake tunnels. Fish entrainment into the intake tunnels are not expected to adversely affect fish populations in Lake Powell. The potential for fish to be entrained into the intake tunnels would be dependent on the intake facility depths with respect to surface water levels and intake structure design. Threadfin shad is expected to be the most vulnerable to fish entrainment because of its high population and ubiquity of this prey base species in Lake Powell (NPS 2005). Game fish generally are more commonly found in side canyons and tributary arms of Lake Powell, rather than in the mainstem channel where the intake tunnels would be located.

The Project would be designed to operate 350 days per year, allowing up to 15 days for inspection and maintenance of the pipeline, penstock, pump stations, and hydro stations each year. Draining segments of the pipeline and penstock would involve releasing water at blowoff valves located at low points along the alignment, usually at or near defined drainages. The water released from blowoff valves would flow to the Paria River, Buckskin Gulch, White Sage Wash, Jacob Canyon, Kanab Creek, Bitter Seeps Wash, Short Creek and other drainages along the Project alignment. The released water may have minor impacts on fish and aquatic resources in perennial waters such as the Paria River.

There is a small potential for Project water discharged into Sand Hollow Reservoir to be transferred to Quail Creek Reservoir, which occasionally discharges to the Virgin River to help meet downstream water right flows. The potential discharge of some Lake Powell water into the Virgin River may slightly change the water quality and aquatic habitat, and may introduce invasive aquatic species to the river from Lake Powell via Sand Hollow and Quail Creek reservoirs. Potential introduction of exotic species is a concern because of aquatic species recovery efforts in the Virgin River and potential spread of invasive and non-native species throughout western waters.

6.3.3 Preliminary Studies and Information Gathering Needs

Fish entrainment studies and analyses will be performed as part of the preliminary design effort for the Project intake facilities at Lake Powell. The tailrace structure at the Sand Hollow Hydro Station will be studied to eliminate releasing water supersaturated with nitrogen gas and the resulting potential effects on fish and aquatic resources in Sand Hollow Reservoir. Intermittent flow periods will be determined for drainages that would be crossed by the Project alignment to plan for construction crossings that would avoid impacts on fish and aquatic resources and their habitat. Critical spawning and other life stage periods will be determined for perennial streams that would be crossed to plan for construction crossings that would avoid or minimize impacts on fish and other aquatic resources.

The potential impacts of releasing Lake Powell water conveyed through the Project pipeline and penstock system indirectly into the Virgin River via discharges into Sand Hollow Reservoir and transfer to Quail Creek Reservoir will be studied and assessed to determine the effects on fish and aquatic resources in the Virgin River. The studies will be coordinated with activities performed under the Virgin River Resource Management and Recovery Plan and the Virgin River Watershed Management Plan.

6.3.4 Potential Protection, Mitigation and Enhancement Measures

Providing Project water to the Hurricane pressurized irrigation system would enhance flow management flexibility in the Virgin River because it would address the potential instream flow needs of native fish species.

Potential fish entrainment impacts would be minimized by designing and installing fish screens on the water intake tunnel inlets. The screens would be designed to minimize inlet velocities and avoid trapping fish against the screens.

Erosion and sediment control measures implemented as part of the SCPs and best management practices such as silt fencing, straw bales, check dams, sediment control logs and bales, and settling basins would be installed during construction activities to avoid or minimize sediment and turbidity impacts on water quality and aquatic resources. Erosion control best management practices would be implemented at stream and ditch crossings to trap sediments and make sure that surface water runoff does not cause water quality and aquatic resource impacts. Erosion and sediment control measures would be installed at all discharge points to minimize the potential for erosion and habitat degradation associated with Project construction. Existing drainage flow patterns through the construction areas would be maintained to extent practicable. Groundwater collected from pipeline excavations would be discharged into local drainages after settling to remove sediments and turbidity. Spill prevention and countermeasure control plans would be developed and implemented in the event of accidental spills of hazardous chemicals or other contaminants associated with construction that may impact water quality and aquatic resource habitat.

The potential for nitrogen gas supersaturation would be minimized by designing Project facilities to rebalance waters to atmospheric pressure and reduce dissolved gas pressures in the water to match existing water quality in Sand Hollow Reservoir before being discharged. Pump station forebay reservoirs, regulating tanks, and forebay and afterbay reservoirs at hydro stations would be designed to operate at atmospheric pressure that would allow dissolved gas pressures to return to ambient conditions. These measures would help protect fish and aquatic resources in Sand Hollow Reservoir from potential impacts caused by nitrogen gas supersaturation.

Invasive species such as quagga mussels that could affect operation of the Lake Powell Pipeline and be transferred to existing reservoirs through the pipeline would be prevented from surviving within the first 16 miles of the pipeline by use of chemicals or other biological control methods.

Impacts on aquatic life and habitats in ephemeral and intermittent streams would be minimized by performing construction activities during dry or low flow periods.

6.3.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Navajo Generating Station Environmental Assessment
- Paria River Management Plan
- Arizona Rivers, Streams, and Wetland Study (also a FERC 10(a)(2)(A) Comprehensive Plan)
- Unique Wildlife Ecosystems of Arizona, USFWS, 1978.(also a FERC 10(a)(2)(A) Comprehensive Plan)
- Arizona Strip EIS
- GSENM Management Plan

- Escalante Management Framework Plan
- Kanab Resource Management Plan
- Colorado River Management Plan
- Biological Opinion for the Colorado River Management Plan
- Biological Opinion on the Operation of Glen Canyon Dam
- Biological Opinion for the Arizona Strip Resource Management Plan
- Virgin River Resource Management and Recovery Program
- Virgin River Management Plan
- Virgin River Watershed Management Plan
- Virgin Spinedace Conservation Agreement and Strategy
- Virgin River Fishes Recovery Plan
- Washington County Habitat Conservation Plan

6.4 Wildlife Resources

6.4.1 Preliminary Issues

Preliminary issues identified for terrestrial wildlife involve potential impacts on wildlife populations and habitats. The Project may have impacts on wildlife populations and habitats from the following disturbances:

- Construction in corridors along the Project alignment and habitat changes from the presence of new facilities such as pipelines, penstocks and associated features (drains, blowoffs), access roads and construction staging areas, pump stations, substations and power transmission lines, hydro stations and reservoirs
- Material borrow sites and spoil disposal areas
- Riparian corridors impacted by Project construction activities
- Wetlands affected by Project construction activity or changes in surface or groundwater flows
- Critical seasonal ranges and migration routes crossed by the Project alignment

6.4.2 Known or Potential Project Impacts

Species that may be impacted by the Project have habitat ranges that are much larger in extent than the Project boundaries. Though some moderate, localized consequences on terrestrial wildlife may occur because of Project activities, disturbances that would substantially impact populations or sub-populations of species are unlikely.

Potential impacts on wildlife resources include loss or alteration of native habitats, direct mortality of wildlife, increased habitat fragmentation, and alterations in habitat and species composition. Surface disturbance actions that alter vegetation characteristics (e.g. structure, composition, and/or production) have the potential to affect habitat suitability for wildlife, particularly where the disturbance removes or reduces cover and/or food resources. Minor changes in vegetation communities may have the potential to affect resident wildlife populations.

Direct impacts on wildlife resources from construction activities may result in mortality or displacement of individuals, disturbance in reduced air or water quality, and alteration of immediate environments through loss of, or changes to key habitat components (BLM 2007e). Key habitat components for wildlife include food availability or quality, cover from predators, insulation from extreme temperatures,

nesting/roosting/denning habitat, water availability and quality, and travel corridors. Direct impacts associated with construction may affect individual species, wildlife populations, or habitat for the duration of the action, for several days thereafter, during one or more growing seasons, or may continue indefinitely where the action results in permanent habitat loss.

Indirect impacts on wildlife resources from construction activities may result from influences of post-disturbance succession, recovery, or rehabilitation of the habitat. Impacts may be long-term, depending on the severity of the habitat alteration or disturbance, the mobility of wildlife species, and the viability of vegetation re-establishment.

Short-term indirect impacts may result from general disturbance, noise and dust from construction mobilization on designated roads and construction easements. The ability to forage and the overall habitat suitability may be compromised as a result of dust settling on vegetation adjacent to construction areas thereby reducing the overall habitat suitability for wildlife.

Wildlife may be injured or killed by collisions with construction vehicles traveling upon existing highways or upon new, temporary roads or access points. Birds, reptiles, and small mammals are among species most commonly killed by vehicle collisions.

Wildlife habitat areas may be temporarily fragmented while the construction easements are in use, an effect that would vary in extent and significance by wildlife species. Actions that may ultimately restore or enhance habitat conditions but that may initially be detrimental, such as re-contouring, ripping compacted areas, replacing topsoil, seeding, planting, and other activities may potentially injure or result in loss of individual animals. Wildlife with lower mobility would be most affected.

Mechanical construction methods may result in localized, short-term decline in air quality resulting from fugitive dust, emissions or exhaust from equipment, and chemical fumes. Air quality decline may lead to reduced fitness, increased susceptibility to predation, or mortality among wildlife species.

Loss of some small mammals and reptiles from construction activities is likely. Mortality impacts would be minimized by the construction standards and temporary environmental controls established for the Project and would not likely affect a large number of any wildlife species population or sub-population. Construction and noise disturbance likely would not likely permanently displace any game or non-game wildlife populations or sub-populations.

Some wildlife habitat loss would be associated with the ongoing presence, operation and maintenance of Project facilities including reservoirs, pump stations, substations, power transmission lines, and hydro stations. Occasional maintenance and repair along the Project alignment may result in some loss of wildlife habitat similar to that associated with initial construction activities. Activities such as noise, night lighting, glare, or vibration associated with permanent facilities may deter wildlife from utilizing previously available habitat. Impacts from collisions on roads or access points used during operations and maintenance would likely be small because of the minimal volume of traffic associated with Project operations and maintenance.

6.4.3 Preliminary Studies and Information Gathering Needs

Specific wildlife resource studies will be performed to obtain habitat and wildlife use data in areas where the Project may affect important or critical wildlife habitats. These studies would be designed and performed in consultation with federal and state wildlife agency resource specialists familiar with the Project area. Wildlife habitat and use data collected from identified studies would be used to determine

the intensity, duration and magnitude of Project impacts on wildlife resources during construction and operation and maintenance activities.

6.4.4 Potential Protection, Mitigation and Enhancement Measures

To the extent practical, above ground permanent structures would be sited in locations away from critical and unique wildlife habitats. Further mitigation measures would be developed to offset impacts unique to the Project area. The mitigation measures would be based on applicable state and federal statutes and regulations, agency guidance. Planned construction timing may play an important role in reducing potential impacts associated with habitat disturbance as well as limiting length and time trenches are left open. Analysis of direct wildlife impacts associated with Project operation and maintenance will be further evaluated to determine the other PM&E measures.

6.4.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Navajo Generating Station Environmental Assessment
- Paria River Management Plan
- Arizona Strip EIS
- GSENM Management Plan
- Escalante Management Framework Plan
- Kanab Resource Management Plan
- Colorado River Management Plan
- Biological Opinion for the Colorado River Management Plan
- Biological Opinion for the Arizona Strip Resource Management Plan
- Virgin River Resource Management and Recovery Program
- Virgin River Management Plan
- Virgin River Watershed Management Plan
- Washington County Habitat Conservation Plan
- Arizona Game and Fish Department Comprehensive Wildlife Conservation Plan 2005 - 2015

6.5 Botanical Resources

6.5.1 Preliminary Issues

Preliminary issues include potential impacts on pinyon-juniper vegetation that provides important habitat for wildlife, potential changes in vegetation cover, potential changes to species composition, production and regeneration, and invasion of disturbed areas by noxious plants and weeds. There could be a loss of native soils from along the pipeline right-of-way from the trenching operation that could affect soils ability to support native vegetation. Potential impacts on non-special status species (generally those that are not Federally or state protected) are discussed in this section. Impacts on federally listed, proposed, candidate or State sensitive species are addressed in the Threatened, Endangered and Special Status Species Section 6.7.

6.5.2 Known or Potential Project Impacts

The extents and ranges of vegetation species that may potentially be impacted by this project are larger than the boundaries of the Project. Some moderate, localized consequences on botanical resources may

occur from Project activities, however, disturbances that would substantially impact populations or sub-populations of species are unlikely.

Potential primary impacts on botanical resources during Project construction include habitat fragmentation, alteration of established vegetated areas, direct disturbance or loss of botanical resources, increased invasion of noxious or exotic weeds, and alterations in species composition and succession stages. Surface disturbing actions associated with construction are likely to temporarily alter vegetation characteristics (e.g. structure, composition, and/or production). Direct impacts on vegetation may affect other biological resources for the duration of the action, for several days thereafter, during one or more growing seasons, or may continue indefinitely where the action results in permanent habitat loss.

Indirect impacts on botanical resources would typically result from influences of post-disturbance succession, recovery, or rehabilitation of the ecosystem. Impacts may be long-term, but would depend on the severity of the vegetation alteration or disturbance and the viability of vegetation re-establishment. Minor, short-term indirect impacts may result from general disturbance and dust from construction vehicles operating on roads and within construction easements.

Disturbed native vegetation areas would be susceptible to invasion by weeds and other undesired species. Vegetation species composition changes may occur within construction easement areas as weed species invade the disturbed soil. Native vegetation re-establishment would be influenced by available water or precipitation. The duration of impacts caused by weed invasion would vary by habitat and community type, availability and viability of native seed, and amount and timing of precipitation.

Occasional pipeline and facility maintenance may result in the need for repairs or excavation of pipeline or penstock segments that may require ground disturbing activities. In such cases, botanical resources would be disturbed for a short period of time in isolated areas.

6.5.3 Preliminary Studies and Information Gathering Needs

Field analysis of pipeline and penstock alignments will be performed to verify mapping and overview data currently available regarding botanical resources. Further study regarding known, effective revegetation methods will be performed and determined in consultation with federal or local agency range management and vegetation specialists. Methods to prevent spread and establishment of undesired or invasive plant species will be determined by consulting with federal and state resource management agency specialists.

6.5.4 Potential Protection, Mitigation and Enhancement Measures

The Project temporary construction workspace areas may provide opportunity for weed infestation. Weed infestations typically occur on disturbed areas where native vegetation has been significantly disturbed or removed. Weed infestation can be minimized by planting disturbed areas with native seed. Noxious weeds may need to be controlled using some active control methods. The primary control methods may entail spot use of herbicides and/or hand grubbing because most infestations would initially be small and could potentially be eliminated by implementing proper management techniques. Temporary irrigation may be used in critical vegetative habitat areas to help re-establish native vegetative species. Coordination with noxious weed control groups and agencies such as BLM would be important to minimizing effects of Project construction activities (BLM 2005).

6.5.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Navajo Generating Station Environmental Assessment
- Paria River Management Plan
- Arizona Strip EIS
- GSENM Management Plan
- Escalante Management Framework Plan
- Kanab Resource Management Plan
- Biological Opinion for the Arizona Strip Resource Management Plan
- Virgin River Resource Management and Recovery Program
- Virgin River Management Plan
- Virgin River Watershed Management Plan
- Arizona Game and Fish Department Comprehensive Wildlife Conservation Plan 2005 - 2015

6.6 Wetlands and Riparian Resources

6.6.1 Preliminary Issues

Preliminary issues include protection of wetland and riparian habitats, minimizing impacts on wetlands and riparian resources, controlling invasive species such as tamarisk, and potential groundwater changes from applying Project water within delivery areas.

6.6.2 Known or Potential Project Impacts

Direct impacts on wetlands would be avoided during construction. Direct impacts on riparian areas may occur during the Project's construction phase. Pipeline and penstock construction activities involving open-cut excavation may result in permanent or temporary loss riparian areas and/or changes in riparian functions, including changes in plant communities, soils, or hydrology.

Indirect impacts on wetlands and riparian areas may occur from increased infestation of disturbed soils with invasive species such as tamarisk. The resulting effects may include more evapotranspiration by new tamarisk plants and less water available for native wetland and/or riparian plant species, and reduction in plant species diversity.

Operation and maintenance activities including release of water from the pipeline and penstock through blowoff valves may affect wetlands and riparian areas during and following annual inspection and maintenance periods. Blowoff valve releases would be regulated to avoid erosion and sedimentation at the blowoff locations. Water released from blowoff valves may provide a temporary source of moisture for wetland and riparian vegetation.

6.6.3 Preliminary Studies and Information Gathering Needs

Wetland and riparian areas have been preliminarily identified and mapped. Data analysis, field surveys, and consultation with federal and state resource management agencies will be performed to more accurately identify resource locations and to determine extent of potential impacts on wetlands and riparian resources. Functional assessments will be performed to determine the baseline hydrologic functions and habitat support provided by identified wetlands and riparian areas. The magnitude and

extent of groundwater change in excavated areas will be determined to estimate the potential effects on adjacent wetland and riparian resources.

6.6.4 Potential Protection, Mitigation and Enhancement Measures

Standard construction and operating procedures including measures to avoid or reduce impacts on wetlands and riparian areas would be utilized. Mitigation and construction measures will be used to avoid disturbance of wetlands and to minimize impacts on riparian areas.

6.6.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Paria River Management Plan
- Arizona Strip EIS
- GSENM Management Plan
- Escalante Management Framework Plan
- Kanab Resource Management Plan
- Biological Opinion for the Arizona Strip Resource Management Plan
- Virgin River Resource Management and Recovery Program
- Virgin River Management Plan
- Virgin River Watershed Management Plan
- Final Recovery Plan, Southwestern Willow Flycatcher
- Washington County Habitat Conservation Plan

6.7 Threatened, Endangered, and Special Status Species

6.7.1 Preliminary Issues

Special status species within the Project area consist of aquatic and terrestrial wildlife and botanical resources that are federally or state listed, are proposed or are candidates for these lists, or are included on the State of Arizona, State of Utah and/or BLM sensitive species list. Small modifications in vegetation or conditions in special status species habitats may lead to effects on the species because many special status species have very narrow habitat requirements and low tolerances for change.

Preliminary issues include avoiding critical habitats for special status species and avoiding effects on or direct interactions with special status species. More specific issues will be determined following initiation of consultation with the U.S. Fish and Wildlife Service and other federal and state agency resource specialists.

6.7.2 Known or Potential Project Effects

Construction effects would be evaluated on a species-by-species basis. The construction effects analysis would be based on the status, population dynamics, behavior, habitat availability and quality for each species relative to the type, intensity, duration and magnitude of a specific effect.

Potential effects on special status species are expected to be similar to impacts associated with other wildlife and biological resources within the Project area. Potential effects may include loss or alteration of native habitat, increased invasion of noxious weeds and other exotic weed species into sensitive

species habitat, decreased water availability in sensitive areas, increased species habitat fragmentation, potential disruption of species behavior leading to reduced reproductive fitness and/or increased susceptibility to predation, and direct mortality of individuals. Surface disturbing actions that alter vegetation characteristics (e.g. structure, composition, and/or production) have the potential to affect habitat suitability for special status plants or animals, particularly where the disturbance removes or reduces cover and/or food resources. Minor changes in vegetation communities have the potential to affect special status species.

Direct effects may affect individuals or habitats for the duration of the construction activity, for several days thereafter, during one or more growing seasons, or may continue indefinitely where the action results in permanent habitat changes. Indirect effects on special status species from construction activities may result from influences of post-disturbance succession or recovery of the species' habitat. The Applicant intends to engage in informal consultation with the U.S. Fish and Wildlife Service and to prepare a draft Biological Assessment addressing the potential effects of the Project on each listed and candidate species. This will lead to issuance of a Biological Assessment of the Project by FERC and may lead to the issuance of a Biological Opinion by the U.S. Fish and Wildlife Service.

The following special status plants have been identified via mapping as potentially occurring within the Project area: Welsh's milkweed, Brady pincushion cactus, Siler pincushion cactus, Holmgren milk-vetch, and Gumbo milk-vetch. Construction impacts on these special status plant species may include reduced fitness as a result of dust, physical disturbance, and injury or mortality where vehicles drive over plants. Impacts on these species may be the greatest following wet weather events. The following special status wildlife species have been identified via mapping as potentially occurring in the Project area: Utah prairie dog, Bald eagle, Peregrine falcon, Burrowing owl, Ferruginous hawk, Swainson's hawk, Southwestern willow flycatcher, Woundfin minnow, Virgin River chub, and Razorback sucker.

6.7.2.1.1 Welsh's milkweed. Populations and habitat must be protected from loss of individuals and environmental degradation to prevent Welsh's milkweed from becoming endangered (currently federally listed as threatened). Project construction may potentially affect the species if surface disturbance occurs in locations where the plant occurs. Conservation and management efforts prescribed in the Welsh's milkweed recovery plan indicate that enforcing off-road vehicle closure areas in the Coral Pink Sand Dunes is critical to preserving habitat (USFWS 1992). Likewise, construction activity and traffic would need to be directed away from closure areas to preserve habitat and be consistent with conservation and management efforts. Identifying milkweed locations within the Project area and avoiding disturbance within identified locations would help avoid or reduce potential negative effects on the species.

6.7.2.1.2 Brady pincushion cactus. This species has been listed without critical habitat. Off-highway vehicle (OHV) traffic is a serious threat to the Brady pincushion cactus. Illegal collection and pesticide application are known threats to this species. To prevent mortality during construction, surveys of known Brady pincushion habitat would be completed prior to construction initiation. Where cacti are identified, locations would be staked and fenced during construction to avoid construction traffic around the plants. Where such avoidance would not be possible, further conservation measures would be needed (USFWS 1990). Pesticide application to prevent noxious weeds and invasive species during vegetation re-establishment would need to be avoided in areas associated with the cactus.

6.7.2.1.3 Siler pincushion cactus. This species has been listed without critical habitat. Threats include illegal collection, herbivory by unknown animals, uranium mining and exploration, OHV disturbance, and pesticide application. Potential damage from OHV disturbance includes the direct destruction of individuals by off-road vehicles; loss of habitat to routes and trails created by the vehicles; and secondary loss of plants and habitat where trails become erosion channels during periods of heavy run-off (USFWS 2007). Creation of construction access points may cause negative effects on the cactus resulting in loss of

habitat, easier OHV access to potential habitat areas in the future, and increased erosion in cactus habitat (USFWS 2007). Conservation measures to prevent construction vehicles from similar disturbance as that associated with OHV disturbance may be needed. Such conservation measures may include efforts to prevent mortality where construction vehicles may drive over plants. Surveys of known Siler pincushion cactus habitat would be completed prior to construction initiation. Where cacti are identified, locations would be staked and fenced during construction to avoid construction traffic around the plants. Pesticide application to prevent noxious weeds and invasive species during vegetation re-establishment would need to be avoided in areas associated with the Siler pincushion cactus. Where avoidance of effects would not be possible, further conservation measures would potentially be needed (USFWS 1990).

6.7.2.1.4 Gumbo milk-vetch. Gumbo milk-vetch (*Astragalus ampullarius*) is a species of concern to the State of Arizona. Threats may include disturbance in Chinle and Moenkope formations, urban expansion and development and/or use of right-of-way corridors (Arizona Game and Fish 2005). The species is possibly threatened by mineral exploration and livestock grazing. Conservation measures associated with the Project would include determining habitat and species location via surveys prior to surface disturbance associated with construction (Arizona Game and Fish 2005). Areas identified as milk-vetch habitat would be avoided to the extent practicable. Consultation with Arizona Game and Fish would occur to develop mitigation plans for milk-vetch areas potentially disturbed by construction activities.

6.7.2.1.5 Utah prairie dog. Construction activities associated with the Cedar Valley Pipeline portion of the Project may result in non-permanent take of Utah prairie dogs (Iron County Commission and Utah Division of Wildlife Resources 1998). The constructed pipeline alignment would be restored to original conditions, thereby allowing prairie dogs to re-inhabit any disturbed habitat following construction completion. Translocation, a conservation strategy wherein prairie dog colonies are relocated away from construction areas, may be a viable conservation measure applicable to the Project. Translocation activities are typically performed during winter months. Should translocation be implemented, there would be little chance of prairie dog mortality associated with construction vehicle strikes, trampling, or covering of burrow entrances (Iron County Commission and Utah Division of Wildlife Resources 1998). Permanent take of prairie dog habitat may occur in areas where above-ground project facilities are built. In areas where permanent changes in land use would occur, conservation measures consisting of the development of consolation habitat may be appropriate. This type of conservation activity might include prescribed burning, brush beating, and disking to develop consolation habitat in areas outside of project boundaries (Iron County Commission and Utah Division of Wildlife Resources 1998). Conservation easements may potentially be acquired along pipeline rights-of-way that may act as dedicated habitat and/or consolation habitat for prairie dogs, though these areas would need to be comprised of at minimum of 10 contiguous acres in order to be considered effective habitat (Iron County Commission and Utah Division of Wildlife Resources 1998).

Occasional inspection, maintenance and repair of the Cedar Valley Pipeline or associated facilities may temporarily disturb the species or affect its habitat.

6.7.2.1.6 Bald eagle. Construction near areas that contain Bald eagle roosts should be avoided between November 15 and March 15, because eagles utilize roosts during this period. Project construction outside of this seasonal period may result in the potential destruction of roost sites; these potential effects would be indirect if construction occurs in roosting habitat following Bald eagle migration.

The quality of habitat for Bald eagle prey base may improve if riparian areas near or within the Project area improve as a result of blowoff water releases to drainages along the pipeline and penstock alignment.

6.7.2.1.7 Burrowing owl. Young Burrowing owls are not likely to survive if construction activities occur during the nesting season. Field surveys would be completed prior to construction to determine if

burrowing owls are present within the construction areas. Construction should be delayed until July 31 after the young have fledged (Iron County Commission and Utah Division of Wildlife Resources 1998).

6.7.2.1.8 Ferruginous hawk. The Ferruginous hawk is considered a neotropical migrant and most leave Utah at the onset of winter, though some have been observed in the state throughout the winter, typically in agricultural areas. Nesting typically occurs in open desert habitats, predominantly in juniper trees on the edges of sagebrush-juniper ecotones. The species is highly sensitive to human disturbance. Limiting construction activities in Ferruginous hawk nesting areas to winter months would minimize potential effects on this species (Iron County Commission and Utah Division of Wildlife Resources 1998).

6.7.2.1.9 Swainson's hawk. Swainson's hawk is known to winter in the tropics and leave North American roosts during the winter months (Iron County Commission and Utah Division of Wildlife Resources 1998). Limiting construction during non-winter months in known Swainson's hawk roosting areas may minimize or avoid effects on this species.

6.7.2.1.10 Southwestern willow flycatcher. The Virgin River has been identified as a management unit and the river floodplain from the Arizona state line to the Washington Fields Diversion has been identified as habitat area for the Southwestern willow flycatcher (USFWS 2005). Habitat characteristics along the Virgin River range from purely native to exotic (primarily tamarisk) dominated stands. Suitable habitat has been identified within riparian areas associated with Jacob Canyon, Kanab Creek canyon, and Bitter Seeps Wash along the Project penstock alignment. The recovery plan for the Southwestern willow flycatcher requires that habitat be sufficiently protected (USFWS 2002). Major stressors on the species and its habitat include reductions of groundwater and surface water levels and lack of available suitable breeding habitat (USFWS 2002). There are no documented nesting sites within the project area within Utah. Management and replacement of exotic and invasive species in areas disturbed by project activities may enhance habitat quality and quantity. The breeding season for the Southwestern willow flycatcher is between March 15 and September 30 (USFWS 2005). Construction disturbance in Southwestern willow flycatcher habitat should be timed to avoid disturbance during the breeding season.

Operation and maintenance activities may promote habitat development for the Southwestern willow flycatcher resulting in positive effects on the species. Southwestern willow flycatchers may benefit from Project blowoff valve releases resulting from operational activities and from increased recharge to groundwater aquifers. Increased water in marsh areas between levees and on floodplains may help support and enhancing flycatcher habitat (USFWS 2002a). Habitat improvements may result in population increases. Direct or indirect discharges into the Virgin River system would most likely be of highest value for the species because the river corridor is considered critical habitat; river flows have been reduced by diversions which has been detrimental to the Southwestern willow flycatcher.

6.7.2.1.11 Woundfin minnow and Virgin River chub. It is not anticipated that construction activities would directly affect Woundfin minnow or Virgin River chub. These potential effects would be avoided by minimizing or avoiding impacts at river crossings and clearing fish species from the construction area by qualified fish biologists.

The Project may potentially provide direct or indirect water discharges into reaches of the Virgin River. Increased streamflow may help maintain existing habitat and promote development of increased minnow and chub range and habitat.

6.7.2.1.12 Razorback sucker. Hatchery-raised Razorback suckers are being stocked in the Colorado, Gunnison, Green and San Juan rivers because few native fish currently remain in the available habitat. The Razorback Sucker Recovery Plan incorporates management actions such as range expansion and providing passage for the sucker over barriers within occupied habitat to allow unimpeded movement

(USFWS 2002b). Indirect effects from Project construction may occur in drainages tributary to the Colorado River and Lake Powell. Risks of increased sediment discharge into drainages and rivers or accidental chemical spills and run-off may be mitigated through implementation of spill prevention control and countermeasure plans and stormwater management planning.

Management goals for the Razorback sucker include the need to prevent entrainment of sub-adult and adult suckers at diversion and intake structures (USFWS 2002b). During Project operation and maintenance, fish entrainment may occur at the Lake Powell intake structure. Entrainment of suckers would be unlikely because the intake design would minimize approach velocities and suckers within Lake Powell likely would not be near the intake structures.

6.7.2.1.13 Desert tortoise. Project construction activities would be the primary factor for potential effects on the Desert tortoise (*Gopherus agassizii*). The Desert tortoise is threatened by humans because of habitat destruction, degradation, and fragmentation as well as direct take of the species. Indirect effects on the tortoise associated with construction activities may occur.

Construction activities may alter habitats in localized areas near tortoise habitat conservation plan areas. Habitat alteration resulting in the decrease of perennial grasses and native annuals and increase of exotic plants has been identified as a detriment to the tortoise. Construction activities may exacerbate existing problems associated with exotic invasion of plants into desert tortoise habitat. Increases in exotic plants have been known to increase the incidence of fire in tortoise habitat (FWS 1994).

Although habitat fragmentation has been identified as a major contributor to tortoise population decline (FWS 1994), the Project would not exacerbate this existing problem because the Cedar Valley Pipeline would be constructed along the existing Interstate 15 right-of-way north of two distinct tortoise habitat conservation areas. Additionally, no Project structures would be constructed within the habitat conservation plan areas and once constructed, no impediments to tortoise habitat would exist. Even though construction would occur outside of the habitat conservation plan areas, tortoises may still be present along the Interstate right-of-way and the construction area near the habitat conservation plan vicinity. Conservation measures may be needed in the vicinity of the habitat conservation plan areas to avoid stress or incidental take of the species within the construction areas.

It is unlikely that the Project would have any operation and maintenance effects on the Desert tortoise, because the Cedar Valley Pipeline would be buried beneath the ground surface outside of the habitat conservation plan areas.

6.7.2.1.14 Peregrine falcon. The quality of habitat for Peregrine falcon prey base may improve if riparian areas near or within the Project area improve as a result of blowoff water discharges to drainages along the pipeline and penstock alignment.

6.7.3 Preliminary Studies and Information Gathering Needs

Available data sources allow for estimating the general location of special status species and their habitats within the Project pipeline and penstock alignments. Comprehensive evaluation of potential effects on sensitive species will be dependent on obtaining more specific data on listed species and their known habitats. Field surveys will be needed to determine specific habitat locations along the Project alignment. Extensive field surveys will be performed in Project areas and alignments that contain known individuals and/or critical habitat. All proposed studies will be performed in consultation with the U.S. Fish and Wildlife Service and biologists and resource managers with affected federal and state resource management agencies.

6.7.4 Potential Protection, Mitigation and Enhancement Measures

Providing Project water to the Hurricane pressurized irrigation system would enhance flow management flexibility in the Virgin River because it would address the potential instream flow needs of endangered fish species.

Protection, mitigation, and enhancement measures for special status species would be developed using standard construction and operating procedures, in consultation with resource management agencies, and with best professional judgment. Measures would be developed on a case-by-case basis depending on the special status species of concern and the potential effects associated with the species and/or their habitat. Some measures for protecting, mitigating and enhancing habitats of special status species are included in the subsections within Section 6.7.2.

Effective Desert tortoise protection and mitigation strategies used on other pipeline projects have been developed in collaboration with the U.S. Fish and Wildlife Service and other local officials. Generally, the protection and mitigation measures include fencing off construction areas to prevent migration of tortoises into active construction zones, educating construction staff to identify and report tortoise sightings, and having authorized biological staff available to monitor construction areas and/or safely relocate tortoises should they be identified within active construction areas (Desert Tortoise Council 1994 and MWH 1998). Tortoise burrows may need to be excavated by authorized biological staff if they are located (even just partially) within construction areas (Desert Tortoise Council 1994). Efforts to minimize potential Project effects or to enhance existing habitat areas can be successful. Enhancement efforts may include planting and monitoring the establishment of native annuals and/or perennial grasses in disturbed construction areas and/or removal of invasive or exotic species within construction areas.

6.7.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Navajo Generating Station Environmental Assessment
- Paria River Management Plan
- Arizona Strip EIS
- GSENM Management Plan
- Escalante Management Framework Plan
- Kanab Resource Management Plan
- Colorado River Management Plan
- Biological Opinion for the Colorado River Management Plan
- Biological Opinion on the Operation of Glen Canyon Dam
- Biological Opinion for the Arizona Strip Resource Management Plan
- Biological Opinion for Grazing Permit Renewal for Six Allotments Containing Silver Cholla Cactus Habitat
- Virgin River Resource Management and Recovery Program
- Virgin River Management Plan
- Virgin River Watershed Management Plan
- Virgin Spinedace Conservation Agreement and Strategy
- Virgin River Fishes Recovery Plan
- Final Recovery Plan, Southwestern Willow Flycatcher
- Holmgren Milk-Vetch and Shrivwits Milk-Vetch Recovery Plan
- Dwarf Bear Poppy Recovery Plan
- Welsh's Milkweed Recovery Plan

- Desert Tortoise (Mohave Population) Recovery Plan
- Guidelines for Handling Desert Tortoises During Construction Projects
- Washington County Habitat Conservation Plan
- SNWA Temporary Environmental Controls Specification for Desert Tortoise Protection
- Siler Pincushion Cactus Recovery Plan
- Arizona Game and Fish Department Comprehensive Wildlife Conservation Plan 2005 - 2015

6.8 Recreation and Land Use

6.8.1 Preliminary Issues

Preliminary issues involving recreation resources include direct and indirect impacts on recreational activities and areas, access to recreational facilities and areas, Preliminary issues involving land use and management include impacts on existing land uses by Project easements, impacts on potential future land use by Project easements, impacts on Federal and State land management practices including special areas such as wilderness, wilderness study areas, and ACECs, and changes in land productivity and use from rock and soil disposal along the Project alignment.

6.8.2 Known or Potential Project Impacts

Regional and some local recreational travel and activities may be affected during Project construction. Construction machinery would operate along transportation routes utilized for access to recreation areas. Within all areas where construction would occur, activities would generate dust and noise which may have impacts on recreational travelers or on recreation use at facilities nearby the construction areas. U.S. Highway 89 and Arizona Highway 389 are primary recreational access routes through southwest Utah and northern Arizona, and recreational users traveling on these routes may experience traffic delays and temporary limitations on access to nearby recreational areas and facilities. Most of the pipeline and penstock construction would occur outside of the running surface of roads, however, some traffic control would be required to slow traffic in active construction areas. Open-cut construction for pipeline and penstock installation is planned along Highways 89 and 389, involving traffic safety zones for active construction activities, which may delay recreational and other traffic. The following subsections describe potential Project impacts associated with specific recreational areas and facilities.

Disposal of Project waste rock and soil excavated during pipeline and penstock installation may change existing land use in approved disposal areas.

6.8.2.1 Lake Powell and Glen Canyon National Recreation Area

In the Glen Canyon National Recreation Area, Project construction would involve building the water intake structure, installation of water conveyance pipeline, power transmission lines, and the pump station and intake above-ground facility. Restricted access in construction zones and temporary visual, noise, and dust nuisances would constitute the types of potential impacts within the recreation area. Boaters would not have access to waters or shoreline near construction areas. The construction easement area, parallel access routes, and segments of U.S. Highway 89 would have various levels of restriction on recreational access, potentially causing detours and delays within currently usable areas.

Construction activities may affect dispersed recreation within this area. Marina use and activity would not be directly affected by Project activities. Designated trails utilized by hikers and bikers along with other

environmental education areas would not likely be directly affected by Project construction activities. Whitewater rafting and fishing opportunities below the Glen Canyon Dam would not likely be affected.

Operation and maintenance activities would not likely have many impacts on recreational use or opportunities in the NRA. Intake structure buildings would be visible to recreation users within of few limited areas of the NRA and access to intake area on Lake Powell would be restricted. Manholes, blowoff valves, vacuum relief and air release valves would be situated in at-grade vaults within the boundaries of the NRA and would not be immediately visible to recreational users. Segments of the pipeline would be drained annually for up to 15 days to allow for inspection and maintenance, and water would be released through blowoff valves resulting in temporary flows in existing drainages. Some of the affected drainages may be visible from highways and turnouts utilized by recreational traffic. Occasionally, maintenance vehicles may access above-ground facilities and activities would occur within and around the vicinity of the intake structure and along the Project pipeline within the NRA. Maintenance activities are not anticipated to have measurable effects on recreational users.

6.8.2.2 Grand Staircase-Escalante National Monument

Project construction activities within the Grand Staircase-Escalante National Monument (GSENM) would be limited to the front-country zone of the GSENM along Highway 89. Construction activities for the pipeline would be situated within the designated utility right-of-way along the Highway 89 corridor outside of the paved road area. Lane or road closures are not anticipated, though some traffic control measures to slow traffic near roadside construction areas are likely. Temporary rerouting to overlooks, trails, interpretation areas or associated GSENM facilities along Highway 89 would be required to accommodate Project construction activities and minimize conflicts with recreation users.

Several crossings of Highway 89 are planned within GSENM. These crossings would be constructed so that recreational traffic could continue to pass safely in each direction. However, construction activities would be situated close to the road and likely would require additional traffic control measures, resulting in potential recreational traffic delays.

The Project construction would parallel the Cockscomb Wilderness Study Area (WSA) and temporary noise from construction activities may be audible in the WSA. Construction noise may exceed existing ambient noise levels associated with Highway 89 traffic and may temporarily affect recreational experiences within GSENM and nearby WSA.

Some recreation users within GSENM would be exposed to the presence of construction machinery and materials in active construction areas. Construction machinery and equipment would present temporary visual contrast to the surroundings of the GSENM. Dust generated by construction activities could adversely affect the recreation experience, but proper dust control and abatement measures would minimize the adverse effects.

The Project crossing of the Paria River within GSENM would affect a river that has been found eligible for potential inclusion in the Federal Wild and Scenic Rivers Act. The river also has been designated as a recreational river by the BLM (BLM 2000). During construction a section of river would be closed off to recreational users. This may potentially interrupt recreational use and restrict mobility of river users during the temporary closure of the river section. Construction activities could affect the qualities for which the river has been found potentially eligible for inclusion in the Wild and Scenic Rivers system.

Manholes, blowoff valves, vacuum relief and air release valves would be situated in at-grade vaults within the boundaries of the GSENM and would not be immediately visible to recreational users. Above-ground facilities such as pump stations, hydro stations, power transmission lines and regulation tanks

would be visible to recreation users. Access to these and other Project facilities would be restricted. Occasional maintenance may require some activity along pipeline and penstock alignment routes or within facilities. Segments of the pipeline may be drained annually for up to 15 days to allow for inspection and maintenance, and water would be released through blowoff valves resulting in temporary flows in existing drainages. Some of the affected drainages may be visible from highways and turnouts utilized by recreational traffic. The pipeline and penstock may require occasional repairs including excavation and temporary construction-like activities. These activities may temporarily create some dust, noise, and delays in traffic, similar to temporary impacts during Project construction, though on a much smaller scale. Frequent repairs of the pipeline and penstock are not anticipated.

6.8.2.3 Arizona Strip Resource Area

The Project would cross through the BLM managed Arizona Strip Resource Area after leaving the GSENM, then traverse south of the Kaibab Indian Reservation and pass through these lands up to Colorado City, Arizona. Much of this segment of the Project alignment would be situated on terrain that can be characterized as remote, undeveloped, with much of it being near or alongside the 500 kV Navajo-McCullough Transmission Line. The BLM-managed land provides opportunities for recreational OHV use, mountain biking, sightseeing, hiking, camping, and hunting. Project construction activities within the Arizona Strip may temporarily affect and displace recreational users. However, the area around the Project is remote and there are vast expanses of other Arizona Strip lands where recreational users may experience desolate recreation conditions thus avoiding the construction activities. The Arizona Strip is managed in these areas for recreation, grazing, mining, and utility corridors.

Construction activities within the Arizona Strip along the Project alignment may temporarily affect hunting and wildlife viewing opportunities. Wildlife may temporarily be more active in other areas away from Project construction activities. These types of changes in wildlife use may affect hunters' and sightseers' recreational use patterns and experiences within the Arizona Strip.

Manholes, blowoff valves, vacuum relief and air release valves would be situated in at-grade vaults within the boundaries of the Arizona Strip and would not be immediately visible to recreational users. Above-ground facilities such as pump stations, hydro stations, power transmission lines and regulation tanks would be visible to recreation users. Access to these and other Project facilities would be restricted. Occasional maintenance may require some activity along pipeline and penstock alignment routes or within facilities. Segments of the pipeline could be drained annually for up to 15 days to allow for inspection and maintenance, and water would be released through blowoff valves resulting in temporary flows in existing drainages. Some of the affected drainages may be visible from highways and turnouts utilized by recreational traffic. The pipeline and penstock may require occasional repairs including excavation and temporary construction-like activities. These activities may temporarily create some dust, noise, and delays in traffic, similar to temporary impacts during Project construction, though on a much smaller scale. Frequent repairs of the pipeline and penstock are not anticipated.

6.8.2.4 Sand Hollow Recreation Area and Reservoir

Construction of the Sand Hollow hydro station would occur near the boundaries of the Sand Hollow Recreation Area, a component of the Utah State Park system. At completion of construction, the hydro station would be partially below grade and partially above grade and would be situated adjacent to the reservoir on the northeast shoreline of Sand Hollow Reservoir. The penstock would be buried; the switchyard, powerhouse and power transmission lines would be above ground.

Project operation and maintenance activities at Sand Hollow Reservoir would have minor to no measurable impacts on recreational users. Hydro stations would be visible within the recreation area; access to Project facilities would be restricted. Water delivery from the Project penstock and tailrace into Sand Hollow Reservoir would increase the amount of water delivered to the reservoir and may improve conditions for recreation users. Manholes, blowoff valves, vacuum relief and air release valves would be situated in at-grade vaults within the boundaries of the recreation area and would not be immediately visible to recreational users. Segments of the penstock would be drained annually for about 15 days to allow for inspection and maintenance, and water would be released through blowoff valves resulting in temporary flows in existing drainages. These flows may be visible to recreational users. Project maintenance activities are not anticipated to affect recreational users. The Project would result in more water to Sand Hollow Reservoir, increasing water levels, and would provide more potential for recreation activities.

6.8.2.5 Quail Creek State Park

Project construction activities are not expected to have any direct impacts on Quail Lake State Park. The Cedar Valley Pipeline System would be constructed east and north of Quail Lake State Park. Temporary indirect impacts on recreational use within the park may occur if recreational users are displaced from Sand Hollow State Park/Sand Hollow Reservoir by Project construction activities and they utilize Quail Lake State Park instead.

6.8.2.6 Regional Recreation Facilities and Opportunities

Access to regional recreation facilities such as national parks, monuments, state parks, recreational areas, and other managed lands may be indirectly affected by traffic delays and detours during Project construction parallel to or across highways. Some of these routes are designated scenic highways. Road closures and lane closures are not anticipated; however, Project construction in some areas likely would require reduced traffic speeds on adjacent highways that may result in recreational traffic delays and slightly extended travel times to recreation destinations.

Impacts on land use within the Project area would be primarily associated with easements for the below-ground pipeline and penstock, and with changes in land use for above-ground facilities. Most of the pipeline and penstock alignment would be situated within designated utility corridors and rights-of-way parallel to highways or other existing utilities. Designated land use in established rights-of-way and utility corridors would not change. New utility easements and rights-of-way would be required for some public and private land along the pipeline and penstock alignment, and future development opportunities on these lands would be limited.

In areas where utility right-of-way has not been dedicated, land use or future development potential would change. Future land use may be limited because pipeline and penstock easements would restrict the types of above ground uses of the land. Some properties that may currently have development potential may be segmented by easements and may become considered unsuitable or limited for future development. Some land uses such as agricultural and grazing land may be allowed across the pipeline and penstock right-of-way and easements for the below-ground pipeline would have little, if any, long term impact on agricultural lands along the conveyance and penstock alignment. Coordination would be performed with landowners, resource area managers, and developers to minimize impacts on future land use patterns in the project area.

The presence of constructed, above-ground Project facilities would alter existing land use patterns. Existing land uses would involve conversions of use in areas where facilities are constructed such as the

intake structure at Lake Powell, pump stations along the conveyance system, hydro stations, power transmission lines, and reservoirs. Nearly all of the Project facilities would primarily be situated on land that is currently undeveloped.

6.8.3 Preliminary Studies and Information Gathering Needs

Potential preliminary studies and information gathering needs for recreation resources include the following:

- Recreation GIS data (data layers) from BLM's St. George, Kanab, GSENM, and Arizona Strip Field Offices
- Special Permitting Information
- Recreation Visitation
- Recreation Activities
- Off-Highway Vehicle Use
- Season of Use and Type of Use at Each Recreation Site
- Amount of Dispersed Recreation Use and Type
- Amount of Hunting and Fishing
- Amount of Boating Use Not Associated with Fishing
- Existing Private/Tribal Recreation Sites, Conditions, and Use
- Proposed Private/Tribal Recreation Sites
- Utah Atlas and Gazetteer
- Arizona Atlas and Gazetteer

6.8.4 Potential Protection, Mitigation and Enhancement Measures

Standard construction and operating procedures including measures to avoid or reduce impacts on recreation resources and land use would be incorporated into the Project construction documents. Some protection and mitigation measures are addressed in Section 6.8.2. Easements for the Project alignment may provide multiple use opportunities such as recreational trails or natural resource preservation areas.

6.8.5 Relevant Resource Management Plans

The following resource management plans provide relevant information regarding current and future plans for recreation management in recreation areas and BLM managed areas. Additional consultation and coordination is anticipated with recreation managers to ensure that Project facilities are designed, constructed, and operated to be consistent with area plans and management.

- Arizona Strip Draft Environmental Impact Statement (also a FERC 10(a)(2)(A) Comprehensive Plan)
- Utah Statewide Comprehensive Outdoor Recreation Plan (SCORP) (also a FERC 10(a)(2)(A) Comprehensive Plan)
- Arizona Statewide Comprehensive Outdoor Recreation Plan (SCORP) (also a FERC 10(a)(2)(A) Comprehensive Plan)
- Grand Staircase-Escalante National Monument Management Plan
- Kanab Field Office RMP/EIS Final Analysis of the Management Situation
- Dixie Resource Area Proposed Management Plan and Final Environmental Impact Statement
- Paria Management Framework Plan

- State of the Parks Zion National Park Resource Assessment
- Zion National Park General Management Plan
- Sand Hollow Recreation Area Recreation Management Plan

6.9 Aesthetic Resources

6.9.1 Visual Resources

6.9.1.1 Preliminary Issues

Preliminary issues include magnitude of changes in visual character along the Project alignment, visibility of Project facilities, visibility of landscape modifications, compliance with the BLM Visual Resource Management (VRM) objectives, and compliance with scenic management plan objectives of other federal and state resource management agencies.

6.9.1.2 Known or Potential Project Impacts

Equipment, project materials and excavation activities would be visible along highway rights-of-way and within active Project construction areas of the pipeline, pump stations, regulating tanks, penstock, reservoirs, hydro stations, and power transmission lines. The contrast of disturbed soils, heavy equipment and stored construction materials would create temporary visual impacts in foreground and middle ground views from key observation points. Most key observation points would be along highways. Construction activities along the Project alignment located away from highways would have minor temporary impacts on visual resources.

The Project pipeline and penstock would be buried and with appropriate restoration techniques should have minimal residual visual impact during operation. Pipeline appurtenances such as air release valves, vacuum relief valves, and blowoff valves would be located in concrete vaults at ground grade with access manholes, minimizing visual impacts. Project facilities such as the water intake structure and pump station at Lake Powell, booster pump stations, regulating tanks, hydro stations, substations and power transmission lines would be above-ground and result in minor visual impacts on form, color, line and texture in foreground and middle ground views. Visual impacts occurring in VRM Class 2 areas must be subordinate to primary landscape characteristics. Night security at remote above-ground facilities generally would involve lighting, which also may result in visual impacts in VRM Class 2 areas. Most of the highway corridors have existing power lines and/or transmission lines, and upgrades to these lines may be accommodated without substantially increasing visual impacts. Project substations likely would cause permanent visual impacts in foreground views where they are located close to key observation points. Forebay and afterbay embankments would cause changes in line, form, color and texture.

6.9.2 Noise

6.9.2.1 Preliminary Issues

Preliminary issues include temporary noise impacts from blasting, sawing, and excavating rock along the pipeline and penstock alignment, long-term noise impacts at pump stations and hydro stations, and noise from Project transmission lines.

6.9.2.2 Known or Potential Project Impacts

The Project would have temporary noise impacts on wildlife and humans from heavy construction equipment operation, blasting and other construction activities. In construction areas along highways, steady noise generated by heavy construction equipment likely would blend with ambient highway traffic noise. In construction areas along the Navajo-McCullough Transmission Line, continuous construction noise may blend with ambient noise from the transmission line. Percussive noise generated by blasting rock as part of pipeline, penstock and other Project facility construction activities would increase sound pressure levels beyond ambient noise levels and may result in temporary noise impacts.

Noise generated by Project facilities may occur at the Lake Powell water intake structure and pump station, booster pump stations, hydro stations, and along power transmission lines. Noise attenuation measures would be designed into enclosed structures and noise impacts would be minor or barely measurable. Noise generated by transmission lines may not be attenuated; however, the transmission loads carried by Project lines are not expected to be high and they would generate minimal noise and have little or no impact. Occasional maintenance activities would generate temporary noise. Annual pipeline and penstock inspection would generate noise at blowoff valves as water is discharged from segments of the pipeline and penstock. Pipeline repairs would generate temporary low-level noise similar to that occurring during construction activities.

6.9.3 Preliminary Studies and Information Gathering Needs

6.9.3.1 Visual Resources

On-site field work will be performed to document existing visual character and conditions, record a photographic record of landmarks and special features, verify areas of visual sensitivity, and verify results of visibility analyses. Color, form and texture data will be collected at locations where above ground facilities would be located in VRM Class 2 areas for use in facility exterior design. Simulation photographs will be taken from key observation points along the pipeline and penstock alignment and at Project structure locations. On-site field work will be performed to complete a post-project visual quality analysis for designated scenic routes.

6.9.3.2 Noise

On-site field work will be performed to collect baseline noise data along the Project alignment and at the intake pump station, booster pump stations, hydro stations, and other potential noise generating sites.

6.9.4 Potential Protection, Mitigation and Enhancement Measures

Standard construction and operating procedures including measures to avoid, minimize or reduce impacts on visual resources and to limit noise would be incorporated into the Project construction documents.

Disturbed soils along pipeline and penstock alignments would be seeded with native plant seed to achieve revegetated conditions. Soil staining may be used to match disturbed soil and rock areas with surrounding soil and rock colors to mitigate pipeline and penstock corridor impacts in sensitive visual classification areas. Exposed at-grade concrete vault surfaces may be colored to match the surrounding soil and/or vegetation to minimize color contrast in sensitive visual classification areas. Above-ground Project structures may be colored and textured to match surrounding soil, rock and vegetation colors and textures to minimize visual impacts in sensitive visual classification areas. Above-ground Project structures may

be equipped with non-intrusive night lighting activated by motion sensors to minimize nighttime visual impacts and provide adequate night security.

Noise generated by blasting and other percussive construction activities would be minimized to the extent possible by using earthen berms to absorb and attenuate sound waves. Noise generated at the Lake Powell water intake structure and pump station, booster pump stations, and hydro stations would be attenuated by acoustic absorption methods involving materials, design techniques and acoustic louvers. In areas where noise ordinances are established, or where Project facilities would be near populated or visited areas, facilities would be designed to have little audible impact and conform to established noise attenuation requirements.

6.9.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Navajo Generating Station Environmental Assessment
- Paria River Management Plan
- Arizona Strip EIS and Resource Management Plan
- GSENM Management Plan
- Escalante Management Framework Plan
- Kanab Resource Management Plan
- Dixie Resource Area Proposed Management Plan and Final Environmental Impact Statement
- Arizona Game and Fish Department Comprehensive Wildlife Conservation Plan 2005 - 2015

6.10 Cultural Resources

6.10.1 Preliminary Issues

Preliminary issues include potential impacts on archaeological sites, historical sites, Traditional Cultural Properties, cultural landscapes, archaeological districts, and historical buildings and structures. Portions of the Project area have been investigated for cultural resource sites as part of other known projects or resource management programs and these areas generally have demonstrated a high incidence of cultural resource sites. This is consistent with Native American use of region prior to settlement by Caucasian people of European descent. Therefore, the entire Project alignment likely contains cultural resource sites that may be affected by Project construction activities.

6.10.2 Known or Potential Project Impacts

The potential for Project impacts on cultural resources is predominantly associated with construction activities. Archaeological sites, historical sites, Traditional Cultural Properties, cultural landscapes, archaeological districts and historical buildings and structures within and near the Project boundaries have yet to be identified. Preliminary evaluation of available literature regarding areas within and adjacent to the Project boundaries has been performed. Project alignment areas with bedrock at the ground surface have a lower potential for containing lithic material; however, certain rock types were used for petroglyphs and other rock art, and these areas must be carefully investigated to determine the presence or absence of sites and the potential for impacts.

Traditional Cultural Properties (TCPs) identified by resource analysis within the Project area would require resource management agency and Native American Indian consultation to make sure that

identified sites within Project boundaries would remain respected, preserved and managed for continued recognized traditional uses. Potential TCPs are located near the Project alignment south of the Kaibab Indian Reservation near Kanab Creek canyon. These and other potential TCPs must be located and avoided during Project construction.

Operation and maintenance activities have little to no potential for impacts on cultural resources. One possible exception is that water discharged from blowoff valves during annual pipeline and penstock inspection and maintenance periods may erode soils along a receiving drainage and uncover one or more cultural resource site(s). Cultural resource investigations will be expanded beyond the Project boundaries as applicable to identify and document potential cultural resource sites and determine the potential for indirect impacts from the Project.

6.10.3 Preliminary Studies and Information Gathering Needs

Class I studies have been performed on specific sections of the Project pipeline and penstock alignment. The preliminary studies and information gathering needs will require Class I studies on the entire Project alignment. Literature search of appropriate repositories is an essential task to establish a baseline understanding of the nature, types, number, and density of cultural resources sites located within and near the Project corridors and facility locations. Site and survey data lying within a two-mile wide corridor (one mile either side of the proposed centerline of the pipeline and penstock alignment) should be obtained to help understand the nature of the cultural resources within the area and to help predict the density and types of resources that may be found along the Project corridor. It will be necessary to visit a number of state and federal government facilities, to copy appropriate cultural resource report and site information, and then to compile and analyze the data.

Initial research will begin at the State Historic Preservation Office (SHPO) in Salt Lake City and at the Arizona State Museum where a comprehensive database of site information and project reports for Utah and Arizona are housed. The databases at these locations are not complete, with many project reports and some site information residing in land management agency offices. Thus, in addition to the SHPO files, it will be necessary to visit and obtain information from BLM Cedar City (Cedar City), St. George (St. George), Kanab (Kanab), Escalante-Grand Staircase National Monument (Kanab), and Arizona Strip (St. George) Field Offices. In addition, it is likely that several other government offices will need to be visited for this purpose including the Glen Canyon National Recreation Area office in Page, Arizona, and, possibly, the Utah Department of Transportation Region 4 Office in Richfield, the Bureau of Reclamation, Provo Project Office, and the Arizona State Lands Office in Phoenix.

Historic research on the Project area will be an integral part of the cultural resources investigations. This research is a critical part of the initial overview document that outlines the history of the area encompassed by the Project, and will provide needed data to help evaluate known historic sites and those located as a result of the inventories carried out during the Class III inventory. It is proposed that the following facilities be researched to help understand historic use of the project area and complete the overview document.

- State Historic Preservation Office, Salt Lake City
- State Historic Library, Salt Lake City
- Arizona Historical Society Library, Tucson
- Southern Utah State University Library, Cedar City
- Cedar City Library, Cedar City
- Washington County Library, St. George
- Dixie College Library, St. George
- Kane County Library, Kanab

- Coconino County Library, Fredonia
- Other identified research facilities later identified

It will be necessary to carry out several tasks in order to determine the need for and the complexity of a Class III field inventory. These tasks will involve preparation of cultural resource overviews, including prehistory, ethnography and history of the Project area, as well as data gathering from a variety of sources. Preparation of the overview and acquisition of site and report data will be required to help support the Class III field inventory.

The Class III field inventory will be performed as necessary on the corridors and areas for the intake, pipeline, penstock, pump stations, power and transmission lines, roads, reservoirs, and hydro stations and related facilities. This will involve not only inventory, but also recording of all sites and isolates encountered as well as evaluation of these resources for eligibility to the NRHP.

6.10.4 Potential Protection, Mitigation and Enhancement Measures

Appropriate strategies would be used to protect sensitive cultural resource sites. Such strategies may include, but would not be limited to, avoiding the site, restricting access to the site using barriers, interpreting the resource, or if necessary, excavating, documenting and archiving the cultural resource. Should any cultural resources not identified by pre-construction surveys be encountered during construction, best management practices would be implemented to make sure that identified resources are contained and archived as required by state and national statute or tribal consultation.

A Programmatic Agreement with respect to the identification, evaluation and protection of sites eligible for the National Register of Historic Places will be developed for signature by FERC, other federal agencies with permitting authority, and the Arizona and Utah State Historic Preservation Officers, with the goal of providing for a Historic Properties Management Plan to be established prior to issuance of a FERC license and other federal authorizations. The Applicant and Indian tribes will be invited to concur.

6.10.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Arizona Strip Draft Environmental Impact Statement and Resource Management Plan
- Grand Staircase-Escalante National Monument Management Plan
- Kanab Field Office Resource Management Plan/EIS Final Analysis of the Management Situation
- Dixie Resource Area Proposed Management Plan and Final Environmental Impact Statement
- Cedar City Field Office Resource Management Plan
- Paria Management Framework Plan

6.11 Paleontological Resources

6.11.1 Preliminary Issues

Preliminary issues include impacts on paleontological localities, vertebrate and other fossils and paleontologically sensitive formations. Southwestern Utah and northern Arizona have a high potential for incidence of paleontological resources.

6.11.2 Known or Potential Project Impacts

Potential impacts on paleontological resources would occur primarily during construction and would include the disturbance and destruction of valuable fossils or geologic matter that may potentially provide data and information regarding ancient ecosystems within southern Utah and northern Arizona. Although various areas in and adjacent to Project boundaries have been evaluated for paleontologic sensitivity because of the high level of interest from paleontologists regarding the region, many areas, particularly those outside of managed public lands, have not been evaluated. Likewise, exhaustive analysis within managed lands has not been performed given the great expanse of territory potentially of value to the paleontologic community. Analysis of the Project alignment by qualified paleontological staff via field and literature analysis would be necessary to identify potential areas of paleontologic sensitivity within the Project boundaries. Areas identified as sensitive from such analysis would be addressed so that valuable paleontological sites are left undisturbed or handled in consultation with managing authorities.

There would not likely be ongoing operation and maintenance impacts on paleontological resources.

6.11.3 Preliminary Studies and Information Gathering Needs

Paleontological studies will be guided, in part, by a geologic formation classification system and a sensitivity classification of fossil localities, both suggested by the Bureau of Land Management (BLM) and modified from the Committee on Guidelines for Paleontological Collecting (Committee) (1987). The classification system for defining the paleontological sensitivity of geological formations consists of the following from the BLM:

Condition 1. Formations known to contain fossils of significant scientific interest, or where significant fossils (especially vertebrates) are likely to be discovered with detailed field work.

Condition 2. Formations where fossils are present, but by their nature are not anticipated to be of high scientific value.

Formations and deposits of Condition 1 sensitivity should be field examined wherever exposures occur within the Project corridor. Formations and deposits of Condition 2 sensitivity should be field examined at known localities and spot surveyed and sampled within the Project impact area. New localities should be recorded on Paleontological Locality Data Forms.

Few management documents address methods and requirements associated with paleontological protection. The Arizona Strip Draft Resource Management Plan and DEIS indicates that a records search and paleontological survey and/or monitoring would be required within certain sensitive areas within the Arizona Strip so that impacts on vertebrate fossils and uncommon invertebrate fossils may be minimized or mitigated. Screening would be required within the Arizona Strip to protect against the potential for the Project to affect vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Significant resources would be protected and evaluated to determine proper and needed protective measures to ensure their continued viability. Measures may include restricting surface disturbing activities (BLM 2007).

The Kanab Management Plan indicates that existing management practices inadequately address the protection of paleontological resources within the area. There is an identified need for additional programmatic decisions providing direction for protecting resources, but guidance within the Kanab Field Office management area is not currently provided within the management plan (USBR 2005). Further consultation is needed with federal agencies in areas where management plans do not dictate the management of paleontologic resources.

6.11.4 Potential Protection, Mitigation and Enhancement Measures

Standard construction and operating procedures including measures to avoid, minimize or reduce impacts on paleontological resources would be incorporated into the Project construction documents. Potential Project impacts would be mitigated to prevent or minimize disturbance and to avoid destruction of paleontological resources.

6.11.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Arizona Strip Draft Environmental Impact Statement and Resource Management Plan
- Grand Staircase-Escalante National Monument Management Plan
- Dixie Resource Area Proposed Management Plan and Final Environmental Impact Statement
- Cedar City Field Office Resource Management Plan

6.12 Socioeconomic Resources

6.12.1 Preliminary Issues

The following preliminary issues regarding socioeconomic resources have been identified:

- Demand for new water resources and power within the southwest Utah area
- Potential to accommodate or affect population and economic growth
- Consistency with state and regional water resource planning efforts
- Integration of water conservation and management programs
- Need for the Project even with new conservation and water management programs in place
- Cost-effectiveness of the Project
- Project affordability in the state and local communities
- Cost allocation among existing and new water users
- Typical residential water bill with the Project in place
- Impacts on local and regional socioeconomic resources from Project construction and operation
- Impact on local and regional socioeconomic resources without the Project

6.12.2 Known or Potential Project Impacts

Project construction would provide a short-term economic stimulus to southwest Utah, resulting in positive impacts on local employment, personal income (wages and salaries) and sales of goods and services. Project construction would provide a variety of temporary construction employment opportunities during its 5-year construction phase. Workers would be needed for construction of various project facilities, including intake structures, pump stations, pipelines, penstocks, hydro stations, regulating tanks, reservoirs, substations and power transmission lines. Project construction would require a typical mix of heavy construction labor skills. This would include heavy equipment operators, pipe fitters, welders, carpenters, masons, electricians, and general construction laborers. Local and regional contractors are available to work on the Project construction; however major construction companies from outside the region will compete for the work. Some portions of the Project would require more specialized and qualified labor, including construction of shafts and tunnels for the intake and hydro

facilities, and hydro stations. Specialized and more highly trained and qualified labor would potentially come from outside of the general project vicinity.

The Project is likely to increase short-term sales at local businesses because of Project expenditures and spending by construction workers and other persons employed as a direct result of Project construction. Therefore, employment opportunities would be generated in other sectors of the local economy as a result of income generated by employees directly working on Project construction activities.

Once operating, the Project would have a minor potential to stimulate the local economy during the operation and maintenance phase. Permanent positions would be created to operate and maintain the Project facilities. Workers would be needed to perform on-site operations at facility locations. Some Project facilities may be remotely monitored and operated, and not all Project facilities would require regular, full time employees. Maintenance activities would be performed by employees and if necessary, outside contractors may be brought in temporarily to assist with more complex maintenance activities.

The Project would annually provide approximately 70,000 acre-feet to WCWCD, 10,000 acre-feet to KCWCD, and 20,000 acre-feet to CICWCD (Lake Powell Pipeline Development Act 2006). This water would assist in meeting the future water demands to existing distribution systems within the WCWCD, KCWCD and CICWCD areas. The delivered water and power would be a critical part of the region's maintenance and development because water is necessary to maintain and support human populations, economies and livelihoods.

The Project would provide water and electricity to the currently served commercial and residential developments within district service areas, which would provide ongoing economic benefits to urban areas in the Project vicinity. Residential neighborhoods, commercial development, and business enterprises require a reliable supply of water and electricity to function. Certain economic sectors, such as recreation and tourism may be especially impacted by water shortages.

Project facility footprints would cover acreage that currently may be zoned for other uses. As a result, some land that may be utilized for other income-generating purposes such as recreation, agriculture, mining, grazing, or resource harvesting, may experience some production loss for use to site Project facilities.

The Project may be constructed by the UBWR or UBWR may contract with a qualified entity for the development or construction of the Project. The UBWR would wholesale the water to the conservancy districts, who would reimburse the State of Utah. Tax burdens and/or fee structures may differ among conservancy districts, and fees may increase in some instances. The Washington County Water Conservancy District will pay for the Project through impact fees assessed on new development, which under its current plans will increase at a rate of five percent per year.

The Project would provide cost-effective, reliable, renewable and green energy for consumers in the Project vicinity. Pump facilities at the Lake Powell intake structure and booster pump stations along the pipeline alignment would provide the approximate 2,500 foot lift needed to transport the water over the high point in the water conveyance system. The 3,000 foot drop between the high point and end of the penstock would be utilized to generate hydropower with new hydro stations. The power sales from the hydro stations would contribute to offsetting pumping costs, thereby reducing some Project costs and fulfilling public interest in energy generation.

6.12.3 Preliminary Studies and Information Gathering Needs

Socioeconomic analyses will involve collecting and compiling several different types of data. These data include State and regional population, services, employment, income, and other historical and forecast data and information. State and local water use data and forecasts will be analyzed to determine current use patterns and to project future water needs and use patterns.

6.12.4 Potential Protection, Mitigation and Enhancement Measures

Standard construction and operating procedures including measures to avoid, minimize or reduce impacts on socioeconomic resources would be incorporated into the Project construction documents.

6.12.5 Relevant Resource Management Plans

Relevant resource management plans include the following:

- Washington County's Urbanizing Region, An Element of the Washington County General Plan
- Iron County General Plan
- Kane County General Plan
- Washington County Water Conservancy District Water Conservation Plan
- Washington County Water Conservancy District Regional Water Capital Facilities Plan and Impact Fee Analysis
- Utah Board of Water Resource State Water Plan, Kanab Creek and Virgin River Basin
- Central Iron County Water Conservancy District Capital Facilities Plan and Impact Fee Analysis
- Central Iron County Water Management and Conservation Plan
- Washington County Water Management and Conservation Plan
- Utah's M&I Water Conservation Plan
- Utah Division of Water Resources, Cedar/Beaver Basin State Water Plan
- Kane County Water Conservancy District Water Management and Conservation Plan
- Kanab City Capital Facilities Plan and Development Impact Fee Analysis
- Water Conservation Plan for Cedar City, Utah
- Central Iron County Water Conservancy District Working Draft Capital Facilities Plan and Impact Fee Analysis
- Washington County Growth Scenarios Study
- Hurricane City Water Conservation Plan
- LaVerkin, Utah City Code: Water Conservation Plan Title 8

6.13 Transportation Resources

6.13.1 Preliminary Issues

The following preliminary issues regarding transportation resources have been identified:

- Impacts of providing water and electricity to the water conservancy district service areas on the existing transportation infrastructure
- Impacts of constructing the pipeline and penstock along highways and roads within southwest Utah and northern Arizona communities and counties
- Impacts on transportation networks from pipeline and penstock construction
- Impacts of the Project on roads and urban areas
- Impacts on traffic in the Glen Canyon NRA and GSENM?

6.13.2 Known or Potential Project Impacts

Vehicular transportation corridors within the Project area would be impacted during construction. Slight increases in traffic levels may occur because of normal construction activities and worker travel to and from active construction sites. Materials would be brought to various sites for construction of Project components and facilities, and in some cases may be removed from construction sites. Equipment would be transported to the construction sites, increasing truck traffic on most roads impacted by the Project. Construction workers would travel to and from work sites on a daily basis. This slight increase in road use may affect traffic volumes and have minor impacts on transportation use and routes in the Project vicinity.

The Project would parallel Interstate 15 and be constructed within the rights-of-way of U.S. Highways 89 and 89A, Arizona State Highway 389, and other roads. The Project construction would be situated outside of the running surface of roads, but would require some traffic control measures to slow traffic or limit use of lanes via lane closures within active construction areas. Temporary periods of full or half lane closures along transportation corridors may occur. Full road closures would not be anticipated because major road crossings would be tunneled via boring methods, leaving the road surfaces passable during construction periods to minimize public inconvenience. There are no anticipated long-term impacts on existing transportation networks.

The Project alignment would cross roads with low traffic volumes and low average daily traffic, and full roadway closures may briefly occur during construction, provided that jurisdictions allow such closures and that appropriate detour plans and traffic control plans are developed.

Permanent and temporary access roads would be constructed or upgraded by construction contractors for utilization during construction. Upon completion of construction, temporary access roads would be removed and areas would be restored to their original or better condition.

Trails located within the Project area may need to be re-routed or closed temporarily during construction activities. This may temporarily affect recreational traffic within recreation areas.

Air traffic and airport resources may experience negligible increases in use during construction activities.

Operation and maintenance activities would slightly increase vehicular traffic on highways and roads that provide access to the intake facilities at Lake Powell, booster pump stations, reservoirs, hydro stations, and substations. The increased traffic from Project operation and maintenance activities is expected to have negligible impacts on roads, highway, traffic and transportation networks.

Some permanent access roads would be constructed to provide access to the pipeline, penstock and related facilities. Some of these access roads may result in new access routes to previously inaccessible areas. These areas include the penstock alignment east, south and west of the Kaibab Indian Reservation as it crosses the Arizona Strip adjacent to the Navajo-McCullough Transmission Line, and through Canaan Gap north of the Utah-Arizona border. New access routes in these areas may create transportation corridors for utilization by off road vehicles and may create access points for hikers, OHV users, or others that were not as easily accessible prior to Project construction.

6.13.3 Preliminary Studies and Information Gathering Needs

The transportation resource analyses will involve collecting and compiling the following information and data:

- Baseline, historic, and projected Average Annual Daily Traffic (AADT) for major roadways
- Percentage of AADT occurring during peak traffic loads
- Baseline level of service (LOS) categories for major roadways
- Minimum acceptable LOS categories for different road types
- Projected and historic population data
- Rights-of-way along potentially impacted roads
- Length of new roads to be constructed
- Field survey of baseline roadway conditions including number of lanes, presence of shoulders, surfacing material, road condition, and level of development along the road corridor

6.13.4 Potential Protection, Mitigation and Enhancement Measures

Standard construction and operating procedures including measures to avoid, minimize or reduce impacts on transportation resources would be incorporated into the Project construction documents. Traffic Control Plans would be coordinated with and approved by appropriate jurisdictions to provide safe access and passage along transportation routes. In all cases, lane closures and traffic control would be temporary and would only occur during Project construction activities or during operational repair to Project facilities.

6.13.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Washington County's Urbanizing Region, An Element of the Washington County General Plan
- Iron County General Plan
- Kane County General Plan
- Washington County Growth Scenarios Study
- Grand Staircase-Escalante National Monument Management Plan
- Kanab Field Office RMP/EIS Final Analysis of the Management Situation
- Dixie Resource Area Proposed Management Plan and Final Environmental Impact Statement
- Arizona Strip EIS and Resource Management Plan
- Sand Hollow Recreation Area Recreation Management Plan
- Utah Department of Transportation Statewide Transportation Improvement Program
- Utah Department of Transportation Long-Range Transportation Plan 2007 – 2030
- Utah's Unified Transportation Plan 2007 – 2030

6.14 Air Quality

6.14.1 Preliminary Issues

Preliminary issues regarding air quality include impacts from fugitive dust and equipment emissions.

6.14.2 Known or Potential Project Impacts

Fugitive dust generated from disturbed land surfaces, soil stockpiles and vegetation removal would cause air quality impacts during Project construction. Construction equipment and machinery emissions and fumes from construction-associated chemicals may cause minor air quality impacts at a local scale.

Hydro power generated by the Project may positively affect the southwest Utah region by reducing local needs for power that might otherwise be generated via sources that can produce harmful air emissions.

The intake and booster pump stations would be equipped with on-site backup generators to provide electricity at some capacity during power outages. Emergency generator use, such as diesel-powered generators, would produce emissions that may affect air quality.

The power required to pump water from Lake Powell to the Project high point in the GSENM likely would be generated from a combination of hydro, coal-fired and combustion turbine generating stations. Emissions from the coal-fired and combustion turbine generators supplying power to the Project pump stations would cause air quality impacts outside of the Project region.

Fugitive dust currently causes air quality problems in southwest Utah. Project construction activities may generate fugitive dust from construction sites, unpaved roads, and pipeline and penstock corridors. Fugitive dust generated from Project construction activities may have cumulative impacts on air quality in the southwest Utah region and contribute to regional fugitive dust problems.

6.14.3 Preliminary Studies and Information Gathering Needs

The air quality analyses will involve collecting and compiling the following information and data:

- Air quality limits within the Project area (if any)
- Construction equipment and likely emissions
- Power generation facility emission data
- Pump station facility emission data
- Detailed emissions inventory from EPA's AP-42 document for a typical construction spread
- Air quality model results showing impacts for applicable areas in addition to historic climatic parameters
- Air quality attainment status
- Historic ambient air quality for the Project impact area
- Historic and projected population data

6.14.4 Potential Protection, Mitigation and Enhancement Measures

Standard construction and operating procedures including measures to avoid, minimize or reduce impacts on transportation resources would be incorporated into the Project construction documents. Fugitive dust control plans would be implemented as part of best management practices employed by the project and likely would include periodic spraying by water trucks on material stockpile and loose soils generated by grading activities.

6.14.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Washington County's Urbanizing Region, An Element of the Washington County General Plan
- Iron County General Plan
- Kane County General Plan
- Washington County Growth Scenarios Study

- Grand Staircase-Escalante National Monument Management Plan
- Kanab Field Office RMP/EIS Final Analysis of the Management Situation
- Dixie Resource Area Proposed Management Plan and Final Environmental Impact Statement
- Arizona Strip EIS and Resource Management Plan
- Sand Hollow Recreation Area Recreation Management Plan

6.15 Tribal Resources

6.15.1 Preliminary Issues

Preliminary issues include impacts on sacred sites, Traditional Cultural Properties (TCPs), reservation lands, Indian Trust Assets (ITAs), and other tribal resources.

6.15.2 Known or Potential Project Impacts

The Project construction would have no direct impacts on known sacred sites, TCPs, reservation lands, or other tribal resources. Potential direct impacts on ITAs would have to be determined after ITAs are identified and impacts on specific resources comprising ITAs are analyzed and documented. Project construction may have indirect impacts on sacred sites, TCPs, reservation lands, ITAs and other tribal resources. Potential indirect impacts may involve temporarily increased noise, fugitive dust, traffic on established transportation networks, and night lighting.

Project operation and maintenance would have no direct impacts on known sacred sites, TCPs, reservation lands, or other tribal resources. Potential direct impacts on ITAs would have to be determined after ITAs are identified and impacts on specific resources comprising ITAs are analyzed and documented. Project operation and maintenance activities may have indirect impacts on sacred sites, TCPs, reservation lands, ITAs and other tribal resources. Potential indirect impacts may involve increased fugitive dust, noise, traffic, and night lighting.

6.15.3 Preliminary Studies and Information Gathering Needs

Consultation with Native American Indian tribes and nations will be performed to identify tribal resources that may be affected by Project construction and operation and maintenance activities. Identified tribal resources will be studied and documented, and then analyzed to determine the intensity, duration and magnitude of potential impacts that may occur.

6.15.4 Potential Protection, Mitigation and Enhancement Measures

Standard construction and operating procedures including measures to avoid, minimize or reduce impacts on tribal resources would be incorporated into the Project construction documents.

6.15.5 Relevant Resource Management Plans

Relevant resource management plans and environmental impact studies include the following:

- Grand Staircase-Escalante National Monument Management Plan
- Kanab Field Office RMP/EIS Final Analysis of the Management Situation
- Dixie Resource Area Proposed Management Plan and Final Environmental Impact Statement
- Arizona Strip EIS and Resource Management Plan